

IR CDS Activities and Plans

April 30, 2015

CLARREO SDT Meeting

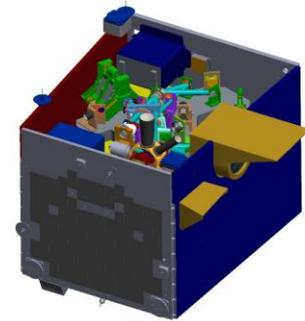
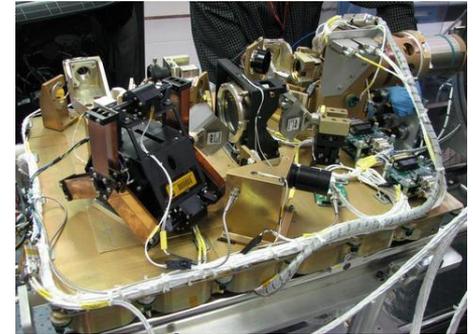
Dave Johnson

Credits

- Note that the work reported here has been performed by:
 - Rich Cageao
 - Charlie Boyer
 - Trevor Jackson
 - Tim Shekoski
 - Glenn Farnsworth
 - Tamer Refaat
- Errors are mine; credit belongs to them

Summary

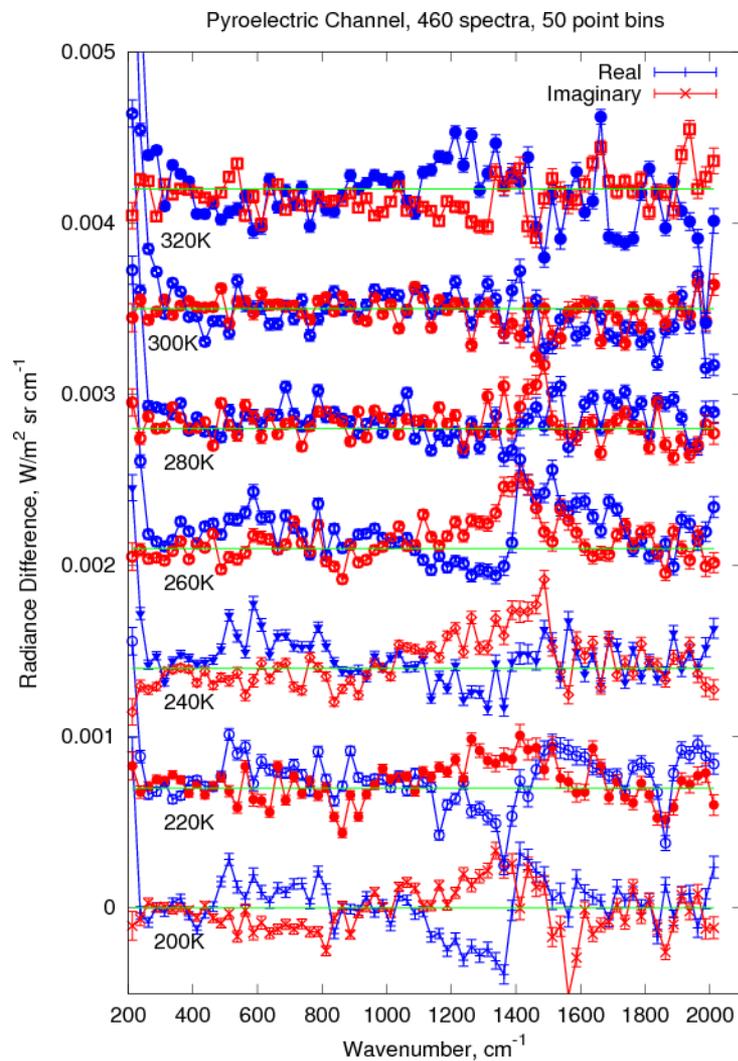
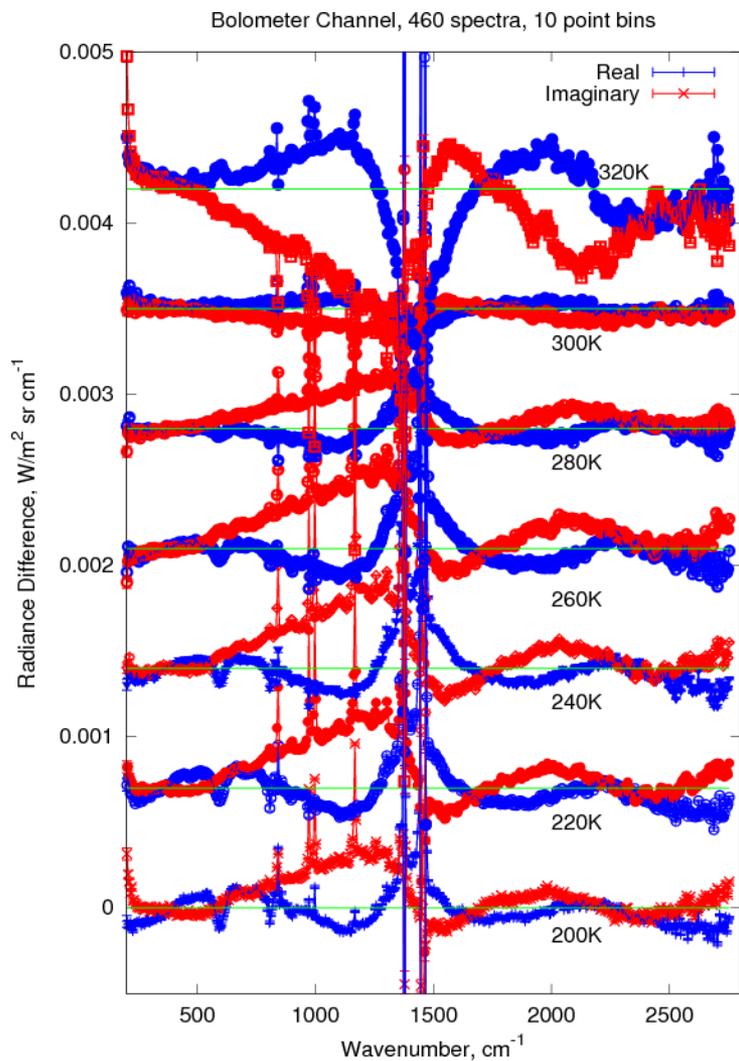
- Test the new SW MCT detector channel and integrate with the CDS
- Refine the free-flyer design reported on last October;
 - Mostly working details of 2-axis scene select mechanism (SSM).
- Pathfinder proposal in FY16 budget motivated a significant change in direction that is still being worked.



