

Science Planning & Sequence Team

SATURN TARGET WORKING TEAM

Rev 137 Segment Legacy Package

Segment Boundary: September 4, 2010 – September 6, 2010 2010-247T06:33 – 2010-249T06:33 (SCET)

> Integration Began 01/04/2010 Segment Delivered to S62 Sequence 01/25/2010 Lead Integrator was Leo Cheng

Legacy Package Assembled by Kyle Cloutier

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

Segment Overview and Final Products

• Saturn 137 is the last segment in S62, a sequence in the Equinox extended mission. The spacecraft stays relatively equatorial during this three day long segment.

• Primary science includes a UVIS scan, VIMS hemispherical maps, and an ISS imaging observation of the transit of Telesto across Rhea (out-of-discipline).

Final Sequenced SPASS

Saturn 137 Legacy

Paguast	Riders	Start (SCET)	Start (Epoch)	Duration	End	Drimony	Focondary	Commonte
Request	Riders	Start (SCET)	Start (Epoch)	Duration	chu	Primary	Secondary	Comments
SATURN REV_137 Segment		2010-247T06:33:00		002T00:00:00	2010-249T06:33:00			
SP_137SA_WAYPTTURN247_PRIME	м	2010-247T06:33:00		000T00:40:00	2010-247T07:13:00	ISS_NAC to Saturn	NEG_Z to 84.1/84.1	
NEW WAYPOINT		2010-247T07:13:00		001T14:20:00	2010-248T21:33:00	ISS_NAC to Saturn	NEG_Z to 84.1/84.1	
UVIS_137SA_EUVFUV001_PRIME	М	2010-247T07:13:00		000T16:00:00	2010-247T23:13:00	UVIS_FUV to Saturn	NEG_Z to 84.1/84.1	
VIMS_137SA_REGMAP001_PRIME	I, M	2010-247T23:13:00		000T03:39:00	2010-248T02:52:00	ISS_NAC to Saturn	NEG_Z to 84.1/84.1	
								ISS_NAC to Telesto control of secondary
ISS_137TL_MUTUALEVE001_PRIME	м	2010-248T02:52:00		000T01:07:00	2010-248T03:59:00	ISS_NAC to Telesto	NEG_Z to 84.1/84.1	axis not required
VIMS_137SA_REGMAP002_PRIME	I, M	2010-248T03:59:00		000T15:24:00	2010-248T19:23:00	ISS_NAC to Saturn	NEG_Z to 84.1/84.1	Secondary: Neg Z to 84.1/84.1
								NEG_Y to 274.96/-3.30, (NEG_Y to Saturn
SP_137EA_DLTURN248_PRIME	м	2010-248T19:23:00		000T00:40:00	2010-248T20:03:00	XBAND to Earth	NEG_Y to 274.96/-3.3	(0,0,-9.5)), MIMI
SP_137EA_YBIAS248_PRIME	м	2010-248T20:03:00		000T01:30:00	2010-248T21:33:00	XBAND to Earth	NEG_Y to 274.96/-3.3	
NEW WAYPOINT		2010-248T21:33:00		000T09:00:00	2010-249T06:33:00	XBAND to Earth	NEG_Y to 274.96/-3.3	
								NEG_Y to 274.96/-3.30, (NEG_Y to Saturn
SP_137EA_C70METSEQ248_PRIME	С, М	2010-248T21:33:00		000T08:40:00	2010-249T06:13:00	XBAND to Earth	NEG_Y to 274.96/-3.3	(0,0,-9.5)), MIMI

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

			OBSERVATION_PERIOD										DOWNLIN	K_PASS			
						P4			P5	RECO	RDED			PLAYB	АСК		
DOWNLINK PASS NAME	Start doy <u>hh:mm</u>	End doy <u>hh:mm</u>	START (Mb)			TOTAL (Mb)	CPACTY (Mb)		OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_M (Mb)	IARGN (%)	CAROVR (Mb)
SP_137EA_C70METSEQ248_PRIME	248 21:33	249 06:13	0	2335	165	2500	3308	808	0	237	51	2788	2898	109	110	4%	0

