CASSINI SOST SEGMENT

Rev 217 (D4) Handoff Package

Segment Boundary 2015-166T15:30:00 to 2015-169T15:29:00

9 Oct 14

Nancy Vandermey

Science Highlights

Notes & Liens

Background

FYI – not for kickoff package!

D4, in the time of PIE and segmentation, was allocated to CAPS as a MAPS flyby. After the death of CAPS, it was assumed INMS could get great data and was made the new PRIME team at closest approach. However during integration, it was found that the desired INMS pointing (NEG_X to SC_RAM, NEG_Z to Sun) put the CIRS & VIMS radiators pointing at the Sun and caused huge amounts of heating (14K CIRS, 10K VIMS). We tried a hybrid approach with CDA pointing inbound & outbound and INMS' attitude for a very short time near C/A but still too much heating. So we went with an all-CDA attitude (NEG_Z to Sun, NEG_X to Dust_RAM) throughout, which made CDA happy and still allowed INMS to gather some of their measurements.
After this was done and agreed to, RSS remembered this was supposed to be an LGA flyby opportunity. And that NEG_Z to Sun was pretty darn close to NEG_Z to Earth, and given SCO/ management reluctance to switch to the LGA, RSS requested to change the primary pointing and make this an HGA gravity flyby (via the secondary axis). After a PSG#63 presentation this was agreed to. DSN supports were added and INMS changed their prime pointing.
Due to the lateness of this becoming a gravity flyby and the complications due to the dual playback, I did not attempt to move the YBIAS window to after the downlink, thus violating RSS's requested thruster keep out zone.

(ORS drag at C/A and a UVIS occ were also looked at but incompatible)

Science Highlights

On DOY 166 the first observation in SOST rev 217 is dedicated to a disk-integrated ISS observation of the irregular moon Tarvos to obtain a lightcurve. The three requests in this segment cover one full rotation of this moon. The phase angle varies between 1.5° and 2.7° and is among the lowest of all outer-moon observations. Science goal is the determination of the phase-angle behavior of this moon, plus support of object shape and pole-axis determination. With a size guess of 15 km, Tarvos is one of the larger irregular moons of Saturn. Its distance to the ring planet varies between ~8.4 and 28 million kilometers. During the observation, the Cassini spacecraft and Tarvos are separated by 21.5 million kilometers. We then spend some time observing Rhea (while CIRS is prime) from 214000 km distance which will allow global multi-color observations of the leading side at 25° phase angle. Rhea is slightly larger than the NAC field-of-view. The spatial resolution of the NAC will be ~1.3 km/pxl.

On DOY 167 ISS_217PO_POLYDU001_PIE represents a rare opportunity to observe this ~3km-sized Trojan satellite at close enough range to resolve its disk over a broad range of phase angles. Our objectives are to obtain improved measurements of the object's shape and high-quality spectrophotometric properties over phase angles from 76-deg to 138-deg. Throughout the observation Polydeuces maintains a relatively consistent size range in the ISS NAC of 10 to 15 pixels across. At the beginning of the observation, the spacecraft range is 54200 km at a phase angle of 76-degrees. At closest approach the range decreases to 34800 km giving Polydeuces a diameter of about 15 NAC pixels. The phase angle is 121 deg and the subspacecraft longitude is 282. At the end of the observing period, the range is 37400 km, the phase angle 138 deg., and the subspacecraft longitude is 307 deg. The dark hemisphere of Polydeuces will be illuminated by Saturnshine so that the entire limb should be visible from a viewing perspective near its equator. We will be able to obtain shape information over a range of about 85 degrees in longitude. ISS will obtain NAC CLR filter images incrementally with increasing phase angle, as well as NAC multispectral coverage from UV2 to IR3 filters.

Next Saturn is viewed to obtain stratospheric thermal structure by means of limb sounding in the mid-IR, longitude coverage.

