



# *NIC-FPS Preliminary Design Review*

*Opto-Mechanical*

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# *NIC-FPS Preliminary Design Review*

## **Overview**

- Opto-Mechanical Requirements
- Optical Layout and Folding
- Optical Bench and Support Structure
- Functional Blocks
- Filter Wheels
- Cold Pupil to Etalon Change





# *NIC-FPS Preliminary Design Review*

## **Opto-Mechanical Requirements**

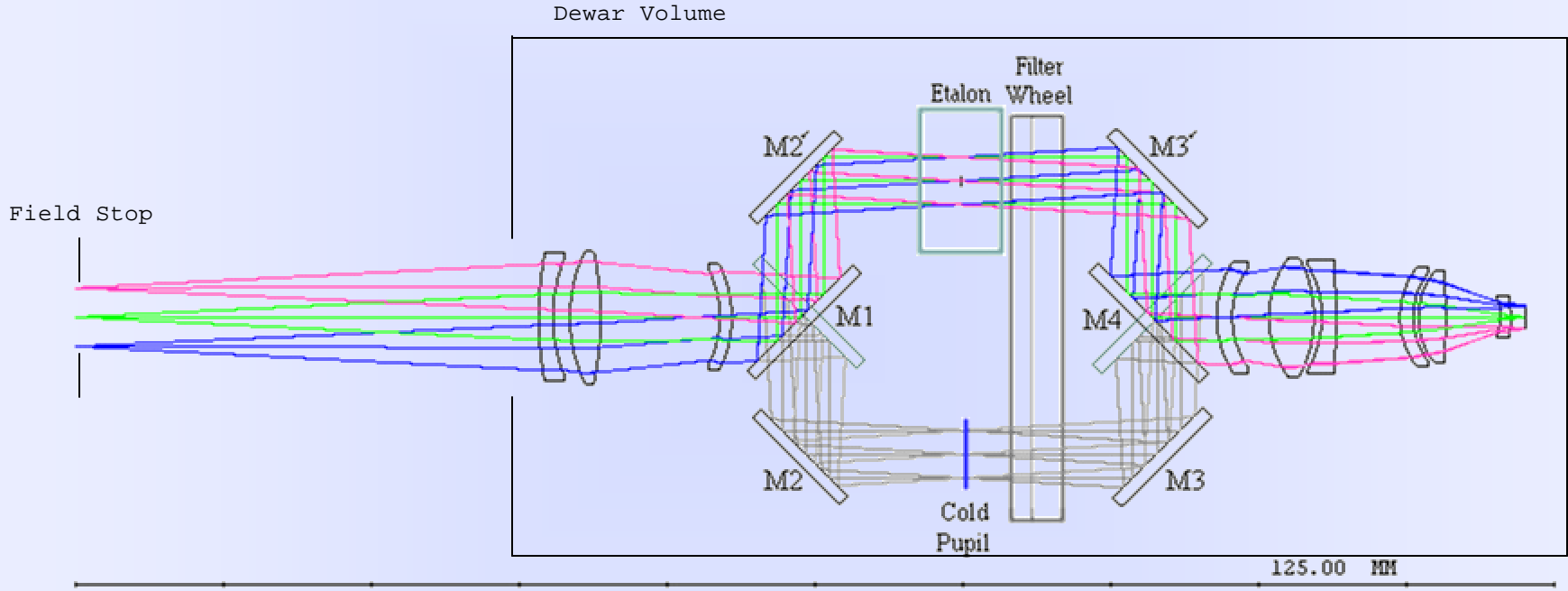
- Ease of alignment and maintenance over 5-10 year lifetime
- Provide a stable instrument support structure
  - $\leq 1/2$  pixel image shift during 20 minute integration
  - Centering repeatability to  $\leq 5$  arcsec throughout a  $180^\circ$  rotation
  - Negligible change in image quality throughout a  $180^\circ$  rotation
- Provide light-tight baffling along optical path
- Field stop at telescope focal plane (warm)
- Suspended mass  $< 500$  lbs. (estimated at 330 lbs.)
- Torque off rotator  $< 1500$  lbs. (estimated at 1000 ft-lbs.)
- Provide support cart with electronics





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## Optical Layout



- Mirrors M1 and M4 rotate to select either the cold pupil or the Filter Wheel
- Mirrors M2, M2', M3 and M3' are stationary
- Length 1.22 m ( 48 inches ) from telescope focal plane to focal plane array
- 0.81 m ( 32 inches ) from field lens to focal plane array
- Width 230 mm ( 9 inches ) between cold pupil and etalon centers





