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DES FTCS

Filter Testing and
Calibration System

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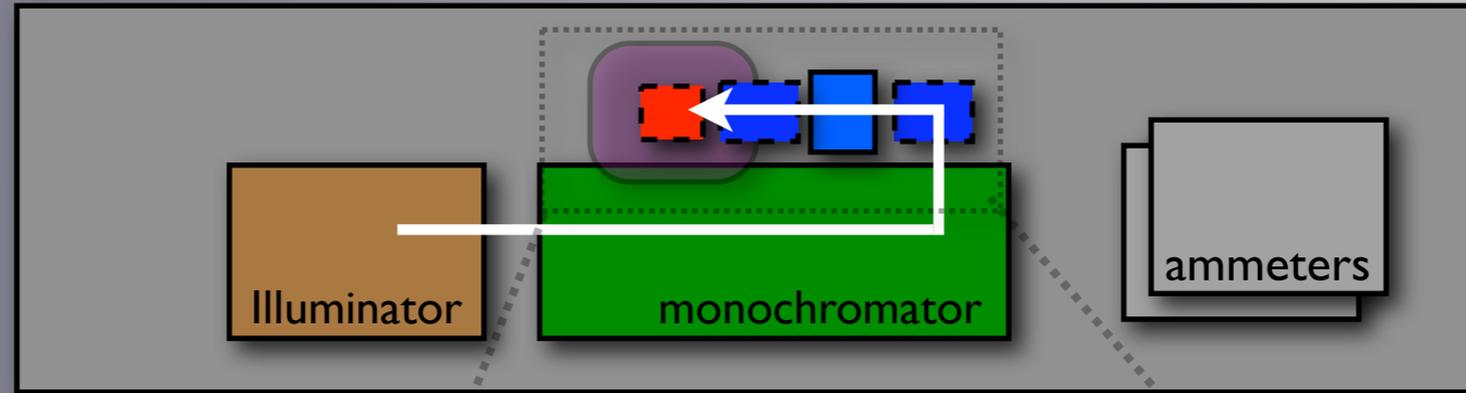
DES Filter and Calibrations
Strategy Workshop
04.04.08

FTCS . Motivated

- *Verify* Manufacturer's Compliance with Specification
 - Characterize uniformity *within* DES
 - less expensive and more reliable than testing by Mfr
 - i.e., B. Nord is relatively cheap
- *Integrate* Filter Map from FTCS (“in situ”) with On-sky (“In vivo”) Calibration
- brainstorming (see end of talk):
 - color-term variation correction
 - tiling specifications