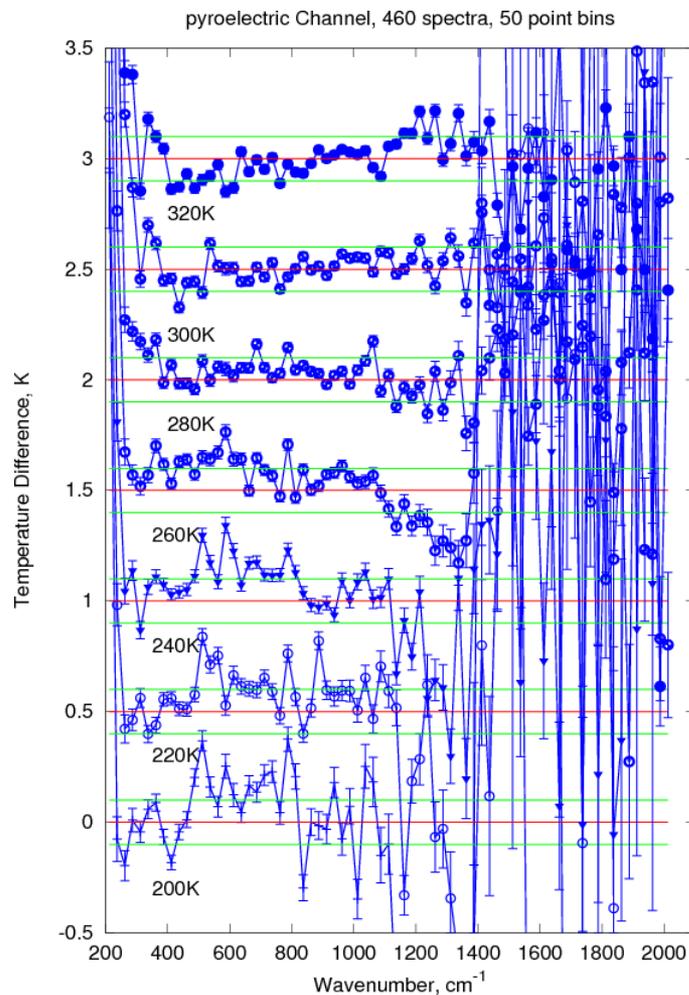
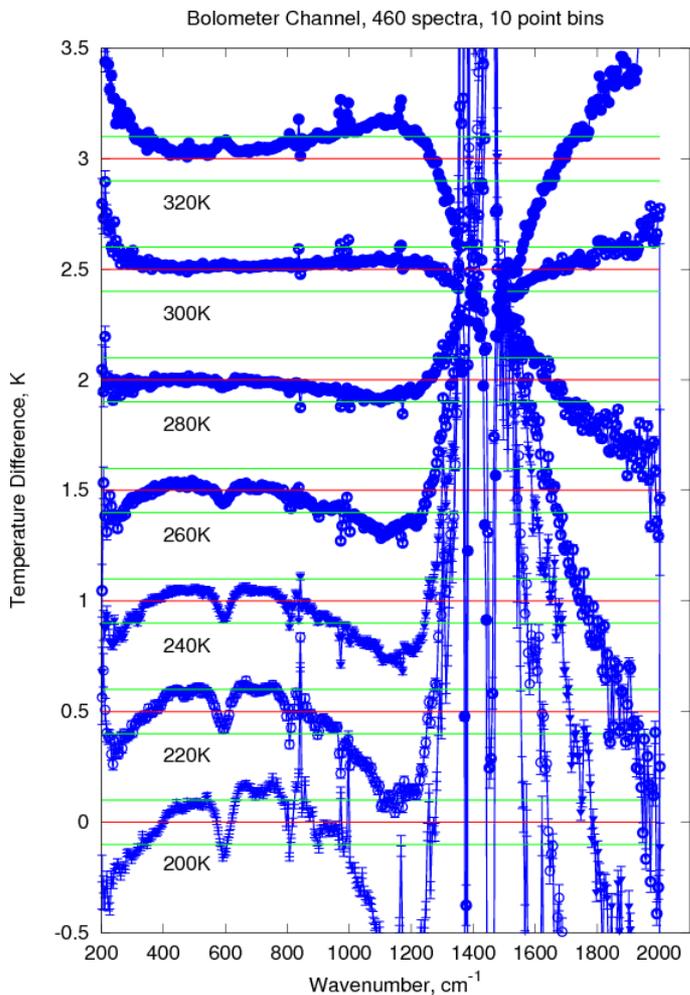
New CDS SW Detector Channel

