



## **CASSINI T118 SEGMENT**

### **Rev 234 Handoff Package**

**Segment Boundary 2016-094T14:26:00 – 2016-097T00:56:00**

**14 Aug 2015**

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Science Highlights

Notes & Liens

This document has been reviewed and determined not to contain export controlled technical data

# Science Highlights

TOST rev 234

**DOY 094 (Apr 3)** – The day starts out with a high –priority UVIS occultation that examines both the rings and Saturn’s atmosphere. For Saturn, the occultation probes near latitude +2 degrees, close to the latitude that the spacecraft will sample in the last five orbits (-5 degrees) to provide both science information on the atmospheric density, composition and temperature, and the density information is relevant to the engineering and safety considerations for the last five orbits. The day ends with a CIRS temperature mapping of Titan.

**DOY 095 (Apr 4)** – T118 is the only flyby in the mission where INMS and UVIS will observe Titan’s atmosphere simultaneously. INMS will sample directly and UVIS will sample remotely by observing the solar occultation signal. This is the first time both instruments will be able to compare upper atmospheric density derived from the two methods. Early comparisons made at different latitudes and times were difficult to reconcile. In T118 we we will have data at the same place and time and any differences will not be attributable to variability in Titan's atmosphere. The UVIS solar occultation has ingress lat/long of -57.9/355.4 degrees and egress lat/long of 58.9/178.9 degrees. These occultations sample inside and near the boundaries of the polar vortex regions. It is in these regions that we are seeing unusual patterns of gas abundances and temperature in the south. These regions in both hemispheres are interesting because they sample a dynamical regime that is not typical of the rest of Titan's atmosphere and where there is significant vertical advection of constituents.

T118 is an inclined south polar flyby at 990 km altitude occurring in the late midnight sector of Saturn’s magnetosphere. With SLT similar to T9, T114 T116 and T117, Cassini will explore the polar sector of the induced magnetosphere of Titan explored during those flybys. **(continued on next page)**

# Science Highlights

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**DOY 095 (continued):** Before closest approach, ISS will image Titan's mid-high southern latitudes at medium- to high-resolution. VIMS will ride along to map Titan's surface at medium resolution and to look for the formation of clouds at mid northern latitudes. Outbound, CIRS has a far-infrared limb observation which will measure vertical gas abundances at 67S, on the edge of the winter polar vortex. By continuing to monitor the latitudinal extent and changes in the compositional gradients over time, we will better be able to understand the chemistry and dynamics of the vortex. VIMS will ride along with UVIS to obtain information on the evolution of the haze density. Finally, VIMS will look for specular reflection on the small lakes above 70 North and will map the northern hemisphere at low resolution.

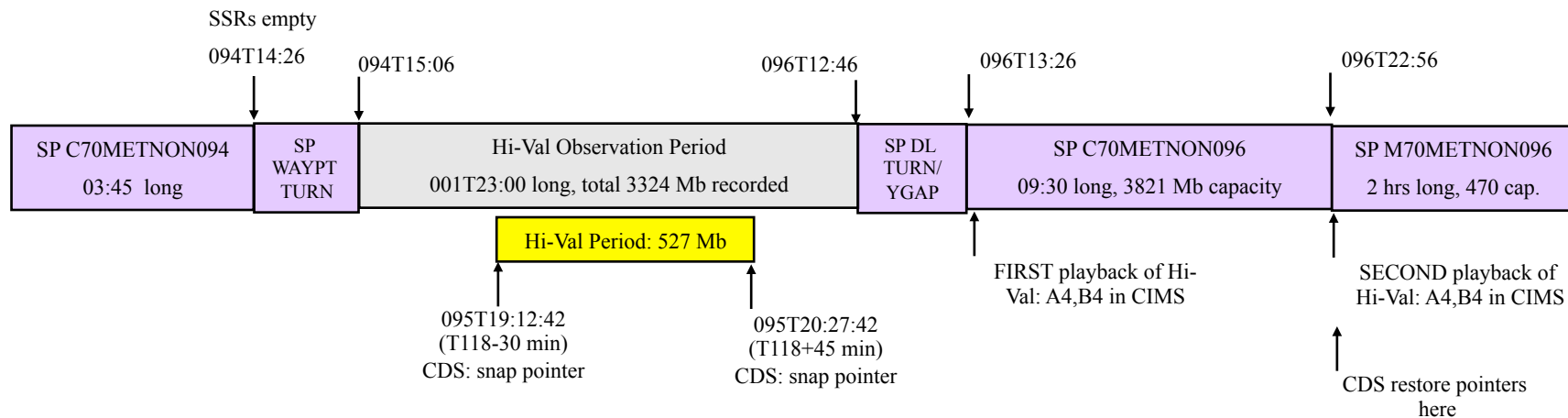
**DOY 096 (Apr 5) –** VIMS will look for specular reflection on the small lakes above 70 North and will map the northern hemisphere at low resolution.

