



## **CASSINI TOST T119 SEGMENT**

**Rev 235 Handoff Package**

**Segment Boundary 2016-126T19:14:00 – 2016-129T19:14:00**

**28 October 2015**

Rudy Boehmer

SMT Report, Timeline, & SPASS

Science Highlights

Notes & Liens

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

# SMT Report

TOST T119

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

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_235EA_C70METNON128_PRIME	128 10:14	128 19:14	0	3121	193	3315	3322	7	0	199	53	3567	3876	308	311	7%	0
SP_235EA_C34BWGNON129_PRIME	129 10:14	129 19:14	0	610	64	673	3322	2649	0	179	53	905	908	2	3	0%	0

SSR PARTITION SIZE SUMMARY - SELECTED SSR CONFIGURATION: DOUBLE

OBSERVATION PERIOD	SSR A/B		
	P4 Size (Frames)	P5 Size (Frames)	P6 Size (Frames)
SP_235NA_OBSERV126_NA	188954	10	38863
SP_235NA_OBSERV128_NA	188954	10	38863

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

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	126 19:14	128 10:14	0.0	73.6	469.4	24.1	540.0	112.0	128.7	0.0	1389.7	50.4	305.0	0.0	191.7	3284.7
SP_235EA_C70METNON128_PRIME	128 10:14	128 19:14	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	42.4	4.9	0.0	0.0	0.0	197.5
DAILY TOTAL SCIENCE	126 19:14	128 19:14	0.0	90.5	555.8	27.3	540.0	128.0	156.2	0.0	1432.1	55.3	305.0	0.0	191.7	
OBSERVATION_NOR	128 19:14	129 10:14	0.0	28.3	0.0	5.4	420.0	26.7	45.9	7.6	55.3	0.0	15.0	0.0	62.7	666.9
SP_235EA_C34BWGNON129_PRIME	129 10:14	129 19:14	0.0	17.0	75.6	3.2	0.0	16.0	27.5	0.0	33.2	4.9	0.0	0.0	0.0	177.4
DAILY TOTAL SCIENCE	128 19:14	129 19:14	0.0	45.3	75.6	8.6	420.0	42.7	73.4	7.6	88.4	4.9	15.0	0.0	62.7	
TOTAL RECORDED (OPNAV data not included)			0.0	135.8	631.4	35.9	960.0	170.7	229.7	7.6	1520.6	60.3	320.0	0.0		

