



Vera C. Rubin Observatory
Data Management

LDM-503-RSPa: RSP on the Interim Data Facility (IDF) is ready for DP0.2 Test Plan and Report

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DMTR-381

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Abstract

This is the test plan and report for **RSP on the Interim Data Facility (IDF) is ready for DP0.2** (LDM-503-RSPa), an LSST milestone pertaining to the Data Management Subsystem.

This document is based on content automatically extracted from the Jira test database on 2023-01-18 . The most recent change to the document repository was on 2023-02-06.

Change Record

Version	Date	Description	Owner name
1.0	2022-09-16	Initial complete version of test plan	Gregory Dubois-Felsmann
pre-2.0	2022-09-20	Tests performed: draft of executed test report	Gregory Dubois-Felsmann
2.0	2023-01-18	Test step status values adjusted to reflect revised guidelines for how to use "Initial Pass" and "Pass with Deviation"	Gregory Dubois-Felsmann

Document curator: Gregory Dubois-Felsmann

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LDM-503-RSPa: RSP on the Interim Data Facility (IDF) is ready for DP0.2 Test Plan and Report

1 Introduction

1.1 Objectives

Demonstrate that the additional capabilities of the Rubin Science Platform necessary to support DP0.2 have been deployed on the Interim Data Facility (IDF). May be demonstrated with the DC2 DP0.2 dataset itself or with a dataset of equivalent complexity, e.g., an HSC reprocessing.

DP0.2 expectations are as described in RTN-001 and RTN-004 . The key difference in RSP capabilities from DP0.1 is the availability of IVOA-compatible image metadata services and image services in the API Aspect, and the addition to the Portal Aspect of specific search capabilities for ObsCore image metadata searches in an ObsTAP service.

Because of issues with passing authorization tokens through PyVO, for the purposes of LDM-503-RSPa the API Aspect services are verified indirectly, though the Portal Aspect.

A supplementary verification of their usability through the Notebook Aspect and externally will have to be performed. See LVV-T2678.

1.2 System Overview

Tested on the IDF at data.lsst.cloud, in Safari 15.6.1 under macOS 11.6.8, based on the DP0.2 dataset.

1.3 Document Overview

This document was generated from Jira, obtaining the relevant information from the LVV-P80 Jira Test Plan and related Test Cycles (LVV-C167).

Section 1 provides an overview of the test campaign, the system under test (LSP Services), the applicable documentation, and explains how this document is organized. Section 2 provides additional information about the test plan, like for example the configuration used for this test or related documentation. 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 3, 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-P80 in Jira is **Approved** .

1.4 References

- [1] **[DMTN-140]**, Comoretto, G., 2021, *Documentation Automation for the Verification and Validation of Rubin Observatory Software*, DMTN-140, URL <https://dmtn-140.lsst.io/>, Vera C. Rubin Observatory Data Management Technical Note
- [2] **[DMTN-178]**, Comoretto, G., 2021, *Docsteady Usecases for Rubin Observatory Constructions*, DMTN-178, URL <https://dmtn-178.lsst.io/>, Vera C. Rubin Observatory Data Management Technical Note
- [3] **[LSE-160]**, Selvy, B., 2013, *Verification and Validation Process*, LSE-160, URL <https://ls.st/LSE-160>

2 Test Plan Details

2.1 Data Collection

Observing is not required for this test campaign.

2.2 Verification Environment

Must be executed in a well-documented controlled state of the IDF.

2.3 Related Documentation

Jira Attachments

To LW-C167 results	HiPS_DP0.2-HiPS-from-DESC-DC2-sim-gri-color-visua-2.png
To LW-C167 results	ScreenShot2022-09-18at18.05.50.png
To LW-C167 results	image_Primary-product-this-MASK.png
To LW-C167 results	ScreenShot2022-09-18at18.44.19.png
To LW-C167 results	ScreenShot2022-09-19at15.15.18.png
To LW-C167 results	676698-R22_S11-calexp-direct.fitsverify.out
To LW-C167 results	676698-R22_S11-calexp-via-firefly.fitsverify.out
To LW-C167 results	ScreenShot2022-09-18at19.13.11.png
To LW-C167 results	ScreenShot2022-09-18at19.14.54.png
To LW-C167 results	ScreenShot2022-09-18at19.20.52.png
To LW-C167 results	coordinate-grid.png
To LW-C167 results	ScreenShot2022-09-19at14.21.50.png
To LW-C167 results	ScreenShot2022-09-19at14.52.29.png
To LW-C167 results	ScreenShot2022-09-19at15.00.39.png
To LW-C167 results	calexp-red-blue.png
To LW-C167 results	free-rotation.png
To LW-C167 results	biugq5jbw97wn8u7.xml
To LW-C167 results	ScreenShot2022-09-19at15.22.35.png
To LW-C167 results	ScreenShot2022-09-19at15.30.33.png
To LW-C167 results	ScreenShot2022-09-19at17.13.57.png

To LW-C167 results	coadd-variance.png
To LW-C167 results	ScreenShot2022-09-20at3.37.34.png
To LW-C167 results	ScreenShot2022-09-20at3.45.39.png
To LW-C167 results	ScreenShot2022-09-20at3.49.40.png
To LW-C167 results	ScreenShot2022-09-20at4.18.38.png
To LW-C167 results	ScreenShot2022-09-20at4.45.49.png
To LW-C167 results	ScreenShot2022-09-20at5.02.39.png
To LW-C167 results	ScreenShot2022-09-20at5.02.39.png

All documents provided as attachments in Jira are downloaded to Github and linked here for convenience. However, since they are not properly versioned, they should be considered informal and therefore not be part of the verification baseline.

2.4 PMCS Activity

Primavera milestones related to the test campaign:

- LDM-503-RSPa

3 Personnel

The personnel involved in the test campaign is shown in the following table.

T. Plan LWV-P80 owner:		Gregory Dubois-Felsmann	
T. Cycle LWV-C167 owner:		Gregory Dubois-Felsmann	
Test Cases	Assigned to	Executed by	Additional Test Personnel
LWV-T2677	Gregory Dubois-Felsmann	Gregory Dubois-Felsmann	
LWV-T2721	Gregory Dubois-Felsmann	Gregory Dubois-Felsmann	
LWV-T707	Jeffrey Carlin	Gregory Dubois-Felsmann	
LWV-T2716	Gregory Dubois-Felsmann	Gregory Dubois-Felsmann	

4 Test Campaign Overview

4.1 Summary

T. Plan LWV-P80:	LDM-503-RSPa: RSP on the Interim Data Facility (IDF) is ready for DP0.2	Approved
T. Cycle LWV-C167:	LDM-503-RSPa: Test RSP capabilities on IDF for DP0.2 readiness	Done
Test Cases	Ver.	Status
		Comment
		Issues

It was possible to carry out all the required test steps, almost all fully successfully.

Three steps were given “Initial Pass” status because of:

- A FITS-verification bug. This does not appear to be fatal and is not a blocker, but should be fixed.
- Distance measurement in pixels is missing. This appears to be a regression, should be fixed, and does block verification of DMS-PRTL-REQ-0085.
- Median calculation missing from image statistics. This was judged sufficient to block verification of DMS-PRTL-REQ-0097.

These are not obstacles to commissioning or Data Preview work; the system is usable as-is. However, these issues should be addressed with priority.

LW-T2677 1 Initial Pass

A few notable points also resulted in tickets but were rated “Pass”:

- The slowness of initial loading of masks, without an in-progress indication;
- Poor choices in the drawing of the coordinate grids overlaid on images;
- The lack of a grid view for the extensions in raw images.

Tickets have been filed for all of these issues. Regarding Firefly, 4 are bugs, 1 is a planned feature that has not yet been implemented, and 5 are suggested improvements, mainly to UX. An additional ticket about warnings in FITS file verification has been filed for Science Pipelines, and seems to be a known issue.

			Display of coadded images was shown to be equally well supported as for single-epoch images, in general.
LWV-T2721	1	Initial Pass	Recommend improvements to the Portal's ability to help users select coadded image types; this is currently awkward and unintuitive. "Initial Pass" status is due to this deficiency.
LWV-T707	1	Pass	Full pass for DMS-PRTL-REQ-0073. Full pass for the requirements covered.
LWV-T2716	1	Pass	Ticket created for improvement to the labeling of the Portal coordinate display grid.

Table 3: Test Campaign Summary

4.2 Overall Assessment

Generally successful. No test steps failed.

Lack of support for easy symbolic selection of filter bands was noted, but band selection was still possible, either by wavelength, or by symbolic selection via the "constraints field". This is expected to be remedied during the remaining life of DP0.2.

Lack of pixel-based distance measurements on images prevented the expected verification of DMS-PRTL-REQ-0085. (This appears to be a recent regression, as this functionality was previously available.) Lack of a median calculation prevented the full verification of DMS-PRTL-REQ-0097.

5 other bugs were reported against the Portal, mostly minor usability issues, with one affecting the format of downloaded FITS files. 7 additional tickets were filed for suggested improvements.