We then turn to the targeted moon Dione. Beginning about 3 hrs before Dione closest approach, ISS will map the sub-Saturn part of the trailing side at ~620 to 430 m/pxl. This observation includes the tectonically extensively deformed terrain "Eurotas Chasmata", also known as the "wispy streaks" from Voyager-spacecraft observations 35 years ago. Range is 104000 to 72000 km, phase angle 51°. A joint MAPS/RSS gravity observation takes place at closest approach. MAPS' main goal is to detect dust particles emitted from Dione. This emission could either be active or passive (ejecta created by larger grains impacting onto Dione's surface). First we want to distinguish these endogenic Dione particles from the E ring background and then, if we succeed, determine their composition with CDA's spectrometer. For RSS, the Dione D4 flyby provides an extremely valuable opportunity to improve our knowledge of Dione's gravitational field, internal structure, and the rigidity of its outer ice shell, and would improve the determination of Dione's quadrupole field by between a factor of 3 (for J_2) to more than a factor of 10 (for C_{22}) over the results from the past D3 and anticipated D5 flybys alone. This is accomplished by riding along on INMS prime time with a primary axis pointing XBAND to Earth. Next up is more imaging led by CIRS, with an Enceladus mutual event. A small mosaic of 4 footprints will image parts of the northern trailing hemisphere at 129° phase and ~70000 km altitude.

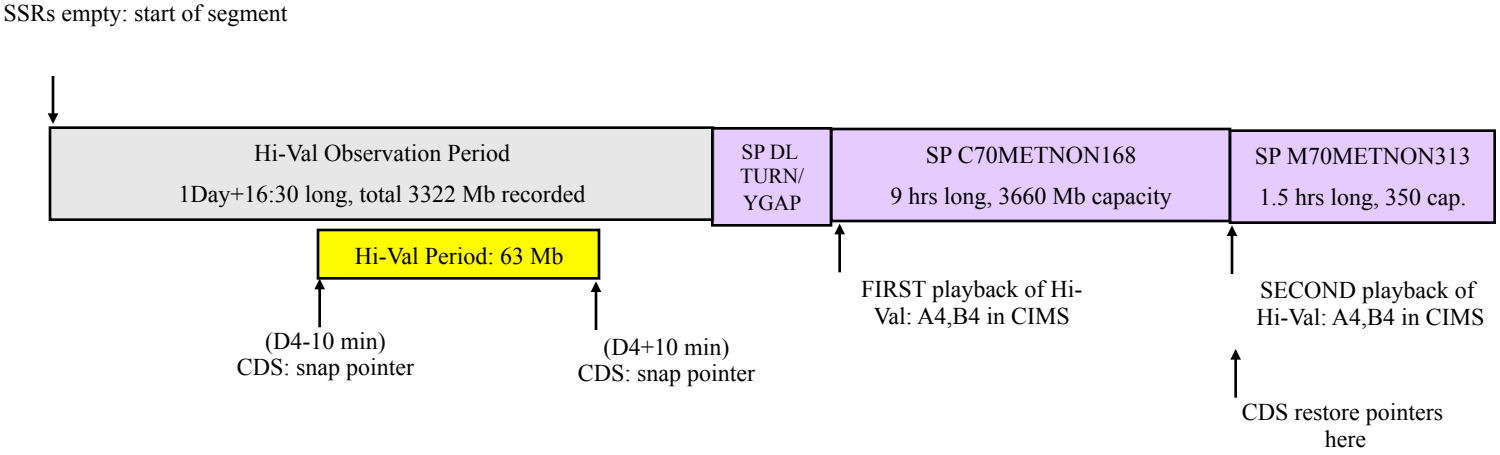
On DOY 168 one more irregular moon is observed before two downlink passes perform a dual playback of the closest approach data. The segment ends with more irregular moon time and another Saturn PIE, with UVIS performing one slow scan across Saturn's visible hemisphere to form spectral images. The goal for the irregular moons is, as usual for these distant objects, to obtain through lightcurves information on basic physical properties like the duration of the day/night cycle, the orientation of the poles, and a rough determination of the shape.
Irregular-moon requests ISS_217OT_OUTERSAT001_PRIME and ISS_217OT_OUTERSAT002_PRIME on 2015-168:
Final target and request name selection are still open because they depend on S90 negotiation results in the XD TWT meeting on Nov. 18. There are two candidate moons:
(1) Target: Ymir (13.1 mag), Req. names: ISS_217OT_YMICOL010_PRIME and ISS_217OT_YMICOLTIM018_PRIME
Science goal: Search for hemispheric color differences; UVIS UV spectra; phase coverage. Both requests will cover ~2/3 of one Ymir rotation.
(2) Target: Albiorix (12.9 mag) Req. names: ISS_217OT_ALBROTA070_PRIME and ISS_217OT_ALBROTB071_PRIME
Science goal: Help determine the precise sidereal rotation period. Both requests will cover ~55% of one Albiorix rotation. A second science goal is the phase-angle coverage.

