Appendix D. ASTER Level 1 Data Products Specification (GDS Version)

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ASTER LEVEL 1 DATA PRODUCTS SPECIFICATION (GDS Version)

Version ß

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ERSDAC
Earth Remote Sensing
Data Analysis Center

PREFACE

This Specification defines Level-1A and 1B Data Products (GDS version), which are output from the software of ASTER Level-1 Data Processing Subsystem (Version b).

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1. Level 1 Overview

1.1. Applicable Standards

This section identifies documents that directly apply in defining this interface specification, and those reference documents that indirectly apply to obtain background information related.

1.1.1. Applicable Documents

The following documents apply to this Specification in whole, unless cited otherwise herein.

1. ERSDAC-LEL/7-13	Algorism Theoretical Basis Document for ASTER Level-1 Data Processing (Ver.2.1), prepared by Level-1 Data Working Group, ASTER Science Team, Japan, December 26, 1995
2. ERSDAC-LEL/7-12	Algorism Development Specification : ASTER Level-1 Data Processing (for Ver.1.1), March 15, 1996 (in Japanese)
3. ERSDAC-LEL/7-11	ASTER Level 1 Data Products Specification (Science Version, Ver.1.1), March 15, 1996
4. ERSDAC-LEL/7-09	Interface Specification : ASTER Level-1 Data Processing (for Ver.1), August 28, 1995 (in Japanese)
5. AG-S-E-0409-R03	ASTER GDS Core Meta Data Specification (Version 1.0 Draft), July 3, 1996

1.1.2. Reference Documents

The following documents are used as background reference documents related to this Specification.

1. 510-ICD-EDOS	Interface Control Document between EDOS and ASTER GDS, CDRL B311, Draft Ver.3, July 1995
2. CCSDS 641.0-B-1	Parameter Value Language Specification (CCSD006), Blue Book, May 1992
3. ERSDAC-LEL/7-5	Interface Specification : ASTER Level-1 Data Processing (for Ver.a, Ver.b), 1994 (in Japanese)
4. HDF User's Guide Version 4.0	the National Center for Supercomputing Applications at University of Illinois at Urbana-Champaign., March 1996
5. HDF-EOS User's Guide for the ECS Project Revision 1 (Draft)	EOSDIS Core System Project, April 1996
6. WBS-WP-xxx-yyy	The HDF-EOS Swath Concept, June 30, 1995
7. 170-WP-002-001	The HDF-EOS Grid Concept, February 1996
8. 333-CD-003-004	Release A SCF Toolkit Users Guide for the ECS Project, May 1996
9. 311-CD-002-005	Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project, May 1996
10. ERSDAC-LEL/8-7	ASTER Level 1 Data Products Specification (Science Version, Ver.2.0), September 5, 1996 (This document partialy apply to this Specification.)

2. Level 1A Data Product

2.1 Overview

Level 1A Data Product is an HDF file. Each file contains a complete 1-scene image data extracted from Level-0 data and corrected for the SWIR and TIR detector's alignment.
Furthermore it includes also the radiometric, the geometric and the SWIR parallax correction tables, spacecraft's supplement data, the satellite ancillary data, the calculated cloud coverage values, and Browse images (see NOTE).
All of these data are stored together with Metadata, Raster, Vgroup/Vdata, and Swath Layout parts in one HDF file.

(NOTE) As Browse images are divided from Level 1A Data Product in "ASTER Level 1 Data Product Specification (science version, version 2.0)", these will be stored in another HDF file as a subset of Level 1A data products in next version.

2.2 Data Structure

(1) Data Type
Level 1A Data Product within HDF file is constructed form eleven categories of HDF data object.
NOTE: VNIR (4 bands) and SWIR (6 bands) image data are 8-bit unsigned integer science data, and TIR (5 bands) image data are 16-bit unsigned integer science data in each Swath object.

(2) Data Structure
The physical data of Level 1A Data Product is shown in Figure 2.2-1.

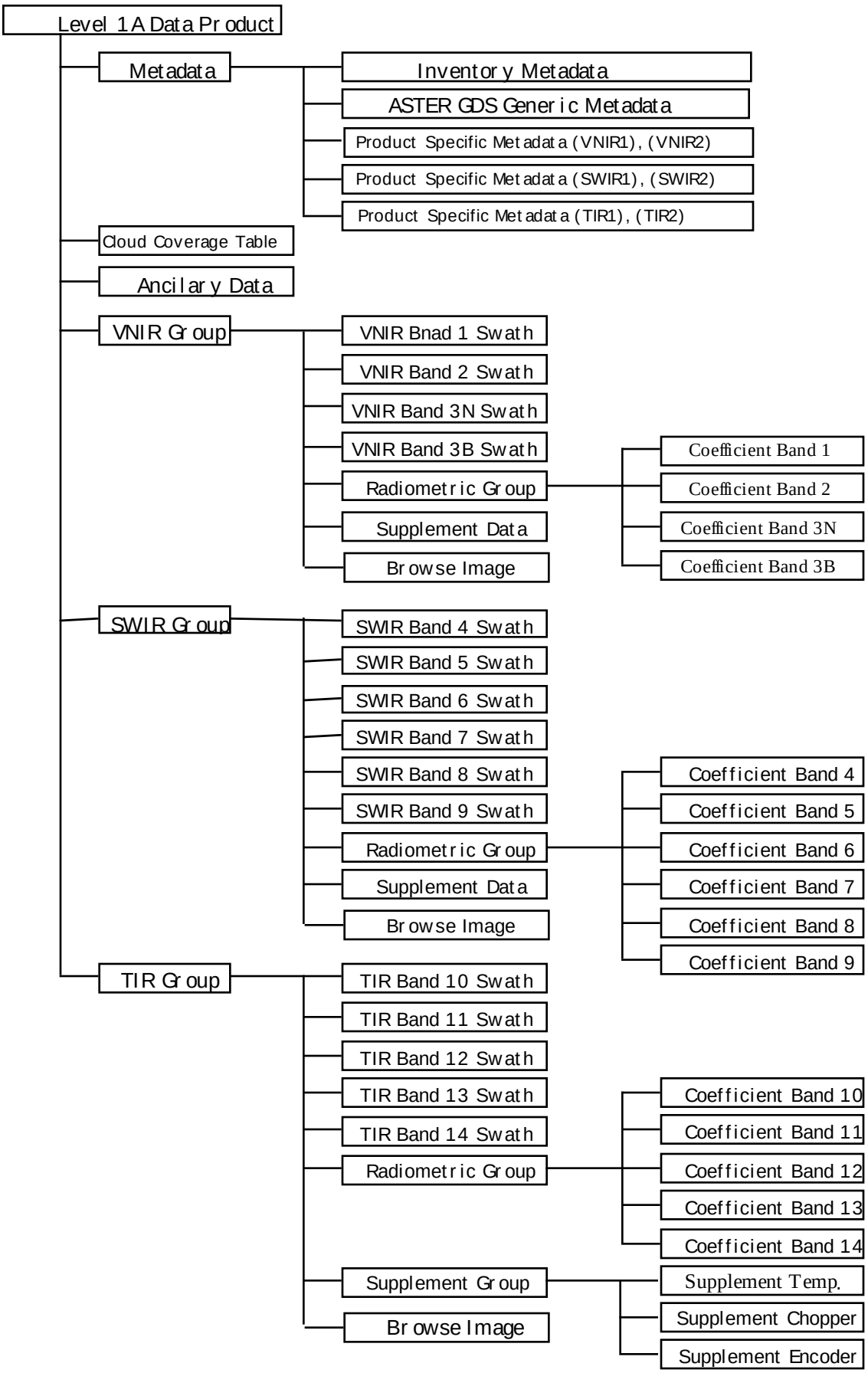


Figure 2.2-1 Physical Data of Level 1A Data Product

2.3 Data Format

2.3.1. Metadata

Level 1A Metadata consists of eight Master Groups, which are

(1) Inventory Metadata
(2) ASTER GDS Generic Metadata
(3) Product Specific Metadata(VNIR1): including the attribute about band-1 and 2 data.
(4) Product Specific Metadata(VNIR2): including the attribute about band-3N, 3B data and input (Level0)data.
(5) Product Specific Metadata(SWIR1): including the attribute about band-4, 5 and 6 data.
(6) Product Specific Metadata(SWIR2): including the attribute about band-7, 8, 9 data and input (Level0)data.
(7) Product Specific Metadata(TIR1): including the attribute about band-10,11 and 12 data.
(8) Product Specific Metadata(TIR2): including the attribute about band-13, 14 data and input (Level0)data.

About concept and definition of master groups, refer to SDP Toolkit Users Guide for the ECS Project, Appendix J.

2.3.1.1. Inventory Metadata

(1) Indexes of Objects
The object list of Inventory Metadata is shown in Table 2.3.1-1. Inventory metadata attributes apply to the whole L1A product, and are written to the HDF file attribute coremetadata.0.
Inventory metadata contains ASTER Meta-Parameters in Generic header for ASTER GDS Products (about Generic header for ASTER GDS Products, see ASTER LEVEL1 DATA PRODUCTS SPECIFICATION, science version, version 2). The attributes included in inventory metadata are associated with DID311.
(In Table 2.3.1-1, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)
The objects in *Italic* character are not authorized by Level1 WG, and will be deleted in next version.

Table 2.3.1-1 List of Objects in Inventory Metadata(1/2)

No.		**Group**/Object Name	type(*1)	Description
1		SizeMBDataGranule	double	The volume of data contained in the granule.
2		PlatformShortName	string	'AM-1' fixed.
3		InstrumentShortName	string	'ASTER' fixed.
4		**BoundingRectangle**		This block contains area coverage for a granule.
	1	WestBoundingCoordinate	double	Western-most coordinate of the scene expressed in longitude.
	2	NorthBoundingCoordinate	double	Northern-most coordinate of the scene expressed in latitude.
	3	EastBoundingCoordinate	double	Eastern-most coordinate of the scene expressed in longitude.
	4	SouthBoundingCoordinate	double	Southern-most coordinate of the scene expressed in latitude.
5		**SingleDateTime**		This contains the time of day and calendar date for a granule.
	1	TimeofDay	string	format: HHMMSSSSSSSZ
	2	CalendarDate	string	format: YYYYMMDD
6		**Review**		This block provides for dates and status as applicable for collection which are active.
	1	FutureReviewDate	string	The date of the nearest planned QA peer review in future. format: YYYYMMDD

Table 2.3.1-1 List of Objects in Inventory Metadata(2/2)

No.		**Group**/Object Name	type(*1)	Description
6	2	ScienceReviewDate	string	The date of the last QA peer review. format: YYYYMMDD
7		**QAStats**		This block contains measures of quality for a granule.
	1	QAPercentMissingData	double	% of missing data of the scene.
	2	QAPercentOutofBoundsData	double	% of out of bounds data of the scene.
	3	QAPercentInterpolatedData	double	% of interpolated data of the scene.
8		ReprocessingActual	string	The stating what reprocessing has been performed on this granule. {not reprocessed, reprocessed once, reprocessed twice, free text}
9		PGEVersion	string	The version of PGE
10		ProcessingLevelID	string	The classification of the science data processing level: '1A'
11		MapProjectionName	string	The type of map projection used: 'N/A'
12		***AdditionalAttributes***		This group contains the product specific attributes definition.
		*AdditionalAttributesContainer(n) (*2)*		This container contains the additional attributes of the product. Currently, only Day/Night Flag is contained in this container.
	1	*AdditionalAttributeName(n)(*2)*	string	Name of additional attribute: Day/Night Flag
	2	*AdditionalAttributeDescription(n) (*2)*	string	Description of additional attribute: ‘The Flag indicates observation condition’
	3	*AdditionalAttributeDataType(n) (*2)*	string	Data type of additional attribute: ‘STRING’
13		*InformationContent*		This group contains the product specific attribute value.
		*InformationContentContainer(n) (*2)*		This container contains the information content. Currently, only Day/Night Flag is contained in this container.
	1	*ParameterValue(n)(*2)*	string	Value of additional attribute: ‘DT’: observation in daytime ‘NT’: observation in nighttime
14		*SensorShortName*	string	The short name for sensor(s) using in generating the product: ‘ASTER_VNIR’,’ASTER_SWIR’,’ASTER_TIR’,’ASTER_STEREO’

NOTES:

(*1) Object types used in Metadata are

a. datetime: CCSDS A(UTC)Format
b. integer
c. double
d. string

(*2) Object whose name followed by (n) has “class” attribute, it may repeat n-times.

