

Science Planning & Sequence Team

SATURN TARGET WORKING TEAM

Rev 146 Segment Legacy Package

Segment Boundary: March 7, 2011 – March 22, 2011 2011-066T13:02:00 – 2011-081T04:33:00

Integration Began 06/28/2010 Segment Delivered to S66 Sequence 09/28/2010 Lead Integrator was Kathleen Kelleher

Legacy Package Assembled by Kathleen Kelleher

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

Kelleher

Segment Overview and Final Products

• Saturn 146 is the second half of a 25-day "CAKE" (Cassini Apoapse for Kronian Exploration) split by a sequence boundary in the first equatorial phase (EQ-1) of the Solstice Mission.

- The first part of this CAKE was in the end of S66 and left off ~18 hours after apoapse.
- Saturn 146 is 14.5 days long in S67, an inbound segment that runs ~13 days until periapse on 079T11:45:07 and ending ~1.7 days after periapse.

•The timeline was filled primarily with typical CAKE template activities, such as VIMS/ISS wind studies, UVIS EUV/FUVs, and CIRS-led composition and mapping.

• During the periapse period, VIMS and RADAR teamed up to perform a deep-atmosphere campaign (Note: These observations proved extremely valuable in discovering the ammoniadry wake of the Great Storm of 2010-2011). A pair of VIMS deep dynamics atmosphere mosaic PIEs (Pre-Integrated Event) were executed on either side of a 14 hour RADAR Saturn global map, positioned to cover the same territory with the ORS instruments and RADAR. These RADAR observations, comprised of pole-to-pole scans, were stressful for the reaction wheels and required special negotiations with AACS.

• Out-of-discipline activities included ISS irregular rock imaging, and an Opnav.

• The same waypoint from the first half of the CAKE was continued for most of the segment until close (-10 hours) to periapse when it required change due to heating. RBOT (reaction wheel) friendly attitude was compatible with science.

Final Sequenced SPASS (1 of 2)

