



Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 37 Segment Legacy Package

**Segment Boundary: January 14, 2007 – January 15, 2007
2007-014T13:34:00 – 2007-015T05:36:00 (SCET)**

Integration Began 01/06/2003

Segment Delivered to S27 Sequence 08/24/2006

Lead Integrators were Shawn Boll & Barbara Larsen

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 very short segment (less than 1 day) in an inclined orbit of the Prime Mission, squeezed in between the T23 Titan flyby and a Rings TWT led periapse segment. Inbound to periapse, the views were of the southern hemisphere.
- The only Saturn focused science in this segment is a VIMS thermal cylindrical map.
- The remainder of the short timeline was dedicated to Titan observing, outbound from the T23 flyby. CIRS took composition measurements and RADAR conducted southern hemisphere scatterometry.

Final Sequenced SPASS

Saturn 37 Legacy

| Request | Riders | Start (SCET) | Start (Epoch) | Duration | End (SCET) | Primary | Secondary | Comments |
|--------------------------------|---------------|--------------------------|--------------------------------|---------------------|--------------------------|-------------------------|--------------------------------|---|
| Start Sequence S027 | | 2007-005T13:50:00 | E036_SEQUENCE_027+000T00:00:00 | 042T21:02:00 | 2007-048T10:52:00 | | | |
| SATURN rev 37 Segment | | 2007-014T13:34:00 | | 000T16:02:00 | 2007-015T05:36:00 | | | |
| SP_037TI_WAYPTTURN014_PRIME | M, R | 2007-014T13:34:00 | | 000T00:30:00 | 2007-014T14:04:00 | ISS_NAC to Titan | NEG_Z to North_Pole_Dir | |
| NEW WAYPOINT | | 2007-014T14:04:00 | | 000T15:56:00 | 2007-015T06:00:00 | ISS_NAC to Titan | NEG_Z to North_Pole_Dir | |
| CIRS_037TI_COMPMAP012_PRIME | I, M, R, U, V | 2007-014T14:04:00 | | 000T02:00:00 | 2007-014T16:04:00 | CIRS_FPB to Titan | NEG_Z to North_Pole_Dir | |
| RADAR_037TI_SOUTHSCAT001_PRIME | M | 2007-014T16:04:00 | | 000T01:15:00 | 2007-014T17:19:00 | NEG_Z to Titan | POS_Y to North_Pole_Dir | RADAR must control primary and secondary axes to obtain correct polarization. |
| VIMS_037SA_THRMAP001_PRIME | I, M, U | 2007-014T17:19:00 | | 000T05:45:00 | 2007-014T23:04:00 | ISS_NAC to Saturn | POS_X to NSP | |
| SP_037EA_DLTURN414_PRIME | M | 2007-014T23:04:00 | | 000T00:32:00 | 2007-014T23:36:00 | XBAND to Earth | NEG_X to NEP | |
| SP_037EA_M70METNON014_PRIME | C, M | 2007-014T23:36:00 | | 000T06:00:00 | 2007-015T05:36:00 | XBAND to Earth | Rolling/SRU | |

