

Large Synoptic Survey Telescope (LSST) Data Management

LSST Data Management Acceptance Test Specification

L.P. Guy, W.M. Wood-Vasey, E. Bellm, J.F. Bosch, J.L. Carlin, G.P. Dubois-Felsmann, M.L. Graham, R. Gruendl, K.S. Krughoff, K.-T. Lim, R.H. Lupton, C. Slater, G. Comoretto

LDM-639

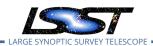
Latest Revision: 2020-02-17

This LSST document has been approved as a Content-Controlled Document by the LSST DM Change Control Board. If this document is changed or superseded, the new document will retain the Handle designation shown above. The control is on the most recent digital document with this Handle in the LSST digital archive and not printed versions. Additional information may be found in the corresponding DM RFC.



Abstract

This document describes the detailed acceptance test specification for the LSST Data Management System.



Change Record

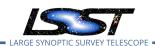
Version	Date	Description	Owner name
1.0	2019-02-07	Document first approved release. Approved	L. Guy
		on RFC-495.	
2.0	2019-07-29	Add test cases for all Priority 1a requirements.	Document: J. Carlin;
		Approved in RFC-622.	Approver:
			W. O'Mullane
2.1	2020-02-17	Consolidated test cases for DMTR-201 test ac-	J. Carlin
		tivity. Approved in RFC-669.	

Document curator: Leanne Guy

Document source location: https://github.com/lsst/ldm-639 from Jira

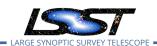
Version from source repository: 64caf94

LDM-639

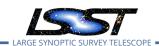


Contents

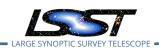
1	Intro	duction	1
	1.1	Objectives	1
	1.2	Scope	1
	1.3	Applicable Documents	2
	1.4	References	2
	1.5	Acronyms	3
2	Appro	pach	4
	2.1	Features to be tested	4
	2.2	Features not to be tested	5
	2.3	Pass/fail criteria	5
	2.4	Suspension criteria and resumption requirements	5
	2.5	Naming convention	5
3	Test C	Cases Summary	7
4	Active	e Test Cases	15
	4.1	LVV-T23 - Verify implementation of Storing Approximations of Per-pixel Metadata	15
	4.2	LVV-T24 - Verify implementation of Computing Derived Quantities	18
	4.3	LVV-T25 - Verify implementation of Denormalizing Database Tables	20
	4.4	LVV-T26 - Verify implementation of Maximum Likelihood Values and Covariances	21
	4.5	LVV-T27 - Verify implementation of Data Availability	24
	4.6	LVV-T28 - Verify implementation of Measurements in catalogs	25
	4.7	LVV-T29 - Verify implementation of Raw Science Image Data Acquisition	26
	4.8	LVV-T30 - Verify implementation of Wavefront Sensor Data Acquisition	28
	4.9	LVV-T31 - Verify implementation of Crosstalk Corrected Science Image Data Ac-	
			20
		quisition	29
	4.10		29 30
	4.10 4.11	LVV-T32 - Verify implementation of Raw Image Assembly	



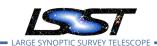
4.13	LVV-T35 - Verify implementation of Nightly Data Accessible Within 24 hrs	35
4.14	LVV-T36 - Verify implementation of Difference Exposures	38
4.15	LVV-T37 - Verify implementation of Difference Exposure Attributes	40
4.16	LVV-T38 - Verify implementation of Processed Visit Images	42
4.17	LVV-T39 - Verify implementation of Generate Photometric Zeropoint for Visit	
	Image	43
4.18	LVV-T40 - Verify implementation of Generate WCS for Visit Images	45
4.19	LVV-T41 - Verify implementation of Generate PSF for Visit Images	47
4.20	LVV-T42 - Verify implementation of Processed Visit Image Content	48
4.21	LVV-T43 - Verify implementation of Background Model Calculation	50
4.22	LVV-T44 - Verify implementation of Documenting Image Characterization $\ . \ . \ .$	52
4.23	LVV-T45 - Verify implementation of Prompt Processing Data Quality Report Def-	
	inition	53
4.24	LVV-T46 - Verify implementation of Prompt Processing Performance Report	
	Definition	55
4.25	LVV-T47 - Verify implementation of Prompt Processing Calibration Report Def-	
	inition	56
4.26	LVV-T48 - Verify implementation of Exposure Catalog	58
4.27	LVV-T49 - Verify implementation of DIASource Catalog	59
4.28	LVV-T50 - Verify implementation of Faint DIASource Measurements	61
4.29	LVV-T51 - Verify implementation of DIAObject Catalog	64
4.30	LVV-T52 - Verify implementation of DIAObject Attributes	65
4.31	LVV-T53 - Verify implementation of SSObject Catalog	67
4.32	LVV-T54 - Verify implementation of Alert Content	69
4.33	LVV-T55 - Verify implementation of DIAForcedSource Catalog	70
4.34	LVV-T56 - Verify implementation of Characterizing Variability	72
4.35	LVV-T57 - Verify implementation of Calculating SSObject Parameters	73
4.36	LVV-T58 - Verify implementation of Matching DIASources to Objects	75
4.37	LVV-T59 - Verify implementation of Regenerating L1 Data Products During Data	
	Release Processing	77



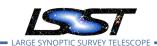
4.38	LVV-T60 - Verify implementation of Publishing predicted visit schedule	78
4.39	LVV-T61 - Verify implementation of Associate Sources to Objects	79
4.40	LVV-T62 - Verify implementation of Provide PSF for Coadded Images	81
4.41	LVV-T63 - Verify implementation of Produce Images for EPO	82
4.42	LVV-T64 - Verify implementation of Coadded Image Provenance	85
4.43	LVV-T65 - Verify implementation of Source Catalog	87
4.44	LVV-T66 - Verify implementation of Forced-Source Catalog	88
4.45	LVV-T67 - Verify implementation of Object Catalog	90
4.46	LVV-T68 - Verify implementation of Provide Photometric Redshifts of Galaxies	93
4.47	LVV-T69 - Verify implementation of Object Characterization	94
4.48	LVV-T71 - Verify implementation of Detecting extended low surface brightness	
	objects	96
4.49	LVV-T72 - Verify implementation of Coadd Image Method Constraints	97
4.50	LVV-T73 - Verify implementation of Deep Detection Coadds	99
4.51	LVV-T74 - Verify implementation of Template Coadds	100
4.52	LVV-T75 - Verify implementation of Multi-band Coadds	102
4.53	LVV-T76 - Verify implementation of All-Sky Visualization of Data Releases	103
4.54	LVV-T77 - Verify implementation of Best Seeing Coadds	105
4.55	LVV-T78 - Verify implementation of Persisting Data Products	107
4.56	LVV-T79 - Verify implementation of PSF-Matched Coadds	108
4.57	LVV-T80 - Verify implementation of Detecting faint variable objects	109
4.58	LVV-T81 - Verify implementation of Targeted Coadds	112
4.59	${\it LVV-T82-Verify}\ implementation\ of\ Tracking\ Characterization\ Changes\ Between$	
	Data Releases	113
4.60	LVV-T83 - Verify implementation of Bad Pixel Map	115
4.61	LVV-T84 - Verify implementation of Bias Residual Image	116
4.62	LVV-T85 - Verify implementation of Crosstalk Correction Matrix	119
4.63	LVV-T86 - Verify implementation of Illumination Correction Frame	120
4.64	LVV-T87 - Verify implementation of Monochromatic Flatfield Data Cube	122
4.65	LVV-T88 - Verify implementation of Calibration Data Products	123



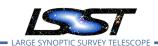
4.66	LVV-T89 - Verify implementation of Calibration Image Provenance	125
4.67	LVV-T90 - Verify implementation of Dark Current Correction Frame	126
4.68	LVV-T91 - Verify implementation of Fringe Correction Frame	128
4.69	LVV-T92 - Verify implementation of Processing of Data From Special Programs	129
4.70	LVV-T93 - Verify implementation of Level 1 Processing of Special Programs Data	131
4.71	LVV-T94 - Verify implementation of Special Programs Database	132
4.72	LVV-T95 - Verify implementation of Constraints on Level 1 Special Program	
	Products Generation	134
4.73	LVV-T96 - Verify implementation of Query Repeatability	136
4.74	LVV-T97 - Verify implementation of Uniqueness of IDs Across Data Releases .	137
4.75	LVV-T98 - Verify implementation of Selection of Datasets	139
4.76	LVV-T99 - Verify implementation of Processing of Datasets	141
4.77	LVV-T100 - Verify implementation of Transparent Data Access	142
4.78	LVV-T101 - Verify implementation of Transient Alert Distribution	143
4.79	$LVV-T102-Verify\ implementation\ of\ Solar\ System\ Objects\ Available\ Within\ Spec-like the properties of\ Solar\ System\ Objects\ Available\ Within\ Spec-like the properties of\ Solar\ System\ Objects\ Available\ Within\ Spec-like\ Spec-$	
	ified Time	145
4.80	LVV-T103 - Verify implementation of Generate Data Quality Report Within Spec-	
	ified Time	146
4.81	LVV-T104 - Verify implementation of Generate DMS Performance Report Within	
	Specified Time	147
4.82	LVV-T105 - Verify implementation of Generate Calibration Report Within Spec-	
	ified Time	149
4.83	LVV-T106 - Verify implementation of Calibration Images Available Within Spec-	
	ified Time	150
4.84	LVV-T107 - Verify implementation of Level-1 Production Completeness	151
4.85	LVV-T108 - Verify implementation of Level 1 Source Association	153
4.86	LVV-T109 - Verify implementation of SSObject Precovery	154
4.87	LVV-T110 - Verify implementation of DIASource Precovery	155
4.88	LVV-T111 - Verify implementation of Use of External Orbit Catalogs	156
4.89	LVV-T112 - Verify implementation of Alert Filtering Service	157



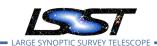
4.90	LVV-T113 - Verify implementation of Performance Requirements for LSST Alert	
	Filtering Service	159
4.91	LVV-T114 - Verify implementation of Pre-defined alert filters	160
4.92	LVV-T115 - Verify implementation of Calibration Production Processing	161
4.93	LVV-T116 - Verify implementation of Associating Objects across data releases	163
4.94	LVV-T117 - Verify implementation of DAC resource allocation for Level 3 pro-	
	cessing	164
4.95	LVV-T118 - Verify implementation of Level 3 Data Product Self Consistency	166
4.96	LVV-T119 - Verify implementation of Provenance for Level 3 processing at DACs	167
4.97	LVV-T120 - Verify implementation of Software framework for Level 3 catalog	
	processing	168
4.98	LVV-T121 - Verify implementation of Software framework for Level 3 image pro-	
	cessing	169
4.99	LVV-T122 - Verify implementation of Level 3 Data Import	171
4.100	LVV-T123 - Verify implementation of Access Controls of Level 3 Data Products	172
4.101	LVV-T124 - Verify implementation of Software Architecture to Enable Commu-	
	nity Re-Use	173
4.102	LVV-T125 - Verify implementation of Simulated Data	176
4.103	LVV-T126 - Verify implementation Image Differencing	177
4.104	LVV-T127 - Verify implementation of Provide Source Detection Software	179
4.105	LVV-T128 - Verify implementation Provide Astrometric Model	180
4.106	LVV-T129 - Verify implementation of Provide Calibrated Photometry	181
4.107	LVV-T130 - Verify implementation of Enable a Range of Shape Measurement	
	Approaches	183
4.108	LVV-T131 - Verify implementation of Provide User Interface Services	184
4.109	LVV-T132 - Verify implementation of Pre-cursor and Real Data	190
4.110	LVV-T133 - Verify implementation of Provide Beam Projector Coordinate Cal-	
	culation Software	191
4.111	LVV-T134 - Verify implementation of Provide Image Access Services	192
4.112	LVV-T136 - Verify implementation of Data Product and Raw Data Access	194



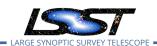
4.113	LVV-T137 - Verify implementation of Data Product Ingest	195
4.114	LVV-T138 - Verify implementation of Bulk Download Service	196
4.115	LVV-T140 - Verify implementation of Production Orchestration	198
4.116	LVV-T141 - Verify implementation of Production Monitoring	199
4.117	LVV-T142 - Verify implementation of Production Fault Tolerance	201
4.118	LVV-T144 - Verify implementation of Task Specification	202
4.119	LVV-T145 - Verify implementation of Task Configuration	203
4.120	LVV-T146 - Verify implementation of DMS Initialization Component	205
4.121	LVV-T147 - Verify implementation of Control of Level-1 Production	206
4.122	LVV-T148 - Verify implementation of Unique Processing Coverage	207
4.123	LVV-T149 - Verify implementation of Catalog Queries	208
4.124	LVV-T150 - Verify implementation of Maintain Archive Publicly Accessible	209
4.125	LVV-T151 - Verify Implementation of Catalog Export Formats From the Note-	
	book Aspect	211
4.126	LVV-T152 - Verify implementation of Keep Historical Alert Archive	214
4.127	LVV-T153 - Verify implementation of Provide Engineering and Facility Database	
	Archive	215
4.128	LVV-T154 - Verify implementation of Raw Data Archiving Reliability	216
4.129	LVV-T155 - Verify implementation of Un-Archived Data Product Cache $\ \ldots \ \ldots$	217
4.130	${\it LVV-T156-Verify\ implementation\ of\ Regenerate\ Un-archived\ Data\ Products}.$	219
4.131	LVV-T157 - Verify implementation Level 1 Data Product Access	220
4.132	LVV-T158 - Verify implementation Level 1 and 2 Catalog Access	221
4.133	LVV-T159 - Verify implementation of Regenerating Data Products from Previous	
	Data Releases	222
4.134	LVV-T160 - Verify implementation of Providing a Precovery Service	223
4.135	LVV-T161 - Verify implementation of Logging of catalog queries	225
4.136	LVV-T162 - Verify implementation of Access to Previous Data Releases	226
4.137	LVV-T163 - Verify implementation of Data Access Services	228
4.138	LVV-T164 - Verify implementation of Operations Subsets	229
4.139	LVV-T165 - Verify implementation of Subsets Support	230



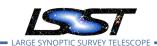
4.140	LVV-T166 - Verify implementation of Access Services Performance	231
4.141	${\it LVV-T167-Verify\ Capability\ to\ serve\ older\ Data\ Releases\ at\ Full\ Performance\ .}$	233
4.142	LVV-T168 - Verify design of Data Access Services allows Evolution of the LSST	
	Data Model	234
4.143	LVV-T169 - Verify implementation of Older Release Behavior	235
4.144	LVV-T170 - Verify implementation of Query Availability	236
4.145	LVV-T171 - Verify implementation of Pipeline Availability	237
4.146	LVV-T172 - Verify implementation of Optimization of Cost, Reliability and Avail-	
	ability	239
4.147	LVV-T173 - Verify implementation of Pipeline Throughput	240
4.148	LVV-T174 - Verify implementation of Re-processing Capacity	241
4.149	LVV-T175 - Verify implementation of Temporary Storage for Communications	
	Links	242
4.150	LVV-T176 - Verify implementation of Infrastructure Sizing for "catching up" $$.	243
4.151	LVV-T177 - Verify implementation of Incorporate Fault-Tolerance	244
4.152	LVV-T178 - Verify implementation of Incorporate Autonomics	246
4.153	LVV-T179 - Verify implementation of Compute Platform Heterogeneity	247
4.154	LVV-T180 - Verify implementation of Data Management Unscheduled Downtime	e248
4.155	LVV-T182 - Verify implementation of Prefer Computing and Storage Down	249
4.156	LVV-T183 - Verify implementation of DMS Communication with OCS $$	250
4.157	LVV-T185 - Verify implementation of Summit to Base Network Availability	252
4.158	LVV-T186 - Verify implementation of Summit to Base Network Reliability	253
4.159	LVV-T187 - Verify implementation of Summit to Base Network Secondary Link	255
4.160	LVV-T188 - Verify implementation of Summit to Base Network Ownership and	
	Operation	256
4.161	LVV-T189 - Verify implementation of Base Facility Infrastructure	257
4.162	LVV-T190 - Verify implementation of Base Facility Co-Location with Existing Facility	y259
4.163	LVV-T191 - Verify implementation of Commissioning Cluster	260
4.164	LVV-T192 - Verify implementation of Base Wireless LAN (WiFi)	261
4.165	LVV-T193 - Verify implementation of Base to Archive Network	262



4.166	LVV-1194 - Verify implementation of Base to Archive Network Availability	264
4.167	LVV-T195 - Verify implementation of Base to Archive Network Reliability	265
4.168	LVV-T196 - Verify implementation of Base to Archive Network Secondary Link	267
4.169	LVV-T197 - Verify implementation of Archive Center	268
4.170	LVV-T198 - Verify implementation of Archive Center Disaster Recovery	269
4.171	LVV-T199 - Verify implementation of Archive Center Co-Location with Existing	
	Facility	270
4.172	LVV-T200 - Verify implementation of Archive to Data Access Center Network .	272
4.173	LVV-T201 - Verify implementation of Archive to Data Access Center Network	
	Availability	273
4.174	LVV-T202 - Verify implementation of Archive to Data Access Center Network	
	Reliability	274
4.175	LVV-T203 - Verify implementation of Archive to Data Access Center Network	
	Secondary Link	276
4.176	LVV-T204 - Verify implementation of Access to catalogs for external Level 3 pro-	
	cessing	277
4.177	LVV-T205 - Verify implementation of Access to input catalogs for DAC-based	
	Level 3 processing	279
4.178	LVV-T206 - Verify implementation of Federation with external catalogs	280
4.179	LVV-T207 - Verify implementation of Access to images for external Level 3 pro-	
	cessing	281
4.180	LVV-T208 - Verify implementation of Access to input images for DAC-based	
	Level 3 processing	282
	LVV-T209 - Verify implementation of Data Access Centers	283
4.182	LVV-T210 - Verify implementation of Data Access Center Simultaneous Connec-	
	tions	284
4.183	LVV-T211 - Verify implementation of Data Access Center Geographical Distri-	
	bution	286
4.184	LVV-T212 - Verify implementation of No Limit on Data Access Centers	287
4.185	LVV-T376 - Verify the Calculation of Ellipticity Residuals and Correlations	288

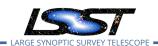


4.186	LVV-T377 - Verify Calculation of Photometric Performance Metrics	290
4.187	LVV-T378 - Verify Calculation of Astrometric Performance Metrics	292
4.188	LVV-T385 - Verify implementation of minimum number of simultaneous re-	
	trievals of CCD-sized coadd cutouts	294
4.189	LVV-T1097 - Verify Summit to Base Network Implementation	296
4.190	LVV-T1168 - Verify Summit - Base Network Integration	297
4.191	LVV-T1232 - Verify Implementation of Catalog Export Formats From the Portal	
	Aspect	299
4.192	LVV-T1240 - Verify implementation of minimum astrometric standards per CCD	302
4.193	LVV-T1250 - Verify implementation of minimum number of simultaneous DM	
	EFD query users	303
4.194	LVV-T1251 - Verify implementation of maximum time to retrieve DM EFD query	
	results	305
4.195	LVV-T1252 - Verify number of simultaneous alert filter users	306
4.196	LVV-T1264 - Verify implementation of archiving camera test data	308
4.197	LVV-T1276 - Verify implementation of latency of reporting optical transients .	309
4.198	LVV-T1277 - Verify processing of maximum number of calibration exposures .	311
4.199	LVV-T1332 - Verify implementation of maximum time for retrieval of CCD-sized	
	coadd cutouts	313
4.200	LVV-T1524 - Verify Implementation of Exporting MOCs as FITS	314
4.201	LVV-T1525 - Verify Implementation of Linkage Between HiPS Maps and Coad-	
	ded Images	315
4.202	LVV-T1526 - Verify Availability of Secure and Authenticated HiPS Service	316
4.203	LVV-T1527 - Verify Support for HiPS Visualization	318
4.204	LVV-T1528 - Verify Visualization of MOCs via Science Platform	319
4.205	LVV-T1529 - Verify Production of All-Sky HiPS Map	320
4.206	LVV-T1530 - Verify Production of Multi-Order Coverage Maps for Survey Data	321
4.207	LVV-T1560 - Verify archiving of processing provenance	322
4.208	LVV-T1561 - Verify provenance availability to science users	323
4.209	LVV-T1562 - Verify availability of re-run tools	325

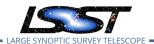


	4.210	LVV-11563 - Verify re-run on different system produces the same results	326
	4.211	LVV-T1564 - Verify re-run on similar system produces the same results	327
	4.212	LVV-T1745 - Verify calculation of median relative astrometric measurement er-	
		ror on 20 arcminute scales	328
	4.213	LVV-T1746 - Verify calculation of fraction of relative astrometric measurement	
		error on 5 arcminute scales exceeding outlier limit	330
	4.214	LVV-T1747 - Verify calculation of relative astrometric measurement error on 5	
		arcminute scales	332
	4.215	LVV-T1748 - Verify calculation of median error in absolute position for RA, Dec	
		axes	334
	4.216	LVV-T1749 - Verify calculation of fraction of relative astrometric measurement	
		error on 20 arcminute scales exceeding outlier limit	336
	4.217	LVV-T1750 - Verify calculation of separations relative to r-band exceeding color	
		difference outlier limit	338
	4.218	LVV-T1751 - Verify calculation of median relative astrometric measurement er-	
		ror on 200 arcminute scales	340
	4.219	LVV-T1752 - Verify calculation of fraction of relative astrometric measurement	
		error on 200 arcminute scales exceeding outlier limit	342
	4.220	LVV-T1753 - Verify calculation of RMS difference of separations relative to r-band	1344
	4.221	LVV-T1754 - Verify calculation of residual PSF ellipticity correlations for separa-	
			346
	4.222	LVV-T1755 - Verify calculation of residual PSF ellipticity correlations for separa-	
		tions less than 1 arcmin	347
	4.223	LVV-T1756 - Verify calculation of photometric repeatability in uzy filters	349
		LVV-T1757 - Verify calculation of photometric repeatability in gri filters	351
		LVV-T1758 - Verify calculation of photometric outliers in uzy bands	352
	4.226	LVV-T1759 - Verify calculation of photometric outliers in gri bands	354
5	Reusa	able Test Cases	357
	5.1	LVV-T837 - Authenticate to Notebook Aspect	357
	5.2	LVV-T838 - Access an empty notebook in the Notebook Aspect	358





Α	Trace	ability	370
6	Depre	ecated Test Cases	369
	5.14	LVV-T1744 - Run validate_drp on precursor data	368
	5.13	LVV-T1208 - Log out of the notebook aspect of the LSP	367
		aspect	366
	5.12	LVV-T1207 - Execute a simple ADQL query using the TAP service in the notebook	
	5.11	LVV-T1064 - Run Data Release Production Payload	365
	5.10	LVV-T1060 - Run Periodic Calibration Products Production Payload	365
	5.9	LVV-T1059 - Run Daily Calibration Products Update Payload	364
	5.8	LVV-T987 - Instantiate the Butler for reading data	363
	5.7	LVV-T901 - Run MOPS payload	362
	5.6	LVV-T866 - Run Alert Production Payload	361
	5.5	LVV-T860 - Initialize science pipelines	360
	5.4	LVV-T850 - Log out of the portal aspect of the LSP	359
	5.3	LVV-T849 - Authenticate to the portal aspect of the LSP	359



LSST Data Management Acceptance Test Specification

1 Introduction

This document is intended to specify the acceptance test procedures for the LSST Data Management System. It is a work in progress; the current version provides Test Cases covering $\sim 35\%$ of the requirements. It does not yet provide full Test Plans for comprehensive testing nor identify the fraction of each requirement covered by the existing Test Cases.

This document will be updated as work continues on completing Test Cases, Test Plans, and requirements coverage.

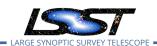
1.1 Objectives

This document describes the test cases required to validate the Data Management System requirements described in the LSST DM Subsystem Requirements document LSE-61. It identifies test cases and procedures for the tests as well as the pass/fail criteria for each test.

A full description of the LSST Data Management System is provided in the Data Management System Design document, LDM-148 with the science requirements detailed in the LSST Science Requirements Document LPM-17.

1.2 Scope

This document provides the acceptance test plan for the whole Data Management System (DMS), as described by the Data Management System Requirements in LSE-61.



1.3 Applicable Documents

LPM-17	LSST Science Requirements Document			
LDM-148	LSST Data Management System Design			
LDM-294	LSST DM Organization & Management			
LDM-503	LSST DM Test Plan			
LSE-61	LSST DM Subsystem Requirements			
LSE-163	LSST Data Products Definition Document			
LDM-151	LSST DM Science Pipelines Design			
LSE-180	Level 2 Photometric Calibration for the LSST Survey			
LSE-30	LSST Observatory System Specifications			

1.4 References

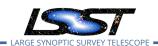
- [1] **[LSE-30]**, Claver, C.F., The LSST Systems Engineering Integrated Project Team, 2018, *Observatory System Specifications (OSS)*, LSE-30, URL https://ls.st/LSE-30
- [2] **[LSE-61]**, Dubois-Felsmann, G., Jenness, T., 2018, *LSST Data Management Subsystem Requirements*, LSE-61, URL https://ls.st/LSE-61
- [3] **[LDM-554]**, Dubois-Felsmann, G., Ciardi, D., Mueller, F., Economou, F., 2018, *Science Plat-form Requirements*, LDM-554, URL https://ls.st/LDM-554
- [4] **[LPM-17]**, Ivezić, Ž., The LSST Science Collaboration, 2018, *LSST Science Requirements Document*, LPM-17, URL https://ls.st/LPM-17
- [5] **[LSE-131]**, Jacoby, S., Emmons, B., Selvy, B., 2017, *Interface between Data Management and Education and Public Outreach*, LSE-131, URL https://ls.st/LSE-131
- [6] **[LSE-180]**, Jones, L., 2013, Level 2 Photometric Calibration for the LSST Survey, LSE-180, URL https://ls.st/LSE-180
- [7] **[LSE-163]**, Jurić, M., et al., 2017, LSST Data Products Definition Document, LSE-163, URL https://ls.st/LSE-163
- [8] [LDM-142], Kantor, J., 2017, Network Sizing Model, LDM-142, URL https://ls.st/LDM-142



- [9] **[LDM-148]**, Lim, K.T., Bosch, J., Dubois-Felsmann, G., et al., 2018, *Data Management System Design*, LDM-148, URL https://ls.st/LDM-148
- [10] **[LDM-294]**, O'Mullane, W., Swinbank, J., Jurić, M., DMLT, 2018, *Data Management Organization and Management*, LDM-294, URL https://ls.st/LDM-294
- [11] **[LDM-503]**, O'Mullane, W., Swinbank, J., Jurić, M., Economou, F., 2018, *Data Management Test Plan*, LDM-503, URL https://ls.st/LDM-503
- [12] **[LDM-151]**, Swinbank, J.D., et al., 2017, *Data Management Science Pipelines Design*, LDM-151, URL https://ls.st/LDM-151

1.5 Acronyms

Acronym	Description				
AP	Alerts Production				
С	Specific programming language (also called ANSI-C)				
CPP	C++ Programming language				
DAC	Data Access Center				
DB	DataBase				
DBB	Data BackBone				
DM	Data Management				
DMCCB	DM Change Control Board				
DMS	Data Management Sub-system				
DR	Data Release				
DRP	Data Release Production				
EFD	Engineering Facilities Database				
IT	Integration Test				
IVOA	International Virtual-Observatory Alliance				
K	Kelvin; SI unit of temperature				
LAN	Local Area Network				
LDM	LSST Data Management (handle for controlled documents)				
LPM	LSST Project Management (Document Handle)				
LSE	LSST Systems Engineering (Document Handle)				
LSP	LSST Science Platform				
LSST	Large Synoptic Survey Telescope				



М	Mega; SI units prefix for 1E6			
MOPS	Moving Object Pipeline System			
OCS	Observatory Control System			
PDAC	Prototype Data Access Center			
S	Strip (CCD chip along-scan coordinate identifier in focal plane)			
SODA	SCOS ORATOS Distributed Access			
SQL	Structured Query Language			
STS	System Test Specification			
W	Watt; SI unit of power			
р	pico; SI units prefix for 1E-12			

2 Approach

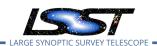
This document describes the acceptance tests for the integrated Data Management System, with a focus on whether the data products and functionality provided satisfy the requirements described in LSE-61.

The requirements from LSE-61 are extracted into the Jira "LSST Verification and Validation" Project, managed through the Jira Test Management Plugin system. Each LSE-61 requirement leads to a "LSST Verification and Validation" (LVV) Element. Each LVV Element comprises one or more more Test Cases. Each Test Case describes a Test Script to be executed, the coverage, pre-conditions, configuration, test results, and other details as specified by LDM-503. Test Scripts may have common set up and analysis steps. The Jira system allows for these steps to be shared by other Test Scripts. This improves clarity and consistency across all Test Cases.

In this document, each Test Case is listed here with the LVV Element it tests, a summary of the Test Items exercised by the Test Case, and the detailed steps to be executed by the Test Case. Shared steps between Test Scripts have been explicitly written out to appear fully in each Test Case.

2.1 Features to be tested

All top-level requirements for the LSST Data Management System described in LSE-61 are to be tested, including



- Data Products
- Alert, Calibration and Data Release Production
- LSST science pipeline software and middleware
- LSST facilities including the data archive, base, summit, and the communications between them to accept science and engineering data

2.2 Features not to be tested

This document does not describe facilities for periodically generating or collecting key performance metrics (KPMs), except insofar as those KPMs are incidentally measured as part of executing the documented test cases.

2.3 Pass/fail criteria

The results of all tests will be assessed using the criteria described in LDM-503 §4.

Note that when executing pipelines, tasks, or individual algorithms, any unexplained or unexpected errors or warnings appearing in the associated log or on screen output must be described in the documentation for the system under test. Any warning or error for which this is not the case must be filed as a software problem report and filed with the DMCCB.

2.4 Suspension criteria and resumption requirements

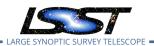
Refer to individual test cases where applicable.

2.5 Naming convention

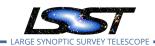
LVV: Is the label for the "LSST Verification and Validation" project in Jira.

LVV-XXX: Are Verification Elements, where XXX is the Verification Element identifier. Each Verification Element has at least one Test Case.

LVV-TYYY: Are Test Cases. Each Test Case is associated with a Verification Element, where YYY is the Test Case identifier.

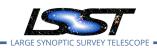


The Verification Elements are drawn from LSE-61 requirements which have names of the form DMS-REQ-ZZZZ.

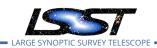


3 Test Cases Summary

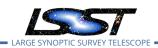
Test Id	Test Name				
LVV-T23	Verify implementation of Storing Approximations of Per-pixel Metadata				
LVV-T24	Verify implementation of Computing Derived Quantities				
LVV-T25	Verify implementation of Denormalizing Database Tables				
LVV-T26	Verify implementation of Maximum Likelihood Values and Covariances				
LVV-T27	Verify implementation of Data Availability				
LVV-T28	Verify implementation of Measurements in catalogs				
LVV-T29	Verify implementation of Raw Science Image Data Acquisition				
LVV-T30	Verify implementation of Wavefront Sensor Data Acquisition				
LVV-T31	Verify implementation of Crosstalk Corrected Science Image Data Acqui-				
	sition				
LVV-T32	Verify implementation of Raw Image Assembly				
LVV-T33	Verify implementation of Raw Science Image Metadata				
LVV-T34	Verify implementation of Guider Calibration Data Acquisition				
LVV-T35	Verify implementation of Nightly Data Accessible Within 24 hrs				
LVV-T36	Verify implementation of Difference Exposures				
LVV-T37	Verify implementation of Difference Exposure Attributes				
LVV-T38	Verify implementation of Processed Visit Images				
LVV-T39	Verify implementation of Generate Photometric Zeropoint for Visit Image				
LVV-T40	Verify implementation of Generate WCS for Visit Images				
LVV-T41	Verify implementation of Generate PSF for Visit Images				
LVV-T42	Verify implementation of Processed Visit Image Content				
LVV-T43	Verify implementation of Background Model Calculation				
LVV-T44	Verify implementation of Documenting Image Characterization				
LVV-T45	Verify implementation of Prompt Processing Data Quality Report Defini-				
	tion				
LVV-T46	Verify implementation of Prompt Processing Performance Report Defini-				
	tion				
LVV-T47	Verify implementation of Prompt Processing Calibration Report Definition				
LVV-T48	Verify implementation of Exposure Catalog				
LVV-T49	Verify implementation of DIASource Catalog				
LVV-T50	Verify implementation of Faint DIASource Measurements				
LVV-T51	Verify implementation of DIAObject Catalog				
LVV-T52	Verify implementation of DIAObject Attributes				



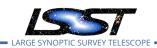
LVV-T54 Verify implementation of SSObject Catalog LVV-T54 Verify implementation of Alert Content LVV-T55 Verify implementation of DIAForcedSource Catalog LVV-T56 Verify implementation of Characterizing Variability LVV-T57 Verify implementation of Calculating SSObject Parameters LVV-T58 Verify implementation of Matching DIASources to Objects LVV-T59 Verify implementation of Regenerating L1 Data Products During Data Release Processing LVV-T60 Verify implementation of Publishing predicted visit schedule LVV-T61 Verify implementation of Associate Sources to Objects LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Provide PSF for Coadded Images LVV-T64 Verify implementation of Produce Images for EPO LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Object Catalog LVV-T69 Verify implementation of Detecting extended low surface brightness objects LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Deptection Coadds LVV-T73 Verify implementation of Template Coadds LVV-T74 Verify implementation of Multi-band Coadds LVV-T75 Verify implementation of All-Sky Visualization of Data Releases LVV-T76 Verify implementation of Persisting Data Products LVV-T77 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of Persisting Data Products	Test Id	Test Name					
LVV-T55 Verify implementation of DIAForcedSource Catalog LVV-T56 Verify implementation of Characterizing Variability LVV-T57 Verify implementation of Calculating SSObject Parameters LVV-T58 Verify implementation of Matching DIASources to Objects LVV-T59 Verify implementation of Regenerating L1 Data Products During Data Release Processing LVV-T60 Verify implementation of Publishing predicted visit schedule LVV-T61 Verify implementation of Associate Sources to Objects LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T69 Verify implementation of Detecting extended low surface brightness objects LVV-T71 Verify implementation of Coadd Image Method Constraints LVV-T72 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of Best Seeing Coadds LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of Persisting Data Products	LVV-T53	Verify implementation of SSObject Catalog					
LVV-T56 Verify implementation of Characterizing Variability LVV-T57 Verify implementation of Calculating SSObject Parameters LVV-T58 Verify implementation of Matching DIASources to Objects LVV-T59 Verify implementation of Regenerating L1 Data Products During Data Release Processing LVV-T60 Verify implementation of Publishing predicted visit schedule LVV-T61 Verify implementation of Associate Sources to Objects LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Deep Detection Coadds LVV-T73 Verify implementation of Template Coadds LVV-T74 Verify implementation of Multi-band Coadds LVV-T75 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T54	Verify implementation of Alert Content					
LVV-T57 Verify implementation of Calculating SSObject Parameters LVV-T58 Verify implementation of Matching DIASources to Objects LVV-T59 Verify implementation of Regenerating L1 Data Products During Data Release Processing LVV-T60 Verify implementation of Publishing predicted visit schedule LVV-T61 Verify implementation of Associate Sources to Objects LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of PSF-Matched Coadds LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T55	· .					
LVV-T58 Verify implementation of Matching DIASources to Objects LVV-T59 Verify implementation of Regenerating L1 Data Products During Data Release Processing LVV-T60 Verify implementation of Publishing predicted visit schedule LVV-T61 Verify implementation of Associate Sources to Objects LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of Best Seeing Coadds LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of Persisting Data Products	LVV-T56						
LVV-T59 Verify implementation of Regenerating L1 Data Products During Data Release Processing LVV-T60 Verify implementation of Publishing predicted visit schedule LVV-T61 Verify implementation of Associate Sources to Objects LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of PSF-Matched Coadds LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T57						
LVV-T60 Verify implementation of Publishing predicted visit schedule LVV-T61 Verify implementation of Associate Sources to Objects LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of Best Seeing Coadds LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of PSF-Matched Coadds	LVV-T58	Verify implementation of Matching DIASources to Objects					
LVV-T60 Verify implementation of Publishing predicted visit schedule LVV-T61 Verify implementation of Associate Sources to Objects LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T59	Verify implementation of Regenerating L1 Data Products During Data Re-					
LVV-T61 Verify implementation of Associate Sources to Objects LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of Best Seeing Coadds LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of PSF-Matched Coadds		ase Processing					
LVV-T62 Verify implementation of Provide PSF for Coadded Images LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T60	Verify implementation of Publishing predicted visit schedule					
LVV-T63 Verify implementation of Produce Images for EPO LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of PSF-Matched Coadds	LVV-T61	Verify implementation of Associate Sources to Objects					
LVV-T64 Verify implementation of Coadded Image Provenance LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Persisting Data Products LVV-T78 Verify implementation of PSF-Matched Coadds LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T62	Verify implementation of Provide PSF for Coadded Images					
LVV-T65 Verify implementation of Source Catalog LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T63	Verify implementation of Produce Images for EPO					
LVV-T66 Verify implementation of Forced-Source Catalog LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T64	,					
LVV-T67 Verify implementation of Object Catalog LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T65	Verify implementation of Source Catalog					
LVV-T68 Verify implementation of Provide Photometric Redshifts of Galaxies LVV-T69 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T66	5					
LVV-T71 Verify implementation of Object Characterization LVV-T71 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T67	Verify implementation of Object Catalog					
LVV-T72 Verify implementation of Detecting extended low surface brightness objects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T68						
jects LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T69	Verify implementation of Object Characterization					
LVV-T72 Verify implementation of Coadd Image Method Constraints LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T71	Verify implementation of Detecting extended low surface brightness ob-					
LVV-T73 Verify implementation of Deep Detection Coadds LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds		jects					
LVV-T74 Verify implementation of Template Coadds LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T72	Verify implementation of Coadd Image Method Constraints					
LVV-T75 Verify implementation of Multi-band Coadds LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T73	Verify implementation of Deep Detection Coadds					
LVV-T76 Verify implementation of All-Sky Visualization of Data Releases LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T74	Verify implementation of Template Coadds					
LVV-T77 Verify implementation of Best Seeing Coadds LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T75	Verify implementation of Multi-band Coadds					
LVV-T78 Verify implementation of Persisting Data Products LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T76	Verify implementation of All-Sky Visualization of Data Releases					
LVV-T79 Verify implementation of PSF-Matched Coadds	LVV-T77	Verify implementation of Best Seeing Coadds					
	LVV-T78	Verify implementation of Persisting Data Products					
I.W. T80 Varify implementation of Detecting faint variable chiects	LVV-T79	Verify implementation of PSF-Matched Coadds					
LVV-100 verify implementation of Detecting faint variable objects	LVV-T80	Verify implementation of Detecting faint variable objects					
LVV-T81 Verify implementation of Targeted Coadds	LVV-T81	Verify implementation of Targeted Coadds					
LVV-T82 Verify implementation of Tracking Characterization Changes Between	LVV-T82	Verify implementation of Tracking Characterization Changes Between					
Data Releases		Data Releases					
LVV-T83 Verify implementation of Bad Pixel Map	LVV-T83	Verify implementation of Bad Pixel Map					
LVV-T84 Verify implementation of Bias Residual Image	LVV-T84	Verify implementation of Bias Residual Image					



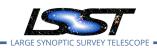
Test Id	Test Name				
LVV-T85	Verify implementation of Crosstalk Correction Matrix				
LVV-T86	Verify implementation of Illumination Correction Frame				
LVV-T87	Verify implementation of Monochromatic Flatfield Data Cube				
LVV-T88	Verify implementation of Calibration Data Products				
LVV-T89	Verify implementation of Calibration Image Provenance				
LVV-T90	Verify implementation of Dark Current Correction Frame				
LVV-T91	Verify implementation of Fringe Correction Frame				
LVV-T92	Verify implementation of Processing of Data From Special Programs				
LVV-T93	Verify implementation of Level 1 Processing of Special Programs Data				
LVV-T94	Verify implementation of Special Programs Database				
LVV-T95	Verify implementation of Constraints on Level 1 Special Program Products Generation				
LVV-T96	Verify implementation of Query Repeatability				
LVV-T97	Verify implementation of Uniqueness of IDs Across Data Releases				
LVV-T98	Verify implementation of Selection of Datasets				
LVV-T99	Verify implementation of Processing of Datasets				
LVV-T100	Verify implementation of Transparent Data Access				
LVV-T101	Verify implementation of Transient Alert Distribution				
LVV-T102	Verify implementation of Solar System Objects Available Within Specified				
	Time				
LVV-T103	Verify implementation of Generate Data Quality Report Within Specified Time				
LVV-T104	Verify implementation of Generate DMS Performance Report Within Specified Time				
LVV-T105	Verify implementation of Generate Calibration Report Within Specific				
	Time				
LVV-T106	Verify implementation of Calibration Images Available Within Specifie Time				
LVV-T107	Verify implementation of Level-1 Production Completeness				
LVV-T108	Verify implementation of Level 1 Source Association				
LVV-T109	Verify implementation of SSObject Precovery				
LVV-T110	Verify implementation of DIASource Precovery				
LVV-T111	Verify implementation of Use of External Orbit Catalogs				
LVV-T112	Verify implementation of Alert Filtering Service				
	<u> </u>				



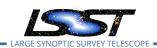
Test Id	Test Name				
LVV-T113	Verify implementation of Performance Requirements for LSST Alert Filt ing Service				
LVV-T114	Verify implementation of Pre-defined alert filters				
LVV-T115	Verify implementation of Calibration Production Processing				
LVV-T116	Verify implementation of Associating Objects across data releases				
LVV-T117	Verify implementation of DAC resource allocation for Level 3 processing				
LVV-T118	Verify implementation of Level 3 Data Product Self Consistency				
LVV-T119	Verify implementation of Provenance for Level 3 processing at DACs				
LVV-T120	Verify implementation of Software framework for Level 3 catalog processing				
LVV-T121	Verify implementation of Software framework for Level 3 image processing				
LVV-T122	Verify implementation of Level 3 Data Import				
LVV-T123	Verify implementation of Access Controls of Level 3 Data Products				
LVV-T124	Verify implementation of Software Architecture to Enable Community Re- Use				
LVV-T125	Verify implementation of Simulated Data				
LVV-T126	Verify implementation Image Differencing				
LVV-T127	Verify implementation of Provide Source Detection Software				
LVV-T128	Verify implementation Provide Astrometric Model				
LVV-T129	Verify implementation of Provide Calibrated Photometry				
LVV-T130	Verify implementation of Enable a Range of Shape Measurement Approaches				
LVV-T131	Verify implementation of Provide User Interface Services				
LVV-T132	Verify implementation of Pre-cursor and Real Data				
LVV-T133	Verify implementation of Provide Beam Projector Coordinate Calculation Software				
LVV-T134	Verify implementation of Provide Image Access Services				
LVV-T136	Verify implementation of Data Product and Raw Data Access				
LVV-T137	Verify implementation of Data Product Ingest				
LVV-T138	Verify implementation of Bulk Download Service				
LVV-T140	Verify implementation of Production Orchestration				
LVV-T141	Verify implementation of Production Monitoring				
LVV-T142	Verify implementation of Production Fault Tolerance				



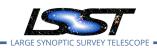
Test Id	Test Name					
LVV-T144	Verify implementation of Task Specification					
LVV-T145	Verify implementation of Task Configuration					
LVV-T146	Verify implementation of DMS Initialization Component					
LVV-T147	Verify implementation of Control of Level-1 Production					
LVV-T148	Verify implementation of Unique Processing Coverage					
LVV-T149	Verify implementation of Catalog Queries					
LVV-T150	Verify implementation of Maintain Archive Publicly Accessible					
LVV-T151	Verify Implementation of Catalog Export Formats From the Notebook Aspect					
LVV-T152	Verify implementation of Keep Historical Alert Archive					
LVV-T153	Verify implementation of Provide Engineering and Facility Database Archive					
LVV-T154	Verify implementation of Raw Data Archiving Reliability					
LVV-T155	Verify implementation of Un-Archived Data Product Cache					
LVV-T156	Verify implementation of Regenerate Un-archived Data Products					
LVV-T157	Verify implementation Level 1 Data Product Access					
LVV-T158	Verify implementation Level 1 and 2 Catalog Access					
LVV-T159	Verify implementation of Regenerating Data Products from Previous Data Releases					
LVV-T160	Verify implementation of Providing a Precovery Service					
LVV-T161	Verify implementation of Logging of catalog queries					
LVV-T162	Verify implementation of Access to Previous Data Releases					
LVV-T163	Verify implementation of Data Access Services					
LVV-T164	Verify implementation of Operations Subsets					
LVV-T165	Verify implementation of Subsets Support					
LVV-T166	Verify implementation of Access Services Performance					
LVV-T167	Verify Capability to serve older Data Releases at Full Performance					
LVV-T168	Verify design of Data Access Services allows Evolution of the LSST Data Model					
LVV-T169	Verify implementation of Older Release Behavior					
LVV-T170	Verify implementation of Query Availability					
LVV-T171	Verify implementation of Pipeline Availability					
LVV-T172	Verify implementation of Optimization of Cost, Reliability and Availability					
LVV-T173	Verify implementation of Pipeline Throughput					



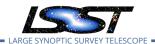
LVV-T174 Verify implementation of Re-processing Capacity LVV-T175 Verify implementation of Temporary Storage for Communications Links LVV-T176 Verify implementation of Infrastructure Sizing for "catching up"				
	;			
LVV-T176 Verify implementation of Infrastructure Sizing for "catching up"				
- 1				
LVV-T177 Verify implementation of Incorporate Fault-Tolerance				
LVV-T178 Verify implementation of Incorporate Autonomics				
LVV-T179 Verify implementation of Compute Platform Heterogeneity				
LVV-T180 Verify implementation of Data Management Unscheduled Downtime				
LVV-T182 Verify implementation of Prefer Computing and Storage Down				
LVV-T183 Verify implementation of DMS Communication with OCS				
LVV-T185 Verify implementation of Summit to Base Network Availability				
LVV-T186 Verify implementation of Summit to Base Network Reliability				
LVV-T187 Verify implementation of Summit to Base Network Secondary Link				
LVV-T188 Verify implementation of Summit to Base Network Ownership and Ope	r-			
ation				
LVV-T189 Verify implementation of Base Facility Infrastructure				
LVV-T190 Verify implementation of Base Facility Co-Location with Existing Facility				
LVV-T191 Verify implementation of Commissioning Cluster				
LVV-T192 Verify implementation of Base Wireless LAN (WiFi)				
LVV-T193 Verify implementation of Base to Archive Network	•			
LVV-T194 Verify implementation of Base to Archive Network Availability				
LVV-T195 Verify implementation of Base to Archive Network Reliability				
LVV-T196 Verify implementation of Base to Archive Network Secondary Link				
LVV-T197 Verify implementation of Archive Center	Verify implementation of Archive Center			
LVV-T198 Verify implementation of Archive Center Disaster Recovery				
LVV-T199 Verify implementation of Archive Center Co-Location with Existing Facility	:у			
LVV-T200 Verify implementation of Archive to Data Access Center Network	Verify implementation of Archive to Data Access Center Network			
LVV-T201 Verify implementation of Archive to Data Access Center Network Availabi	Verify implementation of Archive to Data Access Center Network Availabil-			
ity				
LVV-T202 Verify implementation of Archive to Data Access Center Network Reliabi	-			
ity				
LVV-T203 Verify implementation of Archive to Data Access Center Network Se	C-			
ondary Link				
LVV-T204 Verify implementation of Access to catalogs for external Level 3 process	5-			
ing				



Test Id	Test Name				
LVV-T205	Verify implementation of Access to input catalogs for DAC-based Level 3 processing				
LVV-T206	Verify implementation of Federation with external catalogs				
LVV-T207	Verify implementation of Access to images for external Level 3 processing				
LVV-T208	Verify implementation of Access to input images for DAC-based Level 3 processing				
LVV-T209	Verify implementation of Data Access Centers				
LVV-T210	Verify implementation of Data Access Center Simultaneous Connections				
LVV-T211	Verify implementation of Data Access Center Geographical Distribution				
LVV-T212	Verify implementation of No Limit on Data Access Centers				
LVV-T376	Verify the Calculation of Ellipticity Residuals and Correlations				
LVV-T377	Verify Calculation of Photometric Performance Metrics				
LVV-T378	Verify Calculation of Astrometric Performance Metrics				
LVV-T385	V-T385 Verify implementation of minimum number of simultaneous retrieva				
	CCD-sized coadd cutouts				
LVV-T1097	Verify Summit to Base Network Implementation				
LVV-T1168	Verify Summit - Base Network Integration				
LVV-T1232	Verify Implementation of Catalog Export Formats From the Portal Aspect				
LVV-T1240	Verify implementation of minimum astrometric standards per CCD				
LVV-T1250	Verify implementation of minimum number of simultaneous DM EFD query users				
LVV-T1251	Verify implementation of maximum time to retrieve DM EFD query res				
LVV-T1252	Verify number of simultaneous alert filter users				
LVV-T1264	Verify implementation of archiving camera test data				
LVV-T1276	Verify implementation of latency of reporting optical transients				
LVV-T1277	Verify processing of maximum number of calibration exposures				
LVV-T1332	Verify implementation of maximum time for retrieval of CCD-sized coadd cutouts				
LVV-T1524	Verify Implementation of Exporting MOCs as FITS				
LVV-T1525	Verify Implementation of Linkage Between HiPS Maps and Coadded Images				
LVV-T1526	Verify Availability of Secure and Authenticated HiPS Service				
LVV-T1527	Verify Support for HiPS Visualization				
LVV-T1528	Verify Visualization of MOCs via Science Platform				



Test Id	Test Name			
LVV-T1529	Verify Production of All-Sky HiPS Map			
LVV-T1530	Verify Production of Multi-Order Coverage Maps for Survey Data			
LVV-T1560	Verify archiving of processing provenance			
LVV-T1561	Verify provenance availability to science users			
LVV-T1562	Verify availability of re-run tools			
LVV-T1563	Verify re-run on different system produces the same results			
LVV-T1564	Verify re-run on similar system produces the same results			
LVV-T1745	Verify calculation of median relative astrometric measurement error on			
	20 arcminute scales			
LVV-T1746	Verify calculation of fraction of relative astrometric measurement error			
	on 5 arcminute scales exceeding outlier limit			
LVV-T1747 Verify calculation of relative astrometric measurement error on				
	cminute scales			
LVV-T1748	Verify calculation of median error in absolute position for RA, Dec as			
LVV-T1749	Verify calculation of fraction of relative astrometric measurement error			
	on 20 arcminute scales exceeding outlier limit			
LVV-T1750	Verify calculation of separations relative to r-band exceeding color differ-			
	ence outlier limit			
LVV-T1751	Verify calculation of median relative astrometric measurement error on			
	200 arcminute scales			
LVV-T1752	Verify calculation of fraction of relative astrometric measurement error			
	on 200 arcminute scales exceeding outlier limit			
LVV-T1753	Verify calculation of RMS difference of separations relative to r-band			
LVV-T1754	, ,			
	less than 5 arcmin			
LVV-T1755	1 7			
	less than 1 arcmin			
LVV-T1756	Verify calculation of photometric repeatability in uzy filters			
LVV-T1757	Verify calculation of photometric repeatability in gri filters			
LVV-T1758	Verify calculation of photometric outliers in uzy bands			
LVV-T1759	Verify calculation of photometric outliers in gri bands			



4 Active Test Cases

This section documents all active test cases that have a status in the Jira/ATM system of Draft, Defined or Approved.

