



# 13716 - Constraining the history of the outer Solar System: Definitive proof with HST

Cycle: 22, Proposal Category: GO  
(Availability Mode: SUPPORTED)

## INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
<b>Dr. David E. Trilling (PI) (Contact)</b>	<b>Northern Arizona University</b>	<b>david.trilling@nau.edu</b>
Dr. William M. Grundy (CoI)	Lowell Observatory	w.grundy@lowell.edu
Dr. Paulo Fernando Penteado (CoI)	Northern Arizona University	pp.penteado@gmail.com
Prof. Hilke E. Schlichting (CoI)	Massachusetts Institute of Technology	hilke@mit.edu
Dr. Cesar I. Fuentes (CoI)	Universidad de Chile	cfuentes@das.uchile.cl
Dr. Ruth A. Murray-Clay (CoI)	Smithsonian Institution Astrophysical Observatory	rmurray-clay@cfa.harvard.edu
Dr. Keith S. Noll (CoI)	NASA Goddard Space Flight Center	keith.s.noll@nasa.gov
Dr. Susan D. Benecchi (CoI)	Planetary Science Institute	susank@psi.edu
Dr. David Nesvorny (CoI)	Southwest Research Institute	davidn@boulder.swri.edu

## 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>
01	(1) 2000-PM30	WFC3/UVIS	1	19-May-2015 21:11:48.0	yes
02	(2) 2000-FC8	WFC3/UVIS	1	19-May-2015 21:11:51.0	yes
03	(3) 2000-PN30	WFC3/UVIS	1	19-May-2015 21:11:53.0	yes
04	(4) 2000-OB51	WFC3/UVIS	1	19-May-2015 21:11:55.0	yes
05	(5) 2011-JX31	WFC3/UVIS	1	19-May-2015 21:11:58.0	yes

