Status of AVIRIS Next Generation and Technologies Validated for the HysplRI VSWIR Instrument Concept

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Overview

- Science Objectives
- AVIRIS-classic and AVIRIS-NG Measurement Characteristics
- AVIRIS-NG Concept
- AVIRIS-NG Current Development Status
- Summary and Conclusion

Science Objectives

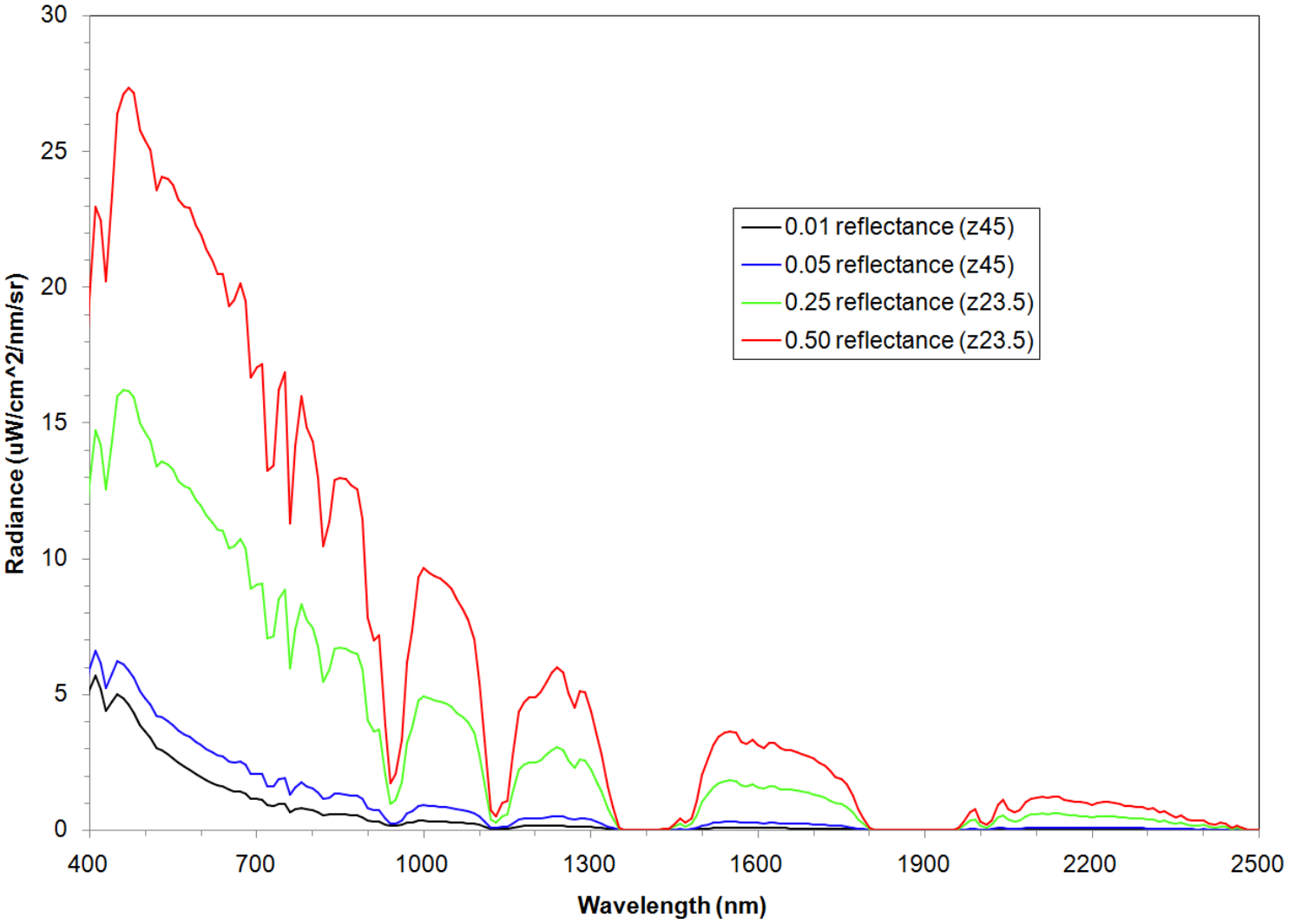
- Support imaging spectroscopy based NASA Earth science and science applications
- Test imaging spectrometer elements that may be used in space instruments
- Provide a calibration/validation under flight resource for HyspIRI

AVIRIS Next Generation Compared to AVIRIS

	AVIRIS-Next Generation	AVIRIS-Classic
SPECTRAL		
Range	380 to 2510 nm	380 to 2500 nm
Position	5 nm	10 nm
Response	1 to 1.5 X sampling	1 to 1.5 X sampling
Calibration	+-0.1 nm	+-0.1 nm
RADIOMETRIC		
Range	0 to max Lambertian	0 to max Lambertian
Precision (SNR)	>2000 @ 600 nm	>1000 @ 600 nm
	>1000 @ 2200 nm	>400 @ 2200 nm
Accuracy	95% (<5% uncertainty)	90% (<10% uncertainty)
Linearity	>=99% characterization	>=99% characterization
SPATIAL		
Range	34° field-of-view	34° field-of-view
Sampling	1 milliradian	1 milliradian
Response	1 to 1.5 X sampling	1 to 1.5 X sampling
Sample Distance	0.3 m to 20 m	4 m to 20 m
Geom Model	Full 3 Axes cosines	Full 3 Axes cosines
UNIFORMITY		
Spectral Cross-Track	>95% across FOV	>98% across FOV
Spectral-IFOV-Variation	>95% Spectral Direction	>98% Spectral Direction

