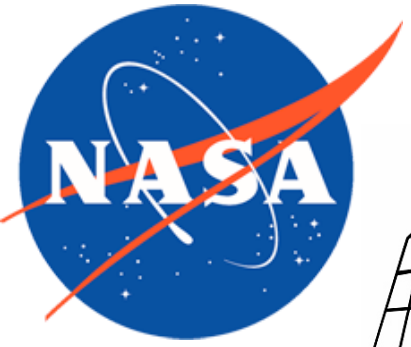
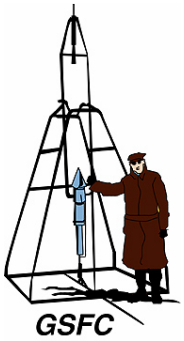


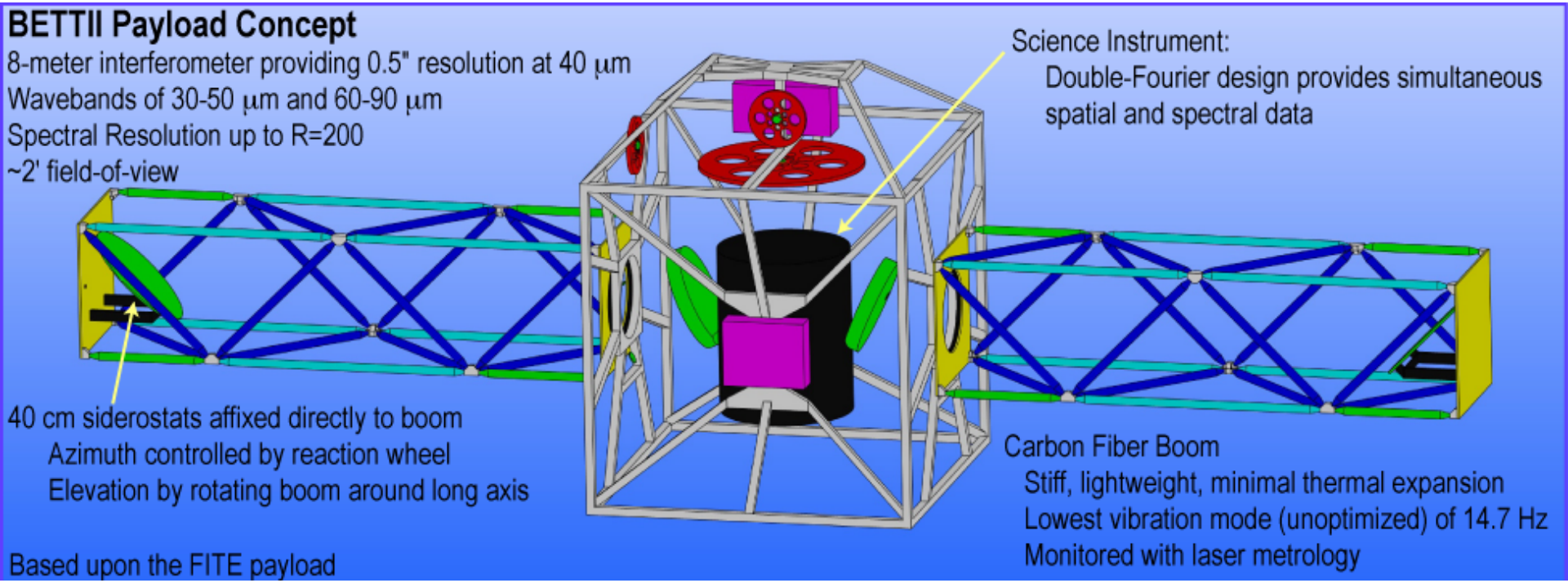


The Balloon Experimental Twin Telescope for Infrared Interferometry (BETTII)

Dr. Stephen Rinehart
NASA's Goddard Space Flight Center
Laboratory for Observational Cosmology

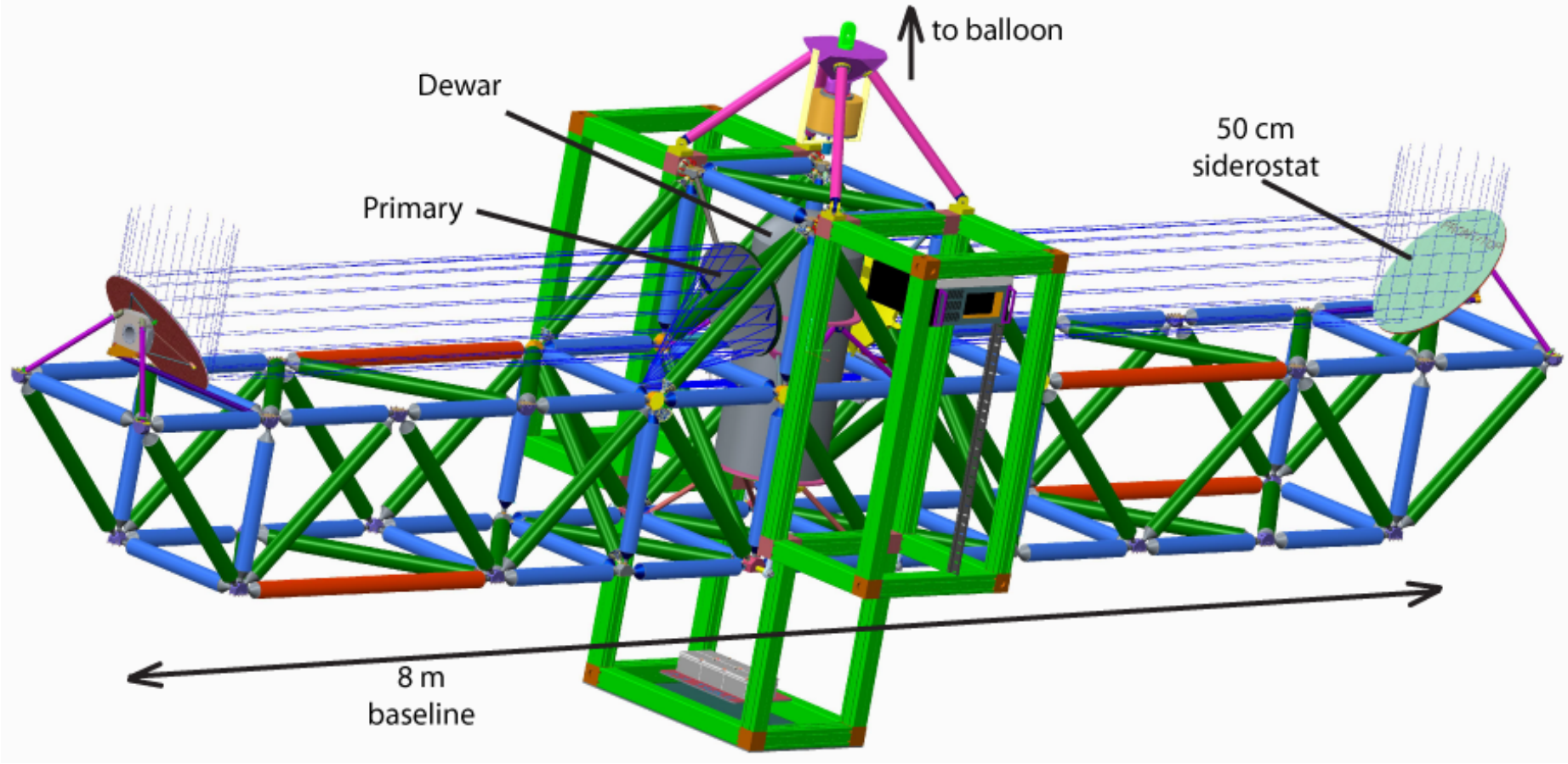
What is BETTII?

