Visible/Infrared Imager/Radiometer Suite (VIIRS)
Sensor Design, Performance, and Status

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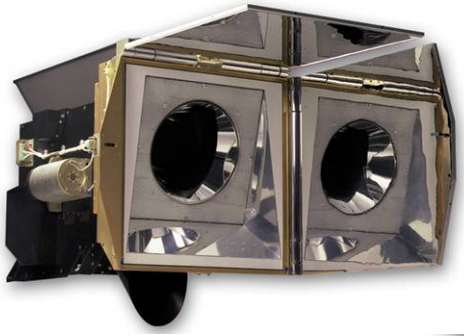
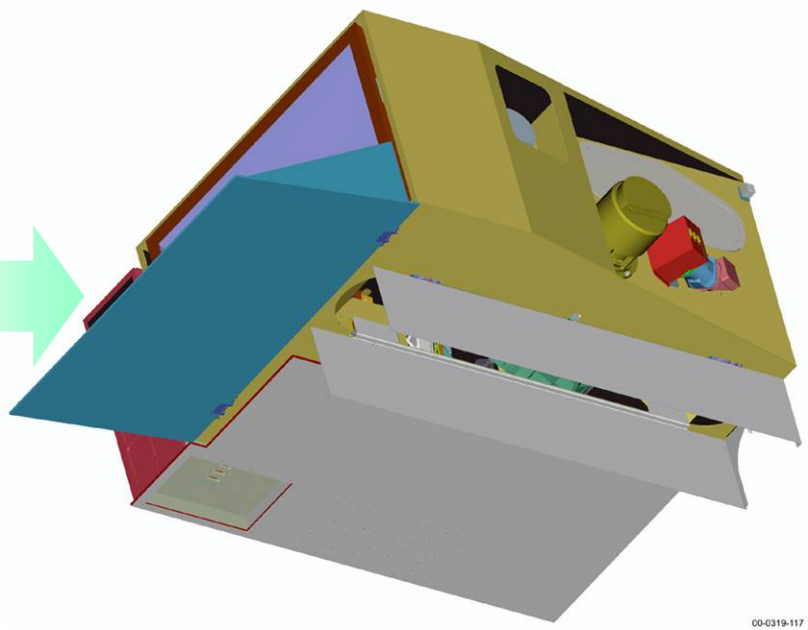
VIIRS Design Developed from Previously Successful Sensors



