



CASSINI SOST SEGMENT

Rev 250 Handoff Package

Segment Boundary 2016-331T05:43:00 – 2016-334T05:28:00

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Science Highlights

Notes & Liens

This document has been reviewed and determined not to contain export controlled technical data

DOY 331:

ISS_250OT_SUTSUP046_PRIME: ISS performs the first of two observations of irregular moon Suttungr from a distance of about 17 million km. Joint with a third observation in the preceding Saturn segment, these observations will nail down the rotational period of this small outer moon down to the <1% level.

CIRS_250RI_ETACAROCC001_PRIME: CIRS will observe an occultation of the *eta Carinae* star system by Saturn's rings. Such occultations allow CIRS to collect optical depth information about the main rings in the 9 to 16.6 micron range. While many such occultation experiments have been performed with the UVIS, VIMS and RSS instruments on Cassini, CIRS has performed few observations like this. Occultation observations by CIRS fill in gaps in the wavelength coverage not sampled by these other instruments. This particular chord occultation, which has a turnaround point in the mid-C ring, is particularly valuable, as CIRS will sample most of the main rings at two distinct ring longitudes.

UVIS_250DI_ICYLON001_PRIME and UVIS_250TE_ICYLON001_PRIME: Solar phase curves at ultraviolet wavelengths reveal information about the nature and scattering properties of icy surfaces. Observations of Dione and Tethys fill in missing coverage in the global phase / longitude matrix. ISS rides along at low spatial resolution.

DOY 332:

CIRS_250EN_NORTHPOLE001_PRIME: The CIRS, VIMS and UVIS instruments will view the partially sunlit Enceladus northern polar regions from a distance of ~200,000 km. The prime instrument, CIRS, will be conducting slow mid-infrared (600 to 1100 cm⁻¹, 9 to 16.6 micron) scans of the northern polar region of Enceladus to search for signs of previously undetected endogenic activity. UVIS and VIMS will be riding on the observation to map the composition of this region of Enceladus.

RADAR_250EN_ENCEL001_PIE

This observation is similar in geometry to that obtained during the 2008 En61 fly-by targeted close to the north pole of Enceladus. Distant radiometry will allow us to look for seasonal temperature change at depths of penetration that are relatively insensitive to diurnal change, in contrast with the more active southern polar region. Scatterometry will provide constraints for modeling to enable us to understand this difference. Nav and SCO approved moving the OTM Prime window to obtain this PIE. It is one of only two such observations in FPROX, with this one being longer and higher resolution.

ISS_250EN_ENCELNPOLE001_PRIME: The primary goal for ISS will be to obtain broadband multispectral images of Enceladus along with other ORS instruments as Cassini flies within 21,000 km of Enceladus.

DOY 332 cont:

For the close Enceladus encounter, ISS will be prime on a 1 hr 46 sec observation ISS_250EN_ENCELNPOLE001_PIE starting at 2016-332T05:29:00. At the beginning of the period, Cassini is approaching Enceladus from 78,600 km away with a phase angle of 74 degrees. ISS sees the North Pole of Enceladus from a latitude of 79 degrees, and the anti-Saturn hemisphere is illuminated and visible at a resolution of about 460 m/pixel. ISS will obtain broadband multi-spectral coverage with the NAC, some of which will be mosaic panels, and context images with the WAC. The high-latitude perspective remains relatively fixed with phase angles less than 90-degrees until about T06:30, when the range is 27,200 km and the spacecraft begins a fast southward pass below the equator, viewing the largely non-illuminated southern latitudes. Cassini passes closest at 06:51 with a range of 20,561. At this point, the phase is 109 deg and spatial resolution is 120 m/pixel. Cassini recedes from Enceladus through the end of the observation when the range is 30,500 kilometers and the phase is 120 degrees. During the latter portion of the observation, ISS will be providing support for coordinated CIRS data collection in the dark southern latitudes.

CIRS_250EN_ENCELSPOLE001_PIE: The CIRS, VIMS and UVIS instruments will view Enceladus' active southern polar region after Cassini's closest approach of the small, active world. The southern polar region, which is now in winter and thus has an easier to distinguish endogenic signature, will be viewed from 30,000 km to 163,000. The prime instrument, CIRS, will primarily be making slow mid-infrared (600 to 1100 cm⁻¹, 9 to 16.6 micron) scans of this region to constrain its endogenic heat flow. This observation is part of a larger observation plan to determine whether Enceladus' heat flow changes with the satellite's mean anomaly, as has been observed to occur in its plumes. VIMS and UVIS are riding to provide additional endogenic heat, surface composition and plume constraints.

