



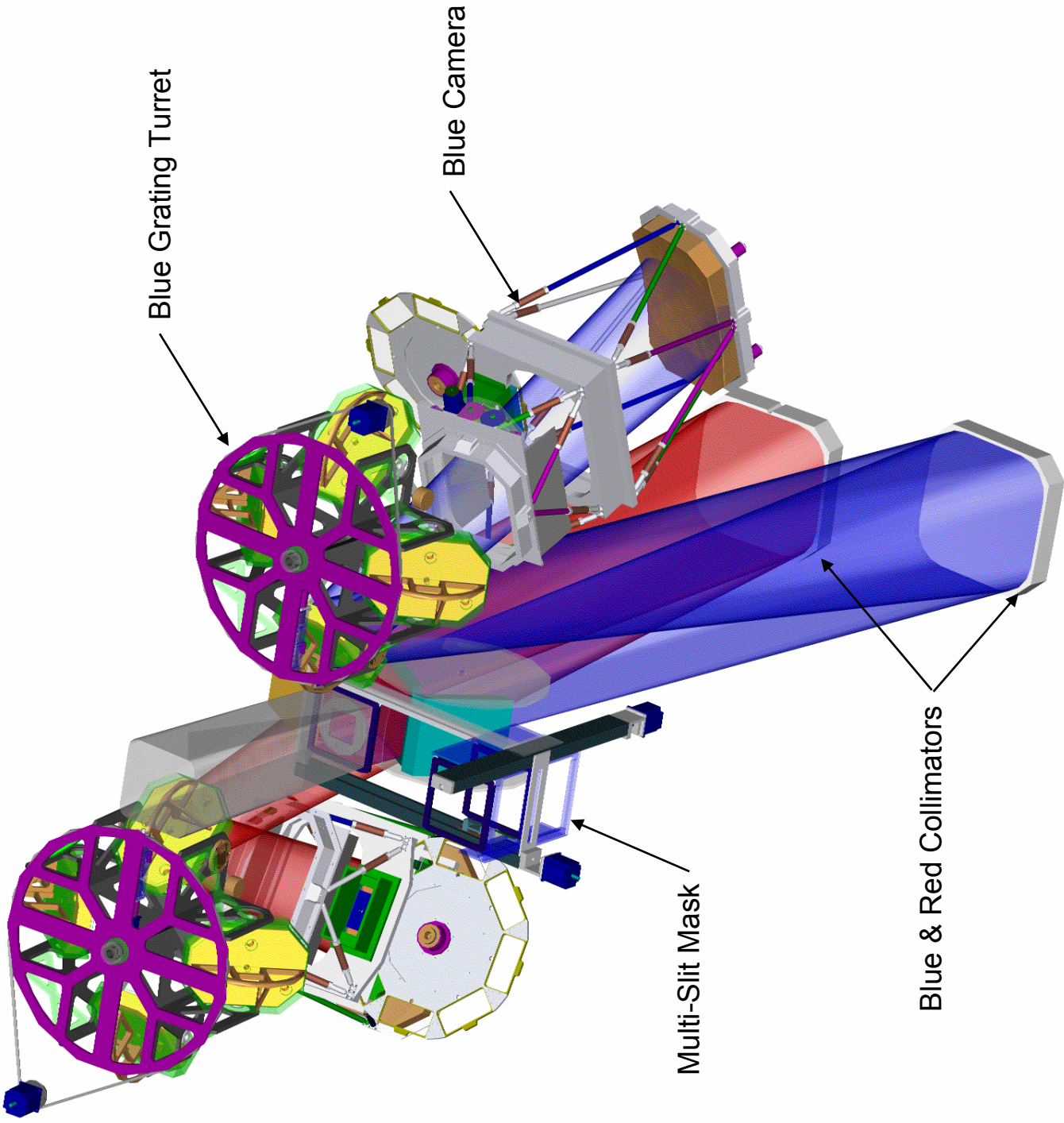
# MODS Mechanical Systems

Tom O'Brien

*The Ohio State University*

*Department of Astronomy*

MODS Progress Review – 2004 April 22



Blue Grating Turret

Blue Camera

Multi-Slit Mask

Blue & Red Collimators

# MODS Mechanical

## Mechanical Design, Fabrication, Assembly & Test,

- Opto-mechanical Design & Analysis
- Focal Plane Mechanisms
- Dual Collimator System (IMCS TTF mechanics)
- Grating Turrets
- Cameras
- MODS Structure, Design & Fabrication
- Instrument handling equipment

