Panchromatic Fourier Transform Spectrometer(PanFTS) Instrument for the GEO-CAPE Mission

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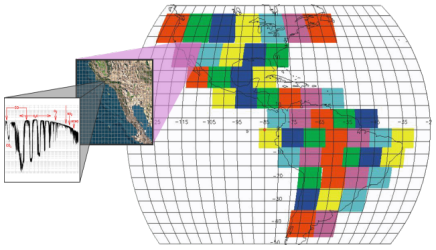
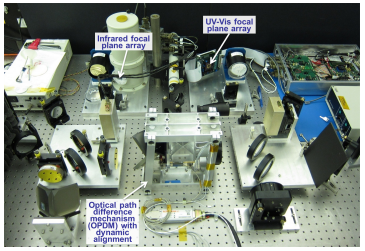
Objective

- Develop a detailed instrument requirement set for imaging Fourier Transform Spectroscopy (FTS) with broad spectral (0.28 – 11 micron) range with the capability to make all of the science measurements for the Decadal Survey GEO-CAPE mission.
- Develop a breadboard PanFTS instrument that demonstrates two key enabling technologies: high-speed, high-dynamic range CMOS hybrid focal plane arrays (FPAs), and parallel, co-aligned optical trains for the Ultraviolet/Visible/Short-Wave-Infrared/Mid-Wave-Infrared (UV/Vis/SWIR/MWIR).
- Verify the performance of PanFTS by acquiring and analyzing atmospheric spectra from JPL's California Laboratory of Atmospheric Remote Sensing (CLARS).

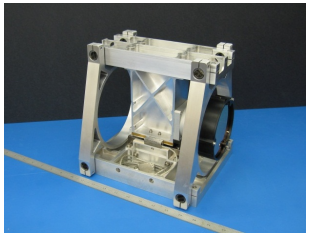
PanFTS Observational Approach



The geostationary orbiting PanFTS will sequentially image ~60 patches for ~1 minute each with an 500km X 500km IFOV (instantaneous filed-of-view) using a 128 X 128 pixel array to provide 4x4-km pixel resolution



PanFTS IR/Vis breadboard demonstrated the capability of simultaneous IR and visible spectral measurements of NO_2



OPDM completed the 2.6-million-cycle life test in vacuum at -100°C with no discernable changes in behavior

Accomplishments

- Developed the broadest spectral coverage (0.28–11 micron) imaging Fourier Transform Spectrometer instrument ever built
  - First-ever demonstration of simultaneous UV-Vis-IR measurement capability
  - Laboratory and field demonstration of simultaneous IR and Visible spectra of NO_2
- Developed a high-precision frictionless cryogenic optical path difference mechanism (OPDM)
  - Completed a life test of more than 2.6 million cycles in vacuum at -100°C with no discernable changes in behavior. The test demonstrated an equivalence of 5 years of space operations
- Developed an advanced focal plane array with on-chip analog-to-digital converters for each pixel

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$TRL_{in} = 3$ $TRL_{out} = 5$