One ticket was filed against the pipelines regarding “warning”-level verification problems with FITS files.

Outside the scope of this test as written: it was impossible to conveniently test the API Aspect image services directly because of a lack of a good recipe for supplying authorization tokens to the image services. This affects their usability externally as well as from the Notebook Aspect.

4.3 Recommended Improvements

In image query, prioritize improving filter-band selection.

In image display, beyond the specific issues filed, revisit performance: add in-progress indications to slow operations that don’t currently have them, like mask display and the changing of stretch functions. Investigate the speed of mask display and of initial loading of HiPS images.

Work on PyVO access to the image services and on possible “convenience” wrapper functions (as we already have for TAP) between now and ComCam operation.

5 Detailed Test Results

5.1 Test Cycle LVV-C167

Open test cycle *LDM-503-RSPa: Test RSP capabilities on IDF for DP0.2 readiness* in Jira.

Test Cycle name: LDM-503-RSPa: Test RSP capabilities on IDF for DP0.2 readiness

Status: Done

This test cycle contains the tests necessary to verify the readiness of the RSP as redeployed on the IDF to meet the needs of the DP0.2 exercise, essentially repeating tests previously carried out on the NCSA RSP deployments. This test cycle builds on LVV-C166, including only the test cases necessary to verify additional capabilities needed for DP0.2, essentially all associated with image and image metadata searches in the API and Portal Aspects.

5.1.1 Software Version/Baseline

Not provided.

5.1.2 Configuration

Not provided.

5.1.3 Test Cases in LVV-C167 Test Cycle

5.1.3.1 LVV-T2677 - LDM-503-RSPa: Portal Aspect tests for DP0.2 readiness - single-epoch images

Version **1**. Status **Approved**. Open *LW-T2677* test case in Jira.

Verify that the subset of RSP Portal capabilities planned to be added for DP0.2 are present, based on single-epoch images.

Preconditions:

Execution status: **Initial Pass**

Final comment:

It was possible to carry out all the required test steps, almost all fully successfully.

Three steps were given “Initial Pass” status because of:

- A FITS-verification bug. This does not appear to be fatal and is not a blocker, but should be fixed.
- Distance measurement in pixels is missing. This appears to be a regression, should be fixed, and does block verification of DMS-PRTL-REQ-0085.
- Median calculation missing from image statistics. This was judged sufficient to block verification of DMS-PRTL-REQ-0097.

These are not obstacles to commissioning or Data Preview work; the system is usable as-is. However, these issues should be addressed with priority.

A few notable points also resulted in tickets but were rated “Pass”:

- The slowness of initial loading of masks, without an in-progress indication;
- Poor choices in the drawing of the coordinate grids overlaid on images;
- The lack of a grid view for the extensions in raw images.

Tickets have been filed for all of these issues. Regarding Firefly, 4 are bugs, 1 is a planned feature that has not yet been implemented, and 5 are suggested improvements, mainly to UX. An additional ticket about warnings in FITS file verification has been filed for Science Pipelines, and seems to be a known issue.

Detailed steps results:

Step 1 Step Execution Status: **Pass**

Description

Navigate to the Portal Aspect endpoint. The stable version of the RSP at the interim data facility (IDF) should be used for this test and is currently located at: <https://data.lsst.cloud/>. The Portal Aspect can be reached by clicking on “Portal” in the RSP home page or by navigating directly to <https://data.lsst.cloud/portal/app>.

Expected Result

A credential-entry screen should be displayed.

Actual Result

Accessed via the data.lsst.cloud home page, clicking on Portal. A GitHub credential entry screen was presented.

Step 2 Step Execution Status: **Pass**

Description

Enter a valid set of credentials for an LSST user with RSP access on the instance under test.

Expected Result

The Portal Aspect UI should be displayed following authentication.

Actual Result

Authenticated successfully after entry of the GitHub two-factor code.

Portal version screen:

Version: v2022.5.3

Built On: Fri Aug 26 18:05:15 UTC 2022

Git Commit: bd3ecd4

Firefly Library Version: 2022.2.2

Firefly Git Commit: 231e1e090

Firefly Git Tag: release-2022.2.2

Step 3 Step Execution Status: **Pass**

Description

Within the Portal Aspect UI, navigate, if necessary, to the “RSP Tap Search” screen, using the “blue button” at the top left of the Portal Aspect UI.

Expected Result

A screen titled "TAP Searches" is displayed.

Actual Result

This screen was displayed by default.

Step 4 Step Execution Status: **Pass**

Description

Ensure that the RSP instance's own TAP service is selected in Section 1 of the screen.

Expected Result

The "Select TAP Service" menu should be displaying "Using LSST RSP".

Actual Result

The display was as expected - "LSST RSP" was selected by default.

Step 5 Step Execution Status: **Pass**

Description

Select "Image Search (ObsTAP)" in Section 2 of the screen.

Expected Result

The screen should change to show "(Searching the ivoa.ObsCore table on this service...)" in Section 2 and to display a Section 3 beginning with an "Observation Type and Source" selector.

Actual Result

Behaved as expected.

Step 6 Step Execution Status: **Pass**

Description

If a calibration level (or levels) is/are specified for this test, here: 2 ensure that the "Observation Type and Source" checkbox is selected, and then check off the specified calibration level(s). Otherwise, ensure that no calibration level is checked.

Expected Result

Actual Result

Step 7 Step Execution Status: **Pass**

Description

Starting from the ObsTAP search screen, ensure that "Location" search is selected (using the checkbox), and that the disclosure triangle for its search specification is opened (i.e., pointing down).

Ensure that the query type "Observation boundary contains point" is selected. Enter the target coordinates 62.0, -37.0 in the "Coordinates or object name" field. Type <TAB> or otherwise leave the entry field.

Expected Result

The "Coordinates of object name" field should not show an error (i.e., should not be highlighted in red).

Actual Result

Behaved as expected.

Comment: after entering numeric coordinates (as instructed) it could be somewhat puzzling to a new user that "Try NED, then Simbad" is still displayed; the mouseover for that menu, "Select which name resolver", is helpful in clarifying it, though.

Step 8 Step Execution Status: **Pass**

Description

Execute the search. Note the number of images returned.

Expected Result

Following the execution of the search, the Portal Aspect should display, in its standard table viewer, a list of single-epoch Processed Visit Images (PVIs), identified by a "dataprodect_subtype" of "Isst.calexp" (a string derived directly from the Butler dataset type of the images).

On the upper left there will be a pane with two tabs: "Coverage", which should display the outline of the images on the sky, and "Data Product", which should display the currently selected image in the table.

On the upper right, there will be an x-y plot of the central RA and Dec of each of the images.

Actual Result

A table of 510 images was displayed. The first one, a "lsst.calexp" image, was displayed in the upper left panel. Switching to the "Coverage" view resulted in the display shown below, with the frames of all the (extensively dithered) images shown.

A result of 510 images is approximately consistent with the expectations for 410+ images for each point on the sky in a 5-year survey like the DC2 simulated dataset.

Comment:

1. The "image download" tool was used to create the attachment, selecting "PNG" for the output format. Unexpectedly, the initially displayed filename for the download ended with ".fits" despite actually being created as ".png" in the end. Ticket filed.

Step 9 Step Execution Status: **Pass**

Description

Verify that the result table contains information on the filter band, both as the custom column "lsst-band" and as the ObsCore-standard columns "em_min" and "em_max". Verify that it is possible to narrow the selection by filter band using the table viewer's filtering tools.

Expected Result

Actual Result

The expected columns were present, with all six LSSTCam filter bands represented (u:34, g:57, r:137, i:128, z:66, y:88) and em_min/max values corresponding.

Comments (not considered obstacles to a "Pass"):

1. The category-column filter menu behavior could be simplified to avoid the need for the confirming click on "filter".
2. The filter band letters are sorted in alphabetical order in the menu; this is workable, but not ideal. (It is understood that this would require LSST-specific metadata to be provided, behind the scenes, to the table viewer.)

Step 10 Step Execution Status: **Pass**

Description

Verify that the result table contains information on the time at which the exposure was taken, via the ObsCore “t_min” and “t_max” columns, which display MJD values. Verify that the selection of images can be filtered with these values (e.g., with column-header filter expressions such as “>60350”, corresponding to dates after 2024-02-10), as well as sorted.

Expected Result

Actual Result

Images from t_min = MJD 59583 to 61404 were returned, corresponding to 2022-01-04 through 2026-12-30, as expected. A Portal histogram of (t_max-t_min)*86400 showed all 510 images with a value of 30.

Step 11 Step Execution Status: **Pass**

Description

Verify that clicking on rows in the table, points in the scatter plot, and frames in the coverage image all serve to change the currently displayed image and are reflected in all the panes in a coordinated way.

Expected Result

The “linking” behavior normal to Portal Aspect results displays should be seen to apply equally well to image search results.

