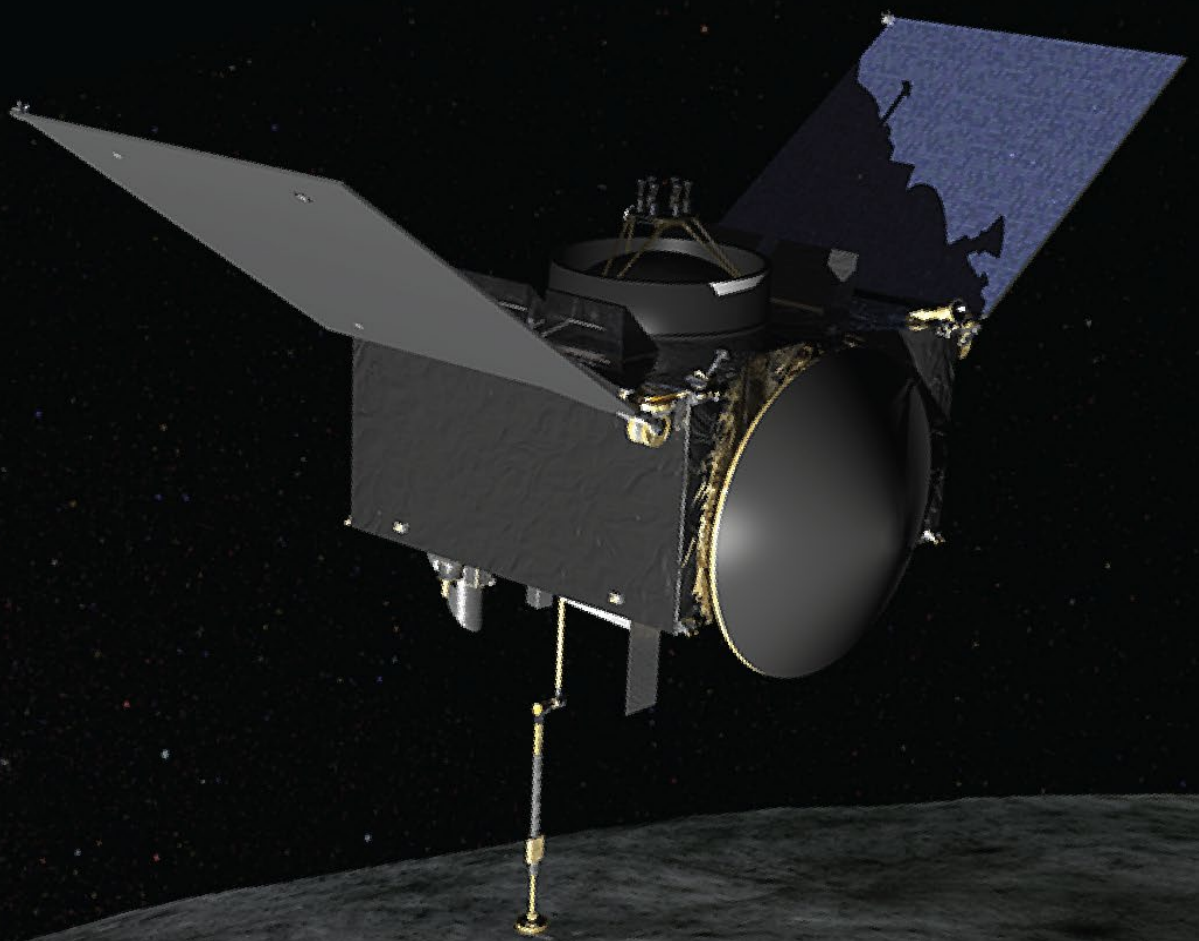
Daily Downlink Tagup

Monday, November 4, 2019 (DOY 308)

OSIRIS-REx™

ASTEROID SAMPLE RETURN MISSION



Agenda & Logistics

- **Quicklook and Weekly 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/2019

Quicklook and Weekly 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
OCAMS										**ON**	**GO**
OLA										**OFF**	**GO**
OTES										**OFF**	**GO**
OVIRS										**OFF**	**GO**
REXIS										**OFF**	**GO**
	Thermal	Power	Command Response	Alarms	Trending	Limited Life & Mechanisms	Data Completeness	Pipeline Status	Science Concurrence		

Downlink Schedule (times in UTC)

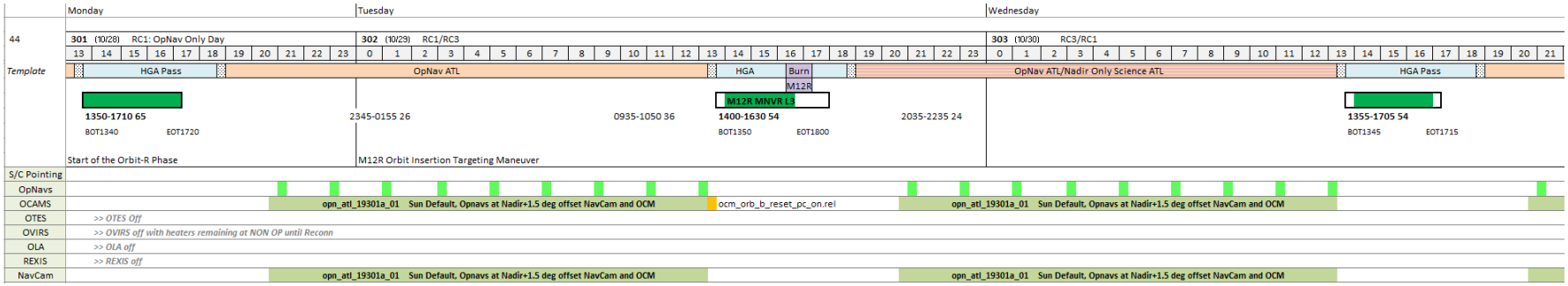
- ***Current Data : 600 kbps – All HGA tracks will be at the 600 kbps rate now.***