- Motivation:
 - Bolometer and Pyroelectric channels cover full 200-2000 cm^{-1} spectral band
 - Covering more than a single octave increases sensitivity to harmonic distortion (nonlinearity, sample position error, etc.)
 - Radiance errors for both channels suggest that harmonic distortions dominate residual errors
- Solution:
 - Reduced bandwidth detector puts harmonics out of signal band
 - We selected TE-cooled MCT detector for ease of integration.

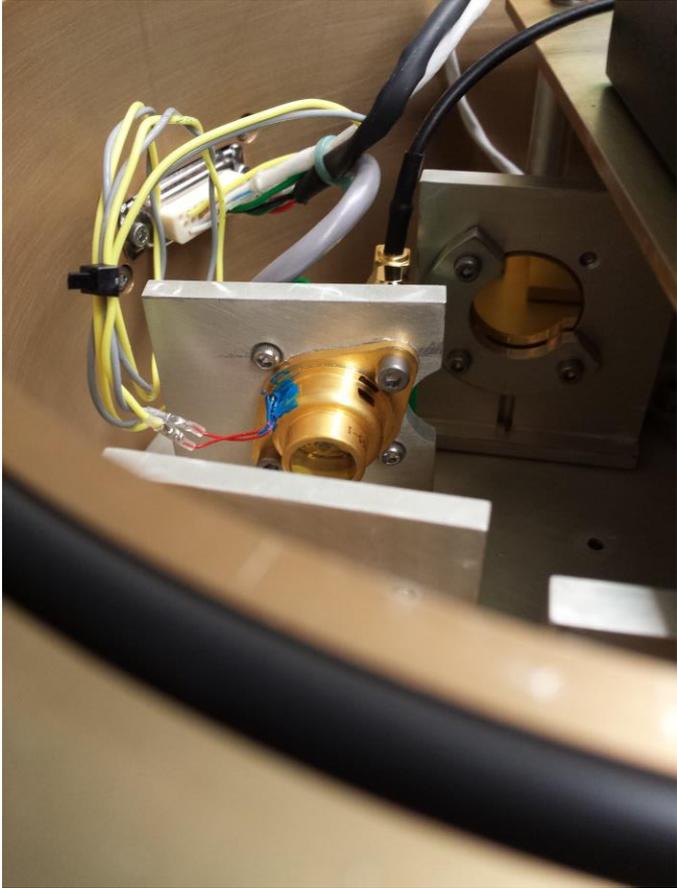
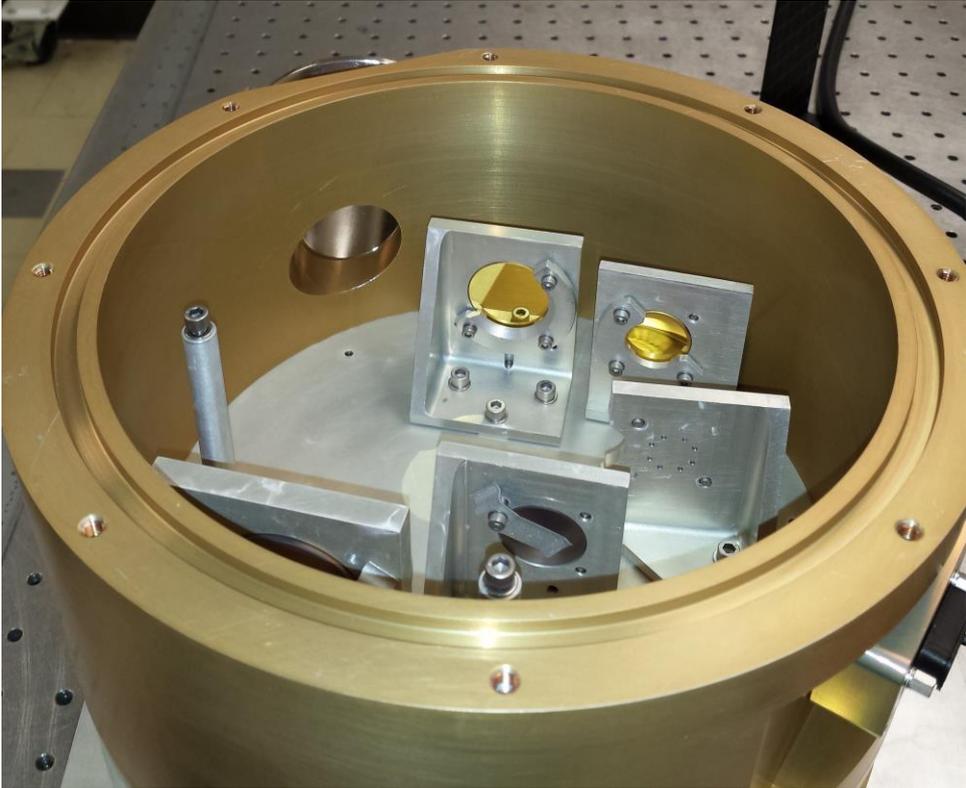
Current CDS Radiance Errors