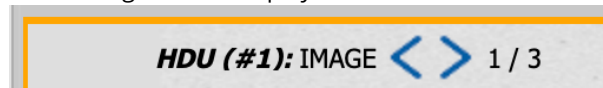
Actual Result

Verified

Step 12 Step Execution Status: **Pass**

Description

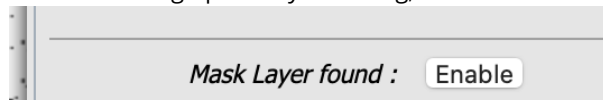
For one of the selected images, verify, by using the select-extension controls, that the mask and variance planes of the image can be displayed.



Use the “image layers” toolbar button



to bring up the layers dialog, and enable the overlay of mask data:



Use the resulting dialog to request the overlay of one or more individual mask planes.

Note that the mask plane colors and transparency may be edited, and that the mask layer dialog also highlights the mask status of the pixel currently at the mouse position.

Expected Result

Actual Result

HDU #2 (MASK) (see screenshot) and #3 (VARIANCE) were readily available as expected.

Overlaying all 12 defined mask planes was not a fast operation - about 25 seconds were required. Once loaded, panning, zooming, and mouse-over inspection of the flag status was fast and smooth. It was easy to explore bleed trails, crosstalk ghosts, and the like.

Not only is the initial load slow, but there is no clear progress indicator, so it is easy to first conclude, in error, that the overlay operation has failed in some way.

Mask plane selection and color editing was verified.

Place in MONITORING state.

Step 13 Step Execution Status: **Pass**

Description

Dismiss the results of the previous search, by clicking on the "x" in the "tab" atop the results table.



Image Search Results Table

Expected Result

Actual Result

The display was cleared by this operation, leaving only the top "button bar" of the Portal UI.

NB: Technical problem with this test plan!

Steps 14-16 of the test plan were not shown in the test player. The missing steps are the three from the library-included test LVV-T2708, "Prepare to perform an ObsTAP image search in the Portal Aspect". In the PDF version of the test plan these steps are also missing, but there is no gap in the numbering.

Step 14 Step Execution Status: **Pass**

Description

If a calibration level is specified for this test, here: (none)
ensure that the "Observation Type and Source" checkbox is selected, and then check off the specified calibration level. Otherwise, ensure that no calibration level is checked.

Expected Result

Actual Result

The missing steps (see above) were performed without difficulty.

This step was then carried out as indicated.

Step 15 Step Execution Status: **Pass**

Description

Starting from the ObsTAP search screen, ensure that "Location" search is unselected (using the checkbox). Ensure that "Timing" searches are selected and that the disclosure triangle for their search specification is opened (i.e., pointing down).

The specified time or time range for this search is: 2024-10-01 00:00Z through 2024-11-01 00:00Z

Depending on the above value, select the appropriate "Time of Observation" menu item: "Completed in the last ..." for a relative time-since specification, or "Overlapping specified range" for an absolute-time range. For the latter, select "UTC date/times (ISO format)" or "MJD" as appropriate to the way the specification appears above. Type <TAB> or otherwise leave the entry field.

Expected Result

The data entry fields in the "Timing" section of the screen should not show any error (i.e., should not be highlighted)

in red).

Actual Result

Carried out successfully; the UI displayed the equivalent MJD values of 60584 and 60615.

Step 16 Step Execution Status: **Pass**

Description

Limit the search to a specific detector: in the right-hand side of the ObsTAP interface, enter the text below in order to do this. Then execute the search. (NB: detector 94 happens to be the central CCD in the array.)

Test Data

=94

Expected Result

The result should be a table of observations for the specified date range and the specified detector. Because no calibration level restriction was applied, the search result should include multiple image types.

Actual Result

2509 images were returned, from MJD 60584 to 60515, as requested. Use of an independent service (at HEASARC) verified that the MJD values corresponded to the specified ISO dates. All six filter bands were represented, with only detector 94.

A rectangular ra,dec space from 49,-44 through 71,-27, roughly, was covered.

Comment:

1. Carrying out an ObsTAP search after having cleared the previous one seems to prevent the Portal's "search in progress" indication from appearing. This could lead a user to think that a search had not been launched successfully.

Comments on the test plan:

1. The instructions for the test step failed to say to enter the value in the "lsst_detector" constraints field.
2. The "Requirements Verified" text for this step should make clearer that it's "this and the above steps" that verify the requirements stated. (This is a Jira-Test artifact arising from the use of "library" test steps in this

test plan.)

Step 17 Step Execution Status: **Pass**

Description

Verify by inspecting the `dataprodct_subtype` column of the search result that raw (`lsst.raw`), PVI (`lsst.calexp`), and difference images (`lsst.goodSeeingDiff_differenceExp`) are available. Verify by clicking on rows of each type that each type of image can be displayed. Note in particular that raw images have a different format (16 single-amplifier images).

Expected Result

Actual Result

The three expected image types were observed.

Raw images were displayable as expected, as 16 separate HDUs.

Comment:

1. The absence of a means for displaying all 16 HDUs at once, perhaps in a grid, is a significant downside. It is not a test failure, but it should be addressed. (NB: there is a UI conflict to be addressed between “display as grid” meaning “display multiple images from the data-product table in a grid” vs. “display all the HDUs from a *single* data product as a grid”.

Step 18 Step Execution Status: **Pass**

Description

Using the ability to sort the image metadata table by the “`t_min`” column, select the earliest “`lsst.calexp`” image for the selected detector in the query result.

Record, for concreteness, the `t_min`, `lsst_band`, `lsst_visit`, `lsst_detector`, and `obs_id` for this row in the table.

In the single-image display (“Data Product” tab) for this image, click on the “Pin Image” button. This saves the image for further inspection. This is not actually a pre-requisite for the actions that follow, but simplifies the test conditions, for concreteness.

Expected Result

Actual Result

MJD 60584.15341161111, band r, visit 676698, detector 94, obs_id 676698-R22_S11.

(Note the encoding of raft and detector-in-raft in the obs_id.)

Step 19 Step Execution Status: **Pass**

Description

Dismiss the results of the ObsTAP search, by clicking on the “x” in the “tab” atop the results table.



Image Search Results Table

Expected Result

This should leave only the previously “pinned” image being displayed.

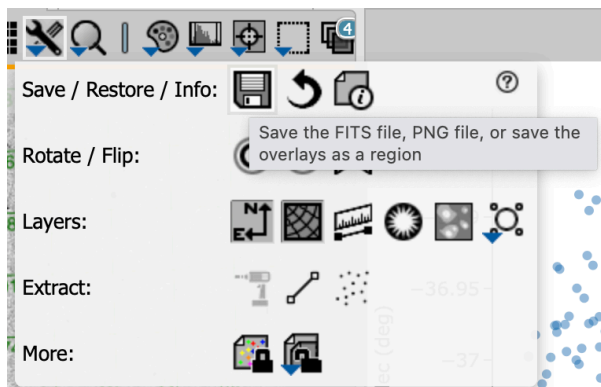
Actual Result

Verified the expected behavior. The image viewer is now filling the whole browser window.

Step 20 Step Execution Status: **Pass**

Description

Use the “diskette” button in the image toolbar to “Save”/download the image to a local FITS file.



Expected Result

A FITS file should be visible in the browser's download list.

Actual Result

A 196.4 MB FITS file was returned.

Step 21 Step Execution Status: **Initial Pass**

Description

Use a non-Rubin tool to confirm that the file is in FITS format. Report the tool used and any validation errors obtained - however, note that Rubin does use some extensions and that the validation is not required to be completely "clean".

A later version of this test will be more explicit about what tool to use and what is an acceptable deviation.

Expected Result

Actual Result

An available 2018 version of fitsverify was used, both on the sample calexp obtained as above, from the Portal's "save" button, and on the file as returned directly from the underlying image service, via the DataLink links service response available through the Firefly UI.

The "save button" version had three verification errors, regarding the presence of the "TFIELDS" header in each image extension. What _appears_ to have happened is that Firefly's underlying FITS library (a combination of Starlink and nom.tam.fits) failed to remove this header when uncompressing the originally compressed image extensions.

Comments:

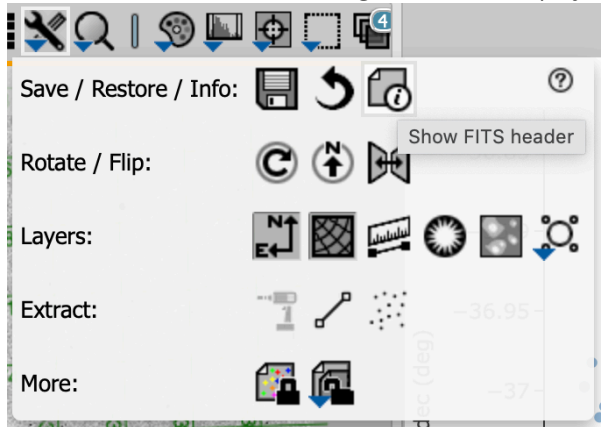
1. This error should be fixed, perhaps by updating to a newer version of nom.tam.fits, or perhaps by modifying Firefly-specific code.
2. Rubin's processed image files (PVIs, diffims, coadd tiles) are so large that it is problematic that Firefly provides them only in their decompressed form. These files are natively around 100MB and they are nearly doubling in size when uncompressed.
3. It is part of the longer-term design that direct access to downloading files from the image services should be possible through the Portal, which would bypass this. This is related to the requirement to download

- selected data from an image metadata table (DMS-PRTL-REQ-0112).
- Other warning-level problems are reported by fitsverify in both the direct download and the via-Firefly download.