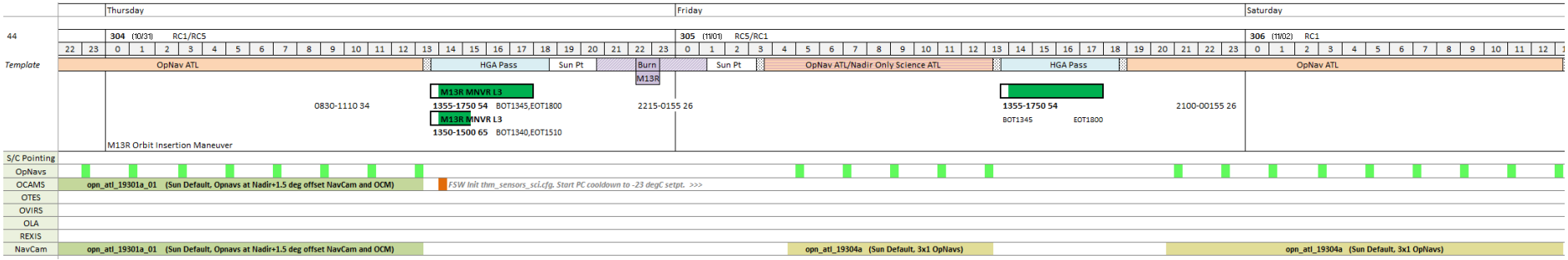
WOY	DOY	Start Date	HGA Start	End Date	HGA End	Duration	Note
45	308	2019-11-04	14:18	2019-11-04	16:19	2:01	*COMPLETE*
45	309	2019-11-05	14:18	2019-11-05	17:14	2:56	
45	310	2019-11-06	16:21	2019-11-06	17:54	1:33	
45	312	2019-11-08	14:18	2019-11-08	17:09	2:51	
45	313	2019-11-09	14:23	2019-11-09	17:54	3:31	
45	314	2019-11-10	14:28	2019-11-10	17:54	3:26	
46	315	2019-11-11	16:06	2019-11-11	17:54	1:48	

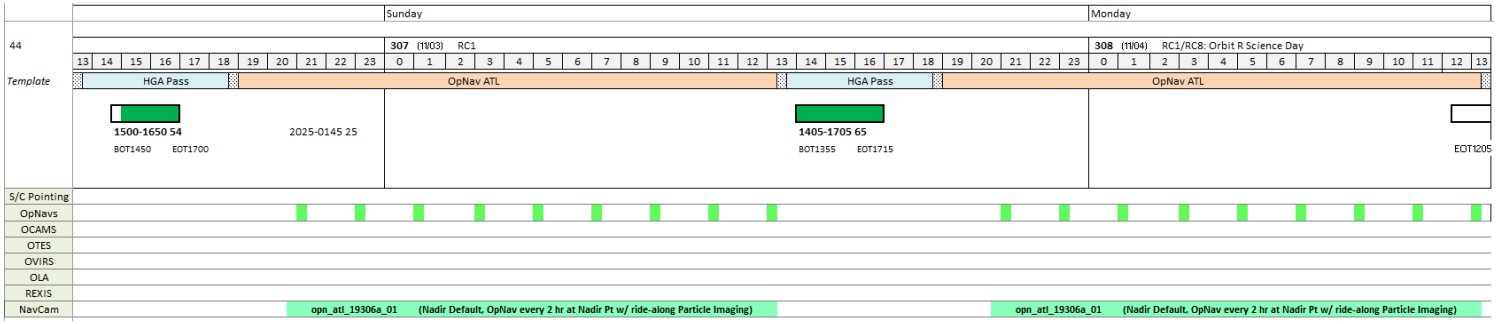
RED EQUIPMENT STATUS:

SPC/DSS	EQUIPMENT	ETRO
DSS54	RID	301/1630z
DSS14	X500kw-R	310/2300z
DSS63	EAC	355/1621z
SPC10	RSR2	358/2300z

Transition to Orbital R – M12R and M13R, OpNavs
WOY 44 - COMPLETE





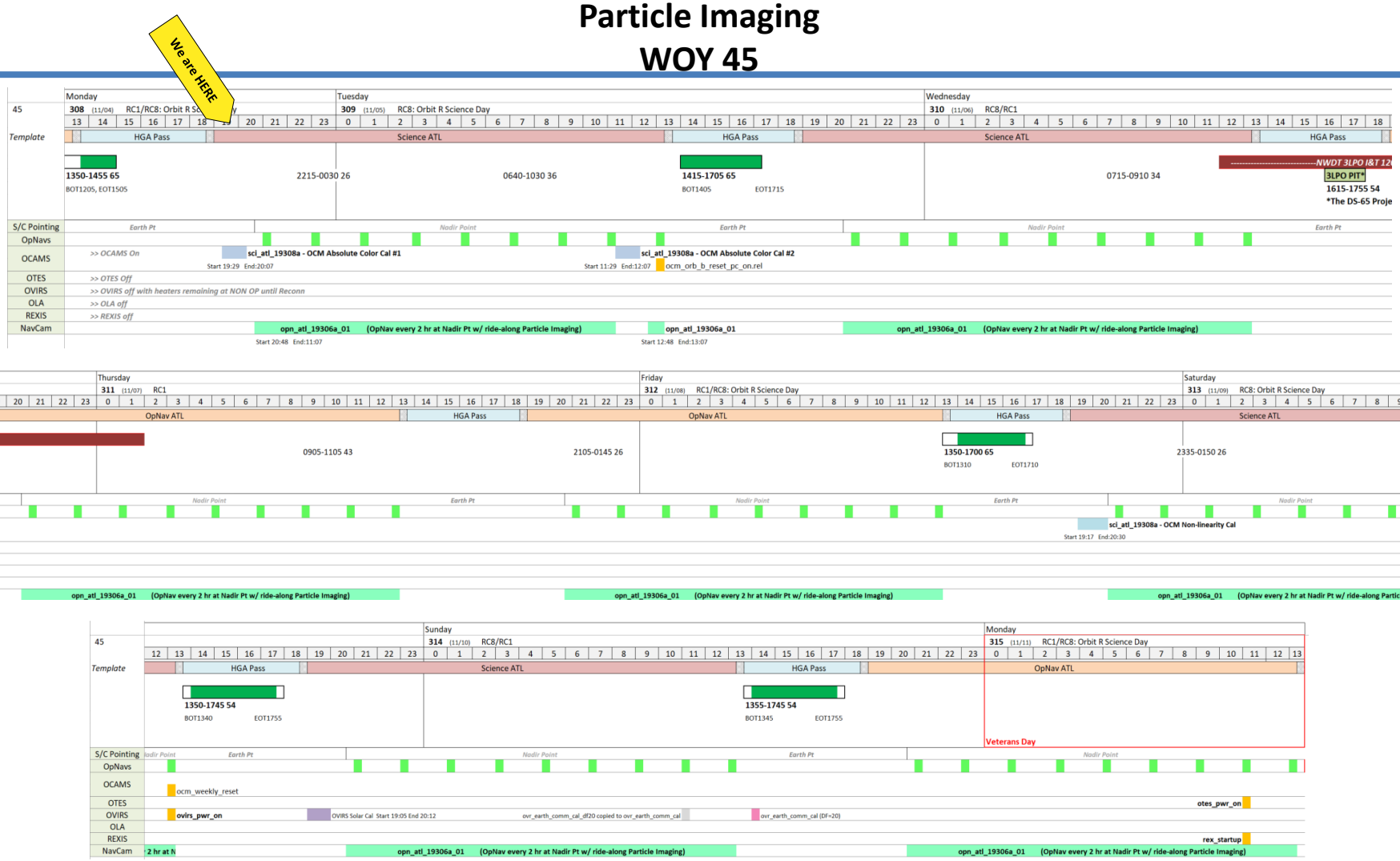


Mission Statistics as of 10/23/19 (L+1140 days)

