NASA Payload Instruments

Glenn Shirtliffe

Jason-1 Microwave Radiometer (JMR)

❑ Presentation contributors:
  ❑ Amarit Kitiyakara, JPL
  ❑ John Hultberg, JPL
❑ Science contributors:
  ❑ Chris Ruf, U. of Michigan
  ❑ Shannon Brown, U. of Michigan
  ❑ Stephen Keihm, JPL
  ❑ Amarit Kitiyakara, JPL
❑ Summary:
  ❑ Turned on 10 Dec 2001
  ❑ No Alarms
  ❑ No Commands
  ❑ No engineering anomalies since launch

JMR Brightness Temperature (TB) and Path Delay (PD) Calibration/Validation Results

❑ Antenna temperature calibration coefficients adjusted to eliminate yaw state dependencies and correct low-end TB offsets

❑ Antenna Pattern Correction coefficients adjusted to correct high-end TB offsets (relative to SSM/I Amazon data) and minimize path delay differences with TOPEX Microwave Radiometer (TMR)

❑ Geophysical Retrieval Algorithm coefficients adjusted to remove JMR low-end path delay bias

Laser Retroreflector Array (LRA)

❑ **Presentation contributor**

❑**John Hultberg, JPL**

❑**Summary:**

❑**The LRA continues to provide returns adequate for tracking**

Turbo Rogue Space Receiver (TRSR)

❑ **Presentation contributors:**

❑**Tim Munson, Cognizant Engineer, JPL**

❑**John Hultberg, JPL**

❑ **Science contributors:**

❑**Bruce Haines, JPL**

❑**Shailen Desai, JPL**

❑Summary:

❑**TRSR2 turned on 10 Dec 2001**

❑**Command sent to track 12 satellites max, 14 Jan 2002**

❑**Memory upload for L2 ramp fix, 3 Mar 2002**

❑**Autonomously switched to track 8 satellites max, 3 Sep 2002 (cause uncertain)**

❑**Command sent to track 12 satellites max, 9 Sep 2002**

Anomalies on Jason-1 TRSR 1/2

❑ TRSR receiver resets from 3 to 9 times per day
  - ❑ Typical reset marked by data gap of 6–12 min and loss-of-lock
  - ❑ Concentrated over South Atlantic Anomaly (radiation induced)

❑ Occasional long duration gaps observed in science (tracking) data
  - ❑ 5 episodes since launch with gap duration exceeding 6 hours
  - ❑ Engineering data suggests receiver continues to track normally
  - ❑ Cause is suspected anomaly with BlackJack "output manager" function
  - ❑ Real time ground software now alarms occurrence of the incident

Anomalies on Jason-1 TRSR 2/2

❑ The DHU counts "non-responses" from the TRSR that are a result of the resets

❑ The DHU counter is routinely reset twice per day

❑ However, on occasion, there has been an overflow of the counter requiring ground intervention to restart the TRSR

TRSR Performance on Jason-1

❑ Tracks up to 12 GPS satellites on 2 frequencies using advanced codeless techniques

  ❑Temporal coverage of 85–95% (5 or more GPS tracked)

❑ Quality of tracking data (point-to-point scatter) is excellent

  ❑20–30 cm for pseudorange (vs. 70 cm for GPSDR on T/P)
  ❑6–7 mm for carrier phase

❑ GPS-based POD results are excellent

  ❑~1 cm RMS radial accuracy for definitive solutions
    ❑Agreement with DORIS/SLR POD solutions is at level of 1–2 cm
    ❑Consistency with high-elevation laser observations is < 1.5 cm.
  ❑2–3 cm RMS radial accuracy within 3 to 5 hours of real-time

TRSR POD Performance

Histogram of RMS Radial Overlaps (290 Samples)

