15406 - Cause and characteristics of the major outburst of comet C/2017 O1 (ASASSN)

Cycle: 25, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) C2017-O1	WFC3/IR WFC3/UVIS	1	01-Feb-2018 15:03:23.0	yes
02	(1) C2017-O1	WFC3/IR	1	01-Feb-2018 15:03:25.0	yes
03	(1) C2017-O1	WFC3/UVIS	1	01-Feb-2018 15:03:27.0	yes

3 Total Orbits Used

ABSTRACT

We seek to observe comet C/2017 O1 (ASASSN), which remained undetected even at a distance from the Sun of only a few a.u., but is currently undergoing a major outburst (dm~5). We aim to search for near-nucleus fragments and, if they are present, determine their size distribution down to <10m, investigate the total mass of ejected material, and identify the cause of the outburst by measuring fragment velocities and searching for color variations among the fragments. C/2017 O1 provides a unique opportunity to collect observational evidence of the origins and evolution of comets, as only a handful of long-period comets that have had outbursts this large have been studied in detail.

We propose a single-orbit observation in November to establish whether fragmentation occurred; only if fragments are detected, we request two additional single-orbit observations in intervals of a few days to determine the fragments' velocity and evolution. Should fragments be found to move too slowly to allow velocity determinations from the resulting dataset, we request a final set of two 1-orbit visits in February 2018 when the fragments' separation has increased.

Regardless of whether splitting occurred or not, the requested observations will allow us to explore the inner coma for any structures or jets that could reveal the physical mechanism behind the outburst, thus adding an important datapoint to a currently still very small sample of well studied cometary outbursts. As such, the proposed project will provide fresh insights into a class of objects that are central to our understanding of the physical and chemical evolution of the solar system.

OBSERVING DESCRIPTION

This single-orbit observation is meant to establish whether fragmentation is the cause of the outburst and to search for differences in color between any fragments, if present. If fragments are detected, two additional visits will be requested in order to measure the fragments' velocities.

The present observation is designed to (a) detect the nucleus as well as any fragments, using the high throughput of the F350LP filter and the excellent angular resolution of WFC3/UVIS, and (b) to explore the presence of color variations by obtaining photometry in a much redder, high-throughput bandpass, namely the F110W filter in the WFC3/IR channel. Both parts of this exploration take about approximately equal parts of this single-orbit observation; dithering is applied to the extent allowed by the constraints set by the need to dump buffers.

The sole visit of this observation needs to be scheduled within the Nov 29 - Dec 3, 2017 window within which projection effects are minimal, thereby allowing fragments to be detected if present. The optimal time within this window, determined by the requirement that a sufficient number of reference stars (and no bright stars) fall within the field of view, is still under investigation.

Visit

Proposal 15406, Visit 1 (01), completed Thu Feb 01 20:03:28 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: BETWEEN 29-NOV-2017:00:00:00 AND 03-DEC-2017:00:00:00

Comments: We request scheduling of this observation in the 2017.335:00:16:14 slot.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(2)
(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

