PanFTS—DFPA electrical/data interface, real-time processing, and validation at CLARS

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Objectives

Demonstrate the performance of digital focal plane technology for use with JPL's PanFTS atmospheric composition instrument, enhancing its readiness for future flight proposal opportunities including NASA Explorer-class missions.

The task objectives are:

1. Partner with MIT-Lincoln Labs to integrate and test one of their IR digital focal plane arrays (DFPA) within a JPL IR Fourier transform spectrometer (FTS).

2. Design, build and test an interface to the MIT-LL DFPA that incorporates a Xilinx Kintex Ultrascale FPGA with a path to flight.

Background

The 2018 Earth Science Decadal Survey recommended several "targeted observables" for the new Earth System Explorer mission line. The Panchromatic Fourier Transform Spectrometer (PanFTS) is an imaging interferometer designed for geostationary or highly elliptical orbits. It offers high spatial resolution (2-4 km/pixel), wide wavelength coverage (TIR to near-UV) and short revisit times. Demanding focal plane array requirements are the key driver for this research.

Approach and Results

The interface to the MIT-LL DFPA has the capability to record digitized laser interferograms and synchronizing them with the science data from the FPAs. During FY21 we began the testing of the interface and FPGA code developed in the first two years of this task. We showed that the interface could both write and read to the FPA at rates up to 5 Gb/s.The interface is now ready to be tested with the MIT-LL DFPA configured as a detector for a PanFTS prototype interferometer operating in the solar occultation mode.

Significance/Benefits to JPL and NASA

By completing the work on this interface in the coming year, benefits will accrue not only to PanFTS development, but all instruments in formulation that use digital focal plane arrays. By making this an in-house development, any required modifications to accommodate other instruments should be relatively straightforward.

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