Daily Downlink Tagup

Monday, October 19, 2020 (DOY 293)

WOY 43

TAG WEEK!

OSIRIS-REx™

ASTEROID SAMPLE RETURN MISSION

T-1 Day to TAG!

Agenda & Logistics

- Quicklook + Instrument Status
- DSN Schedule
- Observation Timeline
- Uplink/Execution/Downlink Summary
- Alarms, Watch items, ISAs, PFRs
- Need for Retransmit, need for Replay?
- Science / PI Comments
- Go-backs / Additional Comments

Daily Downlink Summaries available shortly after each Tagup at on the OREx Ops Wiki:
https://orexwiki.lpl.arizona.edu/wiki/Main_Page (LDAP login)

Daily Downlink Slides available shortly after each Tagup at:
OSIRIS-REx Bennu Proximity Operations/Science Implementation/Downlink_Daily_Summary/2020

OCAMS Slides available at:
ODOCS at 7.0 Mission Operations System/SPOC/OCAMSFlightProducts/Downlink

Quicklook Status

Team	Status	Comment
Spacecraft	G	No issues
Electrical Power System	G	No issues
Flight Software	G	No issues
Fault Protection	G	No issues
G&NC	G	No issues
Mechanisms	G	No issues
Propulsion	G	No issues
Telecom	G	No issues
Thermal	G	No issues
Payload Interfaces	G	No issues

	Health				Safety		Performance				Powered State	GO/NO-GO
	Thermal	Power	Command Response	Alarms	Trending	Limited Life	Mechanisms	Data Completeness	Pipeline Status	Science Concurrence		
OCAMS											**OFF**	**GO**
OLA											**OFF**	**GO**
OTES											**OFF**	**GO**
OVIRS											**OFF**	**GO**
REXIS											**OFF**	**GO**

Yellow Performance Status impacts LELT only

Downlink Schedule (times in UTC)

- ***Current Data Rate: 300 kbps.***

WOY	DOY	Start Date	HGA Start	End Date	HGA End	Duration	Note
43	293	10/19/2020	14:54	10/19/2020	18:24	03:30	Crit-2 Downlink *Complete*
43	294	10/20/2020	12:21	10/20/2020	17:13	05:48	
43	295	10/21/2020	02:42	10/21/2020	08:03	03:20	
43	295	10/21/2020	14:53	10/21/2020	22:37	07:44	Crit-2 Downlink, **Manually command D/L rate to 916 kbps for this pass ONLY.
43	296	10/22/2020	14:22	10/22/2020	23:43	09:21	Crit-2 Downlink, Sample Head Imaging occurring during HGA pass
43	297	10/23/2020	14:22	10/23/2020	18:43	04:21	
43	298	10/24/2020	14:22	10/24/2020	20:23	06:21	
43	299	10/25/2020	14:22	10/25/2020	20:23	06:21	
44	300	10/26/2020	17:46	10/26/2020	20:23	02:23	Crit-3 Downlink

NOTES / ISSUES:
None

SIGNIFICANT EVENTS:

A. NHPC has Entered Safe Mode, DOY 292/0330z

On DOY 292/0330z, NHPC entered Safe Mode. Further details will be provided by the NAD from the supporting mission set. No ETRO is available at this time.

B. GDSCC PDG Declared GREEN, DOY 292/1950z, Closed

On DOY 292/1950z, SPC-10 declared GDSCC PDG (Power Distribution Group) GREEN. Please refer to the Electronic Equipment Status Board on DRMS for details.

RED EQUIPMENT STATUS:

SPC/DSS	EQUIPMENT	ETRO
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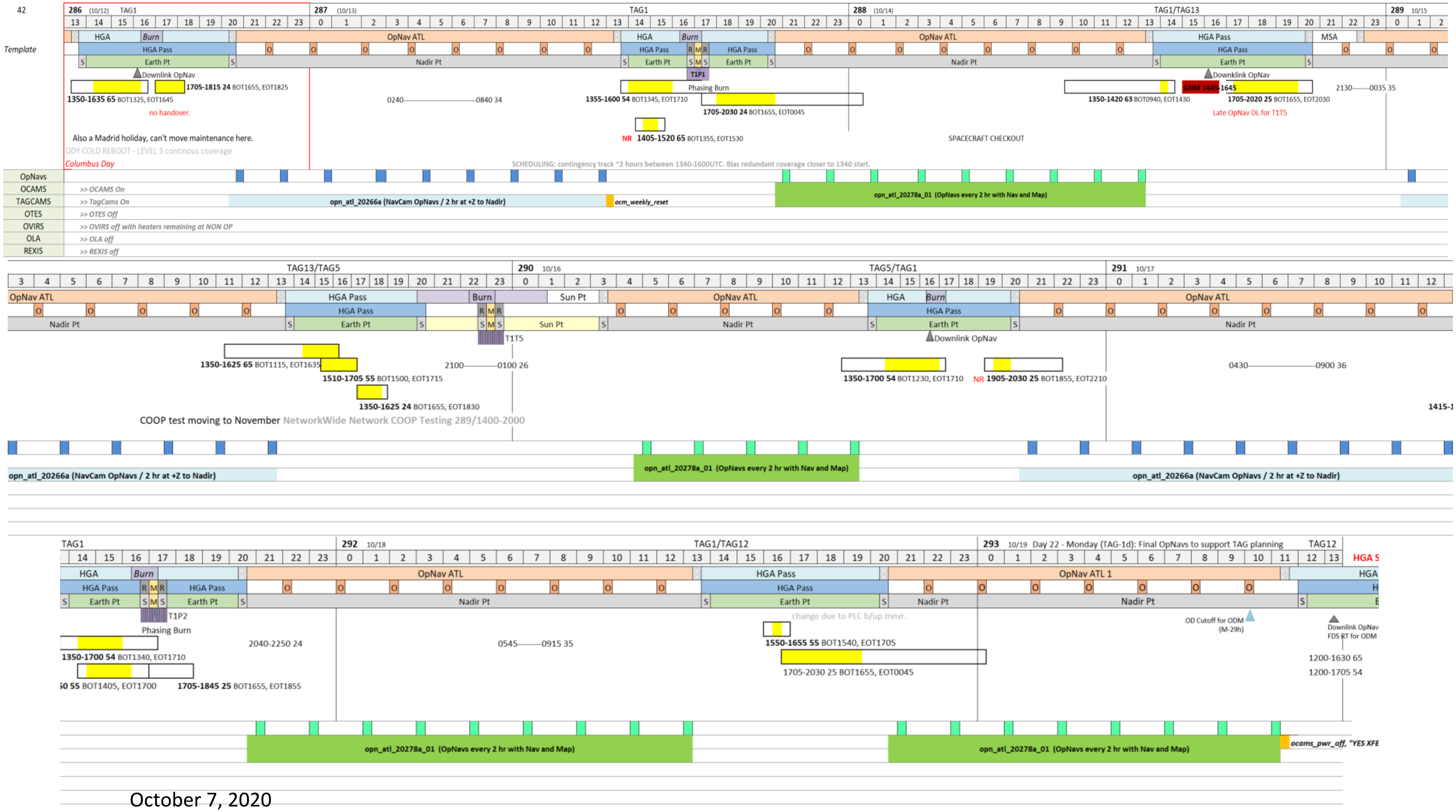
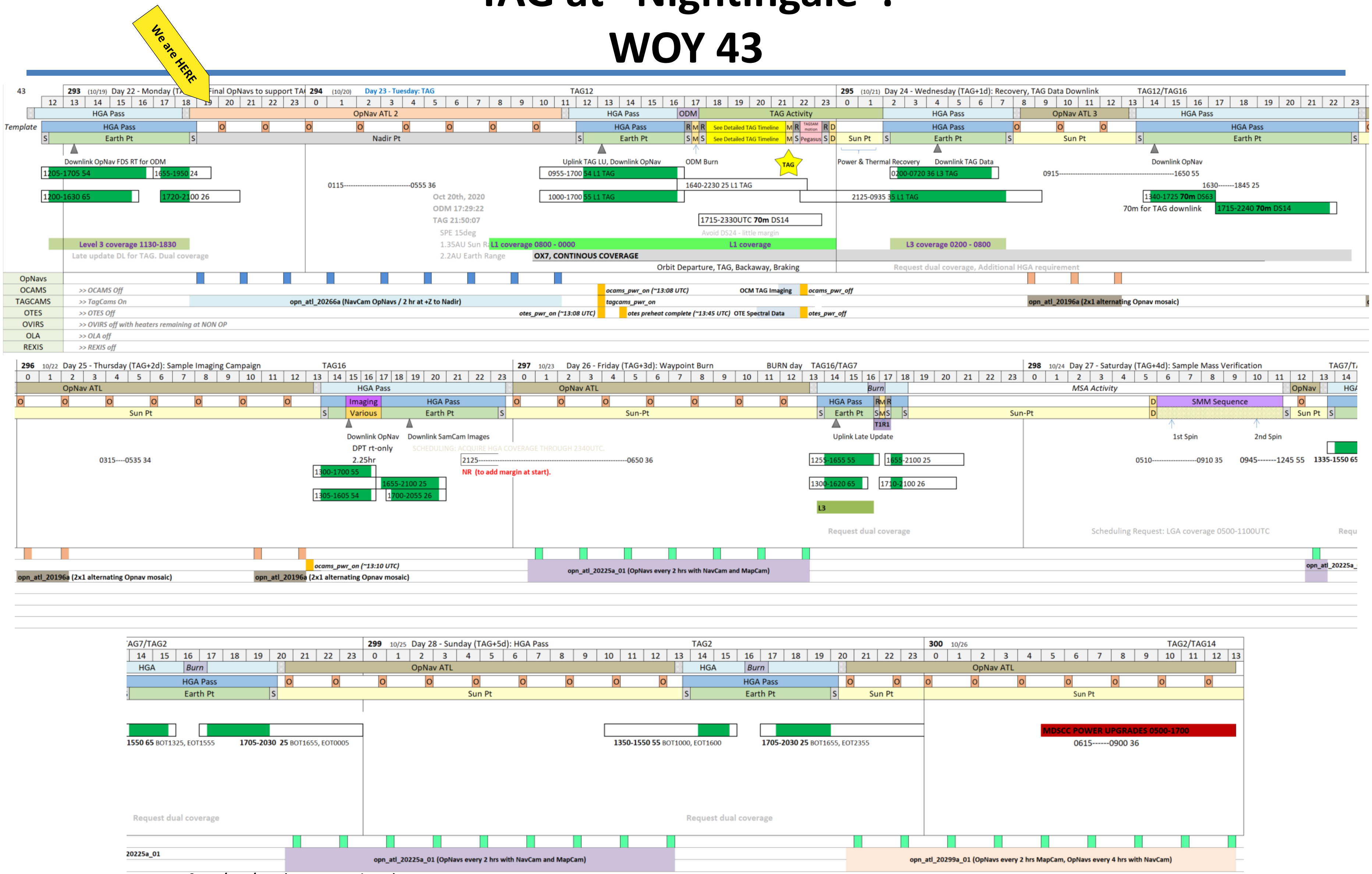
DSS34	X20KW	294/0600z
SPC40	TLP16	297/0400z
SPC40	TLP15	297/0400z
DSS14	X500kw-R	303/2300z
SPC10	MCD3-3	304/2300z
DSS54	NDA	330/1417z
SPC60	MCD3-1	330/1600z
SPC60	NMC-SR1	350/1530z
DSS63	EAC	365/1600z
SPC60	HMA3	366/1530z

