

# Introduction & Point sur les meetings à SLAC & Boston

N. Regnault

(LPNHE, Paris)

# PCWG

- Photometric Corrections Working Group
  - Interface between LSST Project (in charge of delivering the survey calibration) and DESC (end users)
- PCWG Home
  - Agenda & Tasks
  - [lsst-desc-calib@slac.stanford.edu](mailto:lsst-desc-calib@slac.stanford.edu) → inscrivez-vous !
- Telecons:
  - ~ once a month, on Thursdays 5pm (France)
- Recent meetings
  - Feb. 2017: Boston (DESC + project)
  - Mar. 2017: DESC collab week (SLAC)

# Roadmap

— Low hanging fruits  
— Challenging but critical

PC1

Required precision

LPNHE, LAL, ..  
SLAC, Harvard, UW....

PC2

Galactic extinction

SLAC, ...

PC3

Instrument Model

SLAC, Brookhaven, ...

PC4

Survey Uniformity

CPPM, LPNHE, ...  
SLAC, UW, Princeton, ...

PC5

Atmospheric  
extinction

LAL..  
SLAC, Harvard, ....

PC6

Physical  
Flux Calibration

LPNHE, LUPM, CPPM, ...  
Harvard, ...

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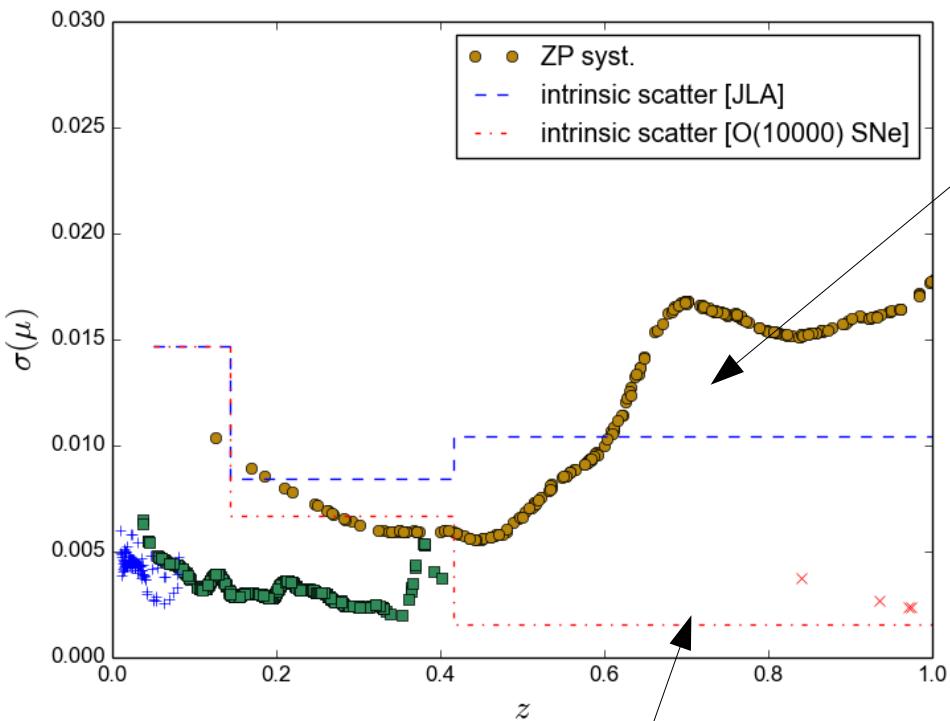
Physical  
Flux Calibration

LPNHE, LUPM, CPPM, ...  
Harvard, ...