Saturn 146 Legacy

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NEW WAYPOINT 2011-072T13:13:00 001T12:50:00 2011-074T02:03:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 collaborative with VIMS ISS_1465A_WINDSHR005_PRIME 2011-072T13:13:00 000T05:00:00 2011-073T00:13:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 collaborative with VIMS CIRS_1465A_WINDSHR006_PRIME V 2011-073T01:13:00 000T05:00:00 2011-073T00:13:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 collaborative with VIMS CIRS_1465A_COMPSIT005_PRIME V 2011-073T01:13:00 000T05:00:00 2011-073T11:13:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 collaborative with VIMS CIRS_1465A_COMPSIT005_PRIME V 2011-073T11:13:00 000T01:30:00 2011-073T11:13:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 collaborative with VIMS IS_1465A_SATMONIT002_PRIME 2011-073T11:13:00 000T01:30:00 2011-073T11:23:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 collaborative with VIMS IRE_1465A_WINDSHR002_PRIME 2011-073T11:23:00 000T01:30:00 2011-074T12:30:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 starts at waypoint, ends at same waypoint IRE_1465A_WINRNO7_PRIME	9	SP 146SA WAYPTTURN072 PRIME		2011-072T12:33:00		000T00:40:00	2011-072T13:13:00	ISS NAC to Saturn	NEG Z to 37.5/83.7	
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NAV_1465K_OPNAV731_PRIME 2011-073T12:53:00 000T01:30:00 2011-073T14:23:00 ISS_NAC to Satellites NEG_Z to 37.5/83.7 Starts at waypoint, ends at same waypoint CIRS_1465A_MIRMAP002_PRIME V 2011-073T14:23:00 000T1:00:00 2011-074T01:23:00 CIRS_FP3 to Saturn NEG_Z to 37.5/83.7 Starts at waypoint, ends at same waypoint Sp_146EA_DITURNO74_PRIME 2011-074T01:23:00 000T01:40:00 2011-074T02:03:00 XBAND to Earth NEG_Y to 285.5/-9.3 NEW WAYPOINT 2011-074T02:03:00 000T11:0:00 2011-074T02:03:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_URDNO74_PRIME 2011-074T02:03:00 000T01:30:00 2011-074T03:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_GTOMETNON074_PRIME 2011-074T03:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_GTOMETNON074_PRIME 2011-074T02:33:00 2011-074T12:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_GTOMETNON074_PRIME 2011-074T12:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_DITURNO74_PRIME 2011-074T12:33:00	. 1	SS 146SA SATMONIT002 PRIME		2011-073T11:13:00		000T01:40:00	2011-073T12:53:00	ISS NAC to Saturn	NEG Z to 37.5/83.7	
CIRS_1465A_MIRMAP002_PRIME V 2011-073T14:23:00 000T11:00:00 2011-074T01:23:00 CIRS_FP3 to Saturn NEG_Z to NSP SP_146EA_DLTURN074_PRIME 2011-074T01:23:00 000T00:40:00 2011-074T02:03:00 XBAND to Earth NEG_Y to 285.5/-9.3 NEW WAYPOINT 2011-074T02:03:00 000T01:30:00 2011-074T03:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_VBIASO74_PRIME 2011-074T02:03:00 000T01:30:00 2011-074T03:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_GOMETNON074_PRIME C 2011-074T03:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_GOMETNON074_PRIME C 2011-074T03:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth NEG_Y to Saturn (0,0,-9.5), MIMI SP_146EA_MAPPTURN074_PRIME C 2011-074T12:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth NEG_Z to 37.5/83.7 SP_146EA_GOMETNON074_PRIME C 2011-074T12:33:00 000T2:40:00 2011-074T13:13:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 NEW WAYPOINT 2011-074T13:13:00 000T2:200:00 <td>1</td> <td>NAV 146SK OPNAV731 PRIME</td> <td></td> <td>2011-073T12:53:00</td> <td></td> <td>000T01:30:00</td> <td>2011-073T14:23:00</td> <td>ISS NAC to Satellites</td> <td>NEG Z to 37.5/83.7</td> <td>Starts at waypoint, ends at same waypoint</td>	1	NAV 146SK OPNAV731 PRIME		2011-073T12:53:00		000T01:30:00	2011-073T14:23:00	ISS NAC to Satellites	NEG Z to 37.5/83.7	Starts at waypoint, ends at same waypoint
SP_146EA_DLTURN074_PRIME 2011-074T01:23:00 000T00:40:00 2011-074T02:03:00 XBAND to Earth NEG_Y to 285.5/-9.3 NEW WAYPOINT 2011-074T02:03:00 000T11:000 2011-074T13:13:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_VBIASO74_PRIME 2011-074T02:03:00 000T01:30:00 2011-074T03:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_GOMETNON074_PRIME C 2011-074T03:33:00 000T01:30:00 2011-074T12:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_GOMETNON074_PRIME C 2011-074T03:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_GOMETNON074_PRIME C 2011-074T02:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_MAPPTURN074_PRIME C 2011-074T12:33:00 000T00:40:00 2011-074T13:30:0 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_MAPPTURN074_PRIME C 2011-074T12:33:00 000T00:40:00 2011-074T13:30:0 XBAND to Earth NEG_Z to 37.5/83.7 NEW WAYPOINT 2011-074T12:33:00 000T2:200:00 2	(CIRS 146SA MIRMAP002 PRIME	v	2011-073T14:23:00		000T11:00:00	2011-074T01:23:00	CIRS FP3 to Saturn	NEG Z to NSP	
