



SATURN TARGET WORKING TEAM

Rev 12a Segment Legacy Package

**Segment Boundary: July 29, 2005 – July 31, 2005
2005-210T21:30:00 – 2005-212T22:00:00 (SCET)**

**Integration Began 9/17/2001
Segment Delivered to S12 Sequence 02/06/2002
Lead Integrator was Jerod Gross**

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 short 2 day long segment in the Prime Mission. The segment started a few days following solar conjunction, inbound to periapse, and was the first of two Saturn TWT segments in Rev 12. Saturn views were of the mostly lit southern hemisphere.
- Saturn science included CIRS Far-IR mapping with ORS riders, ISS and VIMS imaging, and UVIS EUV/FUV. UVIS also led an ORS look for impacts in the rings.

Final Sequenced SPASS

Saturn 12a Legacy

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S012, length = 44 ...		2005-169T01:34:00	E010_SEQUENCE_012+000T00:00:00	043T20:26:00	2005-212T22:00:00			
SATURN rev 12 Segment		2005-210T21:30:00		002T00:30:00	2005-212T22:00:00			
SP_012SA_WAYPTTURN210_PRIME		2005-210T21:30:00		000T00:30:00	2005-210T22:00:00	ISS_NAC to Saturn	NEG X to Sun	
UVIS_012RI_IMPACT004_PRIME	I, V	2005-210T22:00:00		000T04:00:00	2005-211T02:00:00	UVIS_HSP to Rings	NEG X to Sun	
CIRS_012SA_FIRMAP009_PRIME	C, V	2005-211T02:00:00		000T22:00:00	2005-212T00:00:00	CIRS_FP1 to Saturn	POS X to NSP	
ISS_012SA_1X2WPH40001_PRIME	V	2005-212T00:00:00		000T00:50:00	2005-212T00:50:00	ISS_NAC to Saturn	NEG X to Sun	
ISS_012SA_1X2WPH40002_PRIME	V	2005-212T01:00:00		000T00:50:00	2005-212T01:50:00	ISS_NAC to Saturn	NEG X to Sun	
ISS_012SA_1X2WPH40003_PRIME	V	2005-212T02:00:00		000T00:50:00	2005-212T02:50:00	ISS_NAC to Saturn	NEG X to Sun	
ISS_012SA_1X2WPH40004_PRIME	V	2005-212T03:00:00		000T00:50:00	2005-212T03:50:00	ISS_NAC to Saturn	NEG X to Sun	
ISS_012SA_1X2WPH40005_PRIME	V	2005-212T04:00:00		000T00:50:00	2005-212T04:50:00	ISS_NAC to Saturn	NEG X to Sun	
ISS_012SA_1X2WPH40006_PRIME	V	2005-212T05:00:00		000T00:50:00	2005-212T05:50:00	ISS_NAC to Saturn	NEG X to Sun	
UVIS_012SA_EUVFUV001_PRIME	C, M, V	2005-212T05:50:00		000T05:40:00	2005-212T11:30:00	UVIS_FUV to Saturn	POS_Z to NSP	
NAV_012SK_OPNAV121_PRIME	M	2005-212T11:30:00		000T01:29:00	2005-212T12:59:00	ISS_NAC to Satellites	NEG X to Sun	Starts at waypoint, ends at Earth point
NAV_012EA_DLTURN121_PRIME	M	2005-212T12:59:00		000T00:01:00	2005-212T13:00:00	XBAND to Earth	NEG X to Sun	
SP_012EA_G70METSEQ212_PRIME	C, M	2005-212T13:00:00		000T09:00:00	2005-212T22:00:00	XBAND to Earth	NEG X to Sun	No Roll due to DSAT