# PC1 : “required precision”

- DESC version of LSST calibration requirements
  - important for LSS (via photo-z) : uniformity
  - crucial for SNIa science (flux calibration)
- X-project with SNWG
  - Estimate, for a “LSST-like SNIa survey”
    - the sensitivity of the SN luminosity distances to
      - zero-points
      - filter positions / fronts
    - (including the training of the SN light curve fitter (e.g. SALT))
    - impact of calibration uncertainties on cosmology

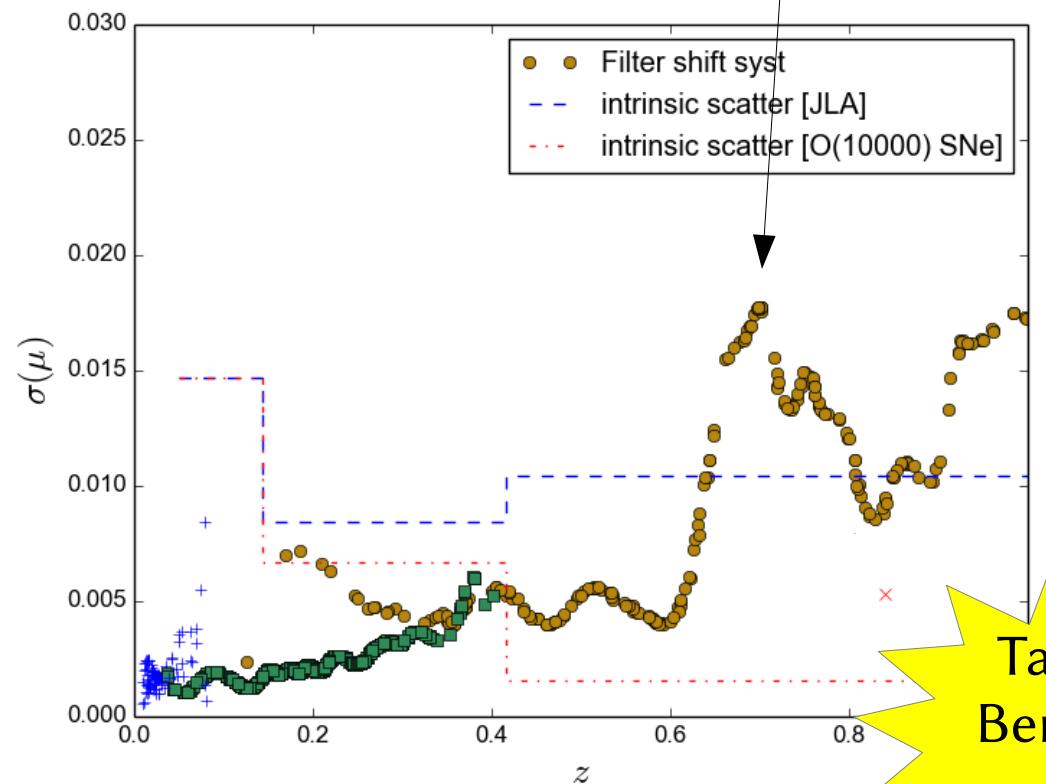
# As an illustration



Level of statistical  
uncertainties expected  
with  $O(10^4)$  SNe

JLA : propagation  
of MegaCam ZP uncertainties  
(5 mmag)

JLA : propagation  
of filter position uncertainties  
(1 nm, uncorrelated)



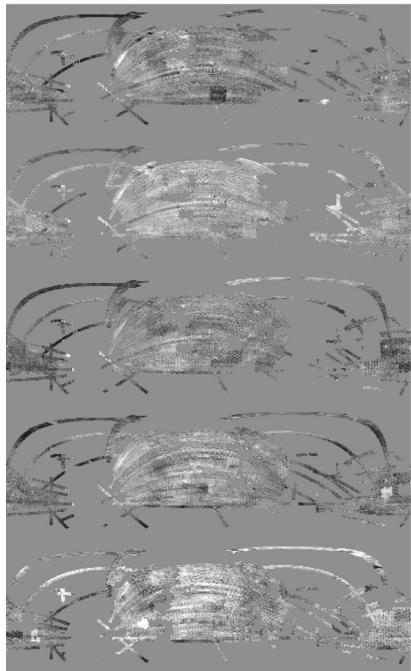
Talk  
Benoit

# PC1 : “required precision”

- Goal
  - Same analysis on a realistic LSST SN survey
  - Integrated with Metric Framework
- Project presented at Oxford (PCWG, SNWG)
  - Clermont (cadence / realistic survey Simulation)
  - LPNHE (SN simulation, FoM)