Current CDS Temperature Errors

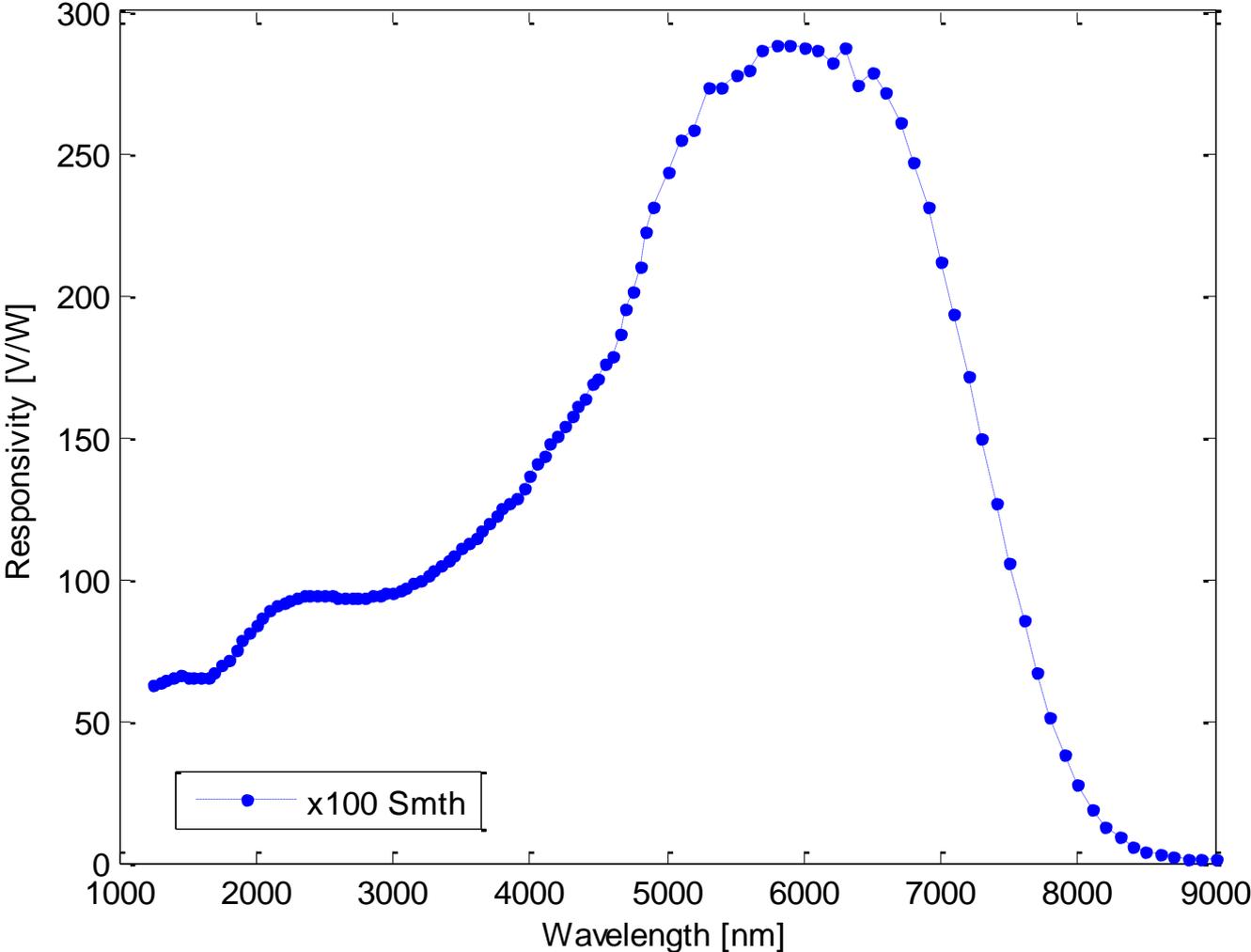


Housing with Detector



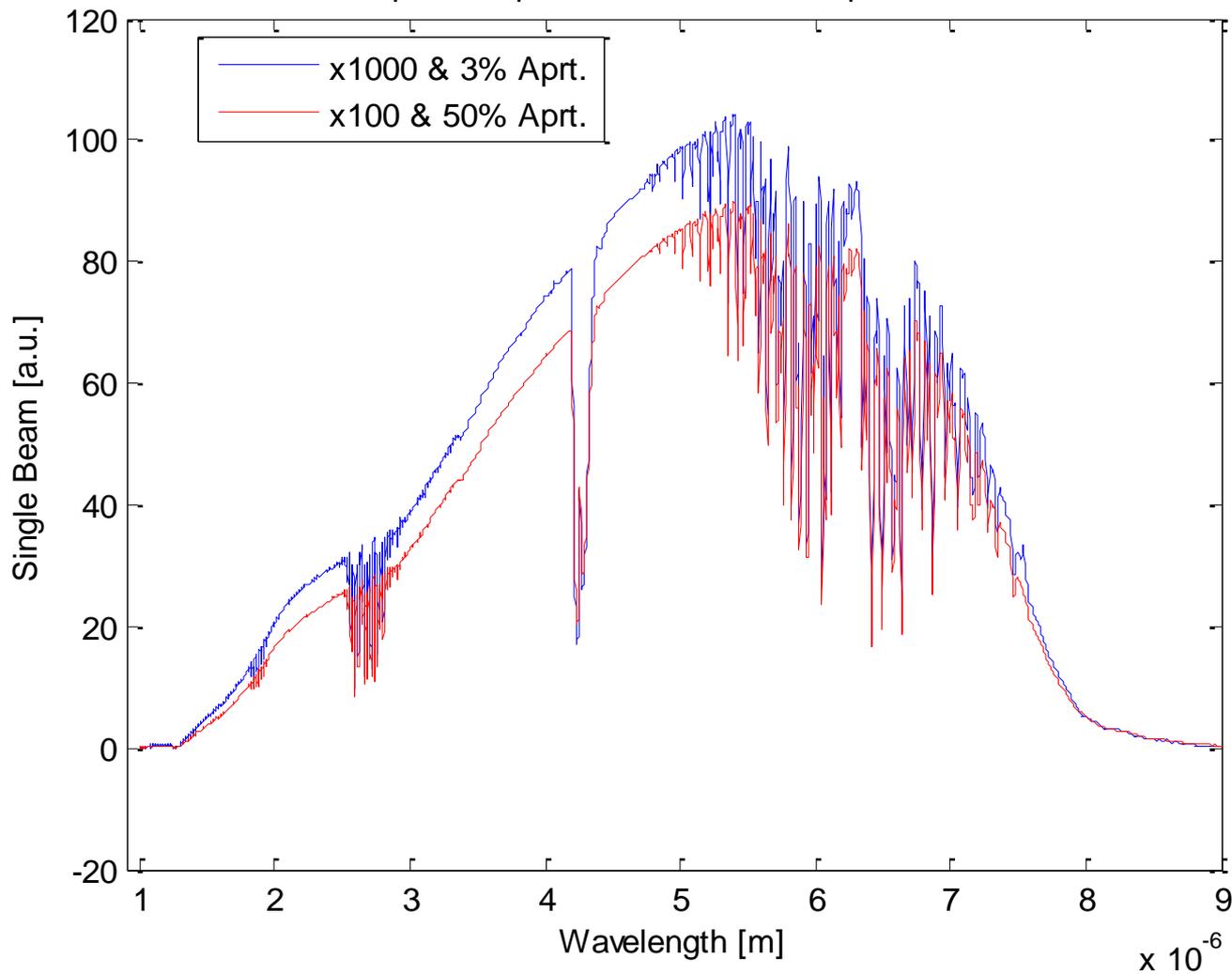
MCT Test Data

