StarDICE progress report

StarDICE collaboration @ LSST France

Reminder : Experiment

Goal : Flux calibration of the survey - potential alternative to WD. (SRM PC6)

Hamamatsu S2281

Detector

Source

NIST calibrated photodiode

convenient and stable light source

DICE: 24 LEDs from near UV to near IR

Telescope (small aperture) + camera

Astronomical standards

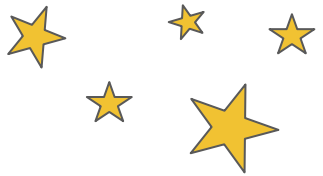
Hayes experiment (setup 10x more stable and smaller distance)

Site: OHP (atmospheric data available, simple logistics)

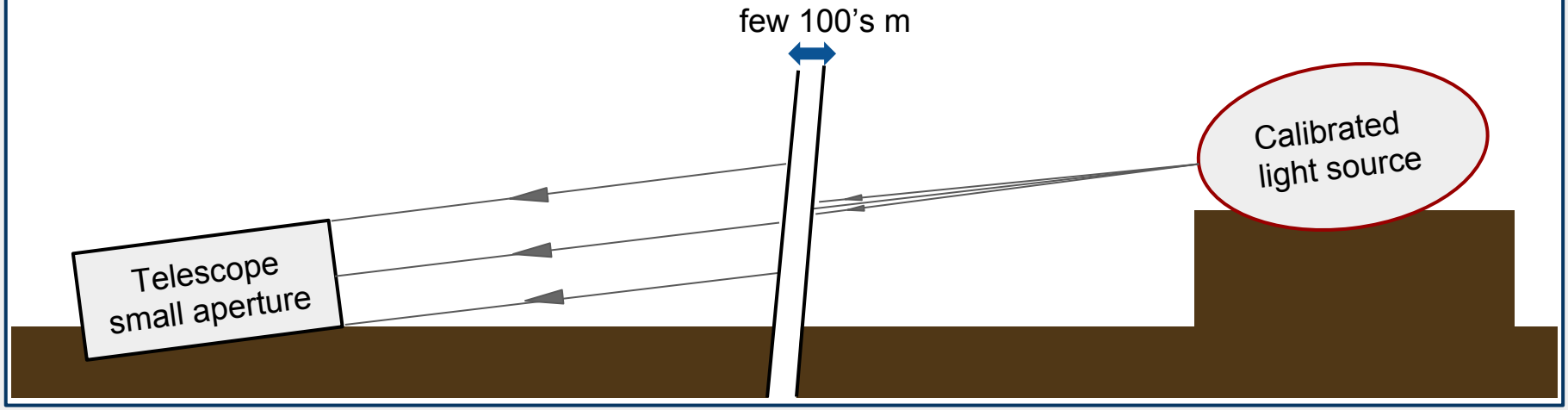
Specificity: Science and calibration beams very similar

