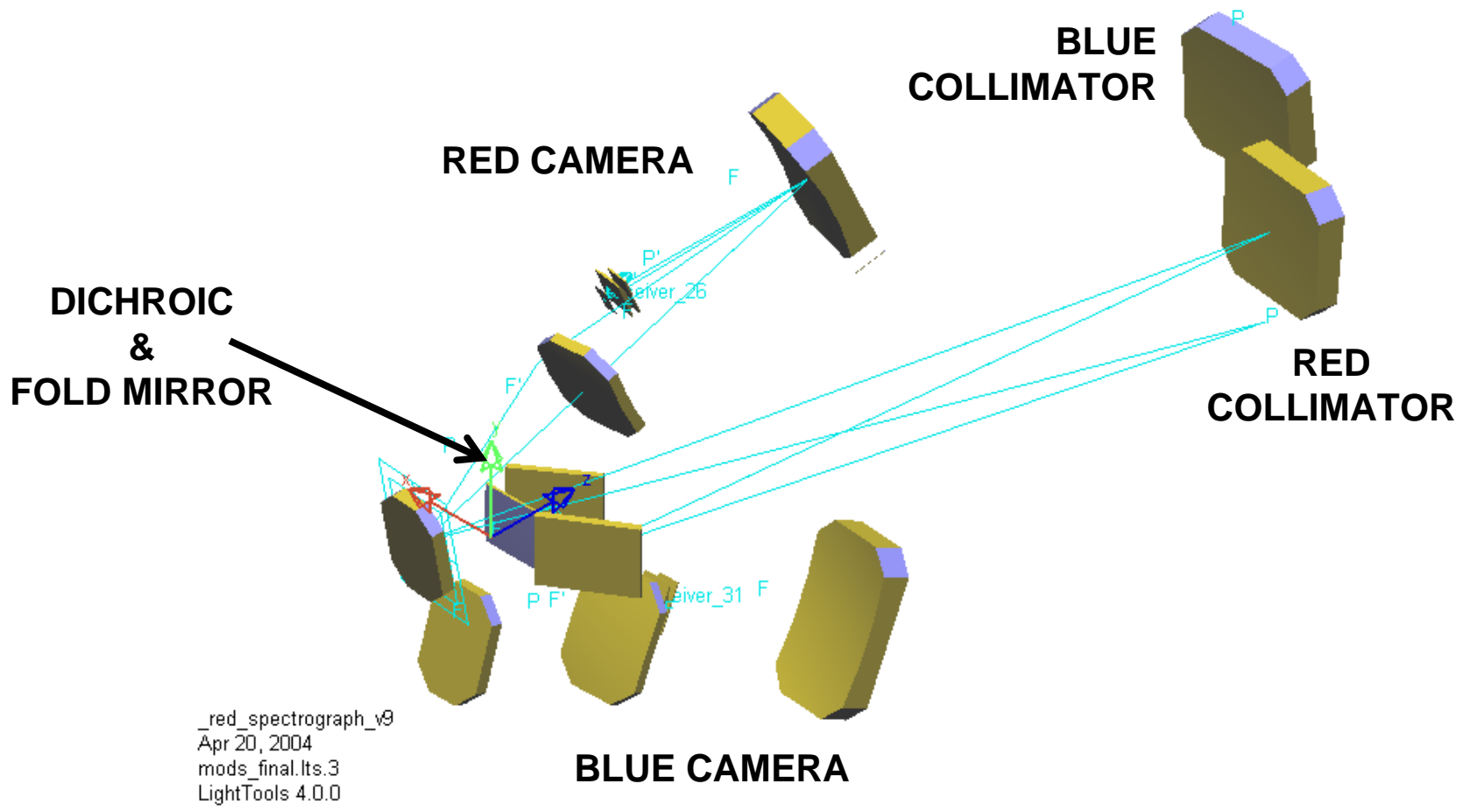


MODS Optics

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MODS 1 both channels shown



Outline

- Tracking status & delivery using spreadsheets showing ongoing status of all optical components for both MODS 1 & MODS 2
- Current status of optical components for MODS 1 & MODS 2
- Evaluation of alignment procedures