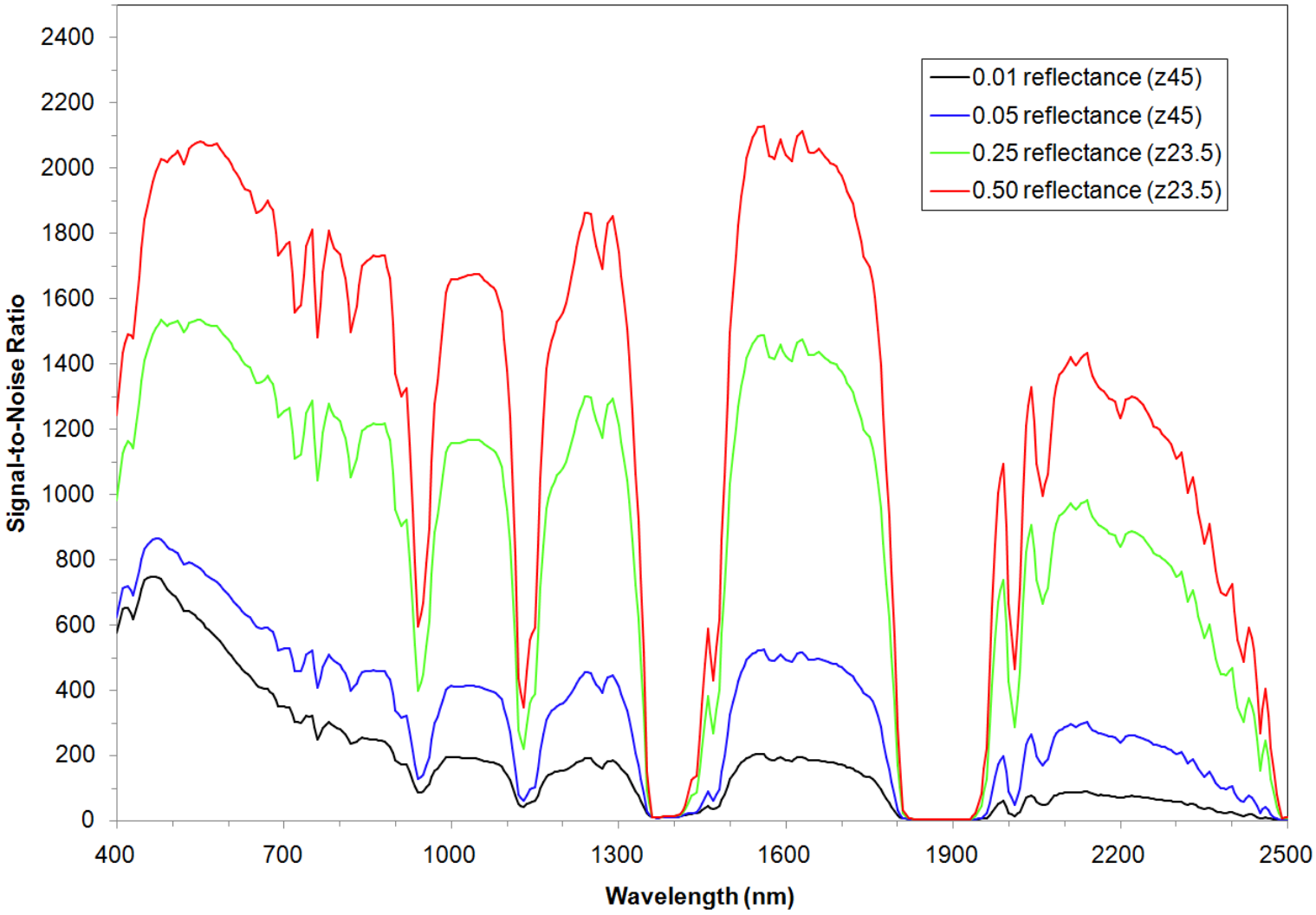
NGIS Reference Radiances

Reference Radiances for SNR Benchmark



NGIS SNR Modeled Performance

SNR at 10 nm and AVIRIS scan line rate

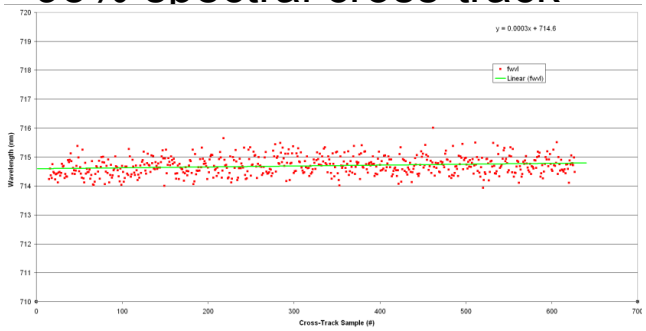


AVIRIS-NG Uniformity

Depiction

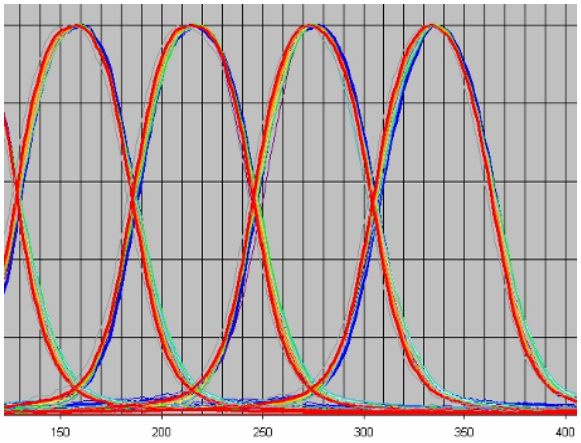
-Grids are the detectors
-Spots are the IFOV centers
-Colors are the wavelengths

>95% spectral cross-track



M3

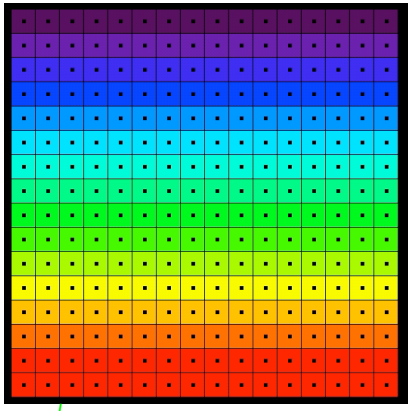
>95% spectral IFOV



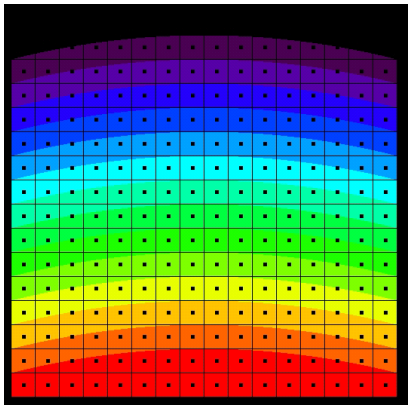
M3

Cross-Track

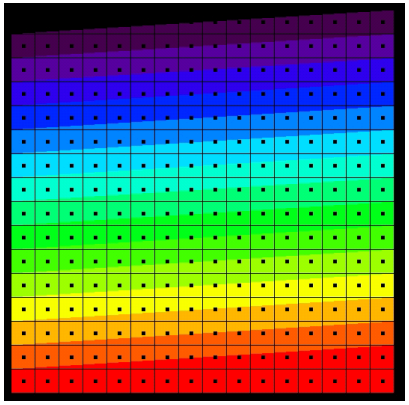
Wavelength (nm)



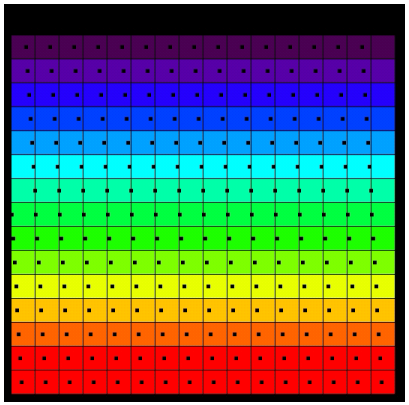
√ Required Uniformity



X Failure by "frown"

