

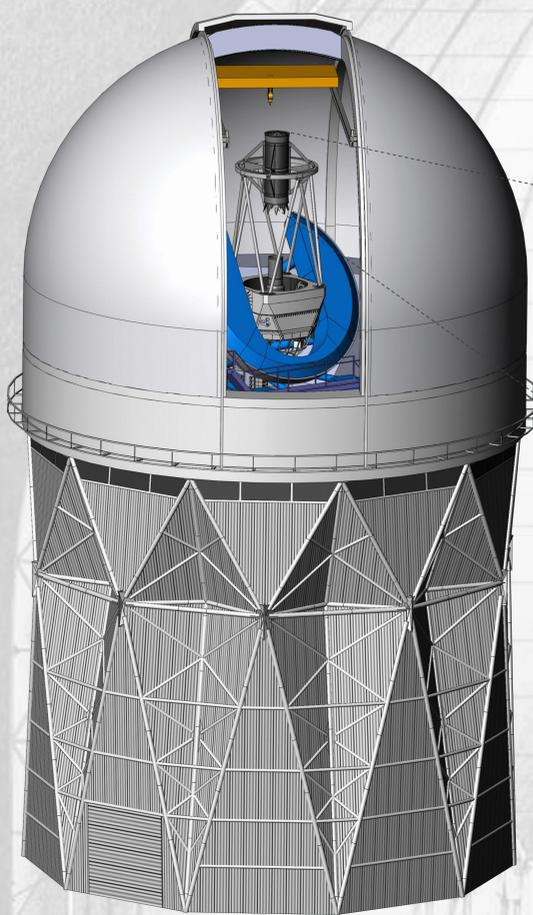


# Integration of the BigBOSS Instrument with the Mayall 4m Telescope

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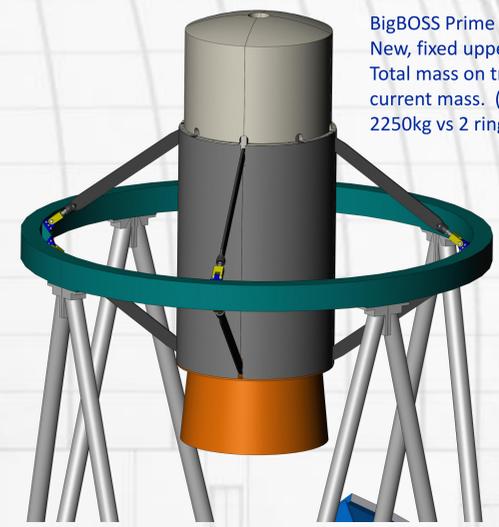
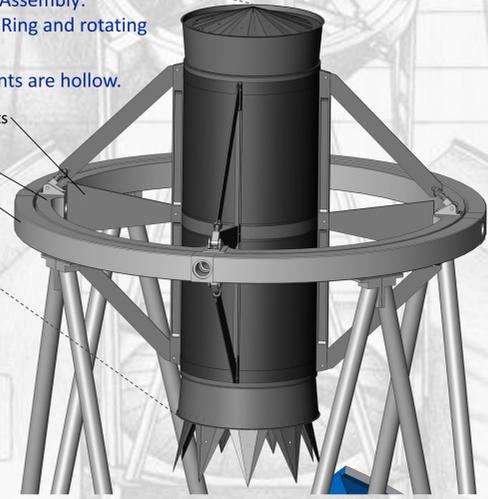
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BigBOSS is a proposed multi-object spectrograph for the Mayall 4-meter telescope at Kitt Peak. Its primary objective is to explore dark energy using the baryon acoustic oscillation method by measuring tens of millions of galaxy redshifts. The BigBOSS corrector optics and its 5000-fiber-positioner focal plane assembly will replace the existing hardware at prime focus on the Mayall telescope. The 40-meter long BigBOSS optical fiber bundle will be routed from prime focus through the telescope declination and polar pivots to the adjacent thermally insulated FTS Laboratory. Ten spectrographs in three color bands will be located in the FTS Laboratory, along with associated support electronics, cooling, and vacuum equipment. The new prime focus assembly will include provisions for mounting the existing F/8 secondary mirror to enable observations with Cassegrain instruments. Here we illustrate the major elements of the BigBOSS instrument and describe the proposed modifications and additions to existing Mayall facilities.