# T119 TOST Master Timeline (1/2)

TOST T119

235TI_T119	971
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Start Time	End Time	Prime Activity	Obs. Detail	Op Mode	TLM Mode	Comments
2016-126T19:14:00	2016-126T19:54:00	SP Turn to WP	NEG_Y to Titan / NEG_X to Sun	DFPW Normal	S_N_ER_3	
2016-126T19:54:00	C/A-20:51:46	OD Uncertainty Dead Time		DFPW Normal	S_N_ER_3	
C/A-20:51:46	-14:00	CIRS	A3 (Tc1b)	DFPW Normal	S_N_ER_3	ISS collaborative
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))	DFPW Normal	S_N_ER_3	
-12:00	-09:00	CIRS	D2 (TN1c)	DFPW Normal	S_N_ER_3	
-09:00	-05:00	CIRS	F (TC1b OR TN1c)	DFPW Normal	S_N_ER_3	
<b>Begin custom period</b>				DFPW Normal	S_N_ER_3	
-05:00	-02:18	CIRS	(TN2c) RSS warmup @ -02:18. Surface temperature map looking at polar collar. <b>Use MIMI-preferred secondary NEG_Z to Earth</b>	RSS3RCS	S_N_ER_3	
-02:18	-02:17	RWA to RCS Transition		RSS3RCS	S_N_ER_3	26 minutes for transition, 2 hours for RSS warmup, set deadband to (0.5, 2.0, 0.5)
-02:17	-01:15	CIRS	(TC1b) <b>Use MIMI-preferred secondary NEG_Z to Earth</b>	RSS3RCS	S_N_ER_3	MIMI collaborative from -02:00 to +02:00
-01:15	-00:45	CIRS	(TC1b) <b>Use MIMI-preferred secondary NEG_Z to Earth</b>	RSS3RCS	S_N_ER_3	
-00:45	-00:15	CIRS	(TC1b) <b>Use MIMI-preferred secondary NEG_Z to Earth</b>	RSS3RCS	S_N_ER_3	
-00:15	0	INMS	(TN1c, MC2a) <b>Use MIMI-preferred secondary NEG_Z to Earth</b>	RSS3RCS	S_N_ER_3	Set Deadband to (2, 2, 2)
2016-127T16:54:37		CLOSEST APPROACH	(Tc2a)			Low abd Mid-Lat Occ., LatN=57S, LatX=46N (Seasonal change, tropospheric winds, Surface tempd); Good Bistatic Opportunity over Lakes (Exit)
0	+00:08:39	INMS	(TN1c, MC2a) <b>Use MIMI-preferred secondary NEG_Z to Earth</b>	RSS3RCS	S_N_ER_3	
+00:08:39	+00:27	RSS occ	(TN2c, TN2d) <b>MIMI prefers NEG_X to RAM secondary</b>	RSS3RCS	S_N_ER_3	Telemetry OFF, set deadband to (0.5, 0.5, 2.0)
+00:27	+02:10	RSS Bistat	(TN1a)	RSS3RCS	S_N_ER_3	Telemetry OFF
+02:10	+02:32	RCS to RWA Transition		DFPW Normal	S_N_ER_3	
<b>End custom period</b>				DFPW Normal	S_N_ER_3	
+02:32	+05:00	VIMS	Y (TC1a, TN1a (depending on pointing) and TN2c)	DFPW Normal	S_N_ER_3	Use MIMI-preferred secondary NEG_X to Sun
+05:00	+09:00	VIMS	Q (TN1a (Specular reflection of lakes-depend on geometry))	DFPW Normal	S_N_ER_3	ISS collaborative
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol )	DFPW Normal	S_N_ER_3	
+13:00	C/A+16:24:23	CIRS	M4 (Tc1b (TN1c on outbound))	DFPW Normal	S_N_ER_3	
C/A+16:24:23	2016-128T09:34:00	OD Uncertainty Dead Time		DFPW Normal	S_N_ER_3	
2016-128T09:34:00	2016-128T10:14:00	SP Turn to Earth for downlink	NEG_Z to Earth / NEG_Y to Saturn (0.0, 0.0, -9.5 deg offset)	DFPW Normal	S_N_ER_3	
2016-128T10:14:00	2016-128T19:14:00	Canberra 70M	NEG_Z to Earth / NEG_Y to Saturn (0.0, 0.0, -9.5 deg offset)	DFPW Normal	RTE_N_SPB	

# T119 TOST Master Timeline (2/2)

TOST T119

235TI_T119	971
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Start Time	End Time	Prime Activity	Obs. Detail	Op Mode	TLM Mode	Comments
2016-128T19:14:00	2016-128T19:54:00	SP Turn to WP	NEG_Y to Titan / NEG_X to NTP	DFPW Normal	S_N_ER_3	
2016-128T19:54:00	2016-128T23:54:00	ISS	Cloud Monitoring Campaign (TC1a, TC1b, TN1a, TN2c, TN2d)	DFPW Normal	S_N_ER_3	
2016-128T23:54:00	2016-129T04:04:00	ISS	Cloud Monitoring Campaign (TC1a, TC1b, TN1a, TN2c, TN2d)	RADWU	S_N_ER_5A for 1st 15 minutes, S_N_ER_3 afterwards	
2016-129T04:04:00	2016-129T05:04:00	ISS	Cloud Monitoring Campaign (TC1a, TC1b, TN1a, TN2c, TN2d)	RADWU	S_N_ER_3	
2016-129T05:04:00	2016-129T07:04:00	RADAR	Radiometry Calibration (TN2c)	RADWU	S_N_ER_5A	
2016-129T07:04:00	2016-129T08:04:00	ISS	Cloud Monitoring Campaign (TC1a, TC1b, TN1a, TN2c, TN2d)	DFPW Normal	S_N_ER_3	
2016-129T08:04:00	2016-129T08:44:00	SP Turn to Earth for downlink	NEG_Z to Earth / NEG_Y to Saturn (0.0, 0.0, -9.5 deg offset)	DFPW Normal	S_N_ER_3	
2016-129T08:44:00	2016-129T10:14:00	Ybias window	NEG_Z to Earth / NEG_Y to Saturn (0.0, 0.0, -9.5 deg offset)	DFPW Normal	S_N_ER_3	
2016-129T10:14:00	2016-129T19:14:00	Canberra 34M	NEG_Z to Earth / NEG_Y to Saturn (0.0, 0.0, -9.5 deg offset)	DFPW Normal	RTE_N_SPB	