2.3.1.2. ASTER GDS Generic Metadata

(1) Indexes of Objects
The Object list of ASTER GDS Generic metadata is shown in Table 2.3.1-2. ASTER GDS Generic metadata attributes are written to the HDF file attribute productmetadata.0.
ASTER GDS Generic metadata contains ASTER Parameters in Generic Header for ASTER GDS Products (about Generic header for ASTER GDS Products, see ASTER LEVEL1 DATA PRODUCTS SPECIFICATION, science version, version 2). The ASTER Parameters are ASTER GDS specific attributes, i.e. not associated with DID311.
(In Table 2.3.1-2, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)
The objects in *Italic* character are not authorized by Level1 WG, and will be deleted in next version.

Table 2.3.1-2 List of Object in ASTER GDS Generic Metadata (1/4)

No.		**Group**/Object Name	type(*1)	Description
1		IDofASTERGDSDataGranule	string	This provides a unique identifier for location of a data granule held in ASTER GDS.
2		RecievingCenter	string	'EDOS' fixed.
3		ProcessingCenter	string	'ASTER-GDS' fixed.
4		GenerationDateandTime	datetime	Generation date and time of this Level1A product.
5		**PointingAngles**		Specification of the pointing angles of ASTER sensors.
		PointingAnglesContainer(n) (*2)		n = number of sensors
	1	SensorName(n)(*2)	string	‘VNIR’ or ‘SWIR’ or ‘TIR’
	2	PointingAngle(n)(*2)	double	pointing angle in degrees
	3	SettingTimeofPointing(n)(*2)	datetime	YYYY-MM-DDThh:mm:ssZ
6		**GainInformation**		The information of the gain level.
		GainInformationContainer(n) (*2)		This container contains the level of the data acquisition gain for VNIR and SWIR.
	1	Gain(n)(*2)	string	(Band Number, Band Gain) where , Band Number: ‘01’,’02’,’3N’,’3B’,’04’,’05’,’06’,’07’,’08’,’09’ Band Gain: for VNIR: ‘HGH’: high gain ‘NOR’: normal gain ‘LOW’: low gain for SWIR: ‘HGH’: high gain ‘NOR’: normal gain ‘LO1’: low gain 1 ‘LO2’: low gain 2 when data is not acquired or doesn't exist: 'OFF'
7		**CalibrationInformation**		Calibration information used to generate the geometric and radiometric correction tables.

Table 2.3.1-2 List of Object in ASTER GDS Generic Metadata (2/4)

No.			**Group**/Object Name	type(*1)	Description
7	1		GeometricDBversion	string	The version information of the geometric correction data. (Version, Issuance date, Comments)
	2		RadiometricDBversion	string	The version information of the radiometric correction data. (Version, Issuance date, Comments)
8			**DataQuality**		The information about the quality of this product.
	1		**CloudCoverage**		The information about the cloud coverage of the scene
		1	SceneCloudCoverage	integer	The percentage of cloud coverage for the whole scene.
		2	QuadrantCloudCoverage	integer	The percentages for 4 quarters of a scene in the order of: upper left -> upper right -> lower left -> lower right
9			SourceDataProduct	string	The information about the input data used for generating this Level-1A product. (DataID, GenDT, Datatyp) where, DataID: ID of Level-0 Data granule. GenDT: Generation date and time. Datatyp: Data type, 'PDS' or 'EDS'
10			**InstrumentInformation**		The information about sensors used to acquire data.
	1		ASTEROperationMode	string	The types of ASTER operation. 'OBSERVATION' or 'CALIBRATION' or 'TEST'
	2		**ObservationMode**		This group contains ASTER observation mode.
			ObservationModeContainer(n) (*2)		The container of ASTER observation mode.
		1	ASTERObservationMode(n) (*2)	string	The observation mode of each sensor group. (SGname, Observation) where, SGname : 'VNIR1' or 'VNIR2' or 'SWIR' or 'TIR' Observation : ‘ON’ (data is acquired) or ‘OFF’ (data is not acquired, or not existing in the granule)

Table 2.3.1-2 List of Object in ASTER GDS Generic Metadata (3/4)

No.		Parameter Name	type(*1)	Description
10	3	ProcessedBands	string	The status of all bands during observation. Format : set of flags described as 2-byte string. byte = 01,02,3N~14 (band 01,02,3N~14 data is acquired.) = XX (data corresponding to its band position is not acquired) Example : Value = "01023NXX0405XXXXXXXX1011121314"
11		**SceneInformation**		The information about the scene concerning with the data granule.
	1	ASTERSceneID	integer	The scene identifier defined by path, row and view. (path, row, view) where, path: 1-233(nominal) row: 1-TBD view: 1-TBD
	2	*AOSSceneID*	string	The scene ID defined by AOS (definition: TBD).
	3	OrbitNumber	integer	The orbit number of the satellite, when data is acquired.
	4	RecurrentCycleNumber	integer	The satellite recurrent cycle number and the revolution number in the cycle. (cycle No., revolution No.) where, cycle: 1-260(max.) revolution: 1-233(nominal)
	5	FlyingDirection	string	The satellite flight direction when observation is done. ‘AS’: ascending direction. ‘DE’: descending direction.
	6	SolarDirection	double	The sun direction as seen from the scene center. (az, el) where, az: azimuth angle in degree. 0.0 <= az < 360.0 measured eastward from North. el: elevation angle in degree. -90.0 <= el <= 90.0
	7	SpatialResolution	integer	The nominal spatial resolutions of VNIR, SWIR and TIR (unit : meter). (resolution of VNIR, resolution of SWIR, resolution of TIR)

Table 2.3.1-2 List of Object in ASTER GDS Generic Metadata (4/4)

No.			Parameter Name	type(*1)	Description
12			*SceneCoordinates*		This group contains the information of coordinates of the scene.
	1		***SceneCoord***		
			*SceneCoordContainer(n)(*2)*		The container of the scene coordinates, in the order of: upper left -> upper right -> lower left -> lower right
		1	*FourCornersLongandLat(n) (*2)*	double	Longitude and latitude of each corners of the full scene. unit : degree (long, lat) where, long: East longitude -180.0 <= long <= 180.0 lat: latitude -90.0 <= lat<= 90.0
	2		*CenterLongitudeandLatitude*	double	Longitude and latitude of the scene center. unit : degree (long, lat) where, long: East longitude -180.0 <= long <= 180.0 lat: latitude -90.0 <= lat <= 90.0
	3		***QuadSceneCoord***		
			*QuadSceneCoordContainer(n) (*2)*		This container contains longitudes and latitudes of the quadrant scene, in the order of: upper left -> upper right -> lower left -> lower right
		1	*FourCornersLongndLatofQuad (n)(*2)*	double	Longitude and latitude of 4 corners of the each quadrant, in the order of: upper left -> upper right -> lower left -> lower right ((long, lat)*4) where, long: East longitude (degree) -180.0 <= long <= 180.0 lat: latitude (degree) -90.0 <= lat <= 90.0
13			*IDofBrowseDatagranule*	string	Logical reference to the browse product.

NOTES:

(*1) Object types used in Metadata are
a. datetime: CCSDS A(UTC)Format
b. integer
c. double
d. string

(*2) Object whose name followed by (n) has “class” attribute, it may repeat n-times.

2.3.1.3. Product Specific Metadata(VNIR)

(1) Indexes of Objects
The Object list of Product Specific metadata(VNIR1) and Product Specific metadata(VNIR2) are shown in Table 2.3.1-3. Product Specific metadata(VNIR1) attributes (VNIRBand1Data and VNIRBand2Data Groups) are written to the HDF file attribute productmetadata.v1 and Product Specific metadata(VNIR2) attributes (VNIRBand3NData, VNIRBand3BData, Level0VNIR1Data and Level0VNIR2Data Groups) are written to productmetadata.v2.
Product Specific Metadata(VNIR1) and Product Specific metadata(VNIR2) include product specific attributes, i.e. not associated with DID311.
(In Table 2.3.1-3, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(1/11)

No.	**Group**/Object Name	type(*1)	Description
1	**VNIRBand1Data**		The information about VNIR band 1 of Level-1A.
1	**ExtractionfromL01**		The information about the extraction from one or two Level 0 GROUP1 PDS (strip data) in order to make VNIR Band 1 Data.
	ExtractionfromL01Container(n)(*2)		
1	RSC1(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
2	SST1(n)(*2)	datetime	SST(scan start time) of first & last scan.
3	PDSid1(n)(*2)	string	Identifier of PDS including first & last scan.
2	ImageDataInformation1	integer	The information of VNIR band 1 image data. (npx, nln, bpp) where, npx: Number of pixels per line (4100: fixed) nln: Number of lines in frame (4200: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(2/11)

No.				**Group**/Object Name	type(*1)	Description
1	3			GeometricCorrection1	integer	The information of VNIR Band-1 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(10: nominal) nlpct: number of lattice points in across-track direction.(11: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (410: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (400: nominal)
	4			RadiometricCorrection1	integer	The information of VNIR Band-1 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(4100 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality1**		This group contains the information about the quality of Level1A VNIR Band-1 data.
		1		NumberofBadPixels1	integer	The information of missing data. (nmp, ndd, nmg) where, nmp: number of missing pixels. ndd: number of damaged detectors. nmg: number of contiguous missing pixel groups (abbreviated ‘Missing Groups’)
		2		**ListofBadPixels1**		This group contains the information about bad pixels.
				ListofBadPixels1Container(n)(*2)		
			1	DirectionofBadPixel1(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(3/11)

No.				**Group**/Object Name	type(*1)	Description
1	5	2	2	BadPixelLP1(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP1(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP1(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel1(n)(*2)	string	The cause of bad data: 'M' : Data Missing 'D' : Damaged Detector
	6			**UnitConversionCoeff1**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-01 image.
		1		Incl1	double	Inclination
		2		Offset1	double	Offset : 0.0 fixed.
		3		UnSatMin1	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax1	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit1	string	Converted Unit
2				**VNIRBand2Data**		The information about VNIR band 2 of Level-1A.
	1			**ExtractionfromL02**		The information about the extraction from one or two Level 0 GROUP1 PDS (strip data) in order to make VNIR Band 2 Data.
				ExtractionfromL02Container(n)(*2)		
		1		RSC2(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST2(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid2(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation2	integer	The information of VNIR Band 2 image data. (npx, nln, bpp) where, npx: Number of pixels per line(4100: fixed) nln: Number of lines in frame(4200: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(4/11)

No.				**Group**/Object Name	type(*1)	Description
2	3			GeometricCorrection2	integer	The information of VNIR Band-2 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(10: nominal) nlpct: number of lattice points in across-track direction.(11: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (410: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (400: nominal)
	4			RadiometricCorrection2	integer	The information of VNIR Band-2 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(4100 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality2**		This group contains the information about the quality of Level1A VNIR Band-2 data.
		1		NumberofBadPixels2	integer	The information of missing data. (nmp, ndd, nmg) where, nmp: number of missing pixels. ndd: number of damaged detectors. nmg: number of contiguous missing pixel groups (abbreviated ‘Missing Groups’)
		2		**ListofBadPixels2**		This group contains the information about bad pixels.
				ListofBadPixels2Container(n) (*2)		
			1	DirectionofBadPixel2(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP2(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(5/11)