- Earth Range = 266,000,000 km (1.78 AU) (↑)
- Sun Range = 192,000,000 km (1.28 AU) (↓)
- Bennu Range = 1.6 km (Recon A Nightingale Flyover this week)
- Sun-Probe-Earth Angle = 33.3 deg (↓)

OCAMS Absolute Color Cal and Non-Linearity Cal, OVIRS Solar Cal, OpNav with ridealong Particle Imaging

WOY 45



October 30, 2019
L+1147 days
Earth Range = 268,000,000 km (1.79 AU) (↑)
Sun Range = 190,000,000 km (1.27 AU) (↓)
Bennu Range = 1.6 km (Orbit-R insertion this week)
Sun-Probe-Earth Angle = 33.3 deg (↓)
One Way Light Time = 00:14:55 hh:mm:ss (↑)
Round Trip Light Time = 00:29:50 hh:mm:ss (↑)

Uplink Summary

UPLINK

WOY 45 (DOY 308-315 / Nov 4-Nov 11, 2019)

- BG Seq, Sci Genies, ATFs, Payload Sequences uplinked 2019-305

Ephemeris Updates

- OD-197 uplinked on DOY 2019-302
- OD-198 uplinked on DOY 2019-304
- OD-199 uplinked on DOY 2019-306

Other Files

- M13R late update uplinked 2019-304

Execution Summary

Executed (times in UTC):

- 2019/305 (Friday, Nov 1) – 2019/306 (Saturday, Nov 2)
  - OpNav Mosaics without particle images
    - # of NavCam OpNav images expected/**received** : 27 **/ 27**

- 2019/306 (Saturday, Nov 2) – 2019/307 (Sunday, Nov 3)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/**received** : 9 **/ 9**
    - # of NavCam Particle images expected/**received**: 18 **/ 18**

- 2019/307 (Sunday, Nov 3) – 2019/308 (Monday, Nov 4)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/**received** : 9 **/ 9**
    - # of NavCam Particle images expected/**received**: 18 **/ 18**

Up Next (times In UTC):

- 2019/308 (Monday, Nov 4) – 2019/309 (Tuesday, Nov 5)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/**received** : 9 **/**
    - # of NavCam Particle images expected/**received**: 18 **/**
  - OCAMS Absolute Color Cal #1 / #2
    - # of MapCam images expected/**received**: 78 **/**

- 2019/309 (Tuesday, Nov 5) – 2019/310 (Wednesday, Nov 6)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/**received** : 9 **/**
    - # of NavCam Particle images expected/**received**: 18 **/**

- 2019/310 (Wednesday, Nov 6) – 2019/311 (Thursday, Nov 7)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/**received** : 9 **/**
    - # of NavCam Particle images expected/**received**: 18 **/**

- 2019/311 (Thursday, Nov 7) – 2019/312 (Friday, Nov 8)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/**received** : 9 **/**
    - # of NavCam Particle images expected/**received**: 18 **/**

- 2019/312 (Friday, Nov 8) – 2019/313 (Saturday, Nov 9)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/**received** : 9 **/**
    - # of NavCam Particle images expected/**received**: 18 **/**
  - OCAMS Non-Linearity
    - # of SAMCAM images expected/**received**: 60 **/**
    - # of MAPCAM images expected/**received**: 60 **/**
    - # of POLYCAM images expected/**received**: 60 **/**

Downlink Summary

- ***Current Data Rate: 600 kbps***

Downlink

- Today's Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Current Partition Fill (%)	Comments
OpNav	0.00	99.37	99.37	14.20%	0.00%	
OTES	0.00	0.00	0.00	0.00%	0.00%	
REXIS	0.00	0.00	0.00	0.00%	0.00%	
OLA	0.00	0.00	0.00	0.00%	0.00%	
OVIRS	0.00	0.00	0.00	0.00%	0.00%	
OCAMS	0.00	198.75	198.75	5.57%	0.00%	
Overflow	0.00	0.00	0.00	0.00%	0.00%	

Downlink Summary

- ***Tomorrow's Data Rate: 600 kbps***

Downlink

- Tomorrow's Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	Comments
OpNav	0.00	99.37	99.37	14.20%	0.00%	
OTES	0.00	0.00	0.00	0.00%	0.00%	
REXIS	0.00	0.00	0.00	0.00%	0.00%	
OLA	0.00	0.00	0.00	0.00%	0.00%	
OVIRS	0.00	0.00	0.00	0.00%	0.00%	
OCAMS	0.00	381.74	388.80	10.53%	0.00%	
Overflow	0.00	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 # 12047 Single Corrupted TAGCAMS NavCam 1 Image**
  - ISA Status: In Progress
  - ISA Type: Spacecraft Minor
  - ISA Criticality: 3 – Minimal impact
- **ISA # 11980 No 2-way Doppler Tracking after M3R maneuver in Recon-A**
  - ISA Status: In Progress
  - ISA Type: Ground Minor
  - ISA Criticality: 2 – Significant impact
- **ISA # 11464 Maneuver Automation froze after executing PEF Gen- M30D Late Update**
  - ISA Status: In Progress
  - ISA Type: Ground Minor
  - ISA Criticality: 3 – Minimal impact
- **ISA # 11268 IMU1 Configuration Issue**
  - ISA Status: In Progress
  - ISA Type: Spacecraft Major
  - ISA Criticality: 2 – Significant impact

