2.16 Visible/Infrared Imaging Radiometer Suite Moderate Resolution Band Sensor Data Records

Table 2.16-1, VIIRS Moderate Resolution Band (M-Band) summarizes the M-Band channels and their respective data mnemonics. The SDRs are available separately, but they are presented in this section grouped together in order to minimize the repeated information.

Table 2.16-1, VIIRS M-Band SDRs

Data Mnemonic	Description/Purpose
SDRE-VM01-C0030	Band M1 - radiance & reflectance at nominal center wavelength 412 nm.
SDRE-VM02-C0030	Band M2 – radiance & reflectance at nominal center wavelength 445 nm.
SDRE-VM03-C0030	Band M3 – radiance & reflectance at nominal center wavelength 488 nm.
SDRE-VM04-C0030	Band M4 – radiance & reflectance at nominal center wavelength 555 nm.
SDRE-VM05-C0030	Band M5 – radiance & reflectance at nominal center wavelength 672 nm.
SDRE-VM06-C0030	Band M6 – radiance & reflectance at nominal center wavelength 746 nm.
SDRE-VM07-C0030	Band M7 – radiance & reflectance at nominal center wavelength 865 nm.
SDRE-VM08-C0030	Band M8 – radiance & reflectance at nominal center wavelength 1240 nm.
SDRE-VM09-C0030	Band M9 – radiance & reflectance at nominal center wavelength 1378 nm.
SDRE-VM10-C0030	Band M10 – radiance & reflectance at nominal center wavelength 1610 nm.
SDRE-VM11-C0030	Band M11 – radiance & reflectance at nominal center wavelength 2250 nm.
SDRE-VM12-C0030	Band M12 – radiance & emittance at nominal center wavelength 3700 nm.
SDRE-VM13-C0030	Band M13 – radiance & emittance at nominal center wavelength 4050 nm.
SDRE-VM14-C0030	Band M14 – radiance & emittance at nominal center wavelength 8550 nm.
SDRE-VM15-C0030	Band M15 – radiance & emittance at nominal center wavelength 10763 nm.
SDRE-VM16-C0030	Band M16 – radiance & emittance at nominal center wavelength 12013 nm.

Data Mnemonic	See Table 2.16-1, VIIRS M-Band SDRs
Description/ Purpose	See Table 2.16-1, VIIRS M-Band SDRs The Visible/Infrared Imaging/Radiometer Suite (VIIRS) collects visible/infrared imagery and radiometric data. There are 16 detectors along-track in the M-Bands and 32 detectors along-track in the Imagery Resolution Bands (I-Band). *General Information on VIIRS SDRs* As the VIIRS telescope rotates across-track, every 1.7872 seconds,

	arrays of pixels are captured, creating a ~3000 km x ~12 km (across-track x along-track) image of the earth. Since VIIRS does not capture an entire earth image instantaneously, there is an inherent time delay in collecting a full set of pixels for each scan, and from scan to scan. From scan to scan, the delay is set such that the next scan is exactly one full field-of-regard, the detectors' horizontal along-track coverage, away from the previous scan. For instance the first row of detectors will be adjacent to the last row of detectors on the next scan. Although the output seen in the SDR is an array of data, for a number of reasons described below, the actual measurements from VIIRS are not perfectly contiguous within the array. Each geolocation data point should be used to accurately georeference the data, especially when viewing data from multiple scans. Since the rotation period is a specification which has a tolerance of +/- .45%, the actual rotation rate can vary. The actual value should be calculated from the scan times provided in the geolocation. The processing system of NPOESS is designed to allow for this specification tolerance. The processing software uses time rather than data size to define granules, and in order to never "overflow" the processing buffer size of one granule, the size of the internal granule is slightly smaller than the expected 85.7856 seconds (1.7872 seconds * 48 scans/second). This has the advantage of never allowing more scans than can fit in a granule, but has the disadvantage of generating scenarios where fewer than the nominal number of scans per granule can occur. Although this can happen for a number of other reasons, for a nominal granule containing 48 scans, on occasion there can be 47 scans due to the design to allow for tolerance in scan rates. The number of actual scans in the granule is stored in the granule metadata item N_Number_Of_Scans. Since granule array dimensions are fixed in size, the last scan in this 47 of 48 scan case will be filled with a "does not exist" type of fill value. The corresponding geolocation will also be filled since the values in the array are simply artifacts of the processing system. More information on fill values can be found in Volume I of the CDFCB-X, D34862-01, Section 3.5. For all nominal NPOESS orbits (afternoon Local Time of Ascending Node) the first detector produces the 16th scan line (or pixel row). When referring to the "bad detector" flag array, the first array element represents detector 1 (which for the M-Band is pixel row 16). Note: VIIRS auxiliary data, such as relative spectral response curves, reference the detector number and not scan line. While the geolocation angles included with VIIRS SDRs are with respect to the Geoid, the calibrated TOA reflectance is calculated using the terrain corrected solar zenith angle. Note that radiances are not corrected for out of band contributions.

<table>
<tr><td></td><td>

Moderate and Imagery Resolution Aggregation and Bow-tie Deletion

VIIRS fundamental spatial measurement unit is a *sample*, however *pixels* are reported in the SDR product. The projected size on the ground of samples gets larger at larger scan angles off nadir due to the increased distance from the sensor and the observed angle of incidence. Samples are created from pixels by averaging (aggregating) across-track which creates more horizontally uniform pixels. The samples with a scan angle within 32 degrees of nadir, have a smaller size when projected on the ground, and so are aggregated 3:1 in the scan (across-track) dimension. Those occurring at scan angles between ~32 degrees and ~45 degrees off nadir are aggregated 2:1 in the scan dimension. The samples at scan angles greater than ~45 degrees off nadir are not aggregated.

The aggregation of samples across the scan reduces the total number of samples; however, there is still a factor of two increase in the projected ground size of each pixel from nadir to maximum scan angle. This is referred to as the bow-tie effect (See Figure 2.16.1-1, VIIRS Bow-Tie Effect), as the projected scan track for all the pixels in one scan generally resembles a bow-tie. The additional pixel rows, in the two outside aggregation zones mentioned above, duplicate coverage from scan to scan, and are deleted. The deletion process impact for M-Band pixels is shown in Figure 2.16.1-2, VIIRS Bow-tie Deletion. This results in about half of the bow-tie overlapping pixels not being transmitted to ground. The values in the resulting product arrays are filled with the on-board pixel trim fill values during ground processing.

</td></tr>
<tr><td>File-Naming Construct</td><td>See the CDFCB-X Volume I, D34862-01, Section 3.0 for details.</td></tr>
<tr><td>File Size</td><td>

Bands	Size per data granule
M1,M2,M6,M8-12,M14-16	Approximately 12,000 KiB
M3-M5, M7	Approximately 16,800 KiB
M13	Approximately 21,600 KiB

Approximately: 79,200 KiB per geolocation granule
Sizes do not include HDF5 overhead or metadata.

</td></tr>
<tr><td>File Format Type</td><td>HDF5</td></tr>
</table>

Data Content and Data Format	See Section 2.16.1 VIIRS M-Band SDR Data Content Summary. See Section 2.16.5 VIIRS M-Band SDR Geolocation Content Summary.

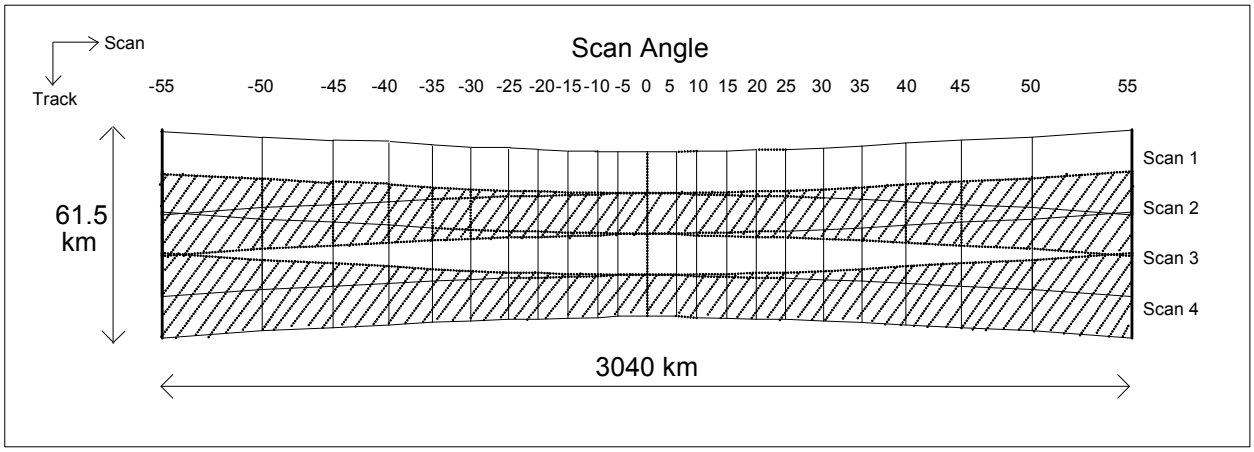

Figure 2.16.1-1, VIIRS Panoramic Bow-tie Effect (Afternoon Local Time of Ascending Node)

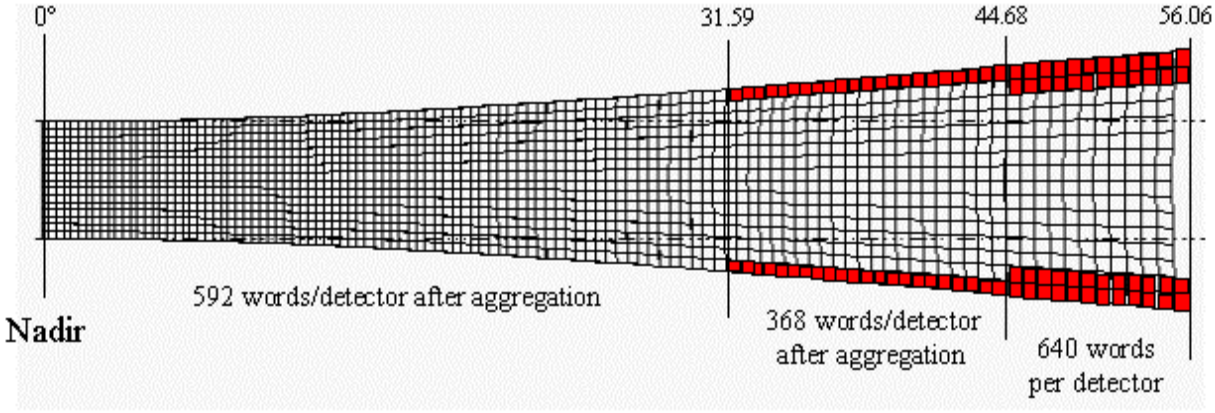

Figure 2.16.1-2, VIIRS Bow-tie Deletion

2.16.1 VIIRS M-Band SDR Data Content Summary

The VIIRS M-Band SDR data arrays structures are summarized below in Table 2.16.1-1, VIIRS M-Band SDR Data Content Summary.

Table 2.16.1-1, VIIRS M-Band SDRs Data Content Summary

Name	Description	Data Type	Bands	Aggregate Dimensions (N = Number of Granules)	Granule Dimensions	Units
Radiance	Calibrated Top of Atmosphere (TOA) Radiance for each VIIRS pixel	32-bit floating point	M3-M5, M7, M13	[N*768, 3200]	[768,3200]	W/(m^2 sr μm)
		unsigned 16-bit integer	M1, M2, M6, M8-M12, M14-M16			
Reflectance	Calibrated TOA Reflectance for each VIIRS pixel	unsigned 16-bit integer	M1 – M11	[N*768, 3200]	[768,3200]	unitless
BrightnessTemperature	Calibrated TOA Brightness Temperature for each VIIRS pixel	32-bit floating point	M13	[N*768, 3200]	[768,3200]	kelvin
		unsigned 16-bit integer	M12, M14 – M16			
ModeScan	The VIIRS operational mode, reported at the scan level.	unsigned 8-bit char	M1 – M16	[N*48]	[48]	unitless
ModeGran	The VIIRS operational mode, reported at the granule level.	unsigned 8-bit char	M1 – M16	[N]	[1]	unitless
PadByte1	Pad byte	unsigned 8-bit char	M1 – M16	[N*3]	[3]	unitless
NumberOfScans	Actual number of VIIRS scans that were used to create this granule.	32-bit integer	M1 – M16	[N]	[1]	unitless
NumberOfMissingPkts	Number of missing packets in scan	32-bit integer	M1 – M16	[N*48]	[48]	unitless
NumberOfBadChecksums	Number of packets with bad checksum in scan	32-bit integer	M1 – M16	[N*48]	[48]	unitless
NumberOfDiscardedPkts	Number of discarded packets in scan	32-bit integer	M1 – M16	[N*48]	[48]	unitless
QF1_VIIRSMBANDSDR	Quality Flag for each pixel	unsigned 8-bit char	M1 – M16	[N*768, 3200]	[768,3200]	unitless

Name	Description	Data Type	Bands	Aggregate Dimensions (N = Number of Granules)	Granule Dimensions	Units
QF2_SCAN_SDR	Quality Flag for each Scan (indicates general SDR information)	unsigned 8-bit char	M1 – M16	[N*48]	[48]	unitless
QF3_SCAN_RDR	Quality Flag for each Scan (indicates general RDR information)	unsigned 8-bit char	M1 – M16	[N*48]	[48]	unitless
QF4_SCAN_SDR	Reduced Quality Indication	unsigned 8-bit char	M1 – M16	[N*768]	[768]	unitless
QF5_GRAN_BADDETECTOR	Quality Flag – Bad detector	unsigned 8-bit char	M1 – M16	[N*16]	[16]	unitless
RadianceFactors	Radiance scale and offset: first array element = scale second array element = offset	32-bit floating point	M1, M2, M6, M8-M12, M14-M16	[N]	[2]	unitless, $W/(m^2\ sr\ \mu m)$
ReflectanceFactors	Reflectance scale and offset: first array element = scale second array element = offset	32-bit floating point	M1-M11	[N]	[2]	unitless, unitless
BrightnessTemperatureFactors	Brightness Temperature scale and offset: first array element = scale second array element = offset	32-bit floating point	M12, M14 – M16	[N]	[2]	unitless, kelvin

2.16.2 VIIRS M-Band SDR Data Product Profile

Table 2.16.2-1, VIIRS M-Band Radiances, Bands 1, 2, 6, 8-12, 14-16

Fields

Name	Data Size	Dimensions

Dimensions

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Calibrated Top of Atmosphere (TOA) Radiance for each VIIRS pixel	0			$W/(m^2\ \mu m\ sr)$	Yes	RadianceFactors	unsigned 16-bit integer		

Fill Values

Name	Value
NA_UINT16_FILL	65535
MISS_UINT16_FILL	65534
ONBOARD_PT_UINT16_FILL	65533
ONGROUND_PT_UINT16_FILL	65532
ERR_UINT16_FILL	65531
SOUB_UINT16_FILL	65528
VDNE_UINT16_FILL	65529

