Calibration Plans

- Conduct a Shallow Survey

  - in all conditions cover the southern sky with 3+ exposures: 8-17th mag

  - Observe the highest two reference fields every 90 minutes

- Anchor the deeper Main Survey to the Five-Second photometry and astrometry

  - Enables the Main Survey to proceed under non-photometric conditions.

- Self Calibration via overlaps, colour of main sequence (in low dust areas) and on photometric nights.

Calibration Plans

- # Primary Standards

    – STIS Program (Bessell, Bohlin, Leap ...)

    – approx 20 stars across the sky including 6 primary standards in SkyMapper Fields

    – Fit through modelling of White Dwarfs and Metal poor F-stars

    – Normalised by Hipparchos B and V photometry via Bessell (2000)

    – 6 secondary standard fields chosen with Primary standards in them. These fields will be observed with dithers and rotations to produce a photometric flat field, with all stars calibrated to primary standards

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Short Survey
- A shallow survey for calibration

Observe the brightest stars (up to the 8-16th mag) during a photometric night (uvgriz)

During each night : 2 of our 6 Standard fields will be observed every 90 minutes. Transformation fit to each night :

$$m_i - m_i^{obs} = \alpha_i X + \beta_{ij}(m_i - m_j) + \gamma_{ij}X(m_i - m_j) + \delta_i$$

Note: α & δ calculated each night, β is small and chip dependent, and changes slowly over time, γ will be fixed
Bright stars of each field will be calibrated

Automatic monitoring of results obtained during night and then visual the next day to confirm the quality

We can do about 100 fields per night in uvgriz -
      Needs 120 photometric nights over a year to be finished.

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New Standard System

- 6-colour photometry will be reduced as soon as possible.

- 6-colours should provide accurate transformations to most other systems

- Standard Stars in every southern field

IRAS-IRIS 3 - 60MU

360° x 180°

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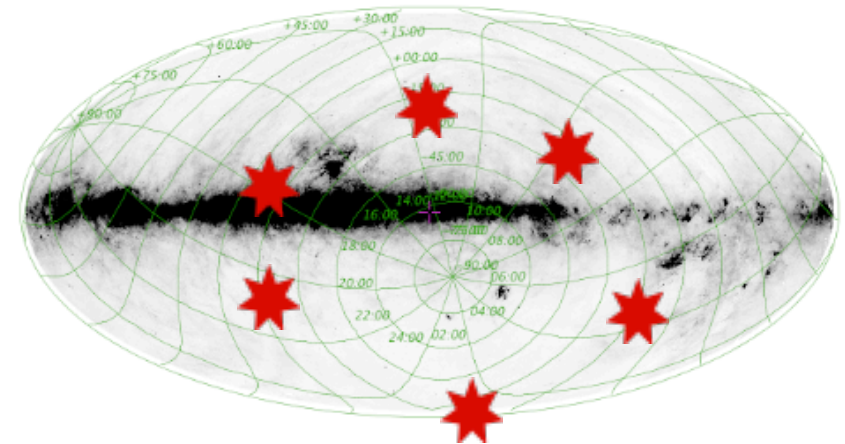
Astrometry Plans
(Thanks Dave Monet)

- 5sec survey tied to UCAC2 (30mas) + 2MASS

- Full survey tied to 5second survey

- Best catalog x,y positions based simple model fits to stars

- ZPN + low order x,y polynomial for main catalog positions
  - Draft FITS standard, not yet implemented in any libraries
  - ZPN is probably good to 50mas, and currently libraries ignore the residual matrix.

- Post-process x,y positions via Dave Monet, using polynomial fits over small patches to eke the last drop out of the astrometry, and derive parallax and proper motions.

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SkyMapper

The Main Survey

- **Combine images (median)**
  - **Accurate WCS**
  - **Dither pattern between images: eliminate ccd-gaps, cosmic, satellite tracks**
  - **Mask saturated stars**
- **Detect Objects in combined images**
- **Use Info from all 6 filters for classification**
- **Objects defined from the Union of detections of all filters**

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The Main Survey -Photometry

- **Use a modified version of SExtractor:** bypass the detection process to use all photometric algorithms : SMSExPhot
  - **Functionality : easy to manipulate, many options**
  - **Input : list of coordinates**
  - **Apply photometry on each object on each individual frame**

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The Main Survey -Photometry

- We work on the uncombined data

- Each object is photometered based on its RA and DEC in each image

- RA and DEC allowed to drift, and kept fixed

- For Galaxies, Kron-Radii etc are allowed to drift, and to be fixed average values

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The Main Survey - Photometry

- Aperture with multiple radii + blending info for each
- **PSFEx**, new tools from TeraPix[*]
  - Handles PSF variations across the field
  - used with Sextractor
  - Fast: ~500 stars/second
  - Excellent measurement accuracy in our tests
- **Galaxies : Petrosian and Kron Photometry**
- **All types of photometry will be done for all objects**
- **Sky Background estimated all over the field.**
  - The background map is subtracted
  - will lead to bias of bright galaxy mags which we will fix via post processing.