# MODS Opto-Mechanical

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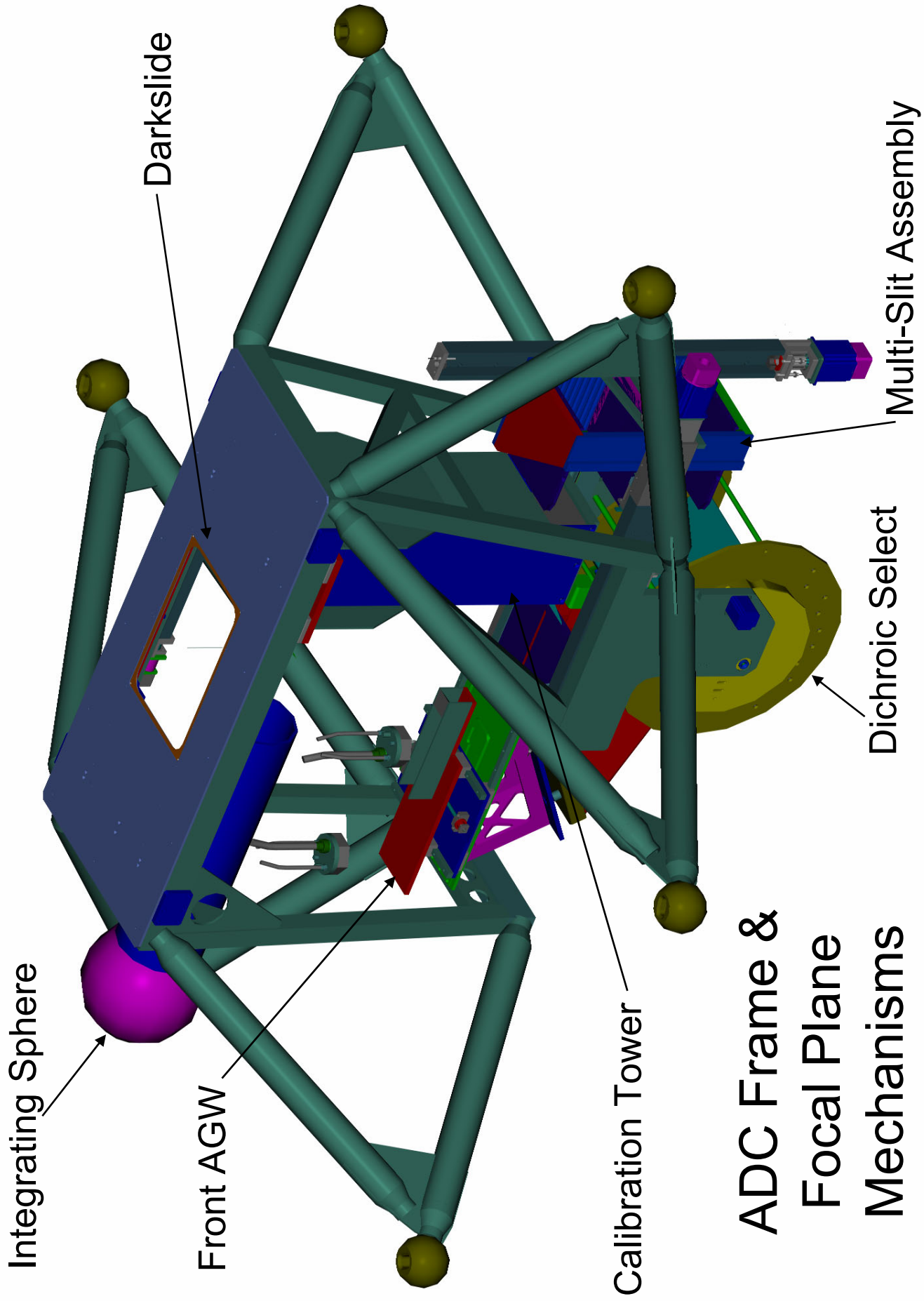
## Opto-Mechanical Work Completed

- All Optical Support design concepts complete
- Deflection Analysis of Collimator, Grating, Camera Primary are complete
- Epoxy for Pyrex to Invar joints has been selected and tested
- Mechanical sample of Camera Primary mirror is complete and ready for flexures to be bonded
- Impact of instrument flexure and alignment errors on image quality has been evaluated

# MODS Focal Plane Mechanisms

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- Dark Slide
- Calibration Optics
- Front Acquisition, Guide, & Wavefront
- Multi-Slit Cassette
- Dichroic Select



