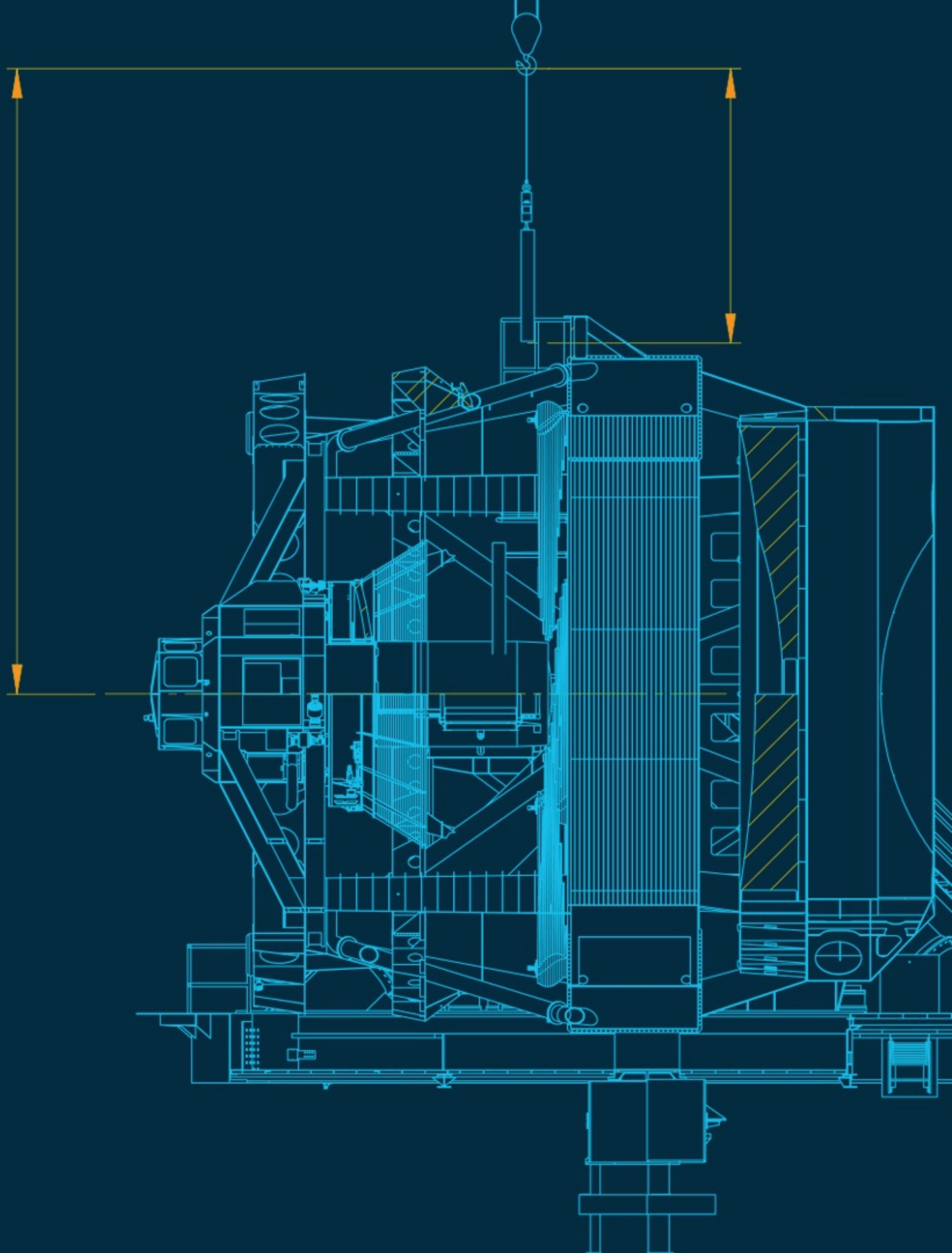
Alert Production

September 2020

Rubin Observatory

LSST

Legacy Survey of Space and Time



Review of recent progress

- **Overall status**
  - The AP team has made good progress over the last several months, and several significant developments are reported below.
  - However, we are also facing significant challenges to team morale and productivity. These obviously focus on the ongoing Covid-19 pandemic, but various team members have also been impacted by:
    - Severe family health problems;
    - Disruption due to public school closures;
    - Smoke inhalation and (in some cases) more immediate damage from forest fires;
    - Parental leave (not all disruptions are bad!);
    - Changes to group leadership;
    - Uncertainty over immigration issues;
    - Generalized angst from several months spent in (near) isolation;
    - etc etc etc.
  - Leadership (both local and subsystem-wide) should be aware of these issues and make plans appropriately.