MODS OPTICS TRACKING								
ITEM		VENDOR	BID	ORDERED	COATING	DELIVERY	STATUS	COMPLETED
Calibration lens	MODS 1	JML	received	yes	to be coated	RECVD.		YES
	MODS 2	JML	received	yes	to be coated	RECVD.		YES
Field lens	MODS 1	SOML	received	yes	JMI quote	pending	in re-work	
	MODS 2	SOML	received	yes	JMI quote	pending	in re-work	
Dichroic	MODS 1	JML	received	yes		RECVD.	to be coated	
	MODS 2	JML	received	yes		RECVD.	to be coated	
Red Fold Mirror 1	MODS 1	JML	received	yes	coated	RECVD.	to be coated	
	MODS 2	JML	received	yes		RECVD.	to be coated	
Red Fold Mirror 2	MODS 1	JML	received	yes	coated	RECVD.	to be coated	
	MODS 2		received	yes	coated	RECVD.	to be coated	
Collimator mirror 1	MODS 1	SAGEM	received	yes	See Quote	RECVD.	to be coated	
Collimator mirror 2	MODS 2	SAGEM	received	yes	"	RECVD.	to be coated	
Collimator mirror 3	MODS 1	SAGEM	received	yes	"	RECVD.	to be coated	
Collimator mirror 4	MODS 2	SAGEM	received	yes	"	RECVD.	to be coated	
R2000 red grating	MODS 1	Richardson	received	yes	NA	RECVD.		YES
	MODS 2	Grating Lab	received		NA		to be ordered	
R2000 blue grating	MODS 1	"	received	yes	NA	RECVD.		YES
	MODS 2	"	received		NA		to be ordered	
R8000 red Grating	MODS 1	"	Pending		NA		Pending	
	MODS 2	"	Pending		NA		Pending	
R8000 blue Grating	MODS 1	"	Pending		NA		Pending	
	MODS 2	"	Pending		NA		Pending	
Red Low Dispersion Prism	MODS 1		Pending				Pending	
	MODS 2		Pending				Pending	
Blue Low Dispersion Prism	MODS 1		Pending				Pending	
	MODS 2		Pending				Pending	
Red Imaging Flat	MODS 1	JML	received	yes	JML coating	RECVD.		YES
	MODS 2	JML	received	yes	JML	RECVD.		YES
Blue Imaging Flat	MODS 1	JML	received	yes	JML	RECVD.		YES
	MODS 2	JML	received	yes	JML	RECVD.		YES
Red Camera Corrector	MODS 1	SOML	received	yes	See Quote		in process	
	MODS 2	SOML	received	yes	"		in process	
Blue Camera Corrector	MODS 1	SOML	received	yes	"		near com-	