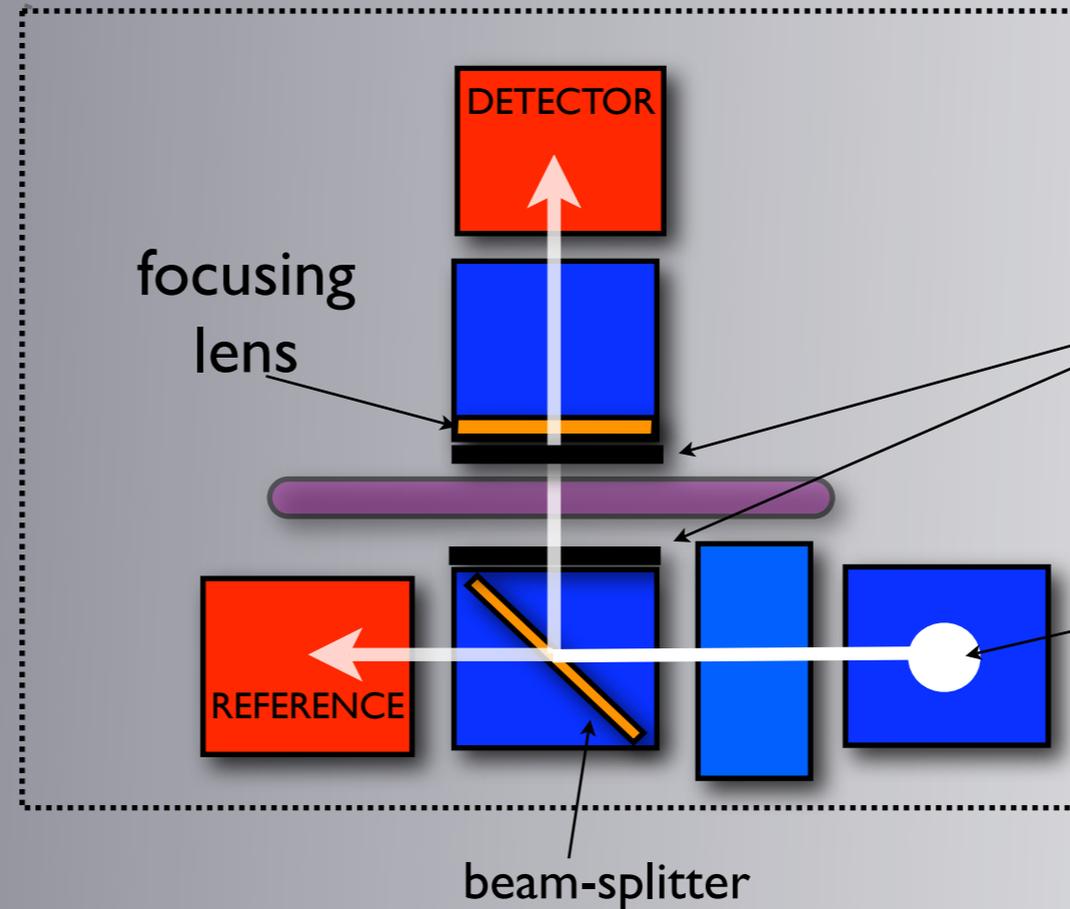
Design . Schematic

Bird's Eye View



OPTICAL PATH

Side View and Zoom

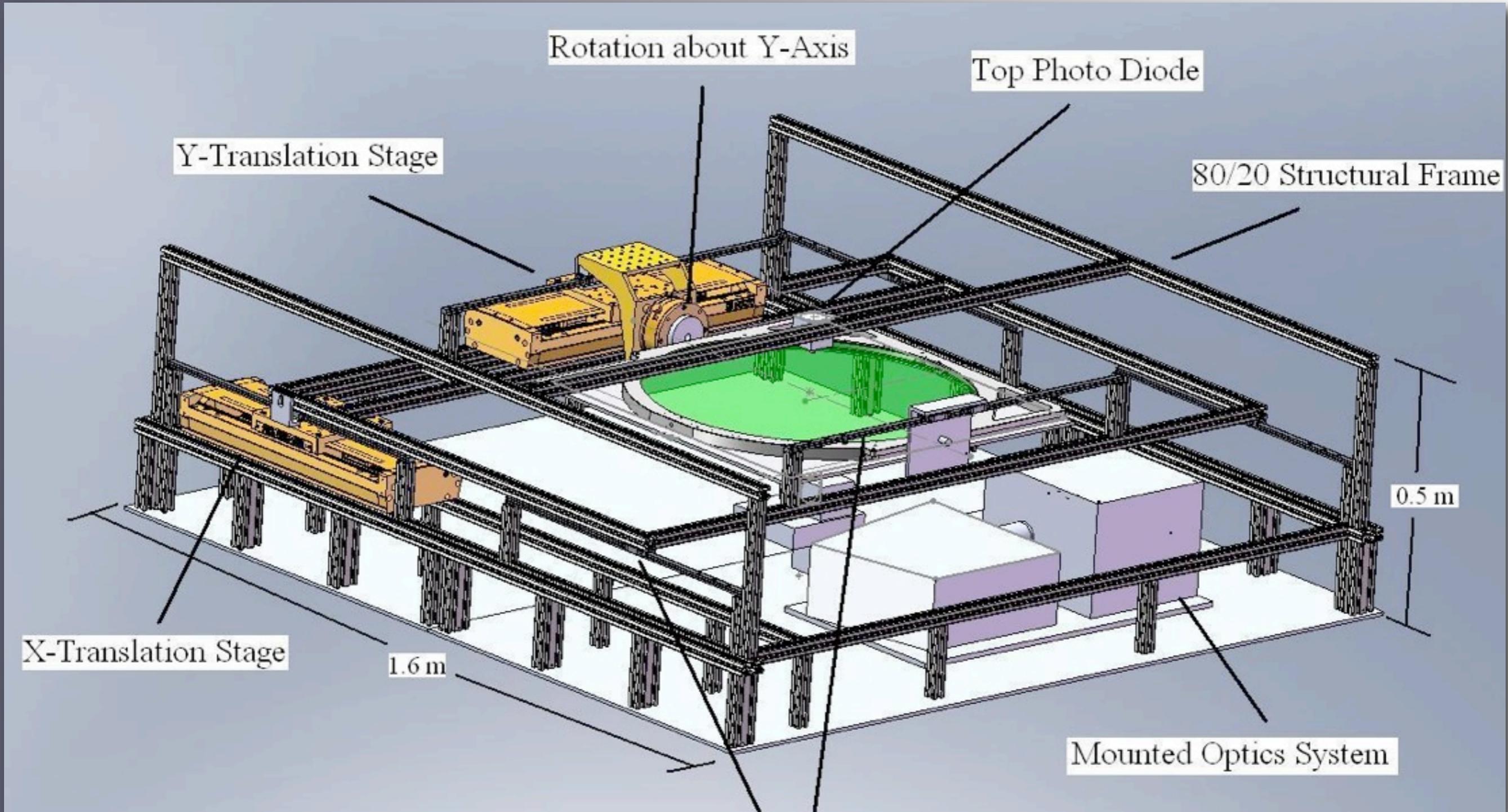