RMS Spectral Response



Spectrum Using Nicolet

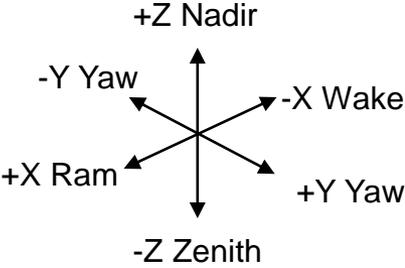
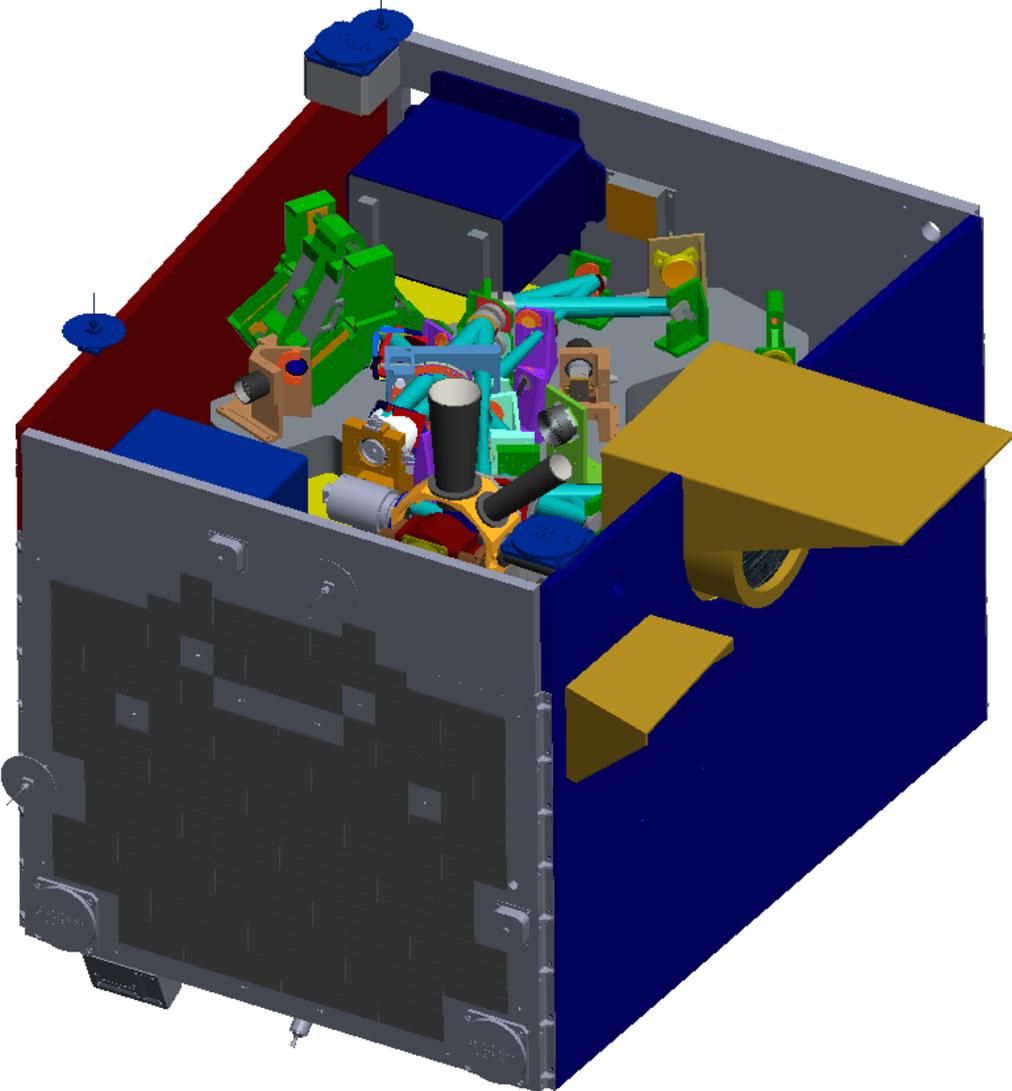
Output Comparison at Different Amplifier Gain