	MODS 2	SOML		received	yes	"		<u>pletion</u>	
Red Camera Mirror	MODS 1	SOML		received	yes	"		<u>to be coated</u>	
	MODS 2	SOML		received	yes	"		<u>to be coated</u>	
Blue Camera Mirror	MODS 1	SOML		received	yes	"	RECVD.	<u>to be coated</u>	
	MODS 2	SOML		received	yes	"		<u>to be coated</u>	
Red Field Flattener	MODS 1	SOML		received	yes	JMI quote	RECVD.	<u>to be coated</u>	
	MODS 2	SOML		received	yes	JMI quote	RECVD.	<u>to be coated</u>	
Blue Field Flattener	MODS 1	SOML		received	yes	JMI quote	RECVD.	<u>to be coated</u>	
	MODS 2	SOML		received	yes	JMI quote	RECVD.	<u>to be coated</u>	
Filter Blank BK7	MODS 1	JML		received	yes	JML	RECVD.		YES
	MODS 2	JML		received	yes	JML	RECVD.		YES
Filter Blank F-S	MODS 1	JML		received	yes	JML	RECVD.		YES
	MODS 2	JML		received	yes	JML	RECVD.		YES
AGW Camera lens	MODS 1	B&H Photo		received	yes	coated	RECVD.		YES
	MODS 2			Pending				to be ordered	
AGW Collimator lenses	MODS 1	Emund			yes	coated	RECVD.		YES
	MODS 2				yes				YES
Filters for AGW		barr-filt		received				to be ordered	
Integrating Sphere	MODS 1								YES
Integrating Sphere	MODS 2								YES
Spectral Pen lamps	MODS 1	Sphere Optics		received	yes	NA	RECVD.		YES
QTH lamps	MODS 2	Sphere Optics		received	yes	NA	RECVD.		YES
QTH Sockets	MODS 1	Oriel			yes		RECVD.		YES
Spectral Pen lamps	MODS 1	Oriel			yes		RECVD.		YES
QTH lamps	MODS 1	Oriel			yes		RECVD.		YES
QTH Sockets	MODS 2						RECVD.	to be ordered	
	MODS 2						RECVD.	to be ordered	
SDSS Filter Set	MODS 1	Barr					RECVD.		YES
SDSS Filter Set	MODS 2						RECVD.	to be ordered	
				Pending				to be ordered	
Bypass Gratings	MODS 1 & 2	Holo or		received	yes	NA		12-14 wks	
40 mm prisms for AGW	MODS 1 & 2	Edmund			yes	JML quote	RECVD.	<u>to be coated</u>	
lenses for AGW & relay	MODS 1 & 2				yes				YES

Small Optics

All the small optics have been received

- Calibration lenses for MODS 1 & MODS 2
- Field lenses for MODS 1 & MODS 2
- Blue field-flatteners for MODS 1 & MODS 2
- Red field-flatteners for MODS 1 & MODS 2

They will receive AR & BBAR coatings from JML Optical.

Additional components

- SDSS filter set for MODS 1
- Clear glass filters for MODS 1 & MODS 2
- Bypass gratings for the IMCS for MODS 1 & MODS 2
- Integrating spheres for MODS 1 & MODS 2

Dichroic and Fold Mirrors

- 4 fold mirrors for MODS 1 & MODS 2 have been received from JML and are coated.
- The dichroic substrates for MODS 1 & MODS 2 have been received.
- Coating quotes for the dichroic from Barr Associates and ZC & R Coatings for Optics Inc. are being evaluated.

Collimators

- We have received 4 collimator mirrors from Sagem REOSC.
- They will be coated after attaching flexure mounts and inserting in cells

Gratings

- Blue and Red R = 2000 gratings for MODS 1 have been received.
- Blue and Red R = 2000 gratings for MODS 2 will be ordered this month.
- R = 5000 – 8000 options for red and blue channels are being investigated.
- Blue channel may require additional rulings or a mosaic of smaller gratings.

Imaging Mirrors

- The blue imaging mirrors with Aluminum coatings have been received from JML for both MODS 1 & MODS 2
- The red imaging mirrors with protected silver coatings have been received from JML for both MODS 1 & MODS 2

