

HiPS and MOC DMS-level requirements for LSE-61

These requirements would be contained under DMS-REQ-0329 (or might replace it).

DMS-REQ-x1:

Specification: Data Release Production shall include the production of an all-sky image map for the existing coadded image area in each filter band, and at least one pre-defined all-sky color image map, following the IVOA HiPS Recommendation.

Discussion: The maximum resolution of the image maps is TBD; however, it would be desirable for it to be at least close to the underlying coadded image resolution, in order not to give a poor impression of the data quality. It is possible that the highest-resolution HiPS tiles could be provided on-demand from the LSST cutout service. It is expected that the HiPS tiles will be generated by resampling the existing coadds, not by performing an independent coaddition. This requires work from Science Pipelines on resolving the ambiguities in overlap regions. Whether the lower-resolution levels of the HiPS tiles will be generated by existing community tools (i.e., `hipsgen`) or by LSST code is also TBD. The color map being "pre-defined" means that the choice of bands will be made by the LSST Project as part of the configuration of a Data Release. This does not preclude the Science Platform additionally providing means for interactive generation of other colorizations from the single-band HiPS maps.

By the terms of the HiPS Recommendation, a HiPS image map should include a corresponding MOC. This may or may not be the same as the MOCs for the survey envisioned under DMS-REQ-* elsewhere in this document, depending on choices made for data selection.

The Project should produce a technical note, during the construction era, detailing which of the optional components of the HiPS standard will be supported.

This requirement specifically calls for making HiPS maps from the standard coadds and therefore whatever policies are used for the inclusion of Special Programs data in the standard coadds will also automatically apply here. If there are both main-survey-depth and full-depth coadds for the deep drilling fields, then, it is a separate question as to whether HiPS maps will be generated for those fields.

DMS-REQ-x2:

Specification: The Data Management system shall include a secure and authenticated Internet endpoint for an IVOA-compliant HiPS service. This service shall be advertised via Registry as well as in the HiPS community mechanism operated by CDS, or whatever equivalent mechanism may exist in the LSST operations era.

Discussion: The DM HiPS service will be available only to data rights holders. LSST EPO will also operate a world-public HiPS service, but with its spatial resolution limited to approximately one arcsecond.

DMS-REQ-x3:

Specification: The HiPS maps produced by the Data Management system shall provide for straightforward linkage from the HiPS data to the underlying LSST coadded images. This SHOULD be implemented using a mechanism supported by both the LSST Science Platform and by community tools.

Discussion: It is intended that this be done using the "HiPS Progenitor" mechanism introduced at the May 2018 IVOA meeting, or an evolution of it that emerges from the IVOA standardization process.

DMS-REQ-x4:

Specification: The LSST Science Platform shall support the visualization of the LSST-generated HiPS image maps as well as other HiPS maps which satisfy the IVOA HiPS Recommendation, and shall provide integrated behavior, such as the overplotting of catalog entries, comparable to that provided for individual source images (e.g., PVLs and coadd tiles).

Discussion: Further details will be provided in the LSST Science Platform Requirements, LDM-554.

DMS-REQ-x5:

Specification: Data Release Production shall include the production of Multi-Order Coverage maps for the survey data, conformant with the IVOA MOC recommendation. A separate MOC shall be produced for each filter band for the main survey. Additional MOCs SHOULD be produced to represent special-programs datasets and other collections of on-sky data.

Discussion: It is likely to be useful to produce quite a large number of MOCs as part of releasing the data and documenting its quality. For example, it may be useful to produce both a MOC for *all* the data from a band and for only that part of the sky for which the SRD requirements in that band have been met. It also seems useful to produce MOCs for the deep drilling fields, etc. It may also be useful to produce MOCs on, for instance, a nightly basis, reflecting that part of the sky for which coverage was obtained in that night. The LSST project should engage in the work begun in 2018 on the development of standards and tools for *spatiotemporal* MOCs.

The tile resolution chosen for these MOCs should be fine enough to represent the dither pattern of the survey as well as the shape of the focal plane. Some testing should be done to determine a suitable scale.

The Project should produce a technical note, during the construction era, detailing the specific plans for creation of MOCs.

DMS-REQ-x6:

Specification: The Data Management system shall provide a means for exporting the LSST-generated MOCs in the FITS serialization form defined in the IVOA MOC Recommendation.

Discussion: The external endpoint for this should be designed to be conformant with relevant community practice and any IVOA standards that may emerge in this area.

DMS-REQ-x7:

Specification: The LSST Science Platform shall support the visualization of the LSST-generated MOCs as well as other MOCs which satisfy the IVOA MOC Recommendation.

Discussion: We are considering the provision of services which allow computations based on MOCs, e.g., the use of a MOC from another mission or survey to define a query on the LSST data, but this is not ready for codification at this time.

Changes to existing requirements:

DMS-REQ-0326's Discussion should be amended to say: "This parametrization could be in formats such as MOC, Mangle polygons or STC regions. Note that, under requirements DMS-REQ-x5 and DMS-REQ-x1, MOCs for the survey coverage as a simple Boolean map are required to be generated; the present requirement covers map providing additional information as a function of sky position."