



15158 - Astrometry of 2014MU69 for New Horizons encounter

Cycle: 24, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
07	(1) 486958-A	WFC3/UVIS	1	18-Jun-2018 18:05:56.0	yes
08	(2) 486958-B	WFC3/UVIS	1	18-Jun-2018 18:05:57.0	yes
09	(3) 486958-C	WFC3/UVIS	1	18-Jun-2018 18:05:58.0	yes

Visit	Targets used in Visit	Configurations used in Visit	Orbits Used	Last Orbit Planner Run	OP Current with Visit?
10	(4) 486958-D	WFC3/UVIS	1	18-Jun-2018 18:05:59.0	yes
11	(5) 486958-E	WFC3/UVIS	1	18-Jun-2018 18:06:00.0	yes

5 Total Orbits Used

ABSTRACT

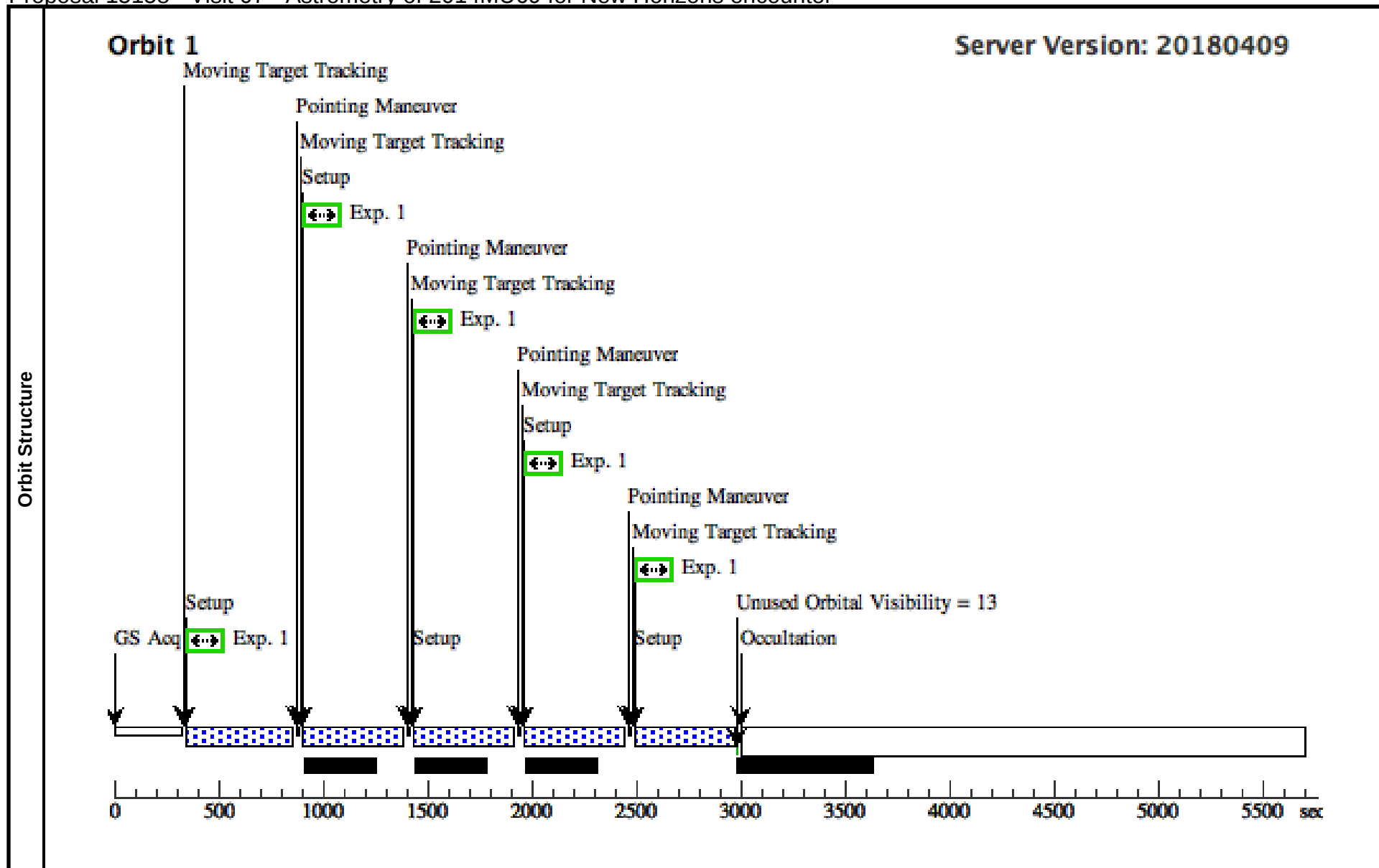
We propose 12 orbits of time to make high-precision astrometric measurements of the New Horizons extended mission target, (486958) 2014MU69. These observations are in direct support of the navigation of New Horizons leading up to its encounter in Jan 2019. These visits represent an optimized plan for improved orbit estimates that will complete as the target becomes directly observable by New Horizons. This astrometry is a key element leading up to a close investigation of a Cold-Classical Kuiper Belt Object, one of the most primitive members of our solar system.