OpNavs in Orbit, T1P1, T1P2, *T1T5 waived*
WOY 42 COMPLETE



October 7, 2020
L+1490 days
Earth Range = 327,000,000 km (2.18 AU) (↑)
Sun Range = 202,000,000 km (1.35 AU) (↑)
Bennu Range = 1 km (1 km frozen orbit)
Sun-Probe-Earth Angle = 18.5 deg (↓)
One Way Light Time = 00:18:09 hh:mm:ss (↑)

TAG at “Nightingale”!
WOY 43



Mission Statistics as of 10/14/20 (L+1497 days)

- Earth Range = 330,000,000 km (2.21 AU) (↑)
- Sun Range = 202,000,000 km (1.35 AU) (↑)
- Bennu Range = 1 km (1 km frozen orbit)
- Sun-Probe-Earth Angle = 17.2 deg (↓)
- One Way Light Time = 00:18:21 hh:mm:ss (↑)

TAG Sequence Summary

DOY 294 (Tuesday, 10/20) <u>(times in UTC)</u>

- ~12:30 - Go for TAG poll, final command sequences uploaded. This turns the keys over to the spacecraft.
- ~13:08 – OCAMS and OTES powered ON for TAG
- 17:51 - Orbit departure burn
- 17:52-21:40 - Various deployments and slews, navigation camera images recorded and processed with NFT
- 22:00 - Beginning of NASA live event
- 22:50 - Checkpoint burn puts spacecraft on intersect course with surface, 125 m altitude
- 23:01 - Matchpoint burn sets up correct relative velocity with surface, 54 m altitude
- 23:12 - Touchdown, back-away burn initiated

Other Key Events

TAG Data Downlink:

- 07:00 Wednesday - End of first post-TAG HGA pass, some engineering telemetry and OCAMS images down
- 17:00 Wednesday - SamCam. movie downlink complete, shows contact with surface
- 18:00 Wednesday - first part of back-away movie down
- 20:30 Wednesday - full back-away movie down

Post-TAG Events:

- OCAMS powered on ~13:10 UTC on DOY 296 (Thursday)
- OCAMS and TAGCAMS Sample Head imaging occurs during HGA pass on DOY 296
- Post-TAG Sample Head imaging sequence occurring on DOY 298 (Saturday)
- Post-TAG degradation checkout DOY 302 (following Wednesday)

Uplink Summary

UPLINK

WOY 43 (DOY 293 – 300; Oct 19– Oct 26, 2020)

- Pre-TAG Sci-genies/genie bottle, ATFs, payload sequences uplinked 2020-291
- Post-TAG science products will be uplinked 2020-295-00:00

Ephemeris Updates

- OD 291 uplinked 2020-291
  - OD 291 will be re-uplinked after TAG
- OD 293 will be uplinked 2020-296

Other Files

- SC checkout files uplinked 2020-283
- T1P1 uplinked 2020-283
- T1D Late Update will be uplinked 2020-294 ~12:30 UTC
- TAG Load and Go will be uplinked 2020-294 ~12:30 UTC after final team "GO" for TAG
- Post-TAG Cleanup products will begin uplink and execution 2020-295 ~00:00 and continue on 2020-296

Execution Summary

Complete (times In UTC): WOY 42

- 2020/286 (Monday, Oct 12) – 2020/287 (Tuesday,Oct 13)
  - OpNavs and particle imaging
    - » # of NavCam OpNav images expected/**received** : 9/**9**
    - » # of NavCam particle img expected/**received :** 9/**9**

- 2020/287 (Tuesday, Oct 13) – 2020/288 (Wednesday, Oct 14)
  - OpNavs and particle imaging. **Criticality 3+.**
    - » # of NavCam OpNav images expected/**received** : 9/**9**
    - » # of NavCam particle img expected/**received :** 9/**9**
    - » # of MapCam OpNav images expected/**received** : 9/**9**

- 2020/288 (Wednesday, Oct 14) – 2020/289 (Thursday, Oct 15)
  - OpNavs and particle imaging
    - » # of NavCam OpNav images expected/**received** : 7/**7**
    - » # of NavCam particle img expected/**received :** 7/**7**
    - » # of NavCam science (SP08)
      - Stowcam images 11/**11**
      - 12bit NavCam2 3/**3**

- 2020/289 (Thursday, Oct 15) – 2020/290 (Friday, Oct 16)
  - OpNavs and particle imaging. **Criticality 2.**
    - » # of NavCam OpNav images expected/**received** : 5/**5**
    - » # of NavCam particle img expected/**received :** 5/**5**
    - » # of MapCam OpNav images expected/**received** : 5/**5**

- 2020/290 (Friday, Oct 16)– 2020/291 (Saturday, Oct 17)
  - OpNavs and particle imaging
    - » # of NavCam OpNav images expected/**received** : 9/**9**
    - » # of NavCam particle img expected/**received :** 9/**9**

- 2020/291 (Saturday, Oct 17) – 2020/292 (Sunday, Oct 18)
  - OpNavs and particle imaging
    - » # of NavCam OpNav images expected/**received** : 9/**9** *
    - » # of NavCam particle img expected/**received :** 9/**9** *
    - » # of MapCam OpNav images expected/**received** : 9/**9**

    * Repeating pattern seen in images beginning with the OpNavs at 09:00 UTC (292). Most likely a radiation upset artifact. Issue was resolved by planned Daily TAGCAMS reset at ~14:00 UTC (292), and pattern did not appear in the latest set of images.