No.				**Group**/Object Name	type(*1)	Description
2	5	2	3	BPSFirstLP2(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP2(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel2(n)(*2)	string	The cause of bad data: 'M' : Data Missing 'D' : Damaged Detector
	6			**UnitConversionCoeff2**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-02 image.
		1		Incl2	double	Inclination
		2		Offset2	double	Offset : 0.0 fixed.
		3		UnSatMin2	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax2	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit2	string	Converted Unit
3				**VNIRBand3NData**		The information about VNIR band 3N of Level-1A.
	1			**ExtractionfromL03N**		The information about the extraction from one or two Level 0 GROUP2 PDS (strip data) in order to make VNIR Band 3N Data.
				ExtractionfromL03NContainer (n)(*2)		
		1		RSC3N(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST3N(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid3N(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation3N	integer	The information of VNIR Band 3N image data. (npx, nln, bpp) where, npx: Number of pixels per line(4100: fixed) nln: Number of lines in frame(4200: nominal) bpp: Bytes per pixel (1 : fixed)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(6/11)

No.					**Group**/Object Name	type(*1)	Description
3	3				GeometricCorrection3N	integer	The information of VNIR Band-3N geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(10: nominal) nlpct: number of lattice points in across-track direction.(11: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (410: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (400: nominal)
	4				RadiometricCorrection3N	integer	The information of VNIR Band-3N radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(4100 : fixed) npara: number of parameters (3 : fixed)
	5				**DataQuality3N**		This group contains the information about the quality of Level1A VNIR Band-3N data.
		1			NumberofBadPixels3N	integer	The information of missing data. (nmp, ndd, nmg) where, nmp: number of missing pixels. ndd: number of damaged detectors.nmg: number of contiguous missing pixel groups (abbreviated ‘Missing Groups’)
		2			**ListofBadPixels3N**		This group contains the information about bad pixels.
					ListofBadPixels3NContainer (n)(*2)		
			1		DirectionofBadPixel3N(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP3N(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(7/11)

No.				**Group**/Object Name	type(*1)	Description
3	5	2	3	BPSFirstLP3N(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP3N(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel3N(n)(*2)	string	The cause of bad data: 'M' : Data Missing 'D' : Damaged Detector
	6			**UnitConversionCoeff3N**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-3N image.
		1		Incl3N	double	Inclination
		2		Offset3N	double	Offset : 0.0 fixed.
		3		UnSatMin3N	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax3N	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit3N	string	Converted Unit
4				**VNIRBand3BData**		The information about VNIR band 3B of Level-1A.
	1			**ExtractionfromL03B**		The information about the extraction from one or two Level 0 GROUP2 PDS (strip data) in order to make VNIR Band 3BData.
				ExtractionfromL03BContainer (n)(*2)		
		1		RSC3B(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST3B(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid3B(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation3B	integer	The information of VNIR Band 3B image data. (npx, nln, bpp) where, npx: Number of pixels per line(5000: fixed) nln: Number of lines in frame(4600: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(8/11)

No.					**Group**/Object Name	type(*1)	Description
4	3				GeometricCorrection3B	integer	The information of VNIR Band-3B geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(10: :nominal) nlpct: number of lattice points in across-track direction.(12: :nominal) dlpat: distance between two neighbor lattice points in along-track direction. (500: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (400: nominal)
	4				RadiometricCorrection3B	integer	The information of VNIR Band-3B radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(5000 : fixed) npara: number of parameters (3 : fixed)
	5				**DataQuality3B**		This group contains the information about the quality of Level1A VNIR Band-3B data.
		1			NumberofBadPixels3B	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels3B**		This group contains the information about bad pixels.
					ListofBadPixels3BContainer (n)(*2)		
			1		DirectionofBadPixel3B(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP3B(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(9/11)

No.				**Group**/Object Name	type(*1)	Description
4	5	2	3	BPSFirstLP3B(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP3B(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel3B(n)(*2)	string	The cause of bad data: 'M' : Data Missing 'D' : Damaged Detector
	6			**UnitConversionCoeff3B**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-3B image.
		1		Incl3B	double	Inclination
		2		Offset3B	double	Offset : 0.0 fixed.
		3		UnSatMin3B	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax3B	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit3B	string	Converted Unit
	7			**FirstPixelAddressGroup**		This group identifies the address of the first available pixel in each refreshing cycle of VNIR band-3B image data.
		1		Ncycles	integer	Number of refreshing cycle. Since there are as many as 9 refreshing cycles in a frame data, nominal value for Ncycles is 9.
		2		**FPAddress**		
				FPAddressContainer(n)(*2)		This container contains relative scan number and address for each refreshing cycle.
			1	FirstPixelAddress(n)(*2)	integer	(Sc-n, Ad-n) where, Sc-n : Relative scan count in n-th cycle. Ad-n : Address in n-th cycle.
5				**Level0VNIR1Data**		The information about Level-0 VNIR Group-1 which contains VNIR band 1 and 2 data.
	1			**PhysicalUnit1**		The information about Level-0 VNIR Group-1 physical unit.
		1		BarCodeID1	string	Bar code serial number of the physical unit.
		2		CompletionDate1	datetime	Date and time of completion of the physical media.
		3		PDSCounts1	integer	Total number of PDSs on the physical unit (<=9999)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(10/11)

No.			**Group**/Object Name	type(*1)	Description
5	2		**L0DataSet1**		This group contains the information of L0 VNIR Group-1 data set(PDSs).
			L0DataSet1Container(n)(*2)		The information about PDSs of Level-0 Group-1.
		1	PDSid1(n)(*2)	string	Identifier of this PDS assigned by EDOS.
		2	FirstPacketTime1(n)(*2)	datetime	First packet time for this PDS.
		3	LastPacketTime1(n)(*2)	datetime	Last packet time for this PDS.
		4	PacketCounts1(n)(*2)	integer	Number of packets in this PDS.
	3		L0DataType1	string	The identifier of the input data type (defined by EDOS). ‘PDS’: Production Data Set ‘EDS’: Expedited Data Set ‘TEST’ : Test Data
	4		**L0DataQuality1**		This specifies the number of input packets used to generate the data granule, and these quality.
		1	SensorGroupName1	string	Sensor group name: ‘VNIR1’ (fixed)
		2	NumberofPackets1	integer	Number of packets used to generate the scene data of each group.
		3	PercentofMissingPackets1	double	percent of missing packets of each group. Unit: %
		4	PercentofCorrectedPackets1	double	percent of packets with errors corrected by Reed Solomon (R-S) decoding. Unit: %
6			**Level0VNIR2Data**		The information about Level-0 VNIR Group-2 which contains VNIR band 3N and 3B data.
	1		**PhysicalUnit2**		The information about Level-0 VNIR Group-2 physical unit.
		1	BarCodeID2	string	Bar code serial number of the physical unit.
		2	CompletionDate2	datetime	Date and time of completion of the physical media.
		3	PDSCounts2	integer	Total number of PDSs on the physical unit (<=9999)
	2		**L0DataSet2**		This group contains the information of L0 VNIR Group-2 data set(PDSs).
			L0DataSet2Container(n)(*2)		The information about PDSs of Level-0 Group-2.
		1	PDSid2(n)(*2)	string	Identifier of this PDS assigned by EDOS.
		2	FirstPacketTime2(n)(*2)	datetime	First packet time for this PDS.
		3	LastPacketTime2(n)(*2)	datetime	Last packet time for this PDS.

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(11/11)

No.			**Group**/Object Name	type(*1)	Description
6	2	4	PacketCounts2(n)(*2)	integer	Number of packets in this PDS.
	3		L0DataType2	string	The identifier of the input data type (defined by EDOS). ‘PDS’: Production Data Set ‘EDS’: Expedited Data Set ‘TEST’ : Test Data
	4		**L0DataQuality2**		This specifies the number of input packets used to generate the data granule, and these quality.
		1	SensorGroupName2	string	Sensor group name: ‘VNIR2’ (fixed)
		2	NumberofPackets2	integer	Number of packets used to generate the scene data of each group.
		3	PercentofMissingPackets2	double	percent of missing packets of each group. Unit: %
		4	PercentofCorrectedPackets2	double	percent of packets with errors corrected by Reed Solomon (R-S) decoding. Unit: %

NOTES:

(*1) Object types used in Metadata are

a. datetime: CCSDS A(UTC)Format
b. integer
c. double
d. string

(*2) Object whose name followed by (n) has “class” attribute, it may repeat n-times.

2.3.1.4. Product Specific Metadata(SWIR)

(1) Indexes of Objects
The Object list of Product Specific metadata(SWIR1) and Product Specific metadata(SWIR2) are shown in Table 2.3.1-4. Product Specific metadata(SWIR1) attributes (SWIRBand4Data, SWIRBand5Data and SWIRBand6Data Groups) are written to the HDF file attribute productmetadata.s1 and Product Specific metadata(SWIR2) attributes (SWIRBand7Data, SWIRBand8Data, SWIRBand9Data, Level0SWIRData, SWIR Registration Quality and Parallax Correction quality Groups) are witten to productmetadata.s2.
Product Specific Metadata(SWIR1) and Product Specific metadata(SWIR2) include product specific attributes, i.e. not associated with DID311.
(In Table 2.3.1-4, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(1/15)

No.			**Group**/Object Name	type(*1)	Description
1			**SWIRBand4Data**		The information about SWIR band 4 of Level-1A.
	1		**ExtractionfromL04**		The information about the extraction from one or two Level 0 GROUP3 PDS(strip data) in order to make SWIR band 4 data.
			ExtractionfromL04Container(n)(*2)		
		1	RSC4(n)(*2)	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST4(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3	PDSid4(n)(*2)	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation4	integer	The information of SWIR band 4 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(2/15)

No.					**Group**/Object Name	type(*1)	Description
1	3				GeometricCorrection4	integer	The information of SWIR Band-4 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4				RadiometricCorrection4	integer	The information of SWIR Band-4 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5				**DataQuality4**		This group contains the information about the quality of Level1A SWIR Band-4 data.
		1			NumberofBadPixels4	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels4**		This group contains the information about bad pixels.
					ListofBadPixels4Container(n) (*2)		
			1		DirectionofBadPixel4(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP4(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(3/15)

No.				**Group**/Object Name	type(*1)	Description
1	5	2	3	BPSFirstLP4(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP4(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel4(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff4**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-4 image.
		1		Incl4	double	Inclination
		2		Offset4	double	Offset : 0.0 fixed.
		3		UnSatMin4	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax4	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit4	string	Converted Unit
2				**SWIRBand5Data**		The information about SWIR band 5 of Level-1A.
	1			**ExtractionfromL05**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 5 Data.
				ExtractionfromL05Container(n)(*2)		
		1		RSC5(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST5(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid5(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation5	integer	The information of SWIR band 5 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(4/15)

No.					**Group**/Object Name	type(*1)	Description
2	3				GeometricCorrection5	integer	The information of SWIR Band-5 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4				RadiometricCorrection5	integer	The information of SWIR Band-5 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5				**DataQuality5**		This group contains the information about the quality of Level1A SWIR Band-5 data.
		1			NumberofBadPixels5	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors.nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels5**		This group contains the information about bad pixels.
					ListofBadPixels5Container(n) (*2)		
			1		DirectionofBadPixel5(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP5(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(5/15)

No.				**Group**/Object Name	type(*1)	Description
2	5	2	3	BPSFirstLP5(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP5(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel5(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff5**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-5 image.
		1		Incl5	double	Inclination
		2		Offset5	double	Offset : 0.0 fixed.
		3		UnSatMin5	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax5	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit5	string	Converted Unit
3				**SWIRBand6Data**		The information about SWIR band 6 of Level-1A.
	1			**ExtractionfromL06**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 6 Data.
				ExtractionfromL06Container(n)(*2)		
		1		RSC6(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST6(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid6(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation6	integer	The information of SWIR band 6 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(6/15)

