



Wrap up Baseline HypsIRI VSWIR Science Measurement Characteristics

NASA Decadal Survey HypsIRI Mission

Robert O. Green et al.,

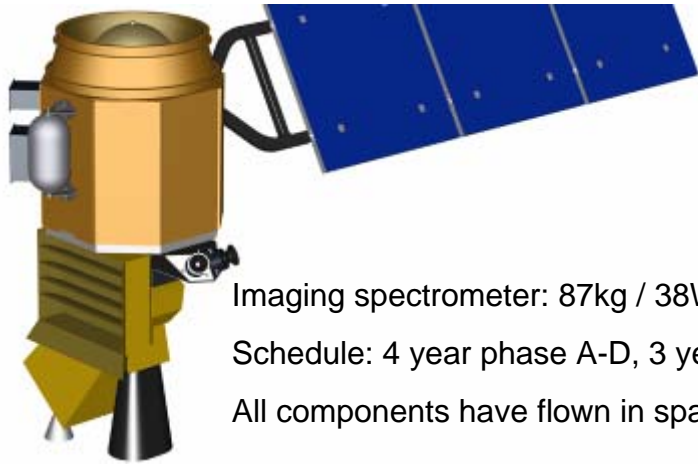
Jet Propulsion Laboratory, California Institute of Technology,
4800 Oak Grove Drive, Pasadena, CA 91109 , 818-354-9136, rog@jpl.nasa.gov

[Http://HypsIRI.jpl.nasa.gov](http://HypsIRI.jpl.nasa.gov)

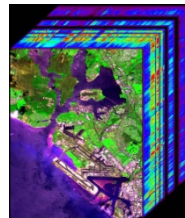
rog@jpl.nasa.gov



HypIRI Imaging Spectroscopy (VSWIR) Science Measurements



Imaging spectrometer: 87kg / 38W
Schedule: 4 year phase A-D, 3 years operations
All components have flown in space

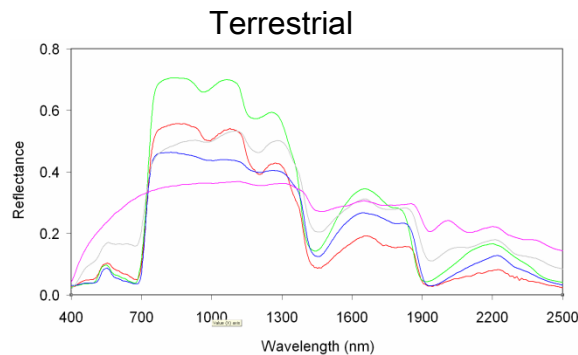
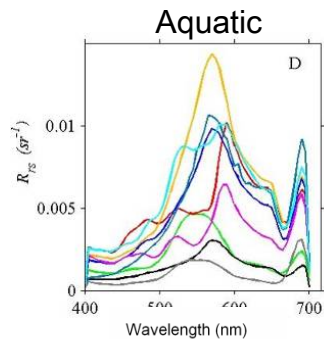
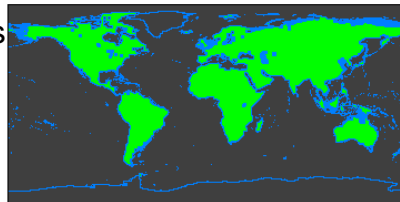


Science Questions:

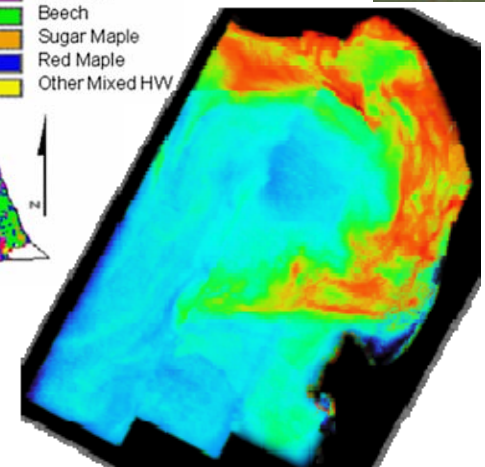
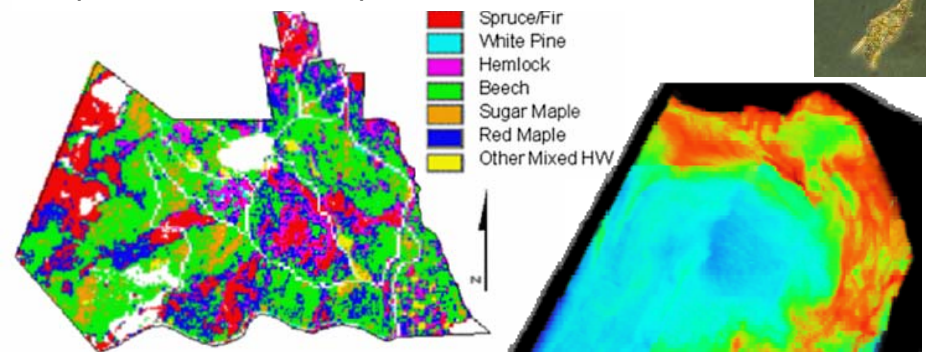
- *What is the composition, function, and health of land and water ecosystems?*
- *How are these ecosystems being altered by human activities and natural causes?*
- *How do these changes affect fundamental ecosystem processes upon which life on Earth depends?*

Measurement:

- 380 to 2500 nm in 10nm bands
- Accurate location 60m spatial
- 19 days revisit
- Global land and shallow water



Map of dominant tree species, Bartlett Forest, NH



Red tide algal bloom in Monterey Bay, CA



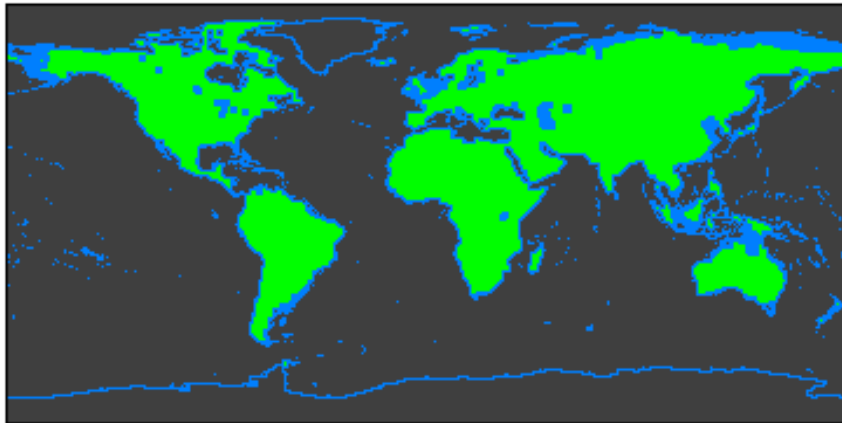
VSWIR Overarching Science Questions



- VQ1. Pattern and Spatial Distribution of Ecosystems and their Components, (EM,JG)
 - What is the pattern of ecosystem distribution and how do ecosystems differ in their composition or biodiversity? [DS 195]
- VQ2. Ecosystem Function, Physiology and Seasonal Activity, (EM,JG)
 - What are the seasonal expressions and cycles for terrestrial and aquatic ecosystems, functional groups and diagnostic species? How are these being altered by changes in climate, land use, and disturbances? [DS 191, 195, 203]
- VQ3. Biogeochemical Cycles (SO, SU)
 - How are biogeochemical cycles for carbon, water and nutrients being altered by natural and human-induced environmental changes?
- VQ4. Changes in Disturbance Activity (RK,GA)
 - How are disturbance regimes changing and how do these changes affect the ecosystem processes that support life on Earth?
- VQ5. Ecosystem and Human Health, (PT,GG)
 - How do changes in ecosystem composition and function affect human health, resource use, and resource management?
- VQ6. Earth Surface and Shallow Water Substrate Composition (RG, HD)
 - What is the land surface soil/rock and shallow water substrate composition?