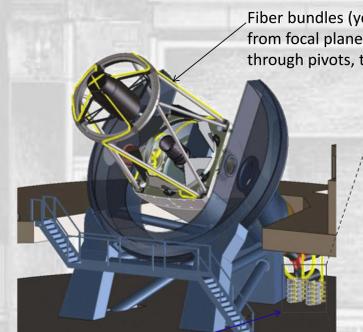


Existing Prime Focus Assembly:  
Includes fixed Upper Ring and rotating Flip Ring.  
Middle spider elements are hollow.

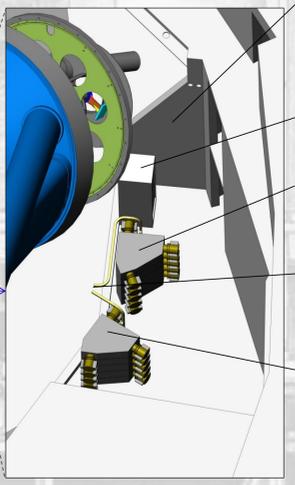
Hollow spider elements  
Flip Ring  
Upper Ring



BigBOSS Prime Focus Assembly:  
New, fixed upper ring and fins.  
Total mass on truss matches current mass. (Single ring saves 2250kg vs 2 rings).



Fiber bundles (yellow) route 40m from focal plane, down telescope, through pivots, to FTS Lab



FTS Lab shown w/ceiling and walls hidden  
19" electronics rack  
5-spectrograph stack  
fiber bundles feed through wall to polar axis wrap  
5-spectrograph stack

- FTS Lab
  - Existing, windowless room.
  - Directly adjacent to polar axis.
  - Thermally insulated.
  - Plumbed with glycol cooling system.
  - Ample space and access for two spectrograph stacks, 19" electronics rack.
  - Co-located with telescope on structurally isolated pier.

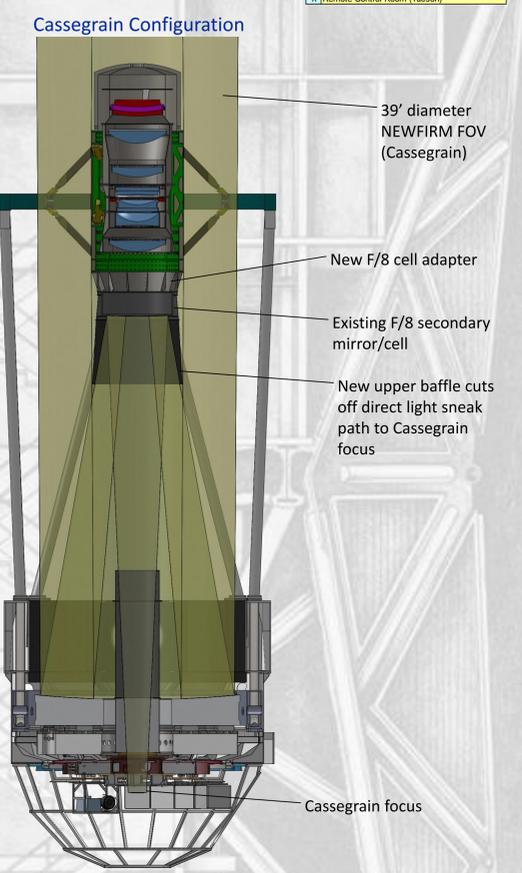
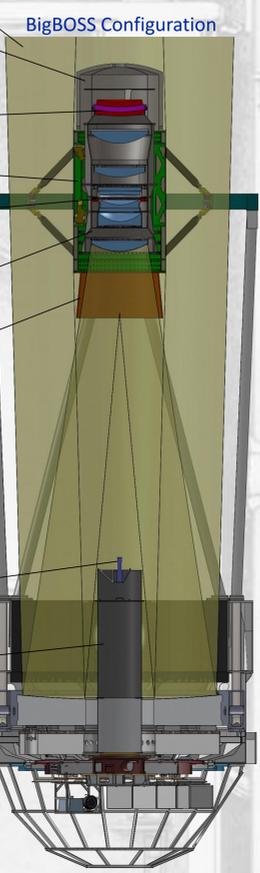
•BigBOSS interface matrix  
–Identifies all the interfaces between major elements.  
–Each non-blank entry represents an Interface Control Document.  
–Interfaces developed in concert between BigBOSS Collaboration and NOAO.