No.					**Group**/Object Name	type(*1)	Description
3	3				GeometricCorrection6	integer	The information of SWIR Band-6 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4				RadiometricCorrection6	integer	The information of SWIR Band-6 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5				**DataQuality6**		This group contains the information about the quality of Level1A SWIR Band-6 data.
		1			NumberofBadPixels6	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels6**		This group contains the information about bad pixels.
					ListofBadPixels6Container(n) (*2)		
			1		DirectionofBadPixel6(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP6(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(7/15)

No.				**Group**/Object Name	type(*1)	Description
3	5	2	3	BPSFirstLP6(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP6(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel6(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff6**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-6 image.
		1		Incl6	double	Inclination
		2		Offset6	double	Offset : 0.0 fixed.
		3		UnSatMin6	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax6	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit6	string	Converted Unit
4				**SWIRBand7Data**		The information about SWIR band 7 of Level-1A.
	1			**ExtractionfromL07**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 7 Data.
				ExtractionfromL07Container(n)(*2)		
		1		RSC7(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST7(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid7(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation7	integer	The information of SWIR band 7 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(8/15)

No.				**Group**/Object Name	type(*1)	Description
4	3			GeometricCorrection7	integer	The information of SWIR Band-7 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4			RadiometricCorrection7	integer	The information of SWIR Band-7 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality7**		The information of VNIR Band-7 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
		1		NumberofBadPixels7	integer	The information about bad pixels. (nmp, nelm, ndd) where, nmp: number of missing pixels. nelm: number of elements of the next list of bad pixels. ndd: number of damaged detectors.
		2		**ListofBadPixels7**		This group contains the information about bad pixels.
				ListofBadPixels7Container(n)(*2)		
			1	DirectionofBadPixel7(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(9/15)

No.				**Group**/Object Name	type(*1)	Description
4	5	2	2	BadPixelLP7(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP7(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP7(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel7(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff7**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-7 image.
		1		Incl7	double	Inclination
		2		Offset7	double	Offset : 0.0 fixed.
		3		UnSatMin7	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax7	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit7	string	Converted Unit
5				**SWIRBand8Data**		The information about SWIR band 8 of Level-1A.
	1			**ExtractionfromL08**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 8 Data.
				ExtractionfromL08Container(n)(*2)		
		1		RSC8(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST8(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid8(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation8	integer	The information of SWIR band 7 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(10/15)

No.					**Group**/Object Name	type(*1)	Description
5	3				GeometricCorrection8	integer	The information of SWIR Band-8 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4				RadiometricCorrection8	integer	The information of SWIR Band-8 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5				**DataQuality8**		This group contains the information about the quality of Level1A SWIR Band-8 data.
		1			NumberofBadPixels8	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels8**		This group contains the information about bad pixels.
					ListofBadPixels8Container(n) (*2)		
			1		DirectionofBadPixel8(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP8(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(11/15)

No.				**Group**/Object Name	type(*1)	Description
5	5	2	3	BPSFirstLP8(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP8(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel8(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff8**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-8 image.
		1		Incl8	double	Inclination
		2		Offset8	double	Offset : 0.0 fixed.
		3		UnSatMin8	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax8	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit8	string	Converted Unit
6				**SWIRBand9Data**		The information about SWIR band 9 of Level-1A.
	1			**ExtractionfromL09**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 9 Data.
				ExtractionfromL09Container(n)(*2)		
		1		RSC9(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST9(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid9(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation9	integer	The information of SWIR band 9 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(12/15)

No.					**Group**/Object Name	type(*1)	Description
6	3				GeometricCorrection9	integer	The information of SWIR Band-9 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4				RadiometricCorrection9	integer	The information of SWIR Band-9 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5				**DataQuality9**		This group contains the information about the quality of Level1A SWIR Band-9 data.
		1			NumberofBadPixels9	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels9**		This group contains the information about bad pixels.
					ListofBadPixels9Container(n) (*2)		
			1		DirectionofBadPixel9(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP9(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(13/15)

No.				**Group**/Object Name	type(*1)	Description
6	5	2	3	BPSFirstLP9(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP9(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel9(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff9**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-9 image.
		1		Incl9	double	Inclination
		2		Offset9	double	Offset : 0.0 fixed.
		3		UnSatMin9	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax9	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit9	string	Converted Unit
7				**Level0SWIRData**		The information about Level-0 SWIR which contains VNIR band 3N and 3B data.
	1			**PhysicalUnit**		The information about Level-0 SWIR physical unit.
		1		BarCodeID	string	Bar code serial number of the physical unit.
		2		CompletionDate	datetime	Date and time of completion of the physical media.
		3		PDSCounts	integer	Total number of PDSs on the physical unit (<=9999)
	2			**L0DataSet**		This group contains the information of L0 SWIR data set(PDSs).
				L0DataSetContainer(n)(*2)		The information about PDSs of Level-0 Group-3.
		1		PDSid(n)(*2)	string	Identifier of this PDS assigned by EDOS.
		2		FirstPacketTime(n)(*2)	datetime	First packet time for this PDS.
		3		LastPacketTime(n)(*2)	datetime	Last packet time for this PDS.
		4		PacketCounts(n)(*2)	integer	Number of packets in this PDS.
	3			L0DataType	string	The identifier of the input data type (defined by EDOS). ‘PDS’: Production Data Set ‘EDS’: Expedited Data Set ‘TEST’ : Test Data

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(14/15)

No.			**Group**/Object Name	type(*1)	Description
7	4		**L0DataQuality**		This specifies the number of input packets used to generate the data granule, and these quality.
		1	SensorGroupName	string	Sensor group name: 'SWIR' (fixed)
		2	NumberofPackets	integer	Number of packets used to generate the scene data of each group.
		3	PercentofMissingPackets	double	percent of missing packets of each group. Unit: %
		4	PercentofCorrectedPackets	double	percent of packets with errors corrected by Reed Solomon (R-S) decoding. Unit: %
8			**SWIRRegistrationQuality**		The registration information of SWIR based on VNIR.
	1		ProcessingFlag	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
	2		NumberofMeasurements	integer	The number of measurements
	3		MeasurementPointNumber	integer	The number of measurement points.
	4		AverageOffset	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
	5		StandardDeviationOffset	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
	6		Threshold	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
9			**ParallaxCorrectionQuality**		The information of SWIR parallax correction.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(15/15)

No.		**Group**/Object Name	type(*1)	Description
9	1	PctImageMatch	integer	The percent of image matching used in the SWIR parallax collection processing.
	2	AvgCorrelCoef	double	The Average Correlation Coefficient.
	3	Cthled	double	The Correlation Threshold value.

NOTES:

(*1) Object types used in Metadata are

a. datetime: CCSDS A(UTC)Format

b. integer

c. double

d. string

(*2) Object whose name followed by (n) has “class” attribute, it may repeat n-times.

2.3.1.5. Product Specific Metadata(TIR)

(1) Indexes of Objects
The Object list of Product Specific metadata(TIR1) and Product Specific metadata(TIR2) are shown in Table 2.3.1-5. Product Specific metadata(TIR1) attributes(TIRBand10Data, TIRBand11Data and TIRBand12Data Groups) are written to the HDF file attribute productmetadata.t1 and Product Specific metadata(TIR2) attributes(TIRBand13Data, TIRBand14Data, Level0TIRData and TIRRegistrationQuality Groups) are written to the HDF file attribute productmetadata.t2.
Product Specific Metadata(TIR1) and Product Specific metadata(TIR2) include product specific attributes, i.e. not associated with DID311.
(In Table 2.3.1-5, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(1/12)

No.			**Group**/Object Name	type(*1)	Description
1			**TIRBand10Data**		The information about TIR band 10 of Level-1A.
	1		**ExtractionfromL010**		The information about the extraction from level 0 strip data.
		1	RSC10	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST10	datetime	SST(scan start time) of first & last scan.
		3	PDSid10	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation10	integer	The information of TIR band 10 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection10	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(2/12)

No.					**Group**/Object Name	type(*1)	Description
1	4				RadiometricCorrection10	integer	The information of TIR Band-10 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)
	5				**DataQuality10**		This group contains the information about the quality of Level1A TIR data.
		1			NumberofBadPixels10	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels10**		This group contains the information about bad pixels.
					ListofBadPixels10Container(n)(*2)		
			1		DirectionofBadPixel10(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP10(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3		BPSFirstLP10(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4		BPSLastLP10(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5		CauseofBadPixel10(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6				**UnitConversionCoeff10**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-10 image.
		1			Incl10	double	Inclination
		2			Offset10	double	Offset : 0.0 fixed.
		3			UnSatMin10	integer	Minimum value of unsaturated pixel : 0 fixed.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(3/12)

No.			**Group**/Object Name	type(*1)	Description
1	6	4	UnSatMax10	integer	Maximum value of unsaturated pixel.
		5	ConUnit10	string	Converted Unit.
2			**TIRBand11Data**		The information about TIR band 11 of Level-1A.
	1		**ExtractionfromL011**		The information about the extraction from level 0 strip data.
		1	RSC11	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST11	datetime	SST(scan start time) of first & last scan.
		3	PDSid11	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation11		The information of TIR band 11 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection11	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)
	4		RadiometricCorrection11	integer	The information of TIR Band-11 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(4/12)

No.					**Group**/Object Name	type(*1)	Description
2	5				**DataQuality11**		This group contains the information about the quality of Level1A TIR data.
		1			NumberofBadPixels11	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels11**		This group contains the information about bad pixels.
					ListofBadPixels11Container(n)(*2)		
			1		DirectionofBadPixel11(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP11(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3		BPSFirstLP11(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4		BPSLastLP11(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5		CauseofBadPixel11(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6				**UnitConversionCoeff11**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-11 image.
		1			Incl11	double	Inclination
		2			Offset11	double	Offset : 0.0 fixed.
		3			UnSatMin11	integer	Minimum value of unsaturated pixel : 0 fixed.
		4			UnSatMax11	integer	Maximum value of unsaturated pixel.
		5			ConUnit11	string	Converted Unit.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(5/12)

No.			**Group**/Object Name	type(*1)	Description
3			**TIRBand12Data**		The information about TIR band 12 of Level-1A.
	1		**ExtractionfromL012**		The information about the extraction from level 0 strip data.
		1	RSC12	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST12	datetime	SST(scan start time) of first & last scan.
		3	PDSid12	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation12		The information of TIR band 12 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection12	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)
	4		RadiometricCorrection12	integer	The information of TIR Band-12 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(6/12)

No.					**Group**/Object Name	type(*1)	Description
3	5				**BandDataQuality12**		This group contains the information about the quality of Level1A TIR data.
		1			NumberofBadPixels12	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels12**		This group contains the information about bad pixels.
					ListofBadPixels12Container(n)(*2)		
			1		DirectionofBadPixel12(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP12(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3		BPSFirstLP12(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4		BPSLastLP12(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5		CauseofBadPixel12(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6				**UnitConversionCoeff12**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-12 image.
		1			Incl12	double	Inclination
		2			Offset12	double	Offset : 0.0 fixed.
		3			UnSatMin12	integer	Minimum value of unsaturated pixel : 0 fixed.
		4			UnSatMax12	integer	Maximum value of unsaturated pixel.
		5			ConUnit12	string	Converted Unit.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(7/12)

No.			**Group**/Object Name	type(*1)	Description
4			**TIRBand13Data**		The information about TIR band 13 of Level-1A.
	1		**ExtractionfromL013**		The information about the extraction from level 0 strip data.
		1	RSC13	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST13	datetime	SST(scan start time) of first & last scan.
		3	PDSid13	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation13		The information of TIR band 13 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection13	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)
	4		RadiometricCorrection13	integer	The information of TIR Band-13 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(8/12)