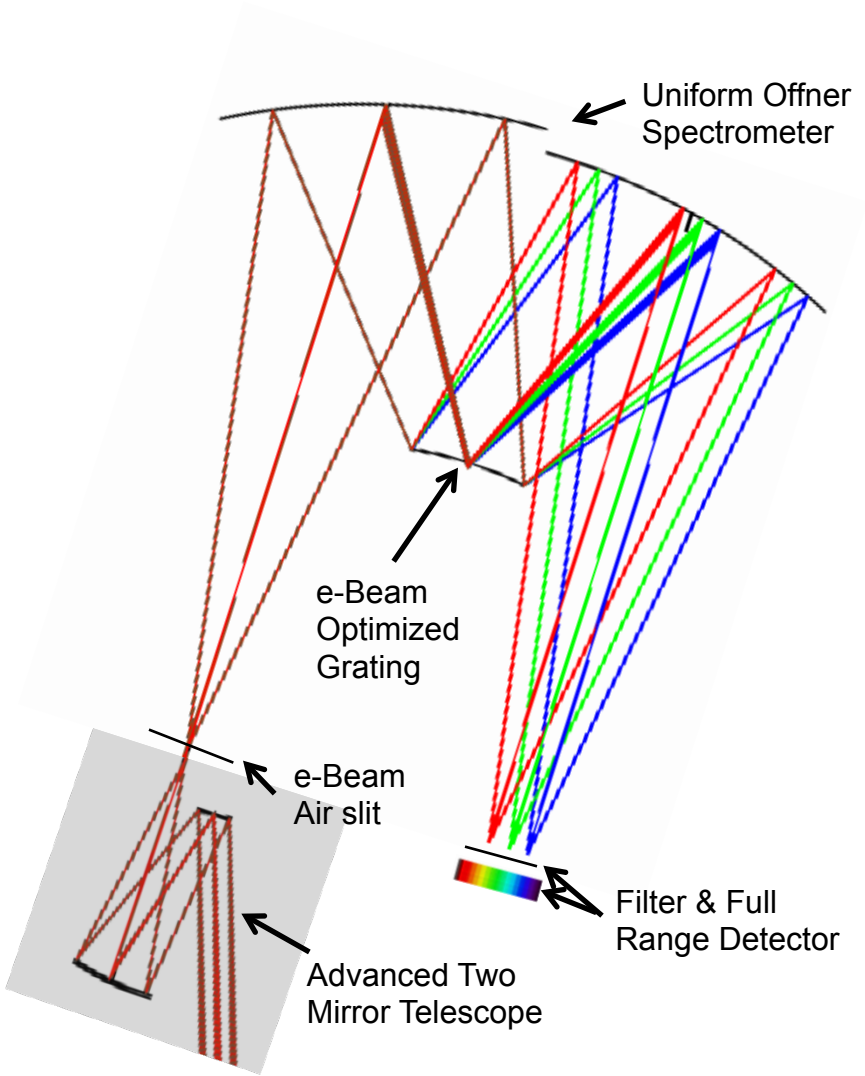


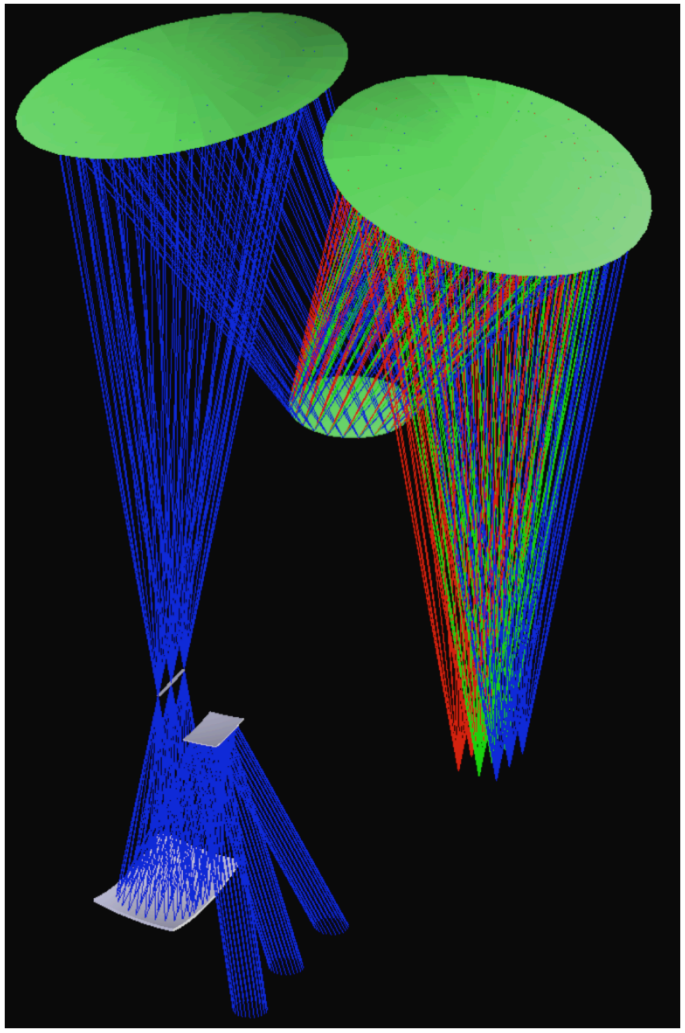
X Failure by twist



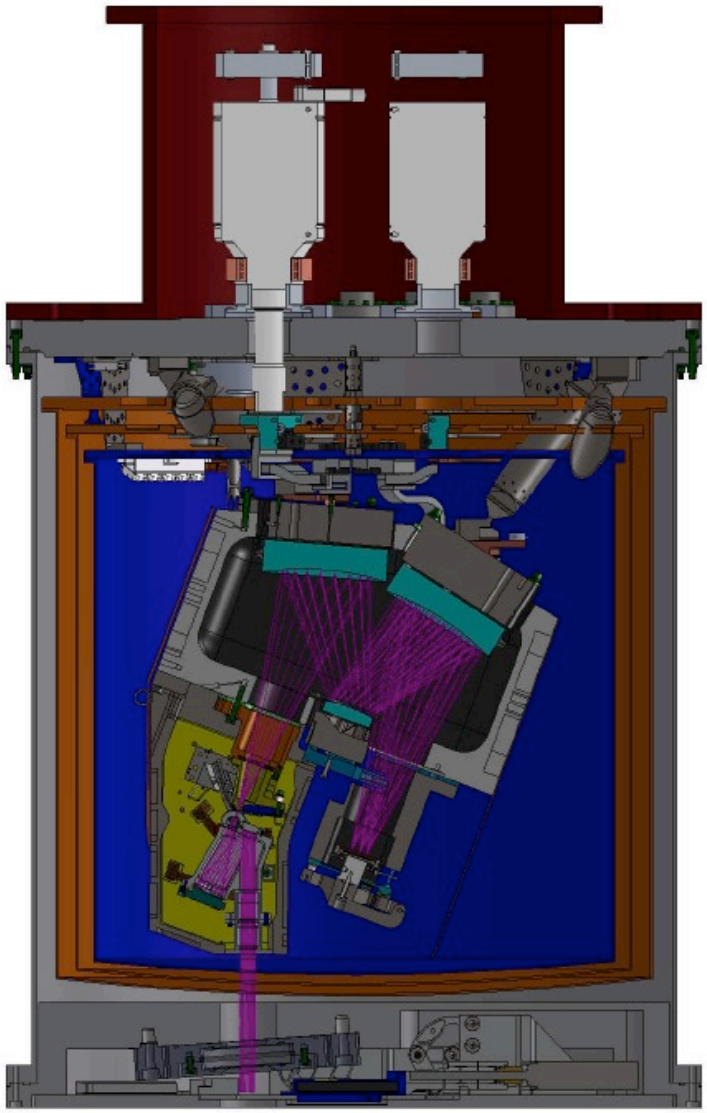
X Failure by Spectral-IFOV-shift

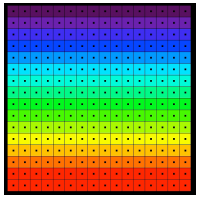
AVIRIS Next Generation Optical Concept



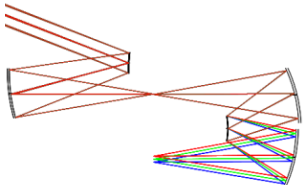


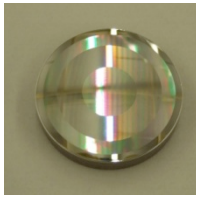
Enabling Elements



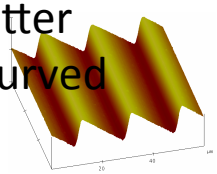


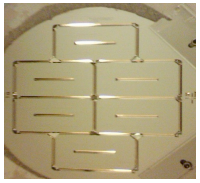
High SNR and high uniformity imaging spectrometer designs (Mouroulis et al., 2000)*



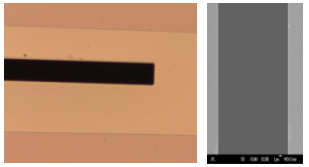