# T119 TOST SPASS (1/2)

TOST T119

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S94, length = 69 days		2016-109T18:43:00		068T21:01:00	2016-178T15:44:00			
Titan Flyby T119 Segment		2016-126T19:14:00		003T00:00:00	2016-129T19:14:00			
SP_235TI_WAYPTTURN126_PRIME		2016-126T19:14:00		000T00:40:00	2016-126T19:54:00	NEG_Y to Titan	NEG_X to Sun	
<b>NEW WAYPOINT</b>		<b>2016-126T19:54:00</b>		<b>001T14:20:00</b>	<b>2016-128T10:14:00</b>	<b>NEG_Y to Titan</b>	<b>NEG_X to Sun</b>	
<b>SP_235TI_DEADTIME126_PRIME</b>		<b>2016-126T19:54:00</b>		<b>000T00:08:51</b>	<b>2016-126T20:02:51</b>	<b>NEG_Y to Titan</b>	<b>NEG_X to Sun</b>	
CIRS_235TI_MIDIRTMAP001_PRIME	I, V	2016-126T20:02:51	GMB_E235_TITAN_T119-000T20:51:46	000T06:51:46	2016-127T02:54:37	CIRS_FPB to Titan	PIC	Collaborative Rider(s): ISS
ISS_235TI_MONITORNAP001_PRIME	C, U, V	2016-127T02:54:37	GMB_E235_TITAN_T119-000T14:00:00	000T02:00:00	2016-127T04:54:37	ISS_NAC to Titan	NEG_X to Sun	No Preference to secondary pointing
CIRS_235TI_FIRNADCMP001_PRIME	I, U, V	2016-127T04:54:37	GMB_E235_TITAN_T119-000T12:00:00	000T03:00:00	2016-127T07:54:37	CIRS_FP1 to Titan	PIC	
CIRS_235TI_MIRLMBMAP001_PRIME	V	2016-127T07:54:37	GMB_E235_TITAN_T119-000T09:00:00	000T04:00:00	2016-127T11:54:37	CIRS_FPB to Titan	PIC	
<b>Begin Custom Period</b>		<b>2016-127T11:54:37</b>	<b>GMB_E235_TITAN_T119-000T05:00:00</b>	<b>000T00:00:01</b>	<b>2016-127T11:54:38</b>			
CIRS_235TI_FIRNADMAP001_PRIME	V	2016-127T11:54:37	GMB_E235_TITAN_T119-000T05:00:00	000T02:42:00	2016-127T14:36:37	CIRS_FP1 to Titan	NEG_Z to Earth	Pick up at NEG_Y to Titan, NEG_X to Sun; Hand off at NEG_Y to Titan, NEG_Z to Earth.
ENGR_235SC_ORSRCS127_PRIME	R	2016-127T14:36:37	GMB_E235_TITAN_T119-000T02:18:00	000T00:01:00	2016-127T14:37:37	NEG_Y to Titan	NEG_Z to Earth	Pick up at NEG_Y to Titan, NEG_Z to Earth; Hand off at NEG_Y to Titan, NEG_Z to Earth. deadband = (0.5,2,0.5) for CIRS
CIRS_235TI_FIRLMBINTO01_PRIME	I, M, R, V	2016-127T14:37:37	GMB_E235_TITAN_T119-000T02:17:00	000T01:02:00	2016-127T15:39:37	CIRS_FP1 to Titan	NEG_Z to Earth	Collaborative Rider(s): MIMI. Pick up at NEG_Y to Titan, NEG_Z to Earth; Hand off at CIRS_FP1 to Titan, NEG_Z to Earth. Collaborative Rider(s): MIMI