Aperture

Off-Axis Parabolic (OAP) Mirror

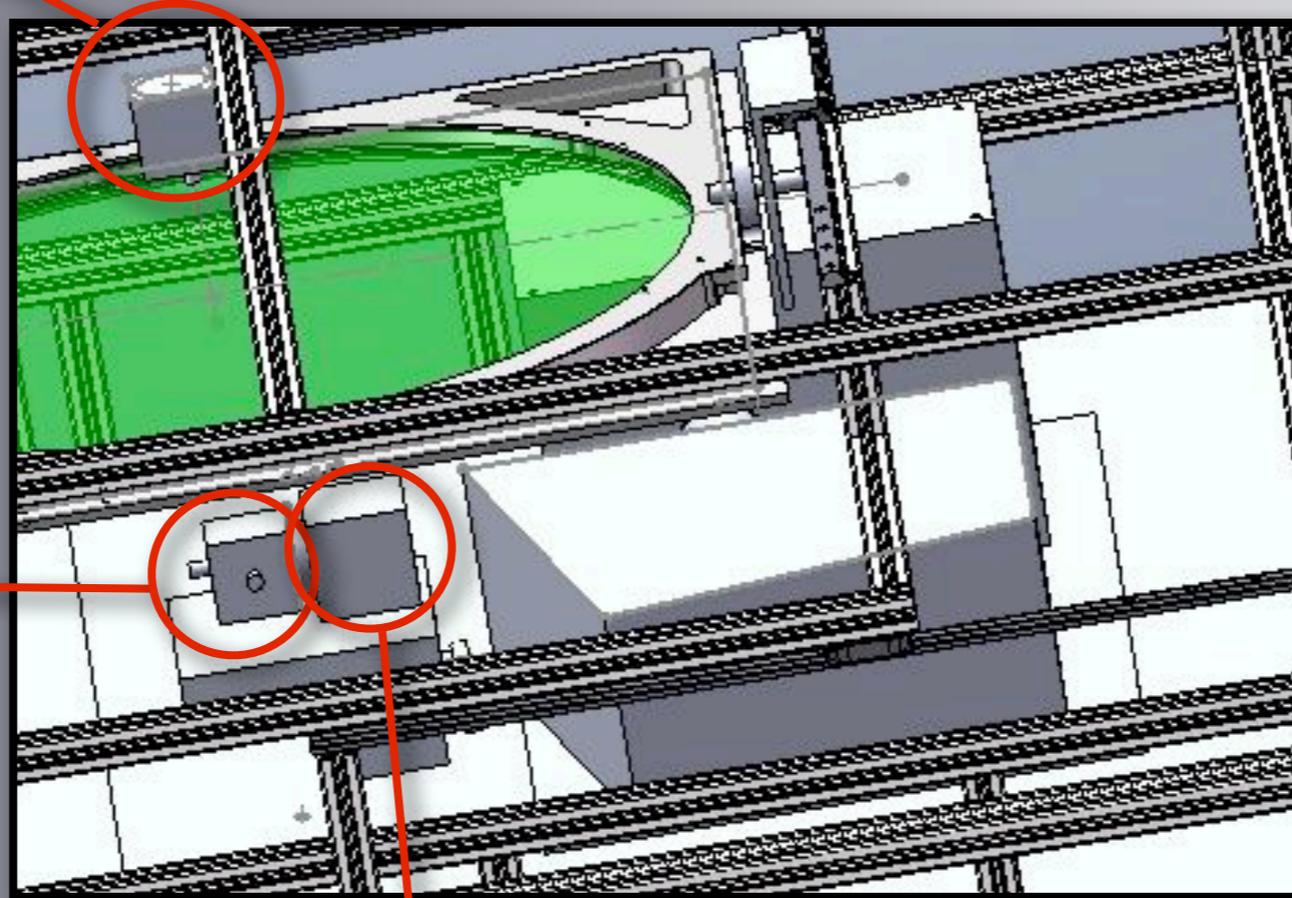
beam-splitter

System. Fixture Design



Fixture . Zoom