No.					**Group**/Object Name	type(*1)	Description
4	5				**BandDataQuality13**		This group contains the information about the quality of Level1A TIR data.
		1			NumberofBadPixels13	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels13**		This group contains the information about bad pixels.
					ListofBadPixels13Container(n)(*2)		
			1		DirectionofBadPixel13(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP13(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3		BPSFirstLP13(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4		BPSLastLP13(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5		CauseofBadPixel13(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6				**UnitConversionCoeff13**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-13 image.
		1			Incl13	double	Inclination
		2			Offset13	double	Offset : 0.0 fixed.
		3			UnSatMin13	integer	Minimum value of unsaturated pixel : 0 fixed.
		4			UnSatMax13	integer	Maximum value of unsaturated pixel.
		5			ConUnit13	string	Converted Unit.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(9/12)

No.			**Group**/Object Name	type(*1)	Description
5			**TIRBand14Data**		The information about TIR band 14 of Level-1A.
	1		**ExtractionfromL014**		The information about the extraction from level 0 strip data.
		1	RSC14	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST14	datetime	SST(scan start time) of first & last scan.
		3	PDSid14	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation14		The information of TIR band 14 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection14	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)
	4		RadiometricCorrection14	integer	The information of TIR Band-14 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(10/12)

No.					**Group**/Object Name	type(*1)	Description
5	5				**BandDataQuality14**		This group contains the information about the quality of Level1A TIR data.
		1			NumberofBadPixels14	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2			**ListofBadPixels14**		This group contains the information about bad pixels.
					ListofBadPixels14Container(n)(*2)		
			1		DirectionofBadPixel14(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2		BadPixelLP14(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3		BPSFirstLP14(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4		BPSLastLP14(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5		CauseofBadPixel14(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6				**UnitConversionCoeff14**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-14 image.
		1			Incl14	double	Inclination
		2			Offset14	double	Offset : 0.0 fixed.
		3			UnSatMin14	integer	Minimum value of unsaturated pixel : 0 fixed.
		4			UnSatMax14	integer	Maximum value of unsaturated pixel.
		5			ConUnit14	string	Converted Unit.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(11/12)

No.			**Group**/Object Name	type(*1)	Description
6			**Level0TIRData**		The information about Level-0 TIR data.
	1		**PhysicalUnit**		The information about Level-0 TIR physical unit.
		1	BarCodeID	string	Bar code serial number of the physical unit.
		2	CompletionDate	datetime	Date and time of completion of the physical media.
		3	PDSCounts	integer	Total number of PDSs on the physical unit (<=9999)
	2		**L0Dataset**		This group contains the information of L0 TIR Group-10 data set(PDSs).
			L0DataSetContainer(n)(*2)		The information about PDSs of Level-0 TIR data.
		1	PDSid(n)(*2)	string	Identifier of this PDS assigned by EDOS.
		2	FirstPacketTime(n)(*2)	datetime	First packet time for this PDS.
		3	LastPacketTime(n)(*2)	datetime	Last packet time for this PDS.
		4	PacketCounts(n)(*2)	integer	Number of packets in this PDS.
	3		L0DataType	string	The identifier of the input data type (defined by EDOS). ‘PDS’: Production Data Set ‘EDS’: Expedited Data Set ‘TEST’ : Test Data
	4		**L0DataQuality**		This specifies the number of input packets used to generate the data granule, and these quality.
		1	SensorGroupName	string	Sensor group name: ‘TIR’ (fixed)
		2	NumberofPackets	integer	Number of packets used to generate the scene data of each group.
		3	PercentofMissingPackets	double	percent of missing packets of each group. Unit: %
		4	PercentofCorrectedPackets	double	percent of packets with errors corrected by Reed Solomon (R-S) decoding. Unit: %
7			**TIRRegistrationQuality**		The registration information of TIR based on VNIR.
	1		ProcessingFlag	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(12/12)

No.		**Group**/Object Name	type(*1)	Description
7	2	NumberofMeasurements	integer	The number of measurements
	3	MeasurementPointNumber	integer	The number of measurement points.
	4	AverageOffset	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
	5	StandardDeviationOffset	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
	6	Threshold	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold

NOTES:

(*1) Object types used in Metadata are

a. datetime: CCSDS A(UTC)Format
b. integer
c. double
d. string

(*2) Object whose name followed by (n) has “class” attribute, it may repeat n-times.

2.3.2. Cloud Coverage Table

(1) Description

Cloud coverage table is available for Level 1A Product corresponding to each ASTER Observation (OBS) modes.

(2) Characteristics(TBD)

a) Data model: SDS (2 Dimension Array)
b) Object Name: Cloud_Coverage_Table
c) Format: Refer to Table 2.3.2-1
d) Contents: each element is 1 byte data, indicates clear (= 0) or cloudy (= 1) for the rectangular area which is centered by the SWIR Band 6 lattice point.

Table 2.3.2-1 Size of Cloud Coverage Data

Reference Coordinates	Dimension Size	Variable Type
SWIR	[n][103]*	UINT8
VNIR	[n][10]*	UINT8
TIR	[n][11]*	UINT8

* Line size (n: 105 or 106 in case of SWIR) is depending on a processing scene.

Note 1: Reference Coordinates will change depending on condition of observation.

a) In nominal case, the lattice coordinates of SWIR Geometric Correction Table(GCT) is used as center of evaluation rectangle.
b) If SWIR data is not available, the lattice coordinate of VNIR GCT will be used as center instead.
c) If both SWIR and VNIR data are not available, the lattice coordinate of TIR GCT will be used .

Note 2: Evaluation area size is shown as follows.

Reference Coordinate	SWIR	VNIR	TIR
Evaluation area size	20P	410P	70P
	20L	400L	70L

2.3.3. Ancillary Data

(1) Description

Ancillary Data include the satellite's orbit/attitude data, and their time tags. Since ancillary data appended to onboard instrument data are updated once per major cycle time (1.024 sec), in order to match with the scene observation time of 9.5 sec (63 km), an extra number of ancillary data will be extracted and provided. To ensure the conformity with instrument data, "zeroes" are assigned to the leading ancillary data of each sensor, and called Relative Scan Number. This is used as control data for extracted Image Data.

(2) Characteristics (TBD)

a) Data model: Vdata
b) Object Name: Ancillary_Data
c) Class Name: Anci_Record.*n* (*n*: Record count number)
d) Format and contents: Table 2.3.3-1 shows the format and the contents of Ancillary Data. Some Ancillary Data contains multiple entries per field. Order which is the number of components in a field is shown in Table 2.3.3-1.

Table 2.3.3-1 Format of Ancillary Data (1/2)

Field Name	Order	Variable Size	Description
Relative_Scan_No	3	UINT32	Relative Scan Number
Primary_Header	6	UINT8	CCSDS Primary Packet Header for downlink, used for ground routing and processing.
Secondary_Header	8	UINT8	This field is part of the secondary header of the packet for downlink. Bit 0: Secondary Header ID Flag (always a data zero) Bit 1-63: Time Stamp - Epoch of the data in the ancillary data message. Spacecraft clock time in CCSDS Day-Segmented Format. The code epoch is January 1, 1958.
Flag_Byte	1	UINT8	Flag Byte - Flags for ground data processing control. First (most significant) bit is the "quick look" bit. Other bits are reserved and will contain data zero. This field is part of the secondary header of the packet for downlink.
Time_Conversion	3	UINT8	Time Conversion - Estimated difference between UTC and the Spacecraft Clock. This may be added to the Spacecraft Clock time to derive UTC time.
Position	3	UINT32	Spacecraft Position (x, y, z) - Estimated position of the spacecraft, expressed in Earth Centered Inertial frame (mean Equator and Equinox of J2000).
Velocity	3	UINT32	Spacecraft Velocity (x, y, z) - Estimated velocity of the spacecraft, expressed in Earth Centered Inertial frame (mean Equator and Equinox of J2000).
Attitude_Angle	3	UINT16	Attitude Angle (Roll, Pitch, Yow) - The estimated attitude of the spacecraft, expressed in the Orbital Reference frame.
Attitude_Rate	3	UINT16	Attitude Rate (Roll, Pitch, Yow) - The estimated attitude rate of the spacecraft, expressed in the Orbital Reference frame.
Magnetic_Coil	3	UINT8	Magnetic Coil Current (x, y, z) - Currents flowing in each of the magnetic torque coils used for Spacecraft momentum unloading.
Solar_Arrary	1	UINT8	Solar Array Current - Current flowing from the Spacecraft solar array.

Table 2.3.3-1 Format of Ancillary Data (2/2)

Field Name	Component	Variable Size	Description
Solar_Position	3	UINT8	Solar Position (x, y, z) - Components of unit vector, expressed in the Spacecraft Reference frame, pointing in the direction of the Sun.
Moon_Position	3	UINT8	Moon Position (x, y, z) - Components of the unit vector, expressed in the Spacecraft Reference frame, pointing in the direction of the Moon.

Note: Resolution and Range are shown as follows.

Ancillary Data	Resolution	Range
Primary Header	N/A	N/A
Secondary Header	N/A	N/A
Time Stamp	1 msec	1958-2047
Flag Byte	N/A	N/A
Time Conversion	1 msec	msec
Spacecraft Position	0.125 m	m
Spacecraft Velocity		
Attitude Angle	1.0 arcsec	arcsec

Attitude Rate	0.5 arcsec	arcsec
Magnetic Coil Current	A	A
Solar Array Current	1.0 A	0-256 A
Solar Position		1
Moon Position		1

2.3.4. VNIR Group

2.3.4.1 Overview

VNIR Group contains a Vdata, and a RIS24, a series of Swath Objects through the use of the Vgroup API. Vgroup name which establishes access to a Vgroup is as follows.

vgroup name: VNIR_Group

2.3.4.2. VNIR Band 1 Swath

(1) Structure
A single swath contains any number of Tables and Multidimensional Arrays. There is however one type of information that is special: geolocation information. In a swath, geolocation information is stored as a series of arrays. We require that every swath contain some geolocation component. The data itself is stored in multidimensional arrays in the swath. The only limitation is that the first dimension is the Track dimension. Each Band is stored as separate Swath structure, one per geolocation object. Consider Figure 2.3.4-1, which is represent of a swath consisting of a combination of 2D and 3D data arrays, a series of 2D geolocation arrays, a series of data tables, and a single 1D geolocation tables.