NEW WAYPOINT 2011-074T02:03:00 000T11:10:00 2011-074T13:13:00 XBAND to Earth NEG_Y to 285:5/-9.3 SP_146EA_YBIASO74_PRIME 2011-074T02:03:00 000T01:30:00 2011-074T03:33:00 XBAND to Earth NEG_Y to 285:5/-9.3 SP_146EA_G70METNON074_PRIME C 2011-074T03:33:00 2001-074T12:33:00 XBAND to Earth Rolling/SRU NEG_Y to 285:5/-9.3 SP_146EA_G70METNON074_PRIME C 2011-074T03:33:00 2001-074T12:33:00 XBAND to Earth Rolling/SRU NEG_Y to Saturn (0,0,-9.5), MIMI SP_146EA_WAYPTTURN074_PRIME 2011-074T12:33:00 000T0:40:00 2011-074T13:13:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 NEW WAYPOINT 2011-074T13:13:00 SOUT2:40:00 2011-075T11:13:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 CIRS_146EA_DITURN075_PRIME V 2011-075T11:31:00 2011-075T11:13:00 CIRS_FP3 to Saturn NEG_Z to NSP SP_146EA_DITURN075_PRIME 2011-075T11:31:00 000T2:00:00 2011-075T11:13:00 REG_Y to 123.7/31.3	9	SP 146EA DLTURN074 PRIME		2011-074T01:23:00		000T00:40:00	2011-074T02:03:00	XBAND to Earth	NEG Y to 285.5/-9.3	
SP_146EA_YBIASO74_PRIME 2011-074T02:03:00 000T01:30:00 2011-074T03:33:00 XBAND to Earth NEG_Y to 285.5/-9.3 SP_146EA_G70METNON074_PRIME C 2011-074T03:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth Rolling/SRU NEG_Y to 285.5/-9.3 SP_146EA_G70METNON074_PRIME C 2011-074T03:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth Rolling/SRU NEG_Y to Saturn (0,0,-9.5), MIMI SP_1465A_WAYPTTURN074_PRIME 2011-074T12:33:00 000T00:40:00 2011-074T13:13:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 NEW WAYPOINT 2011-074T13:13:00 000T22:40:00 2011-075T11:13:00 NEG_X to Saturn NEG_Z to NSP CIRS_1465A_DITURN075_PRIME V 2011-075T11:3:00 000T2:0:00:0 2011-075T11:3:00 NEG_Y to 123.7/31.3 SP_1466A_DITURN075_PRIME 2011-075T11:13:00 000T0:0:40:00 2011-075T11:3:00 XBAND to Earth NEG_Y to 123.7/31.3		NEW WAYPOINT		2011-074T02:03:00		000T11:10:00	2011-074T13:13:00	XBAND to Earth	NEG Y to 285.5/-9.3	
SP_146EA_G70METNON074_PRIME C 2011-074T03:33:00 000T09:00:00 2011-074T12:33:00 XBAND to Earth Rolling/SRU NEG_Y to Saturn (0,0,-9.5), MIMI SP_1465A_WAYPTTURN074_PRIME 2011-074T12:33:00 000T00:40:00 2011-074T13:13:00 ISS_NAC to Saturn NEG_Y to 37.5/83.7 NEW WAYPOINT 2011-074T13:13:00 000T02:40:00 2011-075T11:53:00 ISS_NAC to Saturn NEG_Y to 37.5/83.7 CIRS_1465A_MIRMAP003_PRIME V 2011-074T13:13:00 000T22:00:00 2011-075T11:13:00 ISS_NAC to Saturn NEG_Y to 37.5/83.7 SP_146EA_DLTURN075_PRIME V 2011-074T13:13:00 000T22:00:00 2011-075T11:13:00 ISS_PA to Saturn NEG_Y to 123.7/31.3 SP_146EA_DLTURN075_PRIME 2011-075T11:13:00 000T00:40:00 2011-075T11:53:00 XBAND to Earth NEG_Y to 123.7/31.3	9	SP_146EA_YBIAS074 PRIME		2011-074T02:03:00		000T01:30:00	2011-074T03:33:00	XBAND to Earth	NEG_Y to 285.5/-9.3	
SP_1465A_WAYPTTURN074_PRIME 2011-074T12:33:00 000T00:40:00 2011-074T13:13:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 NEW WAYPOINT 2011-074T13:13:00 000T22:40:00 2011-075T11:53:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 CIRS_1465A_MIRMAP003_PRIME V 2011-074T13:13:00 000T22:00:00 2011-075T11:13:00 ISS_NAC to Saturn NEG_Z to NSP SP_146EA_DLTURN075_PRIME 2011-075T11:13:00 000T0:40:00 2011-075T11:53:00 XBAND to Earth NEG_Y to 123.7/31.3	9	SP 146EA G70METNON074 PRIME	с	2011-074T03:33:00		000T09:00:00	2011-074T12:33:00	XBAND to Earth	Rolling/SRU	NEG Y to Saturn (0,0,-9.5), MIMI
NEW WAYPOINT 2011-074T13:13:00 000122240:00 2011-075T11:53:00 ISS_NAC to Saturn NEG_Z to 37.5/83.7 CIRS_146SA_MIRMAP003_PRIME V 2011-074T13:13:00 000722:00:00 2011-075T11:13:00 REG_Z to NSP SP_146EA_DLTURN075_PRIME 2011-075T11:13:00 000T00:40:00 2011-075T11:53:00 XBAND to Earth NEG_Y to 123.7/31.3	9	SP 146SA WAYPTTURN074 PRIME		2011-074T12:33:00		000T00:40:00	2011-074T13:13:00	ISS NAC to Saturn	NEG Z to 37.5/83.7	
CIRS_146SA_MIRMAP003_PRIME V 2011-074T13:13:00 000T22:00:00 2011-075T11:13:00 CIRS_FP3 to Saturn NEG_2 to NSP SP_146EA_DLTURN075_PRIME 2011-075T11:13:00 000T00:40:00 2011-075T11:53:00 XBAND to Earth NEG_Y to 123.7/31.3		NEW WAYPOINT		2011-074T13:13:00		000T22:40:00	2011-075T11:53:00	ISS NAC to Saturn	NEG Z to 37.5/83.7	
SP_146EA_DLTURN075_PRIME 2011-075T11:13:00 000T00:40:00 2011-075T11:53:00 XBAND to Earth NE6_Y to 123.7/31.3	(CIRS 146SA MIRMAP003 PRIME	V	2011-074T13:13:00		000T22:00:00	2011-075T11:13:00	CIRS FP3 to Saturn	NEG Z to NSP	
	9	SP_146EA_DLTURN075_PRIME		2011-075T11:13:00		000T00:40:00	2011-075T11:53:00	XBAND to Earth	NEG_Y to 123.7/31.3	