Calibration Plans

- Understanding the illumination correction is fundamental
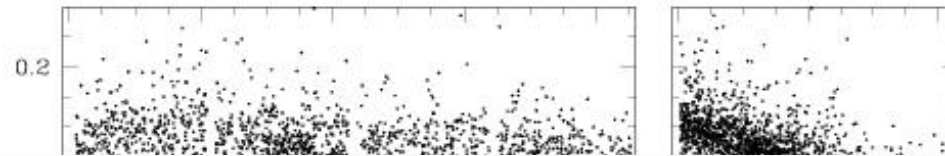
  - In comm... construct... dithered ... a field

  - Then rot... and repea...

  - Develop fields spa... dec~-20, pole (-90)
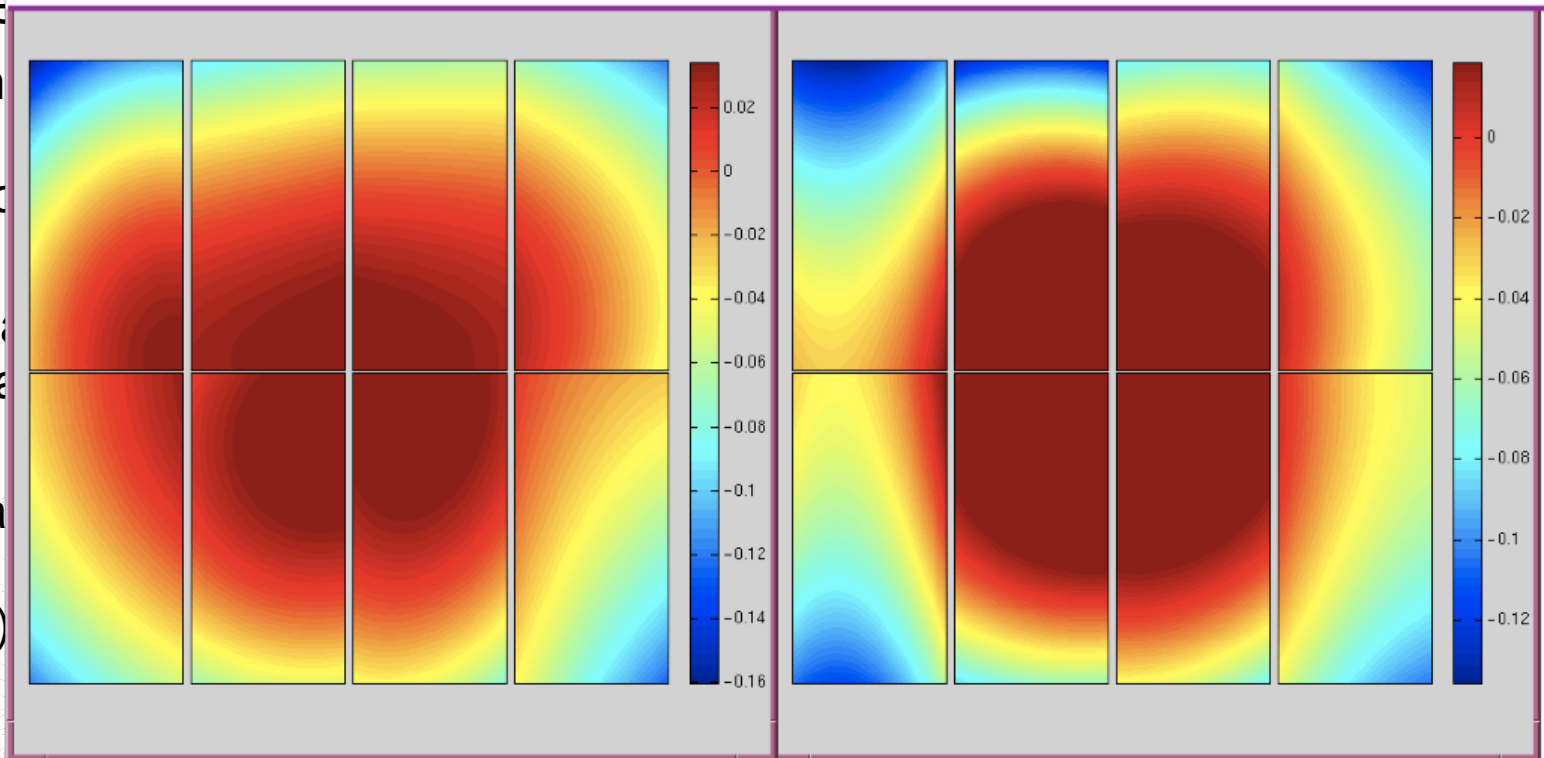
V+R from ESO 2.2m
(Koch+03)