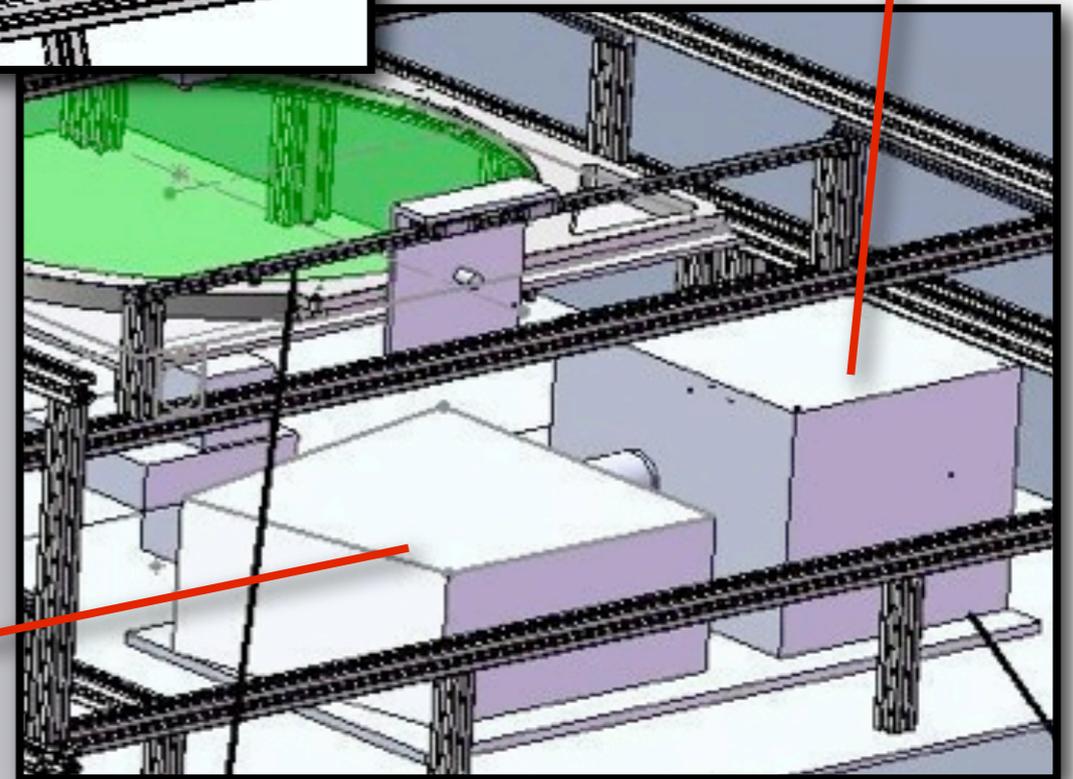
Detector Diode



Reference Diode

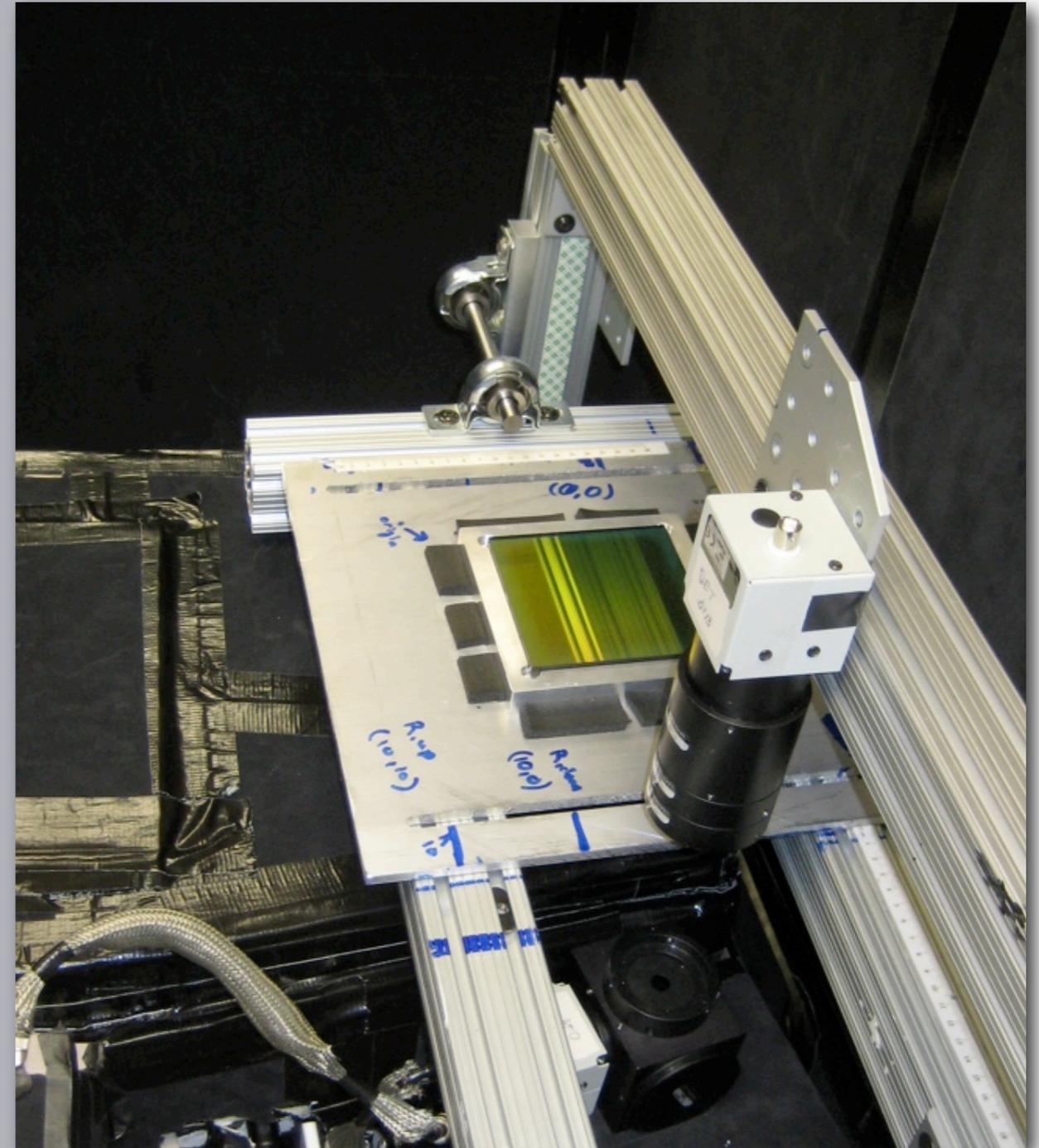
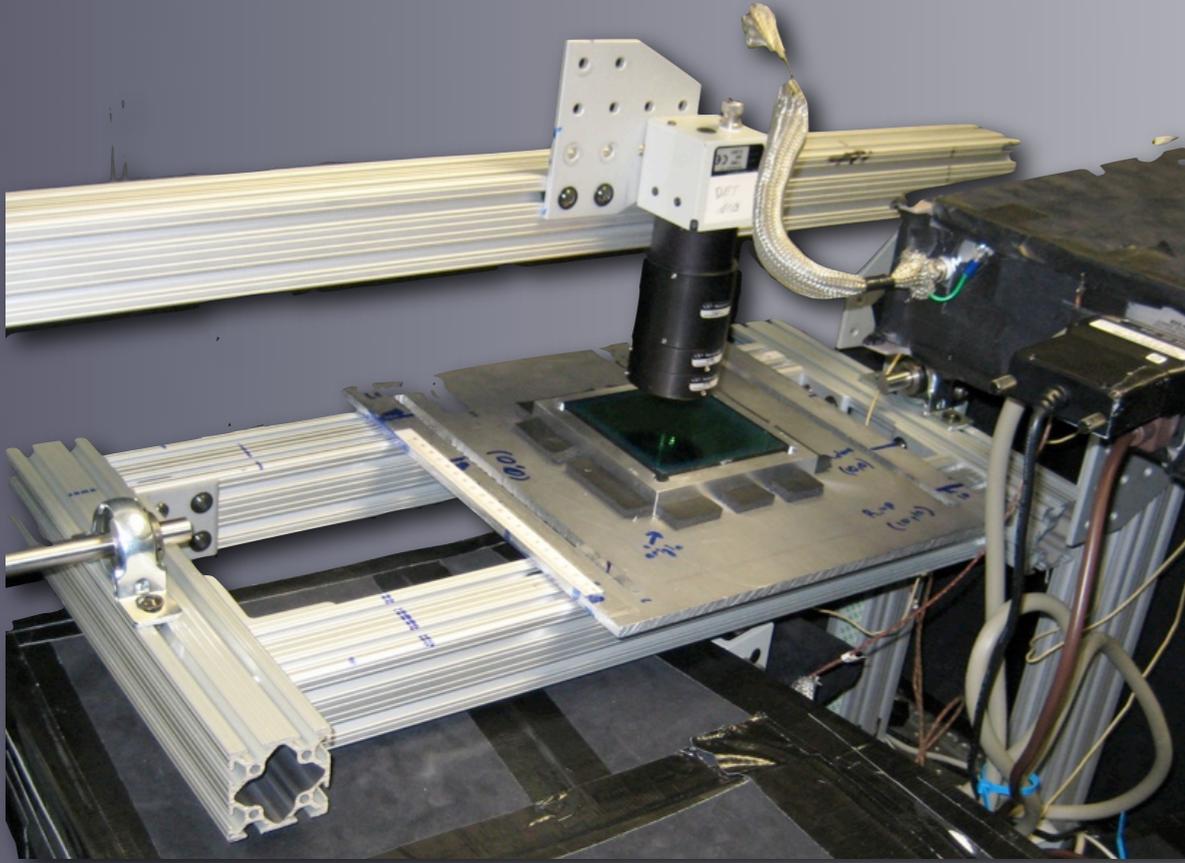
Illuminator

