HyspIRI Instrument Concept - VSWIR

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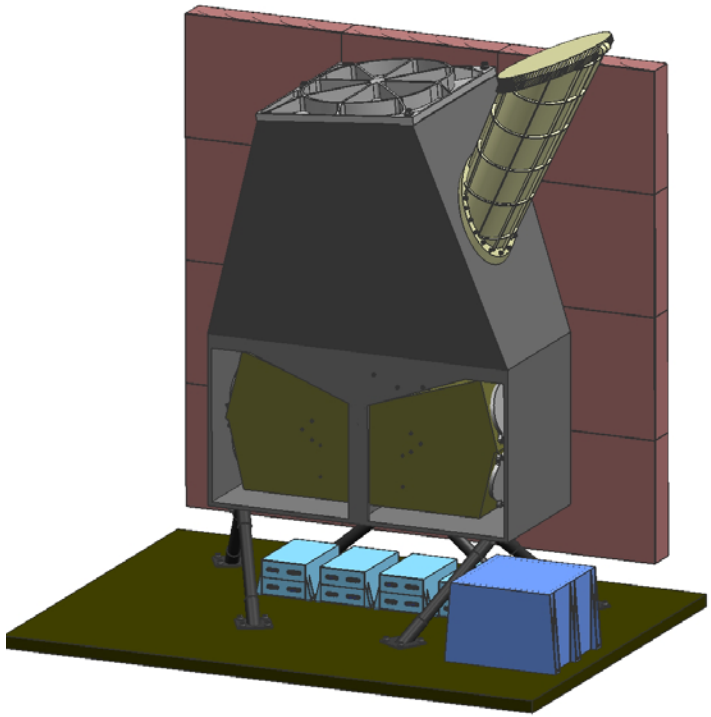
Outline

1. *Key Requirements & Performance*
2. *An Instrument Concept Overview*
3. *Concept's Key Technology*
4. *Technology Readiness & Heritage*
5. *Ongoing Concept Trades*

HyspIRI - VSWIR



Mass (CBE) 66Kg
Power (Ave.) 41Watts

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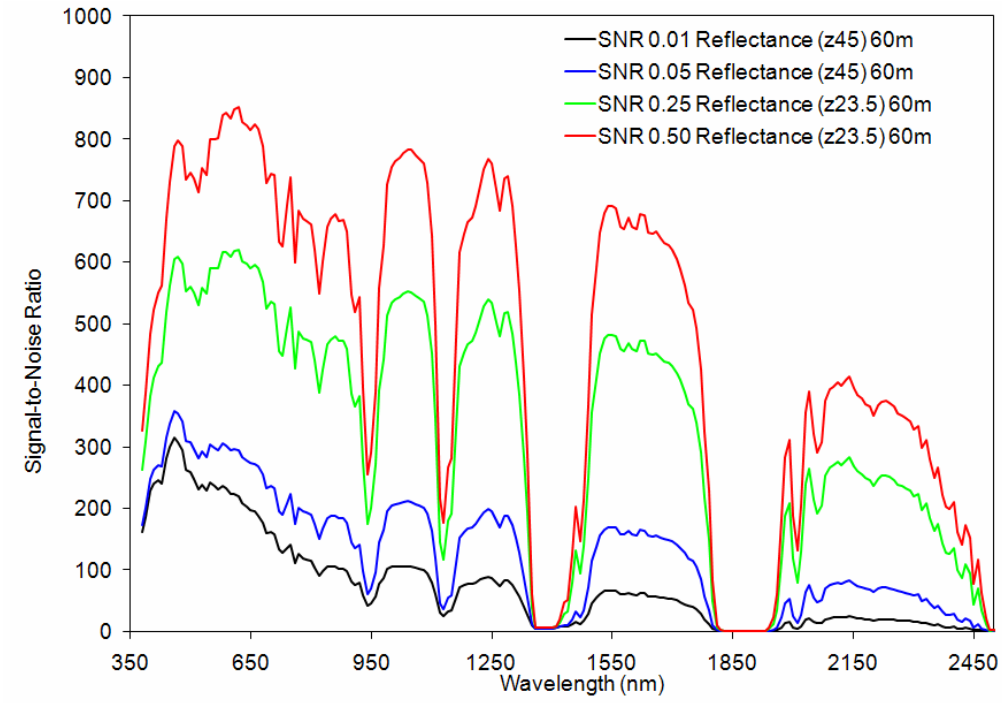
VSWIR Requirements & Performance

