

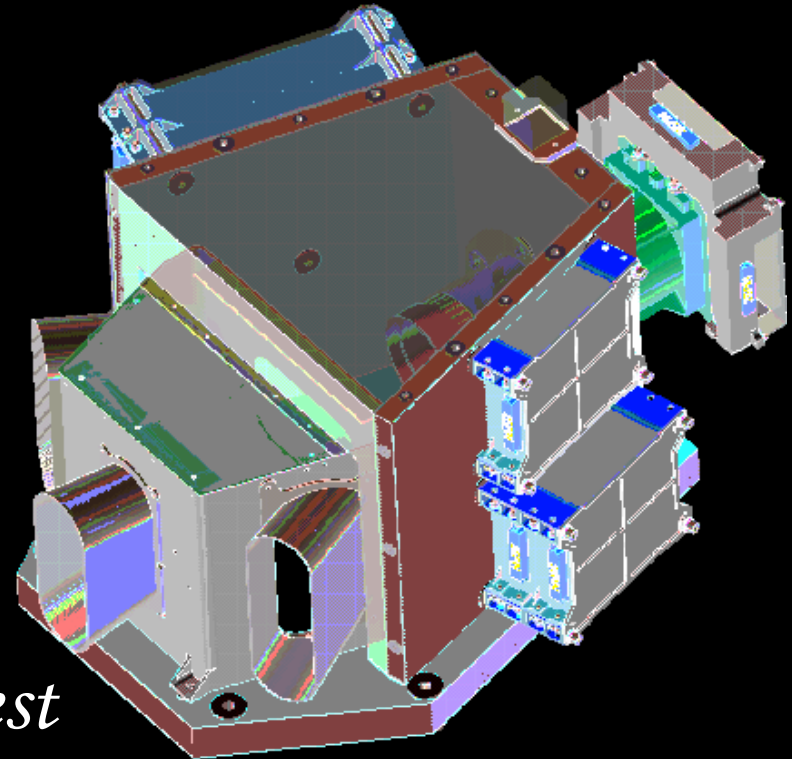
High Resolution Stereoscopic Terrain Mapping Camera of Chandrayaan-1

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Terrain Mapping Camera (TMC)

*Stereoscopic instrument in
Panchromatic band for
Topographic mapping with
high spatial and altitude
resolution.*

- high resolution global map*
- study regions of scientific interest*
- could improve on Moon gravity model*



TMC Viewing geometry

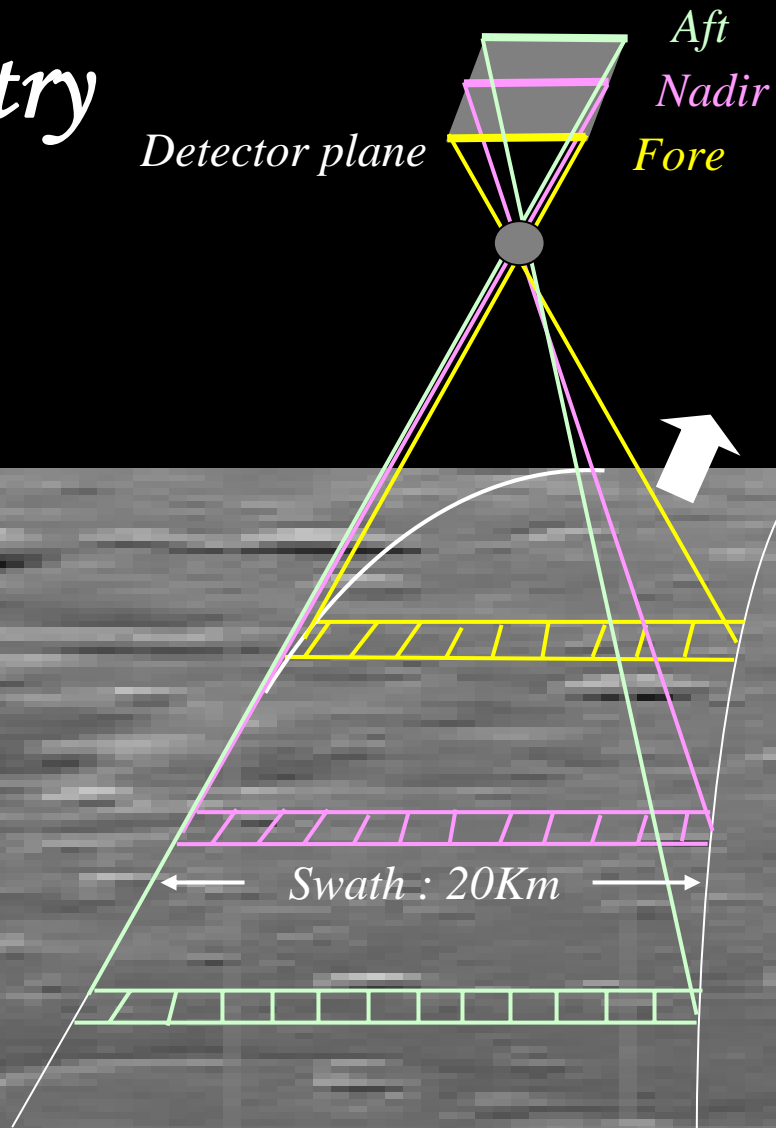
Angular resolution: $50\mu\text{rad}$ (5m)