Legend Entries

Name	Value

Table 2.16.2-2, VIIRS M-Band Radiances, Bands 3-5, 7, 13

Fields

Name	Data Size	Dimensions

Radiance — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Calibrated Top of Atmosphere (TOA) Radiance for each VIIRS pixel	0			$W/(m^2\ \mu m\ sr)$	Yes		32-bit floating point	**Name**	**Value**	**Name**	**Value**
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ONBOARD_PT_FLOAT32_FILL	-999.7		
								ONGROUND_PT_FLOAT32_FILL	-999.6		
								ERR_FLOAT32_FILL	-999.5		
								VDNE_FLOAT32_FILL	-999.3		

Table 2.16.2-3, VIIRS M-Band Reflectance, Bands 1-11

Fields

Name	Data Size	Dimensions

Reflectance — 2byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Calibrated Top of Atmosphere (TOA) Reflectance for each VIIRS pixel	0			unitless	Yes	ReflectanceFactors	unsigned 16-bit integer		

Name	Value
NA_UINT16_FILL	65535
MISS_UINT16_FILL	65534
ONBOARD_PT_UINT16_FILL	65533
ONGROUND_PT_UINT16_FILL	65532
ERR_UINT16_FILL	65531
VDNE_UINT16_FILL	65529
SOUB_UINT16_FILL	65528

Name	Value

Table 2.16.2-4, VIIRS M-Band Brightness Temperature, Bands 12, 14 – 16

Fields

Name	Data Size	Dimensions

BrightnessTemperature — 2byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
								Name	**Value**	**Name**	**Value**
Calibrated Top of Atmosphere (TOA) Brightness Temperature for each VIIRS pixel	0			K	Yes	BrightnessTemperatureFactors	unsigned 16-bit integer	NA_UINT16_FILL	65535		
								MISS_UINT16_FILL	65534		
								ONBOARD_PT_UINT16_FILL	65533		
								ONGROUND_PT_UINT16_FILL	65532		
								ERR_UINT16_FILL	65531		
								VDNE_UINT16_FILL	65529		
								SOUB_UINT16_FILL	65528		

Table 2.16.2-5, VIIRS M-Band Brightness Temperature, Bands 13

Fields

Name	Data Size	Dimensions

BrightnessTemperature — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Calibrated Top of Atmosphere (TOA) Brightness Temperature for each VIIRS pixel	0			kelvin	No		32-bit floating point		

Fill Values — Name	Value
NA_FLOAT32_FILL	-999.9
MISS_FLOAT32_FILL	-999.8
ONBOARD_PT_FLOAT32_FILL	-999.7
ONGROUND_PT_FLOAT32_FILL	-999.6
ERR_FLOAT32_FILL	-999.5
VDNE_FLOAT32_FILL	-999.3

Legend Entries — Name	Value

Table 2.16.2-6, VIIRS M-Band Product Profile, Bands 1 - 16

Name	Data Size	Dimensions
ModeScan	1byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Scan / Yes / No / 48 / 48 **Datum** **Description**: The VIIRS operational mode, reported at the scan level **Datum Offset**: 0 **Unscaled Valid Range Min**: **Unscaled Valid Range Max**: **Measurement Units**: unitless **Scaled**: No **Scale Factor Name**: **Data Type**: unsigned 8-bit char **Fill Values**: MISS_UINT8_FILL = 254; ERR_UINT8_FILL = 251; VDNE_UINT8_FILL = 249 **Legend Entries**: Night = 0; Day = 1
ModeGran	1byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Granule / Yes / No / 1 / 1 **Datum** **Description**: The VIIRS operational mode, reported at the granule level **Datum Offset**: **Unscaled Valid Range Min**: **Unscaled Valid Range Max**: **Measurement Units**: unitless **Scaled**: No **Scale Factor Name**: **Data Type**: unsigned 8-bit char **Fill Values**: MISS_UINT8_FILL = 254; ERR_UINT8_FILL = 251; VDNE_UINT8_FILL = 249 **Legend Entries**: Night = 0; Day = 1; Mixed = 2
PadByte1	1byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Granule / Yes / No / 3 / 3 **Datum** **Description**: Pad byte **Datum Offset**: 0 **Unscaled Valid Range Min**: **Unscaled Valid Range Max**: **Measurement Units**: unitless **Scaled**: No **Scale Factor Name**: **Data Type**: unsigned 8-bit char **Fill Values**: **Legend Entries**:
NumberOfScans	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**

		Granule	Yes	No	1	1									
		Datum													
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**			
		Actual number of VIIRS scans that were used to create this granule	0			unitless	No		32-bit integer	**Name**	**Value**	**Name**	**Value**		
NumberOfMissingPkts	4byte(s)	**Name**	**Granule Boundary**	**Dynamic**	**Min Array Size**	**Max Array Size**									
		Scan	Yes	No	48	48									
		Datum													
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**			
		Number of missing packets in scan	0			unitless	No		32-bit integer	**Name**	**Value**	**Name**	**Value**		
										MISS_INT32_FILL	-998				
										VDNE_INT32_FILL	-993				
NumberOfBadChecksums	4byte(s)	**Name**	**Granule Boundary**	**Dynamic**	**Min Array Size**	**Max Array Size**									
		Scan	Yes	No	48	48									
		Datum													
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**			
		Number of packets with bad checksums in scan	0			unitless	No		32-bit integer	**Name**	**Value**	**Name**	**Value**		
										MISS_INT32_FILL	-998				
										VDNE_INT32_FILL	-993				
NumberOfDiscardedPkts	4byte(s)	**Name**	**Granule Boundary**	**Dynamic**	**Min Array Size**	**Max Array Size**									
		Scan	Yes	No	48	48									
		Datum													
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**			
		Number of	0			unitless	No		32-bit	**Name**	**Value**	**Name**	**Value**		

		discarded packets in scan							integer	MISS_INT32_FILL -998 VDNE_INT32_FILL -993	

Table 2.16.2-7, VIIRS M-Band SDR Product Profile - Quality Flags

Name	Data Size	Dimensions

QF1_VIIRSMBANDSDR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Quality - Indicates calibration quality due to bad space view offsets, OBC view offsets, etc or use of a previous calibration view	0			unitless	No		2 bit(s)	Name / Value	Name: Good — Value: 0 Name: Poor — Value: 1 Name: No Calibration — Value: 2
Saturated Pixel - Indicates the level of pixel saturation	2			unitless	No		2 bit(s)	Name / Value	Name: None Saturated — Value: 0 Name: Some Saturated — Value: 1 Name: All Saturated — Value: 2
Missing Data - Data required for calibration processing is not available for processing	4			unitless	No		2 bit(s)	Name / Value	Name: All data present — Value: 0 Name: EV RDR data missing — Value: 1 Name: Cal data (SV, CV, SD, etc.) missing — Value: 2 Name: Thermistor data missing — Value: 3
Out of Range - Calibrated pixel value outside of LUT	6			unitless	No		2 bit(s)	Name / Value	Name: All data within range — Value: 0 Name: Radiance out of range — Value: 1 Name: Reflectance or EBBT out of range — Value: 2

		threshold limits									Both Radiance and Reflectance or EBBT out of range	3

QF2_SCAN_SDR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
								Name	Value	Name	Value
Half Angle Mirror Side	0			unitless	No		1 bit(s)			A-Side	0
										B-Bide	1
The Moon has corrupted the space view	1			unitless	No		1 bit(s)	Name	Value	Name	Value
										False	0
										True	1
Spare	2			unitless	No		6 bit(s)	Name	Value	Name	Value

QF3_SCAN_RDR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Checksum failed for zone 1	0			unitless	No		1 bit(s)	Name	Value	Name	Value
										False	0
										True	1
Checksum failed for zone 2	1			unitless	No		1 bit(s)	Name	Value	Name	Value
										False	0
										True	1
Checksum failed for zone 3	2			unitless	No		1 bit(s)	Name	Value	Name	Value
										False	0
										True	1
Checksum failed for zone 4	3			unitless	No		1 bit(s)	Name	Value	Name	Value
										False	0

										True	1
		Checksum failed for zone 5	4			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0 True 1
		Checksum failed for zone 6	5			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0 True 1
		Scan data is not Present (No valid data)	6			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0 True 1
		Spare	7			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value**

QF4_SCAN_SDR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Quality for this scan-line is reduced. The value is determined by the combined number of steps required to find a replacement for thermistor or calibration source data.	0			unitless	No		unsigned 8-bit char	**Name** **Value**	**Name** **Value** False 0 True >1

QF5_GRAN_BADDETECTOR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Detector	Yes	No	16	16

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Bad Detector - M-Band	0			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0

											True	1
		Spare	1				No		7 bit(s)	**Name** **Value**	**Name**	**Value**

Table 2.16.2-8, VIIRS M-Band SDR Product Profile – Factors (as applicable)

Name	Data Size	Dimensions
RadianceFactors	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Factors / Yes / No / 2 / 2 **Datum**: **Description**: Scale = first array element; offset = second array element; **Datum Offset**: 0; **Unscaled Valid Range Min**; **Unscaled Valid Range Max**; **Measurement Units**: Scale = unitless; Offset = W/(m^2 sr μm); **Scaled**: No; **Scale Factor Name**; **Data Type**: 32-bit floating point; **Fill Values** (**Name** / **Value**); **Legend Entries** (**Name** / **Value**)
ReflectanceFactors	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Factors / Yes / No / 2 / 2 **Datum**: **Description**: Scale = first array element; offset = second array element; **Datum Offset**: 0; **Unscaled Valid Range Min**; **Unscaled Valid Range Max**; **Measurement Units**: unitless; **Scaled**: No; **Scale Factor Name**; **Data Type**: 32-bit floating point; **Fill Values** (**Name** / **Value**); **Legend Entries** (**Name** / **Value**)
BrightnessTemperatureFactors	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Factors / Yes / No / 2 / 2 **Datum**: **Description**: Scale = first array element; offset = second array element; **Datum Offset**: 0; **Unscaled Valid Range Min**; **Unscaled Valid Range Max**; **Measurement Units**: Scale = unitless, Offset = kelvin; **Scaled**: No; **Scale Factor Name**; **Data Type**: 32-bit floating point; **Fill Values** (**Name** / **Value**); **Legend Entries** (**Name** / **Value**)

2.16.3 VIIRS M-Band SDR HDF5 Details

VIIRS-M[1,2,6,8,9,10,11]-SDR
+Radiance : H5T_NATIVE_USHORT +Reflectance : H5T_NATIVE_USHORT +ModeScan : H5T_NATIVE_UCHAR +ModeGran : H5T_NATIVE_UCHAR +PadByte1 : H5T_NATIVE_UCHAR +NumberOfScans : H5T_NATIVE_INT +NumberOfMissingPkts : H5T_NATIVE_INT +NumberOfBadChecksums : H5T_NATIVE_INT +NumberOfDiscardedPkts : H5T_NATIVE_INT +QF1_VIIRSMBANDSDR : H5T_NATIVE_UCHAR +QF2_SCAN_SDR : H5T_NATIVE_UCHAR +QF3_SCAN_RDR : H5T_NATIVE_UCHAR +QF4_SCAN_SDR : H5T_NATIVE_UCHAR +QF5_GRAN_BADDETECTOR : H5T_NATIVE_UCHAR +RadianceFactors : H5T_NATIVE_FLOAT +ReflectanceFactors : H5T_NATIVE_FLOAT

Figure 2.16.3-1, VIIRS M-Band SDR UML Diagram for Bands 1, 2, 6, 8, 9, 10, 11

VIIRS-M[3,4,5,7]-SDR
+Radiance : H5T_NATIVE_FLOAT +Reflectance : H5T_NATIVE_USHORT +ModeScan : H5T_NATIVE_UCHAR +ModeGran : H5T_NATIVE_UCHAR +NumberOfScans : H5T_NATIVE_INT +PadByte1 : H5T_NATIVE_UCHAR +NumberOfMissingPkts : H5T_NATIVE_INT +NumberOfBadChecksums : H5T_NATIVE_INT +NumberOfDiscardedPkts : H5T_NATIVE_INT +QF1_VIIRSMBANDSDR : H5T_NATIVE_UCHAR +QF2_SCAN_SDR : H5T_NATIVE_UCHAR +QF3_SCAN_RDR : H5T_NATIVE_UCHAR +QF4_SCAN_SDR : H5T_NATIVE_UCHAR +QF5_GRAN_BADDETECTOR : H5T_NATIVE_UCHAR +ReflectanceFactors : H5T_NATIVE_FLOAT

Figure 2.16.3-2, VIIRS M-Band SDR UML Diagram for Bands 3, 4, 5, 7

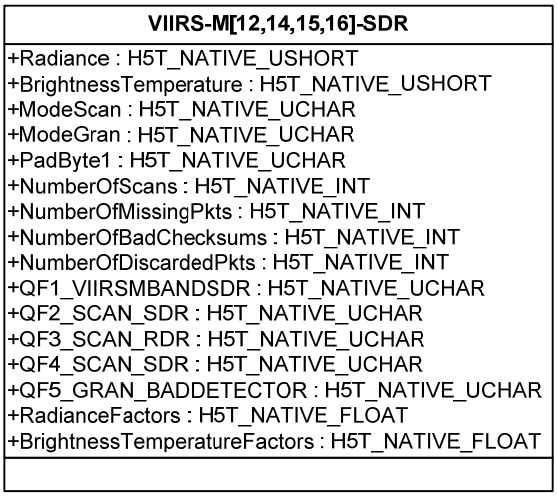

Figure 2.16.3-3, VIIRS M-Band SDR UML Diagram for Bands 12, 14, 15, 16

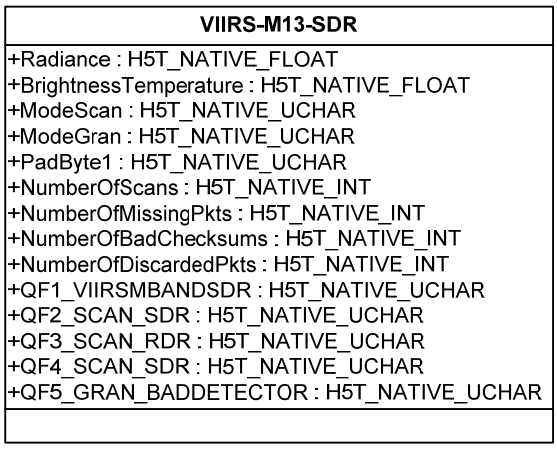

Figure 2.16.3-4, VIIRS M-Band SDR UML Diagram for Band 13

2.16.4 VIIRS M-Band SDR Metadata Details

The HDF5 metadata elements associated with the M-Band SDR are listed in the CDFCB-X Volume V, Section 4.3, HDF5 (Metadata) Hierarchy. The M-Band SDR metadata includes all common metadata at the root, product, aggregation, and granule level.