Spectral

Range	380 to 2500 nm
Sampling	10 nm

Radiometric

Sampling	14 bit
Signal-to-Noise ratio	



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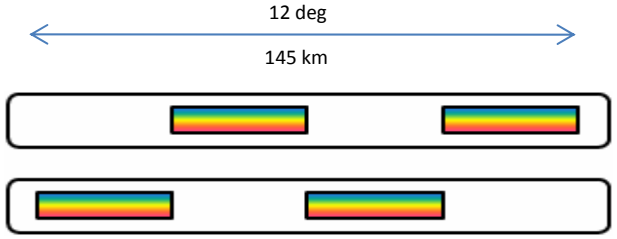
VSWIR Requirements & Performance

Spatial

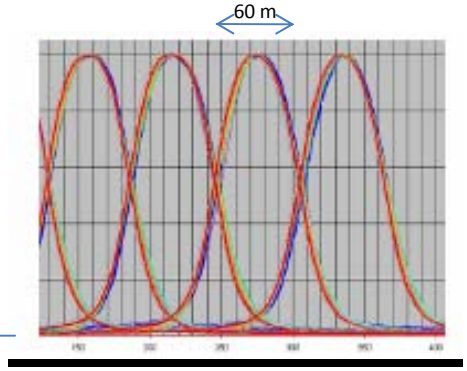
Field-of-View/ Spatial swath	12 deg/145 km
IFOV/ Spatial Sample	86 μrad/60m (GSD)

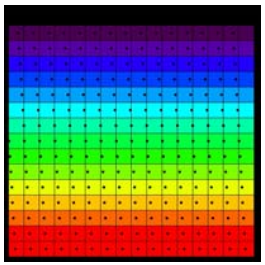
Uniformity

Spectral-Spatial	>95% (0.5 nm)

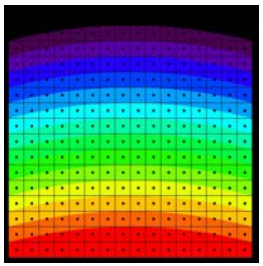


Four detector arrays (640 x 480 pixel) cover the FOV

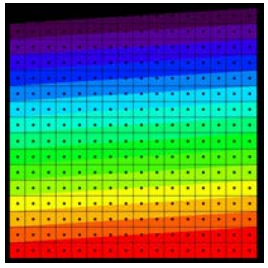




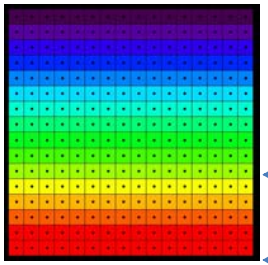
X Spectral-IFOV shift



X Failure by "frown"



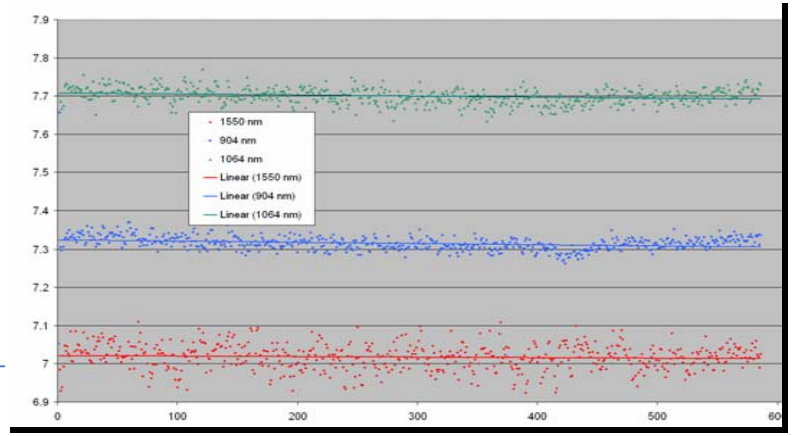
X Failure by twist



√ **Required Uniformity**

Pushbroom Uniformity Depiction

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



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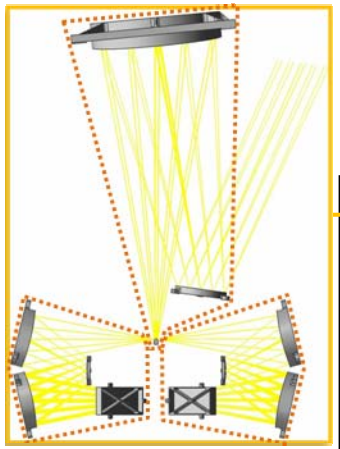
A VSWIR Instrument Concept