(should be settled before S89 kickoff meeting)

Dual Playback

Flyby	BEGHIVAL	ENDHIVAL	P4 Dual Playback Data Volume	SSR empty before hi-val observation period? (if not verify any carryover on A fits with Hi-Val data)	SSR-A empty after first playback?	PPL set to A4,B4 for first AND second playbacks?	SSRs empty after second playback? (if not does any Hi-Val data carry over?)
D4	D4-10 min	D4+10 min	63 Mb	Yes	Yes	Yes	Yes

Playbacks contiguous:



Reminder - ALL instruments' data is played back twice during P4 dual playback periods

Y bias and RSS

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

For gravity observations, the requirement is no biases (thruster firing) in arcs devoted to gravity observations. A gravity arc is defined as the time between the start of the first tracking pass and the end of the last pass, so if there's a gap in between the tracking passes, there should be no biases there as well. Any firing in this arc would destroy the coherence of the trajectory and would lead to an unpredictable result.

The thruster firing/bias keep-out zone is from beginning of inbound GSE until the end of the outbound GSE, with the most critical period being the prime gravity observation (beginning of 1st segment until the end of the third segment).

For D4:
2015-166T06:30:00 to 2015-168T17:00:00
Critical period:
2015-167T17:30:00 to 2015-167T22:30:00

NOTE: there is a YBIAS window scheduled before the outbound GSE pass. Due to the dual playback and the lateness of this becoming a gravity flyby, I did not try to move this YBIAS window (doy 168). So I've place a SPLAT item on the ENGR_YBIAS_168 request asking AACS to try to avoid using this particular window. There is another window in this segment on doy 169

Notes

- Pointing:
  - This is a combined MAPS/RSS gravity flyby. RSS rides on INMS PIE time.
  - Several requests have collaborative riders.
- Data Volume: no issues, standard dual playback
- DSN:
  - The two dual playback stations are contiguous but viewperiods did not allow for a handover pass, ignore the AP_downlink complaints
  - Level 3 requests for D4 gravity. In ERT: 2015-167T14:15:00 to 2015-168T00:15:00
    DSN Stations: 34, 55

- Resource checker: 4 items to mark as ignore at sequence level

Disposition	Time	Request	Lien or Action
dual playback	2015-168T08:00:00	SP_217EA_C70METNON168_PRIME	First_Part value of SSRAP4 does not match default of SSRBP4 Second_Part value of SSRBP4 does not match default of SSRAP4
dual playback	2015-168T17:00:00	SP_217EA_M70METNON168_PRIME	First_Part value of SSRAP4 does not match default of SSRBP4 Second_Part value of SSRBP4 does not match default of SSRAP4
Ignore, checker is comparing wrong requests!	2015-167T16:24:00	CIRS_217DI_DIONE001_ISS	Rider request CIRS_217DI_DIONE001_ISS start/end 2015-167T16:24:00/2015-167T17:30:00 <> Prime request CIRS_217DI_DIONE001_PRIME start/end 2015-167T22:30:00/2015-168T02:00:00
Ignore, checker is comparing wrong requests!	2015-167T16:24:00	VIMS_217DI_DIONE001_ISS	Rider request VIMS_217DI_DIONE001_ISS start/end 2015-167T16:24:00/2015-167T17:30:00 <> Prime request CIRS_217DI_DIONE001_PRIME start/end 2015-167T22:30:00/2015-168T02:00:00

- Opmodes: RSS opmode requires UVIS no HDAC, cat bed heaters off
- Hydrazine: N/A
- Special Activities: None
- Liens: RSS thruster keep out zone: SPLAT item opened on ENGR_YBIAS request, please try to avoid placing a bias here