

Science Planning & Sequence Team

SATURN TARGET WORKING TEAM

Rev 170-171 Segment Legacy Package

Segment Boundary: Aug 14, 2012 – Aug 25, 2012 2012-227T19:20:00 – 2012-238T02:19:00 (SCET)

Integration Began 10/11/2011 Segment Delivered to S74 Sequence 12/20/2012 Lead Integrator was Shawn Brooks.

Legacy Package Assembled by Keven Uchida

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

Segment Overview and Final Products

- This was a ~10.25 day long Solstice Mission, periapsis segment. The S/C was in an inclined orbit.
- CIRS and ISS led the majority of the activities in this segment. CIRS activities included compositional as well Far-IR and Mid-IR mapping. ISS focused on mapping to study/characterize Saturn's winds. UVIS performed two EUV-FUV mapping observations.
- There were three out-of-discipline activities: ISS performed two Titan monitoring studies and MAG an 8hr long calibration roll.
- Due to a conflict (near the end of the segment) with the MSL Mars mission EDL, swaps of DSN stations were made and the end time of the segment was extended, from the original time, by a number of hours.
- After pre-placement of the "template" activities, 6 gaps/open-periods remained, ranging in durations from 3 to 14 hours (see page 11), to be filled with science. There is no record why, but all but the last Gap was left unfilled.
- There were no ORS boresight constraints/issues in this segment.