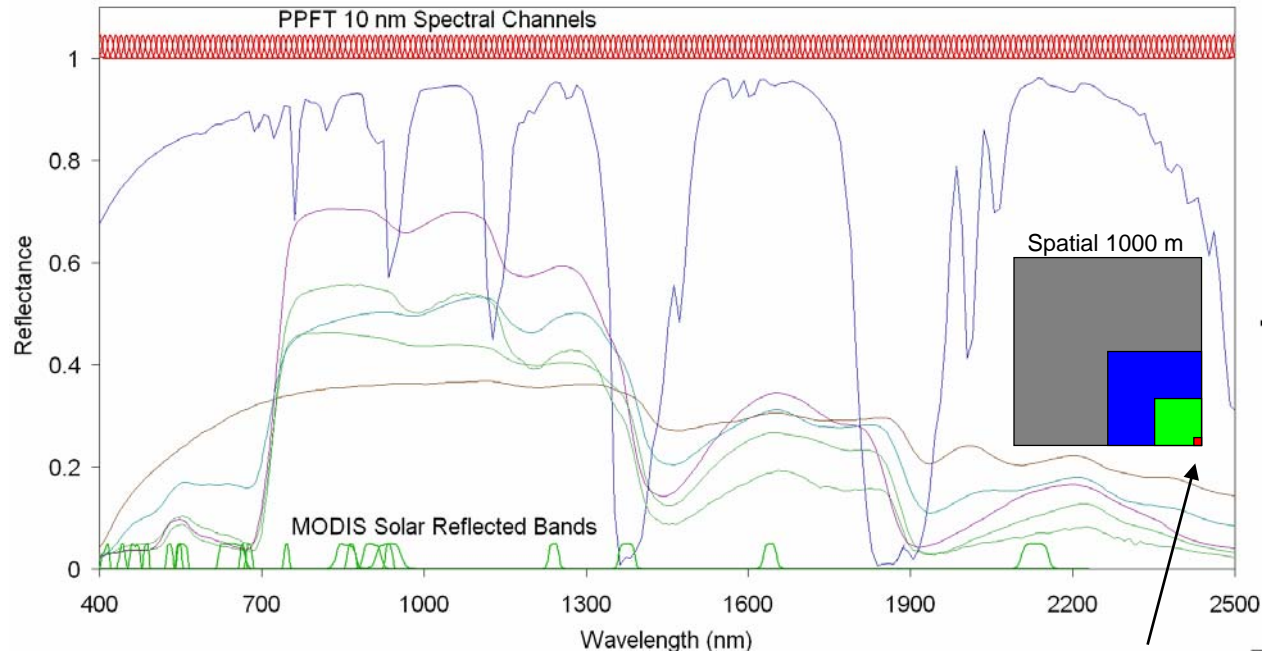


HyspIRI VSWIR Science Measurements



- Measure the **global** land and coastal/shallow water (> -50m).
- 19 day equatorial revisit to generate seasonal and annual products.

- Measure the molecular absorption and constituent scattering signatures in the spectral range from 380 to 2500 nm at 10 nm, and at 60 m spatial sampling.



PPFT at 60 m



HyspIRI VSWIR



Science Measurement Characteristics

Spectral

Range	380 to 2500 nm in the solar reflected spectrum
Sampling	≤ 10 nm {uniform over range}
Response	≤ 10 nm (full-width-at-half-maximum) {uniform over range}
Accuracy	< 0.5 nm

Radiometric

Range & Sampling	0 to 1.5 X max benchmark radiance, 14 bits measured
Accuracy stability	$> 95\%$ absolute radiometric, 98% on-orbit reflectance, 99.5%
Precision (SNR)	See spectral plots at benchmark radiances
Linearity	$> 99\%$ characterized to 0.1 %
Polarization	$< 2\%$ sensitivity, characterized to 0.5 %
Scattered Light	$< 1:200$ characterized to 0.1% (stray, ghost, detector...)