- 2020/292 (Sunday, Oct 18) – 2020/293 (Monday, Oct 19)
  - OpNavs and particle imaging **Criticality 2.**
    - » # of NavCam OpNav images expected/**received** : 8/**8**
    - » # of NavCam particle img expected/**received :** 8/**8** **
    - » # of MapCam OpNav images expected/**received** : 8/**8**

    **1 NavCam Particle image missing 4091 pixels

Execution Summary

Up Next (times In UTC): WOY 43

- 2020/293 (Monday, Oct 19) – 2020/294 (Tuesday,Oct 20)
  - OpNavs and particle imaging
    - » # of NavCam OpNav images expected/**received** : 9/
    - » # of NavCam particle img expected/**received :** 9/

- 2020/294 (Tuesday, Oct 20) – 2020/295 (Wednesday, Oct 21)
  - **TAG!!!. Criticality 2**
    - » # of NavCam OpNav images expected/**received** : 12/
    - » # of OCAMS sci images expected/**received**: up to 265/
    - » OTES data (mb) expected/**received**: 18.5/
    - » # of Nav/NFT sci images expected/**received** : up to 90/

- 2020/295 (Wednesday, Oct 21) – 2020/296 (Thursday, Oct 22)
  - Post TAG sample imaging. **Criticality 2**
    - » # of NavCam OpNav images expected/**received** : 16/
    - » # of SamCam sci images expected/**received**: 189/
      - Sample head images. 99 lights + 90 darks.
    - » # of Nav/NFT sci images expected/**received** : 12/
      - Sample head images. 6 NavCam + 6 NTFCam

- 2020/296 (Thursday, Oct 22) – 2020/297 (Friday, Oct 23)
  - OpNavs
    - » # of NavCam OpNav images expected/**received** : 14/
    - » # of MapCam OpNav images expected/**received** : 14/

- 2020/297 (Friday, Oct 23)– 2020/298 (Saturday, Oct 24)
  - OpNavs
    - » # of NavCam OpNav images expected/**received** : 2/
    - » # of MapCam OpNav images expected/**received :** 2/

- 2020/298 (Saturday, Oct 24) – 2020/299 (Sunday, Oct 25)
  - OpNavs
    - » # of NavCam OpNav images expected/**received** : 18/
    - » # of MapCam OpNav images expected/**received** : 18/

- 2020/299 (Sunday, Oct 25) – 2020/300 (Monday, Oct 26)
  - OpNavs **Criticality 3.**
    - » # of NavCam OpNav images expected/**received** : 10/
    - » # of MapCam OpNav images expected/**received** : 18/

Downlink Summary

Data Rate:

DOY 295 TAG pass: manually command 916 kbps

All other days: 300 kbps.