Integrating Sphere

Front AGW

Darkside

Calibration Tower

Dichroic Select

Multi-Slit Assembly

# ADC Frame & Focal Plane Mechanisms





# Dark Slide

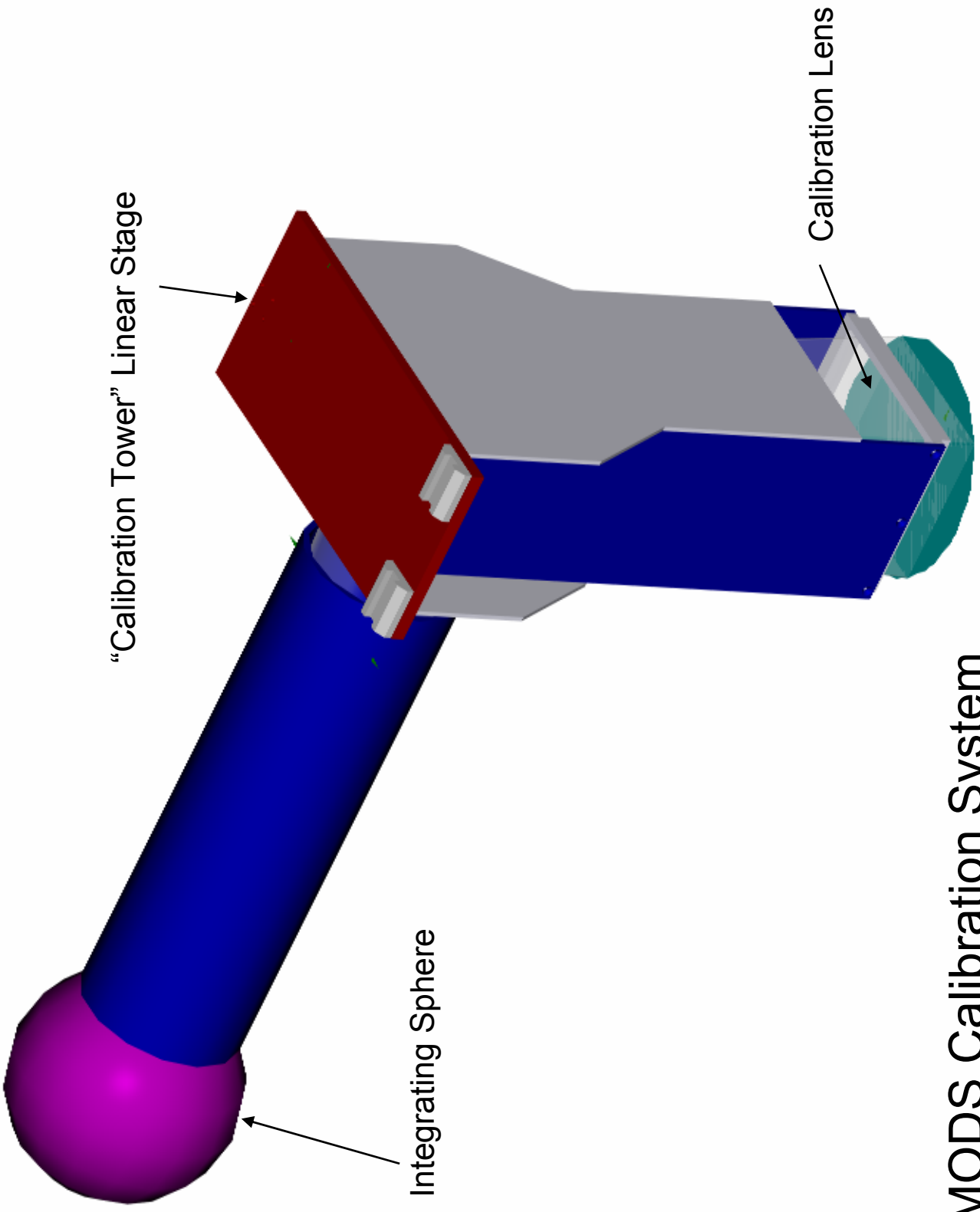
## Dark Slide Work Completed

- Dark Slide Design work complete
- Two copies of purchased components and machined parts have arrived
- One unit is assembled and has completed preliminary functional testing

## Dark Slide Work Remaining

- Anodize & re-assemble
- Light tight verification
- Final Testing





"Calibration Tower" Linear Stage

Integrating Sphere

Calibration Lens

# MODS Calibration System

# Calibration Optics Tower

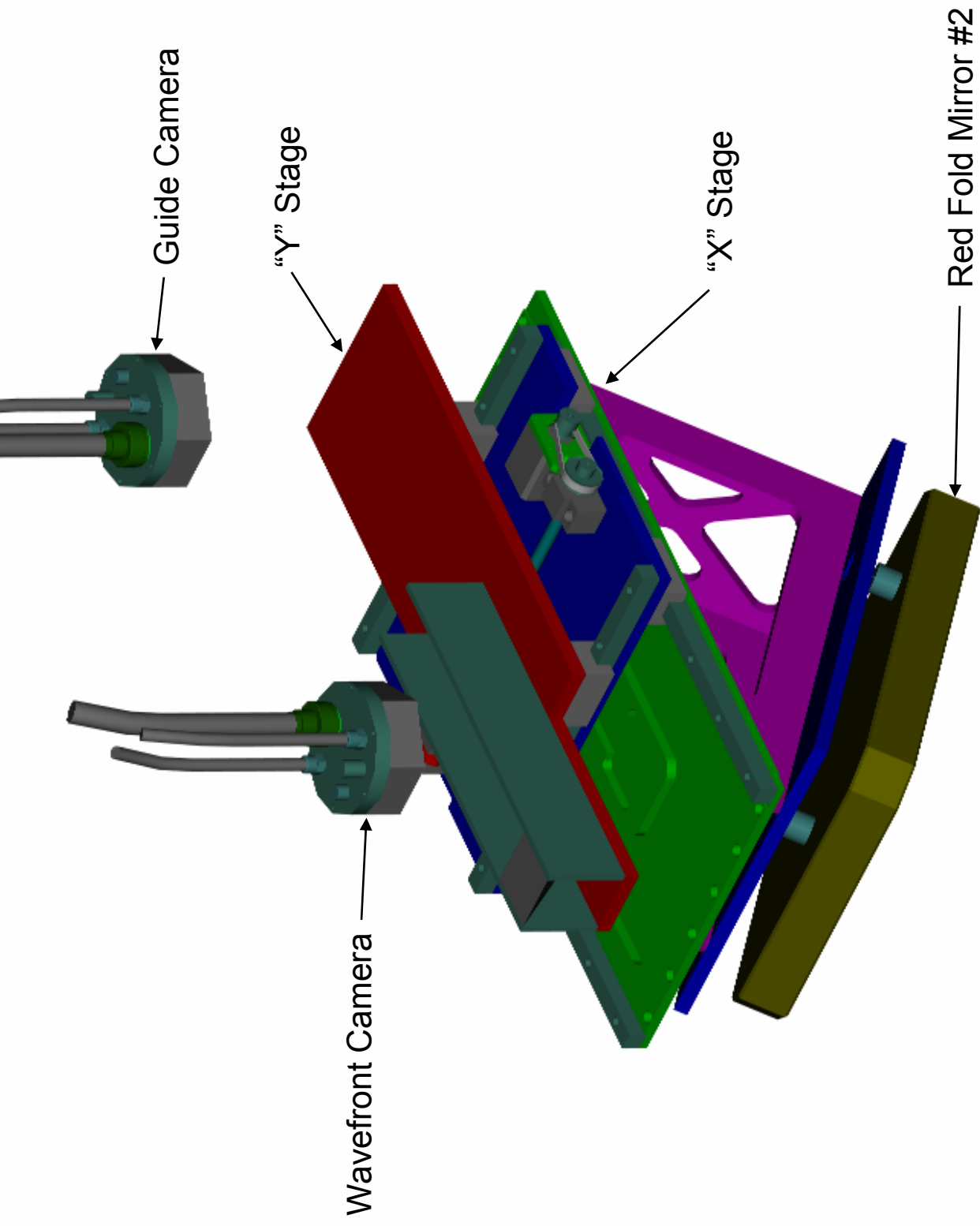
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## Calibration Optics Tower Work Completed