Along track FOV: $\pm 25^\circ$ (B/H=1)

Panchromatic band 500-850nm

Fore to Aft : 60.3s

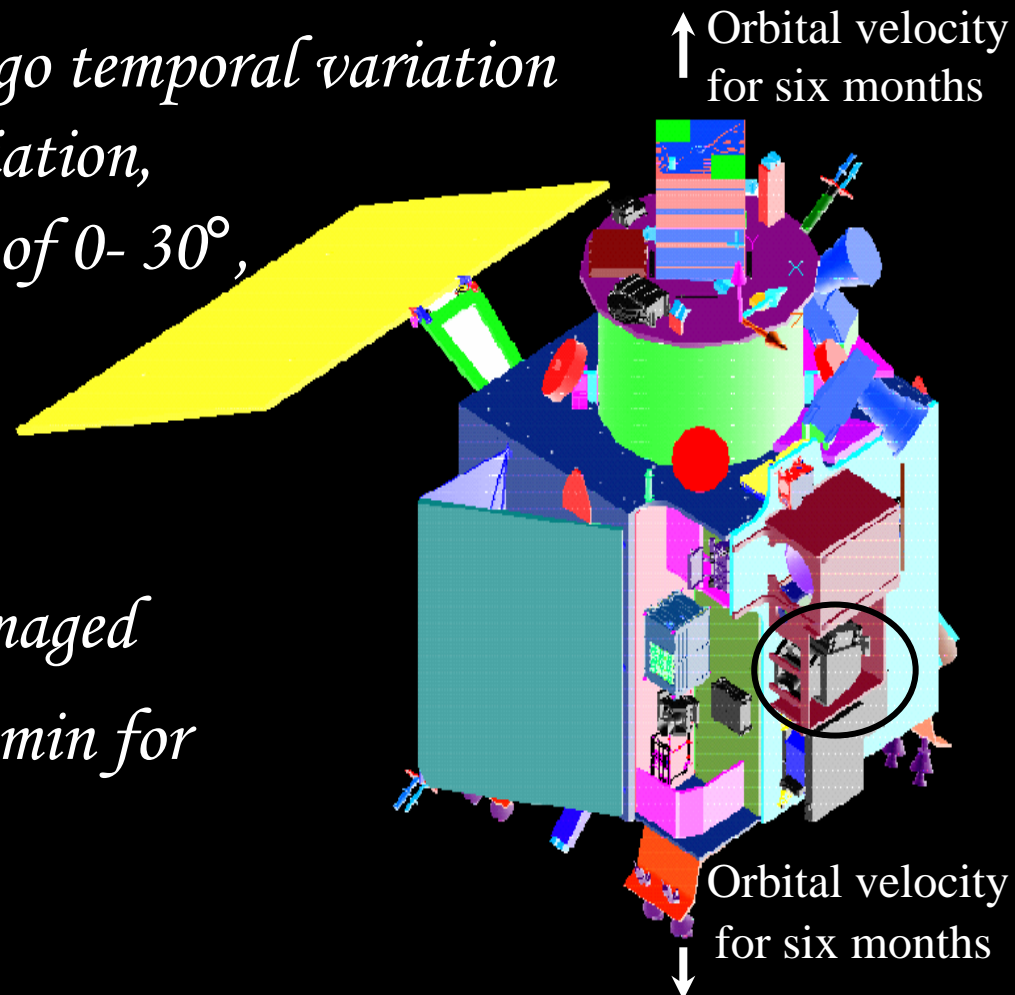
56 pixels due to Moon rotation



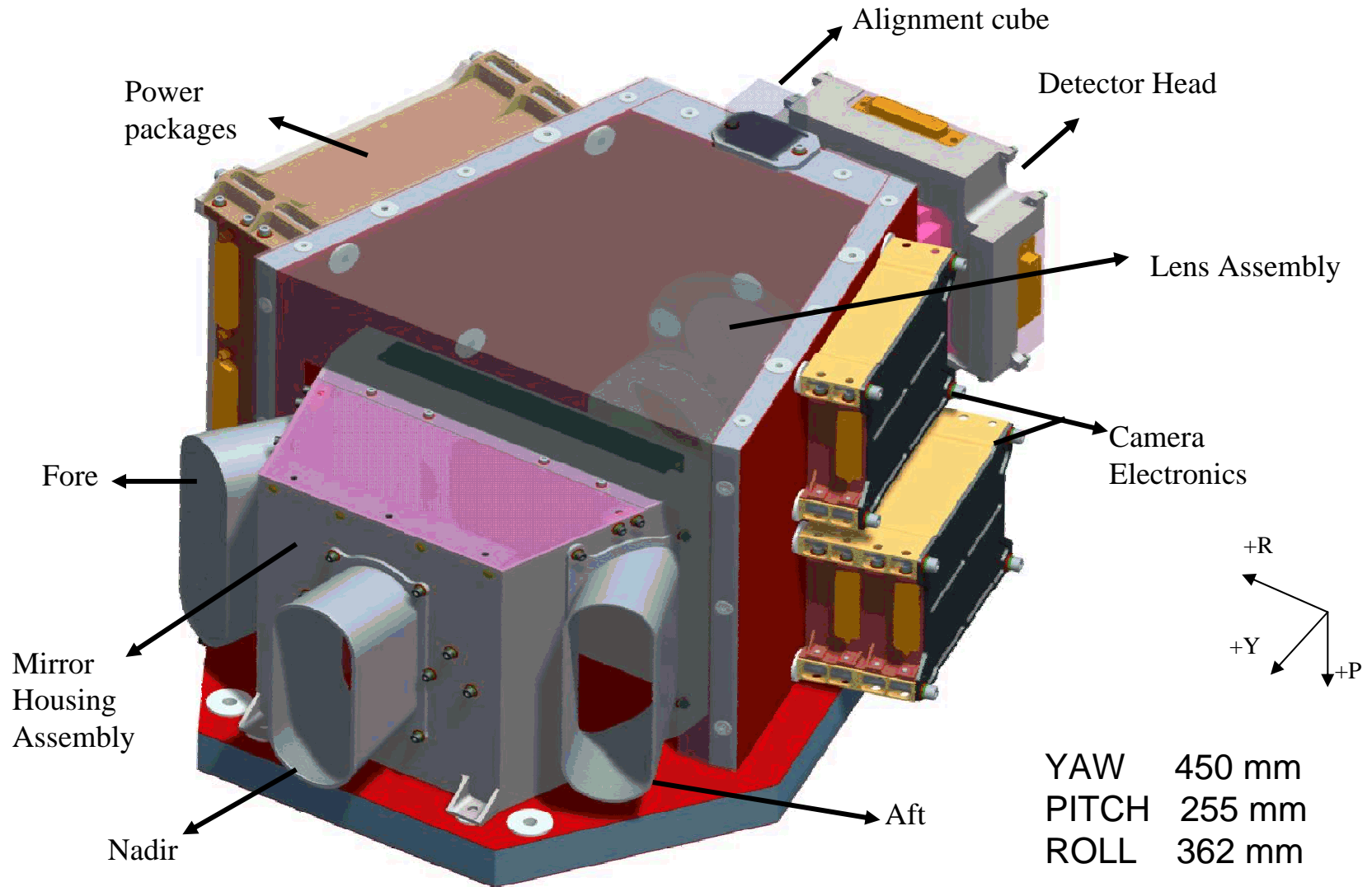
