



SATURN TARGET WORKING TEAM

Rev 195 Segment Legacy Package

**Segment Boundary: July 20, 2013 – July 25, 2013
2013-201T21:40:00 – 2013-206T12:39:00 (SCET)**

**Integration Began 10/08/2012
Segment Delivered to S79 Sequence 12/13/2012
Lead Integrator was Nimisha Mittal**

Legacy Package Assembled by Shawn Boll

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* N.A. = Slide present but content not available.

Segment Overview and Final Products

- This was a 4.5 day long periapse (15.38 Rs) segment in the first inclined phase (IN-1) of the Solstice Mission.
- As the segment began, the spacecraft was in the equatorial plane with views of Saturn's night side. Periapse was over the high northern latitudes, with a view of the half-lit north pole. The segment ended with the spacecraft viewing the fully-lit northern hemisphere of Saturn.
- The timeline was dominated by several UVIS EUV PIEs (Pre-Integrated Event) which performed slow scans across Saturn's illuminated hemisphere to form spectral images.
- Other Saturn science included VIMS northern aurora and a north pole movie on the inbound leg. Outbound, VIMS conducted mapping of the northern hemisphere and a stellar occultation of Saturn.
- The same waypoint was maintained throughout the segment, aligning the UVIS field-of-view with the illuminated limb of Saturn.

Final Sequenced SPASS

Saturn 195 Legacy

| Request | Riders | Start (SCET) | Start (Epoch) | Duration | End (SCET) | Primary | Secondary | Comments |
|-----------------------------------|---------|--------------------------|---------------|---------------------|--------------------------|--|-----------------------------|--|
| Sequence S79, length = 68 days | | 2013-158T00:45:00 | | 068T09:06:00 | 2013-226T09:51:00 | | | |
| SATURN_195 Segment | | 2013-201T21:40:00 | | 004T14:59:00 | 2013-206T12:39:00 | | | |
| SP_195EA_WAYPTTURN201_PRIME | | 2013-201T21:40:00 | | 000T00:40:00 | 2013-201T22:20:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| NEW WAYPOINT | | 2013-201T22:20:00 | | 000T02:35:00 | 2013-202T00:55:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| GAP 1 -> UVIS_195SA_EUVPIE001_PIE | I, V | 2013-201T22:20:00 | | 000T01:55:00 | 2013-202T00:15:00 | UVIS_FUV to Saturn | NEG_X to Sun | This is a PIE |
| SP_195EA_DLTURN202_PRIME | | 2013-202T00:15:00 | | 000T00:40:00 | 2013-202T00:55:00 | XBAND to Earth | NEG_Y to 103.0/-62.0 | |
| NEW WAYPOINT | | 2013-202T00:55:00 | | 000T11:10:00 | 2013-202T12:05:00 | XBAND to Earth | NEG_Y to 103.0/-62.0 | |
| ENGR_195SC_KPTYBIAS202_PRIME | | 2013-202T00:55:00 | | 000T01:30:00 | 2013-202T02:25:00 | NEG_Z to DELTA_H (0,0,0,0,69.999 deg. offset) | NEG_X to Sun | |
| SP_195EA_C70METNON202_PRIME | C | 2013-202T02:25:00 | | 000T09:00:00 | 2013-202T11:25:00 | XBAND to Earth | 6_Hr_Rolling | MIMI. NEG_Y to Saturn (0,0,-9.5). CIRS heating |
| SP_195EA_WAYPTTURN202_PRIME | | 2013-202T11:25:00 | | 000T00:40:00 | 2013-202T12:05:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| NEW WAYPOINT | | 2013-202T12:05:00 | | 000T12:49:00 | 2013-203T00:54:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| GAP 2 -> UVIS_195SA_EUVPIE002_PIE | I, V | 2013-202T12:05:00 | | 000T10:40:00 | 2013-202T22:45:00 | UVIS_FUV to Saturn | NEG_X to Sun | This is a PIE |
| VIMS_195SA_AURSTARE001_PRIME | C, I | 2013-202T22:45:00 | | 000T01:29:00 | 2013-203T00:14:00 | ISS_NAC to Saturn | POS_Z to NSP | |
| SP_195EA_DLTURN203_PRIME | | 2013-203T00:14:00 | | 000T00:40:00 | 2013-203T00:54:00 | XBAND to Earth | NEG_Y to 103.0/-62.0 | |
| NEW WAYPOINT | | 2013-203T00:54:00 | | 000T11:10:00 | 2013-203T12:04:00 | XBAND to Earth | NEG_Y to 103.0/-62.0 | |
| ENGR_195SC_KPTYBIAS203_PRIME | | 2013-203T00:54:00 | | 000T01:30:00 | 2013-203T02:24:00 | POS_Z to DELTA_H (0,0,0,0,65.001 deg. offset) | NEG_X to Sun | |
| SP_195EA_C34BWWGNON203_PRIME | C | 2013-203T02:24:00 | | 000T09:00:00 | 2013-203T11:24:00 | XBAND to Earth | 5_Hr_Rolling | MIMI. NEG_Y to Saturn (0,0,-9.5). SID suspend. CIRS heating |
| SP_195EA_WAYPTTURN203_PRIME | | 2013-203T11:24:00 | | 000T00:40:00 | 2013-203T12:04:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| NEW WAYPOINT | | 2013-203T12:04:00 | | 000T14:20:00 | 2013-204T02:24:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| GAP 3 -> UVIS_195SA_EUVPIE003_PIE | I, V | 2013-203T12:04:00 | | 000T10:40:00 | 2013-203T22:44:00 | UVIS_FUV to Saturn | NEG_X to Sun | This is a PIE |
| VIMS_195SA_NPOLMOV001_PRIME | C, I | 2013-203T22:44:00 | | 000T03:00:00 | 2013-204T01:44:00 | ISS_NAC to Saturn | POS_Z to NSP | |
| SP_195EA_DLTURN204_PRIME | | 2013-204T01:44:00 | | 000T00:40:00 | 2013-204T02:24:00 | XBAND to Earth | POS_X to NEP | |
| NEW WAYPOINT | | 2013-204T02:24:00 | | 000T09:40:00 | 2013-204T12:04:00 | XBAND to Earth | POS_X to NEP | |
| SP_195EA_C34HEFOTP204_PRIME | C, E, N | 2013-204T02:24:00 | | 000T09:00:00 | 2013-204T11:24:00 | XBAND to Earth | 4_Hr_Rolling | CAPS. POS_X to NEP or NSP. OTP. SID suspend. CIRS heating |
| Periapse R = 15.370 Rs, lat... | | 2013-204T05:40:19 | | 000T00:00:01 | 2013-204T05:40:20 | | | |
| SP_195EA_WAYPTTURN204_PRIME | | 2013-204T11:24:00 | | 000T00:40:00 | 2013-204T12:04:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| NEW WAYPOINT | | 2013-204T12:04:00 | | 000T14:20:00 | 2013-205T02:24:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| GAP 4 -> UVIS_195SA_EUVPIE004_PIE | I, V | 2013-204T12:04:00 | | 000T10:40:00 | 2013-204T22:44:00 | UVIS_FUV to Saturn | NEG_X to Sun | This is a PIE |
| VIMS_195SA_NHEMMAP001_PRIME | C, I | 2013-204T22:44:00 | | 000T03:00:00 | 2013-205T01:44:00 | ISS_NAC to Saturn | POS_Z to NSP | |
| SP_195EA_DLTURN205_PRIME | | 2013-205T01:44:00 | | 000T00:40:00 | 2013-205T02:24:00 | XBAND to Earth | POS_X to NEP | |
| NEW WAYPOINT | | 2013-205T02:24:00 | | 000T09:40:00 | 2013-205T12:04:00 | XBAND to Earth | POS_X to NEP | |
| SP_195EA_C70UNQOTB205_PRIME | C, N | 2013-205T02:24:00 | | 000T08:30:00 | 2013-205T10:54:00 | XBAND to Earth | POS_X to NEP | CAPS. same secondary as OTP pass. OTB. CIRS heating |
| SP_195EA_WAYPTTURN205_PRIME | | 2013-205T11:24:00 | | 000T00:40:00 | 2013-205T12:04:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| NEW WAYPOINT | | 2013-205T12:04:00 | | 000T14:05:00 | 2013-206T02:09:00 | ISS_NAC to Saturn | NEG_X to Sun | |
| GAP 5 -> UVIS_195SA_EUVPIE005_PIE | I, V | 2013-205T12:04:00 | | 000T08:21:00 | 2013-205T20:25:00 | UVIS_FUV to Saturn | NEG_X to Sun | This is a PIE |
| VIMS_195SA_WHYAOCC001_PRIME | | 2013-205T20:25:00 | | 000T00:40:00 | 2013-205T21:05:00 | VIMS_IR to 207.261/-28.368 | NEG_X to Sun | No Preference to secondary pointing |
| UVIS_195SA_EUVPIE006_PIE | I, V | 2013-205T21:05:00 | | 000T04:24:00 | 2013-206T01:29:00 | UVIS_FUV to Saturn | NEG_X to Sun | This is a PIE |
| SP_195EA_DLTURN206_PRIME | | 2013-206T01:29:00 | | 000T00:40:00 | 2013-206T02:09:00 | XBAND to Earth | NEG_Y to 103.0/-62.0 | |
| NEW WAYPOINT | | 2013-206T02:09:00 | | 000T11:10:00 | 2013-206T13:19:00 | XBAND to Earth | NEG_Y to 103.0/-62.0 | |
| ENGR_195SC_KPTYBIAS206_PRIME | | 2013-206T02:09:00 | | 000T01:30:00 | 2013-206T03:39:00 | POS_Z to DELTA_H (0,0,0,0,-74.998 deg. offset) | NEG_X to Sun | |
| SP_195EA_C70METNON206_PRIME | C | 2013-206T03:39:00 | | 000T06:30:00 | 2013-206T10:09:00 | XBAND to Earth | NEG_Y to 103.0/-62.0 | MIMI. NEG_Y to Saturn (0,0,-9.5). pre-TOST flyby. CIRS heating |
| SP_195EA_C34HEFNON206_PRIME | C | 2013-206T10:09:00 | | 000T02:30:00 | 2013-206T12:39:00 | XBAND to Earth | NEG_Y to 103.0/-62.0 | MIMI. NEG_Y to Saturn (0,0,-9.5). pre-TOST flyby. CIRS heating |