# Dual Playback

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Flyby	BEGHIVAL	ENDHIVAL	P4 Dual Playback Data Volume	SSR empty before hi-val observation period?  (if not verify any carryover on A fits with Hi-Val data)	SSR-A empty after first playback?	PPL set to A4,B4 for first AND second playbacks?	SSRs empty after second playback?  (if not does any Hi-Val data carry over?)
T118	T118-30 min	T118+45 min	527 Mb	Yes	Yes	Yes	Yes

## Playbacks contiguous:

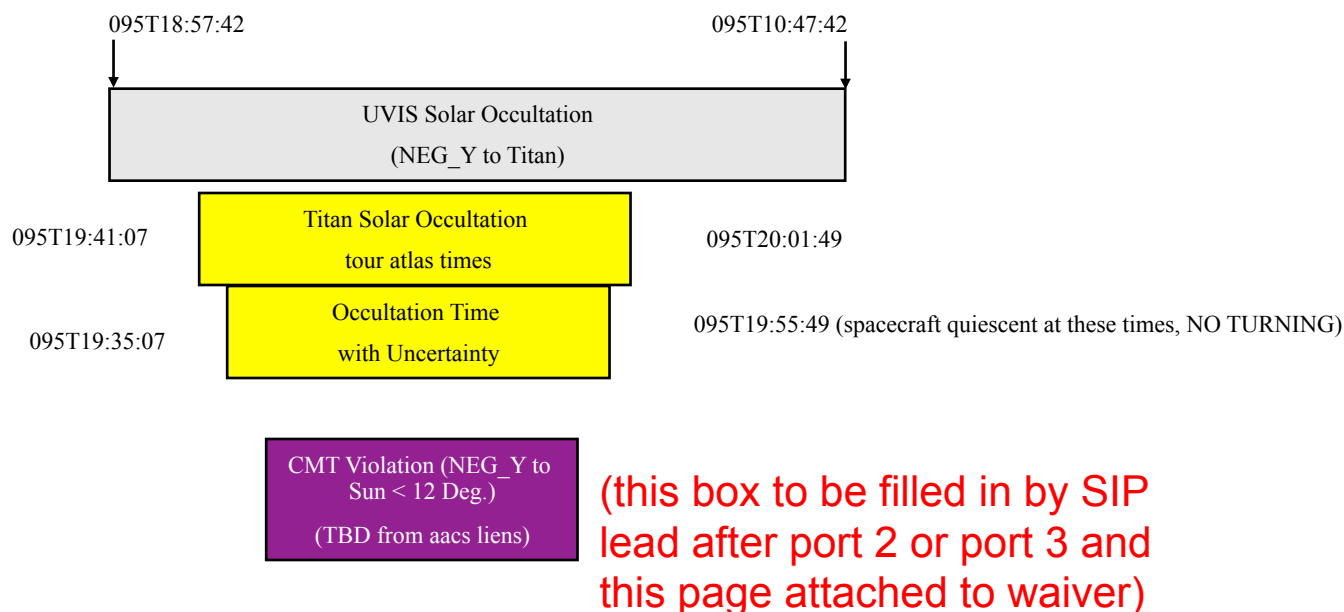


Reminder - ALL instruments' data is played back twice during P4 dual playback periods

# -Y to Sun violation

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- -Y to Sun CMT Management and  $<12^\circ$  boresight to sun flight rule waivers will be needed for the **UVIS Solar Occultation on DOY 095** during the solar occultation
  - Time of Titan Solar Occultation is from the tour atlas.
  - Timing uncertainty is  $\pm 0.0263$  minutes as determined using Brad Wallis' "ask\_carnac.pro" with a total of 6 minutes pad recommended
  - Spacecraft must be quiescent (no turning) at the Occultation Time with Uncertainty boundary times to allow AACS to issue the CMT management commands