Final Sequenced SPASS

4			1						
	Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
	SATURN_170_171 Segment		2012-227T19:20:00		009T23:14:00	2012-237T18:34:00			
	SP 170SA WAYPTTURN227 PRIME		2012-227T19:20:00		000T00:40:00	2012-227T20:00:00	ISS_NAC to Saturn	NEG Z to 132.2/58.6	
1	NEW WAYPOINT		2012-227720:00:00		001T20:05:00	2012-229T16:05:00	ISS NAC to Saturn	NEG Z to 132.2/58.6	
	UVIS 170SA EUVFUV001 PRIME		2012-227T20:00:00		000T16:00:00	2012-228T12:00:00	UVIS FUV to Saturn	NEG Z to 132.2/58.6	
	CIRS 170SA FIRMAP001 PRIME	I. V	2012-228T12:00:00		000T11:00:00	2012-228T23:00:00	CIRS FP1 to Saturn	NEG X to NSP	
	SP 170FA DI TURN229 PRIME		2012-229T15:25:00		000T00:40:00	2012-229T16:05:00	XBAND to Earth	NEG X to 294.0/20.0	
1	NEW WAYPOINT		2012-229716:05:00		000T11:10:00	2012-230103:15:00	XBAND to Earth	NEG X to 294 0/20 0	
1	ENCE 1705C KETVELAS229 PRIME		2012-229716:05:00		000T01:30:00	2012-229717:35:00	POS 7 to DELTA H (0.0.0.0 -	NEG X to Sun	r -
			2012 223110:03:00		000101.00.00	2012 223117.33.00	20 908 deg. offset)		
1	SP 170EA C34826SE0220 PRIME	CR	2012-220T17-35-00		000700.00.00	2012-220702-35-00	XBAND to Earth	Rolling	CDA NEC X to (294/20) CIRS beating
	SP_170EA_0340203EQ229_FIGHE	T	2012-220102:25:00	i i i i i i i i i i i i i i i i i i i	000109.00.00	2012-220102:15:00	ISS NAC to Satura	NEC 7 to 122 2/59 6	CDA. NEG_X to (254) 20). Cito heading
		*	2012-220102-15-00		001712-50-00	2012-221716-05-00	ISS NAC to Saturn	NEC 7 to 122 2/58 6	
-	CIPE 170CA MIRMADOO1 DRIME	TV	2012 230103:15:00		000T22:00:00	2012 231110.03.00	CIPE ED2 to Saturn	NEC 7 to NED	
\rightarrow		1, V	2012-230103.13.00		000122.00.00	2012-231701.13.00	VDAND to Fasth		
	SP_170EA_DLTORN231_PRIME		2012-231115:25:00		000100.40.00	2012-231116:05:00	XBAND to Earth	NEG_X to 294.0/15.0	
-			2012-231116:05:00		000111:10:00	2012-232103:15:00	XBAND to Earth	NEG_X to 294.0/15.0	
-	SP_170EA_YGAP231_PRIME	-	2012-231116:05:00		000101:30:00	2012-231117:35:00	XBAND to Earth	NEG_X to 294.0/15.0	
	SP_170EA_G70METSEQ231_PRIME	C	2012-231117:35:00		000109:00:00	2012-232102:35:00	XBAND to Earth	Kolling/SKU	CIRS heating
1	SP_170SA_WAYPTTURN232_PRIME	I	2012-232T02:35:00		000T00:40:00	2012-232T03:15:00	ISS_NAC to Saturn	NEG_Z to 132.2/58.6	
1	NEW WAYPOINT		2012-232T03:15:00		001T12:50:00	2012-233T16:05:00	ISS NAC to Saturn	NEG Z to 132.2/58.6	
1	ISS 170TI M60R3CLD232 PRIME	C, I, V	2012-232T03:15:00	E170 M60R3CLD232+000	000T01:30:00	2012-232T04:45:00	ISS NAC to Titan	NEG Z to 132.2/58.6	
		10.10		T00:00:00				-	
1	ISS_170SA_WIND5HR001_PRIME	U	2012-232T04:45:00		000T05:00:00	2012-232T09:45:00	ISS_NAC to Saturn	NEG_Z to 132.2/58.6	No Preference to secondary pointing
1	CIRS_170SA_COMPSIT001_PRIME	I, U, V	2012-232T09:45:00		000T06:00:00	2012-232T15:45:00	CIRS_FP1 to Saturn	NEG_Z to NSP	
1	ISS_170SA_WIND5HR002_PRIME	U	2012-232T15:45:00		000T05:00:00	2012-232T20:45:00	ISS_NAC to Saturn	NEG_Z to 132.2/58.6	No Preference to secondary pointing
1	ISS_170SA_WIND5HR003_PRIME	U	2012-232T20:45:00		000T05:00:00	2012-233T01:45:00	ISS_NAC to Saturn	NEG_Z to 132.2/58.6	No Preference to secondary pointing
1	CIRS 170SA COMPSIT002 PRIME	I, U, V	2012-233T01:45:00		000T06:00:00	2012-233T07:45:00	CIRS FP1 to Saturn	NEG Z to NSP	
	ISS 170SA WIND5HR004 PRIME	U	2012-233T07:45:00		000T05:00:00	2012-233T12:45:00	ISS NAC to Saturn	NEG Z to 132.2/58.6	No Preference to secondary pointing