As proposed, BETTII looked something like this…



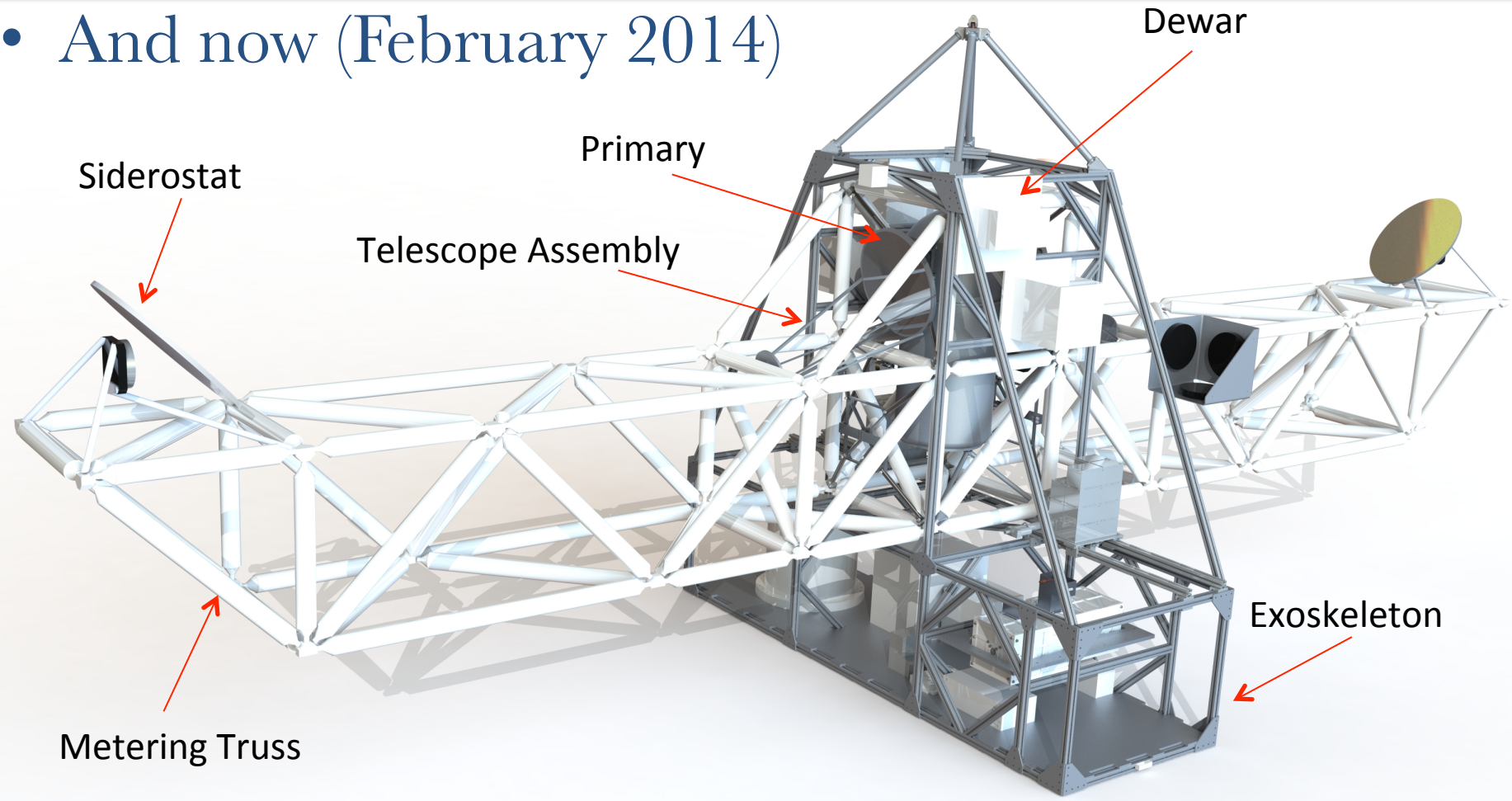
Evolution…

By December 2012, the design looked like…



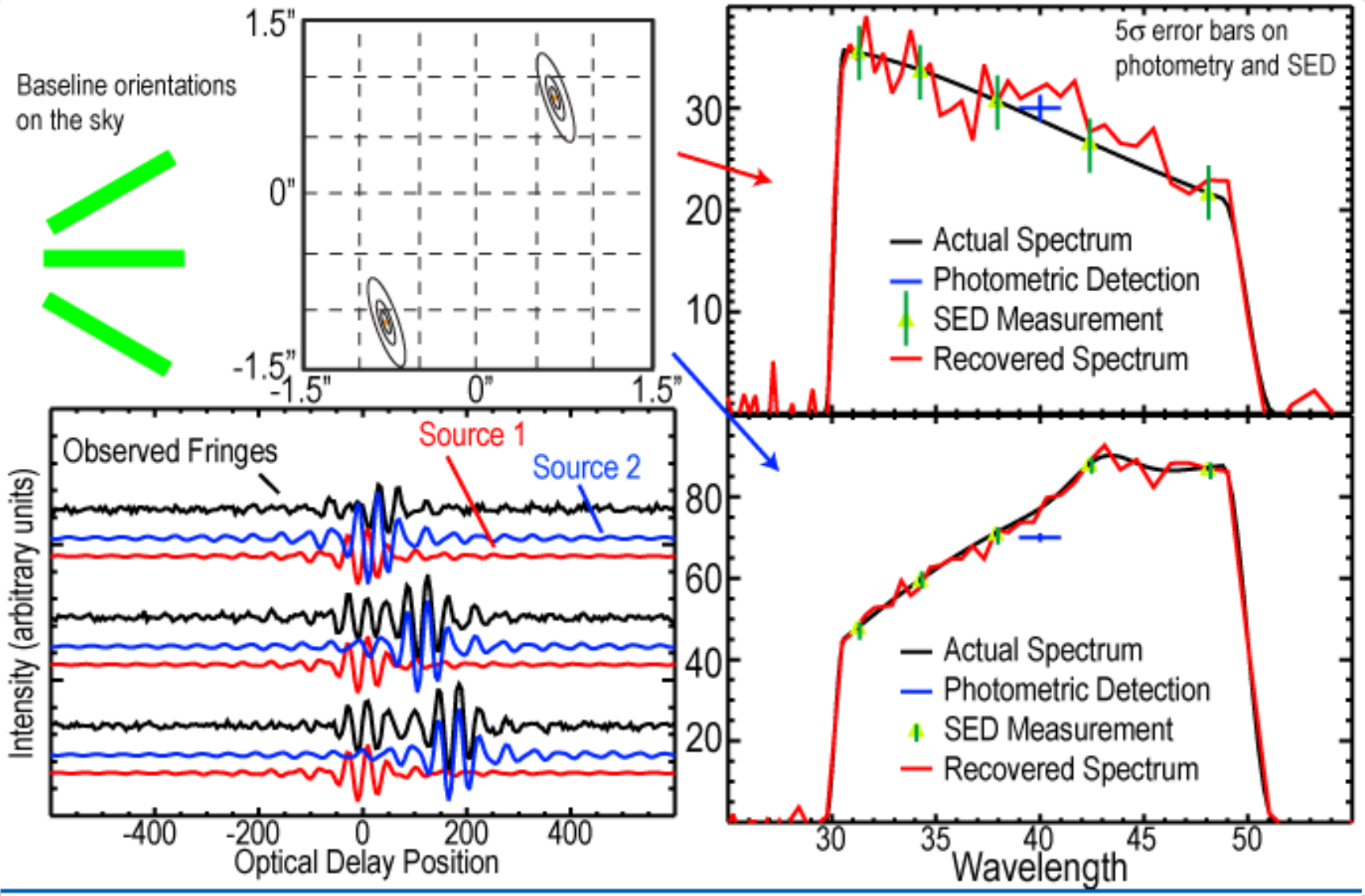
Current Design

- And now (February 2014)