In addition to the common metadata items for the VIIRS Moderate Resolution SDR, the items listed in Table 2.16.4-1, VIIRS Moderate Resolution SDR Quality Summary Metadata are included as name/value pair items under the granule level metadata

attribute “N_Quality_Summary”. The listed name/value pair items in the table are the granule level quality summary flags for the VIIRS M-Band SDRs.

Note that there is a standard granule level metadata item that identifies the M-Band. This metadata item is the “Band_ID” and is set to “M1”, “M2”, “M3”, …”M16”.

Table 2.16.4-1, VIIRS Moderate Resolution SDR Quality Summary Metadata Values

N_Quality_Summary			
Name	**Value**	**Description**	**Comments**
Summary VIIRS SDR Quality	0 – 100 %	Percentage of good quality pixels in granule	
Scan Quality Exclusion	0 – 48	Number of scans in granule excluded from processing (including partial scans)	

2.16.5 VIIRS M-Band SDR Geolocation Content Summary

The VIIRS M-Band SDR geolocation data arrays structures are summarized below in Table 2.16.5-1, VIIRS M-Band SDR Geolocation Content Summary.

Table 2.16.5-1 VIIRS M-Band SDR Geolocation Content Summary

Name	Description	Data Type	Aggregate Dimensions	Granule Dimensions	Units
StartTime	Starting Time of each scan in IET (1/1/1958)	64-bit integer	[N*48]	[48]	microsecond
MidTime	Mid-Time of each scan in IET (1/1/1958)	64-bit integer	[N*48]	[48]	microsecond
Latitude	Latitude of each pixel (positive North)	32-bit floating point	[N*768, 3200]	[768, 3200]	degree
Longitude	Longitude of each pixel (positive East)	32-bit floating point	[N*768, 3200]	[768, 3200]	degree
SolarZenithAngle	Zenith angle of sun at each pixel position	32-bit floating point	[N*768, 3200]	[768, 3200]	degree

Name	Description	Data Type	Aggregate Dimensions	Granule Dimensions	Units
SolarAzimuthAngle	Azimuth angle of sun (measured clockwise positive from North) at each pixel position	32-bit floating point	[N*768, 3200]	[768, 3200]	degree
SatelliteZenithAngle	Zenith angle to Satellite at each pixel position	32-bit floating point	[N*768, 3200]	[768, 3200]	degree
SatelliteAzimuthAngle	Azimuth angle (measured clockwise positive from North) to Satellite at each pixel position	32-bit floating point	[N*768, 3200]	[768, 3200]	degree
Height	Ellipsoid-Geoid separation	32-bit floating point	[N*768, 3200]	[768, 3200]	meter
SatelliteRange	Line of sight distance from the ellipsoid intersection to the satellite	32-bit floating point	[N*768, 3200]	[768, 3200]	meter
SCPosition	Spacecraft position in ECR Coordinates (X, Y, Z) at the mid-time of scan	32-bit floating point	[N*48, 3]	[48, 3]	meter
SCVelocity	Spacecraft velocity in ECR Coordinates (dx/dt, dy/dt, dz/dt) at the mid-time of scan	32-bit floating point	[N*48, 3]	[48, 3]	m/s
SCAttitude	Spacecraft attitude with respect to Geodetic Reference Frame Coordinates (roll, pitch, yaw) at the midtime of scan	32-bit floating point	[N*48, 3]	[48, 3]	arcsecond

Name	Description	Data Type	Aggregate Dimensions	Granule Dimensions	Units
SCSolarZenithAngle	The angle from the normal vector of the Solar Diffuser surface (z-axis of the solar diffuser frame) to the solar vector	32-bit floating point	[N*48]	[48]	degree
SCSolarAzimuthAngle	The angle from the Solar Diffuser reference frame x-axis to the projection of the solar vector onto the solar diffuser surface (x-y plane), measured counterclockwise (observer looking toward the SD surface)	32-bit floating point	[N*48]	[48]	degree
ModeScan	The VIIRS operational mode, reported at the scan level.	unsigned 8-bit char	[N*48]	[48]	unitless
ModeGran	The VIIRS operational mode, reported at the granule level.	unsigned 8-bit char	[N]	[1]	unitless
PadByte1	Pad byte	unsigned 8-bit char	[N*3]	[3]	unitless
NumberOfScans	Actual number of VIIRS scans that were used to create this granule.	32-bit integer	[N]	[1]	unitless
QF1_SCAN_VIIRSSDRGEO	Scan-level quality flag	unsigned 8-bit char	[N*48]	[48]	unitless
QF2_VIIRSSDRGEO	Pixel-level quality flag	unsigned 8-bit char	[N*768, 3200]	[768,3200]	unitless

2.16.6 VIIRS M-Band SDR Geolocation Product Profile

Table 2.16.6-1, VIIRS M-Band SDR Geolocation Product Profile

<table>
<tr><th>Name</th><th>Data Size</th><th>Dimensions</th></tr>
<tr><td>StartTime</td><td>8byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Scan</td><td>Yes</td><td>No</td><td>48</td><td>48</td></tr>
</table>
Datum
<table>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>Starting Time of each scan in IET (1/1/1958)</td><td>0</td><td></td><td></td><td>microsecond</td><td>No</td><td></td><td>64-bit integer</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>NA_INT64_FILL</td><td>-999</td></tr>
<tr><td>MISS_INT64_FILL</td><td>-998</td></tr>
<tr><td>ERR_INT64_FILL</td><td>-995</td></tr>
<tr><td>VDNE_INT64_FILL</td><td>-993</td></tr>
<tr><td></td><td></td></tr>
</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>MidTime</td><td>8byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Scan</td><td>Yes</td><td>No</td><td>48</td><td>48</td></tr>
</table>
Datum
<table>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>Mid-Time of each scan in IET (1/1/1958)</td><td>0</td><td></td><td></td><td>microsecond</td><td>No</td><td></td><td>64-bit integer</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>NA_INT64_FILL</td><td>-999</td></tr>
<tr><td>MISS_INT64_FILL</td><td>-998</td></tr>
<tr><td>ERR_INT64_FILL</td><td>-995</td></tr>
<tr><td>VDNE_INT64_FILL</td><td>-993</td></tr>
<tr><td></td><td></td></tr>
</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>Latitude</td><td>4byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>AlongTrack</td><td>Yes</td><td>No</td><td>768</td><td>768</td></tr>
<tr><td>CrossTrack</td><td>No</td><td>No</td><td>3200</td><td>3200</td></tr>
</table>
Datum
<table>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
</table>
</td></tr>
</table>

		Latitude of each pixel (positive North)	0	-90	90	degree	No		32-bit floating point	**Name** / **Value**: NA_FLOAT32_FILL -999.9; MISS_FLOAT32_FILL -999.8; ERR_FLOAT32_FILL -999.5; ELINT_FLOAT32_FILL -999.4; VDNE_FLOAT32_FILL -999.3			
Longitude	4byte(s)												

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Longitude of each pixel (positive East)	0	-180	180	degree	No		32-bit floating point	**Name**	**Value**	**Name**	**Value**
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ERR_FLOAT32_FILL	-999.5		
								ELINT_FLOAT32_FILL	-999.4		
								VDNE_FLOAT32_FILL	-999.3		

SolarZenithAngle	4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Zenith angle of sun at each pixel position	0	0	180	degree	No		32-bit floating point	**Name**	**Value**	**Name**	**Value**
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ERR_FLOAT32_FILL	-999.5		
								ELINT_FLOAT32_FILL	-999.4		
								VDNE_FLOAT32_FILL	-999.3		

SolarAzimuthAngle	4byte(s)	Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size

		AlongTrack	Yes		No	768	768					
		CrossTrack	No		No	3200	3200					
		Datum										
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**
		Azimuth angle of sun (measured clockwise positive from North) at each pixel position	0	-180	180	degree	No		32-bit floating point	**Name**	**Value**	**Name** **Value**
										NA_FLOAT32_FILL	-999.9	
										MISS_FLOAT32_FILL	-999.8	
										ERR_FLOAT32_FILL	-999.5	
										ELINT_FLOAT32_FILL	-999.4	
										VDNE_FLOAT32_FILL	-999.3	
SatelliteZenithAngle	4byte(s)	**Name**	**Granule Boundary**		**Dynamic**	**Min Array Size**	**Max Array Size**					
		AlongTrack	Yes		No	768	768					
		CrossTrack	No		No	3200	3200					
		Datum										
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**
		Zenith angle to Satellite at each pixel position	0	0	~70	degree	No		32-bit floating point	**Name**	**Value**	**Name** **Value**
										NA_FLOAT32_FILL	-999.9	
										MISS_FLOAT32_FILL	-999.8	
										ERR_FLOAT32_FILL	-999.5	
										ELINT_FLOAT32_FILL	-999.4	
										VDNE_FLOAT32_FILL	-999.3	
SatelliteAzimuthAngle	4byte(s)	**Name**	**Granule Boundary**		**Dynamic**	**Min Array Size**	**Max Array Size**					
		AlongTrack	Yes		No	768	768					
		CrossTrack	No		No	3200	3200					
		Datum										
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**
		Azimuth angle	0	-180	180	degree	No		32-bit	**Name**	**Value**	**Name** **Value**

		(measured clockwise positive from North) to Satellite at each pixel position							floating point	NA_FLOAT32_FILL MISS_FLOAT32_FILL ERR_FLOAT32_FILL ELINT_FLOAT32_FILL VDNE_FLOAT32_FILL	-999.9 -999.8 -999.5 -999.4 -999.3

Height — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Ellipsoid-Geoid separation	0			meter	No		32-bit floating point	Name	Value	Name	Value
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ERR_FLOAT32_FILL	-999.5		
								ELINT_FLOAT32_FILL	-999.4		
								VDNE_FLOAT32_FILL	-999.3		

SatelliteRange — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Line of sight distance from the ellipsoid intersection to the satellite	0			meter	No		32-bit floating point	Name	Value	Name	Value
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ERR_FLOAT32_FILL	-999.5		
								ELINT_FLOAT32_FILL	-999.4		
								VDNE_FLOAT32_FILL	-999.3		

SCPosition — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

		ECRCoordinate | No | No | 3 | 3

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Spacecraft position in ECR Coordinates (X, Y, Z) at the mid-time of scan	0			meter	No		32-bit floating point	Name: Value NA_FLOAT32_FILL: -999.9 MISS_FLOAT32_FILL: -999.8 ERR_FLOAT32_FILL: -999.5 VDNE_FLOAT32_FILL: -999.3	Name: Value

SCVelocity	4byte(s)	Name | Granule Boundary | Dynamic | Min Array Size | Max Array Size
		Scan | Yes | No | 48 | 48
		ECRCoordinate | No | No | 3 | 3

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Spacecraft velocity in ECR Coordinates (dx/dt, dy/dt, dz/dt) at the mid-time of scan	0			m/s	No		32-bit floating point	Name: Value NA_FLOAT32_FILL: -999.9 MISS_FLOAT32_FILL: -999.8 ERR_FLOAT32_FILL: -999.5 VDNE_FLOAT32_FILL: -999.3	Name: Value

SCAttitude	4byte(s)	Name | Granule Boundary | Dynamic | Min Array Size | Max Array Size
		Scan | Yes | No | 48 | 48
		GRFCoordinate | No | No | 3 | 3

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Spacecraft attitude with respect to Geodetic	0			arcsecond	No		32-bit floating point	Name: Value NA_FLOAT32_FILL: -999.9 MISS_FLOAT32_FILL: -999.8	Name: Value

		Reference Frame Coordinates (roll, pitch, yaw) at the midtime of scan								ERR_FLOAT32_FILL -999.5 VDNE_FLOAT32_FILL -999.3	
SCSolarZenithAngle	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size** Scan / Yes / No / 48 / 48									
		Datum									
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**	**Legend Entries**
		The angle from the normal vector of the Solar Diffuser surface (z-axis of the solar diffuser frame) to the solar vector	0	0	180	degree	No		32-bit floating point	**Name** / **Value** NA_FLOAT32_FILL -999.9 MISS_FLOAT32_FILL -999.8 ERR_FLOAT32_FILL -999.5 VDNE_FLOAT32_FILL -999.3	**Name** / **Value**
SCSolarAzimuthAngle	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size** Scan / Yes / No / 48 / 48									
		Datum									
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**	**Legend Entries**
		The angle from the Solar Diffuser reference frame x-axis to the projection of the solar vector onto the solar diffuser surface (x-y plane), measured counterclockwise (observer looking toward the SD surface)	0	-180	180	degree	No		32-bit floating point	**Name** / **Value** NA_FLOAT32_FILL -999.9 MISS_FLOAT32_FILL -999.8 ERR_FLOAT32_FILL -999.5 VDNE_FLOAT32_FILL -999.3	**Name** / **Value**

ModeScan — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
The VIIRS operational mode, reported at the scan level	0			unitless	No		unsigned 8-bit char	Name	Value	Name	Value
								MISS_UINT8_FILL	254	Night	0
								ERR_UINT8_FILL	251	Day	1
								VDNE_UINT8_FILL	249		

ModeGran — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Granule	Yes	No	1	1

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
The VIIRS operational mode, reported at the granule level	0			unitless	No		unsigned 8-bit char	Name	Value	Name	Value
								MISS_UINT8_FILL	254	Night	0
								ERR_UINT8_FILL	251	Day	1
								VDNE_UINT8_FILL	249	Mixed	2

PadByte1 — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Granule	Yes	No	3	3

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Pad byte				unitless	No		unsigned 8-bit char	Name	Value	Name	Value

NumberOfScans — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Granule	Yes	No	1	1

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Actual number of VIIRS scans that were	0			unitless	No		32-bit integer	Name	Value	Name	Value

		used to create this granule									

Table 2.16.6-2, VIIRS M-Band Geolocation Product Profile - Quality Flags

Name	Data Size	Dimensions

QF1_SCAN_VIIRSSDRGEO — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Attitude and Ephemeris availability status	0			unitless	No		2 bit(s)	Name / Value	Name / Value: Nominal - E&A data available = 0; Missing Data <= Small Gap = 1; Small Gap < Missing Data < Granule Boundary = 2; Missing Data >= Granule Boundary = 3
HAM/RTA Encoder Flag - Indicates the quality of the HAM and RTA encoder timestamps	2			unitless	No		2 bit(s)	Name / Value	Name / Value: Good Data = 0; Bad Data – either HAM, RTA, or both are bad for the entire scan = 1; Degraded Data – either HAM, RTA, or both are corrupted within the scan. = 2; Missing Data – Missing = 3

											encoder data for the scan		
		Within South Atlantic Anomaly	4			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0 True 1		
		Solar Eclipse during Earth view scan	5			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0 True 1		
		Spare	6			unitless	No		2 bit(s)	**Name** **Value**	**Name** **Value**		

QF2_VIIRSSDRGEO — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	3200	3200

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Invalid Input Data (Indicates that any of the Spacecraft Ephemeris or Attitude Data is Invalid or the encoder data is invalid)	0			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0 True 1
Bad Pointing (Indicates that the sensor LOS does not intersect the geoid, is near the limb, has invalid sensor angles or other similar condition)	1			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0 True 1
Bad Terrain (Indicates that the algorithm could not obtain a valid terrain value)	2			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0 True 1
Invalid Solar Angles	3			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value** False 0 True 1
Spare	4			unitless	No		4 bit(s)	**Name** **Value**	**Name** **Value**

2.16.7 VIIRS M-Band SDR Geolocation HDF5 Details

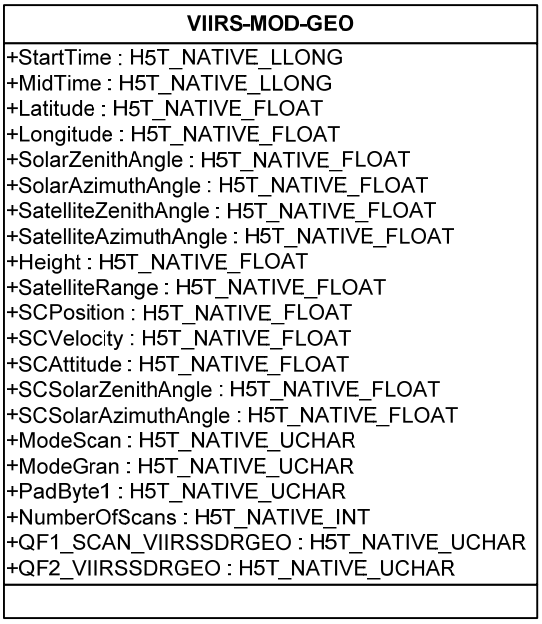

Figure 2.16.7-1, VIIRS M-Band SDR Geolocation UML Diagram

2.16.8 VIIRS M-Band SDR Geolocation Metadata Details

The HDF5 metadata elements associated with the M-Band SDR Geolocation are listed in the CDFCB-X Volume V, Section 4.3, HDF5 (Metadata) Hierarchy. The M-Band SDR geolocation metadata includes all common metadata at the root, product, aggregation, and granule level.

