CASSINI SOST SEGMENT

Rev 230 Handoff Package

Segment Boundary 2016-014T02:16 – 2016-015T12:01

8 June 2015

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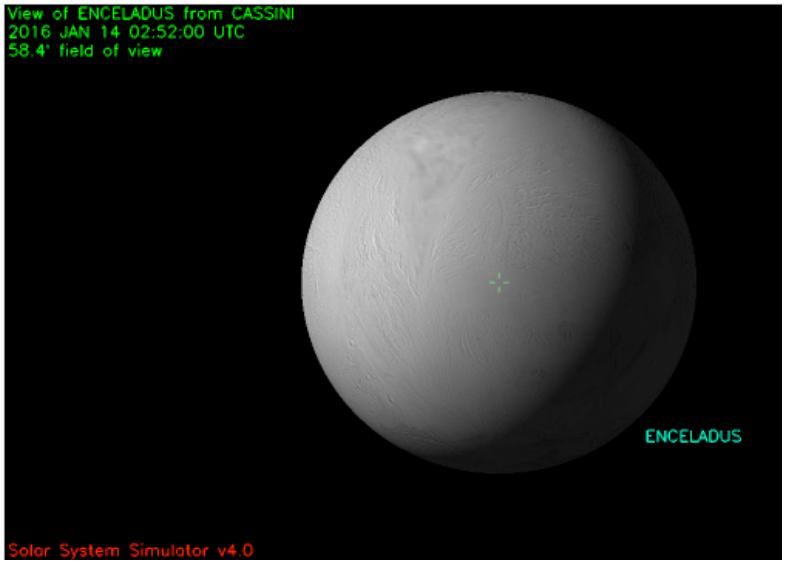
Science Highlights

Notes & Liens

Science Highlights (1 of 3)

For ISS, SOST segment rev 230 will provide observations of a heavily-cratered mid-sized moon, of a ring moon, of a Lagrangean moon, of an irregular moon, and of a crater-poor, but plumy moon.

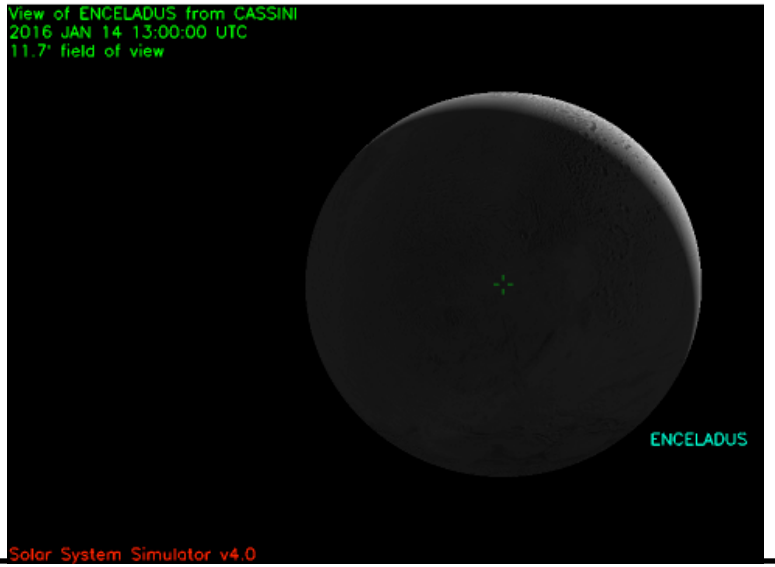


Enceladus: (right)

ISS_230EN_ENCEL001_PIE views the leading hemisphere of Enceladus from above the equator between 2016-014T02:31 and 2016-014T04:00. During that time, the range decreases little (from 82300 to 80400 km), but the phase angle increases from 45° to 92°. Enceladus will be only slightly larger in size than a NAC field of view. The objective of the observation will be to obtain small (1x2) ISS mosaics of Enceladus through a broad range of color and polarization filters. An important goal will be to obtain UV and near-IR spectral coverage that can be tied to UVIS and VIMS spectral data.

Enceladus plumes: (below)

The two plume observations are part of a campaign to monitor Enceladus's plume activity, and are spread throughout the orbit to help test theories of what causes the plume to vary, providing insight into Enceladus's interior and interactions with other satellites.



Science Highlights (2 of 3)

For ISS, SOST segment rev 230 will provide observations of a heavily-cratered mid-sized moon, of a ring moon, of a Lagrangean moon, of an irregular moon, and of a crater-poor, but plumy moon.

Mimas:
ISS_230MI_MIMAS001_PIE begins at 2016-014T04:00 and covers a 3 hour period over which Cassini will fly within 27200 km of Mimas. At the start of the observation, Cassini will be viewing the inbound leading-hemisphere of Mimas above the equator from a range of 53200 km at 53° phase. Mimas will be slightly larger than an ISS NAC field of view. Closest approach at 2016-014T06:02 places Cassini's view nearer to the Saturn-facing hemisphere (lat/lon = 12°N/332°W) at a phase angle of 105° and with a NAC resolution of 169 m/pixel. On the outbound leg, the range increases to 39000 km and a moderately high phase angle of 139°, where the spacecraft will still be viewing the Saturn-facing hemisphere in saturnshine. ISS will obtain a series of multi-spectral mosaics of Mimas at intervals throughout the flyby. Important ISS objectives are to obtain UV and Near-IR coverage that can be tied to UVIS and VIMS observations in addition to visible color-filter sets and to acquire geological surface details at high spatial resolution.