Final Sequenced SMT and Data Volume

Saturn 195 Legacy

DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

| DOWNLINK PASS NAME | Start doy hh:mm | End doy hh:mm | OBSERVATION_PERIOD | | | | | | | DOWNLINK_PASS | | | | | | | |
|-----------------------------|--------------------|------------------|--------------------|-------------|--------------|---------------|----------------|--------------|---------------|---------------|--------------|---------------|----------------|---------------|-------------------|-----|----------------|
| | | | START (Mb) | SCI (Mb) | HK+E (Mb) | TOTAL (Mb) | CPACTY (Mb) | MRGN (Mb) | OPNAV (Mb) | RECORDED | | | PLAYBACK | | | | |
| | | | | | | | | | | SCI (Mb) | ENGR (Mb) | TOTAL (Mb) | CPACTY (Mb) | MARGN (Mb) | NET_MARGN (Mb) | (%) | CAROVN (Mb) |
| SP_195EA_C70METNON202_PRIME | 202 02:25 | 202 11:25 | 829 | 228 | 20 | 1077 | 3322 | 2245 | 0 | 303 | 53 | 1433 | 3590 | 2157 | 2609 | 18% | 0 |
| SP_195EA_C34BWGNON203_PRIME | 203 02:24 | 203 11:24 | 0 | 970 | 63 | 1033 | 3322 | 2289 | 0 | 332 | 53 | 1418 | 775 | -643 | 452 | 3% | 643 |
| SP_195EA_C34HEFOTP204_PRIME | 204 02:24 | 204 11:24 | 643 | 1217 | 63 | 1923 | 3322 | 1399 | 0 | 332 | 53 | 2308 | 689 | -1619 | 452 | 3% | 1618 |
| SP_195EA_C70UNQOTB205_PRIME | 205 02:24 | 205 10:54 | 1618 | 1188 | 63 | 2870 | 3322 | 452 | 0 | 313 | 50 | 3232 | 2875 | -358 | 760 | 5% | 358 |
| SP_195EA_C70METNON206_PRIME | 206 03:39 | 206 10:09 | 358 | 1201 | 71 | 1630 | 3322 | 1692 | 0 | 237 | 38 | 1904 | 2458 | 553 | 760 | 6% | 0 |
| SP_195EA_C34HEFNON206_PRIME | 206 10:09 | 206 12:39 | 0 | 0 | 0 | 0 | 3322 | 3322 | 0 | 95 | 15 | 110 | 157 | 46 | 206 | 2% | 0 |