In addition to the common metadata items for the VIIRS Moderate Resolution SDR Geolocation, the items listed in Table 2.16.8-1, VIIRS Moderate Resolution SDR Geolocation Quality Summary Metadata are included as name/value pair items under the granule level metadata attribute “N_Quality_Summary”. The listed name/value pair items in the table are the granule level quality summary flags for the VIIRS M-Band SDR Geolocation.

Table 2.16.8-1, VIIRS M-Band SDR Geolocation Quality Summary Metadata

N_Quality_Summary			
Name	**Value**	**Description**	**Comments**
Percent Missing Data	0 – 100 %	Percentage of missing pixels (e.g., insufficient data for geolocation).	

N_Quality_Summary			
Name	**Value**	**Description**	**Comments**
Percent Out of Bounds	0 – 100 %	Percentage of out of bounds pixels. For example, pixels could not be geolocated.	
Automatic Quality Flag	0 – 1	Indicates if processing error has occurred.	0 = Passed 1 = Failed

2.17 VIIRS Imagery Resolution Band SDR

Table 2.17-1, VIIRS Imagery Resolution Band SDRs summarizes the image band channels and their respective data mnemonics. The SDRs are available separately, but they are presented in this section grouped together in order to minimize the repeated information.

Table 2.17-1, VIIRS Imagery Resolution Band SDRs

Data Mnemonic	Description/Purpose
SDRE-VI01-C0030	Band I1 –radiance & reflectance at nominal center wavelength 640 nm.
SDRE-VI02-C0030	Band I2 – radiance & reflectance at nominal center wavelength 865 nm.
SDRE-VI03-C0030	Band I3 – radiance & reflectance at nominal center wavelength 1610 nm.
SDRE-VI04-C0030	Band I4 – radiance & emittance at nominal center wavelength 3740 nm.
SDRE-VI05-C0030	Band I5 – radiance & emittance at nominal center wavelength 11450 nm.

Data Mnemonic	See Table 2.17-1, VIIRS Imagery Resolution Band SDRs
Description/ Purpose	See Table 2.17-1, VIIRS Imagery Resolution Band SDRs The Visible/Infrared Imager/Radiometer Suite (VIIRS) collects visible/infrared imagery and radiometric data. The five image bands are described in this section. The Imagery Resolution Bands (I-Band) are composed of five separate bands with 32 along-track detectors per band. See Section 2.16, VIIRS M-Band SDRs for general information about VIIRS Moderate and Imagery Resolution Band SDRs.
File-Naming Construct	See the CDFCB-X Volume I, D34862-01, Section 3.0 for details.
File Size	Approximately 48,000 KiB per data granule. Approximately 316,800 KiB per geolocation granule. Sizes do not include HDF5 overhead or metadata.
File Format Type	HDF5
Data Content and Data Format	See Section 2.17.1, VIIRS I-Band SDR Data See Section 2.17.5 , VIIRS I-Band SDR Geolocation

2.17.1 VIIRS I-Band SDR Data Content Summary

The VIIRS I-Band SDR data arrays structures are summarized below in Table 2.17.1-1,

VIIRS I-Band SDR Data Content Summary.

Table 2.17.1-1, VIIRS I-Band SDR Data Content Summary

Name	Description	Data Type	Bands	Aggregate Dimensions (N = Number of Granules)	Granule Dimensions	Units
Radiance	Calibrated Top of Atmosphere (TOA) Radiance for each VIIRS pixel	unsigned 16-bit integer	I1-I5	[N*1536, 6400]	[1536, 6400]	$W/(m^2$ sr $\mu m)$
Reflectance	Calibrated Top of Atmosphere (TOA) Reflectance for each VIIRS pixel	unsigned 16-bit integer	I1-I3	[N*1536, 6400]	[1536, 6400]	unitless
BrightnessTemperature	Calibrated Top of Atmosphere (TOA) Brightness Temperature for each VIIRS pixel	unsigned 16-bit integer	I4, I5	[N*1536, 6400]	[1536, 6400]	K
ModeScan	The VIIRS operational mode, reported at the scan level	unsigned 8-bit char	I1-I5	[N*48]	[48]	unitless
ModeGran	The VIIRS operational mode, reported at the granule level	unsigned 8-bit char	I1-I5	[N]	[1]	unitless
PadByte1	Pad byte	unsigned 8-bit char	I1-I5	[N*3]	[3]	unitless
NumberOfScans	Actual number of VIIRS scans that were used to create this granule	32-bit integer	I1-I5	[N]	[1]	unitless
NumberOfMissingPkts	Number of missing packets in scan	32-bit integer	I1-I5	[N*48]	[48]	unitless
NumberOfBadChecksums	Number of packets with bad checksum in scan	32-bit integer	I1-I5	[N*48]	[48]	unitless
NumberOfDiscardedPkts	Number of discarded packets in scan	32-bit integer	I1-I5	[N*48]	[48]	unitless
QF1_VIIRSIBANDSDR	Quality Flag for each pixel	unsigned 8-bit char	I1-I5	[N*1536, 6400]	[1536, 6400]	unitless

Name	Description	Data Type	Bands	Aggregate Dimensions (N = Number of Granules)	Granule Dimensions	Units
QF2_SCAN_SDR	Quality Flag for each Scan (indicates general SDR information)	unsigned 8-bit char	I1-I5	[N*48]	[48]	unitless
QF3_SCAN_RDR	Quality Flag for each Scan (indicates general RDR information)	unsigned 8-bit char	I1-I5	[N*48]	[48]	unitless
QF4_SCAN_SDR	Reduced Quality Indicator	unsigned 8-bit char	I1-I5	[N*1536]	[1536]	unitless
QF5_GRAN_BADDETECTOR	Quality Flag – Bad detector	unsigned 8-bit char	I1-I5	[N*32]	[32]	unitless
RadianceFactors	Radiance scale and offset: 1st array element = scale 2nd array element = offset	32-bit floating point	I1-I5	[N*2]	[2]	unitless, $W/(m^2\ sr\ \mu m)$
ReflectanceFactors	Reflectance scale and offset: 1st array element = scale 2nd array element = offset	32-bit floating point	I1-I3	[N*2]	[2]	unitless, unitless
BrightnessTemperatureFactors	Brightness Temperature scale and offset: 1st array element = scale 2nd array element = offset	32-bit floating point	I4, I5	[N*2]	[2]	unitless, kelvin

2.17.2 VIIRS I-Band SDR Data Product Profile

Table 2.17.2-1, VIIRS I-Band SDR Product Profile - Radiance

Name	Data Size	Dimensions

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	1536	1536
CrossTrack	No	No	6400	6400

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Calibrated Top of Atmosphere (TOA) Radiance for each VIIRS pixel	0			$W/(m^2\ sr\ \mu m)$	Yes	RadianceFactors	unsigned 16-bit integer	**Name**	**Value**	**Name**	**Value**
								NA_UINT16_FILL	65535		
								MISS_UINT16_FILL	65534		
								ONBOARD_PT_UINT16_FILL	65533		
								ONGROUND_PT_UINT16_FILL	65532		
								ERR_UINT16_FILL	65531		
								VDNE_UINT16_FILL	65529		
								SOUB_UINT16_FILL	65528		

Table 2.17.2.1- 2, VIIRS I-Band SDR Product Profile - Reflectance, Bands 1, 2, 3

Name	Data Size	Dimensions

Dimensions

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	1536	1536
CrossTrack	No	No	6400	6400

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Calibrated Top of Atmosphere (TOA) Reflectance for each VIIRS pixel	0			unitless	Yes	ReflectanceFactors	unsigned 16-bit integer		

Fill Values

Name	Value
NA_UINT16_FILL	65535
MISS_UINT16_FILL	65534
ONBOARD_PT_UINT16_FILL	65533
ONGROUND_PT_UINT16_FILL	65532
ERR_UINT16_FILL	65531
VDNE_UINT16_FILL	65529
SOUB_UINT16_FILL	65528

Legend Entries

Name	Value

Table 2.17.2-3, VIIRS I-Band SDR Product Profile - Brightness Temperature, Bands 4, 5

Name: BrightnessTemperature

Data Size: 2byte(s)

Dimensions

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	1536	1536
CrossTrack	No	No	6400	6400

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Calibrated Top of Atmosphere (TOA) Brightness Temperature for each VIIRS pixel	0			kelvin	Yes	BrightnessTemperatureFactors	unsigned 16-bit integer	Name	Value	Name	Value
								NA_UINT16_FILL	65535		
								MISS_UINT16_FILL	65534		
								ONBOARD_PT_UINT16_FILL	65533		
								ONGROUND_PT_UINT16_FILL	65532		
								ERR_UINT16_FILL	65531		
								VDNE_UINT16_FILL	65529		
								SOUB_UINT16_FILL	65528		

Table 2.17.2- 4, VIIRS I-Band SDR Product Profile, Bands 1 - 5

Name	Data Size	Dimensions
ModeScan	1byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Scan / Yes / No / 48 / 48 **Datum**: **Description**: The VIIRS operational mode, reported at the scan level; **Datum Offset**: 0; **Unscaled Valid Range Min**; **Unscaled Valid Range Max**; **Measurement Units**: unitless; **Scaled**: No; **Scale Factor Name**; **Data Type**: unsigned 8-bit char **Fill Values**: MISS_UINT8_FILL = 254; ERR_UINT8_FILL = 251; VDNE_UINT8_FILL = 249 **Legend Entries**: Night = 0; Day = 1
ModeGran	1byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Granule / Yes / No / 1 / 1 **Datum**: **Description**: The VIIRS operational mode, reported at the granule level; **Datum Offset**: 0; **Unscaled Valid Range Min**; **Unscaled Valid Range Max**; **Measurement Units**: unitless; **Scaled**: No; **Scale Factor Name**; **Data Type**: unsigned 8-bit char **Fill Values**: MISS_UINT8_FILL = 254; ERR_UINT8_FILL = 251; VDNE_UINT8_FILL = 249 **Legend Entries**: Night = 0; Day = 1; Mixed = 2
PadByte1	1byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Granule / Yes / No / 3 / 3 **Datum**: **Description**: Pad byte; **Datum Offset**: 0; **Unscaled Valid Range Min**; **Unscaled Valid Range Max**; **Measurement Units**: unitless; **Scaled**: No; **Scale Factor Name**; **Data Type**: unsigned 8-bit char **Fill Values**; **Legend Entries**
NumberOfScans	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**

(continued)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Granule	Yes	No	1	1

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values (Name / Value)	Legend Entries (Name / Value)
Actual number of VIIRS scans that were used to create this granule	0			unitless	No		32-bit integer	Name / Value	Name / Value

NumberOfMissingPkts — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Number of missing packets in scan	0			unitless	No		32-bit integer	Name / Value: MISS_INT32_FILL / -998 VDNE_INT32_FILL / -993	Name / Value

NumberOfBadChecksums — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Number of packets with bad checksums in scan	0			unitless	No		32-bit integer	Name / Value: MISS_INT32_FILL / -998 VDNE_INT32_FILL / -993	Name / Value

NumberOfDiscardedPkts — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Number of	0			unitless	No		32-bit	Name / Value	Name / Value

		discarded packets in scan							integer	MISS_INT32_FILL -998 VDNE_INT32_FILL -993	

Table 2.17.2-5, VIIRS I-Band SDR Product Profile - Quality Flags

Name	Data Size	Dimensions

QF1_VIIRSIBANDSDR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	1536	1536
CrossTrack	No	No	6400	6400

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values (Name / Value)	Legend Entries (Name / Value)
SDR Quality - Indicates calibration quality due to bad space view offsets, OBC view offsets, etc or use of a previous calibration view	0			unitless	No		2 bit(s)		Good 0 Poor 1 No Calibration 2
Saturated Pixel - Indicates the level of pixel saturation	2			unitless	No		2 bit(s)		None Saturated 0 Some Saturated 1 All Saturated 2
Missing Data - Data required for calibration processing is not available for processing	4			unitless	No		2 bit(s)		All data present 0 EV RDR data missing 1 Cal data (SV, CV, SD, etc.) missing 2 Thermistor data missing 3
Out of Range - Calibrated pixel value outside of LUT threshold	6			unitless	No		2 bit(s)		All data within range 0

		limits									Radiance out of range	1
											Reflectance or EBBT out of range	2
											Both Radiance and Reflectance or EBBT out of range	3

QF2_SCAN_SDR	1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
								Name	Value	Name	Value
Half Angle Mirror Side	0			unitless	No		1 bit(s)			A-Side	0
										B-Bide	1
The Moon has corrupted the space view	1			unitless	No		1 bit(s)	Name	Value	Name	Value
										False	0
										True	1
Spare	2			unitless	No		6 bit(s)	Name	Value	Name	Value