DOY 333:

RSS_250RI_OCC001_PIE

The Rev250 PIE RSS ring occultation is a chord occultation that captures the full A-Ring and Cassini Division, and part of the outer B-Ring. It's one of a group of 5 chord occultations occurring close to the end of the IN-2 sequence and the start of the F-Ring Orbits. The large ring opening angle during this time (26 to 27 degrees) allows reliable profiling of ring features of large optical depth within the A- and B-Rings. The chord geometry allows characterization of the rings azimuthal asymmetry. Collectively, the group of RSS chord ring occultations, including the Rev 250 one, will provide valuable information about gravitational wakes and the host of density waves populating the A-Ring. Measurements at three radio wavelengths (0.94, 3.6, and 13 cm; Ka-, X-, and S-bands) will be collected throughout the observation period and will help provide information about physical properties of profiled ring structure.

ISS_250OT_SUTROT048_PRIME: ISS performs the second of two observations of irregular moon Suttungr from a distance of about 17 million km.

Y bias and RSS

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One RSS Ring Occultation during this segment. No biases overlap

[No Biases during (overlapping) the RSS science observations: Occultation experiments (rings, Saturn atmospheric, Titan, Satellite), Bistatic observations and prime gravity observations.]

Notes (1 of 2)

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- Pointing:
 - SP turns that require hand edit to spturn script output
 - DLTURN333 requires a hand-edit to avoid violating FRs 07D38 and 07D148
 - Edit z-acceleration to 0.021 (was 0.022)
 - Edit z-rate to 2.580 (was 2.600)
 - Quiescent Periods:
 - Quiescent Period in ISS_250EN_ENCELNPOL001_PIE from 2016-332T06:55 to 7:15
 - CIRS_250RI_ETACAROCC001_PRIME is basically quiescent except for the turns, and they are OK having a bias on top of their observation if needed
 - Using RBOT friendly secondary for Saturn waypoint, but not for Enceladus waypoint (due to SRU issues)
 - Describe any deleted/shortened PIEs and justification
 - Enceladus ORS PIE split between ISS and CIRS
- Data Volume:
 - TOST has accepted 48 Mb of carryover
 - Disposition all SMT warnings
 - RADAR_250EN_WARMUP001_RIDER, Found an activity whose data are NOT recorded in this telemetry mode "S_N_ER_3" commanded at 2016-331T22:45:00.000. Volume of 7.255872 Mb not given data policing space. We are only using the RADAR warmup telemetry mode (5a) for the first 15 minutes of warmup.
- DSN:
 - Any stations requested during maintenance, UNQ passes, split pass OTMs, split downlink passes (boresight cal/Ybias cal)
 - SP_250EA_M34HEFOTP332_PRIME is a split pass, using DSS-65 and DSS-15, and one wedding cake. It was moved from it's original time, and there is not a station with a contiguous viewperiod
 - Level 3 requests, including any 'lasts and bests'.
 - Level 3 for RSS RI OCC from 2016-332/19:45:00 to 2016-333/13:25:00 (ERT)
 - Disposition ap_downlink report check warnings
 - SP_250EA_M34HEFOTP332_PRIME does not have full DSN coverage: *this is a split pass with one wedding cake*
 - SP_250NA_G34HEFOTP332_SP does not seem to support any downlink pass; may be an orphan: *this is the second part of the split pass, the corresponding_PRIME is M34HEFOTP332*
 - SP_250EA_C70METOTB332_PRIME has an unusual DSN lockup time; usual for post-handover passes is 60 sec: *This is NOT a handover pass, but two separate back-to-back passes*
 - RSS pass SP_250NA_M34BWGRSS333_SP is fully within DSS-55 weekly maintenance; move elsewhere to resolve: *RSS requests to move maintenance*

Notes (2 of 2)

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- Resource checker:
 - ENGR_250SC_URSS3SRTC333_PPS – See note about opmodes below
 - ENGR_250SC_URSS3RWAS333_PPS – See note about opmodes below
 - SP_250EA_M34HEFOTP332_PRIME – This is a split pass over two complexes with one wedding cake. See DSN note on previous page
 - SP_250EA_M34HEFOTP332_PRIME – Only one wedding cake is used, so this is OK
 - ISS_250DI_ICYLON001_UVIS – ISS has OK'd this Telemetry mode change. The spacecraft should be just finished turning when the telm mode changes.
- Opmodes:
 - List RWA-slow and/or unique opmodes
 - Switch to RSS3RWAS must be done in real-time due to the overlap with the OTB pass
 - ENGR_250SC_URSS3SRTC333_PPS: Unique DFPWTM to RSS3RWAS (ME_htr_off + RWA_slow + RSS_ska_on) as real time command. Execute this IF the OTB pass is not used for the maneuver
 - ENGR_250SC_URSS3RWAS333_PPS: Unique DFPWTM to RSS3RWAS (ME_htr_off 00:20 + RWA_slow 00:04 + RSS_ska_on 05:02) in background sequence
 - We can still do rolling donwlinks in RWA slow

Liens

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Sequence Liens (should all be SPLAT items):

- List any Liens to be worked in SIP, ie
 - inertial periods due to target motion (>3 hr observations with >60 degrees target motion)
 - S97000210: ISS_250EN_ENCELNPOL001_PIE moves 120 deg, but is only 1:46 long. However, they will include 20 minutes quiescent at the end of the observation (2016-332T06:55 to 7:15)