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

Event	Start doy <u>hh:mm</u>	End doy <u>hh:mm</u>	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)		RADAR (Mb)	RPWS (Mb)	UVIS (Mb)		PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
OBSERVATION_NOR SP_137EA_C70METSEQ248_PRIME DAILY TOTAL SCIENCE	248 21:33	248 21:33 249 06:13 249 06:13	31.2	16.3	82.8	3.1	0.0	18.7	37.4	0.0	40.9	4.8	0.0	0.0	0.0	235.3

Segment Geometry

Saturn 137 Legacy

View of SA														Rev 137 OUT			
2010 SEP			IO UTC		NEF									2010 - 247			
18.4° field	OF VI	ew												2010 SEP 04 2010 SEP 04			
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						-								Periapse 13			
					the second s									Light time:		0 min	
														Orbit perio			
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															936893 1		15.55 Rs
														z ht cyl	15427 1	<m.< th=""><th>0.26 Rs</th></m.<>	0.26 Rs
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														Semi_axs 1	418929]	.cm	23.54 Rs
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Ram -														Barth_range		47 AU	
														DSN ELE			
				1										Goldstone		4 -22.2	
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								C 17						Madrid LOO			
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						SSP	SEP							EPS	2.	360 deg	
Solar Syst	em Si		or v4.0											SEP	22.5	936 deg	
Point NEG	Y	0	at SATU	RN	and all	ian POS	x c	= Up	0	with	NSP		0	ORS b/s ang ORS rad ang			
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urn analyze	n: S	ATURN	4 :	to E	ARTH	O ab	out Z	٥	on RWA	.	•	12.5 mir	/ 127.9	deg	Event	4 Þ]
	s/c	SAT	RAN	ICTR.	ALTI	TIDE	PHASE	ANGLE	DIAMETER	SUB	s/c	ALON	VREL	Z HGHT	ANG	LE E	ROM
BODY		OCC?	[km]	[R8]	[km]	[R8]	[deg]	[deg	mrad]		LAT	(deg)	(km/s)			EARTH	RAM
ATURN			937020	15.55	876754	14.55	49.9	7.38	128.73	55	1	0	7.4	0	0.0	127.9	159.4
SAMIN			1093171	18.14	1092966	18.14	55.3	0.02	0.38	28	-0	146	16.3	-4980	5.4	122.5	153.9
INCELADUS			735117	12.20	734863	12.19	41.2	0.04	0.70	221	1	-28	14.0	32	8.7	136.6	167.9
TETHYS			647819	10.75	647279	10.74	54.0	0.10	1.67	167	0	9	Β.Β	5221	4.1	123.8	155.2
IONE			920101	15.27	919540	15.26	26.7	0.07	1.23	279	1	-76	15.9	152	23.5		175.8
HEA			1381214	22.92	1380447	22.91	35.7	0.06	1.11	337	0	-139	15.7	-108	14.4		173.4
ITAN			1603056	26.60	1600481	26.56	97.0	0.18	3.21	35	1	97	4.8	-6597	47.4	80.7	112.1
HYPERION APETUS			1711666	28.40	1711545 4385911	28.40	6.6 74.3	0.01	0.19	264 13	-41 -2	-94 148	12.5	16078	52.7	174.9	147.7
IAPETUS PHOEBE			4386658 13346575	72.79	4385911 13346464	72.77	74.3 23.0	0.02	0.34	13	-2	148 -109	8.0 6.0	-876590 2287753	27.5	103.2	132.4
-IIJEBE			13346575	221.45	13360606	221.45	23.0	0.00	0.02	124		-103	a.u	2201153	a7.5	12310	13311
SATURN			937020	15.55	876754	14.55	49.9	7.38	128.73	55	1	0	7.4	0	0.0	127.9	159.4

	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	15.55 Rs	49.9 deg	1
Segment End	28.73 Rs	71.9 deg	-1