Step 22 Step Execution Status: **Pass**

Description

Use the "Info" button in the image toolbar to display the FITS headers.



Expected Result

Actual Result

Verified. Allowed display of both the primary HDU headers and the headers of the current extension.

Step 23 Step Execution Status: **Pass**

Description

Click on the coordinate display name in the lower left of the image pane. (This will likely initially say "EQ-J2000".) Record all coordinate systems offered for the readout. Select "Equatorial J2000 decimal". Note that "0-based pixel" readout in fact respects the LSST "XY0" convention, when present in the data, and will correctly display off-set coordinates, as for a patch within a tract.

Click on the "Show expanded readout ..." button in the lower left. Configure the resulting display to show both astrophysical and 0-based pixel coordinates.

Mouse around in the image to explore the results.

Expected Result

Actual Result

With “zero-based pixel”, the lower left pixel was reported as 0.0, 0.0 at the center of the pixel; the upper left as 4071.0, 3999.0 at the center.

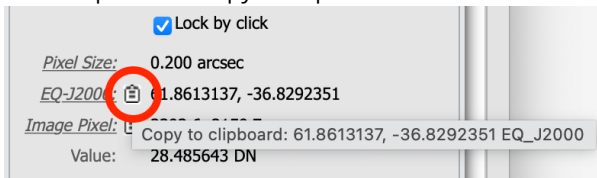
Coordinate systems supplied are shown in the attachment.

Step 24 Step Execution Status: **Pass**

Description

Click on “lock by click” and observe that the mode changes from follow-mouse to retaining coordinate values for a selected point in the image.

Use the provided copy-to-clipboard function



and record the resulting clipboard text.

Expected Result

Actual Result

Verified. A distinctive feature in the upper right of the image was used for this (see attachment). Copy-to-clipboard values at its center (judged by eye):

- Equatorial: 50.1390852, -42.4418851 EQ_J2000
- Galactic: 249.6055239, -56.1303038 GALACTIC
- Zero-based pixel: 3898.4, 3328.0

Step 25 Step Execution Status: **Pass**

Description

Confirm that, when the mouse is not rapidly moving, the pixel value is displayed along with the coordinates.

Expected Result

Actual Result

Confirmed. Note that this readout is also controlled by lock-by-click.

Comment:

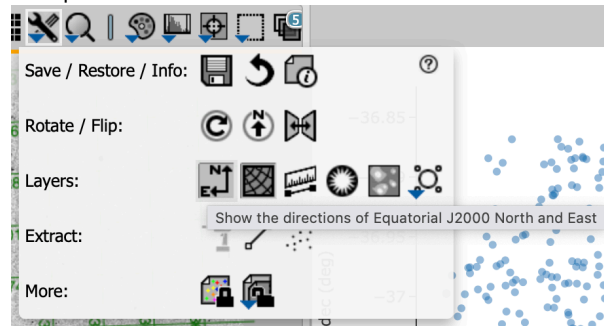
1. While the mask plane values can be inspected symbolically using the layers dialog - where the display of mask plane names follows the mouse, and respects lock-by-click, it might be more natural for the mask plane values to (also?) be visible in the expanded coordinate-readout dialog.

Step 26 Step Execution Status: **Pass**

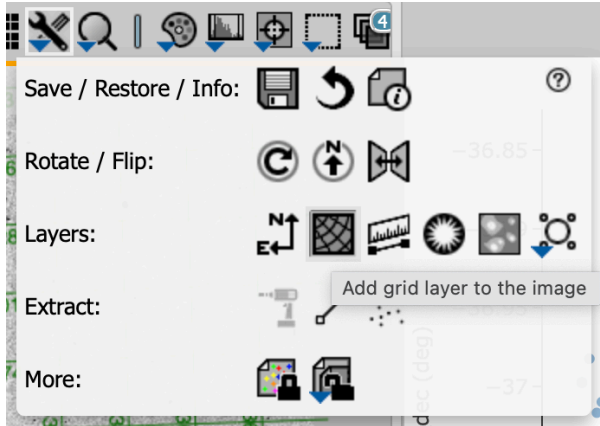
Description

Using the corresponding image toolbar buttons, confirm that a “compass” (with the appropriate handedness) and a coordinate grid overlay are available.

Compass:



Grid:



With the grid displayed, use the layer-control dialog



to explore the different coordinate systems available, and record them.

Then remove these overlays (using “delete” actions in the layer-control dialog) to avoid clutter in following steps.

Expected Result

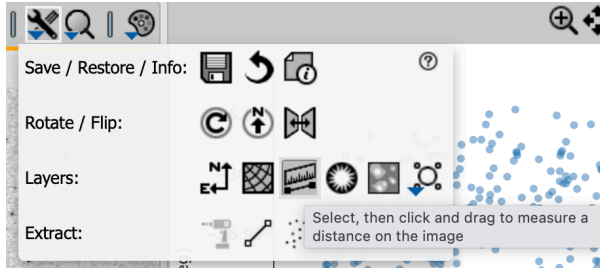
Actual Result

These tools work; however, the coordinate-grid overlay chooses surprising non-round-number values for the lines it draws (regardless of whether labeled in sexagesimal or decimal). It also sometimes fails to draw enough lines when zoomed in, or to adequately label them. (E.g., in the attached display only one line of RA is labeled.) Passes, but needs improvement: leave in MONITORING state.

Step 27 Step Execution Status: **Initial Pass**

Description

Activate the distance-measurement tool using its image toolbar button.



Verify that it functions with both pixel and astrophysical distances and gives plausible results. Use the layer-control dialog to explore the ability to change the units of measurement.

For this test it is not necessary to validate the distance calculation in detail. A separate test case will perform a detailed comparison of an afw-based measurement and a Portal measurement (see DM-36236).

Again, to avoid clutter, use the layer-control dialog to dismiss the distance-measurement tool.

Expected Result

Actual Result

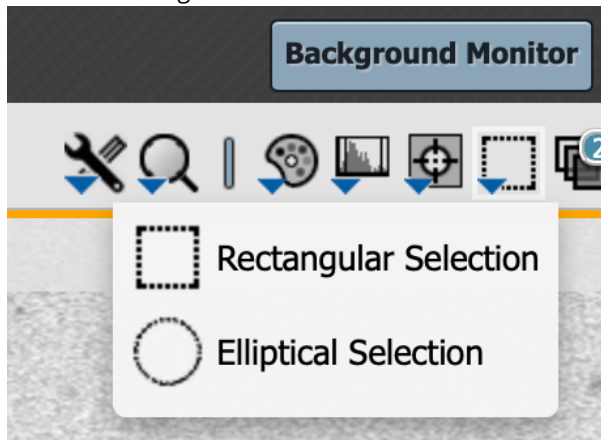
Verified that angular measurements are possible in degrees, arcminutes, and arcseconds, at user selection. Roughly verified that the results are consistent on a calexp with what is expected from the pixel scale (see attachments).

The tool does not appear to function in pixel space, which seems to be a regression from previous experience. Ticket filed.

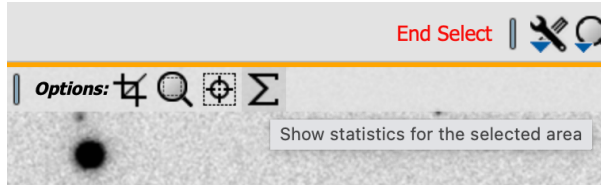
Step 28 Step Execution Status: **Initial Pass**

Description

Use the "rectangular selection" tool to choose a subregion of the displayed image.



Use the "statistics" button which appears in the image toolbar to bring up an image-statistics dialog.



Record a screenshot of the dialog and comment on the functionality compared to the requirement.

Note that hovering over the reported positions in the dialog results in their being highlighted on the image.

Expected Result

Actual Result

See screenshot. The tool provides mean and RMS, as required, as well as reporting the minimum and maximum flux in the selected region, the integrated flux, and readouts of the locations of the minimum and maximum as well as an “aperture centroid” and a “flux-weighted centroid”. The four positions are highlighted in the image when moused-over.

The tool does not provide the median flux, which would generally be useful, and also doesn’t provide the higher-moment statistics (skewness and kurtosis) mentioned, those those are arguably less interesting than the extra capabilities that are provided.

Assessing as “Initial Pass” because of the missing median, specifically. This must be addressed.