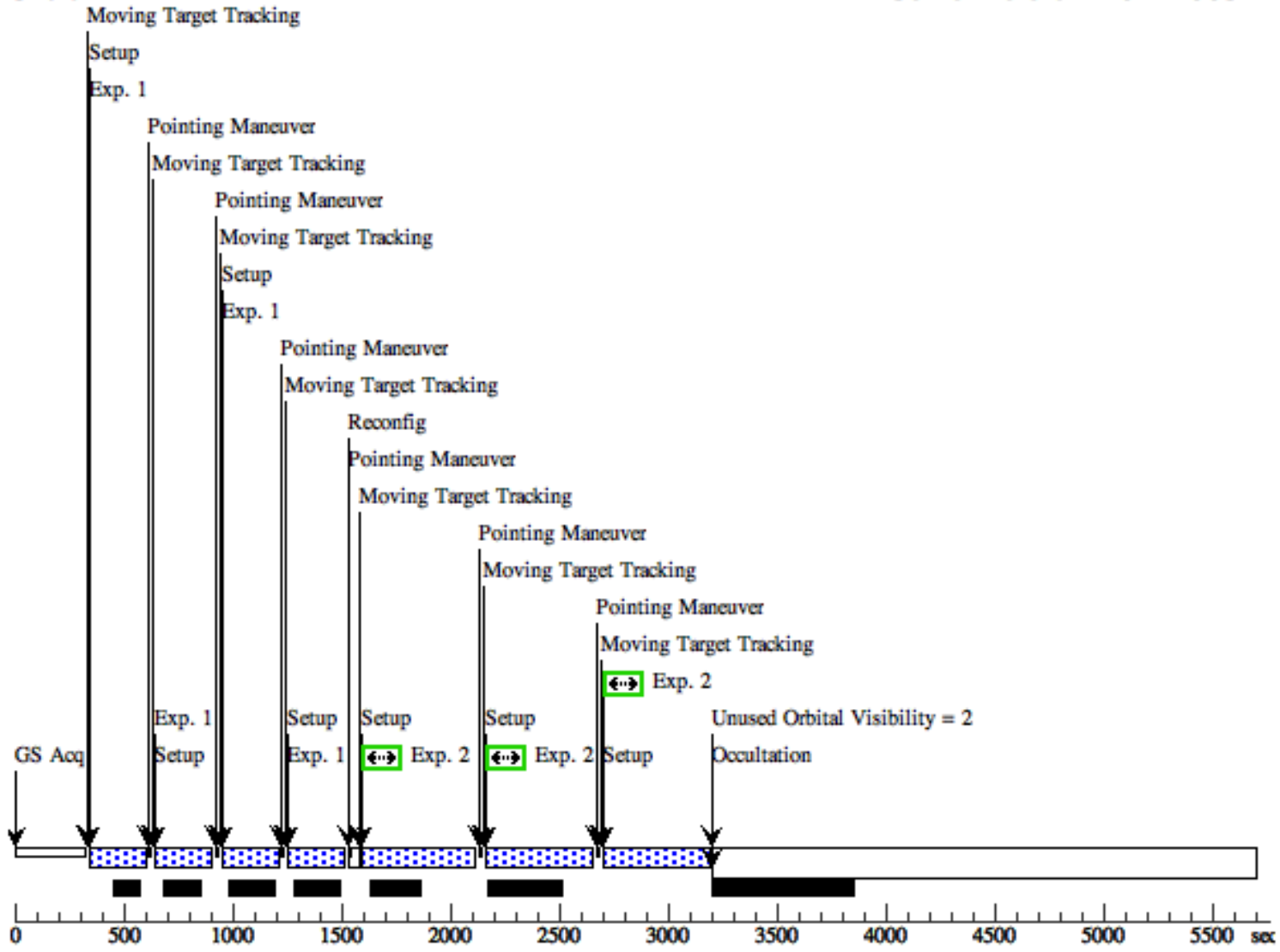
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	C2017-O1	TYPE=COMET,Q=1.49871313,E=0.9965450,I=39.84913,O=25.81029,W=20.90731,T=14-OCT-2017:18:49:20,TTimeScale=UTC,EQUINOX=J2000,EPOCH=01-NOV-2017:00:00:00,EpochTimeScale=UTC,A1=0,A2=0,A3=0				EARTH

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) C2017-O1	WFC3/IR, MULTIACCUM, IR-UVIS	F110W	SAMP-SEQ=SPARS25; NSAMP=10	POS TARG null,45	Sequence 1-1 Non-Int in Visit 1 (01) Pattern 3, Exps 1-1 in Sequence 1-1 Non-Int in Visit 1 (01) (3)	227.936926 Secs (911.748 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) C2017-O1	WFC3/UVIS, ACCUM, UVIS1	F350LP			Sequence 2-2 Non-Int in Visit 1 (01) Pattern 1, Exps 2-2 in Sequence 2-2 Non-Int in Visit 1 (01) (1)	349 Secs (1116 Secs) *[==>372.0 Secs (Pattern 1)]* *[==>372.0 Secs (Pattern 2)]* *[==>372.0 Secs (Pattern 3)]*	***[1]***