4.1 LVV-T23 - Verify implementation of Storing Approximations of Per-pixel Metadata

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff
Open LVV-T23 in Jira				

4.1.1 Verification Elements

• LVV-157 - DMS-REQ-0326-V-01: Storing Approximations of Per-pixel Metadata

4.1.2 Test Items

Test Items

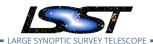
Show that the compressed form depth and mask maps adequately represents the exact version of the same information.

4.1.3 Predecessors

4.1.4 Environment Needs

4.1.4.1 Software

4.1.4.2 Hardware



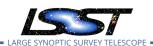
4.1.5 Input Specification

Test data: A data repository containing a full DRP data reduction of the HSC PDR dataset.

4.1.6 Output Specification

4.1.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash
		From the command line, execute the commands below in the example code:
	Test Data Expected	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data Expected Result	Butler repo available for reading.
3	Description	For each of the expected data products types (listed in Test Items section \$\textstyle \textstyle 4.3.2\$) and each of the expected units (PVIs, coadds, etc), retrieve the data product from the Butler and verify that it is non-empty.
	Test Data	No data.



Step	Description, Input Data and Expected Result			
	Expected			
	Result			
	Description	Create the coadd pixel level depth map for the HSC PDR dataset.		
4	Test Data	No data.		
	Expected			
	Result			
	Description	Generate compressed representation of the pixel level depth map.		
5	Test Data	No data.		
	Expected			
	Result			
	Description	Create the coadd pixel level mask map for the HSC PDR dataset.		
6	Test Data	No data.		
	Expected			
	Result			
	Description	Generate compressed representation of the mask map.		
7	Test Data	No data.		
	Expected			
-	Result			
	Description	Sample randomly from both the pixel level and compressed depth maps. Compare the		
8		distribution of depths sampled from the pixel level depth map to that sampled from the		
	Test Data	compressed representation. No data.		
	Expected	No data.		
	Result			
	Description	Divide the mask planes into two groups: INFO and BAD. BAD flags are any that would		
9	Bescription	cause a particular pixel to be excluded from processing: e.g. EDGE, SAT, BAD. Sample		
		masks from both the pixel level mask map and the compressed mask map.		
		For each sample, compute sum(mask_pixel xor mask_compressed). Produce the distri-		
		bution of the number of bits that differ between the samples.		
		Repeat for both the INFO flags and the BAD flags.		
	Test Data	No data.		

LDM-639

Step	Description, Input Data and Expected Result			
	Expected			
	Result			

4.2 LVV-T24 - Verify implementation of Computing Derived Quantities

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Melissa Graham	
Open LVV-T24 in Jira					

4.2.1 Verification Elements

• LVV-162 - DMS-REQ-0331-V-01: Computing Derived Quantities

4.2.2 Test Items

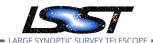
To confirm that common derived quantities (apparent magnitude, FWHM in arcsec, ellipticity) are available to an end-user by, e.g., ensuring a color-color diagram is easy to construction, fitting functions to derived data, or generating other common scientific derivatives.

4.2.3 Predecessors

4.2.4 Environment Needs

4.2.4.1 Software

4.2.4.2 Hardware



4.2.5 Input Specification

Example data set (e.g., non-LSST or LSST commissioning) loaded into the Science Platform in a format consistent with the DPDD.

4.2.6 Output Specification

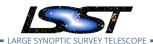
Result

3

4.2.7 Test Procedure

Step	Description, l	Input Data and Expected Result
1-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("Isst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash
		From the command line, execute the commands below in the example code:
	Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.

Description	For each of the expected data product types (listed in Test Items section 004.3.2) and each of the expected units (PVIs, coadds, etc), retrieve the data product from the Butler
	and verify it to be non-empty.
Test Data	No data.



Step	Description, Input Data and Expected Result			
	Expected			
	Result			
	Description	Load into DPDD+Science Platform		
4	Test Data	No data.		
	Expected			
	Result			
	Description	Constructing color-color diagram and fitting stellar locus in Science Platform.		
5	Test Data	No data.		
	Expected			
	Result			
	Description	Invite three members of commissioning team to create color-color diagram from coadd		
6		catalogs based on merged coadd reference catalog.		
	Test Data	No data.		
	Expected			
	Result			

4.3 LVV-T25 - Verify implementation of Denormalizing Database Tables

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Colin Slater		
Open LVV-T25 in Jira						

4.3.1 Verification Elements

• LVV-163 - DMS-REQ-0332-V-01: Denormalizing Database Tables

4.3.2 Test Items

Verify that commonly useful views of data are easy to obtain through the Science Platform.

LDM-639

4.3.3 Predecessors

4.3.4 Environment Needs

4.3.4.1 **Software**

4.3.4.2 Hardware

4.3.5 Input Specification

4.3.6 Output Specification

4.3.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Connect to the Science Platform's portal query interface.		
1	Test Data	No data.		
	Expected			
	Result			
	Description	List the available views in the database.		
2	Test Data	No data.		
	Expected			
	Result			
	Description	Take 20 sampled queries and determine which are easily done on views and which require		
3		complicated joins. Discuss the complicated ones and determine if any could be simplified		
		by adding additional views.		
	Test Data	No data.		
	Expected			
	Result			

4.4 LVV-T26 - Verify implementation of Maximum Likelihood Values and Covariances



Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Jim Bosch		
Open LVV-T26 in Jira						

4.4.1 Verification Elements

• LVV-164 - DMS-REQ-0333-V-01: Maximum Likelihood Values and Covariances

4.4.2 Test Items

- Check that all measurements in source and object schemas include columns containing uncertainties, including covariances between jointly-measured quantities.
- Check that all model-fit measurements in source and object schemas include columns that report goodness-of-fit.
- Check that most sources and objects with successful measurements report finite uncertainty values for those measurements.
- Check that most sources and objects with successful model-fit measurements report finite goodness-of-fit values.

4.4.3 Predecessors

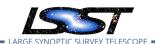
4.4.4 Environment Needs

4.4.4.1 **Software**

4.4.4.2 Hardware

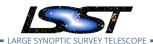
4.4.5 Input Specification

4.4.6 Output Specification



4.4.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("Isst-dev"): /software/Isstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/Isst/software/stack/loadLSST.bash
		From the command line, execute the commands below in the example code:
	Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- lowing:
LVV-T987	Test Data Expected Result	Butler repo available for reading.
3	Description	For each of the expected data product types (listed in Test Items section \$\pi \pi 4.3.2\$) and each of the expected units (PVIs, coadds, etc), retrieve the data product from the Butler and verify it to be non-empty.
	Test Data	No data.
	Expected	
	Result	
4	Description	Verify that maximum likelihood and covariant quantities are provided. Test and manually inspect that they are reasonable (finite, appropriately normed).
-	Test Data	No data.
	Expected Result	



4.5 LVV-T27 - Verify implementation of Data Availability

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Gregory Dubois-Felsmann	
Open IVV T27 in line					

Open LVV-T27 in Jira

4.5.1 Verification Elements

• LVV-177 - DMS-REQ-0346-V-01: Data Availability

4.5.2 Test Items

Determine if all required categories of raw data (specifically enumerated: raw exposures, calibration frames, telemetry, configuration metadata) can be located through the Science Platform and are available for download. Verify through (1) administrative review; (2) checking with precursor data; (3) checking on early data feeds from the Summit such as from AuxTel and ComCam.

4.5.3 Predecessors

4.5.4 Environment Needs

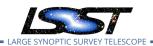
4.5.4.1 Software

4.5.4.2 Hardware

4.5.5 Input Specification

4.5.6 Output Specification

4.5.7 Test Procedure



Step	Description, Input Data and Expected Result			
1	Description	Invite two reviewers to review that plan that seems reasonable to expect the archiving and provision of raw data		
·	Test Data	No data.		
	Expected			
	Result			
2	Description	Pass a set of HSC data through (equal in size to the first public data release) the data backbone through ingest and provide interface		
_	Test Data	No data.		
	Expected			
	Result			
3	Description	Track the ingestion of AuxTel data during one month in 2018-2019 and verify delivery and test download.		
	Test Data	No data.		
	Expected			
	Result			

4.6 LVV-T28 - Verify implementation of Measurements in catalogs

Version	Status	Priority	Verification Type	Owner	
1	Approved	Normal	Test	Colin Slater	
Open LVV-T28 in Jira					

4.6.1 Verification Elements

• LVV-178 - DMS-REQ-0347-V-01: Measurements in catalogs

4.6.2 Test Items

Verify that source measurements in catalogs are in flux units.

4.6.3 Predecessors



4.6.4 Environment Needs

4.6.4.1 Software

4.6.4.2 Hardware

4.6.5 Input Specification

4.6.6 Output Specification

4.6.7 Test Procedure

Step	Description, Input Data and Expected Result				
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:			
LVV-T987	Test Data				
	Expected	Butler repo available for reading.			
	Result				
2	Description	Identify and read appropriate processed precursor datasets with the Butler, including one containing single-visit images, one with coadds, and one with difference imaging.			
_	Test Data	No data.			
	Expected				
	Result				
3	Description	Verify that each of the single-visit, coadd, and difference image catalogs provide measurements in flux units.			
	Test Data	No data.			
	Expected	Confirmation of measurements in catalogs encoded in flux units.			
	Result				

4.7 LVV-T29 - Verify implementation of Raw Science Image Data Acquisition

Version	Status	Priority	Verification Type	Owner
	Status		vermeation type	O TTTTC



1	Defined	Normal	Test	Kian-Tat Lim
		Open LV	V-T29 in Jira	

4.7.1 Verification Elements

• LVV-8 - DMS-REQ-0018-V-01: Raw Science Image Data Acquisition

4.7.2 Test Items

Verify acquisition of raw data from L1 Test Stand DAQ while simulating all modes

4.7.3 Predecessors

4.7.4 Environment Needs

4.7.4.1 Software

4.7.4.2 Hardware

4.7.5 Input Specification

4.7.6 Output Specification

4.7.7 Test Procedure

Step	Description, Input Data and Expected Result				
4	Description	Ingest raw data from L1 Test Stand DAQ, simulating each observing mode			
I	Test Data	No data.			
	Expected				
	Result				
	Description	Observe image and its metadata is present and queryable in the Data Backbone.			
2					



Step	Description, Input Data and Expected Result			
	Test Data	No data.		
	Expected	Well-formed image data with appropriate associated metadata.		
	Result			

4.8 LVV-T30 - Verify implementation of Wavefront Sensor Data Acquisition

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Kian-Tat Lim		
Open LVV-T30 in Jira						

4.8.1 Verification Elements

• LVV-9 - DMS-REQ-0020-V-01: Wavefront Sensor Data Acquisition

4.8.2 Test Items

Verify successful ingestion of wavefront sensor data from L1 Test Stand DAQ while simulating all modes.

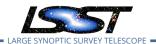
4.8.3 Predecessors

4.8.4 Environment Needs

4.8.4.1 Software

4.8.4.2 Hardware

4.8.5 Input Specification



4.8.6 Output Specification

4.8.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Ingest wavefront sensor data from L1 Test Stand DAQ while simulating all modes		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Observe wavefront sensor data and metadata archived in the Data Backbone.		
2	Test Data	No data.		
	Expected	Well-formed wavefront sensor image data with appropriate associated metadata.		
	Result			

4.9 LVV-T31 - Verify implementation of Crosstalk Corrected Science Image Data Acquisition

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Kian-Tat Lim		
Open LVV-T31 in Jira						

4.9.1 Verification Elements

• LVV-10 - DMS-REQ-0022-V-01: Crosstalk Corrected Science Image Data Acquisition

4.9.2 Test Items

Verify successful ingestion of crosstalk corrected data from L1 Test Stand DAQ while simulating all modes.

4.9.3 Predecessors

4.9.4 Environment Needs

4.9.4.1 Software

4.9.4.2 Hardware

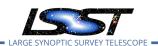
4.9.5 Input Specification

4.9.6 Output Specification

4.9.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Inject signals of different relative strength			
1	Test Data	No data.			
	Expected				
	Result				
	Description	Apply Camera cross-talk correction			
2	Test Data	No data.			
	Expected				
	Result				
	Description	Verify that DMS sytem can import the cross-talk corrected images			
3	Test Data	No data.			
	Expected				
	Result				
	Description	Verify that images are corrected for crosstalk			
4	Test Data	No data.			
	Expected				
	Result				

4.10 LVV-T32 - Verify implementation of Raw Image Assembly



Version	Status	Priority	Verification Type	Owner	
1	Defined	Normal	Test	Kian-Tat Lim	
Open LVV-T32 in Jira					

4.10.1 Verification Elements

LVV-11 - DMS-REQ-0024-V-01: Raw Image Assembly

4.10.2 Test Items

Verify that the raw exposure data from all readout channels in a sensor can be assembled into a single image, and that all required/relevant metadata are associated with the image data.

4.10.3 Predecessors

4.10.4 Environment Needs

4.10.4.1 Software

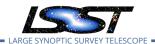
4.10.4.2 Hardware

4.10.5 Input Specification

4.10.6 Output Specification

4.10.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description Ingest data from the L1 Camera Test Stand DAQ.				
1	Test Data No data.				



Step	Description, Input Data and Expected Result				
	Expected Result				
	Description	Simulate all different modes of data gathering.			
2	Test Data	No data.			
	Expected				
	Result				
	Description	Verify that a raw image is constructed in correct format.			
3	Test Data	No data.			
	Expected	A single raw image combining data from all readout channels for a given sensor.			
	Result				
	Description	Verify that a raw image is constructed with correct metadata.			
4	Test Data	No data.			
	Expected Result	Image header or ancillary table contains the required metadata about the observing context in which data were gathered.			

4.11 LVV-T33 - Verify implementation of Raw Science Image Metadata

Version	Status	Priority	Verification Type	Owner	
1	Defined	Normal	Test	Kian-Tat Lim	
Open LVV-T33 in Jira					

4.11.1 Verification Elements

- LVV-28 DMS-REQ-0068-V-01: Raw Science Image Metadata
- LVV-1234 OSS-REQ-0122-V-01: Provenance

4.11.2 Test Items

Verify successful ingestion of raw data from L1 Test Stand DAQ and that image metadata is present and queryable.

4.11.3 Predecessors

LVV-T29, LVV-T32

4.11.4 Environment Needs

4.11.4.1 Software

4.11.4.2 Hardware

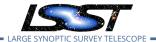
4.11.5 Input Specification

4.11.6 Output Specification

4.11.7 Test Procedure

Step	Description, I	Description, Input Data and Expected Result				
	Description	Identify (or gather) a dataset of raw science images.				
1	Test Data	No data.				
	Expected					
	Result					
	Description	Verify that time of exposure start/end, site metadata, telescope metadata, and camera				
2		metadata are stored in DMS system.				
	Test Data	No data.				
	Expected	Raw image data contain the required metadata.				
	Result					

4.12 LVV-T34 - Verify implementation of Guider Calibration Data Acquisition



1 Defined Normal Test Kian-Tat Lim
Open LVV-T34 in Jira

LDM-639

4.12.1 Verification Elements

• LVV-96 - DMS-REQ-0265-V-01: Guider Calibration Data Acquisition

4.12.2 Test Items

Verify successful

- 1. Ingestion of calibration frames from L1 Test Stand DAQ
- 2. Execution of CPP payloads
- 3. Availability of observed guider calibration products

4.12.3 Predecessors

4.12.4 Environment Needs

4.12.4.1 Software

4.12.4.2 Hardware

4.12.5 Input Specification

4.12.6 Output Specification

4.12.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Ingest calibration frames for the guider sensors from L1 Test Stand DAQ			
1	Test Data No data.				



Step	Description, Input Data and Expected Result					
	Expected Result					
2-1 from LVV-	Description	Execute the Calibration Products Production payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and Calibration Database entries in the Data Backbone.				
T1060	Test Data Expected Result					
2-2 from LVV-T1060	Description Test Data Expected Result	Confirm that the expected Master Calibration images and Calibration Database entries are present _and well-formed				
3	Description Test Data Expected Result	Observe that guider calibration products have been produced. No data. Well-formed calibration frames for the guider sensors.				

4.13 LVV-T35 - Verify implementation of Nightly Data Accessible Within 24 hrs

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
Open LVV-T35 in Jira				

4.13.1 Verification Elements

• LVV-175 - DMS-REQ-0004-V-01: Time to L1 public release

4.13.2 Test Items

Test Items

Verify that

- 1. Alerts are available within OTT1
- 2. Level 1 Data Products are available within L1PublicT
- 3. Solar System Object orbits are available within L1PublicT of the updated calculations completion on the following night.
- 4.13.3 Predecessors
- 4.13.4 Environment Needs
- 4.13.4.1 Software
- 4.13.4.2 Hardware
- 4.13.5 Input Specification
- 4.13.6 Output Specification
- 4.13.7 Test Procedure

Step	Description	Innut Data an	d Expected Result
Step	Description	, iliput Data ali	a Expected Result

1-1 from

Description

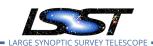
The 'path' that you will use depends on where you are running the science pipelines. Options:

LVV-T860

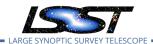
- local (newinstall.sh based install):[path_to_installation]/loadLSST.bash
- development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash
- $\bullet \ \ \mathsf{LSP} \ \mathsf{Notebook} \ \mathsf{aspect} \ \mathsf{(from} \ \mathsf{a} \ \mathsf{terminal)} ; \ \mathsf{/opt/lsst/software/stack/loadLSST.bash}$

From the command line, execute the commands below in the example code:

Test Data			



	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
2-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	
	Expected Result	An output dataset including difference images and DIASource and DIAObject measurements.
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result	
3	Description	Time processing of data starting from (pre-ingested) raw files until an alert is available for distribution; verify that this time is less than OTT1.
3	Test Data	No data.
	Expected Result	
4	Description	Time processing of data starting from (pre-ingested) raw files until the required data products are available in the Science Platform. Verify that this time is less than L1PublicT.
7	Test Data	No data.
	Expected	
	Result	
5	Description	Run MOPS on 1 night equivalent of LSST observing worth of precursor data and verify that Solar System Object orbits can be updated within 24 hours.
	Test Data	No data.
	Expected	
	Result	
	Description	Record time between completion of MOPS processing and availability of the updated
6	Description	SSObject catalogue through the Science Platform; verify this time is less than L1PublicT.



Step	Description, Input Data and Expected Result		
	Test Data	No data.	
	Expected		
	Result		

4.14 LVV-T36 - Verify implementation of Difference Exposures

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV	V-T36 in Jira	

4.14.1 Verification Elements

• LVV-7 - DMS-REQ-0010-V-01: Difference Exposures

4.14.2 Test Items

Verify successful creation of a

- 1. PSF-matched template image for a given Processed Visit Image
- 2. Difference Exposure from each Processed Visit Image

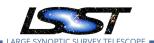
4.14.3 Predecessors

4.14.4 Environment Needs

4.14.4.1 Software

4.14.4.2 Hardware

4.14.5 Input Specification



4.14.6 Output Specification

4.14.7 Test Procedure

	Description, Input Data and Expected Result			
1-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:		
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash 		
		From the command line, execute the commands below in the example code:		
 T 	est Data			
	expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.		
		To check versions in use, type: _eups list -s		
2-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.		
T	est Data			
E	Expected	An output dataset including difference images and DIASource and DIAObject measurements.		
R	Result			
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.		
LVV-T866 T	est Data			
E	Expected			
R	Result			



Step	Description, Input Data and Expected Result		
3	Description	Demonstrate successful creation of a template image from HSC PDF and DECAM HiTS data. Demonstrate successful creation of a Difference Exposure for at least 10 other images from survey, ideally at a range of arimass. In particular, HiTS has 2013A u-band data. While the Blanco 4-m does have an ADC, there are still some chromatic effects and we should demonstrate that we can successfully produce Difference Exposures and templates for diferent airmass bins.	
	Test Data	No data.	
	Expected		
	Result		

4.15 LVV-T37 - Verify implementation of Difference Exposure Attributes

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV	V-T37 in Jira	

4.15.1 Verification Elements

- LVV-32 DMS-REQ-0074-V-01: Difference Exposure Attributes
- LVV-1234 OSS-REQ-0122-V-01: Provenance

4.15.2 Test Items

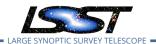
Verify that for each Difference Exposure the DMS stores

- 1. The identify of the input exposures and related provenance information
- 2. Metadata attributes of the subtraction, including the PSF-matching kernel used.

4.15.3 Predecessors

4.15.4 Environment Needs

4.15.4.1 Software



4.15.4.2 Hardware

4.15.5 Input Specification

4.15.6 Output Specification

4.15.7 Test Procedure

Result

Step	Description, Input Data and Expected Result		
1-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:	
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("Isst-dev"): /software/Isstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/Isst/software/stack/loadLSST.bash From the command line, execute the commands below in the example code:	
	Test Data Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.	
		To check versions in use, type: _eups list -s	
2-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.	
	Test Data Expected Result	An output dataset including difference images and DIASource and DIAObject measurements.	
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.	
LVV-T866	Test Data Expected		



Step	Description, I	Description, Input Data and Expected Result		
3	Description	For each of HSC PDR and DECAM HiTS data: set up three different templates and run subtractions on 10 different images from at least two different filters. Verify that we can recover the provenance information about which template was used for each subtraction, which input images were used for that template, and that we can successfull extract the PSF matching kernel.		
	Test Data	No data.		
	Expected			
	Result			

4.16 LVV-T38 - Verify implementation of Processed Visit Images

Version	Status	Priority	Verification Type	Owner	
1	Defined	Normal	Test	Eric Bellm	
Open LVV-T38 in Jira					

4.16.1 Verification Elements

• LVV-29 - DMS-REQ-0069-V-01: Processed Visit Images

4.16.2 Test Items

Verify that the DMS

- 1. Successfully produces Processed Visit Images, where the instrument signature has been removed.
- 2. Successfully combines images obtained during a standard visit.

4.16.3 Predecessors

4.16.4 Environment Needs

4.16.4.1 Software

4.16.4.2 Hardware

4.16.5 Input Specification

4.16.6 Output Specification

4.16.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result		
	Description	Identify suitable precursor datasets containing unprocessed raw images.		
1	Test Data	No data.		
	Expected			
	Result			
2	Description	Run the Prompt Processing payload on these data. Verify that Processed Visit Images are generated at correct size and with significant instrumental artifacts removed.		
_	Test Data	No data.		
	Expected	Raw precursor dataset images have been processed into Processed Visit Images, with		
	Result	instrumental artifacts corrected.		
	Description	Run camera test stand data through full acquisition+backbone+ISR.		
3	Test Data	No data.		
	Expected			
	Result			
4	Description	Run simulated LSST data with calibrations through prompt processing system and inspect Processed Visit images to verify that they have been cleaned of significant artifacts and are of the correct, shape, and described orientation.		
	Test Data	No data.		
	Expected Result	Raw images have been processed into Processed Visit Images, with instrumental artifacts corrected.		

4.17 LVV-T39 - Verify implementation of Generate Photometric Zeropoint for Visit Image

Version Status Priority Verification Type Owner	Priority Verification Type Owner	Verification Typ	Priority	Status	Version
---	----------------------------------	------------------	----------	--------	---------

1 Draft Normal Test Jim Bosch
Open LVV-T39 in Jira

4.17.1 Verification Elements

• LVV-12 - DMS-REQ-0029-V-01: Generate Photometric Zeropoint for Visit Image

4.17.2 Test Items

Verify that Processed Visit Image data products produced by the DRP and AP pipelines include the parameters of a model that relates the observed flux on the image to physical flux units.

- 4.17.3 Predecessors
- 4.17.4 Environment Needs
- 4.17.4.1 Software
- 4.17.4.2 Hardware
- 4.17.5 Input Specification
- 4.17.6 Output Specification

4.17.7 Test Procedure

Step	Description, In	Description, Input Data and Expected Result		
	Description	Delegate to Alert Production		
1	Test Data	No data.		
	Expected			
	Result			



4.18 LVV-T40 - Verify implementation of Generate WCS for Visit Images

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jim Bosch
	(Open LVV-	T40 in Jira	

4.18.1 Verification Elements

• LVV-13 - DMS-REQ-0030-V-01: Absolute accuracy of WCS

4.18.2 Test Items

Verify that Processed Visit Images produced by the AP and DRP pipelines include FITS WCS accurate to specified **astrometricAccuracy** over the bounds of the image.

4.18.3 Predecessors

4.18.4 Environment Needs

4.18.4.1 Software

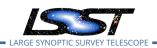
4.18.4.2 Hardware

4.18.5 Input Specification

4.18.6 Output Specification

4.18.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description Identify an appropriate processed dataset for this test.		
1	Test Data	No data.	



Step	Description, l	nput Data and Expected Result
	Expected Result	A dataset with Processed Visit Images available.
2-1 from LVV-T987	Description Test Data	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
	Expected Result	Butler repo available for reading.
	Description	Select a single visit from the dataset, and extract its WCS object and the source list.
3	Test Data	No data.
	Expected Result	A table containing detected sources, and a WCS object associated with that catalog.
4	Description	Confirm that each CCD within the visit image contains at least astrometricMinStandards astrometric standards that were used in deriving the astrometric solution.
	Test Data	No data.
	Expected	At least astrometricMinStandards from each CCD were used in determining the WCS
	Result	solution.
5	Description	Starting from the XY pixel coordinates of the sources, apply the WCS to obtain RA, Dec coordinates.
	Test Data	No data.
	Expected Result	A list of RA, Dec coordinates for all sources in the catalog.
6	Description	We will assume that Gaia provides a source of "truth." Match the source list to Gaia DR2, and calculate the positional offset between the test data and the Gaia catalog.
	Test Data	No data.
	Expected Result	A matched catalog of sources in common between the test source list and Gaia DR2.
7	Description	Apply appropriate cuts to extract the optimal dataset for comparison, then calculate statistics (median, 1-sigma range, etc.; also plot a histogram) of the offsets in milliarcseconds. Confirm that the offset is less than astrometricAccuracy .
	Test Data	No data.



Step	Description, Input Data and Expected Result		
	Expected Result	Histogram and relevant statistics needed to confirm that the WCS transformation is accurate.	
8	Description	Repeat Step 5, but for subregions of the image, to confirm that the accuracy criterion is met at all positions.	
-	Test Data	No data.	
	Expected Result	astrometricAccuracy requirement is met over the entire image.	

4.19 LVV-T41 - Verify implementation of Generate PSF for Visit Images

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jim Bosch
Open LVV-T41 in Jira				

4.19.1 Verification Elements

• LVV-30 - DMS-REQ-0070-V-01: Generate PSF for Visit Images

4.19.2 Test Items

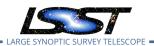
Verify that Processed Visit Images produced by the DRP and AP pipelines are associated with a model from which one can obtain an image of the PSF given a point on the image.

4.19.3 Predecessors

4.19.4 Environment Needs

4.19.4.1 Software

4.19.4.2 Hardware



4.19.5 Input Specification

4.19.6 Output Specification

4.19.7 Test Procedure

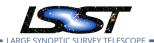
Step	Description, li	nput Data and Expected Result
	Description	Identify a dataset with processed visit images in multiple filters.
1	Test Data	No data.
	Expected	
	Result	
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	
3	Description	Select Objects classified as point sources on at least 10 different processed visit images (including all bands). Evaluate the PSF model at the positions of these Objects, and verify that subtracting a scaled version of the PSF model from the processed visit image yields residuals consistent with pure noise.
	Test Data	No data.
	Expected	Images with the PSF model subtracted, leaving only residuals that are consistent with
	Result	being noise.

4.20 LVV-T42 - Verify implementation of Processed Visit Image Content

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Jim Bosch
Open LVV-T42 in Jira				

4.20.1 Verification Elements

• LVV-31 - DMS-REQ-0072-V-01: Processed Visit Image Content



4.20.2 Test Items

Verify that Processed Visit Images produced by the DRP and AP pipelines include the observed data, a mask array, a variance array, a PSF model, and a WCS model.

4.20.3 Predecessors

4.20.4 Environment Needs

4.20.4.1 Software

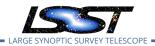
4.20.4.2 Hardware

4.20.5 Input Specification

4.20.6 Output Specification

4.20.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	
	Description	Ingest the data from an appropriate processed dataset.
	Description	ingest the data from an appropriate processed dataset.
2	Test Data	No data.
2	·	
2	Test Data	
	Test Data Expected	No data. Select a single visit from the dataset, and extract its WCS object, calexp image, psf model,
3	Test Data Expected Result	No data.



Step	Description, Input Data and Expected Result		
	Expected		
	Result		
	Description	Inspect the calexp image to ensure that	
4		1. A well-formed image is present,	
		2. The variance plane is present and well-behaved,	
		3. Mask planes are present and contain information about defects.	
	Test Data	No data.	
	Expected	An astronomical image with mask and variance planes. This can be readily visualized using	
	Result	Firefly, which displays mask planes by default.	
	Description	Plot images of the PSF model at various points, and verify that the PSF differs with position.	
5	Test Data	No data.	
	Expected Result	A "star-like" image of the PSF evaluated at various positions. The PSF should vary slightly with position (this could be readily visualized by taking a difference of PSFs at two positions).	
6	Description	Starting from the XY pixel coordinates of the sources, apply the WCS to obtain RA, Dec coordinates. Plot these positions and confirm that they match the expected values from the WCS object.	
	Test Data	No data.	
	Expected	RA, Dec coordinates that are returned should be near the central position of the visit co-	
	Result	ordinate as given in either the calexp metadata or the WCS.	
	Description	Repeat steps 2-6, but now with difference images created by the Alert Production pipeline	
7	T D	(for example, in the 'ap_verify' test data processing).	
	Test Data	No data.	
	Expected		
	Result		

4.21 LVV-T43 - Verify implementation of Background Model Calculation

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jim Bosch
Open LVV-T43 in Jira				



4.21.1 Verification Elements

• LVV-158 - DMS-REQ-0327-V-01: Background Model Calculation

4.21.2 Test Items

Verify that Processed Visit Images produced by the DRP and AP pipelines have had a model of the background subtracted, and that this model is persisted in a way that permits the background subtracted from any CCD to be retrieved along with the image for that CCD.

4.21.3 Predecessors

LVV-T15

LVV-T19

4.21.4 Environment Needs

4.21.4.1 Software

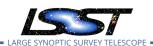
4.21.4.2 Hardware

4.21.5 Input Specification

4.21.6 Output Specification

4.21.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Identify a dataset with processed visit images in multiple filters.	
1	Test Data	No data.	
	Expected		
	Result		
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:	



Step	Description, Input Data and Expected Result		
	Test Data		
	Expected	Butler repo available for reading.	
	Result		
3	Description	Display an image of the background model for a full CCD. Repeat this for all available filters, and confirm that the background is smoothly varying and defined over the full CCD.	
	Test Data	No data.	
	Expected	Well-formed background covering the entire CCD for all CCDs in all filters.	
	Result		

4.22 LVV-T44 - Verify implementation of Documenting Image Characterization

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jim Bosch	
Open LVV-T44 in Jira					

4.22.1 Verification Elements

• LVV-159 - DMS-REQ-0328-V-01: Documenting Image Characterization

4.22.2 Test Items

Verify that the persisted format for Processed Visit Images and associated instrument-signature-removal data products is documented.

4.22.3 Predecessors

4.22.4 Environment Needs

4.22.4.1 Software

4.22.4.2 Hardware

4.22.5 Input Specification

4.22.6 Output Specification

4.22.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Alert Production	
1	Test Data No data.		
	Expected		
	Result		

4.23 LVV-T45 - Verify implementation of Prompt Processing Data Quality Report Definition

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Eric Bellm		
Open LVV-T45 in Jira						

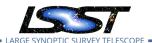
4.23.1 Verification Elements

• LVV-39 - DMS-REQ-0097-V-01: Level 1 Data Quality Report Definition

4.23.2 Test Items

Verify that the DMS produces a Prompt Processing Data Quality Report. Specifically check absolute value and temporal variation of

- 1. Photometric zeropoint
- 2. Sky brightness
- 3. Seeing



- 4. PSF
- 5. Detection efficiency

4.23.3 Predecessors

4.23.4 Environment Needs

4.23.4.1 Software

4.23.4.2 Hardware

4.23.5 Input Specification

4.23.6 Output Specification

4.23.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Ingest raw data from L1 Test Stand DAQ.		
1	Test Data	No data.		
	Expected			
	Result			
2-1 from	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.		
	Test Data			
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.		
	Result			
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.		
LVV-T866	Test Data			
	Expected			
	Result			



Step	Description, Input Data and Expected Result		
Description		Load the Prompt Processing QC reports, and observe that a dynamically updated Data Quality Report has become available at the relevant UI.	
	Test Data	No data.	
	Expected	A Prompt Processing QC report is available via a UI, and contains information about the	
	Result	photometric zeropoint, sky brightness, seeing, PSF, and detection efficiency, and possibly other relevant quantities.	
	Description	Check that a static report is created and archived in a readily-accessible location.	
4	Test Data	No data.	
	Expected	Persistence of a static QC report in an accessible location, containing the same information	
	Result	as in the report from Step 3.	

4.24 LVV-T46 - Verify implementation of Prompt Processing Performance Report Definition

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Eric Bellm	
Open LVV-T46 in Jira					

4.24.1 Verification Elements

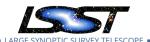
• LVV-41 - DMS-REQ-0099-V-01: Level 1 Performance Report Definition

4.24.2 Test Items

Verify that the DMS produces a Prompt Processing Performance Report. Specifically check that the number of observations that describe each of the following:

- 1. Successfully processed, recoverable failures, unrecoverable failures.
- 2. Archived
- 3. Result in science.

This is testing more the processing rather than the observatory system.



4.24.3 Predecessors

4.24.4 Environment Needs

4.24.4.1 Software

4.24.4.2 Hardware

4.24.5 Input Specification

4.24.6 Output Specification

4.24.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description Execute single-day operations rehearsal, observe report			
1	Test Data No data.			
	Expected			
	Result			

4.25 LVV-T47 - Verify implementation of Prompt Processing Calibration Report Definition

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Eric Bellm		
Open LVV-T47 in Jira						

4.25.1 Verification Elements

• LVV-43 - DMS-REQ-0101-V-01: Level 1 Calibration Report Definition



4.25.2 Test Items

Verify that the DMS produces a Prompt Processing Calibration Report. Specifically check that this report is capable of identifying when aspects of the telescope or camera are changing with time.

4.25.3 Predecessors

4.25.4 Environment Needs

4.25.4.1 Software

4.25.4.2 Hardware

4.25.5 Input Specification

4.25.6 Output Specification

4.25.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Identify precursor and simulated calibration datasets on which to run the L1 calibration pipeline.	
	Test Data	No data.	
	Expected		
	Result		
2-1 from	Description	Execute the Daily Calibration Products Update payload. The payload uses raw calibration images	
LVV-		and information from the Transformed EFD to generate a subset of Master Calibration Images andCalibration Database entries in the Data Backbone.	
T1059	Test Data		
	Expected		
	Result		
2-2 from	Description	Confirm that the expected Master Calibration images and Calibration Database entries are present	
LVV-	Test Data	_and_well-formed	
T1059			



Step	Description, Input Data and Expected Result		
	Expected		
	Result		
	Description	Check that a dynamic report is created that triggers alerts if calibrations go out of range.	
3	Test Data	No data.	
	Expected	A dynamic report is available via UI to users, and if any out-of-spec changes have occurred,	
	Result	alerts have been issued.	
	Description	Check that a static report is created and archived in a readily-accessible location.	
4	Test Data	No data.	
	Expected	An archived version of the calibration report is available and will be retained in a static file	
	Result	format.	

4.26 LVV-T48 - Verify implementation of Exposure Catalog

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Jim Bosch		
Open LVV-T48 in Jira						

4.26.1 Verification Elements

LVV-97 - DMS-REQ-0266-V-01: Exposure Catalog

4.26.2 Test Items

Verify that the DMS creates an Exposure Catalog that includes

- 1. Observation datetime, exposure time
- 2. Filter
- 3. Dome, telescope orientation and status
- 4. Calibration status
- 5. Airmass and zenith
- 6. Environmental information

7. Per-sensor information

4.26.3 Predecessors

4.26.4 Environment Needs

4.26.4.1 Software

4.26.4.2 Hardware

4.26.5 Input Specification

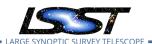
4.26.6 Output Specification

4.26.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Verify that Exposure Catalogs contain the required elements. At present, the form of the exposure catalog is not defined. This information can be found for a given Butler repo from the metadata, but will ultimately be aggregated into a database/table summarizing available exposures.	
	Test Data	No data.	
	Expected Result	A list of the required metadata for a set of exposures is returned and both human- and machine-readable.	

4.27 LVV-T49 - Verify implementation of DIASource Catalog

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV	V-T49 in Jira	



4.27.1 Verification Elements

LVV-100 - DMS-REQ-0269-V-01: DIASource Catalog

4.27.2 Test Items

Verify that the DMS produces a Source catalog from Difference Exposures with the required attributes.

- 4.27.3 Predecessors
- 4.27.4 Environment Needs
- 4.27.4.1 Software
- 4.27.4.2 Hardware
- 4.27.5 Input Specification
- 4.27.6 Output Specification

4.27.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from

Description

The 'path' that you will use depends on where you are running the science pipelines. Options:

LVV-T860

- local (newinstall.sh based install):[path_to_installation]/loadLSST.bash
- development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash
- $\bullet \ \ \mathsf{LSP} \ \mathsf{Notebook} \ \mathsf{aspect} \ \mathsf{(from} \ \mathsf{a} \ \mathsf{terminal)} ; \ \mathsf{/opt/lsst/software/stack/loadLSST.bash}$

From the command line, execute the commands below in the example code:

The contents of this document are subject to configuration control by the LSST DM Change Control Board.



	Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obspackages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
2-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame process ing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result 	
3-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol lowing:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result 	
	Description	Verify that products are produced for DIASource catalog
4	Test Data	No data.
	Expected	
	Result	

4.28 LVV-T50 - Verify implementation of Faint DIASource Measurements

Version Status Priority Verification Type Owner



1	Draft	Normal Test	Eric Bellm
		Open LVV-T50 in Jira	

4.28.1 Verification Elements

• LVV-101 - DMS-REQ-0270-V-01: Faint DIASource Measurements

4.28.2 Test Items

Verify that the DMS can produces DIASources measurements for sources below the nominal S/N cutoff that satisfy additional criteria.

- 4.28.3 Predecessors
- 4.28.4 Environment Needs
- 4.28.4.1 Software
- 4.28.4.2 Hardware
- 4.28.5 Input Specification

Input Data
DECam HiTS data.

- 4.28.6 Output Specification
- 4.28.7 Test Procedure



Step	Description, Input Data and Expected Result			
1-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:		
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash 		
		From the command line, execute the commands below in the example code:		
	Test Data Expected	Science pipeline software is available for use. If additional packages are needed (for example, 'obs'		
	Result	packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.		
		To check versions in use, type: _eups list -s		
2-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.		
	Test Data			
	Expected Result	An output dataset including difference images and DIASource and DIAObject measurements.		
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.		
LVV-T866	Test Data			
	Expected			
	Result			
3	Description	As an example of selecting with constrains, Re-run source detection as an afterburner to select isolated sources (defined as more than 2 arcseconds away from any other objects in the single-image-depth catalog) that are fainter than the fiducial transSNR cut.		
	Test Data	No data.		
	Expected			
	Result			



4.29 LVV-T51 - Verify implementation of DIAObject Catalog

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV	V-T51 in Jira	

4.29.1 Verification Elements

• LVV-102 - DMS-REQ-0271-V-01: Max nearby galaxies associated with DIASource

4.29.2 Test Items

Verify that the DIAObject includes a unique ID, identifiers for nearest stars and nearest galaxies, and probability of matching to static Object.

4.29.3 Predecessors

4.29.4 Environment Needs

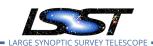
4.29.4.1 Software

4.29.4.2 Hardware

4.29.5 Input Specification

4.29.6 Output Specification

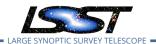
4.29.7 Test Procedure



Step Description, Input Data and Expected Result		
1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result	
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	×
	Expected	Butler repo available for reading.
	Result	
3	Description	Verify that DIAObjects have diaNearbyObjMaxStar and diaNearbyObjMaxGalaxies that point to the Object catalog and are within dianNearbyObjRadius; the probability of association; and the required DIAObject properties.
	Test Data	No data.
	Expected	
	Result	
-		

4.30 LVV-T52 - Verify implementation of DIAObject Attributes

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV	V-T52 in Jira	



4.30.1 Verification Elements

• LVV-103 - DMS-REQ-0272-V-01: DIAObject Attributes

4.30.2 Test Items

Verify that the DMS provides summary attributes for each DIAObject, including periodicity measures.

4.30.3 Predecessors

4.30.4 Environment Needs

4.30.4.1 Software

4.30.4.2 Hardware

4.30.5 Input Specification

4.30.6 Output Specification

4.30.7 Test Procedure

	Step	Description, Input Data and Expected Result		
	1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.	
		Test Data		
		Expected	An output dataset including difference images and DIASource and DIAObject measurements.	
		Result		
-	1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.	
	LVV-T866	Test Data		



	1 /	nput Data and Expected Result
	Expected	
	Result	
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
-	Expected	
	Result 	
	Description	Confirm that the DIAObjects include summary attributes as specified.
3	Test Data	No data.
_	Expected	
	Result	

4.31 LVV-T53 - Verify implementation of SSObject Catalog

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV	V-T53 in Jira	

4.31.1 Verification Elements

• LVV-104 - DMS-REQ-0273-V-01: SSObject Catalog

4.31.2 Test Items

Verify that the DMS produces a catalog of Solar System Objects identify from Moving Object Processing.

Verify that the SSObject catalog includes orbital elements and additional related quanitites.

4.31.3 Predecessors



4.31.4 Environment Needs

4.31.4.1 Software

4.31.4.2 Hardware

4.31.5 Input Specification

4.31.6 Output Specification

4.31.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result	
2-1 from LVV-T901	Description	Perform the steps of Moving Object Pipeline (MOPS) processing on newly detected DIASources, and generate Solar System data products including Solar System objects with associated Keplerian orbits, errors, and detected DIASources. This includes running processes to link DIASource detections within a night (called tracklets), to link these tracklets across multiple nights (into tracks), to fit the tracks with an orbital model to identify those tracks that are consistent with an asteroid orbit, to match these new orbits with existing SSObjects, and to update the SSObject table.
	Test Data	
	Expected Result	An output dataset consisting of an updated SSObject database with SSObjects both added and pruned as the orbital fits have been refined, and an updated DIASource database with DIASources assigned and unassigned to SSObjects.
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T901	Test Data	



Step	Description, l	nput Data and Expected Result
	Expected	
	Result	
3-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	
	Description	Inspect SSObject catalog and verify the presence of the required elements (LVV-104).
4	Test Data	No data.
	Expected	
	Result	

4.32 LVV-T54 - Verify implementation of Alert Content

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV	V-T54 in Jira	

4.32.1 Verification Elements

• LVV-105 - DMS-REQ-0274-V-01: Alert Content

4.32.2 Test Items

Verify that the DMS creates an Alert for each detected DIASource Verify that this Alert is broadcasted using community protocols Verify that the context of the Alert packet match requirements.