Segment Start: 2010-247T06:33

↓ Segment End: 2010-249T06:33

view of SAT	URN fr	rom C	ASSINI			NER								Rev 137 OU			
2010 SEP (UTC											2010 - 24			
10.0° field	of view					U								2010 SEP 0			
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IN INVERSE												+		Barth range		48 AU	
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								/						Goldstone		2 -23.6	
														Canberra	-51.		
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Jser vector - Paste C Paste C Iurn analyzer: BODY SATURS RIMAS	RA: DEC: Current I	+86.5 -20.7 RA/DE URN SAT CC 2	t SATUR 506 791 EC RANS3 [km] 1731926 183996 1967500 1442422 1478224 1478255	Tilt L Left ✓ Imag to E/ (R8) 28.73 30.53 32.65 23.93 24.53 29.01	Up Rese Pe Down ARTH 	Til t Rig n ✓ H ≎ ab TUDE [R8] 27.73 30.64 23.92 24.52 29.00	S_X t R ght li Res pHASE [deg] 71.9 76.7 71.0 81.9 89.2	Zoom Fill Sc Zool (deg 3.99 0.01 0.01 0.04 0.04 0.05	n Out (creen (m In () on RWA on RWA RWA ON RWA ON RWA ON RWA ON RWA ON RWA O	✓ FO\ SUB_ LON 214 51 357 169 127 82	Labels Orbits /s =	✓ Vec: ✓ Lat/ 10.9 min (deg) 0 123 -172 10 43 83	↓ 106.0 VREL (km/≥) 4.1 13.2 15.6 9.1 6.1	ETS SEP ORS b/s an ORS frad an Year Month Day deg Z_HSHT (km) 0 -3846 -39 5614 -151 -1060	2. 21. 1916 108. 1916 108. 1916 108. 1916 108. 21. 1916 108. 21. 21. 21. 21. 21. 21. 21. 21	189 deg 209 deg 8 deg 8 deg 9 EARTH 106.0 101.2 106.9 104.0 960.0 38.7	Hour Minut Secon RAM 144.6 139.8 145.5 142.6 134.6 127.2
Jser vector - C Paste C Furn analyzer BODY SATURN HIMAS ENCELADUS DIONE RHEA TITAN	RA: DEC: Current I	+86.5 -20.7 RA/DE URN SAT CC 2	t SATURI 506 (791 (EC (RANG 1939906 1987500 142242 1748505 1761555	Tilt L Left ✓ Imag to E/ [R8] 28.73 30.53 32.65 23.93 24.53 29.01 29.23	Up Rese Down ARTH 1671459 183705 1967243 1441882 1477662 1747742 1759078	Till t Rig n ✓ H ↓ ↓ ab tUDE [Ra] 27.73 30.53 32.64 23.92 24.52 29.02 29.00 29.10	S_X ≎ t R ght ti Res ti Re	Zoom Fill Sc Zool ANGLE 1 [deg 3.99 0.01 0.04 0.04 0.04 0.04	n Out (creen (m In () DIAMETER mrad] 69.62 0.23 0.26 0.75 0.76 0.75 0.76 0.75	✓ FOV SUB_ LON 214 51 357 169 127 82 65	Labels Orbits /s 	 ✓ Vect ✓ Lat/ 10.9 min ΔLON (deg) 0 123 -172 10 43 71 	↓ 106.0 VREL (km/2) 4.1 13.2 15.6 9.1 6.1 5.1 2.1 5.2 2.1 5.4<	EIS SEP ORS b/s an ORS rad an Year Month Day 2_HGHT (km) 0 -3846 -39 5614 -151 -1060 -1549	2. 21. igle 108.3. igle 83. Event (SATRS 0.0 4.9 0.9 2.0 10.0 17.4 39.48	189 deg 209 deg 0 deg 8 deg • • • • • • • • • • • • • • • • • • •	Hour Minut Secor 144.6 139.8 145.5 142.6 134.6 127.2 104.8