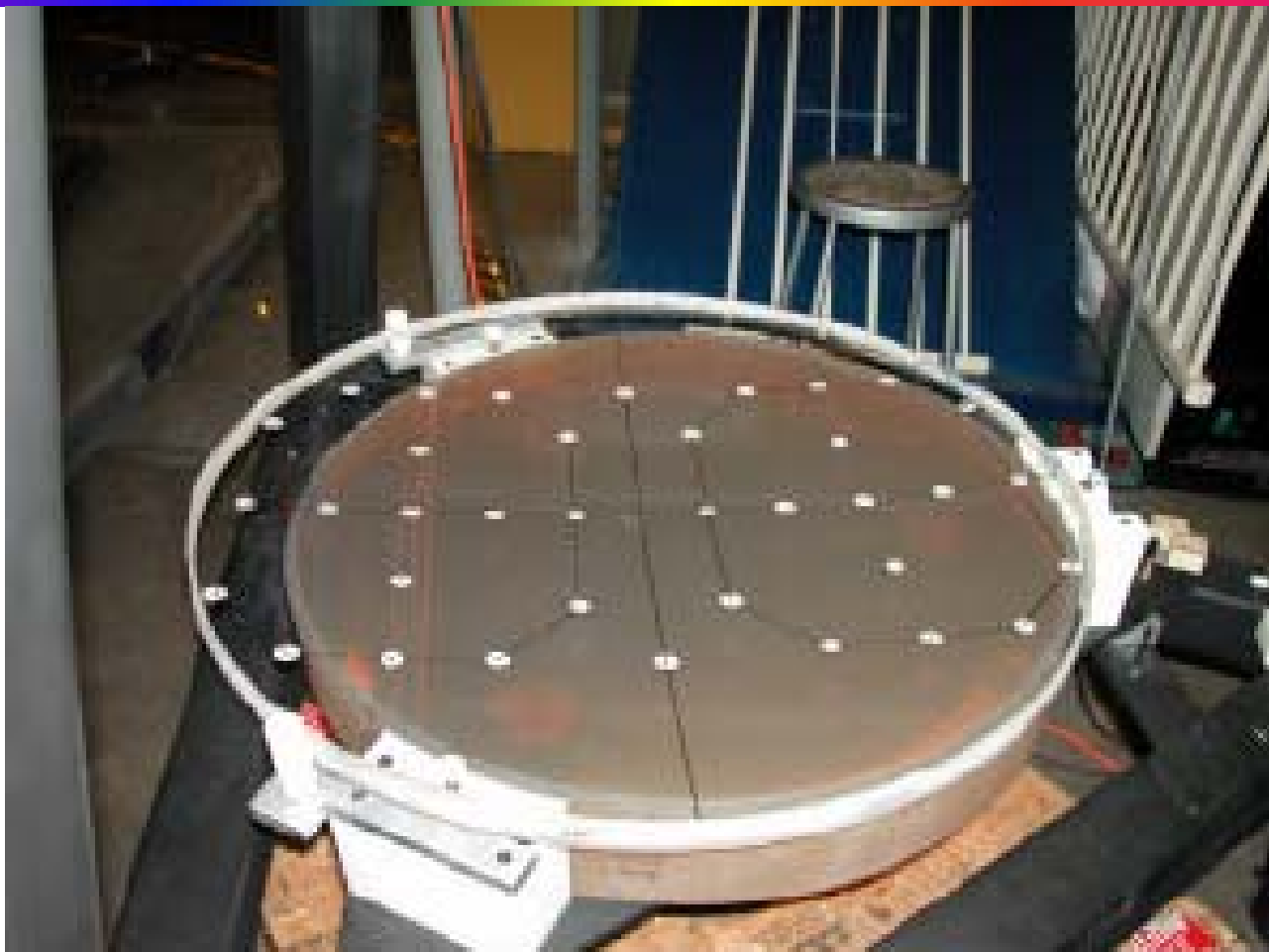
Camera Mirrors

- 1 Mirror has been delivered from SOML
- The three additional mirrors are fine ground and generated but need finishing.
- The mirrors will be coated after attaching flexures & mounting in cells

Blue Corrector lenses

- The Blue corrector parent is in the final stages of figuring at SOML
- The parent will be cut to provide the correctors for MODS 1 & MODS 2 as soon as the figure has been verified.
- Current delivery date is July 6 2005

