# Pre-launch System Performance Testing of the Thermal And Near-infrared Sensor for carbon Observation (TANSO) Fourier Transform Spectrometer (TANSO-FTS-2) for GOSAT-2

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In cooperation with Japan Aerospace Exploration Agency (JAXA) and National Institute of Environmental Research (NIES), Harris Corporation recently delivered the next-generation, full-spectrum, hyperspectral instrument for the second Greenhouse Gases Observing Satellite, or GOSAT-2, which is scheduled for launch in late 2018. The instrument is called the Thermal And Near-infrared Sensor for carbon Observation (TANSO) Fourier transform spectrometer (FTS), or TANSO-FTS-2. The TANSO-FTS-2 instrument measures upwelling Earth radiance in multiple spectral bands ranging from 0.755 to 14.3 microns. This data is used to determine atmospheric concentrations of carbon dioxide, methane, and carbon monoxide on a global basis. It is a critical asset for the monitoring and trending of these greenhouse gases, which are major contributors to global climate change. The development and testing of TANSO-FTS-2 was performed by Harris under a subcontract with Mitsubishi Electric Corporation, the GOSAT-2 prime contractor.

The TANSO-FTS-2 instrument includes new design features intended to improve mission performance. A new intelligent pointing camera system is used to identify cloud-free locations within the field of view, and the instrument’s line of sight is autonomously adjusted to collect hyperspectral data from the cloud-free location. This improvement will greatly increase the yield of high-quality, cloud-free observations. A comprehensive set of onboard calibration targets are used to accurately calibrate the instrument over its entire spectral range. A larger sensor aperture, improvements to the interferometer design based on lessons learned from the first mission, and a new scan system with enhanced line of sight stability all ensure high data quality throughout mission life.

This paper will summarize the functionality, test results, and expected performance of the TANSO-FTS-2. It includes details of the system signal to noise ratio, instrument line shape, linearity, polarization, field-of-view, and scanner performance testing. The expected system calibration error and line of sight performance will also be discussed. A nominal on-orbit operational scenario will be presented, including a summary of the intelligent pointing functionality and expected performance.

Keywords: GOSAT, carbon dioxide, methane, greenhouse gas, fourier transform spectrometer, system performance

 