Imaging considerations

Chandrayaan-1 orbit : 100Km polar, non sun-synchronous

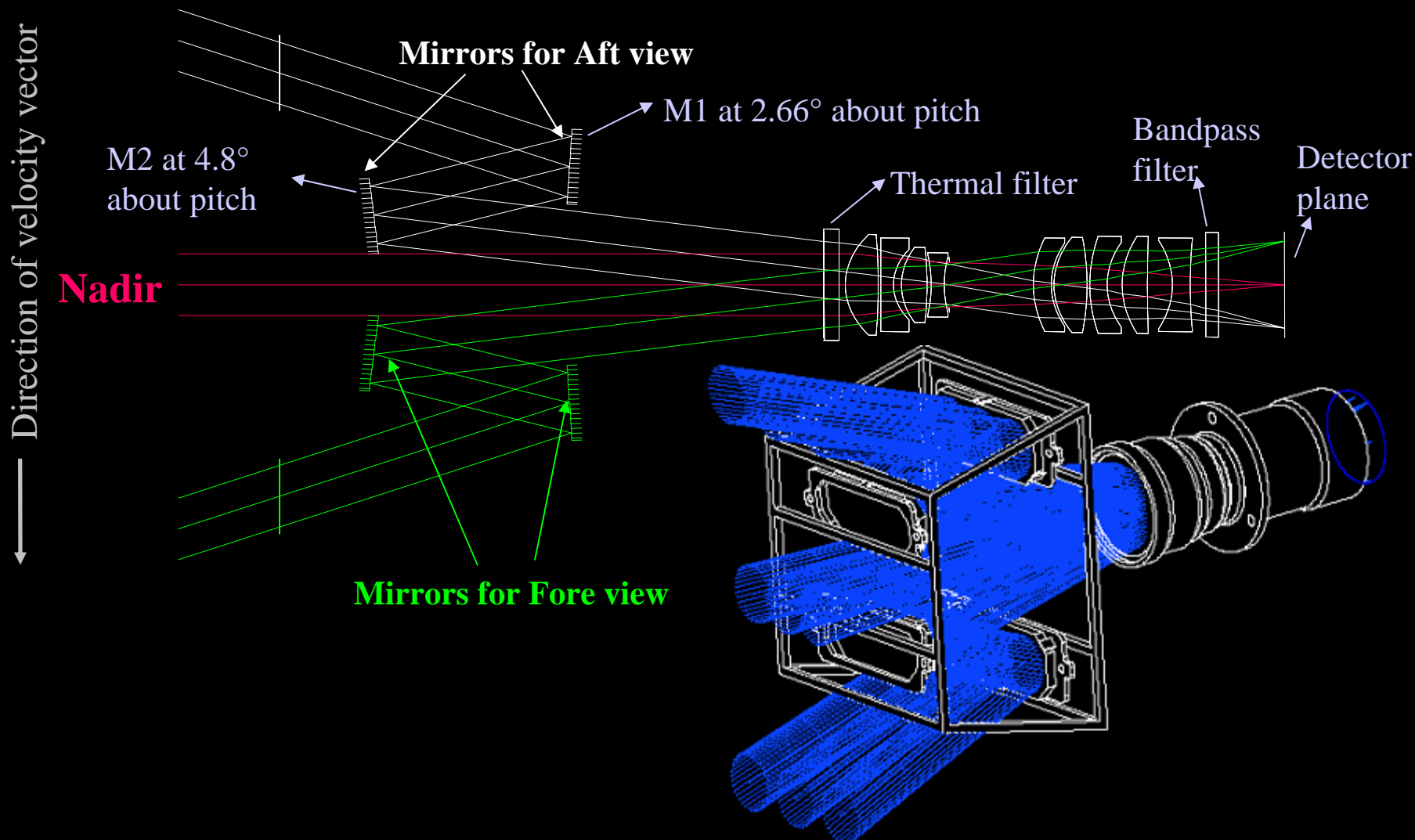
- scene illumination will undergo temporal variation*
- to minimize illumination variation, imaging will be for sun angle of 0- 30°, Prime imaging time.*
- 2 time slots of 60 day/year separated by 4 months*
- at other times Poles will be imaged*
- 20min time for imaging & 50min for transmission (near side)*



