



Discussion

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Focal plane commissioning workshop
LAPP, 27-29 March 2024



U.S. DEPARTMENT OF
ENERGY

SLAC



Discussion

- Global view and organization of LSST France commissioning activities
 - Identify possible contributions and available workforce
 - Try to define priorities between project needs, our own need, our wishes and availability
 - Integration to the project through participation to Science Units
- Strategy
 - EOTest data, Ops-Rehearsal, ComCam, LSSTCam first light...

Science Units structured to bring together expertise from across the Project

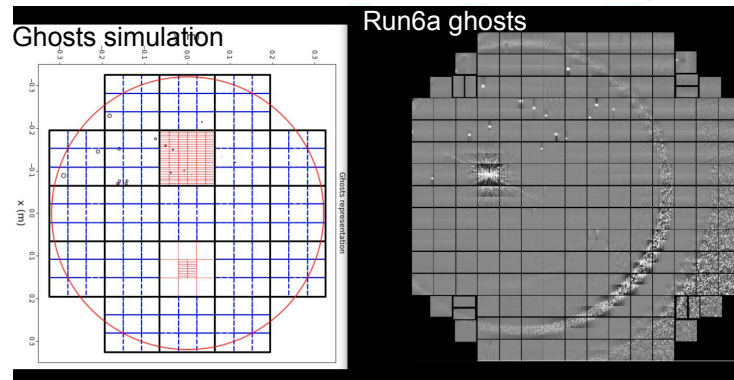
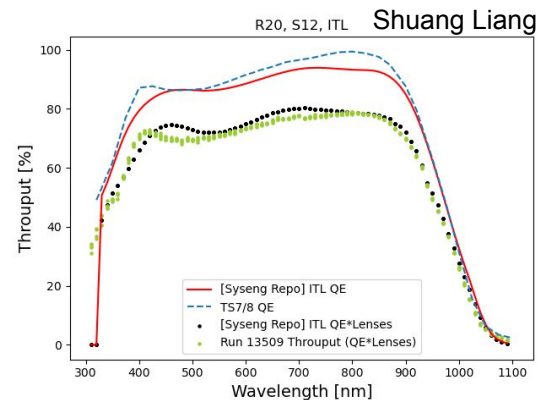
- **Throughput for focused light** – Elana Urbach
 - **Delivered image quality and PSF modeling** – Josh Meyers
 - **Instrument signature removal / detector characterization** – Chris Waters and Yousuke Utsumi
 - **Sky background / low surface brightness / ghosts and scattered light** – Lee Kelvin
 - **Photometric calibration** – Jeff Carlin
 - **Astrometric calibration / proper motions** – Clare Saunders
 - **Survey performance / survey strategy optimization** – Lynne Jones and Leanne Guy
 - **Object detection, quality flags, V&V sample production, survey property maps** – Peter Ferguson
 - **Difference image analysis – transient and variable objects** – Eric Bellm
 - **Difference image analysis – Solar System objects** – Mario Juric
 - **Galaxy photometry / photo-z** – Dan Taranu and Melissa Graham
 - **Weak lensing shear** – Arun Kannawadi
 - **Crowded stellar fields** – Ian Sullivan
 - **Eyeball squad / beautiful images** – Lauren MacArthur and Clare Higgs
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- [Keith@JTM 2024](#)
 - [Keith@DESC meeting 2024](#)

Commissioning topics

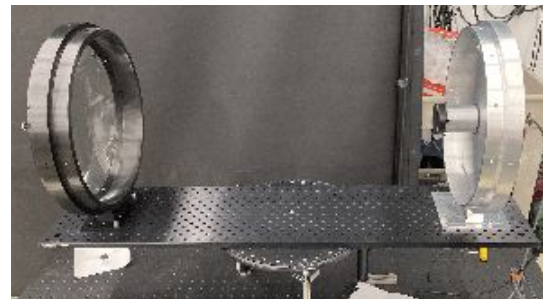
- CCOB, ghosts and low surface brightness objects
- CBP
- AuxTel
- Deblending
- Clusters
- Supernovæ
- Alerts generation and processing by brokers