- Calibration Optics Tower Conceptual Design work is 65% complete
- Integrating sphere is on order
- Calibration lens is on order

## Calibration Optics Tower Work Remaining

- Complete the concept design, detail design
- Complete baffle design for calibration system
- Design a pupil mask holder
- Order machined parts & commercial components



MODS Front Acquisition, Guide, & Wavefront Mechanism

# Front Acquisition, Guide, & Wavefront

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## Front Acquisition, Guide, & Wavefront Work Completed

- Interface of mechanism with Red Fold #2, multi-slit mechanism and structure is complete
- X-Y Stage concept design is complete
- Some components ordered for linear stages

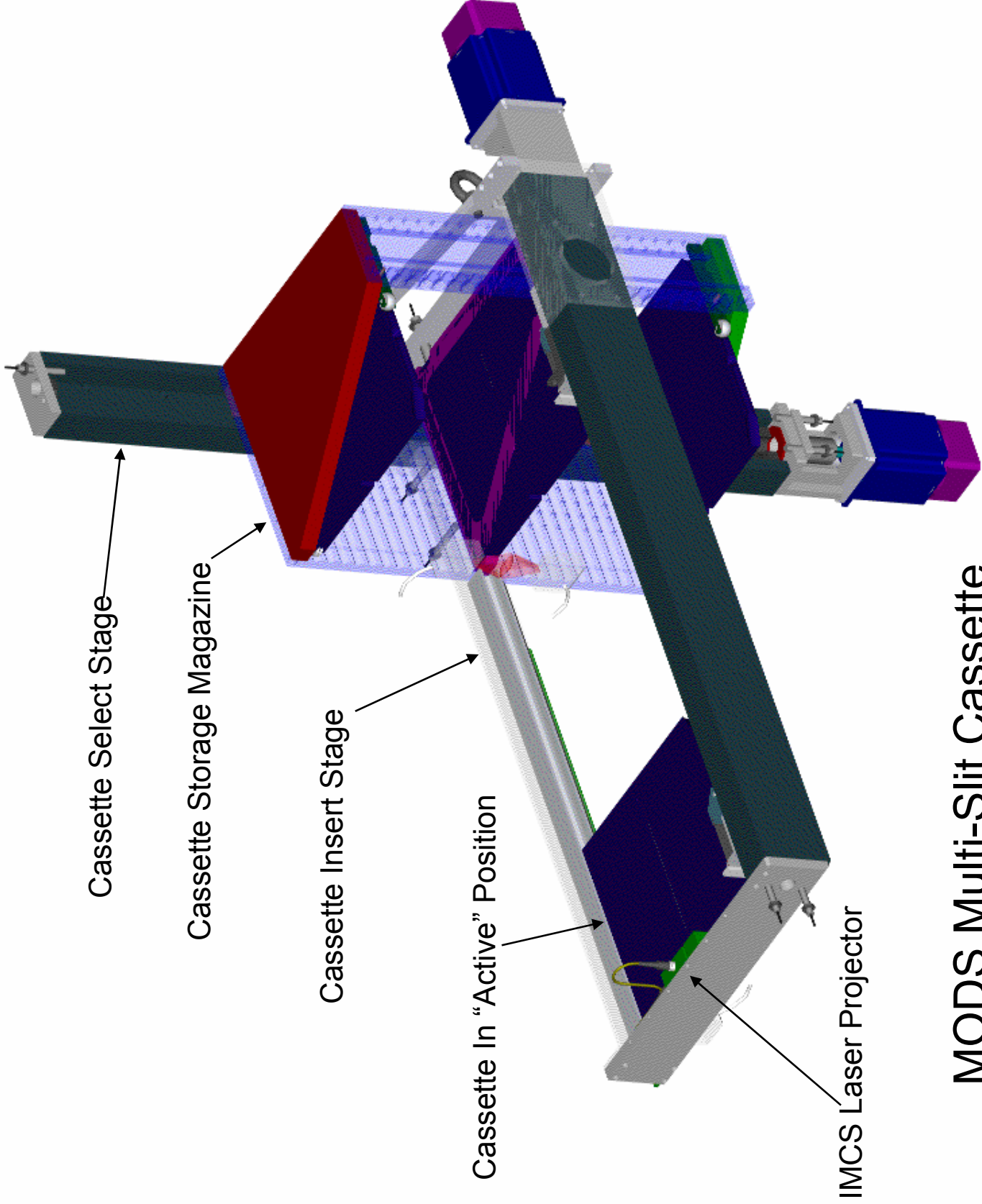
# Front Acquisition, Guide, & Wavefront

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## Front AGW Work Remaining

- Layout of Guide and Wavefront optics
- Design of Lens Cells, mirror supports, etc.
- Mounting of Guide and Wavefront cameras
- Design Focus mechanism
- Design Filter wheel for Guide camera
- Detail design machined parts
- Order machined parts & commercial components
- Assemble & Test