Statistics taken for central 4 hours of 6 hour overlap
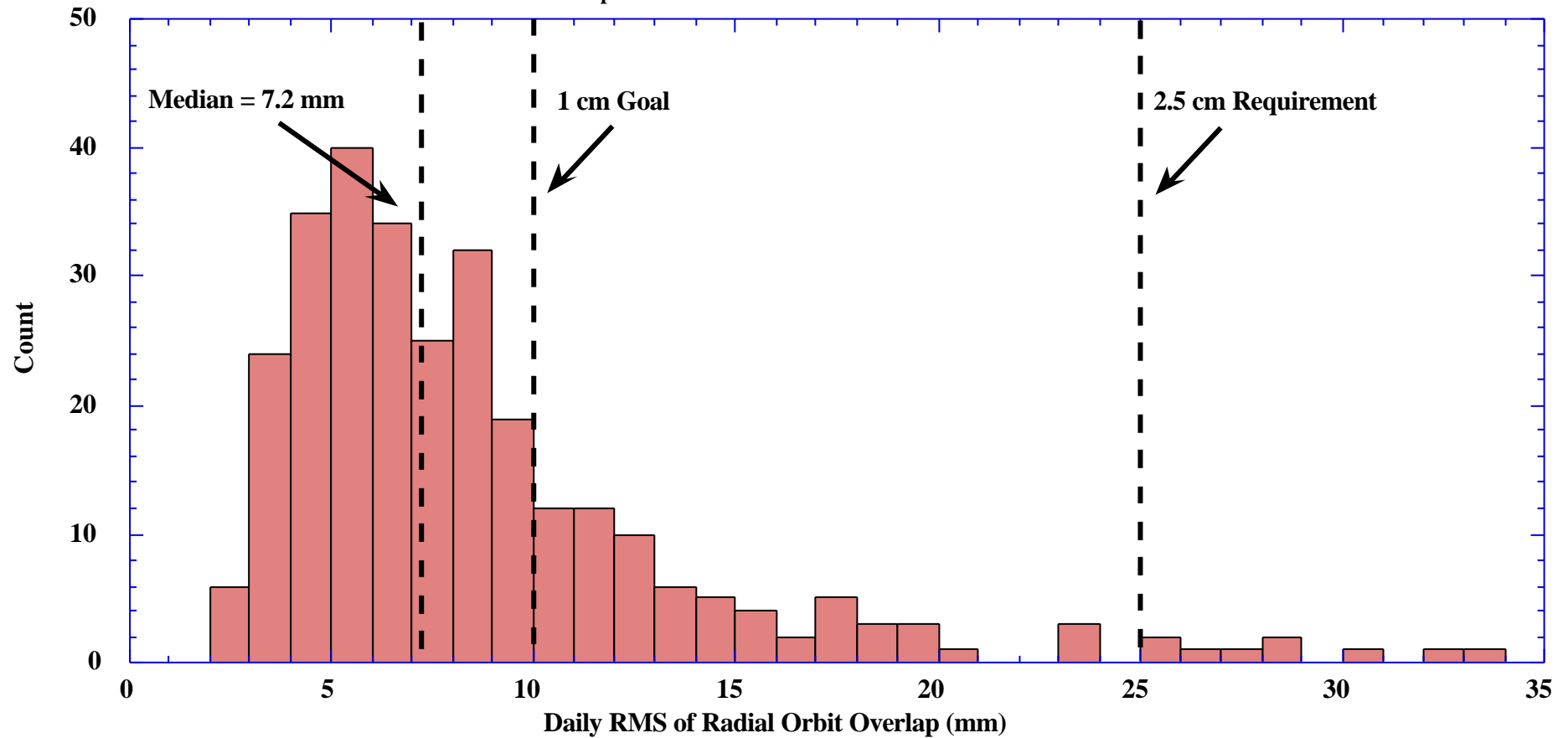
TRSR – Discussion

- ❑ Jason uses BlackJack architecture
  - ❑ Also used on ICESat, FedSat, Champ, SAC-C

- ❑ Resets
  - ❑ Reset function designed to mitigate the radiation effects on known soft parts

- ❑ 1553 DHU Interface
  - ❑ Fewer resets should decrease interface incidents

- ❑ A new software memory upload was planned for TRSR2
  - ❑ Goal was to improve the TRSR performance
  - ❑ On 25 Sept. 2003, the TRSR1 was turned on to confirm nominal performance prior to the software upload for TRSR2
    - ❑ Performance was anomalous and is under investigation
    - ❑ TRSR1 was turned off again on 06-Oct.
  - ❑ The TRSR2 software upload has been postponed, pending further investigation