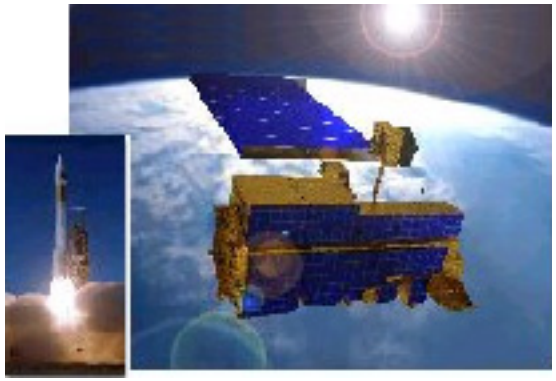
TRMM/VIRS

MODIS

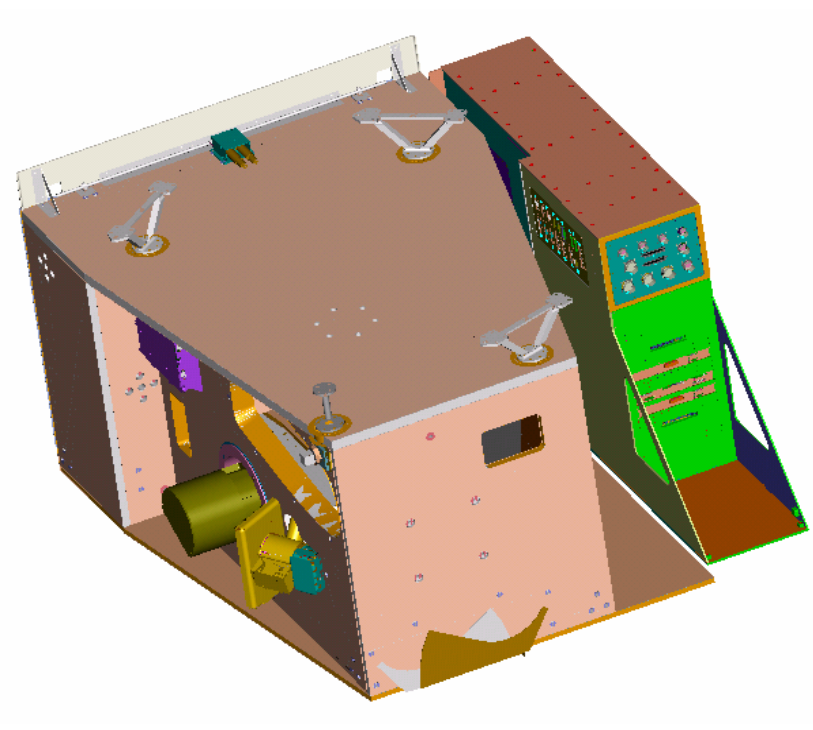
NPOESS VIIRS

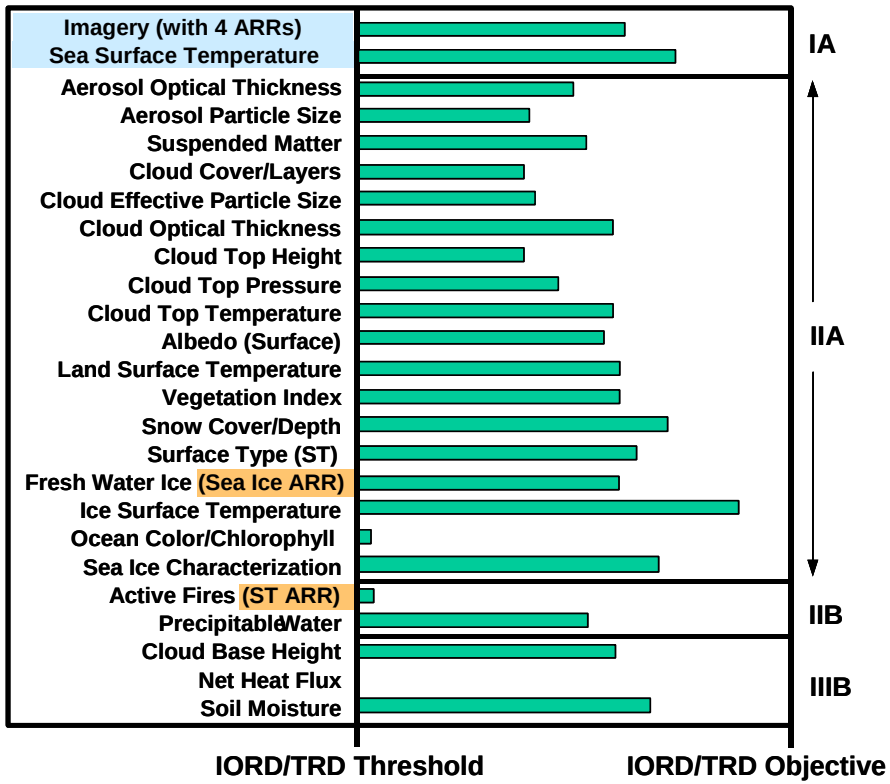


SeaWiFS



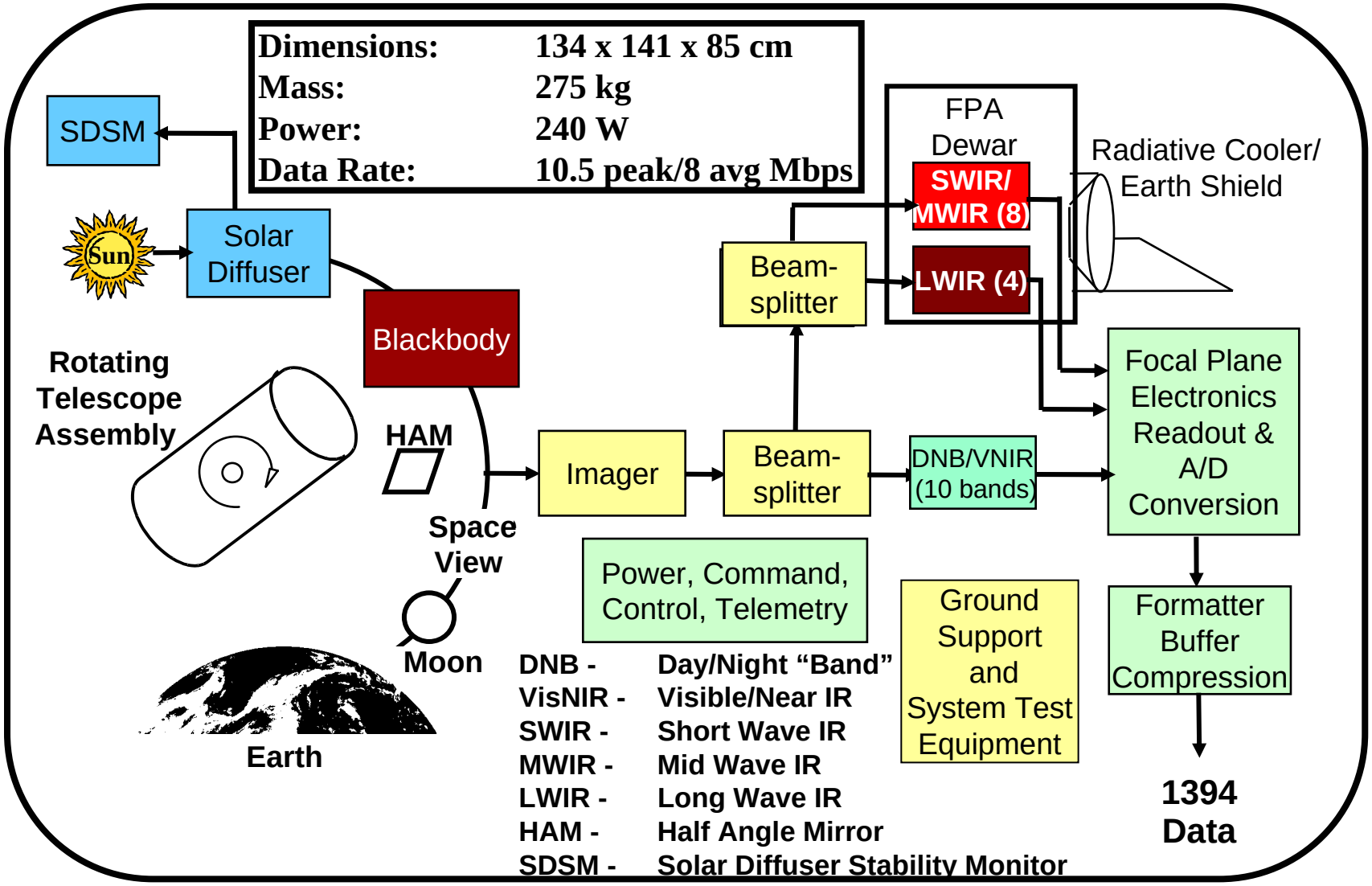
VIIRS Sensor Provides Data in Support of 23 EDRs



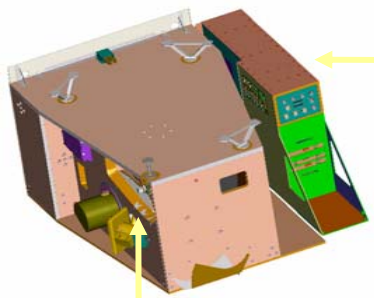


- VIIRS System Design based on integrated Sensor and Algorithms
- VIIRS Sensor provides digitized scene and on-board calibration data (RDRs)
- EDR Science Algorithms developed, documented, and publicly released by Raytheon Technical Services Company (RTSC) Information Technology and Scientific Services (ITSS)