Review of recent progress

- **Gen 3 porting**
    - This is broadly complete: we are now capable of running the ap_verify test suite, demonstrating “end-to-end” AP pipeline processing, with Gen 3 middleware.
    - This includes process HSC data in CI using Gen 3.
    - Work is ongoing on minor “clean-up” issues and enhancements.
- **Fake Object insertion**
    - Earlier proof-of-concept code for adding fakes to AP pipeline runs has been “productized” and is now available as `CreateRandomApFakesTask` for use in pipeline processing.
    - (Work ongoing to integrate with CI and produce analysis code.)

Review of recent progress

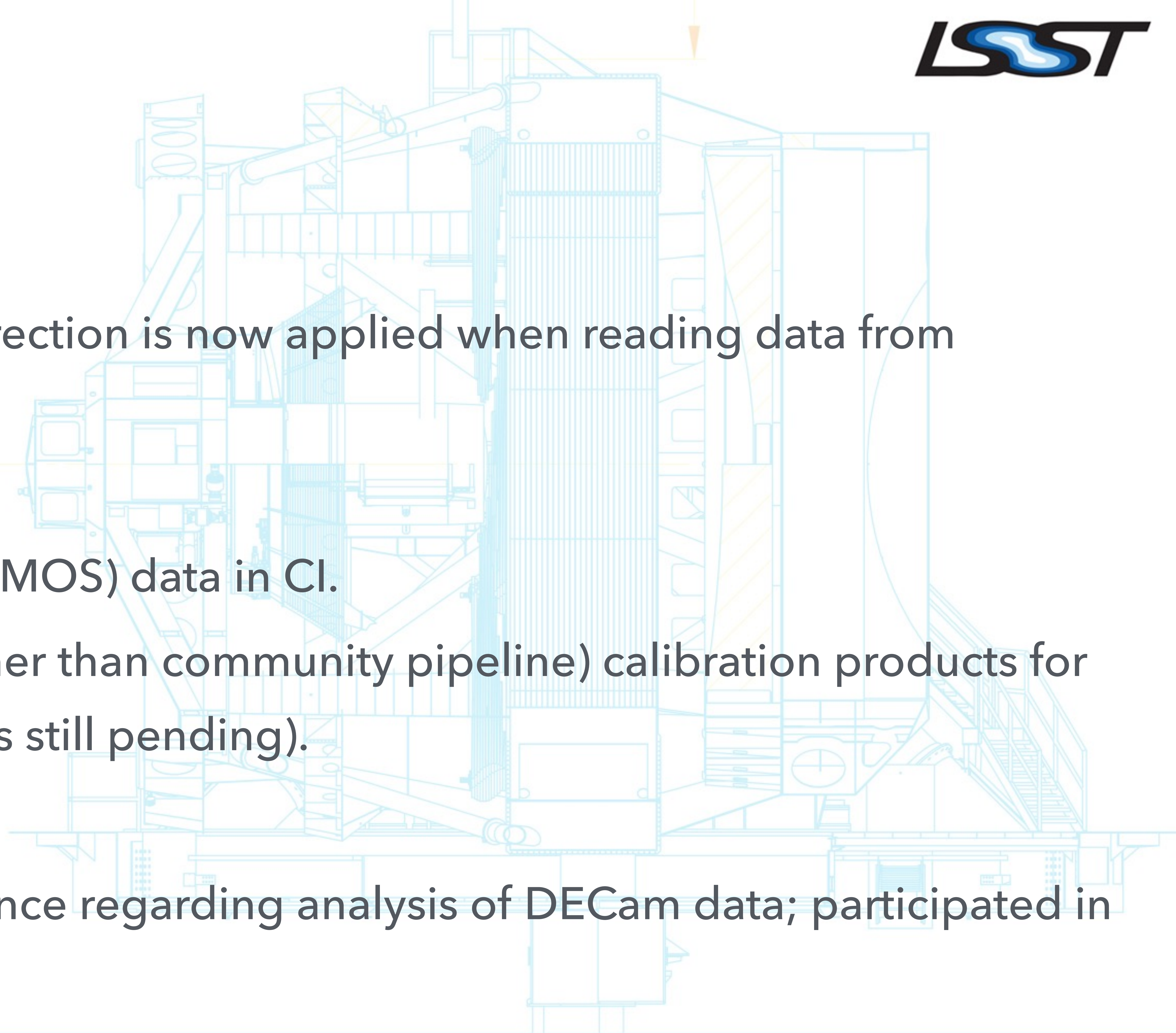
- **Alert Generation**
  - Avro-format alert packets can now be generated as part of regular pipeline execution.
  - This includes cut-out images, serialized using Astropy's CCDData (rather than a Rubin-specific type, like `afw::Exposure`; we do not yet include a PSF) .
- **Alert Distribution**
  - Sample alert data, and the Alert Stream Simulator (DMTN-149), were distributed to the community.
  - A new concept for “lightweight alerts” was sketched and presented to the community at the PCW; initial response was positive, so further design work is merited.