Final Sequenced SMT and Data Volume

Saturn 12a 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)	CAROVR (%)	
SP_012EA_G70METSEQ212_PRIME	212 13:00	212 22:00	0	2757	134	2892	3460	568	35	222	53	3202	3276	75	74	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	210 21:30	212 13:00	142.1	21.3	357.6	7.1	650.3	46.7	131.4	0.0	186.3	196.9	980.0	0.0	0.0	2719.7
OBSERVATION_OPN	210 21:30	212 13:00	0.0	0.0	0.0	0.0	34.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.8
OBSERVATION_SI	210 21:30	212 13:00	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
SP_012EA_G70METSEQ212_PRIME	212 13:00	212 22:00	32.4	4.9	86.4	1.6	0.0	10.5	38.9	0.0	42.4	2.5	0.0	0.0	0.0	219.6
DAILY TOTAL SCIENCE	210 21:30	212 22:00	174.5	26.2	456.5	8.7	650.3	57.2	170.3	0.0	228.7	199.4	980.0	0.0		

Segment Geometry

Cassini Legacy Graphics and Information Tool (Digit)

Rev 012 INBOUND
 2005 - 210721:30:00 SCET
 2005 JUL 29 21:30:00 SCET
 2005 JUL 29 22:53:53 ERT

Apoapse_012 + 005719:32:46
 Periapse_012 - 003708:18:00
 Orbit period: 18.32 days
 Light time: 83.9 min

Radius 1736190 km 28.81 Rs
 Rad_cyl 1645442 km 27.39 Rs
 Z_ht_cyl -553962 km -9.19 Rs
 Mag_L 32.07
 Semi_axs 1340283 km 22.24 Rs
 Eccentricity 0.838
 Inclination 21.82 deg
 Sun_range 9.08 AU
 Earth_range 10.09 AU
 EPS 0.57 deg
 SEP 5.07 deg

--- DSN ELEV --- D/L --- U/L ---
 Goldstone 43.6 73.1
 Canberra 20.6 -8.4
 Madrid -27.4 -8.2

----- LOOK DIRECTION INFO -----
 FOV 14.1 deg 246.1 mrad
 RA 77.360 deg
 DEC 13.466 deg
 XSRingsØ 1 km 0.00 Rs

BODY	Occs S/C?	Satrn Occs?	RANGE (km)	ALTIMUDE (Rs)	PHASE (deg)	ANGULAR_DIAMETER (mrad)	SUB_S/C LON	SUB_S/C LAT	ΔLON (deg)	VREL (km/s)	Z_wrt_SP (km)	ANGLE SATURN	FROM EARTH	RAM			
SATURN	--	--	1736190	28.81	1676499	27.82	44.4	3.98	69.44	49	-19	0	3.9	0	0.0	135.0	38.0
MIMAS	--	--	1580186	26.22	1579963	26.22	41.3	0.02	0.26	150	-20	25	14.3	1237	3.4	138.1	35.7
ENCLADUS	--	--	1864621	30.94	1864368	30.93	50.8	0.02	0.28	311	-17	-121	11.6	30	6.4	128.6	44.0
TETHYS	--	--	1546349	25.66	1545815	25.65	36.6	0.04	0.70	129	-20	43	12.6	-4144	7.9	142.8	31.3
DIONE	--	--	1630438	27.05	1629897	27.04	36.2	0.04	0.69	260	-20	66	6.3	127	12.4	123.1	50.4
RHEA	--	--	2206523	36.61	2205757	36.60	39.8	0.04	0.70	22	-14	135	12.0	2168	7.0	139.7	31.7
TITAN	--	--	2722904	45.18	2720329	45.14	62.5	0.11	1.89	331	-12	-138	6.4	2466	18.2	116.9	54.5
HYPERION	--	--	1832188	30.40	1832059	30.40	88.6	0.01	0.18	231	42	-70	3.8	-19534	45.5	90.7	83.4
IAPETUS	--	--	5189160	86.10	5188413	86.09	28.3	0.02	0.29	8	-2	154	6.9	942482	16.9	151.0	21.4
PHOEBE	--	--	12059447	200.10	12059337	200.10	135.3	0.00	0.02	81	-8	-84	5.7	-2488166	91.2	43.8	126.7
SATURN	--	--	1736190	28.81	1676499	27.82	44.4	3.98	69.44	49	-19	0	3.9	0	0.0	135.0	38.0

← Seg Start (Left)

↓ Seg End (below)

Cassini Legacy Graphics and Information Tool (Digit)