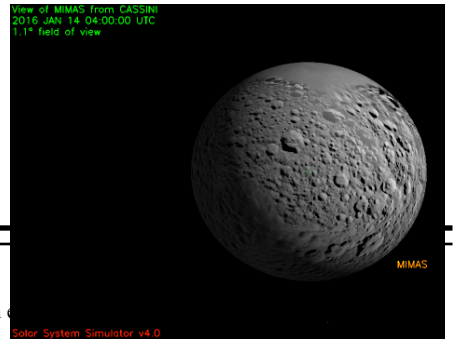
Daphnis:
ISS_230DA_DAPHNIS001_PIE will begin observing Daphnis at 2016-014T07:00 from a range of 22500 km, when the 8 km sized Kepler-gap moon will be about 60 NAC pixels in diameter and the phase angle will be 41°. Cassini recedes from Daphnis throughout the two-hour observation. The distance will be 53400 km at ~09:00 UTC, the phase angle ~100°. ISS will coordinate observations with other ORS instruments and will point-and-stare to obtain multi-spectral coverage at a variety of different phase angles. An important ISS objective will be to obtain surface geological details at resolutions as fine as 130 m/pixel as well as to obtain body shape data as the viewing perspective changes.

Telesto:
ISS_230TL_TELESTO001_PRIME provides a close flyby of Telesto, the leading Lagrange satellite of Tethys. At observation start (2016-014T11:00), Cassini is on the inbound leg of the flyby, the range is 43600 km, the phase angle 51°. Cassini will be looking at the Saturn-facing hemisphere of Telesto which will be about 80 NAC pixels in diameter. At closest approach (2016-014T12:13), Cassini will fly within 15200 km of Telesto, providing a spatial resolution of about 90 m/pxl. At this point, Telesto's leading hemisphere will be viewed and the long-axis of the elipsoidal moon will be over 300 pixels across. Although at the phase angle of 116°, the visible portion will be less than half of that size. At the end of the observation, Cassini is on the outbound leg, the phase angle will be 159°, and the anti-Saturn hemisphere will be facing the spacecraft from a distance of 30100 km. ISS will obtain point-and-stare images of Telesto periodically throughout the encounter. ISS will obtain multi-spectral coverage, including spectro-photometric observations as the phase angle increases from 51° to over 150°. Especially important will be to obtain high-resolution surface details of Telesto's geological features and improved shape and topography measurements.

Narvi:
Irregular moon Narvi (diameter guess ~7 km, retrograde orbit) was only rarely observed by Cassini so far, and from an observation in March 2013, its rotational period is guessed to be somewhere between 11 and 16 h. To get a reliable number, Narvi will again be observed twice in rev 230, just a few days before the SOST segment (09 and 10 Jan 2016; MAPS segment; ~13 hrs of tracking at each occasion), and for a little bit over 2 hrs at the end of the SOST segment on 14 Jan 2016. The SOST observation is expected to significantly increase the precision of the period to be determined in the first two observations. The result will be the 22nd determination of a rotational period of a moon of Saturn by Cassini.

At right: **Mimas**, at the start of the observation.

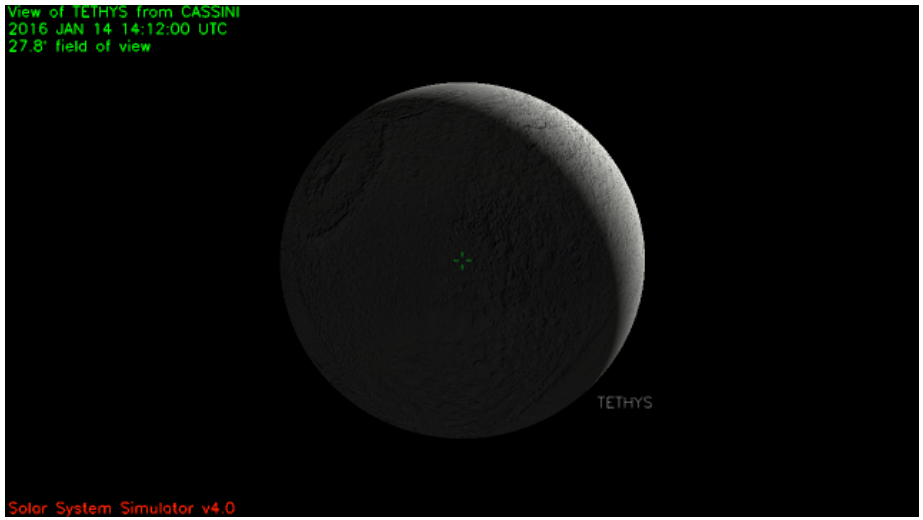
Daphnis will be set against the rings, and Saturn will provide a backdrop for Telesto