Reminder : Experiment

Goal: broadband flux calibration transfert at **0.1%**

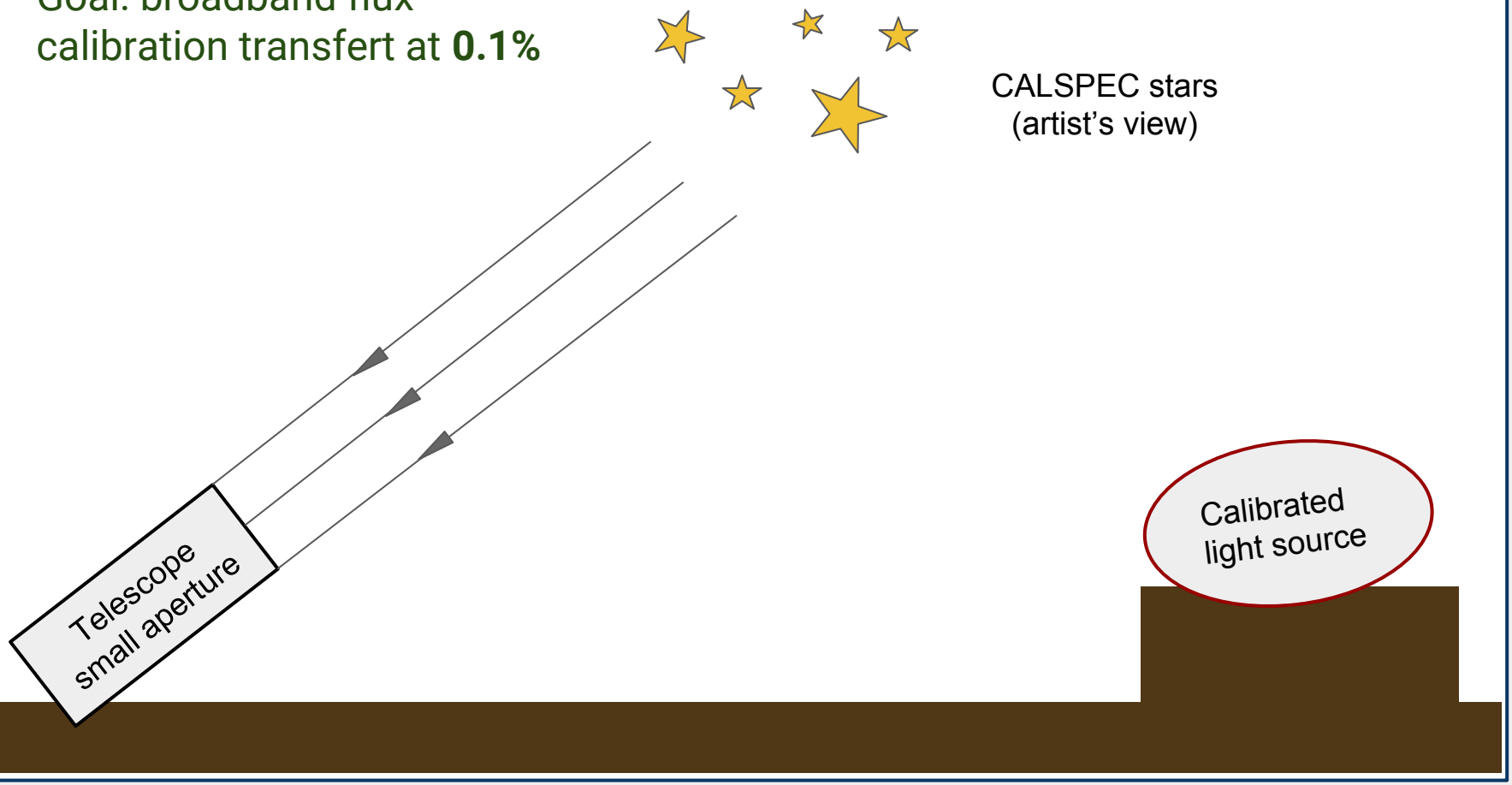


CALSPEC stars
(artist's view)