Alert Production F20B

Review of recent progress

- **Image Differencing**
  - Reworked ZOGY image differencing code, resolving bugs; initial implementation merged, but this effort is still a work in progress.
- **Solar System Processing**
  - Ongoing work on solar system object association pipeline.
    - “Nearly done”, but not quite ready!
  - Synthetic solar system object catalog constructed, and made available to SSSC.
  - LCR-2376 (new solar system processing scheme) has effectively passed the project CCB (in “approval pending” state).

Review of recent progress



- **Jointcal**
  - Proper motion and parallax correction is now applied when reading data from reference catalogs.
- **Data Analysis**
  - Regularly processing HSC (COSMOS) data in CI.
  - Generated stack produced (rather than community pipeline) calibration products for DECam (comparison of results is still pending).
- **Satellite Constellations**
  - Supported work by Project Science regarding analysis of DECam data; participated in SATCON-1.

Plans for the F20B cycle

- **Pipeline Infrastructure**
  - Finish remaining Gen3 clean-up tickets, including tools for management of APDB.
  - Support databases other than SQLite in ap_verify processing for scalability.
  - Start work on profiling and understanding code performance with a view to latency targets.
  - Continue work on updating documentation to Numpydoc standards.
- **Image Differencing**
  - Complete ongoing ZOGY reimplementation.
  - Work with Robert L. to develop a more complete understanding of the mathematical background for image differencing, and use that to drive future development.

Plans for the F20B cycle

- **Fake Source Insertion**
  - Regularly run end-to-end AP pipelines with fake sources inserted in CI.
  - Provide tools for analyzing results, including posting to SQuaSH.
- **Astrometry**
  - Start using the new fitter (`FitAffineWcsTask`) which was developed in summer 2019, and provide an assessment of the results obtained.
- **Jointcal**
  - Apply proper motions & parallaxes to matched sources (as well as refcats).
  - Generated distortion models for use with the new astrometric fitter (above).
  - Gen 3 porting.

Plans for the F20B cycle

- **afw::Filter Redesign**
  - Implement a system which avoids the infamous singleton, thereby making Tim happy.
- **Crowded Fields**
  - Characterize and improve the performance of existing pipelines in crowded fields.
  - Analysis of DECam bulge and HSC New Horizons data is ongoing.
  - Should result in a report to the Project Scientist (Zeljko) by the end of the year.
- **Data Analysis**
  - Regular analysis of processing of DECam and HSC data through AP pipelines, including identifying issues, tracking them down, and resolving them. Where appropriate, integrating analysis of new datasets, and ultimately working with the Data Facility to automate processing.

Plans for the F20B cycle

- **Infrastructure for Real/Bogus**
  - Develop tooling which can be used as part of training a real-bogus classifier.
  - This is, extracting cutouts corresponding to DIASources, packaging, displaying them to a user, etc; this is not actually building the classifier itself.
  - Potential for overlap with the EPO team.