OBSERVING DESCRIPTION

These observations will use the full field of WFC3/UVIS due to its improved broadband PSF and detector sensitivity compared to ACS. This was the HST instrument used to successfully detect 2014MU69 and our other potential KBO targets in our 2014 search campaign. We are using the F350LP filter for its sensitivity and image quality as well as consistency with the prior observations. Our observing strategy is based on the successful strategy developed for our 2014-2016 HST KBO search and followup campaigns. For each HST orbit we will use WFC3 with the F350LP filter to obtain five 370 second exposures. We will track on the known motion of 2014MU69, which results in trailing of stars, but does not prevent their removal to provide robust detections in single orbits as shown. The formal uncertainty of the position is less than 1 pixel for the entire campaign. Thus, the target can easily be placed near the center of WFC3/UVIS2, and very bright stars can be avoided by adjusting the timing of the observations as necessary. Once preliminary observing windows are available we need to examine the background star field for contamination and final scheduling to avoid field stars. We require acquisition of the full WFC3 field for precise astrometric solutions. The visit timing is designed to get broad time coverage for the orbit estimation needed for New Horizons navigation support. The one week period is chosen to provide ample scheduling flexibility and could be shifted by another day or two if needed. The timing of these weeks is controlled by avoiding the time around quadrature when the sky-plane velocity is below 1 arcsec/hour and the need to get the visits spread out in time throughout the annual observing window.