- Essential design elements are unchanged…

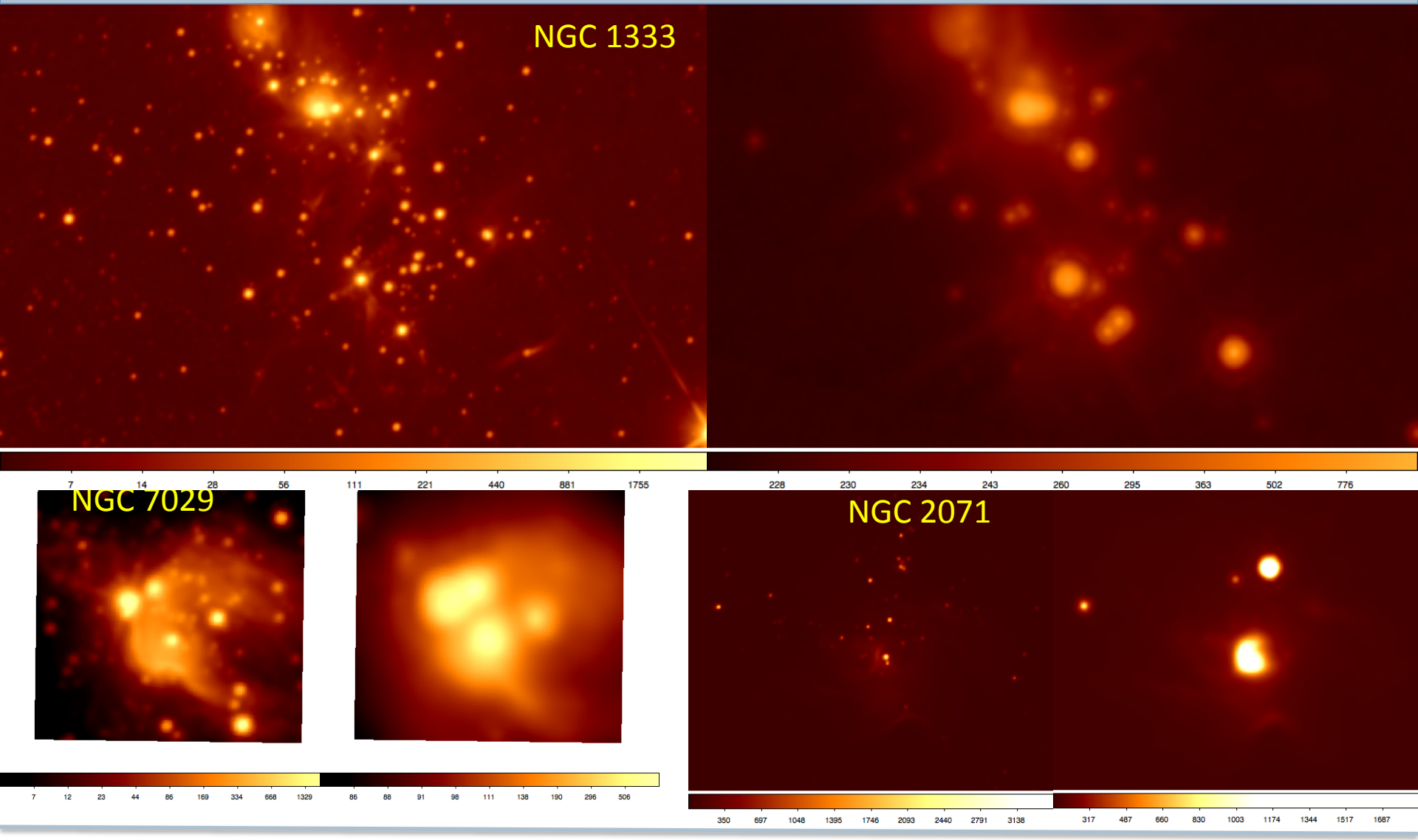
What can it do?



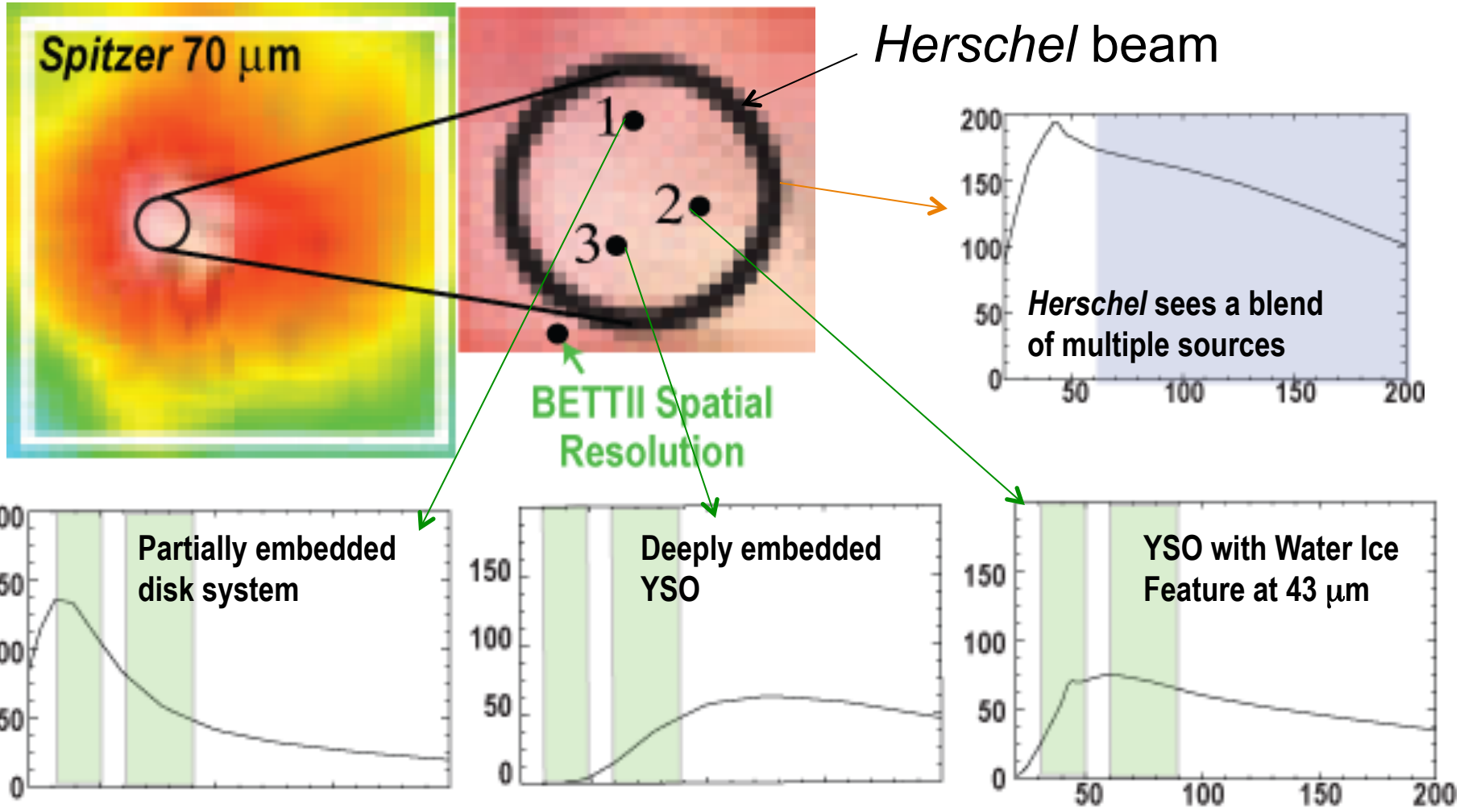
Key Science Features

- 8-meter baseline + Double-Fourier =
  - Angular Resolution of ~0.5” at 40 μm
  - Spectral Resolution of up to R~200
- Wavelength Coverage from 30-90 μm
- Sensitivity: ~20 Jy in 10 minutes
  - The Negative Spin: Require bright targets
  - The Positive Spin: Can do targets that saturate for *Spitzer* and *Herschel*