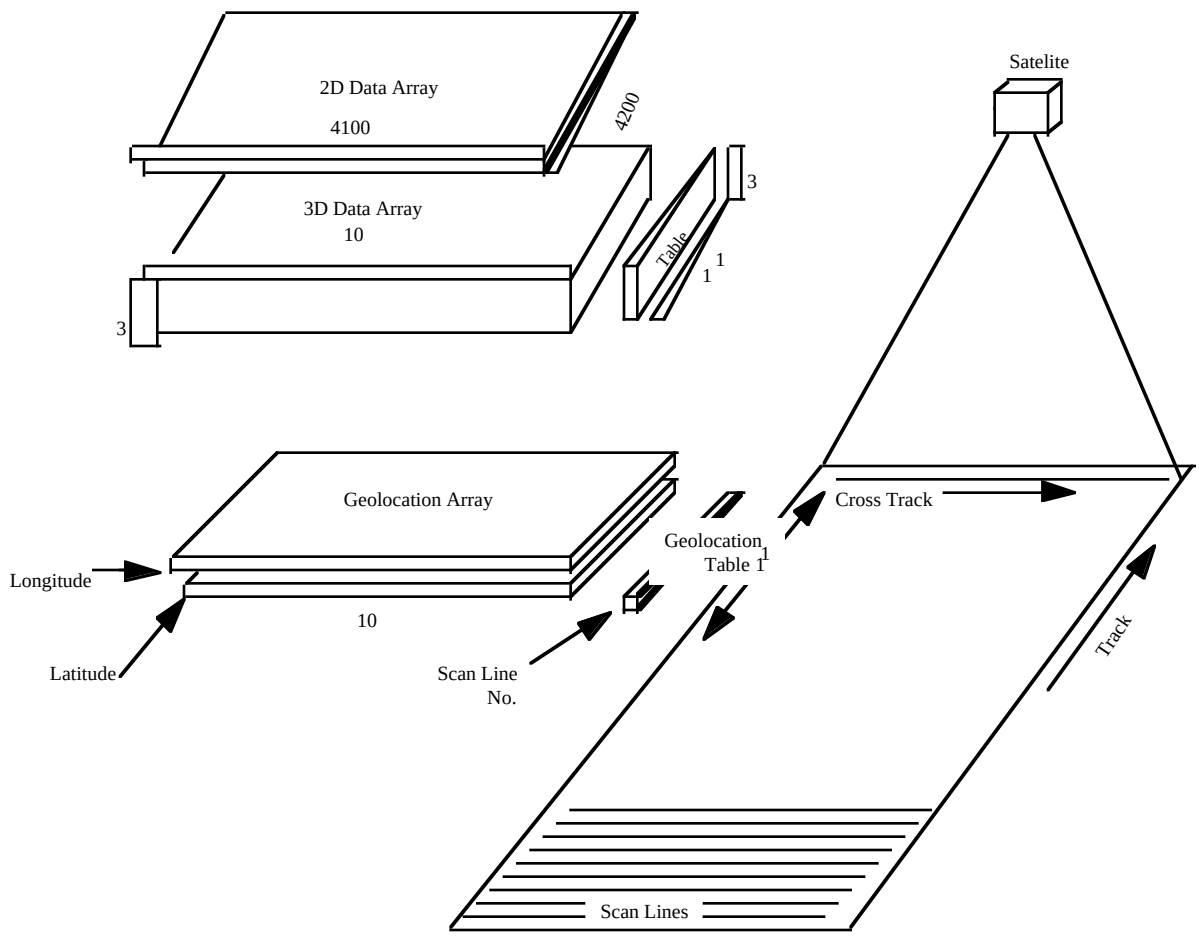


Figure 2.3.4-1. Conceptual View of Example of Swath

(2) Characteristics
Table 2.3.4-1 shows the List of data items in VNIR Band 1 Swath.

a) Data model: Swath
b) Object Name: VNIR_Band1
c) Format: Table 2.3.4-1 shows the contents of Swath Object. Table 2.3.4-2 shows the format of one.

Table 2.3.4-1 List of data items in Level 1A VNIR Band 1 Swath

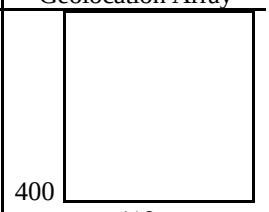
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.4-2 Format of data items in VNIR Band 1 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][10]	DOUBLE	geolocation field (Array)
Longitude	[n][10]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][10][2]	INT32	mapping to geolocation array
SightVector	[n][10][3]	DOUBLE	mapping to geolocation array
Altitude	[n][10]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[4200][4100]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 400 lines in image data).

2.3.4.3. VNIR Band 2 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.4-3 shows the List of data items in VNIR Band 2 Swath.

a) Data model: Swath
b) Object Name: VNIR_Band2
c) Format: Table 2.3.4-3 shows the contents of Swath Object. Table 2.3.4-4 shows the format of one.

Table 2.3.4-3 List of data items in Level 1A VNIR Band 2 Swath

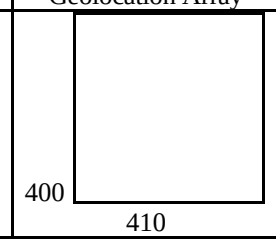
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.4-4 Format of data items in VNIR Band 2 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][10]	DOUBLE	geolocation field (Array)
Longitude	[n][10]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][10][2]	INT32	mapping to geolocation array
SightVector	[n][10][3]	DOUBLE	mapping to geolocation array
Altitude	[n][10]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[4200][4100]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 400 lines in image data).

2.3.4.4. VNIR Band 3N Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.4-5 shows the List of data items in VNIR Band 3N Swath.

a) Data model: Swath
b) Object Name: VNIR_Band3N
c) Format: Table 2.3.4-5 shows the contents of Swath Object. Table 2.3.4-6 shows the format of one.

Table 2.3.4-5 List of data items in Level 1A VNIR Band 3N Swath

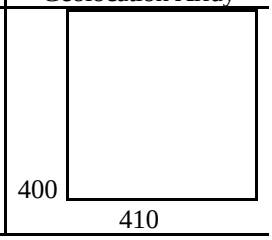
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.4-6 Format of data items in VNIR Band 3N Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][10]	DOUBLE	geolocation field (Array)
Longitude	[n][10]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][10][2]	INT32	mapping to geolocation array
SightVector	[n][10][3]	DOUBLE	mapping to geolocation array
Altitude	[n][10]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[4200][4100]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 400 lines in image data).

2.3.4.5. VNIR Band 3B Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.4-7 shows the List of data items in VNIR Band 3B Swath.

a) Data model: Swath
b) Object Name: VNIR_Band3B
c) Format: Table 2.3.4-7 shows the contents of Swath Object. Table 2.3.4-8 shows the format of one.

Table 2.3.4-7 List of data items in Level 1A VNIR Band 3B Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.4-8 Format of data items in VNIR Band 3B Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][10]	DOUBLE	geolocation field (Array)
Longitude	[n][10]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][10][2]	INT32	mapping to geolocation Array
SightVector	[n][10][3]	DOUBLE	mapping to geolocation Array
Altitude	[n][10]	DOUBLE	mapping to geolocation Array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation Table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation Table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation Table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation Table
ObservationTime	[n]	DOUBLE	mapping to geolocation Table
ImageData	[4600][5000]	UINT8	mapping to geolocation Array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	400 500

Scan Line No. is skipped along line dimension. (one per 400 lines in image data).

2.3.4.6. Radiometric Correction Table

VNIR Radiometric Correction Table Group contains a series of SDS Objects through the use of the Vgroup API. Each SDS object named as follows. Characteristics of each SDS object are described later subsection.

(1) VNIR Band 1
(2) VNIR Band 2
(3) VNIR Band 3N
(4) VNIR Band 3B

Radiometric correction coefficients of

equation :

First entry in coefficients dimension is **Dv**.
vgroup name which establishes access to a Vgroup is as follows.

vgroup name: VNIR_Radiometric

2.3.4.6.1. VNIR Band 1

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_1
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[4100][2]	FLOAT

2.3.4.6.2. VNIR Band 2

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_2
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[4100][2]	FLOAT

2.3.4.6.3. VNIR Band 3N

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_3N
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[4100][2]	FLOAT

2.3.4.6.4. VNIR Band 3B

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_3B
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[5000][2]	FLOAT

2.3.4.7. VNIR Supplement Data

(1) Description

VNIR Supplement Data contain VNIR status data, calibration data, and pointing angles etc.

(2) Characteristics (TBD)

a) Data model: Vdata
b) Object Name: VNIR_Supplement
c) Class Name: VNIR_Supple_Record.*n* (*n*: Record count number)
d) Format: Each record is stored in class. Table 2.3.4-9 shows the format and the contents of Supplement Data.

Table 2.3.4-9 Format of Supplement Data (1/2)

Field Name	Variable Size	Description
Relative_Scan_No	UNIT32	Relative Scan Number
B1_DET_Temp	UINT8	Band 1 Detector Temperature
B2_DET_Temp	UINT8	Band 2 Detector Temperature
B3N_DET_Temp	UINT8	Band 3N Detector Temperature
B3B_DET_Temp	UINT8	Band 3B Detector Temperature
LAMP_A_Temp	UINT8	Calibration Lamp A Temperature
LAMP_B_Temp	UINT8	Calibration Lamp B Temperature
MON_AMP_Temp	UINT8	Monitor Amp. Temperature
PD_1_Temp	UINT8	Photodiode 1 Temperature
PD_2A_Temp	UINT8	Photodiode 2A Temperature
PD_2B_Temp	UINT8	Photodiode 2B Temperature
VSP1_Temp	UINT8	VSP 1 Temperature
VSP2_Temp	UINT8	VSP 2 Temperature
VEL_RAD_Temp	UINT8	VEL Base Plate Temperature
TELSCP_Temp1N	UINT8	Nadir Telescope Temperature 1
TELSCP_Temp2N	UINT8	Nadir Telescope Temperature 2
TELSCP_Temp3N	UINT8	Nadir Telescope Temperature 3
TELSCP_Temp1B	UINT8	Backward Telescope Temperature 1
TELSCP_Temp2B	UINT8	Backward Telescope Temperature 2
TELSCP_Temp3B	UINT8	Backward Telescope Temperature 3
PS_Vol	UINT8	VPS Lamp Power Supply Voltage
PD_1A_OUT	UINT8	Photodiode 1A Output
PD_1B_OUT	UINT8	Photodiode 1B Output
PD_2A_OUT	UINT8	Photodiode 2A Output
PD_2B_OUT	UINT8	Photodiode 2B Output
ECAL_Vol1	UINT8	Electric Calibration Voltage.1
ECAL_Vol2	UINT8	Electric Calibration Voltage.2
ECAL_Vol3	UINT8	Electric Calibration Voltage.3
ECAL_Vol4	UINT8	Electric Calibration Voltage.4
VSP1_APS_Vol+	UINT8	VSP1 APS Vol. +10V
VSP1_APS_Vol-	UINT8	VSP1 APS Vol. -10V
Ptg_Angl1	UINT8	Pointing Angle 1
Ptg_Angl2	UINT8	Pointing Angle 2
Init_E_Address1	UINT8	Initial Extract Address 1
Init_E_Address2	UINT8	Initial Extract Address 2
Platform_Pos1	UINT8	Platform Position (Z) 1
Platform_Pos2	UINT8	Platform Position (Z) 2

Table 2.3.4-9 Format of Supplement Data (2/2)

Field Name	Variable Size	Description
GAIN_SEL	UINT8	Bit-0: Band 1 Normal/High Gain Selection Bit-1: Band 1 Normal/Low Gain Selection Bit-2: Band 2 Normal/High Gain Selection Bit-3: Band 2 Normal/Low Gain Selection Bit-4: Band 3 Normal/High Gain Selection Bit-5: Band 3 Normal/Low Gain Selection Bit-6: Band 3 A/B Selection Bit-7: OPE. Optical/Electric Calibration Selection
On/Off	UINT8	Bit-0: Calibration Lamp A/B Selection Bit-1: PS1 On/Off Bit-2: PS3 On/Off Bit-3: Table Cancel On/Off Bit-4: PS4 On/Off Bit-5: TBD Bit-6: TBD Bit-7: TBD
R1	UINT8	TBD
R2	UINT8	TBD
R3	UINT8	TBD
R4	UINT8	TBD
R5	UINT8	TBD
R6	UINT8	TBD
R7	UINT8	TBD
R8	UINT8	TBD
R9	UINT8	TBD
R10	UINT8	TBD
R11	UINT8	TBD
R12	UINT8	TBD

2.3.4.8. VNIR Browse Image

(1) Description

VNIR Browse Image is compressed, using the standard features of the HDF libraries.
As Browse images are divided from Level 1A Data Product in "ASTER Level 1 Data Product Specification (science version, version 2.0)", these will be stored in another HDF file as a subset of Level 1A data products in next version.

(2) Characteristics (TBD)

a) Color Assignment: Current base line is as follows.