4.32.3 Predecessors

4.32.4 Environment Needs

4.32.4.1 Software

4.32.4.2 Hardware

4.32.5 Input Specification

4.32.6 Output Specification

4.32.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result	
2	Description	Examine the serialized alert packets to confirm the presence of the required elements (LVV-105).
_	Test Data	No data.
	Expected	
	Result	

4.33 LVV-T55 - Verify implementation of DIAForcedSource Catalog

Version	Status	Priority	Verification Type	Owner	
* 0. 5. 5	Status		vermeation type	0 111101	



1	Draft	Normal Test	Eric Bellm
		Open LVV-T55 in Jira	

4.33.1 Verification Elements

LVV-148 - DMS-REQ-0317-V-01: DIAForcedSource Catalog

4.33.2 Test Items

Verify that the DMS produces a DIAForcedSource Catalog and that the catalog contains measured fluxes for DIAObjects.

- 4.33.3 Predecessors
- 4.33.4 Environment Needs
- 4.33.4.1 Software
- 4.33.4.2 Hardware
- 4.33.5 Input Specification
- 4.33.6 Output Specification

4.33.7 Test Procedure

Step	Description, Input Data and Expected Result		
1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.	
	Test Data		
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.	
	Result		

Step	Description, I	nput Data and Expected Result
1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result	
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- lowing:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	
	Description	Confirm that the DIAForcedSource catalog contains measurements for each source.
3	Test Data	No data.
	Expected	
	Result	

4.34 LVV-T56 - Verify implementation of Characterizing Variability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV	V-T56 in Jira	

4.34.1 Verification Elements

• LVV-150 - DMS-REQ-0319-V-01: Characterizing Variability

4.34.2 Test Items

Verify that the variability characterization in the DIAObject catalog includes data collected within previous "diaCharacterizationCutoff" period of time.

4.34.3 Predecessors

4.34.4 Environment Needs

4.34.4.1 Software

4.34.4.2 Hardware

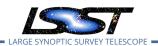
4.34.5 Input Specification

4.34.6 Output Specification

4.34.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result	
	Description	Verify that the issued alerts contain measurements during the diaCharacterizationCutoff.
2	Test Data	No data.
	Expected	
	Result	

4.35 LVV-T57 - Verify implementation of Calculating SSObject Parameters



Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV	V-T57 in Jira	

4.35.1 Verification Elements

• LVV-154 - DMS-REQ-0323-V-01: Calculating SSObject Parameters

4.35.2 Test Items

Verify that the DMS database provides functions to compute phase angles and magnitudes in LSST bands for every SSObject.

- 4.35.3 Predecessors
- 4.35.4 Environment Needs
- 4.35.4.1 Software
- 4.35.4.2 Hardware
- 4.35.5 Input Specification
- 4.35.6 Output Specification

4.35.7 Test Procedure

Step	Description, Input Data and Expected Result		
1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.	



	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result	
2-1 from LVV-T901	Description	Perform the steps of Moving Object Pipeline (MOPS) processing on newly detected DIASources, and generate Solar System data products including Solar System objects with associated Keplerian orbits errors, and detected DIASources. This includes running processes to link DIASource detections within a night (called tracklets), to link these tracklets across multiple nights (into tracks), to fit the tracks with an orbital model to identify those tracks that are consistent with an asteroid orbit, to match these new orbits with existing SSObjects, and to update the SSObject table.
	Test Data	
	Expected Result	An output dataset consisting of an updated SSObject database with SSObjects both added and pruned as the orbital fits have been refined, and an updated DIASource database with DIASources assigned and unassigned to SSObjects.
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T901	Test Data	
	Expected	
	Result	
3	Description	Computer the phase angle, reduced and absolute asteroid magnitudes for objects identified in SSObject Catalog
_	Test Data	No data.
	Expected	
	Result	

4.36 LVV-T58 - Verify implementation of Matching DIASources to Objects

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Eric Bellm	
Open LVV-T58 in lira					



4.36.1 Verification Elements

LVV-155 - DMS-REQ-0324-V-01: Matching DIASources to Objects

4.36.2 Test Items

Verify that a cross-match table is available between DIASources and Objects.

4.36.3 Predecessors

4.36.4 Environment Needs

4.36.4.1 Software

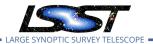
4.36.4.2 Hardware

4.36.5 Input Specification

4.36.6 Output Specification

4.36.7 Test Procedure

Description, Input Data and Expected Result Step Description Perform the steps of Alert Production (including, but not necessarily limited to, single frame process-1-1 from ing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is LVV-T866 presumed that these are automated for a given dataset. Test Data Expected An output dataset including difference images and DIASource and DIAObject measurements. Result Description Verify that the expected data products have been produced, and that catalogs contain reasonable 1-2 from values for measured quantities of interest. LVV-T866 Test Data **Expected** Result



Step	Description, Input Data and Expected Result			
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:		
LVV-T987	Test Data			
	Expected	Butler repo available for reading.		
	Result			
3	Description	Verify that a cross-match table between the Prompt DIASources and DRP Objects is available.		
J	Test Data	No data.		
	Expected			
	Result			

4.37 LVV-T59 - Verify implementation of Regenerating L1 Data Products During Data Release Processing

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Kian-Tat Lim	
Open LVV-T59 in Jira					

4.37.1 Verification Elements

LVV-156 - DMS-REQ-0325-V-01: Regenerating L1 Data Products During Data Release Processing

4.37.2 Test Items

Verify that the Prompt Processing data products are regenerated during DRP.

4.37.3 Predecessors



4.37.4 Environment Needs

4.37.4.1 Software

4.37.4.2 Hardware

4.37.5 Input Specification

4.37.6 Output Specification

4.37.7 Test Procedure

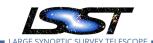
Step	Description, Input Data and Expected Result			
	Description	Execute DRP		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Observe production of difference image data products		
2	Test Data	No data.		
	Expected			
	Result			

4.38 LVV-T60 - Verify implementation of Publishing predicted visit schedule

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Eric Bellm	
Open LVV-T60 in Jira					

4.38.1 Verification Elements

• LVV-184 - DMS-REQ-0353-V-01: Publishing predicted visit schedule



4.38.2 Test Items

Verify that a predict-visit schedule can be published by the OCS.

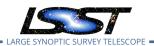
- 4.38.3 Predecessors
- 4.38.4 Environment Needs
- 4.38.4.1 Software
- 4.38.4.2 Hardware
- 4.38.5 Input Specification
- 4.38.6 Output Specification

4.38.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description				
1	Test Data	No data.			
	Expected				
	Result				

4.39 LVV-T61 - Verify implementation of Associate Sources to Objects

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Jim Bosch		
Open LVV-T61 in Jira						



4.39.1 Verification Elements

• LVV-16 - DMS-REQ-0034-V-01: Associate Sources to Objects

4.39.2 Test Items

Verify that each Source record contains an ID that associates it with a best guess at the Object it corresponds to.

4.39.3 Predecessors

4.39.4 Environment Needs

4.39.4.1 Software

4.39.4.2 Hardware

4.39.5 Input Specification

4.39.6 Output Specification

4.39.7 Test Procedure

Step	Description, Input Data and Expected Result				
1-1 from	Description Test Data	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- lowing:			
LVV 1307	Expected Result	Butler repo available for reading.			
	Description	Read a dataset via the Butler and extract its source and object catalogs.			
2	Test Data	No data.			
	Expected				
	Result				



Step	Description, Input Data and Expected Result			
	Description	Verify that sources have objects		
3	Test Data	No data.		
	Expected			
	Result			
	Description	Verify that objects list sources that seem reasonably near them.		
4	Test Data	No data.		
	Expected			
	Result			

4.40 LVV-T62 - Verify implementation of Provide PSF for Coadded Images

Version	Status	Priority	Verification Type	Owner	
2	Approved	Normal	Test	Jim Bosch	
Open LVV-T62 in Jira					

4.40.1 Verification Elements

• LVV-20 - DMS-REQ-0047-V-01: Provide PSF for Coadded Images

4.40.2 Test Items

Verify that all coadd images produced by the DRP pipelines include a model from which an image of the PSF at any point on the coadd can be obtained.

4.40.3 Predecessors

4.40.4 Environment Needs

4.40.4.1 Software



4.40.4.2 Hardware

4.40.5 Input Specification

Fully covered by preconditions for LVV-T16.

4.40.6 Output Specification

4.40.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result				
	Description	Identify a dataset with coadded images in multiple filters.				
1	Test Data	No data.				
	Expected	Multi-band data that has been processed through the coaddition stage.				
	Result					
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:				
LVV-T987	Test Data					
	Expected	Butler repo available for reading.				
	Result					
3	Description	Load the exposures, then select Objects classified as point sources on at least 10 different coadd images (including all bands). Evaluate the PSF model at the positions of these Objects, and verify that subtracting a scaled version of the PSF model from the processed visit image yields residuals consistent with pure noise.				
	Test Data	No data.				
	Expected Result	Images with the PSF model subtracted, leaving only residuals that are consistent with being noise.				
	result					

4.41 LVV-T63 - Verify implementation of Produce Images for EPO

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Gregory Dubois-Felsmann		
Open LVV-T63 in Jira						



4.41.1 Verification Elements

LVV-45 - DMS-REQ-0103-V-01: Produce Images for EPO

4.41.2 Test Items

This test will verify that the DRP pipelines produce the image data products called out in LSE-131. Currently this is limited to a color all-sky HiPS map. This will be verified (1) by inspection of pipeline configurations and (2) in operations rehearsals on precursor data. The production of a usable HiPS map will be verified by browsing it with community tools.

4.41.3 Predecessors

4.41.4 Environment Needs

4.41.4.1 Software

4.41.4.2 Hardware

4.41.5 Input Specification

In order for an operational test to be successful, as a precondition the inputs to that production must exist. For the only currently mandated image data production in LSE-131, a color all-sky HiPS map down to 1 arcsecond resolution, the prerequisite inputs to that are the single-filter coadds in the bands required by the yet-to-be-specified color prescription.

4.41.6 Output Specification

4.41.7 Test Procedure

Step	Description, Input Data and Expected Result				
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:			
LVV-T987	Test Data				



Step	Description, Input Data and Expected Result			
	Expected Result	Butler repo available for reading.		
2	Description	For each of the expected data product types needed for creation of HiPS images, retrieve the data product from the Butler and verify it to be non-empty.		
	Test Data	No data.		
	Expected			
	Result			
3	Description	Verify that a HiPS image map covering the LSST survey area, with a limiting depth yielding 1 arcsecond resolution, has been produced matching the color prescriptions provided by EPO (in updates to LSE-131 which are expected to be made "once ComCam data is available").		
	Test Data	No data.		
	Expected			
	Result			
4	Description	Place the image map in a location accessible to a Firefly and an Aladin Lite client, ideally with the client running in the EPO data systems environment.		
·	Test Data	No data.		
	Expected			
	Result			
5	Description	Use Firefly to manually explore the image map at the largest scales to verify coverage of the entire sky. Sample in various locations to confirm the 1 arcsecond maximum depth. Confirm using Aladin Lite that the format of the image map is supported by this common community tool.		
	Test Data	No data.		
	Expected			
	Result			
6	Description	Verify programmatically, perhaps both by sampling a variety of locations, and by counting the tiles created at the 1-arcsecond-resolution depth, that the map is complete and meets its specifications.		
	Test Data	No data.		
	Expected			
	Result			
	Description	Apply an IVOA-community HiPS service validation tool, if available, to the service location.		
7	Test Data	No data.		



Step	Description, I	Description, Input Data and Expected Result		
	Expected Result			
	Description	Verify that the HiPS map created is in a location accessible to the EPO data systems.		
8	Test Data	No data.		
	Expected			
	Result			

4.42 LVV-T64 - Verify implementation of Coadded Image Provenance

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jim Bosch	
Open LVV-T64 in Jira					

4.42.1 Verification Elements

- LVV-46 DMS-REQ-0106-V-01: Coadded Image Provenance
- LVV-1234 OSS-REQ-0122-V-01: Provenance

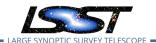
4.42.2 Test Items

Verify that all coadd data products produced by the DRP pipelines are associated with provenance information that includes the set of input epochs contributing to that coadd as well as any additional information needed to exactly produce that coadd.

4.42.3 Predecessors

4.42.4 Environment Needs

4.42.4.1 Software



4.42.4.2 Hardware

4.42.5 Input Specification

4.42.6 Output Specification

4.42.7 Test Procedure

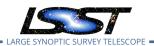
3

Test Data

Expected Result No data.

Step	Description, I	nput Data and Expected Result		
1-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:		
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash 		
		From the command line, execute the commands below in the example code:		
	Test Data			
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obspackages such as 'obs_subaru'), then additional 'setup' commands will be necessary.		
		To check versions in use, type: _eups list -s		
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:		
LVV-T987	Test Data			
	Expected Result			
	Description	For each of the expected data product types and each of the expected units (PVIs, coadds		

etc), retrieve the data product from the Butler and verify it to be non-empty.



Step	Description, I	Description, Input Data and Expected Result		
4	Description	Query and verify provenance of input images, and software versions that went into producing stack.		
•	Test Data	No data.		
	Expected			
	Result			
5	Description	Test re-generating 10 different coadds tract+patches based on the provenance image given		
J	Test Data	No data.		
	Expected			
	Result			

4.43 LVV-T65 - Verify implementation of Source Catalog

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Jim Bosch		
Open LVV-T65 in Jira						

4.43.1 Verification Elements

• LVV-98 - DMS-REQ-0267-V-01: Source Catalog

4.43.2 Test Items

Verify that all Sources produced by the DRP pipelines contain the entries listed in DMS-REQ-0267.

4.43.3 Predecessors

4.43.4 Environment Needs

4.43.4.1 Software



4.43.4.2 Hardware

4.43.5 Input Specification

4.43.6 Output Specification

4.43.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result				
	Description	Identify a suitable small dataset to process through the DRP.				
1	Test Data	No data.				
	Expected					
	Result					
2-1 from	Description	Process data with the Data Release Production payload, starting from raw science images and generating science data products, placing them in the Data Backbone.				
	Test Data					
T1064	Expected					
	Result					
3	Description	Confirm that source catalogs have been produced for single visits and coadds, and that it contains the required measurements.				
J	Test Data	No data.				
	Expected	A source catalog containing the measured attributes (and associated errors), including				
	Result	location on the focal plane; a static point-source model fit to world coordinates and flux; a centroid and adaptive moments; and surface brightnesses through elliptical multiple apertures that are concentric, PSF-homogenized, and logarithmically spaced in intensity.				

4.44 LVV-T66 - Verify implementation of Forced-Source Catalog

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jim Bosch	
Open LVV-T66 in Jira					



4.44.1 Verification Elements

LVV-99 - DMS-REQ-0268-V-01: Forced-Source Catalog

4.44.2 Test Items

Verify that all ForcedSources produced by the DRP pipelines contain fluxes measured on difference and direct single-epoch images, associated uncertainties, an Object ID, and a Visit ID.

4.44.3 Predecessors

4.44.4 Environment Needs

4.44.4.1 Software

4.44.4.2 Hardware

4.44.5 Input Specification

4.44.6 Output Specification

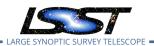
Test Data

No data.

4.44.7 Test Procedure

2

Step	Description, I	Description, Input Data and Expected Result		
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:		
LVV-T987	Test Data			
	Expected	Butler repo available for reading.		
	Result			
	Description	Retrieve the forced-source catalog from the Butler and verify it to be non-empty.		



Step	Description, I	Description, Input Data and Expected Result		
	Expected Result			
-	Result			
3	Description	Verify that there exist entries in the forced-photometry table for all coadd objects for the PVIs on which the object should appear.		
J	Test Data	No data.		
	Expected			
	Result			
4	Description	Verify that there exist entries in a forced-photometry table for each image for all DIAObjects.		
	Test Data	No data.		
	Expected			
	Result			

4.45 LVV-T67 - Verify implementation of Object Catalog

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Jim Bosch		
Open LVV-T67 in Jira						

4.45.1 Verification Elements

LVV-106 - DMS-REQ-0275-V-01: Object Catalog

4.45.2 Test Items

Verify that the DRP pipelines produce an Object catalog derived from detections made on both coadded images and difference images and measurements performed on coadds and possibly overlapping single-epoch images.



4.45.3 Predecessors

4.45.4 Environment Needs

4.45.4.1 Software

4.45.4.2 Hardware

4.45.5 Input Specification

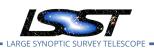
Input Data

DECam HiTS data (raw science images and master calibrations) HSC "RC2" data (raw science images and master calibrations)

4.45.6 Output Specification

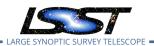
4.45.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	load LSST DM Stack			
1	Test Data	No data.			
	Expected				
	Result				
	Description	Run the single-frame processing and self-calibration steps of the DRP pipeline.			
2	Test Data	No data.			
	Expected				
	Result				



Result

Step Description, Input Data and Expected Result **Description** Insert simulated sources into all single-frame images, including: 3 • static objects (e.g. galaxies), including some too faint to be detectable in singleepoch images; • objects with static positions that are sufficiently bright and variable that they should be detectable in single-epoch difference images; • transient objects that appear in only a few epochs; stars with significant proper motions and parallaxes, some below the single-epoch detection limit simulated solar system objects with orbits that can be constrained from just the epochs in the test dataset Test Data No data. Expected Result Description Run all remaining DRP pipeline steps. 4 **Test Data** No data. **Expected** Result Description Load data into DRP database 5 Test Data No data. **Expected** Result Description Verify that the injected simulated objects are recovered at a rate consistent with their S/N when not blended with each other or real objects, and that flags indicating how each Object 6 was detected are consistent with their properties: • static objects should be detected in coadds only (not difference images) · static-position/variable-flux objects should be detected in coadds and possibly difference images transient objects should be detected in difference images only • stars with significant proper motions may be detected in either coadds or difference images solar system objects should be detected in difference images only. Test Data No data. Expected



4.46 LVV-T68 - Verify implementation of Provide Photometric Redshifts of Galaxies

Version	Status	Priority	Verification Type	Owner			
1	Draft	Normal	Test	Jim Bosch			
Open LVV-T68 in Jira							

4.46.1 Verification Elements

• LVV-19 - DMS-REQ-0046-V-01: Provide Photometric Redshifts of Galaxies

4.46.2 Test Items

Verify that Object catalogs produced by the DRP Pipeline include photometric redshift information.

4.46.3 Predecessors

4.46.4 Environment Needs

4.46.4.1 Software

4.46.4.2 Hardware

4.46.5 Input Specification

Input Data

HSC Public Data Release (raw science images, master calibrations)

Assorted public spectroscopic catalogs and high-accuracy photometric redshift catalogs in the HSC PDR footprint.

4.46.6 Output Specification

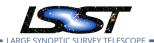


4.46.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Run DRP processing steps through (at least) final galaxy photometry measurements.			
1	Test Data	No data.			
	Expected				
	Result				
2	Description	Train photometric redshift algorithm(s) on spectroscopic and high-accuracy photometric redshift catalogs.			
2	Test Data	No data.			
	Expected				
	Result				
	Description	Estimate photometric redshifts for all Objects generated by DRP processing.			
3	Test Data	No data.			
	Expected				
	Result				
	Description	Load into DRP Database			
4	Test Data	No data.			
	Expected				
	Result				
	Description	Inspect database to verify that photometric redshifts are present for all objects			
5	Test Data	No data.			
	Expected				
	Result				

4.47 LVV-T69 - Verify implementation of Object Characterization

Version	Status	Priority	Verification Type	Owner			
1	Draft	Normal	Test	Jim Bosch			
Open LVV-T69 in Jira							



4.47.1 Verification Elements

• LVV-107 - DMS-REQ-0276-V-01: Object Characterization

4.47.2 Test Items

Verify that Object catalogs produced by the DRP pipeline include all measurements listed in DMS-REQ-0276: a point-source model fit, a bulge-disk model fit, standard colors, a centroid, adap- tive moments, Petrosian and Kron fluxes, surface brightness at multiple apertures, proper motion and parallax, and a variability characterization.

4.47.3 Predecessors

4.47.4 Environment Needs

4.47.4.1 Software

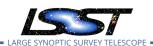
4.47.4.2 Hardware

4.47.5 Input Specification

4.47.6 Output Specification

4.47.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Precursor data, execute DRP, load results, observe catalog contents			
1	Test Data No data.				
	Expected				
	Result				



4.48 LVV-T71 - Verify implementation of Detecting extended low surface brightness objects

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jim Bosch	
Open LVV-T71 in Jira					

4.48.1 Verification Elements

• LVV-180 - DMS-REQ-0349-V-01: Detecting extended low surface brightness objects

4.48.2 Test Items

Verify that low-surface brightness objects (including those whose PSF S/N is lower than the detection threshold) are detected in coadds.

4.48.3 Predecessors

4.48.4 Environment Needs

4.48.4.1 Software

4.48.4.2 Hardware

4.48.5 Input Specification

Input Data

HSC "RC2" data (raw science images and master calibrations)

4.48.6 Output Specification

4.48.7 Test Procedure



Step	Description, l	nput Data and Expected Result
	Description	load LSST DM Stack
1	Test Data	No data.
	Expected	
	Result	
	Description	Run the single-frame processing and self-calibration steps of the DRP pipeline.
2	Test Data	No data.
	Expected	
	Result	
	Description	Insert simulated low-surface-brightness galaxies (with exponential profiles) consistently
3		into all calibrated single-epoch images.
	Test Data	No data.
	Expected	
	Result	
	Description	Run all remaining DRP pipeline steps.
4	Test Data	No data.
	Expected	
	Result	
	Description	Load data into DRP database
5	Test Data	No data.
	Expected	
	Result	
	Description	Verify that the injected simulated objects are recovered at a rate consistent with their S/N
6		and true profile when not blended with each other or real objects.
	Test Data	No data.
	Expected	
	Result	

4.49 LVV-T72 - Verify implementation of Coadd Image Method Constraints

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jim Bosch	
Open LVV-T72 in Jira					



4.49.1 Verification Elements

• LVV-109 - DMS-REQ-0278-V-01: Coadd Image Method Constraints

4.49.2 Test Items

Verify the implementation of how Coadd images are created.

4.49.3 Predecessors

4.49.4 Environment Needs

4.49.4.1 Software

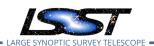
4.49.4.2 Hardware

4.49.5 Input Specification

4.49.6 Output Specification

4.49.7 Test Procedure

Step	Description, I	nput Data and Expected Result
	Description	Identify a dataset that has been processed to create coadd images.
1	Test Data	No data.
	Expected	
	Result	
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	



Step	Description, l	Description, Input Data and Expected Result		
3	Description Test Data	Retrieve the coadds in the dataset and verify that they are non-empty. No data.		
	Expected			
	Result			
	Description	Verify that coadds were created following specification		
4	Test Data	No data.		
	Expected			
	Result			

4.50 LVV-T73 - Verify implementation of Deep Detection Coadds

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jim Bosch	
Open LVV-T73 in Jira					

4.50.1 Verification Elements

• LVV-110 - DMS-REQ-0279-V-01: Deep Detection Coadds

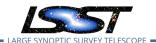
4.50.2 Test Items

Verify that the DRP pipelines produce a suite of per-band coadded images that are optimized for depth.

4.50.3 Predecessors

4.50.4 Environment Needs

4.50.4.1 Software



4.50.4.2 Hardware

4.50.5 Input Specification

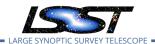
4.50.6 Output Specification

4.50.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result 	
	Description	Verify through inspection that per-filter coadds exist for each tract+patch possible
2	Test Data	No data.
	Expected	
	Result	
3	Description	Verify through inspection that the images used to generate those coadds met specified conditions
5	Test Data	No data.
	Expected	
	Result	
4	Description	Visually inspect a subset of the coadds to verify that they visually appear reasonable and to be from good quality data.
·	Test Data	No data.
	Expected	
	Result	

4.51 LVV-T74 - Verify implementation of Template Coadds

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm



Open LVV-T74 in Jira

4.51.1 Verification Elements

• LVV-111 - DMS-REQ-0280-V-01: Template Coadds

4.51.2 Test Items

Verify that the DMS can produce Template Coadds for DIA processing.

4.51.3 Predecessors

4.51.4 Environment Needs

4.51.4.1 Software

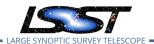
4.51.4.2 Hardware

4.51.5 Input Specification

4.51.6 Output Specification

4.51.7 Test Procedure

Step	Description, I	Input Data and Expected Result
1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866		



Description, Input Data and Expected Result				
Test Data				
Expected				
Result				
Description	Confirm that the template coadds have been created and are well-formed.			
Test Data	No data.			
Expected				
Result				
	Test Data Expected Result Description Test Data Expected			

4.52 LVV-T75 - Verify implementation of Multi-band Coadds

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jim Bosch	
Open LVV-T75 in Jira					

4.52.1 Verification Elements

• LVV-112 - DMS-REQ-0281-V-01: Multi-band Coadds

4.52.2 Test Items

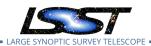
Verify that the DRP pipelines produce multi-band coadds for detection purposes.

4.52.3 Predecessors

4.52.4 Environment Needs

4.52.4.1 Software

4.52.4.2 Hardware



4.52.5 Input Specification

4.52.6 Output Specification

4.52.7 Test Procedure

escription, Input Data and Expected Result			
Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- lowing:		
Test Data			
Expected	Butler repo available for reading.		
Result			
Description	Verify that deep detection coadds exist based on all filters.		
Test Data	No data.		
Expected			
Result			
	Description Test Data Expected Result Description Test Data Expected		

4.53 LVV-T76 - Verify implementation of All-Sky Visualization of Data Releases

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Simon Krughoff	
Open LVV-T76 in Jira					

4.53.1 Verification Elements

• LVV-160 - DMS-REQ-0329-V-01: All-Sky Visualization of Data Releases

4.53.2 Test Items

Show that it's possible to produce large area visualizations from Data Release data products.



4.53.3 Predecessors

4.53.4 Environment Needs

4.53.4.1 Software

4.53.4.2 Hardware

4.53.5 Input Specification

Input Data

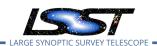
Dataset of perhaps ~100 square degrees. The first HSC Public Data Release will be used for this test. Larger (in sky area) datasets should be identified for further testing.

4.53.6 Output Specification

4.53.7 Test Procedure

Step	Description, In	iput Data and E	xpected Result

1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	
2	Description	Run all sky tile generation task to produce the data products necessary for serving the all sky visualization.
۷	Test Data	No data.
	Expected	
	Result	



Step	Description, Input Data and Expected Result			
3	Description	ription Manually perform, and log (including timing where applicable), the following steps aga that all sky visualization application. At all steps take special care to note any missin un-rendered image tiles:		
		 Navigate to the all sky viewer and log the URL, browser and version. Zoom to native pixel display (1 image pixel per display pixel) Zoom to fit the full PDR footprint Zoom to 1/4x native resolution Pan to eastern edge of the footprint. Pan to western edge of the footprint. Navigate to the middle of the footprint. Zoom to max magnification 		
	Test Data	No data.		
	Expected			
	Result			

4.54 LVV-T77 - Verify implementation of Best Seeing Coadds

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jim Bosch	
Open LVV-T77 in Jira					

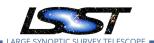
4.54.1 Verification Elements

• LVV-161 - DMS-REQ-0330-V-01: Best Seeing Coadds

4.54.2 Test Items

Verify that the DRP pipelines produce a suite of per-band coadds with input images filtered to optimize the size of the effective PSF on the coadd.

4.54.3 Predecessors



4.54.4 Environment Needs

4.54.4.1 Software

4.54.4.2 Hardware

4.54.5 Input Specification

4.54.6 Output Specification

4.54.7 Test Procedure

Step	Description, Input Data and Expected Result				
1-1 from	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:			
LVV-T860					

- local (newinstall.sh based install):[path_to_installation]/loadLSST.bash
- development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash
- LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash

From the command line, execute the commands below in the example code:

	Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	

The contents of this document are subject to configuration control by the LSST DM Change Control Board.



Step	Description, Input Data and Expected Result		
	Description	Explicitly create a coadd for a specified seeing range in each filter.	
3	Test Data	No data.	
	Expected		
	Result		
	Description	Verify that these coadds exist.	
4	Test Data	No data.	
	Expected		
	Result		

4.55 LVV-T78 - Verify implementation of Persisting Data Products

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Kian-Tat Lim	
Open I VV-T78 in lira					

4.55.1 Verification Elements

• LVV-165 - DMS-REQ-0334-V-01: Persisting Data Products

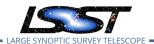
4.55.2 Test Items

Verify that per-band deep coadds and best-seeing coadds are present, kept, and available.

4.55.3 Predecessors

4.55.4 Environment Needs

4.55.4.1 Software



4.55.4.2 Hardware

4.55.5 Input Specification

Precursor data from HSC PDR.

4.55.6 Output Specification

4.55.7 Test Procedure

_	Step	Description, Input Data and Expected Result		
		Description	Produce some relevant coadds and store them in the Archive	
1		Test Data	No data.	
		Expected		
		Result		
		Description	Examine the data retention policies for those products	
	2	Test Data	No data.	
		Expected		
		Result		

4.56 LVV-T79 - Verify implementation of PSF-Matched Coadds

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Jim Bosch		
Open LVV-T79 in Jira						

4.56.1 Verification Elements

• LVV-166 - DMS-REQ-0335-V-01: PSF-Matched Coadds



4.56.2 Test Items

Verify that the DRP pipelines produce PSF matched coadds.

- 4.56.3 Predecessors
- 4.56.4 Environment Needs
- 4.56.4.1 Software
- 4.56.4.2 Hardware
- 4.56.5 Input Specification
- 4.56.6 Output Specification

4.56.7 Test Procedure

Result

Step	ep Description, Input Data and Expected Result					
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:				
LVV-T987	Test Data					

Expected Butler repo available for reading.

Description Verify that PSF-matched coadds were created. 2 Test Data No data. Expected Result

4.57 LVV-T80 - Verify implementation of Detecting faint variable objects

r

1 Draft Normal Test Melissa Graham
Open LVV-T80 in Jira

4.57.1 Verification Elements

LVV-168 - DMS-REQ-0337-V-01: Detecting faint variable objects

4.57.2 Test Items

To verify that the Data Release Production pipeline will be able to detect faint sources with long-term variability (e.g., quasars, proper motion stars) via, e.g., shorter timescale coadds (month to a few months).

4.57.3 Predecessors

4.57.4 Environment Needs

4.57.4.1 Software

4.57.4.2 Hardware

4.57.5 Input Specification

Input Data such as:

DECam HiTS data.

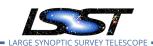
Gaia catalog of faint moving objects.

Catalog of spectroscopically confirmed quasars.

(Alternative: input data injected with faint variable sources).

4.57.6 Output Specification

4.57.7 Test Procedure



Step	Description, I	nput Data and Expected Result
1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result 	
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result 	
3	Description	Identify 100 objects from Gaia with proper motions high enough to have detectably moved during HSC observations.
	Test Data	No data.
	Expected	
	Result	
4	Description	Measure reported proper motion of these objects in DM Stack processing. Verify that it is consistent with Gaia objects.
7	Test Data	No data.
	Expected	
	Result	
	Description	Identify 100 quasars from color-space or existing extragalactic spectroscopic catalog.
5	Test Data	No data.
	Expected	
	Result	
6	Description	Measure lightcurves of these quasars. Determine if structure function is reasonable (may require at least a year to determine if the structure function of 100 quasars is "reasonable").



Step	Description, Input Data and Expected Result			
	Test Data	No data.		
	Expected			
	Result			
7	Description	(Alternative: if faint variable source can be injected into the input data, test to see if they are recovered).		
,	Test Data	No data.		
	Expected	(This Alternative would enable us not only to tell if faint variable objects are detected, but		
	Result	exactly which kinds, how faint, and with what efficiency.)		

4.58 LVV-T81 - Verify implementation of Targeted Coadds

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jim Bosch	
Open LVV-T81 in Jira					

4.58.1 Verification Elements

• LVV-169 - DMS-REQ-0338-V-01: Targeted Coadds

4.58.2 Test Items

Verify that small sections of any coadd produced by the DRP pipelines can be retained, even if the full coadd is not.

4.58.3 Predecessors

4.58.4 Environment Needs

4.58.4.1 Software

4.58.4.2 Hardware

4.58.5 Input Specification

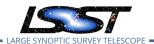
4.58.6 Output Specification

4.58.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Remove DR from disk			
1	Test Data	No data.			
	Expected				
	Result				
	Description	Observe retention of designated coadd sections			
2	Test Data	No data.			
	Expected				
	Result				
	Description	Observe accessibility of designated coadd sections via simulated DAC LSP instance			
3	Test Data	No data.			
	Expected				
	Result				

4.59 LVV-T82 - Verify implementation of Tracking Characterization Changes Between Data Releases

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Jim Bosch		
Open LVV-T82 in lira						



4.59.1 Verification Elements

• LVV-170 - DMS-REQ-0339-V-01: Tracking Characterization Changes Between Data Releases

4.59.2 Test Items

Verify that small-area subsets of a DR can be retained when most of that DR is retired, for comparison with future DRs.

- 4.59.3 Predecessors
- 4.59.4 Environment Needs
- 4.59.4.1 Software
- 4.59.4.2 Hardware
- 4.59.5 Input Specification
- 4.59.6 Output Specification

4.59.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1	Description	Prepare a second DRP run -> DPDD with different configuration parameters for this second test Data Release.
'	Test Data	No data.
	Expected	
	Result	
2-1 from	Description	Process data with the Data Release Production payload, starting from raw science images and generating science data products, placing them in the Data Backbone.
LVV- T1064	Test Data	erating science data products, placing them in the Data Backbone.



Step	Description, Input Data and Expected Result				
	Expected				
	Result				
	Description	Stage subset of products from first test Data Release to separate storage.			
3	Test Data	No data.			
	Expected				
	Result				
	Description	Scientifically compare the results of the subset of that region of sky to those in the second			
4		test Data Release comparing the results of the DRP Scientific Verification tests.			
	Test Data	No data.			
	Expected	Diagnostic plots quantifying the differences between scientific outputs between the first			
	Result	and second test datasets.			

4.60 LVV-T83 - Verify implementation of Bad Pixel Map

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Robert Lupton		
Open LVV-T83 in Jira						

4.60.1 Verification Elements

• LVV-22 - DMS-REQ-0059-V-01: Bad Pixel Map

4.60.2 Test Items

Verify that the DMS can produce a map of detector pixels that suffer from pathologies, and that these pathologies are encoded in at least 32-bit values.

4.60.3 Predecessors



4.60.4 Environment Needs

4.60.4.1 Software

4.60.4.2 Hardware

4.60.5 Input Specification

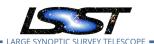
4.60.6 Output Specification

4.60.7 Test Procedure

Step	Description, Input Data and Expected Result			
1	Description	Interrogate the calibRegistry for the metadata associated with a bad pixel map, where the validity range contains the date of interest.		
·	Test Data	No data.		
	Expected	A bad pixel map for the requested date has been returned.		
	Result			
2	Description	Check that the bad pixel pathologies are encoded as at least 32-bit values, and that the various pathologies are represented by different encoding.		
_	Test Data	No data.		
	Expected	Bad pixel values can be decoded to determine their pathologies using their 32-bit values.		
	Result			

4.61 LVV-T84 - Verify implementation of Bias Residual Image

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Robert Lupton		
Open LVV-T84 in Jira						



4.61.1 Verification Elements

• LVV-23 - DMS-REQ-0060-V-01: Bias Residual Image

4.61.2 Test Items

Verify that DMS can construct a bias residual image that corrects for temporally-stable bias structures.

Verify that DMS can do this on demand.

4.61.3 Predecessors

4.61.4 Environment Needs

4.61.4.1 Software

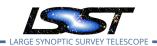
4.61.4.2 Hardware

4.61.5 Input Specification

4.61.6 Output Specification

4.61.7 Test Procedure

Step	Description, I	Description, Input Data and Expected Result				
	Description	Identify the location of an appropriate precursor dataset.				
1	Test Data	No data.				
	Expected					
	Result					
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:				
LVV-T987	Test Data					
	Expected	Butler repo available for reading.				
	Result					



Step Description, Input Data and Expected Result

	Description	Import the standard libraries required for the rest of this test:
3	Test Data	No data.
	Example	import osimport lsst.afw.display as afwDisplay
	Code	from lsst.daf.persistence import Butler
		from lsst.ip.isr import lsrTask
		from firefly_client import FireflyClient
		from IPython.display import IFrame
	Expected	
	Result	
	Description	Ingest the dataset from step 1 using the Butler (e.g., following example code below).
4	Test Data	No data.
	Example	butler = Butler(\$REPOSITORY_PATH)
	Code	raw = butler.get("raw", visit=\$VISIT_ID, detector=2)
		bias = butler.get("bias", visit=\$VISIT_ID, detector=2)
	Expected	
	Result	
	Description	Display the bias image and inspect that its pixels contain unique values.
5	Test Data	No data.
	Expected	A relatively flat image showing the bias level with roughly Poisson noise.
	Result	
	Description	Configure and run an Instrument Signature Removal (ISR) task on the raw data. Most
6	, -	corrections are disabled for simplicity, but the bias frame is applied.
-		

Test Data	No data.
Example	isr_config = IsrTask.ConfigClass()
Code	isr_config.doDark=False
	isr_config.doFlat=False
	isr_config.doFringe=False
	isr_config.doDefect=False
	isr_config.doAddDistortionModel=False
	isr_config.doLinearize=False
	isr = IsrTask(config=isr_config)
	result = isr.run(raw, bias=bias)



Step	Description, Input Data and Expected Result				
	Expected Result	A trimmed, bias-corrected image in 'result'.			
	Description	Display the 'result' image and confirm that the bias correction has been performed.			
7	Test Data	No data.			
	Expected Result	A displayed image with bias removed (i.e., typical background counts reduced relative to the raw frame).			

4.62 LVV-T85 - Verify implementation of Crosstalk Correction Matrix

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Robert Lupton		
Open LVV-T85 in Jira						

4.62.1 Verification Elements

• LVV-24 - DMS-REQ-0061-V-01: Crosstalk Correction Matrix

4.62.2 Test Items

Verify that the DMS can generate a cross-talk correction matrix from appropriate calibration data.

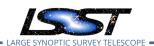
Verify that the DMS can measure the effectiveness of the cross-talk correction matrix.

4.62.3 Predecessors

4.62.4 Environment Needs

4.62.4.1 Software

4.62.4.2 Hardware



4.62.5 Input Specification

4.62.6 Output Specification

4.62.7 Test Procedure

Step	Description, Input Data and Expected Result				
1	Description	Identify an appropriate calibration dataset that can be used to derive the crosstalk correction matrix.			
'	Test Data	No data.			
	Expected				
	Result				
2-1 from LVV-	Description	Execute the Calibration Products Production payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and Calibration Database entries in the Data Backbone.			
T1060	Test Data				
	Expected				
	Result				
2-2 from	Description	Confirm that the expected Master Calibration images and Calibration Database entries are present _and_well-formed			
LVV-	Test Data	_and_well-loinied			
T1060	Expected				
	Result				
	Description	Confirm that the crosstalk correction matrix is produced and persisted.			
3	Test Data	No data.			
	Expected	A correction matrix quantifying what fraction of the signal detected in any given amplifier			
	Result	on each sensor in the focal plane appears in any other amplifier.			
4	Description	Apply the crosstalk correction to simulated images, and confirm that the correction is performing as expected.			
	Test Data	No data.			
	Expected	A noticeable difference between images before and after applying the correction.			
	Result				

4.63 LVV-T86 - Verify implementation of Illumination Correction Frame



Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Robert Lupton		
Open LVV-T86 in Jira						

4.63.1 Verification Elements

• LVV-25 - DMS-REQ-0062-V-01: Illumination Correction Frame

4.63.2 Test Items

Verify that the DMS can produce an illumination correction frame calibration product. Verify that the DMS can determine the effectiveness of an illumination correction and determine how often it should be updated.

4.63.3 Predecessors

4.63.4 Environment Needs

4.63.4.1 Software

4.63.4.2 Hardware

4.63.5 Input Specification

4.63.6 Output Specification

4.63.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to CPP	
1	Test Data	No data.	

Step	Description, Input Data and Expected Result			
	Expected			
	Result			

4.64 LVV-T87 - Verify implementation of Monochromatic Flatfield Data Cube

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Robert Lupton		
Open LVV-T87 in Jira						

4.64.1 Verification Elements

• LVV-26 - DMS-REQ-0063-V-01: Monochromatic Flatfield Data Cube

4.64.2 Test Items

Verify that the DMS can generate a calibration image/cube that corrects for pixel-to-pixel wavelength-dependent detector response.

Verify that the DMS can measure the effectiveness of this monochromatic flatfield data cube.

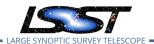
4.64.3 Predecessors

4.64.4 Environment Needs

4.64.4.1 Software

4.64.4.2 Hardware

4.64.5 Input Specification



4.64.6 Output Specification

4.64.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Delegate to CPP		
1	Test Data	No data.		
	Expected			
	Result			

4.65 LVV-T88 - Verify implementation of Calibration Data Products

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Robert Lupton		
Open LVV-T88 in Jira						

4.65.1 Verification Elements

• LVV-57 - DMS-REQ-0130-V-01: Calibration Data Products

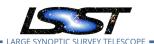
4.65.2 Test Items

Verify that the DMS can produce and archive the required Calibration Data Products: cross talk correction, bias, dark, monochromatic dome flats, broad-band flats, fringe correction, and illumination corrections.

4.65.3 Predecessors

4.65.4 Environment Needs

4.65.4.1 Software



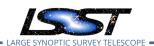
4.65.4.2 Hardware

4.65.5 Input Specification

4.65.6 Output Specification

4.65.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Identify a suitable set of calibration frames, including biases, dark frames, and flat-field frames.	
'	Test Data	No data.	
	Expected		
	Result		
2-1 from LVV-	Description	Execute the Calibration Products Production payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and Calibration Database entries in the Data Backbone.	
T1060	Test Data	TOTATION DESCRIPTION OF THE DESCRIPTION OF THE PROPERTY OF THE	
	Expected		
	Result		
2-2 from		Confirm that the expected Master Calibration images and Calibration Database entries are present _and well-formed	
LVV-	Test Data		
T1060	Expected		
	Result		
3	Description	Confirm that the expected data products are created, and that they have the expected properties.	
3	Test Data	No data.	
	Expected	A full set of calibration data products has been created, and they are well-formed.	
	Result		
4	Description	Test that the calibration products are archived, and can readily be applied to science data to produce the desired corrections.	
7	Test Data	No data.	
	Expected	Confirmation that application of the calibration products to processed data has the de-	
	Result	sired effects.	



4.66 LVV-T89 - Verify implementation of Calibration Image Provenance

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton
Open LVV-T89 in Jira				

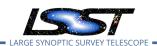
4.66.1 Verification Elements

- LVV-59 DMS-REQ-0132-V-01: Calibration Image Provenance
- LVV-1234 OSS-REQ-0122-V-01: Provenance

4.66.2 Test Items

Verify that the DMS records the required provenance information for the Calibration Data Products.

- 4.66.3 Predecessors
- 4.66.4 Environment Needs
- 4.66.4.1 Software
- 4.66.4.2 Hardware
- 4.66.5 Input Specification
- 4.66.6 Output Specification
- 4.66.7 Test Procedure



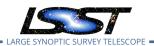
Description, Input Data and Expected Result		
Description	Ingest an appropriate precursor calibration dataset into a Butler repo.	
Test Data	No data.	
Expected		
Result		
Description	Execute the Calibration Products Production payload. The payload uses raw calibration images and	
	information from the Transformed EFD to generate a subset of Master Calibration Images and Calibration Database entries in the Data Backbone.	
Test Data		
Expected		
Result		
Description	Confirm that the expected Master Calibration images and Calibration Database entries are presentand_well-formed	
Test Data		
Expected		
Result		
Description	Load the relevant database/Butler data product, and observe that all provenance information has been retained.	
Test Data	No data.	
Expected	A dataset consisting of calibration images, with provenance information recorded and	
Result	properly associated with the calibration images.	
	Description Test Data Expected Result Description Test Data Expected Expected Result	

4.67 LVV-T90 - Verify implementation of Dark Current Correction Frame

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton
Open LVV-T90 in Jira				

4.67.1 Verification Elements

• LVV-113 - DMS-REQ-0282-V-01: Dark Current Correction Frame



4.67.2 Test Items

Verify that the DMS can produce a dark correction frame calibration product. Verify that the DMS can determine the effectiveness of a dark correction and determine how often it should be updated.

4.67.3 Predecessors

4.67.4 Environment Needs

4.67.4.1 Software

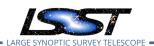
4.67.4.2 Hardware

4.67.5 Input Specification

4.67.6 Output Specification

4.67.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Identify the path to a dataset containing dark frames (i.e., exposures taken with the shutter closed).	
·	Test Data	No data.	
	Expected		
	Result		
2	Description	Execute the relevant steps from 'cp_pipe' (the calibration pipeline) to produce dark correction frames.	
۷	Test Data	No data.	
	Expected		
	Result		
	Description	Inspect the resulting dark correction frame to confirm that it appears as expected.	
3	Test Data	No data.	



Step	Description, Input Data and Expected Result		
	Expected Result	A well-formed dark correction frame is present and accessible via the Data Butler.	
4	Description	Determining whether the dark correction is being done properly will require on-sky science data. The dark correction can be applied to these frames and the results inspected to ensure that the correction was correctly measured and applied.	
	Test Data	No data.	
	Expected Result	Applying the dark correction to a dataset produces noticeable differences between the original frame(s) and the corrected outputs.	

4.68 LVV-T91 - Verify implementation of Fringe Correction Frame

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Lupton
Open LVV-T91 in Jira				

4.68.1 Verification Elements

• LVV-114 - DMS-REQ-0283-V-01: Fringe Correction Frame

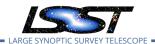
4.68.2 Test Items

Verify that the DMS can produce an fringe-correction frame calibration product. Verify that the DMS can determine the effectiveness of the fringe-correction frame and determine how often it should be updated.

4.68.3 Predecessors

4.68.4 Environment Needs

4.68.4.1 Software



4.68.4.2 Hardware

4.68.5 Input Specification

4.68.6 Output Specification

4.68.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to CPP	
1	Test Data	No data.	
	Expected		
	Result		

4.69 LVV-T92 - Verify implementation of Processing of Data From Special Programs

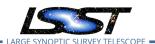
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham
		Open	LVV-T92 in Jira	

4.69.1 Verification Elements

• LVV-151 - DMS-REQ-0320-V-01: Processing of Data From Special Programs

4.69.2 Test Items

For a simulated night of observing that includes some special program observations, show that the SP observations are reduced using their designated reconfigured pipelines (i.e., that the image metadata is sufficient to trigger the processing and include all other relevant images in the processing).