# PC4 : survey uniformity

- Méthodes à la “Ubercal”
  - Utiliser redondance → déterminer
    - magnitudes
    - paramètres de calibration
- GAIA comme catalogue externe
  - Spectro basse résolution
  - Uniformité  $\sim 0.1\%$
  - Implications → cadence

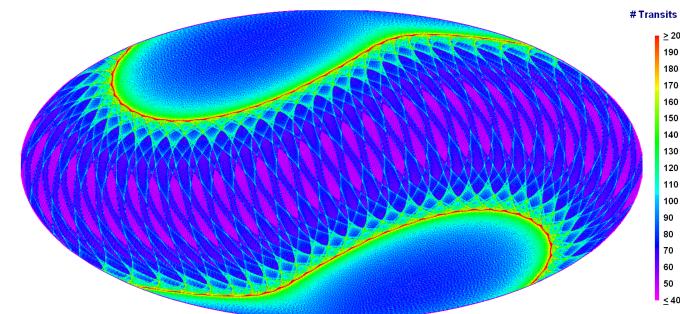


SDSS vs. PanSTARRS  
(Schlafly et al, 2013)

$\sim 1\%$

mais

certains modes  
mal contraints



$\sim 0.1\%$  probable  
(à démontrer)

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# PC4: survey uniformity

- Marseille group working on a Ubcral simulation:
  - Given a simulated survey:

$$m_i = m(\text{ra}, \text{dec}) + \delta zp(t, \text{ra}, \text{dec}) + \text{constraints}$$

Measurements  $O(10^8)$

Parameters  $(O(10^6))$

Parameters  $(O(10^4))$

- Build the Fisher matrix of the model above
- extract the dominant error modes on the sky (i.e. diagonalize the zp matrix)
- Compare with what GAIA expects

Talk  
Fabrice

# PC4: survey simulation

- Since the last SLAC meeting:
  - PCWG now in charge of discussions with GAIA
  - on behalf of the Project
- Roadmap
  - Push analysis presented above (modes of Ubcral)
  - Re-engage GAIA (our previous correspondants + Heidelberg)
  - Goal : obtain expected dominant modes from GAIA, or the information to estimate them.
  - Report at next DESC meeting (July)