	SP 170EA DLTURN233 PRIME		2012-233T15:25:00		000T00:40:00	2012-233T16:05:00	XBAND to Earth	NEG X to 294.0/15.0	
1	NEW WAYPOINT		2012-233T16:05:00		000T11:10:00	2012-234T03:15:00	XBAND to Earth	NEG X to 294.0/15.0	
	SP 170EA YGAP233 PRIME	M	2012-233T16:05:00		000T01:30:00	2012-233T17:35:00	XBAND to Earth	NEG X to 294.0/15.0	
	SP_170EA_G34HEFSEQ233_PRIME	C, M, R	2012-233T17:35:00		000T09:00:00	2012-234T02:35:00	XBAND to Earth	5_Hr_Rolling	CDA. NEG_X to (294/15). SID suspend.
	CD 170CA WAYDTTUDWDD1 DDW15		2012 221722 25-00		000700-10-00	2010 224702 15 00			CIRS heating
	SP_170SA_WAYPTTURN234_PRIME	1, ™	2012-234102:35:00		000100:40:00	2012-234103:15:00	ISS_NAC to Saturn	NEG_2 to 132.2/58.6	
-	NEW WAYPOINI	0.1.11.11	2012-234103:15:00	5470 H00000 0000 4.000	001112:84:00	2012-23511549.00	ISS_NAC to Saturn	NEG_Z to 132.2/58.6	
	ISS_I7011_M90R3CLD234_PRIME	C, I, M, V	2012-234103:15:00	E170_M90R3CLD234+000	000101:30:00	2012-234104:45:00	ISS_NAC to IItan	NEG_2 to 132.2/58.6	
			2040 00 1704 15 00	100:00:00	000745 00 00				
	UVIS_170SA_EUVFUV002_PRIME	I, M, V	2012-234104:45:00		000116:00:00	2012-234120:45:00	UVIS_FUV to Saturn	NEG_Z to 132.2/58.6	
	CIRS_170SA_COMPSIT003_PRIME	1, U, V	2012-234120:45:00		000111:00:00	2012-235107:45:00	CIRS_FP1 to Saturn	NEG_Z to NSP	
-	SP_170EA_DLTURN235_PRIME	M	2012-235115:09:00		000100:40:00	2012-235115:49:00	XBAND to Earth	NEG_X to 294.0/15.0	
	NEW WAYPOINT		2012-235115:49:00		000111:10:00	2012-236102:59:00	XBAND to Earth	NEG_X to 294.0/15.0	
	ENGR_170SC_KPTYBIAS235_PRIME	м	2012-235115:49:00		000101:30:00	2012-235117:19:00	NEG_Z to DELIA_H (0.0,0.0,-	NEG_X to Sun	
							15.002 deg. offset)		
-	SP_170EA_G70METSEQ235_PRIME	С, М	2012-235117:19:00		000109:00:00	2012-236102:19:00	XBAND to Earth	Rolling/SRU	CDA. NEG_X to (294/15). SID suspend
	SP_170SA_WAYPTTURN236_PRIME	I, M	2012-236102:19:00		000100:40:00	2012-236102:59:00	ISS_NAC to Saturn	NEG_Z to 132.2/58.6	
	NEW WAYPOINT		2012-236102159:00		001112:50:00	2012-237115:49:00	ISS_NAC to Saturn	NEG_2 to 132.2/58.6	
-	ISS_170SA_WINDSHR005_PRIME	M, U	2012-236102:59:00		000105:00:00	2012-236107:59:00	ISS_NAC to Saturn	NEG_2 to 132.2/58.6	No Preference to secondary pointing
-	CIRS_170SA_COMPSITOU4_PRIME	1, U, V	2012-236107:59:00		000106:00:00	2012-236113:59:00	CIRS_FP1 to Saturn	NEG_Z to NSP	
4	Apoppoo Dor = 21.2 d inc	0	2012-236113:59:00		000105:00:00	2012-236118:59:00	ISS_NAC to Saturn	NEG_Z to 132.2/58.6	No Preference to secondary pointing
	CIRE 17164 COMPRISION PRIME	T M II M	2012-230110:38:50		000100:00:01	2012-230110:38:51	CIPC ED1 to Caturn	NEC 7 to NCD	
	MAC 171SH CALPOLLOOD DRIME	I, M, U, V	2012-230110:59:00		000111.00.00	2012-23/105:59:00	NEC X to Earth (0.0.0.0. 20.0	Polling	
	MAG_17150_CALKULLUUZ_PRIME	1, WI, V	2015-23/10/:03:00		000108:00:00	2015-23/112:04:00	deg_offset)	Rolling	
1	SP 171EA DI TURN237 PRIME	M	2012-237T15-09-00		000700.40.00	2012-237T15-49-00	XBAND to Earth	NEG X to 294 0/15 0	
	NEW WAYPOINT		2012-237715-49-00		000110-30-00	2012-238T02-19-00	XBAND to Earth	NEG X to 294 0/15 0	
1	ENGR 1715C YBIASRTC237 BRIME	M	2012-237T15-49-00		000T01:30:00	2012-237T17-19-00	POS Z to DELTA H	NEG X to Sup	
1	SP 171EA G70METSE0237 DRIME	CMB	2012-237T17-19-00		000109:00:00	2012-238T02-19-00	XBAND to Earth	NEG X to 294 0/15 0	CDA NEG X to (294/15) EOS
							the second		