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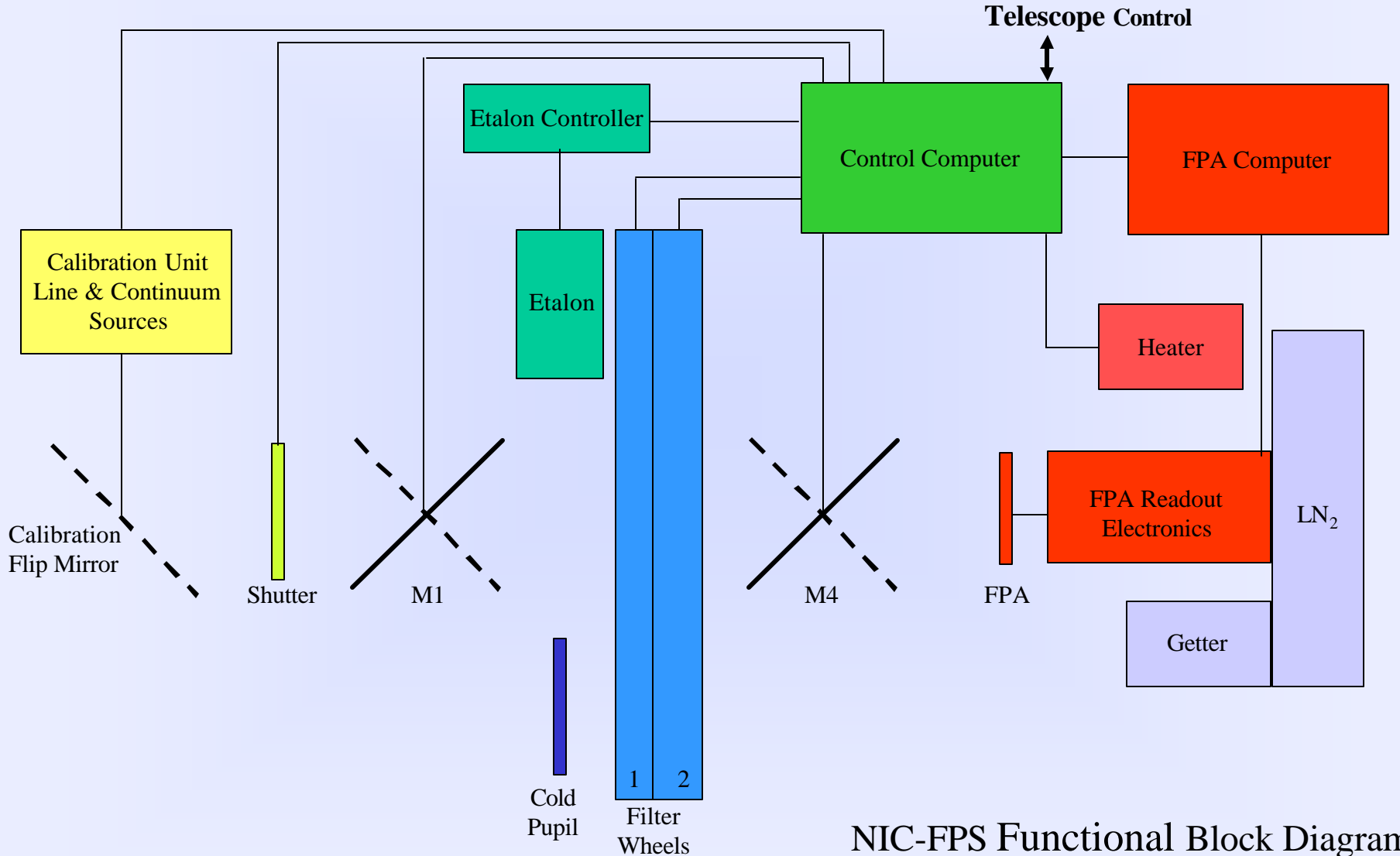
## **Optical Bench and Support Structure**

- Support structure based on Ohio State's G10 ring design
  - OSIRIS, TIFKAM, ANDICAM and FLAMINGOS use this design
  - CTIO version of NIC-FPS was to use this design
  - G10 ring fabricated of layers of 1/32 inch sheet wrapped over a mandrel and epoxied together
- Optical bench is cantilevered
  - Flexure ~10 arcsec from vertical horizontal
  - FLAMINGOS flexes 44  $\mu\text{m}$  over its 870 mm length
  - Optical alignment is independent of dewar shell
- Optical bench provides a long, wide flat surface (up to 32 x 12 inches)





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NIC-FPS Functional Block Diagram





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## **Filter Wheels**

- 2 x 10 slots filter wheels provides up to 18 slots for filters and 2 open slots
- Outer Diameter ~ 315 mm (12.4 inches)
- Nominal filter size 65 mm dia. x 5 mm thick, 5° tilt
- Face loading for easy insertion and removal
- < 90 seconds for full rotation, ~ 10 seconds between slots
- Direct filter position readout.
  - Binary readout of 4 microswitches when filter is in position





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## **Cold Pupil to Etalon Mode Change**

- Rotate M1 and M4 to select modes
- Direct detent readout on M1 and M4
- < 90 seconds access time between modes
- Image repeatability of  $\leq 5$  arcsec. when returning to a given mode
- Image shift of  $\leq 30$  arcsec. between modes







# *NIC-FPS Preliminary Design Review*

## **Under Review**

- Lens, Mirror and Filter mount designs
- Cold pupil alignment technique

## **ARC Input**

- Centering tolerances
- Flexure