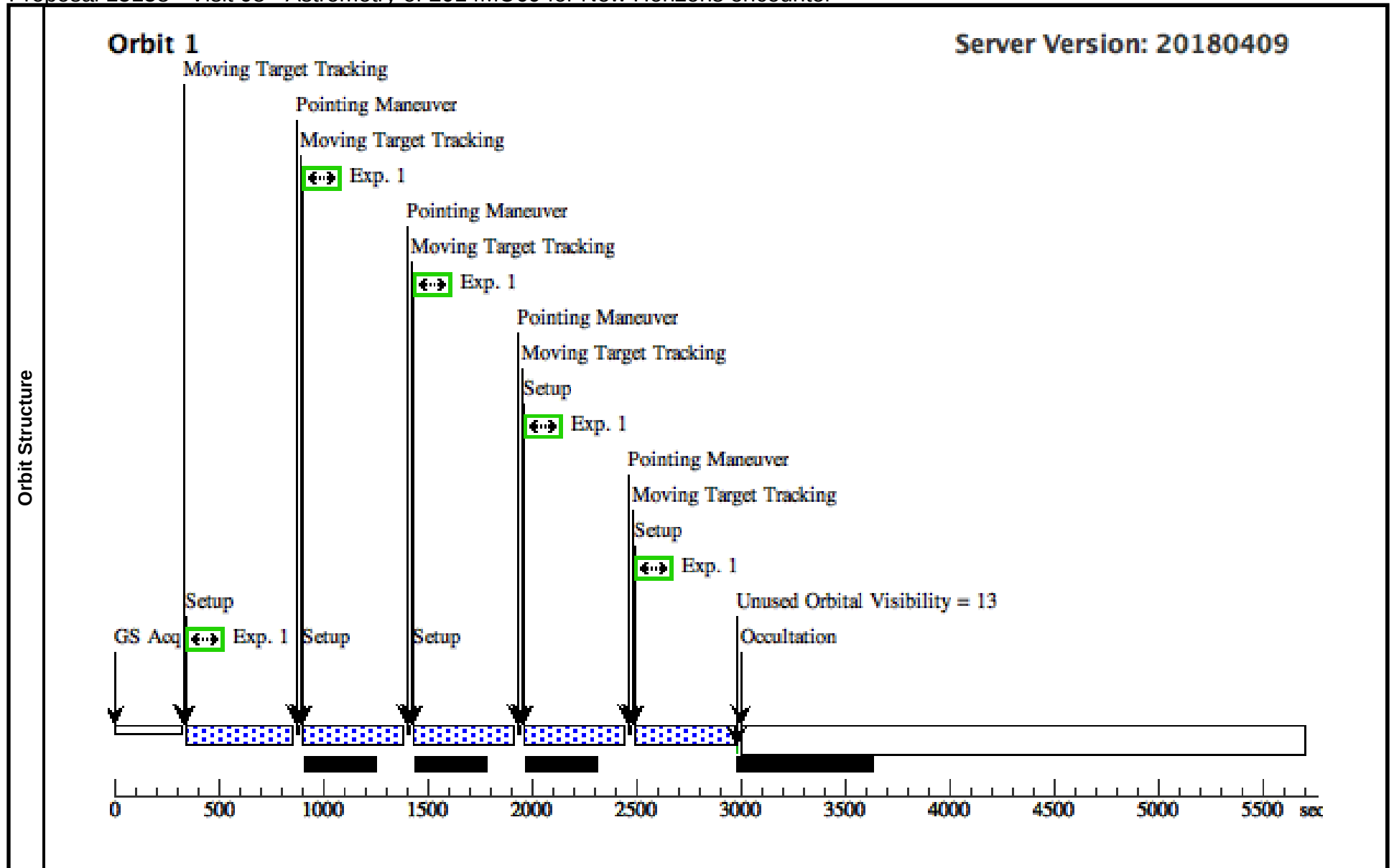
Proposal 15158 - Visit 07 - Astrometry of 2014MU69 for New Horizons encounter

Visit	Proposal 15158, Visit 07, completed										Mon Jun 18 22:06:01 GMT 2018	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: WFC3/UVIS											
	Special Requirements: SCHED 90%; BETWEEN 23-OCT-2017:00:00:00 AND 30-OCT-2017:00:00:00											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(1)	Pattern Type=LINE Purpose=OTHER Number Of Points=5 Point Spacing=.030 Line Spacing=		Coordinate Frame=CELESTIAL Pattern Orientation=0 Angle Between Sides= Center Pattern=true						(1)		
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center					
	(1)	486958-A	TYPE=ASTEROID,A=44.4244765802 57,E=0.038363213356,I=2.453094139 706,O=158.936790467222,W=176.622 025091325,M=312.385824919521,EQ UINOX=J2000,EPOCH=15-OCT-2017:00:00:00,EpochTimeScale=UTC								EARTH	
	Comments: Description=Kuiper-Belt Object											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1		(1) 486958-A	WFC3/UVIS, ACCUM, UVIS2	F350LP			Sequence 1-1 Non-Int in Visit 07	367.0 Secs (1835 Secs)		[1]	
								Pattern 1, Exps 1-1 in Sequence 1-1 Non-Int in Visit 07 (1)	[>=>(Pattern 1)]			
								[>=>(Pattern 2)]				
								[>=>(Pattern 3)]				
								[>=>(Pattern 4)]				
								[>=>(Pattern 5)]				