Rev 012 INBOUND
 2005 - 231722:00:00 SCET
 2005 JUL 31 22:00:00 SCET
 2005 JUL 31 23:23:52 ERT

Apoapse_012 + 00720:02:46
 Periapse_012 - 001707:48:00
 Orbit period: 18.32 days
 Light time: 83.9 min

Radius 985243 km 16.35 Rs
 Rad_cyl 916551 km 15.21 Rs
 Z_ht_cyl -361440 km -6.00 Rs
 Mag_L 18.89
 Semi_axs 1339983 km 22.23 Rs
 Eccentricity 0.838
 Inclination 21.82 deg
 Sun_range 9.08 AU
 Earth_range 10.08 AU
 EPS 0.76 deg
 SEP 6.77 deg

--- DSN ELEV --- D/L --- U/L ---
 Goldstone 36.0 68.3
 Canberra 25.5 -1.3
 Madrid -29.1 -13.7

----- LOOK DIRECTION INFO -----
 FOV 19.9 deg 347.3 mrad
 RA 99.256 deg
 DEC 18.257 deg
 XSRingsØ 1 km 0.00 Rs

BODY	Occs S/C?	Satrn Occs?	RANGE (km)	ALTIMUDE (Rs)	PHASE (deg)	ANGULAR_DIAMETER (mrad)	SUB_S/C LON	SUB_S/C LAT	ΔLON (deg)	VREL (km/s)	Z_wrt_SP (km)	ANGLE SATURN	FROM EARTH	RAM			
SATURN	--	--	985243	16.35	925743	15.36	22.9	7.01	122.42	225	-22	0	7.0	0	0.0	156.3	21.6
MIMAS	--	--	812619	14.48	812414	13.48	24.1	0.03	0.51	183	-25	-4	11.4	-3243	4.7	155.2	23.5
ENCLADUS	--	--	1020122	16.93	1019871	16.92	9.5	0.03	0.50	79	-21	92	18.7	-22	13.5	169.8	8.3
TETHYS	--	--	802776	13.32	802244	13.31	10.0	0.08	1.35	124	-25	41	13.8	-5380	15.0	169.3	10.9
DIONE	--	--	820162	13.61	819581	13.60	5.4	0.08	1.37	106	-26	30	13.5	-16	21.7	171.1	8.5
RHEA	--	--	869173	9.44	868408	9.43	18.7	0.13	2.70	145	-39	17	9.2	-1250	24.9	160.9	21.7
TITAN	--	--	2150882	35.69	2148317	35.65	35.6	0.14	2.39	347	-10	-161	10.0	735	15.3	143.7	31.1
HYPERION	--	--	1693241	28.10	1693107	28.09	83.1	0.01	0.19	7	49	-84	3.4	-5677	60.4	96.0	81.9
IAPETUS	--	--	4543663	75.39	4542916	75.38	14.4	0.02	0.33	3	-1	167	9.5	960667	115.3	165.0	12.1
PHOEBE	--	--	11073066	193.69	11072951	193.68	141.0	0.00	0.02	169	-6	-60	8.8	-2611132	118.3	38.0	139.7
SATURN	--	--	985243	16.35	925743	15.36	22.9	7.01	122.42	225	-22	0	7.0	0	0.0	156.3	21.6

No ORS Boresight Solar Constraints on Science Pointing.

Science Highlights for the days in this segment were not available.

Segment Integration Planning

Rev 12 Inbound Strawman

- **Rev 12 inbound segment (210T22:00 to 212T22:00)**
 - Periapse is 2005-214T05:31:27.70, so this seg starts at Peri-3T07:30
 - Total data volume of all inputs: ~3100 Mb
 - Proposed DSN passes: 1 Goldstone 70-m, capability ~ 3350 Mb

- **Proposed Strawman:**

- CIRS moved 11:00 earlier
- ISS observations moved 0:30 earlier
- OPNAV given 2:30 to do whatever they need
- 30 minutes to turn to Earth after OpNav
- 9-hour d/I assumed (13 hrs. pictured)
- **Questions**
- Should we do 1/2 UVIS EUV in place of ISS?
- What to do with SatOrb?