Keven Uchida

Gap 1

Gap 2

Gap 3

Gap 4

Gap 5

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

		1			OBS	ERVATI	ON_PERIO	DD		l			DOWNLIN	K_PASS			I
		: 				P4			P5	 RECC 	RDED	 		PLAYE	BACK		
DOWNLINK PASS NAME	Start doy hh:mm	 End doy hh:mm	START (Mb)	SCI (Mb)	HK+E (Mb)	TOTAL (Mb)	CPACTY (Mb)	MRGN (Mb)	 OPNAV (Mb)	 SCI <mark>(</mark> Mb)	ENGR (Mb)	 TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_ (Mb)	MARGN (%)	CAROVR (Mb)
SP 170EA G34B26SEQ229 PRIME	229 17:35	230 02:35	0	1220	195	1415	3322	1907	0	163	53	1631	637	-994	1144	11%	994
SP 170EA G70METSEQ231 PRIME	231 17:35	232 02:35	994	1019	165	2178	3322	1144	0	163	53	2394	3070	676	1629	17%	0
SP 170EA G34HEFSEQ233 PRIME	233 17:35	233 21:35	0	1902	165	2067	3322	1255	0	163	24	2253	1358	-896	953	14%	895
SP_170EA_G70METSEQ235_PRIME	235 17:19	236 02:19	895	1221	164	2279	3322	1043	0	163	53	2495	3058	563	953	18%	0
SP_171EA_G70METSEQ237_PRIME	237 19:34	238 02:19	0	1629	167	1796	3322	1526	0	128	40	1964	2354	389	390	17%	0

DATA VOLUME REPORT TRANS	SFER FI	RAME (OVERH	HEAD NOT	INCLUDE	ED												
Event	Start doy hł	h: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	227 19	9:20	229	17:35	0.0	43.6	273.6	26.7	4.4	41.1	108.2	0.0	149.8	230.9	330.0	0.0	193.3	1401.8
SP_170EA_G34B26SEQ229_PRIME DAILY TOTAL SCIENCE	229 17 227 19	7:35 9:20	230 230	02:35	0.0	8.5 52.1	86.4 360.0	3.2 30.0	0.0 4.4	8.0 49.1	21.1 129.3	0.0	29.2 179.0	4.9 235.9	0.0 330.0	0.0	0.0 193.3	161.3
OBSERVATION_NOR	230 02	2:35	231	17:35	0.0	36.8	<mark>316.8</mark>	14.0	60.1	34.7	91.3	0.0	126.4	0.0	33 <mark>0.</mark> 0	0.0	16 <mark>3.</mark> 0	1173.1
SP_170EA_G70METSEQ231_PRIME DAILY TOTAL SCIENCE	231 17 230 02	7:35 2:35	232 232	02:35	0.0	8.5 45.3	86.4 403.2	3.2 17.3	0.0	8.0 42.7	21.1 112.3	0.0	29.2 155.5	4.9 4.9	0.0	0.0	0.0	161.3
OBSERVATION_NOR	232 02	2:35	233	17:35	0.0	36.8	108.0	14.0	952.6	34.7	91.3	0.0	126.4	104.9	416.0	0.0	163.0	2047.7
SP_1/UEA_G34HEFSEQ233_PRIME DAILY TOTAL SCIENCE	233 1	2:35	233	21:35	0.0	45.3	194.4	3.2 17.3	952.6	42.7	112.3	0.0	155.5	4.9	416.0	0.0	163.0	161.3
OBSERVATION_NOR	234 02	2:35	235	17:19	0.0	36.5	216.0	13.9	52.6	34.4	90.6	0.0	125.5	295.8	344.0	0.0	161.9	1371.3
SP_170EA_G70METSEQ235_PRIME DAILY TOTAL SCIENCE	235 17 234 02	7:19 2:35	236 236	02:19 02:19	0.0	8.5 45.0	86.4 302.4	3.2 17.2	0.0 52.6	8.0 42.4	21.1 111.7	0.0	29.2 154.7	4.9 300.7	0.0 344.0	0.0	0.0 161.9	161.3
OBSERVATION_NOR	236 02	2:19	237	19:34	0.0	38.9	135.9	24.9	467.6	86.5	96.5	0.0	133.6	94.4	536.0	0.0	172.4	1786.8
DAILY TOTAL SCIENCE	236 02	2:19	238	02:19	0.0	45.3	208.8	27.3	467.6	92.5	112.3	0.0	155.5	96.2	536.0	0.0	172.4	127.2