Science Status and/or PI Status

Reminders, Go Backs…

- **Daily Downlinks are now on a Monday / Wednesday / Friday schedule**

Looking Ahead

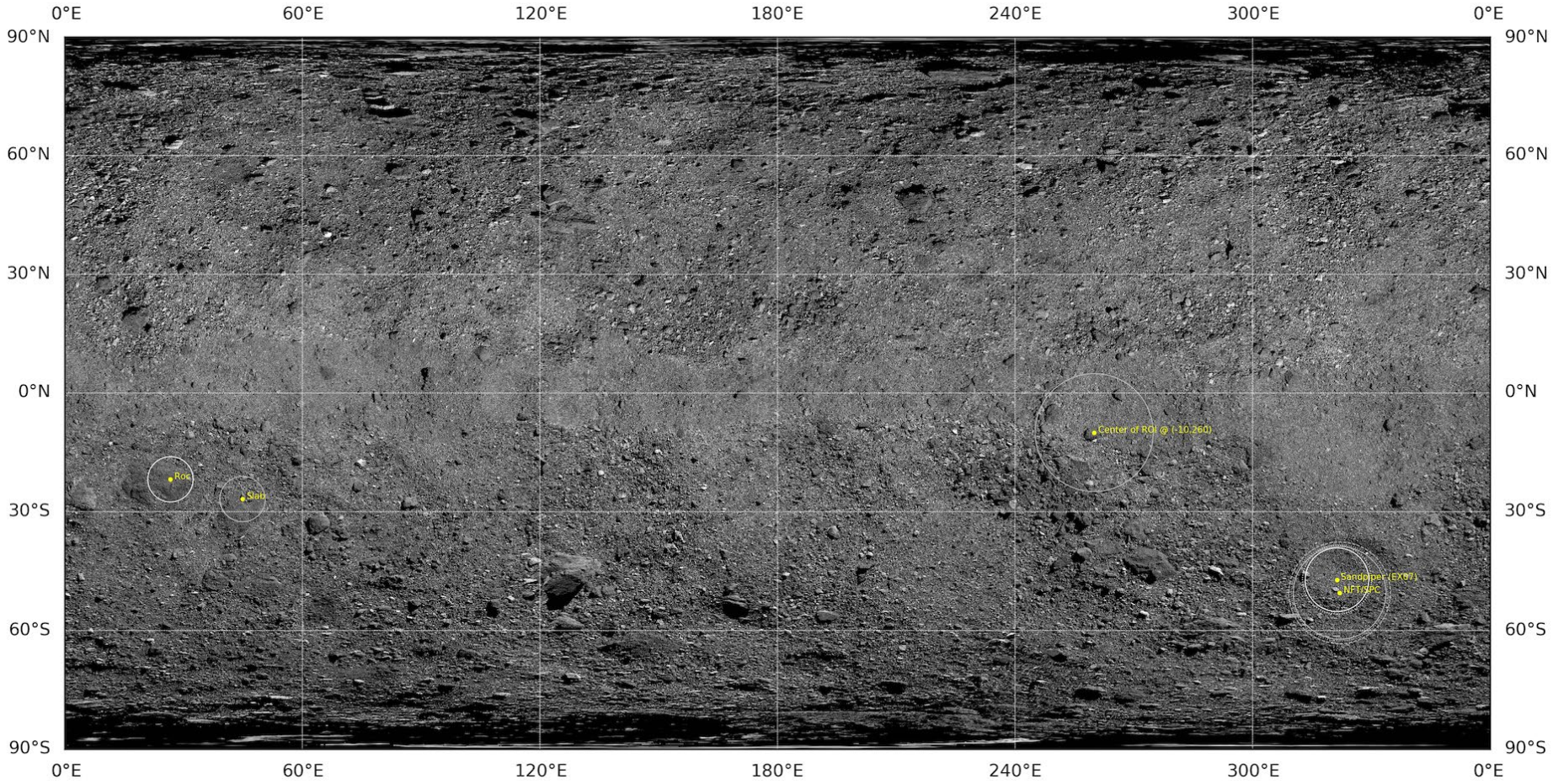
44							45							46							47						
301	302	303	304	305	###	###	308	309	310	311	312	###	###	315	316	317	318	319	###	###	322	323	324	325	326	###	###
10/28	10/29	10/30	10/31	11/1	###	###	11/4	11/5	11/6	11/7	11/8	###	###	11/11	11/12	11/13	11/14	11/15	###	###	11/18	11/19	11/20	11/21	11/22	###	###
M	T	W	R	F	Sa	Su	M	T	W	R	F	Sa	Su	M	T	W	R	F	Sa	Su	M	T	W	R	F	Sa	Su
														xm2004 - Medium Pass Flyby													
																					xm2004 - Medium Pass Flyby						
xm1949 - Orbital R - OpNavs							xm1950 - Orbital R - OpNavs							xm1951 - Orbital R - OpNavs							xm1952/01 - Orbital R - OpNavs						
xm1948 - Orbital R - OpNavs							xm1949 - Orbital R - OpNavs							xm1950 - Orbital R - OpNavs							xm1951 - Orbital R - OpNavs						
xm1947 - Orbital R - Global Mapping							xm1948 - Orbital R - OpNavs							xm1949 - Orbital R - OpNavs							xm1950 - Orbital R - OpNavs						
xm1946 - Orbital R - Global Mapping							xm1947 - Orbital R - Global Mapping							xm1948 - Orbital R - OpNavs							xm1949 - Orbital R - OpNavs						
xm1945 - Orbital R - Payload Cals							xm1946 - Orbital R - Global Mapping							xm1947 - Orbital R - Global Mapping							xm1948 - Orbital R - OpNavs						
xm1944 - Transit to Orbital R							**xm1945 - Orbital R - Payload Cals**							**xm1946 - Orbital R - Global Mapping**							**xm1947 - Orbital R - Global Mapping**						