Beamsplitter

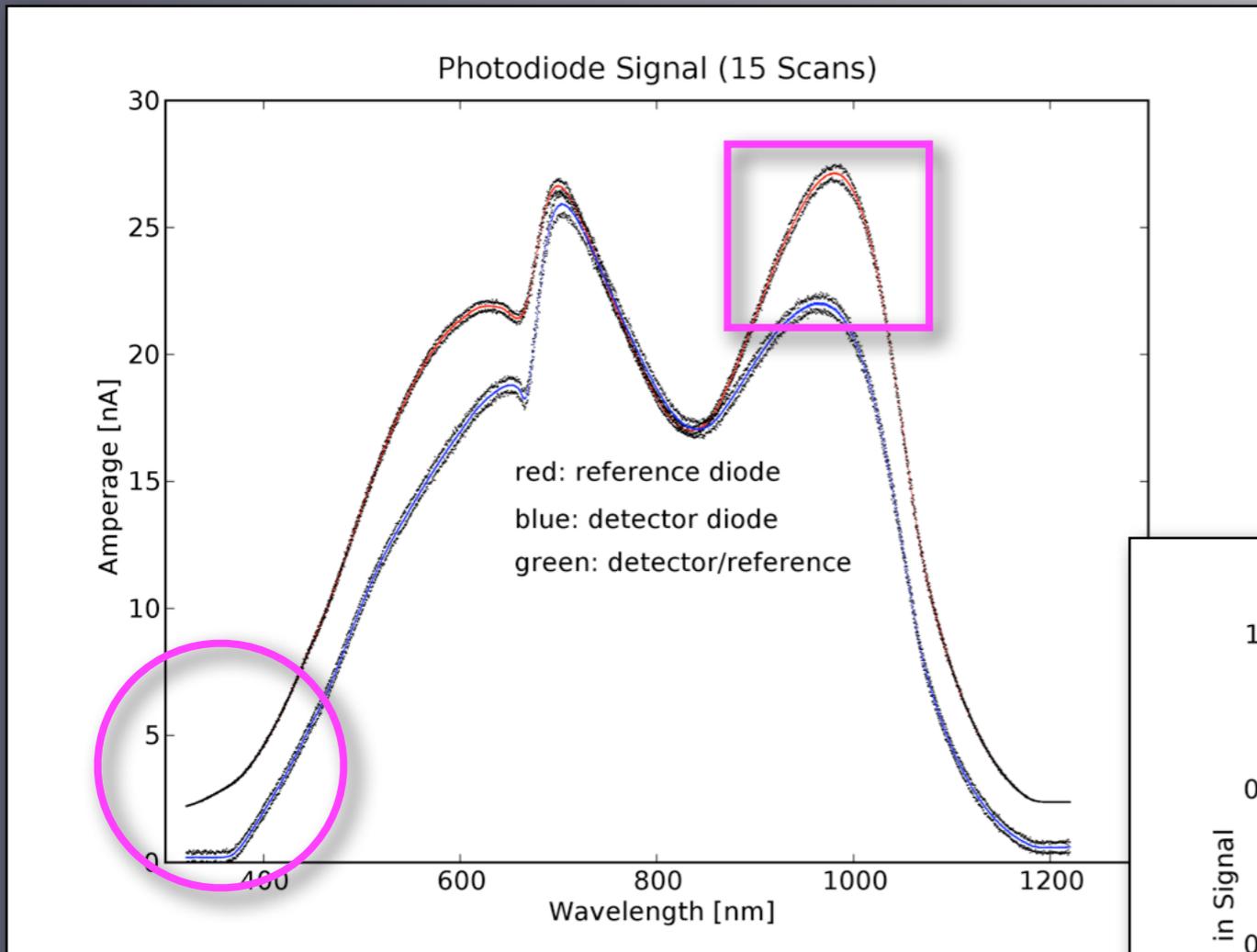


0.4nm - Monochromator

System . Prototype

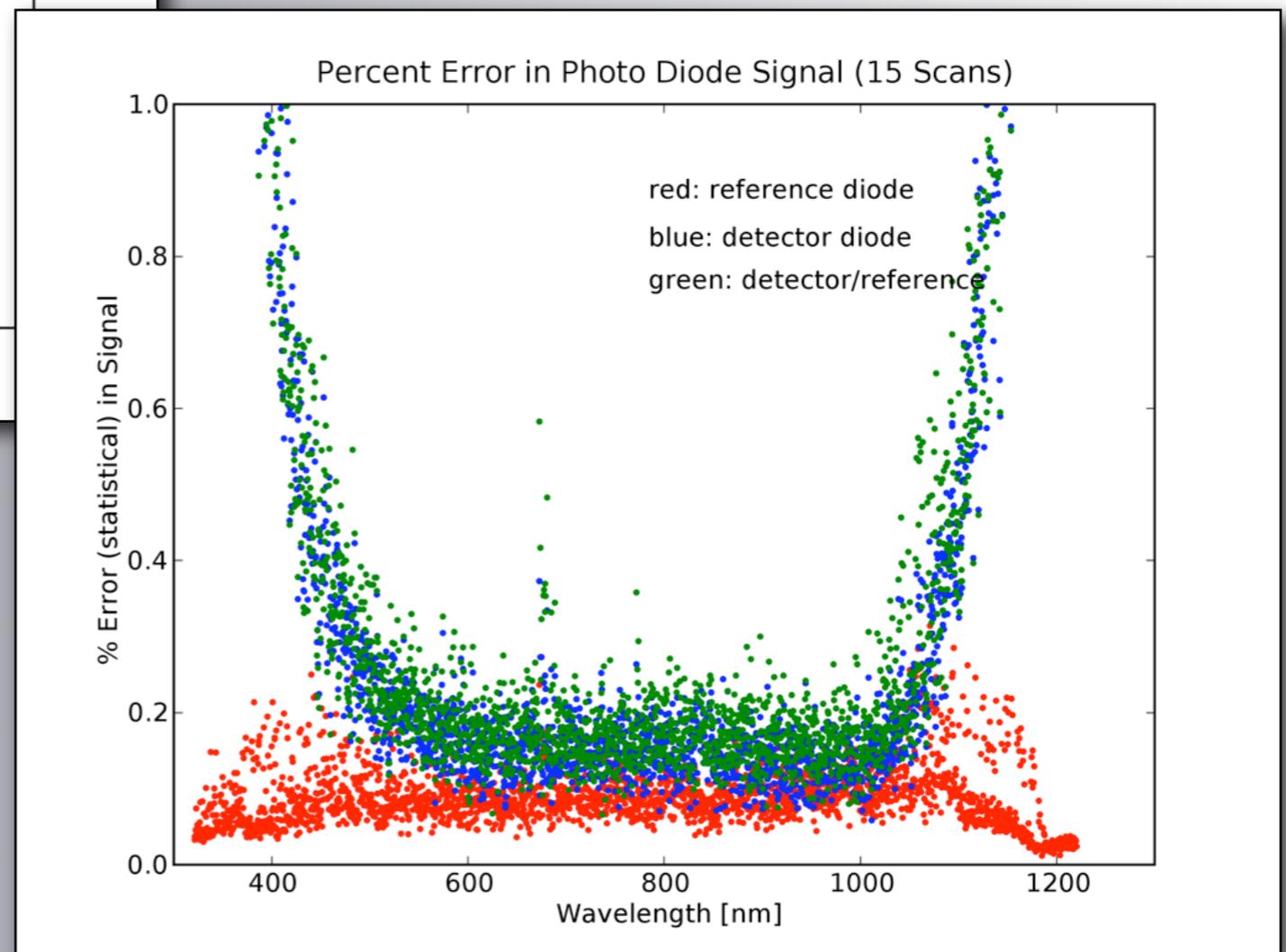