Jser vector - D Paste C Paste C Nurn analyzer: BODY BODY BATURS MIRAS ENCELADUS ENCELA	RA: DEC: Current I	+86.5 -20.7 RA/DE URN SAT CC 2	t SATURI 506 791 EC	Tilt L Left ✓ Imag to E/ (Rs) 28.73 30.53 32.65 23.93 24.53 29.01 29.23 42.80	Up Rese Dowr ARTH 	Til t Rig b ✓ H t Rig TUDE [Ra] 27.73 30.53 32.64 23.92 24.52 29.00 29.19 42.80	S_X t R ght ii Res pHASE [deg] 71.9 76.7 71.0 71.0 74.0 89.2 111.6	Zoom Fill Sc Zool Col Col Col Col Col Col Col Col Col	n Out (creen (m In (0 m RWA 0 IAMETER mrad] 0.23 0.26 0.75 0.75 0.76 0.88 2.92 0.13	✓ FO\ ✓ FO\ LON 214 51 357 169 127 82 65 339	Labels Orbits /s =	 Vect Lat/ Lat/ 10.9 min (deg) 0 12.3 -172 10 43 83 71 -112 	↓ 106.0 VREL (km/s) 4.1 13.2 15.6 9.1 6.1 5.1 2.0 9.2 9.2 9.3 9.4 1.5<	EFS SEP ORS b/s an ORS trad an Year Month Day deg z_HCHT (km) 0 -3846 -1511 -1060 -1549 3244	2. 21. 1916 108.3. 1916 83. Event (ANK SATRN 0.0 4.9 0.9 0.9 10.0 17.4 39.8 29.5	189 deg 209 deg 0 deg 8 deg •	Hour Minut Secor RAM 144.6 139.8 142.6 134.6 134.6 127.2 104.8 173.7
User vector - D Paste C Turn analyzer BODY SATURN MIMAS MICELADUS TITHYS DIONE RIFEA TITAN HYPERION HAPETIS	RA: DEC: Current I	+86.5 -20.7 RA/DE URN MAT 30002	t SATURI 5066 791 EC	Tilt L Left ✓ Imag to E/ 30.53 32.65 23.93 24.53 29.01 29.23 42.80 86.08	Up Rese Down RTH 	Till t Rig ab 7008 (Ra) 27.73 30.53 32.64 23.92 24.52 29.00 29.19 42.80 86.07	S_X ♀ It R ght fi Res put Z PHASE [deg] 71.9 76.7 71.0 74.0 81.9 2111.6 42.6 83.6	Zoom Fill Sc Zool 2 cool 3.99 0.01 0.01 0.04 0.05 0.17 0.02	n Out (creen) (m In) (DIAMETER mrad) 69.62 (0.26 (0.75 (0.76 (0.75 (0	✓ FOV ✓ FOV SUE LON 214 51 357 169 127 82 65 339 13	Labels Orbits /s = -1 -1 -2 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -2 -1 -1 -1 -1 -2 -1 -1 -1 -2 -1 -1 -1 -2 -1 -1 -2 -1 -4 -2 	✓ Vect ✓ Lat/ 10.9 min 123 -172 10 43 83 71 -112 161	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	EFS SIEP CRS b/s an ORS rad an Year Month Day	2. 21. 1916 108. 1916 83. Event (SATRN 0.0 4.9 0.9 2.0 10.0	189 deg 209 deg 0 deg 8 deg • • • • • • • • • • • • • • • • • • •	Hour Minut Secor RAM 143-6 139-8 145-65 142-6 134-6 134-6 134-6 134-6 134-6 134-7 130-2
Jser vector - D Paste C Furn analyzer BODY SATURS HIMAS ENCELADUS TETHYS ENCELADUS TETHYS TETHYS HIMAS	RA: DEC: Current I	+86.5 -20.7 RA/DE URN MAT 30002	t SATURI 5066 791 EC	Tilt L Left ✓ Imag to E/ (Rs) 28.73 30.53 32.65 23.93 24.53 29.01 29.23 42.80	Up Rese Dowr ARTH 	Til t Rig b ✓ H t Rig TUDE [Ra] 27.73 30.53 32.64 23.92 24.52 29.00 29.19 42.80	S_X t R ght ii Res pHASE [deg] 71.9 76.7 71.0 71.0 74.0 89.2 111.6	Zoom Fill Sc Zool Col Col Col Col Col Col Col Col Col	n Out (creen (m In (0 m RWA 0 IAMETER mrad] 0.23 0.26 0.75 0.75 0.76 0.88 2.92 0.13	✓ FO\ ✓ FO\ LON 214 51 357 169 127 82 65 339	Labels Orbits /s =	 Vect Lat/ Lat/ 10.9 min (deg) 0 12.3 -172 10 43 83 71 -112 	↓ 106.0 VREL (km/s) 4.1 13.2 15.6 9.1 6.1 5.1 2.0	EFS SEP ORS b/s an ORS trad an Year Month Day deg z_HCHT (km) 0 -3846 -1511 -1060 -1549 3244	2. 21. 1916 108.3. 1916 83. Event (ANK SATRN 0.0 4.9 0.9 0.9 10.0 17.4 39.8 29.5	189 deg 209 deg 0 deg 8 deg •	Hour Minut Secor RAM 143.6 139.8 145.5 142.6 134.6 134.6 127.2 104.8 173.7 130.2



08/31/2017

No ORS Boresight Solar Constraints on Science Pointing Noted.