VIIRS Converts Scene Photons into Raw Data Records (RDRs)



VIIRS Design Based on Demonstrated LEO Sensors



Electronics module (EM) & cables refined to minimize EMI

MODIS-heritage Solar Diffuser screen redesigned to minimize solar modulation

MODIS-heritage blackbody relocated to minimize Earth shine

MODIS-heritage Solar Diffuser Stability Monitor refined to improve performance

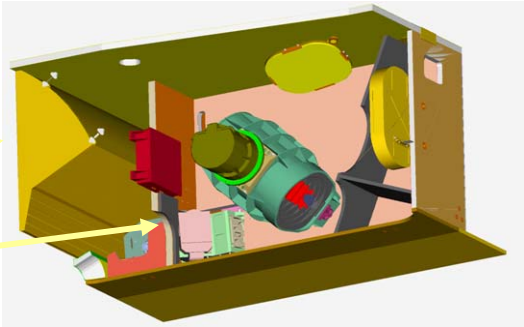
3-Mirror Anastigmat Rotating telescope refined to eliminate modulated instrument background (MIB)

4-mirror anastigmat All-reflective Aft optics imager

- Constant-speed rotating telescope
- Simple all-reflective diamond point turned bolt-together optics
- Proven emissive/reflective calibration

Passive Cryoradiator

Cold FPA Dewar Assembly



Spectral, Spatial, and Radiometric Attributes of 22 VIIRS Bands

		Band No.	Wave-length (□m)	Horiz Sample Interval (km Downtrack x Crosstrack)		Driving EDRs	Radi-ance Range	Ltyp or Ttyp	Signal to Noise Ratio (dimensionless) or NE□T (Kelvins)		
				Nadir	End of Scan				Required	Predicted	Margin
VIS/NIR FPA	Silicon PIN Diodes	M1	0.412	0.742 x 0.259	1.60 x 1.58	Ocean Color	Low	44.9	352	479	36%
						Aerosols	High	155	316	856	170%
		M2	0.445	0.742 x 0.259	1.60 x 1.58	Ocean Color	Low	40	380	442	16%
						Aerosols	High	146	409	856	109%
		M3	0.488	0.742 x 0.259	1.60 x 1.58	Ocean Color	Low	32	416	558	34%
						Aerosols	High	123	414	745	80%
		M4	0.555	0.742 x 0.259	1.60 x 1.58	Ocean Color	Low	21	362	474	31%
						Aerosols	High	90	315	651	106%
		I1	0.640	0.371 x 0.387	0.80 x 0.789	Imagery	Single	22	119	150	26%
		M5	0.672	0.742 x 0.259	1.60 x 1.58	Ocean Color	Low	10	242	291	20%
						Aerosols	High	68	360	516	43%
		M6	0.746	0.742 x 0.776	1.60 x 1.58	Atmospheric Corr'n	Single	9.6	199	252	27%
		I2	0.865	0.371 x 0.387	0.80 x 0.789	NDVI	Single	25	150	228	52%
		M7	0.865	0.742 x 0.259	1.60 x 1.58	Ocean Color	Low	6.4	215	394	83%
						Aerosols	High	33.4	340	497	46%
CCD		DNB	0.7	0.742 x 0.742	0.742 x 0.742	Imagery	Var.	6.70E-05	5.5	5.7	4%
S/MWIR	PV HgCdTe (HCT)	M8	1.24	0.742 x 0.776	1.60 x 1.58	Cloud Particle Size	Single	5.4	74	111	50%
		M9	1.378	0.742 x 0.776	1.60 x 1.58	Cirrus/Cloud Cover	Single	6	83	168	103%
		I3	1.61	0.371 x 0.387	0.80 x 0.789	Binary Snow Map	Single	7.3	6.0	97	1510%
		M10	1.61	0.742 x 0.776	1.60 x 1.58	Snow Fraction	Single	7.3	342	437	28%
		M11	2.25	0.742 x 0.776	1.60 x 1.58	Clouds	Single	0.12	10	17	73%
		I4	3.74	0.371 x 0.387	0.80 x 0.789	Imagery Clouds	Single	270 K	2.500	0.177	124%
		M12	3.70	0.742 x 0.776	1.60 x 1.58	SST	Single	270 K	0.396	0.509	391%
		M13	4.05	0.742 x 0.259	1.60 x 1.58	SST	Low	300 K	0.107	0.061	75%
						Fires	High	380 K	0.423	0.328	29%
LWIR	PV HCT	M14	8.55	0.742 x 0.776	1.60 x 1.58	Cloud Top Properties	Single	270 K	0.091	0.078	16%
		M15	10.763	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K	0.070	0.037	88%
		I5	11.450	0.371 x 0.387	0.80 x 0.789	Cloud Imagery	Single	210 K	1.500	0.644	133%
		M16	12.013	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K	0.072	0.056	28%