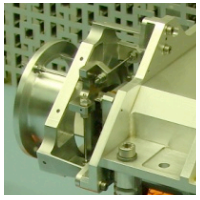
Electron-beam lithography low-scatter tuned-high-efficiency gratings on curved surfaces for space



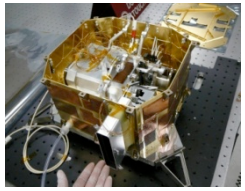


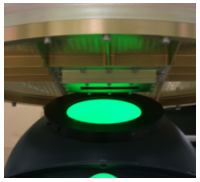
Ultra uniform 27 µm x 20 mm electron-beam lithography slit for space flight



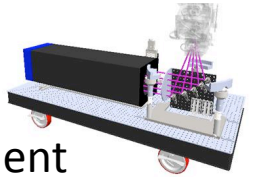


Component mounts with 0.25 micron feedback adjustment that are lockable for space flight



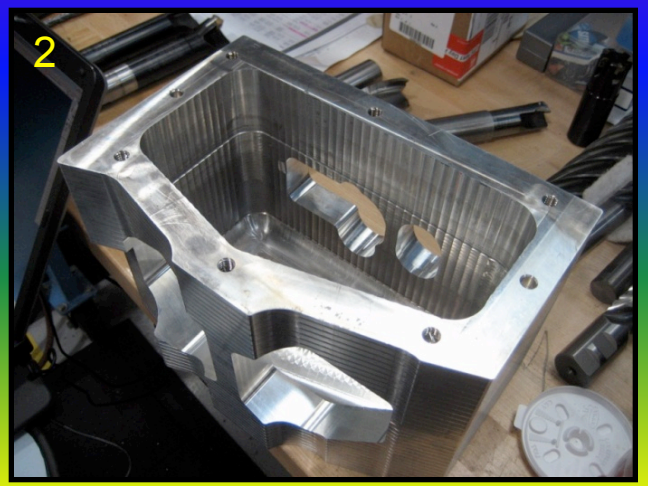


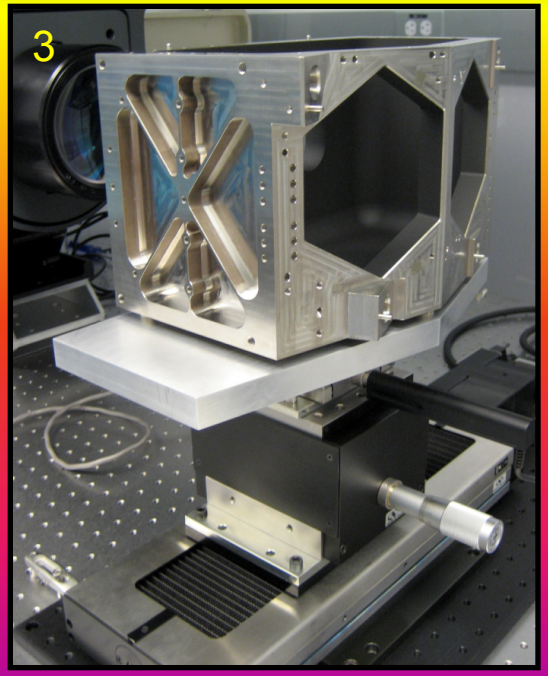
Unique set of alignment and calibration sources and tools for imaging spectrometer development

