

# **TOST: Handoff**

## **031TI (T20)**

Segment: 2006-296T10:56:00 – 2006-299T14:56:00

Titan C/A: 2006-298T15:58:07, Altitude = 1030 km

Epoch: GMB\_E031\_Titan20

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Candy Hansen, Trina Ray, Doug Equils, and Dave Mohr

## T20 Science Objectives

RPWS - Measure the thermal plasma properties of Titan's ionosphere, including the electron density and pressure, as well as characterize the interaction of Saturn's magnetosphere with Titan.

RADAR - Radiometry map of Northern Xanadu and terrain up to 70° N latitude.

MAG - T20 is a very close wake flyby with 950 km altitude at closest approach making possible to study the wake, tail formation and Saturn facing flank region, where the magnetic field topology may be particularly complex. The very close approach also makes this orbit particularly useful for studies of an internal magnetic field.

MIMI – T20 has nominally good orientation to characterize the plasma flow, and to sample field-aligned energetic ions and electrons. Titan, or at least part of Titan, will remain within the INCA field of view throughout the close encounter, so MIMI should be able to image the energetic ion/exosphere interaction through a large range of geometries.

Most of the Titan encounters have taken place under fairly weak energetic particle environments (exceptions being T5 and T9). With its location for this encounter in the post-midnight quadrant, we think chances are better than average for a healthy energetic particle flux during the encounter.

VIMS - main objective is to acquire high spatial resolution images of Titan's surface (500 m/pixel) in order to characterize the different units that have been discovered by either VIMS or Radar. For example, VIMS should be able to see the dunes that seem to cover a sub-unit of the dark area. If the size of spectrally different units is larger than 500m, it should allow us to determine the end-members. In order to reach this objective, the pointing was designed to get a long stripe across Titan that will fly over dark and bright areas with a 64.64 cubic image at an interface between bright and dark area. The pointing was refined after a study by scientists who have compared VIMS and Radar images.

031TI(T20) Timeline						
C/A 2006-298T15:58:07 @1030km						
Start Time	End Time	Prime Activity.	Obs. Detail	Op Mode	TLM Mode	Comments
296T10:56	296T11:26	SP turn to WP	NEG_Y Titan, NEG_X Sun	DFPW Norm	S_N_ER_3	
296T11:26	297T01:26	CIRS	Composition map	DFPW Norm	S_N_ER_3	
297T01:26	297T08:56	CIRS	Composition map	DFPW Norm	S_N_ER_3	
297T08:56	297T09:26	SP turn to Earth	NEG_Z Earth, NEG_X NEP	DFPW Norm	S_N_ER_3	
297T09:26	297T18:26	G70 D/L		DFPW Norm	S_N_ER_3	
297T18:26	297T18:56	SP turn to WP	NEG_Y Titan, POS_X NTP	DFPW Norm	S_N_ER_3	
297T18:56	297T19:18	OD Deadtime		DFPW Norm	S_N_ER_3	
-20:40	-7:30	VIMS	CLOUDMAP	DFPW Norm	S_N_ER_3	RADAR_WU and SNER_5a start at -8:30
-7:30	-5:30	VIMS	MEDRES	RADAR_WU	S_N_ER_3	back to SNER_3 at -8:15
-5:30		Begin Custom period			S_N_ER_3	
-5:30	-00:52	RADAR	Radiometry	Radar_WU	S_N_ER_8	
-01:14	-0:52	Transition to RCS	(0.5,2.0,0.5)	WU_RCS	S_N_ER_8	
-0:52	-00:10	CAPS		RADAR_RCS	S_N_ER_3	
+00:23		End Custom period				
-00:10	+00:20	VIMS	Composition map	RADAR_RCS	S_N_ER_3	
+00:20	+00:42	Transition to DFPW Normal		DFPW Norm	S_N_ER_3	
+00:42	+02:00	VIMS	HIRES	DFPW Norm	S_N_ER_3	
+02:00	+04:30	ISS	REGMAP	DFPW Norm	S_N_ER_3	
+04:30	+07:30	CIRS	MIRLMBMAP			5min dwells for ISS/VIMS
+07:30	+08:00	VIMS	DARKSIDE			
+08:00	+10:30	VIMS	COMPMAP			
299T02:28	299T02:37	OD Uncertainty - Dead Time		DFPW Norm	S_N_ER_3	
299T02:37	299T03:07	SP turn to D/L		DFPW Norm	S_N_ER_3	
299T03:07	299T08:11	Downlink over Madrid HEF		DFPW Norm	RTE_N_SPB	
299T08:11	299T14:56	Downlink over G70				