September 4th, 2010 (DOY 247): UVIS began the day with a scan, in high resolution mode, across Saturn's visible hemisphere. This was followed by a VIMS hemispherical map of Saturn.

September 5th, 2010 (DOY 248): ISS took the opportunity to image a "mutual event", where Telesto, one of the small satellites of Saturn transited across another satellite, Rhea. We ended the day with another VIMS hemispherical map of Saturn.

Segment Integration Planning

Timeline Gaps and Suggested Observations

Saturn 137 Legacy

This segment contained only one observation period.

Suggested Observations:

- VIMS Regional Maps and an ISS observation of the transit of Telesto across Rhea
- OpNav observation

Beginning of Integration:

DATA VOLUME SUMMARY TRANSFER	FRAME OVERHE	EAD INCLU	JDED (80	BITS PER 880	0-BIT FRAME)			
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Downlink Limited - margin available: approx 460 Mb Gap fill must not exceed downlink margin

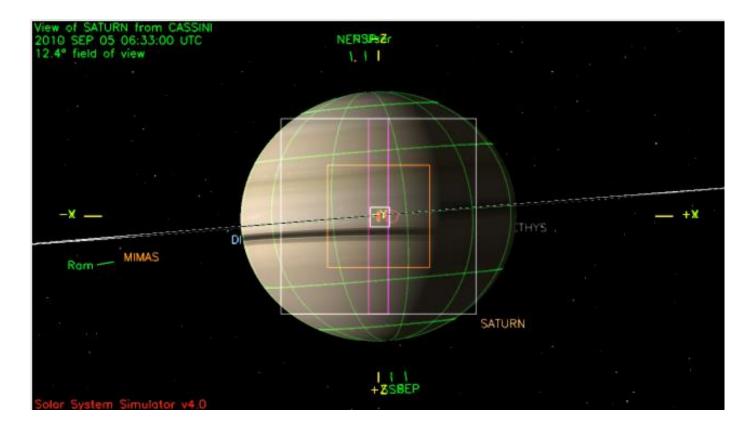
Event	Start doy hh:mm	End doy	hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
OBSERVATION_NOR OBSERVATION_SI SP_137EA_C70METSEQ248_PRIME DAILY TOTAL SCIENCE	247 06:33 247 06:33 248 21:33 247 06:33	248 249	21:33 06:33	140.4 0.0 32.4 172.8	90.1 0.0 17.0 107.1	0.0	0.0	248.0 43.5 0.0 291.5	0.0	168.5 0.0 38.9 207.4	0.0 0.0 0.0 0.0	183.9 0.0 42.4 226.4	0.0	0.0	0.0 0.0 0.0 0.0	163.0 0.0 0.0 163.0	
					DA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIM (Mb)			RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	
TOTAL RECORDED (OPNAV data n	ot included	l)	172	2.8 10	07.1	86.4	27.3	291.5	103.7	207.4	a 0	.0 2	26.4	294.8	760.0	0.0	

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

Waypoint Options for Secondary Axis:

	Turn Time to NSP	Turn Time to NEP	Turn Time to Sun
NEG_X to 84.1/84.1	2.72 min	5.36 min	19.4 min
NEG_Z to 84.1/84.1	2.72 min	5.36 min	19.4 min

Waypoint 1 (2010-247T06:33 - 249T06:33): NAC to Saturn, NEG_Z to 84.1/84.1



Notes & Liens

Saturn 137 Legacy

- Pointing:
 - None
- Data Volume:
 - SSR emptied at the end of sequence
- DSN:
 - No issues
- Opmodes:
 - None
- Special Activities:
 - None

Sequence Liens:

• None