Reminder : Experiment

Goal: broadband flux calibration transfert at **0.1%**

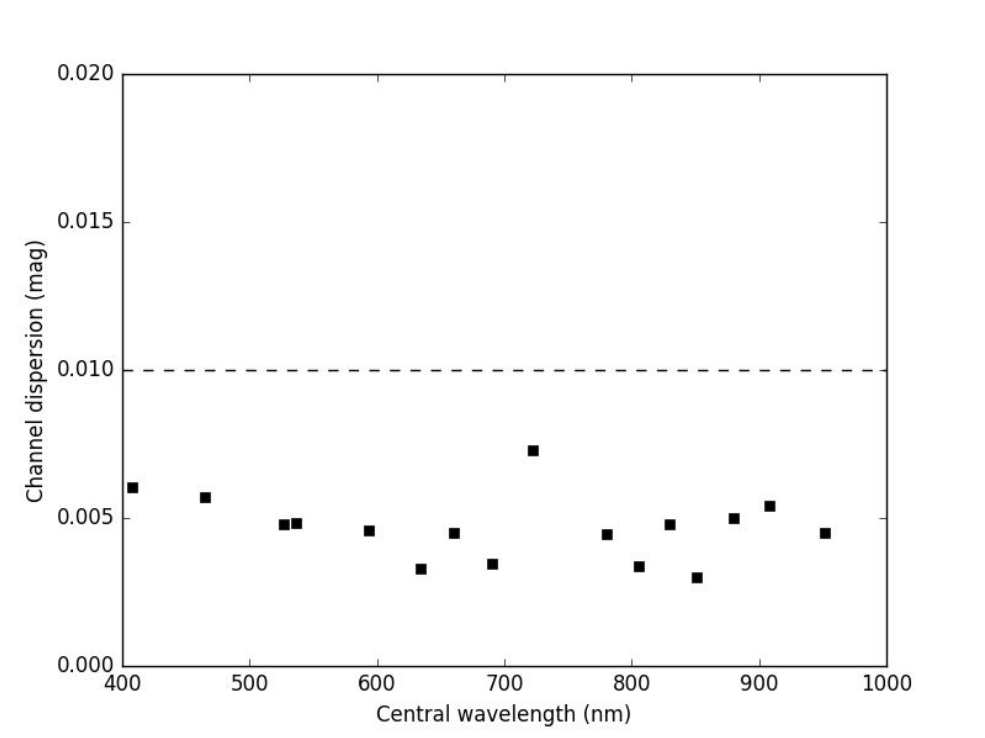


Setup @ OHP

Data taken over six months @ OHP

- **Goal** : reach the %
- CALSPEC :
  - 2260 astrometry confirmed CALSPECs
- LEDs :
  - 1320 exposures over 12 nights with Filter (+ LEDOFF exposures)
  - 59 exposures without Filter (open transmission)
  - 15 exposures with GRISM
  - 16 stable LEDs (< 1%), 4 noisy (including 3 very faint)
- Dark exposures : 383
- Twilight : 851

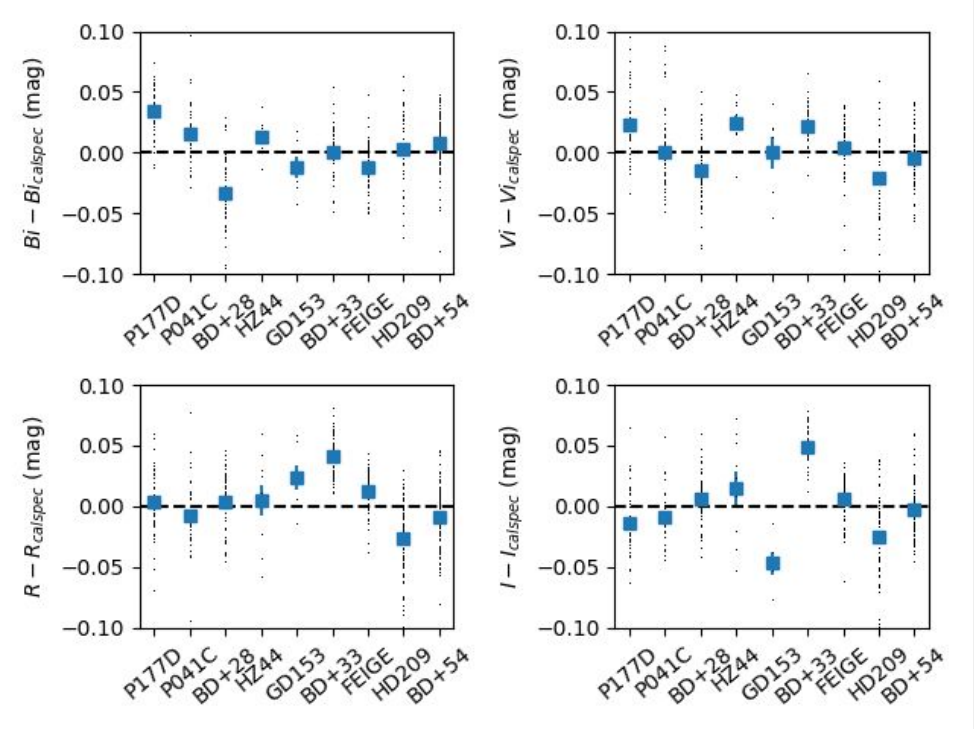
First results on the LEDs



- Repeatability of LEDs measurements between 3 and 7 mmag (photon noise at ~3mmag)
- Could reach the mmag level with 25 measurements/channel/night
- → 1 hour per night with realistic overheads.

First results on the CALSPEC observations

- 9 CALSPECs/7 nights
- Average determination of the airmass term at ~2%
- Dispersion of individual measurements ~3%
- Dispersion of stars < 2% in all channels
- Could get to 1% by averaging all data
- Detailed analysis ongoing



Problems in July

During the May-June break of observations : fall of the protection cover of the LED head.

Contamination of the LED head by hornets nests:

- 4 channels obstructed
- Temperature monitoring lost

Observation week completed and calibration source brought back to the bench at LPNHE for cleaning, examination and calibration

Problems in the analysis

We realized some on-site data were missing for the % analysis.

- Hornet nests seem to have impacted the july flux
- July LEDs temperature monitoring broken
- → July LEDs data lost
- Analysis performed using LEDs spectrophotometric models computed after the LED head cleaning
- Photometric response map obtained using twilight images as flatfields
- → Response to punctual sources unknown
- More statistics for the stars would be great.