Final Sequenced SMT and Data Volume

Saturn 37 Legacy

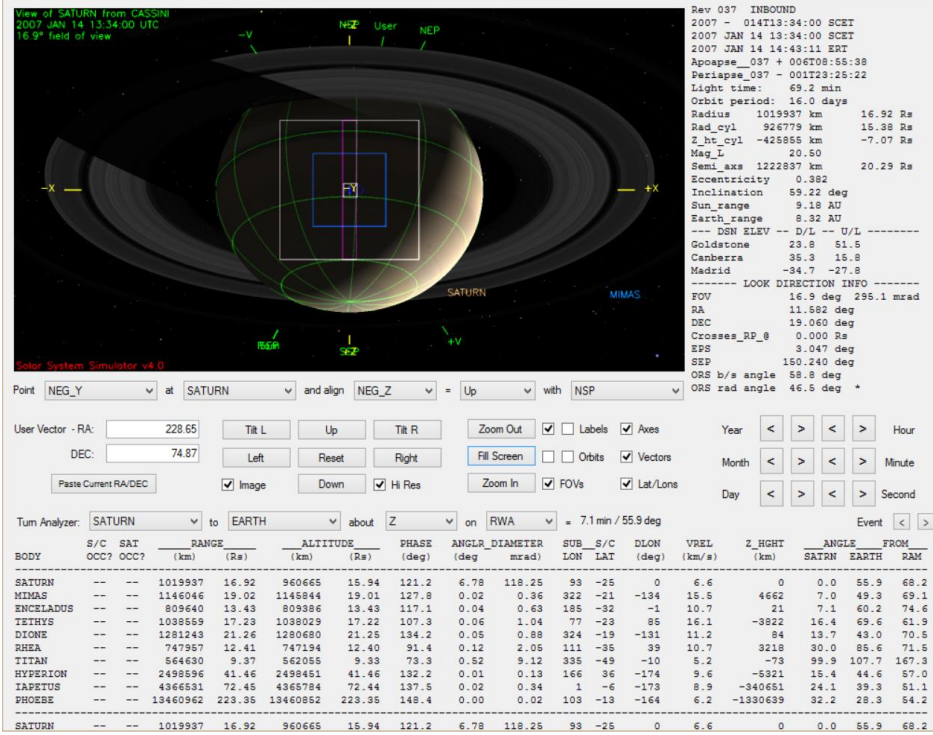
DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

| DOWNLINK PASS NAME | Start doy hh:mm | End doy hh:mm | OBSERVATION_PERIOD | | | | | | | DOWNLINK_PASS | | | | | | | |
|-----------------------------|--------------------|------------------|--------------------|-------------|--------------|---------------|----------------|--------------|---------------|---------------|--------------|---------------|----------------|---------------|-------------------|-----|----------------|
| | | | P4 | | | P5 | RECORDED | | PLAYBACK | | | | | | | | |
| | | | START (Mb) | SCI (Mb) | HK+E (Mb) | TOTAL (Mb) | CPACTY (Mb) | MRGN (Mb) | OPNAV (Mb) | SCI (Mb) | ENGR (Mb) | TOTAL (Mb) | CPACTY (Mb) | MARGN (Mb) | NET_MARGN (Mb) | (%) | CAROVR (Mb) |
| SP_037EA_M70METNON014_PRIME | 014 23:36 | 015 05:36 | 0 | 1622 | 38 | 1660 | 3516 | 1856 | 0 | 160 | 35 | 1856 | 3010 | 1153 | 1172 | 7% | 0 |