Calibration Products Production

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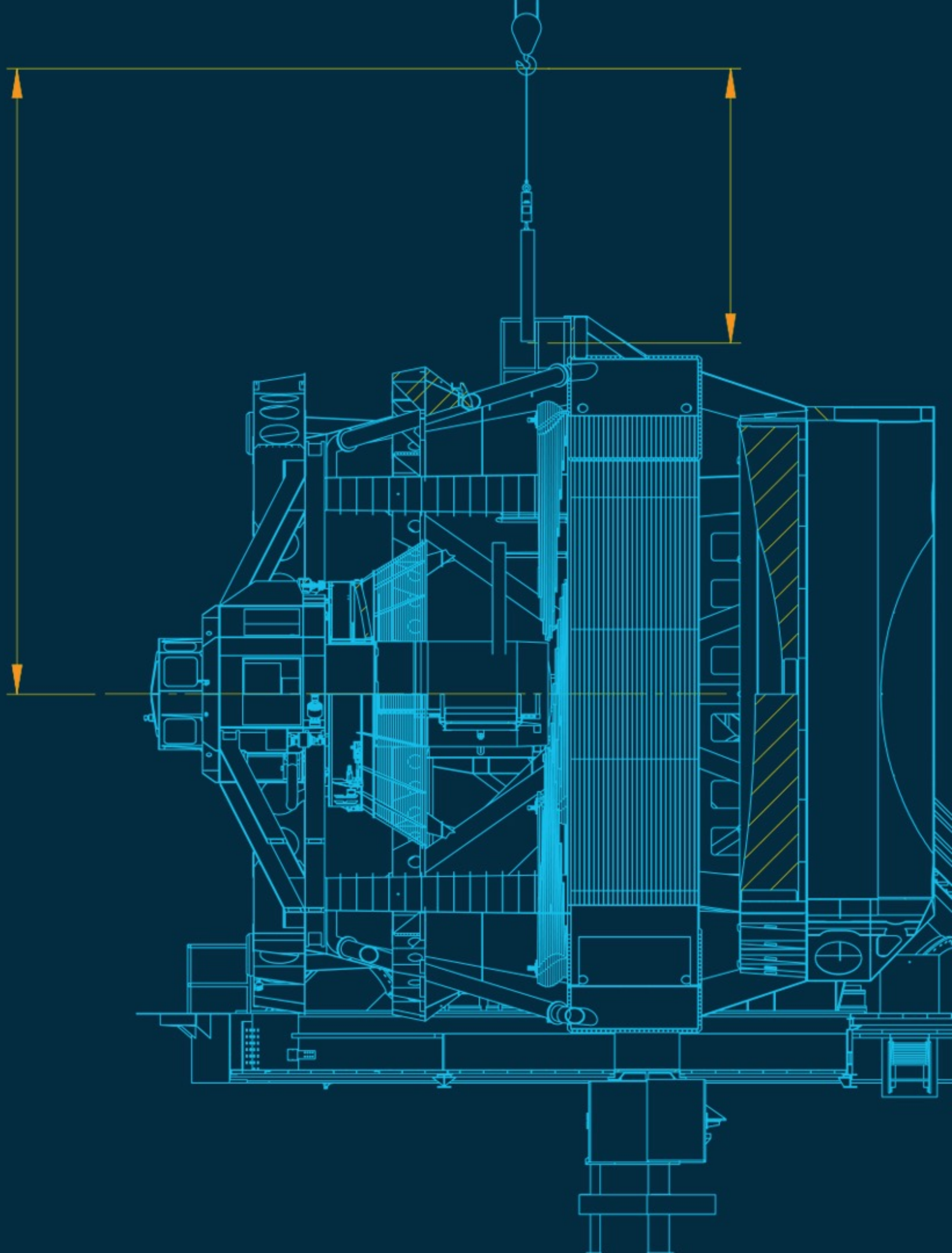

Calibration Products Production F20B

Current activities

- **AuxTel Processing**
  - Shepherding data taken with AuxTel earlier this year through prototype DM pipelines.
  - This requires specializing existing pipelines to work with the AuxTel data, and further integration of the “Spectractor” package.
- **Calibration Products Pipeline Infrastructure**
  - Development of the ci_cpp package.
  - Gen 3 conversion.
  - Validation/certification system for calibration products (RFC-726).

Calibration Products Production F20B

Current activities

- **Detector effects**
    - Working on running all calibration product generation code that has been generated by the Camera Team on DM systems at NCSA, with the aim of comparing results generated by their code with DM implementations (where available), updating the latter as appropriate.