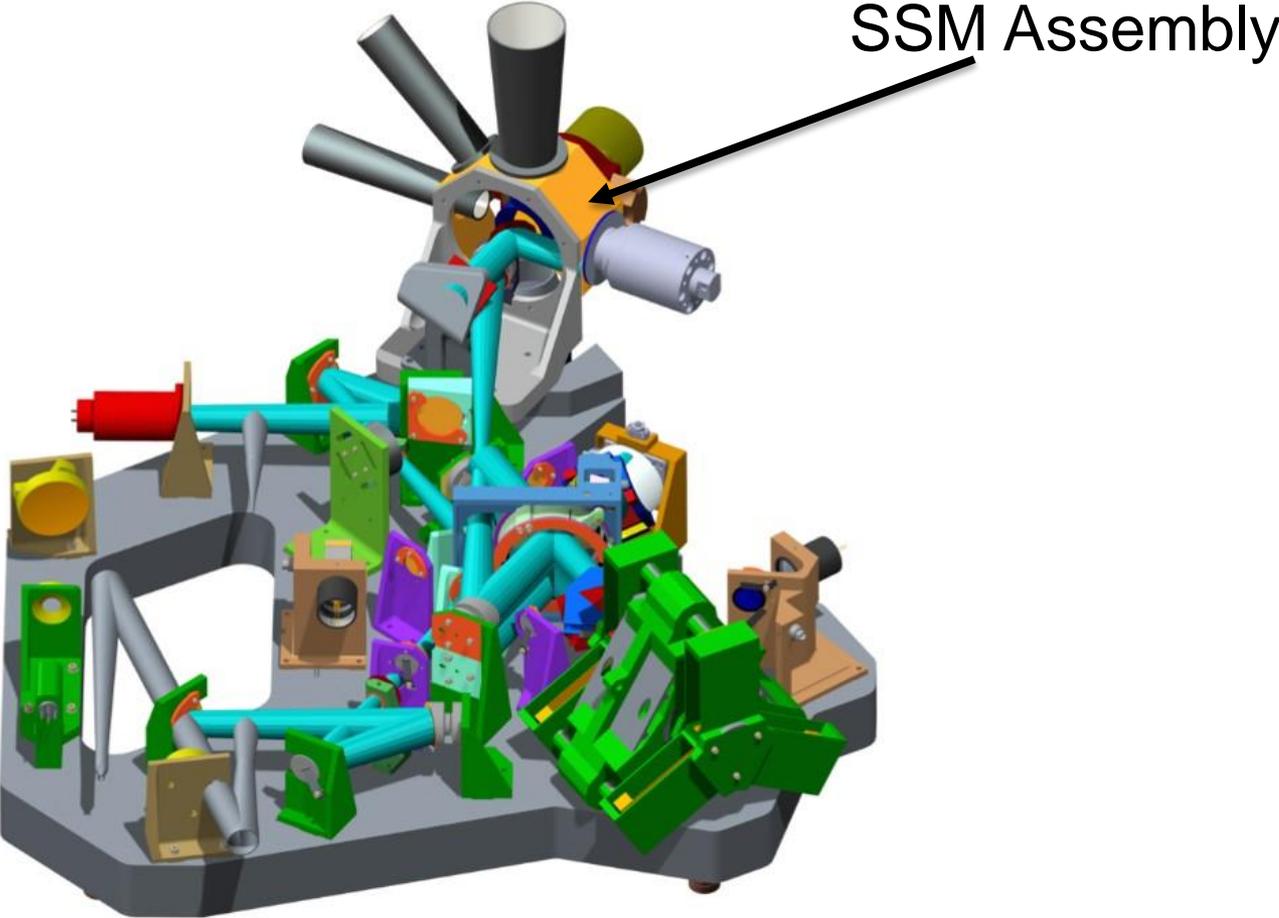
SSM Design

- Motivation:
 - The MCR scan concept (2010) was modified to simplify packaging and enable mounting on the nadir deck of a spacecraft without requiring a zenith space view through the bus.
 - Avoiding putting the space view in ram or wake directions requires adding in-track motion to nadir to compensate for spacecraft velocity.
 - The new 2-axis design is more complicated than the old single axis scanner and we are still working details.
 - We plan to build a prototype by the end of FY15.