# MODS Multi-Slit Cassette

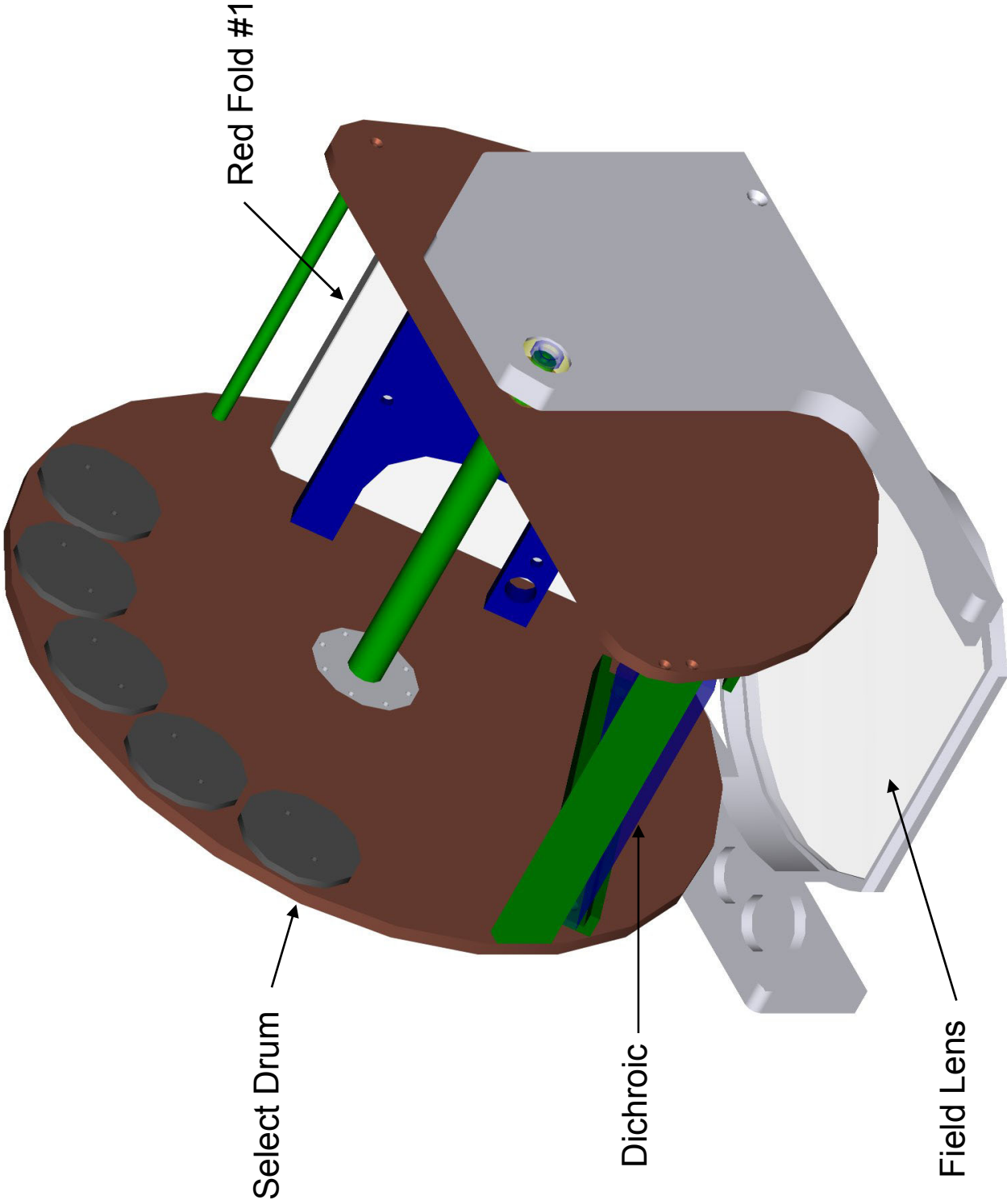
# Multi-Slit Cassette

## Multi-Slit Cassette Work Completed

- Design work complete
- Commercial components and machined parts are ordered

## Multi-Slit Cassette Work Remaining

- Assemble and Test first unit
- Complete detailed design of curved focal plane mask holding features
- Specify curved mask blanks, select vendor
- Specify and order laser mask cutting machine