# Notes

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- Pointing:
  - Deadband = (0.5, 0.5, 0.5) for UVIS solar occultation
  - Some VIMS heating during waypoint at start of segment to accommodate UVIS PIE.
  - Some CIRS radiator heating during downlink turn
  - Main waypoint uses CIRS and VIMS consumables and uses CMT—is because of the solar occ. This is NOT a request to use CIRS and VIMS consumables!!!
- Data Volume:
  - P4 overfilled by 1.7 Mb during DOY094 Observation period. TOST accepts risk of lost data, but expects compression to make this a nonissue.
  - Data carryover of 85 Mb to XD\_234\_235 (tentatively) approved by XD.
- DSN:
  - 5 minute lockup time on dual PB due to insufficient overlap
- Resource checker:
  - No issues
- Opmodes:
  - No issues
- Hydrazine:
  - KPT estimate (not including transitions): 124 g. FSDS estimate (not including transitions): 94 g. TOST estimate: 143 g (including transitions)
- Special Activities:
  - Known CMT management period from UVIS solar occultation.
  - Dual Playback

# Liens

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## Sequence Liens (should all be SPLAT items):

- Dual Playback identified

# T118 Master Timeline

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234TI_T118	990
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Start Time	End Time	Prime Activity	Obs. Detail	Op Mode	TLM Mode	Comments
2016-094T14:26:00	2016-094T15:06:00	SP Turn to WP	NEG_Y to 81.283/6.35 / NEG_X to NEP	DFPW Normal	S_N_ER_3	
2016-094T15:06:00	2016-094T19:04:00	UVIS_URGAMORI	NEG_Y to 81.283/6.35 / NEG_X to NEP	DFPW Normal	S_N_ER_3	RINGS PIE
2016-094T19:04:00	2016-094T19:57:00	SP Turn to WP	NEG_Y to Titan / NEG_X to NEP	DFPW Normal	S_N_ER_3	Two part turn
2016-094T19:57:00	C/A - 23:43:42	OD Uncertainty Dead Time		DFPW Normal		
C/A - 23:43:42	-14:00	CIRS	A2 (Tc1b)	DFPW Normal	S_N_ER_3	ISS collaborative rider
-14:00	-09:00	CIRS	C (TN1c)	DFPW Normal	S_N_ER_3	
-09:00	-02:15	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))	DFPW Normal	S_N_ER_3	
-02:15	-01:15	ISS		DFPW Normal	S_N_ER_3	
Begin custom period						
-01:15	-00:45	VIMS		DFPW Normal	S_N_ER_3	
-00:45	-00:30	UVIS solar occ	(TC1b(1c))	DFPW Normal	S_N_ER_3	Occ: 19:41:07 to 20:01:49 (-00:06:53 to +00:20:42)
-00:30	-00:29	RWA to RCS Transition		ORSRCS	S_N_ER_3	
-00:29	0	UVIS solar occ	INMS riding (TC1b(1c))	ORSRCS	S_N_ER_3	Occ: 19:41:07 to 20:01:49 (-00:06:53 to +00:20:42)
2016-095T19:48:00		CLOSEST APPROACH	Solar port to SUN, NEG_X to RAM (Tc2a)			Good Egress solar occ; Ingress is opportunity to compare with INMS
0	+00:09	UVIS solar occ	INMS riding (TC1b(1c))	ORSRCS	S_N_ER_3	Occ: 19:41:07 to 20:01:49 (-00:06:53 to +00:20:42)
+00:09	+00:31	RCS to RWA Transition		DFPW Normal	S_N_ER_3	
+00:31	+01:05	UVIS solar occ	(TC1b(1c))	DFPW Normal	S_N_ER_3	Occ: 19:41:07 to 20:01:49 (-00:06:53 to +00:20:42)
+01:05	+02:15	CIRS	(TN1c)	DFPW Normal	S_N_ER_3	
End custom period						
+02:15	+09:00	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))	DFPW Normal	S_N_ER_3	
+09:00	+13:00	VIMS	O (TN1a (Specular reflection of lakes-depending on geometry))	DFPW Normal	S_N_ER_3	
+13:00	C/A + 16:48:18	VIMS	O extended (TN1a (Specular reflection of lakes-depending on geometry))	DFPW Normal	S_N_ER_3	ISS collaborative rider
C/A + 16:48:18	2016-096T12:46:00	OD Uncertainty Dead Time		DFPW Normal		
2016-096T12:46:00	2016-096T13:26:00	SP Turn to Earth for downlink		DFPW Normal	S_N_ER_3	
2016-096T13:26:00	2016-096T22:56:00	Canberra 70M		DFPW Normal	RTE_N_SPB	
2016-096T22:56:00	2016-097T00:56:00	Madrid 70M*		DFPW Normal	RTE_N_SPB	Dual playback for UVIS occ, -00:30 to +00:45