TMC view

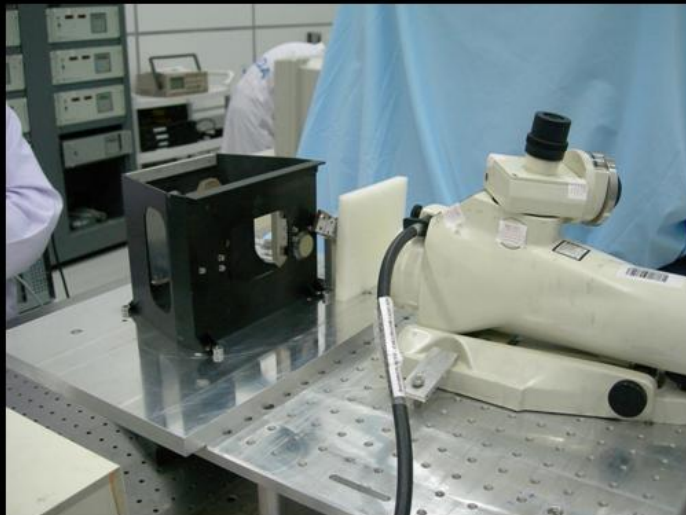
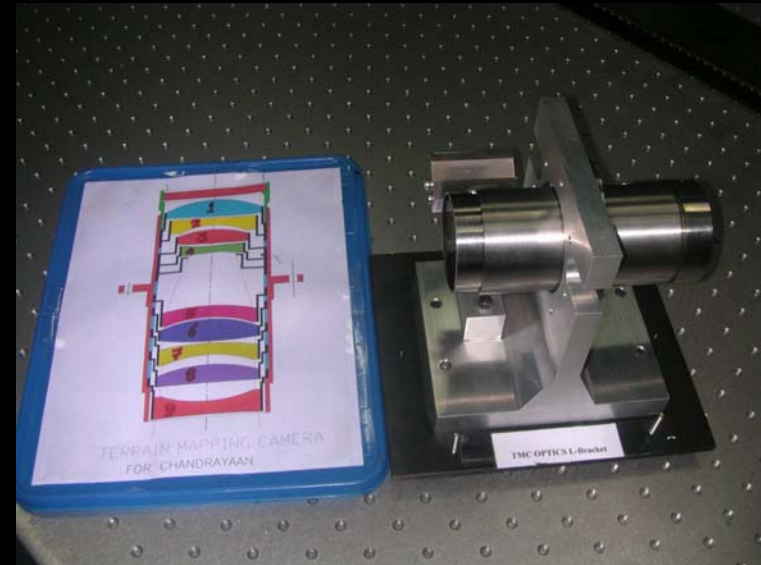


TMC Optics



TMC Optics

- *Spherical, Refractive optics*
- *Single lens assembly*
- *Folding mirrors for $\pm 25^\circ$ FOV*