Kelleher

Gap 1

Gap 2

Gap 3

Gap 4

Final Sequenced SPASS (2 of 2)

Saturn 146 Legacy

	NEW WAYPOINT		2011-075T11:53:00	003	1T01:05:00	2011-076T12:58:00	XBAND to Earth	NEG_Y to 123.7/31.3	
	ISS_146OT_SKAROT072_PRIME		2011-075T11:53:00	000	0T13:55:00	2011-076T01:48:00	UVIS_FUV to Rocks	NEG_Z to Earth	
	SP_146EA_YBIAS076_PRIME		2011-076T01:48:00	000	0T01:30:00	2011-076T03:18:00	XBAND to Earth	NEG_Y to 123.7/31.3	
	SP_146EA_G70METNON076_PRIME	С	2011-076T03:18:00	000	0T09:00:00	2011-076T12:18:00	XBAND to Earth	Rolling/SRU	NEG_Y to Saturn (0,0,-9.5), MIMI
	SP_146SA_WAYPTTURN076_PRIME		2011-076T12:18:00	000	0T00:40:00	2011-076T12:58:00	ISS_NAC to Saturn	NEG_Z to 37.5/83.7	
	NEW WAYPOINT		2011-076T12:58:00	002	1T12:50:00	2011-078T01:48:00	ISS_NAC to Saturn	NEG_Z to 37.5/83.7	
	UVIS_146SA_EUVFUV003_PRIME		2011-076T12:58:00	000	0T16:00:00	2011-077T04:58:00	UVIS_FUV to Saturn	NEG_Z to 37.5/83.7	No Preference to secondary pointing
	CIRS_146SA_COMPSIT006_PRIME	V	2011-077T04:58:00	000	0T11:00:00	2011-077T15:58:00	CIRS_FP1 to Saturn	NEG_Z to NSP	
-	ISS_146SA_NALGTNG001_PRIME	V	2011-077T15:58:00	000	0T09:10:00	2011-078T01:08:00	ISS_NAC to Saturn	NEG_Z to 37.5/83.7	collaborative with VIMS
	SP_146EA_DLTURN078_PRIME		2011-078T01:08:00	000	0T00:40:00	2011-078T01:48:00	XBAND to Earth	NEG_X to NSP	
	NEW WAYPOINT		2011-078T01:48:00	000	0T11:04:00	2011-078T12:52:00	XBAND to Earth	NEG_X to NSP	
	ENGR_146SC_KPTYBIAS078_PRIME		2011-078T01:48:00	000	0T01:30:00	2011-078T03:18:00	NEG_Z to DELTA_H	NEG_X to Sun	
	SP_146EA_G70METNON078_PRIME	С	2011-078T03:18:00	000	0T09:00:00	2011-078T12:18:00	XBAND to Earth	NEG_X to NSP	NEG_X to NEP or NSP, CAPS
	SP_146SA_WAYPTTURN078_PRIME		2011-078T12:18:00	000	0T00:34:00	2011-078T12:52:00	ISS_NAC to Saturn (0.0,0.0,15.0 deg. offset)	NEG_X to NSP	
	NEW WAYPOINT		2011-078T12:52:00	000	0T00:06:00	2011-078T12:58:00	ISS_NAC to Saturn (0.0,0.0,15.0 deg. offset)	NEG_X to NSP	
	SP_146SA_WAYPTTURN478_PRIME		2011-078T12:52:00	000	0T00:06:00	2011-078T12:58:00	ISS_NAC to Saturn (0.0,0.0,6.5 deg. offset)	NEG_X to NSP	
	NEW WAYPOINT		2011-078T12:58:00	000	0T14:42:00	2011-079T03:40:00	ISS_NAC to Saturn (0.0,0.0,6.5 deg. offset)	NEG_X to NSP	
	VIMS_146SA_DEEPDYN001_PIE	С	2011-078T12:58:00	000	0T05:02:00	2011-078T18:00:00	ISS_NAC to Saturn	NEG_X to NSP	PIE
	UVIS_146SA_EUVFUV004_PIE		2011-078T18:00:00	000	0T03:00:00	2011-078T21:00:00	UVIS_FUV to Saturn	NEG_X to NSP	This is a PIE
	CIRS_146SA_COMPSIT007_PRIME	М	2011-078T21:00:00	000	0T06:00:00	2011-079T03:00:00	CIRS_FP1 to Saturn	NEG_X to NSP	
	SP_146SA_WAYPTTURN079_PRIME	M	2011-079T03:00:00	000	0T00:06:00	2011-079T03:06:00	NEG_Y to Saturn (0.0,0.0,20.0 deg. offset)	NEG_X to NSP	
	SP_146SA_WAYPTTURN479_PRIME	М	2011-079T03:06:00	000	0T00:34:00	2011-079T03:40:00	NEG_Z to 26.139/-6.213	NEG_Y to NSP	
	NEW WAYPOINT		2011-079T03:40:00	000	0T15:20:00	2011-079T19:00:00	NEG_Z to 26.139/-6.213	NEG_Y to NSP	
									pickup [-Z to 26.139/-6.213, -Y to NSP];
	RADAR_146SA_GLOBALMAP001_PIE		2011-079T04:00:00	000	0T14:15:00	2011-079T18:15:00	NEG_Z to Saturn	NEG_Y to NSP	handoff [-Z to 154.208/2.863, -Y to NSP].
	Periapse R = 4.716 Rs, lat		2011-079T11:45:07	000	0T00:00:01	2011-079T11:45:08			
									Pick-up at RADAR h/o per RBOT (NEG_Z to
	SP_146SA_WAYPTTURN579_PRIME		2011-079T18:30:00	000	OT00:30:00	2011-079T19:00:00	ISS_NAC to Saturn	NEG_X to NSP	154.208/2.863; NEG_Y to NSP)
	NEW WAYPOINT		2011-079T19:00:00	000	0T23:03:00	2011-080T18:03:00	ISS_NAC to Saturn	NEG_X to NSP	
-	VIMS_146SA_DEEPDYN002_PIE	С, М	2011-079T19:00:00	000	0T17:45:00	2011-080T12:45:00	ISS_NAC to Saturn	NEG_X to NSP	PIE
	UVIS_146SA_EUVFUV005_PIE		2011-080T12:45:00	000	0T04:38:00	2011-080117:23:00	UVIS_FUV to Saturn	NEG_X to NSP	This is a PIE
	SP_146EA_DLTURN080_PRIME		2011-080T17:23:00	000	0T00:40:00	2011-080T18:03:00	XBAND to Earth	NEG_X to NSP	
	NEW WAYPOINT		2011-080T18:03:00	000	0T11:10:00	2011-081T05:13:00	XBAND to Earth	NEG_X to NSP	
	ENGR_146SC_KPTYBIAS080_PRIME		2011-080T18:03:00	000	0T01:30:00	2011-080T19:33:00	POS_Z to DELTA_H (0.0,0.0,68.0 deg. offset)	NEG_X to Sun	
	SP_146EA_M70METNON080_PRIME	С	2011-080T19:33:00	000	0T09:00:00	2011-081T04:33:00	XBAND to Earth	Rolling/SRU	POS_X to NEP or NSP, CAPS

				OBSERVATION_PERIOD							DOWNLINK_PASS							
			P4 P5				RECO	RECORDED PLAYBAC				ACK	 \СК					
DOWNLINK PASS NAME	Start doy hh:mm	End doy hh:mm	START (Mb)	SCI (Mb)	нк+Е (Mb)	TOTAL (Mb)	CPACTY (Mb)	MRGN (Mb)	OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_M (Mb)	ARGN (१)	CAROVR (Mb)	
SP_146EA_G34BWGNON068_PRIME	068 04:03	068 13:03	0	981	165	1146	3307	2161	0	193	53	1392	877	-515	-14	 0%	515	
SP_146EA_G70MEINON070_PRIME SP_146EA_G34BWGNON072_PRIME	072 03:48	072 12:48	0	1758	164	1921	3307	1385	0	201	53	2175	863	-1312	-13	28 08	1312	
SP_146EA_G70METNON074_PRIME	074 03:33	074 12:33	1312	1844	165	3321	3307	-13	0	219	53	3579	4259	680	2107	9 %	0	
SP_146EA_G70METNON076_PRIME	076 03 : 18	076 12 : 18	0	1716	164	1880	3307	1427	0	206	53	2139	4230	2091	3337	16%	0	
SP_146EA_G70METNON078_PRIME	078 03 : 18	078 12:18	0	1896	165	2061	3307	1246	0	228	53	2342	4222	1879	1885	10%	0	
SP_146EA_M70METNON080_PRIME	080 19:33	081 04:33	0	3066	235	3301	3307	6	0	214	53	3568	3944	376	1674	11%	0	

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

* NOTE: Negative SSR (P4) Margins did not result in data loss due to compression/under-utilization.

