Solar-Earth Radiance Comparison Experiment (SERCE)

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Solar-Earth Radiance Comparison Experiment (SERCE)

- Hyperspectral IR Channel
- Hyperspectral Visible Channel
- Thermal Pointing System (TPS)
- Spectral Irradiance Monitor (SIM)
- Total Irradiance Monitor (TIM)
- Two Axis Pointing and Tracking System
- Nadir Field of View (Push Broom)
- Solar Field of View
  - TIM & SIM
- Two Axis Pointing and Tracking System
Earth Viewing Configuration

- TIM & SIM Solar viewing continuous
- Co-spatial Co-temporal Viewing Intersection
- 200 Km width
- ½ Km resolution
- TPS Nadir Tracking Configuration
Solar Viewing Configuration

Co-spatial
Co-temporal
Solar Calibration Transfer
(SIM ESR → Hyperspectral Inst.)

Hyperspectral Solar viewing
2 orbits/day

TIM & SIM Solar viewing continuous

TPS Solar pointing Configuration
Earth Viewing Configuration
Off Nadir flexibility

TPS
Matching View Angle Tracking
Configuration

TIM & SIM
Solar viewing continuous

Co-spatial
Co-temporal
Viewing
Intersection
Off Nadir

200 Km width
½ Km resolution Nadir
Earth Viewing Configuration
View Angle Matching flexibility

TIM & SIM
Solar viewing continuous

TPS
Matching Angle Tracking Configuration

700-850 km
~97 deg inc.

550 km
48 deg inc.

Co-spatial
Co-temporal (+-)
Viewing
Intersection
Angle Matching

100 km
Reference Circle

200 Km width
½ Km resolution
Nadir
Solar Irradiance Instruments

- SIM Instrument
- ESR Absolute Detector

Thermal Pointing System

- TIM Instrument
- ESR Absolute Detector

Hyperspectral Instrument

- Visible/VNIR Channel (300-1000 nm)
- Near-Infrared Channel (1000-2400 nm)

AP
Application Processor and Data Recorder

(TSIS, LDCM, Glory, TIMED)

(SORCE, AIM, Glory)
### Hyperspectral Imager Requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial Resolution</td>
<td>0.5</td>
<td>km</td>
</tr>
<tr>
<td>Spatial Range (cross-track)</td>
<td>200</td>
<td>km</td>
</tr>
<tr>
<td>Wavelength (min)</td>
<td>300</td>
<td>nm</td>
</tr>
<tr>
<td>Wavelength (max)</td>
<td>2400</td>
<td>nm</td>
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<tr>
<td>Spectral Resolution</td>
<td>10</td>
<td>nm</td>
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</table>

### Calibration Transfer Uncertainties

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Uncertainty</th>
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<tbody>
<tr>
<td>TSIS/SIM Accuracy with SIRCUS Calibration</td>
<td>0.10%</td>
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<tr>
<td>Aperture Ratio</td>
<td>0.05%</td>
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<tr>
<td>Diffraction</td>
<td>0.10%</td>
</tr>
<tr>
<td>Underfilled Optics</td>
<td>0.10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>0.2%</strong></td>
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</table>
Radiance Comparisons

Incident Solar Radiance
Solar Radiance / $10^{-4.7}$
Reflected Radiance, Clouds
Reflected Radiance, Ocean
Lunar Radiance

Reduced Solar Radiance for Cross-Calibration

Radiance [W m$^{-2}$ nm$^{-1}$ sr$^{-1}$]

Wavelength [nm]

500  1000  1500  2000  2500

MODIS  VIIRS
SeoWiFS
AVHRR
SERCE in a Pegasus fairing

550Km Orbit Altitude
45deg inclination

View coverage
+-60deg. Latitude

1TB data/day total

30% coverage with 6 instruments,
cospatial, co-temporal
(5% per polar instrument)
Ku band high gain (uses SC roll in eclipse to point at TDRSS or ground station)

Omni Antennas
Low data rate control

$160M-$180M for mission
Single satellite dependent on orbit inclination
Low cost launch
Low inc orbit
Selective redundancy
PI mode management

$160M-$180M for mission
Single satellite dependent on orbit inclination
Low cost launch
Low inc orbit
Selective redundancy
PI mode management

1/2 Km resolution
200Km swath

Dual Star tracker
Large momentum wheels
No propulsion
Precision Sun Sensor
Non-formation orbits viewing overlap

Provided by
Bruce Wielicki [bruce.a.wielicki@nasa.gov]Sent: Sat 7/14/2007