CIRS_235TI_FIRLMBBAERO01_PRIME	M, R, V	2016-127T15:39:37	GMB_E235_TITAN_T119-000T01:15:00	000T00:30:00	2016-127T16:09:37	CIRS_FP1 to Titan	NEG_Z to Earth	Collaborative Rider(s): MIMI. Pick up at CIRS_FP1 to Titan, NEG_Z to Earth; Hand off at CIRS_FP1 to Titan, NEG_Z to Earth. Collaborative Rider(s): MIMI
CIRS_235TI_FIRLMBT001_PRIME	M, R, V	2016-127T16:09:37	GMB_E235_TITAN_T119-000T00:45:00	000T00:30:00	2016-127T16:39:37	CIRS_FP1 to Titan	NEG_Z to Earth	Collaborative Rider(s): MIMI. Pick up at CIRS_FP1 to Titan, NEG_Z to Earth; Hand off at NEG_X to Titan_SC_RAM, NEG_Z to Earth. Collaborative Rider(s): MIMI
Set deadband to (2,2,2)		2016-127T16:39:37	GMB_E235_TITAN_T119-000T00:15:00	000T00:01:00	2016-127T16:40:37			Deadband = (2.0, 2.0, 2.0)
INMS_235TI_TITAN119001_PRIME	C, M, R	2016-127T16:39:37	GMB_E235_TITAN_T119-000T00:15:00	000T00:23:39	2016-127T17:03:16	NEG_X to Titan_SC_RAM	XBAND to Earth	Collaborative Rider(s): MIMI. Pick up at NEG_X to Titan_SC_RAM, NEG_Z to Earth; Hand off at XBAND to Earth (12.0,8.5,-6.5 deg. offset), NEG_X to Titan_SC_RAM. Collaborative Rider(s): MIMI. Use MIMI- preferred secondary NEG_Z to Earth
235TI (t) T119 TITAN Outbound		2016-127T16:54:37		000T00:00:01	2016-127T16:54:38			
Set deadband to (0.5,0.5,2)		2016-127T17:03:16	GMB_E235_TITAN_T119+000T00:08:39	000T00:01:00	2016-127T17:04:16			Deadband = (0.5, 0.5, 2.0)
RSS_235TI_OCC001_PRIME	C, M	2016-127T17:03:16	LUB_E235_TITAN_T119+000T00:08:39	000T00:18:21	2016-127T17:21:37	XBAND to Earth	NEG_X to Titan_SC_RAM	Collaborative Rider(s): MIMI. Pick up at XBAND to Earth (12.0,8.5,-6.5 deg. offset), NEG_X to Titan_SC_RAM; Hand off at XBAND to Earth, NEG_X to Titan_SC_RAM. Collaborative Rider(s): MIMI. RSS egress occultation of Titan's atmosphere
RSS_235TI_BISTATOUT001_PRIME	C, M	2016-127T17:21:37	LUB_E235_TITAN_T119+000T00:27:00	000T01:43:00	2016-127T19:04:37	XBAND to Titan	PIC	Collaborative Rider(s): MIMI. Pick up at XBAND to Earth, NEG_X to Titan_SC_RAM; Hand off at NEG_Y to Titan, NEG_X to Sun. Collaborative Rider(s): MIMI. Egress bistatic surface scattering observation
<b>End Custom Period</b>		<b>2016-127T19:04:37</b>	<b>GMB_E235_TITAN_T119+000T02:10:00</b>	<b>000T00:00:01</b>	<b>2016-127T19:04:38</b>			

