

## **2. Overview of OCTS**

### **2.1 Overview**

OCTS is an optical sensor devoted to the frequent global measurement of ocean color and sea surface temperature. OCTS observes the amount of chlorophyll, floating substances and dissolved substances in the water, and temperature distribution.

OCTS has 8 bands in visible and near infrared region and 4 bands in, and achieves highly sensitive spectral measurement with these bands. These observation bands are determined on the characteristics of spectral reflectance of the object substances, atmospheric windows and atmospheric correction.

This is 700 meters approximately, and the swath width is around 1,400 km on the ground surface, and OCTS can observe the same area every 3 days.

OCTS has two data transmission modes. All raw pixel data are transmitted as fine data transmission mode, one pixel data is sampled from every  $6 \times 6$  km area as typical data of the area and is transmitted as coarse data transmission mode.

## **2.2 Functions**

### **2.2.1 Functions**

- (1) OCTS acquires multi-band image data by means of observation wave length windows which are set 8 bands in visible and near infrared region and 4 bands in thermal infrared region.
- (2) OCTS acquires ground surface image data by means of satellite's along track movement and cross track mechanical scanning of the sensor.
- (3) Instantaneous field of view is 0.85 mrad (ground surface spinal nadir is around 700 meters), and scan width is around 1,400km (about  $\pm 40$  deg.) of ground surface span distance with nadir centering.
- (4) After A/D conversion of acquired data, they are edited with necessary telemetry data, then they are transferred to the ADEOS system.
- (5) Image data consists of fine data and coarse data.
- (6) OCTS has tilting capability of its scanning center along the track direction by  $\pm 20$  deg. to prevent the sun glitter at the sea surface from interrupting the observation.
- (7) OCTS also has optical calibration capabilities for visible and near infrared region by solar and internal light source, and for thermal infrared region by deep space and reference blackbody, and electric calibration capability.

## 2.2.2 Components

OCTS consists of the following components;

Items	Acronyms	Components	Acronyms		
Scanning Radiometer Unit	SRU	Optics Assembly	OPT		
		Scanning Mechanism Assembly	SMA		
		VNIR Detector Assembly VNIR Detector VNIR Pre-Amplifier	VDET VPA		
		Radiation Cooler Assembly Second Stage Cooling Stage Temperature Control Amplifier Infrared Pre-Amplifier	RC RC-S RC-C RC-R IPA		
		Calibration Assembly Lamp Calibration Module Solar Calibration Module Light Volume Monitor Amplifier Black Body	CAL VCAL-L VCAL-S VCAL-M ICAL		
		Analog Signal Processor Analog Multiplexer A/D Converter	ASP AMUX ADO		
		SRU Power Supply	SRPS		
		Scan Radiator Unit Structure	SRST		
				Digital Signal Processor A Digital Signal Processor B	DSP A DSP B
				Scan Drive Electronics A Scan Drive Electronics B	SDE A SDE B
		CAL Power Supply	CALPS		
		Thermal Controller A Thermal Controller B	TC A TC B		
		RIU A RIU B	RIU A RIU B		
		Electrical Unit	ELST		
Harness between Units		-----	-----		

## 2.3 Performance

### 2.3.1 Main Elements

Main elements of overall OCTS are as follows:

Items	Performance			Notes	
Observation Wavelength	Wavelength at the center [ $\mu$ ]	Band width [ $\mu$ ]			
	Band 1	0.412±0.003	0.020±0.003		
	Band 2	0.443±0.003	0.020±0.003		
	Band 3	0.490±0.004	0.022±0.003		
	Band 4	0.520±0.004	0.018±0.003		
	Band 5	0.565±0.004	0.020±0.003		
	Band 6	0.670±0.005 -0.03	0.020±0.003		
	Band 7	0.765±0.003	0.040±0.003		
	Band 8	0.865±0.003	0.040±0.003		
	Band 9	3.55 -0 - +0.03	3.88 +0 -0.03		
	Band 10	8.25 -0 - +0.06	8.80 +0 -0.06		
	Band 11	10.3 -0 - -0	11.4 +0.15 -0.15		
	Band 12	11.4 -0.15 - +0.15	12.7 ±0		
Instantaneous Field Of View	0.85 mrad (earth surface distance: 700m)			* Nadir point of the satellite	
Observation Swath	40 deg. (Earth surface distance: over 1,400 km)				
Scanning Rate	0.905 sec.				
S/N NE $\Delta$ T	Input Brightness (* 1)		S/N	* 1 : [W /m <sup>2</sup> /Sr/ $\mu$ m]  * 2: [K]	
	Band 1	145	450		
	Band 2	150	500		
	Band 3	130	500		
	Band 4	120	500		
	Band 5	90	500		
	Band 6	60	500		
	Band 7	40	500		
	Band 8	20	450		
	Target Temp. (*2)		NE $\Delta$ T		
	Band 9	300	0.15K		
	Band 10	300	0.15K		
	Band 11	300	0.15K		
Band 12	300	0.20K			
MTF	>0.35 at Nyquist Freq.(SN)			SN : 5881 p/rad	