4.69.3 Predecessors

4.69.4 Environment Needs

4.69.4.1 Software

4.69.4.2 Hardware

4.69.5 Input Specification

A variety of imaging data from Special Programs, including these scenarios:

- (1) Special Programs data that can be processed by the Prompt pipeline (i.e., standard visits)
- (2) Special Programs data that requires 'real-time' (~24) processing with a reconfigured pipeline (e.g., DDF imaging sequence)
- (3) Special Programs data that can (should) be processed by the Data Release pipeline (e.g., North Ecliptic Spur standard visits)

4.69.6 Output Specification

4.69.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	(1) Special Programs data that can be processed by the Prompt pipeline (i.e., standard visits).	
		Check that all images with the header keyword for SP were processed by the Prompt pipeline. Check that the Prompt pipeline's data products – DIASource, DIAObject catalogs and the Alerts – contain items flagged with their origin as that SP.	
	Test Data	No data.	
	Expected		
	Result		
2	Description	(2) Special Programs data that requires 'real-time' (~24) processing with a reconfigured pipeline (e.g., DDF imaging sequence)	
_		Check that all images with the header keywords for a given SP were processed by their reconfigured pipeline. Check that the pipeline's data products have been updated, and passed their QA.	
	Test Data	No data.	



Step	Description, Input Data and Expected Result		
	Expected Result		
3	Description	(3) Special Programs data that can (should) be processed by the Data Release pipeline (e.g., North Ecliptic Spur standard visits). SP data would be added manually to the DRP processing. Check that the DRP's data products – Source, Object, CoAdds – contain items flagged as originating in that SP.	
	Test Data Expected	No data.	
	Result		

4.70 LVV-T93 - Verify implementation of Level 1 Processing of Special Programs Data

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham
Open LVV-T93 in lira				

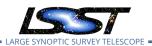
4.70.1 Verification Elements

• LVV-152 - DMS-REQ-0321-V-01: Level 1 Processing of Special Programs Data

4.70.2 Test Items

Execute multi-day operations rehearsal. Observe whether Prompt Processing data products generated in time and confirm whether processing has completed before the start of the next simulated night.

4.70.3 Predecessors



4.70.4 Environment Needs

4.70.4.1 Software

4.70.4.2 Hardware

4.70.5 Input Specification

Imaging data obtained under a Special Program: for example, a sequence of consecutive images of a deep drilling field.

4.70.6 Output Specification

4.70.7 Test Procedure

Step	Description, I	Description, Input Data and Expected Result		
1	Description	If imaging data for a Special Program that requires processing with the Prompt pipeline was obtained the previous night, check that there exist DIASources/Objects/Alerts with flags that they originated from the Special Program.		
	Test Data	No data.		
	Expected			
	Result			
2	Description	If imaging data for a Special Program that requires prompt processing with a reconfigured pipeline was obtained the previous night, check that the relevant data products have been updated.		
	Test Data	No data.		
	Expected			
	Result			

4.71 LVV-T94 - Verify implementation of Special Programs Database

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham



Open LVV-T94 in Jira

4.71.1 Verification Elements

• LVV-153 - DMS-REQ-0322-V-01: Special Programs Database

4.71.2 Test Items

To confirm that data products from Special Programs are based solely on images obtained as part of SP via, e.g., metadata queries. To confirm that the SP data products can be joined to Prompt and DRP products by attempting to do so via, e.g., coordinate table joins, and attempting to e.g., find the faint counterparts in a Deep Drilling stack to variables with no Object detections in the DRP coadds.

4.71.3 Predecessors

4.71.4 Environment Needs

4.71.4.1 Software

4.71.4.2 Hardware

4.71.5 Input Specification

Databases created by reconfigured pipelines for processing Special Programs data (e.g., DIAObject/DIASource catalogs for a Deep Drilling Field).

4.71.6 Output Specification

4.71.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	SP data product: DDF DIAObjects catalog	
1		Non-SP data product: WFD DIAObjects catalog	
		Test: join the two catalogs by coordinate (e.g., to get a longer time baseline for variable stars in the DDF)	
	Test Data	No data.	
	Expected		
	Result		
	Description	SP data product: DDF Objects catalog	
2		Non-SP data product: WFD DIAObjects catalog	
		Test: join the two catalogs by coordinate to identify faint host galaxies of transients found in WFD	
	Test Data	No data.	
	Expected		
	Result		

4.72 LVV-T95 - Verify implementation of Constraints on Level 1 Special Program Products Generation

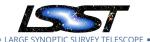
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham
Open LVV-T95 in Jira				

4.72.1 Verification Elements

- LVV-175 DMS-REQ-0004-V-01: Time to L1 public release
- LVV-1276 OSS-REQ-0127-V-01: Level 1 Data Product Availability

4.72.2 Test Items

Execute single-day operations rehearsal. Observe Prompt Processing data products generated in time. Confirm that data from Special Programs is processed with the same latency as required for main survey data: release of public data within L1publicT and Alerts within OTT1.



4.72.3 Predecessors

4.72.4 Environment Needs

4.72.4.1 Software

4.72.4.2 Hardware

4.72.5 Input Specification

Data from a Special Program that is appropriate for the Prompt pipeline (i.e., a Deep Drilling type series of standard visits from a non-crowded field).

4.72.6 Output Specification

4.72.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result		
1-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.		
	Test Data			
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.		
	Result			
1-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.		
LVV-T866	Test Data			
	Expected			
	Result			
2	Description	Confirm that Special Program prompt data products have been generated within 24 hours.		
_	Test Data	No data.		
	Expected			
	Result			



Step Description, Input Data and Expected Result

4.73 LVV-T96 - Verify implementation of Query Repeatability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open L\	/V-T96 in Jira	

4.73.1 Verification Elements

• LVV-122 - DMS-REQ-0291-V-01: Query Repeatability

4.73.2 Test Items

Verify that prior queries can be rerun with identical results, or with new additional data for live (Alert Production) databases.

4.73.3 Predecessors

4.73.4 Environment Needs

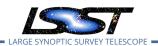
4.73.4.1 Software

4.73.4.2 Hardware

4.73.5 Input Specification

4.73.6 Output Specification

4.73.7 Test Procedure



Step	Description, Input Data and Expected Result		
1	Description	Select and download (deterministic) random subsample of records from Data Release Object and Source tables.	
•	Test Data	No data.	
	Expected		
	Result		
	Description	Select and download random subsample of PPDB DIAObject and DIASource tables.	
2	Test Data	No data.	
	Expected		
	Result		
3	Description	As appropriate, wait for some amount of non-trivial database usage to occur, such as Prompt Processing ingestion or ingestion of other DRP database tables.	
3	Test Data	No data.	
	Expected		
	Result		
	Description	Re-run the queries in steps 1 and 2 and verify that the resulting data are identical.	
4	Test Data	No data.	
	Expected		
	Result		

4.74 LVV-T97 - Verify implementation of Uniqueness of IDs Across Data Releases

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim
Open LVV-T97 in Jira				

4.74.1 Verification Elements

• LVV-123 - DMS-REQ-0292-V-01: Uniqueness of IDs Across Data Releases



4.74.2 Test Items

Verify that the IDs of Objects, Sources, DIAObjects, and DIASources from different Data Releases are unique.

4.74.3 Predecessors

4.74.4 Environment Needs

4.74.4.1 Software

4.74.4.2 Hardware

4.74.5 Input Specification

4.74.6 Output Specification

4.74.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Identify an appropriate precursor dataset to be processed through Data Release Production.	
'	Test Data	No data.	
	Expected		
	Result		
2-1 from	Description	Process data with the Data Release Production payload, starting from raw science images and generating science data products, placing them in the Data Backbone.	
	Test Data		
T1064	Expected		
	Result		
3-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:	
LVV-T987	Test Data		



Step	Description, Input Data and Expected Result		
	Expected Result	Butler repo available for reading.	
4	Description Test Data Expected Result	After running the DRP payload multiple times, load the resulting data products (both data release and prompt products) using the Butler. No data. Multiple datasets resulting from processing of the same input data.	
5	Description Test Data Expected Result	Inspect the IDs in the multiple data products and confirm that all IDs are unique. No data. No IDs are repeated between multiple processings of the identical input dataset.	

4.75 LVV-T98 - Verify implementation of Selection of Datasets

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim
Open LVV-T98 in Jira				

4.75.1 Verification Elements

• LVV-124 - DMS-REQ-0293-V-01: Selection of Datasets

4.75.2 Test Items

Verify that the DMS can identify and retrieve datasets consisting of logical groupings of Exposures, metadata, provenance, etc., or other groupings that are processed or produced as a logical unit.

4.75.3 Predecessors

4.75.4 Environment Needs

4.75.4.1 Software

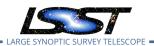
4.75.4.2 Hardware

4.75.5 Input Specification

4.75.6 Output Specification

4.75.7 Test Procedure

Step	Description, Input Data and Expected Result		
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:	
LVV-T987	Test Data		
	Expected	Butler repo available for reading.	
	Result 		
	Description	Ingest data from an appropriate processed dataset.	
2	Test Data	No data.	
	Expected		
	Result		
	Description	Observe retrieval of single Processed Visit Image (PVI) with metadata.	
3	Test Data	No data.	
	Expected	A PVI and its associated metadata.	
	Result		
	Description	Observe retrieval of multiple PVIs with metadata.	
4	Test Data	No data.	
	Expected	A set of PVIs and their associated metadata.	
	Result		
	Description	Observe retrieval of coadd patch with metadata and provenance information.	
5	Test Data	No data.	



Step	Description, Input Data and Expected Result		
	Expected Result	An image of coadded data in a patch, along with its metadata and information describing the provenance of the patch constituents.	
	Description	Observe retrieval of subset of rows in each of the above catalogs.	
6	Test Data	No data.	
	Expected		
	Result		

4.76 LVV-T99 - Verify implementation of Processing of Datasets

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open L	VV-T99 in Jira	

4.76.1 Verification Elements

• LVV-125 - DMS-REQ-0294-V-01: Processing of Datasets

4.76.2 Test Items

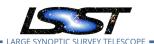
Execute AP and DRP, simulate failures, observe correct processing

4.76.3 Predecessors

4.76.4 Environment Needs

4.76.4.1 Software

4.76.4.2 Hardware



4.76.5 Input Specification

4.76.6 Output Specification

4.76.7 Test Procedure

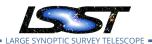
Step	Description, l	Description, Input Data and Expected Result		
	Description	Execute AP and DRP		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Simulate failures		
2	Test Data	No data.		
	Expected			
	Result			
	Description	Observe correct processing		
3	Test Data	No data.		
	Expected			
	Result			

4.77 LVV-T100 - Verify implementation of Transparent Data Access

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open L\	/V-T100 in Jira	

4.77.1 Verification Elements

• LVV-126 - DMS-REQ-0295-V-01: Transparent Data Access



4.77.2 Test Items

Test Items

Observe dataset retrieval from multiple LSP instances

- 4.77.3 Predecessors
- 4.77.4 Environment Needs
- 4.77.4.1 Software
- 4.77.4.2 Hardware
- 4.77.5 Input Specification
- 4.77.6 Output Specification

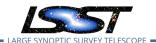
4.77.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Observe dataset retrieval from multiple LSP instances	
1	Test Data	No data.	
	Expected		
	Result		

4.78 LVV-T101 - Verify implementation of Transient Alert Distribution

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Onen I\	//-T101 in lira	

Open Lvv-1101 in Jira



4.78.1 Verification Elements

• LVV-3 - DMS-REQ-0002-V-01: Transient Alert Distribution

4.78.2 Test Items

Precursor or simulated data, execute AP, observe distribution to simulated clients using standard protocols

4.78.3 Predecessors

4.78.4 Environment Needs

4.78.4.1 Software

4.78.4.2 Hardware

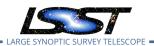
4.78.5 Input Specification

Obtain precursor or simulated data; duplicated by LVV-T217 – delete?

4.78.6 Output Specification

4.78.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Execute AP	
1	Test Data	No data.	
	Expected		
	Result		
	Description	Observe distribution to simulated clients using standard protocols	
2	Test Data	No data.	



Step	Description, Input Data and	d Expected Result
------	-----------------------------	-------------------

Expected

Result

4.79 LVV-T102 - Verify implementation of Solar System Objects Available Within Specified Time

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open L\	/V-T102 in Jira	

4.79.1 Verification Elements

- LVV-36 DMS-REQ-0089-V-01: Solar System Objects Available Within Specified Time
- LVV-1276 OSS-REQ-0127-V-01: Level 1 Data Product Availability
- LVV-9803 DMS-REQ-0004-V-03: Time to availability of Solar System Object orbits

4.79.2 Test Items

Execute single-day operations rehearsal, observe data products generated in time

4.79.3 Predecessors

4.79.4 Environment Needs

4.79.4.1 Software

4.79.4.2 Hardware



4.79.5 Input Specification

4.79.6 Output Specification

4.79.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Execute single-day operations rehearsal	
1	Test Data	No data.	
	Expected		
	Result		
	Description	Observe data products generated in time	
2	Test Data	No data.	
	Expected		
	Result		

4.80 LVV-T103 - Verify implementation of Generate Data Quality Report Within Specified Time

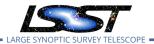
Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim
		Open LV	V-T103 in Jira	

4.80.1 Verification Elements

• LVV-38 - DMS-REQ-0096-V-01: Generate Data Quality Report Within Specified Time

4.80.2 Test Items

Verify that the DMS can generate a nightly L1 Data Quality Report within **dqReportCom-plTime = 4[hour]**, in both human- and machine-readable formats.



4.80.3 Predecessors

4.80.4 Environment Needs

4.80.4.1 Software

4.80.4.2 Hardware

4.80.5 Input Specification

4.80.6 Output Specification

4.80.7 Test Procedure

Step	Description, li	Description, Input Data and Expected Result		
	Description	Execute single-day operations rehearsal		
1	Test Data	No data.		
	Expected			
	Result			
2	Description	After dqReportComplTime = 4[hour] has passed, confirm (via timestamps) that the data quality report has been generated within dqReportComplTime = 4[hour] , and that it contains the correct contents.		
2	Description Test Data			

4.81 LVV-T104 - Verify implementation of Generate DMS Performance Report Within Specified Time

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open L\	/V-T104 in Jira	

The contents of this document are subject to configuration control by the LSST DM Change Control Board.



4.81.1 Verification Elements

• LVV-40 - DMS-REQ-0098-V-01: Generate DMS Performance Report Within Specified Time

4.81.2 Test Items

Verify that the DMS can generate a nightly Perfomance Report within perfReportComplTime

4.81.3 Predecessors

4.81.4 Environment Needs

4.81.4.1 Software

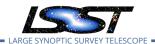
4.81.4.2 Hardware

4.81.5 Input Specification

4.81.6 Output Specification

4.81.7 Test Procedure

Description, Input Data and Expected Result		
Description	Execute single-day operations rehearsal	
Test Data	No data.	
Expected		
Result		
Description	Observe performance report is generated on time and with correct contents	
Test Data	No data.	
Expected		
Result		
	Description Test Data Expected Result Description Test Data	



4.82 LVV-T105 - Verify implementation of Generate Calibration Report Within Specified Time

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open L\	/V-T105 in Jira	

4.82.1 Verification Elements

• LVV-42 - DMS-REQ-0100-V-01: Generate Calibration Report Within Specified Time

4.82.2 Test Items

Verify that the DMS can generate a night Calibration Report in both human-readable and machine-parseable forms.

- 4.82.3 Predecessors
- 4.82.4 Environment Needs
- 4.82.4.1 Software
- 4.82.4.2 Hardware
- 4.82.5 Input Specification
- 4.82.6 Output Specification
- 4.82.7 Test Procedure



Step	Description, Input Data and Expected Result		
	Description	Execute single-day operations rehearsal	
1	Test Data	No data.	
	Expected		
	Result		
	Description	Observe calibration report is generated on time and with correct contents	
2	Test Data	No data.	
	Expected		
	Result		

4.83 LVV-T106 - Verify implementation of Calibration Images Available Within Specified Time

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open L\	/V-T106 in lira	

4.83.1 Verification Elements

• LVV-58 - DMS-REQ-0131-V-01: Time allowed to process calibs

4.83.2 Test Items

Execute single-day operations rehearsal, observe data products generated

4.83.3 Predecessors

4.83.4 Environment Needs

4.83.4.1 Software

4.83.4.2 Hardware

4.83.5 Input Specification

4.83.6 Output Specification

4.83.7 Test Procedure

Step	Description, I	Description, Input Data and Expected Result		
1	Description	Identify a dataset of raw calibration exposures containing at least nCalExpProc = 25 exposures. (If it contains more than 25 exposures, use only 25 for the test.)		
	Test Data	No data.		
	Expected			
	Result			
2-1 from	Description	Execute the Daily Calibration Products Update payload. The payload uses raw calibration images		
LVV-		and information from the Transformed EFD to generate a subset of Master Calibration Images and		
T1059	Test Data			
	Expected			
	Result			
2-2 from	Description	Confirm that the expected Master Calibration images and Calibration Database entries are present		
LVV-	Test Data			
T1059	Expected			
	Result			
	Description	Confirm that the processing completed successfully within calProcTime = 1200 seconds.		
3	Test Data	No data.		
	Expected	Calibration products resulting from processed raw calibration exposures are present		
	Result	within calProcTime, and are well-formed images.		

4.84 LVV-T107 - Verify implementation of Level-1 Production Completeness

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm



Open LVV-T107 in Jira

4.84.1 Verification Elements

• LVV-115 - DMS-REQ-0284-V-01: Level-1 Production Completeness

4.84.2 Test Items

Verify that the DMS successfully processes all images of sufficiently quality for processing are eventually processed even after connectivity failures.

4.84.3 Predecessors

LVV-T284

4.84.4 Environment Needs

4.84.4.1 Software

4.84.4.2 Hardware

4.84.5 Input Specification

4.84.6 Output Specification

4.84.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Ingest raw data while simulating failures and outages, observe eventual recovery	
1	Test Data	No data.	
	Expected		
	Result		



4.85 LVV-T108 - Verify implementation of Level 1 Source Association

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV\	/-T108 in Jira	

4.85.1 Verification Elements

• LVV-116 - DMS-REQ-0285-V-01: Level 1 Source Association

4.85.2 Test Items

Verify that the DMS associates DIASources into a DIAObject or SSObject.

4.85.3 Predecessors

4.85.4 Environment Needs

4.85.4.1 Software

4.85.4.2 Hardware

4.85.5 Input Specification

4.85.6 Output Specification

4.85.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to AP	
1	Test Data	No data.	



Step	ep Description, Input Data and Expected Result		
	Expected		
	Result		

4.86 LVV-T109 - Verify implementation of SSObject Precovery

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
Open LVV-T109 in Jira				

4.86.1 Verification Elements

• LVV-117 - DMS-REQ-0286-V-01: SSObject Precovery

4.86.2 Test Items

Verify that the DMS associates additional DIAObjects (both forward and back in time) with objects classified as SSObjects.

4.86.3 Predecessors

4.86.4 Environment Needs

4.86.4.1 Software

4.86.4.2 Hardware

4.86.5 Input Specification

4.86.6 Output Specification



4.86.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to AP	
1	Test Data	No data.	
	Expected		
	Result		

4.87 LVV-T110 - Verify implementation of DIASource Precovery

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
Open LVV-T110 in Jira				

4.87.1 Verification Elements

• LVV-118 - DMS-REQ-0287-V-01: Max look-back time for precovery

4.87.2 Test Items

Verify that DMS performs forced photometry for new DIAObjects at all available images within the precoveryWindow.

4.87.3 Predecessors

4.87.4 Environment Needs

4.87.4.1 Software

4.87.4.2 Hardware

4.87.5 Input Specification

4.87.6 Output Specification

4.87.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description Execute single-day operations rehearsal, observe data products generated in time			
1	Test Data	No data.		
	Expected			
	Result			

4.88 LVV-T111 - Verify implementation of Use of External Orbit Catalogs

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
Open LVV-T111 in Jira				

4.88.1 Verification Elements

• LVV-119 - DMS-REQ-0288-V-01: Use of External Orbit Catalogs

4.88.2 Test Items

Verify that the DMS can make use of external catalogs to improve identification of SSObjects.

4.88.3 Predecessors

4.88.4 Environment Needs

4.88.4.1 Software

4.88.4.2 Hardware

4.88.5 Input Specification

4.88.6 Output Specification

4.88.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to AP	
1	Test Data	No data.	
	Expected		
	Result		

4.89 LVV-T112 - Verify implementation of Alert Filtering Service

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Eric Bellm
Open LVV-T112 in Jira				

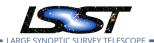
4.89.1 Verification Elements

• LVV-173 - DMS-REQ-0342-V-01: Alert Filtering Service

4.89.2 Test Items

Verify that user-defined filters can be used to generate a basic alert filtering service.

4.89.3 Predecessors



4.89.4 Environment Needs

4.89.4.1 Software

4.89.4.2 Hardware

4.89.5 Input Specification

4.89.6 Output Specification

4.89.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Identify a suitable precursor dataset for processing through the Alert Production pipeline.	
1	Test Data	No data.	
	Expected		
	Result		
2-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.	
	Test Data		
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.	
	Result		
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.	
LVV-T866	Test Data		
	Expected		
	Result		
3	Description	Confirm that alerts are generated, and that an Alert Distribution service is making them available via a stream.	
3	Test Data	No data.	
	Expected	Via either a UI or API, confirmation that a stream of alerts are available.	
	Result		



Step	Description, Input Data and Expected Result		
4	Description Confirm that a UI (or API) exists that allows users to define simple filters. Def ter, and observe both the full and the filtered alert streams to confirm that the reduced the volume of alerts.		
	Test Data	No data.	
	Expected Result	The user-defined filter has reduced the number of alerts being received relative to the full stream.	

4.90 LVV-T113 - Verify implementation of Performance Requirements for LSST Alert Filtering Service

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Eric Bellm
Open LVV-T113 in Jira				

4.90.1 Verification Elements

• LVV-174 - DMS-REQ-0343-V-01: Number of full-size alerts

4.90.2 Test Items

Verify that the DMS alert filter service provides sufficient bandwidth for **numBrokerUsers = 100** simultaneously-operating brokers to receive up to **numBrokerAlerts = 20** alerts per visit.

4.90.3 Predecessors

4.90.4 Environment Needs

4.90.4.1 Software

4.90.4.2 Hardware



4.90.5 Input Specification

4.90.6 Output Specification

4.90.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Create a simulated alert stream.	
1	Test Data	No data.	
	Expected		
	Result		
2	Description	Simultaneously execute user-defined alert filters for at least numBrokerUsers = 100 users, and confirm that the system successfully filters the stream as requested. Confirm that the bandwidth requirement of numBrokerAlerts = 20 per user was met.	
	Test Data	No data.	
	Expected Result	All of the (simulated) users successfully receive their requested filtered alerts, with num-BrokerAlerts = 20 per user.	

4.91 LVV-T114 - Verify implementation of Pre-defined alert filters

Version	Status	Priority	Verification Type	Owner	
1	Defined	Normal	Test	Eric Bellm	
Open LVV-T114 in Jira					

4.91.1 Verification Elements

• LVV-179 - DMS-REQ-0348-V-01: Pre-defined alert filters

4.91.2 Test Items

Verify that users of the Alert Filtering service can use a predefined set of filters.

4.91.3 Predecessors

4.91.4 Environment Needs

4.91.4.1 Software

4.91.4.2 Hardware

4.91.5 Input Specification

4.91.6 Output Specification

4.91.7 Test Procedure

Step	Description, Input Data and Expected Result				
1	Description	Create a simulated alert stream. Confirm that alerts are generated, and that an Alert Distribution service is making them available.			
	Test Data	No data.			
	Expected	A stream of alerts that is confirmed to be generated and distributed.			
	Result				
	Description	Confirm that a UI (or API) exists that presents users some pre-defined filters.			
2	Test Data	No data.			
	Expected	The UI (or API) for accessing alert streams has some pre-defined filters available for users.			
	Result				
3	Description	Select one of the pre-defined filters, and confirm that the results have been properly filtered.			
5	Test Data	No data.			
	Expected	After applying the pre-defined filter, the number of alerts has decreased relative to the			
	Result	raw stream.			

4.92 LVV-T115 - Verify implementation of Calibration Production Processing

Version	Status	Priority	Verification Type	Owner	
1	Defined	Normal	Test	Kian-Tat Lim	
Open LVV-T115 in Jira					



4.92.1 Verification Elements

• LVV-120 - DMS-REQ-0289-V-01: Calibration Production Processing

4.92.2 Test Items

Execute CPP on a variety of representative cadences, and verify that the calibration pipeline correctly produces necessary calibration products.

4.92.3 Predecessors

4.92.4 Environment Needs

4.92.4.1 Software

4.92.4.2 Hardware

4.92.5 Input Specification

4.92.6 Output Specification

4.92.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Identify a suitable set of calibration frames, including biases, dark frames, and flat-field		
1		frames.		
•	Test Data	No data.		
	Expected			
	Result			
2-1 from	Description	Execute the Calibration Products Production payload. The payload uses raw calibration images and		
LVV-		information from the Transformed EFD to generate a subset of Master Calibration Images and Calibration Database entries in the Data Backbone.		
T1060	Test Data			
	Expected			
	Result			



Step	Description, l	nput Data and Expected Result
2-2 from	Description	Confirm that the expected Master Calibration images and Calibration Database entries are present _and well-formed
LVV-	Test Data	
T1060	Expected	
	Result	
3	Description	Confirm that the expected data products are created, and that they have the expected properties.
3	Test Data	No data.
	Expected	Repos containing valid calibration products that are well-formed and ready to be applied
	Result	to processed datasets.

4.93 LVV-T116 - Verify implementation of Associating Objects across data releases

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Kian-Tat Lim	
Open LVV-T116 in Jira					

4.93.1 Verification Elements

• LVV-181 - DMS-REQ-0350-V-01: Associating Objects across data releases

4.93.2 Test Items

Load DR, observe queryable association

4.93.3 Predecessors

4.93.4 Environment Needs

4.93.4.1 Software

4.93.4.2 Hardware

4.93.5 Input Specification

4.93.6 Output Specification

4.93.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Load DR	
1	Test Data	No data.	
	Expected		
	Result		
	Description	Observe queryable association	
2	Test Data	No data.	
	Expected		
	Result		

4.94 LVV-T117 - Verify implementation of DAC resource allocation for Level 3 processing

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Colin Slater	
Open LVV-T117 in Jira					

4.94.1 Verification Elements

• LVV-47 - DMS-REQ-0119-V-01: DAC resource allocation for Level 3 processing

4.94.2 Test Items

Verify that compute time and storage space allocations can be granted to science users.



4.94.3 Predecessors

4.94.4 Environment Needs

4.94.4.1 Software

4.94.4.2 Hardware

4.94.5 Input Specification

4.94.6 Output Specification

4.94.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Create a test user account for the Science Platform.	
1	Test Data	No data.	
	Expected		
	Result		
	Description	Set the LSP resource allocations for the test user to very low values.	
2	Test Data	No data.	
	Expected		
	Result		
3	Description	Initiate example batch jobs and notebook sessions that will exceed the specified resource limits.	
J	Test Data	No data.	
	Expected	Quota error.	
	Result		
	Description	Transfer sufficient data volumes into the user workspace and MyDB tables that would	
4		exceed the resource quotas.	
	Test Data	No data.	
	Expected	Quota error.	
	Result		
5	Description	Reset the user resource quotas to normal values.	



Step	Description, Input Data and Expected Result			
	Test Data	No data.		
	Expected			
	Result			
6	Description	Initiate the same example batch jobs and notebook sessions that previously caused an error.		
U	Test Data	No data.		
	Expected	Successful notebook and batch job execution.		
	Result			
	Description	Transfer the same data volumes into the user workspace and MyDB tables that previously		
7		caused an error.		
	Test Data	No data.		
	Expected	Successful data transfer.		
	Result			

4.95 LVV-T118 - Verify implementation of Level 3 Data Product Self Consistency

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Colin Slater	
Open LVV-T118 in Jira					

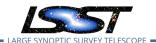
4.95.1 Verification Elements

• LVV-48 - DMS-REQ-0120-V-01: Level 3 Data Product Self Consistency

4.95.2 Test Items

Verify that user-driven Level 3 processing is conducted on consistent sets of input data.

4.95.3 Predecessors



4.95.4 Environment Needs

4.95.4.1 Software

4.95.4.2 Hardware

4.95.5 Input Specification

4.95.6 Output Specification

4.95.7 Test Procedure

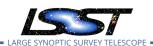
Step	Description, Input Data and Expected Result		
	Description	Execute representative processing on DR in PDAC, observe consistency	
1	Test Data	No data.	
	Expected		
	Result		

4.96 LVV-T119 - Verify implementation of Provenance for Level 3 processing at DACs

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open LV	V-T119 in lira	

4.96.1 Verification Elements

- LVV-49 DMS-REQ-0121-V-01: Provenance for Level 3 processing at DACs
- LVV-1234 OSS-REQ-0122-V-01: Provenance



4.96.2 Test Items

Verify that provenance information is recorded and accessible for user-generated Level 3 products.

- 4.96.3 Predecessors
- 4.96.4 Environment Needs
- 4.96.4.1 Software
- 4.96.4.2 Hardware
- 4.96.5 Input Specification
- 4.96.6 Output Specification

4.96.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Execute representative processing on DR in PDAC, observe provenance recording	
1	Test Data	No data.	
	Expected		
	Result		

4.97 LVV-T120 - Verify implementation of Software framework for Level 3 catalog processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open I V	V-T120 in lira	

The contents of this document are subject to configuration control by the LSST DM Change Control Board.



4.97.1 Verification Elements

• LVV-53 - DMS-REQ-0125-V-01: Software framework for Level 3 catalog processing

4.97.2 Test Items

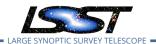
Verify that user-driven Level 3 processing can be consistently applied to all records in a catalog.

- 4.97.3 Predecessors
- 4.97.4 Environment Needs
- 4.97.4.1 Software
- 4.97.4.2 Hardware
- 4.97.5 Input Specification
- 4.97.6 Output Specification

4.97.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Execute representative processing on DR in PDAC, observe recognition of and recovery from failures	
Į	Test Data	No data.	
	Expected		
	Result		

4.98 LVV-T121 - Verify implementation of Software framework for Level 3 image processing



Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open LV	V-T121 in Jira	

4.98.1 Verification Elements

• LVV-56 - DMS-REQ-0128-V-01: Software framework for Level 3 image processing

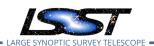
4.98.2 Test Items

Verify that user-specified Level 3 processing can be applied to the desired set of images.

- 4.98.3 Predecessors
- 4.98.4 Environment Needs
- 4.98.4.1 Software
- 4.98.4.2 Hardware
- 4.98.5 Input Specification
- 4.98.6 Output Specification

4.98.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Execute representative processing on DR in PDAC, observe recognition of and recovery	
1		from failures	
'	Test Data	No data.	
	Expected		
	Result		



4.99 LVV-T122 - Verify implementation of Level 3 Data Import

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open I V	V-T122 in lira	

Open LVV-1122 in Jira

4.99.1 Verification Elements

• LVV-121 - DMS-REQ-0290-V-01: Level 3 Data Import

4.99.2 Test Items

Verify that the Science Platform can ingest data from community-standard file formats.

4.99.3 Predecessors

4.99.4 Environment Needs

4.99.4.1 Software

4.99.4.2 Hardware

4.99.5 Input Specification

4.99.6 Output Specification

4.99.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Use the Science Platform catalog upload tool to ingest a small example FITS table.	
1	Test Data	No data.	



Step	Description, Input Data and Expected Result		
	Expected		
	Result		
	Description	Use the Science Platform catalog upload tool to ingest a small example CSV table.	
2	Test Data	No data.	
	Expected		
	Result		
	Description	Use the Science Platform catalog upload tool to ingest a large FITS table that needs to be	
3		spatially-sharded in the database.	
	Test Data	No data.	
	Expected		
	Result		
	Description	Perform example queries on each of the three tables to verify that all data is present.	
4	Test Data	No data.	
	Expected	Data returned in the queries is identical to the data uploaded.	
	Result		

4.100 LVV-T123 - Verify implementation of Access Controls of Level 3 Data Products

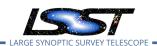
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T123 in Jira				

4.100.1 Verification Elements

• LVV-171 - DMS-REQ-0340-V-01: Access Controls of Level 3 Data Products

4.100.2 Test Items

This test touches upon the interface between the following areas: IT Security, Identity Management, LSP Portal, and Parallel Distributed Database. The purpose is to show that access



to user generated data products (previously Level 3) can have a variety of access restrictions varying from single-user, a list, a named group, or open access.

- 4.100.3 Predecessors
- 4.100.4 Environment Needs
- 4.100.4.1 Software
- 4.100.4.2 Hardware
- 4.100.5 Input Specification
- 4.100.6 Output Specification
- 4.100.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Configure representative access controls in PDAC, observe proper restrictions	
1	Test Data	No data.	
	Expected		
	Result		

4.101 LVV-T124 - Verify implementation of Software Architecture to Enable Community Re-Use

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Simon Krughoff
		Open L	.VV-T124 in Jira	

The contents of this document are subject to configuration control by the LSST DM Change Control Board.



4.101.1 Verification Elements

• LVV-139 - DMS-REQ-0308-V-01: Software Architecture to Enable Community Re-Use

4.101.2 Test Items

Show that the LSST software is capable of being executed in multiple contexts: single user instance, batch processing, continuous integration.

Also show that the algorithms can be reconfigured and, if desired, completely replaced at run time.

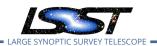
- 4.101.3 Predecessors
- 4.101.4 Environment Needs
- 4.101.4.1 Software
- 4.101.4.2 Hardware
- 4.101.5 Input Specification
- 4.101.6 Output Specification
- 4.101.7 Test Procedure

Description, Input Data and Expected Result



Step

Description The 'path' that you will use depends on where you are running the science pipelines. Options: 1-1 from LVV-T860 • local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash • development cluster ("Isst-dev"): /software/Isstsw/stack/loadLSST.bash • LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash From the command line, execute the commands below in the example code: Test Data Expected Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary. Result To check versions in use, type: eups list -s Description Using curated test datasets for multiple precursor instruments, verify and log that the prototype DRP pipelines execute successfully in three contexts: 2 1. The CI system 2. On a single user system: laptop, desktop, or notebook running in the Notebook aspect of the LSP. 3. Project workflow system. **Test Data** No data. **Expected** Result Description Using a template testing notebook in the Notebook aspect of the LSP, verify and log the following: 3 1. Individual pipeline steps (tasks) are importable and executable on their own. this is not comprehensive, but demonstrative. 2. Individual pipeline steps may be overridden by configuration. 3. Users can implement a custom pipeline step and insert i into the processing flow via configuration. **Test Data** No data. **Expected** Result Description Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol-4-1 from lowing: LVV-T987

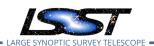


Step	Description, l	nput Data and Expected Result
	Test Data	
	Expected	Butler repo available for reading.
	Result 	
5	Description	Read the resulting dataset using the Bulter, and confirm that it produced the desired data products.
	Test Data	No data.
	Expected	
	Result	
6	Description	Run subset of full DRP from previous step on an individual node. Was this organizationally easy? Did the performance scale appropriately?
O	Test Data	No data.
	Expected	
	Result	
	Description	Re-run aperture correction on subset. Verify that same results as DRP run are achieved.
7	Test Data	No data.
	Expected	
	Result	
0	Description	Re-run photometric redshift estimation algorithm on subset coadd catalogs. Verify that same results are achieved as from full DRP.
8	Test Data	No data.
	Expected	
	Result	

4.102 LVV-T125 - Verify implementation of Simulated Data

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Lupton
		Open I	W-T125 in lira	

Open LVV-1125 in Jira



4.102.1 Verification Elements

• LVV-6 - DMS-REQ-0009-V-01: Simulated Data

4.102.2 Test Items

Verify that the DMS can inject simulated data into data products for testing.

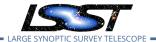
- 4.102.3 Predecessors
- 4.102.4 Environment Needs
- 4.102.4.1 Software
- 4.102.4.2 Hardware
- 4.102.5 Input Specification
- 4.102.6 Output Specification

4.102.7 Test Procedure

Step	Description, l	nput Data and Expected Result
	Description	Delegate to AP and DRP
1	Test Data	No data.
	Expected	
	Result	

4.103 LVV-T126 - Verify implementation Image Differencing

Version	Status	Priority	Verification Type	Owner	
---------	--------	----------	-------------------	-------	--



1 Draft Normal Test Eric Bellm
Open LVV-T126 in Jira

4.103.1 Verification Elements

• LVV-14 - DMS-REQ-0032-V-01: Image Differencing

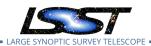
4.103.2 Test Items

Verify that the DMS can performance image differencing from single exposures and coadds.

- 4.103.3 Predecessors
- 4.103.4 Environment Needs
- 4.103.4.1 Software
- 4.103.4.2 Hardware
- 4.103.5 Input Specification
- 4.103.6 Output Specification

4.103.7 Test Procedure

Step	Description, l	nput Data and Expected Result
	Description	Delegate to AP and DRP
1	Test Data	No data.
	Expected	
	Result	



4.104 LVV-T127 - Verify implementation of Provide Source Detection Software

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton
		Onen I \	//-T127 in lira	

Open LVV-1127 in Jira

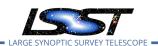
4.104.1 Verification Elements

• LVV-15 - DMS-REQ-0033-V-01: Provide Source Detection Software

4.104.2 Test Items

Verify that the DMS provides source detection software that can be applied to calibrated images, including both difference images and coadds. This will be verified using simulated data, but could also be done by inserting artificial sources into existing datasets.

- 4.104.3 Predecessors
- 4.104.4 Environment Needs
- 4.104.4.1 Software
- 4.104.4.2 Hardware
- 4.104.5 Input Specification
- 4.104.6 Output Specification
- 4.104.7 Test Procedure



Step	Description, li	nput Data and Expected Result
1	Description	Run DRP and AP processing, including source detection and measurement algorithms, on a small portion of the data from a simulated dataset.
	Test Data	No data.
	Expected	Source catalogs containing measurements of all sources detected in the input images.
	Result	
2	Description	Confirm that the output repos contain catalogs of source detections. Compare these output catalogs to the original simulated source catalogs, and confirm that a large fraction of the sources within a reasonable signal-to-noise range were recovered.
	Test Data	No data.
	Expected	Most sources above a reasonable S/N threshold were detected, and their measured fluxes
	Result	are reasonably close to the simulated inputs.

4.105 LVV-T128 - Verify implementation Provide Astrometric Model

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open LV	V-T128 in Jira	

4.105.1 Verification Elements

• LVV-17 - DMS-REQ-0042-V-01: Provide Astrometric Model

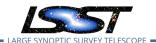
4.105.2 Test Items

Verify that an astrometric model is available for Objects and DIAObjects.

4.105.3 Predecessors

4.105.4 Environment Needs

4.105.4.1 Software



4.105.4.2 Hardware

4.105.5 Input Specification

4.105.6 Output Specification

4.105.7 Test Procedure

Step	Description, li	nput Data and Expected Result
	Description	Delegate to AP and DRP
1	Test Data	No data.
	Expected	
	Result	

4.106 LVV-T129 - Verify implementation of Provide Calibrated Photometry

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton
		Open L\	VV-T129 in Jira	

4.106.1 Verification Elements

• LVV-18 - DMS-REQ-0043-V-01: Provide Calibrated Photometry

4.106.2 Test Items

Verify that the DMS provides photometry calibrated in AB mags and fluxes (in nJy) for all measured objects and sources. Must be tested for both DRP and AP products.

4.106.3 Predecessors

4.106.4 Environment Needs

4.106.4.1 Software

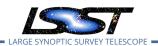
4.106.4.2 Hardware

4.106.5 Input Specification

4.106.6 Output Specification

4.106.7 Test Procedure

1-1 from LVV-T987 Description Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following: Expected Butler repo available for reading. Result Description Ingest the data products from an appropriate DRP-processed dataset. Test Data No data. Expected
Expected Butler repo available for reading. Result Description Ingest the data products from an appropriate DRP-processed dataset. Test Data No data.
Description Ingest the data products from an appropriate DRP-processed dataset. Test Data No data.
Description Ingest the data products from an appropriate DRP-processed dataset. Test Data No data.
2 Test Data No data.
2 Test Data No data.
Expected
Result
Description Confirm that AB-calibrated magnitudes and fluxes are available for all measured Sources
and Objects. [An enhanced verification could include matching the sources to an external
source catalog and comparing the magnitudes to show that they are well-calibrated.]
Test Data No data.
Expected Calibrated fluxes and magnitudes are available for all sources, as well as tools to convert
Result measured fluxes to magnitudes (and vice-versa).
Description Ingest the data products from an appropriate AP processing dataset.
4 Test Data No data.
Expected
Result



Step	Description, I	nput Data and Expected Result	
5	Description	Confirm that AB-calibrated magnitudes and fluxes are available for all measured Sources, DIASources, and Objects. [An enhanced verification could include matching the sources to an external source catalog and comparing the magnitudes to show that they are well-calibrated.]	
	Test Data	No data.	
, ·		Calibrated fluxes and magnitudes are available for all Sources, DIASources, and Objects, as well as tools to convert measured fluxes to magnitudes (and vice-versa).	

4.107 LVV-T130 - Verify implementation of Enable a Range of Shape Measurement Approaches

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Colin Slater	
Open LVV-T130 in Jira					

4.107.1 Verification Elements

• LVV-21 - DMS-REQ-0052-V-01: Enable a Range of Shape Measurement Approaches

4.107.2 Test Items

Verify that multiple shape measurement algorithms can be used.

4.107.3 Predecessors

4.107.4 Environment Needs

4.107.4.1 Software

4.107.4.2 Hardware



4.107.5 Input Specification

4.107.6 Output Specification

4.107.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to AP and DRP	
1	Test Data	No data.	
	Expected		
	Result		

4.108 LVV-T131 - Verify implementation of Provide User Interface Services

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Gregory Dubois-Felsmann
			110/74041 11	

Open LVV-T131 in Jira

4.108.1 Verification Elements

• LVV-63 - DMS-REQ-0160-V-01: Provide User Interface Services

4.108.2 Test Items

Verify the availability and functionality of the broad range of user interface services called for in the requirement, as applied to both Nightly and DRP data. This will primarily be done by verifications performed at the LSST Science Platform level, based on the requirements in LDM-554; however, a high-level set of tests corresponding to the DMS-REQ-0160 requirement are defined below.

4.108.3 Predecessors



4.108.4 Environment Needs

4.108.4.1 Software

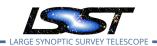
4.108.4.2 Hardware As noted in Verification Configuration, the systems required to carry out the tests include both an "inside" test execution platform - the ability to execute test notebooks within the Science Platform Notebook Aspect - and an "outside" test execution platform with connectivity to the Science Platform instance under test that is comparable to that available to offsite science users.

4.108.5 Input Specification

- 1. Testing this requirement relies on a set of data products meeting the data model implied by the DPDD existing in a deployment of the Science Platform and its underlying database and file services.
 - (a) In particular, both image and catalog data products are required.
 - (b) From the specific language of the underlying requirement, it appears clear that coadded data products are required, but in practice single-epoch data products should be included in the test as well.
- 2. Depending on when this requirement is tested, the tests may involve either or both of precursor data and LSST commissioning data. The use of the latter is ultimately essential to ensure that the tests are performed with as LSST-like a dataset as possible.

4.108.6 Output Specification

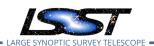
4.108.7 Test Procedure



Result

Step	Description, li	nput Data and Expected Result
1	Description	Establishment of test coordinates: Establish sky positions and surrounding regions (e.g., cones or polygons), field sizes, filter bands, and temporal epochs for the tests that are consistent with the known content of the test dataset, whether precursor or LSST commissioning data. Establishing sky positions should include pre-determining the corresponding LSST "tract
		and patch" identifiers. If the plan to not keep all calibrated single-epoch images on disk is still in place at the time of the test, identify for use in the test both images that are, and are not, on disk. Establish target image boundaries, projections, and pixel scales to be used for resampling tests. Ensure that at least some of these test conditions include coadded image boundaries that cross tract and patch boundaries, and single-epoch image boundaries that cross focal plane raft boundaries.
	Test Data	No data.
	Expected	
	Result	
	Description	Butler image access:
2		From within the Notebook Aspect, verify that coadded images for the identified regions of sky and filter bands are accessible via the Butler. Verify that the same images are available whether obtained by direct reference to the previous established tract/patch identifiers or by the use of LSST stack code for retrieving images based on sky coordinates. From within the Notebook Aspect, verify that single-epoch raw images for the selected locations and times are available. Verify that calibrated images (PVIs) for the selected locations and times are available; depending on the details of the test dataset, verify that PVIs still on disk can be retrieved immediately. Verify that lists or tables of image metadata, not just individual images, can be retrieved.
	Task Dake	E.g., a list of all the single-epoch images covering a selected sky location.
	Test Data	No data.
	Expected	

The contents of this document are subject to configuration control by the LSST DM Change Control Board.



Step Description, Input Data and Expected Result

Description Programmatic PVI re-creation:

3 From within the Notebook Asp

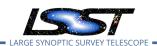
From within the Notebook Aspect, verify that the recreation on demand of a PVI can be performed. Ideally, this should be done as follows:

- Verify that recreation of a PVI that *is* still available works and that it reproduces the original PVI exactly (except for provenance metadata that must be different) or within the reasonable ability of processing systems to do so (e.g., taking into account that the original calibration and the recreation may have run on different CPU architectures).
- The test conditions should ensure the verification that a recreation was actually performed, i.e., that the still-available PVI was not returned instead.
- Note that it does not appear to be a requirement that *at Butler level* recreation on demand of PVIs is a completely transparent process. If this *is* decided to be a requirement, the test must also verify that it has been satisfied. If it is *not* a requirement, verify that adequate documentation on the PVI-recreation process (e.g., the SuperTasks and configuration to be used) is available.