Backup

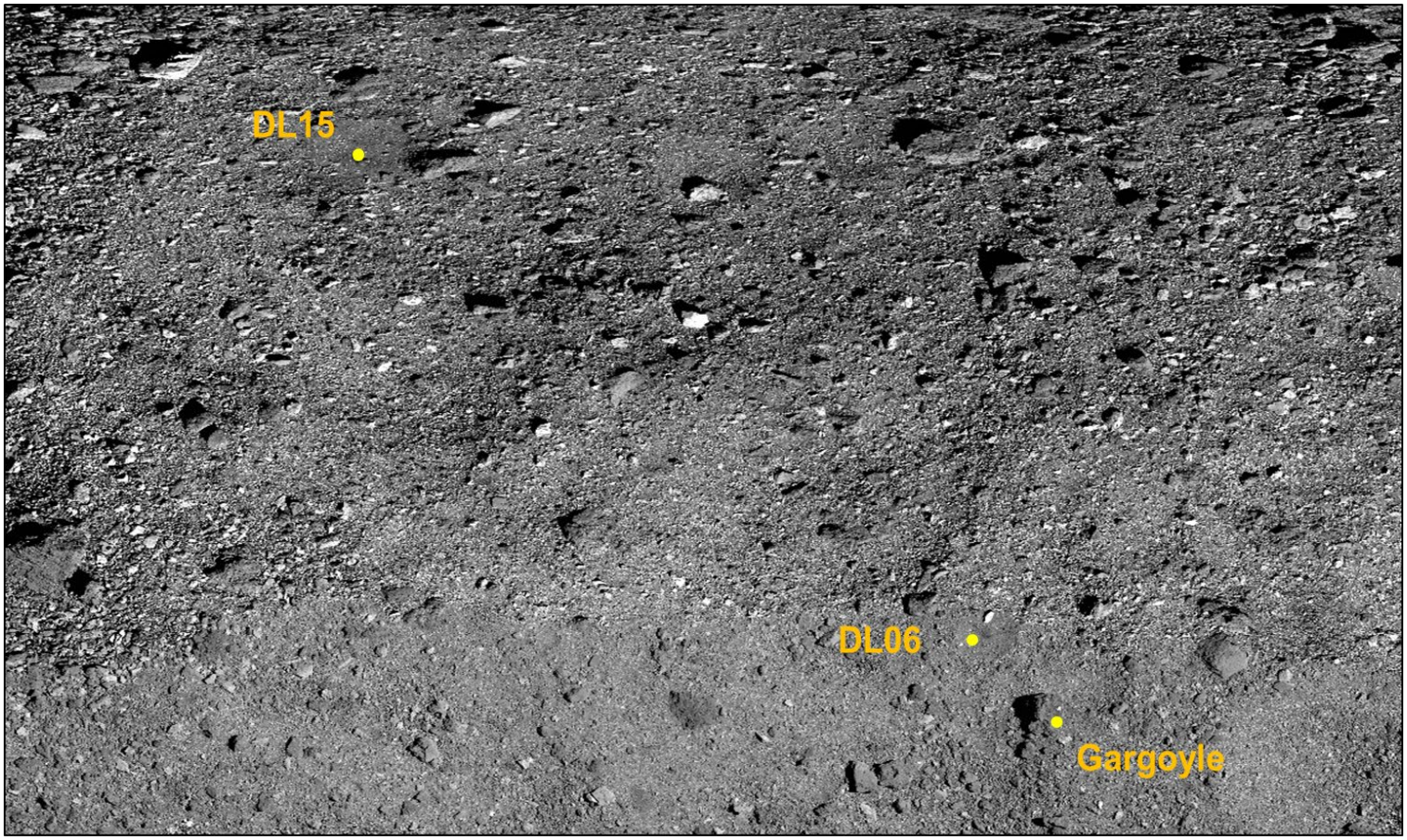
Instrument Weekly Status

- **OCAMS (Bashar) – On and nominal!**
- **OLA (“All IEs”) – Off and nominal!**
- **OTES (Chris) – Off and nominal!**
- **OVIRS (Amy) – Off and nominal!**
- **REXIS (Maddy) – Off and nominal!**