Comments:

1. Median is not provided, and should be.
2. Higher-moment statistics (skewness and kurtosis) are not provided but may not be very widely useful.
[The following comments go beyond the stated requirement and are not germane to the “pass” status of the test.]
3. The exact pixel frame of the rectangle on the image, in pixel coordinates, is not reported, but would be useful for downstream use and/or reproducibility.
4. The coordinates reported are always in equatorial sexagesimal, regardless of the settings of the associated image display; this is surprising UX and makes the tool harder to use in some contexts.
5. It would be useful to provide pixel coordinates of the four identified locations, in FITS or zero-based coordinates as configured for the associated image (or selectable).
6. The tool doesn’t follow the contemporary Firefly convention of making coordinates uniformly available for copy-to-clipboard via an icon.
7. It’s far outside the original requirement, but the ability to produce an image histogram from this dialog would be most useful.
8. Integration with the newer “extract” tools should be explored.
9. It would be useful to be able to use the points identified in a similar build-up-a-table workflow to that of the new point-extract tool.

Step 29 Step Execution Status: **Pass**

Description

Use the image manipulation entries on the toolbar to modify the image display. Comment on the behavior.

Use the "Save" button to confirm that it is possible to save a snapshot of the current state as a PNG. Use this to document some samples of the behavior.

It is not necessary to validate the actual stretch algorithms in this test case, but a future test case should address this.

Expected Result

Actual Result

A linear stretch in a small region around 0 (-100 to +100) was used, together with a red-to-blue colormap, to highlight image noise and, in particular, the presence of negative values.

An asinh stretch was used to improve contrast among bright objects - the galaxy core in the upper right, with a peak flux around 1,128 DN, the bright spot below it, around 21,879 DN, and the substantially brighter spot above, around 50,995 DN.

Step 30 Step Execution Status: **Pass**

Description

Confirm that it is possible to pan, zoom, and rotate an image, and to save-as-PNG to save the results.

Expected Result

Actual Result

Pan and zoom (both by clicking on +/- and with the scrollwheel) were used heavily in all these tests and are satisfactory. Scrollwheel zoom acts at the mouse location as one has come to expect from other applications.

Both "place north up" and "free rotation" tools are available and work well. Saving a PNG after free rotation works as expected.

Step 31 Step Execution Status: **Pass**

Description

Close the Portal window and open a new one. Re-authentication should not be necessary unless using a private window.

Again, this is not required but keeps the test conditions from accumulating residue of previous steps.

Expected Result

Actual Result

Carried out without difficulty.

Step 32 Step Execution Status: **Pass**

Description

If a calibration level is specified for this test, here: 2 ensure that the "Observation Type and Source" checkbox is selected, and then check off the specified calibration level. Otherwise, ensure that no calibration level is checked.

Expected Result

Actual Result

(Again, three steps from a nested test case were missing from the test plan at this point, again having to do with initiating an ObsTAP search. Note the gap for 35-37 in the screen shot.)

The steps were carried out successfully.

Step 33 Step Execution Status: **Pass**

Description

Ensure that the "Location" and "Timing" selectors on the ObsTAP screen are unchecked. (These will be implicit in the Visit ID.)

Expected Result

Actual Result

Done

Step 34 Step Execution Status: **Pass**

Description

Enter the Visit ID, 538450 , as a constraint on the "lsst_visit" field in the constraints table on the right side of the UI, as "= 538450 ".

Expected Result

Actual Result

Done

Step 35 Step Execution Status: **Pass**

Description

Execute the search.

Expected Result

The usual Portal "tri-view" should appear, with a table of all the CCD-level images in the selected visit in the bottom half of the display, coverage map and single-image-display tabs in the upper left, and an X-Y plot in the upper right.

Actual Result

Worked as expected.

Step 36 Step Execution Status: **Pass**

Description

Verify that clicking on rows in the table, image frames in the coverage plot, and points in the X-Y plot all take effect across all three views, and change which image is actually displayed.

Expected Result

Actual Result

Works as expected.

Step 37 Step Execution Status: **Pass**

Description

Verify that the coverage image displays the expected pattern of CCDs in the focal plane for a single visit, projected on the sky.

Expected Result

Actual Result

Works as expected. The coverage image (HiPS "gri" from DP0.2) did take several seconds to load - performance improvement in this case would be welcome.

Step 38 Step Execution Status: **Pass**

Description

Verify that the correct visit was returned.

Expected Result

Actual Result

The requested visit ID was returned in the table. Visit start time was reported as MJD 60369.04159661111.

Step 39 Step Execution Status: **Pass**

Description

This step confirms that the image search was done via an ADQL (ObsTAP) search in the Portal Aspect.

Click on the "(i)" button in the image metadata table toolbar. From the resulting dialog, record the "Job Link", using the copy-to-clipboard button provided. Note that it is under the API-Aspect endpoint of the RSP instance under test.

Click on the "Job Link" URL in the dialog. A browser window containing the XML job definition will appear. Save

the XML and attach it to this test. Extract the ADQL text from the '<uws:parameter id="QUERY">' element in the XML and record it.

Expected Result

Actual Result

Job link: <https://data.lsst.cloud/api/tap/async/biugq5jbw97wn8u7>

Query text:

```
SELECT dataproduct_type,dataproduct_subtype,calib_level,lsst_band,em_min,em_max,lsst_tract,lsst_patch,lsst_visit,lsst_filter,lsst_obs_collection,o_ucd,facility_name,instrument_name,s_region,access_url,access_format FROM ivoa.ObsCore WHERE calib_level = 2 AND dataproduct_type = 'image' AND (lsst_visit =538450)
```

Step 40 Step Execution Status: **Pass**

Description

Use the "RSP TAP Search" screen to perform a search on the dp02_dc2_catalogs.Visit table for visit 538450 :

1. Unselect both the "Spatial" and "Temporal" constraint tools on the left side of section 4, "Enter Constraints".
2. On the right side, enter "= 538450 " in the "Constraints" field in the table for the "visit" attribute.
3. Execute the search.

Record the number of rows returned and describe the data.

Expected Result

A single-row table should be returned with high-level metadata for the full visit.

Actual Result

A single row was returned as expected, with the proper visit ID and time and additional properties as shown, including airmass and other conditions of the observations such as zenith distance, elevation, etc.

Step 41 Step Execution Status: **Pass**

Description

Use the "RSP TAP Search" screen to perform a search on the dp02_dc2_catalogs.CcdVisit table for visit 538450 :

1. Unselect both the "Spatial" and "Temporal" constraint tools on the left side of section 4, "Enter Constraints".
2. On the right side, enter "= 538450 " in the "Constraints" field in the table for the "visitId" attribute.
3. Execute the search.

Record the number of rows returned and describe the data.

Note whether the observation time varies per-CCD as it should for real data. However, that is not germane to the test-passing criteria; it is a Science Pipelines issue.

Expected Result

A 189-row table should be returned with per-CCD metadata on the result of the data processing.

Actual Result

189 rows, one per CCD, were returned. Three scatterplots of observation quality parameters were made as a demonstration of the data available.

5.1.3.2 LVV-T2721 - LDM-503-RSPa: Portal Aspect tests for DP0.2 readiness - coadded images

Version **1**. Status **Approved**. Open *LVV-T2721* test case in Jira.

Verify that the subset of RSP Portal capabilities planned to be added for DP0.2 are present, as pertaining to coadded images

Preconditions:

Execution status: **Initial Pass**

Final comment:

Display of coadded images was shown to be equally well supported as for single-epoch images, in general.

Recommend improvements to the Portal’s ability to help users select coadded image types; this is currently awkward and unintuitive. “Initial Pass” status is due to this deficiency.

Detailed steps results:

Step 1 Step Execution Status: **Pass**

Description

Navigate to the Portal Aspect endpoint. The stable version of the RSP at the interim data facility (IDF) should be used for this test and is currently located at: <https://data.lsst.cloud/>. The Portal Aspect can be reached by clicking on “Portal” in the RSP home page or by navigating directly to <https://data.lsst.cloud/portal/app>.

Expected Result

A credential-entry screen should be displayed.

Actual Result

Done

Step 2 Step Execution Status: **Pass**

Description

Enter a valid set of credentials for an LSST user with RSP access on the instance under test.

Expected Result

The Portal Aspect UI should be displayed following authentication.

Actual Result

Done

Step 3 Step Execution Status: **Pass**

Description

Within the Portal Aspect UI, navigate, if necessary, to the “RSP Tap Search” screen, using the “blue button” at the top left of the Portal Aspect UI.

Expected Result

A screen titled “TAP Searches” is displayed.

Actual Result

This was the default screen.

Step 4 Step Execution Status: **Pass**

Description

Ensure that the RSP instance's own TAP service is selected in Section 1 of the screen.

Expected Result

The "Select TAP Service" menu should be displaying "Using LSST RSP".

Actual Result

Verified; the correct default is in place.

Step 5 Step Execution Status: **Pass**

Description

Select "Image Search (ObsTAP)" in Section 2 of the screen.

Expected Result

The screen should change to show "(Searching the ivoa.ObsCore table on this service...)" in Section 2 and to display a Section 3 beginning with an "Observation Type and Source" selector.

