STEREO IMPACT STE Status

2006-12-11
On-Orbit Results

• The STE-U-B unit is significantly saturated even with the door closed.
  - High front end current, no counts
  - Consistent with significant light on the detector
• The STE-U-A unit has an elevated reset rate with the door closed and is saturated with the door open
• The STE-D units work fine so long as the Earth is not in their FOV
  - Given the nominal spacecraft orientation, this means STE-D-B is usually working and STE-D-A is kept closed in Phasing orbits.
  - Should be OK in heliocentric orbit
• The STE units saturate in the magnetosphere
  - Due to high particle fluxes
  - Even with the doors closed the units start to saturate in the radiation belts
• All 4 STE units worked well during the P1 eclipse with their doors opened. As soon as we came out of earth’s shadow the STE units saturated.
  - P3 eclipse was too high (6000km instead of 500km). STE units saturated with high particle fluxes when doors opened
On-Orbit Results, Continued

- During off-pointing events, sometimes STE-U-B will come out of saturation
  - even with as low an off-pointing angle as 1.6 degrees (A4)
  - Door still closed
  - Reset rates elevated
  - STE-U-A only seems to get worse with off-pointing

- STE-U did not improve when TWTA powered off during P1
  - Seems to invalidate theory that problem could have been from RF
  - STE-U-B is close to LGA

- As yet no good theory of why STE-U-B is so much worse than STE-U-A in spite of having less glint issues
  - It would take ~10 suns illumination directly on the closed door to explain the level of saturation we see
    - designed for no direct sunlight on door and no other path for light
  - Something damaged in launch or separation?
Plans

• Investigations on-going using the ETU unit on the ground to try to understand what we see in space
• We are trying to get a special off-point maneuver over a range of small angles to help diagnose the sensitivity
Backup Slides
STE Locations

Ahead Spacecraft

- STE-U
- IMPACT Boom
- STE-D
- MAG
- SWEA
The STE units are sensitive to light

- Above ~1E-5 Suns it saturates (moonlight is not bright enough to saturate it, but earthlight)
  - With the door closed the unit works OK in room light, but is not perfectly sealed
- Saturation starts with increasing reset rates until at ~1000 resets/second the dead time due to reset paralyzes the system and no events are counted. The front end electronics current also starts to rise significantly at this point
- The STE instrument apertures are not sunlit and there is nothing in the STE FOV that can scatter light into the instrument, so sunlight takes at least 2 bounces to get onto the detector
- A simple scattered light analysis indicated we should be OK
  - STE-U-A was the biggest concern as there are a number of objects that can scatter light onto the front of the instrument (though not directly into the aperture).
  - STE-U-B has fewer items that can scatter light onto the front of the instrument
  - Note that the sun-shades on the STE-U unit are outside the FOV
  - STE-D units are in the dark and pointing away from the spacecraft.
Closeout Pictures

STE-U-A

STE-U-B
ETU STE Tests on the ground

- Testing ETU STE on the ground with calibrated light source to attempt to replicate what we see on orbit with STE-U (door closed)
- Results indicate a significant light leak for STE-U-B
Sample STE-D-B Results