Blue corrector and test sphere set-up for Null-lens test at SOML



Red Corrector lenses

- The Red corrector parent has been generated and awaits polishing

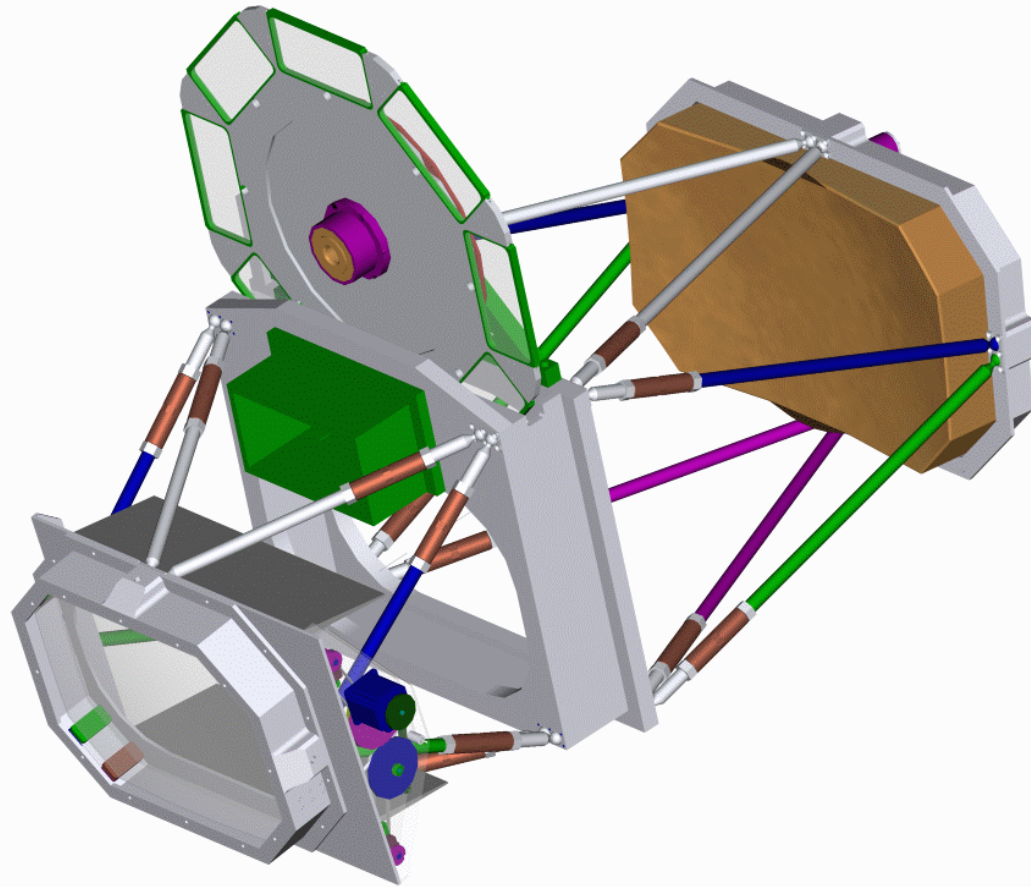
BBAR & Reflective Coatings

- Quotes have been received from 2 vendors.
- The correctors for the cameras will receive BBAR coatings for the blue and red wavelength ranges (320 –550nm & 550 – 1100 nm)
- The collimator and camera mirrors for the red channel will be coated with protected silver.
- The mirrors for the blue channel will be coated with UV enhanced aluminum.
- The optics will be coated when they are mounted in their cells.