Orbit Structure



Visit

Proposal 15406, IR-F110W (02), implementation Thu Feb 01 20:03:28 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 90D TO 91 D; BETWEEN 12-FEB-2018:00:00:00 AND 18-FEB-2018:00:00:00

Diagnostics

(Exposure 1 (Pattern 4, Exps 1-1 in Sequence 1-1 Non-Int in IR-F110W (02)) special requirements) Warning (Form): Be very careful mixing POS TARG and Center_Pattern = Yes

Patterns

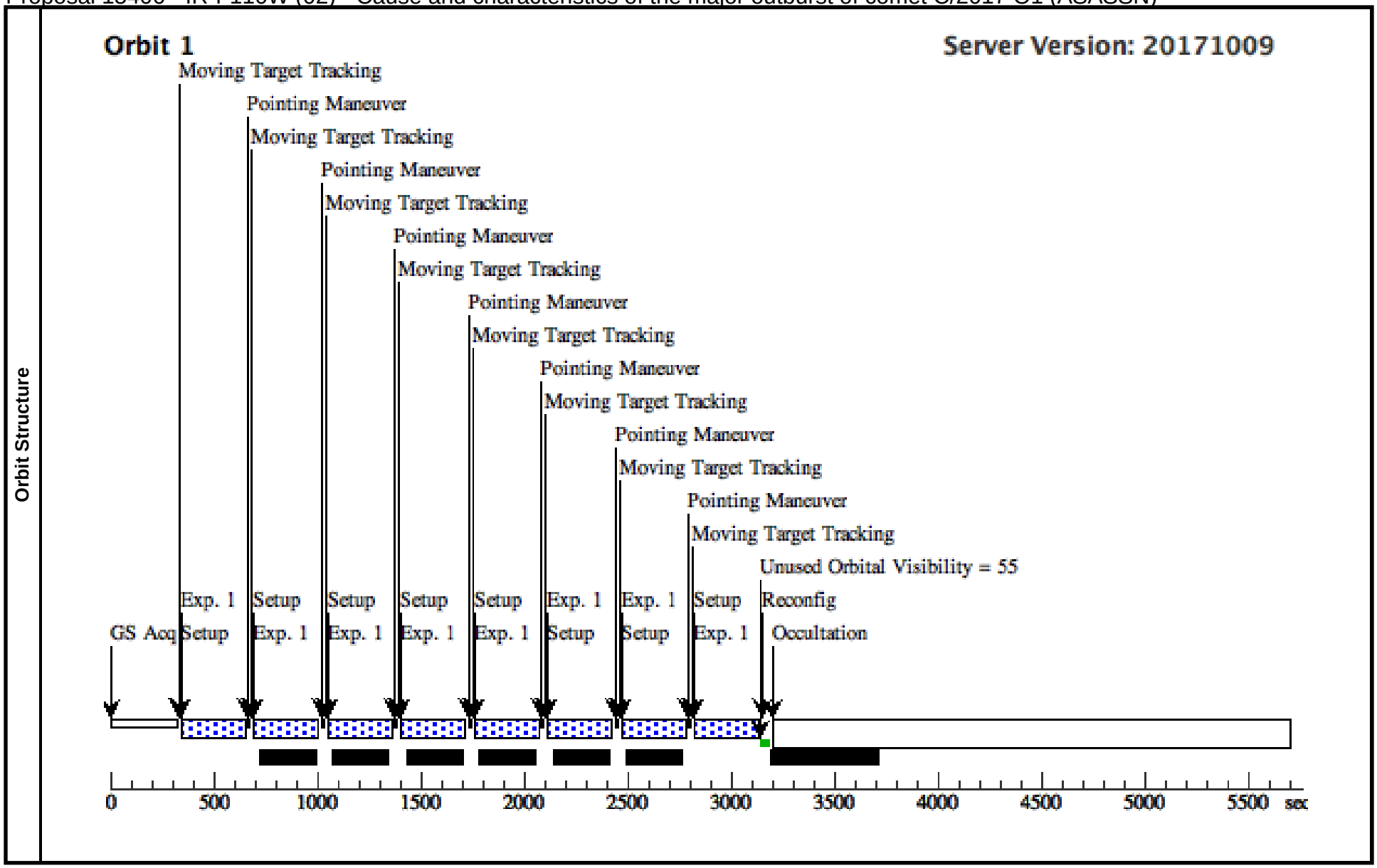
#	Primary Pattern		Secondary Pattern		Exposures
(4)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false	(1)