Red Fold #1

Select Drum

Dichroic

Field Lens

# MODS Dichroic Changer

# Dichroic Changer

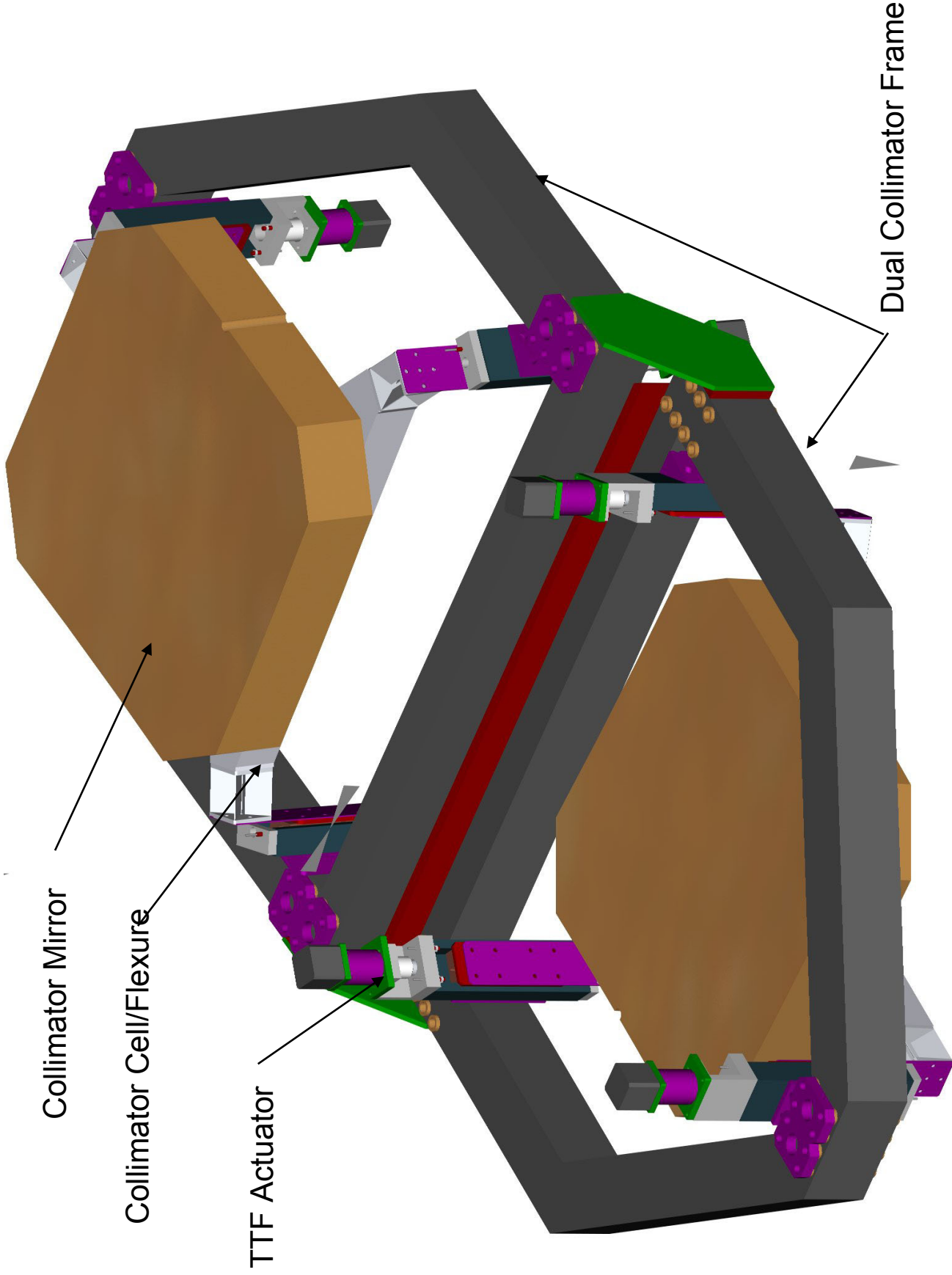
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## Dichroic Changer Work Completed

- Design concept is 85% complete
- Interfaces to field lens, multi-slit, optics beams, etc. are checked and complete.

## Dichroic Changer Work Remaining

- Complete concept design, detail design
- Order machined parts & commercial components
- Assemble & Test



Collimator Mirror

Collimator Cell/Flexure

TTF Actuator

Dual Collimator Frame

MODS Dual Collimator System



# Dual Collimator System

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## Dual Collimator Work Completed

- Red & Blue Collimator mounting with three Invar flexures between Hextek blank and steel collimator cell
- Special collimator cell flexures between cell and TTF mechanisms
- Three identical linear stages with stepper motor drive, reducer, home & limit switches
- Performance verified at the linear stage level and in the IMCS test rig

# Dual Collimator System

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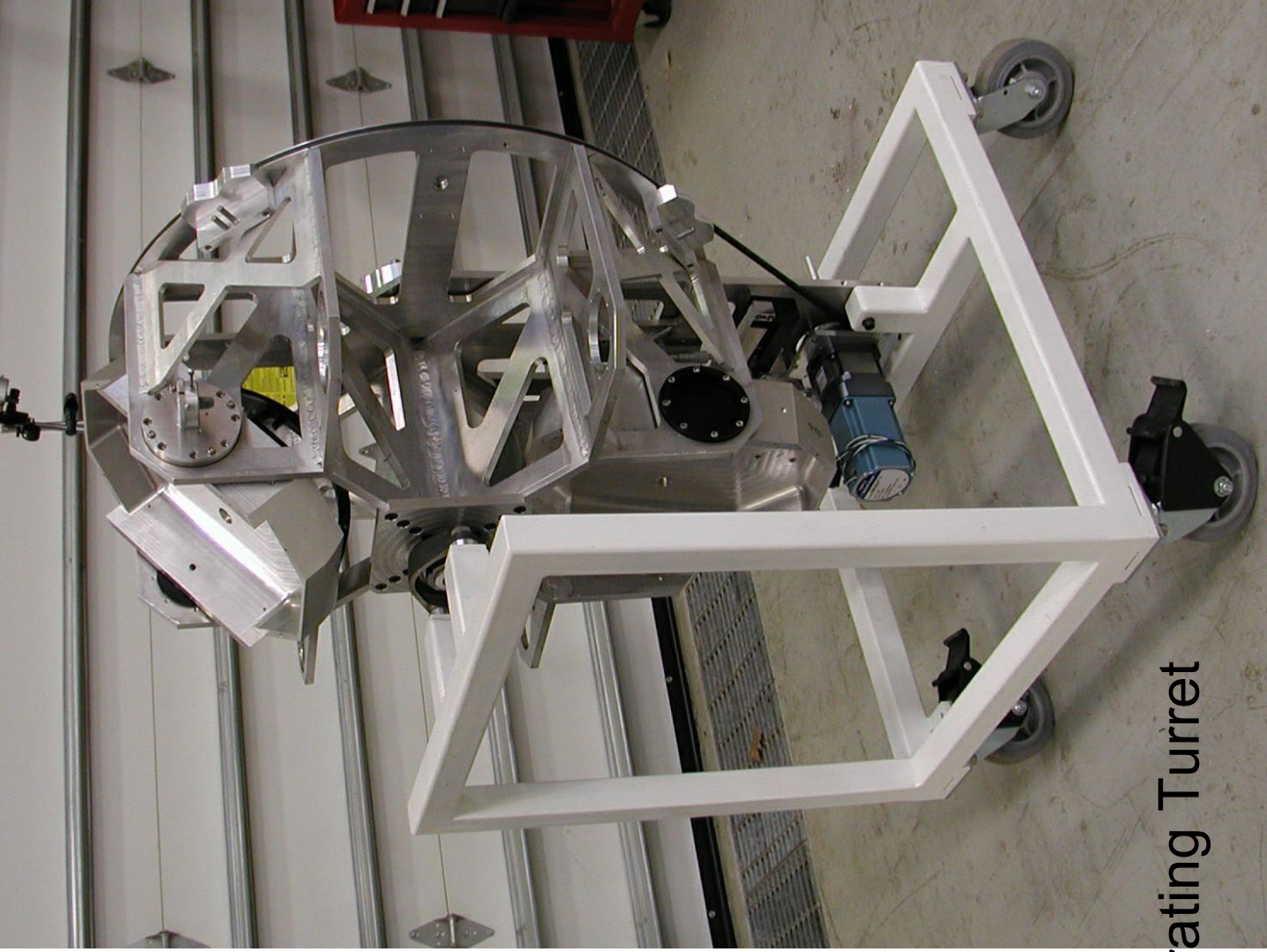
## Dual Collimator Work Remaining