Sandpiper – EX07 Observations
WOY 40



Osprey – DL06 Observations
WOY 41

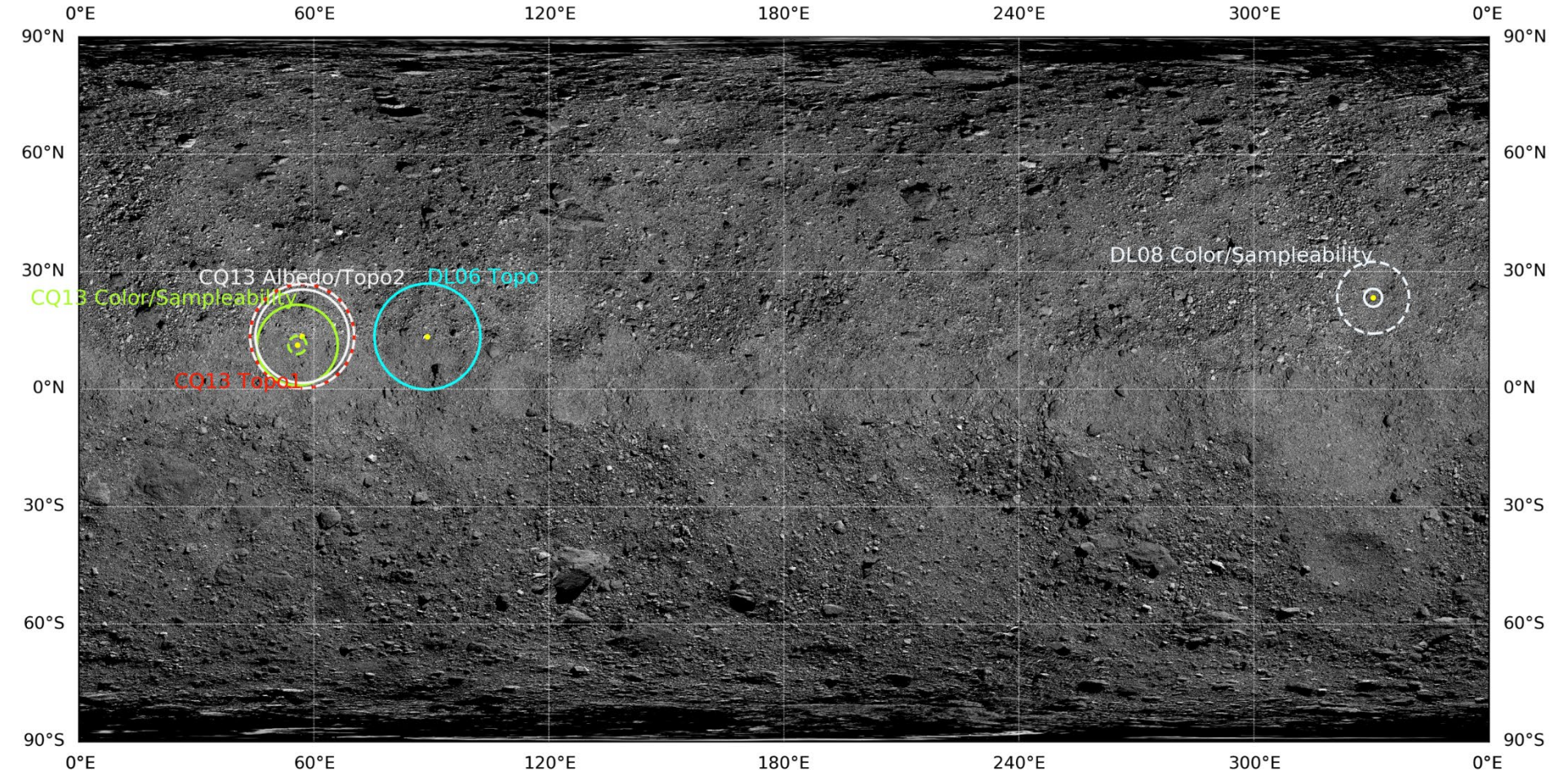


DL15 NFT: 57.28, 44.63
Scan Radius: 63.2 m

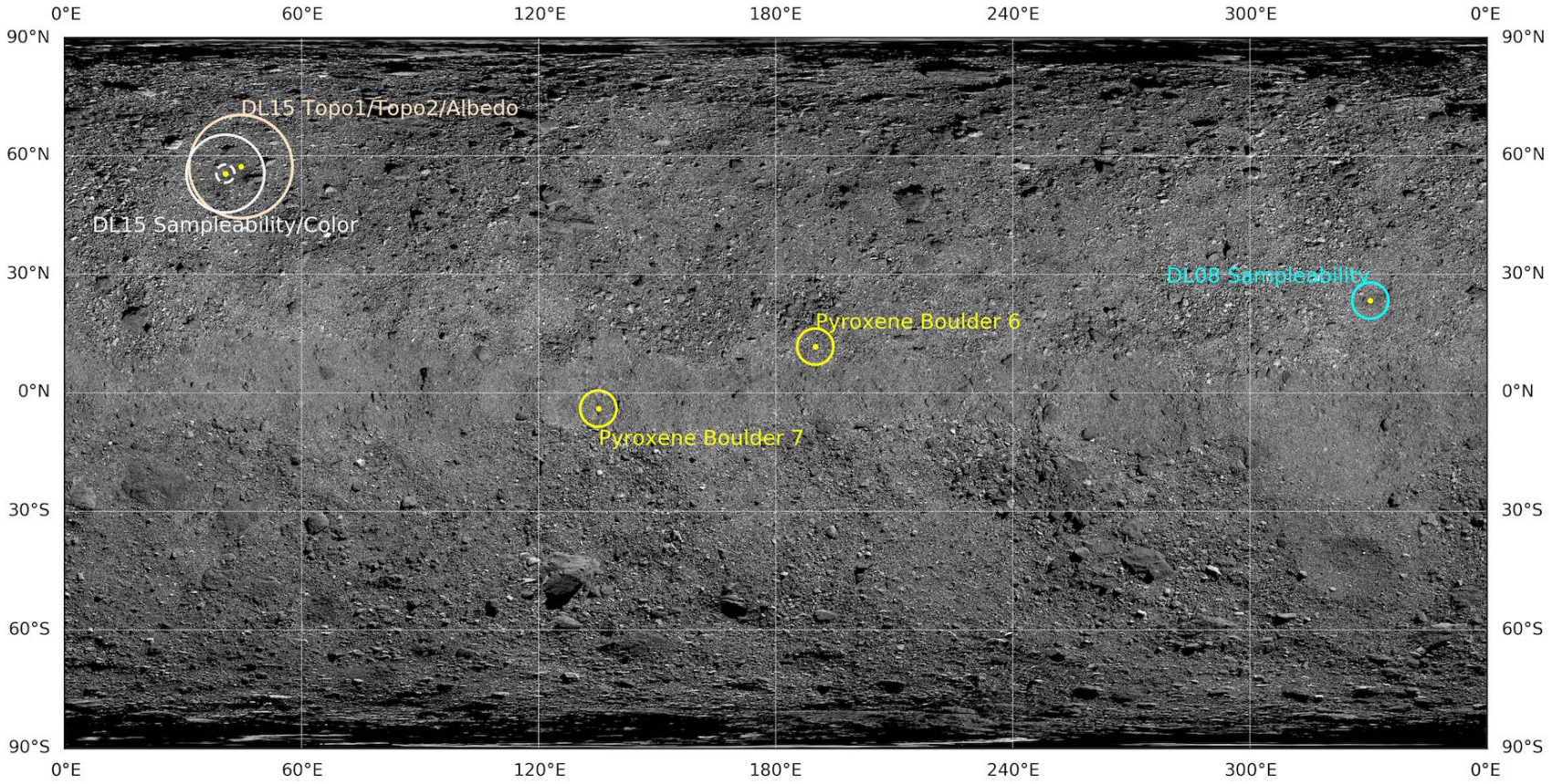
DL06 Site: 11.69, 87.93
Scan Radius: 41.4 m
DL06 NFT: 13.41, 89.00
Radii: (25m + 3-sig)
Scan Area: 57.23 – 63.8m

Gargoyle: 4.58, 92.69
Radius: 25 m

Kingfisher – CQ13 Observations
WOY 42



Nightingale – DL-15 Observations
WOY 43



	Primary DL15 Sampleability/Color	55.5°, 40.72°	43m/10m
	Primary DL15 Topo/Albedo	57.28°, 44.63°	57m
	Context Pyroxene	11.7°, 190°/-4°, 135.1°	20m
	Context DL08 Sampleability	23.34°, 330.45°	20m

Recon A EX07 (Sandpiper) Downlink Summary

Expected partition status at the end of the HGA passes

Data Rate: 600 kbps

Total Partition Fill % / Sandpiper Data (% Downlinked)

	DOY 279 Sunday	DOY 280 Monday	DOY 281 Tuesday	DOY 282 Wednesday	DOY 283 Thursday	DOY 284 Friday	DOY 285 Saturday
OCAMS	26.09% / (20%)	11.32% / **(100%)**	9.21% / **(100%)**	0.00% / **(100%)**	1.09% / **(100%)**	0.00% / **(100%)**	0.00% / **(100%)**
OTES	6.79% / (0%)	9.51% / (0%)	12.24%/ (0%)	0.00% / **(100%)**	0.00% / **(100%)**	0.00% / **(100%)**	0.00% / **(100%)**
OVIRS	31.43%/ (0%)	32.40%/ (0%)	33.37% / (0%)	6.55% / (98%)	3.60% / **(100%)**	0.00% / **(100%)**	0.00% / **(100%)**

Recon A DL06 (Osprey) Downlink Summary

Expected partition status at the end of the HGA passes

Data Rate: 600 kbps

Total Partition Fill % / Osprey Data (% Downlinked)

	DOY 286 Sunday	DOY 287 Monday	DOY 288 Tuesday	DOY 289 Wednesday	DOY 290 Thursday	DOY 291 Friday	DOY 292 Saturday
OCAMS	15.29% (70%)	7.47% (100%)	1.87% (100%)	0.00% (100%)	0.00% (100%)	0.00% (100%)	0.00% (100%)
OTES	7.07% (0%)	9.31% (0%)	11.92% (0%)	0.00% (100%)	0.00% (100%)	0.00% (100%)	0.00% (100%)
OVIRS	41.58% (0%)	42.6% (0%)	43.19% (0%)	10.55% (85%)	1.34% (100%)	0.00% (100%)	0.00% (100%)