Scan . Full-Spectrum



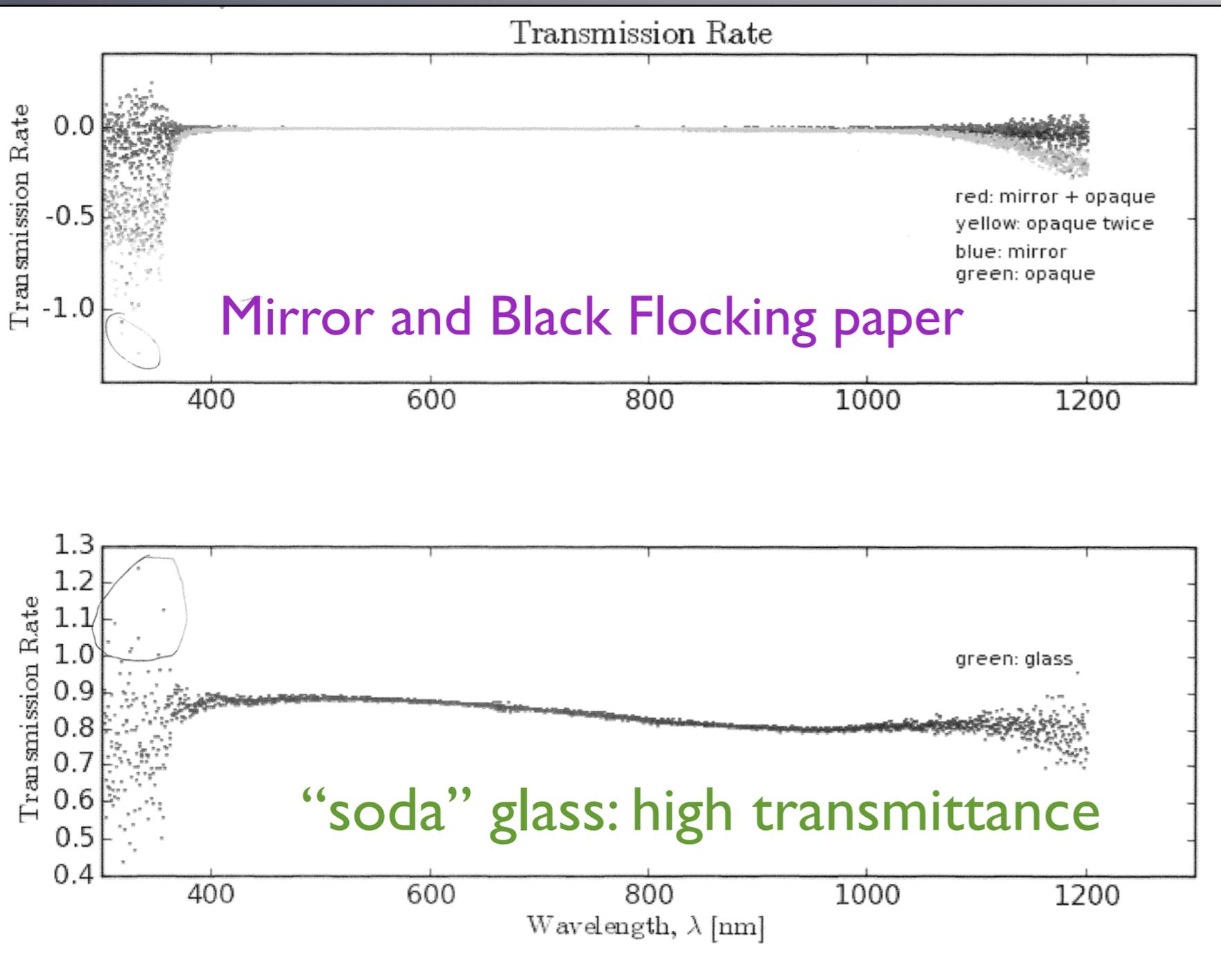
Differences in optical path between reference and detector diodes; will be probed