Component	Connector Barrel	Cage/Fins	Hexapod	F/B Exchange System	Upper ring	Power/data harness to focal plate	Focal Plate Cooling System	ADC Rotator	Focal Plate Rear Plenum	Corrector optics	ADC	Fiber view camera	Focal Plate	Fiber Positioner	Wireless Communication System	Focus Sensors	Guide Detectors	Focal Plane (for FiberView Cam)	E-Box for Guide/Focus Sensors/Fiducial Fibers	Fiber Optics Bundle	Spectrograph slit	Spectrograph entrance/back-illuminator	Spectrograph Cryostat/LPT Cooler	Detector Front End Electronics	Data storage	Instrument Control System	Data Acquisition System	Science Data Analysis System	Telescope Room	Telescope	F/B Secondary Mirror	Telescope Control System	Remote Control Room (Tucson)	
Mechanical	X																																	
Command/monitoring/telemetry																																		
Thermal																																		
Data																																		
Power																																		

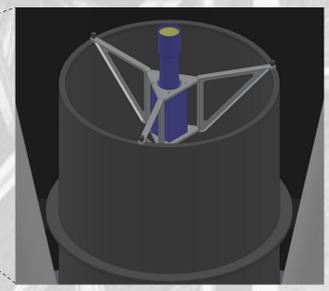
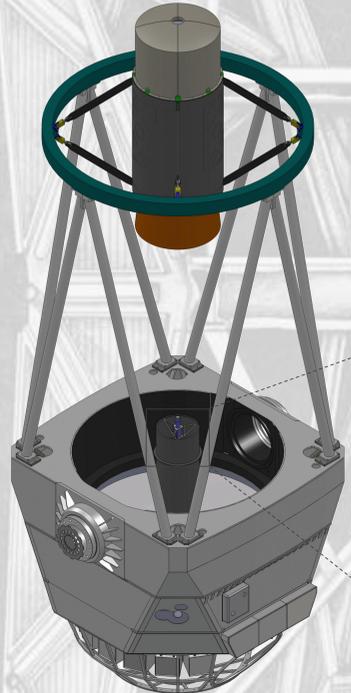
3° diameter BigBOSS FOV

Thermal fairing insulates to maintain seeing, shields wireless communication to positioners.

Focal plate/fiber positioners  
Fixed Cage  
Atmospheric Dispersion Compensators (ADCs)  
Corrector assembly on Hexapod actuators  
F/8 mass simulator maintains telescope balance



•Fiber View Camera System  
–Feedback for fiber positioning.  
–Measure fiber tip positions during slews.  
–Image back-illuminated fiber tips, including fiducials.  
–Centroid fiber positions, send position data to positioner control system.  
–Iterate as needed.  
–Remove for Cassegrain instruments.



New Lower Baffle does not vignette BigBOSS FOV, has lower thermal mass for better seeing, and provides mounting points for Fiber View Camera