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	C2017-O1	TYPE=COMET,Q=1.49871313,E=0.9965450,I=39.84913,O=25.81029,W=20.90731,T=14-OCT-2017:18:49:20,TTimeScale=UTC,EQUINOX=J2000,EPOCH=01-NOV-2017:00:00:00,EpochTimeScale=UTC,A1=0,A2=0,A3=0				EARTH

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) C2017-O1	WFC3/IR, MULTIACCUM, IR-UVIS-CENTER	F110W	SAMP-SEQ=SPARS25; NSAMP=12	POS TARG -45,null	Sequence 1-1 Non-Int in IR-F110W (02) Pattern 4, Exps 1-1 in Sequence 1-1 Non-Int in IR-F110W (02) (4)	277.937956 Secs (2223.504 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 1,3)]* *[==>(Pattern 1,4)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]* *[==>(Pattern 2,3)]* *[==>(Pattern 2,4)]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20171009
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Orbital Visibility = 55
GS Acq
Exp. 1
Setup
Setup
Exp. 1
Setup
Exp. 1
Setup
Exp. 1
Setup
Exp. 1
Setup
Exp. 1
Setup
Exp. 1
Setup
Exp. 1
Reconfig
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15406, UVIS-F350LP (03), implementation Thu Feb 01 20:03:28 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: SAME ORIENT AS 02

Diagnostics

(Exposure 1 (Pattern 5, Exps 1-1 in Sequence 1-2 Non-Int in UVIS-F350LP (03)) special requirements) Warning (Form): Be very careful mixing POS TARG and Center_Pattern = Yes