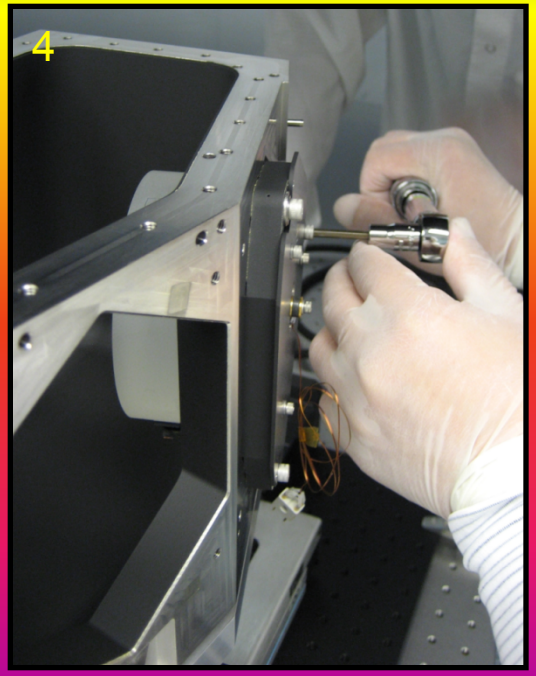


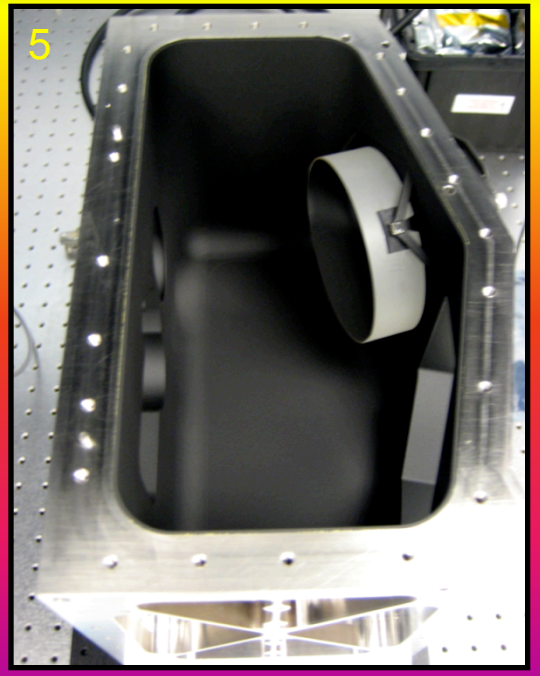
*Mouroulis P., Green R. O., Chrien T. G., “Design of pushbroom imaging spectrometers for optimum recovery of spectroscopic and spatial information,” APPL OPTICS 39: (13) 2210-2220 MAY 1 2000

AVIRIS Next Generation Spectrometer
Installation of First Mirror

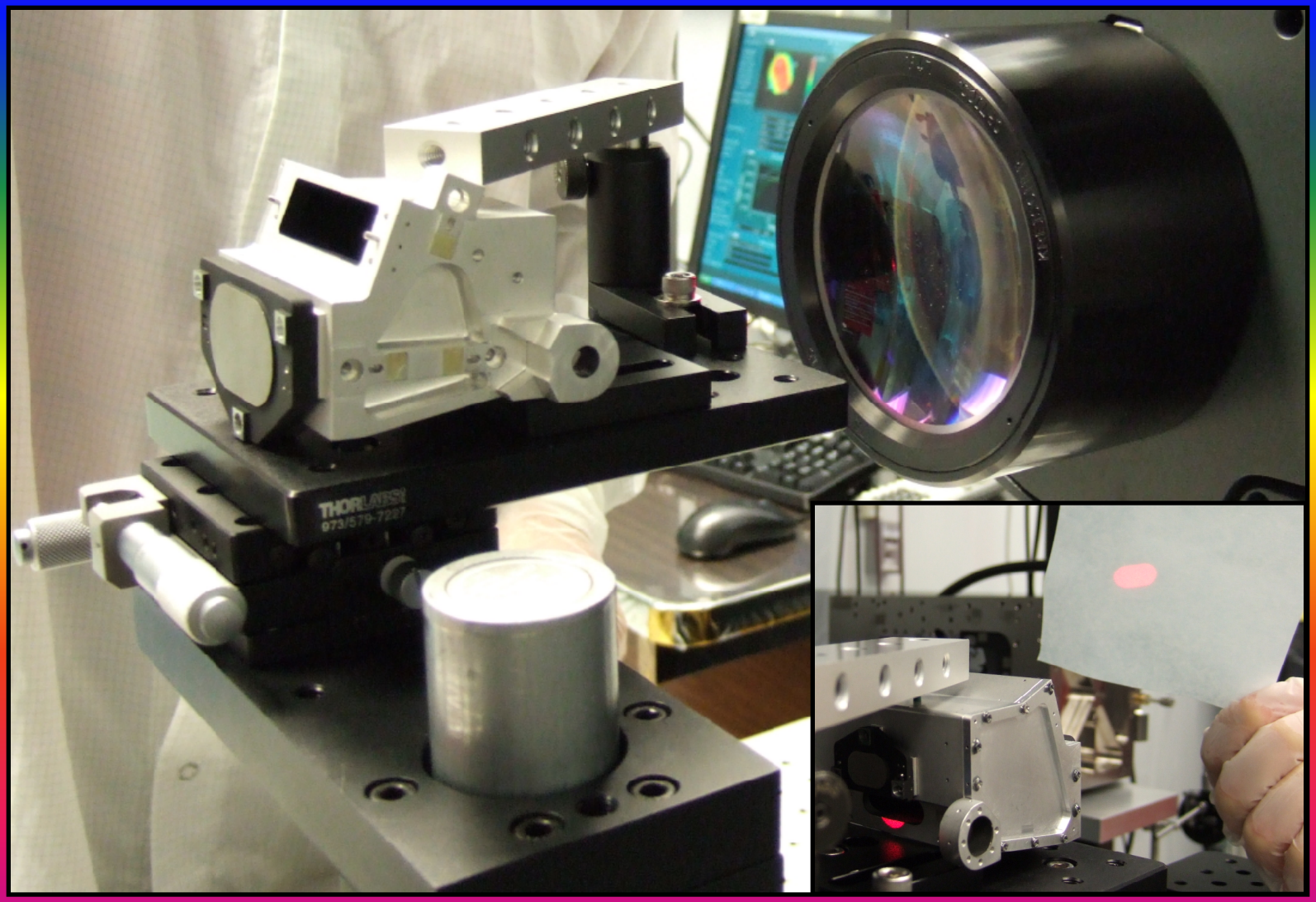








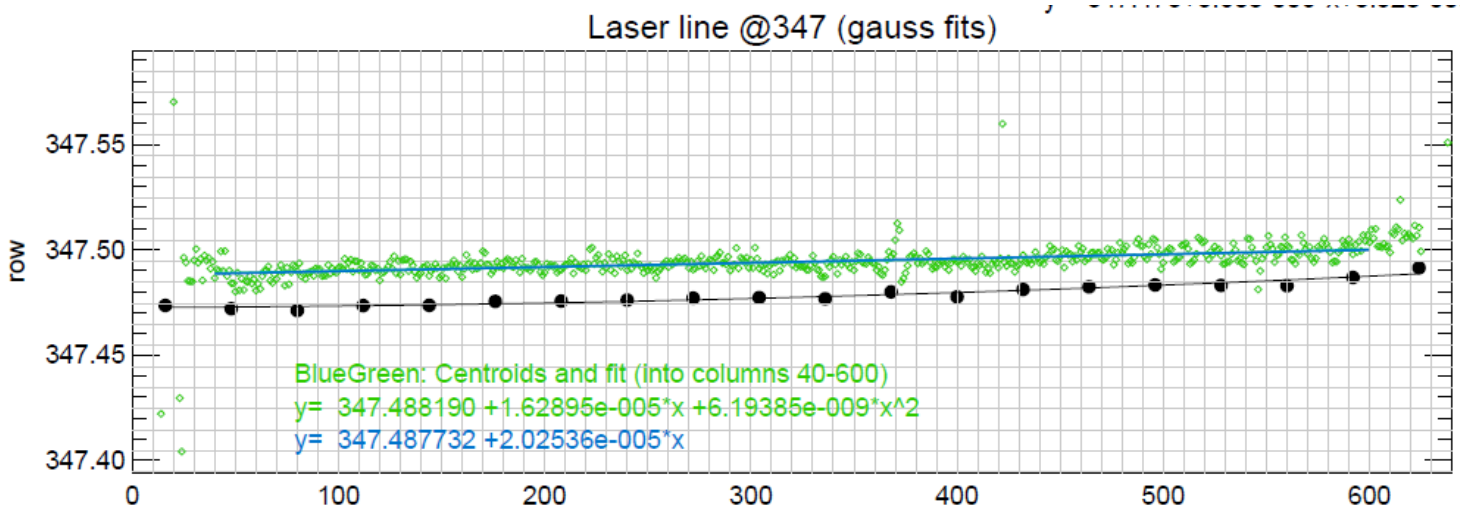
AVIRIS Next Generation Telescope
Fully Aligned