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

| Event | Start doy hh:mm | End doy hh:mm | CAPS (Mb) | CDA (Mb) | CIRS (Mb) | INMS (Mb) | ISS (Mb) | MAG (Mb) | MIMI (Mb) | RADAR (Mb) | RPWS (Mb) | UVIS (Mb) | VIMS (Mb) | PROBE (Mb) | ENGR (Mb) | TOTAL (Mb) |
|-----------------------------|--------------------|------------------|--------------|-------------|--------------|--------------|-------------|-------------|--------------|---------------|--------------|--------------|--------------|---------------|--------------|---------------|
| OBSERVATION_NOR | 201 21:40 | 202 02:25 | 17.1 | 9.0 | 27.6 | 1.7 | 50.0 | 8.4 | 14.5 | 0.0 | 22.4 | 34.7 | 40.0 | 0.0 | 19.9 | 245.3 |
| SP_195EA_C70METNON202_PRIME | 202 02:25 | 202 11:25 | 32.4 | 17.0 | 86.4 | 3.2 | 0.0 | 16.0 | 27.5 | 0.0 | 112.8 | 4.9 | 0.0 | 0.0 | 0.0 | 300.3 |
| DAILY TOTAL SCIENCE | 201 21:40 | 202 11:25 | 49.5 | 25.9 | 114.0 | 5.0 | 50.0 | 24.5 | 42.1 | 0.0 | 135.2 | 39.7 | 40.0 | 0.0 | 19.9 | |
| OBSERVATION_NOR | 202 11:25 | 203 02:24 | 53.9 | 28.3 | 87.5 | 5.4 | 65.0 | 26.6 | 45.8 | 0.0 | 235.0 | 193.2 | 220.0 | 0.0 | 62.6 | 1023.4 |
| SP_195EA_C34BWGNON203_PRIME | 203 02:24 | 203 11:24 | 32.4 | 17.0 | 86.4 | 3.2 | 0.0 | 16.0 | 27.5 | 0.0 | 141.1 | 4.9 | 0.0 | 0.0 | 0.0 | 328.7 |
| DAILY TOTAL SCIENCE | 202 11:25 | 203 11:24 | 86.3 | 45.2 | 173.9 | 8.6 | 65.0 | 42.7 | 73.4 | 0.0 | 376.1 | 198.2 | 220.0 | 0.0 | 62.6 | |
| OBSERVATION_NOR | 203 11:24 | 204 02:24 | 82.6 | 28.3 | 98.4 | 5.4 | 150.0 | 26.7 | 45.9 | 0.0 | 235.2 | 193.2 | 340.0 | 0.0 | 62.7 | 1268.4 |
| SP_195EA_C34HEFOTP204_PRIME | 204 02:24 | 204 11:24 | 32.4 | 17.0 | 86.4 | 3.2 | 0.0 | 16.0 | 27.5 | 0.0 | 141.1 | 4.9 | 0.0 | 0.0 | 0.0 | 328.7 |
| DAILY TOTAL SCIENCE | 203 11:24 | 204 11:24 | 115.0 | 45.3 | 184.8 | 8.6 | 150.0 | 42.7 | 73.4 | 0.0 | 376.4 | 198.2 | 340.0 | 0.0 | 62.7 | |
| OBSERVATION_NOR | 204 11:24 | 205 02:24 | 54.0 | 28.3 | 98.4 | 5.4 | 150.0 | 26.7 | 45.9 | 0.0 | 235.2 | 193.2 | 340.0 | 0.0 | 62.7 | 1239.9 |
| SP_195EA_C70UNQOTB205_PRIME | 205 02:24 | 205 10:54 | 30.6 | 16.0 | 81.0 | 3.1 | 0.0 | 15.1 | 26.0 | 0.0 | 133.3 | 4.7 | 0.0 | 0.0 | 0.0 | 309.8 |
| DAILY TOTAL SCIENCE | 204 11:24 | 205 10:54 | 84.6 | 44.3 | 179.4 | 8.5 | 150.0 | 41.8 | 71.9 | 0.0 | 368.6 | 197.9 | 340.0 | 0.0 | 62.7 | |
| OBSERVATION_NOR | 205 10:54 | 206 03:39 | 60.3 | 31.6 | 97.2 | 6.0 | 100.0 | 29.8 | 51.3 | 0.0 | 262.7 | 231.2 | 320.0 | 0.0 | 70.0 | 1260.1 |
| SP_195EA_C70METNON206_PRIME | 206 03:39 | 206 10:09 | 23.4 | 12.3 | 59.4 | 2.3 | 0.0 | 11.6 | 19.9 | 0.0 | 101.9 | 3.6 | 0.0 | 0.0 | 0.0 | 234.4 |
| SP_195EA_C34HEFNON206_PRIME | 206 10:09 | 206 12:39 | 9.0 | 4.7 | 27.0 | 0.9 | 0.0 | 4.4 | 7.6 | 0.0 | 39.2 | 1.4 | 0.0 | 0.0 | 0.0 | 94.3 |
| DAILY TOTAL SCIENCE | 205 10:54 | 206 12:39 | 92.7 | 48.6 | 183.6 | 9.3 | 100.0 | 45.8 | 78.8 | 0.0 | 403.8 | 236.2 | 320.0 | 0.0 | 70.0 | |

Segment Geometry (1 of 2)

Cassini Legacy Graphics and Information Tool (Digit)

View of SATURN from Cassini
2013 JUL 20 21:40:00 UTC
15.4° field of view

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Rev 195 INBOUND
2013 JUL 20 21:40:00 S CET
2013 JUL 20 21:40:00 S CET
2013 JUL 20 23:00:31 E RT
Apopsae_195 = 005715:24:49
Periapsae_195 = 002708:00:31
Orbit period: 35.95 days
Light time: 80.5 min

Radius 1098446 km 18.23 Rs
Rad_cyl 1098421 km 18.23 Rs
Z_ht_cyl 7413 km -0.12 Rs
Mag_L 18.23
Semi_axs 1222140 km 20.28 Rs
Eccentricity 0.241
Inclination 56.73 deg
Sun_range 9.85 AU
Earth_range 9.68 AU
EPS 5.88 deg +
SEP 96.83 deg