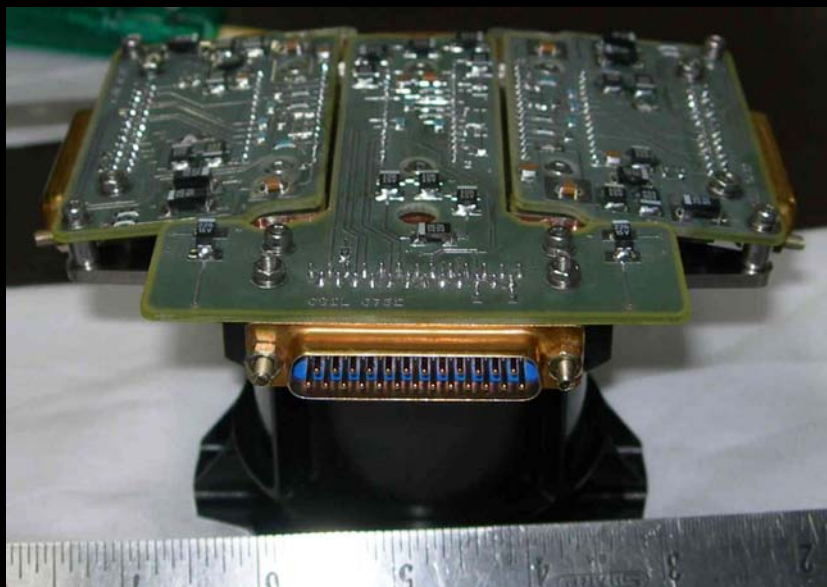
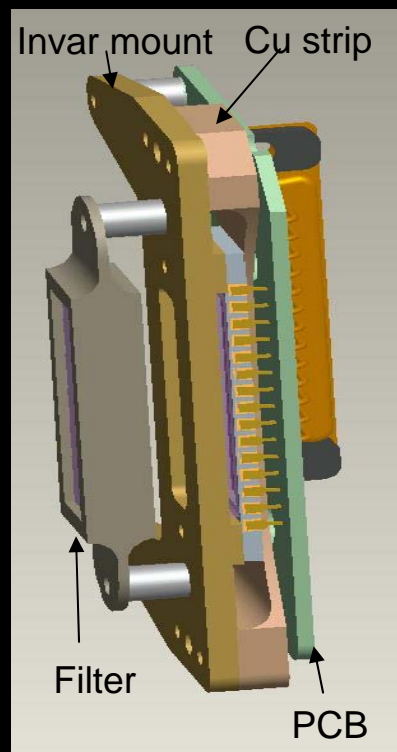


- *EFL : 140mm, Fno. : 4*
- *Spectral range : 500 – 850nm*
- *Spatial frequency : 70 lp/mm*