	B	G	R
Band No.	1	2	3N

b) Sampling Method: average sampling
c) Sampling Rate: 1/20.5
d) Format: Table 2.3.4-10 shows the format

Table 2.3.4-10 Format of Browse Image

Object Name	Dimension Size	Data Model	Compression Method	Quality Factor
VNIR_Browse	200 210	RIS24	JPEG	50

2.3.5. SWIR Group

2.3.5.1 Overview

SWIR Group contains a Vdata, and a RIS24, a series of Swath Objects through the use of the Vgroup API. Vgroup name which establishes access to a Vgroup is as follows.

vgroup name: SWIR_Group

2.3.5.2. SWIR Band 4 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.5-1 shows the List of data items in SWIR Band 4 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band4
c) Format: Table 2.3.5-1 shows the contents of Swath Object. Table 2.3.5-2 shows the format of one.

Table 2.3.5-1 List of data items in Level 1A SWIR Band 4 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-2 Format of data items in SWIR Band 4 Swath (1/2)

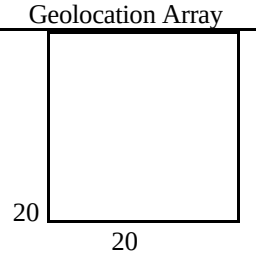
Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table

Table 2.3.5-2 Format of data items in SWIR Band 4 Swath (2/2)

Field Name	Dimension Size	Variable Type	Remarks
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.3. SWIR Band 5 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.5-3 shows the List of data items in SWIR Band 5 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band5
c) Format: Table 2.3.5-3 shows the contents of Swath Object. Table 2.3.5-4 shows the format of one.

Table 2.3.5-3 List of data items in Level 1A SWIR Band 5 Swath

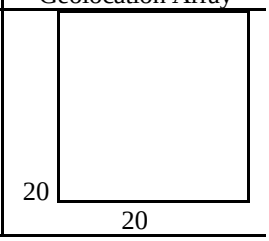
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-4 Format of data items in SWIR Band 5 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.4. SWIR Band 6 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.5-5 shows the List of data items in SWIR Band 6 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band6
c) Format: Table 2.3.5-5 shows the contents of Swath Object. Table 2.3.5-6 shows the format of one.

Table 2.3.5-5 List of data items in Level 1A SWIR Band 6 Swath

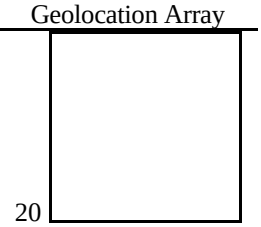
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-6 Format of data items in SWIR Band 6 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.5. SWIR Band 7 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.5-7 shows the List of data items in SWIR Band 7 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band7
c) Format: Table 2.3.5-7 shows the contents of Swath Object. Table 2.3.5-8 shows the format of one.

Table 2.3.5-7 List of data items in Level 1A SWIR Band 7 Swath

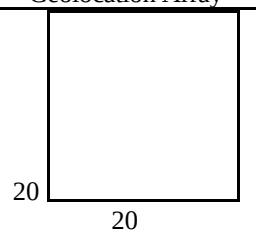
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-8 Format of data items in SWIR Band 7 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.6. SWIR Band 8 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.5-9 shows the List of data items in SWIR Band 8 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band8
c) Format: Table 2.3.5-9 shows the contents of Swath Object. Table 2.3.5-10 shows the format of one.

Table 2.3.5-9 List of data items in Level 1A SWIR Band 8 Swath

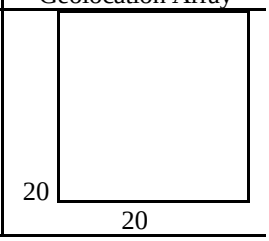
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-10 Format of data items in SWIR Band 8 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.7. SWIR Band 9 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.5-11 shows the List of data items in SWIR Band 9 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band9
c) Format: Table 2.3.5-11 shows the contents of Swath Object. Table 2.3.5-12 shows the format of one.

Table 2.3.5-11 List of data items in Level 1A SWIR Band 9 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-12 Format of data items in SWIR Band 9 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	20 20

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.8. Radiometric Correction Table

SWIR Radiometric Correction Table Group contains a series of SDS Objects through the use of the Vgroup API. Each SDS object named as follows. Characteristics of each SDS object are described later subsection.

(1) SWIR Band 4
(2) SWIR Band 5
(3) SWIR Band 6
(4) SWIR Band 7
(5) SWIR Band 8
(6) SWIR Band 9

Radiometric correction coefficients of

equation :

First entry in coefficients dimension is **Dv**.
vgroup name which establishes access to a Vgroup is as follows.

vgroup name: SWIR_Radiometric

2.3.5.8.1. SWIR Band 4

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_4
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.8.2. SWIR Band 5

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_5
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.8.3. SWIR Band 6

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_6
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.8.4. SWIR Band 7

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_7
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.8.5. SWIR Band 8

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_8
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.8.6. SWIR Band 9

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_9
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.9. SWIR Supplement Data

(1) Description
SWIR Supplement Data contain SWIR status data, calibration data, and pointing angles etc.

(2) Characteristics (TBD)
a) Data Model: Vdata
b) Object Name: SWIR_Supplement
c) Class Name: SWIR_Supple_Record.*n* (*n*: Record count number)
d) Format: Each record is stored in class. Since SWIR Supplement Data are updated once per cycle time (4.398msec), Increment of frame number is attended on this update. Table 2.3.5-13 shows the contents of each entry. Table 2.3.5-14~18 show the format and the contents of Supplement Data in detail.

Table 2.3.5-13 Contents of Supplement Data

Frame Number	Contents of the Entries
0	all of synchronous code, frame number, and reserved field and Major Frame No. 0 & 1 (MF-0,1) from WORD#38 to WORD#53 in Table 2.3.5-14~18.
1	all of synchronous code, frame number, and reserved field and Major Frame No. 2 & 3 (MF-2,3) from WORD#38 to WORD#53 in Table 2.3.5-14~18.
2	all of synchronous code, frame number, and reserved field and Major Frame No. 4 & 5 (MF-4,5) from WORD#38 to WORD#53 in Table 2.3.5-14~18.
3	all of synchronous code, frame number, and reserved field and Major Frame No. 6 & 7 (MF-6,7) from WORD#38 to WORD#53 in Table 2.3.5-14~18.
....	write following entries repeatedly concerning above four frames.

Table 2.3.5-14 Format of Supplement Data (1/4)

Field Name	Variable Size	Description
Relative_Scan_No	UINT32	Relative Scan Number
SynchronousCode1	UINT8	Synchronous Code (6DE2B846)
SynchronousCode2	UINT8	
SynchronousCode3	UINT8	
SynchronousCode4	UINT8	
FrameNumber1	UINT8	Frame Number (sequential number from 0 to 10^{24}-1)
FrameNumber2	UINT8	
FrameNumber3	UINT8	
WORD#38	UINT16	WORD#38 MF-0: Optics monitor voltage A MF-1: Cooler current 3 MF-2: Optics monitor voltage A MF-3: Cooler current 3 MF-4: Optics monitor voltage A MF-5: Cooler current 3 MF-6: Optics monitor voltage A MF-7: Cooler current 3

Table 2.3.5-14 Format of Supplement Data (2/4)

Field Name	Variable Size	Description
WORD#39	UINT16	WORD#39 MF-0: Spare MF-1: Cooler current 4 MF-2: Spare MF-3: Cooler current 4 MF-4: Spare MF-5: Cooler current 4 MF-6: Spare MF-7: Cooler current 4
WORD#40	UINT16	WORD#40 MF-0: Optics monitor voltage B MF-1: Detector temperature (NARROW) MF-2: Optics monitor voltage B MF-3: Detector temperature (NARROW) MF-4: Optics monitor voltage B MF-5: Detector temperature (NARROW) MF-6: Optics monitor voltage B MF-7: Detector temperature (NARROW)
WORD#41	UINT16	WORD#41 MF-0: Spare MF-1: TLM/CMD circuit reference voltage 1 MF-2: Spare MF-3: TLM/CMD circuit reference voltage 1 MF-4: Spare MF-5: TLM/CMD circuit reference voltage 1 MF-6: Spare MF-7: TLM/CMD circuit reference voltage 1
WORD#42	UINT16	WORD#42 MF-0: Cooler current 1 MF-1: TLM/CMD circuit reference voltage 2 MF-2: Cooler current 1 MF-3: TLM/CMD circuit reference voltage 2 MF-4: Cooler current 1 MF-5: TLM/CMD circuit reference voltage 2 MF-6: Cooler current 1 MF-7: TLM/CMD circuit reference voltage 2
WORD#43	UINT16	WORD#43 MF-0: Cooler current 2 MF-1: TLM/CMD circuit reference voltage 3 MF-2: Cooler current 2 MF-3: TLM/CMD circuit reference voltage 3 MF-4: Cooler current 2 MF-5: TLM/CMD circuit reference voltage 3 MF-6: Cooler current 2 MF-7: TLM/CMD circuit reference voltage 3
WORD#44	UINT16	WORD#44 See Table 2.3.5-14
WORD#45	UINT16	WORD#45 MF-0: See Table 2.3.5-15 MF-1: Drive plus width MF-2: See Table 2.3.5-15 MF-3: Drive plus width MF-4: See Table 2.3.5-15 MF-5: Drive plus width MF-6: See Table 2.3.5-15 MF-7: Drive plus width

Table 2.3.5-14 Format of Supplement Data (3/4)

Field Name	Variable Size	Description
WORD#46	UINT16	WORD#46 MF-0: A/D reference voltage (Band 4) MF-1: Calibration lamp voltage A MF-2: Calibration lump temperature A MF-3: Support STR temperature 5 MF-4: Collector module temperature 1A MF-5: Electric circuit temperature 1 MF-6: Spare MF-7: Spare
WORD#47	UINT16	WORD#47 MF-0: A/D reference voltage (Band 5) MF-1: Calibration lamp voltage B MF-2: Calibration lump temperature B MF-3: Support STR temperature 6 MF-4: Collector module temperature 2A MF-5: Electric circuit temperature 2 MF-6: Spare MF-7: Spare
WORD#48	UINT16	WORD#48 MF-0: A/D reference voltage (Band 6) MF-1: Detector temperature (Wide) MF-2: Support STR temperature 1 MF-3: Support STR temperature 7 MF-4: Detector preamp/dewar temperature A MF-5: Electric circuit temperature 3A MF-6: Spare MF-7: Spare
WORD#49	UINT16	WORD#49 MF-0: A/D reference voltage (Band 7) MF-1: Monitor amplitude MF-2: Support STR temperature 2 MF-3: Support STR temperature 8 MF-4: Pointing mechanism temperature MF-5: Electric circuit temperature 4 MF-6: Spare MF-7: Spare
WORD#50	UINT16	WORD#50 MF-0: A/D reference voltage (Band 8) MF-1: Spare MF-2: Support STR temperature 3 MF-3: Support STR temperature 9 MF-4: Cooler temperature 1 MF-5: Optics monitor temperature A MF-6: Spare MF-7: Spare
WORD#51	UINT16	WORD#51 MF-0: A/D reference voltage (Band 9) MF-1: Spare MF-2: Support STR temperature 4 MF-3: Support STR temperature 10 MF-4: Cooler temperature 2 MF-5: Optics monitor temperature B MF-6: Spare MF-7: Spare

Table 2.3.5-14 Format of Supplement Data (4/4)

Field Name	Variable Size	Description
WORD#52	UINT16	WORD#52 MF-0: Drive plus number 1 MF-1: See Table 2.3.5-16 MF-2: See Table 2.3.5-16 MF-3: See Table 2.3.5-16 MF-4: See Table 2.3.5-16 MF-5: Spare MF-6: Spare MF-7: Spare
WORD#53	UINT16	WORD#53 MF-0: Drive plus number 1 MF-1: See Table 2.3.5-17 MF-2: See Table 2.3.5-17 MF-3: See Table 2.3.5-17 MF-4: See Table 2.3.5-17 MF-5: Spare MF-6: Spare MF-7: Spare
R1	UINT8	reserved
R2	UINT8	reserved