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

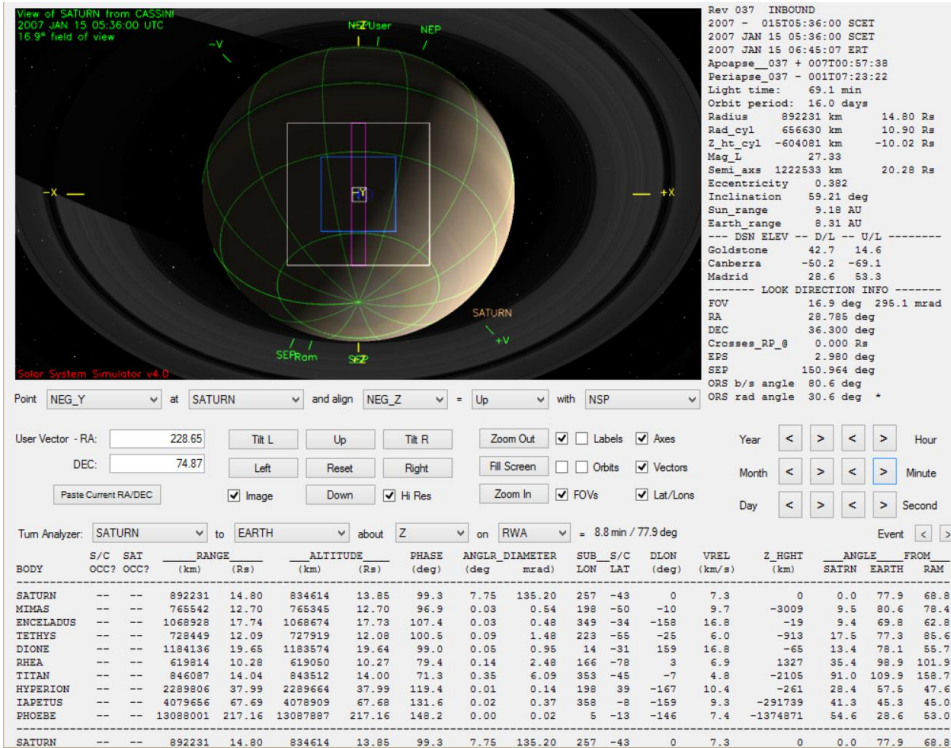
| Event | Start doy hh:mm | End doy hh:mm | CAPS (Mb) | CDA (Mb) | CIRS (Mb) | INMS (Mb) | ISS (Mb) | MAG (Mb) | MIMI (Mb) | RADAR (Mb) | RPWS (Mb) | UVIS (Mb) | VIMS (Mb) | PROBE (Mb) | ENGR (Mb) | TOTAL (Mb) |
|-----------------------------|--------------------|------------------|--------------|-------------|--------------|--------------|-------------|-------------|--------------|---------------|--------------|--------------|--------------|---------------|--------------|---------------|
| OBSERVATION_NOR | 014 13:34 | 014 23:36 | 36.1 | 7.2 | 28.8 | 1.8 | 1018.2 | 21.7 | 43.6 | 137.2 | 47.3 | 25.7 | 240.0 | 0.0 | 3.1 | 1610.7 |
| SP_037EA_M70METNON014_PRIME | 014 23:36 | 015 05:36 | 21.6 | 4.3 | 64.8 | 1.1 | 0.0 | 13.0 | 25.9 | 0.0 | 28.3 | 0.0 | 0.0 | 0.0 | 0.0 | 159.0 |
| DAILY TOTAL SCIENCE | 014 13:34 | 015 05:36 | 57.7 | 11.5 | 93.6 | 2.9 | 1018.2 | 34.6 | 69.5 | 137.2 | 75.6 | 25.7 | 240.0 | 0.0 | | |

Segment Geometry



← Seg Start (Left)

↓ Seg End (below)



| | Saturn Range | Phase Angle | Sub-S/C Lat. |
|---------------|--------------|-------------|--------------|
| Segment Start | 16.92 | 121.2 | -25 |
| Segment End | 14.8 | 99.3 | -43 |

No ORS Boresight Solar Constraints on Science Pointing.

Events in this segment were not noted in the Significant Events for these days.

Segment Integration Planning

Timeline Gaps and Suggested Observations

Saturn 37 Legacy

Rev 37 - Proposed TOL

| Activity | Start | Duration | Pointing | Notes |
|--------------------------------|-------------------|----------|---------------------------------|----------------|
| Segment Start/Turn to Waypoint | 2007-014T13:34:00 | 00:30:00 | | |
| CIRS Titan Comp Map | 014T14:04:00 | 02:00:00 | NAC to Titan; +/-Z to POLE_DIR | |
| RADAR Titan South Map | 014T16:04:00 | 01:00:00 | -Z to Titan; ??? | |
| VIMS Thermal Cylindrical Map | 014T17:04:00 | 06:00:00 | NAC to Saturn; +/-Z to POLE_DIR | |
| Turn to Downlink | 014T23:04:00 | 00:32:00 | | |
| Downlink | 014T23:36:00` | 06:00:00 | | 70 m available |

Initial SMT and Data Volume

Saturn 37 Legacy

Beginning of Integration:

DATA VOLUME SUMMARY

| DOWNLINK PASS NAME | OBSERVATION_PERIOD | | | | | | | | | | DOWNLINK_PASS | | | | | | |
|-----------------------------|--------------------|------------------|---------------|-------------|--------------|---------------|----------------|---------------|---------------|-------------|---------------|---------------|----------------|---------------|----------------|-----|---|
| | Start doy hh:mm | End doy hh:mm | P4 | | | | | P5 | RECORDED | PLAYBACK | | | | | | | |
| | | | START (Mb) | SCI (Mb) | HK+E (Mb) | TOTAL (Mb) | CPACTY (Mb) | MARGIN (%) | OPNAV (Mb) | SCI (Mb) | ENGR (Mb) | TOTAL (Mb) | CPACTY (Mb) | MARGIN (%) | CAROVR (Mb) | | |
| SP_037EA_M70METNON014_PRIME | 014 23:36 | 015 05:36 | 0 | 842 | 34 | 876 | 3569 | 2693 | 75% | 0 | 273 | 35 | 1183 | 2878 | 1694 | 59% | 0 |