CCOB from focal plane to on-sky images

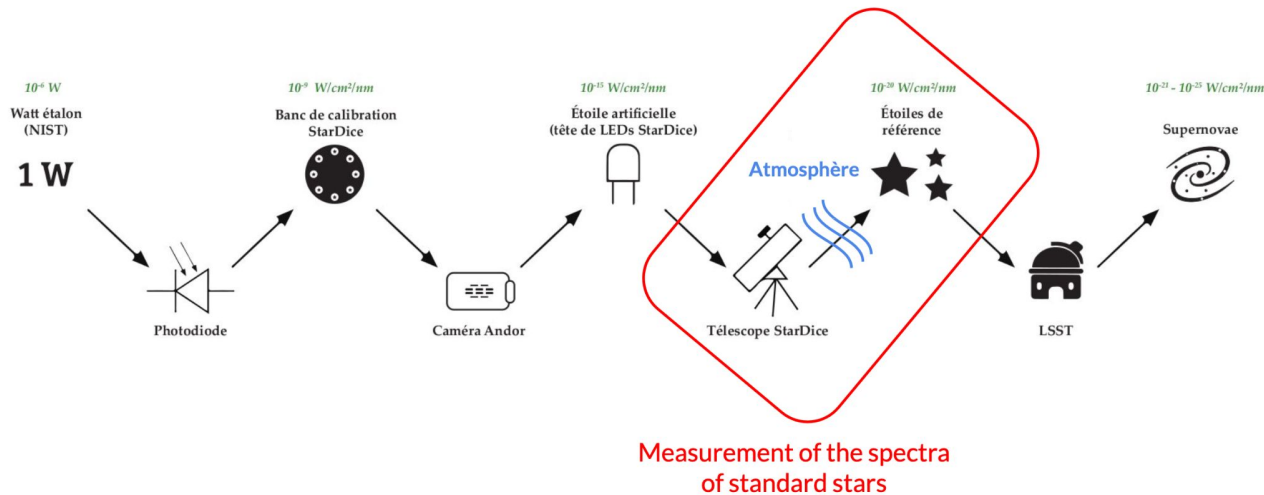
- CCOB thin beam **data** on focal plane (Run6)
 - Pupil throughput, CCD Quantum Efficiency, filter transmission - *SLAC*
 - Optics alignment - *Johan*
 - Cross-talk, persistence, ...
- On-sky data through Science Units
 - Sky background / low surface brightness / ghosts - *Johan*
 - Throughput for focused light ?



- Goals for summer 2024:
 - get amplifier response and filter for ComCam calibration, at mean position on the primary mirror
 - monochromatic parallel light flats
- Current status:
 - All systems integrated
 - 5 masks selected for ComCam commissioning
 - Analysis code ported from LPNHE CBP to Rubin CBP
- Shipment to Chile in May. To do before shipment:
 - Validation of the Calibration Unit (get rid of chromatic effects from lens)
 - Validation of all Project requirements
- First CBP light in lab in May/June, first CBP light in ComCam in July/August



Goal: provide reference stars anchored on instrumental calibration (NIST standard)

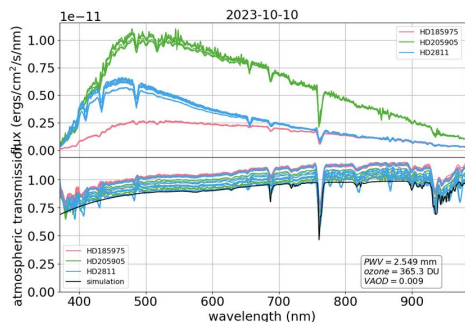


Side products:

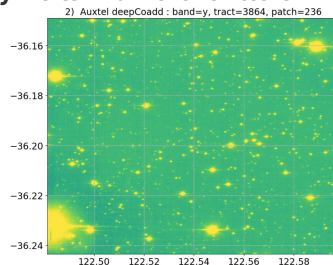
- calibration of Project photodiodes that will be equipped the dome
- Test bench for travelling CBP being built for Auctel

Commissioning linked to the main telescope operations

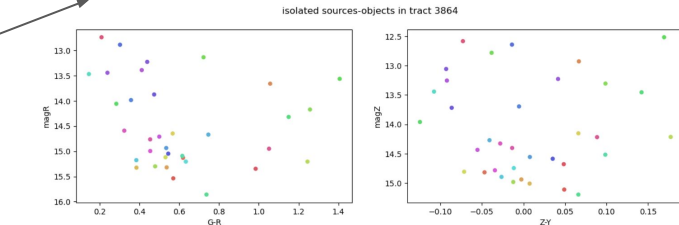
Spectroscopy : (atmospheric transmission + atmospheric parameters data product)



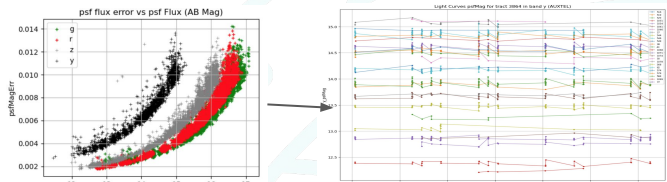
Photometry on fields with many visits in different filters