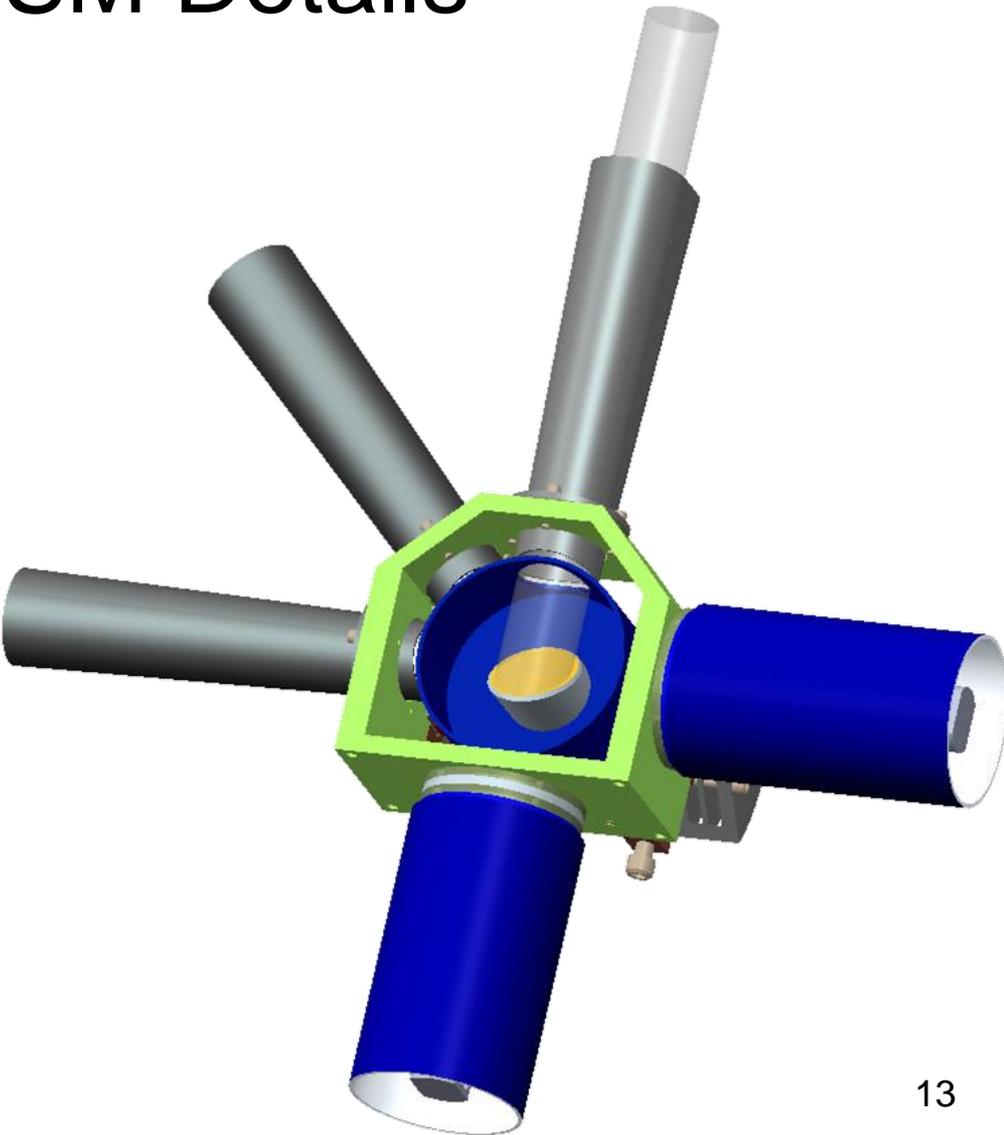
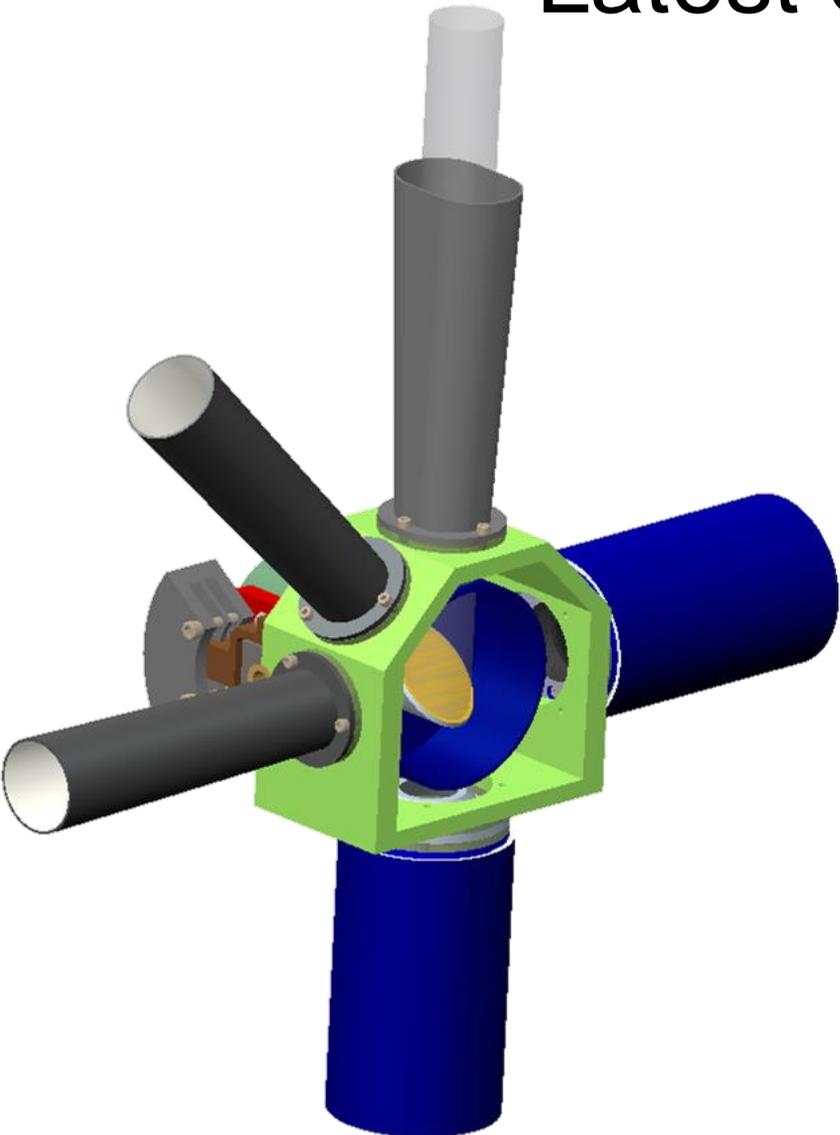
IR Instrument in SSTL-150 S/C Bus