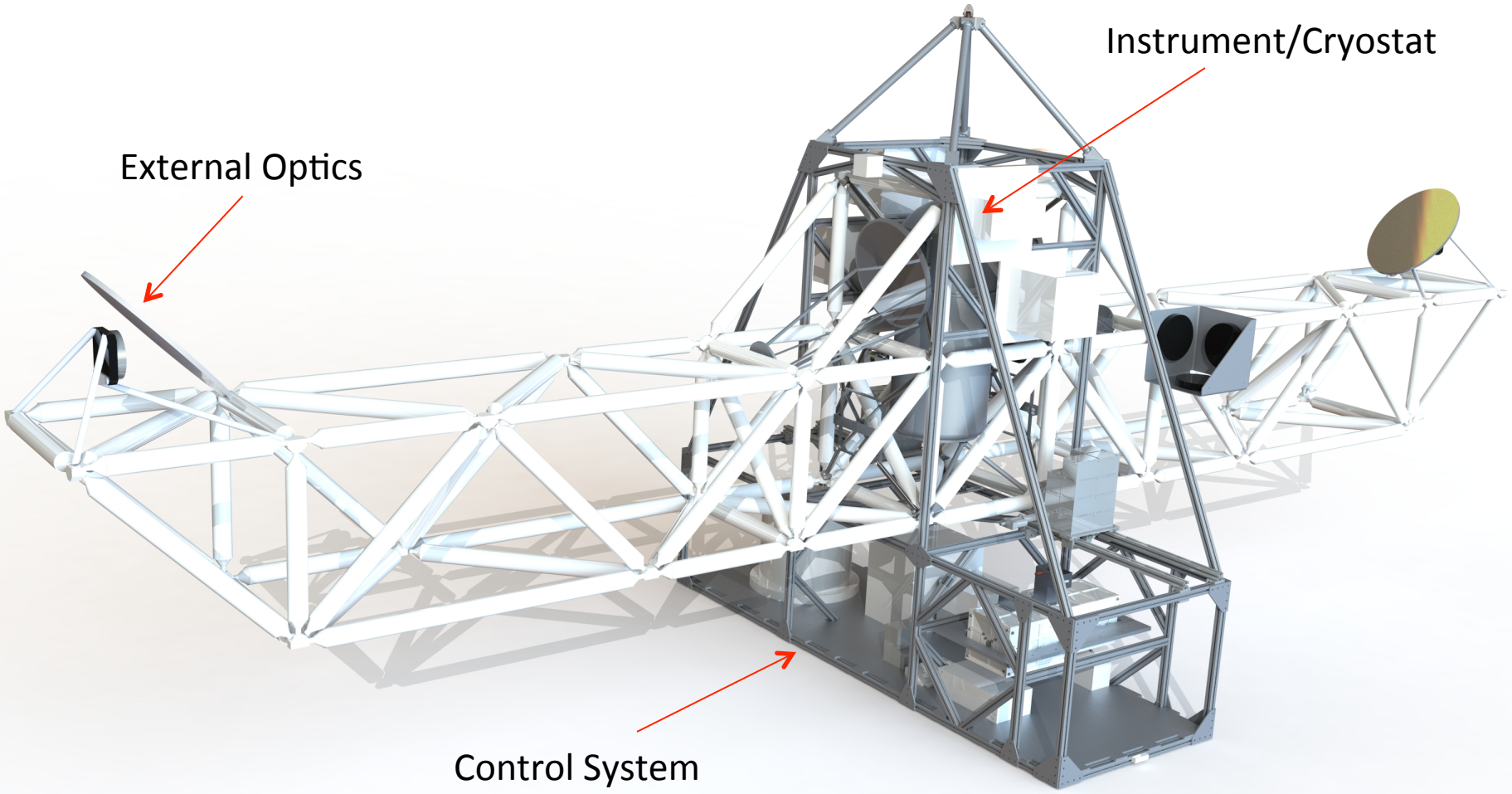
Science Goals



Spectra of Cores

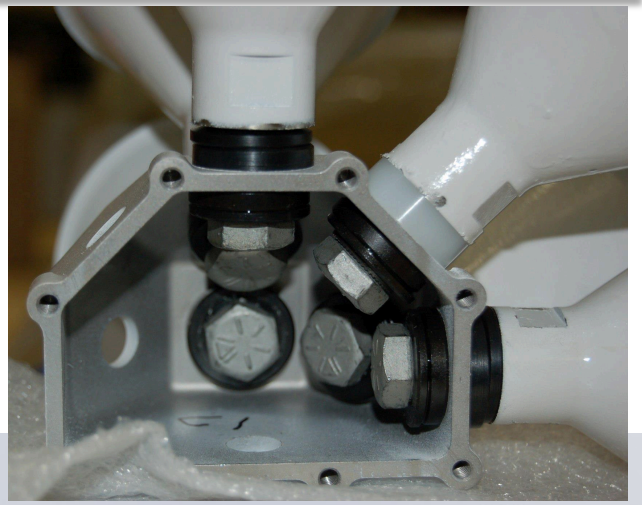


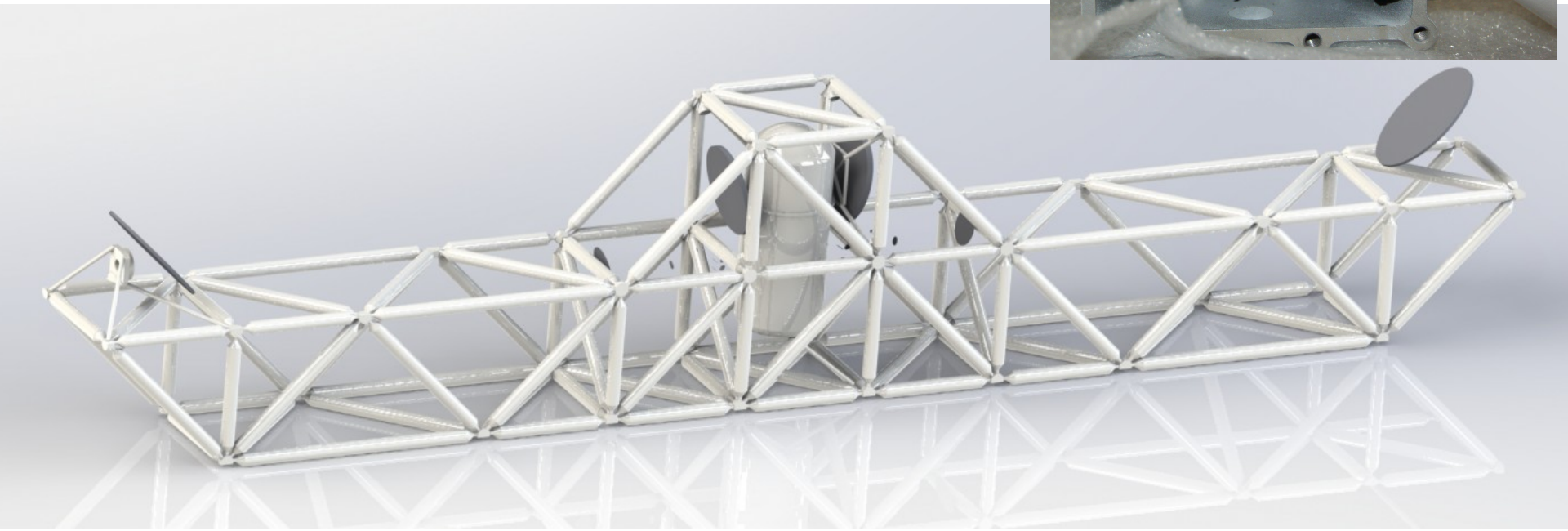
A Tale of Three Systems



Metering Truss

- Must be stiff, strong, and light
  - Made of carbon fiber tubes with stainless steel nosecones and nodes