--- DSN ELEV --- D/L -- U/L -----
Goldstone 26.2 -3.7
Candiera -30.6 -43.7
Madrid 10.3 33.4

--- LOOK DIRECTION INFO ---
FOV 18.4 deg 321.1 mrad
RA 49.945 deg
DEC -5.994 deg
XsRings@ 47 km 0.00 Rs
    
```

Point at SATURN and align Up with NSP

User vector - R.A.: 136.7
User vector - Dec.: 38

Epoch: Go

Year Hour
Month Minute
Day Second

| BODY | Occs S/C? | Satrn Occs? | RANGE (km) | (Rs) | ALTITUDE (km) | (Rs) | PHASE (deg) | ANGULAR_DIAMETER (mrad) | SUB_S/C LON LAT (deg) | ΔLON (deg) | VREL (km/s) | Z_wrt_RP (km) | SATURN ANGLE FROM EARTH FROM RAM | | | | |
|-----------|-----------|-------------|------------|--------|---------------|--------|-------------|-------------------------|-----------------------|------------|-------------|---------------|----------------------------------|----------|-------|-------|-------|
| SATURN | -- | -- | 1098446 | 18.23 | 1038178 | 17.23 | 158.3 | 6.29 | 109.79 | 326 | -0 | 0 | 6.2 | 0 | 0.0 | 23.6 | 76.5 |
| MIMAS | -- | -- | 958018 | 15.90 | 957816 | 15.89 | 158.3 | 0.02 | 0.43 | 138 | -0 | 36 | 14.2 | 1961 | 6.5 | 28.3 | 73.3 |
| ENCELADUS | -- | -- | 1263693 | 20.97 | 1263438 | 20.96 | 161.0 | 0.02 | 0.41 | 322 | -0 | -129 | 14.9 | 5 | 8.4 | 18.8 | 80.5 |
| TETHYS | -- | -- | 813143 | 13.46 | 810803 | 13.45 | 160.5 | 0.08 | 1.33 | 196 | -2 | -11 | 9.4 | 5267 | 4.0 | 20.6 | 77.9 |
| DIONE | -- | -- | 1416974 | 23.51 | 1416411 | 23.50 | 152.6 | 0.05 | 0.80 | 28 | -0 | 143 | 14.4 | 256 | 9.3 | 30.7 | 72.5 |
| RHEA | -- | -- | 1622003 | 26.90 | 1620236 | 26.88 | 159.5 | 0.05 | 0.95 | 357 | -0 | -171 | 12.7 | 2674 | 2.9 | 21.7 | 77.8 |
| TITAN | -- | -- | 840076 | 15.60 | 837001 | 15.56 | 117.1 | 0.31 | 5.48 | 301 | -0 | -48 | 5.9 | -7373 | 72.0 | 57.0 | 110.6 |
| HYPERION | -- | -- | 1296454 | 21.51 | 1296298 | 21.51 | 106.2 | 0.01 | 0.25 | 153 | 10 | -54 | 5.6 | -29763 | 83.4 | 68.0 | 115.4 |
| ZAPETUS | -- | -- | 4256198 | 70.62 | 4255551 | 70.62 | 143.9 | 0.02 | 0.35 | 353 | 2 | -131 | 6.9 | -382207 | 38.3 | 30.6 | 99.7 |
| PHOEBE | -- | -- | 10950311 | 181.69 | 10950201 | 181.69 | 26.0 | 0.00 | 0.02 | 64 | 21 | 32 | 6.5 | -1366350 | 144.6 | 159.7 | 92.4 |
| SATURN | -- | -- | 1098446 | 18.23 | 1038178 | 17.23 | 158.3 | 6.29 | 109.79 | 326 | -0 | 0 | 6.2 | 0 | 0.0 | 23.6 | 76.5 |

← Seg Start (Left)

↓ Periapse (below)

Cassini Legacy Graphics and Information Tool (Digit)

View of SATURN from Cassini
2013 JUL 23 05:40:31 UTC
28.3° field of view

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Rev 195 INBOUND
2013 JUL 23 05:40:31 S CET
2013 JUL 23 05:40:31 S CET
2013 JUL 23 07:01:17 E RT
Apopsae_195 = 007723:25:20
Periapsae_195 = -001001:00:00
Orbit period: 15.95 days
Light time: 80.8 min

Radius 927196 km 15.38 Rs
Rad_cyl 927166 km 15.38 Rs
Z_ht_cyl 758570 km 12.59 Rs
Mag_L 46.53
Semi_axs 1222168 km 20.28 Rs
Eccentricity 0.241
Inclination 56.72 deg
Sun_range 9.84 AU
Earth_range 9.71 AU
EPS 5.91 deg +
SEP 94.46 deg

--- DSN ELEV --- D/L -- U/L -----
Goldstone 4.8 32.8
Candiera 60.5 31.7
Madrid -39.5 -49.2

--- LOOK DIRECTION INFO ---
FOV 26.3 deg 459.0 mrad
RA 128.466 deg
DEC -53.662 deg
XsRings@ 1 km 0.00 Rs
    
```