QF3_SCAN_RDR	1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Checksum failed for zone 1	0			unitless	No		1 bit(s)	Name	Value	Name	Value
										False	0
										True	1
Checksum failed for zone 2	1			unitless	No		1 bit(s)	Name	Value	Name	Value
										False	0
										True	1
Checksum failed for zone	2			unitless	No		1 bit(s)	Name	Value	Name	Value

		3									False 0 True 1
		Checksum failed for zone 4	3			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
		Checksum failed for zone 5	4			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
		Checksum failed for zone 6	5			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
		Scan data is not Present (No valid data)	6			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
		Spare	7			unitless	No		1 bit(s)	Name Value	Name Value

QF4_SCAN_SDR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	1536	1536

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Quality for this scan-line is reduced. The value is determined by the combined number of steps required to find a replacement for thermistor or calibration source data	0			unitless	No		unsigned 8-bit char	Name Value	Name Value False 0 True >1

QF5_GRAN_BADDETECTOR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Detector	Yes	No	32	32

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Bad Detector	0			unitless	No		1 bit(s)	Name Value	Name Value

											False	0
											True	1
		Spare	1			unitless	No		7 bit(s)	**Name** **Value**	**Name**	**Value**

Table 2.17.2- 6, VIIRS I-Band SDR Product Profile - Factors, as applicable

Name	Data Size	Dimensions
RadianceFactors	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Factors / Yes / No / 2 / 2 **Datum**: **Description**: Scale = first array element; offset = second array element; **Datum Offset**: 0; **Unscaled Valid Range Min**: ; **Unscaled Valid Range Max**: ; **Measurement Units**: Scale = unitless; Offset = W/(m^2 sr μm); **Scaled**: No; **Scale Factor Name**: ; **Data Type**: 32-bit floating point; **Fill Values** (**Name** / **Value**): ; **Legend Entries** (**Name** / **Value**):
ReflectanceFactors	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Factors / Yes / No / 2 / 2 **Datum**: **Description**: Scale = first array element; offset = second array element; **Datum Offset**: 0; **Unscaled Valid Range Min**: ; **Unscaled Valid Range Max**: ; **Measurement Units**: unitless; **Scaled**: No; **Scale Factor Name**: ; **Data Type**: 32-bit floating point; **Fill Values** (**Name** / **Value**): ; **Legend Entries** (**Name** / **Value**):
BrightnessTemperatureFactors	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Factors / Yes / No / 2 / 2 **Datum**: **Description**: Scale = first array element; offset = second array element; **Datum Offset**: 0; **Unscaled Valid Range Min**: ; **Unscaled Valid Range Max**: ; **Measurement Units**: Scale = unitless; Offset = K; **Scaled**: No; **Scale Factor Name**: ; **Data Type**: 32-bit floating point; **Fill Values** (**Name** / **Value**): ; **Legend Entries** (**Name** / **Value**):

2.17.3 VIIRS I-Band SDR HDF5 Details

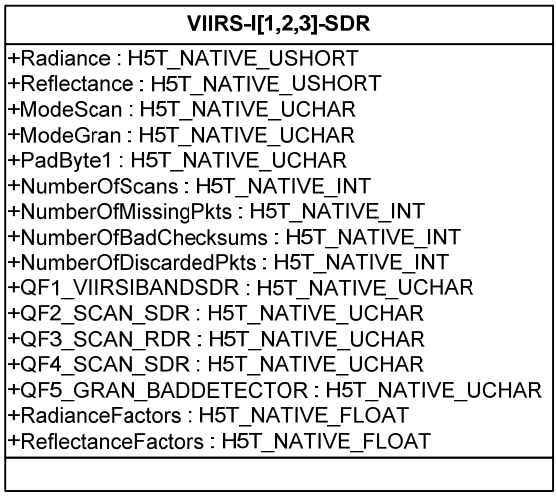

Figure 2.17.3-1, VIIRS I-Band SDR UML Diagram for Bands 1, 2, 3

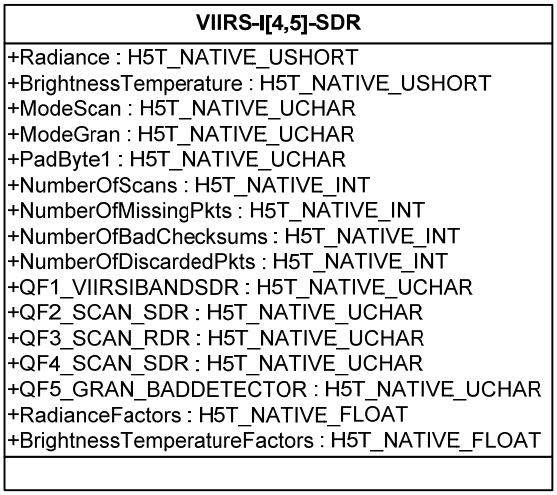

Figure 2.17.3-2, VIIRS I-Band SDR UML Diagram for Bands 4, 5

2.17.4 VIIRS I-Band SDR Metadata Details

The HDF5 metadata elements associated with the I-Band SDRs are listed in the CDFCB-X Volume V, Section 4.3, HDF5 (Metadata) Hierarchy. The I-Band SDR metadata includes all common metadata at the root, product, aggregation, and granule level.

In addition to the common metadata items for the VIIRS Imagery Resolution SDR, the items listed in Table 2.16.4-1, VIIRS Imagery Resolution SDR Quality Summary

Metadata are included as name/value pair items under the granule level metadata attribute “N_Quality_Summary”. The listed name/value pair items in the table are the granule level quality summary flags for the VIIRS I-Band SDRs.

Note that there is a standard granule level metadata item that identifies the Imagery Band. This metadata item is the “Band_ID” and is set to “I1”, “I2”, “I3”, …”I5”.

Table 2.17.4-1, VIIRS Imagery Resolution SDR Quality Summary Metadata Values

N_Quality_Summary			
Name	**Value**	**Description**	**Comments**
Summary VIIRS SDR Quality	0 – 100 %	Percentage of good quality pixels in granule	
Scan Quality Exclusion	0 – 48	Number of scans in granule excluded from processing (including partial scans)	

2.17.5 VIIRS I-Band SDR Geolocation Content Summary

The VIIRS I-Band SDR Geolocation arrays structures are summarized below in Table 2.17.5-1, VIIRS I-Band SDR Geolocation Content Summary.

Table 2.17.5-1, VIIRS I-Band SDR Geolocation Content Summary

Name	Description	Data Type	Aggregate Dimensions	Granule Dimensions	Units
StartTime	Starting Time of each scan in IET (1/1/1958)	64-bit integer	[N*48]	[48]	microsecond
MidTime	Mid-Time of each scan in IET (1/1/1958)	64-bit integer	[N*48]	[48]	microsecond
Latitude	Latitude of each pixel (positive North)	32-bit floating point	[N*1536, 6400]	[1536, 6400]	degree
Longitude	Longitude of each pixel (positive East)	32-bit floating point	[N*1536, 6400]	[1536, 6400]	degree
SolarZenithAngle	Zenith angle of sun at each pixel position	32-bit floating point	[N*1536, 6400]	[1536, 6400]	degree

Name	Description	Data Type	Aggregate Dimensions	Granule Dimensions	Units
SolarAzimuthAngle	Azimuth angle of sun (measured clockwise positive from North) at each pixel position	32-bit floating point	[N*1536, 6400]	[1536, 6400]	degree
SatelliteZenithAngle	Zenith angle to Satellite at each pixel position	32-bit floating point	[N*1536, 6400]	[1536, 6400]	degree
SatelliteAzimuthAngle	Azimuth angle (measured clockwise positive from North) to Satellite at each pixel position	32-bit floating point	[N*1536, 6400]	[1536, 6400]	degree
Height	Ellipsoid-Geoid separation	32-bit floating point	[N*1536, 6400]	[1536, 6400]	meter
SatelliteRange	Line of sight distance from the ellipsoid intersection to the satellite	32-bit floating point	[N*1536, 6400]	[1536, 6400]	meter
SCPosition	Spacecraft position in ECR Coordinates (X, Y, Z) at the mid-time of scan	32-bit floating point	[N*48, 3]	[48, 3]	meter
SCVelocity	Spacecraft velocity in ECR Coordinates (dx/dt, dy/dt, dz/dt) at the mid-time of scan	32-bit floating point	[N*48, 3]	[48, 3]	m/s
SCAttitude	Spacecraft attitude with respect to Geodetic Reference Frame Coordinates (roll, pitch, yaw) at the mid-time of scan	32-bit floating point	[N*48, 3]	[48, 3]	arcsecond

Name	Description	Data Type	Aggregate Dimensions	Granule Dimensions	Units
SCSolarZenithAngle	The angle from the normal vector of the Solar Diffuser surface (z-axis of the solar diffuser frame) to the solar vector	32-bit floating point	[N*48]	[48]	degree
SCSolarAzimuthAngle	The angle from the Solar Diffuser reference frame x-axis to the projection of the solar vector onto the solar diffuser surface (x-y plane), measured counterclockwise (observer looking toward the SD surface)	32-bit floating point	[N*48]	[48]	degree
ModeScan	The VIIRS operational mode, reported at the scan level	unsigned 8-bit char	[N*48]	[48]	unitless
ModeGran	The VIIRS operational mode, reported at the granule level	unsigned 8-bit char	[N]	[1]	unitless
PadByte1	Pad byte	unsigned 8-bit char	[N*3]	[3]	unitless
NumberOfScans	Actual number of VIIRS scans that were used to create this granule	32-bit integer	[N]	[1]	unitless
QF1_SCAN_VIIRSSDRGEO	Scan-level quality flag	unsigned 8-bit char	[N*48]	[48]	unitless
QF2_VIIRSSDRGEO	Pixel-level quality flag	unsigned 8-bit char	[N*1536, 6400]	[1536,6400]	unitless

2.17.6 VIIRS I-Band SDR Geolocation Product Profile

Table 2.17.6-1, VIIRS I-Band SDR Geolocation Product Profile

<table>
<tr><th>Name</th><th>Data Size</th><th>Dimensions</th></tr>
<tr><td>StartTime</td><td>8byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Scan</td><td>Yes</td><td>No</td><td>48</td><td>48</td></tr>
</table>
Datum
<table>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>Starting Time of each scan in IET (1/1/1958)</td><td>0</td><td></td><td></td><td>microsecond</td><td>No</td><td></td><td>64-bit integer</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>NA_INT64_FILL</td><td>-999</td></tr>
<tr><td>MISS_INT64_FILL</td><td>-998</td></tr>
<tr><td>ERR_INT64_FILL</td><td>-995</td></tr>
<tr><td>VDNE_INT64_FILL</td><td>-993</td></tr>
<tr><td></td><td></td></tr>
</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>MidTime</td><td>8byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Scan</td><td>Yes</td><td>No</td><td>48</td><td>48</td></tr>
</table>
Datum
<table>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>Mid-Time of each scan in IET (1/1/1958)</td><td>0</td><td></td><td></td><td>microsecond</td><td>No</td><td></td><td>64-bit integer</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>NA_INT64_FILL</td><td>-999</td></tr>
<tr><td>MISS_INT64_FILL</td><td>-998</td></tr>
<tr><td>ERR_INT64_FILL</td><td>-995</td></tr>
<tr><td>VDNE_INT64_FILL</td><td>-993</td></tr>
<tr><td></td><td></td></tr>
</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>Latitude</td><td>4byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>AlongTrack</td><td>Yes</td><td>No</td><td>1536</td><td>1536</td></tr>
<tr><td>CrossTrack</td><td>No</td><td>No</td><td>6400</td><td>6400</td></tr>
</table>
Datum
<table>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
</table>
</td></tr>
</table>

		Latitude of each pixel (positive North)	0	-90	90	degree	No		32-bit floating point	**Name** / **Value**: NA_FLOAT32_FILL -999.9; MISS_FLOAT32_FILL -999.8; ERR_FLOAT32_FILL -999.5; ELINT_FLOAT32_FILL -999.4; VDNE_FLOAT32_FILL -999.3			
Longitude	4byte(s)	**Name**	**Granule Boundary**		**Dynamic**	**Min Array Size**		**Max Array Size**					
		AlongTrack	Yes		No	1536		1536					
		CrossTrack	No		No	6400		6400					
		Datum											
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**	
		Longitude of each pixel (positive East)	0	-180	180	degree	No		32-bit floating point	**Name** / **Value**: NA_FLOAT32_FILL -999.9; MISS_FLOAT32_FILL -999.8; ERR_FLOAT32_FILL -999.5; ELINT_FLOAT32_FILL -999.4; VDNE_FLOAT32_FILL -999.3		**Name** / **Value**	
SolarZenithAngle	4byte(s)	**Name**	**Granule Boundary**		**Dynamic**	**Min Array Size**		**Max Array Size**					
		AlongTrack	Yes		No	1536		1536					
		CrossTrack	No		No	6400		6400					
		Datum											
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**	
		Zenith angle of sun at each pixel position	0	0	180	degree	No		32-bit floating point	**Name** / **Value**: NA_FLOAT32_FILL -999.9; MISS_FLOAT32_FILL -999.8; ERR_FLOAT32_FILL -999.5; ELINT_FLOAT32_FILL -999.4; VDNE_FLOAT32_FILL -999.3		**Name** / **Value**	
SolarAzimuthAngle	4byte(s)	**Name**	**Granule Boundary**		**Dynamic**	**Min Array Size**		**Max Array Size**					

		AlongTrack: Granule Boundary = Yes; Dynamic = No; Min Array Size = 1536; Max Array Size = 1536 CrossTrack: Granule Boundary = No; Dynamic = No; Min Array Size = 6400; Max Array Size = 6400 **Datum** **Description**: Azimuth angle of sun (measured clockwise positive from North) at each pixel position Datum Offset: 0 Unscaled Valid Range Min: -180 Unscaled Valid Range Max: 180 Measurement Units: degree Scaled: No Scale Factor Name: Data Type: 32-bit floating point Fill Values: NA_FLOAT32_FILL = -999.9; MISS_FLOAT32_FILL = -999.8; ERR_FLOAT32_FILL = -999.5; ELINT_FLOAT32_FILL = -999.4; VDNE_FLOAT32_FILL = -999.3 Legend Entries:
SatelliteZenithAngle	4byte(s)	AlongTrack: Granule Boundary = Yes; Dynamic = No; Min Array Size = 1536; Max Array Size = 1536 CrossTrack: Granule Boundary = No; Dynamic = No; Min Array Size = 6400; Max Array Size = 6400 **Datum** **Description**: Zenith angle to Satellite at each pixel position Datum Offset: 0 Unscaled Valid Range Min: 0 Unscaled Valid Range Max: ~70 Measurement Units: degree Scaled: No Scale Factor Name: Data Type: 32-bit floating point Fill Values: NA_FLOAT32_FILL = -999.9; MISS_FLOAT32_FILL = -999.8; ERR_FLOAT32_FILL = -999.5; ELINT_FLOAT32_FILL = -999.4; VDNE_FLOAT32_FILL = -999.3 Legend Entries:
SatelliteAzimuthAngle	4byte(s)	AlongTrack: Granule Boundary = Yes; Dynamic = No; Min Array Size = 1536; Max Array Size = 1536 CrossTrack: Granule Boundary = No; Dynamic = No; Min Array Size = 6400; Max Array Size = 6400 **Datum** **Description**: Azimuth angle Datum Offset: 0 Unscaled Valid Range Min: -180 Unscaled Valid Range Max: 180 Measurement Units: degree Scaled: No Scale Factor Name: Data Type: 32-bit Fill Values: Legend Entries:

		(measured clockwise positive from North) to Satellite at each pixel position							floating point	NA_FLOAT32_FILL MISS_FLOAT32_FILL ERR_FLOAT32_FILL ELINT_FLOAT32_FILL VDNE_FLOAT32_FILL	-999.9 -999.8 -999.5 -999.4 -999.3

Height — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	1536	1536
CrossTrack	No	No	6400	6400

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Ellipsoid-Geoid separation	0			meter	No		32-bit floating point	Name	Value	Name	Value
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ERR_FLOAT32_FILL	-999.5		
								ELINT_FLOAT32_FILL	-999.4		
								VDNE_FLOAT32_FILL	-999.3		

SatelliteRange — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	1536	1536
CrossTrack	No	No	6400	6400

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Line of sight distance from the ellipsoid intersection to the satellite	0			meter	No		32-bit floating point	Name	Value	Name	Value
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ERR_FLOAT32_FILL	-999.5		
								ELINT_FLOAT32_FILL	-999.4		
								VDNE_FLOAT32_FILL	-999.3		

SCPosition — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

		ECRCoordinate: Granule Boundary = No; Dynamic = No; Min Array Size = 3; Max Array Size = 3
SCVelocity	4byte(s)	Scan: Granule Boundary = Yes; Dynamic = No; Min Array Size = 48; Max Array Size = 48 ECRCoordinate: Granule Boundary = No; Dynamic = No; Min Array Size = 3; Max Array Size = 3
SCAttitude	4byte(s)	Scan: Granule Boundary = Yes; Dynamic = No; Min Array Size = 48; Max Array Size = 48 GRFCoordinate: Granule Boundary = No; Dynamic = No; Min Array Size = 3; Max Array Size = 3

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Spacecraft position in ECR Coordinates (X, Y, Z) at the mid-time of scan	0			meter	No		32-bit floating point	Name: Value NA_FLOAT32_FILL: -999.9 MISS_FLOAT32_FILL: -999.8 ERR_FLOAT32_FILL: -999.5 VDNE_FLOAT32_FILL: -999.3	Name: Value

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Spacecraft velocity in ECR Coordinates (dx/dt, dy/dt, dz/dt) at the mid-time of scan	0			m/s	No		32-bit floating point	Name: Value NA_FLOAT32_FILL: -999.9 MISS_FLOAT32_FILL: -999.8 ERR_FLOAT32_FILL: -999.5 VDNE_FLOAT32_FILL: -999.3	Name: Value

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Spacecraft attitude with respect to Geodetic	0			arcsecond	No		32-bit floating point	Name: Value NA_FLOAT32_FILL: -999.9 MISS_FLOAT32_FILL: -999.8	Name: Value

		Reference Frame Coordinates (roll, pitch, yaw) at the mid-time of scan								ERR_FLOAT32_FILL -999.5 VDNE_FLOAT32_FILL -999.3	

SCSolarZenithAngle — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
The angle from the normal vector of the Solar Diffuser surface (z-axis of the solar diffuser frame) to the solar vector	0	0	180	degree	No		32-bit floating point	Name / Value NA_FLOAT32_FILL -999.9 MISS_FLOAT32_FILL -999.8 ERR_FLOAT32_FILL -999.5 VDNE_FLOAT32_FILL -999.3	Name / Value

SCSolarAzimuthAngle — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
The angle from the Solar Diffuser reference frame x-axis to the projection of the solar vector onto the solar diffuser surface (x-y plane), measured counterclockwise (observer looking toward the SD surface)	0	-180	180	degree	No		32-bit floating point	Name / Value NA_FLOAT32_FILL -999.9 MISS_FLOAT32_FILL -999.8 ERR_FLOAT32_FILL -999.5 VDNE_FLOAT32_FILL -999.3	Name / Value

<table>
<tr><td>ModeScan</td><td>1byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Scan</td><td>Yes</td><td>No</td><td>48</td><td>48</td></tr>
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<table>
<tr><th colspan="10">Datum</th></tr>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>The VIIRS operational mode, reported at the scan level.</td><td>0</td><td></td><td></td><td>unitless</td><td>No</td><td></td><td>unsigned 8-bit char</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>MISS_UINT8_FILL</td><td>254</td></tr>
<tr><td>ERR_UINT8_FILL</td><td>251</td></tr>
<tr><td>VDNE_UINT8_FILL</td><td>249</td></tr>
</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>Night</td><td>0</td></tr>
<tr><td>Day</td><td>1</td></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>ModeGran</td><td>1byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Granule</td><td>Yes</td><td>No</td><td>1</td><td>1</td></tr>
</table>
<table>
<tr><th colspan="10">Datum</th></tr>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>The VIIRS operational mode, reported at the granule level.</td><td>0</td><td></td><td></td><td>unitless</td><td>No</td><td></td><td>unsigned 8-bit char</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>MISS_UINT8_FILL</td><td>254</td></tr>
<tr><td>ERR_UINT8_FILL</td><td>251</td></tr>
<tr><td>VDNE_UINT8_FILL</td><td>249</td></tr>
</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>Night</td><td>0</td></tr>
<tr><td>Day</td><td>1</td></tr>
<tr><td>Mixed</td><td>2</td></tr>
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</td></tr>
</table>
</td></tr>
<tr><td>PadByte1</td><td>1byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Granule</td><td>Yes</td><td>No</td><td>3</td><td>3</td></tr>
</table>
<table>
<tr><th colspan="10">Datum</th></tr>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>Pad byte</td><td>0</td><td></td><td></td><td>unitless</td><td>No</td><td></td><td>unsigned 8-bit char</td><td>
<table>
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</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>NumberOfScans</td><td>4byte(s)</td><td>
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<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Granule</td><td>Yes</td><td>No</td><td>1</td><td>1</td></tr>
</table>
<table>
<tr><th colspan="10">Datum</th></tr>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>Actual number of VIIRS scans that were</td><td>0</td><td></td><td></td><td>unitless</td><td>No</td><td></td><td>32-bit integer</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td></tr>
</table>
</td></tr>
</table>

		used to create this granule.									

Table 2.17.6- 2, VIIRS I-Band Geolocation Product Profile - Quality Flags

Name	Data Size	Dimensions

QF1_SCAN_VIIRSSDRGEO — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Attitude and Ephemeris availability status	0			unitless	No		2 bit(s)	Name / Value:	Name / Value: Nominal - E&A data available / 0; Missing Data <= Small Gap / 1; Small Gap < Missing Data <= Granule Boundary / 2; Missing Data > Granule Boundary / 3
HAM/RTA Encoder Flag - Indicates the quality of the HAM and RTA encoder timestamps	2			unitless	No		2 bit(s)	Name / Value:	Name / Value: Good Data / 0; Bad Data – either HAM, RTA, or both are bad for the entire scan. / 1; Degraded Data – either HAM, RTA, or both are corrupted within the scan. / 2; Missing Data – Missing

											encoder data for the scan	
		Within South Atlantic Anomaly	4			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1	
		Solar Eclipse during Earth view scan	5			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1	
		Spare	6			unitless	No		2 bit(s)	Name Value	Name Value	

QF2_VIIRSSDRGEO — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	1536	1536
CrossTrack	No	No	6400	6400

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Invalid Input Data (Indicates that any of the Spacecraft Ephemeris or Attitude Data is Invalid or the encoder data is invalid)	0			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
Bad Pointing (Indicates that the sensor LOS does not intersect the geoid, is near the limb, has invalid sensor angles or other similar condition)	1			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
Bad Terrain (Indicates that the algorithm could not obtain a valid terrain value)	2			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
Invalid Solar Angles	3			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1

		Spare	4			unitless	No		4 bit(s)	**Name** **Value**	**Name** **Value**

2.17.7 VIIRS I-Band SDR Geolocation HDF5 Details

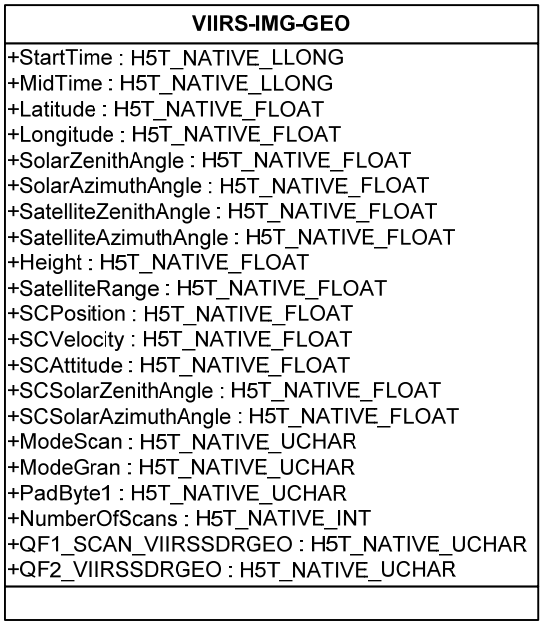

Figure 2.17.7-1, VIIRS I-Band SDR Geolocation UML Diagram

2.17.8 VIIRS I-Band SDR Geolocation Metadata Details

The HDF5 metadata elements associated with the I-Band SDR Geolocation are listed in the CDFCB-X Volume V, Section 4.3, HDF5 (Metadata) Hierarchy. The I-Band SDR geolocation metadata includes all common metadata at the root, product, aggregation, and granule level.

In addition to the common metadata items for the VIIRS Imagery Resolution SDR Geolocation, the items listed in Table 2.17.8-1, VIIRS Imagery Resolution SDR Geolocation Quality Summary Metadata are included as name/value pair items under the granule level metadata attribute “N_Quality_Summary”. The listed name/value pair items in the table are the granule level quality summary flags for the VIIRS I-Band SDR Geolocation.

Table 2.17.8-1, VIIRS Imagery Resolution SDR Geolocation Quality Summary Metadata

N_Quality_Summary			
Name	**Value**	**Description**	**Comments**
Percent Missing Data	0 – 100 %	Percentage of missing pixels (e.g., insufficient data for geolocation).	
Percent Out of Bounds	0 – 100 %	Percentage of out of bounds pixels. For example, pixels could not be geolocated.	
Automatic Quality Flag	0 – 1	Indicates if processing error has occurred.	0 = Passed 1 = Failed

2.18 VIIRS Day/Night Band (DNB) SDR

Data Mnemonic	SDRE-VDNB-C0030
Description/ Purpose	The Visible/Infrared Imaging/Radiometer Suite (VIIRS) collects visible/infrared imagery and radiometric data. The Day/Night Band (DNB) is described in this section. VIIRS DNB measures radiance over a panchromatic band at wavelengths between 500 nm and 900 nm. For more information on the VIIRS SDR data see Section 2.16, VIIRS M-Band SDRs, sub-section Description/Purpose, *General Information on VIIRS SDRs*. Day/Night Band (DNB) sub-pixels are aggregated on-board and are not subject to pixel trim effects. The DNB pixels maintain a near constant projected spatial size with scan angle.
File-Naming Construct	See the CDFCB-X Volume I, D34862-01, Section 3.0 for details.
File Size	Approximately 15,240 KiB per data granule. Approximately 124,970 KiB per geolocation granule. Sizes do not include HDF5 overhead or metadata.
File Format Type	HDF5
Data Content and Data Format	See Section 2.18.1, VIIRS DNB SDR Data See Section 2.18.5, VIIRS DNB SDR Geolocation

2.18.1 VIIRS DNB SDR Data Content Summary

The VIIRS DNB SDR data arrays structures are summarized below in Table 2.18.1-1, VIIRS DNB SDR Data Content Summary.

Table 2.18.1-1, VIIRS DNB SDR Data Content Summary

Name	Description	Data Type	Aggregate Dimensions (N = Number of Granules)	Granule Dimensions	Units
Radiance	Calibrated Top of Atmosphere (TOA) Radiance for each VIIRS DNB pixel	32-bit floating point	[N*768,4064]	[768, 4064]	W/(cm^2 sr)

Name	Description	Data Type	Aggregate Dimensions (N = Number of Granules)	Granule Dimensions	Units
ModeScan	The VIIRS operational mode, reported at the scan level	unsigned 8-bit char	[N*48]	[48]	unitless
ModeGran	The VIIRS operational mode, reported at the granule level	unsigned 8-bit char	[N]	[1]	unitless
PadByte1	Pad byte	unsigned 8-bit char	[N*3]	[3]	unitless
NumberOfScans	Actual number of VIIRS scans in granule.	32-bit integer	[N]	[1]	unitless
NumberOfMissingPkts	Number of missing packets in scan	32-bit integer	[N*48]	[48]	unitless
NumberOfBadChecksums	Number of packets with bad checksum in scan	32-bit integer	[N*48]	[48]	unitless
NumberOfDiscardedPkts	Number of discarded packets in scan	32-bit integer	[N*48]	[48]	unitless
QF1_VIIRSDNBSDR	Pixel-level Quality Flag	unsigned 8-bit char	[N*768,4064]	[768, 4064]	unitless
QF2_SCAN_SDR	Quality Flag for each Scan (indicates general SDR information)	unsigned 8-bit char	[N*48]	[48]	unitless
QF3_SCAN_RDR	Quality Flag for each Scan (indicates general RDR information)	unsigned 8-bit char	[N*48]	[48]	unitless

2.18.2 VIIRS DNB SDR Data Product Profile

Table 2.18.2-1, VIIRS DNB Band SDR Product Profile

<table>
<tr><th>Name</th><th>Data Size</th><th>Dimensions</th></tr>
<tr><td>Radiance</td><td>4byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>AlongTrack</td><td>Yes</td><td>No</td><td>768</td><td>768</td></tr>
<tr><td>CrossTrack</td><td>No</td><td>No</td><td>4064</td><td>4064</td></tr>
</table>
<table>
<tr><th colspan="10">Datum</th></tr>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>Calibrated Top of Atmosphere (TOA) Radiance for each VIIRS DNB pixel</td><td>0</td><td></td><td></td><td>W/(cm^2 sr)</td><td>No</td><td></td><td>32-bit floating point</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>NA_FLOAT32_FILL</td><td>-999.9</td></tr>
<tr><td>MISS_FLOAT32_FILL</td><td>-999.8</td></tr>
<tr><td>ERR_FLOAT32_FILL</td><td>-999.5</td></tr>
<tr><td>VDNE_FLOAT32_FILL</td><td>-999.3</td></tr>
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</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>ModeScan</td><td>1byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Scan</td><td>Yes</td><td>No</td><td>48</td><td>48</td></tr>
</table>
<table>
<tr><th colspan="10">Datum</th></tr>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>The VIIRS operational mode, reported at the scan level</td><td>0</td><td></td><td></td><td>unitless</td><td>No</td><td></td><td>unsigned 8-bit char</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>MISS_UINT8_FILL</td><td>254</td></tr>
<tr><td>ERR_UINT8_FILL</td><td>251</td></tr>
<tr><td>VDNE_UINT8_FILL</td><td>249</td></tr>
</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>Night</td><td>0</td></tr>
<tr><td>Day</td><td>1</td></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>ModeGran</td><td>1byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Granule</td><td>Yes</td><td>No</td><td>1</td><td>1</td></tr>
</table>
<table>
<tr><th colspan="10">Datum</th></tr>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
</table>
</td></tr>
</table>