Actual Result

Behaved as expected.

Step 6 Step Execution Status: **Pass**

Description

If a calibration level (or levels) is/are specified for this test, here: 3 ensure that the "Observation Type and Source" checkbox is selected, and then check off the specified calibration level(s). Otherwise, ensure that no calibration level is checked.

Expected Result

Actual Result

Done

Step 7 Step Execution Status: **Pass**

Description

Starting from the ObsTAP search screen, ensure that “Location” search is selected (using the checkbox), and that the disclosure triangle for its search specification is opened (i.e., pointing down).

Ensure that the query type “Observation boundary contains point” is selected. Enter the target coordinates 62.0, -37.0 in the “Coordinates or object name” field. Type <TAB> or otherwise leave the entry field.

Expected Result

The “Coordinates of object name” field should not show an error (i.e., should not be highlighted in red).

Actual Result

Done

Step 8 Step Execution Status: **Initial Pass**

Description

Observe and report on the absence of an obvious way to say “I only want to see coadds”. This is a known weakness of relying on the ObsCore data model exclusively; there’s no unambiguous way in ObsCore to express such a limitation on a search.

Calibration level 3, chosen above, selects derived images, but unfortunately for this purpose that includes both single-epoch difference images and multi-epoch coadds.

It would be possible to select on `t_exptime`, to ask for effective exposure times (much) longer than the single-epoch norm of 30 seconds, but unfortunately at this time the pipelines don’t report even an approximate exposure time for coadds.

A forthcoming version of the Portal will be pre-configured with a pick list of the available image types, which will address this need, but in the mean time, the next test step provides a workaround.

(This test case will be updated once it is available.)

Expected Result

Actual Result

As suggested by the test plan, this is not a user-friendly situation, so although the requirement is met, it is awkward and needs the promised improvement.

Step 9 Step Execution Status: **Pass**

Description

Use the constraints table on the right of the search screen to add the constraint ">0" to the "lsst_tract" field. This requires the images selected by the search to have an assigned location in the coadded skymap, effectively selecting coadds.

As noted above, this is a workaround and is not the intended final UX.

Expected Result

Actual Result

This workaround was successful at producing a query for only coadds.

Step 10 Step Execution Status: **Pass**

Description

Execute the search. Note the number of images returned. Note the values of "dataprodct_subtype" returned.

Expected Result

Following the execution of the search, the Portal Aspect should display, in its standard table viewer, a list of 24 coadded images: from two coadd "patches" that both happen to overlap the specified target, from two types of coadds - "deep" and "good seeing", identified by "dataprodct_subtype" values of "lsst.deepCoadd_calexp" and "lsst.goodSeeingCoadd", respectively (strings derived directly from the Butler dataset type of the images) - and from six filters; $2*2*6 = 24$.

On the upper left there will be a pane with two tabs: "Coverage", which should display the outline of the images on the sky, and "Data Product", which should display the currently selected image in the table.

On the upper right, there will be an x-y plot of the central RA and Dec of each of the images.

Actual Result

The expected tri-view was displayed. 24 images were returned, with the expected distribution over filters, coadd types, and patches - (3831,3) and (3831,10).

Image and mask visualization worked well, just as for single-epoch images.

Comments:

1. The initial zoom level of the coverage map is not ideal - it's too "zoomed in".
2. The coverage map zoom level seems to reset every time the coverage tab is selected.

Step 11 Step Execution Status: **Pass**

Description

Verify that the result table contains information on the filter band, both as the custom column "lsst-band" and as the ObsCore-standard columns "em_min" and "em_max". Verify that it is possible to narrow the selection by filter band using the table viewer's filtering tools.

Expected Result

Actual Result

Behaved as expected; easy to use.

As noted in the "Requirement(s) Verified" text of the test plan, this is not adequate to verify DMS-PRTL-REQ-0039 fully, especially since a) the parameters not currently provided by the pipelines for coadds - "date, number of single-epoch images, coverage, survey depth" - are not part of ObsCore, except for the date, and b) no coadd-tile-metadata table was provided in DP0.2. These are not Portal issues, but a Portal workflow can't be demonstrated without at least a table to work with, even if some attributes may still be missing from the Pipelines output.

Step 12 Step Execution Status: **Pass**

Description

Verify that clicking on rows in the table, points in the scatter plot, and frames in the coverage image all serve to change the currently displayed image and are reflected in all the panes in a coordinated way.

Expected Result

The “linking” behavior normal to Portal Aspect results displays should be seen to apply equally well to image search results.

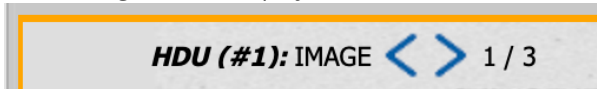
Actual Result

Verified.

Step 13 Step Execution Status: **Pass**

Description

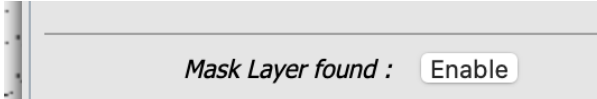
For one of the selected images, verify, by using the select-extension controls, that the mask and variance planes of the image can be displayed.



Use the “image layers” toolbar button



to bring up the layers dialog, and enable the overlay of mask data:



Use the resulting dialog to request the overlay of one or more individual mask planes.

Note that the mask plane colors and transparency may be edited, and that the mask layer dialog also highlights the mask status of the pixel currently at the mouse position.

Expected Result

Actual Result

As noted above, mask displays work fine. Variance displays also - see screen shot.

Step 14 Step Execution Status: **Pass**

Description

Dismiss the results of the previous search, by clicking on the “x” in the “tab” atop the results table.

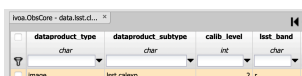


Image Search Results Table

Expected Result

Actual Result

5.1.3.3 LVV-T707 - Verify multi-image scaling and alignment

Version **1**. Status **Approved**. Open *LW-T707* test case in Jira.

Verify that the Portal has the capability to display multiple images on a common astrophysical coordinate scale, aligned on the screen in a common orientation.

Preconditions:

Execution status: **Pass**

Final comment:

Full pass for DMS-PRTL-REQ-0073.

Detailed steps results:

Step 1	Step Execution Status: Pass
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Description

Navigate to the Portal Aspect endpoint. The stable version of the RSP at the interim data facility (IDF) should be used for this test and is currently located at: <https://data.lsst.cloud/>. The Portal Aspect can be reached by clicking on "Portal" in the RSP home page or by navigating directly to <https://data.lsst.cloud/portal/app>.

Expected Result

A credential-entry screen should be displayed.

Actual Result

Done

Step 2 Step Execution Status: **Pass**

Description

Enter a valid set of credentials for an LSST user with RSP access on the instance under test.

Expected Result

The Portal Aspect UI should be displayed following authentication.

Actual Result

Done

Step 3 Step Execution Status: **Pass**

Description

If a calibration level (or levels) is/are specified for this test, here: 2, 3 ensure that the "Observation Type and Source" checkbox is selected, and then check off the specified calibration level(s). Otherwise, ensure that no calibration level is checked.

Expected Result

Actual Result

Done; verified that two calibration levels can be selected at the same time.

Step 4 Step Execution Status: **Pass**

Description

Starting from the ObsTAP search screen, ensure that "Location" search is selected (using the checkbox), and that the disclosure triangle for its search specification is opened (i.e., pointing down). Ensure that the query type "Observation boundary contains point" is selected. Enter the target coordinates 60.361, -34.980 in the "Coordinates or object name" field. Type <TAB> or otherwise leave the entry field.

Expected Result

The "Coordinates of object name" field should not show an error (i.e., should not be highlighted in red).

Actual Result

Done

Step 5 Step Execution Status: **Pass**

Description

Use the “Spectral Coverage” section of the “3. Enter Constraints” field on the left to restrict coverage to images covering 600 nanometers .

(This selects the r-band. Symbolic selection of this will be available in a subsequent release of the Portal Aspect.)

Expected Result

Actual Result

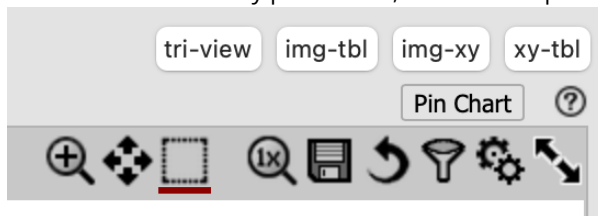
Done.

Confirmed that the “Spectral coverage” section currently doesn’t have a way to select a filter band by symbolic name.

Step 6 Step Execution Status: **Pass**

Description

Execute the search. The usual “tri-view” should appear. Use the “img-tbl” button on the upper right to change to a mode without the x-y plot viewer, which is not particularly useful for this test.



Expected Result

The image table should appear on the right, with the image (“Data Product”) viewer and the coverage image in tabs on the left. Only r-band images should be shown.

Actual Result

Verified.