VIIRS Performance Depends on Key Suppliers

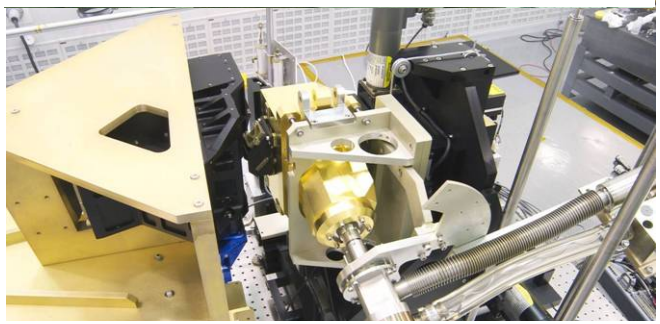
- Honeywell (Clearwater, FL) - Single Board Computers (SBC), 1394 Interface Cards
- Sarnoff (Princeton, NJ) – Day/Night Band (DNB) Charge Coupled Device (CCD)
- Axsys (Rochester Hills, MI) - Three Mirror Anastigmat (TMA in Rotating Telescope Assembly), Half Angle Mirror (HAM)
- Elcan (Raytheon - Richardson, TX) – Four Mirror Anastigmat (FMA in Aft Optics)
- BEI (Maumelle, AR) – Motor Encoder assembly
- Denton (Moorestown, NJ) – Silver Coatings on VIIRS reflective optics
- Babcock (La Mirada, CA) – Sensor Power Supply
- ASI (Pasadena, CA) – Opto-Mech Module Mainframe

VIIRS Hardware on Track for Successful EDU Completion

Opto-Mech Module Mainframe

Telescope Vibe

DNB–Elec. Module Integration



FMA - Dewar Alignment

Scan Motor - Servo Test

SDSM

Electronics Module Enclosure

VIIRS On-track for NPP Flight Unit Development

- VIIRS Sensor approaching Engineering Development Unit (EDU) integration
  - All Focal Plane Assemblies (FPAs) complete and being integrated into Aft Optics Assembly
  - Opto-Mech Module Housing complete through risk reduction vibration; module-level integration started
  - Scan Motor Assemblies completing environmental testing
  - Principle optical assemblies (RTA, HAM, FMA, Beamsplitters) completed through risk-reduction vibration; Opto-Mech Module optical alignment in-process
  - Electronics Module assemblies complete (enclosure, backplanes, power supply, circuit card assemblies including SBCs and 1394 Interface); Module being prepared for risk-reduction environmental testing starting this month (Vibration, TVAC)
  - Remaining EDU fabrication and testing will verify design performance models
- First flight unit for NPOESS Preparatory Project (NPP) scheduled for completion in November 2005 for 2006 launch
  - LWIR and DNB FPAs completing integration and test
  - Opto-Mech Module Mainframe panels complete; assembly/bonding in process
  - Scan Motor assemblies in final assembly
  - Electronics Module enclosure assembled; painting in process