DATA VOLUME REPORT

| 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 | 014 13:34 | 014 23:36 | 36.1 | 7.2 | 28.8 | 1.8 | 0.0 | 21.7 | 43.3 | 112.8 | 47.3 | 0.0 | 542.7 | 0.0 | 0.0 | 841.8 |
| SP_037EA_M70METNON014_PRIME | 014 23:36 | 015 05:36 | 21.6 | 4.3 | 75.6 | 1.1 | 0.0 | 13.0 | 25.9 | 1.4 | 28.3 | 0.0 | 101.6 | 0.0 | 0.0 | 272.8 |

Waypoint Selection

| Activity | Start | Duration | Pointing | Notes | TLM |
|--------------------------------|-------------------|----------|---------------------------------|--|-----------------|
| Segment Start/Turn to Waypoint | 2007-014T13:34:00 | 00:30:00 | | | |
| Waypoint | | | NAC to Saturn; +Z to POLE_DIR | Safe; NAC to Titan; +/-Z to POLE_DIR also safe | |
| CIRS Titan Comp Map | 014T14:04:00 | 02:00:00 | NAC to Titan; +/-Z to POLE_DIR | | S&ER3 or S&ER5A |
| RADAR Titan South Map | 014T16:04:00 | 01:00:00 | -Z to Titan; ??? | | S&ER8 |
| VIMS Thermal Cylindrical Map | 014T17:04:00 | 06:00:00 | NAC to Saturn; +/-Z to POLE_DIR | | S&ER3 |
| Turn to Downlink | 014T23:04:00 | 00:32:00 | | | |
| Downlink | 014T23:36:00` | 06:00:00 | Rolling? | 70 m available | RTE&SBx |

Once Titan was chosen as the waypoint primary...

| Request | Riders | Start(SCET) | Start(Epoch) | Duration | End(SCET) | Primary Pointing | Secondary Pointing |
|--------------------------------|--------|--------------------------|--------------|---------------------|--------------------------|-------------------------|--------------------------------|
| SP_037TI_WAYPTTURN014_PRIME | | 2007-014T13:34:00 | | 000T00:30:00 | 2007-014T14:04:00 | ISS_NAC to Titan | POS_X to North_Pole_Dir |
| NEW WAYPOINT | | 2007-014T14:04:00 | | 000T15:32:00 | 2007-015T05:36:00 | ISS_NAC to Titan | POS_X to North_Pole_Dir |
| CIRS_037TI_COMPMAP012_PRIME | | 2007-014T14:04:00 | | 000T02:00:00 | 2007-014T16:04:00 | CIRS_FPB to Titan | POS_X to North_Pole_Dir |
| RADAR_037TI_SOUTHSCAT001_PRIME | | 2007-014T16:04:00 | | 000T01:15:00 | 2007-014T17:19:00 | NEG_Z to Titan | POS_X to North_Pole_Dir |
| VIMS_037SA_THRMAP001_PRIME | | 2007-014T17:19:00 | | 000T05:45:00 | 2007-014T23:04:00 | ISS_NAC to Saturn | POS_Z to North_Pole_Dir |
| SP_037EA_DLTURN414_PRIME | | 2007-014T23:04:00 | | 000T00:32:00 | 2007-014T23:36:00 | XBAND to Earth | NEG_X to NEP |
| SP_037EA_M70METNON014_PRIME | | 2007-014T23:36:00 | | 000T06:00:00 | 2007-015T05:36:00 | XBAND to Earth | Rolling |

