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
Angular resolution: 50µrad (5m)
Along track FOV: ± 25º (B/H=1)
Panchromatic band  500-850nm
Fore to Aft : 60.3s
56 pixels due to Moon rotation

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**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 Optics**

- Mirrors for Aft view
- M1 at 2.66° about pitch
- M2 at 4.8° about pitch
- Thermal filter
- Bandpass filter
- Detector plane

Nadir

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ICEUM9, Oct’07
TMC Optics

- Spherical, Refractive optics
- Single lens assembly
- Folding mirrors for ± 25º FOV

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

Detector - Active Pixel Sensor

Linear, 7\(\mu\) 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 Ti upto 32 times
Radiance setting

Moon viewed by Cartosat-2

<table>
<thead>
<tr>
<th>Imaging zone (deg lat)</th>
<th>Max Sun angle (deg)</th>
<th>Radiance (mW/cm²/str/µ)</th>
<th>Estimated SNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature Mare soil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-30</td>
<td>41.4</td>
<td>2.11</td>
<td>183</td>
</tr>
<tr>
<td>30-60</td>
<td>61.3</td>
<td>1.22</td>
<td>119</td>
</tr>
<tr>
<td>Fresh rock surface</td>
<td>0</td>
<td>14.2</td>
<td>615</td>
</tr>
</tbody>
</table>

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SNR: > 100 (±60° lat)
MTF: > 10
Power: 3.7 W
Weight: 6 Kg
Op. Temp: 20±10 °C
Thank you