5 Total Orbits Used

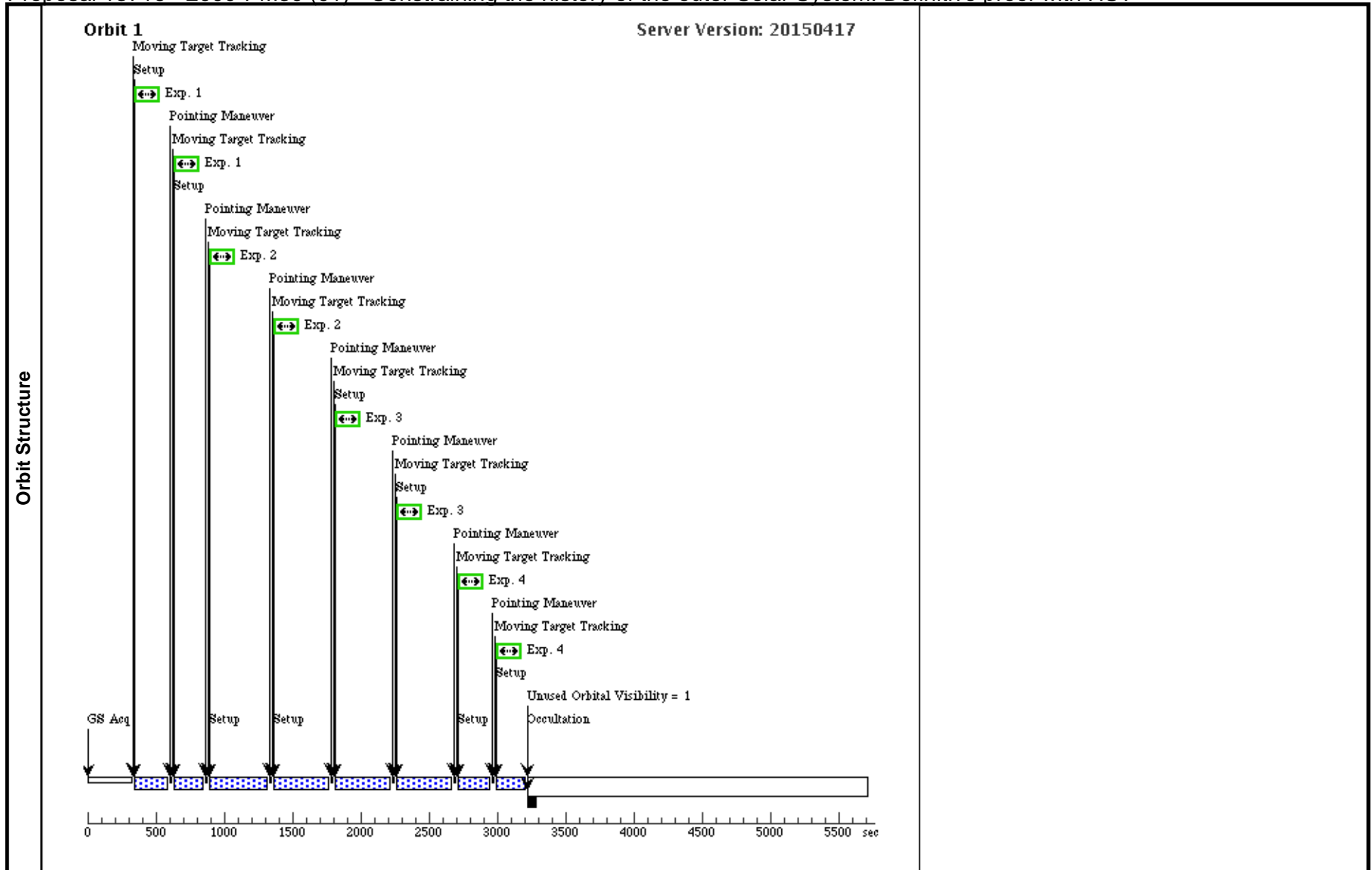
## **ABSTRACT**

We propose to image five faint cold classical Kuiper Belt Objects (KBOs) to test hypotheses about the collisional evolution of the outer Solar System. There is an observed break in the size distribution of cold classical KBOs at around 40 km. If small cold classicals exhibit bluer colors and a smaller binary fraction than large cold classicals then the nature of the break is collisional. If the small cold classicals are as red as their larger counterparts and have a similar binary fraction, then the break is most likely primordial and a product of the environment in which these objects formed. Our data in-hand suggests the collisional model, using both binary statistics and color measurements, but the signal is not unequivocal. We propose to observe the five smallest available cold classical KBOs to search for binaries and measure colors. The five KBOs that we will observe here, combined with our existing data, will allow us to determine conclusively the physical process that drive the break in the size distribution and the evolution of the outer Solar System. This well-posed experiment will offer for the first time a direct observational test of the broad collisional history of the outer Solar System and is only possible with HST.

Proposal 13716 - 2000-PM30 (01) - Constraining the history of the outer Solar System: Definitive proof with HST