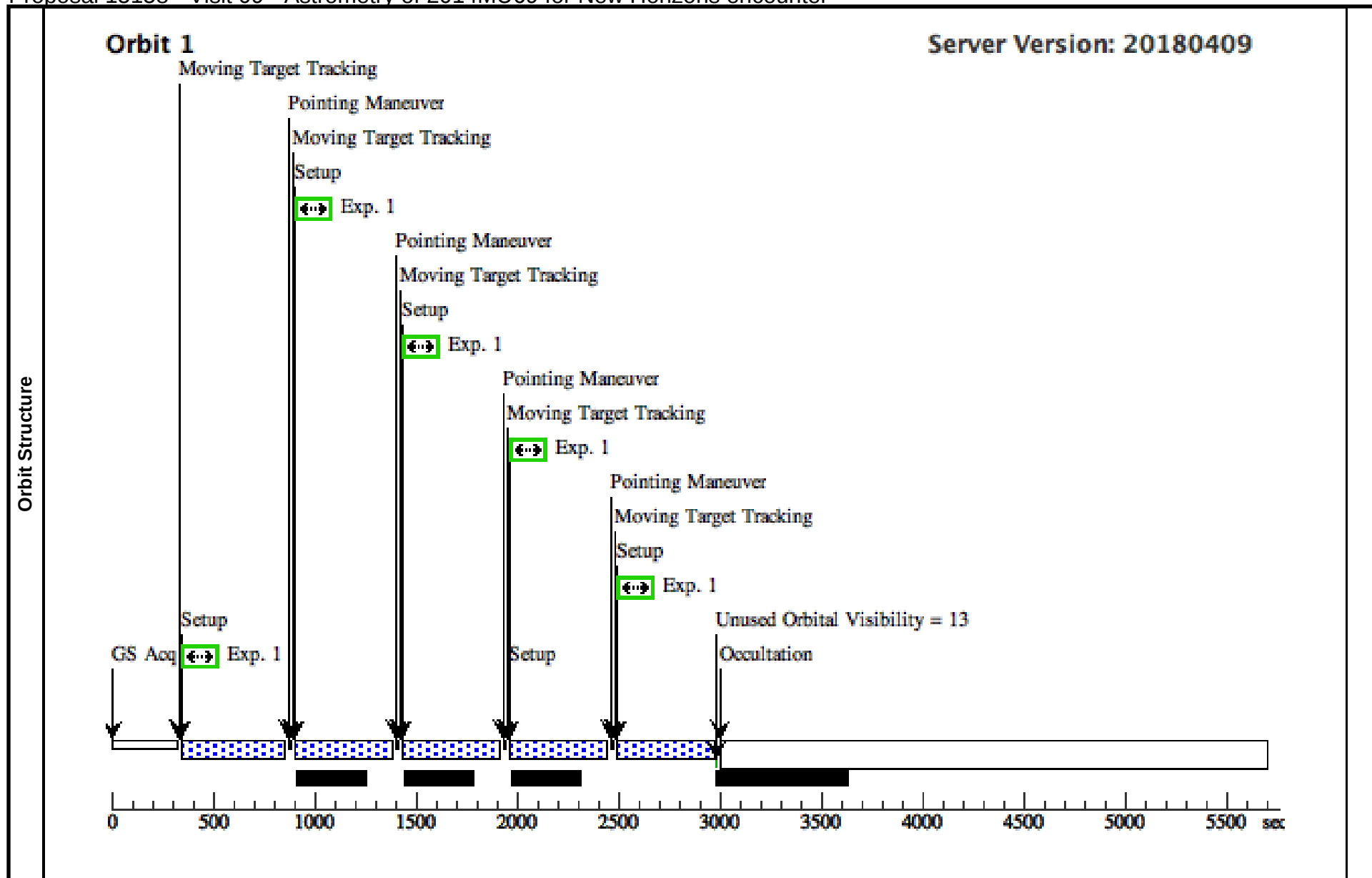
Proposal 15158 - Visit 08 - Astrometry of 2014MU69 for New Horizons encounter

Visit	Proposal 15158, Visit 08, completed										Mon Jun 18 22:06:01 GMT 2018
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: WFC3/UVIS										
	Special Requirements: SCHED 90%; BETWEEN 16-MAR-2018:00:00:00 AND 23-MAR-2018:00:00:00										
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(1)	Pattern Type=LINE Purpose=OTHER Number Of Points=5 Point Spacing=.030 Line Spacing=		Coordinate Frame=CELESTIAL Pattern Orientation=0 Angle Between Sides= Center Pattern=true						(1)	
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
	(2)	486958-B	TYPE=ASTEROID,A=44.4731028129 02,E=0.039259517927,I=2.452733880 004,O=158.948389200514,W=175.695 512739008,M=313.833282669452,EQ UINOX=J2000,EPOCH=15-MAR- 2018:00:00:00,EpochTimeScale=UTC				EARTH				
	Comments: Description=Kuiper-Belt Object										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1		(2) 486958-B	WFC3/UVIS, ACCUM, UVIS2	F350LP			Sequence 1-1 Non-Int in Visit 08	367.0 Secs (1835 Secs)		[1]
								Pattern 1, Exps 1-1 in Sequence 1-1 Non-Int in Visit 08 (1)	[>=>(Pattern 1)]		
								[>=>(Pattern 2)]			
								[>=>(Pattern 3)]			
								[>=>(Pattern 4)]			
								[>=>(Pattern 5)]			