Optics

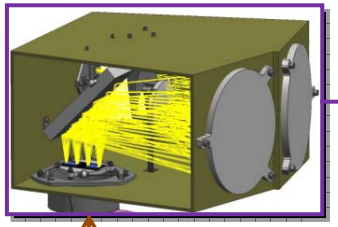
• Front End Telescope
consists of a primary spherical mirror and a secondary aspherical mirror

• Back End Spectrometers
consist of 2 optimized Offner spectrometers



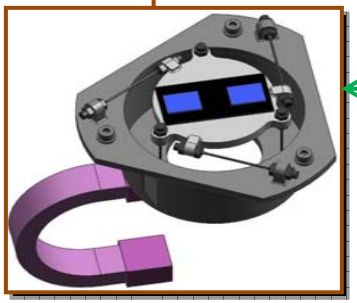
Spectrometers (2x)

- 2 identical Offner spectrometers
- Each contains:
  - E-Beam grating
  - Si air slits
  - FPA assembly



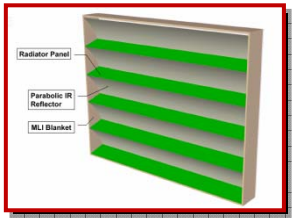
FP A (2x)

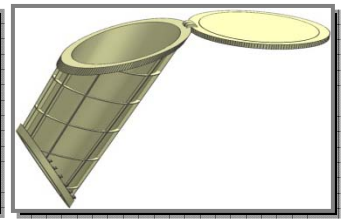
- Mount is adjustable in 6 DOF
- Thermal strap connects mount to radiator
- Each assembly contains two Teledyne 6604a detector arrays
- Includes integral OSF

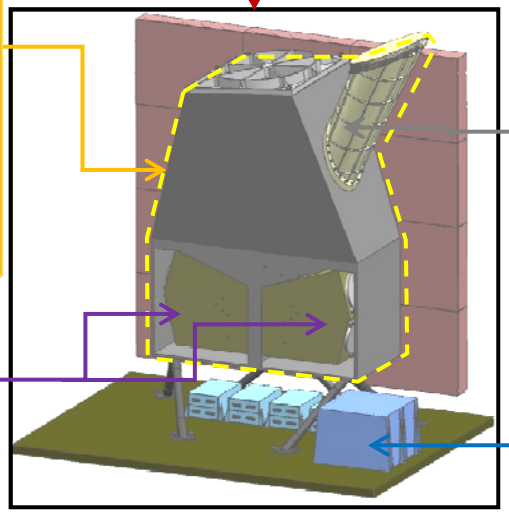


Radiator

- Area 1.4m²
- M3 heritage; 4x larger





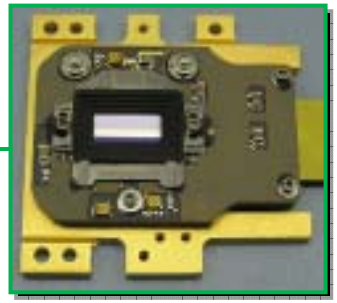


Baffle/Cover

- *Launch cover*
- *Used as a solar reflectance calibration target*

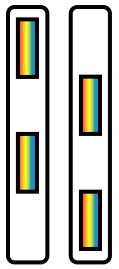
Electronics Boxes

- M3 Derivative
- Electra module with:
  - SPARC processor
  - FPGAs for his-speed compression in logic
- Compressed data sent to s/c via LVDS interface



Detectors (4x)

- Teledyne 6604a detectors; full flight heritage from M3.
- Analog I/O
- Each spectrum readout as snapshot, so that there is no time delay, yaw, or jitter impact to the spectral-IFOV-uniformity.