Sub-0.5% statistical error



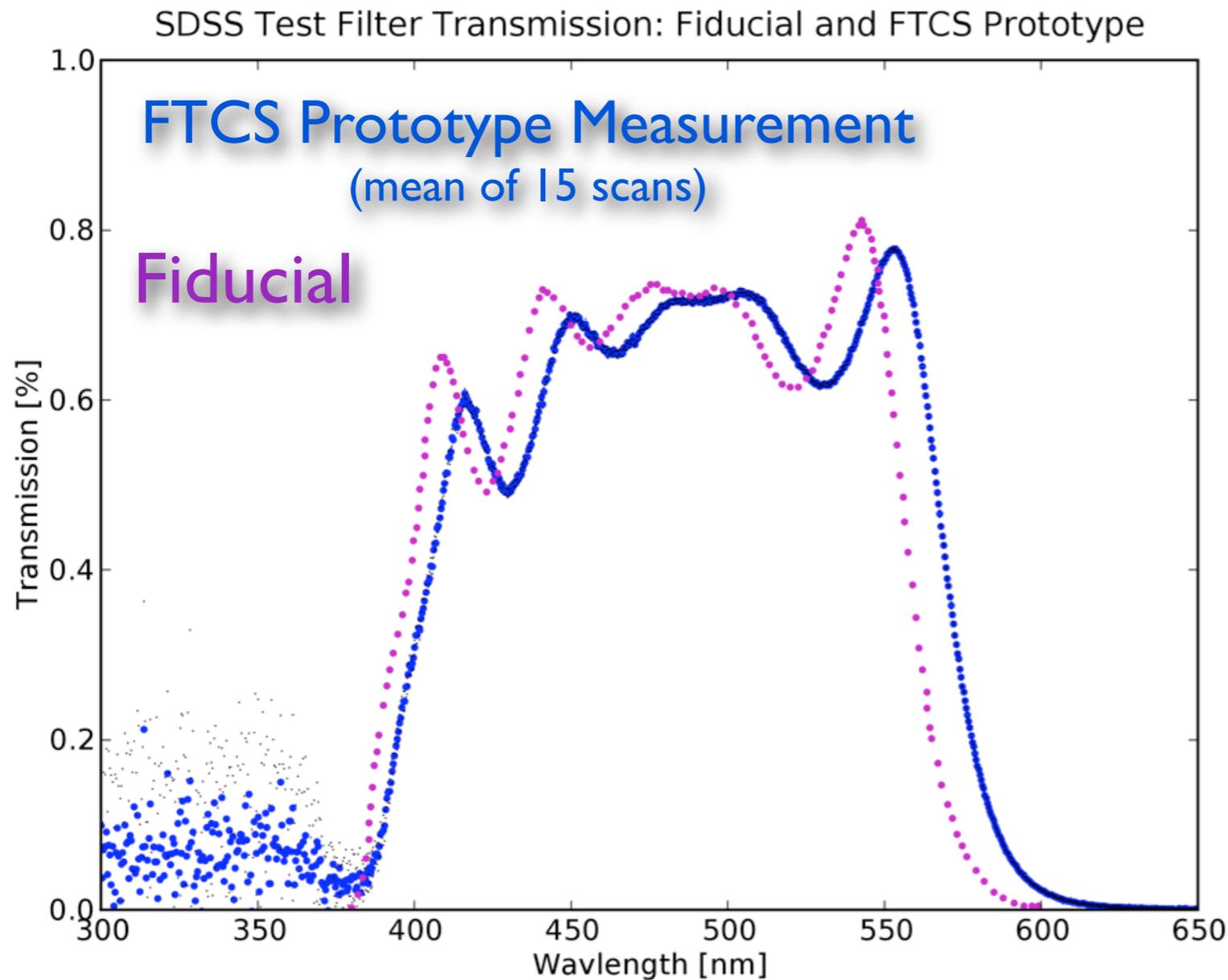
Reference Diode
betrays small offset ...
Enhance light-tightening

~~X~~ Scattered Light (?)



- Scans with various media replace the filter
- highly opaque or reflective materials show **identical** signals
- **Glass** has high transmission

Filter Scan . Single-Point SDSS G-Band Test Filter



FTCS:

very precise; statistical errors in black (on top of mean data points)

check: use well-known narrow-band SNAP filters to verify monochromator calibration

Fiducial:

test procedure unknown

Prototype . Finalization

Primary Error Sources

- Beam De-Collimation
- Thermal Stability
- Noise Reduction and Signal Cleansing
- Alignment

Next Steps

- Preliminary Filter Tests
 - Narrow-band (SNAP)
 - Wide-band (SDSS)
Spatial Scans
- Incidence-angle tests