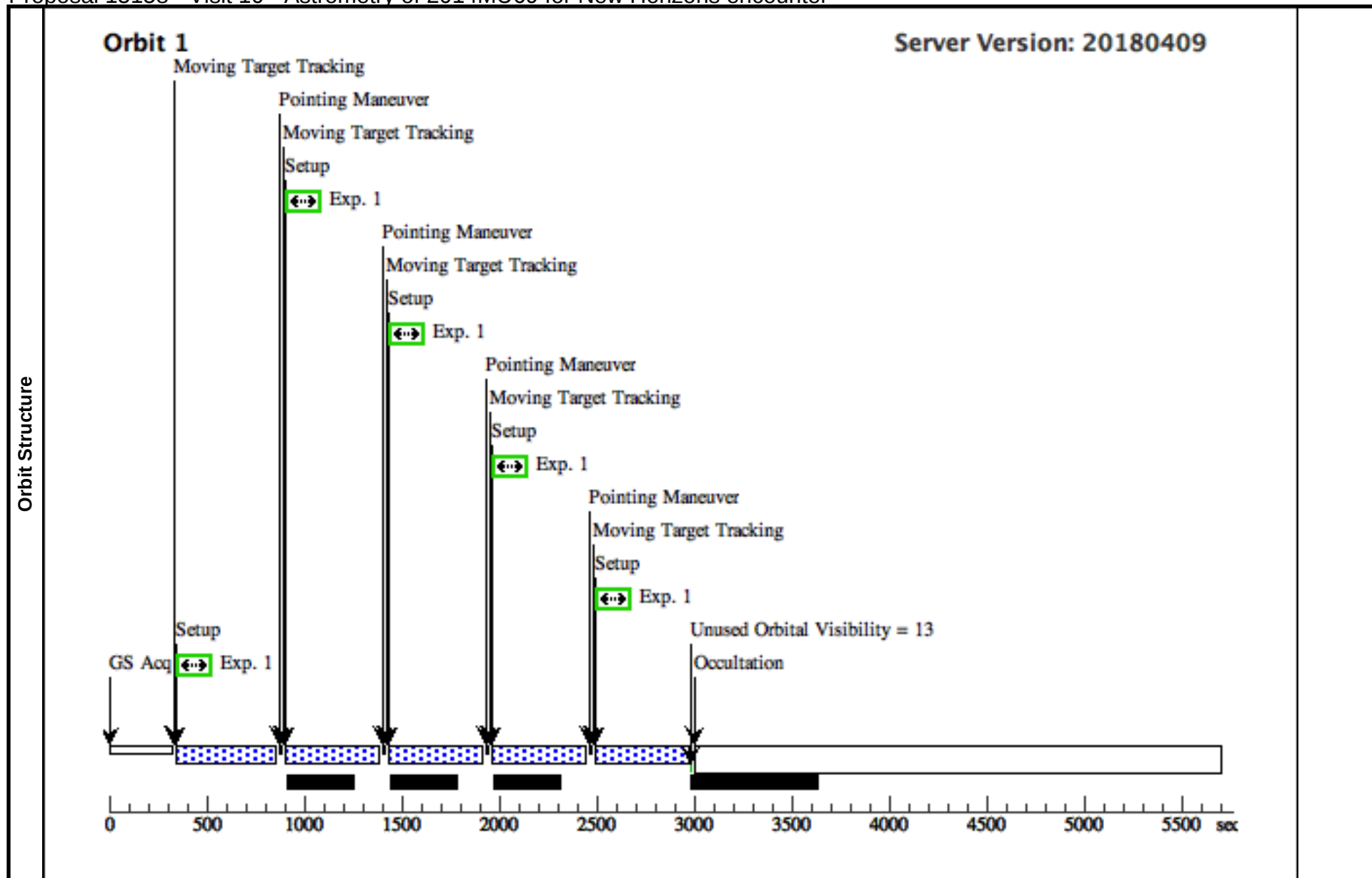
Proposal 15158 - Visit 09 - Astrometry of 2014MU69 for New Horizons encounter