Recon A CQ13 (Kingfisher) Downlink Summary

Expected partition status at the end of the HGA passes

Data Rate: 600 kbps

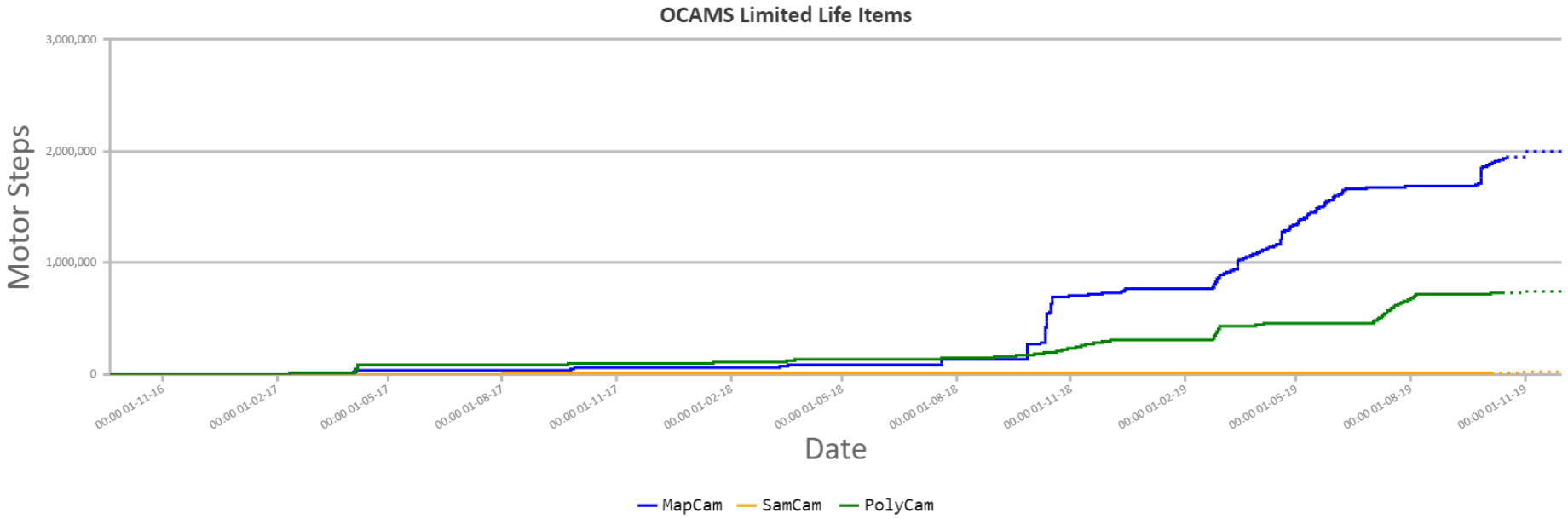
Total Partition Fill % / Kingfisher (% Downlinked)

	DOY 293 Sunday	DOY 294 Monday	DOY 295 Tuesday	DOY 296 Wednesday	DOY 297 Thursday	DOY 298 Friday	DOY 299 Saturday
OCAMS	28.84% (5.4%)	11.18% (93%)	5.17% (100%)	0.00% (100%)	0.00% (100%)	0.00% (100%)	0.00% (100%)
OTES	6.98% (0%)	9.71% (0%)	12.44% (0%)	0.00% (100%)	0.00% (100%)	0.00% (100%)	0.00% (100%)
OVIRS	41.39% (0%)	42.35% (0%)	43.32% (0%)	12.32% (100%)	0.00% (100%)	0.00% (100%)	0.00% (100%)

OCAMS Mechanism Life Tracking

	Launch (steps)	Flight (steps)	NTE (steps)
MapCam	1057475	1947916	3400320
SamCam	738110	15246	958384
PolyCam	1775496	735030	8876160

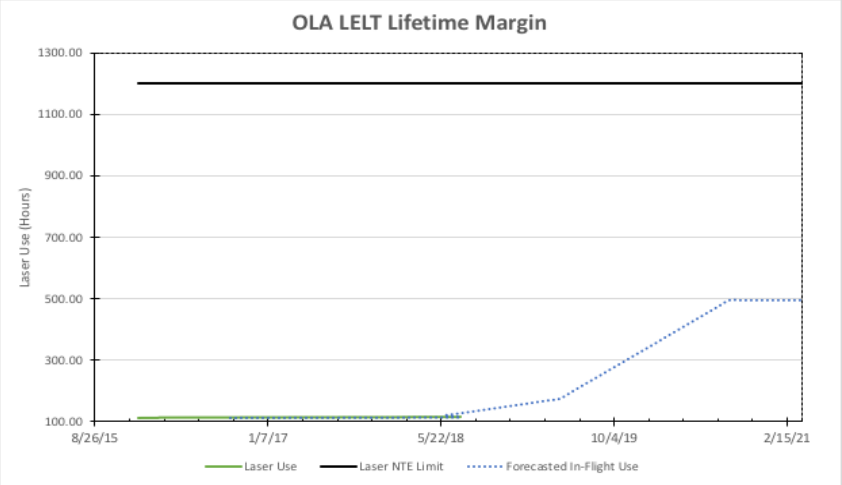
Status as of October 16, 2019

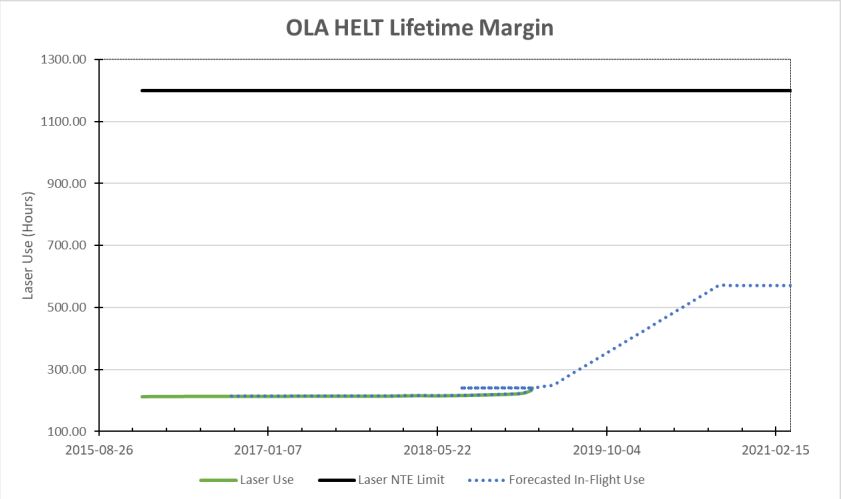


OLA Limited Life Laser Tracking

	Launch (hours)	Flight (hours)	NTE Margin (hours)
LELT	110.70	89.55	1,085.01
HELT	212.50	108.43	983.80