	Partition Fill Estimator		Partition	Destination Partition	Volume (MB)	Volume (MB)	Volume (MB)	HK Data (MB)	New Data (MB)	Fill (MB)	Fill (%)	DOY+1 Part Fill (%)
	DOY	292	OpNav	Overflow	0.00	0.00	N/A	N/A	112.34	112.34	16.05%	0.00%
	Science Downlink Time (s)	19228.00	OTES	Overflow	0.00	0.00	0.00		0.00	0.00	0.00%	0.00%
	Data Rate (MBps):	0.027906	REXIS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New OCAMS OpNav (MB):	18.76879	OLA	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TAG OpNav (MB):	93.57492	OVIRS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TagCams NonOpNav (MB):	0	OCAMS	Overflow	0.00	0.00	0.00	7.06	0.00	7.06	0.19%	0.00%
	Low Pri Data for Overflow (MB):	0	Overflow	N/A	0.00	0.00	0.00	N/A	0.00	0.00	0.00%	0.00%
	DOY	293	OpNav	Overflow	0.00	0.00	N/A	N/A	105.27	105.27	15.04%	0.00%
	Science Downlink Time (s)	13878.00	OTES	Overflow	0.00	0.00	0.00		0.00	0.00	0.00%	0.00%
	Data Rate (MBps):	0.027906	REXIS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New OCAMS OpNav (MB):	0	OLA	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TAG OpNav (MB):	105.2718	OVIRS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TagCams NonOpNav (MB):	0	OCAMS	Overflow	0.00	0.00	0.00		105.27	105.27	2.85%	0.00%
	Low Pri Data for Overflow (MB):	0	Overflow	N/A	0.00	0.00	0.00	N/A	0.00	0.00	0.00%	0.00%
	DOY	294	OpNav	Overflow	0.00	0.00	N/A	N/A	140.36	140.36	20.05%	0.00%
	Science Downlink Time (s)	19500.00	OTES	Overflow	0.00	0.00	0.00	2.62	15.88	18.50	6.70%	0.00%
	Data Rate (MBps):	0.114588	REXIS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New OCAMS OpNav (MB):	0	OLA	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TAG OpNav (MB):	140.3624	OVIRS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TagCams NonOpNav (MB):	1003.95	OCAMS	Overflow	0.00	0.00	0.00	7.06	621.90	628.96	17.03%	0.00%
	Low Pri Data for Overflow (MB):	0	Overflow	N/A	0.00	0.00	0.00	N/A	1003.95	790.00	100.00%	0.00%
	DOY	295	OpNav	Overflow	0.00	0.00	N/A	N/A	187.15	187.15	26.74%	0.00%
	Science Downlink Time (s)	29128.00	OTES	Overflow	0.00	0.00	0.00		0.00	0.00	0.00%	0.00%
	Data Rate (MBps):	0.027906	REXIS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New OCAMS OpNav (MB):	0	OLA	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TAG OpNav (MB):	187.1498	OVIRS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TagCams NonOpNav (MB):	133.86	OCAMS	Overflow	0.00	0.00	0.00	7.06	443.39	450.45	12.20%	0.00%
	Low Pri Data for Overflow (MB):	0	Overflow	N/A	0.00	0.00	0.00	N/A	133.86	133.86	16.94%	0.00%
	DOY	296	OpNav	Overflow	0.00	0.00	N/A	N/A	196.60	196.60	28.09%	0.00%
	Science Downlink Time (s)	12628.00	OTES	Overflow	0.00	0.00	0.00		0.00	0.00	0.00%	0.00%
	Data Rate (MBps):	0.027906	REXIS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
Week 2	New OCAMS OpNav (MB):	32.84539	OLA	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TAG OpNav (MB):	163.7561	OVIRS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TagCams NonOpNav (MB):	0	OCAMS	Overflow	0.00	0.00	0.00	7.06	0.00	7.06	0.19%	0.00%
	Low Pri Data for Overflow (MB):	0	Overflow	N/A	0.00	0.00	0.00	N/A	0.00	0.00	0.00%	0.00%
	DOY	297	OpNav	Overflow	0.00	0.00	N/A	N/A	28.09	28.09	4.01%	0.00%
	Science Downlink Time (s)	15028.00	OTES	Overflow	0.00	0.00	0.00		0.00	0.00	0.00%	0.00%
	Data Rate (MBps):	0.027906	REXIS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New OCAMS OpNav (MB):	4.692198	OLA	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TAG OpNav (MB):	23.39373	OVIRS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TagCams NonOpNav (MB):	0	OCAMS	Overflow	0.00	0.00	0.00	7.06	0.00	7.06	0.19%	0.00%
	Low Pri Data for Overflow (MB):	0	Overflow	N/A	0.00	0.00	0.00	N/A	0.00	0.00	0.00%	0.00%
	DOY	298	OpNav	Overflow	0.00	0.00	N/A	N/A	252.77	252.77	36.11%	0.00%
	Science Downlink Time (s)	15328.00	OTES	Overflow	0.00	0.00	0.00		0.00	0.00	0.00%	0.00%
	Data Rate (MBps):	0.027906	REXIS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New OCAMS OpNav (MB):	42.22978	OLA	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TAG OpNav (MB):	210.5436	OVIRS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TagCams NonOpNav (MB):	0	OCAMS	Overflow	0.00	0.00	0.00	7.06	0.00	7.06	0.19%	0.00%
	Low Pri Data for Overflow (MB):	0	Overflow	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	DOY	299	OpNav	Overflow	0.00	0.00	N/A	N/A	159.20	159.20	22.74%	22.74%
	Science Downlink Time (s)	0.00	OTES	Overflow	0.00	0.00	0.00		0.00	0.00	0.00%	0.00%
	Data Rate (MBps):	0.039184	REXIS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New OCAMS OpNav (MB):	42.22978	OLA	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TAG OpNav (MB):	116.9687	OVIRS	Overflow	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	New TagCams NonOpNav (MB):	0	OCAMS	Overflow	0.00	0.00	0.00	7.06	0.00	7.06	0.19%	0.19%
	Low Pri Data for Overflow (MB):	0	Overflow	N/A	0.00	0.00	0.00	N/A	0.00	0.00	0.00%	0.00%

Need for Retransmit? Need for Replay?