6

Segment Geometry

Saturn 170_171 Legacy

000					iDigit - D.	ave's Inte	eractive	Geome	try and	Inform	ation	Tool v	3.1				
View of S 2012 AU0 15.5° fiel	ATURN 14 19 d of vi	from):20:0 ≥w	CASSINI O.UTC	etica i El A etic	NEP	NEXP I				² на к		9 - 11 - 11 - 11		Rev 170 007 2012 - 227 2012 AUG 14 2012 AUG 14 Apoapso_17 Periapse_17 Light time: Orbit perin	BOUND T19:20:1 20:44:1 0 + 012 0 + 001 0 + 001 0 + 001	00 SCEP 00 SCEP 88 ERT 708:27:5 717:48:2 5 win 3 days	5
User		÷				R		1					2	Radius I Rad_cyl I Z_ht_cyl I Mag_L Seni_axs I Eccentricit Inclination	110476 1 109178 1 53682 1 18.4 479642 1 y 0.1 32.1	cm cm cm 17 cm 766 20 deg	18.43 R 18.40 R 0.89 R 24.55 R
			3. 					SATU	RN	2 W				Sun_range Earth_range DSN ELE Boldstone Canberra Hadrid LOD	9. 10.1 7 D/I 29.1 -33.1 12.0 K DEREC	75 AU 18 AU 2 U/I 2 -2.5 0 -47.1 1 37.2 PION INF	0
Solor Sys Point NE	terri Si G_Y	nulati	R or v4 0 at SATUR	arm RN	and al	ign POS	SEP _X \$	= Up	\$	+V with (NSP		•	PO7 RA DEC Crosses_RF_ EPS SEP ORS b/s ang DRS rai ang	15. -131.1 3.1 0. 5.1 62.1 1e 156.1 1e 77.1	5 deg 2 334 deg 336 deg 300 Rs 283 deg 895 deg 7 deg *	71.1 mr:
User vector	- RA:	-115	.996	(Tilt L			tR	Zoon	n Out	Ø 🗆 I	abels	Axe:	5	Year 🖪		4 >	Hour
Paste	DEC:	+5	.710	Left	Reset		i Res	(Fill S	m In	□ □ 0	Orbits	✓ Vect	lons	Month A		4 1	Minute
Craste	carrer			()				<u></u>		Q	5 201	() and				- F	Second
Turn analyz	er: SA	TURN		toE	ARTH	ab	out Z	÷ .	on RWA	1) =	14.4 min	/ 153.2	2 deg	Event	4 1	Second
Turn analyz BODY	er: 5/ s/c 8002	SAP DCC2	RAN (kn)	to E	ARTH ALFII (kn)	(Rs)	PHASE (deg)	ANGLR_ (deg	ON RWA	SUB_	_S/C LAT	14.4 min	/ 153.2 VREL (kn/s)	Z deg Z_HGHT (km)	Event	LEF	Second ROH RAH
Tum analyz BODY SATURN	ser: 5/ 5/C 00C2	SAP DCC2	RAN (km) 1110475	to E	ARTH ALFII (km) 1050828	200E (Re) 17.43	PHASE (deg) 89.9	ANGLR_ (deg 6.82	on RWA DIAHETER nrad) 100.60	SUB_ 108 159		14.4 min <u>ALON</u> (deg) 0	/ 153.2 VREL (kn/s) 6.5	2 deg 2_HGHT (2m) 0	EventANG SATEN 0.0	LEF EARTH 159.2	Second ROII RAII 147.1
Tum analyz BODY SATURN HIMAS	sr: 5/ 8/C 00C2	SAP DCC?	RAN 	to E (Rs) (Rs) 10.43 21.37	ARTH ALFTI (kw) 1050222 1287517	* ab ************************************	PHASE (1eg) B3.2 25.1	ANGLR_ (1eg 6.82 0.02	on RWA DIAHETER nrsd) 100.60 0.32	SUB_ 103 159 12	_S/C LAT 3 2	14.4 min <u>ALON</u> (deg) 0 165	/ 153.2 VREL (kn/s) 6.5 17.9	2 deg 2_HGHT (2m) 0 -3604	Event ANG SATEN 0.0 2.1	LEF EARTH 153.2 151.2	Second ROII RAII 147 1 145 8
Tum analyz BODY SAFURN HEHAS ENCELADUS	s/c 8/c 8002	SAT DCC2	RAN (km) 1110476 1287724 1258099	to E (Rs) 19.43 21.37 20.87	ARTH ALFII (kw) 1050228 1287517 1257839	(Rs) 17.43 21.36 20.67	PHASE (1eg) 83.2 25.1 31.3	ANGLR_ (deg 6.92 0.02 0.02	on RWA DIAHETER nrad) 100.60 0.32 0.41	SUB_ 103 159 12 48	= _S/C LAT 3 2 2	14.4 min	/ 153.2 VREL (kn/s) 6.5 17.9 12.1	2 deg 2_NGHT (2m) 0 -3604 -19	Event	LEF EARTH 153.2 151.2 144.6	Second ROII RAII 147.1 145.8 140.5
Tum analyz BODY SAFURN HEMAS ENCELADUS FETHYS	s/c 8/c 8002	SAT DCC?	RAN (kn) 1110475 1287724 1258093 1340424	to E (Rs) 19.43 21.37 20.87 22.24	ARTH ALTIJ (km) 1050828 1287517 1257839 1339885	17.43 21.36 20.87 22.23	PHASE (1-97) B3.2 25.1 31.3 17.1	ANGLR_ (deg 6.82 0.02 0.02 0.05	on RWA DIAMETER nrad) 109.60 0.32 0.41 0.81	SUB_ 10¥ 159 12 48 327	= _S/C LAT 3 2 2 2	14.4 min	/ 153.2 VREL (kn/s) 6.5 17.9 12.1 17.6	2 deg 2_N9HT (2m) 0 -3604 -19 -1310	Event	LEF EARTH 153.2 151.2 144.6 160.5	Second ROII RAII 147.1 145.8 140.5 152.7
Tum analyz BODY SAFURN HINAS ENCELADUS TETHY S DIDNE	ser: 5/ 8/C 8/C 8/C 8/C 8/C 8/C 8/C 8/C 8/C 8/	SAT DCC?	RAN (km) 1110475 1287724 1258093 1340424 952777	to E (Rs) 19.43 21.37 20.87 22.24 15.81	ARTH ALFTI (km) 1050222 1287517 1257839 1339886 952216	* at ************************************	PHASE (1eg) 83.2 25.1 31.3 17.1 40.2	ANGLR_ (deg 6.82 0.02 0.02 0.05 0.07	ON RWA DIAMETER nrsd) 100 60 0 32 0 41 0 81 1 18	SUB_ 103 159 12 48 327 105	= _S/C LAT 3 2 2 2 3	14.4 min (deg) 0 165 124 -137 56	/ 153.2 VREL (kn/s) 6.5 17.9 12.1 17.6 4.4	2 deg 2_NGHT (2m) 0 -3604 -19 -1310 -138	Event	LEF EARTH 153.2 151.2 144.6 160.5 135.3	Second ROII RAII 147.1 145.8 140.5 152.7 131.8