Point at SATURN and align Up with NSP

User vector - R.A.: 136.7
User vector - Dec.: 38

Epoch: Go

Year Hour
Month Minute
Day Second

| BODY | Occs S/C? | Satrn Occs? | RANGE (km) | (Rs) | ALTITUDE (km) | (Rs) | PHASE (deg) | ANGULAR_DIAMETER (mrad) | SUB_S/C LON LAT (deg) | ΔLON (deg) | VREL (km/s) | Z_wrt_RP (km) | SATURN ANGLE FROM EARTH FROM RAM | | | | |
|-----------|-----------|-------------|------------|--------|---------------|--------|-------------|-------------------------|-----------------------|------------|-------------|---------------|----------------------------------|----------|-------|-------|-------|
| SATURN | -- | -- | 927196 | 15.38 | 870829 | 14.45 | 79.8 | 7.45 | 130.09 | 349 | 55 | 0 | 7.1 | 0 | 0.0 | 101.8 | 90.0 |
| MIMAS | -- | -- | 904052 | 15.00 | 903800 | 15.00 | 89.0 | 0.03 | 0.46 | 268 | 59 | -66 | 11.1 | -2527 | 11.8 | 95.9 | 92.0 |
| ENCELADUS | -- | -- | 860713 | 14.28 | 860464 | 14.28 | 66.0 | 0.03 | 0.60 | 112 | 62 | 46 | 11.2 | 35 | 14.7 | 115.0 | 101.0 |
| TETHYS | -- | -- | 815753 | 13.57 | 813704 | 13.56 | 84.2 | 0.08 | 1.32 | 234 | 67 | -27 | 5.0 | -1481 | 18.1 | 95.7 | 103.3 |
| DIONE | -- | -- | 1016890 | 16.87 | 1016329 | 16.86 | 100.8 | 0.06 | 1.11 | 309 | 48 | -95 | 11.3 | 154 | 21.7 | 80.4 | 84.7 |
| RHEA | -- | -- | 985592 | 16.35 | 984829 | 16.34 | 48.1 | 0.09 | 1.56 | 150 | 72 | 10.8 | -2865 | 31.8 | 133.6 | 103.1 | |
| TITAN | -- | -- | 1106628 | 18.36 | 1104053 | 18.32 | 105.0 | 0.27 | 4.65 | 337 | 44 | -54 | 8.8 | -5637 | 70.8 | 70.4 | 127.5 |
| HYPERION | -- | -- | 1328529 | 22.04 | 1328373 | 22.04 | 92.1 | 0.01 | 0.25 | 355 | 25 | -18 | 2.6 | -22229 | 86.1 | 82.3 | 147.1 |
| ZAPETUS | -- | -- | 3467478 | 57.53 | 3466733 | 57.52 | 140.0 | 0.02 | 0.43 | 359 | 15 | -72 | 5.9 | -208796 | 31.5 | 35.8 | 95.8 |
| PHOEBE | -- | -- | 12143057 | 201.48 | 12142947 | 201.48 | 26.0 | 0.00 | 0.02 | 79 | 24 | 103 | 6.8 | -1203814 | 73.7 | 159.7 | 93.5 |
| SATURN | -- | -- | 927196 | 15.38 | 870829 | 14.45 | 79.8 | 7.45 | 130.09 | 349 | 55 | 0 | 7.1 | 0 | 0.0 | 101.8 | 90.0 |

Segment Geometry (2 of 2)

Cassini Legacy Graphics and Information Tool (Digit)

View of SATURN from Cassini
2013 JUL 25 12:39:00 UTC
22.3° field of view

Solar System Simulator v4.0

Rev 195 OUTBOUND
2013 - 206T12:39:00 SCET
2013 JUL 25 12:39:00 SCET
2013 JUL 25 14:00:02 ERT

Apoapse_195 + 010T06:23:49
Periapse_195 + 002T06:58:29
Orbit period: 15.97 days
Light time: 81.0 min

Radius 1093454 km 18.14 Rs
Rad_cyl 1025925 km 17.02 Rs
Z_ht_cyl 378311 km 6.28 Rs
Mag_L 20.61
Semi_axis 1222777 km 20.29 Rs
Eccentricity 0.242
Inclination 96.73 deg
Sun_range 9.84 AU
Earth_range 9.74 AU
EPS 5.92 deg °
SEP 92.32 deg

--- DSN ELEV --- D/L --- U/L -----
Goldstone -65.4 -48.0
Canberra 7.3 40.1
Madrid 11.5 -18.5

----- LOOK DIRECTION INFO -----
FOV 22.3 deg 389.2 mrad
RA -143.723 deg
DEC -13.797 deg
XsRings@ 0 km 0.00 Rs

Point at SATURN and align Up with NSP

User vector - R.A.: 136.7 Tilt L Up Tilt R Zoom Out Labels Vectors

User vector - Dec.: 38 Left Reset Right Fill Screen Orbits Lats/Ions

Paste Current RA/DEC Down Zoom In ORS FOVs

Epoch: Go

Year: Hour

Month: Minute

Day: Second

| BODY | Occs S/C? | Satrn Occs? | RANGE | | ALTITUDE | | PHASE (deg) | ANGULAR_DIAMETER (deg) | SUB_S/C | ΔLON (deg) | VREL (km/s) | Z_wrt_RP (km) | ANGLE FROM | | | |
|-----------|-----------|-------------|----------|--------|----------|--------|-------------|------------------------|---------|------------|-------------|---------------|------------|-------|-------|-------|
| | | | (km) | (Rs) | (km) | (Rs) | | | | | | | SATURN | EARTH | RAM | |
| SATURN | -- | -- | 1093454 | 18.14 | 1033868 | 17.15 | 3.0 | 6.32 | 110.29 | 309.20 | 0 | 6.2 | 0 | 0.0 | 176.0 | 104.0 |
| MIMAS | -- | -- | 1194432 | 19.82 | 1194232 | 19.82 | 10.2 | 0.02 | 0.35 | 312.18 | -122 | 19.4 | 4018 | 7.6 | 175.2 | 108.7 |
| ENCELADUS | -- | -- | 1147847 | 19.05 | 1147595 | 19.04 | 14.6 | 0.03 | 0.45 | 295.19 | -98 | 16.9 | -31 | 11.8 | 170.7 | 109.3 |
| TETHYS | -- | -- | 828499 | 13.75 | 827962 | 13.74 | 9.8 | 0.07 | 1.30 | 190.28 | -7 | 9.8 | -5592 | 7.8 | 169.7 | 98.3 |
| DIONE | -- | -- | 982161 | 16.30 | 981600 | 16.29 | 17.5 | 0.07 | 1.15 | 98.23 | 61 | 7.3 | -95 | 20.0 | 156.6 | 91.7 |
| RHEA | -- | -- | 647716 | 10.75 | 646951 | 10.73 | 21.7 | 0.14 | 2.37 | 209.35 | -13 | 8.0 | 2940 | 19.2 | 159.6 | 94.1 |
| TITAN | -- | -- | 446846 | 7.41 | 444271 | 7.37 | 91.9 | 0.66 | 11.53 | 36.57 | 9 | 5.1 | 1335 | 92.2 | 84.0 | 11.9 |
| HYPERION | -- | -- | 1083973 | 17.99 | 1083816 | 17.98 | 84.4 | 0.02 | 0.30 | 151.5 | 43 | 4.2 | -6402 | 86.7 | 89.6 | 46.3 |
| IAPETUS | -- | -- | 2510869 | 41.66 | 2510122 | 41.65 | 143.6 | 0.03 | 0.60 | 11.7 | 14 | 5.5 | -30999 | 144.5 | 31.5 | 41.3 |
| PHOEBE | -- | -- | 12963552 | 215.10 | 12963440 | 215.10 | 25.2 | 0.00 | 0.02 | 51.20 | -159 | 5.9 | -1043225 | 23.5 | 160.4 | 123.7 |
| SATURN | -- | -- | 1093454 | 18.14 | 1033868 | 17.15 | 3.0 | 6.32 | 110.29 | 309.20 | 0 | 6.2 | 0 | 0.0 | 176.0 | 104.0 |

← Seg End

No ORS Boresight Solar Constraints on Science Pointing Noted.