Step 7 Step Execution Status: **Pass**

Description

Select the coverage image tab.

Expected Result

The coverage tab should display the frames of all the images returned from the search.

Actual Result

Verified.

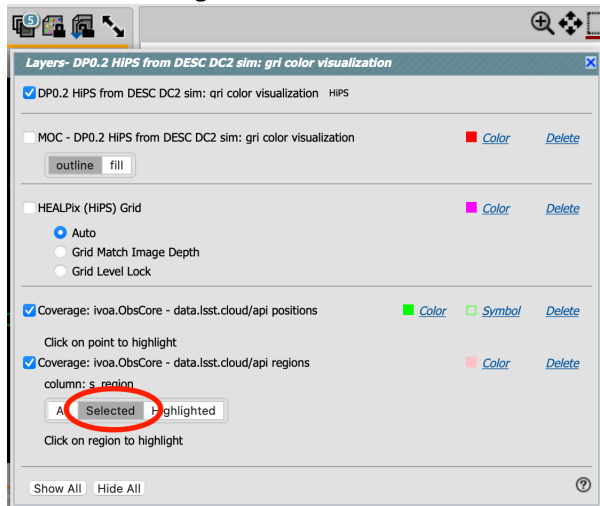
Step 8 Step Execution Status: **Pass**

Description

Use the layers dialog, from the “Manipulate overlay display” button in the image toolbar:



to change the display of image frames from “all” to “selected”. (This shows only the frames of images that are selected using the checkbox in their table row.)



Expected Result

Actual Result

Verified. Works as expected.

Comment:

1. Adding text making clearer that the control is on which images' regions to display might help make the dialog more understandable.

Step 9 Step Execution Status: **Pass**

Description

Click on the header of the "t_min" column to sort the data in increasing order of time.

Expected Result

Two coadded images, one "deep" (dataprodect_subtype = lsst.deepCoadd_calexp) and one "good seeing" (lsst.goodSeeingCoadd), of the same sky tile, should appear at the top of the list (NB: coadded images do not have times assigned in the DP0.2 dataset; this will be changed in later data releases).

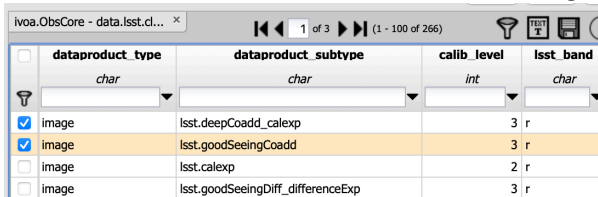
Actual Result

Verified.

Step 10 Step Execution Status: **Pass**

Description

Use the checkboxes to select the two coadded images at the top of the list.



<input type="checkbox"/>	dataprodect_type	dataprodect_subtype	calib_level	lsst_band
	char	char	int	char
<input checked="" type="checkbox"/>	image	lsst.deepCoadd_calexp	3	r
<input checked="" type="checkbox"/>	image	lsst.goodSeeingCoadd	3	r
<input type="checkbox"/>	image	lsst.calexp	2	r
<input type="checkbox"/>	image	lsst.goodSeeingDiff_differenceExp	3	r

Expected Result

Their (identical) frames should appear in the coverage image.

Actual Result

Verified.

Step 11 Step Execution Status: **Pass**

Description

Look down in the list to the two single-epoch CCD images (a coadd and a difference image) from visit 193110 (see the "lsst_visit" column). These should be the 7th and 8th in the table. Use the checkboxes to select these.

(This visit is chosen for this test case because it's at a distinctive angle to the coadd tiles.)

Zoom the coverage display so that it clearly displays the frames of both the coadds and the single-epoch images.

Expected Result

There should now be four images selected.

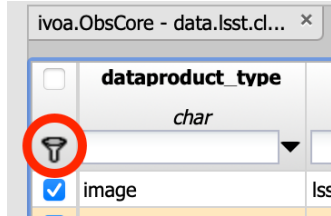
Actual Result

Verified.

Step 12 Step Execution Status: **Pass**

Description

Use the "Filter on selected rows" control in the table header



to limit the display to only the selected images.

Expected Result

Only the four selected images should remain in the table.

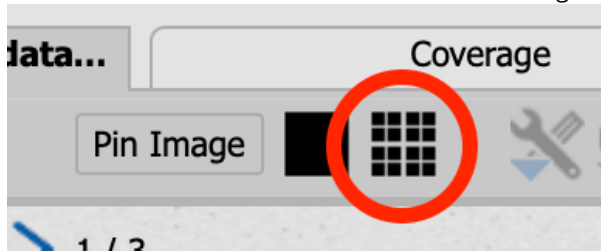
Actual Result

Verified.

Step 13 Step Execution Status: **Pass**

Description

Select the "Data Product" tab. Use the "Show full grid" control in the image toolbar



to show all four images at once.

Expected Result

The images should be displayed in a 2x2 grid.

One image will be highlighted with a yellow/orange border, following the highlighted row in the table.

(Note that the image display itself does not clearly indicate which image is which; this is a known deficiency and will be addressed by future changes to the back-end image services and the Portal. In the mean time, the image metadata table highlight can be used to explore which is which.)

Actual Result

Verified.

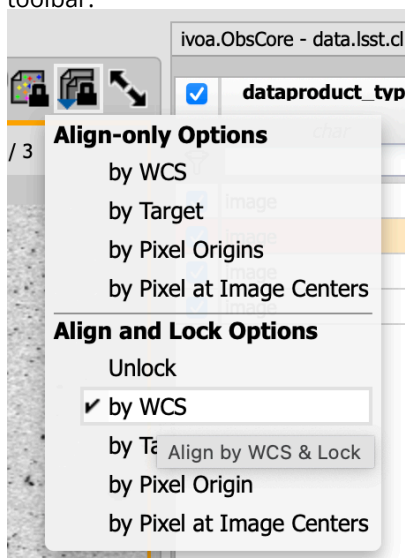
Image labeling does need to be improved.

Step 14 Step Execution Status: **Pass**

Description

If the test started in a fresh session, the images will normally be initially displayed each in its own natural row/column orientation.

Highlight one of the coadded images in the table. Then select the “Align and lock by WCS” control in the image toolbar.



Expected Result

All four images should now be displayed at the same orientation and scale. Note that the Visit-193110 images appear significantly rotated.

Actual Result

Verified.

Step 15 Step Execution Status: **Pass**

Description

Zoom and pan on the images to verify that they move together.

Enjoy the comparison of the single-epoch and coadded image depths, and the comparison of the single-epoch image and the difference image. (Note: in the DP0.2 production, the “good seeing” coadd was used as the template image for the image differencing.)

Expected Result

Actual Result

Verified. Panning and zooming on four 4k*4k images is fast and smooth.

Comment:

1. The “Pan by table row” feature goes from normally useful to unintuitive and disruptive when applied to highly-zoomed-in images, causing the display to jump away from a carefully selected scene to the image center (s_ra, s_dec point) when changing the highlighted image. Its behavior needs revision, or it should be turned off by default in the image metadata viewer.

5.1.3.4 LVV-T2716 - LDM-503-RSPa: Test HiPS functionality in DP0.2

Version **1**. Status **Approved**. Open *LW-T2716* test case in Jira.

Verify DM and RSP requirements on the availability of Rubin-created HiPS imaging, within the

context of DP0.2.

Preconditions:

Execution status: **Pass**

Final comment:

Full pass for the requirements covered.

Ticket created for improvement to the labeling of the Portal coordinate display grid.

Detailed steps results:

Step 1	Step Execution Status: Pass
Description	
Navigate to the Portal Aspect endpoint. The stable version of the RSP at the interim data facility (IDF) should be used for this test and is currently located at: https://data.lsst.cloud/ . The Portal Aspect can be reached by clicking on "Portal" in the RSP home page or by navigating directly to https://data.lsst.cloud/portal/app .	

Expected Result	
A credential-entry screen should be displayed.	

Actual Result	
Done	

Step 2	Step Execution Status: Pass
Description	
Enter a valid set of credentials for an LSST user with RSP access on the instance under test.	

Expected Result	
The Portal Aspect UI should be displayed following authentication.	

Actual Result	

Credentials from executing LVV-T707 were still available in the browser, so no authentication was needed.

Step 3 Step Execution Status: **Pass**

Description

Navigate to the "External Images" tab of the interface. This is a temporary workaround - a more obvious path for this will be provided in a future version of the Portal Aspect application.

Expected Result

Actual Result

Done.

Step 4 Step Execution Status: **Pass**

Description

In "1. Choose Image Type" select "View HiPS Images". Leave "2. Select Image Source" and "3. Select Target" at their defaults ("Search", and empty data-entry fields, respectively).

Record the HiPS images that are displayed in the resulting pick list.

Expected Result

In "4. Select Data Set" a checkbox "Rubin Featured" should be checked, and a list of seven or eight HiPS images from DP0.2 should be displayed: six single-band images and one or more three-color images.

Actual Result

Six single-band images as well as "gri" and "riz" colorizations were displayed.