	Test Data	No data.
	Expected	
	Result	
	Description	Butler catalog access:
4		From within the Notebook Aspect, verify that all the catalog data products described in
		the DPDD can be retrieved for the coordinates selected above via the Butler. (This test
		should include access to SSObject data, but the details of how such a test would depend on the coordinate selections require additional thought.)
	Test Data	No data.
	Expected	
	Result	
	Description	LSST-stack-based resampling/reprojection:
5		Verify the availability of software in the LSST stack, and associated documentation, that
		permits the resampling of LSST images to different pixel grids and projections.
		Exercise this capability for the test conditions selected in Step 1 above.
		Perform photometric and astrometric tests on the resulting resampled images to provide
		evidence that the transformations performed were correct to the accuracy supported by
	Test Data	the data. No data.
	Expected	
	•	
	Result	



Step	Description, Input Data and Expected Result			
6	Description	Comment: The following API Aspect test steps should be carried out on the required "offsite-like" test platform, to ensure that their success does not reflect any privileged access given to processes inside the Data Access Center or other Science Platform instance. However, at least a small sampling of them should also be carried out within the Science Platform environment, i.e., in the Notebook Aspect, and the results compared.		
	Test Data	No data.		
	Expected Result			
7	Description	API Aspect image access: Using IVOA services such as the Registry and ObsTAP, from the "offsite-like" test platform, verify that the existence of the classes of image data products foreseen in the DPDD can be determined. Verify that ObsTAP and/or SIAv2 can be used to find the same images and lists of images for the established test coordinates that were retrieved via the Butler in Step 2 above. Verify that the selected images are retrievable from the Web services. Verify that the retrieved images are identical in their pixel content and metadata. The tests must include both coadded and single-epoch images.		
	Test Data	No data.		
	Expected Result			
8	Description	API Aspect image transformations: Verify that image cutouts and resamplings can be performed via the IVOA SODA service, and that the results are identical to those obtained for the same parameters from the LSST-stack-based tests in Step 5. (The requirements for supported reprojections, if any, in the SODA service have not been established at the time of writing.)		
	Test Data	No data.		
	Expected Result			
9	Description	API Aspect catalog data access: Verify that the IVOA Registry, RegTAP, TAP_SCHEMA, and other relevant mechanisms can be used to discover the existence of all the catalog data products foreseen in the DPDD. Using the IVOA TAP service, verify that all the catalog data products foreseen in the DPDD can be retrieved for the coordinates determined in Step 1. Verify that their scientific content is the same as when they are retrieved via the Butler.		
	Test Data	No data.		



Step	Description, Input Data and Expected Result		
	Expected Result		
10	Description	Comment: The Portal Aspect tests below should be carried out from a web browser on an "offsite-like" test platform, to ensure that no privileged access provided to intra-data-center clients is relied upon.	
	Test Data	No data.	
	Expected Result		
11	Description	Portal Aspect data browsing: Verify that the Portal Aspect can be used to discover the existence of all the data products foreseen in the DPDD. Verify that the UI permits locating the data for the coordinates selected in Step 1 by visual means, e.g., by zooming and panning in from an all-sky view. Verify that the UI permits locating the data by typing in coordinates as well.	
	Test Data	No data.	
	Expected		
	Result		
12	Description	Portal Aspect image access: Verify that the Portal Aspect allows both the retrieval of "original" image data, i.e., in its native LSST pixel projection and with full metadata, as well as retrieval of on-demand UI cutouts of coadded image data for selected locations.	
	Test Data	No data.	
	Expected Result		
13	Description	Portal Aspect catalog query and visualization: Verify that the Portal Aspect allows graphical querying of DPDD catalog data, both coadded and single-epoch, for selected regions of sky and/or with selected properties, and supports the visualization of the results (including histogramming, scatterplots, time series, table manipulations, and overplotting on image data). (Note that the Science Platform requirements, LDM-554, lay out a detailed set of requirements on the selection and visualization of catalog data.)	
	Test Data	No data.	
	Expected		
	Result		



Step	Description, I	Pescription, Input Data and Expected Result		
14	Description	Portal Aspect data download: Verify that data identified and/or visualized in the Portal Aspect can be downloaded to the remote system running the web browser in which the Portal is displayed, as well as to the User Workspace.		
	Test Data	No data.		
	Expected Result			

4.109 LVV-T132 - Verify implementation of Pre-cursor and Real Data

Version	Status	Priority	Verification Type	Owner		
1	Approved	Normal	Test	Robert Gruendl		
Open LVV-T132 in Jira						

4.109.1 Verification Elements

• LVV-127 - DMS-REQ-0296-V-01: Pre-cursor, and Real Data

4.109.2 Test Items

Demonstrate that pixel-oriented data from astronomical imaging cameras (precursor or otherwise) can be processed using LSST Science Algorithms and organized for access through the Data Butler Access Client.

4.109.3 Predecessors

4.109.4 Environment Needs

4.109.4.1 Software

4.109.4.2 Hardware



4.109.5 Input Specification

4.109.6 Output Specification

4.109.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Confirm that the CI jobs used to test DRP processing successfully run. These jobs use precursor datasets from cameras other than LSST.	
·	Test Data	No data.	
	Expected		
	Result		
2	Description	For the precursor dataset, instantiate the Butler, load the data products, and confirm that they exist as expected.	
_	Test Data	No data.	
	Expected	Processed images, catalogs, calibration information, and other related data products are	
	Result	present and accessible via the Butler.	

4.110 LVV-T133 - Verify implementation of Provide Beam Projector Coordinate Calculation Software

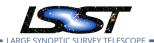
Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Robert Lupton		
Open LVV-T133 in Jira						

4.110.1 Verification Elements

• LVV-182 - DMS-REQ-0351-V-01: Provide Beam Projector Coordinate Calculation Software

4.110.2 Test Items

Verify that the DMS provides software to calculate coordinates relating the collimated beam projector position and telescope pupil position to the illumination position on the telescope



optical elements and focal plane.

4.110.3 Predecessors

4.110.4 Environment Needs

4.110.4.1 Software

4.110.4.2 Hardware

4.110.5 Input Specification

4.110.6 Output Specification

4.110.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1	Description	On the LSST development cluster or notebook aspect, git clone the repo containing the CBP package: https://github.com/lsst/cbp
-	Test Data	No data.
	Expected	
	Result	
	Description	Follow the steps in the package README to install the package.
2	Test Data	No data.
	Expected	
	Result	
3	Description	Confirm that the package can be loaded in python, and that some of the tests in the 'tests/' folder will execute.
5	Test Data	No data.
	Expected	Successful execution of test scripts, which demonstrate the calculation of beam projector
	Result	coordinates.

4.111 LVV-T134 - Verify implementation of Provide Image Access Services



Version	Status	Priority	Verification Type	Owner	
1	1 Draft Normal Ir		Inspection	Gregory Dubois-Felsmann	
Open LVV-T134 in Jira					

4.111.1 Verification Elements

• LVV-27 - DMS-REQ-0065-V-01: Provide Image Access Services

4.111.2 Test Items

Verify that images can be identified and that images and image cut-outs can be retrieved using the network interfaces - primarily IVOA standards-based - and Python APIs provided for image access by science users.

4.111.3 Predecessors

4.111.4 Environment Needs

4.111.4.1 Software

4.111.4.2 Hardware

4.111.5 Input Specification

Testing requires the establishment of running services such as SIAv2 and SODA to which the tests can be applied.

4.111.6 Output Specification

4.111.7 Test Procedure



Step	Description, I	Description, Input Data and Expected Result		
1	Description	Inspect that the following test cases have been executed and passed: LVV-T803, LVV-T810, LVV-T811, LVV-T812.		
	Test Data	The requirement is fully satisfied by lower-level LSP test cases. No data.		
	Expected Test cases LVV-T803, LVV-T810, LVV-T811, LVV-T812 passed without block Result			

4.112 LVV-T136 - Verify implementation of Data Product and Raw Data Access

Version	Status	Priority	Verification Type	Owner	
1	Defined	Normal	Test	Colin Slater	
Open LVV-T136 in lira					

4.112.1 Verification Elements

• LVV-129 - DMS-REQ-0298-V-01: Data Product and Raw Data Access

4.112.2 Test Items

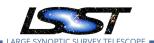
Verify that available image, file, and catalog data products, and their metadata and provenance information, can be listed and retrieved.

4.112.3 Predecessors

4.112.4 Environment Needs

4.112.4.1 Software

4.112.4.2 Hardware



4.112.5 Input Specification

4.112.6 Output Specification

4.112.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Details of the Gen3 Butler and ObsTAP tables are still being worked out. The general overview of this test will be to use some combination of the Gen3 Butler and TAP access to the ObsTAP tables to test that the required access is provided.	
	Test Data No data.		
	Expected Result	Verification that the relevant data products and their related tables, metadata, and provenance information are available and readily accessible.	

4.113 LVV-T137 - Verify implementation of Data Product Ingest

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Colin Slater		
Open LVV-T137 in Jira						

4.113.1 Verification Elements

LVV-130 - DMS-REQ-0299-V-01: Data Product Ingest

4.113.2 Test Items

Verify that data products can be ingested.

4.113.3 Predecessors

4.113.4 Environment Needs

4.113.4.1 Software

4.113.4.2 Hardware

4.113.5 Input Specification

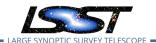
4.113.6 Output Specification

4.113.7 Test Procedure

Step	Description, Ir	nput Data and Expected Result
	Description	Identify a suitable set of raw data to be run through "mini-DRP" processing.
1	Test Data	No data.
	Expected	
	Result	
2-1 from	Description	Process data with the Data Release Production payload, starting from raw science images and generating science data products, placing them in the Data Backbone.
LVV-	Test Data	
T1064	Expected	
	Result	
3-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	
	Description	Confirm that the data products from the DRP processing have been ingested into the Data Backbone.
4	Test Data	No data.
	Expected	Processed images, catalogs, calibration information, and other related data products are
	Result	present and accessible via the Butler.

4.114 LVV-T138 - Verify implementation of Bulk Download Service

ion Status Priority Verification Type Owner	
---	--



1 Draft Normal Test Robert Gruendl
Open LVV-T138 in Jira

4.114.1 Verification Elements

• LVV-131 - DMS-REQ-0300-V-01: Bulk Download Service

4.114.2 Test Items

Bulk Download

4.114.3 Predecessors

4.114.4 Environment Needs

4.114.4.1 Software

4.114.4.2 Hardware

4.114.5 Input Specification

A large dataset (at least a few TB) must be available.

Requires identity management to confirm bulk download use.

While this can be tested and shown to work using LSST DAC, Chilean DAC, and IN2P3 endpoints, this should also be tested to demonstrate expected throughput for outside users (e.g. FNAL, NERSC sites could be tested).

4.114.6 Output Specification

4.114.7 Test Procedure



Step	Description, I	Description, Input Data and Expected Result		
	Description	Setup large transfer request and examine the data transfer rates achieved.		
1	Test Data	No data.		
	Expected			
	Result			
2	Description	Test should be repeated while observing in firehose mode (with LSSTCam) during science verification to ensure that bulk transfer does not compromise normal nightly operations.		
_	Test Data	No data.		
	Expected			
	Result			

4.115 LVV-T140 - Verify implementation of Production Orchestration

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Robert Gruendl		
Open LVV-T140 in Jira						

4.115.1 Verification Elements

• LVV-133 - DMS-REQ-0302-V-01: Production Orchestration

4.115.2 Test Items

Demonstrate use to orchestration software to perform real-time and batch production on LSST compute platform(s).

4.115.3 Predecessors

4.115.4 Environment Needs

4.115.4.1 Software

4.115.4.2 Hardware

4.115.5 Input Specification

4.115.6 Output Specification

4.115.7 Test Procedure

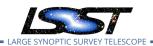
Step	Description, l	Description, Input Data and Expected Result	
	Description	Identify an appropriate precursor dataset.	
1	Test Data	No data.	
	Expected		
	Result		
2	Description	Execute a batch processing job using the orchestration system, and confirm (manually and/or via QA tools typically used for HSC reprocessing) that the pipeline executed and produced all expected products (or error logs in cases of failure).	
Test Data No data.		No data.	
	Result Calexp single-visit and coadd images, and associated catalogs, are present in repository. Logs of the processing are available to be inspected for identification lems in the processing.		

4.116 LVV-T141 - Verify implementation of Production Monitoring

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Robert Gruendl		
Open LVV-T141 in Jira						

4.116.1 Verification Elements

• LVV-134 - DMS-REQ-0303-V-01: Production Monitoring



4.116.2 Test Items

Demonstrate monitoring capabilities that give real-time view of pipeline execution and production systems usage/load.

4.116.3 Predecessors

LVV-T140

4.116.4 Environment Needs

4.116.4.1 Software

4.116.4.2 Hardware

4.116.5 Input Specification

Data set and mechanism for Production Orchestration as outlined in LVV-T140.

4.116.6 Output Specification

4.116.7 Test Procedure

Step	Description, Input Data and Expected Result				
1-1 from	Description	Process data with the Data Release Production payload, starting from raw science images and generating science data products, placing them in the Data Backbone.			
LVV- T1064	Test Data				
	Expected				
	Result				
	Description	While DRP processing is executing, monitor the progress and resource usage of process-			
2		ing.			
	Test Data	No data.			



Step	Description, Input Data and Expected Result		
	Expected Result	Ability to monitor in real-time the orchestrated production processing, including resource usage.	

4.117 LVV-T142 - Verify implementation of Production Fault Tolerance

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Robert Gruendl		
Open LVV-T142 in Jira						

4.117.1 Verification Elements

• LVV-135 - DMS-REQ-0304-V-01: Production Fault Tolerance

4.117.2 Test Items

Demonstrate production systems report faults in pipeline executions and that system is able to recover. Where recovery can mean the ability to provide production artifacts for examination, return production elements ready for subsequent use, and/or reset and repeat production attempts.

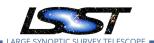
4.117.3 Predecessors

4.117.4 Environment Needs

4.117.4.1 Software

4.117.4.2 Hardware

4.117.5 Input Specification



4.117.6 Output Specification

4.117.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Execute AP and DRP, simulate failures, observe correct processing		
1	Test Data	No data.		
	Expected			
	Result			

4.118 LVV-T144 - Verify implementation of Task Specification

Version	Status	Priority	Verification Type	Owner		
1	Defined	Normal	Test	Kian-Tat Lim		
Open LVV-T144 in Jira						

4.118.1 Verification Elements

• LVV-136 - DMS-REQ-0305-V-01: Task Specification

4.118.2 Test Items

Verify that the DMS provides the ability to define a new or modified pipeline task without recompilation.

4.118.3 Predecessors

4.118.4 Environment Needs

4.118.4.1 Software



4.118.4.2 Hardware

4.118.5 Input Specification

4.118.6 Output Specification

4.118.7 Test Procedure

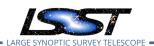
Step	Description, l	nput Data and Expected Result
1	Description	Inspect software architecture. Verify that there exist Tasks that can be run and configured without re-compilation.
·	Test Data	No data.
	Expected	Confirmation that the software architecture has allowed for reconfiguring and running
	Result	Tasks without recompilation.
2	Description	Verify that an example science algorithm can be run through one of these Tasks. Three examples from different areas: source measurement, image subtraction, and photometric-redshift estimation.
	Test Data	No data.
	Expected	Successful Task execution with different configurations, including confirmation that the
	Result	outputs are different from tasks with altered configurations.

4.119 LVV-T145 - Verify implementation of Task Configuration

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton
Open LVV-T145 in Jira				

4.119.1 Verification Elements

• LVV-137 - DMS-REQ-0306-V-01: Task Configuration



4.119.2 Test Items

Verify that the DMS software provides configuration control to define, override, and verify the configuration for a DMS Task.

4.119.3 Predecessors

4.119.4 Environment Needs

4.119.4.1 Software

4.119.4.2 Hardware

4.119.5 Input Specification

4.119.6 Output Specification

4.119.7 Test Procedure

Step	Description, li	nput Data and Expected Result
	Description	Inspect software design to verify that one can define the configuration for a Task.
1	Test Data	No data.
	Expected	
	Result	
	Description	Run a Task with a known invalid configuration. Verify that the error is caught before the
2		science algorithm executes.
	Test Data	No data.
	Expected	
	Result	
	Description	Run a simple task with two different configurations that make a material difference for a
3		Task. E.g., specify a different source detection threshold. Verify that the configuration is
	-	different between the two runs through difference in recorded provenance and in results.
	Test Data	No data.



Step	Description, Input Data and Expected Result	
	Expected	
	Result	

4.120 LVV-T146 - Verify implementation of DMS Initialization Component

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl
		Open L	VV-T146 in Jira	

4.120.1 Verification Elements

• LVV-128 - DMS-REQ-0297-V-01: DMS Initialization Component

4.120.2 Test Items

Demonstrate that the DMS can be initialized in a safe state that will not allow data corruption/loss.

4.120.3 Predecessors

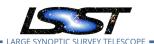
4.120.4 Environment Needs

4.120.4.1 Software

4.120.4.2 Hardware

4.120.5 Input Specification

4.120.6 Output Specification



4.120.7 Test Procedure

Step	Description, l	nput Data and Expected Result
	Description	Power-cycle all of the DM systems at each Facility.
1	Test Data	No data.
	Expected	Restart of all DM systems.
	Result	
	Description	Observe each system and ensure that it has recovered in a properly initialized state.
2	Test Data	No data.
	Expected	Systems are all active and initialized for their designated purpose.
	Result	

4.121 LVV-T147 - Verify implementation of Control of Level-1 Production

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T147 in Jira				

4.121.1 Verification Elements

• LVV-132 - DMS-REQ-0301-V-01: Control of Level-1 Production

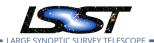
4.121.2 Test Items

Demonstrate that the DMS can control all Prompt Processing across DMS facilities.

4.121.3 Predecessors

4.121.4 Environment Needs

4.121.4.1 Software



4.121.4.2 Hardware

4.121.5 Input Specification

4.121.6 Output Specification

4.121.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result		
	Description	Observe existence and capability of Prompt DMCS		
1	Test Data	No data.		
	Expected			
	Result			

4.122 LVV-T148 - Verify implementation of Unique Processing Coverage

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open LV	V-T148 in Jira	

4.122.1 Verification Elements

• LVV-138 - DMS-REQ-0307-V-01: Unique Processing Coverage

4.122.2 Test Items

Verify that a user-specified criterion can be used to process each record in a table exactly once.

4.122.3 Predecessors

4.122.4 Environment Needs

4.122.4.1 Software

4.122.4.2 Hardware

4.122.5 Input Specification

4.122.6 Output Specification

4.122.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result		
1	Description	Execute representative processing, observe lack of duplicates or missing rows even in the presence of failures		
ı	Test Data	No data.		
	Expected			
	Result			

4.123 LVV-T149 - Verify implementation of Catalog Queries

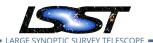
Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Colin Slater
Open I W-T149 in lira				

4.123.1 Verification Elements

LVV-33 - DMS-REQ-0075-V-01: Catalog Queries

4.123.2 Test Items

Verify that SQL, or a similar structured language, can be used to query catalogs.



4.123.3 Predecessors

4.123.4 Environment Needs

4.123.4.1 Software

4.123.4.2 Hardware

4.123.5 Input Specification

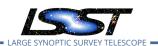
An operational QSERV database that has been verified via LVV-T1085 and LVV-T1086.

4.123.6 Output Specification

4.123.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1	Description	Execute a simple query (for example, the one below) and confirm that it returns the expected result.
	Test Data	No data.
	Example	SELECT * FROM Object WHERE qserv_areaspec_box(316.582327, -6.839078, 316.653938,
	Code	-6.781822)
	Expected	A catalog of objects satisfying the specified constraints.
	Result	
2	Description	Repeat the query from all available access routes (e.g., an external VO client, internal DM tools on the development cluster, the Science Platform query tool, and from within the Notebook Aspect), confirming in each case that the results are as expected.
	Test Data	No data.
	Expected	
	5 L	
	Result	

4.124 LVV-T150 - Verify implementation of Maintain Archive Publicly Accessible



Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Colin Slater
Open LVV-T150 in Jira				

4.124.1 Verification Elements

• LVV-34 - DMS-REQ-0077-V-01: Maintain Archive Publicly Accessible

4.124.2 Test Items

Verify that prior data releases remain accessible.

4.124.3 Predecessors

4.124.4 Environment Needs

4.124.4.1 Software

4.124.4.2 Hardware

4.124.5 Input Specification

Availability of at least three (3) data releases, of which at least one of them must be archived outside the QSERV database. These can be precursor datasets, if needed.

4.124.6 Output Specification

4.124.7 Test Procedure



Step	Description, Input Data and Expected Result		
1	Description	Confirm that at least two data releases (the most recent, and one previous) are accessible to users (and can be queried) from the standard channels.	
·	Test Data	No data.	
	Expected	Simple queries return catalog data from the data releases that are available in QSERV.	
	Result		
2	Description	Confirm that previous data releases are accessible for bulk download (perhaps with significant latency) from tape or other bulk store, and that the downloaded tables contain the expected data products.	
	Test Data	No data.	
	Expected	A download of an entire previous data release from its bulk store.	
	Result		

4.125 LVV-T151 - Verify Implementation of Catalog Export Formats From the Notebook Aspect

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Colin Slater
		Open LV\	/-T151 in Jira	

4.125.1 Verification Elements

• LVV-35 - DMS-REQ-0078-V-01: Catalog Export Formats

4.125.2 Test Items

Verify that catalog data is exportable from the notebook aspect in a variety of communitystandard formats.

4.125.3 Predecessors



4.125.4 Environment Needs

4.125.4.1 Software

4.125.4.2 Hardware

4.125.5 Input Specification

4.125.6 Output Specification

4.125.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1-1 from	Description	Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb.
LVV-T837	Test Data	
	Expected	Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version and machine flavor.
	_ Result 	and machine havor.
1-2 from LVV-T837	Description	Spawn a container by: 1) choosing an appropriate stack version: e.g. the latest weekly. 2) choosing an appropriate machine flavor: e.g. medium 3) click "Spawn"
	Test Data	
	Expected	Redirection to the JupyterLab environment served from the chosen container containing the correct
	Result	stack version.
2-1 from	Description	Open a new launcher by navigating in the top menu bar "File" -> "New Launcher"
	Test Data	
LVV-T838	Expected	A launcher window with several sections, potentially with several kernel versions for each.
	Result	
2-2 from	Description	Select the option under "Notebook" labeled "LSST" by clicking on the icon.
LVV-T838	Test Data	
	Expected	An empty notebook with a single empty cell. The kernel show up as "LSST" in the top right of the
	Result	notebook.



Step	Description, I	nput Data and Expected Result
3-1 from LVV- T1207	Description Test Data Expected Result	Execute a query in a notebook to select a small number of stars. In the example code below, we query the WISE catalog, then extract the results to an Astropy table.
4	Description	Using the example code below, save the files to your storage space on the LSP Notebook Aspect.
		Confirm that non-empty output files appear on disk.
	Test Data	No data.
	Example	tab.write('test.csv', format='ascii.csv')
	Code	tab.write('test.vot', format='votable')
	Expected	tab.write('test.fits', format='fits') For the example given here, there should be the following files with the file size as listed:
	Result	
	Result	test.csv 5.7Mtest.vot 16M
		• test.fits 4.5M
	Description	Check that these files contain the same number of rows:
5	Test Data	No data.
	Example	from astropy.table import Table
	Code	dat_csv = Table.read('test.csv', format='ascii.csv')
		dat_vot = Table.read('test.vot', format='votable')
		dat_fits = Table.read('test.fits', format='fits')
		import numpy as np
		print(np.size(dat_csv), np.size(dat_vot), np.size(dat_fits))
	Expected Result	Print statement produces output "97058 97058 97058".
6-1 from LVV- T1208	Description	Under the 'File' menu at the top of your Jupyter notebook session, select one of the following:
		Save All, Exit, and Log Out Exit and Log Out Without Saving



Step	Description, Input Data and Expected Result		
	Test Data		
	Expected	You will be returned to the LSP landing page: https://lsst-lsp-stable.ncsa.illinois.edu/ lt is now	
	Result	safe to close the browser window.	

4.126 LVV-T152 - Verify implementation of Keep Historical Alert Archive

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
		Open LV\	/-T152 in Jira	

4.126.1 Verification Elements

• LVV-37 - DMS-REQ-0094-V-01: Keep Historical Alert Archive

4.126.2 Test Items

Verify that the DMS preserves and makes accessible an Alert Archive for reference and for false alert analyses

4.126.3 Predecessors

4.126.4 Environment Needs

4.126.4.1 Software

4.126.4.2 Hardware

4.126.5 Input Specification



4.126.6 Output Specification

4.126.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Simulated alert stream, load Alert DB, observe access to Alert DB	
1	Test Data	No data.	
	Expected		
	Result		

4.127 LVV-T153 - Verify implementation of Provide Engineering and Facility Database Archive

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl
Open LVV-T153 in Jira				

4.127.1 Verification Elements

• LVV-44 - DMS-REQ-0102-V-01: Provide Engineering & Facility Database Archive

4.127.2 Test Items

Demonstrate Engineering and Facilities Data (images, associated metadata, and observatory environment and control data) are archived and available for public access within **L1PublicT** (24 hours).

4.127.3 Predecessors

4.127.4 Environment Needs

4.127.4.1 Software



4.127.4.2 Hardware

4.127.5 Input Specification

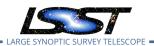
4.127.6 Output Specification

4.127.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Execute a single-day operations rehearsal, ingesting (simulated) OCS commands into the EFD.	
•	Test Data	No data.	
	Expected		
	Result		
	Description	Wait at least L1PublicT=24 hours, then access the archived EFD. Confirm that the data	
2		products are present in the archived EFD after L1PublicT=24 hours have elapsed.	
	Test Data	No data.	
	Expected	The EFD contains the simulated OCS commands, and they were ingested	
	Result	within L1PublicT=24 hours of the operations rehearsal.	
	Description	From the public access portal to the EFD, execute a query and demonstrate that the data	
3		are publicly available.	
	Test Data	No data.	
	Expected	A query at the public interface to the EFD successfully executes and returns EFD data.	
	Result		

4.128 LVV-T154 - Verify implementation of Raw Data Archiving Reliability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open LV	V-T154 in Jira	



4.128.1 Verification Elements

• LVV-140 - DMS-REQ-0309-V-01: Raw Data Archiving Reliability

4.128.2 Test Items

Verify that raw images are reliably archived.

- 4.128.3 Predecessors
- 4.128.4 Environment Needs
- 4.128.4.1 Software
- 4.128.4.2 Hardware
- 4.128.5 Input Specification
- 4.128.6 Output Specification

4.128.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Analyze sources of loss or corruption after mitigation to compute estimated reliability	
1	Test Data	No data.	
	Expected		
	Result		

4.129 LVV-T155 - Verify implementation of Un-Archived Data Product Cache

Version Status Priority Verification Type Owner	
---	--

Test Spec for LSST Data Management

Draft

Robert Gruendl

LDM-639

Open LVV-T155 in Jira

Normal Test

4.129.1 Verification Elements

1

• LVV-141 - DMS-REQ-0310-V-01: Un-Archived Data Product Cache

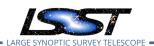
4.129.2 Test Items

Demonstrate that the DMS provides low-latency storage for at least I1CacheLifetime (30 days) to keep prompt processing pre-covery images on hand.

- 4.129.3 Predecessors
- 4.129.4 Environment Needs
- 4.129.4.1 Software
- 4.129.4.2 Hardware
- 4.129.5 Input Specification
- 4.129.6 Output Specification

4.129.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to DBB	
1	Test Data	No data.	
	Expected		
	Result		



4.130 LVV-T156 - Verify implementation of Regenerate Un-archived Data Products

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff
		Open	LVV-T156 in Jira	

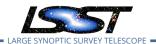
4.130.1 Verification Elements

• LVV-142 - DMS-REQ-0311-V-01: Regenerate Un-archived Data Products

4.130.2 Test Items

Not all of the ancillary data products produced by a data release will be archived permanently. These ancillary products have been promised as accessible to the community. Show that these products can be produced from an archived data release after the fact.

- 4.130.3 Predecessors
- 4.130.4 Environment Needs
- 4.130.4.1 Software
- 4.130.4.2 Hardware
- 4.130.5 Input Specification
- 4.130.6 Output Specification
- 4.130.7 Test Procedure



Step	Description, l	Description, Input Data and Expected Result		
	Description	Run a small DRP processing job and download unarchived data products.		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Wait for (or force) a processing stack change so that the subsequent re-processing will be forced to use an older software build.		
2	Test Data	No data.		
	Expected			
	Result			
3	Description	Using provenance information from the products in Step 1, request a re-processing and compare results with previously unarchived products.		
-	Test Data	No data.		
	Expected			
	Result			

4.131 LVV-T157 - Verify implementation Level 1 Data Product Access

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open LV	V-T157 in Jira	

4.131.1 Verification Elements

• LVV-143 - DMS-REQ-0312-V-01: Level 1 Data Product Access

4.131.2 Test Items

Verify that Level 1 Data Products are accessible by science users.

4.131.3 Predecessors

4.131.4 Environment Needs

4.131.4.1 Software

4.131.4.2 Hardware

4.131.5 Input Specification

4.131.6 Output Specification

4.131.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to LSP	
1	Test Data	No data.	
	Expected		
	Result		

4.132 LVV-T158 - Verify implementation Level 1 and 2 Catalog Access

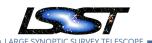
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open LV	V-T158 in Jira	

4.132.1 Verification Elements

LVV-144 - DMS-REQ-0313-V-01: Level 1 & 2 Catalog Access

4.132.2 Test Items

Verify that Data Release Products are accessible by science users.



4.132.3 Predecessors

4.132.4 Environment Needs

4.132.4.1 Software

4.132.4.2 Hardware

4.132.5 Input Specification

4.132.6 Output Specification

4.132.7 Test Procedure

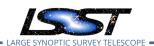
Step	Description, Input Data and Expected Result		
	Description	Delegate to LSP	
1	Test Data	No data.	
	Expected		
	Result		

4.133 LVV-T159 - Verify implementation of Regenerating Data Products from Previous Data Releases

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff
		Open	LVV-T159 in Jira	

4.133.1 Verification Elements

• LVV-167 - DMS-REQ-0336-V-01: Regenerating Data Products from Previous Data Releases



4.133.2 Test Items

Show that un-archived data products from previous data releases can be generated using through the LSST Science Platform.

- 4.133.3 Predecessors
- 4.133.4 Environment Needs
- 4.133.4.1 Software
- 4.133.4.2 Hardware
- 4.133.5 Input Specification
- 4.133.6 Output Specification

4.133.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to LSP	
1	Test Data	No data.	
	Expected		
	Result		

4.134 LVV-T160 - Verify implementation of Providing a Precovery Service

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Gregory Dubois-Felsmann

Open LVV-T160 in Jira



4.134.1 Verification Elements

• LVV-172 - DMS-REQ-0341-V-01: Max elapsed time for precovery results

4.134.2 Test Items

Verify that a technical capability to perform user-directed precovery analyses on difference images exists and that it is exposed through the LSST Science Platform. Verified by testing against precursor datasets.

(Involves: LSP Portal, MOPS and Forced Photometry)

4.134.3 Predecessors

4.134.4 Environment Needs

4.134.4.1 Software

4.134.4.2 Hardware

4.134.5 Input Specification

- 1. DECam HiTS data could be an appropriate set for this activity.
- 2. Precovery pipelines for follow-on to alert processing must exist and be made available as a containerized version within the Science Platform.
- 3. Determine limitations over which general precovery is supported. I would suggest that precovery services be limited to current (or last two) DRP campaigns with the possible addition of including non-DRP products to encompass observations over the preceding year (does this then require means to re-generate PVIs from Alert Production in addition to DRP?)
- 4. Could re-use elements of LVV-T80 where quasars are used to test faint object detection.

4.134.6 Output Specification



4.134.7 Test Procedure

Step	Description, I	nput Data and Expected Result
1	Description	Run Precovery within follow-on Alert Production (i.e. daily post-processing on 30 day store).
·	Test Data	No data.
	Expected	
	Result	
	Description	Within Science Platform, initiate request to perform precovery for a list of sources over
2		same period (and longer). Include among the sources for precovery quasars from LVV-T80.
	Test Data	No data.
	Expected	
	Result	
3	Description	Examine the results. Compare the results for the period where there is overlap with precovery run and quasar photometry with those from LVV-T80 to verify user service performs as production services.
	Test Data	No data.
	Expected	
	Result	

4.135 LVV-T161 - Verify implementation of Logging of catalog queries

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
		Open	LVV-T161 in Jira	

4.135.1 Verification Elements

• LVV-176 - DMS-REQ-0345-V-01: Logging of catalog queries



4.135.2 Test Items

Demonstrate logging of queries of LSST databases. Logged queries are globally available to DB administrators but otherwise private excepting the user that made the query.

- 4.135.3 Predecessors
- 4.135.4 Environment Needs
- 4.135.4.1 Software
- 4.135.4.2 Hardware
- 4.135.5 Input Specification
- 4.135.6 Output Specification

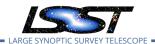
4.135.7 Test Procedure

Step	Description, li	nput Data and Expected Result
	Description	Delegate to LSP
1	Test Data	No data.
	Expected	
	Result	

4.136 LVV-T162 - Verify implementation of Access to Previous Data Releases

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Gregory Dubois-Felsmann

Open LVV-T162 in Jira



4.136.1 Verification Elements

• LVV-189 - DMS-REQ-0363-V-01: Access to Previous Data Releases

4.136.2 Test Items

Verify this high-level requirement, which states that the other data access requirements, for images and catalogs, all must be satisfied for multiple data releases. Verified by inspection, i.e., by determining that the data access system components, from middleware through APIs to user interfaces, are designed to support data from multiple releases, as well as by direct testing using a synthetic test environment containing multiple releases.

(Involves: Data Backbone, Managed Database, LSP Portal, LSP JupyterLab, LSP Web APIs, Parallel Distributed Database)

4.136.3 Predecessors

4.136.4 Environment Needs

4.136.4.1 Software

4.136.4.2 Hardware

4.136.5 Input Specification

Requires two or more (fake) releases within DAC (or PDAC) with common area/observations (preferably with some differing results but could use metadata identifying provenance).

4.136.6 Output Specification

4.136.7 Test Procedure



Step	Description, l	nput Data and Expected Result
1	Description	From Science Platform initiate request for image and catalog products from one of the two release sets.
•	Test Data	No data.
	Expected	
	Result	
2	Description	From Science Platform re-issue the same request but specifying the alternate/earlier re-lease set.
۷	Test Data	No data.
	Expected	
	Result	
3	Description	Compare results and identify differences that are germaine to the relevant Data Release Sets are found.
3	Test Data	No data.
	Expected	
	Result	

4.137 LVV-T163 - Verify implementation of Data Access Services

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
		Open	LVV-T163 in lira	

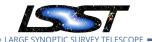
4.137.1 Verification Elements

• LVV-190 - DMS-REQ-0364-V-01: Total number of data releases

4.137.2 Test Items

Demonstrate that Data Access Services are capable of scaling to serve data from nDRTot (11) data releases over a surveyYears (10) year survey.

4.137.3 Predecessors



4.137.4 Environment Needs

4.137.4.1 Software

4.137.4.2 Hardware

4.137.5 Input Specification

4.137.6 Output Specification

4.137.7 Test Procedure

Step	Description, In	nput Data and Expected Result
	Description	Delegate to LSP
1	Test Data	No data.
	Expected	
	Result	

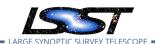
4.138 LVV-T164 - Verify implementation of Operations Subsets

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
		Open	IVV/T164 in lira	

Open LVV-1164 in Jira

4.138.1 Verification Elements

• LVV-191 - DMS-REQ-0365-V-01: Operations Subsets



4.138.2 Test Items

Demonstrate that Data Access Services are designed such that subsets of a Data Release may be retained and served (made available) after a Data Release has been superseded. (Data Backbone, Managed Database, LSP Portal, LSP JupyterLab, LSP Web APIs, Parallel Distributed Database)

- 4.138.3 Predecessors
- 4.138.4 Environment Needs
- 4.138.4.1 Software
- 4.138.4.2 Hardware
- 4.138.5 Input Specification
- 4.138.6 Output Specification

4.138.7 Test Procedure

Step Descripti	on, Input Data and	Expected Result
----------------	--------------------	-----------------

	Description	Delegate to LSP
1	Test Data	No data.
	Expected	
	Result	

4.139 LVV-T165 - Verify implementation of Subsets Support

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Lupton
		Open L	.VV-T165 in Jira	



4.139.1 Verification Elements

• LVV-192 - DMS-REQ-0366-V-01: Subsets Support

4.139.2 Test Items

Verify that the DMS can provide designated subsets of previous Data Releases.

- 4.139.3 Predecessors
- 4.139.4 Environment Needs
- 4.139.4.1 Software
- 4.139.4.2 Hardware
- 4.139.5 Input Specification
- 4.139.6 Output Specification

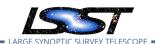
4.139.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to LSP
1	Test Data	No data.
	Expected	
	Result	

4.140 LVV-T166 - Verify implementation of Access Services Performance

Version Status Priority Verification Type Owner



1 Draft Normal Test Robert Gruendl
Open LVV-T166 in Jira

4.140.1 Verification Elements

• LVV-193 - DMS-REQ-0367-V-01: Access Services Performance

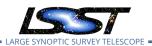
4.140.2 Test Items

Demonstrate monitoring of Data Access Services that give real and long-time views of system performance and usage.

- 4.140.3 Predecessors
- 4.140.4 Environment Needs
- 4.140.4.1 Software
- 4.140.4.2 Hardware
- 4.140.5 Input Specification
- 4.140.6 Output Specification

4.140.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Delegate to LSP		
1	Test Data	No data.		
	Expected			
	Result			



4.141 LVV-T167 - Verify Capability to serve older Data Releases at Full Performance

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
		Onen	I VV-T167 in lira	

4.141.1 Verification Elements

• LVV-194 - DMS-REQ-0368-V-01: Implementation Provisions

4.141.2 Test Items

Verify that implementation of the data access services do not preclude serving all older Data Releases with the same performance requirements as current Data Releases. Note that it is an operational consideration whether sufficient compute and storage resources would actually be provisioned to meet those requirements.

- 4.141.3 Predecessors
- 4.141.4 Environment Needs
- 4.141.4.1 Software
- 4.141.4.2 Hardware
- 4.141.5 Input Specification
- 4.141.6 Output Specification
- 4.141.7 Test Procedure



Step	Description, Input Data and Expected Result			
	Description	Delegate to LSP		
1	Test Data	No data.		
	Expected			
	Result			

4.142 LVV-T168 - Verify design of Data Access Services allows Evolution of the LSST Data Model

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Robert Gruendl	
Open IVV T169 in line					

Open LVV-1168 in Jira

4.142.1 Verification Elements

• LVV-195 - DMS-REQ-0369-V-01: Evolution

4.142.2 Test Items

Verify that the design of the Data Access Services are able to accommodate changes/evolution of the LSST data model from one release to another.

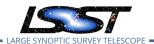
4.142.3 Predecessors

4.142.4 Environment Needs

4.142.4.1 Software

4.142.4.2 Hardware

4.142.5 Input Specification



4.142.6 Output Specification

4.142.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Delegate to LSP		
1	Test Data	No data.		
	Expected			
	Result			

4.143 LVV-T169 - Verify implementation of Older Release Behavior

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Gregory Dubois-Felsmann
Open LVV T160 in line				

Open LVV-1169 in Jira

4.143.1 Verification Elements

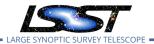
• LVV-196 - DMS-REQ-0370-V-01: Older Release Behavior

4.143.2 Test Items

Verify that the components of the data access system are technically capable of handling data releases beyond the two for which full services are required. DMS-REQ-0364 requires that up to 11 be supported. Verified by inspection, i.e., by determination that the system design and implementation contain the necessary features to support this number of releases, and by direct test in a synthetic test environment with multiple releases.

(Involves: Data Backbone, Managed Database, LSP Portal, LSP JupyterLab, LSP Web APIs, Parallel Distributed Database)

4.143.3 Predecessors



4.143.4 Environment Needs

4.143.4.1 Software

4.143.4.2 Hardware

4.143.5 Input Specification

4.143.6 Output Specification

4.143.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Delegate to LSP		
1	Test Data	No data.		
	Expected			
	Result			

4.144 LVV-T170 - Verify implementation of Query Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open LV	V-T170 in Jira	

4.144.1 Verification Elements

• LVV-197 - DMS-REQ-0371-V-01: Query Availability

4.144.2 Test Items

Verify that queries continue to be successfully executable over time.

4.144.3 Predecessors

4.144.4 Environment Needs

4.144.4.1 Software

4.144.4.2 Hardware

4.144.5 Input Specification

4.144.6 Output Specification

4.144.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to LSP	
1	Test Data	No data.	
	Expected		
	Result		

4.145 LVV-T171 - Verify implementation of Pipeline Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T171 in Jira				

4.145.1 Verification Elements

• LVV-5 - DMS-REQ-0008-V-01: Pipeline Availability



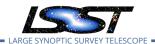
4.145.2 Test Items

Demonstrate that Data Management System pipelines are available for use without disruptions of greater than productionMaxDowntime (24 hours). This requires a regimented change control process and testing infrastructure for all pipelines and their underlying software services, and regimented management and monitoring of compute and networking resources. The list of services covered by this test include: Image and EFD Archiving, Prompt Processing, OCS Driven Batch, Telemetry Gateway, Alert Distribution, Alert Filtering, Batch Production, Data Backbone, Compute/Storage/LAN, Inter-Site Networks, and Service Management and Monitoring.

- 4.145.3 Predecessors
- 4.145.4 Environment Needs
- 4.145.4.1 Software
- 4.145.4.2 Hardware
- 4.145.5 Input Specification
- 4.145.6 Output Specification

4.145.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result			
1	Description	Analyze sources of downtime after mitigation to compute estimated reliability; observe unscheduled downtime of developer, integration, and pre-production systems			
•	Test Data	No data.			
	Expected				
	Result				



4.146 LVV-T172 - Verify implementation of Optimization of Cost, Reliability and Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T172 in Jira				

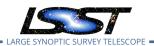
4.146.1 Verification Elements

• LVV-64 - DMS-REQ-0161-V-01: Optimization of Cost, Reliability and Availability in Order

4.146.2 Test Items

In matters of cost, system reliability (functioning properly at a given time) has precedence over system availability (ability to use the system at a given time). The optimization may be outside the realm of direct testing as it is more of a system provisioning guideline but on its face it demands that the Data Management System include failure reporting, regimented change control, acceptance testing, maintenance and monitoring.

- 4.146.3 Predecessors
- 4.146.4 Environment Needs
- 4.146.4.1 Software
- 4.146.4.2 Hardware
- 4.146.5 Input Specification
- 4.146.6 Output Specification
- 4.146.7 Test Procedure



Step	Description, Input Data and Expected Result			
	Description	Analyze resource management policy		
1	Test Data	No data.		
	Expected			
	Result			

4.147 LVV-T173 - Verify implementation of Pipeline Throughput

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
		Open	LVV-T173 in Jira	

4.147.1 Verification Elements

• LVV-65 - DMS-REQ-0162-V-01: Pipeline Throughput

4.147.2 Test Items

Demonstrate that the Alert Production Pipeline is capable of processing nRawExpNightMax (2800) science exposures within a (24-nightDurationMax) 12 hour period and issue alerts in offline batch mode.

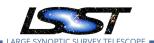
4.147.3 Predecessors

4.147.4 Environment Needs

4.147.4.1 Software

4.147.4.2 Hardware

4.147.5 Input Specification



4.147.6 Output Specification

4.147.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Execute single-day operations rehearsal, observe data products generated in time		
1	Test Data	No data.		
	Expected			
	Result			

4.148 LVV-T174 - Verify implementation of Re-processing Capacity

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T174 in Jira				

4.148.1 Verification Elements

LVV-66 - DMS-REQ-0163-V-01: Re-processing Capacity

4.148.2 Test Items

Verify that the DMS has sufficient processing, storage, and network to reprocess all data within "drProcessingPeriod" (1 year) while maintaining full Prompt Processing capability.

4.148.3 Predecessors

4.148.4 Environment Needs

4.148.4.1 Software

LDM-639



4.148.4.2 Hardware

4.148.5 Input Specification

4.148.6 Output Specification

4.148.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Analyze sizing model; execute DRP, observe scaling		
1	Test Data	No data.		
	Expected			
	Result			

4.149 LVV-T175 - Verify implementation of Temporary Storage for Communications Links

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T175 in Jira				

4.149.1 Verification Elements

• LVV-67 - DMS-REQ-0164-V-01: Temporary Storage for Communications Links

4.149.2 Test Items

Demonstrate that storage capacity is present and usable to prevent data loss if networking is interrupted between summit and base, base and archive, or archive and DAC. The requirement is to have storage necessary to hold tempStorageRelMTTR (200%) of the expected raw data that would arrive during the Mean Time to Repair (summToBaseNetMTTR = 24 hours, baseToArchNetMTTR = 48 hours, archToDacNetMTTR = 48 hours). This scale is further set by nCalibExpDay + nRawExpNightMax = 450 + 2800 = 3250 exposures/day.

LDM-639

4.149.3 Predecessors

4.149.4 Environment Needs

4.149.4.1 Software

4.149.4.2 Hardware

4.149.5 Input Specification

4.149.6 Output Specification

4.149.7 Test Procedure

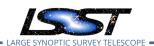
Step	Description, Input Data and Expected Result			
	Description	Analyze sizing model and network/storage design		
1	Test Data	No data.		
	Expected			
	Result			

4.150 LVV-T176 - Verify implementation of Infrastructure Sizing for "catching up"

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T176 in lira				

4.150.1 Verification Elements

- LVV-68 DMS-REQ-0165-V-01: Infrastructure Sizing for "catching up"
- LVV-994 OSS-REQ-0051-V-01: Summit-Base Connectivity Loss



4.150.2 Test Items

Demonstrate Data Management System has sufficient excess capacity (compute infrastructure) to process one night's data (2800 exposures) within 24 hours while also maintaining nightly Alert Production (note this is very similar to LVV-T173).

- 4.150.3 Predecessors
- 4.150.4 Environment Needs
- 4.150.4.1 Software
- 4.150.4.2 Hardware
- 4.150.5 Input Specification
- 4.150.6 Output Specification

4.150.7 Test Procedure

Step	Description, Input Data and Expected Result			
, , , , , , , , , , , , , , , , , , , ,		Execute single-day operations rehearsal including catch-up after failure, observe data products generated in time		
'	Test Data	No data.		
	Expected			
	Result			

4.151 LVV-T177 - Verify implementation of Incorporate Fault-Tolerance

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T177 in Jira				



4.151.1 Verification Elements

• LVV-69 - DMS-REQ-0166-V-01: Incorporate Fault-Tolerance

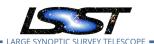
4.151.2 Test Items

Demonstrate that Data Management Systems have features that prevent data loss. Includes: MD5SUM/checksum verification for data transfer; RAID to eliminate single-point disk failures; multi-site and tape for disaster recovery of raw data; multiple site (and tape?) for backup/recovery of Data Release products; DB transaction logging and backup to maintain DB integrity. (Note: storage to prevent loss in case of networking failures is covered in LVV-T175).

- 4.151.3 Predecessors
- 4.151.4 Environment Needs
- 4.151.4.1 Software
- 4.151.4.2 Hardware
- 4.151.5 Input Specification
- 4.151.6 Output Specification

4.151.7 Test Procedure

Step	Description, Input Data and Expected Result			
1	Description	Analyze design; execute single-day operations rehearsal including failures, observe recovery without loss of data		
'	Test Data	No data.		
	Expected			
	Result			



4.152 LVV-T178 - Verify implementation of Incorporate Autonomics

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Robert Gruendl	
Open LVV-T178 in Jira					

4.152.1 Verification Elements

• LVV-70 - DMS-REQ-0167-V-01: Incorporate Autonomics

4.152.2 Test Items

Demonstrate that production systems monitor and report faults. Where possible fault mitigation can include re-start, re-submission, or return of partial products for triage.

4.152.3 Predecessors

4.152.4 Environment Needs

4.152.4.1 Software

4.152.4.2 Hardware

4.152.5 Input Specification

4.152.6 Output Specification

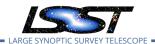
4.152.7 Test Procedure

1

Step Description, Input Data and Expected Result

Description Analyze design; execute single-day operations rehearsal including failures, observe automated recovery and continuation of processing

The contents of this document are subject to configuration control by the LSST DM Change Control Board.



Step	Description, Input Data and Expected Result			
	Test Data	No data.		
	Expected			
	Result			

4.153 LVV-T179 - Verify implementation of Compute Platform Heterogeneity

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Robert Gruendl		
Open LVV-T179 in Jira						

4.153.1 Verification Elements

• LVV-145 - DMS-REQ-0314-V-01: Compute Platform Heterogeneity

4.153.2 Test Items

Demonstrate that production results are the same (within machine accuracy) when production occurs on different platforms (OS, kernel, hardware provisioning).

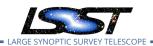
4.153.3 Predecessors

4.153.4 Environment Needs

4.153.4.1 Software

4.153.4.2 Hardware

4.153.5 Input Specification



4.153.6 Output Specification

4.153.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Configure heterogeneous cluster, execute AP+DRP+LSP, observe correct functioning		
1	Test Data	No data.		
	Expected			
	Result			

4.154 LVV-T180 - Verify implementation of Data Management Unscheduled Downtime

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Robert Gruendl	
Open LVV-T180 in Jira					

4.154.1 Verification Elements

• LVV-149 - DMS-REQ-0318-V-01: Data Management Unscheduled Downtime

4.154.2 Test Items

This applies only to downtime that would prevent the collection of survey data. Verification means that analysis has occurred to identify likely hardware failures that would prevent survey operations and that mitigations that minimize the downtime to less than DMDowntime (1 day/year) are in place. Known systems that fall in this category include: Image and EFD Archiving, Observatory Operations Data, Telemetry Gateway, Data Backbone, Managed Database, Inter-Site Networks, and Service Management and Monitoring.

4.154.3 Predecessors



4.154.4 Environment Needs

4.154.4.1 Software

4.154.4.2 Hardware

4.154.5 Input Specification

4.154.6 Output Specification

4.154.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Analyze likely hardware failures with mitigations to compute estimated unplanned down-			
1		time			
•	Test Data	No data.			
	Expected				
	Result				

4.155 LVV-T182 - Verify implementation of Prefer Computing and Storage Down

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Robert Gruendl	
Open LVV-T182 in Jira					

4.155.1 Verification Elements

• LVV-72 - DMS-REQ-0170-V-01: Prefer Computing and Storage Down



4.155.2 Test Items

Only build compute or storage facilities at the summit that are justified by operational need or to prevent loss of data during networking downtimes.

- 4.155.3 Predecessors
- 4.155.4 Environment Needs
- 4.155.4.1 Software
- 4.155.4.2 Hardware
- 4.155.5 Input Specification
- 4.155.6 Output Specification

4.155.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Analyze design			
1	Test Data	No data.			
	Expected				
	Result				

4.156 LVV-T183 - Verify implementation of DMS Communication with OCS

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Gregory Dubois-Felsmann

Open LVV-T183 in Jira



4.156.1 Verification Elements

• LVV-146 - DMS-REQ-0315-V-01: DMS Communication with OCS

4.156.2 Test Items

Verify that the DMS at the Base Facility can receive commands from the OCS and send command responses, events, and telemetry back. Verified by Early Integration activities and during AuxTel commissioning.

4.156.3 Predecessors

4.156.4 Environment Needs

4.156.4.1 Software

4.156.4.2 Hardware

4.156.5 Input Specification

4.156.6 Output Specification

4.156.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	From the Base Site, connect to the (simulated) OCS telemetry stream.		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Send a command to the OCS, and observe that the command has been executed.		
2	Test Data	No data.		
	Expected	Confirmation that the OCS command successfully executed.		
	Result			



Step	Description, Input Data and Expected Result				
3	Description	Extract information from the telemetry being broadcast by the OCS, and ensure that these data are readable.			
J	Test Data	No data.			
	Expected	A readable extract from the OCS telemetry stream.			
	Result				

4.157 LVV-T185 - Verify implementation of Summit to Base Network Availability

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Inspection	Robert Gruendl		
Open LVV-T185 in Jira						

4.157.1 Verification Elements

• LVV-74 - DMS-REQ-0172-V-01: Summit to Base Network Availability

4.157.2 Test Items

Monitor summit to base networking for at least 1 week, model annual availability, and verify that the mean time between failures is less than summToBaseNetMTBF (90 days) over 1 year.

4.157.3 Predecessors

See pre-conditions.

4.157.4 Environment Needs

4.157.4.1 Software See pre-conditions.

LDM-639



4.157.4.2 Hardware See pre-conditions.

4.157.5 Input Specification

PMCS DMTC-7400-2400 Complete. perSonar installed in Summit and publishing statistics to MadDash.

4.157.6 Output Specification

4.157.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.158 LVV-T186 - Verify implementation of Summit to Base Network Reliability

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Demonstration	Robert Gruendl		
Open LVV-T186 in Jira						

4.158.1 Verification Elements

• LVV-75 - DMS-REQ-0173-V-01: Summit to Base Network Reliability

4.158.2 Test Items

This approach is necessitated by not wanting to actually cut the fiber just for test purposes:

• Pick a point on the network (Time Domain graph) and simulate a fault (e.g. disconnect



a cable).

- · Detect there a fault.
- Diagnose that it is a break.
- Measure the cable with the OTDR to locate the distance from the end point.
- Elapse time to simulate the following:
 - Go to the most inaccessible place which would mean carrying all the tools/splicer/generator/tent equipment some metres.
 - Erect a tent to make the splice
 - Start the generator
 - Do a splice on some random piece of cable
 - At an end point measure the cable again to ensure it is break free.
 - Take down and reinstall an isolate pole (not in the actual fiber path)
 - Put the cable on the pole.
- Restore connection (e.g. reconnect cable)
- Measure with OTDR to ensure back to normal state.

4.158.3 Predecessors

See pre-conditions.

4.158.4 Environment Needs

4.158.4.1 Software See pre-conditions.

4.158.4.2 Hardware See pre-conditions.

4.158.5 Input Specification

PMCS DMTC-7400-2400 Complete



4.158.6 Output Specification

4.158.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.159 LVV-T187 - Verify implementation of Summit to Base Network Secondary Link

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Robert Gruendl	
Open LVV-T187 in Jira					

4.159.1 Verification Elements

• LVV-76 - DMS-REQ-0174-V-01: Summit to Base Network Secondary Link

4.159.2 Test Items

Transfer data between summit and base on primary equipment (LSST Summit - Base) over uninterrupted 1 day period. Simulate outage by disconnecting fiber from equipment on primary and verify that network fails over to secondary equipment. Demonstrate transfer of data at or exceeding rates specified in LDM-142 between summit and base over secondary equipment uninterrupted 1 day period (except for <=60s to fail-over to secondary and recover to primary connection execution). Verify that link is capable of transferring 1 night of raw data (nCalibExpDay + nRawExpNightMax = 450 + 2800 = 3250 exposures) within summ-ToBaseNet2TransMax (72 hours). Restore connection between fiber and primary equipment (i.e. reconnect primary), verify that network recovers to primary.



4.159.3 Predecessors

See pre-conditions.

4.159.4 Environment Needs

4.159.4.1 Software See pre-conditions.

4.159.4.2 Hardware See pre-conditions.

4.159.5 Input Specification

PMCS DMTC-7400-2400 complete.

4.159.6 Output Specification

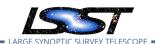
4.159.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.160 LVV-T188 - Verify implementation of Summit to Base Network Ownership and Operation

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Inspection	Robert Gruendl	
Open IV// T199 in line					

Open LVV-T188 in Jira



4.160.1 Verification Elements

• LVV-77 - DMS-REQ-0175-V-01: Summit to Base Network Ownership and Operation

4.160.2 Test Items

Inspect construction and operations contracts and Indefeasible Rights to Use (IRUs).

4.160.3 Predecessors

PMCS DMTC-7400-2140, -2240, -2330 Complete

4.160.4 Environment Needs

4.160.4.1 Software None

4.160.4.2 Hardware None

4.160.5 Input Specification

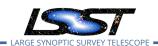
4.160.6 Output Specification

4.160.7 Test Procedure

Step	Description, input Data and Expected Result

	Description	Delegate to Networks
1	Test Data	No data.
	Expected	
	Result	

4.161 LVV-T189 - Verify implementation of Base Facility Infrastructure



Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Test	Robert Gruendl		
Open LVV-T189 in Jira						

4.161.1 Verification Elements

• LVV-78 - DMS-REQ-0176-V-01: Base Facility Infrastructure

4.161.2 Test Items

Verify that the (a) planned infrastructure and (b) as-built infrastructure for the Base Facility satisfies the needs for data transfer and buffering, a copy of the Archive Facility, and support for Commissioning.

4.161.3 Predecessors

4.161.4 Environment Needs

4.161.4.1 Software

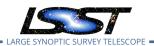
4.161.4.2 Hardware

4.161.5 Input Specification

4.161.6 Output Specification

4.161.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Analyze design and sizing model	
1	Test Data	No data.	



Step	Description, Input Data and Expected Result
•	Expected

Result

4.162 LVV-T190 - Verify implementation of Base Facility Co-Location with Existing Facility

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Robert Gruendl	
Open LW/ T100 in line					

Open LVV-1190 in Jira

4.162.1 Verification Elements

• LVV-80 - DMS-REQ-0178-V-01: Base Facility Co-Location with Existing Facility

4.162.2 Test Items

Verify that the Base Facility is located at an existing known supported facility.

4.162.3 Predecessors

4.162.4 Environment Needs

4.162.4.1 Software

4.162.4.2 Hardware

4.162.5 Input Specification

4.162.6 Output Specification



4.162.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Analyze design	
1	Test Data	No data.	
	Expected		
	Result		

4.163 LVV-T191 - Verify implementation of Commissioning Cluster

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T191 in Jira				

4.163.1 Verification Elements

• LVV-147 - DMS-REQ-0316-V-01: Commissioning Cluster

4.163.2 Test Items

Verify that the Commissioning Cluster has sufficient Compute/Storage/LAN at the Base Facility to support Commissioning.

4.163.3 Predecessors

4.163.4 Environment Needs

4.163.4.1 Software

4.163.4.2 Hardware

LDM-639



4.163.5 Input Specification

4.163.6 Output Specification

4.163.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Analyze design and budget	
1	Test Data	No data.	
	Expected		
	Result		

4.164 LVV-T192 - Verify implementation of Base Wireless LAN (WiFi)

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T192 in Jira				

4.164.1 Verification Elements

LVV-183 - DMS-REQ-0352-V-01: Base Wireless LAN (WiFi)

4.164.2 Test Items

Verify (a) plannned and (b) as-built wireless network at the Base Facility supports minBaseWiFi bandwidth (1000 Mbs). Test internet web browsing and file download, email at summit and base over wireless. Verify wireless signal strength meets or exceeds typical, and average and peak bandwidths meet or exceed minBaseWiFI bandwidth.

4.164.3 Predecessors

PMCS DLP-465 Complete.



4.164.4 Environment Needs

4.164.4.1 Software See pre-conditions.

4.164.4.2 Hardware Desktop with WiFi NIC, email reader, internet browser.

4.164.5 Input Specification

Base Wireless LAN is installed/configured and Test Personnel have accounts for email, internet access.

4.164.6 Output Specification

4.164.7 Test Procedure

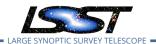
Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.165 LVV-T193 - Verify implementation of Base to Archive Network

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T193 in Jira				

4.165.1 Verification Elements

• LVV-81 - DMS-REQ-0180-V-01: Base to Archive Network



4.165.2 Test Items

Transfer data between base and archive over uninterrupted 1 day period (with repeated transfers on normal observing cadence). Analyze the network and show that data acquired by a DAQ can be transferred within the required time, i.e. verify that link is capable of transferring image for prompt processing in oArchiveMaxTransferTime = 5[second]. Verify transfer of data at or exceeding rates specified in LDM-142.

4.165.3 Predecessors

PMCS DM-Net-5 Complete

4.165.4 Environment Needs

4.165.4.1 Software See pre-conditions.

4.165.4.2 Hardware See pre-conditions.

4.165.5 Input Specification

Archiver/Forwarders are configured at Base, connected to REUNA DWDM, loaded with simulated or pre-cursor data.

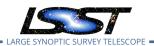
Archiver/Forwarder receivers or other capability is on configured at LDF, connected to Base - Archive Network.

4.165.6 Output Specification

4.165.7 Test Procedure

Step De:	scription, Inp	ut Data and	Expected	Result
----------	----------------	-------------	----------	--------

	Description	Delegate to Networks
1	Test Data	No data.



Step Description, Input Data and Expected Result

Expected Result

4.166 LVV-T194 - Verify implementation of Base to Archive Network Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Onen I VV-T194 in lira				

4.166.1 Verification Elements

• LVV-82 - DMS-REQ-0181-V-01: Base to Archive Network Availability

4.166.2 Test Items

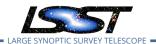
Transfer data between base and archive over uninterrupted 1 week period. Extrapolate to a full year to estimate if expect to meet baseToArchNetMTBF = 180[day]. Note that this is for complete loss of transfer service (all paths), not a single path failure with successful failover. Demonstrate transfer of data at or exceeding rates specified in LDM-142, verify achieved average and peak throughput and latency.

4.166.3 Predecessors

PMCS DMTC-7400-2130 Complete

4.166.4 Environment Needs

4.166.4.1 Software



4.166.4.2 Hardware

4.166.5 Input Specification

Archiver/Forwarders are configured at Base, connected to REUNA DWDM, loaded with simulated or pre-cursor data.

Archiver/Forwarder receivers or other capability is on configured at LDF, connected to Base - Archive Network.

4.166.6 Output Specification

4.166.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.167 LVV-T195 - Verify implementation of Base to Archive Network Reliability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T195 in Jira				

4.167.1 Verification Elements

• LVV-83 - DMS-REQ-0182-V-01: Base to Archive Network Reliability



4.167.2 Test Items

Disconnect, reconnect and recover transfer of data between base and archive, after disconnecting fiber at an intermediate location between base and archive. Verify recovery can occur within baseToArchNetMTTR = 48[hour]. Demonstrate reconnection and recovery to transfer of data at or exceeding rates specified in LDM-142.

4.167.3 Predecessors

PMCS DM-NET-5 Complete

4.167.4 Environment Needs

4.167.4.1 Software See pre-conditions.

4.167.4.2 Hardware See pre-conditions.

4.167.5 Input Specification

Archiver/Forwarders are configured at Base, connected to REUNA DWDM, loaded with simulated or pre-cursor data.

Archiver/Forwarder receivers or other capability is on configured at LDF, connected to Base - Archive Network.

4.167.6 Output Specification

4.167.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		



4.168 LVV-T196 - Verify implementation of Base to Archive Network Secondary Link

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T196 in Jira				

4.168.1 Verification Elements

• LVV-84 - DMS-REQ-0183-V-01: Base to Archive Network Secondary Link

4.168.2 Test Items

FOR EACH SEGMENT (LS - SCL, SCL - FL, FL - CHI, CHI - CHMPGN): Transfer data between base and archive on primary links over uninterrupted 1 day period. Simulate outage by disconnecting fiber on primary and verify that network fails over to secondary links. Transfer data between base and archive over secondary equipment uninterrupted 1 day period. Restore connection on primary link verify that network recovers to primary. Transfer data between base and archive on primary links over uninterrupted 1 day period. Demonstrate transfer of data at or exceeding rates specified in LDM-142 throughout fail-over period except for <=60s fail-over fail-over to secondary and recover to primary connection execution.

4.168.3 Predecessors

PMCS DM-NET-5 Complete
PMCS DMTC-8000-0990 Complete

PMCS DMTC-8100-2130 Complete

PMCS DMTC-8100-2530 Complete

PMCS DMTC-8200-0600 Complete

4.168.4 Environment Needs

4.168.4.1 Software See pre-conditions.



4.168.4.2 Hardware See pre-conditions.

4.168.5 Input Specification

Archiver/Forwarders are configured at Base, connected to REUNA DWDM, loaded with simulated or pre-cursor data.

Archiver/Forwarder receivers or other capability is on configured at LDF, connected to Base - Archive Network.

4.168.6 Output Specification

4.168.7 Test Procedure

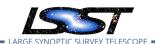
Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.169 LVV-T197 - Verify implementation of Archive Center

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T197 in Jira				

4.169.1 Verification Elements

• LVV-85 - DMS-REQ-0185-V-01: Archive Center



4.169.2 Test Items

Verify that the Archive Center is sufficiently provisioned to support prompt processing, DRP, and data access needs.

- 4.169.3 Predecessors
- 4.169.4 Environment Needs
- 4.169.4.1 Software
- 4.169.4.2 Hardware
- 4.169.5 Input Specification
- 4.169.6 Output Specification

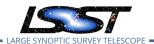
4.169.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Analyze design and sizing model	
1	Test Data	No data.	
	Expected		
	Result		

4.170 LVV-T198 - Verify implementation of Archive Center Disaster Recovery

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open I W/T108 in lina				

Open LVV-T198 in Jira



4.170.1 Verification Elements

• LVV-86 - DMS-REQ-0186-V-01: Archive Center Disaster Recovery

4.170.2 Test Items

Verify disaster recovery plan for Archive Center.

- 4.170.3 Predecessors
- 4.170.4 Environment Needs
- 4.170.4.1 Software
- 4.170.4.2 Hardware
- 4.170.5 Input Specification
- 4.170.6 Output Specification

4.170.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Analyze design; simulate storage failure, observe restore from disaster recovery			
1	Test Data	No data.			
	Expected				
	Result				

4.171 LVV-T199 - Verify implementation of Archive Center Co-Location with Existing Facility

Version	Status	Priority	Verification Type	Owner

LDM-639



1 Draft Normal Test Robert Gruendl
Open LVV-T199 in Jira

4.171.1 Verification Elements

• LVV-87 - DMS-REQ-0187-V-01: Archive Center Co-Location with Existing Facility

4.171.2 Test Items

Verify the Archive Center is located at an existing supported facility.

4.171.3 Predecessors

4.171.4 Environment Needs

4.171.4.1 Software

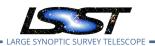
4.171.4.2 Hardware

4.171.5 Input Specification

4.171.6 Output Specification

4.171.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Analyze design	
1	Test Data	No data.	
	Expected		
	Result		



4.172 LVV-T200 - Verify implementation of Archive to Data Access Center Network

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T200 in Jira				

4.172.1 Verification Elements

• LVV-88 - DMS-REQ-0188-V-01: Archive to Data Access Center Network

4.172.2 Test Items

Transfer data between archive and both DACs over uninterrupted 1 day period (data can be simulated, i.e. files of similar size and quantity to real data). Verify can meet archTo-DacBandwidth = 10000[megabit per second]. Analyze the network and show that data can be transferred within the required time. Demonstrate transfer of data at or exceeding rates specified in LDM-142.

4.172.3 Predecessors

PMCS DMTC-8100-2550 Complete

4.172.4 Environment Needs

4.172.4.1 Software See pre-conditions.

4.172.4.2 Hardware See pre-conditions.

4.172.5 Input Specification

Data is staged in LDF and data transfer capabilities to US DAC and Chilean DAC are in place.



4.172.6 Output Specification

4.172.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.173 LVV-T201 - Verify implementation of Archive to Data Access Center Network Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open I VV-T201 in lira				

4.173.1 Verification Elements

• LVV-89 - DMS-REQ-0189-V-01: Archive to Data Access Center Network Availability

4.173.2 Test Items

Transfer data between archive and DACs over uninterrupted 1 week period. Extrapolate to 1 year to estimate can meet archToDacNetMTBF = 180[day]. Demonstrate transfer of data at or exceeding rates specified in LDM-142, verify achieved average and peak throughput and latency.

4.173.3 Predecessors

PMCS DMTC-8100-2550 Complete



4.173.4 Environment Needs

4.173.4.1 Software See pre-conditions.

4.173.4.2 Hardware See pre-conditions.

4.173.5 Input Specification

Data is staged in LDF and data transfer capabilities to US DAC and Chilean DAC are in place.

4.173.6 Output Specification

4.173.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.174 LVV-T202 - Verify implementation of Archive to Data Access Center Network Reliability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
Open LVV-T202 in Jira				

4.174.1 Verification Elements

• LVV-90 - DMS-REQ-0190-V-01: Archive to Data Access Center Network Reliability



4.174.2 Test Items

Reconnect and recover transfer of data between archive and DACs, after disconnecting fiber at an intermediate location between archive and DACs. Verify can meet chToDacNetMTTR = 48[hour]. Demonstrate reconnection and recovery to transfer of data at or exceeding rates specified in LDM-142.

4.174.3 Predecessors

PMCS DMTC-8100-2550 Complete

4.174.4 Environment Needs

4.174.4.1 Software See pre-conditions.

4.174.4.2 Hardware See pre-conditions.

4.174.5 Input Specification

Data is staged in LDF and data transfer capabilities to US DAC and Chilean DAC are in place.

4.174.6 Output Specification

4.174.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		



4.175 LVV-T203 - Verify implementation of Archive to Data Access Center Network Secondary Link

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open L\	/V-T203 in Jira	

4.175.1 Verification Elements

• LVV-91 - DMS-REQ-0191-V-01: Archive to Data Access Center Network Secondary Link

4.175.2 Test Items

FOR EACH SEGMENT (LS - SCL, SCL - FL, FL - CHI, CHI - CHMPGN): Transfer data between base and archive on primary links over uninterrupted 1 day period. Simulate outage by disconnecting fiber on primary and verify that network fails over to secondary links. Transfer data between base and archive over secondary equipment uninterrupted 1 day period. Restore connection on primary link verify that network recovers to primary. Transfer data between base and archive on primary links over uninterrupted 1 day period. Demonstrate transfer of data at or exceeding rates specified in LDM-142 throughout fail-over period except for <=60s fail-over fail-over to secondary and recover to primary connection execution.

4.175.3 Predecessors

PMCS DMTC-8100-2550 Complete

4.175.4 Environment Needs

4.175.4.1 Software See pre-conditions.

4.175.4.2 Hardware See pre-conditions.



4.175.5 Input Specification

Data is staged in LDF and data transfer capabilities to US DAC and Chilean DAC are in place.

4.175.6 Output Specification

4.175.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result		
	Description	Take primary network link down		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Observe operations support over secondary link		
2	Test Data	No data.		
	Expected			
	Result			
	Description	Bring primary network link back up		
3	Test Data	No data.		
	Expected			
	Result			
	Description	Observe catch-up capability over secondary link		
4	Test Data	No data.		
	Expected			
	Result			

4.176 LVV-T204 - Verify implementation of Access to catalogs for external Level 3 processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open L\	/V-T204 in Jira	



4.176.1 Verification Elements

• LVV-50 - DMS-REQ-0122-V-01: Access to catalogs for external Level 3 processing

4.176.2 Test Items

Verify that catalog export, and maintenance/validation tools for Level 3 products to outside of the Data Access Centers.

4.176.3 Predecessors

4.176.4 Environment Needs

4.176.4.1 Software

4.176.4.2 Hardware

4.176.5 Input Specification

4.176.6 Output Specification

4.176.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Execute bulk distribution of DRP catalogs	
1	Test Data	No data.	
	Expected		
	Result		
	Description	Observe correct transfer and use of maintenance/validation tools	
2	Test Data	No data.	
	Expected		
	Result		



4.177 LVV-T205 - Verify implementation of Access to input catalogs for DAC-based Level 3 processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl
		Open	LVV-T205 in lira	

4.177.1 Verification Elements

• LVV-51 - DMS-REQ-0123-V-01: Access to input catalogs for DAC-based Level 3 processing

4.177.2 Test Items

Verify that data products are available at the Data Access Centers for use in Level 3 processing.

4.177.3 Predecessors

4.177.4 Environment Needs

4.177.4.1 Software

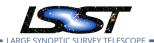
4.177.4.2 Hardware

4.177.5 Input Specification

4.177.6 Output Specification

4.177.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description Load Prompt and DR catalogs into PDAC, observe access via LSP			
1	Test Data	No data.		



Step	Description, Input Data and Expected Result		
	Expected		
	Result		

4.178 LVV-T206 - Verify implementation of Federation with external catalogs

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater
		Open LV	V-T206 in Jira	

4.178.1 Verification Elements

• LVV-52 - DMS-REQ-0124-V-01: Federation with external catalogs

4.178.2 Test Items

Verify that LSST-produced data can be combined with external datasets.

4.178.3 Predecessors

4.178.4 Environment Needs

4.178.4.1 Software

4.178.4.2 Hardware

4.178.5 Input Specification

4.178.6 Output Specification

4.178.7 Test Procedure



Step	Description, Input Data and Expected Result		
	Description	Load external catalog into PDAC (using VO if possible), observe federation with other cat-	
1		alogs via LSP	
-	Test Data	No data.	
	Expected		
	Result		

4.179 LVV-T207 - Verify implementation of Access to images for external Level 3 processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open L\	/V-T207 in Jira	

4.179.1 Verification Elements

• LVV-54 - DMS-REQ-0126-V-01: Access to images for external Level 3 processing

4.179.2 Test Items

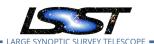
Verify that bulk distribution of images, and accompanying maintenance/validation tools for Level 3 image products to outside of the Data Access Centers.

4.179.3 Predecessors

4.179.4 Environment Needs

4.179.4.1 Software

4.179.4.2 Hardware



4.179.5 Input Specification

4.179.6 Output Specification

4.179.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Execute bulk distribution of DRP images	
1	Test Data	No data.	
	Expected		
	Result		
	Description	Observe correct transfer and use of maintenance/validation tools	
2	Test Data	No data.	
	Expected		
	Result		

4.180 LVV-T208 - Verify implementation of Access to input images for DAC-based Level 3 processing

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Kian-Tat Lim	
Open LVV-T208 in Jira					

4.180.1 Verification Elements

• LVV-55 - DMS-REQ-0127-V-01: Access to input images for DAC-based Level 3 processing

4.180.2 Test Items

Verify that prompt processing and DRP products are available at the DACs for Level 3 processing at the DACs.



4.180.3 Predecessors

4.180.4 Environment Needs

4.180.4.1 Software

4.180.4.2 Hardware

4.180.5 Input Specification

4.180.6 Output Specification

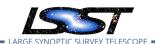
4.180.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Load Prompt and DR images into PDAC			
1	Test Data	No data.			
	Expected				
	Result				
	Description	Observe access via LSP			
2	Test Data	No data.			
	Expected				
	Result				

4.181 LVV-T209 - Verify implementation of Data Access Centers

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Analysis	Kian-Tat Lim		
Open LVV-T209 in Jira						

The contents of this document are subject to configuration control by the LSST DM Change Control Board.



4.181.1 Verification Elements

• LVV-92 - DMS-REQ-0193-V-01: Data Access Centers

4.181.2 Test Items

Verify that the Data Access Centers are provisioned with computing resources necessary to support end-user access to LSST Data Products.

4.181.3 Predecessors

4.181.4 Environment Needs

4.181.4.1 Software

4.181.4.2 Hardware

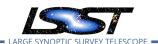
4.181.5 Input Specification

4.181.6 Output Specification

4.181.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Analyze design			
1	Test Data	No data.			
	Expected				
	Result				

4.182 LVV-T210 - Verify implementation of Data Access Center Simultaneous Connections



Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Kian-Tat Lim	
Open LVV-T210 in Jira					

4.182.1 Verification Elements

• LVV-93 - DMS-REQ-0194-V-01: Data Access Center Simultaneous Connections

4.182.2 Test Items

Verify that the each DAC can support at least dacMinConnections simultaneously

4.182.3 Predecessors

4.182.4 Environment Needs

4.182.4.1 Software

4.182.4.2 Hardware

4.182.5 Input Specification

4.182.6 Output Specification

4.182.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Simulate data access to PDAC			
1	Test Data	No data.			
	Expected				
	Result				



Step	Description, Input Data and Expected Result			
	Description	Observe scaling		
2	Test Data	No data.		
	Expected			
	Result			

4.183 LVV-T211 - Verify implementation of Data Access Center Geographical Distribution

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Analysis	Kian-Tat Lim	
Open LVV-T211 in Jira					

4.183.1 Verification Elements

• LVV-94 - DMS-REQ-0196-V-01: Data Access Center Geographical Distribution

4.183.2 Test Items

Verify that the DACs are geographically distributed to provide low-latency access to data-rights community.

4.183.3 Predecessors

4.183.4 Environment Needs

4.183.4.1 Software

4.183.4.2 Hardware



4.183.5 Input Specification

4.183.6 Output Specification

4.183.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Analyze design			
1	Test Data	No data.			
	Expected				
	Result				

4.184 LVV-T212 - Verify implementation of No Limit on Data Access Centers

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Colin Slater	
Open LVV-T212 in Jira					

4.184.1 Verification Elements

• LVV-95 - DMS-REQ-0197-V-01: No Limit on Data Access Centers

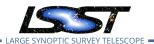
4.184.2 Test Items

Verify that additional Data Access Centers can be set up.

4.184.3 Predecessors

4.184.4 Environment Needs

4.184.4.1 Software



4.184.4.2 Hardware

4.184.5 Input Specification

4.184.6 Output Specification

4.184.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Analyze design; instantiate and load simulated DAC, observe correct functioning			
1	Test Data	No data.			
	Expected				
	Result				

4.185 LVV-T376 - Verify the Calculation of Ellipticity Residuals and Correlations

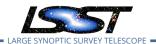
Version	Status	Priority	Verification Type	Owner	
1	Approved	Normal	Test	Leanne Guy	
Open LVV-T376 in lira					

4.185.1 Verification Elements

- LVV-3404 DMS-REQ-0362-V-01: Median residual PSF ellipticity correlations on 5 arcmin scales
- LVV-9780 DMS-REQ-0362-V-02: Max fraction of excess ellipticity residuals on 1 and 5 arcmin scales

4.185.2 Test Items

Verify that the DMS includes software to enable the calculation of the ellipticity residuals and correlation metrics defined in the OSS.



4.185.3 Predecessors

4.185.4 Environment Needs

4.185.4.1 Software

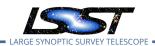
4.185.4.2 Hardware

4.185.5 Input Specification

4.185.6 Output Specification

4.185.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result		
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:		
LVV-T987	Test Data			
	Expected	Butler repo available for reading.		
	Result			
2	Description	Point the butler to an appropriate (precursor or simulated) dataset containing data in all filters, that is sufficient for the purposes of measuring astrometric performance metrics.		
2	Test Data	No data.		
	Expected			
	Result			
3	Description	Execute the LSST Stack package 'validate_drp' (or an alternate package that is relevant) on this dataset to perform the measurements of the metrics.		
J	Test Data	No data.		
	Expected	Measurements of validation metrics and the presence of QA plots resulting from the val-		
	Result	idation pipeline.		
4	Description	Compare measured ellipticity correlations to known (for simulated data) or measured (if using precursor data) values from input (precursor or simulated) data, and confirm that the output values for all of the ellipticity performance metrics are as expected.		
	Test Data	No data.		



Step	Description, Input Data and Expected Result		
	Expected Result	Measured ellipticity metrics that are within reasonable values given the (known) input dataset.	

4.186 LVV-T377 - Verify Calculation of Photometric Performance Metrics

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Leanne Guy
		Open LVV	-T377 in Jira	

4.186.1 Verification Elements

- LVV-3401 DMS-REQ-0359-V-01: RMS photometric repeatability in uzy
- LVV-9751 DMS-REQ-0359-V-02: Max fraction of sensors with excess unusable pixels
- LVV-9757 DMS-REQ-0359-V-08: Max cross-talk imperfections
- LVV-9755 DMS-REQ-0359-V-06: Accuracy of photometric transformation
- LVV-9754 DMS-REQ-0359-V-05: Repeatability outlier limit in gri
- LVV-9752 DMS-REQ-0359-V-03: Max fraction of outliers among non-saturated sources
- LVV-9756 DMS-REQ-0359-V-07: RMS width of zero point in u-band
- LVV-9753 DMS-REQ-0359-V-04: Accuracy of zero point for colors with u-band
- LVV-9762 DMS-REQ-0359-V-13: Max sky brightness error
- LVV-9760 DMS-REQ-0359-V-11: Fraction of zero point outliers
- LVV-9759 DMS-REQ-0359-V-10: RMS photometric repeatability in gri
- LVV-9758 DMS-REQ-0359-V-09: Repeatability outlier limit in uzy
- LVV-9761 DMS-REQ-0359-V-12: Max fraction of unusable pixels per sensor
- LVV-9764 DMS-REQ-0359-V-15: Percentage of image area with ghosts



- LVV-9766 DMS-REQ-0359-V-17: Max RMS of resolved/unresolved flux ratio
- LVV-9763 DMS-REQ-0359-V-14: RMS width of zero point in all bands except u
- LVV-9765 DMS-REQ-0359-V-16: Accuracy of zero point for colors without u-band

4.186.2 Test Items

Verify that the DMS system provides software to calculate photometric performance metrics, and that the algorithms are properly calculating the desired quantities. Note that because the DMS requirement is that the software shall be provided (and not on the actual measured values of the metrics), we verify all of the requirements via a single test case.

- 4.186.3 Predecessors
- 4.186.4 Environment Needs
- 4.186.4.1 Software
- 4.186.4.2 Hardware
- 4.186.5 Input Specification
- 4.186.6 Output Specification

4.186.7 Test Procedure

Step	Description, Input Data and Expected Result		
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:	
LVV-T987	Test Data		
	Expected	Butler repo available for reading.	
	Result		



Step	Description, l	Description, Input Data and Expected Result		
2	Description	Point the butler to a simulated dataset containing data in all filters, that is sufficient for the purposes of measuring photometric performance metrics.		
_	Test Data	No data.		
	Expected			
	Result			
3	Description	Execute the LSST Stack package 'validate_drp' (or an alternate package that is relevant) on this dataset to perform the measurements of the metrics.		
J	Test Data	No data.		
	Expected Result	Measurements of validation metrics and the presence of QA plots resulting from the validation pipeline.		
4	Description	Compare measured photometry to known values from input simulated data, and confirm that the output values for all of the photometric performance metrics are as expected.		
•	Test Data	No data.		
	Expected	Measured astrometry metrics that are within reasonable values given the (known) input		
	Result	dataset.		

4.187 LVV-T378 - Verify Calculation of Astrometric Performance Metrics

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Leanne Guy
Open LVV-T378 in Jira				

4.187.1 Verification Elements

- LVV-9778 DMS-REQ-0360-V-12: RMS difference between r-band and other filter separation
- LVV-9777 DMS-REQ-0360-V-11: Max fraction of r-band color difference outliers
- LVV-9779 DMS-REQ-0360-V-13: Max fraction exceeding limit on 200 arcmin scales
- LVV-9773 DMS-REQ-0360-V-07: Outlier limit on 5 arcmin scales
- LVV-9770 DMS-REQ-0360-V-05: Outlier limit on 20 arcmin scales



- LVV-9775 DMS-REQ-0360-V-09: Outlier limit on 200 arcmin scales
- LVV-9769 DMS-REQ-0360-V-04: Median absolute error in RA, Dec
- LVV-9774 DMS-REQ-0360-V-08: Median astrometric error on 200 arcmin scales
- LVV-9768 DMS-REQ-0360-V-03: Median astrometric error on 5 arcmin scales
- LVV-9771 DMS-REQ-0360-V-06: Color difference outlier limit relative to r-band
- LVV-9776 DMS-REQ-0360-V-10: Max fraction exceeding limit on 20 arcmin scales
- LVV-9767 DMS-REQ-0360-V-02: Max fraction exceeding limit on 5 arcmin scales

4.187.2 Test Items

Verify that the DMS system provides software to calculate astrometric performance metrics, and that the algorithms are properly calculating the desired quantities. Note that because the DMS requirement is that the software shall be provided (and not on the actual measured values of the metrics), we verify all of the requirements via a single test case.

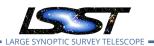
- 4.187.3 Predecessors
- 4.187.4 Environment Needs
- 4.187.4.1 Software
- 4.187.4.2 Hardware
- 4.187.5 Input Specification
- 4.187.6 Output Specification
- 4.187.7 Test Procedure



Step	Description, I	Description, Input Data and Expected Result		
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:		
LVV-T987	Test Data			
	Expected	Butler repo available for reading.		
	Result			
2	Description	Point the butler to an appropriate (precursor or simulated) dataset containing data in all filters, that is sufficient for the purposes of measuring astrometric performance metrics.		
	Test Data	No data.		
	Expected			
	Result			
3	Description	Execute the LSST Stack package 'validate_drp' (or an alternate package that is relevant) on this dataset to perform the measurements of the metrics.		
3	Test Data	No data.		
	Expected Result	Measurements of validation metrics and the presence of QA plots resulting from the validation pipeline.		
4	Description	Compare measured astrometry to known (for simulated data) or measured (if using precursor data) values from input (precursor or simulated) data, and confirm that the output values for all of the astrometric performance metrics are as expected.		
	Test Data	No data.		
	Expected Result	Measured astrometry metrics that are within reasonable values given the (known) input dataset.		

4.188 LVV-T385 - Verify implementation of minimum number of simultaneous retrievals of CCD-sized coadd cutouts

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Leanne Guy
		Open LV	/-T385 in Jira	



4.188.1 Verification Elements

• LVV-3394 - DMS-REQ-0377-V-01: Min number of simultaneous single-CCD coadd cutout image users

4.188.2 Test Items

Verify that at least **ccdRetrievalUsers = 20** users can simultaneously retrieve a single CCD-sized coadd cutout using the IVOA SODA protocol.

- 4.188.3 Predecessors
- 4.188.4 Environment Needs
- 4.188.4.1 Software
- 4.188.4.2 Hardware
- 4.188.5 Input Specification
- 4.188.6 Output Specification

4.188.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result		
1	Description Confirm that CCD-sized cutouts from coadds, also containing mask and variance pla are available on the SODA server. If none are available, copy an image (or some image) to the server.			
	Test Data	No data.		
	Expected	At least one CCD-sized coadd cutout is available, and is a well-formed image.		
	Result			
	Description	Simulate SODA queries by at least ccdRetrievalUsers = 20 users at the same time.		
2	Test Data	No data.		



Step	Description, Input Data and Expected Result		
	Expected Result		
3	Description	Confirm that all simulated users retrieved the desired image(s), and that the returned images are well-formed, with (at least) image, mask, and variance planes.	
	Test Data	No data.	
	Expected Result	All of the simulated ccdRetrievalUsers = 20 users retrieved images within the specified time (see related Verification Element and Test Case).	

4.189 LVV-T1097 - Verify Summit to Base Network Implementation

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeff Kantor
		Open LVV	/-T1097 in Jira	

4.189.1 Verification Elements

• LVV-71 - DMS-REQ-0168-V-01: Summit Facility Data Communications

4.189.2 Test Items

Control the AuxTel through a night of Observing, read out data and transfer data to LSST Summit DWDM. Verify that data acquired by a AuxTel DAQ can be transferred to LSST Summit DWDM and loaded in EFD without problems.

4.189.3 Predecessors

PMCS DMTC-7400-2400 Complete PMCS T&SC-2600-1545 Complete



4.189.4 Environment Needs

4.189.4.1 Software See pre-conditions

4.189.4.2 Hardware See pre-conditions.

4.189.5 Input Specification

- 1. Summit Control Network and Camera Data Backbone installed and operating properly.
- 2. Summit Base Network installed and operating properly.
- 3. AuxTel hardware and control systems are functional with LATISS. AuxTel TCS, AuxTel EFD, AuxTel CCS, AuxTel DAQ are connected via LSST Control Network on Summit to LSST DWDM (with at least 2×10 Gbps ethernet port client cards).
- 4. AuxTel Archiver/forwarders installed in Summit and operating properly.

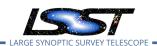
4.189.6 Output Specification

4.189.7 Test Procedure

Step	Description, lı	Description, Input Data and Expected Result		
	Description	Verify the available documentation in order to ensure that the Summit to Base Network		
1		has been set-up and is working.		
-	Test Data	No data.		
	Expected	List of documents that demonstrate the network implementation		
	Result			

4.190 LVV-T1168 - Verify Summit - Base Network Integration

Version Status Priority Verification Type Owner	
---	--



1 Approved Normal Inspection Jeff Kantor Open LVV-T1168 in Jira

4.190.1 Verification Elements

• LVV-73 - DMS-REQ-0171-V-01: Summit to Base Network

4.190.2 Test Items

3 phases done (in collaboration with equipment/installation vendors):

- 1. Installation of fiber optic cables and Optical Time Domain Reflector (OTDR) fiber testing (completed 20170602 REUNA deliverable RD10)
- 2. Installation of AURA DWDM and Data Transfer Node (DTN) (completed 20171218 DMTR-82)
- 3. Installation of LSST DWDM and Bit Error Rate Tester (BERT) data (completed 20190505 collection-7743, 20191108 DAQ DWDM Connection Tests)

4.190.3 Predecessors

See pre-conditions by phase above.

4.190.4 Environment Needs

4.190.4.1 Software perfsonar on DTN.

4.190.4.2 Hardware OTDR, DTN.

4.190.5 Input Specification

PMCS DMTC-7400-2330 COMPLETE By phase:



- 1. Posts from Cerro Pachon to AURA Gatehouse repaired/improved. Fiber installed on posts from Cerro Pachon to AURA Gatehouse. Fiber installed from AURA Gatehouse to AURA compound in La Serena. OTDR purchased.
- 2. AURA DWDM installed in caseta on Cerro Pachon and in existing computer room in La Serena. DTN installed in La Serena. DTN loaded with software and test data staged.
- 3. Base Data Center (BDC) ready for installation of LSST DWDM. Fiber connecting existing computer room to BDC. LSST DWDM equipment installed in Summit Computer Room and BDC.

4.190.6 Output Specification

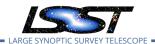
Fiber tested to within acceptable Db. Bandwidth, latency within specifications.

4.190.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Test optical fiber with OTDR		
1	Test Data	OTDR generated optical data		
	Expected	Fiber tested to within acceptable Db.		
	Result			
	Description	Test AURA DWDM		
2	Test Data	DTN perfSonar generated data		
	Expected	Summit - Base bandwidth and latency within specifications		
	Result			
	Description	Test LSST DWDM		
3	Test Data	BERT generated data		
	Expected	Summit - Base bandwidth, latency, bit error rate within specifications		
	Result			

4.191 LVV-T1232 - Verify Implementation of Catalog Export Formats From the Portal Aspect

rsion Status Priority Verification Type Owner



1 Defined Normal Test Colin Slater
Open LVV-T1232 in Jira

4.191.1 Verification Elements

• LVV-35 - DMS-REQ-0078-V-01: Catalog Export Formats

4.191.2 Test Items

Verify that catalog data is exportable from the portal aspect in a variety of community-standard formats.

- 4.191.3 Predecessors
- 4.191.4 Environment Needs
- 4.191.4.1 Software
- 4.191.4.2 Hardware
- 4.191.5 Input Specification
- 4.191.6 Output Specification

4.191.7 Test Procedure

Step	Description, l	Input Data and Expected Result
1-1 from	Description	Navigate to the Portal Aspect endpoint. The stable version should be used for this test and is currently located at: https://lsst-lsp-stable.ncsa.illinois.edu/portal/app/.
LVV-T849	Test Data	
	Expected	A credential-entry screen should be displayed.
	Result	



Step	Description, Input Data and Expected Result				
1-2 from	Description Test Data	Enter a valid set of credentials for an LSST user with LSP access on the instance under test.			
LVV-T849	Expected Result	The Portal Aspect UI should be displayed following authentication.			
	Description	Select query type "ADQL".			
2	Test Data	No data.			
	Expected				
	Result				
3	Description	Execute the example query given in the example code below by entering the text in the ADQL Query box, then clicking "Search" at the lower left corner of the page.			
	Test Data	No data.			
	Example	SELECT cntr, ra, decl, w1mpro_ep, w2mpro_ep, w3mpro_ep FROM			
	Code	wise_00.allwise_p3as_mep WHERE CONTAINS(POINT('ICRS', ra, decl), CIRCLE('ICRS', 192.85, 27.13, .2)) = 1			
	Expected	A new page will load with the search results as a table, with some plots as well.			
	Result				
4	Description	Click the icon that looks like a floppy disk (it says "Save the content as an IPAC, CSV, or TSV table" when you mouse over it).			
	Test Data	No data.			
	Expected				
	Result				
5	Description	 Select "CSV", then specify a destination to save the file on your local computer. Select "VOTable", then specify a destination to save the file on your local computer. Select "FITS", then specify a destination to save the file on your local computer. 			
	Test Data	No data.			
	Expected				
	Result				
6	Description	Open each of the files (either in TOPCAT, or using Astropy io tools). Confirm that the data tables are well-formed, and that each table contains the same columns and the same number of rows.			
	Test Data	No data.			
	Expected				
	Result				



Step De	Description, Input Data and Expected Result			
7-1 from LVV-T850	escription	Currently, there is no logout mechanism on the portal. This should be updated as the system matures.		
Te	est Data	Simply close the browser window.		
	xpected esult	Closed browser window. When navigating to the portal endpoint, expect to execute the steps in LVV-T849.		

4.192 LVV-T1240 - Verify implementation of minimum astrometric standards per CCD

Version	Status	Priority	Verification Type	Owner	
1	Approved	Normal	Test	Jim Bosch	
Open LVV-T1240 in Jira					

4.192.1 Verification Elements

• LVV-9741 - DMS-REQ-0030-V-02: Minimum astrometric standards per CCD

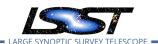
4.192.2 Test Items

Verify that each CCD in a processed dataset had its astrometric solution determined by at least **astrometricMinStandards = 5** astrometric standards.

4.192.3 Predecessors

4.192.4 Environment Needs

4.192.4.1 Software



4.192.4.2 Hardware

4.192.5 Input Specification

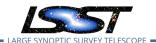
4.192.6 Output Specification

4.192.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Identify an appropriate processed dataset for this test.		
1	Test Data	No data.		
	Expected	A dataset with Processed Visit Images.		
	Result			
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:		
LVV-T987	Test Data			
	Expected	Butler repo available for reading.		
	Result 			
3	Description	Select a single visit from the dataset, and extract its calibration data. For a subset of CCDs, check how many astrometric standards contributed to the solution. Confirm that this number is at least astrometricMinStandards = 5.		
	Test Data	No data.		
	Expected	At least astrometricMinStandards from each CCD were used in determining the WCS		
	Result	solution.		

4.193 LVV-T1250 - Verify implementation of minimum number of simultaneous DM EFD query users

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jeffrey Carlin	
Open LVV-T1250 in Jira					



4.193.1 Verification Elements

• LVV-3400 - DMS-REQ-0358-V-01: Min number of simultaneous DM EFD query users

4.193.2 Test Items

Verify that the DM EFD can support **dmEfdQueryUsers = 5** simultaneous queries. The additional requirement that each query must last no more than **dmEfdQueryTime = 10 seconds** will be verified separately in LVV-T1251, but these must be satisfied together.

4.193.3 Predecessors

4.193.4 Environment Needs

4.193.4.1 Software

4.193.4.2 Hardware

4.193.5 Input Specification

4.193.6 Output Specification

4.193.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Send multiple (at least 5) simultaneous queries to the DM EFD.		
1	Test Data	No data.		
	Expected			
	Result			
2	Description	Confirm that (a) the queries executed successfully, and that (b) they return reasonable results.		
۷	Test Data	No data.		
	Expected			
	Result			



Step	Description, Input Data and Expected Result			
3	Description	Repeat the above steps for different queries, and different numbers of simultaneous queries, to confirm that the expected performance is met regardless of the query being executed.		
	Test Data	No data.		
	Expected			
	Result			

4.194 LVV-T1251 - Verify implementation of maximum time to retrieve DM EFD query results

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jeffrey Carlin	
Open LVV-T1251 in Jira					

4.194.1 Verification Elements

• LVV-9788 - DMS-REQ-0358-V-02: Max time to retrieve DM EFD query results

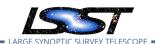
4.194.2 Test Items

Verify that the DM EFD can support **dmEfdQueryUsers = 5** simultaneous queries, with each query must executing in no more than **dmEfdQueryTime = 10 seconds.** The requirement on at least 5 simultaneous queries will be verified separately in LVV-T1250, but these must be satisfied together.

4.194.3 Predecessors

4.194.4 Environment Needs

4.194.4.1 Software



4.194.4.2 Hardware

4.194.5 Input Specification

4.194.6 Output Specification

4.194.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Send multiple (at least 5) simultaneous queries to the DM EFD.	
1	Test Data	No data.	
	Expected		
	Result		
2	Description	Confirm that (a) the queries executed successfully, and that (b) they return reasonable results. Check that the time of execution for all queries was less than 10 seconds.	
_	Test Data	No data.	
	Expected		
	Result		
3	Description	Repeat the above steps for different queries, and different numbers of simultaneous queries, to confirm that the expected performance is met regardless of the query being executed.	
	Test Data	No data.	
	Expected		
	Result		

4.195 LVV-T1252 - Verify number of simultaneous alert filter users

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Eric Bellm
Open LVV-T1252 in Jira				



4.195.1 Verification Elements

• LVV-9748 - DMS-REQ-0343-V-02: Number of simultaneous users

4.195.2 Test Items

Verify that the DMS alert filter service supports **numBrokerUsers = 100** simultaneous brokers.

4.195.3 Predecessors

4.195.4 Environment Needs

4.195.4.1 Software

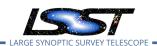
4.195.4.2 Hardware

4.195.5 Input Specification

4.195.6 Output Specification

4.195.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Create a simulated alert stream.	
1	Test Data	No data.	
	Expected		
	Result		
2	Description	Simultaneously execute user-defined alert filters for at least numBrokerUsers = 100 users, and confirm that the system successfully filters the stream as requested. Confirm that the bandwidth requirement of numBrokerAlerts = 20 per user was met.Simultaneously execute user-defined alert filters for at least 100 users, and confirm that the system successfully filters the stream as requested.	
	Test Data	No data.	



Step	Description, Input Data and Expected Result		
	Expected Result	All of the (simulated) numBrokerUsers = 100 users successfully receive their requested filtered alerts.	

4.196 LVV-T1264 - Verify implementation of archiving camera test data

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl
		Open L\	/V-T1264 in Jira	

4.196.1 Verification Elements

• LVV-9637 - DMS-REQ-0372-V-01: Archiving Camera Test Data

4.196.2 Test Items

Verify that a subset of camera test data has been ingested into Butler repos and is available through standard data access tools.

4.196.3 Predecessors

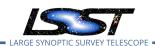
4.196.4 Environment Needs

4.196.4.1 Software

4.196.4.2 Hardware

4.196.5 Input Specification

4.196.6 Output Specification



4.196.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Obtain some data on a camera test stand.	
1	Test Data	No data.	
	Expected		
	Result		
2	Description	Wait a sufficient amount of time, then confirm that automatic transfer/ingest of the data has occurred, and a repo is available at NCSA.	
_	Test Data	No data.	
	Expected	The data is present at NCSA in non-empty repos.	
	Result		
	Description	Identify the relevant Butler repo of ingested camera test stand data.	
3	Test Data	No data.	
	Expected		
	Result		
4-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:	
LVV-T987	Test Data		
	Expected	Butler repo available for reading.	
	Result		
5	Description	Read various repo data products with the Butler, and confirm that they contain the expected data.	
3	Test Data	No data.	
	Expected	Camera test stand data that is well-formed.	
	Result		

4.197 LVV-T1276 - Verify implementation of latency of reporting optical transients

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm
Open I W-T1276 in lira				



4.197.1 Verification Elements

• LVV-9740 - DMS-REQ-0004-V-02: Latency of reporting optical transients

4.197.2 Test Items

Verify that alerts are generated for optical transients within **OTT1 = 1 minute** of the completion of the readout of the last image.

4.197.3 Predecessors

4.197.4 Environment Needs

4.197.4.1 Software

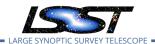
4.197.4.2 Hardware

4.197.5 Input Specification

4.197.6 Output Specification

4.197.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Identify a precursor dataset containing raw images (and templates), that is suitable for testing the Alert Production.	
•	Test Data	No data.	
	Expected		
	Result		
2-1 from	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration,	
LVV-T866		difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.	
	Test Data		



Step	Description, Input Data and Expected Result		
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.	
	Result		
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.	
LVV-T866	Test Data		
	Expected		
	Result		
3	Description	Time processing of data starting from (pre-ingested) raw files until an alert is available for distribution; verify that this time is less than OTT1.	
J	Test Data	No data.	
	Expected	Alerts are received via the alert stream within OTT1=1 minute from the time the Alert	
	Result	Production payload was executed.	

4.198 LVV-T1277 - Verify processing of maximum number of calibration exposures

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim
		Open LV	V-T1277 in Jira	

4.198.1 Verification Elements

• LVV-9745 - DMS-REQ-0131-V-02: Max number of calibs to be processed

4.198.2 Test Items

Verify that as many as **nCalExpProc = 25** calibration exposures can be processed together within time calProcTime.

4.198.3 Predecessors



4.198.4 Environment Needs

4.198.4.1 Software

4.198.4.2 Hardware

4.198.5 Input Specification

4.198.6 Output Specification

4.198.7 Test Procedure

Step	Description, I	Description, Input Data and Expected Result		
1	Description	Identify a dataset of raw calibration exposures containing at least nCalExpProc = 25 exposures. (If it contains more than 25 exposures, use only 25 for the test.)		
	Test Data	No data.		
	Expected			
	Result			
2-1 from LVV-	Description	Execute the Daily Calibration Products Update payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and _Calibration Database entries in the Data Backbone.		
T1059	Test Data			
	Expected			
	Result			
2-2 from	•	Confirm that the expected Master Calibration images and Calibration Database entries are present and well-formed.		
LVV-	Test Data			
T1059	Expected			
	Result			
	Description	Confirm that the processing completed successfully within calProcTime = 1200 seconds.		
3	Test Data	No data.		
	Expected	Calibration products resulting from processed raw calibration exposures are present		
	Result	within calProcTime, and are well-formed images.		
4	Description	Perform the test again with <i>more than</i> nCalExpProc = 25 images, and confirm that the processing completes within calProcTime = 1200 seconds .		



Step	Description,	Description, Input Data and Expected Result		
	Test Data No data.			
	Expected Result	Calibration products resulting from processed raw calibration exposures are present within calProcTime, and are well-formed images. (To verify that the test with 25 images was not at the limits of what the software can handle – should be able to exceed that bare minimum.)		

4.199 LVV-T1332 - Verify implementation of maximum time for retrieval of CCD-sized coadd cutouts

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Leanne Guy
		Open LVV	-T1332 in Jira	

4.199.1 Verification Elements

• LVV-9797 - DMS-REQ-0377-V-02: Max time to retrieve single-CCD coadd cutout image

4.199.2 Test Items

Verify that at least **ccdRetrievalUsers = 20** users can retrieve CCD-sized coadd cutouts using the IVOA SODA protocol within a maximum retrieval time of **ccdRetrievalTime = 15 seconds**.

4.199.3 Predecessors

4.199.4 Environment Needs

4.199.4.1 Software

4.199.4.2 Hardware



4.199.5 Input Specification

4.199.6 Output Specification

4.199.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result		
1	Description	Confirm that CCD-sized cutouts from coadds, also containing mask and variance planes are available on the SODA server. If none are available, copy an image (or some images to the server.		
	Test Data	No data.		
	Expected	At least one CCD-sized coadd cutout is available, and is a well-formed image.		
	Result			
	Description	Simulate SODA queries by at least ccdRetrievalUsers = 20 users at the same time.		
2	Test Data	No data.		
	Expected			
	Result			
3	Description	Monitor the time that each query takes to complete, and confirm that all simulated users retrieved the desired image(s) within ccdRetrievalTime = 15 seconds .		
J	Test Data	No data.		
	Expected	All of the simulated ccdRetrievalUsers = 20 users retrieved images within ccdRetrieval -		
	Result	Time = 15 seconds.		

4.200 LVV-T1524 - Verify Implementation of Exporting MOCs as FITS

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Demonstration	Jeffrey Carlin
		Open LV	V-T1524 in Jira	

4.200.1 Verification Elements

LVV-18222 - DMS-REQ-0384-V-01: Export MOCs As FITS_1



4.200.2 Test Items

Verify that the Data Management system provides a means for exporting the LSST-generated MOCs in the FITS serialization form defined in the IVOA MOC Recommendation.

- 4.200.3 Predecessors
- 4.200.4 Environment Needs
- 4.200.4.1 Software
- 4.200.4.2 Hardware
- 4.200.5 Input Specification
- 4.200.6 Output Specification

4.200.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description		
1	Test Data	No data.	
	Expected		
	Result		

4.201 LVV-T1525 - Verify Implementation of Linkage Between HiPS Maps and Coadded Images

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Demonstration	Jeffrey Carlin
		Open I V	V-T1525 in lira	



4.201.1 Verification Elements

LVV-18223 - DMS-REQ-0381-V-01: HiPS Linkage to Coadds_1

4.201.2 Test Items

Verify that the HiPS maps produced by the Data Management system provide for straightforward linkage from the HiPS data to the underlying LSST coadded images, and that this has been implemented using a mechanism supported by both the LSST Science Platform and by community tools.

- 4.201.3 Predecessors
- 4.201.4 Environment Needs
- 4.201.4.1 Software
- 4.201.4.2 Hardware
- 4.201.5 Input Specification
- 4.201.6 Output Specification
- 4.201.7 Test Procedure

Result

Step	Description, Input Data and Expected Result		
	Description		
1	Test Data	No data.	
	Expected		

4.202 LVV-T1526 - Verify Availability of Secure and Authenticated HiPS Service



Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Demonstration	Jeffrey Carlin
		Open LV	V-T1526 in Jira	

4.202.1 Verification Elements

LVV-18224 - DMS-REQ-0380-V-01: HiPS Service_1

4.202.2 Test Items

Verify that the Data Management system includes a secure and authenticated Internet endpoint for an IVOA-compliant HiPS service. Confirm that this service is advertised via Registry as well as in the HiPS community mechanism operated by CDS, or whatever equivalent mechanism may exist in the LSST operations era.

- 4.202.3 Predecessors
- 4.202.4 Environment Needs
- 4.202.4.1 Software
- 4.202.4.2 Hardware
- 4.202.5 Input Specification
- 4.202.6 Output Specification
- 4.202.7 Test Procedure
- Step Description, Input Data and Expected Result

Description

1

Step	Description, Input Data and Expected Result		
	Test Data	No data.	
	Expected		
	Result		

4.203 LVV-T1527 - Verify Support for HiPS Visualization

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Demonstration	Jeffrey Carlin	
Open LVV-T1527 in Jira					

4.203.1 Verification Elements

LVV-18225 - DMS-REQ-0382-V-01: HiPS Visualization_1

4.203.2 Test Items

Verify that the LSST Science Platform supports the visualization of LSST-generated HiPS image maps as well as other HiPS maps which satisfy the IVOA HiPS Recommendation. Also verify that integrated behavior is available, such as the overplotting of catalog entries, comparable to that provided for individual source images (e.g., PVIs and coadd tiles).

4.203.3 Predecessors

4.203.4 Environment Needs

4.203.4.1 Software

4.203.4.2 Hardware

4.203.5 Input Specification



4.203.6 Output Specification

4.203.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description				
1	Test Data	No data.			
	Expected				
	Result				

4.204 LVV-T1528 - Verify Visualization of MOCs via Science Platform

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Demonstration	Jeffrey Carlin	
Open LVV-T1528 in Jira					

4.204.1 Verification Elements

LVV-18226 - DMS-REQ-0385-V-01: MOC Visualization_1

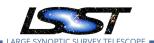
4.204.2 Test Items

Verify that the LSST Science Platform supports the visualization of the LSST-generated MOCs as well as other MOCs which satisfy the IVOA MOC Recommendation.

4.204.3 Predecessors

4.204.4 Environment Needs

4.204.4.1 Software



4.204.4.2 Hardware

4.204.5 Input Specification

4.204.6 Output Specification

4.204.7 Test Procedure

Step	Description, Ir	nput Data and Expected Result
	Description	
1	Test Data	No data.
	Expected	
	Result	

4.205 LVV-T1529 - Verify Production of All-Sky HiPS Map

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Demonstration	Jeffrey Carlin	
Open LVV-T1529 in Jira					

4.205.1 Verification Elements

LVV-18227 - DMS-REQ-0379-V-01: Produce All-Sky HiPS Map_1

4.205.2 Test Items

Verify that Data Release Production includes the production of an all-sky image map for the existing coadded image area in each filter band, and at least one pre-defined all-sky color image map, following the IVOA HiPS Recommendation.

4.205.3 Predecessors



4.205.4 Environment Needs

4.205.4.1 Software

4.205.4.2 Hardware

4.205.5 Input Specification

4.205.6 Output Specification

4.205.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description				
1	Test Data	No data.			
	Expected				
	Result				

4.206 LVV-T1530 - Verify Production of Multi-Order Coverage Maps for Survey Data

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Demonstration	Jeffrey Carlin	
Open LVV-T1530 in Jira					

4.206.1 Verification Elements

LVV-18228 - DMS-REQ-0383-V-01: Produce MOC Maps_1



4.206.2 Test Items

Verify that Data Release Production includes the production of Multi-Order Coverage maps for the survey data, conformant with the IVOA MOC recommendation. Confirm that separate MOC are produced for each filter band for the main survey, and additional MOCs are produced to represent special-programs datasets and other collections of on-sky data.

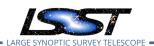
- 4.206.3 Predecessors
- 4.206.4 Environment Needs
- 4.206.4.1 Software
- 4.206.4.2 Hardware
- 4.206.5 Input Specification
- 4.206.6 Output Specification

4.206.7 Test Procedure

Step	Description, Input Data and Expected Result	
	Description	
1	Test Data No data.	
	Expected	
	Result	

4.207 LVV-T1560 - Verify archiving of processing provenance

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Inspection	Jeffrey Carlin	
Open LVV-T1560 in Jira					



4.207.1 Verification Elements

LVV-18230 - DMS-REQ-0386-V-01: Archive Processing Provenance_1

4.207.2 Test Items

Verify that provenance information related to data processing, including relevant data from other subsystems, has been archived.

4.207.3 Predecessors

4.207.4 Environment Needs

4.207.4.1 Software

4.207.4.2 Hardware

4.207.5 Input Specification

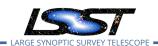
4.207.6 Output Specification

4.207.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description				
1	Test Data	No data.			
	Expected				
	Result				

4.208 LVV-T1561 - Verify provenance availability to science users

Version	Status	Priority	Verification Type	Owner
VEI 31011	Status	Filority	vernication Type	OWITEI



1	Draft	Normal	Inspection	Jeffrey Carlin

4.208.1 Verification Elements

LVV-18231 - DMS-REQ-0387-V-01: Serve Archived Provenance_1

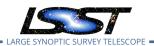
4.208.2 Test Items

Verify that archived provenance data is available to science users together with the associated science data products.

- 4.208.3 Predecessors
- 4.208.4 Environment Needs
- 4.208.4.1 Software
- 4.208.4.2 Hardware
- 4.208.5 Input Specification
- 4.208.6 Output Specification

4.208.7 Test Procedure

Step	Description,	Input Data and Expected Result
	Description	
1	Test Data	No data.
	Expected	
	Result	



4.209 LVV-T1562 - Verify availability of re-run tools

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Demonstration	Jeffrey Carlin		
Open LVV-T1562 in Jira						

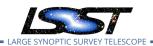
4.209.1 Verification Elements

• LVV-18232 - DMS-REQ-0388-V-01: Provide Re-Run Tools_1

4.209.2 Test Items

Verify that tools are provided to use the archived provenance data to re-run a data processing operation under the same conditions (including LSST software version, its configuration parameters, and supporting data such as calibration frames) as a previous run of that operation.

- 4.209.3 Predecessors
- 4.209.4 Environment Needs
- 4.209.4.1 Software
- 4.209.4.2 Hardware
- 4.209.5 Input Specification
- 4.209.6 Output Specification
- 4.209.7 Test Procedure



Step	Description, Ir	nput Data and Expected Result
	Description	
1	Test Data	No data.
	Expected	
	Result	

4.210 LVV-T1563 - Verify re-run on different system produces the same results

Version	Status	Priority	Verification Type	Owner		
1	Draft	Normal	Demonstration	Jeffrey Carlin		
Open LVV-T1563 in Jira						

4.210.1 Verification Elements

LVV-18233 - DMS-REQ-0390-V-01: Re-Runs on Other Systems_1

4.210.2 Test Items

Verify that tools are provided to use the archived provenance data to re-run a data processing operation on different systems, and that the results produced are the same to the extent computationally feasible.

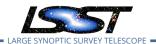
4.210.3 Predecessors

4.210.4 Environment Needs

4.210.4.1 Software

4.210.4.2 Hardware

4.210.5 Input Specification



4.210.6 Output Specification

4.210.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description		
1	Test Data	No data.	
	Expected		
	Result		

4.211 LVV-T1564 - Verify re-run on similar system produces the same results

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Demonstration	Jeffrey Carlin	
Open LVV-T1564 in Jira					

4.211.1 Verification Elements

LVV-18234 - DMS-REQ-0389-V-01: Re-Runs on Similar Systems_1

4.211.2 Test Items

Verify that a provenance-based re-run that is run on the same system, or a system with identically configured hardware and system software, produces the same results.

4.211.3 Predecessors

4.211.4 Environment Needs

4.211.4.1 Software



4.211.4.2 Hardware

4.211.5 Input Specification

4.211.6 Output Specification

4.211.7 Test Procedure

Step	Description, Input Data and Expected Result
	Description
1	Test Data No data.
	Expected
	Result

4.212 LVV-T1745 - Verify calculation of median relative astrometric measurement error on 20 arcminute scales

Version	Status	Priority	Verification Type	Owner		
1	Approved	Normal	Test	Jeffrey Carlin		
Open LVV-T1745 in Jira						

4.212.1 Verification Elements

• LVV-3402 - DMS-REQ-0360-V-01: Median astrometric error on 20 arcmin scales

4.212.2 Test Items

Verify that the DM system has provided the code to calculate the median relative astrometric measurement error on 20 arcminute scales and assess whether it meets the requirement that it shall be no more than AM2 = 10 milliarcseconds.

4.212.3 Predecessors



4.212.4 Environment Needs

4.212.4.1 Software

4.212.4.2 Hardware

4.212.5 Input Specification

4.212.6 Output Specification

4.212.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description Test Data	Identify a dataset containing at least one field with multiple overlapping visits. No data.	
'	Expected Result	A dataset that has been ingested into a Butler repository.	
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:	

- local (newinstall.sh based install):[path_to_installation]/loadLSST.bash
- development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash
- $\bullet \ \ \mathsf{LSP} \ \mathsf{Notebook} \ \mathsf{aspect} \ \mathsf{(from} \ \mathsf{a} \ \mathsf{terminal)} ; \ \mathsf{/opt/lsst/software/stack/loadLSST.bash}$

From the command line, execute the commands below in the example code:

	Test Data			
	Expected Science pipeline software is available for use. If additional packages are needed (for exa packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.			
		To check versions in use, type: _eups list -s		
3-1 from LVV-	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):		



Step	Description, l	Description, Input Data and Expected Result		
	Test Data			
	Expected	JSON files (and associated figures) containing the Measurements and any associated "extras."		
	Result			
	Description	Confirm that the metric AM2 has been calculated, and that its values are reasonable.		
4	Test Data	No data.		
	Expected	A JSON file (and/or a report generated from that JSON file) demonstrating that AM2 has		
	Result	been calculated.		

4.213 LVV-T1746 - Verify calculation of fraction of relative astrometric measurement error on 5 arcminute scales exceeding outlier limit

Version	Status	Priority	Verification Type	Owner		
1	Approved	Normal	Test	Jeffrey Carlin		
Open LVV-T1746 in Jira						

4.213.1 Verification Elements

- LVV-9767 DMS-REQ-0360-V-02: Max fraction exceeding limit on 5 arcmin scales
- LVV-9773 DMS-REQ-0360-V-07: Outlier limit on 5 arcmin scales

4.213.2 Test Items

Verify that the DM system has provided the code to calculate the maximum fraction of relative astrometric measurements on 5 arcminute scales that exceed the 5 arcminute outlier limit **AD1 = 20 milliarcseconds**, and assess whether it meets the requirement that it shall be less than **AF1 = 10 percent**.

4.213.3 Predecessors



4.213.4 Environment Needs

4.213.4.1 Software

4.213.4.2 Hardware

4.213.5 Input Specification

4.213.6 Output Specification

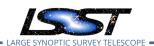
4.213.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Identify a dataset containing at least one field with multiple overlapping visits.		
1	Test Data	No data.		
	Expected	A dataset that has been ingested into a Butler repository.		
	Result			
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:		

- local (newinstall.sh based install):[path_to_installation]/loadLSST.bash
- development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash
- LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash

From the command line, execute the commands below in the example code:

	Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
3-1 from LVV-	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):



Step	Description, Input Data and Expected Result		
	Test Data		
	Expected	JSON files (and associated figures) containing the Measurements and any associated "extras."	
	Result		
4	Description	Confirm that the metric AF1 has been calculated using the outlier limit AD1, and that its values are reasonable.	
4	Test Data	No data.	
	Expected	A JSON file (and/or a report generated from that JSON file) demonstrating that AF1 has	
	Result	been calculated (and used the limit AD1).	

4.214 LVV-T1747 - Verify calculation of relative astrometric measurement error on 5 arcminute scales

Version	Status	Priority	Verification Type	Owner		
1	Approved	Normal	Test	Jeffrey Carlin		
Open LVV-T1747 in Jira						

4.214.1 Verification Elements

• LVV-9768 - DMS-REQ-0360-V-03: Median astrometric error on 5 arcmin scales

4.214.2 Test Items

Verify that the DM system has provided the code to calculate the relative astrometric measurement error on 5 arcminute scales, and assess whether it meets the requirement that it shall be less than **AM1 = 10 milliarcseconds.**

4.214.3 Predecessors



4.214.4 Environment Needs

4.214.4.1 Software

4.214.4.2 Hardware

4.214.5 Input Specification

4.214.6 Output Specification

4.214.7 Test Procedure

Step	Description, Input Data and Expected Result				
1	Description Test Data	Identify a dataset containing at least one field with multiple overlapping visits. No data.			
	Expected Result	A dataset that has been ingested into a Butler repository.			
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:			

- local (newinstall.sh based install):[path_to_installation]/loadLSST.bash
- development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash
- $\bullet \ \ \mathsf{LSP} \ \mathsf{Notebook} \ \mathsf{aspect} \ \mathsf{(from} \ \mathsf{a} \ \mathsf{terminal)} ; \ \mathsf{/opt/lsst/software/stack/loadLSST.bash}$

From the command line, execute the commands below in the example code:

	Test Data		
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.	
		To check versions in use, type: _eups list -s	
3-1 from LVV-	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):	
T1744			



Step	Description, Input Data and Expected Result		
	Test Data		
	Expected	JSON files (and associated figures) containing the Measurements and any associated "extras."	
	Result		
	Description	Confirm that the metric AM1 has been calculated, and that its values are reasonable.	
4	Test Data	No data.	
	Expected	A JSON file (and/or a report generated from that JSON file) demonstrating that AM1 has	
	Result	been calculated.	

4.215 LVV-T1748 - Verify calculation of median error in absolute position for RA, Dec axes

Version	Status	Priority	Verification Type	Owner		
1	Approved	Normal	Test	Jeffrey Carlin		
Open LVV-T1748 in lira						

4.215.1 Verification Elements

• LVV-9769 - DMS-REQ-0360-V-04: Median absolute error in RA, Dec

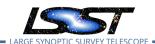
4.215.2 Test Items

Verify that the DM system has provided the code to calculate the median error in absolute position for each axis, RA and DEC, and assess whether it meets the requirement that it shall be less than **AA1 = 50 milliarcseconds**.

4.215.3 Predecessors

4.215.4 Environment Needs

4.215.4.1 Software



4.215.4.2 Hardware

4.215.5 Input Specification

4.215.6 Output Specification

4.215.7 Test Procedure

4.215.7	Test Procedu	ire
Step	Description, l	nput Data and Expected Result
	Description	Identify a dataset containing at least one field with multiple overlapping visits.
1	Test Data	No data.
	Expected Result	A dataset that has been ingested into a Butler repository.
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash From the command line, execute the commands below in the example code:

Test Data					
Expected	Science pipeline software is available for use. If additional packages are needed (for example, 'obs'				
Result	packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.				
	To check versions in use, type: _eups list -s				
Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):				
Test Data					

JSON files (and associated figures) containing the Measurements and any associated "extras."

Description Confirm that the metric AA1 has been calculated, and that its values are reasonable.

4

3-1 from LVV-

Expected

Result



Step	Description, Input Data and Expected Result		
Test Data No data.		No data.	
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that AA1 has been calculated.	

4.216 LVV-T1749 - Verify calculation of fraction of relative astrometric measurement error on 20 arcminute scales exceeding outlier limit

Version	Status	Priority	Verification Type	Owner		
1	Approved	Normal	Test	Jeffrey Carlin		
Open LVV-T1749 in Jira						

4.216.1 Verification Elements

- LVV-9776 DMS-REQ-0360-V-10: Max fraction exceeding limit on 20 arcmin scales
- LVV-9770 DMS-REQ-0360-V-05: Outlier limit on 20 arcmin scales

4.216.2 Test Items

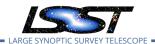
Verify that the DM system has provided the code to calculate the maximum fraction of relative astrometric measurements on 20 arcminute scales that exceed the 20 arcminute outlier limit **AD2 = 20 milliarcseconds**, and assess whether it meets the requirement that it shall be less than **AF2 = 10 percent**.

4.216.3 Predecessors

4.216.4 Environment Needs

4.216.4.1 Software

4.216.4.2 Hardware



4.216.5 Input Specification

4.216.6 Output Specification

Test Data

No data.

4.216.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Identify a dataset containing at least one field with multiple overlapping visits.		
1	Test Data	No data.		
	Expected	A dataset that has been ingested into a Butler repository.		
	Result			
2.4	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:		
2-1 from				
LVV-T860				
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash 		
		development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash		
		 LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash 		
		From the command line, execute the commands below in the example code:		
	Test Data			
	Expected	Science pipeline software is available for use. If additional packages are needed (for example, 'obs'		
	Result	packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.		
		To check versions in use, type:		
		_eups list -s		
3-1 from	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which		
LVV-	Test Data	_we will call 'DATA/path', then execute the following (with additional flags specified as needed):		
T1744	Expected	JSON files (and associated figures) containing the Measurements and any associated "extras."		
	Result			
	Description	Confirm that the metric AF2 has been calculated using the outlier limit AD2, and that its		
4		values are reasonable.		



Step	Description, Input Data and Expected Result		
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that AF2 has been calculated (and used the limit AD2).	

4.217 LVV-T1750 - Verify calculation of separations relative to r-band exceeding color difference outlier limit

Version	Status	Priority	Verification Type	Owner	
1	Approved	Normal	Test	Jeffrey Carlin	
Open LVV-T1750 in lira					

4.217.1 Verification Elements

- LVV-9771 DMS-REQ-0360-V-06: Color difference outlier limit relative to r-band
- LVV-9777 DMS-REQ-0360-V-11: Max fraction of r-band color difference outliers

4.217.2 Test Items

Verify that the DM system has provided the code to calculate the separations measured relative to the r-band that exceed the color difference outlier limit **AB2 = 20 milliarcseconds**, and assess whether it meets the requirement that it shall be less than **ABF1 = 10 percent**.

4.217.3 Predecessors

4.217.4 Environment Needs

4.217.4.1 Software

4.217.4.2 Hardware



4.217.5 Input Specification

4.217.6 Output Specification

Expected

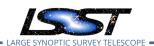
Result

4.217.7 Test Procedure

Step	·	nput Data and Expected Result
1	Description	Identify a dataset containing at least one field with multiple overlapping visits, and including at least one visit in r-band.
'	Test Data	No data.
	Expected	A dataset that has been ingested into a Butler repository.
	Result	
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("Isst-dev"): /software/Isstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/Isst/software/stack/loadLSST.bash
		From the command line, execute the commands below in the example code:
	Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
3-1 from	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which _we will call 'DATA/path', then execute the following (with additional flags specified as needed):
LVV-	Test Data	
T1744		

	Description	Confirm that the metric ABF1 has been calculated using the outlier limit AB2, and that its values are reasonable.
4	Test Data	No data.

JSON files (and associated figures) containing the Measurements and any associated "extras."



Step	Description, Input Data and Expected Result		
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that ABF1 has been calculated (and used the limit AB2).	

4.218 LVV-T1751 - Verify calculation of median relative astrometric measurement error on 200 arcminute scales

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jeffrey Carlin
Open LVV-T1751 in Jira				

4.218.1 Verification Elements

• LVV-9774 - DMS-REQ-0360-V-08: Median astrometric error on 200 arcmin scales

4.218.2 Test Items

Verify that the DM system has provided the code to calculate the median relative astrometric measurement error on 200 arcminute scales and assess whether it meets the requirement that it shall be no more than AM3 = 15 milliarcseconds.

4.218.3 Predecessors

4.218.4 Environment Needs

4.218.4.1 Software

4.218.4.2 Hardware

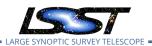
4.218.5 Input Specification



4.218.6 Output Specification

4.218.7 Test Procedure

Step	Description, Input Data and Expected Result				
1	Description	Identify a dataset containing at least one field with multiple overlapping visits, and that covers an area larger than 200 arcminutes.			
•	Test Data	No data.			
	Expected Result	A dataset that has been ingested into a Butler repository.			
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:			
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash 			
		From the command line, execute the commands below in the example code:			
	Test Data				
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.			
		To check versions in use, type: _eups list -s			
3-1 from LVV-	Description Test Data	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):			
T1744	Expected Result	JSON files (and associated figures) containing the Measurements and any associated "extras."			
	Description	Confirm that the metric AM3 has been calculated, and that its values are reasonable.			
4	Test Data	No data.			
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that AM3 has been calculated.			



4.219 LVV-T1752 - Verify calculation of fraction of relative astrometric measurement error on 200 arcminute scales exceeding outlier limit

Version	Status	Priority	Verification Type	Owner	
1	Approved	Normal	Test	Jeffrey Carlin	
Open LVV-T1752 in Jira					

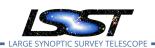
4.219.1 Verification Elements

• LVV-9779 - DMS-REQ-0360-V-13: Max fraction exceeding limit on 200 arcmin scales

4.219.2 Test Items

Verify that the DM system has provided the code to calculate the maximum fraction of relative astrometric measurements on 200 arcminute scales that exceed the 200 arcminute outlier limit **AD3 = 30 milliarcseconds**, and assess whether it meets the requirement that it shall be less than **AF3 = 10 percent**.

- 4.219.3 Predecessors
- 4.219.4 Environment Needs
- 4.219.4.1 Software
- 4.219.4.2 Hardware
- 4.219.5 Input Specification
- 4.219.6 Output Specification
- 4.219.7 Test Procedure



Step	Description, l	nput Data and Expected Result
1	Description	Identify a dataset containing at least one field with multiple overlapping visits, and that covers an area larger than 200 arcminutes.
'	Test Data	No data.
	Expected Result	A dataset that has been ingested into a Butler repository.
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash
		From the command line, execute the commands below in the example code:
	Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
3-1 from LVV-	Description Test Data	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):
T1744	Expected Result	JSON files (and associated figures) containing the Measurements and any associated "extras."
4	Description	Confirm that the metric AF3 has been calculated using the outlier limit AD3, and that its values are reasonable.
•	Test Data	No data.
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that AF3 has been calculated (and used the limit AD3).



4.220 LVV-T1753 - Verify calculation of RMS difference of separations relative to r-band

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jeffrey Carlin
Open IVA/ T17F2 in live				

Open LVV-T1753 in Jira

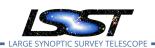
4.220.1 Verification Elements

• LVV-9778 - DMS-REQ-0360-V-12: RMS difference between r-band and other filter separation

4.220.2 Test Items

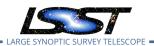
Verify that the DM system has provided the code to calculate the separations measured relative to the r-band, and assess whether it meets the requirement that it shall be less than **AB1** = **10** milliarcseconds.

- 4.220.3 Predecessors
- 4.220.4 Environment Needs
- 4.220.4.1 Software
- 4.220.4.2 Hardware
- 4.220.5 Input Specification
- 4.220.6 Output Specification
- 4.220.7 Test Procedure



Step	Description, Input Data and Expected Result			
1	Description	Identify a dataset containing at least one field with multiple overlapping visits, and including at least one visit in r-band.		
•	Test Data	No data.		
	Expected	A dataset that has been ingested into a Butler repository.		
	Result			
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:		
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash 		
		From the command line, execute the commands below in the example code:		
	Test Data			
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.		
		To check versions in use, type: _eups list -s		
3-1 from	Description Test Data	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which _we will call 'DATA/path', then execute the following (with additional flags specified as needed):		
T1744 	Expected Result	JSON files (and associated figures) containing the Measurements and any associated "extras."		
	Description	Confirm that the metric AB1 has been calculated, and that its values are reasonable.		
4	Test Data	No data.		
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that AB1 has been calculated.		

345



4.221 LVV-T1754 - Verify calculation of residual PSF ellipticity correlations for separations less than 5 arcmin

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jeffrey Carlin
Open LVV-T1754 in Jira				

4.221.1 Verification Elements

• LVV-3404 - DMS-REQ-0362-V-01: Median residual PSF ellipticity correlations on 5 arcmin scales

4.221.2 Test Items

Verify that the DM system has provided the code to calculate the median residual PSF ellipticity correlations averaged over an arbitrary field of view for separations less than 5 arcmin, and assess whether it meets the requirement that it shall be no greater than **TE2 = 1.0e-7[arcminuteSeparationCorrelation].**

- 4.221.3 Predecessors
- 4.221.4 Environment Needs
- 4.221.4.1 Software
- 4.221.4.2 Hardware
- 4.221.5 Input Specification
- 4.221.6 Output Specification
- 4.221.7 Test Procedure



	Description	Identify a dataset containing at least one field with multiple overlapping visits.
1	Test Data	No data.
	Expected Result	A dataset that has been ingested into a Butler repository.
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash
		From the command line, execute the commands below in the example code:
	 Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obspackages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
3-1 from	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):
LVV-	Test Data	
T1744	Expected	JSON files (and associated figures) containing the Measurements and any associated "extras."
	Result 	
	Description	Confirm that the metric TE2 has been calculated, and that its values are reasonable.
4	Test Data	No data.
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that TE2 has been calculated.

4.222 LVV-T1755 - Verify calculation of residual PSF ellipticity correlations for separations less than 1 arcmin



Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jeffrey Carlin
Open LVV-T1755 in Jira				

4.222.1 Verification Elements

• LVV-9782 - DMS-REQ-0362-V-04: Median residual PSF ellipticity correlations on 1 arcmin scales

4.222.2 Test Items

Verify that the DM system has provided the code to calculate the median residual PSF ellipticity correlations averaged over an arbitrary field of view for separations less than 1 arcmin, and assess whether it meets the requirement that it shall be no greater than **TE1 = 2.0e-5[arcminuteSeparationCorrelation].**

- 4.222.3 Predecessors
- 4.222.4 Environment Needs
- 4.222.4.1 Software
- 4.222.4.2 Hardware
- 4.222.5 Input Specification
- 4.222.6 Output Specification
- 4.222.7 Test Procedure



	Description	Identify a dataset containing at least one field with multiple overlapping visits.
1	Test Data	No data.
	Expected Result	A dataset that has been ingested into a Butler repository.
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash
		From the command line, execute the commands below in the example code:
	Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obspackages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
3-1 from	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):
LVV-	Test Data	
T1744	Expected	JSON files (and associated figures) containing the Measurements and any associated "extras."
	Result	
	Description	Confirm that the metric TE1 has been calculated, and that its values are reasonable.
4	Test Data	No data.
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that TE1 has been calculated.

4.223 LVV-T1756 - Verify calculation of photometric repeatability in uzy filters



Version	Status	Priority	Verification Type	Owner	
1	Approved	Normal	Test	Jeffrey Carlin	
Open LVV-T1756 in lira					

4.223.1 Verification Elements

• LVV-3401 - DMS-REQ-0359-V-01: RMS photometric repeatability in uzy

4.223.2 Test Items

Verify that the DM system has provided the code to calculate the RMS photometric repeatability of bright non-saturated unresolved point sources in the u, z, and y filters, and assess whether it meets the requirement that it shall be less than **PA1uzy = 7.5 millimagnitudes**.

- 4.223.3 Predecessors
- 4.223.4 Environment Needs
- 4.223.4.1 Software
- 4.223.4.2 Hardware
- 4.223.5 Input Specification
- 4.223.6 Output Specification

4.223.7 Test Procedure

1

Step Description, Input Data and Expected Result

Description Identify a dataset containing at least one field in each of the u, z, and y filters y

Description Identify a dataset containing at least one field in each of the u, z, and y filters with multiple overlapping visits.

LDM-639



Step	Description, l	nput Data and Expected Result
	Test Data	No data.
	Expected	A dataset that has been ingested into a Butler repository.
	Result	
2-1 from	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):
	Test Data	
T1744	Expected	JSON files (and associated figures) containing the Measurements and any associated "extras."
	Result	
	Description	Confirm that the metric PA1uzy has been calculated, and that its values are reasonable.
3	Test Data	No data.
	Expected	A JSON file (and/or a report generated from that JSON file) demonstrating that PA1uzy has
	Result	been calculated.

4.224 LVV-T1757 - Verify calculation of photometric repeatability in gri filters

Version	Status	Priority	Verification Type	Owner	
1	Approved	Normal	Test	Jeffrey Carlin	
Open LVV-T1757 in Jira					

4.224.1 Verification Elements

• LVV-9759 - DMS-REQ-0359-V-10: RMS photometric repeatability in gri

4.224.2 Test Items

Verify that the DM system has provided the code to calculate the RMS photometric repeatability of bright non-saturated unresolved point sources in the g, r, and i filters, and assess whether it meets the requirement that it shall be less than **PA1gri = 5.0 millimagnitudes**.

4.224.3 Predecessors

LDM-639

4.224.4 Environment Needs

4.224.4.1 Software

4.224.4.2 Hardware

4.224.5 Input Specification

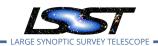
4.224.6 Output Specification

4.224.7 Test Procedure

Step	Description, I	Description, Input Data and Expected Result		
1	Description	Identify a dataset containing at least one field in each of the g, r, and i filters with multiple overlapping visits.		
	Test Data	No data.		
	Expected	A dataset that has been ingested into a Butler repository.		
	Result			
2-1 from	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):		
	Test Data			
T1744	Expected	JSON files (and associated figures) containing the Measurements and any associated "extras."		
	Result			
	Description	Confirm that the metric PA1gri has been calculated, and that its values are reasonable.		
3	Test Data	No data.		
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that PA1gri has been calculated.		

4.225 LVV-T1758 - Verify calculation of photometric outliers in uzy bands

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jeffrey Carlin



Open LVV-T1758 in Jira

4.225.1 Verification Elements

- LVV-9758 DMS-REQ-0359-V-09: Repeatability outlier limit in uzy
- LVV-9752 DMS-REQ-0359-V-03: Max fraction of outliers among non-saturated sources

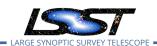
4.225.2 Test Items

Verify that the DM system has provided the code to calculate the photometric repeatability in the u, z, and y filters, and assess whether it meets the requirement that no more than **PF1 = 10[percent]** of the repeatability outliers exceed the outlier limit of **PA2uzy = 22.5 millimagnitudes**.

- 4.225.3 Predecessors
- 4.225.4 Environment Needs
- 4.225.4.1 Software
- 4.225.4.2 Hardware
- 4.225.5 Input Specification
- 4.225.6 Output Specification

4.225.7 Test Procedure

Step	Description, Input Data and Expected Result	
	Description	Identify a dataset containing at least one field in each of the u, z, and y filters with multiple
1		overlapping visits.
·	Test Data	No data.



Step	Description, I	nput Data and Expected Result
	Expected Result	A dataset that has been ingested into a Butler repository.
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash From the command line, execute the commands below in the example code:
	Test Data Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary. To check versions in use, type: eups list -s
3-1 from LVV-	Description Test Data	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which _we will call 'DATA/path', then execute the following (with additional flags specified as needed):
	Expected Result	JSON files (and associated figures) containing the Measurements and any associated "extras."
4	Description Test Data	Confirm that the metric PA2uzy has been calculated using the threshold PF1, and that its values are reasonable.
	Expected Result	No data. A JSON file (and/or a report generated from that JSON file) demonstrating that PA2uzy has been calculated (and that it used PF1).

4.226 LVV-T1759 - Verify calculation of photometric outliers in gri bands

Version Status	Priority	Verification Type	Owner
----------------	----------	-------------------	-------

LDM-639



1 Approved Normal Test Jeffrey Carlin
Open LVV-T1759 in Jira

4.226.1 Verification Elements

- LVV-9752 DMS-REQ-0359-V-03: Max fraction of outliers among non-saturated sources
- LVV-9754 DMS-REQ-0359-V-05: Repeatability outlier limit in gri

4.226.2 Test Items

Verify that the DM system has provided the code to calculate the photometric repeatability in the g, r, and i filters, and assess whether it meets the requirement that no more than **PF1 = 10[percent]** of the repeatability outliers exceed the outlier limit of **PA2gri = 15 millimagnitudes**.

- 4.226.3 Predecessors
- 4.226.4 Environment Needs
- 4.226.4.1 Software
- 4.226.4.2 Hardware
- 4.226.5 Input Specification
- 4.226.6 Output Specification

4.226.7 Test Procedure

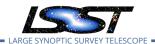
1

Step Description, Input Data and Expected Result

Description Identify a dataset containing at least one field in each of the g, r, and i filters with multiple overlapping visits.



Step	Description, I	nput Data and Expected Result
	Test Data	No data.
	Expected Result	A dataset that has been ingested into a Butler repository.
2-1 from LVV-T860	Description	The 'path' that you will use depends on where you are running the science pipelines. Options:
		 local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash
		From the command line, execute the commands below in the example code:
	Test Data	
	Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
		To check versions in use, type: _eups list -s
3-1 from LVV-	Description Test Data	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):
T1744 	Expected Result	JSON files (and associated figures) containing the Measurements and any associated "extras."
4	Description	Confirm that the metric PA2gri has been calculated using the threshold PF1, and that its values are reasonable.
7	Test Data	No data.
	Expected Result	A JSON file (and/or a report generated from that JSON file) demonstrating that PA2gri has been calculated (and that it used PF1).



5 Reusable Test Cases

Test cases in this section are made up of commonly encountered steps that have been factored out into modular, reusable scripts. These test cases are meant solely for the building of actual tests used for verification, to be inserted in test scripts via the "Call to Test" functionality in Jira/ATM. They streamline the process of writing test scripts by providing pre-designed steps, while also ensuring homogeneity throughout the test suite. These reusable modules are not themselves verifying requirements. Also, these test cases shall not call other reusable test cases in their script.

5.1 LVV-T837 - Authenticate to Notebook Aspect

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin
		Onen I \	/V-T837 in lira	

5.1.1 Test Items

Not specifically a test – modular script to be used in multiple other Test Scripts.

5.1.2 Input Specification

Must have a user account on the LSP.

5.1.3 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb.	
	Test Data	No data.	
	Expected	Redirection to the spawner page of the NB-LSP allowing selection of the containerized	
	Result	stack version and machine flavor.	



Step	Description, Input Data and Expected Result		
2	Description	Spawn a container by: 1) choosing an appropriate stack version: e.g. the latest weekly. 2) choosing an appropriate machine flavor: e.g. medium 3) click "Spawn"	
	Test Data	No data.	
	Expected Result	Redirection to the JupyterLab environment served from the chosen container containing the correct stack version.	

5.2 LVV-T838 - Access an empty notebook in the Notebook Aspect

Test Spec for LSST Data Management

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff
		Open	LVV-T838 in Jira	

5.2.1 Test Items

The steps here cover just those necessary to gain access to an empty notebook after authentication is complete.

5.2.2 Input Specification

Authentication to the Notebook aspect.

5.2.3 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Open a new launcher by navigating in the top menu bar "File" -> "New Launcher"	
1	Test Data	No data.	
	Expected	A launcher window with several sections, potentially with several kernel versions for each.	
	Result		
	Description	Select the option under "Notebook" labeled "LSST" by clicking on the icon.	
2	Test Data	No data.	

LDM-639

Step	Description, Input Data and Expected Result		
	Expected Result	An empty notebook with a single empty cell. The kernel show up as "LSST" in the top right of the notebook.	

5.3 LVV-T849 - Authenticate to the portal aspect of the LSP

Version	Status	Priority	Verification Type	Owner
2	Draft	Normal	Test	Simon Krughoff
		Open	LVV-T849 in Jira	

5.3.1 Test Items

Obtain an authenticated session in the portal aspect of the LSST Science Platform

5.3.2 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Navigate to the Portal Aspect endpoint. The stable version should be used for this test and is currently located at: https://lsst-lsp-stable.ncsa.illinois.edu/portal/app/ .	
•	Test Data	No data.	
	Expected	A credential-entry screen should be displayed.	
	Result		
	Description	Enter a valid set of credentials for an LSST user with LSP access on the instance under test.	
2	Test Data	No data.	
	Expected	The Portal Aspect UI should be displayed following authentication.	
	Result		

5.4 LVV-T850 - Log out of the portal aspect of the LSP

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff



Open LVV-T850 in Jira

5.4.1 Test Items

Leave the portal aspect of the LSST Science Platform in a clean state

5.4.2 Test Procedure

Step	Description, I	Description, Input Data and Expected Result		
1	Description	Currently, there is no logout mechanism on the portal. This should be updated as the system matures.		
	Test Data	Simply close the browser window. No data.		
	Expected Result	Closed browser window. When navigating to the portal endpoint, expect to execute the steps in LVV-T849.		

5.5 LVV-T860 - Initialize science pipelines

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin
		Open L\	/V-T860 in lira	

5.5.1 Test Items

Initialize the science pipelines software for use.

5.5.2 Input Specification

An installed software stack, either locally, on 'Isst-dev', or through the Notebook aspect.



1

5.5.3 Test Procedure

Description, Input Data and Expected Result Step Description The 'path' that you will use depends on where you are running the science pipelines. Options:

- local (newinstall.sh based install):[path_to_installation]/loadLSST.bash
- development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash
- LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash

From the command line, execute the commands below in the example code:

Test Data	No data.
Example	source 'path'
Code	setup lsst_distrib
Expected Result	Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs_subaru'), then additional 'setup' commands will be necessary.
	To check versions in use, type: eups list -s

5.6 LVV-T866 - Run Alert Production Payload

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jeffrey Carlin	
Open LVV-T866 in Jira					

5.6.1 Test Items

Execute Alert Production payload on a dataset. Generate all (or a subset of) Prompt science data products including Alerts (with the exception of Solar System object orbits) and load them



into the Data Backbone and Prompt Products Database.

5.6.2 Test Procedure

Step	Description, I	nput Data and Expected Result
1	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	No data.
	Expected	An output dataset including difference images and DIASource and DIAObject measure-
	Result	ments.
2	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
_	Test Data	No data.
	Expected	
	Result	

5.7 LVV-T901 - Run MOPS payload

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jeffrey Carlin	
Open LVV-T901 in Jira					

5.7.1 Test Items

Run MOPS payload on a dataset (for example, one night's data). Generate entries in the MOPS Database and the Prompt Products Database, including Solar System Object records, measurements, and orbits. Perform precovery forced photometry of transients.

5.7.2 Predecessors

Uses results loaded into Prompt Products database and Data Backbone services in LVV-T866.

5.7.3 Test Procedure

Step	Description, I	Description, Input Data and Expected Result			
1	Description	Perform the steps of Moving Object Pipeline (MOPS) processing on newly detected DIA-Sources, and generate Solar System data products including Solar System objects with associated Keplerian orbits, errors, and detected DIASources. This includes running processes to link DIASource detections within a night (called tracklets), to link these tracklets across multiple nights (into tracks), to fit the tracks with an orbital model to identify those tracks that are consistent with an asteroid orbit, to match these new orbits with existing SSObjects, and to update the SSObject table.			
	Test Data	No data.			
	Expected Result	An output dataset consisting of an updated SSObject database with SSObjects both added and pruned as the orbital fits have been refined, and an updated DIASource database with DIASources assigned and unassigned to SSObjects.			
2	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.			
_	Test Data	No data.			
	Expected				
	Result				

Test Spec for LSST Data Management

5.8 LVV-T987 - Instantiate the Butler for reading data

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jeffrey Carlin	
Open LVV-T987 in Jira					

5.8.1 Test Items

Create a Butler client to read data from an input repository.

5.8.2 Input Specification

LVV-T860 must be executed to initialize the science pipelines.

5.8.3 Test Procedure



Step	Description, Input Data and Expected Result			
1	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:		
•	Test Data	No data.		
	Example	import lsst.daf.persistence as dafPersist		
	Code	<pre>butler = dafPersist.Butler(inputs='DATA/path')</pre>		
	Expected Result	Butler repo available for reading.		

5.9 LVV-T1059 - Run Daily Calibration Products Update Payload

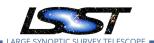
Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jeffrey Carlin	
Open LVV-T1059 in Jira					

5.9.1 Test Items

Execute the Daily Calibration Products Update payload to create a subset of Master Calibration images and Calibration Database entries.

5.9.2 Test Procedure

Step	Description, Input Data and Expected Result			
1	Description Execute the Daily Calibration Products Update payload. The payload uses raw cali tion images and information from the Transformed EFD to generate a subset of Ma Calibration Images and Calibration Database entries in the Data Backbone.			
	Test Data	No data.		
	Expected			
	Result			
	Description	Confirm that the expected Master Calibration images and Calibration Database entries		
2	Test Data	are present and well-formed. No data.		



Step	Description, Input Data and Expected Result
	Expected
	Result

5.10 LVV-T1060 - Run Periodic Calibration Products Production Payload

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jeffrey Carlin	
Open LVV-T1060 in Jira					

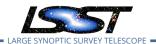
5.10.1 Test Items

Execute the Calibration Products Production payload to create a subset of Master Calibration images and Calibration Database entries.

5.10.2 Test Procedure

Step	Description, Input Data and Expected Result			
1	Description	Execute the Calibration Products Production payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and Calibration Database entries in the Data Backbone.		
	Test Data	No data.		
	Expected			
	Result			
2	Description	Confirm that the expected Master Calibration images and Calibration Database entries are present and well-formed.		
_	Test Data	No data.		
	Expected			
	Result			

5.11 LVV-T1064 - Run Data Release Production Payload



Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Jeffrey Carlin	
Open LVV-T1064 in Jira					

5.11.1 Test Items

Execute the Data Release Production payload, starting from raw images and producing science data products.

5.11.2 Test Procedure

Step	Description, l	nput Data and Expected Result
	Description	Process data with the Data Release Production payload, starting from raw science images
1		and generating science data products, placing them in the Data Backbone.
	Test Data	No data.
	Expected	
	Result	

5.12 LVV-T1207 - Execute a simple ADQL query using the TAP service in the notebook aspect

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin
		Open LV	V-T1207 in Jira	

5.12.1 Test Items

Extract a small amount of data from a catalog via the LSST TAP service.



5.12.2 Input Specification

One must have access to the LSST Notebook Aspect, and have logged in and opened an empty notebook.

5.12.3 Test Procedure

Step	Description, l	nput Data and Expected Result		
1	Description	Execute a query in a notebook to select a small number of stars. In the example code below, we query the WISE catalog, then extract the results to an Astropy table.		
	Test Data No data.			
	Example	import pandas		
	Code	import pyvo		
		<pre>service = pyvo.dal.TAPService('http://lsst-lsp-stable.ncsa.illinois.edu/api/tap')</pre>		
		results = service.search("SELECT ra, decl, w1mpro_ep, w2mpro_ep, w3mpro_ep FROM wise_00.allwise_p3as_mep WHERE CONTAINS(POINT('ICRS', ra, decl), CIRCLE('ICRS', 192.85, 27.13, .2)) = 1") tab = results.to_table()		
	Expected			
	Result			

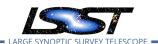
5.13 LVV-T1208 - Log out of the notebook aspect of the LSP

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff
		Open I	VV-T1208 in lira	

5.13.1 Test Items

Leave the notebook aspect of the LSST Science Platform in a clean state

5.13.2 Test Procedure



Step	Description, l	nput Data and Expected Result
1	Description	Under the 'File' menu at the top of your Jupyter notebook session, select one of the following:
	 Test Data	Save All, Exit, and Log Out Exit and Log Out Without Saving No data.
	Expected	You will be returned to the LSP landing page: https://lsst-lsp-stable.ncsa.illinois.
	Result	edu/ It is now safe to close the browser window.

5.14 LVV-T1744 - Run validate_drp on precursor data

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Analysis	Jeffrey Carlin
		Open LV\	/-T1744 in Jira	

5.14.1 Test Items

Run the validate_drp code on a precursor dataset to evaluate the metrics that have been implemented in validate_drp.

5.14.2 Test Procedure

Step	Description, I	nput Data and Expected Result
1	Description	Execute 'validate_drp' on a repository containing precursor data. Identify the path to the data, which we will call 'DATA/path', then execute the following (with additional flags specified as needed):
	Test Data	No data.
	Example	validateDrp.py 'DATA/path'
	Code	
	Expected	JSON files (and associated figures) containing the Measurements and any associated "ex-
	Result	tras."



6 Deprecated Test Cases

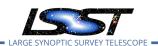
This section includes all test cases that have been marked as deprecated. These test cases will never be executed again, but have been in the past. For this reason it is important to keep them in the baseline as a reference.

No deprecated test cases found.

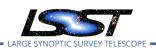


A Traceability

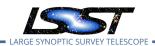
Verification Elements	High Level Requirements	Test Cases
LVV-157 - DMS-REQ-0326-V-01: Storing Approximations of Per-pixel Metadata	OSS-REQ-0391	LVV-T23
LVV-162 - DMS-REQ-0331-V-01: Computing Derived Quantities	OSS-REQ-0391	 LVV-T24
LWV-163 - DMS-REQ-0332-V-01: Denormalizing Database Tables	OSS-REQ-0133	LVV-T25
LVV-164 - DMS-REQ-0333-V-01: Maximum Likelihood Values and Covariances	OSS-REQ-0391	LVV-T26
	OSS-REQ-0004	
LVV-177 - DMS-REQ-0346-V-01: Data Availability	OSS-REQ-0167	LVV-T27
	OSS-REQ-0313	
VV-178 - DMS-REQ-0347-V-01: Measurements in catalogs	OSS-REQ-0391	LVV-T28
LVV-8 - DMS-REQ-0018-V-01: Raw Science Image Data Acquisition	OSS-REQ-0114	LVV-T29
VV-9 - DMS-REQ-0020-V-01: Wavefront Sensor Data Acquisition	OSS-REQ-0316	LVV-T30
IVV 10 DMS PEO 0022 V 01: Crosstally Corrected Science Image Data Acqui	OSS-REQ-0114	
LVV-10 - DMS-REQ-0022-V-01: Crosstalk Corrected Science Image Data Acquisition	OSS-REQ-0127	LVV-T31
N// 11 DMC DEO 0034 V 014 Days Innoce Acceptable	OSS-REQ-0114	
LVV-11 - DMS-REQ-0024-V-01: Raw Image Assembly	OSS-REQ-0129	LVV-T32
	`	
NA 20 DMC DEC 0000 V 04 D	DMS-REQ-0320	
LVV-28 - DMS-REQ-0068-V-01: Raw Science Image Metadata	DMS-REQ-0066	LVV-T33
	OSS-REQ-0171	
		LVV-T33
		LVV-T37
.VV-1234 - OSS-REQ-0122-V-01: Provenance	OSS-REQ-0123	LVV-T64
		LVV-T89
		LVV-T119
LVV-96 - DMS-REQ-0265-V-01: Guider Calibration Data Acquisition	OSS-REQ-0194	LVV-T34
NA 175 DMC DEG 2004 V 01. Time to 11 millions	DMS-REQ-0003	LVV-T35
LVV-175 - DMS-REQ-0004-V-01: Time to L1 public release	OSS-REQ-0127	LVV-T95
	DMS-REQ-0011	
LVV-7 - DMS-REQ-0010-V-01: Difference Exposures	DMS-REQ-0033	LVV-T36
·	OSS-REQ-0129	
100/22 DMC DEO 0074 V 04 Difference 5	OSS-REQ-0122	
LVV-32 - DMS-REQ-0074-V-01: Difference Exposure Attributes	DMS-REQ-0066	LVV-T37
LVV-29 - DMS-REQ-0069-V-01: Processed Visit Images	OSS-REQ-0129	LVV-T38
	`	
LVV-12 - DMS-REQ-0029-V-01: Generate Photometric Zeropoint for Visit Image	OSS-REQ-0056	LVV-T39
	OSS-REQ-0152	
	`	
VAV 4.2. DAMC DEO 2020 V 04. Absolute	DMS-REQ-0104	110/740
LVV-13 - DMS-REQ-0030-V-01: Absolute accuracy of WCS	OSS-REQ-0149	LVV-T40
	OSS-REQ-0162	
NA 20. DMC DEO 0070 V 04. Companies DCE (5 m) V 11.	OSS-REQ-0056	
LVV-30 - DMS-REQ-0070-V-01: Generate PSF for Visit Images	DMS-REQ-0116	LVV-T41
	`	
NA 24 DMC DEG 0072 V 04: December 107 111		
LVV-31 - DMS-REQ-0072-V-01: Processed Visit Image Content LVV-158 - DMS-REQ-0327-V-01: Background Model Calculation	DMS-REQ-0066	LVV-T42



Verification Elements	High Level Requirements	Test Cases
LVV-159 - DMS-REQ-0328-V-01: Documenting Image Characterization	OSS-REQ-0391	LVV-T44
LVV-39 - DMS-REQ-0097-V-01: Level 1 Data Quality Report Definition	OSS-REQ-0131	LVV-T45
	DMS-REQ-0096	
LVV-41 - DMS-REQ-0099-V-01: Level 1 Performance Report Definition	DMS-REQ-0098	LVV-T46
	OSS-REQ-0131	
LVV-43 - DMS-REQ-0101-V-01: Level 1 Calibration Report Definition	OSS-REQ-0131	LVV-T47
LVV-97 - DMS-REQ-0266-V-01: Exposure Catalog	DMS-REQ-0100 OSS-REQ-0130	LVV-T48
	OSS-REQ-0130	
LVV-100 - DMS-REQ-0269-V-01: DIASource Catalog	DMS-REQ-0270	LVV-T49
LVV-101 - DMS-REQ-0270-V-01: Faint DIASource Measurements	`	LVV-T50
LVV-102 - DMS-REQ-0271-V-01: Max nearby galaxies associated with DIA-	OSS-REQ-0130	LVV-T51
Source	·	
LVV-103 - DMS-REQ-0272-V-01: DIAObject Attributes	OSS-REQ-0130	LVV-T52
LVV-104 - DMS-REQ-0273-V-01: SSObject Catalog	OSS-REQ-0130	LVV-T53
LVV-105 - DMS-REQ-0274-V-01: Alert Content	OSS-REQ-0128	LVV-T54
LVV-148 - DMS-REQ-0317-V-01: DIAForcedSource Catalog	OSS-REQ-0130	LVV-T55
LVV-150 - DMS-REQ-0319-V-01: Characterizing Variability	OSS-REQ-0126	LVV-T56
LVV-154 - DMS-REQ-0323-V-01: Calculating SSObject Parameters	OSS-REQ-0126	LVV-T57
LVV-155 - DMS-REQ-0324-V-01: Matching DIASources to Objects	OSS-REQ-0126	LVV-T58
LVV-156 - DMS-REQ-0325-V-01: Regenerating L1 Data Products During Data Release Processing	OSS-REQ-0135	LVV-T59
LVV-184 - DMS-REQ-0353-V-01: Publishing predicted visit schedule	OSS-REQ-0378	LVV-T60
LVV-16 - DMS-REQ-0034-V-01: Associate Sources to Objects	DMS-REQ-0081	LVV-T61
	OSS-REQ-0339	
	OSS-REQ-0153	
LVV-20 - DMS-REQ-0047-V-01: Provide PSF for Coadded Images	DMS-REQ-0041	LVV-T62
	OSS-REQ-0136	
110/45 DMC PEO 0402 // 04 Produce les cos for EDO	OSS-REQ-0316	
LVV-45 - DMS-REQ-0103-V-01: Produce Images for EPO	OSS-REQ-0136	LVV-T63
LVV-46 - DMS-REQ-0106-V-01: Coadded Image Provenance	OSS-REQ-0122	LVV-T64
 LVV-98 - DMS-REQ-0267-V-01: Source Catalog	DMS-REQ-0104	 LVV-T65
LVV-99 - DMS-REQ-0268-V-01: Source Catalog LVV-99 - DMS-REQ-0268-V-01: Forced-Source Catalog	OSS-REQ-0137	LVV-163 LVV-T66
	OSS-REQ-0137	LVV-100 LVV-T67
LVV-106 - DMS-REQ-0275-V-01: Object Catalog	OSS-REQ-0137 OSS-REQ-0133	
LVV-19 - DMS-REQ-0046-V-01: Provide Photometric Redshifts of Galaxies	DMS-REQ-0040	LVV-T68
LVV-107 - DMS-REQ-0276-V-01: Object Characterization	OSS-REQ-0137	LVV-T69
LVV-180 - DMS-REQ-0349-V-01: Detecting extended low surface brightness	OSS-REQ-0137	<u> </u>
objects	,	
LVV-109 - DMS-REQ-0278-V-01: Coadd Image Method Constraints	OSS-REQ-0136	LVV-T72
LVV-110 - DMS-REQ-0279-V-01: Deep Detection Coadds	OSS-REQ-0136	LVV-T73
LVV-111 - DMS-REQ-0280-V-01: Template Coadds	OSS-REQ-0136	LVV-T74
LVV-112 - DMS-REQ-0281-V-01: Multi-band Coadds	OSS-REQ-0136	LVV-T75
LVV-160 - DMS-REQ-0329-V-01: All-Sky Visualization of Data Releases	OSS-REQ-0136	LVV-T76
LVV-161 - DMS-REQ-0330-V-01: Best Seeing Coadds	OSS-REQ-0136	LVV-T77
LVV-165 - DMS-REQ-0334-V-01: Persisting Data Products	OSS-REQ-0136	LVV-T78



Verification Elements	High Level Requirements	Test Cases
LVV-166 - DMS-REQ-0335-V-01: PSF-Matched Coadds	OSS-REQ-0133	LVV-T79
VV-168 - DMS-REQ-0337-V-01: Detecting faint variable objects	OSS-REQ-0136	LVV-T80
\\\.160 - DMS-PEO-0338.\\-011 Targeted Coadds	LSR-REQ-0040	LVV-T81
LVV-169 - DMS-REQ-0338-V-01: Targeted Coadds	OSS-REQ-0136	LVV-IXI
LVV-170 - DMS-REQ-0339-V-01: Tracking Characterization Changes Between Data Releases	LSR-REQ-0040	LVV-T82
	OSS-REQ-0271	
LVV-22 - DMS-REQ-0059-V-01: Bad Pixel Map	DMS-REQ-0058	LVV-T83
	OSS-REQ-0129	
	DMS-REQ-0055	
LVV-23 - DMS-REQ-0060-V-01: Bias Residual Image	OSS-REQ-0271	LVV-T84
	OSS-REQ-0046	
LVV-24 - DMS-REQ-0061-V-01: Crosstalk Correction Matrix	DMS-REQ-0056	LVV-T85
	OSS-REQ-0349	
	OSS-REQ-0271	
LVV-25 - DMS-REQ-0062-V-01: Illumination Correction Frame	OSS-REQ-0046	LVV-T86
	DMS-REQ-0058 	
	OSS-REQ-0271	
.VV-26 - DMS-REQ-0063-V-01: Monochromatic Flatfield Data Cube	OSS-REQ-0046	LVV-T87
•	DMS-REQ-0058	,
	DMS-REQ-0057	
	DMS-REQ-0076	
.VV-57 - DMS-REQ-0130-V-01: Calibration Data Products	OSS-REQ-0271	LVV-T88
	OSS-REQ-0194	
	OSS-REQ-0129	
VV FO. DMC DFO 0122 V 01. Calibratica language	OSS-REQ-0122	110/ TCC
.VV-59 - DMS-REQ-0132-V-01: Calibration Image Provenance	OSS-REQ-0123	LVV-T89
	DMS-REQ-0130	
.VV-113 - DMS-REQ-0282-V-01: Dark Current Correction Frame	OSS-REQ-0271	LVV-T90
	OSS-REQ-0046	
.VV-114 - DMS-REQ-0283-V-01: Fringe Correction Frame	OSS-REQ-0271	LVV-T91
	OSS-REQ-0046 LSR-REQ-0075	
	LSR-REQ-0075 LSR-REQ-0121	
.VV-151 - DMS-REQ-0320-V-01: Processing of Data From Special Programs	LSR-REQ-0121 LSR-REQ-0122	LVV-T92
	OSS-REQ-0392	
	OSS-REQ-0392	 LVV-T93
.VV-153 - DMS-REQ-0322-V-01: Special Programs Database	033-REQ-0392 OSS-REQ-0392	LVV-193 LVV-T94
	LSR-REQ-0117	LVV-T95
.VV-1276 - OSS-REQ-0127-V-01: Level 1 Data Product Availability	LSR-REQ-0118	LVV-T93
	LSR-REQ-0126	200 1102
	OSS-REQ-0181	 LVV-T96
· · · · · · · · · · · · · · · · · · ·	OSS-REQ-0181	
.VV-123 - DMS-REQ-0292-V-01: Uniqueness of IDs Across Data Releases	OSS-REQ-0137	LVV-T97
	OSS-REQ-0176	
LVV-124 - DMS-REQ-0293-V-01: Selection of Datasets	OSS-REQ-0178	LVV-T98



erification Elements	High Level Requirements	Test Cases
	OSS-REQ-0120	
WW 12E DMC DEC 0204 V 01, Drocossing of Datacets	OSS-REQ-0119	LVA/ TOO
VV-125 - DMS-REQ-0294-V-01: Processing of Datasets	OSS-REQ-0118	LVV-T99
	OSS-REQ-0117	
VV-126 - DMS-REQ-0295-V-01: Transparent Data Access	OSS-REQ-0176	LVV-T100
	OSS-REQ-0184	
vV-3 - DMS-REQ-0002-V-01: Transient Alert Distribution	OSS-REQ-0127	LVV-T101
	DMS-REQ-0086	
W-36 - DMS-REQ-0089-V-01: Solar System Objects Available Within Specified	DMS-REQ-0004	LVV-T102
ime	OSS-REQ-0127	
	`	
/V-9803 - DMS-REQ-0004-V-03: Time to availability of Solar System Object	OSS-REQ-0127	LVV-T102
rbits 		
VV-38 - DMS-REQ-0096-V-01: Generate Data Quality Report Within Specified ime	OSS-REQ-0131	LVV-T103
VV-40 - DMS-REQ-0098-V-01: Generate DMS Performance Report Within	OSS-REQ-0131	LVV-T104
pecified Time		
VV-42 - DMS-REQ-0100-V-01: Generate Calibration Report Within Specified	OSS-REQ-0131	LVV-T105
me 		
	OSS-REQ-0046	
W-58 - DMS-REQ-0131-V-01: Time allowed to process calibs	OSS-REQ-0021	LVV-T106
	OSS-REQ-0194	
	DMS-REQ-0130	
/V-115 - DMS-REQ-0284-V-01: Level-1 Production Completeness	OSS-REQ-0052	LVV-T107
	OSS-REQ-0130	
vV-116 - DMS-REQ-0285-V-01: Level 1 Source Association	OSS-REQ-0160	LVV-T108
	OSS-REQ-0159	
vV-117 - DMS-REQ-0286-V-01: SSObject Precovery	OSS-REQ-0159	LVV-T109
/V-118 - DMS-REQ-0287-V-01: Max look-back time for precovery	OSS-REQ-0130	LVV-T110
/V-119 - DMS-REQ-0288-V-01: Use of External Orbit Catalogs	OSS-REQ-0159	LVV-T111
/V-173 - DMS-REQ-0342-V-01: Alert Filtering Service	LSR-REQ-0025	LVV-T112
/V-174 - DMS-REQ-0343-V-01: Number of full-size alerts	OSS-REQ-0184	LVV-T113
	LSR-REQ-0026	LVV-T114
	OSS-REQ-0004	
VV-120 - DMS-REQ-0289-V-01: Calibration Production Processing	OSS-REQ-0170	LVV-T115
		LVV-T116
vV-47 - DMS-REQ-0119-V-01: DAC resource allocation for Level 3 processing		LVV-T117
2 ALQ 0113 T 011 SACTESSAIRC MISCARIOTTOL ECVELS PROCESSING	000 NEQ 0170	-∀∀ 111/
N// 48 DMS DEC 0120 V 01: Loval 2 Data Braduet Salf Consistency	OSS-REQ-0120	110/ T110
vV-48 - DMS-REQ-0120-V-01: Level 3 Data Product Self Consistency	OSS-REQ-0118	LVV-T118
N/ 40 DNC DEC 0121 V 01. Provence of all avail 2 provence of DAC.	OSS-REQ-0122	LVV-T119
VV-49 - DMS-REQ-0121-V-01: Provenance for Level 3 processing at DACs	OSS-REQ-0122	
vv-49 - DMS-REQ-0121-v-01: Provenance for Level 3 processing at DACS		
	DMS-REQ-0120	LVV-T120
vV-53 - DMS-REQ-0125-V-01: Software framework for Level 3 catalog pro-	DMS-REQ-0120	LVV-T120
VV-53 - DMS-REQ-0125-V-01: Software framework for Level 3 catalog pro-	DMS-REQ-0120 OSS-REQ-0121	LVV-T120
	DMS-REQ-0120 - OSS-REQ-0121 - OSS-REQ-0122	
vV-53 - DMS-REQ-0125-V-01: Software framework for Level 3 catalog pro-	DMS-REQ-0120 OSS-REQ-0121	LVV-T120 LVV-T121



Verification Elements	High Level Requirements	Test Cases
	OSS-REQ-0176	-
LVV-171 - DMS-REQ-0340-V-01: Access Controls of Level 3 Data Products	OSS-REQ-0187	LVV-T123
	OSS-REQ-0142	
LVV-139 - DMS-REQ-0308-V-01: Software Architecture to Enable Community	OSS-REQ-0121	LVV-T124
Re-Use	OSS-REQ-0353	
	DMS-REQ-0007	
LVV-6 - DMS-REQ-0009-V-01: Simulated Data	OSS-REQ-0351	LVV-T125
	OSS-REQ-0354	
	OSS-REQ-0121	
LVV-14 - DMS-REQ-0032-V-01: Image Differencing	OSS-REQ-0129	LVV-T126
	OSS-REQ-0130	
	OSS-REQ-0137	
LVV-15 - DMS-REQ-0033-V-01: Provide Source Detection Software	OSS-REQ-0121	LVV-T127
	DMS-REQ-0080	
	OSS-REQ-0050 OSS-REQ-0153	
	OSS-REQ-0149	
LVV-17 - DMS-REQ-0042-V-01: Provide Astrometric Model	OSS-REQ-0160	LVV-T128
	OSS-REQ-0162	
	OSS-REQ-0130	
LVV-18 - DMS-REQ-0043-V-01: Provide Calibrated Photometry	OSS-REQ-0275	LVV-T129
277 To Bills NEQ 0045 7 01. Frovide calibrated Friotometry	OSS-REQ-0137	LVV 1123
LVV-21 - DMS-REQ-0052-V-01: Enable a Range of Shape Measurement Ap-	OSS-REQ-0137	LVV-T130
proaches LW-63 - DMS-REQ-0160-V-01: Provide User Interface Services		LVV-T131
LVV-127 - DMS-REQ-0100-V-01: Pro-cursor, and Real Data		LVV-1131 LVV-T132
ion Software	OSS-REQ-0383	LVV-T133
	OSS-REQ-0180	. – – – – –
LVV-27 - DMS-REQ-0065-V-01: Provide Image Access Services	OSS-REQ-0176	LVV-T134
144 27 DIVID-INEQ-0000-4-01. I TOVIDE IIIIAKE ACCESS DELVICES	OSS-REQ-0181	LVV-1134
	DMS-REQ-0066	
	OSS-REQ-0176	LVV-T136
1/V/ 120 DMS REQ 0200 V 01: Data Broduct Ingest	OSS-REQ-0141	110/ 7107
LVV-130 - DMS-REQ-0299-V-01: Data Product Ingest	OSS-REQ-0004	LVV-T137
LVV-131 - DMS-REQ-0300-V-01: Bulk Download Service	OSS-REQ-0178	LVV-T138
	OSS-REQ-0004	
LVV-133 - DMS-REQ-0302-V-01: Production Orchestration	OSS-REQ-0038	LVV-T140
	OSS-REQ-0117	
	OSS-REQ-0004	
LVV-134 - DMS-REQ-0303-V-01: Production Monitoring	OSS-REQ-0038	LVV-T141
	OSS-REQ-0034	
LVV-135 - DMS-REQ-0304-V-01: Production Fault Tolerance	OSS-REQ-0117	LVV-T142
	OSS-REQ-0122	
LVV-136 - DMS-REQ-0305-V-01: Task Specification	OSS-REQ-0121	LVV-T144
	OSS-REQ-0122	
CANTILL LINES DECEMBER VALUE Lack Configuration	•	LVV-T145



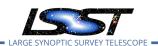
Verification Elements	High Level Requirements	Test Cases
LVV-128 - DMS-REQ-0297-V-01: DMS Initialization Component	OSS-REQ-0041	LVV-T146
	OSS-REQ-0122	
	OSS-REQ-0307	
	OSS-REQ-0121	
vV-132 - DMS-REQ-0301-V-01: Control of Level-1 Production	OSS-REQ-0044	LVV-T147
/V-138 - DMS-REQ-0307-V-01: Unique Processing Coverage	OSS-REQ-0120	LVV-T148
	OSS-REQ-0118	LVV-1140
LVV-33 - DMS-REQ-0075-V-01: Catalog Queries	DMS-REQ-0076	LVV-T149
	OSS-REQ-0176	
vV-34 - DMS-REQ-0077-V-01: Maintain Archive Publicly Accessible	DMS-REQ-0076	LVV-T150
	OSS-REQ-0186	
vV-35 - DMS-REQ-0078-V-01: Catalog Export Formats	DMS-REQ-0076	LVV-T151
	OSS-REQ-0176	LVV-T1232
VV-37 - DMS-REQ-0094-V-01: Keep Historical Alert Archive	DMS-REQ-0092	LVV-T152
·	OSS-REQ-0128	
VV-44 - DMS-REQ-0102-V-01: Provide Engineering & Facility Database Archive	OSS-REQ-0132	LVV-T153
vV-140 - DMS-REQ-0309-V-01: Raw Data Archiving Reliability	OSS-REQ-0111	LVV-T154
VV-141 - DMS-REQ-0310-V-01: Un-Archived Data Product Cache	OSS-REQ-0130	LVV-T155
VV-142 - DMS-REQ-0311-V-01: Regenerate Un-archived Data Products	OSS-REQ-0129	LVV-T156
AV 142 DMC DEC 0212 V 01. Level 1 Data Product Access	OSS-REQ-0185	
/V-143 - DMS-REQ-0312-V-01: Level 1 Data Product Access	OSS-REQ-0127	LVV-T157
VV-144 - DMS-REQ-0313-V-01: Level 1 & 2 Catalog Access	OSS-REQ-0186	LVV-T158
W-167 - DMS-REQ-0336-V-01: Regenerating Data Products from Previous	LSR-REQ-0049	LVV-T159
ata Releases VV-172 - DMS-REQ-0341-V-01: Max elapsed time for precovery results		LVV-T160
VV-172 - DMS-REQ-0341-V-01. Max elapsed time for precovery results VV-176 - DMS-REQ-0345-V-01: Logging of catalog queries	OSS-REQ-0126	
VV-170 - DMS-REQ-0343-V-01: Logging of Catalog queries VV-189 - DMS-REQ-0363-V-01: Access to Previous Data Releases	OSS-REQ-0134	LVV-T161
VV-199 - DMS-REQ-0303-V-01. Access to Frevious Data Releases VV-190 - DMS-REQ-0364-V-01: Total number of data releases	OSS-REQ-0186	LVV-T162
	OSS-REQ-0396	LVV-T163
VV-191 - DMS-REQ-0365-V-01: Operations Subsets	OSS-REQ-0398	LVV-T164
vV-192 - DMS-REQ-0366-V-01: Subsets Support vV-193 - DMS-REQ-0367-V-01: Access Services Performance	OSS-REQ-0400	LVV-T165
	OSS-REQ-0394	LVV-T166
/V-194 - DMS-REQ-0368-V-01: Implementation Provisions	OSS-REQ-0399	LVV-T167
/V-195 - DMS-REQ-0369-V-01: Evolution	OSS-REQ-0395	LVV-T168
/V-196 - DMS-REQ-0370-V-01: Older Release Behavior	OSS-REQ-0397	LVV-T169
VV-197 - DMS-REQ-0371-V-01: Query Availability	OSS-REQ-0401	LVV-T170
VV-5 - DMS-REQ-0008-V-01: Pipeline Availability		LVV-T171
vV-64 - DMS-REQ-0161-V-01: Optimization of Cost, Reliability and Availability of Order		LVV-T172
/V-65 - DMS-REQ-0162-V-01: Pipeline Throughput	OSS-REQ-0020	LVV-T173
	OSS-REQ-0127	
VV-66 - DMS-REQ-0163-V-01: Re-processing Capacity	OSS-REQ-0134	LVV-T174
VV-67 - DMS-REQ-0164-V-01: Temporary Storage for Communications Links	DMS-REQ-0162	LVV-T175
LVV-68 - DMS-REQ-0165-V-01: Infrastructure Sizing for "catching up"	OSS-REQ-0052	
	OSS-REQ-0051	LVV-T176
	DMS-REQ-0162	
	OSS-REQ-0050	
VV-994 - OSS-REQ-0051-V-01: Summit-Base Connectivity Loss		LVV-T176



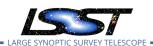
Verification Elements	High Level Requirements	Test Cases
LVV-69 - DMS-REQ-0166-V-01: Incorporate Fault-Tolerance	DMS-REQ-0161	LVV-T177
LVV-70 - DMS-REQ-0167-V-01: Incorporate Autonomics	DMS-REQ-0166	LVV-T178
LVV-145 - DMS-REQ-0314-V-01: Compute Platform Heterogeneity	OSS-REQ-0177	
	OSS-REQ-0124	LVV-T179
LVV-149 - DMS-REQ-0318-V-01: Data Management Unscheduled Downtime	OSS-REQ-0373	LVV-T180
LVV-72 - DMS-REQ-0170-V-01: Prefer Computing and Storage Down	DMS-REQ-0161	LVV-T182
LVV-146 - DMS-REQ-0315-V-01: DMS Communication with OCS	OSS-REQ-0003	LVV-T183
LVV-74 - DMS-REQ-0172-V-01: Summit to Base Network Availability	OSS-REQ-0373	LVV-T185
	DMS-REQ-0161	
LVV-75 - DMS-REQ-0173-V-01: Summit to Base Network Reliability	OSS-REQ-0373	LVV-T186
	DMS-REQ-0161	
	DMS-REQ-0173	
LVV-76 - DMS-REQ-0174-V-01: Summit to Base Network Secondary Link	OSS-REQ-0049	LVV-T187
	DMS-REQ-0172	
	DMS-REQ-0173	
LVV-77 - DMS-REQ-0175-V-01: Summit to Base Network Ownership and Op	•	LVV-T188
eration	DMS-REQ-0172	
LVV-78 - DMS-REQ-0176-V-01: Base Facility Infrastructure	OSS-REQ-0003	LVV-T189
LVV-80 - DMS-REQ-0178-V-01: Base Facility Co-Location with Existing Facility	DMS-REQ-0161	LVV-T190
	OSS-REQ-0006	
LVV-147 - DMS-REQ-0316-V-01: Commissioning Cluster		LVV-T191
LVV-183 - DMS-REQ-0352-V-01: Base Wireless LAN (WiFi)	OSS-REQ-0003	LVV-T192
	OSS-REQ-0053	
LVV-81 - DMS-REQ-0180-V-01: Base to Archive Network	OSS-REQ-0055	LVV-T193
	DMS-REQ-0162	
VAV 92 DAVE DEC 0191 V 01. Page to Archive Network Availability	OSS-REQ-0053	LVA/ T104
LVV-82 - DMS-REQ-0181-V-01: Base to Archive Network Availability	DMS-REQ-0162	LVV-T194
	DMS-REQ-0161 OSS-REQ-0053	
LVV-83 - DMS-REQ-0182-V-01: Base to Archive Network Reliability	DMS-REQ-0161	LVV-T195
	DMS-REQ-0161 DMS-REQ-0181	
LVV-84 - DMS-REQ-0183-V-01: Base to Archive Network Secondary Link	DMS-REQ-0181	LVV-T196
LVV 04 DIVID-INEQ-0100-17-01. Dase to Archive Network Secondary Lilik	OSS-REQ-0049	LVV-1190
	OSS-REQ-0004	
LVV-85 - DMS-REQ-0185-V-01: Archive Center	DMS-REQ-0163	LVV-T197
	OSS-REQ-0176	
LVV-86 - DMS-REQ-0186-V-01: Archive Center Disaster Recovery	DMS-REQ-0161	LVV-T198
	OSS-REO-0022	
VV-87 - DMS-REQ-0187-V-01: Archive Center Co-Location with Existing Facil-	DMS-REQ-0161	LVV-T199
ty	OSS-REQ-0004	LVV-T200
LVV-89 - DMS-REQ-0189-V-01: Archive to Data Access Center Network Avail	- DMS-REQ-0161	LVV-T201
ability		 LVV-T202
oility	PINI2-IVE 4-0101	LVV-12U2
	DMS-REQ-0189	
LVV-91 - DMS-REQ-0191-V-01: Archive to Data Access Center Network Sec	DMS-REQ-0190	LVV-T203
ondary Link		



Verification Elements	High Level Requirements	Test Cases
LVV-50 - DMS-REQ-0122-V-01: Access to catalogs for external Level 3 processing	OSS-REQ-0180 OSS-REQ-0140	LVV-T204
LVV-51 - DMS-REQ-0123-V-01: Access to input catalogs for DAC-based Level 3 processing	OSS-REQ-0140	LVV-T205
LVV-52 - DMS-REQ-0124-V-01: Federation with external catalogs	OSS-REQ-0140 DMS-REQ-0125	LVV-T206
.VV-54 - DMS-REQ-0126-V-01: Access to images for external Level 3 process-	OSS-REQ-0180 OSS-REQ-0140	LVV-T207
ng	OSS-REQ-0140	LVV-T208
processing .VV-92 - DMS-REQ-0193-V-01: Data Access Centers	OSS-REQ-0004	 LVV-T209
VV-93 - DMS-REQ-0194-V-01: Data Access Center Simultaneous Connections		LVV-T210
.VV-94 - DMS-REQ-0196-V-01: Data Access Center Geographical Distribution	DMS-REQ-0193 OSS-REQ-0021 OSS-REQ-0022	LVV-T211
.VV-95 - DMS-REQ-0197-V-01: No Limit on Data Access Centers	DMS-REQ-0193 OSS-REQ-0021 OSS-REQ-0022	LVV-T212
.VV-3404 - DMS-REQ-0362-V-01: Median residual PSF ellipticity correlations on 5 arcmin scales	OSS-REQ-0403 OSS-REQ-0404 OSS-REQ-0405	LVV-T376 LVV-T1754
LVV-9780 - DMS-REQ-0362-V-02: Max fraction of excess ellipticity residuals on and 5 arcmin scales	OSS-REQ-0403 OSS-REQ-0404 OSS-REQ-0405	LVV-T376
LVV-3401 - DMS-REQ-0359-V-01: RMS photometric repeatability in uzy	OSS-REQ-0387	LVV-T377 LVV-T1756
W-9751 - DMS-REQ-0359-V-02: Max fraction of sensors with excess unusable bixels	OSS-REQ-0387	LVV-T377
.W-9757 - DMS-REQ-0359-V-08: Max cross-talk imperfections	OSS-REQ-0387	 LVV-T377
VV-9755 - DMS-REQ-0359-V-06: Accuracy of photometric transformation	OSS-REQ-0387	LVV-T377
VV-9754 - DMS-REQ-0359-V-05: Repeatability outlier limit in gri	OSS-REQ-0387	LVV-T1759
.VV-9752 - DMS-REQ-0359-V-03: Max fraction of outliers among non- aturated sources	OSS-REQ-0387	LVV-T377 LVV-T1758 LVV-T1759
VV-9756 - DMS-REQ-0359-V-07: RMS width of zero point in u-band	OSS-REQ-0387	LVV-T377
VV-9753 - DMS-REQ-0359-V-04: Accuracy of zero point for colors with u-band	OSS-REQ-0387	LVV-T377
VV-9762 - DMS-REQ-0359-V-13: Max sky brightness error	OSS-REQ-0387	LVV-T377
VV-9760 - DMS-REQ-0359-V-11: Fraction of zero point outliers	OSS-REQ-0387	LVV-T377
.VV-9759 - DMS-REQ-0359-V-10: RMS photometric repeatability in gri	OSS-REQ-0387	LVV-T377 LVV-T1757
.VV-9758 - DMS-REQ-0359-V-09: Repeatability outlier limit in uzy	OSS-REQ-0387	LVV-T377 LVV-T1758
LVV-9761 - DMS-REQ-0359-V-12: Max fraction of unusable pixels per sensor	OSS-REQ-0387	LVV-T377
LVV-9764 - DMS-REQ-0359-V-15: Percentage of image area with ghosts	OSS-REQ-0387	LVV-T377



Verification Elements	High Level Requirements	Test Cases
LVV-9766 - DMS-REQ-0359-V-17: Max RMS of resolved/unresolved flux ratio	OSS-REQ-0387	LVV-T377
LVV-9763 - DMS-REQ-0359-V-14: RMS width of zero point in all bands except u	OSS-REQ-0387	LVV-T377
LVV-9765 - DMS-REQ-0359-V-16: Accuracy of zero point for colors without uband	OSS-REQ-0387	LVV-T377
LVV-9778 - DMS-REQ-0360-V-12: RMS difference between r-band and other iller separation	OSS-REQ-0388	LVV-T378 LVV-T1753
LVV-9777 - DMS-REQ-0360-V-11: Max fraction of r-band color difference outiers	OSS-REQ-0388	LVV-T1750
LVV-9779 - DMS-REQ-0360-V-13: Max fraction exceeding limit on 200 arcmin scales	OSS-REQ-0388	LVV-T1752
LVV-9773 - DMS-REQ-0360-V-07: Outlier limit on 5 arcmin scales	OSS-REQ-0388	LVV-T378 LVV-T1746
.VV-9770 - DMS-REQ-0360-V-05: Outlier limit on 20 arcmin scales	OSS-REQ-0388	LVV-T378 LVV-T1749
VV-9775 - DMS-REQ-0360-V-09: Outlier limit on 200 arcmin scales	OSS-REQ-0388	LVV-T378
.VV-9769 - DMS-REQ-0360-V-04: Median absolute error in RA, Dec	OSS-REQ-0388	LVV-T378 LVV-T1748
LVV-9774 - DMS-REQ-0360-V-08: Median astrometric error on 200 arcmin scales	OSS-REQ-0388	LVV-T378 LVV-T1751
.VV-9768 - DMS-REQ-0360-V-03: Median astrometric error on 5 arcmin scales	OSS-REQ-0388	LVV-T378 LVV-T1747
LVV-9771 - DMS-REQ-0360-V-06: Color difference outlier limit relative to roband	OSS-REQ-0388	LVV-T378 LVV-T1750
LVV-9776 - DMS-REQ-0360-V-10: Max fraction exceeding limit on 20 arcmin scales	OSS-REQ-0388	LVV-T1749
LVV-9767 - DMS-REQ-0360-V-02: Max fraction exceeding limit on 5 arcmin scales	OSS-REQ-0388	LVV-T378 LVV-T1746
VV-3394 - DMS-REQ-0377-V-01: Min number of simultaneous single-CCD coadd cutout image users	OSS-REQ-0181	LVV-T385
VV-71 - DMS-REQ-0168-V-01: Summit Facility Data Communications	OSS-REQ-0002	LVV-T1097
VV-73 - DMS-REQ-0171-V-01: Summit to Base Network	OSS-REQ-0003 OSS-REQ-0127	LVV-T1168
.VV-9741 - DMS-REQ-0030-V-02: Minimum astrometric standards per CCD	DMS-REQ-0090 DMS-REQ-0104 OSS-REQ-0149 OSS-REQ-0162	LVV-T1240
VV-3400 - DMS-REQ-0358-V-01: Min number of simultaneous DM EFD query	OSS-REQ-0181	LVV-T1250
.W-9788 - DMS-REQ-0358-V-02: Max time to retrieve DM EFD query results	OSS-REQ-0181	LVV-T1251
LVV-9748 - DMS-REQ-0343-V-02: Number of simultaneous users	OSS-REQ-0193	LVV-T1252
LVV-9637 - DMS-REQ-0372-V-01: Archiving Camera Test Data	OSS-REQ-0184 	 LVV-T1264
LVV-9740 - DMS-REQ-0004-V-02: Latency of reporting optical transients		LVV-T1276



Verification Elements	High Level Requirements	Test Cases
LVV-9745 - DMS-REQ-0131-V-02: Max number of calibs to be processed	OSS-REQ-0046	LVV-T1277
	OSS-REQ-0021	
	OSS-REQ-0194	
	DMS-REQ-0130	
VV-9797 - DMS-REQ-0377-V-02: Max time to retrieve single-CCD coadd	OSS-REQ-0181	LVV-T1332
cutout image		
VV-18222 - DMS-REQ-0384-V-01: Export MOCs As FITS_1	OSS-REQ-0391	LVV-T1524
	OSS-REQ-0122	LVV-T1525
	OSS-REQ-0061	
_VV-18224 - DMS-REQ-0380-V-01: HiPS Service_1	OSS-REQ-0176	LVV-T1526
_VV-18225 - DMS-REQ-0382-V-01: HiPS Visualization_1	OSS-REQ-0061	LVV-T1527
LVV-18226 - DMS-REQ-0385-V-01: MOC Visualization 1	OSS-REQ-0033	
-10220 DINISTREGTOSOSTATOTE MICH AISMAILEACHOLL	OSS-REQ-0061	LVV-T1528
	OSS-REQ-0391	
-10227 - Divis-REQ-0375-4-01. Floudice All-Sky Hirs Iviap_1	OSS-REQ-0136	LVV-T1529
	OSS-REQ-0391	LVV-T1530
277-10220 - DINIS-REQ-0303-7-01. Produce MOC Maps_1	OSS-REQ-0033	
LVV-18230 - DMS-REQ-0386-V-01: Archive Processing Provenance_1	OSS-REQ-0172	LVV-T1560
VV-18231 - DMS-REQ-0387-V-01: Serve Archived Provenance_1	OSS-REQ-0172	LVV-T1561
	OSS-REQ-0122	LVV-T1562
LVV-18232 - DMS-REQ-0388-V-01: Provide Re-Run Tools_1	OSS-REQ-0123	
	OSS-REQ-0172	
	OSS-REQ-0122	
LVV-18233 - DMS-REQ-0390-V-01: Re-Runs on Other Systems_1	OSS-REQ-0169	LVV-T1563
LVV-18233 - DMS-REQ-0390-V-01: Re-Runs on Other Systems_1	OSS-REQ-0123	
	OSS-REQ-0172	
	OSS-REQ-0122	
_VV-18234 - DMS-REQ-0389-V-01: Re-Runs on Similar Systems_1	OSS-REQ-0169	LVV-T1564
LVV-18234 - DMS-REQ-0389-V-01: Re-Runs on Similar Systems_1	OSS-REQ-0123	
	OSS-REQ-0172	
VV-3402 - DMS-REQ-0360-V-01: Median astrometric error on 20 arcmin scales	OSS-REQ-0388	LVV-T1745
LVV-9782 - DMS-REQ-0362-V-04: Median residual PSF ellipticity correlations on 1 arcmin scales	OSS-REQ-0403	
	OSS-REQ-0404	LVV-T1755
	OSS-REQ-0405	