Observation	Start Time	Dur	End Time
VIMS Fomalhaut	210T22:00	8:30	211T06:30
CIRS Far-IR Map	211T06:30	22:00	212T04:30
ISS Saturn Photom 001	212T04:30	0:24	212T04:54
ISS Saturn Photom 002	212T05:30	0:24	212T05:54
ISS Saturn Photom 003	212T06:30	0:24	212T06:54
ISS Saturn Photom 004	212T07:30	0:24	212T07:54
ISS Saturn Photom 005	212T08:30	0:24	212T08:54
ISS Saturn Photom 006	212T09:30	0:24	212T09:54
OPNAV	212T10:00	2:30	212T12:30
Downlink & CIRS Cal	212T13:00	9:00	212T22:00

First Look During Integration:

Rev 12 Inbound Data Volume Analysis

(Based on CIMS inputs as of 01/04/02)

- Current Data Volumes

Playback	Start doy hh:mm	End doy hh:mm	Volume (Mb)	5% (Mb)	ENG+HK (Mb)	SCIENCE (Mb)	TOTAL (Mb)	MARGIN (Mb)
PLAYBACK**	212 13:13	212 22:29	3384	169	186	3043	3229	-14

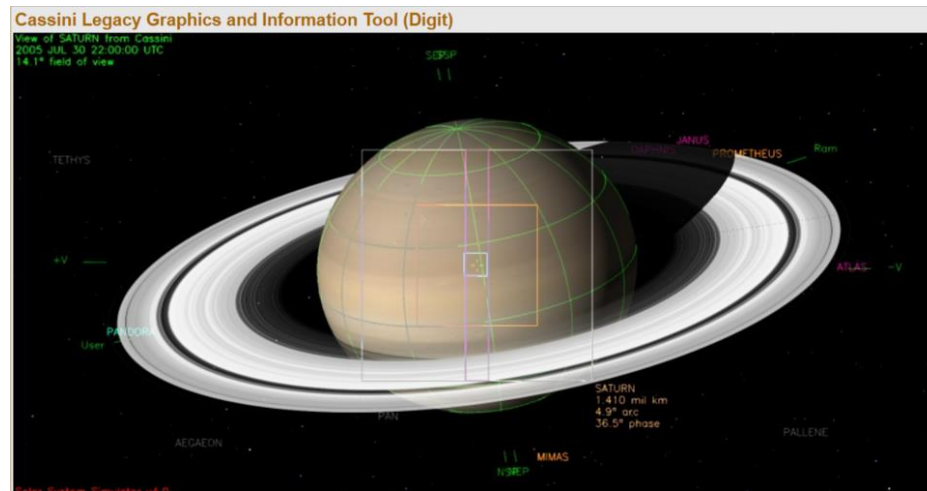
Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	RSS (Mb)	ENG (Mb)	SCIENC (Mb)	TOTAL (Mb)
OBSERVATION	210 21:51	212 13:13	141.8	21.2	398.4	7.1	686.8	85.1	131.1	0.0	184.3	197.0	920.0	0.0	101.8	31.0	2905.5
PLAYBACK**	212 13:13	212 22:29	33.4	5.0	86.4	1.7	37.7	20.0	40.0	0.0	43.4	2.4	0.0	0.0	53.2	0.0	323.2

* = back-to-back or multirate playbacks; first one listed

- We have a margin of **-14**.
- Problems
 - ISS_012MI_PHOTOM001_RIDER not removed yet. This puts us over by 37.7 Mb.
 - VIMS rider pickets giving zero data volume => Check CIMS inputs

No Waypoint Selection Info Available.

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



Saturn Rev 12 Inbound Open Issues (as of 02/06/02)

- **Pointing Issues**
 - The waypoint is NAC to Saturn, -X to Sun.
- **Data Volume Issues**
 - 185 Mb of “extra” data volume available
 - There are OpNavs in the observation period.
- **CIMS Issues**
 - None
- **Power Issues**
 - None
- **Flight Rule / Mission Planning Guideline & Constraint Issues**
 - None
- **Other Issues**
 - None