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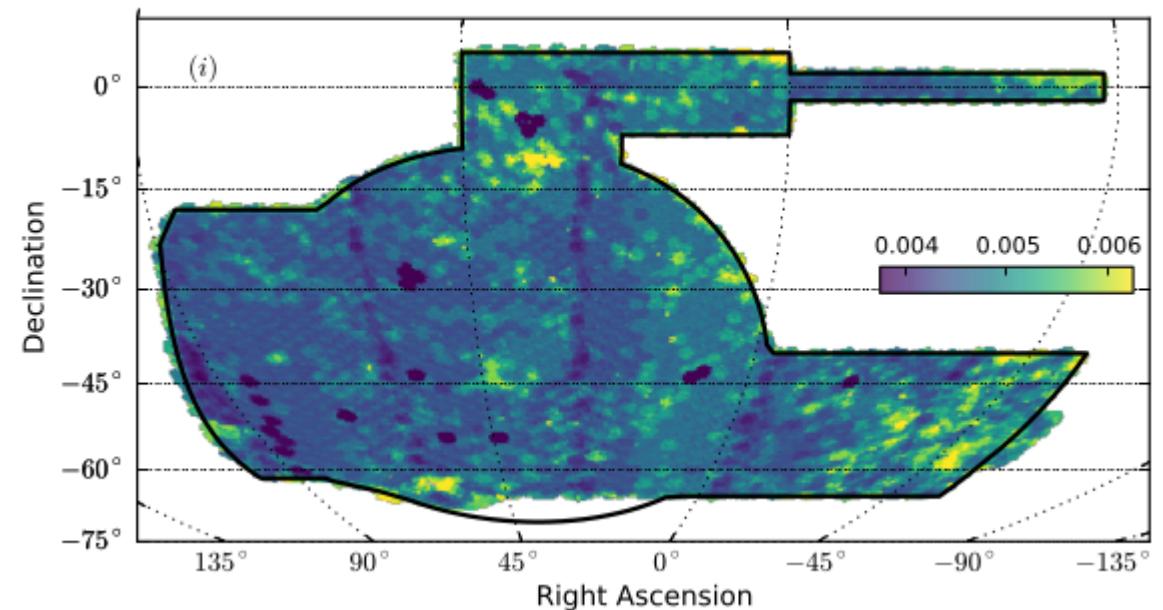
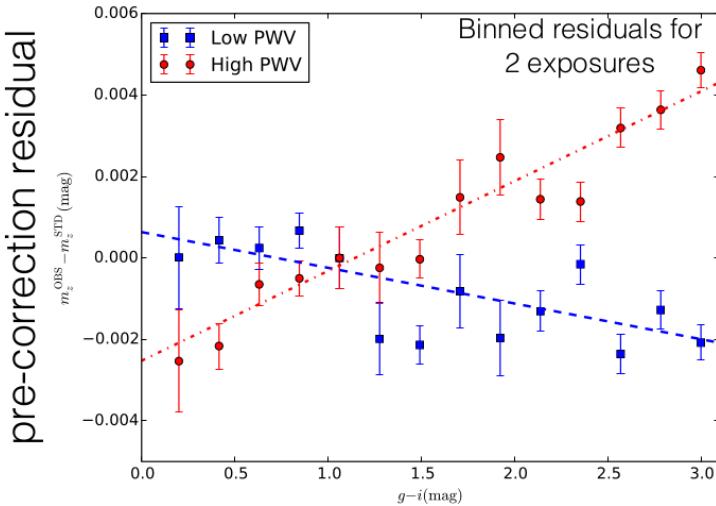
# PC5 : Atmospheric Extinction

- Work by Sylvie and Kirk on model comparison
  - Modtran vs. libRadTran
  - To be concluded soon
- LAL group working in close connection with the Project (Stubbs group + Ingraham) on
  - Design of auxiliary telescope
  - Analysis of test data @ CTIO