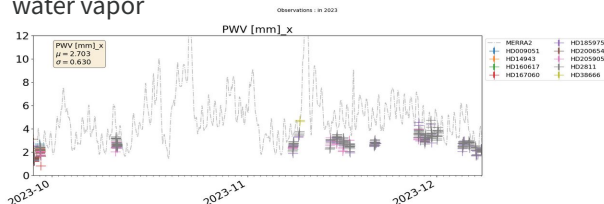
Isolated bright objects with multiple sources



Reconstruct sources light-curves from selected objects after applying color correction from atmospheric conditions



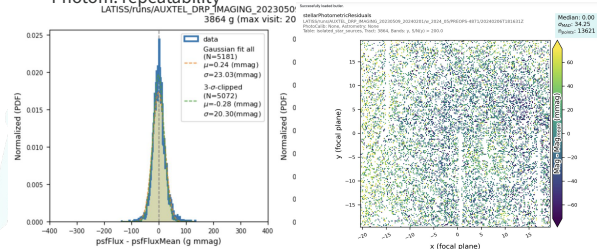
Atmospheric parameters ex. Precipitable water vapor



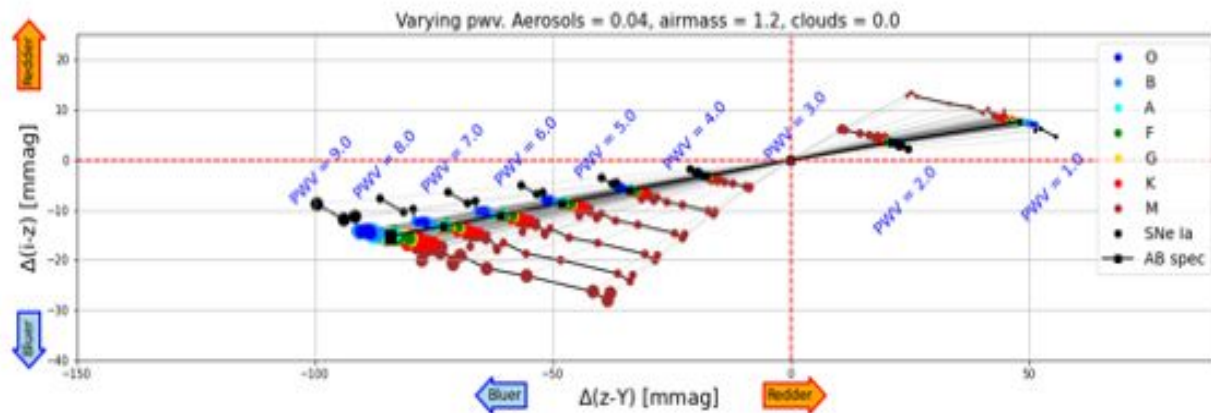
+ Aerosols

Study photometric repeatability, uniformity on focal plane:
Performances metrics & plots

Photom. repeatability

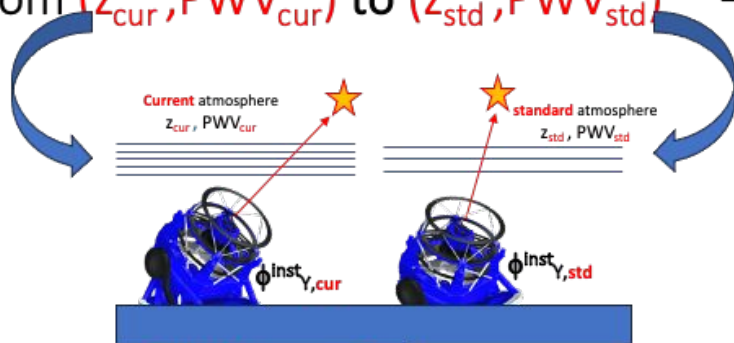


Mettre au point les procédures de compensation atmosphérique



Water Vapor impacts the colors of objects depending on their intrinsic color
 -> SN very different than M stars
 -> If we know PWV and the type of the object, we can go back to standard atmospheric conditions (airmass=1.2, PWV=3)

Photometry atmospheric compensation: 3 ingredients to go from $(z_{\text{cur}}, \text{PWV}_{\text{cur}})$ to $(z_{\text{std}}, \text{PWV}_{\text{std}})$ – case of passband Y