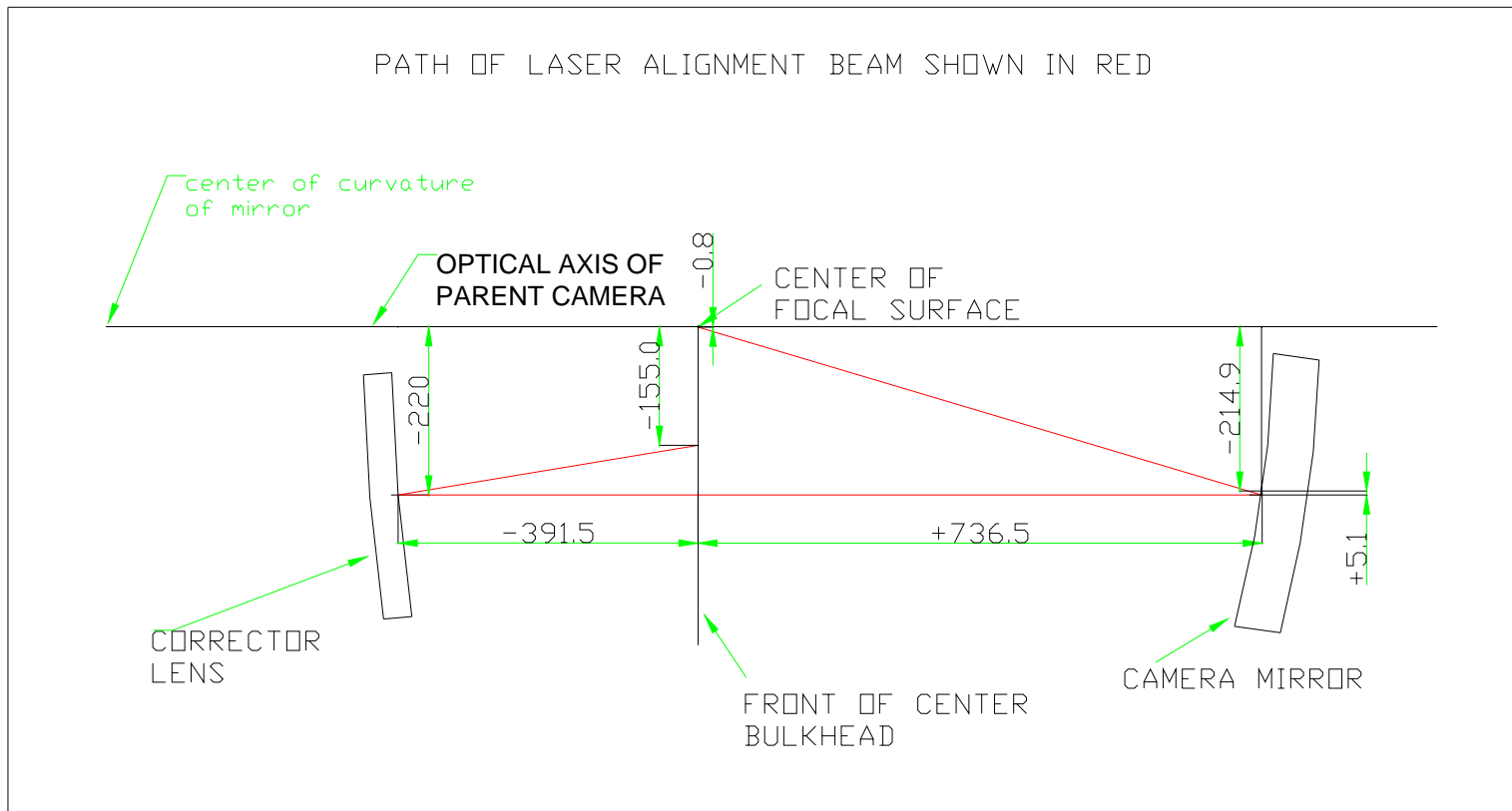
Alignment procedure

- A preliminary alignment is done using a direct measurement to space the camera optics.
- A laser is used to adjust the corrector and camera mirror in tip and tilt

Preliminary Camera Alignment



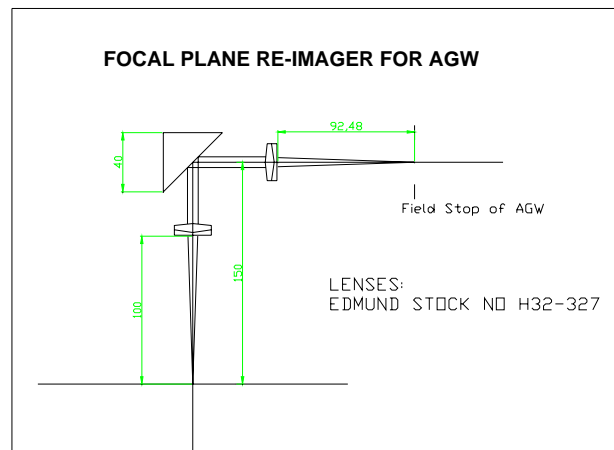
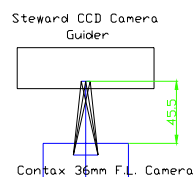
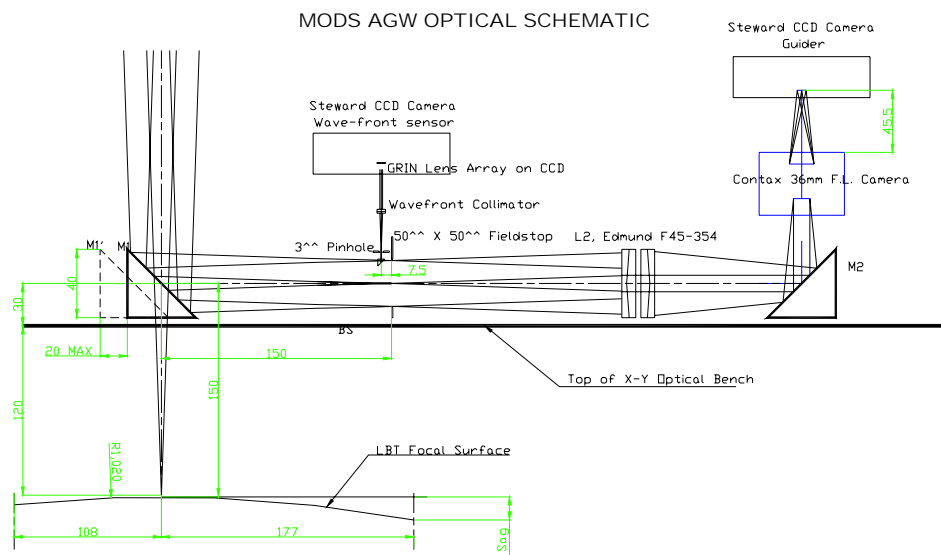
Preliminary Camera Alignment