Tum analyz BODY SAFURN HIMAS ENCELADUS TETHYS DIONE RHEA	sr: 5/ 8007	SAT 9CC?	RAN (km) 1110475 1287724 1258099 1340424 952777 1379749	to E (Rs) (Rs) 10.43 21.37 20.67 22.24 15.81 22.89	ARTH ALFT1 (km) 1050822 1287517 1257839 1339885 952215 1378985	* at ************************************	PHASE (1eg) 83.2 25.1 31.3 17.1 40.2 42.3	ANGLR_ (deg 6.82 0.02 0.02 0.03 0.07 0.06	ON RWA DIAMETER nrad) 100 60 0 32 0 41 0 81 1 18 1 11	SUB_ 103 159 12 46 327 105 52	= _S/C LAT 3 2 2 2 3 2 3 2	14.4 min	/ 153.2 VREL (kn/s) 6.5 17.9 12.1 17.6 4.4 7.5	2 deg 2_369HT (2m) -3604 -19 -1310 -138 -2808	EventANG SATEN 0.0 2.1 9.1 8.7 19.1 21.1	LEF EARTH 153.2 151.2 144.6 160.5 135.3 133.2	Second ROH RAH 147.1 145.8 140.5 152.7 131.8 130.6
Turn analyz BODY SATURN HIHAS ENCELADUS TETHYS DIDNE RHEA FITAN	s/c 8/c 0002	SAT 00007	RAN (kn) 1110475 1257024 1256093 1340424 952777 1379749 1987845	to E (Rs) (Rs) 19.43 21.37 20.67 22.24 15.81 22.89 32.98	ARTH ALTI (km) 1050222 1287517 1257839 1339885 952216 1378985 1985270	(Re) 17.43 21.36 20.87 22.23 15.80 22.88 32.94	Rout Z PHASE (leg) 25.1 31.3 17.1 40.2 42.3 20.7	ANGLR_(deg 6.82 0.02 0.02 0.03 0.07 0.06 0.15	On RWA DIAMETER nrad) 100 60 0 32 0 41 0 81 1 18 1 11 2 59	SUB_ 103 159 12 48 327 105 52 327	= S/C LAT 3 2 2 2 3 2 2 3 2 2 2 3 2 2 2 3 2 2 2	14.4 min	/ 153.2 VREL (kn/s) 6.5 17.9 12.1 17.6 4.4 7.5 11.7	2 deg 2_HGHT (2m) 0 -3604 -19 -130 -138 -2808 4855	EventANG SATEN 0.0 2.1 9.1 8.7 19.1 21.1 35.3	HE F EARTH 153.2 151.2 144.6 160.5 135.3 133.2 164.1	ROH RAH 147.1 145.8 140.5 152.7 131.8 130.6 155.0
Turn analyz BODY SAPURN HIMAS ENCELADUS TETHYS DIDNE RHEA RIEA HYPERIDN	ser: S/ 8/C 9007	SAT 0CC?	RAB (km) 1110476 1287724 1258093 1340424 952777 1379749 1987845 2333146	to E (Rs) 19.43 21.37 20.67 22.24 15.81 22.89 32.98 38.71	ARTH ALFTI (km) 1050828 1287517 1257539 1339885 952216 1378985 1378985 1985270 2333003	(Re) 17.43 21.36 20.87 22.23 15.80 22.88 32.94 38.71	PHASE (leg) 25.1 31.3 17.1 40.2 42.3 20.7 58.6	ANGLR_ (deg 6.82 0.02 0.02 0.05 0.07 0.06 0.15 0.01	on RWA DIAMETER nrad) 100.60 0.32 0.41 0.81 1.18 1.11 2.59 0.14	STUB_ 1037 159 12 48 327 105 52 327 182	= S/C 3 2 2 2 2 3 2 2 2 3 2 2 2 40	14.4 min (deg) 0 165 124 -137 56 110 -114 117	/ 153.2 VREL (kn/s) 6.5 17.9 12.1 17.6 4.4 7.5 11.7 6.2	2 deg 2_HGHT (2m) 0 -3604 -19 -1310 -138 -2808 4855 -23224	Event ANG SATEN 0.0 2.1 9.1 8.7 19.1 21.1 35.3 38.2	LEF EARTH 153.2 151.2 144.6 160.5 135.3 133.2 164.1 116.6	ROH RAH 147.1 145.8 140.5 152.7 131.8 130.6 155.0 115.5
Turn analyz BODY SAFURN HIHAS ENCELADUS FETHYS DIDNE RHEA FITAN HYPERION LAPETUS	syc 8/C 80C2 	SAT 0007	RAB (km) 1110476 1287724 1256099 1340424 952777 1379749 1987845 2333146 4628565	to E (Re) (Re) 10.43 21.37 20.67 22.24 15.81 22.98 38.71 76.80	ARTH ALFTJ (km) 1050828 1287517 1257839 1339885 952215 1378985 1985270 2333003 4627817 109057	(Re) 17.43 21.36 20.87 22.23 15.80 22.88 32.94 38.71 76.79 20.97	PHASE (1eg) 25.1 31.3 17.1 40.2 42.3 20.7 58.6 38.2	ANGCR_ (deg 6.92 0.02 0.05 0.07 0.06 0.15 0.01 0.02	on RWA DIAHETER nrad) 100.60 0.32 0.41 0.81 1.18 1.11 2.59 0.14 0.32	SUB_ LOW 159 12 46 327 105 52 327 182 7	= 	14.4 min ALOW (deg) 0 165 124 -L37 56 110 -114 117 155	/ 153.2 VREL (kn/s) 6.5 17.9 12.1 17.6 4.4 7.5 11.7 6.2 7.5 5	2_HGHT (2m) 0 -3604 -19 -1310 -1310 -138 -2808 4855 -29224 -745602	Event	LEF EARTH 159.2 151.2 144.6 160.5 135.3 133.2 164.1 116.6 136.8	ROH RAH 147.1 145.8 140.5 152.7 131.8 130.6 155.0 115.5 128.0
Tum analyz BODY SAFURN HIMAS ENCELADUS TETHYS DIDNE RHEA TITAN HYPERION IAPEFUS PHDEBE	s/c 9007	SAP 00007		to E 10.43 21.37 20.67 22.24 15.81 22.89 32.98 38.71 76.80 236.05	ARTH ALFTI (km) 1 05 0322 1 287517 1 257839 1 339885 9 52216 1 378985 1 985270 2 333003 4627817 1 4226589		NUT Z PHASE (deg) 25.1 31.3 17.1 40.2 20.7 58.6 38.2 128.6	ANGLR (deg 6.92 0.02 0.05 0.07 0.06 0.15 0.01 0.02 0.00	on RWA DIAMETER nrad) 100.60 0.32 0.41 0.81 1.18 1.18 1.18 1.18 1.18 1.18 1.1	SUB_ LON 129 12 46 327 105 52 327 182 7 124	= S/C LAT 3 2 2 2 3 2 2 2 3 2 2 2 -40 -1 -24	14.4 min (deg) 0 165 124 -137 56 110 -114 117 155 -31	/ 153.2 VREL (km/s) 6.5 17.9 12.1 17.6 4.4 7.5 11.7 6.2 7.5 6.7	2_HGHT (2m) 0 -3604 -19 -1310 -138 -2808 4855 -29224 -749602 6828771	ANG SATEN 0.0 2.1 9.1 8.7 19.1 21.1 21.1 21.1 35.3 38.2 20.4 138.8	LE F EARTH 159.2 151.2 144.6 169.5 135.3 133.2 164.1 116.6 136.8 56.3	ROH RAH 147.1 145.8 152.7 131.6 155.0 115.5 128.0 74.1