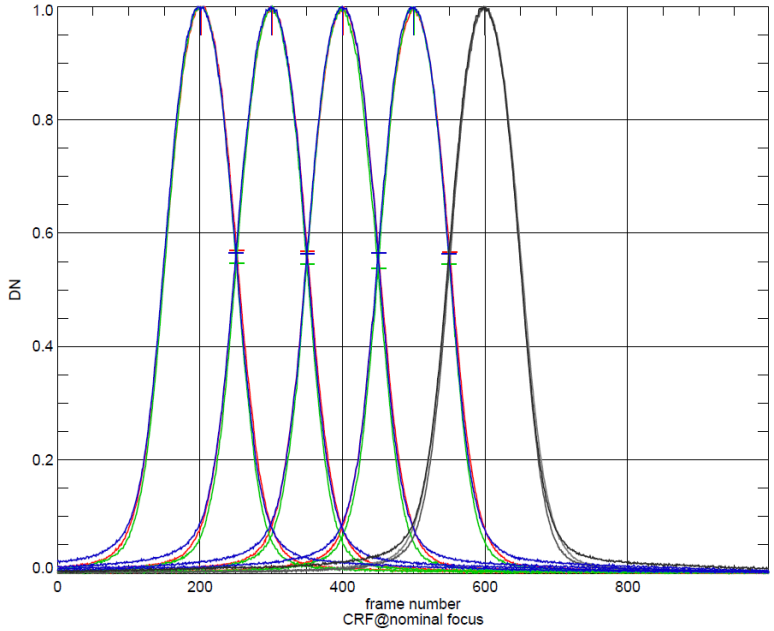


Spectrometer toThermal Shields

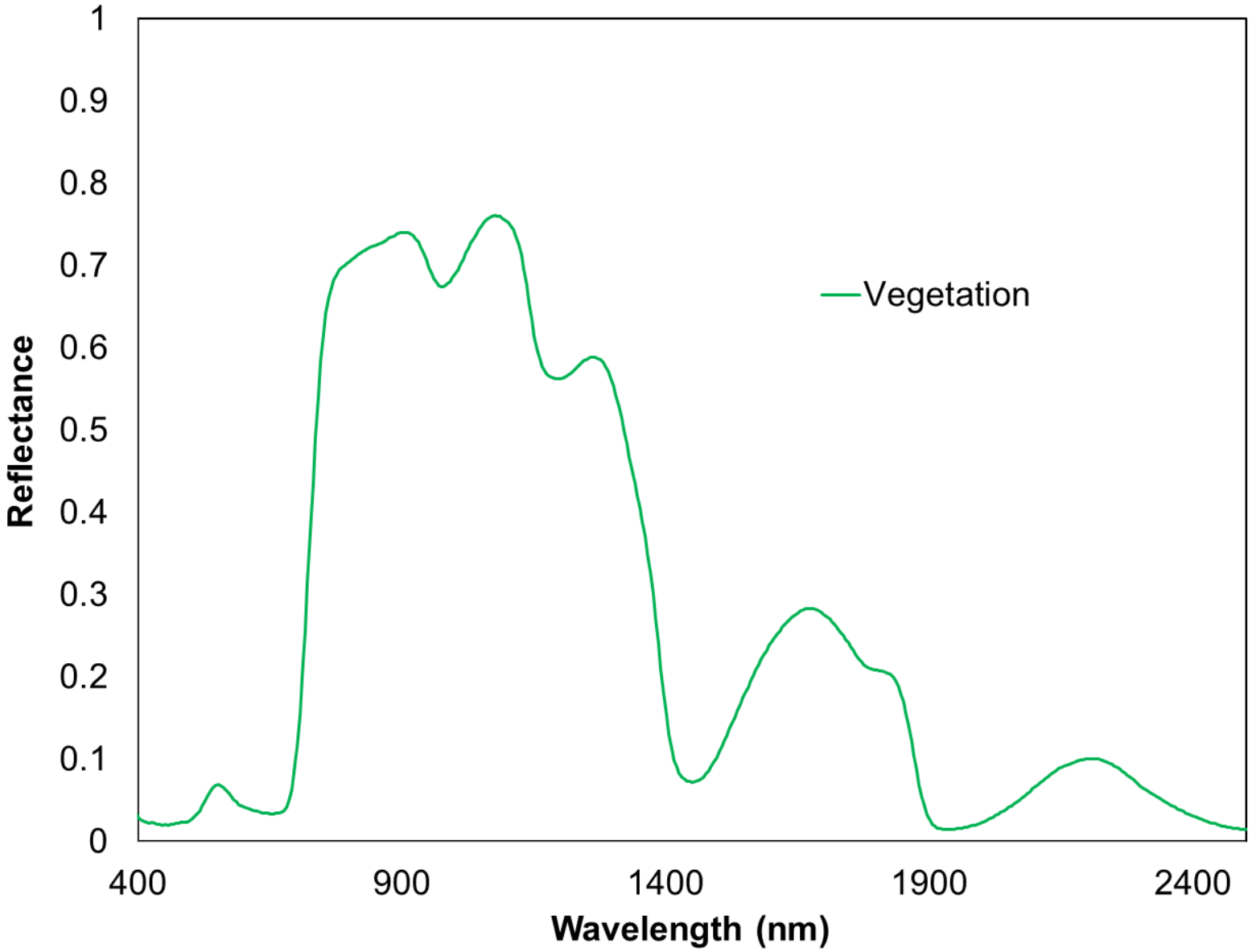
Alignment Understanding

> 95% Uniformity (Precursor Instrument)