===== Jul 20 2013 =====

DOY 201

MAPS teams continued their dust and outer magnetosphere survey campaigns. This was to help determine atmospheric and ionospheric thermal structure in the Saturnian system. UVIS then performed a high priority EUVFUV which involved slow scans across Saturn's illuminated hemisphere to form spectral images. ISS, VIMS and CIRS rode along.

===== Jul 21 2013 =====

DOY 202

UVIS measured Lyman Alpha emissions while scanning the interplanetary medium to search for hydrogen. RPWS then observed the auroral magnetosphere as part of the auroral and Saturn magnetosphere campaign. UVIS conducted another high priority EUVFUV with ISS, VIMS and CIRS riding along. VIMS then observed Saturn's North Pole to make auroral maps. CIRS and ISS rode along.

===== Jul 22 2013 =====

DOY 203

UVIS continued its interplanetary hydrogen search campaign. After that, UVIS performed another high priority EUVFUV with ISS, VIMS and CIRS riding along. VIMS observed Saturn's north pole to make a mosaic movie of atmospheric dynamics.

===== Jul 23 2013 =====

DOY 204

UVIS continued its interplanetary hydrogen search campaign, after which it conducted another high priority EUVFUV with ISS, VIMS and CIRS riding along. VIMS observed Saturn's northern hemisphere to make mosaics of the latitudes where storms are typically seen.

===== Jul 24 2013 =====

DOY 205

UVIS continued its interplanetary hydrogen search campaign, after which it conducted another high priority EUVFUV with ISS, VIMS and CIRS riding along. VIMS mosaicked Saturn's northern hemisphere to make mosaics in particular of the mid-latitude region of the Great Storm of 2010-2011 to follow its aftermath. After 8 hours, UVIS paused its measurements to allow VIMS to observe an atmospheric occultation of the star 'W Hydrae'. After the occultation, UVIS resumed its EUVFUV.

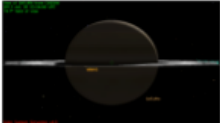
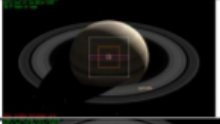

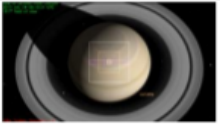
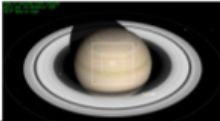
===== Jul 25 2013 =====

DOY 206

UVIS continued its interplanetary hydrogen search campaign, and CIRS performed a deep space calibration.

Segment Integration Planning

Timeline Gaps and Suggested Observations

| Gap | Start | End | Duration | Phase angle (range) | Rs range | Sub s/c latitude | Snapshot (mid-gap) |
|-----|-------------------|-------------------|--------------|---------------------|-------------|------------------|--|
| 1 | 2013-201T22:20:00 | 2013-202T00:15:00 | 000T01:55:00 | 157.5° - 155.4° | 18.17-18.02 | 0° to 2° |  |
| 2 | 2013-202T22:45:00 | 2013-203T00:16:00 | 000T01:31:00 | 126.7° - 124.6° | 16.4-16.31 | 26° to 27° |  |
| 3 | 2013-203T22:44:00 | 2013-204T01:44:00 | 000T03:00:00 | 90.8° - 86.0° | 15.44-15.4 | 50° to 53° |  |
| 4 | 2013-204T22:44:00 | 2013-205T01:44:00 | 000T03:00:00 | 53.2° - 48.6° | 15.71-15.83 | 54° to 52° |  |
| 5 | 2013-205T22:44:00 | 2013-206T01:29:00 | 000T02:45:00 | 19.4° -15.9° | 17.07-17.27 | 34° to 31° |  |

Beginning of Integration:

SMT Report(Includes UVIS PIEs and Riders)

Will start with ~1.5 Gb of RINGS carryover

DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

| DOWNLINK PASS NAME | Start | | End | | OBSERVATION_PERIOD | | | | | | DOWNLINK_PASS | | | | | | | | |
|-----------------------------|-------|-------|-----|-------|--------------------|----------|-----------|-------------------|------------|------------|---------------|-----------|------------|-------------|------------|----------------|------|------------|------|
| | doy | hh:mm | doy | hh:mm | P4 | | | P5 | RECORDED | | PLAYBACK | | | | | | | | |
| | | | | | START (Mb) | SCI (Mb) | HK+E (Mb) | TOTAL CPACTY (Mb) | MARGN (Mb) | OPNAV (Mb) | SCI (Mb) | ENGR (Mb) | TOTAL (Mb) | CPACTY (Mb) | MARGN (Mb) | NET_MARGN (Mb) | (%) | CAROV (Mb) | |
| SP_195EA_C70METNON202_PRIME | 202 | 02:25 | 202 | 11:25 | 0 | 214 | 20 | 234 | 3322 | 3088 | 0 | 303 | 53 | 590 | 3590 | 3000 | 3918 | 34% | 0 |
| SP_195EA_C34BWGNON203_PRIME | 203 | 02:24 | 203 | 11:24 | 0 | 943 | 63 | 1007 | 3322 | 2315 | 0 | 332 | 53 | 1392 | 775 | -617 | 918 | 11% | 617 |
| SP_195EA_C34BWGOTP204_PRIME | 204 | 02:24 | 204 | 11:24 | 617 | 973 | 63 | 1653 | 3322 | 1669 | 0 | 332 | 53 | 2038 | 641 | -1397 | 918 | 13% | 1397 |
| SP_195EA_C70METOTB205_PRIME | 205 | 02:24 | 205 | 11:24 | 1397 | 944 | 63 | 2404 | 3322 | 918 | 0 | 332 | 53 | 2789 | 3535 | 745 | 2436 | 37% | 0 |
| SP_195EA_C70METNON206_PRIME | 206 | 03:39 | 206 | 12:39 | 0 | 977 | 69 | 1046 | 3322 | 2276 | 0 | 332 | 53 | 1431 | 3121 | 1689 | 1690 | 54% | 0 |

