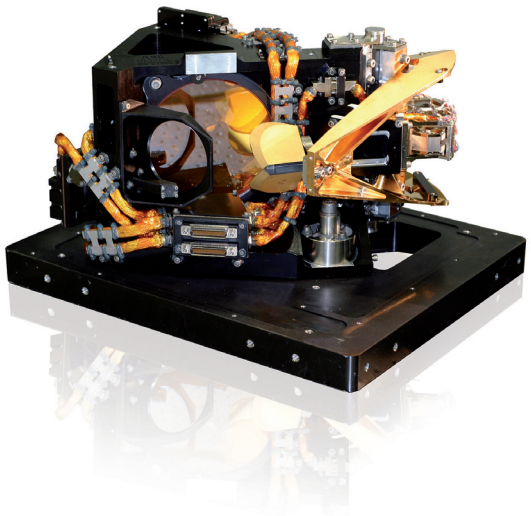
Data Sheet DS/TANSO–EN Rev. A

GOSAT
Interferometer Subsystem

Global warming has become a major concern for human beings, raising the need for a better knowledge and understanding of the impact of greenhouse gases on climate and a better monitoring of their concentration.



The Greenhouse gases Observing SATellite (GOSAT) is designed to observe and monitor the global distribution of greenhouse gases (GHG) from space. By acquiring current levels of GHG, GOSAT will provide a quantitative evaluation of the effects of the international efforts to regulate the emission of GHG. GOSAT is a joint project of the Japan Aerospace Exploration Agency (JAXA), the Japanese Ministry of Environment (MOE), and the National Institute for Environmental Studies (NIES). JAXA is responsible for the sensor and satellite development, launch and operation while MOE and NIES are in charge of the utilization of obtained data such as understanding the current absorption and emission levels of greenhouse gases.

The GOSAT satellite, also called Ibuki, has been successfully launched in January 2009 and the mission is planned for 5 years. GOSAT measures the distribution of GHG on a near global basis, while orbiting our planet every 100 minutes and obtaining data of the same regional point every three days. These measurements are used to estimate the distribution of methane and carbon dioxide worldwide, two significant greenhouse gases, to identify sources and sinks of theses gases and to study the absorption and emission levels of greenhouse gases per continent or large country over a certain period of time.

TANSO – FTS

The TANSO-FTS (Thermal And Near infrared Sensor for carbon Observation – Fourier Transform Spectrometer) is the main instrument on board of GOSAT. NEC Toshiba Space System (NTS) is the prime contractor of this instrument. ABB was in charge of designing, building and testing the interferometer, the core sub-system of the FTS instrument. The main purpose of the TANSO-FTS is to measure spectra of reflected and emitted radiance that will be used to determine the total column amount of carbon dioxide (CO_2) and methane (NH_4).

The interferometer sub-system consists of tree modules: the Opto-Mechanical (OM) module and two remote control electronics modules. The OM module is inspired by the ACE-FTS interferometer launched on SCISAT-1 in August 2003, as well as by ABB's expertise in commercial laboratory and process analyzers.

The maximum optical path difference of 2.5 cm provides an unapodized spectral resolution of 0.2 cm-1. The interferometer supports the wide spectral range of the TANSO-FTS that extends from 750 nm to about 14 µm and accommodates an optical beam of 68 mm in diameter to provide the high throughput that is required, without using a telescope.

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The motion of the scan arm is induced by a voice coil actuator driven by a sophisticated servo-control algorithm. A metrology system built around a 1310 nm distributed feedback laser diode provides the position and speed information to the motion control algorithm. The scan speed can be adjusted for scanning periods of 1.1, 2 and 4 seconds. The interferometer was delivered to NTS in June 2007. The main performances and characteristics are given in the table below.

Design and Performance parameters of the TANSO interferometer

Parameter	Values
Spectral range	4 bands between 700 and 13200 cm-1
	Band 1: 0.758-0.775 µm
	Band 2: 1.56-1.72 µm
	Band 3: 1.92-2.08 µm
	Band 4: 5.56-14.3 µm
IFOV	15.8 mrad (10.5 km GIFOV at Nadir)
Mirror Travel	± 2.5 cm
Speed instability	< 0.12 %
Spectral interval	0.2 cm^{-1}
Pupil diameter	68 mm
Sweep period	1.1 to 4 seconds
Modulation efficiency	>70% to >99% from 13200 to 700 cm^{-1}
Total Mass	21 kg
Power	~ 21 Watt
Dimensions	35 x 35 x 35 cm^3

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