# Data Volume Summary

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_031EA_M34HEFOTB296_PRIME	296 01:56	296 08:14	0	1352	26	1378	3514	2136	0	1033	37	2449	622	-1828	-482	-3%	1007
SP_031EA_G70METOTB296_PRIME	296 08:14	296 10:56	1827	0	0	1827	3514	1687	0	443	16	2286	934	-1352	-482	-2%	1352
SP_031EA_G70METNON297_PRIME	297 09:26	297 18:26	1352	2569	77	3997	3514	-482	0	756	53	4323	3834	-490	-463	-1%	489
SP_031EA_M34HEFNON299_PRIME	299 03:07	299 08:11	489	3329	118	3937	3514	-421	0	211	30	3756	518	-3238	-318	-1%	3237
SP_031EA_G70METNON299_PRIME	299 08:11	299 14:56	3237	0	0	3237	3514	277	0	393	40	3721	2762	-959	-318	-1%	959
SP_031EA_G70METNON300_PRIME	300 09:20	300 16:35	959	1364	63	2385	3514	1129	0	457	43	2885	3108	223	-318	-1%	0

This shows we are currently accepting 1352 from XD and giving Rings 959.

- 1) Carryover into Rings is currently not a problem.
- 2) Cuts will need to be made between XD and TOST (400Mb total)
- 3) No DSN Allocation file yet (not expected for another 3 to 4 weeks).
- 4) We will be losing the final 1.5 hrs of the G70 D/L

- When the allocation file comes out, we'll have to react fast if there will be cuts.