Initial SMT and Data Volume (2 of 2)

Beginning of Integration: SMT Report (Team Summary- Includes UVIS PIEs and riders)

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

| Event | Start day hh:mm | End day hh:mm | CAPS (Mb) | CDA (Mb) | CIRS (Mb) | INMS (Mb) | ISS (Mb) | MAG (Mb) | MIMI (Mb) | RADAR (Mb) | RPWS (Mb) | UVIS (Mb) | VIMS (Mb) | PROBE (Mb) | ENGR (Mb) | TOTAL (Mb) |
|-----------------------------|--------------------|------------------|--------------|-------------|--------------|--------------|-------------|-------------|--------------|---------------|--------------|--------------|--------------|---------------|--------------|---------------|
| OBSERVATION_NOR | 201 21:40 | 202 02:25 | 17.1 | 9.0 | 13.8 | 1.7 | 50.8 | 8.4 | 14.5 | 0.0 | 22.4 | 34.7 | 39.3 | 0.0 | 19.9 | 231.7 |
| SP_195EA_C70METNON202_PRIME | 202 02:25 | 202 11:25 | 32.4 | 17.0 | 86.4 | 3.2 | 0.0 | 16.0 | 27.5 | 0.0 | 112.8 | 4.9 | 0.0 | 0.0 | 0.0 | 300.3 |
| DAILY TOTAL SCIENCE | 201 21:40 | 202 11:25 | 49.5 | 25.9 | 100.2 | 5.0 | 50.8 | 24.5 | 42.1 | 0.0 | 135.2 | 39.7 | 39.3 | 0.0 | 19.9 | |
| OBSERVATION_NOR | 202 11:25 | 203 02:24 | 53.9 | 28.3 | 76.8 | 5.4 | 50.8 | 26.6 | 45.8 | 0.0 | 235.0 | 193.2 | 219.0 | 0.0 | 62.6 | 997.5 |
| SP_195EA_C34BWGNON203_PRIME | 203 02:24 | 203 11:24 | 32.4 | 17.0 | 86.4 | 3.2 | 0.0 | 16.0 | 27.5 | 0.0 | 141.1 | 4.9 | 0.0 | 0.0 | 0.0 | 328.7 |
| DAILY TOTAL SCIENCE | 202 11:25 | 203 11:24 | 86.3 | 45.2 | 163.2 | 8.6 | 50.8 | 42.7 | 73.4 | 0.0 | 376.1 | 198.2 | 219.0 | 0.0 | 62.6 | |
| OBSERVATION_NOR | 203 11:24 | 204 02:24 | 82.6 | 28.3 | 76.8 | 5.4 | 50.8 | 26.7 | 45.9 | 0.0 | 235.2 | 193.2 | 219.0 | 0.0 | 62.7 | 1026.6 |
| SP_195EA_C34BWGOTP204_PRIME | 204 02:24 | 204 11:24 | 32.4 | 17.0 | 86.4 | 3.2 | 0.0 | 16.0 | 27.5 | 0.0 | 141.1 | 4.9 | 0.0 | 0.0 | 0.0 | 328.7 |
| DAILY TOTAL SCIENCE | 203 11:24 | 204 11:24 | 115.0 | 45.3 | 163.2 | 8.6 | 50.8 | 42.7 | 73.4 | 0.0 | 376.4 | 198.2 | 219.0 | 0.0 | 62.7 | |
| OBSERVATION_NOR | 204 11:24 | 205 02:24 | 54.0 | 28.3 | 76.8 | 5.4 | 50.8 | 26.7 | 45.9 | 0.0 | 235.2 | 193.2 | 219.0 | 0.0 | 62.7 | 998.0 |
| SP_195EA_C70METOTB205_PRIME | 205 02:24 | 205 11:24 | 32.4 | 17.0 | 86.4 | 3.2 | 0.0 | 16.0 | 27.5 | 0.0 | 141.1 | 4.9 | 0.0 | 0.0 | 0.0 | 328.7 |
| DAILY TOTAL SCIENCE | 204 11:24 | 205 11:24 | 86.4 | 45.3 | 163.2 | 8.6 | 50.8 | 42.7 | 73.4 | 0.0 | 376.4 | 198.2 | 219.0 | 0.0 | 62.7 | |
| OBSERVATION_NOR | 205 11:24 | 206 03:39 | 58.5 | 30.7 | 76.8 | 5.9 | 50.8 | 28.9 | 49.7 | 0.0 | 254.9 | 193.2 | 219.0 | 0.0 | 67.9 | 1036.2 |
| SP_195EA_C70METNON206_PRIME | 206 03:39 | 206 12:39 | 32.4 | 17.0 | 86.4 | 3.2 | 0.0 | 16.0 | 27.5 | 0.0 | 141.1 | 4.9 | 0.0 | 0.0 | 0.0 | 328.7 |
| DAILY TOTAL SCIENCE | 205 11:24 | 206 12:39 | 90.9 | 47.6 | 163.2 | 9.1 | 50.8 | 44.9 | 77.3 | 0.0 | 396.0 | 198.2 | 219.0 | 0.0 | 67.9 | |

| CAPS (Mb) | CDA (Mb) | CIRS (Mb) | INMS (Mb) | ISS (Mb) | MAG (Mb) | MIMI (Mb) | RADAR (Mb) | RPWS (Mb) | UVIS (Mb) | VIMS (Mb) | PROBE (Mb) |
|--------------|-------------|--------------|--------------|-------------|-------------|--------------|---------------|--------------|--------------|--------------|---------------|
|--------------|-------------|--------------|--------------|-------------|-------------|--------------|---------------|--------------|--------------|--------------|---------------|

TOTAL RECORDED (OPNAV data not included) 428.1 209.4 753.0 40.0 254.2 197.4 339.6 0.0 1660.1 832.3 915.3 0.0