	Saturn Range	Phase Angle
Segment Start	18.43 R _{Sat}	23.2 degrees
Apoapse	43.36 R _{Sat}	77.2 degrees
Periapse	N/A	N/A
Segment End	43.05 R _{Sat}	80.9 degrees

Seg Start (Left)

Seg End (below)

000				iDigit - D.	ave's Int	eractive	Geomet	try and	Inform	nation	Tool v	3.1				
View of SATU 2012 AUG 2 9.6° field of	JRN from 3 16:38: view	CASSINI 48 UTC	TETHYS		NER. I	NEP	JUS	*			*		Rev 170 00 2012 - 20 2012 AUG 2 2012 AUG 2 Apoapso Periapse Light time Drbit peri Radius	UTBDUND 36T16:38: 23 16:38: 23 18:04: 170 + 021 170 + 010 e: 95. 10d: 21. 2612973	48 SCEF 48 SCEF 31 ERT F05:46:: F15:07: 7 min 3 days km	29 09 43.36 Rs
-z	MIMAS						ATURN				· _ +	z	Rad_cyl Z_ht_cyl - Mag_L Seni_axs Eccentric: Inclinatic Sun_range Earth_rang DSN ED Boldstone Canberra	2392987 1 -1049400 1 51. 1479885 1 ity 0. on 32. 9. ge 10. LSV D/ 5. -46.	km 69 km 766 18 deg 75 AU 31 AU L U/I 3 -29 - 2 -35 1	39.71 Rs -17.41 Rs 24.56 Rs L 4
Scior System	n simula r :)	tor v4.0 at SATUR	RN	\$ and at	SSR	x ÷	= Up		User	NSP		•	Hadrid LC FOT RA DEC Crosses_RJ EPS SEP DRS b/s al	32. DOK DIREC 9. -80. 27. P_0 0. 4. 54. ngle 102. pgle 2.	1 41.: FIDN IN 6 deg 692 deg 161 deg 000 Rs 842 deg 520 deg 7 deg 0 deg	3 F0 156:0 mrai *
User vector - I Di Paste Cu	RA: -11 EC: +	5.996 5.710 /DEC	Tilt L Left	Up Reset		t R ght li Res	Zoon (Fill Se Zoon	n Out) creen) m In		Labels Orbits /s	✓ Axe	s tors 'lons	Year A Month A Day A		4 b 4 b	Hour Minute Second
Turn analyzer:	SATUR	N ;	to E	ARTH	¢ at	ocut Z	;	on RWA	4	• =	10.4 min	n / 99.6	deg	Event	• •]
BODY	S/C SAF		BE	ALFII (kn)	(Re)	PHASE (deg)	ANGLR_) (deg	DIAMETER nrad)	SUB_ LON	_S/C LAT	ALON (deg)	VREL (kn/s)	Z_HGHJ (2m)	r <u>an</u> Satrn	BLE] EARTH	ROII RAII
SAFURN		3612973	43.36	8553621	49.97	77.9	8.64	46.13	117	-94	0	1.0	(0.0	99.6	90.0
ENCELADUS	2 2	2398205	39.79	2397950	39.79	77.6	0.01	0.00	184	-26	-4	11.0	1010	2 2 3	99.1	91.1
TETHYS		2336646	39.10	23561.09	39.09	80.1	0.03	0.46	162	-26	17	9.8	-4996	5 34	96.7	88.9
DIDNE		2286483	37.94	2285920	37.93	80.9	0.03	0.49	162	-27	15	8.5	215	9 4.4	96.0	88.8
RHEA		3095382	51.36	3094615	51.35	77.2	0.03	0.50	11	-20	178	10.2	-3105	7 4.3	99.3	87.1
FIFAN		2912597	48.33	291 0022	48.28	99.1	0.10	1.77	58	-21	92	6.4	-1876	5 24.1	77.1	67.1
HYPERION		1659769	27.54	1659624	27.54	104.1	0.01	0.20	37	-26	25	4.0	23161	28.4	73.4	76.6
IAPEPUS		5735051	95.16	5734306	95.15	79.0	0.01	0.26	9	-16	162	5.0	-954465	5 24.9	96.4	73.1
PHDEBE		13681831	227.02	13681721	227.01	138.0	0.00	0.02	133	-33	22	3.1	6663629	9 116.7	46.4	84.7
SAFURN		2612973	43.36	2553621	42.37	77.2	2.64	46.13	117	-24	0	1.8	(0.0	99.6	90.0

Keven Uchida

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Saturn 170_171 Legacy

No ORS Boresight Solar Constraints on Science Pointing

Daily Science Highlights

DOY 227 (14 August 2012): Following a downlink with the Earth, Cassini turned its attention back to Saturn with UVIS mapping of Saturn's atmosphere in the ultraviolet to begin the Saturn_170/171 segment.

DOY 228 (15 August 2012): The UVIS EUVFUV map was followed by a CIRS observation to map Saturn's atmosphere with it's far infrared sensor.

DOY 229 (16 August 2012): This day's activity was largely constrained to a downlink and magnetospheric survey activities executed by the particles and fields (MAPS) instruments.

DOY 230 (17 August 2012): CIRS turned back to Saturn to map its atmosphere in the mid-infrared for 22 contiguous hours. **DOY 231 (18 August 2012)**: This day's activity was largely constrained to a downlink and magnetospheric survey activities executed by the particles and fields (MAPS) instruments.

DOY 232 (19 August 2012): ORS science activities resumed with another observation in the campaign to monitor Titan's atmosphere at brief yet frequent intervals. ISS and CIRS subsequently traded off observing Saturn's atmosphere in a joint campaign to measure Saturn's winds and atmospheric composition.

DOY 233 (20 August 2012): CIRS and ISS completed the second set of two coordinated campaigns to map out the winds and composition of the Saturnian atmosphere. The spacecraft subsequently turned its high-gain antenna back towards Earth to relay the data.

DOY 234 (21 August 2012): Following the downlink, ISS turned back towards Titan for the second observation in the Titan monitoring campaign in this segment. UVIS then executed another set of slow scans of Saturn's atmosphere in the ultraviolet.

DOY 235 (22 August 2012): As on DOY 228, the UVIS EUVFUV observation was followed by a CIRS compositional mapping activity intended to measure trace gases and isotopes in Saturn's atmosphere. This was followed by a downlink through the large, 70-meter dish at the DSN's Goldstone complex.

DOY 236 (23 August 2012): ISS and CIRS traded off observing Saturn to study its winds and atmospheric composition. **DOY 236 (23 August 2012)**: Following the conclusion of the final CIRS compositional study in that sequence of observations, the spacecraft performed an 8-hour roll to calibrate the sensors on the MAG instrument. This was followed by a engineering end-of-sequence Ybias activity. The segment and sequence then came to a close with the final downlink of the segment.