None

List of Unexpected Alarms, Watch Items, ISAs, PFRs

Unexpected Alarms:

- **None**

New or Updated Watch Items, ISA's and PFR's

ISA #	Date	Criticality	Type	Priority	Title	Detailed Description - Action Plan	Status
16640	10/18/2020	3	Spacecraft Minor	Normal	TAGCAMS: (10/18/2020) NavCam1 Repeating Pattern	The OpNav team noticed that some of the TAGCAMS images contained a repeating pattern in the images. Other than the pattern, the team indicated the images seemed to have reasonable pixel values and were still usable.	New
16605	10/12/2020	3	Ground minor	Normal	Incorrect Sequence Boundary During Week 2041 DKF Generation	he DSN was late configuring for the DSS-65 pass on DOY 286. The subsequent investigation discovered that the HGA pass was not present in the DKF/SOE at the station.	In Progress
16521	9/29/2020	3	Ground minor	Normal	Bad Drive for ORX/MVN LM/JPL Backup System	LM had an issue on one of the RAIDs attached to mvnarchive, which is used for archiving/backing up MVN/ORX data. It started with a bad drive, but when LM replaced it, the new drive wasn't recognized.	In Progress
15762	8/5/2020	3	Spacecraft minor	Normal	RW4 Digital Tach Variance Red AlarmsRehearsal	GN&C reviewed all of the RWA telemetry and attitude data (rates, attitude errors, etc). The spacecraft was in quiescent Nadir-Sun point, and not slewing, so no significant torque commands were on the wheels during the time of the tach variance count. No ATL activities were occurring either. GN&C did not observe any changes or concerns with the RWA data and everything looked nominal before and after the tach variance count occurred.	Monitor
13071	1/30/2020	3	Ground minor	Normal	STL invalid CRCs problem caught in action	During setup for an interactive test, frames were being rejected by the FEDS for invalid CRCs. The Test Engineer discovered the problem and assembled a group of people to troubleshoot while frames were in the process of being rejected. Please reference ISA #6476 for details on the initial discovery of this problem.	Monitor

Science Status and/or PI Status

- **There will be a post-TAG Science Weekly on 10/22**

Looking Ahead

2020																					
	42							43							44						
	286	287	288	289	290	#	#	293	294	295	296	297	298	299	300	301	302	303	304	#	#
	10/12	10/13	10/14	10/15	10/16	##	##	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	##	##
	M	T	W	R	F	Sa	Su	M	T	W	R	F	Sa	Su	M	T	W	R	F	Sa	Su
			Space craft Check						TAG		TAGS AM Imagi		SMM		Space craft Check	OCAM S/OTE S C/o	Samp Succ. Revie		OKDP-3		
Week 8 - Tactical kickoff																					
Week 7 - SOS																					
Week 6 - J-A 1																					
Week 5 - J-A 2	xm2047 - OpNav (Reboot Scenario)																				
- TCR approval, Handshake	xm2046 - OpNav (Reboot Scenario)							xm2047 - OpNav (Reboot Scenario)													
Week 3 - FA Kickoff								xm2046 - OpNav (Reboot Scenario)							xm2047 - OpNav (Reboot Scenario)						
: - Final Build/Delivery/Test															xm2046 - OpNav (Reboot Scenario)						
Week 1 - Review/Uplink	xm2044 - OpNav																				
	xm2045 - OpNav (Stow or Reboot Scenarios)																				
Week 0 - Execution	**xm2042 - Opnav**							**xm2043 - Opnav**							**xm2044 - OpNav**						