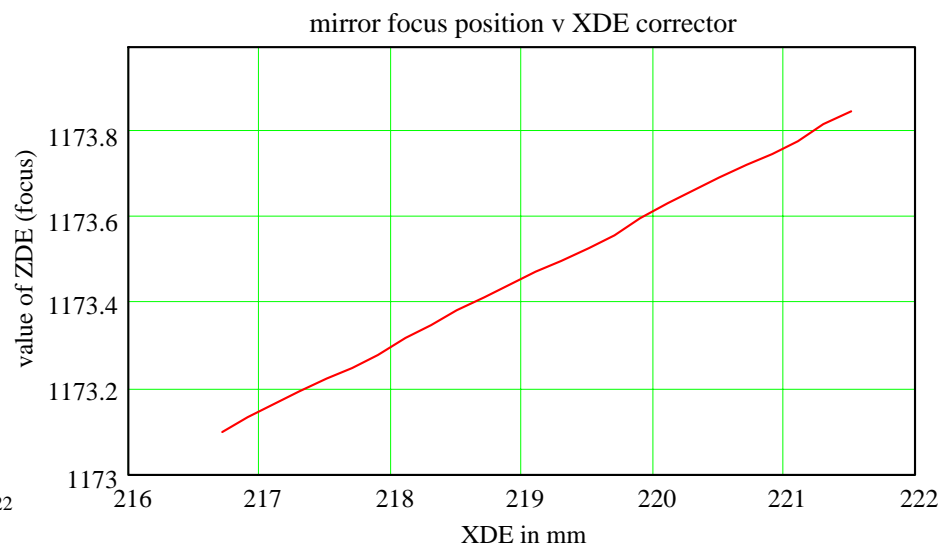
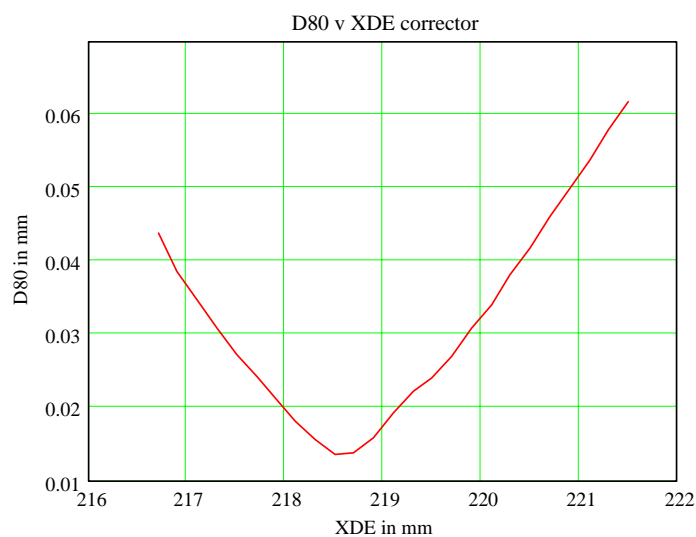
Fine Alignment procedure