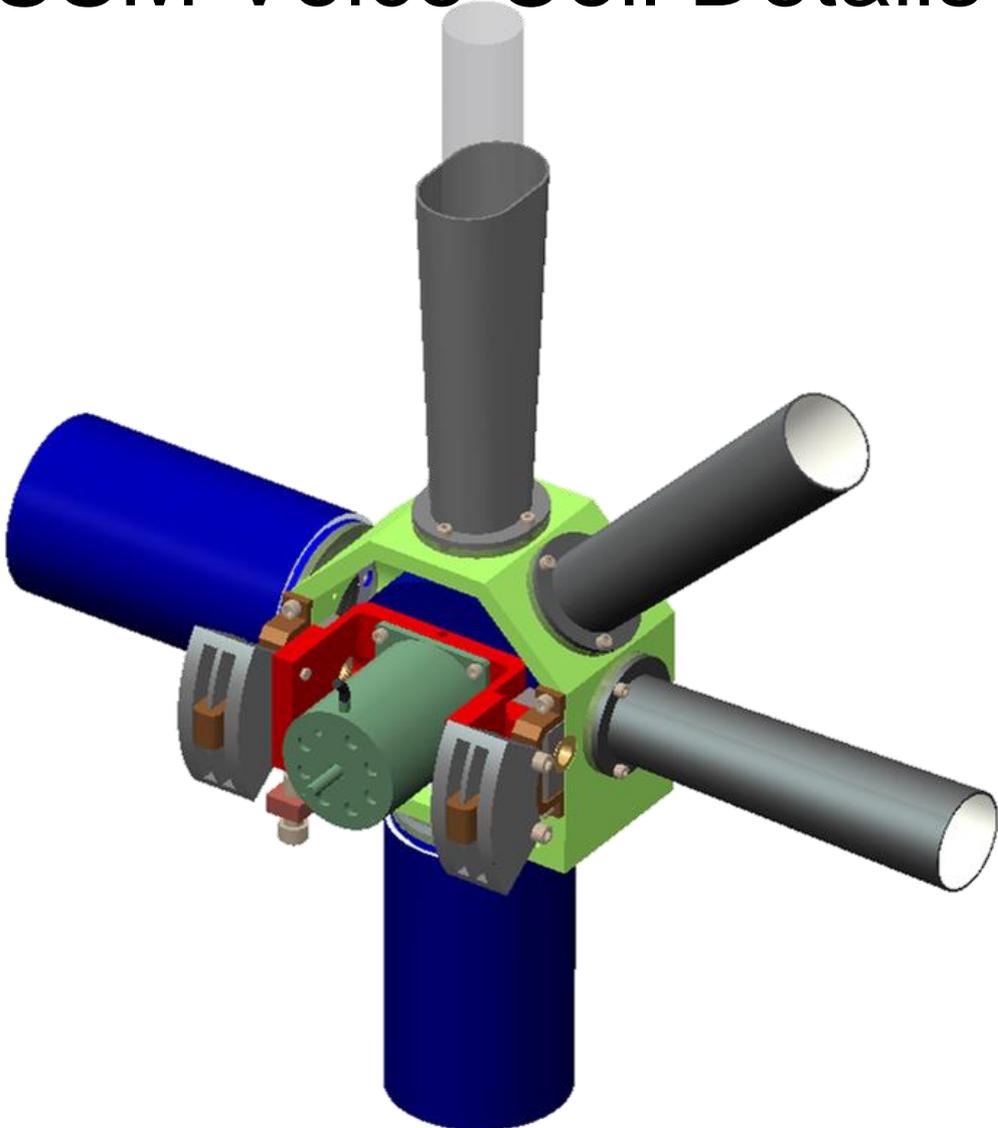
Design as of 1/2015



Latest SSM Details



SSM Voice Coil Details



Next steps

- Integrate new detector with CDS and evaluate SW radiometric accuracy;
- Prepare publication summarizing CDS performance;
- Fabricate, assemble, and test SSM prototype;
- Continue preparing for Pathfinder in case it is funded in FY16.