Comment:

1. The y band image is described as "Waveband: optical". This was a decision at the time of creation of the HiPS images in Science Pipelines, and falls on the edge of the IVOA's conventions, which put the boundary between "Optical" and "Infrared" at 1um - which is in the middle of the y-band. So it would be equally acceptable to label the y-band image as "Infrared".

Step 5 Step Execution Status: **Pass**

Description

Click on the "(i)" icon in one of the rows. Note the display of a HiPS "properties" file in a new window. Record the full URL for this window. Then close the window.

Verify that the URL begins with "https:".

Verify that the URL cannot be opened successfully in a private browser window. Record the error indication received.

Expected Result

E.g., "https://data.lsst.cloud/api/hips/images/band_u/properties".

Actual Result

Verified:

https://data.lsst.cloud/api/hips/images/band_y/properties

Attempting to open the URL in a browser without credentials yielded "401 Authorization Required", as expected. Attempting to open the "http:" version of the URL resulted in a redirection to the secure version.

Step 6 Step Execution Status: **Pass**

Description

Select one of the HiPS images in the displayed table, and record the selected map and its displayed pixel scale.

Click on the "Search" button in the lower left of the UI. Record the time required to put up an initial display of the image.

Expected Result

The HiPS image should be displayed.

Actual Result

Chose the z-band image. Pixel scale 5.591612e-5 degrees = 0.201".

Initial display of the image required 8-9 seconds.

Step 7 Step Execution Status: **Pass**

Description

Verify that the UI permits panning and zooming on the image. Note the limited coverage (roughly 300 sq. deg., less than 1% of the sky) of the map, so this is not a full test of the performance of these functions at a zoomed-out scale.

Expected Result

Actual Result

Verified. Reloading of tiles when zooming in and out was rapid but still noticeable.

Step 8 Step Execution Status: **Pass**

Description

Verify that coordinate readouts are available for the mouse position on the HiPS image. Record the available coordinate systems.

Expected Result

Actual Result

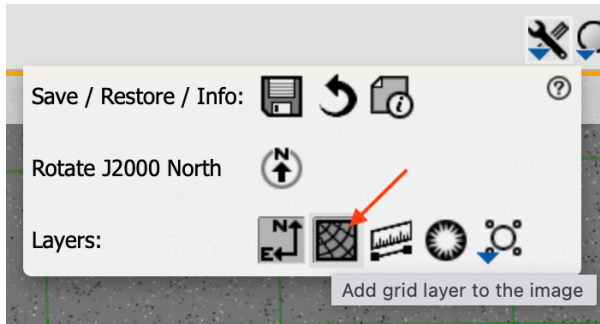
Equatorial, ecliptic, and galactic coordinates were available.

In addition, a HEALPixel number was available, partially satisfying DMS-PRTL-REQ-0081, which was not explicitly included in this test. Currently there are no utilities for using a HEALPixel index elsewhere in the RSP, so this is of limited use for now.

Step 9 Step Execution Status: **Pass**

Description

Add the coordinate-lines overlay with the usual toolbar button:



Verify that the display accords roughly with the standard Portal Aspect coordinate readout. Then use the layers dialog



to delete the grid overlay.

Expected Result

Actual Result

Verified that the coordinate grid is available and that it accords with the coordinate readout.

The same concern applies to the coordinate grid on HiPS images as on FITS images: the labeling is odd in its choice of non-round numbers. This needs to be fixed.

Step 10 Step Execution Status: **Pass**

Description

If the selected HiPS image was the "gri color" one, change to one of the single-band ones. Ensure that it behaves similarly. Leave it selected.

Expected Result

Actual Result

Experimented with various selections; ultimately left the i-band image displayed.

Comment:

1. The default stretch applied to the monochrome and color images seems very different.
2. In the attachment the distance-arrow covers 28" or about 140 pixels at the native resolution. No "pixel blockiness" is evident at all, though. Perhaps the pngs were generated at too low a resolution? This may be worth revisiting with Science Pipelines.

Step 11 Step Execution Status: **Pass**

Description

Navigate to the "RSP TAP Search" screen in the Portal. Select the "Single Table" query type.

Expected Result

Actual Result

Done.

Step 12 Step Execution Status: **Pass**

Description

Select the " dp02_dc2_catalogs " table collection/schema and the " Object " table.

Expected Result

Actual Result

Done. (These were the defaults.)

Step 13 Step Execution Status: **Pass**

Description

Verify that queries in Galactic and Ecliptic coordinate systems are possible:

1. Enter a search radius of 0.02 degrees.
2. Enter the target coordinates "239.143686, -47.681348 gal" (Galactic). Use the "Populate and edit ADQL" button at the bottom of the screen to inspect the resulting ADQL for the CIRCLE construct, which should be in ICRS degrees. Verify that it is close to (62.0, -37.0) in those units. Return to the "Single Table" search screen.

3. Enter the target coordinates “47.388563, -56.371758 ecl” (ecliptic). Use the “Populate and edit ADQL” button at the bottom of the screen to inspect the resulting ADQL for the CIRCLE construct, which should be in ICRS degrees. Verify that it is close to (62.0, -37.0) in those units. Return to the “Single Table” search screen.

Expected Result

E.g., CIRCLE('ICRS', 61.9999155538758, -36.99994564119228, 0.02)

Actual Result

Done.

- The specified galactic coordinates yielded “CIRCLE('ICRS', 61.9999155538758, -36.99994564119228, 0.02)”.
- The specified ecliptic coordinates yielded “CIRCLE('ICRS', 62.00000008141517, -37.000000085338996, 0.02)”.

Conversions were additionally verified against the HEASARC and NED coordinate calculators, and are generally good to six figures.

Step 14 Step Execution Status: **Pass**

Description

Confirm that the specified Table Collection and Table are still selected. Ensure that the “Spatial” section of the constraints-builder on the left of Section 4 is selected (checked) and its disclosure triangle is open. Ensure that the query type “Cone” is chosen. Ensure that the “Temporal” section is unchecked.

Expected Result

Actual Result

Done.

Step 15 Step Execution Status: **Pass**

Description

Enter the search target coordinates: 62, -37 .
Enter the search radius: 0.02 degrees degrees.

Expected Result

Actual Result

Done.

Step 16 Step Execution Status: **Pass**

Description

Execute the query.

Expected Result

The results of the catalog query should be displayed in the standard Portal Aspect "tri-view", with an overlay on the previously selected HiPS image. Note that the "coverage" image used (which should be visible in a separate tab inside the interface) is also a HiPS image. It should be the "gri color" image (which is why an above step suggested not using "gri color" for the selected image - so that they could be more clearly distinguished).

Actual Result

Verified. Overlays appear in the right place with regard to the images down to at least sub-arcsecond level, perhaps +/- 1-2 pixels. Difficult to verify beyond that level without generating some test images without PSFs and blending, over a wide area of sky.

Step 17 Step Execution Status: **Pass**

Description

Click the "logout" button at the upper right corner of the Portal screen.

Expected Result

Returned to the RSP home page at <https://data.lsst.cloud/>. When navigating to the portal endpoint, expect to execute the steps in LVV-T849.

Actual Result

Verified.

A Documentation

The verification process is defined in LSE-160. The use of Docsteady to format Jira information in various test and planing documents is described in DMTN-140 and practical commands are given in DMTN-178.

B Acronyms used in this document

Acronym	Description
ADQL	Astronomical Data Query Language
API	Application Programming Interface
CCD	Charge-Coupled Device
ComCam	The commissioning camera is a single-raft, 9-CCD camera that will be installed in LSST during commissioning, before the final camera is ready.
DC2	Data Challenge 2 (DESC)
DESC	Dark Energy Science Collaboration
DM	Data Management
DMS	Data Management Subsystem
DMTN	DM Technical Note
DPO	Data Preview 0
FITS	Flexible Image Transport System
HEASARC	NASA's Archive of Data on Energetic Phenomena
HSC	Hyper Suprime-Cam
IDF	Interim Data Facility
ISO	International Standards Organisation
IVOA	International Virtual-Observatory Alliance
LDM	LSST Data Management (Document Handle)
LSE	LSST Systems Engineering (Document Handle)
LSST	Legacy Survey of Space and Time (formerly Large Synoptic Survey Telescope)
LVV	LSST Verification and Validation
MB	MegaByte
MJD	Modified Julian Date (to be avoided; see also JD)
NCSA	National Center for Supercomputing Applications

NED	NASA/IPAC Extragalactic Database
PDF	Portable Document Format
PMCS	Project Management Controls System
PNG	Portable Network Graphics
PVI	Processed Visit Image
RA	Right Ascension
RMS	Root-Mean-Square
RSP	Rubin Science Platform
RTN	Rubin Technical Note
TAP	Table Access Protocol
UI	User Interface
URL	Universal Resource Locator
UTC	Coordinated Universal Time
UX	User Experience
WCS	World Coordinate System
XML	eXtensible Markup Language
deg	degree; unit of angle