Patterns

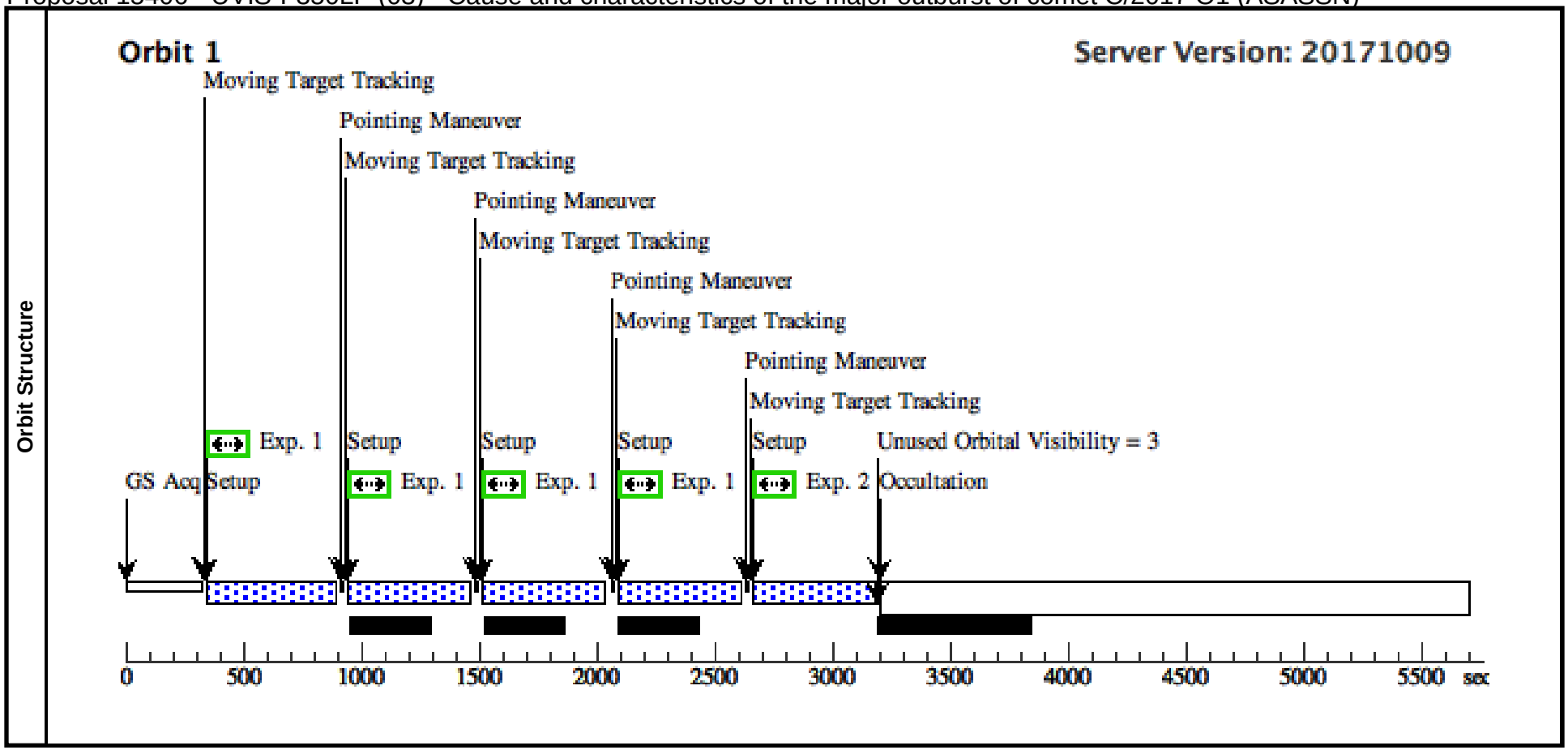
#	Primary Pattern		Secondary Pattern		Exposures
(5)	Pattern Type=WFC3-UVIS-GAP-LINE Purpose=MOSAIC Number Of Points=2 Point Spacing=2.414 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.759 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false	(1)

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	C2017-O1	TYPE=COMET,Q=1.49871313,E=0.9965450,I=39.84913,O=25.81029,W=20.90731,T=14-OCT-2017:18:49:20,TTimeScale=UTC,EQUINOX=J2000,EPOCH=01-NOV-2017:00:00:00,EpochTimeScale=UTC,A1=0,A2=0,A3=0				EARTH

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) C2017-O1	WFC3/UVIS, ACCUM, UVIS-CENTER	F350LP	CR-SPLIT=NO	POS TARG -45,5; GS ACQ SCENARIO BASE1B3	Sequence 1-2 Non-Int in UVIS-F350LP (03) Pattern 5, Exps 1-1 in Sequence 1-2 Non-Int in UVIS-F350LP (03) (5)	409 Secs (1636 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[1]***
2		(1) C2017-O1	WFC3/UVIS, ACCUM, UVIS-CENTER	F350LP		POS TARG -45,5	Sequence 1-2 Non-Int in UVIS-F350LP (03)	409 Secs (409 Secs) *[==>]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20171009
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
GS Acq
Setup
Exp. 1
Setup
Exp. 1
Setup
Exp. 1
Setup
Exp. 1
Setup
Exp. 2
Unused Orbital Visibility = 3
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec