



LARGE SYNOPTIC SURVEY TELESCOPE

**Large Synoptic Survey Telescope (LSST)
Data Management**

**LVV-P65 Fall 2019 Pipelines Release
Acceptance Test Campaign Test Plan
and Report**

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DMTR-201

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DRAFT

Abstract

This is the test plan and report for LVV-P65 (Fall 2019 Pipelines Release Acceptance Test Campaign), an LSST level 2 milestone pertaining to the Data Management Sub-system.

Change Record

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Draft

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LVV-P65 Fall 2019 Pipelines Release Acceptance Test Campaign Test Plan and Report

1 Introduction

1.1 Objectives

This Acceptance Test campaign aims to verify a small number of DMSR (LSE-61) requirements related to the LSST Science Pipelines. It will be executed in conjunction with the release of Science Pipelines Version 19.0.0, but the pipeline release is not contingent upon this test campaign. This Test Plan aims to demonstrate that the included requirements have been met by Version 19.0.0 of the Pipelines, and to thus fully verify their completion and readiness for LSST Operations.

1.2 System Overview

The tests to be executed are intended to verify that the DM system satisfies a subset of the requirements outlined in the Data Management System Requirements (DMSR; LSE-61). This subset of requirements is related to pipeline algorithms, and was selected for this campaign to coincide with the release of a new version of the LSST Science Pipelines. Additional DMSR requirements will be verified in later Acceptance Test Campaigns.

1.3 Document Overview

This document was generated from Jira, obtaining the relevant information from the LVV-P65 Jira Test Plan and related Test Cycles (LVV-C115).

Section 1 provides an overview of the test campaign, the system under test (Acceptance), the applicable documentation, and explains how this document is organized. Section 2 describes the configuration used for this test. Section 3 describes the necessary roles and lists the individuals assigned to them.

Section 4 provides a summary of the test results, including an overview in Table 1, an overall assessment statement and suggestions for possible improvements. Section 5 provides

detailed results for each step in each test case.

The current status of test plan LVV-P65 in Jira is **Draft**.

1.4 References

[1] **[LSE-61]**, Dubois-Felsmann, G., Jenness, T., 2018, *LSST Data Management Subsystem Requirements*, LSE-61, URL <https://ls.st/LSE-61>

2 Test Configuration

2.1 Data Collection

Observing is not required for this test campaign.

2.2 Verification Environment

The “lsst-lsp-stable” instance of the LSST Science Platform (LSP), hosted at the LDF, and the “lsst-dev” development cluster at NCSA. In particular, we will use Release 19.0.0 of the Pipelines, whose release is DM Milestone LDM-503-11b (Test Plan located here).

3 Personnel

The following personnel are involved in this test activity:

- Test Plan (LVV-P65) owner: Jeffrey Carlin
- Test Cycles:
 - LVV-C115 owner: Jeffrey Carlin
 - * Test case LVV-T41 tester:
 - * Test case LVV-T62 tester:
 - * Test case LVV-T132 tester:
 - * Test case LVV-T40 tester:
 - * Test case LVV-T1240 tester:
 - * Test case LVV-T376 tester:
 - * Test case LVV-T378 tester:
 - * Test case LVV-T377 tester:
 - * Test case LVV-T28 tester:
 - * Test case LVV-T43 tester:
- Additional Test Personnel involved:
 - Test case LVV-T28:
 - Test case LVV-T40:
 - Test case LVV-T41:
 - Test case LVV-T43:
 - Test case LVV-T62:
 - Test case LVV-T132:
 - Test case LVV-T376:
 - Test case LVV-T377:
 - Test case LVV-T378:
 - Test case LVV-T1240:

4 Overview of the Test Results

4.1 Summary

Test Cycle LVV-C115: Fall 2019 Pipelines Release Acceptance Test Campaign			
test case	status	comment	issues
LVV-T41	Not Executed		
LVV-T62	Not Executed		
LVV-T132	Not Executed		
LVV-T40	Not Executed		
LVV-T1240	Not Executed		
LVV-T376	Not Executed		
LVV-T378	Not Executed		
LVV-T377	Not Executed		
LVV-T28	Not Executed		
LVV-T43	Not Executed		

Table 1: Test Results Summary

4.2 Overall Assessment

Not yet available.

4.3 Recommended Improvements

Not yet available.

5 Detailed Test Results

5.1 Test Cycle LVV-C115

Open test cycle *Fall 2019 Pipelines Release Acceptance Test Campaign* in Jira.

Fall 2019 Pipelines Release Acceptance Test Campaign

Status: Not Executed

This test cycle verifies a subset of DMSR (LSE-61) requirements related to the LSST Science Pipelines, in order to verify their completion and readiness for LSST Operations (i.e., that the requirements laid out in LSE-61 have been met by the DM Systems).

5.1.1 Software Version/Baseline

All tests will be performed with LSST Science Pipelines release version 19.0.0, including its algorithms and resulting science data products.

5.1.2 Configuration

Not provided.

5.1.3 Test Cases in LVV-C115 Test Cycle

5.1.3.1 Test Case LVV-T41 - Verify implementation of Generate PSF for Visit Images

Open *LVV-T41* test case in Jira.

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.

Preconditions:

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status	
1	Description	Identify a dataset with processed visit images in multiple filters.
	Expected	
	Result	
	Actual	
	Result	
	Status	Not Executed
2	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	
	Actual	
	Result	
	Status	Not Executed
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.
	Expected	Images with the PSF model subtracted, leaving only residuals that are consistent with being noise.
	Result	
	Actual	
	Result	

Status	Not Executed
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5.1.3.2 Test Case LVV-T62 - Verify implementation of Provide PSF for Coadded Images

Open *LVV-T62* test case in Jira.

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.

Preconditions:

Fully covered by preconditions for LVV-T16.

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status	
1	Description	The DM Stack shall be initialized using the loadLSST script (as described in LVV-T10 - DRP-00-00)
	Expected	
	Result	
	Actual	
	Result	
	Status	Not Executed
2	Description	A "Data Butler" will be initialized to access the repository.
	Expected	
	Result	

Actual
Result-----
Status Not Executed

3	Description	For each combination of tract/patch/filter, the PVI will be retrieved from the Butler, and the existence of all components described in Test items section §4.6.2 will be verified.
---	-------------	---

Expected
ResultActual
Result-----
Status Not Executed

4	Description	Scripts from the pipe_analysis package will be run on every visit to check for the presence of data products and make plots
---	-------------	---

Expected
ResultActual
Result-----
Status Not Executed

5	Description	Ten patches will be chosen at random and inspected by eye for unmasked artifacts.
---	-------------	---

Expected
ResultActual
Result-----
Status Not Executed

6	Description	Select Objects classified as point sources on 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 coadd image yields residuals consistent with pure noise.
---	-------------	--

Expected Result	Images with the PSF model subtracted, leaving only residuals that are consistent with being noise.
<hr/>	
Actual Result	
Status	Not Executed

5.1.3.3 Test Case LVV-T132 - Verify implementation of Pre-cursor and Real Data

Open *LVV-T132* test case in Jira.

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.

Preconditions:

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status	
1	Description	Confirm that the CI jobs used to test DRP and AP processing successfully run. These jobs use precursor datasets from cameras other than LSST.
<hr/>		
Expected Result		
<hr/>		
Actual Result		

Status	Not Executed
2 Description	For each of these two datasets, instantiate the Butler, ingest the data products, and confirm that they exist as expected.
Expected Result	Processed images, catalogs, calibration information, and other related data products are present and accessible via the Butler.
Actual Result	
Status	Not Executed

5.1.3.4 Test Case LVV-T40 - Verify implementation of Generate WCS for Visit Images

Open *LVV-T40* test case in Jira.

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.

Preconditions:

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status
1 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	
-----	-----
Actual	
Result	
-----	-----
Status	Not Executed
2	Description Ingest data from an appropriate processed dataset.
-----	-----
Expected	
Result	
-----	-----
Actual	
Result	
-----	-----
Status	Not Executed
3	Description Select a single visit from the dataset, and extract its WCS object and the source list.
-----	-----
Expected	A table containing detected sources, and a WCS object associated with that catalog.
Result	
-----	-----
Actual	
Result	
-----	-----
Status	Not Executed
4	Description Confirm that each CCD within the visit image contains at least astrometricMinStandards astrometric standards that were used in deriving the astrometric solution.
-----	-----
Expected	At least astrometricMinStandards from each CCD were used in determining the WCS solution.
Result	
-----	-----
Actual	
Result	
-----	-----
Status	Not Executed

5	Description	Starting from the XY pixel coordinates of the sources, apply the WCS to obtain RA, Dec coordinates.
	Expected Result	A list of RA, Dec coordinates for all sources in the catalog.
	Actual Result	
	Status	Not Executed
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.
	Expected Result	A matched catalog of sources in common between the test source list and Gaia DR2.
	Actual Result	
	Status	Not Executed
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 .
	Expected Result	Histogram and relevant statistics needed to confirm that the WCS transformation is
	Actual Result	
	Status	Not Executed
8	Description	Repeat Step 5, but for subregions of the image, to confirm that the accuracy criterion is met at all positions.

Expected **astrometricAccuracy** requirement is met over the entire image.
Result

Actual
Result

Status Not Executed

5.1.3.5 Test Case LVV-T1240 - Verify implementation of minimum astrometric standards per CCD

Open *LVV-T1240* test case in Jira.

Verify that each CCD in a processed dataset had its astrometric solution determined by at least **astrometricMinStandards = 5** astrometric standards.

Preconditions:

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status	
1	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	
	Actual	
	Result	

	Status	Not Executed
2	Description	Ingest data from an appropriate processed dataset.
<hr/>		
	Expected	
	Result	
<hr/>		
	Actual	
	Result	
<hr/>		
	Status	Not Executed
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 .
<hr/>		
	Expected	At least astrometricMinStandards from each CCD were used in determining the WCS solution.
	Result	
<hr/>		
	Status	Not Executed

5.1.3.6 Test Case LVV-T376 - Verify the Calculation of Ellipticity Residuals and Correlations

Open *LVV-T376* test case in Jira.

Verify that the DMS includes software to enable the calculation of the ellipticity residuals and correlation metrics defined in the OSS.

Preconditions:

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status	
1	Description	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.
	Actual Result	
	Status	Not Executed
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.
	Expected Result	
	Actual Result	
	Status	Not Executed
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.
	Expected Result	Measurements of validation metrics and the presence of QA plots resulting from the validation pipeline.
	Actual Result	
	Status	Not Executed
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.

Expected Result	Measured ellipticity metrics that are within reasonable values given the (known) input dataset.
Actual Result	
Status	Not Executed

5.1.3.7 Test Case LVV-T378 - Verify Calculation of Astrometric Performance Metrics

Open *LVV-T378* test case in Jira.

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.

Preconditions:

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status	
1	Description	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.

Actual Result	
Status	Not Executed
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.
Expected Result	
Actual Result	
Status	Not Executed
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.
Expected Result	Measurements of validation metrics and the presence of QA plots resulting from the validation pipeline.
Actual Result	
Status	Not Executed
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.
Expected Result	Measured astrometry metrics that are within reasonable values given the (known) input dataset.
Actual Result	
Status	Not Executed

5.1.3.8 Test Case LVV-T377 - Verify Calculation of Photometric Performance Metrics

Open *LVV-T377* test case in Jira.

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.

Preconditions:

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status	
1	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	
	Actual	
	Result	
	Status	Not Executed
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.
	Expected	
	Result	

Actual Result	
Status	Not Executed
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.
Expected Result	
	Measurements of validation metrics and the presence of QA plots resulting from the validation pipeline.
Actual Result	
Status	Not Executed
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.
Expected Result	
	Measured astrometry metrics that are within reasonable values given the (known) input dataset.
Actual Result	
Status	Not Executed

5.1.3.9 Test Case LVV-T28 - Verify implementation of Measurements in catalogs

Open *LVV-T28* test case in Jira.

Verify that source measurements in catalogs are in flux units.

Preconditions:

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status	
	Expected	Actual
	Status	Result
1	Description	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
	Expected	
	Result	
	Actual	
	Status	Not Executed
2	Description	The alert generation processing will be executed using the verification cluster: "bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin .ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 ln -s ap_verify/bin/demo_run.sl ln -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl " and any errors or failures reported.
	Expected	
	Result	
	Actual	
	Status	Not Executed
3	Description	A "Data Butler" will be initialized to access the repository.

Expected Result	
Actual Result	
Status	Not Executed
4	Description For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs, catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty.
Expected Result	
Actual Result	
Status	Not Executed
5	Description DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.
Expected Result	
Actual Result	
Status	Not Executed
6	Description The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
Expected Result	
Actual Result	

	Status	Not Executed
7	Description	A "Data Butler" will be initialized to access the repository.
	Expected Result	
	Actual Result	
	Status	Not Executed
8	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.
	Expected Result	
	Actual Result	
	Status	Not Executed
9	Description	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.
	Actual Result	
	Status	Not Executed
10	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.
	Expected Result	

Actual Result	
Status	Not Executed
11	<p>Description Verify that each of the single-visit, coadd, and difference image catalogs provide measurements in flux units.</p> <p>Expected Confirmation of measurements in catalogs encoded in flux units.</p> <p>Result</p>
Actual Result	
Status	Not Executed

5.1.3.10 Test Case LVV-T43 - Verify implementation of Background Model Calculation

Open *LVV-T43* test case in Jira.

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.

Preconditions:

Execution status: **Not Executed**

Final comment:

Detailed step results:

Step	Description, Results and Status	
1	Description	Identify a dataset with processed visit images in multiple filters.

Expected Result	
Actual Result	
Status	Not Executed
2	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	
Actual Result	
Status	Not Executed
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.
Expected Well-formed background covering the entire CCD for all CCDs in all filters. Result	
Actual Result	
Status	Not Executed

A Acronyms used in this document

Acronym	Description
AP	Alert Production
CCD	Charge-Coupled Device
CI	Cyber Infrastructure
DM	Data Management
DMS	Data Management Subsystem
DMSR	DM System Requirements; LSE-61
DMTR	DM Test Report
DRP	Data Release Production
FITS	Flexible Image Transport System
LDF	LSST Data Facility
LDM	LSST Data Management (Document Handle)
LSE	LSST Systems Engineering (Document Handle)
LSP	LSST Science Platform
LSST	Large Synoptic Survey Telescope
NCSA	National Center for Supercomputing Applications
OSS	Observatory System Specifications; LSE-30
PSF	Point Spread Function
QA	Quality Assurance
RA	Right Ascension
SQL	Structured Query Language
WCS	World Coordinate System