- Flatfields and Photometric Flatfields go hand in hand

- Photometric Flatfields constructed after standard stars fields are flatfielded - these are used to tweak the flatfields to ensure a flat focal plane
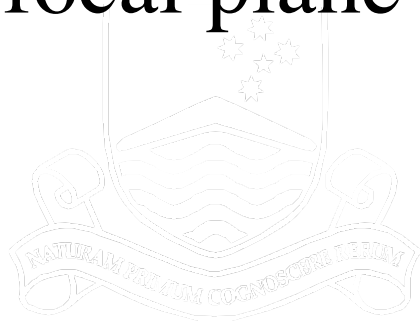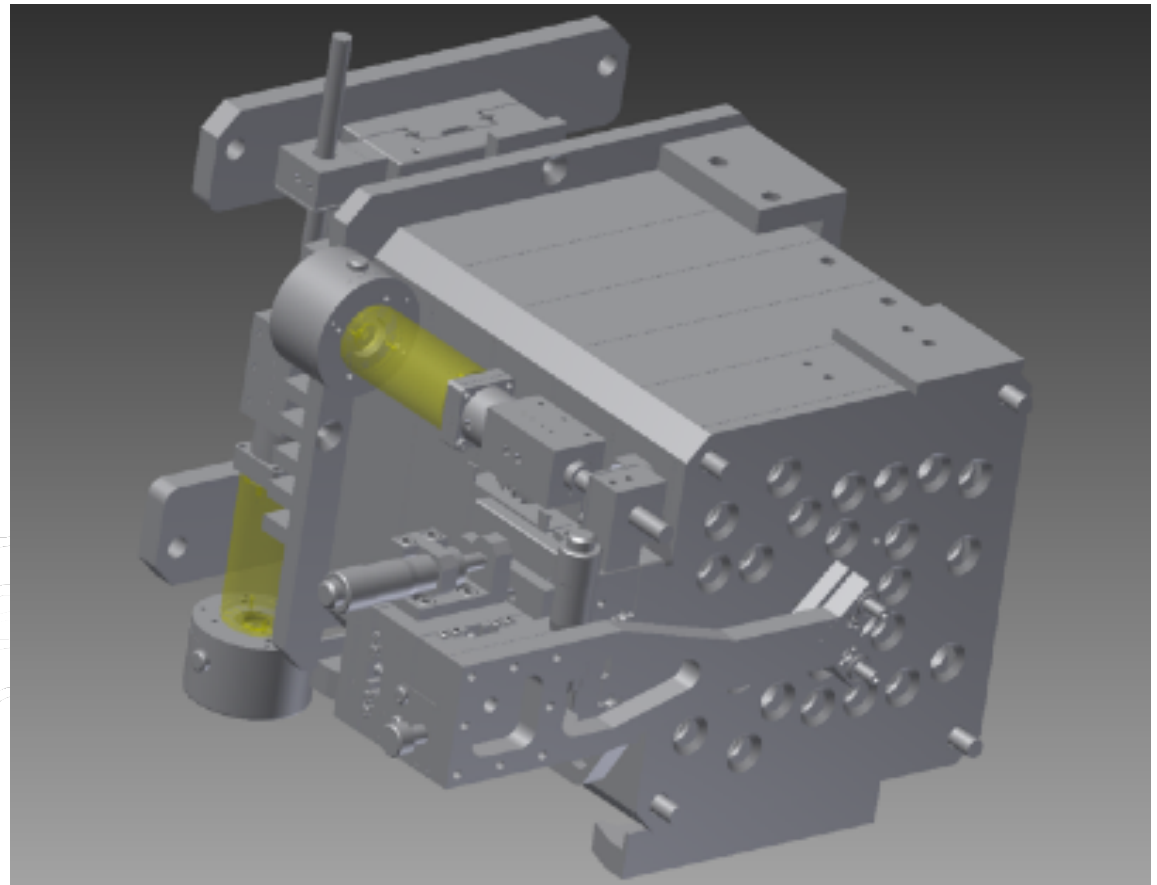
Calibration Plans

SkyDice - PI Nicolas Regnault - LPNHE

- >20 LEDs covering 0.3-1μ
- observed through telescope with NIS calibrated photo diode
- absolute calibration and monitoring of optics