Reminders, Go Backs…

- **Learn more about the OSIRIS-REx team's last minute preparations for the sample collection event! Tune in TODAY at 3 pm EDT. More details here: https://go.nasa.gov/31lYkY7**
- **Upcoming Daily Downlink Tagups (note changes to upcoming schedule):**
  - Monday, 10/26
  - Monday, 11/02
- **Sampling Assessment Status meeting run by Project Office Oct 21-27. Limited participation in these meetings. Status will be provided weekly on Mondays at the Daily Downlink Tagups.**
- **Sampling Success Review 10/28**
- **OSIRIS-REx OKDP-3 Briefing to SMD AA DOY 304**

Backup

Instrument Weekly Status

- **OCAMS – off and nominal**
- **OTES – off and nominal**
- **TAGCAMS – issue we saw over the weekend is the ~3rd manifestation of a similar pattern than what we've seen before due to a radiation hit. As with the previous events, the pattern cleared upon a camera reset, so TAGCAMS is good to go for TAG.**

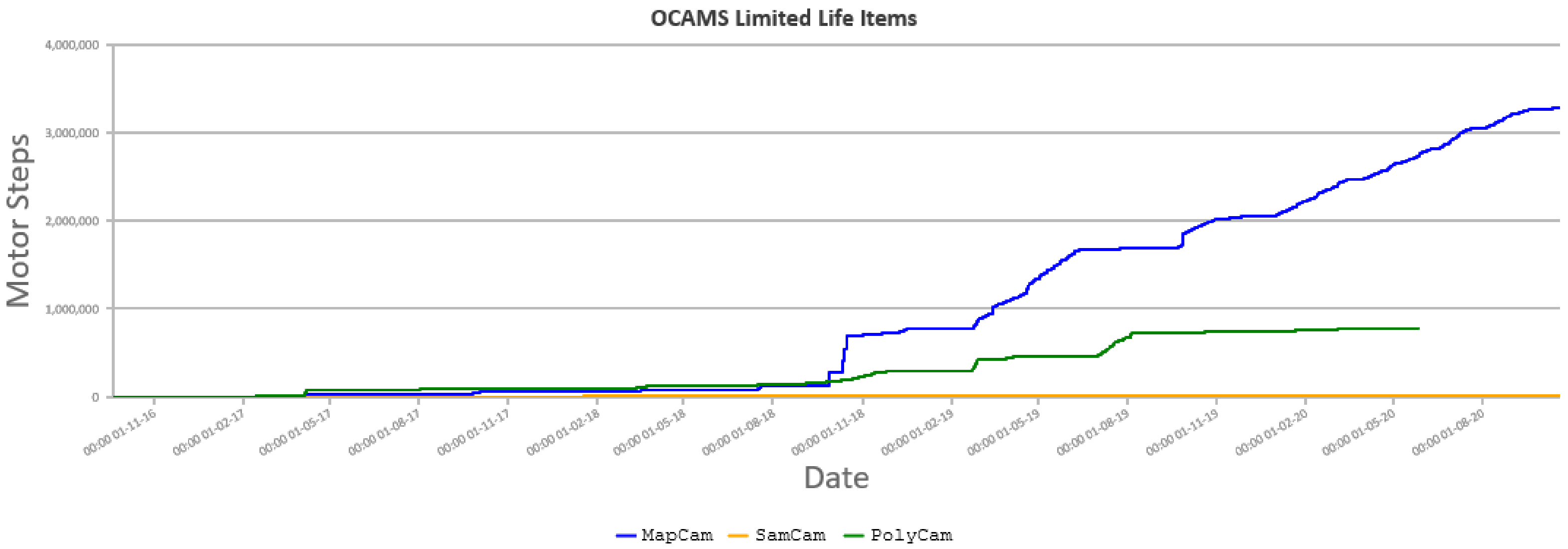
SPOC Watch Item List

- **None, all watch items now closed.**

OCAMS Mechanism Life Tracking

Status as of October 19, 2020

	Launch (steps)	Flight (steps)	Total (steps)	NTE (steps)
MapCam	1,057,475	3,298,255	4,355,730	5,000,000
SamCam	738,110	17,170	755,280	958,384
PolyCam	1,775,496	794,981	2,570,477	8,876,160



OLA Limited Life Laser Tracking

	Launch (hours)	Flight (hours)	NTE Margin (hours)
LELT	110.70	215.35	1,085.01
HELT	212.50	333.79	983.80

Status as of June 15, 2020

LELT has failed