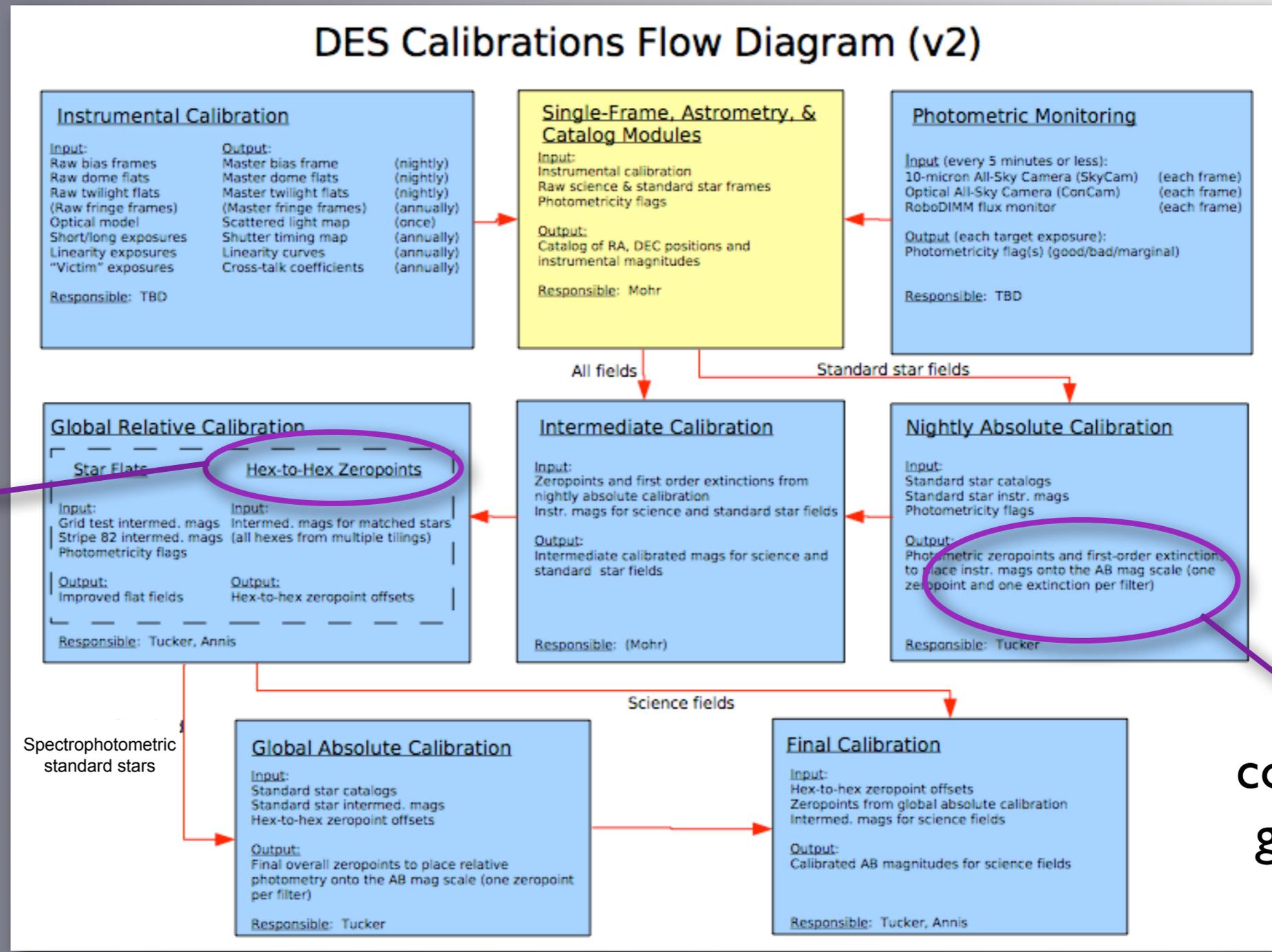
RESULT:

Functional Form of the
filter Map

$$T(r, \theta | \lambda)$$

Integrating FTCS with Calibration Scheme

Brainstorm



Filter Spatial Variation may inform tiling strategy

color-term gradients

(D. Tucker: Plenary Talk)

Integration

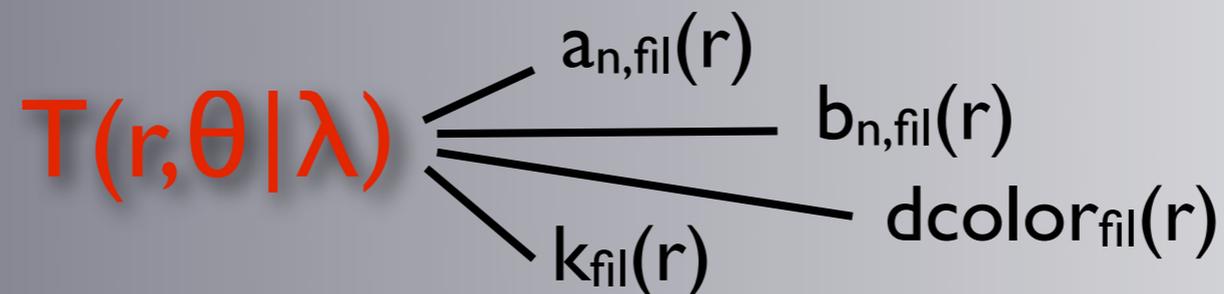
Ex: Color-Term Variation

Nightly Photometric Calibration

$$m_{inst} - m_{std} = a_n + b_n \times (stdColor - stdColor_0) + kX$$

What are spatial variations in each element of on-sky calibration?

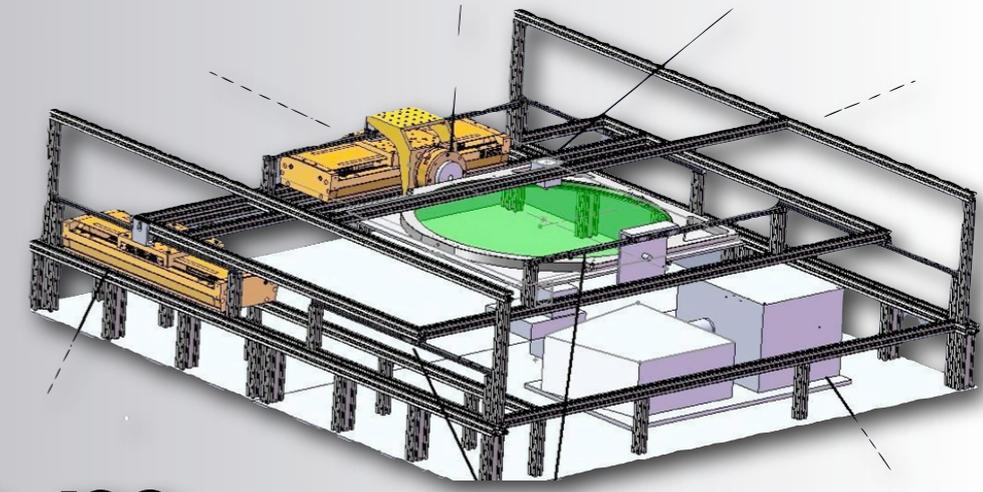
We can apply corrections based on filter gradients from the FTCS map:



... especially when it becomes dominant source of spatial variation

I) Prototype has achieved high precision, but there are still improvements and tests to perform.

II) How will we integrate filter calibration into main calibration to mediate costs and the error budget?



UMDES Team

System Design
and Analysis



Fixture Design and
Construction

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