# T119 TOST SPASS (2/2)

TOST T119

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S94, length = 69 days		2016-109T18:43:00		068T21:01:00	2016-178T15:44:00			
Titan Flyby T119 Segment		2016-126T19:14:00		003T00:00:00	2016-129T19:14:00			
ENGR_235SC_DFPWBIAS127_PPS	C, V	2016-127T19:04:37	GMB_E235_TITAN_T119+000T02:10:00	000T00:21:07	2016-127T19:25:44			Deadband: (2,2,2).
VIMS_235TI_REGMAP001_PRIME	C, I	2016-127T19:26:37	GMB_E235_TITAN_T119+000T02:32:00	000T02:28:00	2016-127T21:54:37	VIMS_IR to Titan	NEG_X to Sun	No Preference to secondary pointing
VIMS_235TI_MEDRES001_PRIME	C, I	2016-127T21:54:37	GMB_E235_TITAN_T119+000T05:00:00	000T04:00:00	2016-128T01:54:37	VIMS_IR to Titan	NEG_X to Sun	Collaborative Rider(s): ISS. No Preference to secondary pointing
CIRS_235TI_FIRNADCMP002_PRIME	I, U, V	2016-128T01:54:37	GMB_E235_TITAN_T119+000T09:00:00	000T04:00:00	2016-128T05:54:37	CIRS_FP1 to Titan	PIC	
CIRS_235TI_MIDIRMAP002_PRIME	I, V	2016-128T05:54:37	GMB_E235_TITAN_T119+000T13:00:00	000T03:24:23	2016-128T09:19:00	CIRS_FP2 to Titan	PIC	
SP_235TI_DEADTIME128_PRIME		2016-128T09:19:00	GMB_E235_TITAN_T119+000T16:24:23	000T00:15:00	2016-128T09:34:00	NEG_Y to Titan	NEG_X to Sun	
SP_235EA_DLTRN128_PRIME		2016-128T09:34:00		000T00:40:00	2016-128T10:14:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
NEW WAYPOINT		2016-128T10:14:00		000T09:40:00	2016-128T19:54:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
SP_235EA_C70METNON128_PRIME	C	2016-128T10:14:00		000T09:00:00	2016-128T19:14:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	Rolling/SRU	MIMI.NEG_Y to Saturn (0,0,-9.5).SRU.
SP_235TI_WAYPTTURN128_PRIME		2016-128T19:14:00		000T00:40:00	2016-128T19:54:00	NEG_Y to Titan	NEG_X to NTP	
NEW WAYPOINT		2016-128T19:54:00		000T12:50:00	2016-129T08:44:00	NEG_Y to Titan	NEG_X to NTP	
ISS_235TI_CLOUD001_PRIME	V	2016-128T19:54:00		000T04:00:00	2016-128T23:54:00	ISS_NAC to Titan	NEG_X to NTP	No Preference to secondary pointing
ISS_235TI_CLOUD002_PRIME	V	2016-128T23:54:00		000T04:10:00	2016-129T04:04:00	ISS_NAC to Titan	NEG_X to NTP	No Preference to secondary pointing
ISS_235TI_CLOUD003_PRIME	V	2016-129T04:04:00		000T01:00:00	2016-129T05:04:00	ISS_NAC to Titan	NEG_X to NTP	No Preference to secondary pointing
RADAR_235TI_RADIOCAL134_PRIME		2016-129T05:04:00		000T02:00:00	2016-129T07:04:00	NEG_Z to Titan	NEG_X to NTP	No Preference to secondary pointing
ISS_235TI_CLOUD004_PRIME	V	2016-129T07:04:00		000T01:00:00	2016-129T08:04:00	ISS_NAC to Titan	NEG_X to NTP	No Preference to secondary pointing
SP_235EA_DLTRN129_PRIME		2016-129T08:04:00		000T00:40:00	2016-129T08:44:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
NEW WAYPOINT		2016-129T08:44:00		000T10:30:00	2016-129T19:14:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
SP_235EA_YGAP129_PRIME	E	2016-129T08:44:00		000T01:30:00	2016-129T10:14:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
SP_235EA_C34BWGNON129_PRIME	C	2016-129T10:14:00		000T09:00:00	2016-129T19:14:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	Rolling/SRU	MIMI.NEG_Y to Saturn (0,0,-9.5).SRU.

# T119 TOST High-Priority Observations

TOST T119

## T119: Summary of PIEs and Other High Priority Observations

Discipline	CIMS Request Name	Start Time	End Time	Flexibility in secondary pointing	Comments (e.g., pointing tolerance, uniqueness; relative priority)	Science Traceability Matrix Code(s)	Pointing designer POC
Titan	CIRS_235TI_FIRLMBINT001_PRIME	2016-127T14:37:37	2016-127T15:39:37	Significant Science Impact if Secondary Changed	Significant Impact to Science	TC1b	conor.nixon@nasa.gov
Titan	CIRS_235TI_FIRLMBBAER001_PRIME	2016-127T15:39:37	2016-127T16:09:37	Significant Science Impact if Secondary Changed	Significant Impact to Science	TC1b	conor.nixon@nasa.gov
Titan	CIRS_235TI_FIRLMBT001_PRIME	2016-127T16:09:37	2016-127T16:39:37	Significant Science Impact if Secondary Changed	Significant Impact to Science	TC1b	conor.nixon@nasa.gov
Titan	INMS_235TI_TITAN119001_PRIME	2016-127T16:39:37	2016-127T17:03:16	Significant Science Impact if Secondary Changed	Significant Impact to Science	TN1c, MC2a	Rebecca Perryman <rperryman@swri.edu>
Titan	RSS_235TI_OCC001_PRIME	2016-127T17:03:16	2016-127T17:21:37	Significant Science Impact if Secondary Changed	On thrusters, so attitude should stick.	TN2c, TN2d	jeff.boyer@jpl.nasa.gov
Titan	RSS_235TI_BISTATOUT001_PRIME	2016-127T17:21:37	2016-127T19:04:37	Significant Science Impact if Secondary Changed	On thrusters, so attitude should stick.	TN1a	jeff.boyer@jpl.nasa.gov