Spatial

Range	> 145 km (12 degrees at ~ 700 km altitude)
Cross-Track Samples	> 2400
Sampling	≤ 60 m
Response	≤ 60 m sampling (FWHM)

Uniformity

Spectral Cross-Track	$> 95\%$ cross-track uniformity { < 0.5 nm min-max over swath}
Spectral-IFOV-Variation	$> 95\%$ spectral IFOV uniformity { $< 5\%$ variation over spectral range}



HyspIRI VSWIR Science Measurements Characteristics



Temporal

Orbit Crossing	11 am sun synchronous descending
Global Land Coast Repeat	19 days at equator
Rapid Response Revisit	3 days (cross-track pointing)

Sunlint Avoidance

Cross Track Pointing	4 degrees in backscatter direction
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OnOrbit Calibration

Lunar View	1 per month {radiometric}
Solar Cover Views	1 per week {radiometric}
Surface Cal Experiments	6-12 per year {Dark Water and Bright}

Data Collection

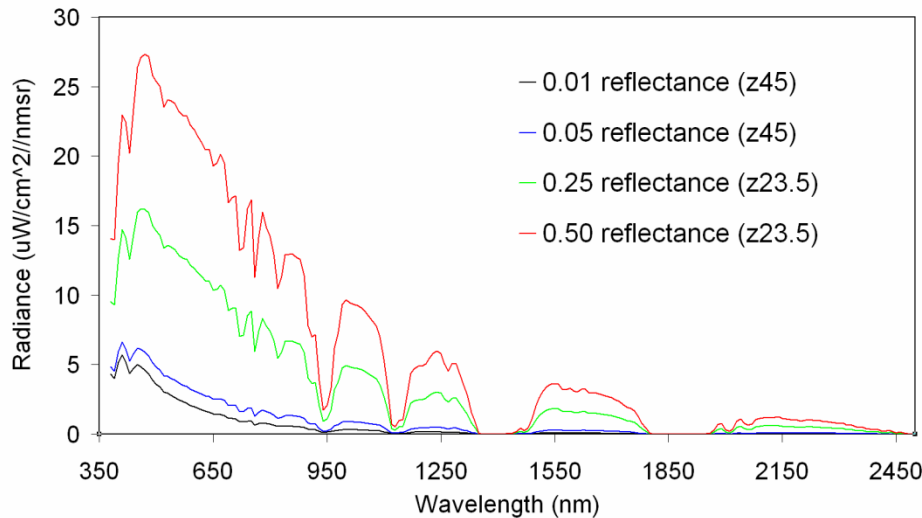
Land Coverage	Land surface above sea level excluding ice sheets
Water Coverage	Coastal zone -50 m and shallower
Solar Elevation	20 degrees or greater (15 degrees snow)
Open Ocean	Averaged to 1km (28 bits)
Ice Sheets	Averaged to 1 km (28 bits)
Compression	≥ 3.0 lossless



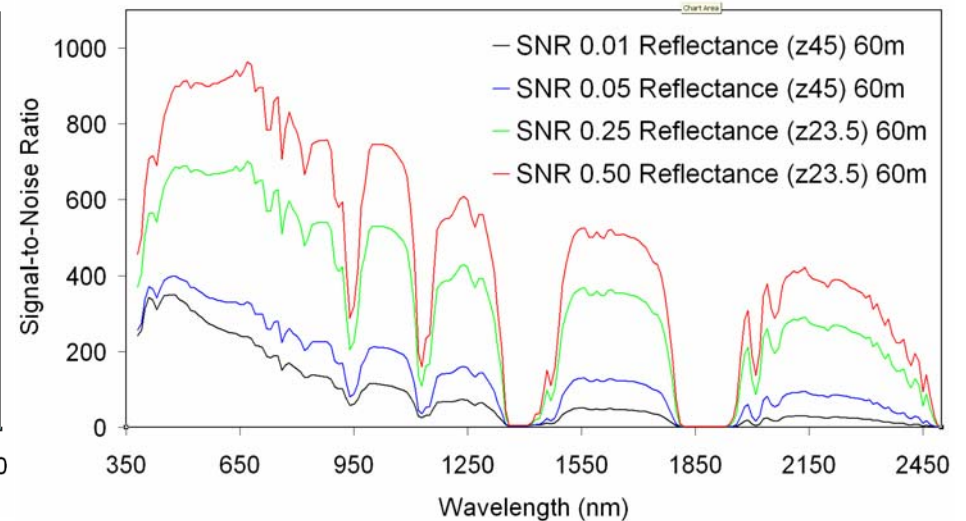
HypIRI VSWIR Science Measurements Key SNR and Uniformity Requirements