Table 2.3.5-15 WORD#44

Major Frame	Contents
0, 2, 4, 6	Bit-0: Pointing mirror encoder 1 Bit-1: Pointing mirror encoder 1 Bit-2: Pointing mirror encoder 1 Bit-3: Pointing mirror encoder 1 Bit-4: Pointing mirror encoder 1 Bit-5: Pointing mirror encoder 1 Bit-6: Pointing mirror encoder 1 Bit-7: Pointing mirror encoder 1
1, 3, 5, 7	Bit-0: Pointing mirror encoder 3 Bit-1: Mirror position status Bit-2: Mirror position status Bit-3: Mirror position limit status Bit-4: Limit ENA/DISA Bit-5: Pointing motor ENA/DISA Bit-6: Encoder on/off Bit-7: Monitor rotation CW/CCW

Table 2.3.5-16 WORD#45

Major Frame	Contents
0, 2, 4, 6	Bit-0: Thermal control circuit on/off Bit-1: CLR DRV circuit PS on/off Bit-2: Calibration circuit on/off Bit-3: Spare Bit-4: Spare Bit-5: Spare Bit-6: Spare Bit-7: Spare

Table 2.3.5-17 WORD#52 (1/2)

Major Frame	Contents
1	Bit-0: Band 4 gain status Bit-1: Band 4 gain status Bit-2: Band 5 gain status Bit-3: Band 5 gain status Bit-4: Band 6 gain status Bit-5: Band 6 gain status Bit-6: Spare Bit-7: Spare
2	Bit-0: DIG SIG PROC PWR Bit-1: TML/CMD PWR on/off Bit-2: Analog circuit power on/off Bit-3: Spare Bit-4: Spare Bit-5: Detector DRV PWR Bit-6: Pointing CIR PWR Bit-7: Spare
3	Bit-0: THER CIR PWR Bit-1: Heater 1 on/off Bit-2: Heater 2 on/off Bit-3: Heater 3 on/off Bit-4: Heater 4 on/off Bit-5: Heater 5 on/off Bit-6: Detector heater Bit-7: Spare

Table 2.3.5-17 WORD#52 (2/2)

Major Frame	Contents
4	Bit-0: Party flag status Bit-1: ERR CMD DIS status Bit-2: ERR CMD DIS status Bit-3: ERR CMD DIS status Bit-4: ERR CMD DIS status Bit-5: ERR CMD DIS status Bit-6: Spare Bit-7: Spare

Table 2.3.5-18 WORD#53

Major Frame	Contents
1	Bit-0: Band 7 gain status Bit-1: Band 7 gain status Bit-2: Band 8 gain status Bit-3: Band 8 gain status Bit-4: Band 9 gain status Bit-5: Band 9 gain status Bit-6: Spare Bit-7: Spare
2	Bit-0: Calibration lamp power on/off Bit-1: Calibration lamp A/B selection Bit-2: CAL CIR PWR on/off Bit-3: Cooler DRV CIR PWR Bit-4: Spare Bit-5: Spare Bit-6: Spare Bit-7: Spare
3	Bit-0: CLR monitor amplitude 1 status Bit-1: CLR monitor amplitude 1 status Bit-2: CLR monitor amplitude 1 status Bit-3: CLR monitor amplitude 1 status Bit-4: Detector temperature set status Bit-5: Detector temperature set status Bit-6: Spare Bit-7: Spare
4	Bit-0: Thermal control circuit on/off Bit-1: Thermal control circuit on/off Bit-2: Spare Bit-3: Spare Bit-4: Spare Bit-5: Spare Bit-6: Spare Bit-7: Spare

2.3.5.10. SWIR Browse Image

(1) Description

SWIR Browse Image is compressed, using the standard features of the HDF libraries.
As Browse images are divided from Level 1A Data Product in "ASTER Level 1 Data Product Specification (science version, version 2.0)", these will be stored in another HDF file as a subset of Level 1A data products in next version.

(2) Characteristics (TBD)

a) Color Assignment: Current base line is as follows.

	B	G	R
Band No.	4	5	9

b) Sampling Method: average sampling
c) Sampling Rate: 1/10.2
c) Format: Table 2.3.5-19 shows the format

Table 2.3.5-19 Format of Browse Image

Object Name	Dimension Size	Data Model	Compression Method	Quality Factor
SWIR_Browse	200 210	RIS24	JPEG	50

2.3.6. TIR Group

2.3.6.1 Overview

TIR Group contains a Vgroup, and a RIS24, a series of Swath Objects through the use of the Vgroup API. Vgroup name which establishes access to a Vgroup is as follows.

vgroup name: TIR_Group

2.3.6.2. TIR Band 10 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.5-1 shows the List of data items in TIR Band 10 Swath.

a) Data model: Swath
b) Object Name: TIR_Band10
c) Format: Table 2.3.6-1 shows the contents of Swath Object. Table 2.3.6-2 shows the format of one.

Table 2.3.6-1 List of data items in Level 1A TIR Band 10 Swath

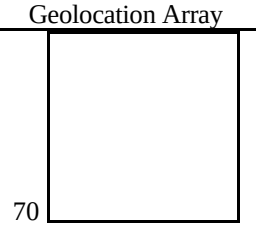
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.6-2 Format of data items in TIR Band 10 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.3. TIR Band 11 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.6-3 shows the List of data items in TIR Band 11 Swath.

a) Data model: Swath
b) Object Name: TIR_Band11
c) Format: Table 2.3.6-3 shows the contents of Swath Object. Table 2.3.6-4 shows the format of one.

Table 2.3.6-3 List of data items in Level 1A TIR Band 11 Swath

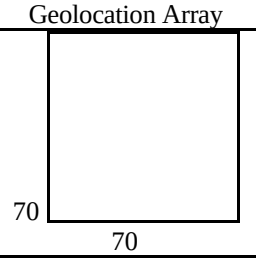
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.6-4 Format of data items in TIR Band 11 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.4. TIR Band 12 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.6-5 shows the List of data items in TIR Band 12 Swath.

a) Data model: Swath
b) Object Name: TIR_Band12
c) Format: Table 2.3.6-5 shows the contents of Swath Object. Table 2.3.6-6 shows the format of one.

Table 2.3.6-5 List of data items in Level 1A TIR Band 12 Swath

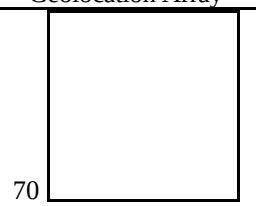
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.6-6 Format of data items in TIR Band 12 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.5. TIR Band 13 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.6-7 shows the List of data items in TIR Band 13 Swath.

a) Data model: Swath
b) Object Name: TIR_Band13
c) Format: Table 2.3.6-7 shows the contents of Swath Object. Table 2.3.6-8 shows the format of one.

Table 2.3.6-7 List of data items in Level 1A TIR Band 13 Swath

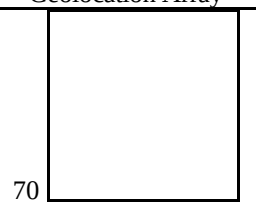
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.6-8 Format of data items in TIR Band 13 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.6. TIR Band 14 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page D-57.

(2) Characteristics
Table 2.3.6-9 shows the List of data items in TIR Band 14 Swath.

a) Data model: Swath
b) Object Name: TIR_Band14
c) Format: Table 2.3.6-9 shows the contents of Swath Object. Table 2.3.6-10 shows the format of one.

Table 2.3.6-9 List of data items in Level 1A TIR Band 14 Swath

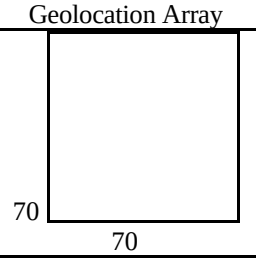
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.6-10 Format of data items in TIR Band 14 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.7. Radiometric Correction Table

SWIR Radiometric Correction Table Group contains a series of SDS Objects through the use of the Vgroup API. Each SDS object named as follows. Characteristics of each SDS object are described later subsection.

(1) TIR Band 10
(2) TIR Band 11
(3) TIR Band 12
(4) TIR Band 13
(5) TIR Band 14

Radiometric correction coefficients of

equation :

First entry in coefficients dimension is $\mathbf{C_0}$.
vgroup name which establishes access to a Vgroup is as follows.

vgroup name: TIR_Radiometric

2.3.6.7.1. TIR Band 10

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_10
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.7.2. TIR Band 11

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_11
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.7.3. TIR Band 12

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_12
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.7.4. TIR Band 13

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_13
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.7.5. TIR Band 14

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_14
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.8. TIR Supplement Data

(1) Description

TIR Supplement Data contain TIR status data, calibration data, and pointing angles etc. TIR Supplement Data contains a single Vdata Object (Temperature) and a series of Vdata Objects (Chopper, Encoder) through the use of the Vgroup API. vgroup name which establishes access to a Vgroup is as follows.

vgroup name: TIR_Supplemant

(2) Characteristics (TBD)

Three categories in Vgroup object are shown as follows.

Supplement Data about Temperature

a) Data Object: Vdata
b) Object Name: TIR_Supplement_Temp
c) Class Name: TIR_Supple_Temp.*n* (*n*: Record count number)
d) Format: Table 2.3.6-11 show the format and contents of Supplement Data about temperatures.

Table 2.3.6-11 Format of Supplement Data (Temperature)

Field Name	Variable Size	Description
Relative_Scan_No	UINT32	Relative Scan Number
Detector_Temp	UINT32	Detector Temperature
Black-Body_Temp1	UINT32	Temperature of Black-Body 1
Black-Body_Temp2	UINT32	Temperature of Black-Body 2
Black-Body_Temp3	UINT32	Temperature of Black-Body 3
Black-Body_Temp4	UINT32	Temperature of Black-Body 4
Black-Body_Temp5	UINT32	Temperature of Black-Body 5
Chopper_Temp1	UINT32	Temperature of Chopper 1
Chopper_Temp2	UINT32	Temperature of Chopper 2
Chopper_Temp3	UINT32	Temperature of Chopper 3
Telescope_Temp	UINT32	Temperature of Telescope
Lens_Temp	UINT32	Temperature of Lens

Supplemant Data about Chopper

a) Data Object: SDS (4 Dimension Array)
b) Object Name: TIR_Supplement_Chopper
c) Format: Table 2.3.6-12 show the format and contents of Supplement Data about chopper images.

Table 2.3.6-12 Format of Supplement Data (Chopper)

Dimension Size	Variable Type
[n][100][10][8]*	UINT8

n: revised to accommodate a processing scene.

*: chopper image is stored as record [ ] line [ ] detector [ ] component.

Supplemant Data about Encoder

a) Data Object: SDS (2 Dimension Array)
b) Object Name: TIR_Supplement_Encoder
c) Format: Table 2.3.6-13 show the format and contents of Supplement Data about encoder data.

Table 2.3.6-13 Format of Supplement Data (Chopper)

Dimension Size	Variable Type
[n][935]	UINT16

n: revised to accommodate a processing scene.

2.3.6.9. TIR Browse Image

(1) Description

TIR Browse Image is compressed, using the standard features of the HDF libraries. Converting TIR data from 16-bits format into 8-bits format subject to HDF Raster Images. As Browse images are divided from Level 1A Data Product in "ASTER Level 1 Data Product Specification (science version, version 2.0)", these will be stored in another HDF file as a subset of Level 1A data products in next version.

(2) Characteristics (TBD)

a) Color Assignment: Current base line is as follows.

	B	G	R
Band No.	10	12	14

b) Sampling Method: average sampling
c) Sampling Rate: 1/3.5
c) Format: Table 2.3.6-14 shows the format

Table 2.3.6-14 Format of Browse Image

Object Name	Dimension Size	Data Model	Compression Method	Quality Factor
TIR_Browse	200 210	RIS24	JPEG	50