Segment Integration Planning

Timeline Gaps and Suggested Observations

Saturn 170_171 Legacy

Gap	Start	End	Duration	Phase angle (range)	Range (R _{Sat})	Suggested observations/activities
1	2012-229T10:00:00	2012-229T15:25:00	000T05:25:00	43.3°-45.2°	27.82 – 28.88	See Legacy Note 1 below
2	2012-231T01:15:00	2012-231T15:25:00	000T14:10:00	54.4°-57.4°	34.45 - 36.31	
3	2012-233T12:45:00	2012-233T15:25:00	000T02:40:00	65.7°-66.1°	40.67 – 40.86	
4	2012-235T07:45:00	2012-235T15:39:00	000T07:54:00	72.4°-73.5°	42.86 - 43.07	
5*	2012-236T19:29:00	2012-236T23:24:00	000T03:55:00	77.6°-78.1°	43.35 – 43.34	

Legacy Note 1: Gaps were identified, but there were no suggested observations prior to the first meeting. There is no information why, but all but the last gap was left unfilled. Gap 5 that was partially filled with a CIRS COMPSIT observation.

Beginning of Integration:

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

			OBSERVATION_PERIOD							DOWNLINK_PASS							
		 				P4			P5	RECC	RDED	 		PLAYB	ACK		
DOWNLINK PASS NAME	Start doy hh:mm	 End doy hh:mm	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_M (Mb)	ARGN (%)	CAROVR (Mb)
SP 170EA G34BWGSEQ229 PRIME	229 17:35	230 02:35	0	1391	195	1587	3322	1735	0	180	53	1820	547	-1273	81	1%	1273
SP 170EA G70METSEQ231 PRIME	231 17:35	232 02:35	1273	1451	165	2888	3322	434	0	180	53	3121	3070	-52	81	1%	51
SP 170EA G34HEFSEQ233 PRIME	233 17:35	234 02:35	51	1974	165	2191	3322	1132	0	180	53	2424	670	-1754	81	18	1753
SP 170EA G70METNON235 PRIME	235 17:49	236 02:49	1753	1322	166	3241	3322	81	0	180	53	3474	3022	-453	483	88	452
SP_171EA_G70METNON237_PRIME	237 16:49	238 01:49	452	1653	161	2266	3322	1056	0	180	53	2499	2982	482	483	16%	0

Alternate timeline

(Legacy Note: Changes below due to conflicts with MSL EDL)

- DOY 235 pass upgraded from DSS-63 (Madrid 70M) to DSS-14 (Goldstone 70M)
- DOY 237 pass upgraded from DSS-63 to DSS-14
- Sequence boundary moved later by 7 hours, 15 minutes (request not yet granted!)

Waypoint Selection

Saturn 170_171 Legacy

RBOT - Friendly

OBSERVATION PERIOD	START	END	POS_X	NEG_X	POS_Z	NEG_Z
SP_170NA_OBSERV227_NA	2012-227T19:20:00	2012-229T17:35:00	132.2/ 58.6	132.2/ 58.6		132.2/ 58.6
SP_170NA_OBSERV230_NA	2012-230T02:35:00	2012-231T17:35:00	132.2/ 58.6	132.2/ 58.6		132.2/ 58.6
SP_170NA_OBSERV232_NA	2012-232T02:35:00	2012-233T17:35:00	132.2/ 58.6	132.2/ 58.6		132.2/ 58.6
SP_170NA_OBSERV234_NA	2012-234T02:35:00	2012-235T09:49:00	132.2/ 58.6	132.2/ 58.6		132.2/ 58.6
SP_170NA_OBSERV235_NA	2012-235T18:49:00	2012-237T09:34:00	132.2/ 58.6	132.2/ 58.6		132.2/ 58.6

Note: The observation period waypoints were the same throughout the segment.

Waypoint 1-2 (2012-227T20:00:00 – 231T16:05:00): NEG_Y to Saturn, NEG_Z to 132.2/58.6



Waypoint 3-5 (2012-232T03:15:00 - 237T15:49:00): NEG_Y to Saturn, NEG_Z to 132.2/58.6



- Pointing:
 - Downlinks in this segment invoke minor CIRS heating and require SID suspend commands.
 - The implementation of the MAG CALROLL on DOY 237 is a violation of the "2-of-3" RBOT rule.
 - There are no other pointing issues of note.
- Data Volume:
 - none (Though we note that CIRS wishes to add riders to the ISS WINDS observations if sufficient data volume becomes available.)
- DSN:
 - There are *no* stations requested during maintenance, UNQ passes, split pass OTMs, split downlink passes (boresight cal/ Ybias cal), Level 3 requests or ap_downlink report check warnings (with the exception of excessive use of 70M stations).
 - The DOY 235 and DOY 237 downlinks were moved from Madrid (DSS-63) to Goldstone (DSS-14) in an attempt to avoid direct competition with MSL for DSN resources. This required us to extend the segment and change the end time/start time of S74/S75. All necessary approvals have been obtained.
 - RSS would like to exchange DSS-15 for DSS-25 on DOY 233 so that tracking and an ORT can be combined; owing to data volume restrictions, we were unable to accommodate this request at the segment level.
 - A second DSN pass on DSS-63 was added over the DOY 237 downlink at Goldstone to secure an additional ORT for RSS.
- Resource checker:
 - All 5 SPASS gaps listed in the segment resource checker run are expected and acceptable to the Saturn TWT.
- Opmodes:
 - none
- Hydrazine:
 - N/A
- Special Activities:
 - none

Sequence Liens (should all be SPLAT items):

• There are *no* liens for the S74 sequence inherited from the Saturn_170/171 segment.