Benchmark Radiances

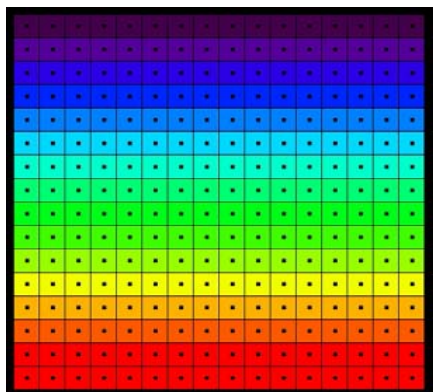


Required SNR



Uniformity Requirement

Cross Track Sample



Depiction

- Grids are the detectors
- dots are the IFOV centers
- Colors are the wavelengths

Requirement

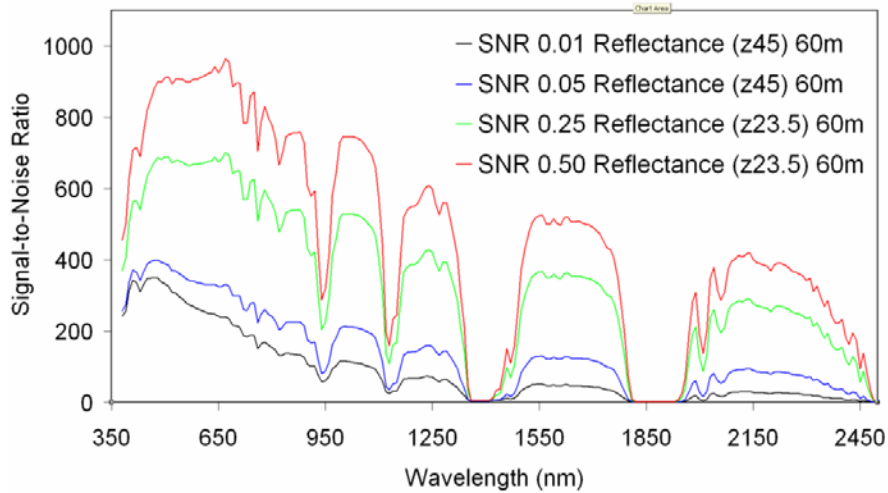
- Spectral Cross-Track >95% cross-track uniformity {<0.5 nm min-max over swath}
- Spectral-IFOV-Variation >95% spectral IFOV uniformity {<5% variation over spectral range}



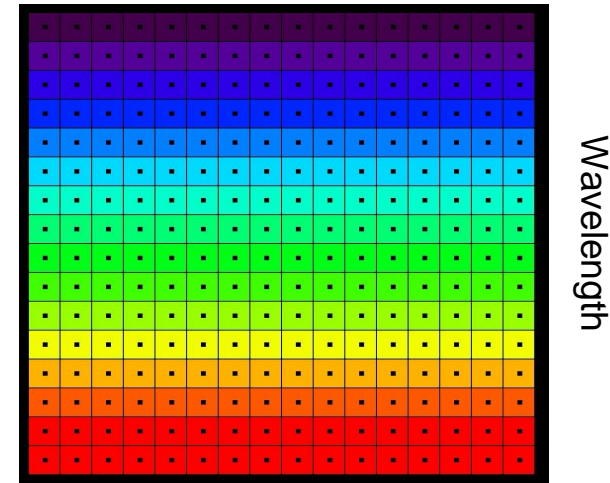
Building on NASA Hyperion Technology Demonstration



