CASSINI SOST SEGMENT

Rev 258_259 Handoff Package

Segment Boundary 2017-025T19:45:00 to 2017-032T07:39:00

3 June 2016

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Science Highlights

Notes & Liens

Science Highlights

In the SOST 258/259 segments, three irregular satellites are targeted during eight requests. For all three, these observations will be the last opportunities where Cassini will target them.

(1) Tarqeq (ISS_258OT_TAQROTA048_PRIME, ISS_258OT_TAQROTB048_PRIME, ISS_259OT_TAQROTC048_PRIME, ISS_259OT_TAQROTD048_PRIME).
Tarqeq has been discovered in 2007 and is the smallest known moon of the progradely orbiting irregulars. Tarqeq was found by the Cassini NAC to be very unusual because of its very long rotation period which lasts in the order of ~3 days. While earlier Tarqeq requests (in June 2016) are dedicated to determine the period exactly, the requests in this SOST segment will help to determine if Tarqeq is a tumbler. This might be well possible; if so, there would be a second object in the Saturnian system with such rotational properties. The first one is Hyperion which is known to rotate chaotically.

(2) Paaliaq (ISS_258OT_PAAPOLA112_PRIME, ISS_259OT_PAAPOLB111_PRIME, ISS_259OT_PAAPOLC106_PRIME).
These high-phase observations of Paaliaq, the first prograde irregular moon ever discovered at Saturn, finalize the task to determine the sidereal period and the pole-axis orientation, and to obtain a convex-hull shape model of this moon. Paaliaq is so far the only object where a lightcurve with four maxima and four minima has been measured (all others show "only" 1, 2, or 3 maxima/minima). It will be interesting to see what kind of shape creates this peculiarity; might Paaliaq be a contact binary or even triple object? The three SOST requests were placed in time so that a complete lightcurve of 18.75 h duration can be derived. They also extend the available time baseline of Paaliaq Cassini data by 1.5 years.

(3) Albiorix (ISS_259OT_ALBPOL064_PRIME).
This observation of Albiorix, the presumably second-largest of Saturn's prograde irregular moons, also finalizes data collection for the pole/shape task of this moon. In addition, color data will be taken to see if Albiorix indeed shows hemispheric color variations as suspected from earth-based data taken about 10 years ago.

ISS_259EN_ENCELNP001_PRIME begins at 2017-030T03:38:00 and lasts for 2h 40min. Its purpose is to provide ORS observations, especially ISS color and polarization coverage, of Enceladus North Pole with the leading hemisphere illuminated by the sun – a geometry that was not obtained earlier in the mission. The viewing and illumination geometry remains relatively constant over the duration of the request: Cassini's range is ~500,000 km from Enceladus and the phase angle varies only from 85-deg to 91 deg. At this range, Enceladus will be remain about 170 ISS NAC pixels in diameter. ISS will be obtaining a wide suite of broadband filtered images, extending from the NAC shortest-wavelength (UV1) filter to the near-infrared (IR3) filter. NAC polarization images will also be obtained. The opportunity will be shared with CIRS, VIMS, and UVIS so that an integrated collection of data will be collected.

ISS_259EN_TETHYS001_PRIME begins at 2017-030T06:18:00 and lasts 1h 27m. Its purpose is to obtain ORS coverage of the North Pole and region to the east of Odysseus basin (viewed from above subspacecraft lat,lon 45N, 60W). This viewing and illumination geometry was unavailable earlier in the mission and it is important for mapping and analyzing the red streaks on Tethys. The observation begins from a range of 606073 km at 65-deg phase angle. At this range Tethys is about 300 ISS NAC pixels in diameter. The geometry changes little over the duration ending at a range of 550226 km, phase angle of 58-deg. And viewed above subspacecraft lat,lon 49N, 61W. ISS will be obtaining a wide suite of broadband filtered images, extending from the NAC shortest-wavelength (UV1) filter to the near-infrared (IR3) filter. NAC polarization images will also be obtained. The opportunity will be shared with CIRS, VIMS, and UVIS so that an integrated collection of data will be collected.

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UVIS_259SA_AURSLEW001_PIE is an auroral observations led by UVIS. Repeated slews across the bright northern auroral oval try to capture the whole oval between 55-90 degrees latitude over several slews.

ISS_259EN_REDTETHYS001_PRIME begins at 2017-030T18:45:00 and lasts 37 minutes. It is devoted to an ongoing observation campaign to map the global extend of Tethys red streaks with ISS color filter coverage. This request covers the eastern half of the leading hemisphere, southeast of the Odysseus basin. Cassini will be 356,000 km from Tethys and viewing at phase angle of 48 deg. as viewed above subspacecraft point 23N, 27W. At this range Tethys is about 500 pixels across in the ISS NAC field of view. ISS will obtain four NAC color images UV3, GRN, IR3, and CLR needed to consistently map the red streaks with adjacent coverage from other requests. ISS will acquire additional color filter coverage in summation mode to provide complementary wavelengths needed to tiepoint UVIS and VIMS observations.