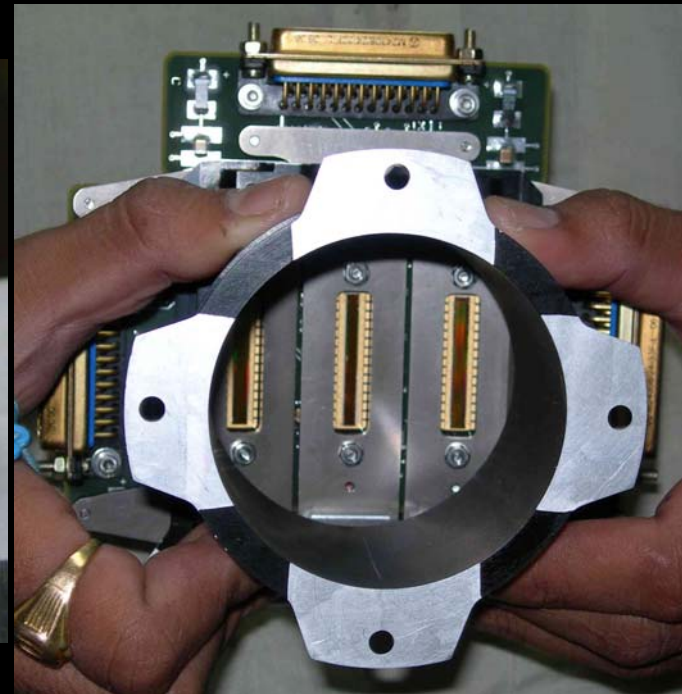
Detector Head

Detector - Active Pixel Sensor

Linear, 7μ pixel, 4000 element, snapshot operation, Readout 3ms

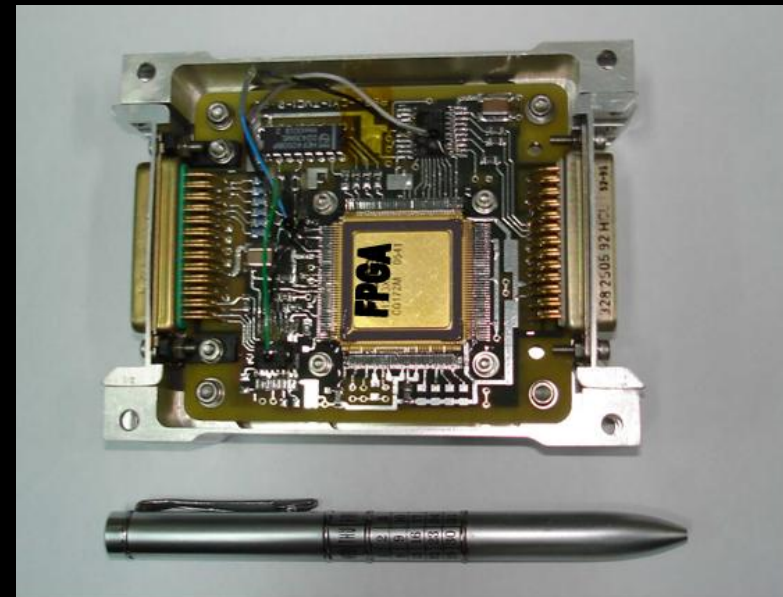


3 detectors in focal plane



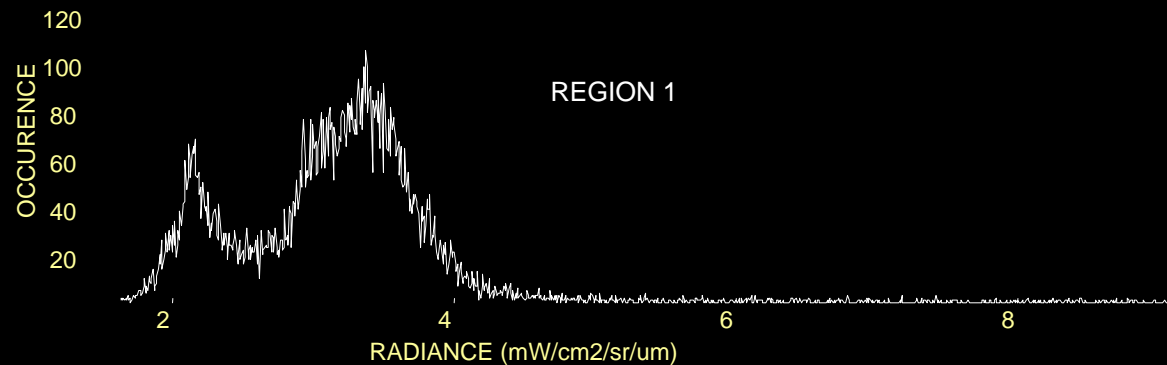
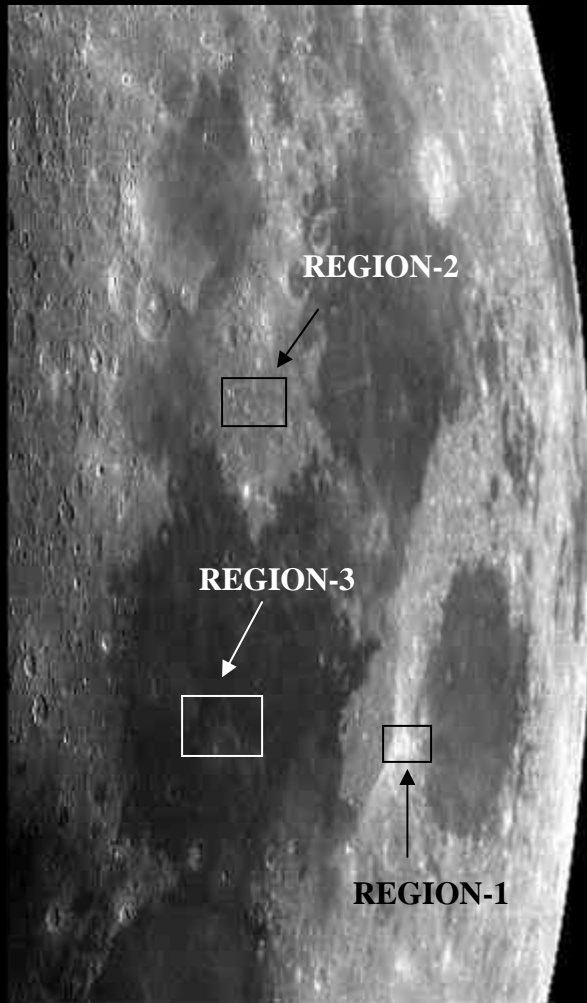
Camera Electronics