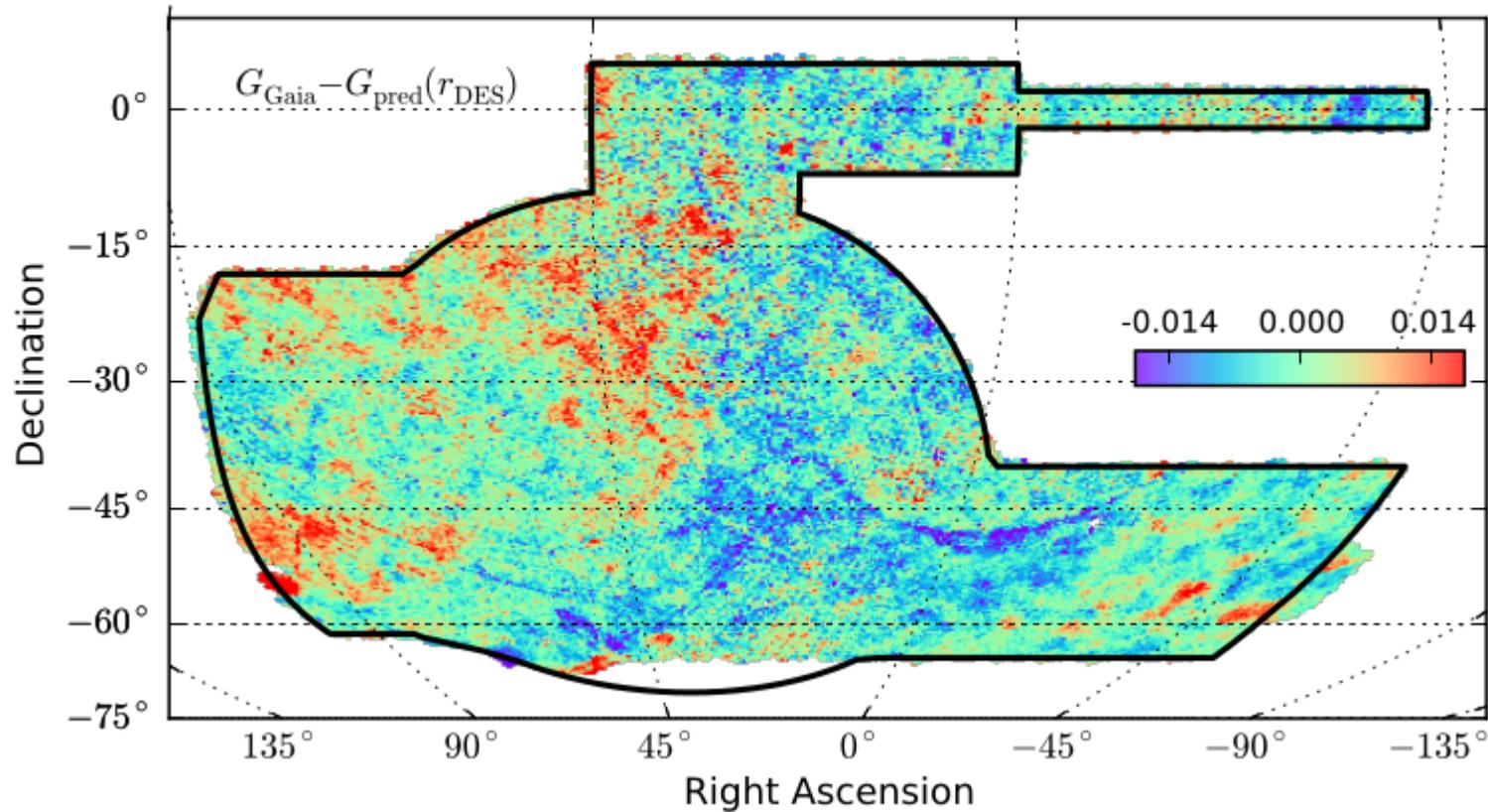


# PC5: Atmospheric extinction

- Major progress reported by DES: FGCM  
(see E. Rykoff slides at the Boston Meeting)
- Ubergal + first order expansion of atmosph model
  - constraints on atmosphere model from survey photometry alone