Final Sequenced SMT and Data Volume (2 of 2) n 146 Legacy

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

Event	Start doy h	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 SP_146EA_G34BWGNON068_PRIME DAILY TOTAL SCIENCE	066 1 068 0 066 1	3:02 4:03 3:02	068 068 068	04:03 13:03 13:03	98.3 22.7 121.0	73.6 17.0 90.6	21.6 86.4 108.0	18.4 3.2 21.6	180.0 0.0 180.0	34.7 8.0 42.7	119.4 19.4 138.8	0.0 0.0 0.0	126.4 29.2 155.6	289.8 4.9 294.8	10.0 0.0 10.0	0.0 0.0 0.0	163.1 0.0 163.1	1135.3 190.8
OBSERVATION_NOR SP_146EA_G70METNON070_PRIME DAILY TOTAL SCIENCE	068 1 070 0 068 1	3:03 3:48 3:03	070 070 070	03:48 12:48 12:48	127.4 22.7 150.1	73.1 17.0 90.1	108.0 86.4 194.4	15.9 3.2 19.1	1250.0 0.0 1250.0	53.0 16.0 69.0	83.7 19.4 103.1	0.0 0.0 0.0	125.5 42.4 168.0	72.5 4.9 77.4	710.0 0.0 710.0	0.0 0.0 0.0	162.0 0.0 162.0	2781.0 212.1
OBSERVATION_NOR SP_146EA_G34BWGNON072_PRIME DAILY TOTAL SCIENCE	070 1 072 0 070 1	2:48 3:33 2:48	072 072 072	03:33 12:33 12:33	97.7 22.7 120.3	73.1 17.0 90.1	144.0 86.4 230.4	14.0 3.2 17.2	135.0 0.0 135.0	68.9 16.0 84.9	83.7 19.4 103.1	0.0 0.0 0.0	125.5 29.2 154.7	239.7 4.9 244.6	760.0 0.0 760.0	0.0 0.0 0.0	162.0 0.0 162.0	1903.5 198.8
OBSERVATION_NOR OBSERVATION_SI SP_146EA_G70METNON074_PRIME DAILY TOTAL SCIENCE	072 1 072 1 074 0 072 1	2:33 2:33 3:33 2:33	074 074 074 074	03:33 03:33 12:33 12:33	98.3 0.0 22.7 121.0	73.6 0.0 17.0 90.5	165.6 0.0 86.4 252.0	14.0 0.0 3.2 17.3	616.5 43.5 0.0 660.0	69.4 0.0 16.0 85.4	84.2 0.0 24.3 108.5	0.0 0.0 0.0 0.0	126.4 0.0 42.4 168.8	36.2 0.0 4.9 41.2	500.0 0.0 0.0 500.0	0.0 0.0 0.0 0.0	163.0 0.0 0.0 163.0	1947.2 43.5 217.0
OBSERVATION_NOR SP_146EA_G70METNON076_PRIME DAILY TOTAL SCIENCE	074 1 076 0 074 1	2:33 3:18 2:33	076 076 076	03:18 12:18 12:18	97.6 22.7 120.3	73.1 17.0 90.1	316.8 86.4 403.2	14.0 3.2 17.2	300.0 0.0 300.0	68.9 16.0 84.9	104.6 24.3 128.9	0.0 0.0 0.0	125.5 29.2 154.7	0.0 4.9 4.9	600.0 0.0 600.0	0.0 0.0 0.0	162.0 0.0 162.0	1862.5 203.7
OBSERVATION_NOR SP_146EA_G70METNON078_PRIME DAILY TOTAL SCIENCE	076 1 078 0 076 1	2:18 3:18 2:18	078 078 078	03:18 12:18 12:18	98.3 22.7 121.0	73.6 37.6 111.1	79.2 86.4 165.6	14.0 3.2 17.3	213.0 0.0 213.0	69.4 16.0 85.4	105.3 24.3 129.6	0.0 0.0 0.0	126.4 36.1 162.5	289.8 0.0 289.8	810.0 0.0 810.0	0.0 0.0 0.0	163.0 0.0 163.0	2041.9 226.3
OBSERVATION_NOR SP_146EA_M70METNON080_PRIME DAILY TOTAL SCIENCE	078 1 080 1 078 1	2:18 9:33 2:18	080 081 081	19:33 04:33 04:33	139.2 22.7 161.9	368.1 17.0 385.1	262.2 86.4 348.6	30.0 3.2 33.2	200.0 0.0 200.0	98.3 16.0 114.3	149.2 24.3 173.5	56.5 0.0 56.5	496.6 42.4 539.1	138.3 0.0 138.3	1100.0 0.0 1100.0	0.0 0.0 0.0	230.9 0.0 230.9	3269.2 212.0
OBSERVATION_NOR SP_146EA_C34BWGNON082_PRIME DAILY TOTAL SCIENCE	081 0 082 0 081 0	4:33 9:48 4:33	082 082 082	09:48 18:18 18:18	421.2 122.4 543.6	55.2 16.0 71.2	0.0 86.4 86.4	20.6 3.1 23.7	0.0 0.0 0.0	208.1 60.5 268.5	89.5 26.0 115.5	0.0 0.0 0.0	137.9 40.1 178.0	0.3 4.7 4.9	0.0 0.0 0.0	0.0 0.0 0.0	122.2 0.0 122.2	1055.0 359.1