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S025, length = 33 ... TOST rev 31 Segment		2006-295T18:26:00	E031_SEQUENCE_025+00	032T22:04:00	2006-328T16:30:00			
SP_031TI_WAYPTTURN296_PRIME	M	2006-296T10:56:00		003T04:00:00	2006-299T14:56:00	ISS_NAC to Titan	NEG_X to Sun	SP Turn to Waypoint
<b>NEW WAYPOINT</b>		<b>2006-296T11:26:00</b>		<b>001T07:30:00</b>	<b>2006-297T18:56:00</b>	<b>ISS_NAC to Titan</b>	<b>NEG_X to Sun</b>	
CIRS_031TI_COMPMPA008_PRIME	I,M,V	2006-296T11:26:00		000T14:00:00	2006-297T01:26:00	CIRS_FPB to Titan	POS_Z to North_Pole_Dir	
CIRS_031TI_TEMPMA022_PRIME	I,M,V	2006-297T01:26:00		000T07:30:00	2006-297T08:56:00	CIRS_FPB to Titan	NEG_X to North_Pole_Dir	
SP_031EA_DLTURN297_PRIME	M	2006-297T08:56:00		000T00:30:00	2006-297T09:26:00	XBAND to Earth	NEG_X to NEP	SP Turn to Earth
SP_031EA_G70METNON297_PRIME	C,M	2006-297T09:26:00		000T09:00:00	2006-297T18:26:00	XBAND to Earth	NEG_X to NEP	
SP_031TI_WAYPTTURN297_PRIME	M	2006-297T18:26:00		000T00:30:00	2006-297T18:56:00	ISS_NAC to Titan	POS_X to North_Pole_Dir	SP Turn to Waypoint
<b>NEW WAYPOINT</b>		<b>2006-297T18:56:00</b>		<b>001T23:15:00</b>	<b>2006-299T18:11:00</b>	<b>ISS_NAC to Titan</b>	<b>POS_X to North_Pole_Dir</b>	
SP_031TI_DEADTIME297_PRIME	M	2006-297T18:56:00		000T00:22:07	2006-297T19:18:07	ISS_NAC to Titan	POS_X to North_Pole_Dir	
VIMS_031TI_CLOUDMAP001_PRIME	C,I,M,R,U	2006-297T19:18:07	GMB_E031_Titan20-000T20:40:00	000T13:10:00	2006-298T08:28:07	ISS_NAC to Titan	POS_X to North_Pole_Dir	
VIMS_031TI_MEDRES001_PRIME	C,I,R	2006-298T08:28:07	GMB_E031_Titan20-000T07:30:00	000T02:00:00	2006-298T10:28:07	VIMS_IR to Titan	POS_X to North_Pole_Dir	
<b>Begin Custom Period</b>		<b>2006-298T10:28:07</b>	<b>GMB_E031_Titan20-000T05:30:00</b>	<b>000T00:01:00</b>	<b>2006-298T10:29:07</b>			
RADAR_031TI_T20AINRAD101_PRIME	M	2006-298T10:28:07	GMB_E031_Titan20-000T05:30:00	000T04:15:00	2006-298T14:43:07	NEG_Z to Titan	POS_X to North_Pole_Dir	Pick up at ISS_NAC to Titan, POS_X to North_Pole_Dir; Hand off at NEG_Z to Titan, NEG_Y to North_Pole_Dir.
ENGR_031SC_ORSRC198_PPS	M	2006-298T14:44:07	GMB_E031_Titan20-000T01:14:00	000T00:21:21	2006-298T15:05:28			Pick up at NEG_Z to Titan, NEG_Y to North_Pole_Dir, Hand off at NEG_Z to Titan, NEG_Y to North_Pole_Dir. Deadband = (2,20,2)
CAPS_031TI_TITANPTG101_PRIME	M	2006-298T15:06:07	GMB_E031_Titan20-000T00:52:00	000T00:42:00	2006-298T15:48:07	POS_X to North_Pole_Dir	POS_Z to Saturn	Pick up at NEG_Z to Titan, NEG_Y to NTP; Hand off at ISS_NAC to Titan, POS_X to North_Pole_Dir.
<b>End Custom Period</b>		<b>2006-298T15:48:07</b>	<b>GMB_E031_Titan20-000T00:10:00</b>	<b>000T00:01:00</b>	<b>2006-298T15:49:07</b>			
VIMS_031TI_COMPMPA101_PRIME	C,I,M	2006-298T15:48:07	GMB_E031_Titan20-000T00:10:00	000T00:30:00	2006-298T16:18:07	VIMS_IR to Titan	POS_X to North_Pole_Dir	Global comp. map. Obtain two 64X64 in double res. mode, 0.320 msec integration and 0.80 msec.
ENGR_031SC_DFPWBIAS198_PPS	M	2006-298T16:18:07	GMB_E031_Titan20+000T00:20:00	000T00:21:09	2006-298T16:39:16	ISS_NAC to Titan	POS_X to North_Pole_Dir	
VIMS_031TI_HIGHRESNA101_PRIME	C,I,M	2006-298T16:41:07	GMB_E031_Titan20+000T00:43:00	000T03:47:00	2006-298T20:28:07	VIMS_IR to Titan	NEG_X to Sun	
ISS_031TI_REGMAPNA101_PRIME	C,M	2006-298T17:58:07	GMB_E031_Titan20+000T02:00:00	000T02:30:00	2006-298T20:28:07	ISS_NAC to Titan	NEG_X to Sun	
CIRS_031TI_MIRLMBMAP004_PRIME	C,I,M,V	2006-298T20:28:07	GMB_E031_Titan20+000T04:30:00	000T03:00:00	2006-298T23:28:07	CIRS_FPB to Titan	PIC	
VIMS_031TI_DARKSIDE001_PRIME	C,I,M	2006-298T23:28:07	GMB_E031_Titan20+000T07:30:00	000T00:30:00	2006-298T23:58:07	VIMS_IR to Titan	POS_X to North_Pole_Dir	
VIMS_031TI_COMPMPA001_PRIME	C,I,M,U	2006-298T23:58:07	GMB_E031_Titan20+000T08:00:00	000T02:30:00	2006-299T02:28:07	VIMS_IR to Titan	POS_X to North_Pole_Dir	
SP_031TI_DEADTIME299_PRIME	M	2006-299T02:28:07	GMB_E031_Titan20+000T10:30:00	000T00:15:31	2006-299T02:43:38	ISS_NAC to Titan	POS_X to North_Pole_Dir	
SP_031EA_DLTURN299_PRIME	M	2006-299T02:37:00		000T00:30:00	2006-299T03:07:00	XBAND to Earth	NEG_X to NEP	SP Turn to Earth
SP_031EA_M34HEFNON299_PRIME	M	2006-299T03:07:00		000T05:04:00	2006-299T08:11:00	XBAND to Earth	Rolling	
SP_031EA_G70METNON299_PRIME	C,M	2006-299T08:11:00		000T06:45:00	2006-299T14:56:00	XBAND to Earth	NEG_X to NEP	