The camera will be aligned in the spectrograph structure using the AGW stage with a re-imaging probe and a pinhole source in the camera focal plane

Re-imager for Front AGW Unit

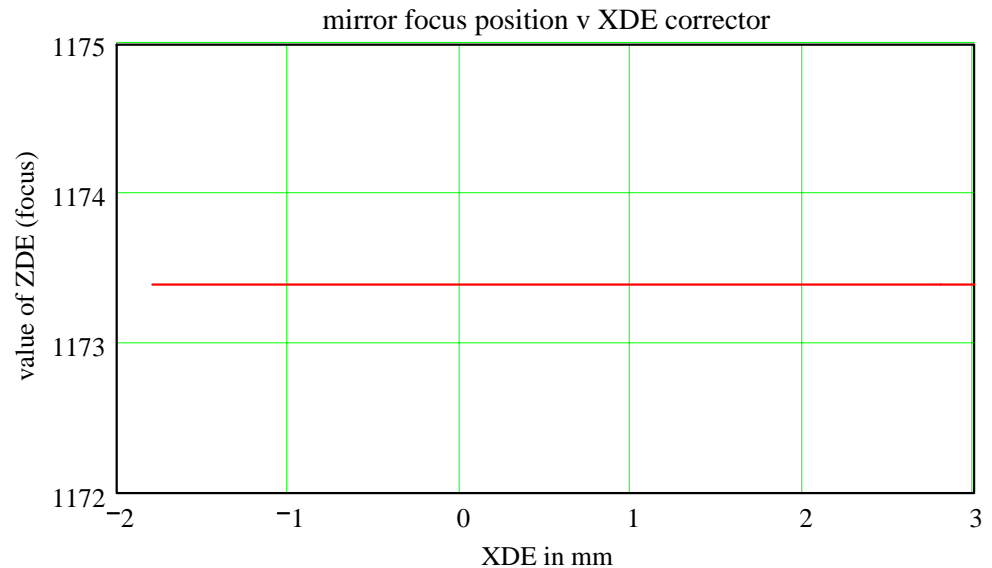
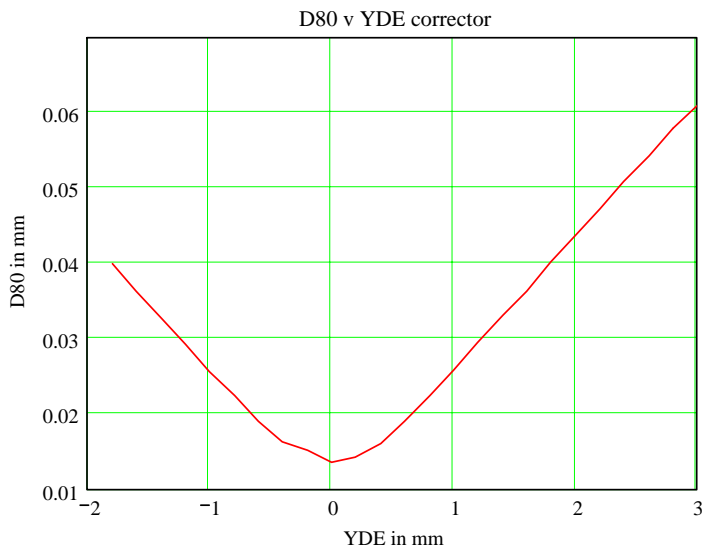


Camera Alignment



Variation of Image size and focus with de-center of the corrector in X

Camera Alignment



Variation of Image size and focus
with de-center of the corrector in Y

Camera Alignment

The convergence of the alignment has been tested using Code-V by starting with random de-centers of the corrector of 3 – 5 mm and is usually accomplished in 2 or three iterations between motions of the corrector in Y and X with change of focus.