SNR > 10X

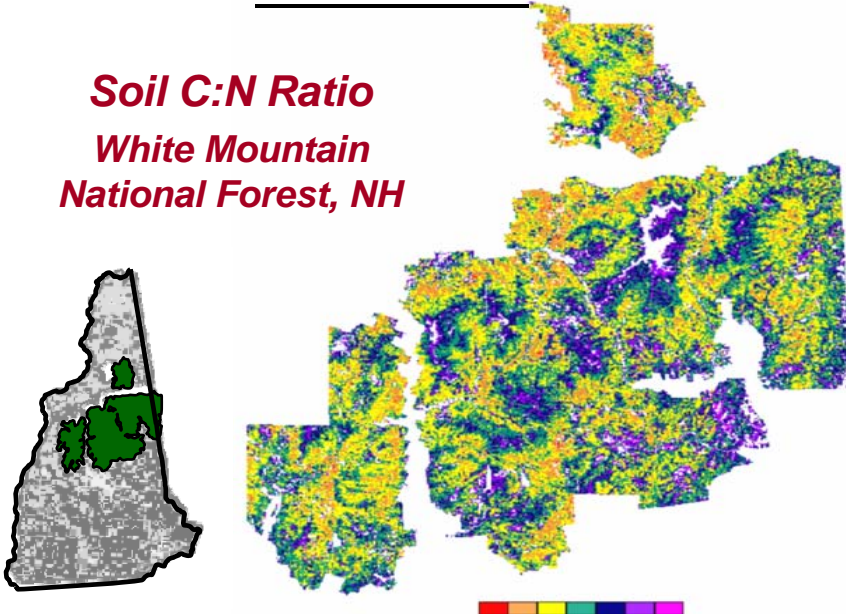


Uniformity > 10X

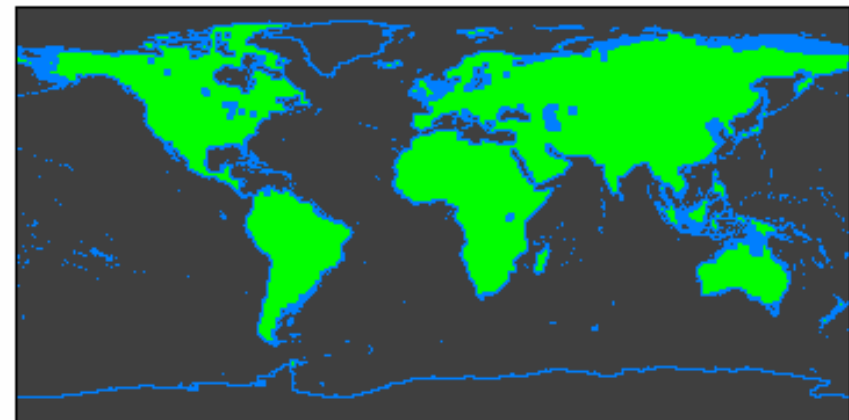


Swath > 10X

Soil C:N Ratio
White Mountain
National Forest, NH



Global Coverage >> 10X





Summary Thoughts



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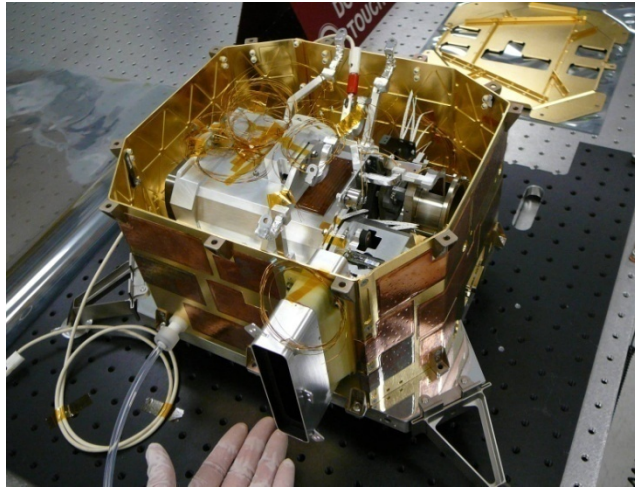