ISS_259EP_EPIMETHEU001_PIE begins at 2017-030T19:22:00 and lasts 1 hr 50 min. Its purpose is to obtain unique close-flyby ORS multi-spectral observations of the north pole of Epimetheus and ISS images needed to better define the shape and surface geology of the small satellite. At the start, Cassini will be under 115,000 km from Epimetheus and viewing it at 69 deg phase angle from above 70N, 340W. The leading hemisphere will be illuminated. At this range, Epimetheus will present an elongated disk 193 x 157 pixels in size. As the flyby progresses, Cassini will converge on Epimethus until closest approach at 21:02:28 when it will be only 3584 km from Epimetheus, viewing it from the dark side at 117 deg phase angle from 13-deg above the equator. The relative motion of Epimetheus at closest approach is to fast for Cassini to track. This is an ORS coordinated PIE observation, so during the earlier Cassini-trackable portion of the flyby, the ORS instruments will trade between one another for CIRS scans and UVIS observations, point-and-stare multispectral observations for VIMS and ISS and a few ISS high resolution mosaics.

ISS_259MI_MIMASSP001_PRIME begins at 2017-030T21:12:00 and lasts 2h 8m. Its purpose is to obtain high-resolution ORS coverage of the south pole of Mimas and surrounding regions. At the start of this period Cassini is 49,105 km from Mimas as viewed at 123 deg phase angle from above 9S, 328W. At this range, Mimas is slightly over 1600 ISS NAC pixels in diameter and the South Pole is beyond the terminator. Throughout the observation period, Cassini is receding from Mimas until at the end it is almost 157,000 km away and Mimas is 430 pixels in diameter. ISS will obtain broadband multi-color imaging of the illuminated crescent and clear filter Saturnshine images of the south polar region. CIRS and VIMS will be able to obtain thermal imaging of the south pole in darkness.

CIRS_259EN_SP004_PIE is the fourth in a long campaign during Cassini's XXM to determine whether Enceladus' heat varies with orbital location (as its plumes are known to). It is a 8 hr 40 min observation of Enceladus, which will begin with a short inertial pointing period followed by an 5 minute ISS stare at Enceladus. The remaining observation time will be used to make many slow CIRS FP3 scans of Enceladus' active south polar terrain region. Differences between these scans, and those from other observations in the campaign, will be looked for to determine the temporal variability of Enceladus' thermal activity.

The moderate wavelength far-infrared spectra of Saturn's moon *Rhea* obtained over the course of the CIRS observation CIRS_COMPGLBL001_PRIME will be used to constrain near-surface composition. This observation is part of a broader campaign to acquire high signal-to-noise far-IR spectra of Saturn's icy satellites for the purposes of comparing the spectral properties of the ices among Saturn's icy moons, as well as its main rings.

Notes & Liens

- Pointing:
  - Waypoint run will show SID issues and major VIMS heating at periapse, we are in a big custom period
  - Epimetheus PIE will have SID issues and some CIRS/VIMS heating (below waiver level), see liens. Also, this PIE was shortened to accommodate a MIMAS observation (in-discipline PIE, in-discipline science trade)
  - ISS REDTETHYS has been designated as a PIE per Project Science
  - There is a long solar occ on doy 31, the waypoint is Earth and the Rhea and outer satellite observations should be fine
  - Observations in custom periods were pre-designed in PDT
- Data Volume: Carryover to TOST OK with them
- DSN: SEQ pass <9 hours, OK in FRPO: due to viewperiod & long Earth occ
  - stations requested during maintenance: Erick and I both disagree with what ap_downlink is calling maintenance conflicts….

SP	2017-031T08:16:00	SP_259NA_M34HEFNON031_SP	SP_259NA_M34HEFNON031_SP is fully within DSS-65 weekly maintenance; move elsewhere to resolve
SP	2017-031T20:46:00	SP_259EA_C70METSEQ031_PRIME	SP_259EA_C70METSEQ031_PRIME is a SEQ upload pass and should be at least 9 hours in duration
SP	2017-032T03:35:42	SP_259NA_M70METNON032_SP	SP_259NA_M70METNON032_SP overlaps start of DSS-63 weekly maintenance by 143 minute(s); move earlier to resolve

- Resource checker: Both can be ignored/are deprecated for FRPO

SP	2017-031T20:46:00	SP_259EA_C70METSEQ031_PRIME	Downlink Pass for sequence request has a duration of 000T07:00:00
SP	2017-031T08:00:00	SP_259EA_DLTURN031_PRIME	Waypoint change cannot occur during a Custom Period

- Opmodes: none
- Hydrazine: n/a
- Liens:
  - No waivers identified in PDT run, but possible CIRS/VIMS heating
  - SPLAT items:
    - UVIS AURSLEW PIE: inertial pointing: 2017-030T18:01 to 030T18:24 (for SID suspend, also possible RWA bias)
    - CIRS Enceladus SP004 PIE: Inertial pointing: 2017-030T23:20:00 to 23:40:00 (for target motion, SID unsuspend, also possible RWA bias)