		The VIIRS operational mode, reported at the granule level	0			unitless	No		unsigned 8-bit char	**Name** / **Value**: MISS_UINT8_FILL 254; ERR_UINT8_FILL 251; VDNE_UINT8_FILL 249		**Name** / **Value**: Night 0; Day 1; Mixed 2	
PadByte1	1byte(s)	**Name**: Granule; **Granule Boundary**: Yes; **Dynamic**: No; **Min Array Size**: 3; **Max Array Size**: 3												
		Datum												
		Description: Pad byte	**Datum Offset**: 0	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**: unitless	**Scaled**: No	**Scale Factor Name**	**Data Type**: unsigned 8-bit char	**Fill Values**		**Legend Entries**		
NumberOfScans	4byte(s)	**Name**: Granule; **Granule Boundary**: Yes; **Dynamic**: No; **Min Array Size**: 1; **Max Array Size**: 1												
		Datum												
		Description: Actual number of VIIRS scans that were used to create this granule	**Datum Offset**: 0	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**: unitless	**Scaled**: No	**Scale Factor Name**	**Data Type**: 32-bit integer	**Fill Values**		**Legend Entries**		
NumberOfMissingPkts	4byte(s)	**Name**: Scan; **Granule Boundary**: Yes; **Dynamic**: No; **Min Array Size**: 48; **Max Array Size**: 48												
		Datum												
		Description: Number of missing packets in scan	**Datum Offset**: 0	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**: unitless	**Scaled**: No	**Scale Factor Name**	**Data Type**: 32-bit integer	**Fill Values**		**Legend Entries**		
										Name / **Value**: MISS_INT32_FILL -998; VDNE_INT32_FILL -993				
NumberOfBadChecksums	4byte(s)	**Name**: Scan; **Granule Boundary**: Yes; **Dynamic**: No; **Min Array Size**: 48; **Max Array Size**: 48												
		Datum												

		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**	**Legend Entries**
		Number of packets with bad checksums in scan	0			unitless	No		32-bit integer	**Name** / **Value**: MISS_INT32_FILL -998; VDNE_INT32_FILL -993	**Name** / **Value**
NumberOfDiscardedPkts	4byte(s)	**Name**: Scan; **Granule Boundary**: Yes; **Dynamic**: No; **Min Array Size**: 48; **Max Array Size**: 48									
		Datum									
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**	**Legend Entries**
		Number of discarded packets in scan	0			unitless	No		32-bit integer	**Name** / **Value**: MISS_INT32_FILL -998; VDNE_INT32_FILL -993	**Name** / **Value**

Table 2.18.2-2, VIIRS DNB Band SDR Product Profile - Quality Flags

Name	Data Size	Dimensions

QF1_VIIRSDNBSDR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	4064	4064

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values (Name / Value)	Legend Entries (Name / Value)
SDR Quality - Indicates calibration quality due to bad space view offsets, OBC view offsets, etc or use of a previous calibration view	0			unitless	No		2 bit(s)		Good 0 Poor 1 No Calibration 2
Saturated Pixel - Indicates the level of pixel saturation	2			unitless	No		2 bit(s)		None Saturated 0 Some Saturated 1 All Saturated 2
Missing Data - Data required for calibration processing is not available for processing	4			unitless	No		2 bit(s)		All data present 0 EV RDR data missing 1 Cal data (SV, CV, SD, etc.) missing 2 Thermistor data missing 3
Out of Range - Calibrated pixel value outside of LUT threshold limits	6			unitless	No		1 bit(s)		All data within range 0 Radiance out of range 1
Spare	7			unitless	No		1 bit(s)		

QF2_SCAN_SDR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Half Angle Mirror Side	0			unitless	No		1 bit(s)	Name / Value	Name / Value: A-Side 0; B-Side 1
The Moon has corrupted the space view	1			unitless	No		1 bit(s)	Name / Value	Name / Value: False 0; True 1
Spare	2			unitless	No		6 bit(s)	Name / Value	Name / Value

QF3_SCAN_RDR — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Checksum failed for zone 1	0			unitless	No		1 bit(s)	Name / Value	Name / Value: False 0; True 1
Checksum failed for zone 2	1			unitless	No		1 bit(s)	Name / Value	Name / Value: False 0; True 1
Checksum failed for zone 3	2			unitless	No		1 bit(s)	Name / Value	Name / Value: False 0; True 1
Checksum failed for zone 4	3			unitless	No		1 bit(s)	Name / Value	Name / Value: False 0; True 1
Checksum failed for zone 5	4			unitless	No		1 bit(s)	Name / Value	Name / Value: False 0; True 1
Checksum failed for zone 6	5			unitless	No		1 bit(s)	Name / Value	Name / Value: False 0; True 1

		Scan data is not Present (No valid data)	6			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value**	False 0 True 1
		Spare	7			unitless	No		1 bit(s)	**Name** **Value**	**Name** **Value**	

2.18.3 VIIRS DNB SDR Data HDF5 Details

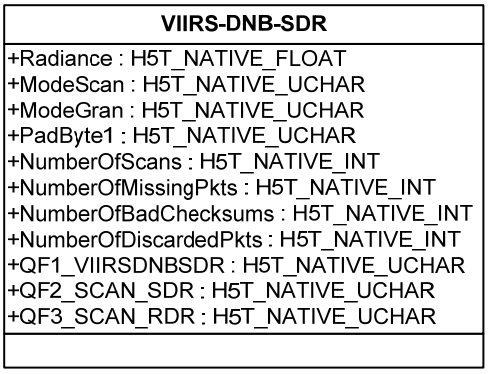

Figure 2.18.3-1, VIIRS DNB SDR UML Diagram

2.18.4 VIIRS DNB SDR Data Metadata Details

The HDF5 metadata elements associated with the VIIRS DNB SDRs are listed in the CDFCB-X Volume V, Section 4.3, HDF5 (Metadata) Hierarchy. The DNB SDR metadata includes all common metadata at the root, product, aggregation, and granule level.

In addition to the common metadata items for the VIIRS DNB SDR, the items listed in Table 2.18.4-1, VIIRS DNB SDR Quality Summary Metadata are included as name/value pair items under the granule level metadata attribute "N_Quality_Summary". The listed name/value pair items in the table are the granule level quality summary flags for the VIIRS DNB SDRs.

Note that there is a standard granule level metadata item that identifies the Imagery Band. This metadata item is the "Band_ID" and is set to "DNB".

Table 2.18.4-1, VIIRS DNB SDR Quality Summary Metadata Values

N_Quality_Summary			
Name	**Value**	**Description**	**Comments**
Summary VIIRS SDR Quality	0 – 100 %	Percentage of good quality pixels in granule	
Scan Quality Exclusion	0 – 48	Number of scans in granule excluded from processing (including partial scans)	

2.18.5 VIIRS DNB SDR Geolocation Content Summary

The VIIRS DNB SDR geolocation arrays structures are summarized below in Table 2.18.5-1, VIIRS DNB SDR Geolocation Content Summary.

Table 2.18.5-1, VIIRS DNB SDR Geolocation Content Summary

Name	Description	Data Type	Aggregate Dimensions	Granule Dimensions	Units
StartTime	Starting Time of each scan in IET (1/1/1958)	64-bit integer	[N*48]	[48]	microsecond
MidTime	Mid-Time of each scan in IET (1/1/1958)	64-bit integer	[N*48]	[48]	microsecond
Latitude	Latitude of each pixel (positive North)	32-bit floating point	[N*768, 4064]	[768, 4064]	degree
Longitude	Longitude of each pixel (positive East)	32-bit floating point	[N*768, 4064]	[768, 4064]	degree
SolarZenithAngle	Zenith angle of sun at each pixel position	32-bit floating point	[N*768, 4064]	[768, 4064]	degree
SolarAzimuthAngle	Azimuth angle of sun (measured clockwise positive from North) at each pixel position	32-bit floating point	[N*768, 4064]	[768, 4064]	degree
SatelliteZenithAngle	Zenith angle to Satellite at each pixel position	32-bit floating point	[N*768, 4064]	[768, 4064]	degree
SatelliteAzimuthAngle	Azimuth angle (measured clockwise positive from North) to Satellite at each pixel position	32-bit floating point	[N*768, 4064]	[768, 4064]	degree
LunarZenithAngle	Zenith angle of moon at each pixel position	32-bit floating point	[N*768, 4064]	[768, 4064]	degree
LunarAzimuthAngle	Azimuth angle of moon (measured clockwise positive from North) at each pixel position	32-bit floating point	[N*768, 4064]	[768, 4064]	degree
Height	Ellipsoid-Geoid separation	32-bit floating point	[N*768, 4064]	[768, 4064]	meter
SatelliteRange	Line of sight distance from the ellipsoid intersection to the satellite	32-bit floating point	[N*768, 4064]	[768, 4064]	meter

Name	Description	Data Type	Aggregate Dimensions	Granule Dimensions	Units
SCPosition	Spacecraft position in ECR Coordinates (X, Y, Z) at the mid-time of scan	32-bit floating point	[N*48,3]	[48, 3]	meter
SCVelocity	Spacecraft velocity in ECR Coordinates (dx/dt, dy/dt, dz/dt) at the mid-time of scan	32-bit floating point	[N*48,3]	[48, 3]	m/s
SCAttitude	Spacecraft attitude with respect to Geodetic Reference Frame Coordinates (roll, pitch, yaw)	32-bit floating point	[N*48, 3]	[48, 3]	arcsecond
SCSolarZenithAngle	The angle from the normal vector of the Solar Diffuser surface (z-axis of the solar diffuser frame) to the solar vector	32-bit floating point	[N*48]	[48]	degree
SCSolarAzimuthAngle	The angle from the Solar Diffuser reference frame x-axis to the projection of the solar vector onto the solar diffuser surface (x-y plane), measured counterclockwise (observer looking toward the SD surface)	32-bit floating point	[N*48]	[48]	degree
MoonPhaseAngle	Angle between ray vector to moon from earth and ray vector of satellite to earth	32-bit floating point	[N]	[1]	degree
MoonIllumFraction	Fraction of the moon illuminated (expressed as percent)	32-bit floating point	[N]	[1]	unitless
ModeScan	The VIIRS operational mode, reported at the scan level	unsigned 8-bit char	[N*48]	[48]	unitless
ModeGran	The VIIRS operational mode, reported at the granule level	unsigned 8-bit char	[N]	[1]	unitless
PadByte1	Pad byte	unsigned 8-bit char	[N*3]	[3]	unitless
NumberOfScans	Actual number of VIIRS scans that were used to create this granule	32-bit integer	[N]	[1]	unitless
QF1_SCAN_VIIRSSDRGEO	Scan-level quality flag	unsigned 8-bit char	[N*48]	[48]	unitless

Name	Description	Data Type	Aggregate Dimensions	Granule Dimensions	Units
QF2_VIIRSSDRGEO	Pixel-level quality flag	unsigned 8-bit char	[N*768, 4064]	[768,4064]	unitless

2.18.6 VIIRS DNB SDR Geolocation Product Profile

Table 2.18.6-1, VIIRS DNB SDR Geolocation Product Profile

<table>
<tr><th>Name</th><th>Data Size</th><th>Dimensions</th></tr>
<tr><td>StartTime</td><td>8byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Scan</td><td>Yes</td><td>No</td><td>48</td><td>48</td></tr>
</table>
Datum
<table>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>Starting Time of each scan in IET (1/1/1958)</td><td>0</td><td></td><td></td><td>microsecond</td><td>No</td><td></td><td>64-bit integer</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
<tr><td>NA_INT64_FILL</td><td>-999</td></tr>
<tr><td>MISS_INT64_FILL</td><td>-998</td></tr>
<tr><td>ERR_INT64_FILL</td><td>-995</td></tr>
<tr><td>VDNE_INT64_FILL</td><td>-993</td></tr>
<tr><td></td><td></td></tr>
</table>
</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>MidTime</td><td>8byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>Scan</td><td>Yes</td><td>No</td><td>48</td><td>48</td></tr>
</table>
Datum
<table>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
<tr><td>Mid-Time of each scan in IET (1/1/1958)</td><td>0</td><td></td><td></td><td>microsecond</td><td>No</td><td></td><td>64-bit integer</td><td>
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<tr><th>Name</th><th>Value</th></tr>
<tr><td>NA_INT64_FILL</td><td>-999</td></tr>
<tr><td>MISS_INT64_FILL</td><td>-998</td></tr>
<tr><td>ERR_INT64_FILL</td><td>-995</td></tr>
<tr><td>VDNE_INT64_FILL</td><td>-993</td></tr>
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</td><td>
<table>
<tr><th>Name</th><th>Value</th></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>Latitude</td><td>4byte(s)</td><td>
<table>
<tr><th>Name</th><th>Granule Boundary</th><th>Dynamic</th><th>Min Array Size</th><th>Max Array Size</th></tr>
<tr><td>AlongTrack</td><td>Yes</td><td>No</td><td>768</td><td>768</td></tr>
<tr><td>CrossTrack</td><td>No</td><td>No</td><td>4064</td><td>4064</td></tr>
</table>
Datum
<table>
<tr><th>Description</th><th>Datum Offset</th><th>Unscaled Valid Range Min</th><th>Unscaled Valid Range Max</th><th>Measurement Units</th><th>Scaled</th><th>Scale Factor Name</th><th>Data Type</th><th>Fill Values</th><th>Legend Entries</th></tr>
</table>
</td></tr>
</table>

		Latitude of each pixel (positive North)	0	-90	90	degree	No		32-bit floating point	**Name** / **Value**: NA_FLOAT32_FILL -999.9; MISS_FLOAT32_FILL -999.8; ERR_FLOAT32_FILL -999.5; ELINT_FLOAT32_FILL -999.4; VDNE_FLOAT32_FILL -999.3		
Longitude	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: AlongTrack — Yes — No — 768 — 768; CrossTrack — No — No — 4064 — 4064											
		Datum											
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**	
		Longitude of each pixel (positive East)	0	-180	180	degree	No		32-bit floating point	**Name** / **Value**: NA_FLOAT32_FILL -999.9; MISS_FLOAT32_FILL -999.8; ERR_FLOAT32_FILL -999.5; ELINT_FLOAT32_FILL -999.4; VDNE_FLOAT32_FILL -999.3		**Name** / **Value**	
SolarZenithAngle	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: AlongTrack — Yes — No — 768 — 768; CrossTrack — No — No — 4064 — 4064											
		Datum											
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**		**Legend Entries**	
		Zenith angle of sun at each pixel position	0	0	180	degree	No		32-bit floating point	**Name** / **Value**: NA_FLOAT32_FILL -999.9; MISS_FLOAT32_FILL -999.8; ERR_FLOAT32_FILL -999.5; ELINT_FLOAT32_FILL -999.4; VDNE_FLOAT32_FILL -999.3		**Name** / **Value**	
SolarAzimuthAngle	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**											