# TOST T119 Science Highlights (1/3)

TOST T119

DOY 126 (May 5th) – The T119 segment begins with CIRS inbound mid-infrared mapping of Titan's visible southern hemisphere, allowing measurements of temperatures and inferences of winds. Next, ISS is prime and will image the surface and atmosphere at low-southern latitudes over Titan's sub-Saturnian hemisphere, including Aztlan and Tsegih. CIRS follows with far infrared mapping to continue monitoring of seasonal changes in temperatures and trace gas abundances. Note that CIRS will pay special attention to the south pole, which has recently been exhibiting very cold temperatures and greatly increased gas abundances in the stratosphere, plus peculiar and poorly understood condensate clouds and hazes. VIMS is riding along throughout, monitoring the evolution of the south polar vortex and looking for the formation of clouds at mid northern latitudes. UVIS is also riding along, mapping in EUV & FUV spectra to measure aerosol scattering and gaseous absorption features.

DOY 127 (May 6th) – CIRS continues as prime observer, using its closest inbound allocation on limb observations to monitor of seasonal changes in temperatures and trace gas abundances. ISS and VIMS continue to ride along as well.

Next, INMS will perform atmospheric measurements at closest approach. This is a critical flyby for INMS, as T119 is in the midnight local time for Cassini relative to Titan and midnight local time for Titan relative to Saturn. This is the only time in the mission that INMS will have the chance to measure Titan's atmosphere in this geometry.



## TOST T119 Science Highlights (2/3)

TOST T119

DOY 127 (May 6th) continued – Immediately following INMS at closest approach is RSS. RSS will first capture the mid-northern latitude (~42.6N) egress-only atmospheric occultation to profile the thermal structure of the atmosphere and its possible seasonal variation. RSS then follows the occultation with a short duration (~ 1hr) high northern latitude egress-only bistatic scattering observation of ground track possibly crossing small lakes. The bistatic covers the region from about (78N, 130W) to about (60N, 150W) degrees, and captures scattering angles decreasing from about 80 to 65 degrees, partly grazing and partly within the Brewster angle range. Measurements of the absolute power of the right and left circularly polarized echo components, when detectable, yield information about surface reflectivity, dielectric constant, and roughness.

VIMS is prime after the RSS bistatic, and will take medium resolution images of the north pole area to look for seasonal changes in the seas and lakes, with CIRS and ISS riding along. VIMS will also look for specular reflections in the lake area at about 75N and 120 E. CIRS follows VIMS on the outbound and will perform far-infrared nadir observations of the visible northern hemisphere to continue monitoring of seasonal changes in temperatures and trace gas abundances. CIRS will make mid-infrared maps of this hemisphere as well, allowing measurements of temperatures and inferences of winds, with ISS and VIMS riding along.

# TOST T119 Science Highlights (3/3)

TOST T119

DOY 127 (May 6th) continued – Note that T119 has key MAPS objectives as well. T119 was previously a CAPS-allocated flyby. MIMI is standing in for CAPS, and will measure the energetic ion and electron environment to estimate the energetic particle input to Titan's atmosphere and ionosphere, which will help interpret the ionization layers and scale heights observed by RSS. MIMI is a collaborative rider (for secondary axes) within 2 hours of closest approach. In addition, with SLT similar to T9, T114, T116, T117, and T118 and at low altitude, MAG will explore the south polar, late-midnight sector of the induced magnetosphere of Titan explored during those previous flybys. Finally, RPWS will measure thermal plasmas in Titan's ionosphere and surrounding environment, search for lightning in Titan's atmosphere, and investigate the interaction of Titan with Saturn's atmosphere.