Status as of August 5, 2019





SPOC Watch Item List

Todays Date:	10/11/2019	SPOC Watch Item List									
Status	Date Added	Date Removed	Item ID	Instrument	Title	Watch Item Description	Impact Type	Watch Item Age	ISA # or TCR #	Watch Item Action	Watch Item Action Plan
Open	4/3/18		Item10	OLA	OLA T0 Intensity	L+10 day, L+6 mo, and L+10 mo On-orbit checkouts showed that OLA's T0 signal intensity (Return Intensity) is an order of magnitude lower than expected as compared with pre-launch spacecraft and stand-alone test data. The L+18 calibrations revealed that the T0 intensity is at pre-launch levels on both the Gold and Silver sides of OLA. SPOC has opted to close ISA 2257 and continue to monitor T0 intensity as a watch item.	Instrument Performance	556		Watch	Monitor the T0 Intensity at the L+22 and L+30 OLA checkouts Update 08/06/2018: Based on results from L+18 and L+22, OLA has not been able to discern a temperature dependency with t0 Intensity value. We will continue to watch, but may never fully understand the cause. OLA can still operate as expected despite the inconsistency seen in the t0 value. Update 5/9/2019: The OLA Team continues to monitor the T0 intensity. Since it was first detected, the behavior of the HELT laser has remained constant through Orbital A and Detailed Survey. At this time, our recommendation is to maintain this item on the watch list through (at least) Orbital-B so as to observe behavior of the second laser (LELT).
Open	9/5/18		Item11	OCAMS	OCAMS Error on Polycam Startup	During power on of the OCAMS cameras there is the possibility of a 4 byte packet being created due to line noise. SPOCFLIGHT is unsure what to do with this packet, so flags it as an error. So far this has only occurred twice during flight, both times with Polycam but it is possible this could occur with any of the OCAMS cameras. As OCAMS has only been used sparingly during Cruise, it is not certain how frequently this error will occur.	Instrument Performance	401		Watch	Will monitor for future occurances across all of the OCAMS cameras and assess if any action is warranted. Update 5/7/2019: We are continuing to monitor this behavior. We have seen this issue crop up all when powering on PolyCam.

Anomaly Response & Status

ISA #	Date Created	Type	Priority	Title	Detailed Description - Action Plan	Notes	Status	Resolved Date	Need Date
11575	10/3/19	Ground Minor	Normal	Sequence Collision in WOY 41 SoftSim run	The DOY 285 preliminary SoftSim run indicated a sequence collision between ocm_rcn_19285_dl06_002 and ocm_rcn_19285_028. The J-Asteroid plan showed an 1.6 second margin between these two sequences. The OLVM run showed 3 seconds margin between the two sequences. The SoftSim run showed a 0.1 second overrun of the first sequence therefor not loading the second sequence.		New	TBD	TBD
11287	9/9/19	Ground Minor	Normal	Incorrect Spacing Between OVIRS BPM Update Sequences	During review of the OVIRS bad pixel map update, it was discovered that one of the OVIRS BPM sequences needed to be rebuilt for a pass 2 cycle. This update resulted in a change to the sequence execution duration which was not communicated to the MSA. This drove a change to the OVIRS BPM activity sequence built by the MSA to prevent sequence collisions during the activity as a result of the longer execution duration. When the correct runtime was presented by the SPOC, the MSA interpreted the sequence runtime without the original 2-minute padding planned during the activity at kickoff.		In Progress	TBD	TBD
11268	9/5/19	Spacecraft Major	Normal	IMU1 Configuration Issue	During MIMU procurement on the LUCY program, it was found that the OSIRIS-REx IMU1 (S/N 502) was loaded with an incorrect Built-In-Test (BIT) parameter file at Honeywell prior to delivery to Lockheed Martin. This file defines the bit mapping of the MIMU status word. The status word contains a set of bits that are set high in the presence of various errors detected internally by the MIMU when performing Built-In-Tests.		In Progress	TBD	TBD
11196	9/2/19	Spacecraft Minor	Normal	TAGCAMS: (09/02/19) Aliveness and Low Speed Sync Search	Approximately 35 minutes after the weekly power-cycle completed on DoY 2019-245 several counts on were taken on the TAGCAMS low speed sync search. These errors resulted in an aliveness count. As this error occurred after the nominal daily TAGCAMS DVR management and prior to any nominal usage there should be no missing or corrupted image data due to this upset (from the prior day, and none expected for the upcoming day).		In Progress	TBD	TBD
10979	8/7/19	Ground Minor	Normal	Delayed reconstructed CK delivery on a Crit 2 OpNav Downlink day	There was a delay in receipt of the reconstructed CK on DOY 217 08/05/19 during a Criticality 2 OpNav Downlink day.		In Progress	TBD	TBD
10939	8/2/19	Spacecraft Minor	Normal	REXIS SXM recording significantly fewer counts	During Orbital B operations (starting Jul 1 2019) the REXIS Solar X-ray Monitor (SXM)		Monitor	TBD	TBD
7704	1/10/19	Spacceraft Major	Normal	Potential particles detected in NavCam images while in Bennu Orbit-A Phase	Investigation and detailed image analysis are underway to determine if particles detected in a pair of NavCam images taken on 01/06/19 may have originated from Bennu (or from other causes such as cold traps on the spacecraft, cosmic rays, etc.) MPB convened to determine if it was safe for the spacecraft to remain in orbit and agreed to remain in orbit but to collect more data for the remaining weeks of the orbit phase as a precaution. The details of the additional and more efficient and targeted observations are being worked.		Monitor	TBD	TBD
7518	1/4/19	Ground Major	High	CenturyLink National Outage	A nationwide CenturyLink outage did not allow normal ground activities for OSIRIS-REx including uplink, downlink, and moving data between elements. Outage Start December 27, 2018 08:40 GMT Outage Stop December 29, 2018 10:12 GMT Approximately 50 hours		In Progress	TBD	TBD

Current ISA Status

#	Status	Priority	Subject	Assignee	Updated
11464	In Progress	Normal	Maneuver Automation froze after executing PEF Gen - M30D Late Update	Paul Falkenstern	9/28/19 8:52
11287	In Progress	Normal	Incorrect Spacing Between OVIRS BPM Update Sequences	Andy Calloway	9/13/19 10:19
11268	In Progress	Normal	IMU1 Configuration Issue	Mark Fisher	9/13/19 10:18
11196	In Progress	Normal	TAGCAMS: (09/02/19) Aliveness and Low Speed Sync Search	Brent Bos	9/4/19 8:38
11180	In Progress	Normal	orxmsanfs System Patching Issue with ZFS	Lance Tanaka	8/29/19 10:36
10939	Monitor	Normal	REXIS SXM recording significantly fewer counts	Karl Harshman	10/7/19 8:57
8767	In Progress	Normal	Re-occurrence: STL intermittent downlink issues during setup	Amir Mirfakhrai	9/29/19 20:07
7704	Monitor	Normal	Potential particles detected in NavCam images while in Bennu Orbit-A Phase	Ron Mink	9/13/19 9:07
7518	In Progress	High	CenturyLink National Outages	Andy Calloway	9/28/19 8:55