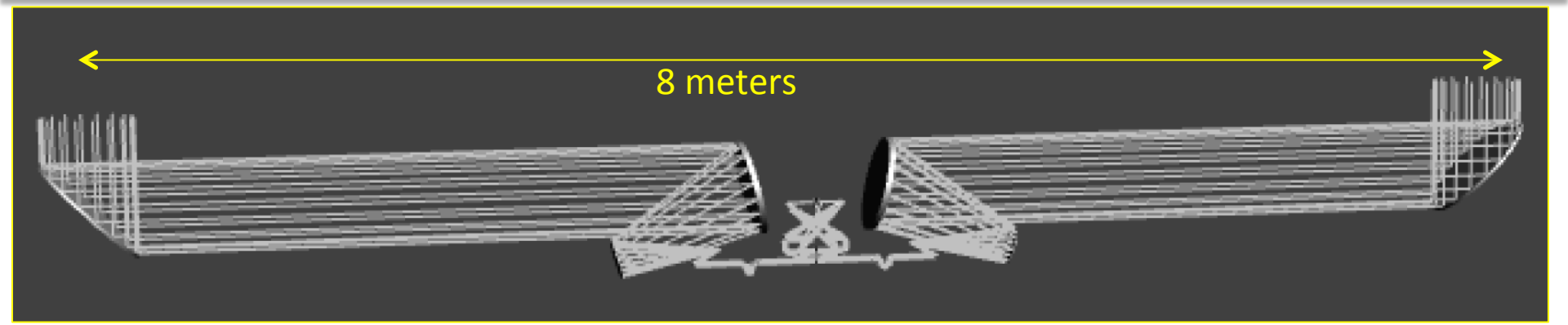


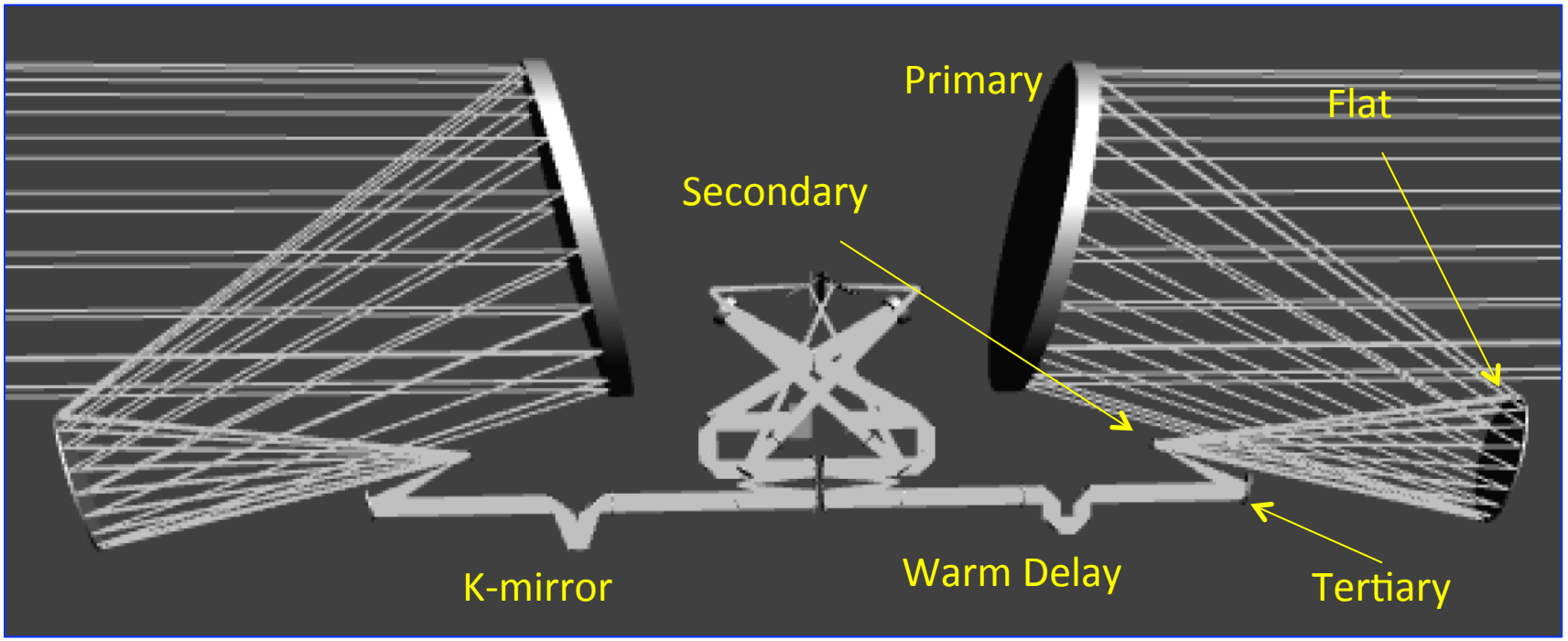


The Completed Truss

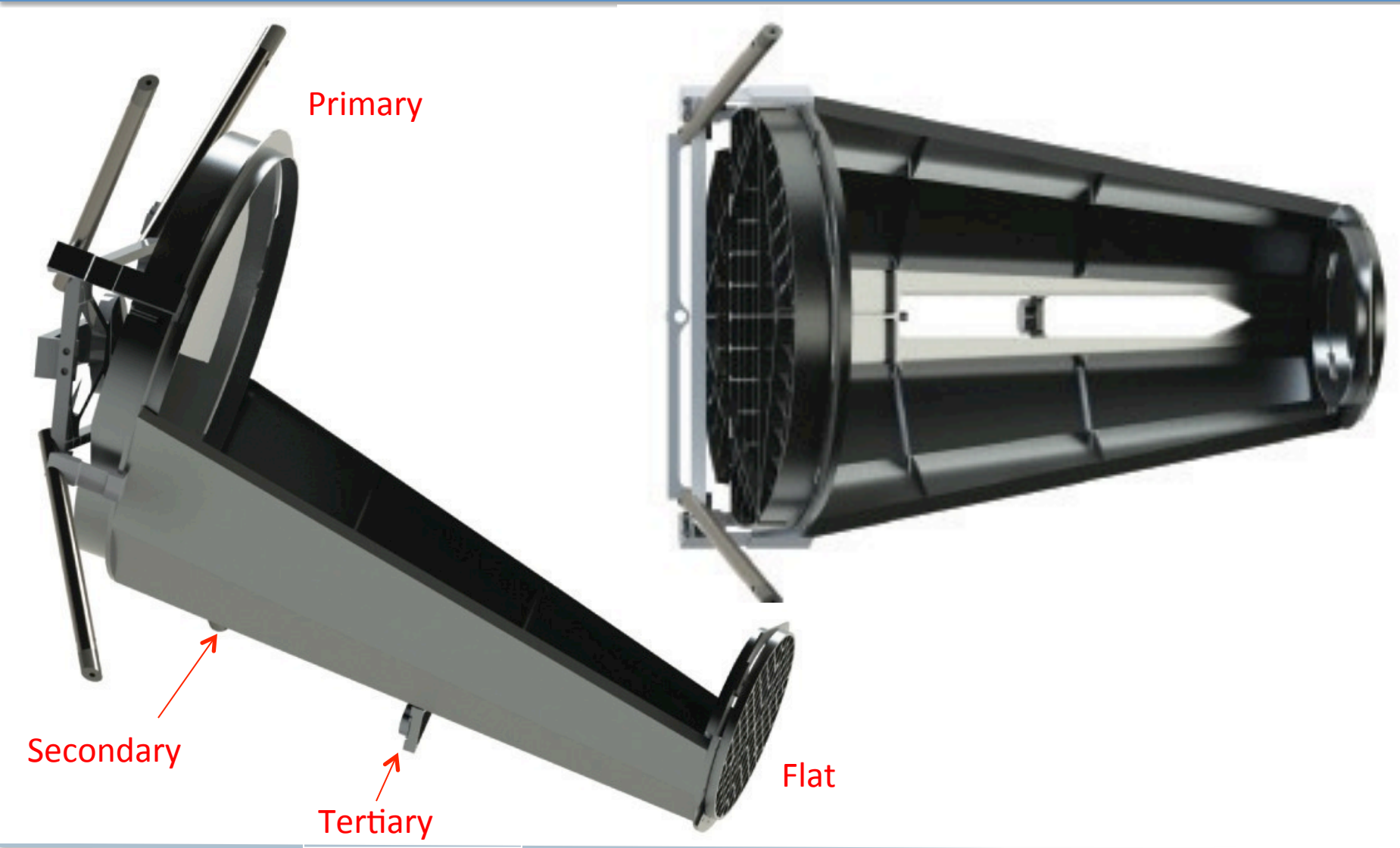
- Light (~70kg)
- Strong – can take a 10g load with factor of 2 margin
- Stiff: first mode at 23.0 Hz.