8

Segment Geometry

Saturn 146 Legacy



Segment End

34.1

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Segment Geometry Periapse

Saturn 146 Legacy

View of SA 2011 MAR 47.9° field • • • • • • • • • • • • • • • • • • •	TURN 20 t of vi 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	from 1:45:C ew	cASSINI 7 UTC		 and all 	IPPIER		ETUS SA		RH	• NSP	AUS		Rev 146 007 2011 - 079 2011 MAR 20 2011 MAR 20 2011 MAR 20 2011 MAR 21 Periapse_14 Light time: Orbit period Radius Rad_cyl Z_ht_cyl Mag_L Semi_axs J Eccentricit Inclination Sun_range Earth_range DSN ELH Goldstone Canberra Madrid LOC FOV RA DEC Crosses_RP_ EPS SEP ORS b/s ang ORS rad ang	PBOUND PT1145:0 PT1145:0 11:45:0 11:45:0 11:45:0 11:45:0 11:45:0 12:57:1 46:0 12:57:1 284543 -1817 284543 -1817 284543 -1817 28459 0.2 1783626 bty 0.8 12:57:2 1783626 28 9:0 9:0 8:0 12:17 21:3 4:52 -52:4 DK DIRECT 47:5 95:5 -3:2 0:0 1:0 1:0 1:0 1:0 0:1.5 0:1.5 0:1.5 0:1.5 0:1.5 0:1.5 1:0 0:1.5<)7 SCET)7 SCET)1 ERT (23:05:4)0:02) min L days cm cm cm cm cm cm 340 38 deg 51 AU 55 AU L U/I 7 45.1 2 18.2 4 -36.1 fION IN 9 deg { 147 deg 390 deg 2000 Rs 607 deg 298 deg 2 deg 7 deg	4.72 Rs 4.72 Rs -0.03 Rs 29.59 Rs
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BODY	OCC?	OCC?	(km)	(Rs)	(km)	(Rs)	(deg)	(deg	mrad)	LON	LAT	(deg)	(km/s)	(km)	SATRN	EARTH	RAM
SATURN			284549	4.72	224281	3.72	97.8	24.46	426.84	259		0	15.7	0	0.0	80.7	90.0
MIMAS			327426	5.43	327226	5.43	131.2	0.07	1.27	303	-2	-86	20.7	-975	34.0	47.3	56.0
ENCELADUS			500088	8.30	499831	8.29	113.3	0.06	1.03	345	-0	-145	27.0	-2	15.8	65.1	74.2
TETHYS			283257	4.70	282724	4.69	36.0	0.22	3.82	59	1	59	13.7	-5575	62.5	142.3	152.5
DIONE			580718	9.64	580154	9.63	64.5	0.11	1.94	25	-0	122	22.6	223	33.7	113.9	123.7
RHEA			797408	13.23	796641	13.22	112.2	0.11	1.92	355	0	-158	23.7	2964	14.6	66.2	75.4
TITAN			1520742	25.23	1518167	25.19	96.8	0.19	3.39	355	-0	179	21.2	7819	1.0	81.6	91.0
HYPERION			1236076	20.51	1235952	20.51	45.9	0.02	0.27	337	-58	30	11.8	-21773	143.3	135.5	126.7
DHORDE			15142237	251 25	3812490	251 25	103.7	0.02	0.39	300	1	-175	10.9	876056	13.7	14.0	05.0 50.1
			10142270	201.20	10145120	201.20			0.02		-25	-145	14.5		40.2	40.5	
SATURN			284549	4.72	224281	3.72	97.8	24.46	426.84	259	-0	0	15.7	0	0.0	80.7	90.0

10

Kelleher

08/21/2017

Solar Geometry – ORS Boresight Concerns_{Saturn 146 Legacy}

While there are *no* NEG_Y to Sun violations anticipated during Saturn 146, there is a period during which Saturn center will come within the 12° cone. This period falls during the CIRS observation CIRS_146SA_COMPSIT007_PRIME. To avoid this violation, CIRS has agreed to point NEG_Y at the south pole of Saturn, which should keep them out of violation.



• Pointing to NEG_Y to Saturn (center) would lead to a CMT violation between ~2010-078T21:40:00 and ~2010-079T03:50:00.

• Minimum NEG_Y to Sun angle is ~8.7° at 2010-079T01:10:00.

• CIRS_146SA_COMPSIT007_PRIME will come within 15° (but not less than 12°) of the Sun. CIRS will write the necessary waiver to cover this action.

Kelleher

Daily Science Highlights (1 of 2)

Saturn 146 Legacy

DOY 066 (7 March 2011): Sequence S67 and the Saturn 146 segment began on DOY 066 with an ORS Titan cloud monitor. This observation was followed by an ISS observation which was part of a campaign to observe Saturn's atmosphere. The MAPS instruments began the segment with a continuous survey of the outer magnetosphere.

DOY 067 (8 March 2011): UVIS occupied most of the day with an EUV/FUV observation, which involved slow scans across Saturn's visible hemisphere to form spectral images.