- Red & Blue Collimators need to have flexures epoxy bonded into optics hardpoints
- Three more TTF actuators need to be assembled (parts complete for 12 actuators)
- Two halves of Dual Collimator Frame structure need to be joined

# Grating Turrets

## Grating Turrets Work Complete

- Grating turret design and analysis are complete
- Blue grating turret is assembled and has undergone preliminary functional testing
- Grating Tilt mechanism design and analysis are complete
- Grating tilt prototype has been performance tested in detail
- Imaging flat mechanisms are complete



MODS Grating Turret

# Grating Turrets

## Grating Turrets Work Remaining

- Grating Tilt mechanism needs to be integrated into the turret and tested
- Two more copies of the Grating tilt need to be assembled and tested (fab is complete for 6 tilt mechanisms)
- Gratings and imaging flats need flexures bonded to optics
- Red grating turret needs to be fabricated, assembled and tested



Camera Primary & Focus

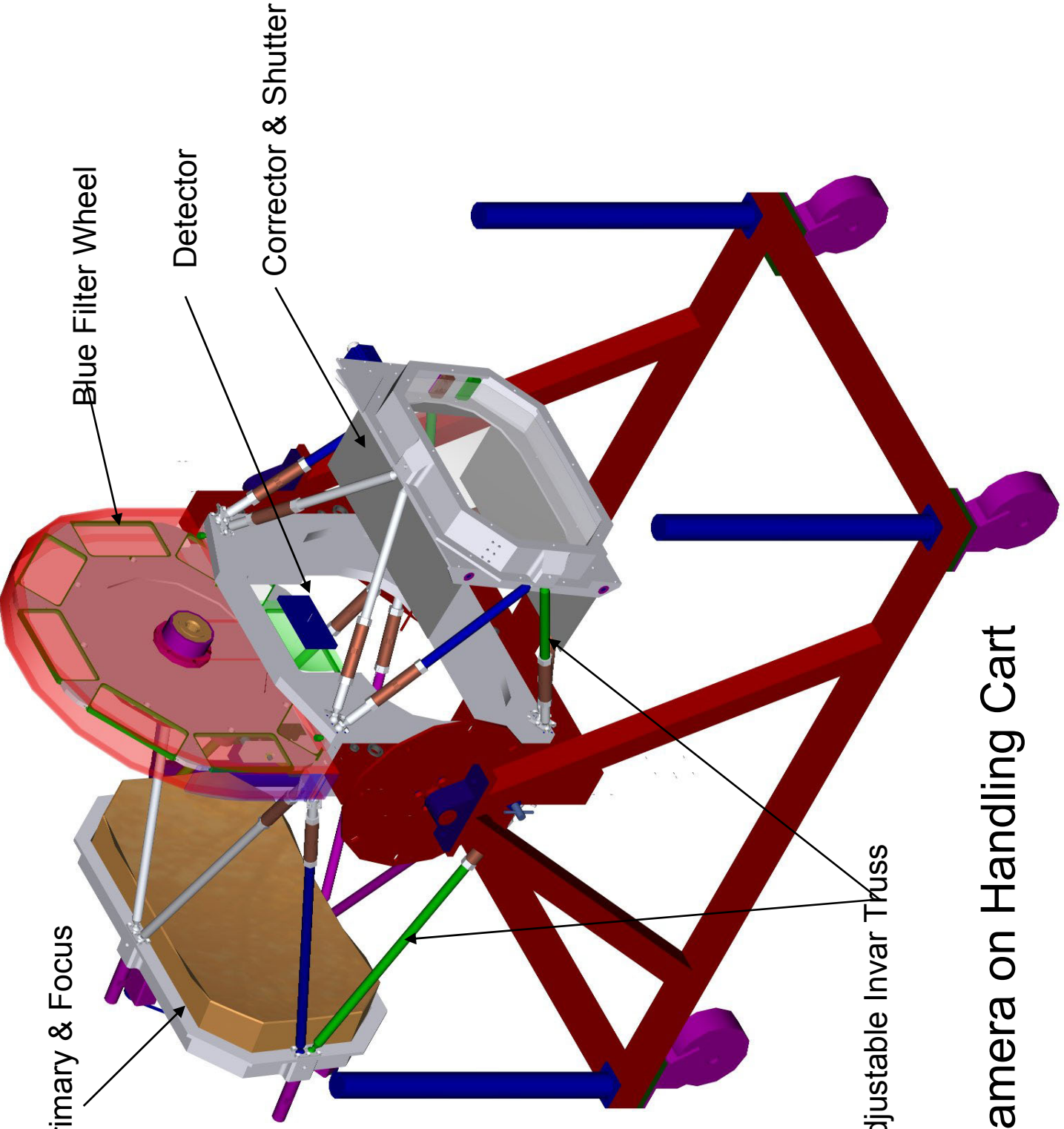
Blue Filter Wheel

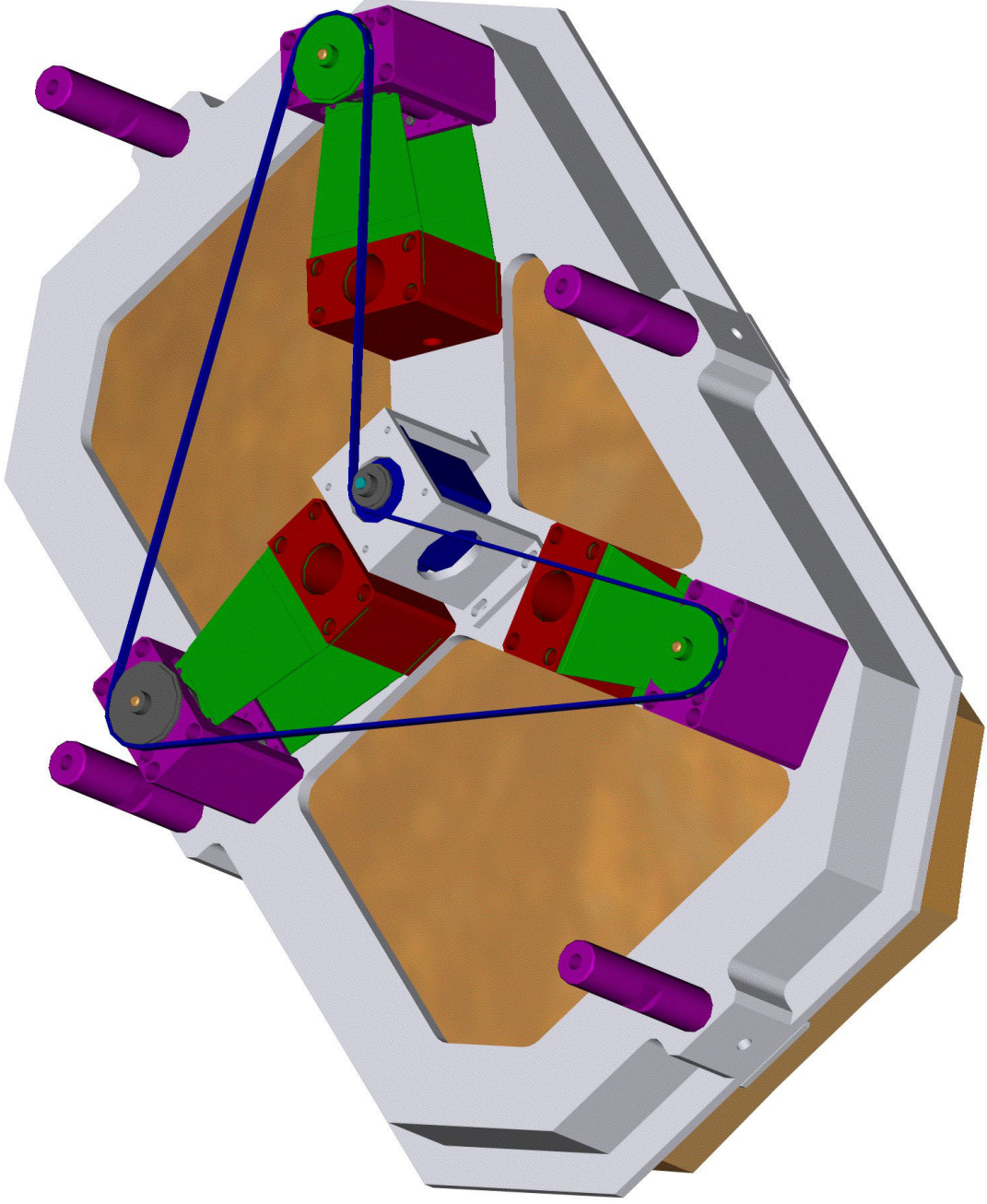
Detector

Corrector & Shutter

Adjustable Invar Truss

Blue Camera on Handling Cart





Camera Primary Cell & Focus Mechanism

# MODS Cameras

## Camera Work Complete

- Blue Camera design and analysis are complete
- Blue and Red Filter Wheels are complete and tested
- Blue and Red Shutters are complete and partially tested
- Blue camera focus is complete and partially tested
- Blue Camera truss is complete and has been tested for stiffness and alignment repeatability
- Red Camera Corrector cell, mirror cell, middle bulkhead, focus parts, are complete

# MODS Cameras

## Camera Work Remaining

- Full Integration and test of blue camera with all mechanisms
- Design of Detector dewar which also carries the field flattener
- Fabricate Red Camera Truss
- Full Integration and test of Red camera

# MODS Mechanical

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