External Optics



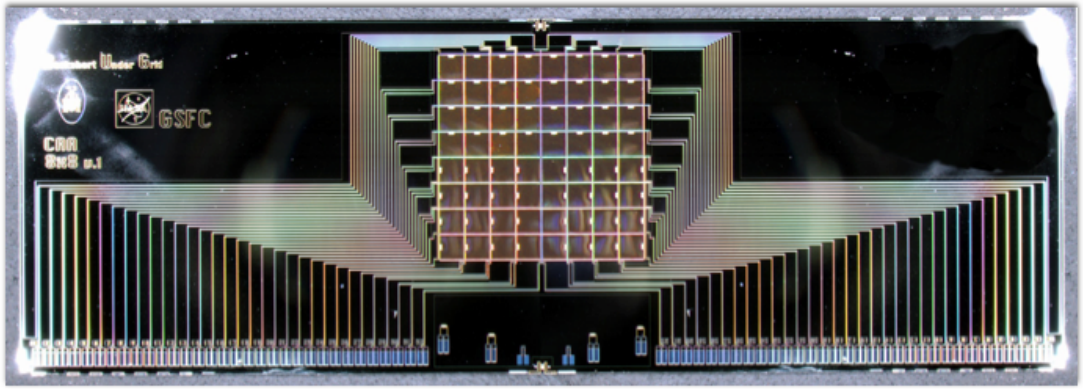


The Telescope Assembly



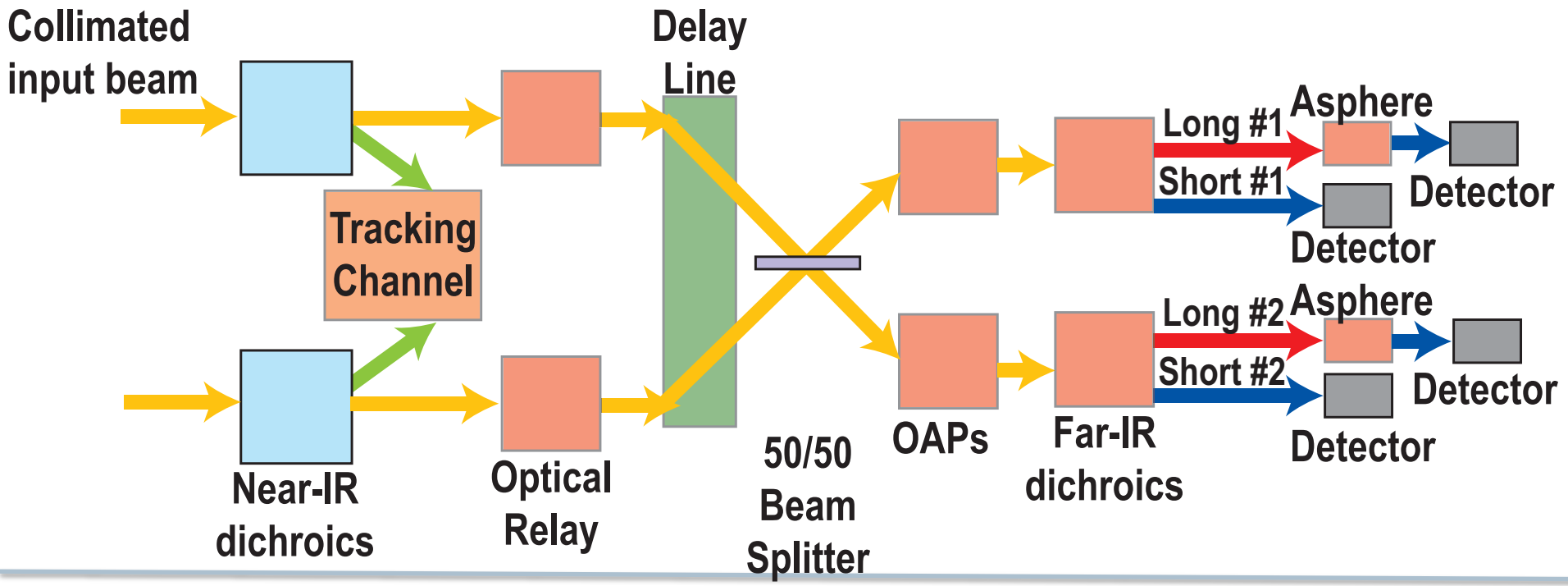
The Instrument

- Double-Fourier instrument
  - FIR channel for science
  - NIR channel for angle tracking and fringe tracking (maybe)
- TES Bolometer Arrays (BUGs)