DOY 068 (9 March 2011): After downlinking data to the Earth, Cassini turned back towards Titan for an ORS Titan cloud monitor. Following this observation, Cassini turned back towards Saturn so that the ORS instruments could begin a sequence of observations in which ISS, UVIS and VIMS take observations to learn more about Saturn's wind field by staring and shooting every 10 minutes to mosaic in longitude. CIRS subsequently measured oxygen compounds (H_2O , CO_2) in Saturn's stratosphere as a function of latitude.

DOY 069 (10 March 2011): CIRS, ISS, UVIS and VIMS continued their wind speed and composition measurements of Saturn's atmosphere.

DOY 070 (11 March 2011): After relaying data to the Earth, Cassini turned towards Titan to execute the third ORS Titan cloud monitor of the sequence. Following this, UVIS took its second Saturn EUV/FUV observation of the segment.

DOY 071 (12 March 2011): When DOY 071 began, CIRS was the process of taking a Saturn mid-IR map for the purposes of determining Saturn's upper troposphere and tropopause temperatures. CIRS then took observations of Saturn designed to observe oxygen compounds in Saturn's stratosphere.

DOY 072 (13 March 2011): Having pointed its high-gain antenna towards the Earth to relay data, Cassini turned back towards Saturn. The ORS instruments resumed their pattern of taking wind field measurements (ISS, UVIS) followed by CIRS observations of molecular compounds in Saturn's stratosphere with VIMS riding along.

DOY 073 (14 March 2011): After the completion of the previous day's sequence of observations, ISS snapped some images of Hyperion for the purposes of spacecraft navigation. CIRS then turned toward Saturn to observe Saturn in the mid-infrared and determine temperatures in Saturn's upper troposphere and tropopause.

DOY 074 (15 March 2011): CIRS began another long mid-IR map of Saturn's atmosphere.

Daily Science Highlights (2 of 2)

DOY 075 (16 March 2011): Following the conclusion of the CIRS mid-IR map, ISS trained its cameras on Skathi, one of Saturn's most distant satellites to measure its rotational light curve.

DOY 076 (17 March 2011): The first half of the day was primarily spent relaying data back to Earth. After the downlink, a UVIS EUV/FUV observation of Saturn followed.

DOY 077 (18 March 2011): A CIRS mid-IR map followed the UVIS EUV/FUV observation. Afterwards, ISS looked for lightning on Saturn, with VIMS observing in concert.

DOY 078 (19 March 2011): Following a downlink through the Goldstone 70-meter antenna, VIMS took a series of global mosaics of Saturn designed to study dynamics deep within Saturn's atmosphere. UVIS took another EUV/FUV observation from close range. This was followed by a CIRS mid-IR map that continues into the next day. RPWS prepared to survey the inner portion of the Saturnian magnetosphere.

DOY 079 (20 March 2011): As Cassini passed through periapse for this orbit, RADAR was taking a high-resolution global map of Saturn. CDA, RPWS and INMS prepared to observe the descending ring plane crossing.

DOY 080 (21 March 2011): As DOY 080 began, VIMS followed up on its previous deep dynamics observation with a second set of deep dynamics mosaics of the day side of Saturn. UVIS came next with its second EUV/FUV of the periapse period.

Segment Integration Planning

Timeline Gaps and Suggested Observations (1 of 2)

Gap	Start	End	Duration	Phase angle (range)	Rs range	Sub- S/C Lat.	Snapshot (mid-gap)
1	2011- 066T15:18:00	2011- 067T09:53:00	18h 35m	55.8 to 56.2	34.09 to 34.45	0	ver et di ALSE han occurs por la di do Also por etc. En la do Also p
2	2011- 070T00:13:00	2011- 070T01:38:00	1h 25m	41.95 to 42.14	63.8 to 64	0	extend CIRS_146SA_COMPSIT003?
3	2011- 071T17:58:00	2011- 072T01:23:00	7h 25m	47.74 to 47.83	69.9 to 70	0	Here in difference control of the second sec
4	2011- 073T11:13:00	2011- 073T12:53:00	1h 40m	49.8 to 50.56	48.8 to 73.3	0	extend CIRS_146SA_COMPSIT005?
— Ke	lleher 🚮	Science Planning * See	wence Team CASSINI	15			08/21/2017

Timeline Gaps and Suggested Observations (2 of 2)

Gap	Start	End	Duratio n	Phase angle (range)	Rs range	Sub-S/C Lat.	Snapshot (mid-gap)
5	2011- 077T15:58:00	2011- 078T02:38:00	9h 10m	54.13	83.7	0	CIRS or ISS?
6	2011- 080T05:45:00	2011- 080T10:22:00	4h 37m	55.8 to 56.2	34.09 to 34.45	0	extend VIMS_146SA_DEEPDYN002_PIE and/or UVIS_146SA_EUVFUV002_PIE?

Beginning of Integration:

No Initial SMT Report Available.