Waypoint Selection

RBOT - Friendly

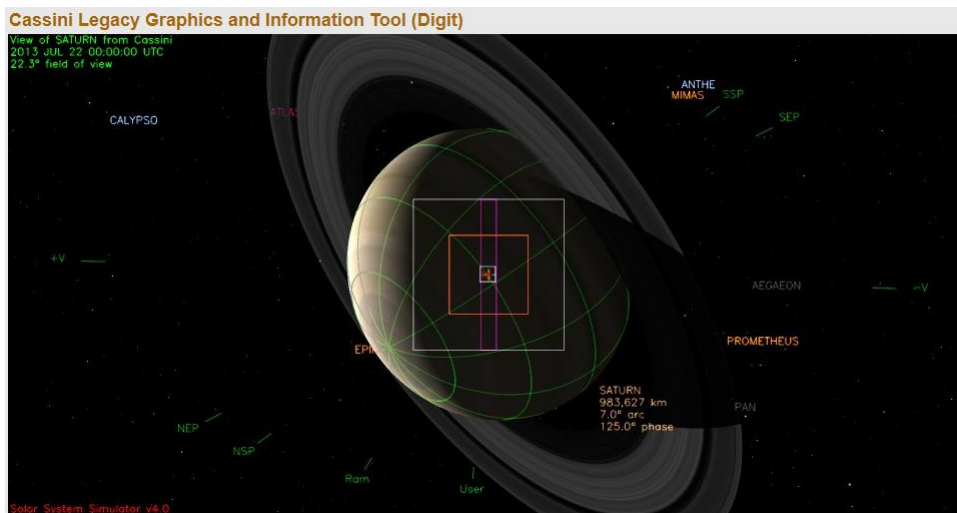
| OBSERVATION PERIOD | START | END | POS_X | NEG_X | POS_Z | NEG_Z |
|-----------------------|-------------------|-------------------|-------------|-------------|-------------|-------|
| SP_195NA_OBSERV201_NA | 2013-201T21:40:00 | 2013-202T02:25:00 | 135.9/ 34.1 | 135.9/ 34.1 | 135.9/ 34.1 | ----- |
| SP_195NA_OBSERV202_NA | 2013-202T11:25:00 | 2013-203T02:24:00 | ----- | 135.9/ 34.1 | 135.9/ 34.1 | ----- |
| SP_195NA_OBSERV203_NA | 2013-203T11:24:00 | 2013-204T02:24:00 | ----- | 135.9/ 34.1 | 135.9/ 34.1 | ----- |
| SP_195NA_OBSERV204_NA | 2013-204T11:24:00 | 2013-205T02:24:00 | ----- | 135.9/ 34.1 | 135.9/ 34.1 | ----- |
| SP_195NA_OBSERV205_NA | 2013-205T11:24:00 | 2013-206T03:39:00 | ----- | 135.9/ 34.1 | 135.9/ 34.1 | ----- |

NEG_Y to Saturn Waypoints (Safe NSP Secondaries)

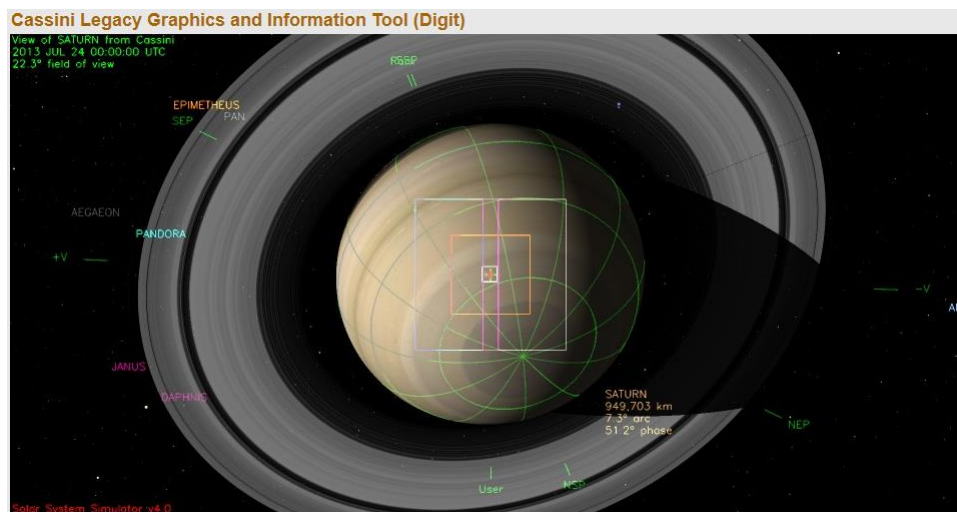
| OBSERVATION PERIOD | START | END | POS_X | NEG_X | POS_Z | NEG_Z |
|-----------------------|-------------------|-------------------|-----------------|------------------|-------|-------|
| SP_195NA_OBSERV201_NA | 2013-201T21:40:00 | 2013-202T02:25:00 | NO | YES | YES | NO |
| SP_195NA_OBSERV202_NA | 2013-202T11:25:00 | 2013-203T02:24:00 | NO | YES | YES | NO |
| SP_195NA_OBSERV203_NA | 2013-203T11:24:00 | 2013-204T02:24:00 | NO | YES | YES | NO |
| SP_195NA_OBSERV204_NA | 2013-204T11:24:00 | 2013-205T02:24:00 | Bad until 13:25 | Safe until 14:20 | YES | NO |
| SP_195NA_OBSERV205_NA | 2013-205T11:24:00 | 2013-206T03:39:00 | YES | NO | YES | NO |

Waypoints Chosen

Waypoint 1 (Whole Segment): ISS_NAC to Saturn; NEG_X to Sun



INBOUND



OUTBOUND

- Pointing:
 - There is operational CIRS heating on the first four downlinks in this segment, which will require waivers.
 - RBOT friendly waypoints were not used in this segment as science goals could not be fully met by RBOT-friendly RA/Dec. To avoid unnecessary slewing, the science-preferred secondary was chosen as the waypoint.
- Data Volume:
 - Saturn TWT is accepting the RINGS TWT (Rings 195) carryover into this segment (no more than 3 Gb)
 - Although RINGS will be playing back some of its high priority data at the start of Saturn_195, it has not asked that the priority playback list for the DOY 202 station be changed to A4, B4. The two end of segment stations in the Rings 195 segment will be the official dual playback stations with the altered PPL requirement.
- DSN:
 - The 34 m station (DSS-34) on DOY 202 was upgraded to a 70m station per an agreement with the Mission Planning team, the RINGS TWT, and the Saturn TWT.