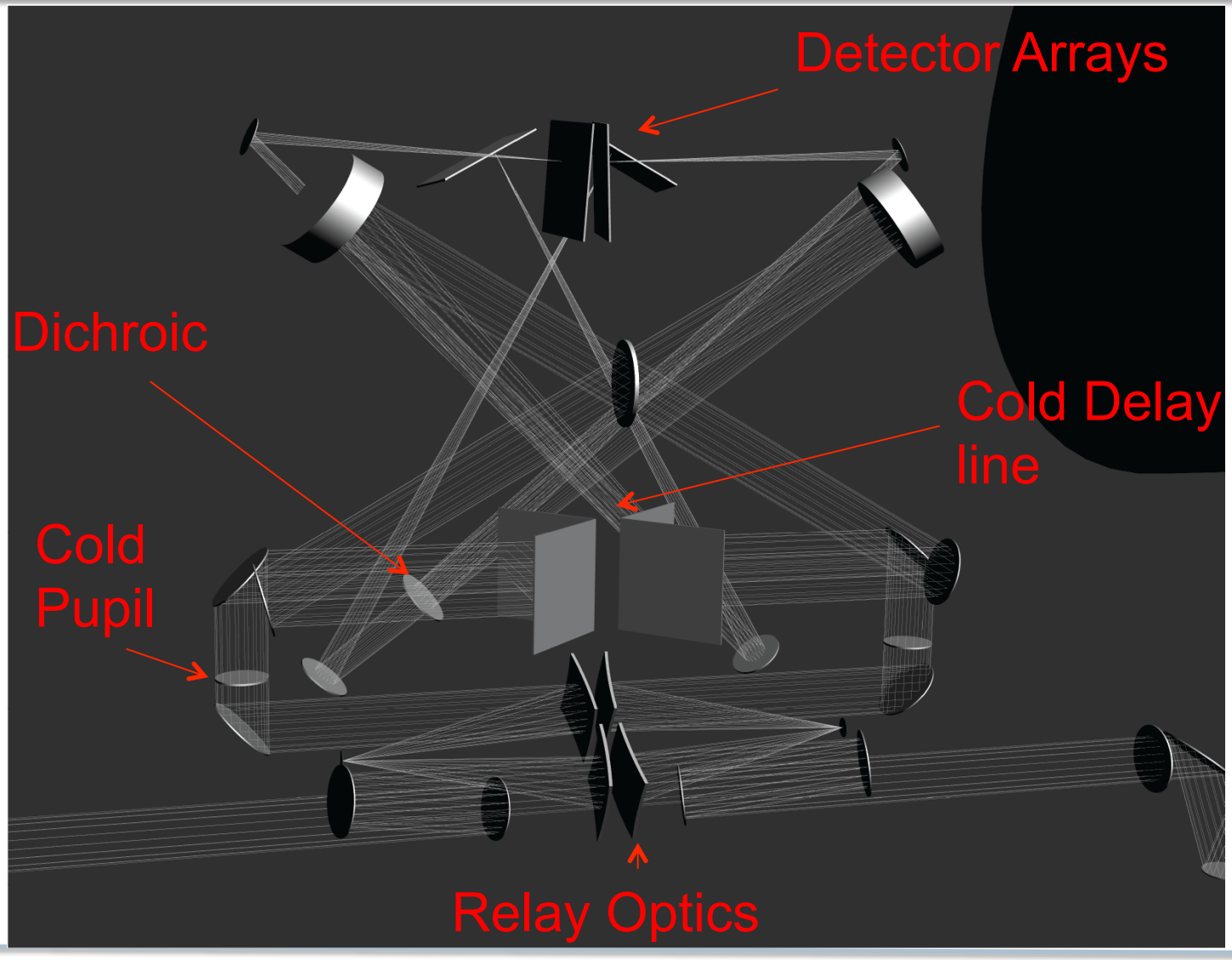


Instrument Optics

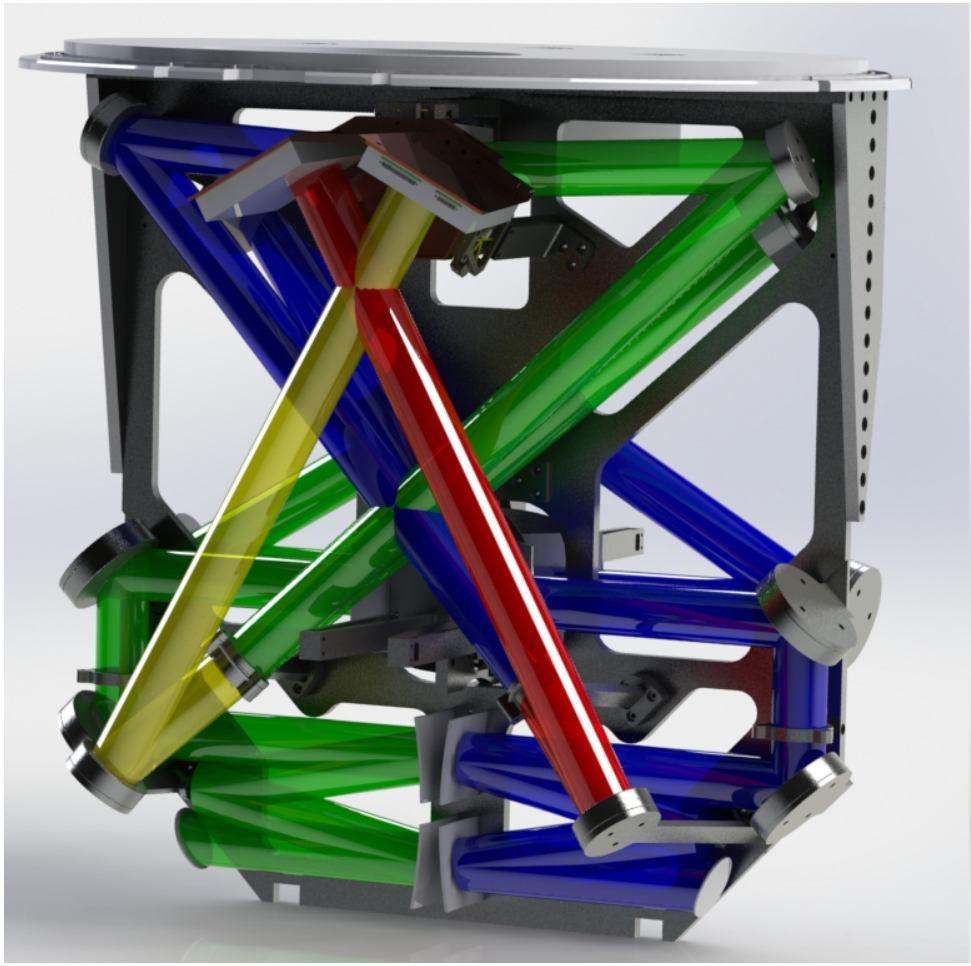
- Key features of the internal optics:
  - Optical relay for cold pupil
  - Cold delay line
  - FIR beam splitter
  - FIR dichroics