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	4064	4064

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Azimuth angle of sun (measured clockwise positive from North) at each pixel position	0	-180	180	degree	No		32-bit floating point	see Fill Values table below	see Legend Entries table below

Fill Values:

Name	Value
NA_FLOAT32_FILL	-999.9
MISS_FLOAT32_FILL	-999.8
ERR_FLOAT32_FILL	-999.5
ELINT_FLOAT32_FILL	-999.4
VDNE_FLOAT32_FILL	-999.3

Legend Entries:

Name	Value

SatelliteZenithAngle 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	4064	4064

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Zenith angle to Satellite at each pixel position	0	0	~70	degree	No		32-bit floating point	see Fill Values table below	see Legend Entries table below

Fill Values:

Name	Value
NA_FLOAT32_FILL	-999.9
MISS_FLOAT32_FILL	-999.8
ERR_FLOAT32_FILL	-999.5
ELINT_FLOAT32_FILL	-999.4
VDNE_FLOAT32_FILL	-999.3

Legend Entries:

Name	Value

SatelliteAzimuthAngle 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	4064	4064

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Azimuth angle	0	-180	180	degree	No		32-bit	see Fill Values table below	see Legend Entries table below

Fill Values:

Name	Value

Legend Entries:

Name	Value

		(measured clockwise positive from North) to Satellite at each pixel position							floating point	NA_FLOAT32_FILL MISS_FLOAT32_FILL ERR_FLOAT32_FILL ELINT_FLOAT32_FILL VDNE_FLOAT32_FILL	-999.9 -999.8 -999.5 -999.4 -999.3	

LunarZenithAngle — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	4064	4064

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Zenith angle of moon at each pixel position	0	0	180	degree	No		32-bit floating point	**Name**	**Value**	**Name**	**Value**
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ERR_FLOAT32_FILL	-999.5		
								ELINT_FLOAT32_FILL	-999.4		
								VDNE_FLOAT32_FILL	-999.3		

LunarAzimuthAngle — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	4064	4064

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Azimuth angle of moon (measured clockwise positive from North) at each pixel position	0	-180	180	degree	No		32-bit floating point	**Name**	**Value**	**Name**	**Value**
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ERR_FLOAT32_FILL	-999.5		
								ELINT_FLOAT32_FILL	-999.4		
								VDNE_FLOAT32_FILL	-999.3		

Height — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768

		CrossTrack | No | No | 4064 | 4064
		Datum
		Description | **Datum Offset** | **Unscaled Valid Range Min** | **Unscaled Valid Range Max** | **Measurement Units** | **Scaled** | **Scale Factor Name** | **Data Type** | **Fill Values** | **Legend Entries**
		Ellipsoid-Geoid separation | 0 | | | meter | No | | 32-bit floating point
		Name | **Value**: NA_FLOAT32_FILL | -999.9; MISS_FLOAT32_FILL | -999.8; ERR_FLOAT32_FILL | -999.5; ELINT_FLOAT32_FILL | -999.4; VDNE_FLOAT32_FILL | -999.3
		Name | **Value**
SatelliteRange	4byte(s)	**Name** | **Granule Boundary** | **Dynamic** | **Min Array Size** | **Max Array Size**
		AlongTrack | Yes | No | 768 | 768
		CrossTrack | No | No | 4064 | 4064
		Datum
		Description | **Datum Offset** | **Unscaled Valid Range Min** | **Unscaled Valid Range Max** | **Measurement Units** | **Scaled** | **Scale Factor Name** | **Data Type** | **Fill Values** | **Legend Entries**
		Line of sight distance from the ellipsoid intersection to the satellite | 0 | | | meter | No | | 32-bit floating point
		Name | **Value**: NA_FLOAT32_FILL | -999.9; MISS_FLOAT32_FILL | -999.8; ERR_FLOAT32_FILL | -999.5; ELINT_FLOAT32_FILL | -999.4; VDNE_FLOAT32_FILL | -999.3
		Name | **Value**
SCPosition	4byte(s)	**Name** | **Granule Boundary** | **Dynamic** | **Min Array Size** | **Max Array Size**
		Scan | Yes | No | 48 | 48
		ECRCoordinate | No | No | 3 | 3
		Datum
		Description | **Datum Offset** | **Unscaled Valid Range Min** | **Unscaled Valid Range Max** | **Measurement Units** | **Scaled** | **Scale Factor Name** | **Data Type** | **Fill Values** | **Legend Entries**
		Spacecraft position in ECR | 0 | | | meter | No | | 32-bit floating point
		Name | **Value**: NA_FLOAT32_FILL | -999.9
		Name | **Value**

		Coordinates (X, Y, Z) at the mid-time of scan								MISS_FLOAT32_FILL -999.8 ERR_FLOAT32_FILL -999.5 VDNE_FLOAT32_FILL -999.3	

SCVelocity	4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48
ECRCoordinate	No	No	3	3

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Spacecraft velocity in ECR Coordinates (dx/dt, dy/dt, dz/dt) at the mid-time of scan	0			m/s	No		32-bit floating point	Name: Value NA_FLOAT32_FILL -999.9 MISS_FLOAT32_FILL -999.8 ERR_FLOAT32_FILL -999.5 VDNE_FLOAT32_FILL -999.3	Name: Value

SCAttitude	4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48
GRFCoordinate	No	No	3	3

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Spacecraft attitude with respect to Geodetic Reference Frame Coordinates (roll, pitch, yaw)	0			arcsecond	No		32-bit floating point	Name: Value NA_FLOAT32_FILL -999.9 MISS_FLOAT32_FILL -999.8 ERR_FLOAT32_FILL -999.5 VDNE_FLOAT32_FILL -999.3	Name: Value

SCSolarZenithAngle	4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**	**Legend Entries**
		The angle from the normal vector of the Solar Diffuser surface (z-axis of the solar diffuser frame) to the solar vector	0	0	180	degree	No		32-bit floating point	**Name** / **Value**: NA_FLOAT32_FILL -999.9; MISS_FLOAT32_FILL -999.8; ERR_FLOAT32_FILL -999.5; VDNE_FLOAT32_FILL -999.3	**Name** / **Value**
SCSolarAzimuthAngle	4byte(s)	**Name**: Scan; **Granule Boundary**: Yes; **Dynamic**: No; **Min Array Size**: 48; **Max Array Size**: 48									
		Datum									
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**	**Legend Entries**
		The angle from the Solar Diffuser reference frame x-axis to the projection of the solar vector onto the solar diffuser surface (x-y plane), measured counterclockwise (observer looking toward the SD surface)	0	-180	180	degree	No		32-bit floating point	**Name** / **Value**: NA_FLOAT32_FILL -999.9; MISS_FLOAT32_FILL -999.8; ERR_FLOAT32_FILL -999.5; VDNE_FLOAT32_FILL -999.3	**Name** / **Value**
MoonPhaseAngle	4byte(s)	**Name**: Granule; **Granule Boundary**: Yes; **Dynamic**: No; **Min Array Size**: 1; **Max Array Size**: 1									
		Datum									
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**	**Legend Entries**
		Angle between ray	0	0	180	degree	No		32-bit floating	**Name** / **Value**	**Name** / **Value**

		vector to moon from earth and ray vector of satellite to earth							point	NA_FLOAT32_FILL -999.9 MISS_FLOAT32_FILL -999.8 ERR_FLOAT32_FILL -999.5 ELINT_FLOAT32_FILL -999.4 VDNE_FLOAT32_FILL -999.3	

MoonIllumFraction — 4byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Granule	Yes	No	1	1

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
Fraction of the moon illuminated (expressed as percent)	0	0	100	percent	No		32-bit floating point	Name	Value	Name	Value
								NA_FLOAT32_FILL	-999.9		
								MISS_FLOAT32_FILL	-999.8		
								ERR_FLOAT32_FILL	-999.5		
								VDNE_FLOAT32_FILL	-999.3		

ModeScan — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values		Legend Entries	
The VIIRS operational mode, reported at the scan level	0			unitless	No		unsigned 8-bit char	Name	Value	Name	Value
								MISS_UINT8_FILL	254	Night	0
								ERR_UINT8_FILL	251	Day	1
								VDNE_UINT8_FILL	249		

ModeGran — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Granule	Yes	No	1	1

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries

		The VIIRS operational mode, reported at the granule level	0			unitless	No		unsigned 8-bit char	**Name** / **Value**: MISS_UINT8_FILL 254; ERR_UINT8_FILL 251; VDNE_UINT8_FILL 249	**Name** / **Value**: Night 0; Day 1; Mixed 2
PadByte1	1byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Granule; Yes; No; 3; 3									
		Datum									
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**	**Legend Entries**
		Pad byte	0			unitless	No		unsigned 8-bit char	**Name** / **Value**	**Name** / **Value**
NumberOfScans	4byte(s)	**Name** / **Granule Boundary** / **Dynamic** / **Min Array Size** / **Max Array Size**: Granule; Yes; No; 1; 1									
		Datum									
		Description	**Datum Offset**	**Unscaled Valid Range Min**	**Unscaled Valid Range Max**	**Measurement Units**	**Scaled**	**Scale Factor Name**	**Data Type**	**Fill Values**	**Legend Entries**
		Actual number of VIIRS scans that were used to create this granule	0			unitless	No		32-bit integer	**Name** / **Value**	**Name** / **Value**

Table 2.18.6-2, VIIRS DNB Geolocation Product Profile - Quality Flags

Name	Data Size	Dimensions

QF1_SCAN_VIIRSSDRGEO — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
Scan	Yes	No	48	48

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Attitude and Ephemeris availability status	0			unitless	No		2 bit(s)	Name / Value	Name / Value: Nominal - E&A data available = 0; Missing Data <= Small Gap = 1; Small Gap < Missing Data < Granule Boundary = 2; Missing Data >= Granule Boundary = 3
HAM/RTA Encoder Flag - Indicates the quality of the HAM and RTA encoder timestamps	2			unitless	No		2 bit(s)	Name / Value	Name / Value: Good Data = 0; Bad Data – either HAM, RTA, or both are bad for the entire scan = 1; Degraded Data – either HAM, RTA, or both are corrupted within the scan. = 2; Missing Data – Missing encoder data for the scan = 3

		Within South Atlantic Anomaly	4			unitless	No		1 bit(s)	Name Value		Name Value		
												False 0		
												True 1		
		Solar Eclipse during Earth view scan	5			unitless	No		1 bit(s)	Name Value		Name Value		
												False 0		
												True 1		
		Lunar Eclipse during Earth view scan	6			unitless	No		1 bit(s)	Name Value		Name Value		
												False 0		
												True 1		
		Spare	7			unitless	No		1 bit(s)	Name Value		Name Value		

QF2_VIIRSSDRGEO — 1byte(s)

Name	Granule Boundary	Dynamic	Min Array Size	Max Array Size
AlongTrack	Yes	No	768	768
CrossTrack	No	No	4064	4064

Datum

Description	Datum Offset	Unscaled Valid Range Min	Unscaled Valid Range Max	Measurement Units	Scaled	Scale Factor Name	Data Type	Fill Values	Legend Entries
Invalid Input Data (Indicates that any of the Spacecraft Ephemeris or Attitude Data is Invalid or the encoder data is invalid)	0			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
Bad Pointing (Indicates that the sensor LOS does not intersect the geoid, is near the limb, has invalid sensor angles or other similar condition)	1			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
Bad Terrain (Indicates that the algorithm could not obtain a valid terrain value)	2			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
Invalid Solar Angles	3			unitless	No		1 bit(s)	Name Value	Name Value False 0 True 1
Spare	4			unitless	No		4 bit(s)	Name Value	Name Value

2.18.7 VIIRS DNB SDR Geolocation HDF5 Details

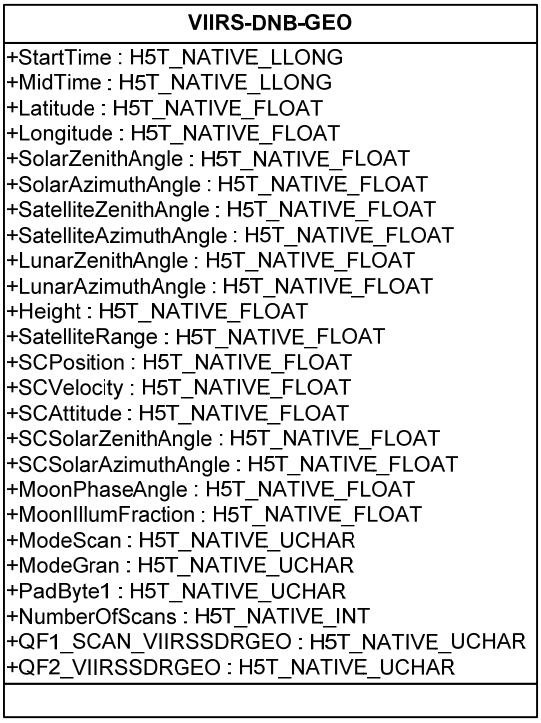

Figure 2.18.7-1, VIIRS DNB SDR Geolocation UML Diagram

2.18.8 VIIRS DNB SDR Geolocation Metadata Details

The HDF5 metadata elements associated with the DNB SDR Geolocation are listed in the CDFCB-X Volume V, Section 4.3, HDF5 (Metadata) Hierarchy. The DNB SDR geolocation metadata includes all common metadata at the root, product, aggregation, and granule level.

In addition to the common metadata items for the VIIRS DNB SDR Geolocation, the items listed in Table 2.18.8-1, VIIRS DNB SDR Geolocation Quality Summary Metadata are included as name/value pair items under the granule level metadata attribute “N_Quality_Summary”. The listed name/value pair items in the table are the granule level quality summary flags for the VIIRS DNB SDR Geolocation.

Table 2.18.8-1, VIIRS DNB SDR Geolocation Quality Summary Metadata

N_Quality_Summary			
Name	**Value**	**Description**	**Comments**
Percent Missing Data	0 – 100 %	Percentage of missing pixels (e.g., insufficient data for geolocation).	

N_Quality_Summary			
Name	**Value**	**Description**	**Comments**
Percent Out of Bounds	0 – 100 %	Percentage of out of bounds pixels. For example, pixels could not be geolocated.	
Automatic Quality Flag	0 – 1	Indicates if processing error has occurred.	0 = Passed 1 = Failed