- *Modular and Separate Electronics for 3 detectors*
- *Digital output : 12 bits, Serial with hot redundancy*
- *Data rate per detector : 16.3 Mbps*
- *Bit-sliding & loss less compression*
- *10 bit transmission*
- *4 programmable Gains*
- *4 Exposure settings*
- *SNR improvement by increasing T_i upto 32 times*

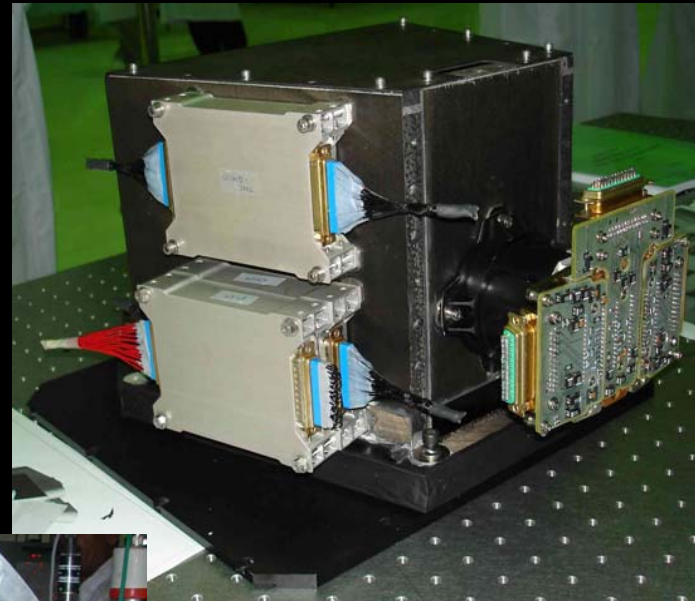
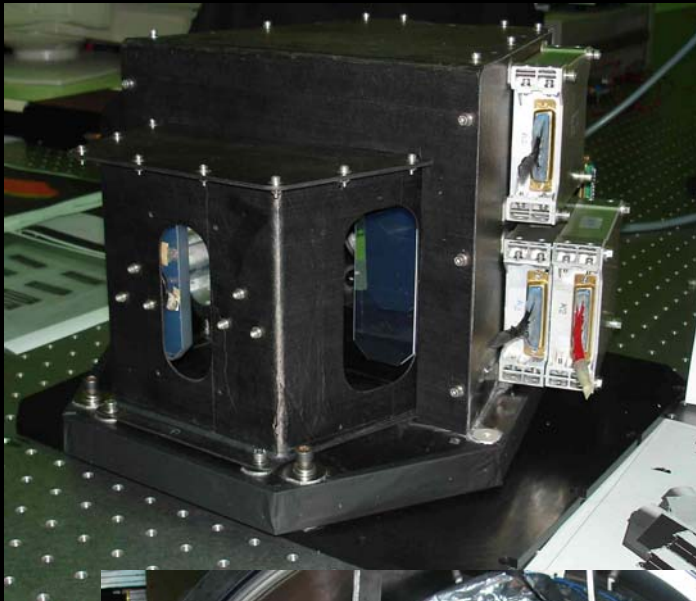


Radiance setting

Moon viewed by Cartosat-2



Imaging zone (deg lat)	Max Sun angle (deg)	Radiance (mW/cm ² /sr/μ)	Estimated SNR
<i>Mature Mare soil</i>			
0-30	41.4	2.11	183
30-60	61.3	1.22	119
<i>Fresh rock surface</i>			
0	0	14.2	615



$SNR : > 100 (\pm 60^\circ \text{ lat})$

$MTF : > 10$

$Power : 3.7 \text{ W}$

$Weight : 6 \text{ Kg}$

$Op. Temp : 20 \pm 10^\circ \text{ C}$

Thank you