Items	Performance		Notes
Polarization	Band 1	< 5%	
Sensitivity	Band 2 - 8	< 2%	
Linearity	Within $\pm 5\%$		
Quantization Bit Number	10 bits / pixel		
Tilting Angles	-20 deg. , 0 deg. , +20 deg		+ : Same direction as satellite - : Opposite direction from satellite
Output Data Rate	Fine Image Data	: 3 Mbps	
	Coarse Image Data	: 23.4375 Kbps	
Type of Output Signal	Serial NRZ-L		
Calibration	VNIR	Solar Calibration Lamp Calibration Electric Calibration	Halogen Lamp
	TIR	Reference Blackbody Electric Calibration	
Coarse Data (DTL)	4 bands (Band 2, Band 5, Band 6 and Band 11)		Each band outputs CH5

## **2.4 System Running and Operation**

### **2.4.1 Definition of Running Mode**

#### (1) Observation Mode

This mode performs observation. This mode includes start of scanning to normal operation period and tilting operation period of the scanning mirror. Gain setting is possible band by band. The gain for visible and near infrared region has four selections from the combination of LAND for land observation OCEAN for ocean observation, HIGH/NORMAL. And the gain for infrared region has three selections from "G1 / G2 / G3."

#### (2) Calibration Mode

##### (a) Solar Calibration Mode

This mode performs calibration by solar light. This mode uses solar light from solar light incident window and then processes it like observation light through the scanning mirror. A different data format is used from that of observation mode. Tilting is possible only at 0 degree.

##### (b) Lamp Calibration Mode

This mode performs calibration by internal lamp. The light from a halogen lamp set inside of the SRU is powered by Calibration power supply is processed through scanning mirror like observation light. Two lamp systems are provided with configuration.

A different data format is used from that of observation mode.

Tilting is possible only at 0 degree.

##### (c) Electrical Calibration Mode

This mode performs electrical calibration. Electrical signals are generated by analog signal processor and are calibrated in the stages after A/D conversion.

A different data format is used from that of observation mode.

#### (3) Stand-by Mode

This mode maintains conditions (each component should be within operational temperature) to perform observation mode or other calibration modes.

#### (4) Preservation Mode

This mode maintains component equipment installed on OCTS within its tolerant unoperational temperature. On the other hand, This mode maintains full time operational RIU and Thermal Controller within their operational temperatures. Also, when autonomization starts, it shifts to maintenance mode by an autonomization command.

#### (5) Safety Mode

This mode maintains preservation from failure, malfunction and unrecoverability and performance degradation for OCTS in case of abnormal attitude or abnormal power level of ADEOS. This mode is commanded by ADEOS side command (LLM command). This mode is substantially the same status as "preservation mode" of OCTS running status. When returning from safety mode after changing to safety mode by LIM command, operation will start by the same procedures as in safety mode in normal operation. However, when it is changed from baking mode to safety mode, baking is required again when returning since baking was canceled.

(6) Baking Mode

This mode is performed with controlling all components of radiation cooling unit around normal temperature to maintain and to recover their cooling performance of radiation cooling unit and optical performance. This Mode is performed after deployment of the earth shield in the satellite launch phase. It is also performed even after normal operation when it is needed.

(7) Earth Shield Deployment Mode

This Mode deploys the earth shield of Radiation cooling component. Deployment is performed by activating a wire cutter by signal from ADEOS EPS after stabilization of satellite attitude (after completion of critical phase).

(8) All off Mode

All components (except RIU) of OCTS are in off status. During launch stage, OCTS components are in this stage. No thermal control is activated in this stage, therefore, system should be put in "Preservation Mode" within 30 minutes after launch (after opening of fairing). This Mode is prohibited other than during this time period.