Mission Concept

Heritage: NASA Moon Mineralogy Mapper (M3) Called for in the NRC Decadal Survey



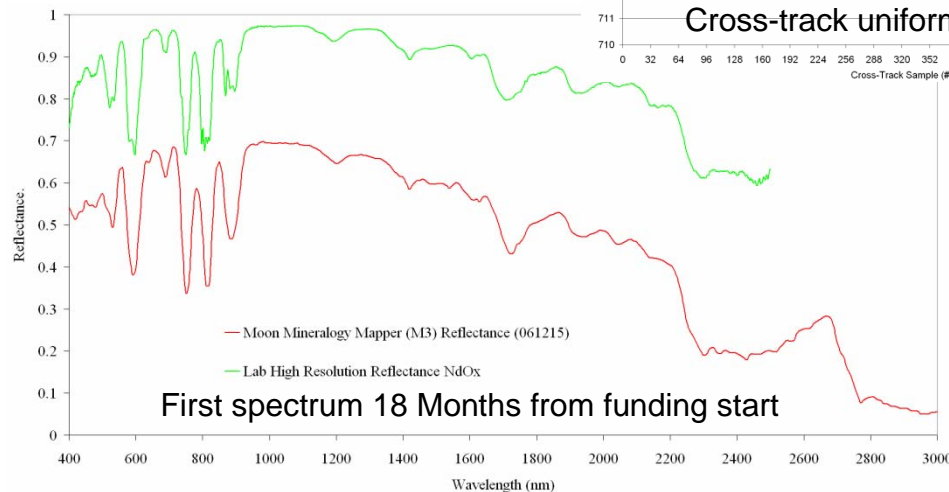
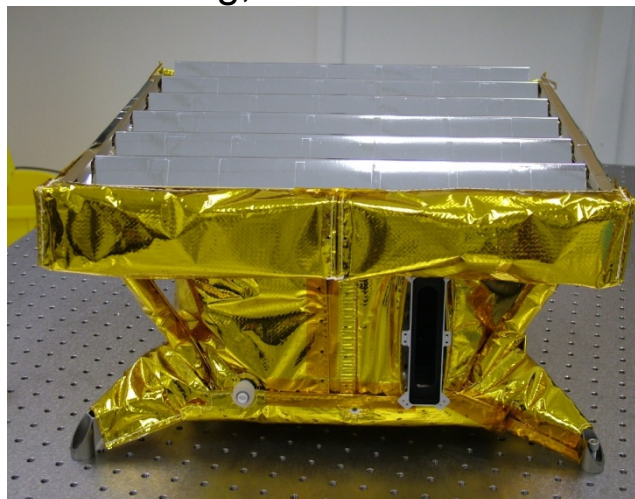
M3 Spectrometer