# Telemetry Mode Report

TELEMETRY MODE REPORT

EPOCH RELATIVE	UTC	DURATION	TELEMETRY MODE	REQUEST
2006-296T10:56:00.000		22:30:00	S_N_ER_3	SP_031NA_G70OBSNON297_NA
2006-297T09:26:00.000		00:45:00	RTE_N_SPB_124425	SP_031EA_G70METNON297_PRIME
2006-297T10:11:00.000		07:45:00	RTE_N_SPB_142200	SP_031EA_G70METNON297_PRIME
2006-297T17:56:00.000		00:30:00	RTE_N_SPB_124425	SP_031EA_G70METNON297_PRIME
2006-297T18:26:00.000		13:02:07	S_N_ER_3	SP_031NA_M34OBSNON299_NA
GMB_E031_Titan20-000T08:30:00	2006-298T07:28:07.000	00:15:00	S_N_ER_5A	SP_031NA_M34OBSNON299_NA
GMB_E031_Titan20-000T08:15:00	2006-298T07:43:07.000	02:45:00	S_N_ER_3	SP_031NA_M34OBSNON299_NA
GMB_E031_Titan20-000T05:30:00	2006-298T10:28:07.000	04:38:00	S_N_ER_8	SP_031NA_M34OBSNON299_NA
GMB_E031_Titan20-000T00:52:00	2006-298T15:06:07.000	12:00:53	S_N_ER_3	SP_031NA_M34OBSNON299_NA
2006-299T03:07:00.000		00:19:00	RTE_N_SPB_33180	SP_031EA_M34HEFNON299_PRIME
2006-299T03:26:00.000		04:45:00	RTE_N_SPB_35550	SP_031EA_M34HEFNON299_PRIME
2006-299T08:11:00.000		00:15:00	RTE_N_SPB_82950	SP_031EA_G70METNON299_PRIME
2006-299T08:26:00.000		00:15:00	RTE_N_SPB_99540	SP_031EA_G70METNON299_PRIME
2006-299T08:41:00.000		00:30:00	RTE_N_SPB_110600	SP_031EA_G70METNON299_PRIME
2006-299T09:11:00.000		00:45:00	RTE_N_SPB_124425	SP_031EA_G70METNON299_PRIME
2006-299T09:56:00.000		05:00:00	RTE_N_SPB_142200	SP_031EA_G70METNON299_PRIME

# DSN Requests

CASSINI DOWNLINK/DSN COVERAGE SUMMARY for T20\_060621.apf on 2006-Jun-21 13:52:56  
 (+ = pass overlaps with previous pass; \* = conflicts with DSN weekly maintenance; o = overlaps occultation)

DOWNLINK PASS					DSN PASS						
NAME	START_TO_END SCET	START_TO_END ERT	DUR hh:mm	DATA_RATES kbps	ID	START_TO_END SCET	START_TO_END ERT	DUR hh:mm	CALS min	LABEL	CNFG
G70METNON297	297T09:26-18:26	297T10:45-19:45	09:00	124,142,124	14	297T09:26-18:26	297T10:45-19:45	09:00	60/15	Ranging_ X_up_on	
M34HEFNON299	299T03:07-08:11	299T04:26-09:30	05:04	33,35	65	299T03:07-08:11	299T04:25-09:30	05:05	60/15	TP	N006
+G70METNON299	299T08:11-14:56	299T09:30-16:15	06:45	82,99,110,124,142	14*	299T07:56-14:56	299T09:15-16:15	07:00	60/15	TP	N003

Overlaps weekly  
 maintenance by 0.5 hrs –  
 has been OKed.

We're also losing the final 1.5 hrs



## Open Issues

- DV issues – wait til DSN allocation file comes out
- An SCR has been submitted to mark the SSR pointer locations at -00:10 and +00:20 for potential use in a recovery scenario.

## TWT/OST Integration Constraint and Guideline Checklist

Below are Target Working Team (TWT) and Orbiter Science Team (OST) constraints that must be followed during segment implementation. Any exceptions to constraint numbers 3, 4, 6, or 7 must be approved by the Science Planning Manager.

Constraint	C=Comply V=Violate N/A=Not Applicable	Comments	Disposition
1. A. SP has checked all waypoints turns to and from waypoints. B. All initial downlink attitudes have been checked as waypo ints.			
2. All turns to and from waypoints checked for violations and margins. <input type="checkbox"/> CAPS <input type="checkbox"/> CDA <input type="checkbox"/> CIRS <input type="checkbox"/> INMS <input type="checkbox"/> ISS <input type="checkbox"/> MIMI <input type="checkbox"/> MAG <input type="checkbox"/> NAV <input type="checkbox"/> RADAR <input type="checkbox"/> RPWS <input type="checkbox"/> RSS <input type="checkbox"/> UVIS <input type="checkbox"/> VIMS Each Prime Instrument agrees to accept a reduction in observation time during implementation if problems arise.			
3. Custom handoffs limited to: A. ±3 hours from targeted Icy Satellite flyby B. ±3 hours from targeted Titan Flyby C. OpNavs preceding/following a downlink			
4. Minimum 30 min SPASS Prime request duration outside ±5 hours from targeted satellite flyby (5 min. integer duration if >30 min.)			
5. Live and Ground Movable Blocks include appropriate time margins.		K. Klaasen's margin for flyby is min. according to memo dated .	
6. Waypoints changes are ≤3 per day A. All turns that accomplish the waypoint strategy are requested by SP or OpNav.			
7. Live Movable Blocks limited to the following orbits: 7, 8, 9, 10, 12, 28, 51, 56, 57, 60, 63, 64			

Guideline	Yes / No	Comments
1. Were repeatable/reusable templates used where possible?		
2. During Pre-Integration: Was 30 min. used for 90° RWA turns and/or 10 min. for RCS turns?		

(DOUBLE-CLICK TO MAKE CHANGES)