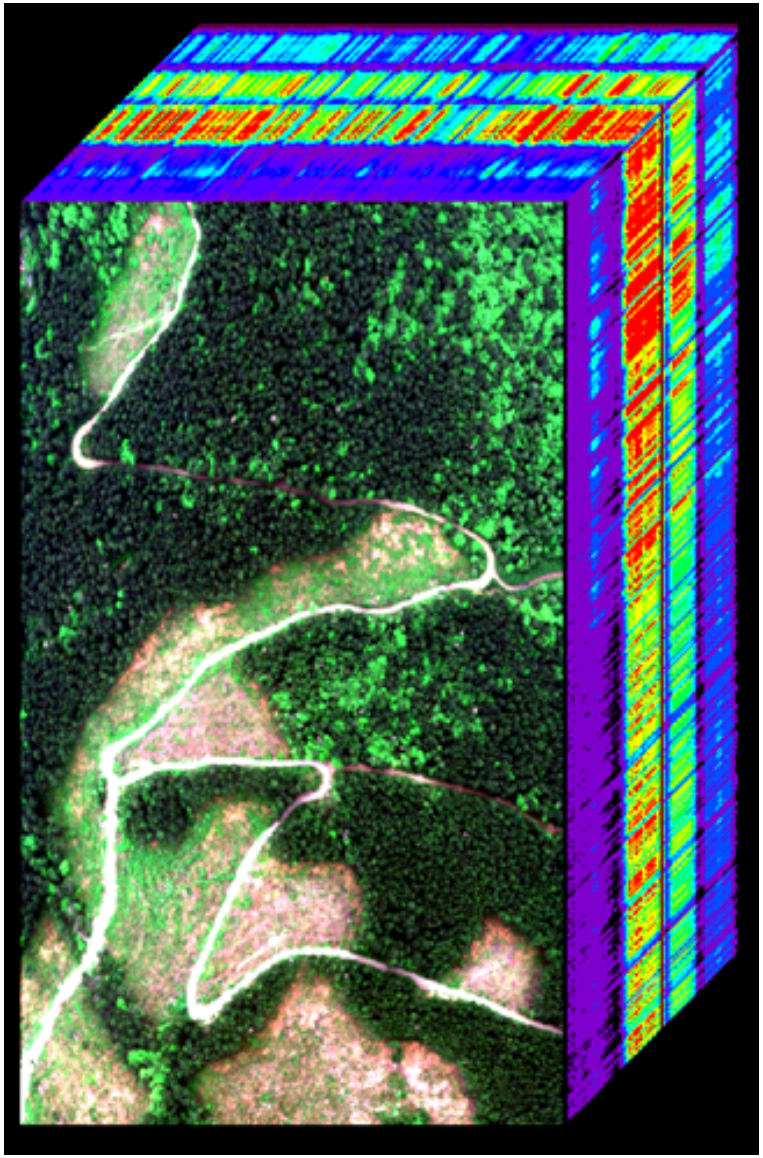


Laboratory Test Spectrum

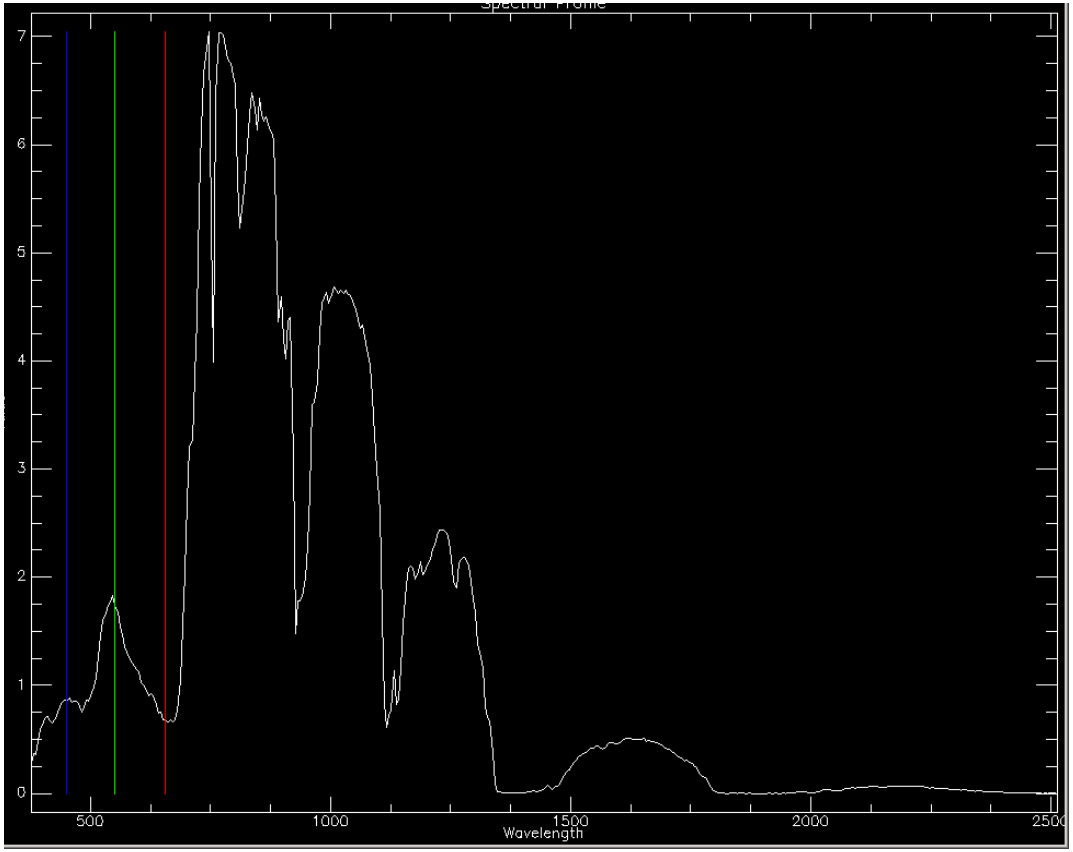


Precursor to AVIRIS-NG in Testing

Measurements from the Precursor Imaging Spectrometer



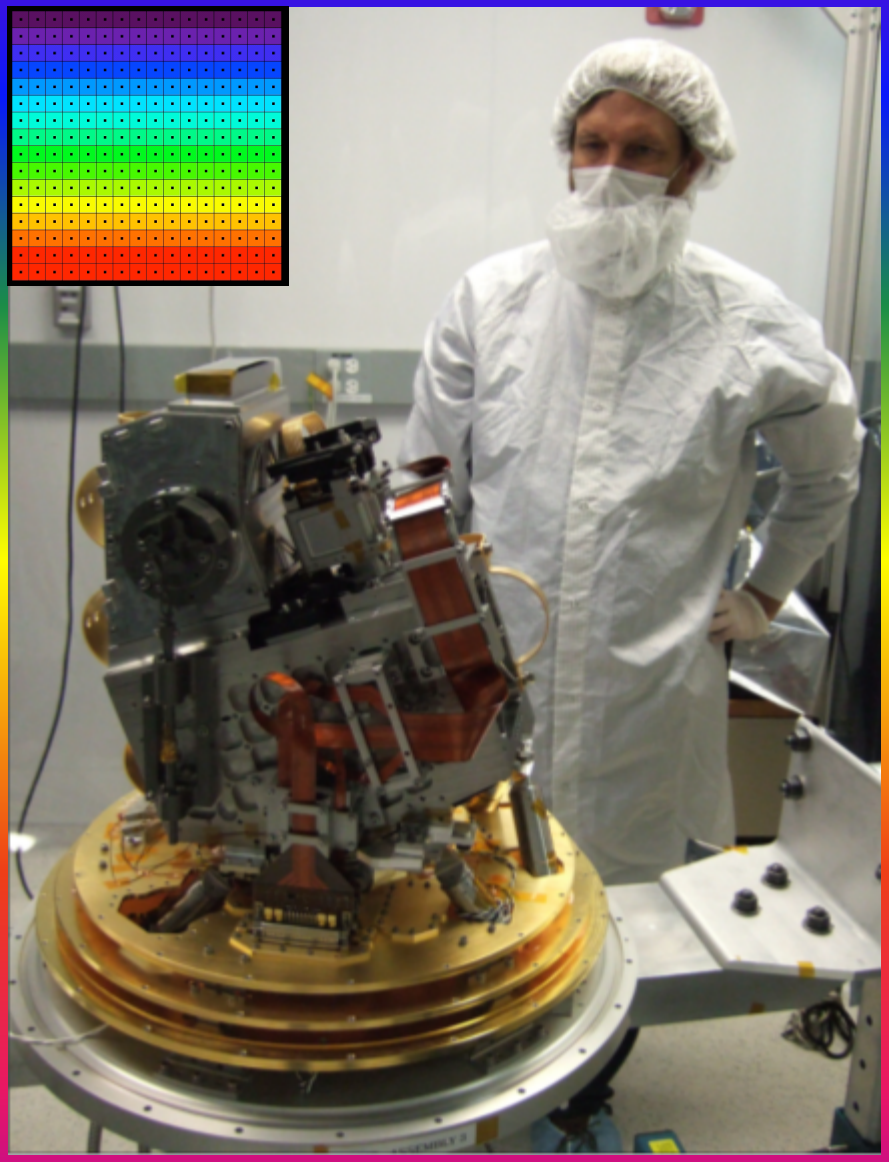
Full solar reflected spectral range 380 to 2500 nm at 5 nm
95% spectral cross-track and IFOV uniformity
High signal-to-noise ratio

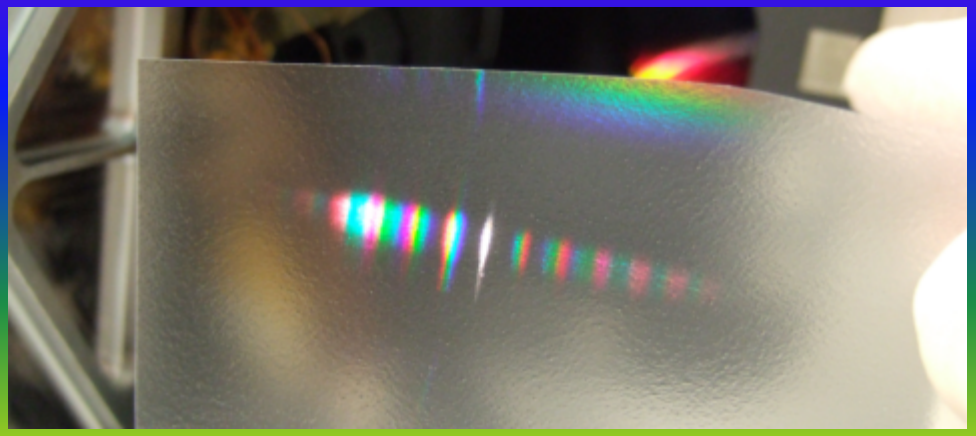


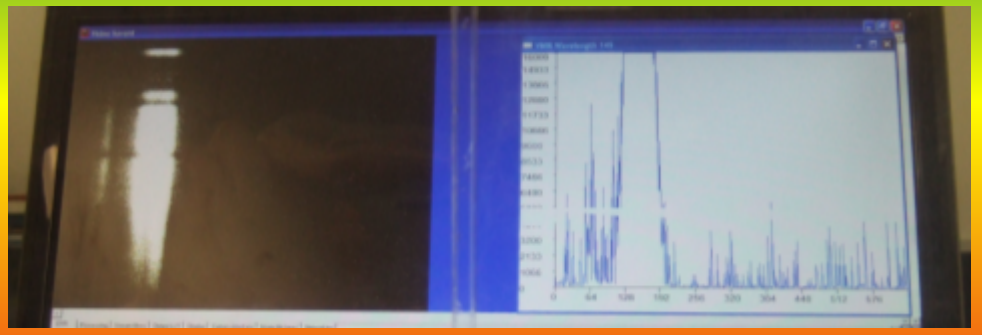
Summary and Conclusion

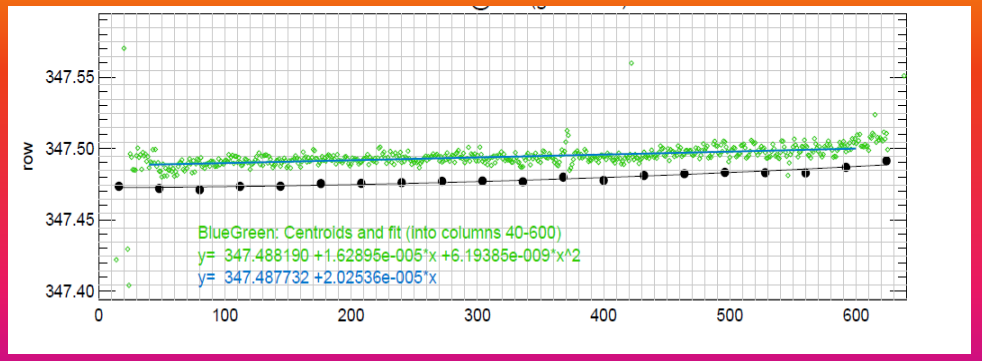
- AVIRIS-NG development is nearly complete.
- AVIRIS-NG is on track to begin cold alignment and then calibration.
- At present all of the requirements are on track to be met.
- Test flights of AVIRIS Next Generation should occur in the Autumn of 2011.
- AVIRIS-NG is expected to be available in 2012 for science validation activities

QUESTIONS?








347.55
347.50
347.45
347.40
row
0
100
200
300
400
500
600
BlueGreen: Centroids and fit (into columns 40-600)
y= 347.488190 +1.62895e-005*x +6.19385e-009*x^2
y= 347.487732 +2.02536e-005*x