Passed Preship review 3 May 2007

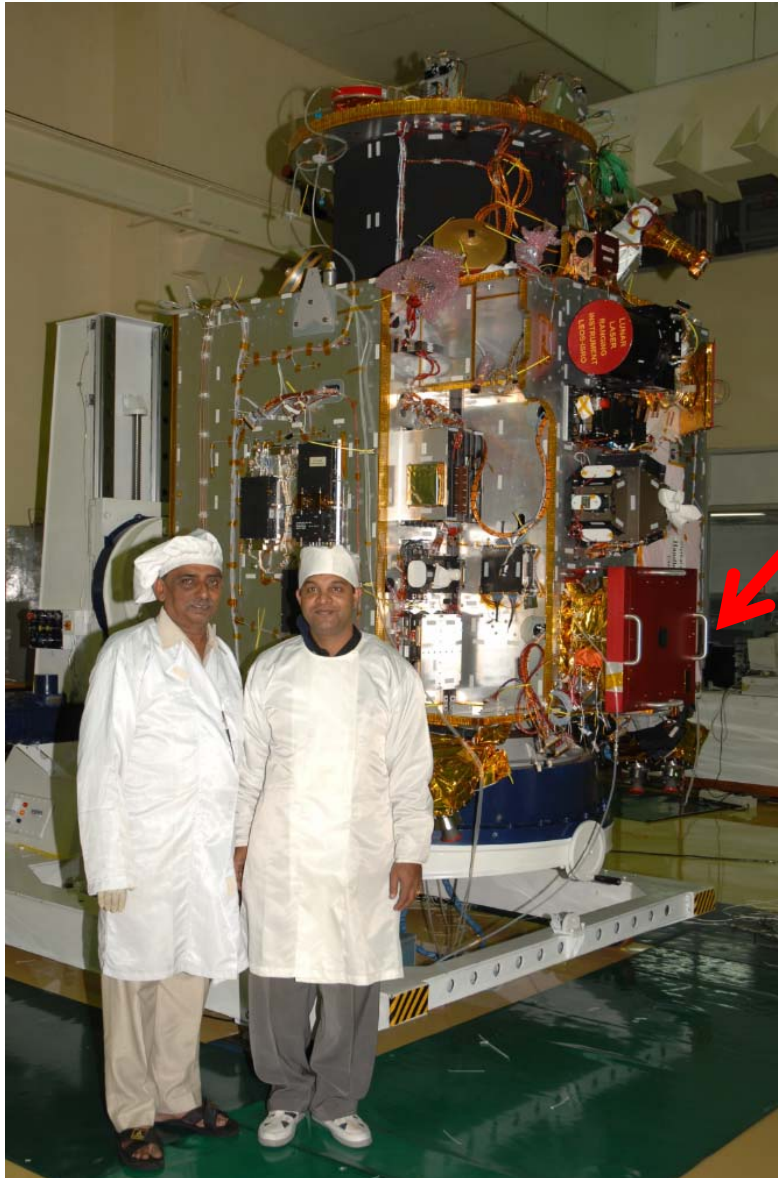
- Mouroulis Offner Design (PPFT)
- Convex e-beam grating (PPFT)
- 6604a MCT full range detector array, multiplexor & signal chain (PPFT)
- Uniform slit (PPFT)
- 0.5 micron adjustment mounts lockable for flight
- Aligned to 95% cross-track uniformity (PPFT)
- Aligned to 95% spectral IFOV uniformity (PPFT)
- Meets high SNR requirements (PPFT)
- Passive radiator (PPFT)

Mass 8 kg, Power 15 Watts





M3 NASA Imaging Spectrometer



- Launch scheduled
- 22 Oct 2008 (21st 5:52pm)
- <http://Isro.gov.in>
- M3 Installed on spacecraft





Indian Space Research Organisation

Chandrayaan-1 Spacecraft's Orbit Raised

October 23, 2008



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Home

The first orbit-raising manoeuvre of Chandrayaan-1 spacecraft was performed at 09:00 hrs Indian Standard Time (IST) this morning (October 23, 2008) when the spacecraft's 440 Newton Liquid Engine was fired for about 18 minutes by commanding the spacecraft from Spacecraft Control Centre (SCC) at ISRO Telemetry, Tracking and Command Network (ISTRAC) at Peenya, Bangalore. With this engine firing, Chandrayaan-1's apogee has been raised to 37,900 km, while its perigee has been raised a little, to 305 km. In this orbit, Chandrayaan-1 spacecraft takes about 11 hours to go round the Earth once.

Chandrayaan-1, India's first spacecraft to Moon, was successfully launched by PSLV-C11 yesterday (October 22, 2008) from Satish Dhawan Space Centre SHAR, Sriharikota. The launch vehicle placed Chandrayaan-1 in an elliptical orbit with a perigee (closest point to the earth) of 255 km and apogee (farthest point to earth) of 22,860 km. In this initial orbit, Chandrayaan-1 orbited the Earth once in about six and a half hours. Following its successful launch, the SCC acquired the first signals and conducted preliminary operations on Chandrayaan-1. The Deep Space Network (DSN) at Byalu tracked the spacecraft in this orbit and received signals in S and X band and has sent commands to the spacecraft.



All systems onboard the spacecraft are functioning normally. Further orbit raising maneuvers are planned in the coming few days.