DOY 128 (May 7th) – Playback of the closest approach observation period data will take place over the Canberra 70M downlink. Following the playback, ISS will monitor Titan to track clouds and the evolution thereof as northern summer approaches. VIMS will also ride along to look for clouds at mid-northern latitudes. In addition, RADAR will target Titan for a distant radiometric calibration.

DOY 129 (May 8th) – Playback of the caboose observation period data will take place over the Canberra 34M BWG.

# Notes (1/3)

TOST T119

- Pointing:
  - Waypoints:
    - Waypoint widget warning: closest-approach observation period waypoint has RWA CMT rate violation at 127T17:56:00 – OK, S/C on RCS at this time (C/A altitude: 971 km) and using custom period
    - RBOT: C/A observation period requires specific secondaries for instruments; Caboose observation period waypoint is RBOT-friendly
  - Custom Period – used to minimize turn times among instruments (CIRS/INMS/RSS) at closest approach
    - SPST Approval to start at C/A-05:00:00 for CIRS to accommodate a MAPS Secondary (which differs from waypoint)
    - RSS Occ & Bistatic Prime Observations in Custom Period: early-delivery Integration KPT run validates attitudes as safe.
      - Note: Occultation Egress at 127T17:09:08: obs. duration does not meet +/-20 minute margin – accepted by RSS.
  - CIRS and VIMS consumable-level temperature violations:
    - CIRS (Handoff Turn to INMS) Inbound / INMS C/A on RCS, AACS analysis:
      - CIRS temperature rises to max of 80.85 K at 2016-127T16:54:01 (dT = 6.25 K).
      - VIMS temperature rises to max of 64.45 K at 2016-127T16:54:01 (dT = 3.05 K).
    - CIRS and VIMS agreed to accept consumables; INMS agreed to submit waiver.
  - POS\_X to SUN angle decreases to minimum angle of 53.62 degrees (padded threshold is 85 degrees). CMT management required (127T16:34:33 – 127T17:04:36, wholly within GMB boundaries).
- Data Volume:
  - No carryover to next segment
  - SMT Warnings (OK and expected, RADAR Warmup in S\_N\_ER\_5A for 1st 15 minutes):
    - RADAR\_235OT\_WU4RADCAL134\_RIDER: Found an activity whose data are NOT recorded in this telemetry mode "S\_N\_ER\_3" commanded at 2016-129T00:09:00.000. Volume of 8.523187 Mb not given data policing space.

# Notes (2/3)

TOST T119

- DSN:
  - DSS-14 extended maintenance from DOY 025-134 (not requested in T119)
  - No ap\_downlink report check warnings
  - Level 3 Requests: C70 & C34BWG passes requested on DOY 127 in support of RSS Occultation & Bistatic observations.
- Resource checker:
  - RSS\_235TI\_OCC001\_PRIME, RSS\_235TI\_BISTATOUT001\_PRIME: Prime request inside a Movable Block not referenced to GMB\_E235\_TITAN\_T119 – OK, RSS Observations referenced to LUB inside of GMB
  - ISS\_235TI\_CLOUD002\_PRIME: Telemetry mode transition during observation – S\_N\_ER\_5A for first 15m to see RADAR Warmup. OK with ISS.
- Opmodes:
  - No RWA-slow or unique opmodes.
  - RSS and RADAR power-on opmodes allow for sufficient warm-ups prior to observations.

# Notes (3/3)

TOST T119

- Hydrazine:
  - KPT Estimate: 380 g (per L. Andrade analysis)
  - FSDS Estimate: 360 g
  - Deadbands:
    - 0.5. 2.0, 0.5 mrad from RCS begin to C/A-00:15:00 (CIRS)
    - 2.0. 2.0, 2.0 mrad from C/A-00:15:00 to C/A+00:08:39 (INMS)
    - 0.5. 0.5, 2.0 mrad from C/A+00:08:39 to RCS end (RSS)
    - Steps for walking deadband = 3
- Special Activities:
  - CMT Management for POS\_X to Sun violation
  - Consumable for CIRS & VIMS heating during INMS-attitude at C/A

# Liens

TOST T119

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

- CIRS/VIMS heating violation; POS\_X to Sun CMT violation
  - SPLAT item initiated for INMS to submit waiver for CIRS & VIMS heating consumable and CMT management