Waypoint Selection

Saturn 146 Legacy

RBOT – Friendly (Primary is NEG_Y to Saturn Center)

OBSERVATION PERIOD	START	END	POS_X	NEG_X	POS_Z	NEG_Z
SP_146NA_OBSERV068_NA	2011-068T13:03:00	2011-070T03:48:00		37.6/ 83.7		37.6/83.7
SP_146NA_OBSERV070_NA	2011-070T12:48:00	2011-072T03:33:00		37.5/ 83.7		37.5/ 83.7
SP_146NA_OBSERV072_NA	2011-072T12:33:00	2011-074T03:33:00		37.5/ 83.7		37.5/ 83.7
SP_146NA_OBSERV074_NA	2011-074T12:33:00	2011-076T03:18:00		37.5/ 83.7		37.5/ 83.7
SP_146NA_OBSERV076_NA	2011-076T12:18:00	2011-078T03:18:00		37.4/ 83.7		37.4/ 83.7
SP_146NA_OBSERV078_NA	2011-078T12:18:00	2011-080T19:33:00		37.4/83.7		37.4/83.7

Other Waypoints (Primary is NEG_Y to Saturn Center)

OBSERVATION PERIOD	START	END	POS_X_NSP	POS_X_NEP	NEG_X_NSP	NEG_X_NEP	POS_Z_NSP	POS_Z_NEP	NEG_Z_NSP	NEG_Z_NEP	NEG_X_SUN	NEG_Z_EARTH
SP_146NA_OBSERV068_NA	2011-068T13:03:00	2011-070T03:48:00	**BAD**	ОК	ОК	**BAD**	**BAD**	**BAD**	ОК	ОК	ОК	OK
SP_146NA_OBSERV070_NA	2011-070T12:48:00	2011-072T03:33:00	**BAD**	ОК	OK	**BAD**	**BAD**	**BAD**	OK	OK	OK	ОК
SP_146NA_OBSERV072_NA	2011-072T12:33:00	2011-074T03:33:00	**BAD**	ОК	OK	**BAD**	**BAD**	**BAD**	OK	OK	OK	ОК
SP_146NA_OBSERV074_NA	2011-074T12:33:00	2011-076T03:18:00	**BAD**	OK	OK	**BAD**	**BAD**	**BAD**	OK	ОК	OK	ОК
SP_146NA_OBSERV076_NA	2011-076T12:18:00	2011-078T03:18:00	**BAD**	OK	OK	**BAD**	**BAD**	**BAD**	OK	OK	OK	ОК
SP_146NA_OBSERV078_NA	2011-078T12:18:00	2011-080T19:33:00	**BAD**									
SP_146NA_OBSERV080_NA	2011-081T04:33:00	2011-082T09:18:00	**BAD**	**BAD**	OK	OK	**BAD**	**BAD**	OK	OK	OK	ОК

Saturn 146 Legacy

Waypoint 1: ISS_NAC to Saturn; Neg_Z to 37.5/83.7 Chosen for most of the segment (apoapse portion)



Note: an RA/Dec of 37.5/83.7 ~ NSP

Waypoint 2 (2011-078T12:58:00-079T03:40:00) ISS_NAC to Saturn (0,0,6.51); NEG_X to NSP



Waypoint 3 (2011-079T03:40:00 - 079T19:00): NEG_Z to 26.139/-6.213; NEG_Y to NSP





Waypoint 4 (2011-079T19:00:00-080T18:03:00) ISS_NAC to Saturn; NEG_X to NSP



- Pointing:
 - Collaborative prime/rider coordination designs The following observations have been identified as collaborative:
 - ISS_146SA_WIND5HR001_PRIME
 - ISS_146SA_WIND5HR001_PRIME
 - ISS_146SA_WIND5HR001_PRIME
 - ISS_146SA_WIND5HR001_PRIME
 - ISS_146SA_WIND5HR001_PRIME
 - ISS_146SA_WIND5HR001_PRIME
 - ISS_146SA_NALGTNG001_PRIME
 - >3 hr observations near periapse: <60 degrees target motion or inertial period lien added
 - This applies to RADAR_146SA_GLOBALMAP001_PIE. There will be 127° of target motion (Saturn) during this observation. RADAR has agreed to add bias windows as needed. SPLAT item entered.
 - Minor CIRS heating noted during the waypoint beginning at 2011-079T03:40:00.
 - All YBIAS windows precede the associated downlink
 - RBOT friendliness of delivery: RBOT secondaries used wherever possible.
- Data Volume:
 - none
- DSN:
 - This segment exceeds the 35% 70M station guideline for apoapse segments, but this includes two days of periapse. Without these periapse passes, it would be 40% (2 of 5).
- Opmodes:
 - RADAR will need the appropriate opmode to support their PIE on DOY 079

- Special Activities:
 - CIRS will have an observation requiring a NEG_Y to Sun waiver, CIRS_146SA_COMPSIT007_PRIME. To avoid coming within 12° of the Sun, CIRS will stare at Saturn's southern pole. SPLAT item entered.

Sequence Liens:

- RBOT difficulties are anticipated during the period of the RADAR PIE on DOY 079. SP has left a gap of 35 minutes preceding this observation (Resource_Check000118). AACS should be notified of this quiescent period so that they can insert a gap if need be. SP would have liked to have found a suitable *inertial* pointing, but all such pointing required very long slews. To take advantage of this 35-minute gap, AACS may need to implement a custom hand-off period.
- SMT warnings: see https://cassini3.jpl.nasa.gov/cims/SMT?mode=200&smtid=307
 - SMT000099 I will personally compensate RADAR and the Cassini project to the tune of \$1,000,000.00 per Mb for every Mb of data lost per this SMT error. SMB, 07 September 2010
 - SMT000099,000100 These SSR overages are well within allowed ranges.
 - SMT000101-000108 These error messages arise because SMT doesn't know about the removal of P5 from the playback priority list. They can be ignored.
- Resource Check errors: see <u>https://cassini3.jpl.nasa.gov/cims/ResourceChecker?mode=270&rcid=2219</u>
 - Resource_check000109-000115 These error messages arise because CIMS doesn't know about the removal of P5 from the playback priority list. They can be ignored.
 - Resource_check000116-000118 These gaps are intentional.
 - Resource_check000116-000118 ISS, UVIS to add correct secondaries (should be NEG_Z to 37.5/83.7) Note: UVIS has
 since updated their EUVFUV with the correct secondary.