We decided to go back to OHP to get missing data.

Back to OHP 2 weeks ago

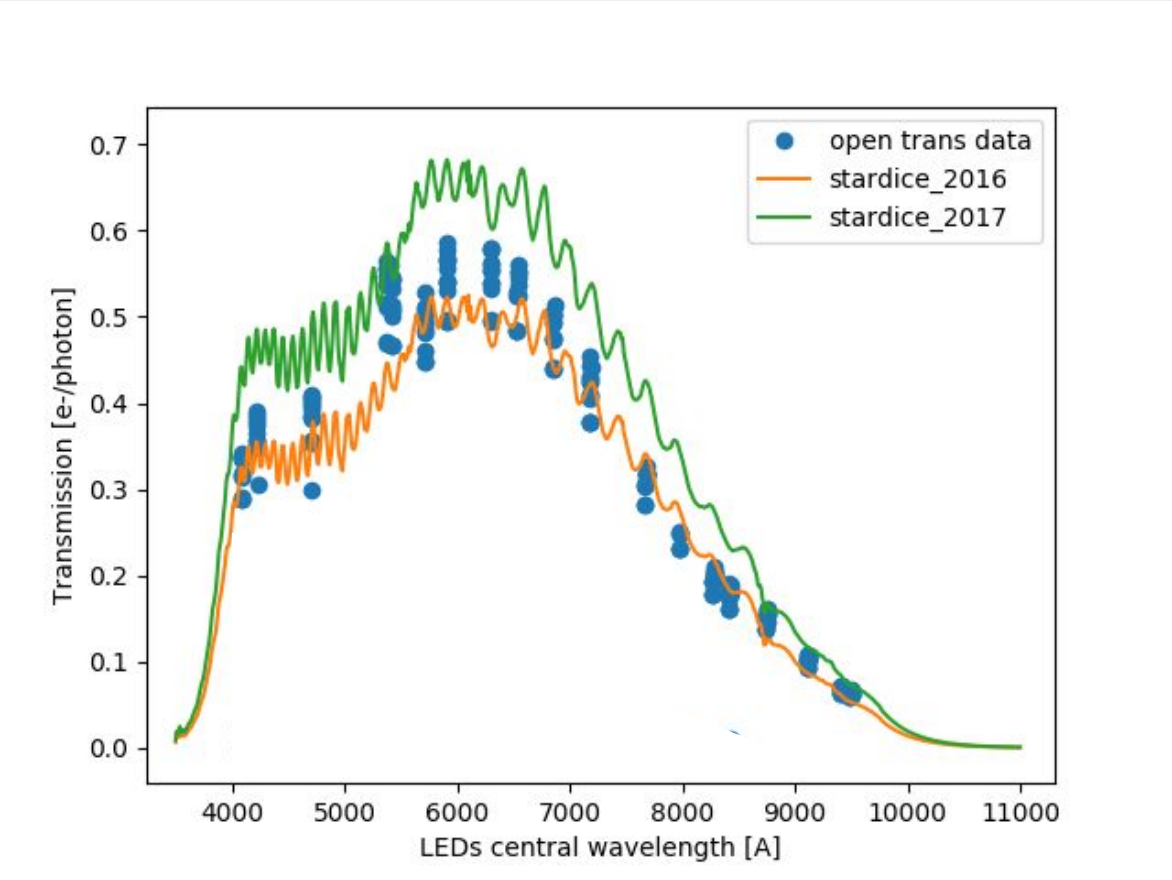
One excellent night and 3 observable (some high altitude clouds).

- ~ 1k5 CALSPEC images (G191B2B : primary standard) including:
  - photometric grids to study the response of the detector
  - series of images of G191B2B for the science
- ~ 1k5 LEDs images with precise temperature monitoring including:
  - LEDs with associated filters
  - Open transmission data
- Twilight images each night to compute flatfields in each filter

Currently performing the analysis of those data.

Preliminary results

Site vs model open transmission comparison:



Ongoing effort

- Preparing the Proof of Concept paper, with a complete calibration transfert at the % level, release estimated by 2018's end including:
  - Bench characterization of the instrument transmission (Camera QE + Filters + Gain)
  - Description of the raw data reduction
  - Details of the analysis
- R&D on the new low flux source being build at CPPM
  - That will be put on top of a mast at OHP
  - Simpler electronics, to go below 0.1% in stability
- Refurbishing of the old telescope mount + buying a new tube