Visit	Proposal 15158, Visit 09, completed										Mon Jun 18 22:06:01 GMT 2018
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: WFC3/UVIS										
	Special Requirements: SCHED 90%; BETWEEN 20-MAY-2018:00:00:00 AND 27-MAY-2018:00:00:00										
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(1)	Pattern Type=LINE Purpose=OTHER Number Of Points=5 Point Spacing=.030 Line Spacing=		Coordinate Frame=CELESTIAL Pattern Orientation=0 Angle Between Sides= Center Pattern=true						(1)	
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
	(3)	486958-C	TYPE=ASTEROID,A=44.4925748976 11,E=0.039629508082,I=2.452583078 982,O=158.953189784881,W=175.350 376717272,M=314.389538439094,EQ UINOX=J2000,EPOCH=15-MAY-2018:00:00:00,EpochTimeScale=UTC Comments: Description=Kuiper-Belt Object			EARTH					
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1		(3) 486958-C	WFC3/UVIS, ACCUM, UVIS2	F350LP			Sequence 1-1 Non-Int in Visit 09 Pattern 1, Exps 1-1 in Sequence 1-1 Non-Int in Visit 09 (1)	367.0 Secs (1835 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)] [==>(Pattern 5)]		[1]



Proposal 15158 - Visit 10 - Astrometry of 2014MU69 for New Horizons encounter

Visit	Proposal 15158, Visit 10, implementation										Mon Jun 18 22:06:01 GMT 2018
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: WFC3/UVIS										
	Special Requirements: SCHED 90%; BETWEEN 07-JUL-2018:00:00:00 AND 22-JUL-2018:00:00:00										
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(1)	Pattern Type=LINE Purpose=OTHER Number Of Points=5 Point Spacing=.030 Line Spacing=		Coordinate Frame=CELESTIAL Pattern Orientation=0 Angle Between Sides= Center Pattern=true						(1)	
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
	(4)	486958-D	TYPE=ASTEROID,A=44.5135016219 71,E=0.040055519605,I=2.452413335 340,O=158.958551873314,W=175.026 266510289,M=314.929209695644,EQ UINOX=J2000,EPOCH=15-JUL- 2018:00:00:00,EpochTimeScale=UTC						EARTH		
Comments: Description=Kuiper-Belt Object											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1		(4) 486958-D	WFC3/UVIS, ACCUM, UVIS2	F350LP			Sequence 1-1 Non-Int in Visit 10 Pattern 1, Exps 1-1 in Sequence 1-1 Non-Int in Visit 10 (1)	367.0 Secs (1835 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)] [==>(Pattern 5)]		[1]



Proposal 15158 - Visit 11 - Astrometry of 2014MU69 for New Horizons encounter

Visit	Proposal 15158, Visit 11, implementation										Mon Jun 18 22:06:01 GMT 2018
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: WFC3/UVIS										
	Special Requirements: SCHED 90%; BETWEEN 21-AUG-2018:00:00:00 AND 28-AUG-2018:00:00:00										
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(1)	Pattern Type=LINE Purpose=OTHER Number Of Points=5 Point Spacing=.030 Line Spacing=		Coordinate Frame=CELESTIAL Pattern Orientation=0 Angle Between Sides= Center Pattern=true						(1)	
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
	(5)	486958-E	TYPE=ASTEROID,A=44.5226075626 38,E=0.040269637522,I=2.452265958 242,O=158.963182412558,W=174.926 199040395,M=315.140003030700,EQ UINOX=J2000,EPOCH=15-AUG- 2018:00:00:00,EpochTimeScale=UTC				EARTH				
	Comments: Description=Kuiper-Belt Object										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1		(5) 486958-E	WFC3/UVIS, ACCUM, UVIS2	F350LP			Sequence 1-1 Non-Int in Visit 11 Pattern 1, Exps 1-1 in Sequence 1-1 Non-Int in Visit 11 (1)	367.0 Secs (1835 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)] [==>(Pattern 5)]		[1]