# Comparing to Gaia G



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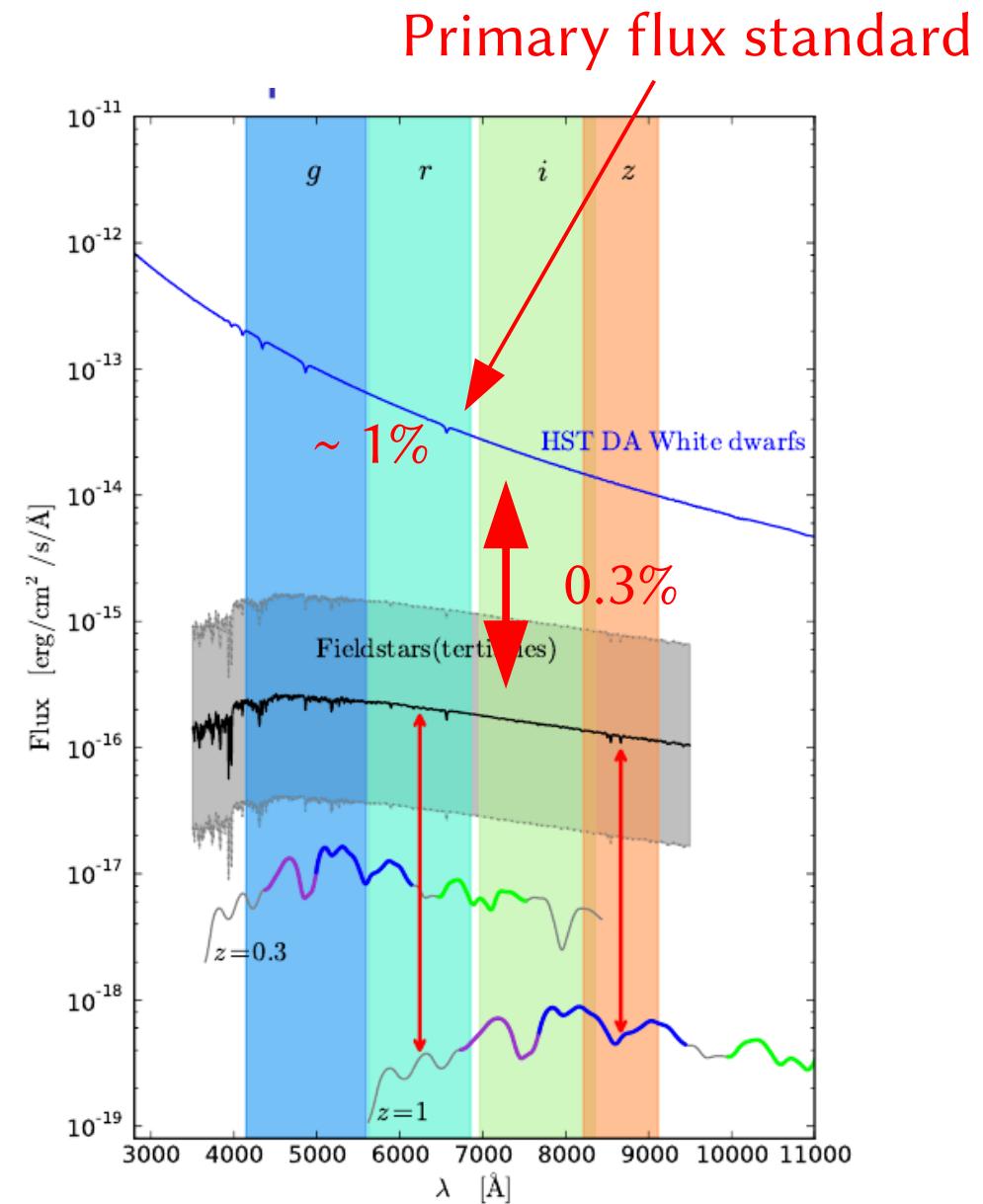
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# PC6 : Physical Flux Calibration