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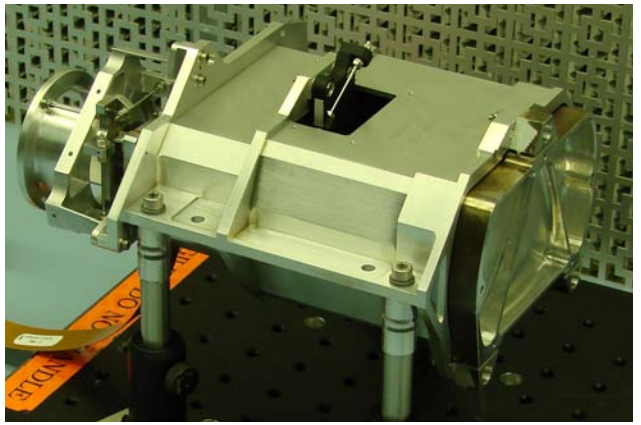
Concept's Key Technologies are Proven

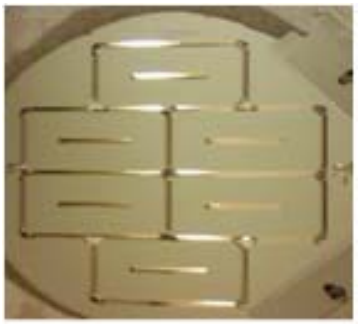
1. Spatially and spectrally uniform Offner spectrometer

2. Finely adjustable optics and detector mounts that can be locked within fraction of a micron (< 0.1 microns)

3. Electron beam fabricated convex gratings with large ruling period (>> λ)

4. Electron beam fabricated air slits (non-uniformity < .05 microns)





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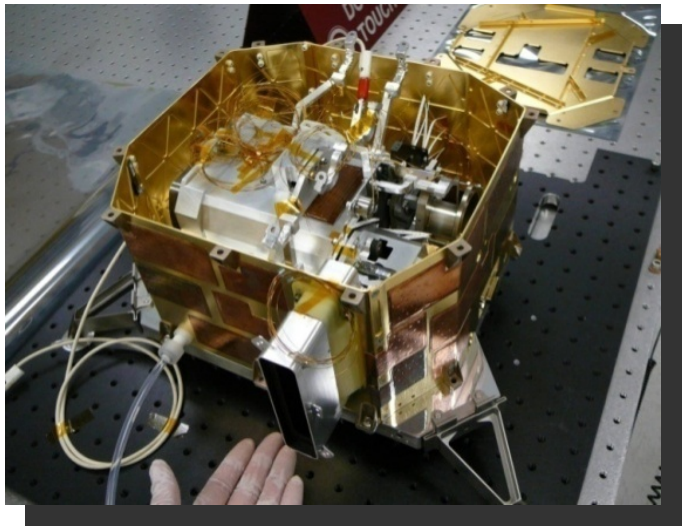
TRL & Heritage for this Concept

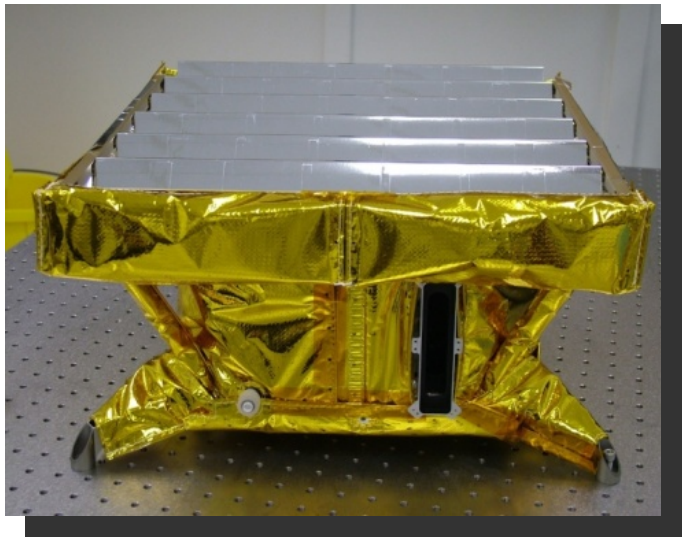
No new technology is <u>required</u>

Technology Readiness Highlights

Key Technology	TRL	Comments
Optimized Spectrometer	9	Flown on M3
Grating	9	Flown on Hyperion, CRISM, M3, ARTEMIS
Detector array	9	Flown on M3, CRISM, ARTEMIS
Uniform Slit	9	Flown on ARTEMIS
Opto-Mechanical (alignment & stability)	9	Flown on M3

M^3 Spectrometer





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Instrument Concept Trades

Ongoing Instrument Concept Trades:

1.Instrument Electronics' Architecture

2.Instrument Sensitivity/Stability Vs. Radiator Area and Mass