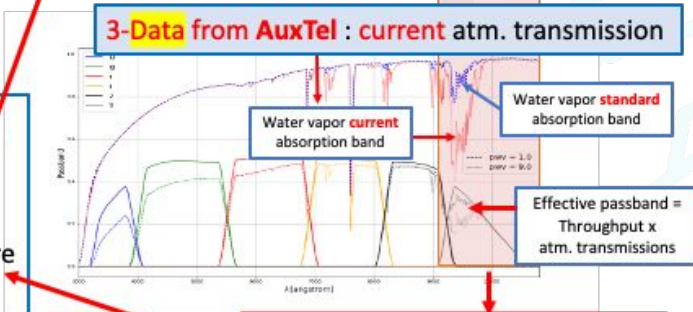
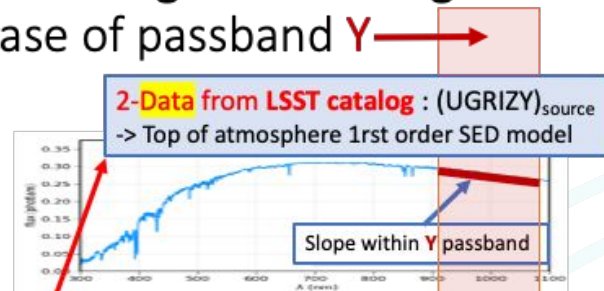
1-Data: LSST current image in Y

For each source on the LSST image

- Extract current **LSST instrumental flux** $\phi_{\text{inst}, Y, \text{cur}}$.
- Consult **LSST catalog** to interpolate its spectrum within passband Y
- Compute $\Phi_{Y, \text{std}}^{\text{pred}}$ **predicted flux** in LSST-Y with **standard atmosphere** and $\Phi_{Y, \text{cur}}^{\text{pred}}$ **predicted flux** in LSST-Y with **current atmosphere**

Flux back to the standard atmosphere is then:

$$\phi_{\text{inst}, Y, \text{std}} = \phi_{\text{inst}, Y, \text{cur}} \times (\Phi_{Y, \text{std}}^{\text{pred}} / \Phi_{Y, \text{cur}}^{\text{pred}})$$



Integrate instrumental fluxes through **standard and current atmospheres**

- Part of Science Unit “Weak lensing shear”
 - Requirements
 - LSR-REQ-0043: Data Products for Dark Energy/Matter Science
 - OSS-REQ-0155: Object Blending
 - OSS-REQ-0161: Deep Detection and Measurement Quality
 - Contributions
 - US/Chile-05: Matthew Becker
 - FRA-INP-S9: Cyrille Doux : *“The team will carry out remote data analysis, to probe the Rubin system’s image quality, deblending, and shape measurement efficiency.”*
 - US/Chile-16: Anja von der Linden
 - Not very active yet (last meeting a year ago), though some work on image sims for shear
- My two cents
 - Shape measurement: if CC-IN2P3 can offer resources, then participating to the image sims campaign(s) and test runs of metadetector during commissioning would be great
 - Deblending: though perhaps not necessary for mdet (image sims are needed to prove it), the deblender is likely needed for other measurements, and we could use synthetic source injection (SSI) to evaluate the performance of the LSST deblender (scarlet-lite).

From Anja von der Linden's [presentation](#) at the DESC meeting

- “Clusters” goals: test **detection / deblending, photometry / photo-z’s, shear estimation, sky subtraction** in cluster fields
- On Project Side, (science) commissioning is organized into the **SITCom Science Units**
- Any Commissioning Team member can join any Science Unit
- Clusters LOI does not map 1-1 to a single SU. Nominally, associated with “**Galaxy Photometry / Photo-z**”. Other SUs of interest: “PSF”, “LSB”, “Object Detection”, “Shear”, “Image Inspection” (see [Monday parallel session](#))

“French” strategy on the Cluster commissioning is tbd.

My personal opinion : Try to align with other science interests to gain more momentum?

- Participation to the Science Unit: Difference image analysis – transient and variable objects,
 - lead E. Bellm, contribution DESC coordinated by M. Wood-Vasey
 - CPPM involved in testing the Real vs Bogus pipeline.
- Potential interest in photometric calibration TBD

Alert generation and processing (brokers)

Two axes for Fink (2024 Q3+)

- Finalize the deployment of Fink @ CC-IN2P3
 - Already in good shape, some services missing to be fully operational
 - Need to understand how to connect Fink with the other data products at CC (e.g. catalogs)
- Upgrade of classifiers with LSST data
 - Bootstrapping from the ELASTICC challenge
 - LSST alert schema is still evolving
 - The project has not sent a roadmap for alerts during commissioning → not sure what will happen in 2024.
 - Communication between brokers and project is low currently.

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