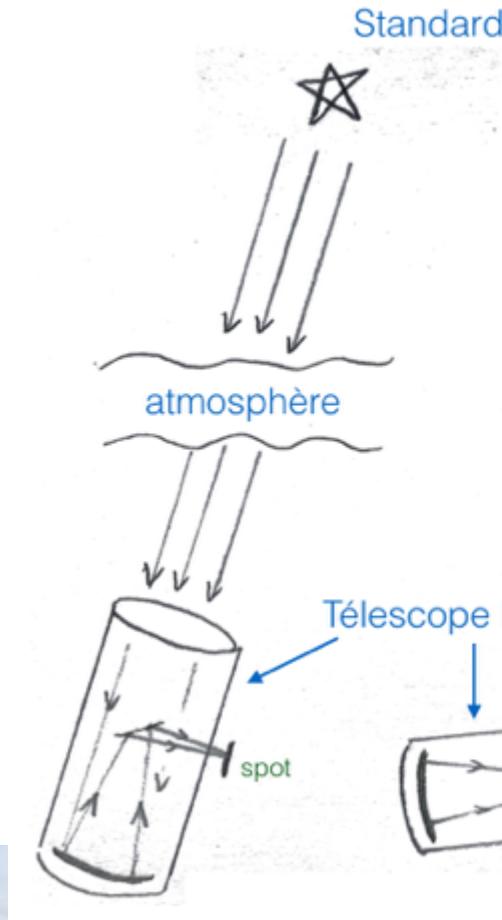
- Connecter

- flux instrumentaux uniformisés (en pseudo ADU/s)
- à des flux physiques (à une échelle grise près)



... 2017

# Methodology

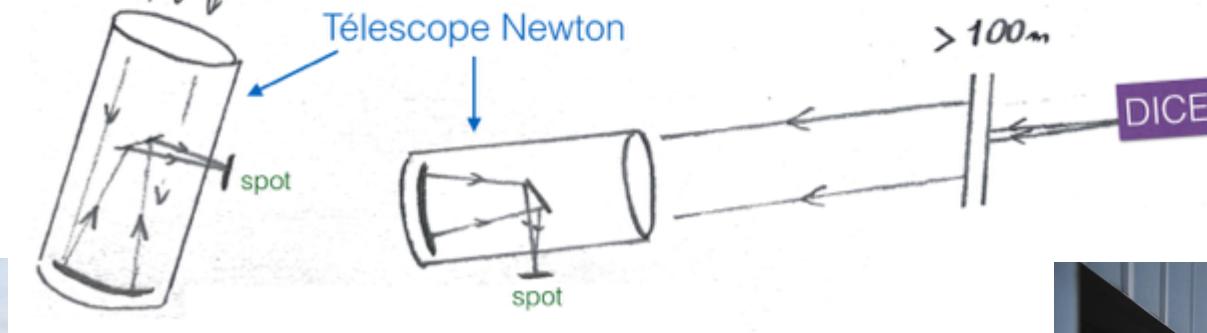


- **Observe alternatively**

- The calibrated source ( $\rightarrow$  star on the focal plane)
- A selection of bright (and faint) CALSPEC standards

**Challenges :**

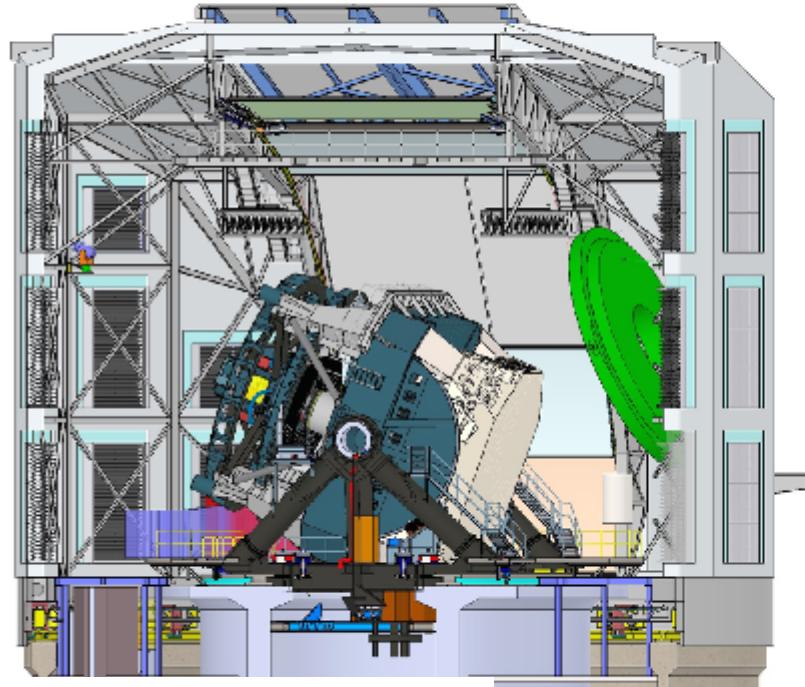
- Generate a stable artificial point source
- Account for the differential extinction