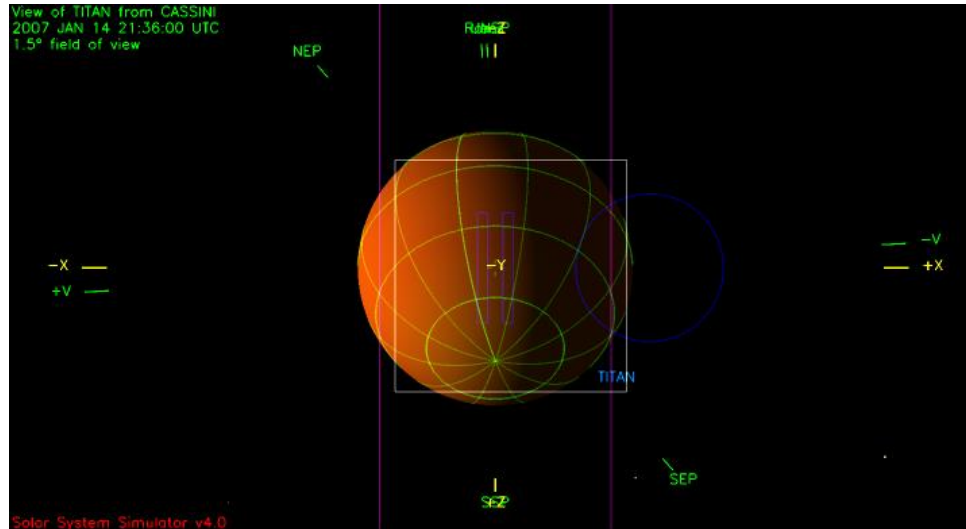
Note: Waypoint has SRU violations. A new waypoint is needed!

Options for secondary:

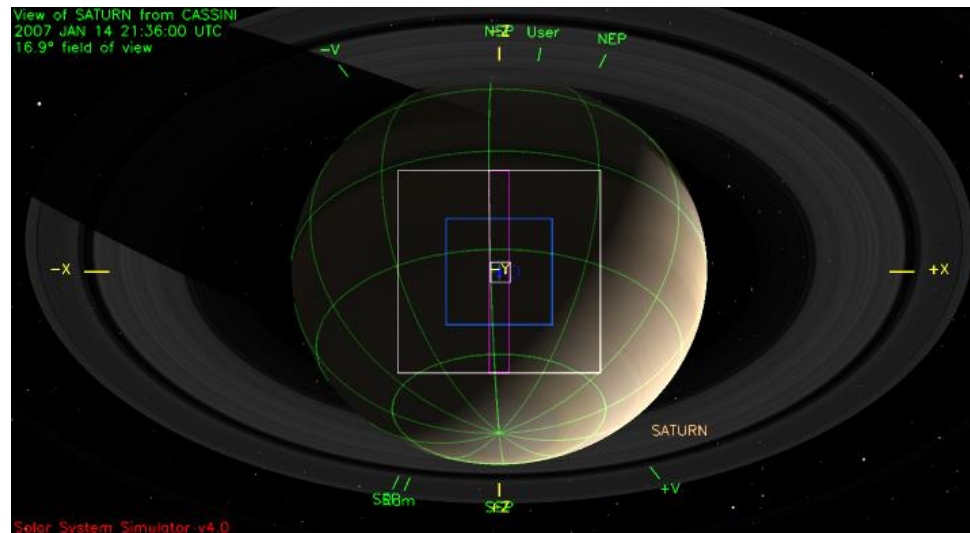
- NEG_Z to North_Pole_Dir
- POS_X to SEP
- ???

Waypoints Chosen

Waypoint 1 (Whole Segment): ISS_NAC to Titan; NEG_Z to North_Pole_Dir



View of Saturn at the same time.



- Timing
 - Start 2007-014T13:34:00
 - End 2007-015T05:36:00
- Pointing
 - Waypoints have been re-validated
 - Downlink attitudes have been re-validated
 - SP turns are safe
- Data Volume
 - OK with significant margin. (See DSN note below).
- CIMS
 - All requests are currently approved
- OpModes
 - RADWU014, RADRWA014, DFPW014
 - Timing on page 11
- DSN
 - Assumes STEREO launches before January
 - 70M Usage is 100% over 1 pass
 - Stations Used:
 - DSS-63 (Madrid 70M) on DOY 014/015. Proposed return to service is DOY 02.
 - 942 Mb margin will reduce pain if 70M is not available