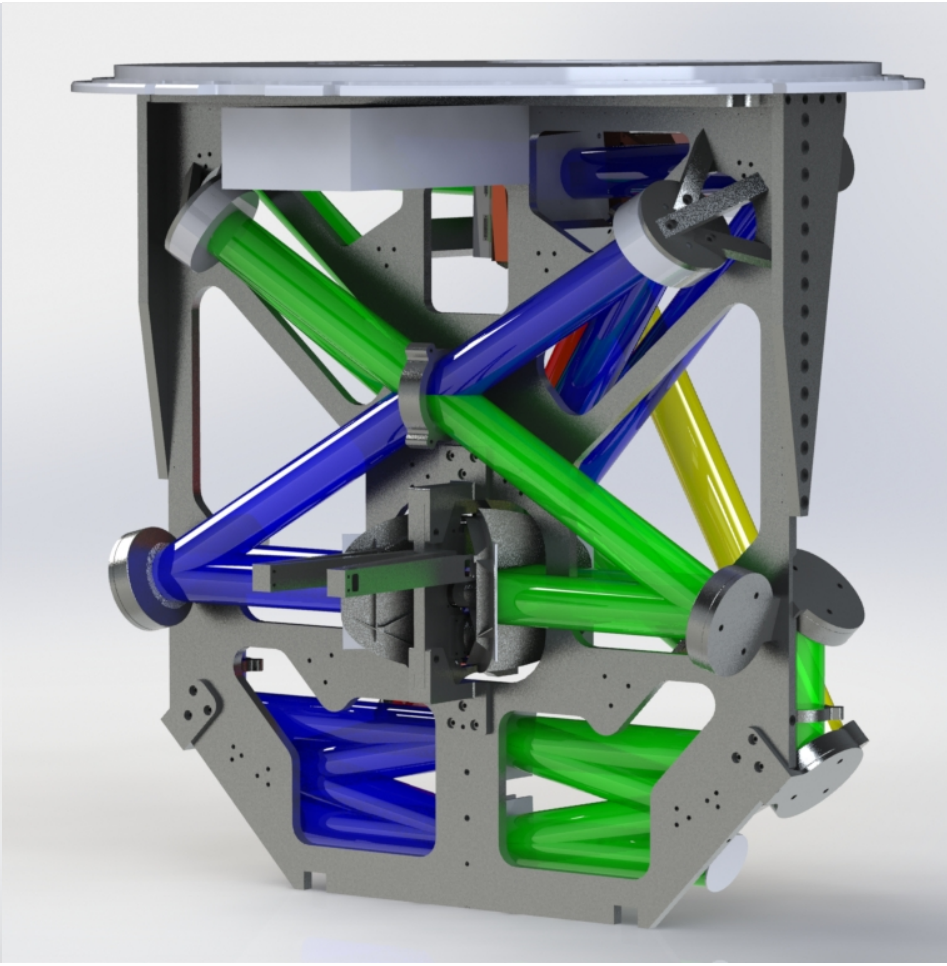


The Layout


Detector Arrays
Dichroic
Cold Delay line
Cold Pupil
Relay Optics

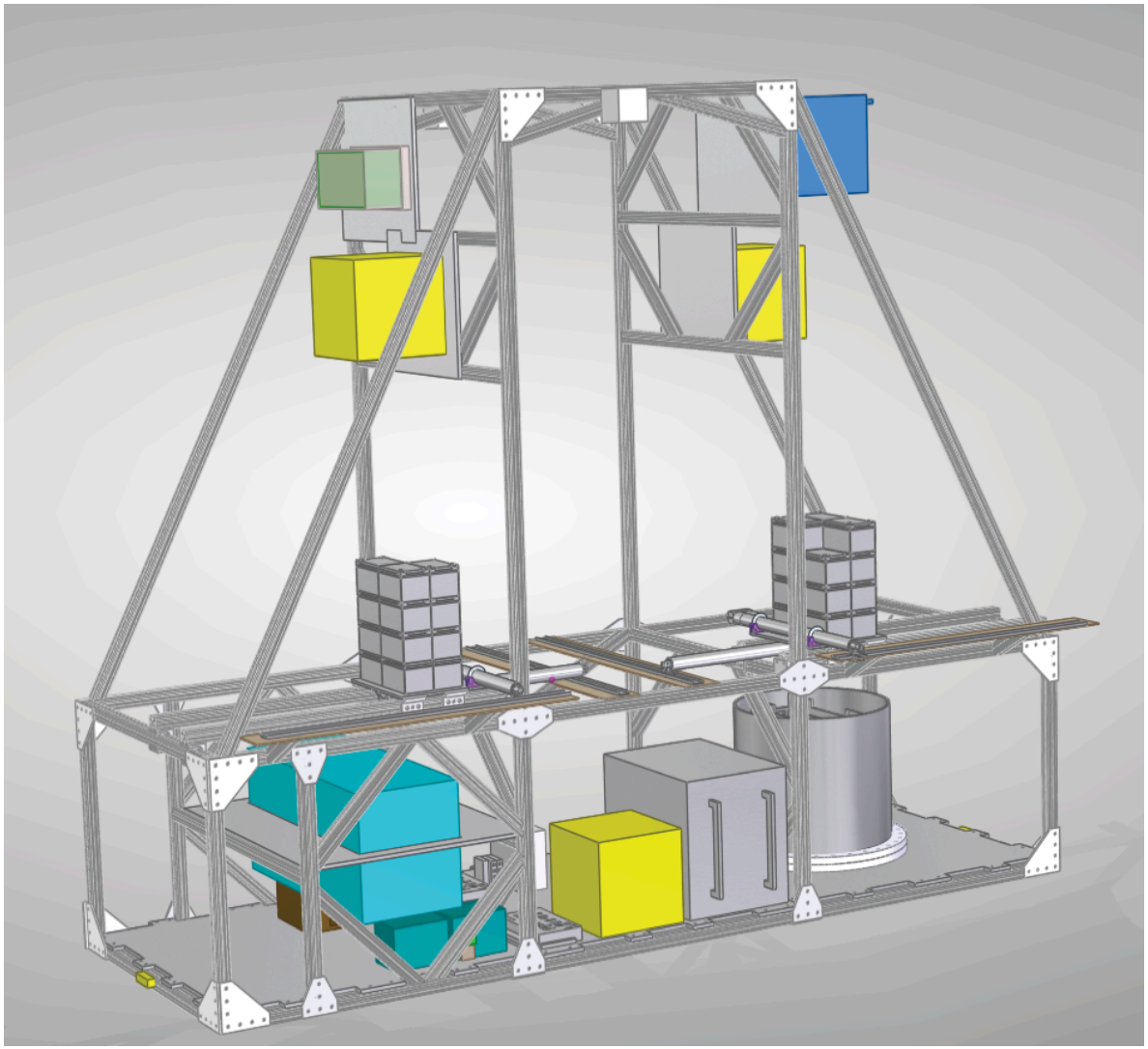
Opto-Mechanical



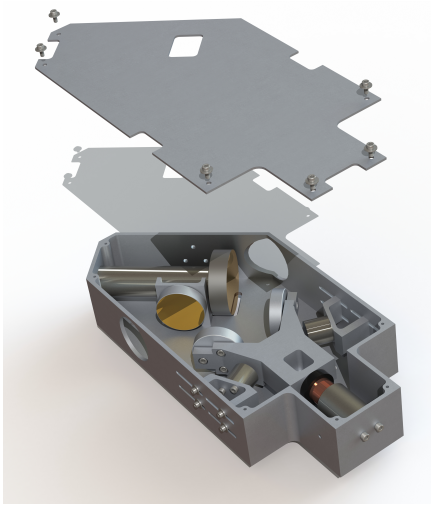


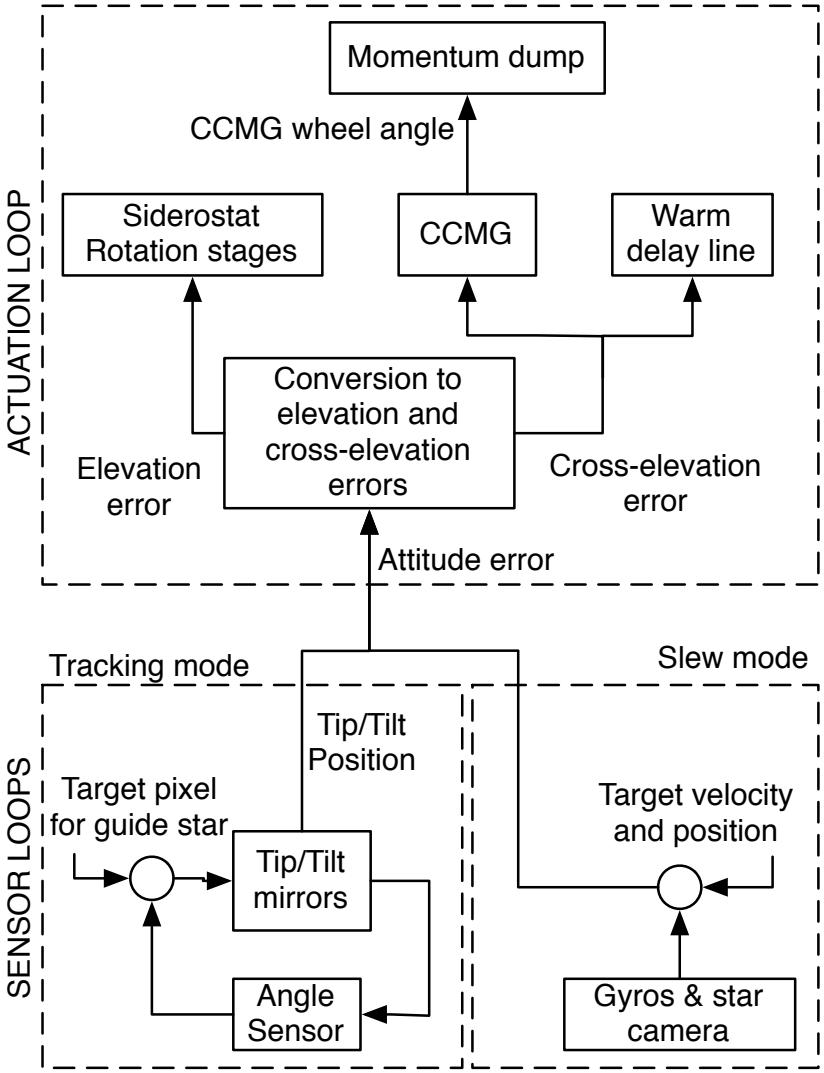
The Control System

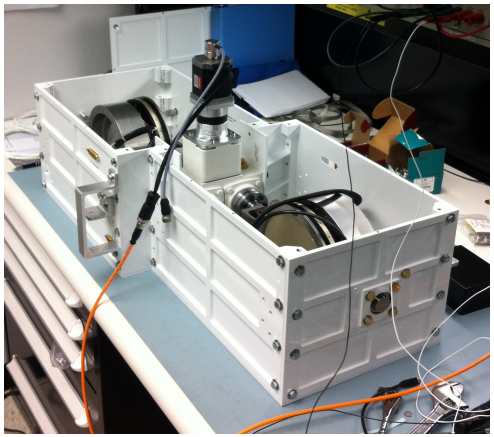
- Exoskeleton
- Computers
- Housekeeping



Control Scheme







Overall Status

- Proceeding well: upcoming milestones
  - Cryostat complete by April 2014
    - Internal optics installed and aligned by August 2014
  - Detector delivery in June 2014
    - Detector testing/characterization through August 2014
  - Delivery of telescope assemblies in August 2014 (!!!)
    - Alignment of external optics by November 2014
  - Control system testing ongoing
    - Performing better than expected!
- On track for launch in Fall 2015 from Fort Sumner

Thanks

The BETTII Team:

- R. Barry
- D. Benford
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- L. Mundy
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- J. Staghun
- T. Veach

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- M. Griffin
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- G. Savini

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- J. Mather

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