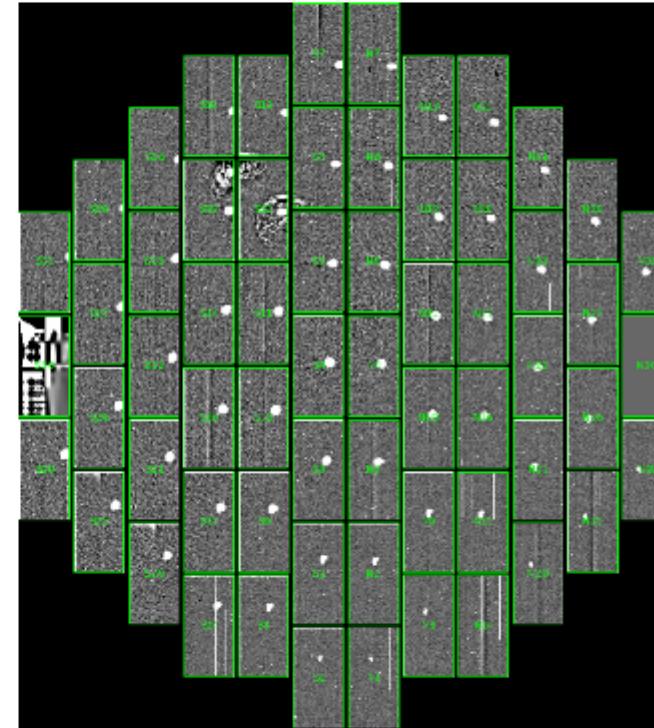
# Progress

- **Simultaneous observations of**
  - LED source @ 250-m
  - CALSPEC stars
    - analysis of the entire dataset (Bench + OHP data)
    - ~ 5% reported so far (mainly because no model of the LED source at that time)
- **Goals for this year**
  - run(s) @ OHP in June with existing setup
  - Target : 1% (challenging!)

- Demonstrated concept for Collimated Beam Projector
  - See Coughlin et al SPIE paper



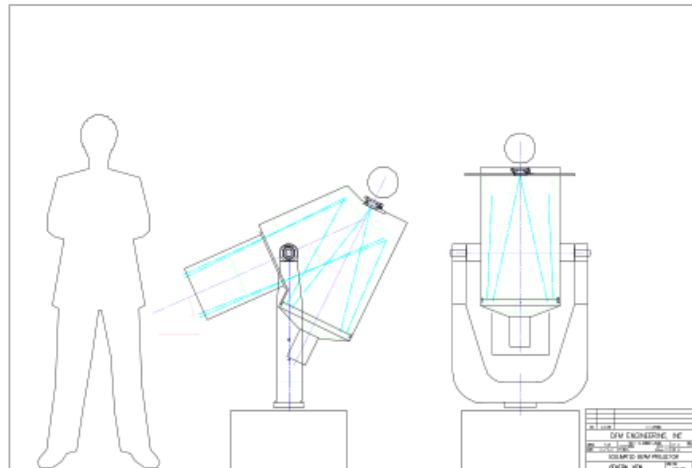
Joe Devries



DECam data processed using the DM stack by Robert Lupton and Merlin Fisher-Levine

LSST Calibration Workshop, Harvard, Feb 1-3, 2017

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## Iterating on design

- switch back to tunable laser ?
- goals:
  - follow-up of filters
  - uniformity tests

See P. Ingraham + N. Mondrik slides (Boston)

# Conclusion

- Projects & teams well identified
- Collaborations at the Institute level
- Ambitious goals for 2017
  - Survey uniformity / GAIA (PC4)
  - Flux scale / DICE (PC6)
  - Requirements for SN survey (PC1)
- To discuss:
  - Level of integration with US community ?
  - telecons schedule ?