Science Highlights (3 of 3)

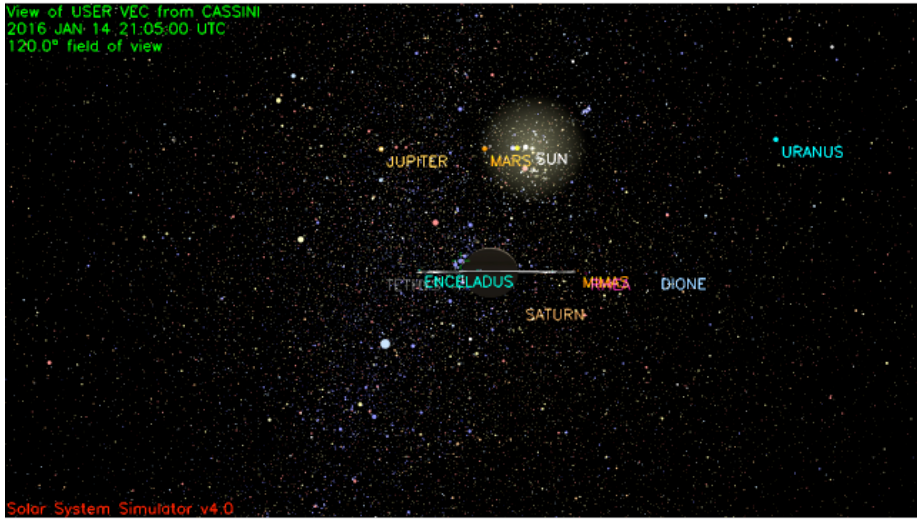
CIRS_230TE_COMPGLB001_PRIME

CIRS_230TE_COMPGLBL001_PRIME is long, dedicated stare at Saturn's moon Tethys. The goal of this observation is to collect a large number of infrared spectra of Tethys at moderate spectral resolutions to constrain its near surface composition. These spectra will be averaged together in order to more easily detect emission features from non-icy components and to better characterize the spectral roll-off typical of water ice near millimeter wavelengths.



UVIS_230ST_EPSORI001_PIE

Occultations by UV-bright stars sense atomic and molecular hydrogen and some light hydrocarbons in Saturn's upper atmosphere. They are especially valuable because they provide detailed vertical profiles of these constituents and temperature in the region of the atmosphere (pressures around 1 nbar) where the heating mechanism is still unexplained, and where much of the conversion of methane to other hydrocarbons occurs. No other instrument senses this region.



Notes

- Pointing:
  - All waypoint have been checked with waypt_widget, and have a small amount (<0.5 deg) of Saturn Heating
  - SP turns have been run through PDT, and include ONLY 2 minutes margin. This was done to maximize science in a very short segment
  - HAND EDIT REQUIRED for SP_230EN_WAYPTTURN014_PRIME. Enceladus is moving quickly at this point, and we end up exceeding the XXM recommended turn rates. The x-turn-rate must be hand edited to be 1.09 (instead of 1.25)
  - RBOT secondaries not used: None available during first half of segment, second waypoint chosen to minimize turn times and heating
  - ISS_230EN_ENCEL001_PIE was shortened: originally allocated 1:44, however it starts at the same time as the segment and no time was allocated for a waypoint turn. The PIE was shortened to 1:08 accommodate.
  - The observation ISS_230EN_PLUME002_PRIME is labeled as a PIE in the notes, but it is not a PIE (not in the PIE spreadsheet)
- Data Volume:
  - See DSN
- DSN:
  - Added a downlink pass for data volume, SP_230EA_C70METNON014_PRIME. Adjacent to existing YGAP.
  - Proposed C70 Maintenance from 2016-010T22:30 – 2016-015T15:01 impacts our C70 pass
    - Downgrading to a HEF would required 940Mb of cuts
    - This can be accomplished by all MAPS instruments going to minimum survey rates
    - CIRS (Shawn Brooks) has also volunteered 24.9 Mb
    - RPWS would like to preserve some high-rate data close to periapse and willing to cut data in the beginning of the following TOST segment to accommodate
  - Disposition ap_downlink report check warnings
    - 70m usage exceeds project commitment: work at sequence level
    - number of sequence upload passes is 0: work at sequence level
- Resource checker:
  - No items
- Opmodes:
  - Only DFPW used
- Hydrazine:
  - None
- Special Activities
  - None

Liens

Sequence Liens (should all be SPLAT items):

- List any Liens to be worked in SIP
  - The first 12 hours of the segment will likely be a challenge for RBOT. See SPLAT #S92000135, 136, 137
    - Targets are Enceladus, Mimas, Daphnis, Enceladus, Telesto, and Enceladus
    - Turns are very large (ISS will be doing internal handoffs and not always returning to the waypoint)
    - Target motion is also large, but there are no technical violations since the longest observation is 3 hrs long
    - ISS plans to design the observations with quiescent periods: one during Mimas, and one during either Daphnis or Telesto or both
  - DSN Maintenance (C70) 2016-010T22:30 – 2016-015T15:01 still TBD. See SPLAT #S92000149