Wed May 20 01:12:00 GMT 2015

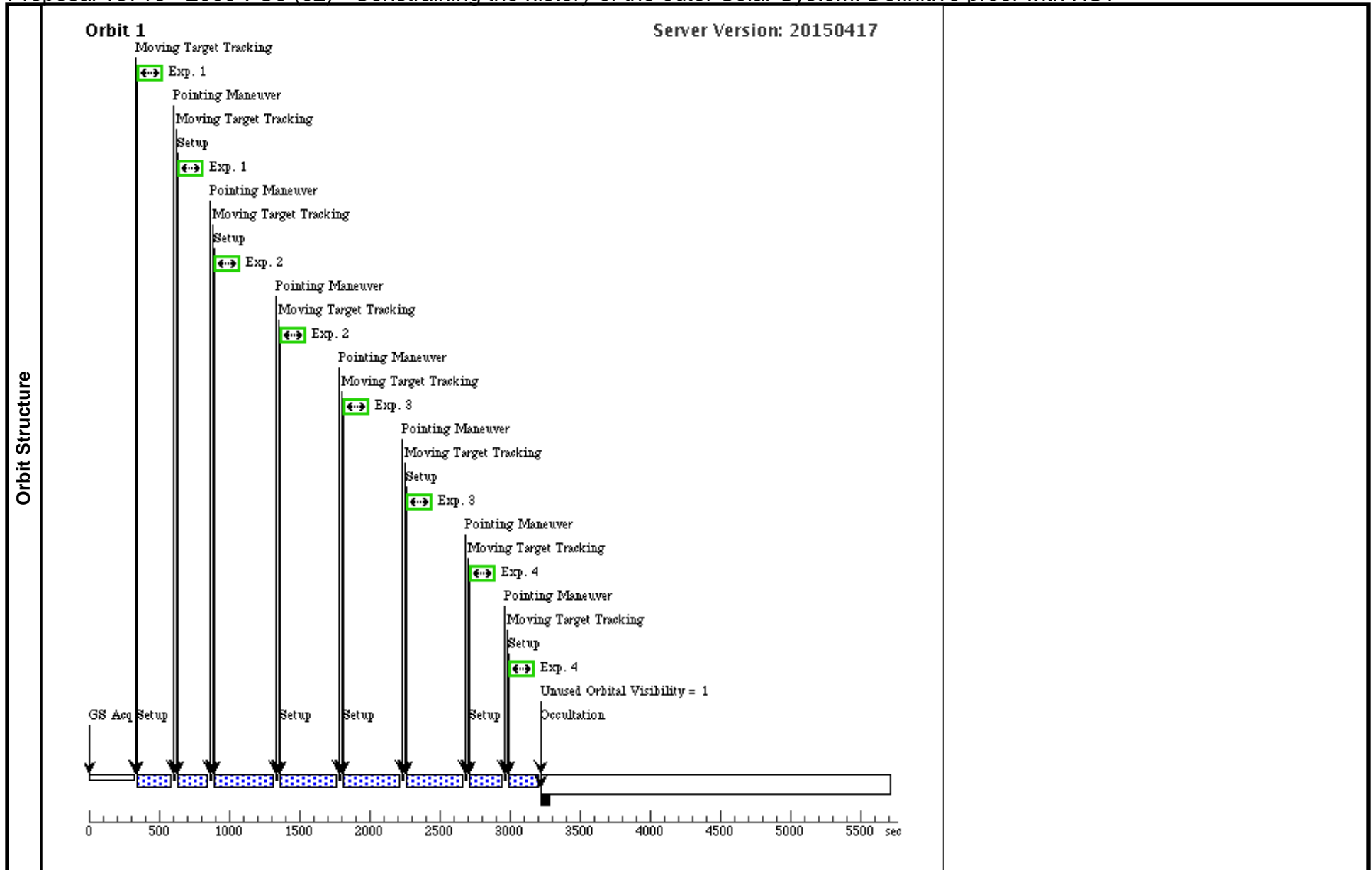
Visit	Proposal 13716, 2000-PM30 (01), completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 30%										
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures		
		(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false					(1), (2), (3), (4)		
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
	(1)	2000-PM30	TYPE=ASTEROID,A=44.1809628300 00,E=0.053161090000,I=2.278460000 000,O=129.77317000000,W=66.02067 00000,M=115.185580000,EQUINOX= J2000,EPOCH=21-JUL- 1999,EpochTimeScale=UTC					EARTH			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	(1) 2000-PM30	(1) 2000-PM30	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG -.1582,0 .0289867	Pattern 1, Exps 1-1 i n 2000-PM30 (01) (1 )	170 Secs (340 Secs)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]
	2	(1) 2000-PM30	(1) 2000-PM30	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG -0.1532 56,-0.144537	Pattern 1, Exps 2-2 i n 2000-PM30 (01) (1 )	365 Secs (730 Secs)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]
	3	(1) 2000-PM30	(1) 2000-PM30	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG 0.05418 35,0.0385166	Pattern 1, Exps 3-3 i n 2000-PM30 (01) (1 )	365 Secs (730 Secs)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]
	4	(1) 2000-PM30	(1) 2000-PM30	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG 0.04943 75,-0.145331	Pattern 1, Exps 4-4 i n 2000-PM30 (01) (1 )	170 Secs (340 Secs)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]



Proposal 13716 - 2000-FC8 (02) - Constraining the history of the outer Solar System: Definitive proof with HST

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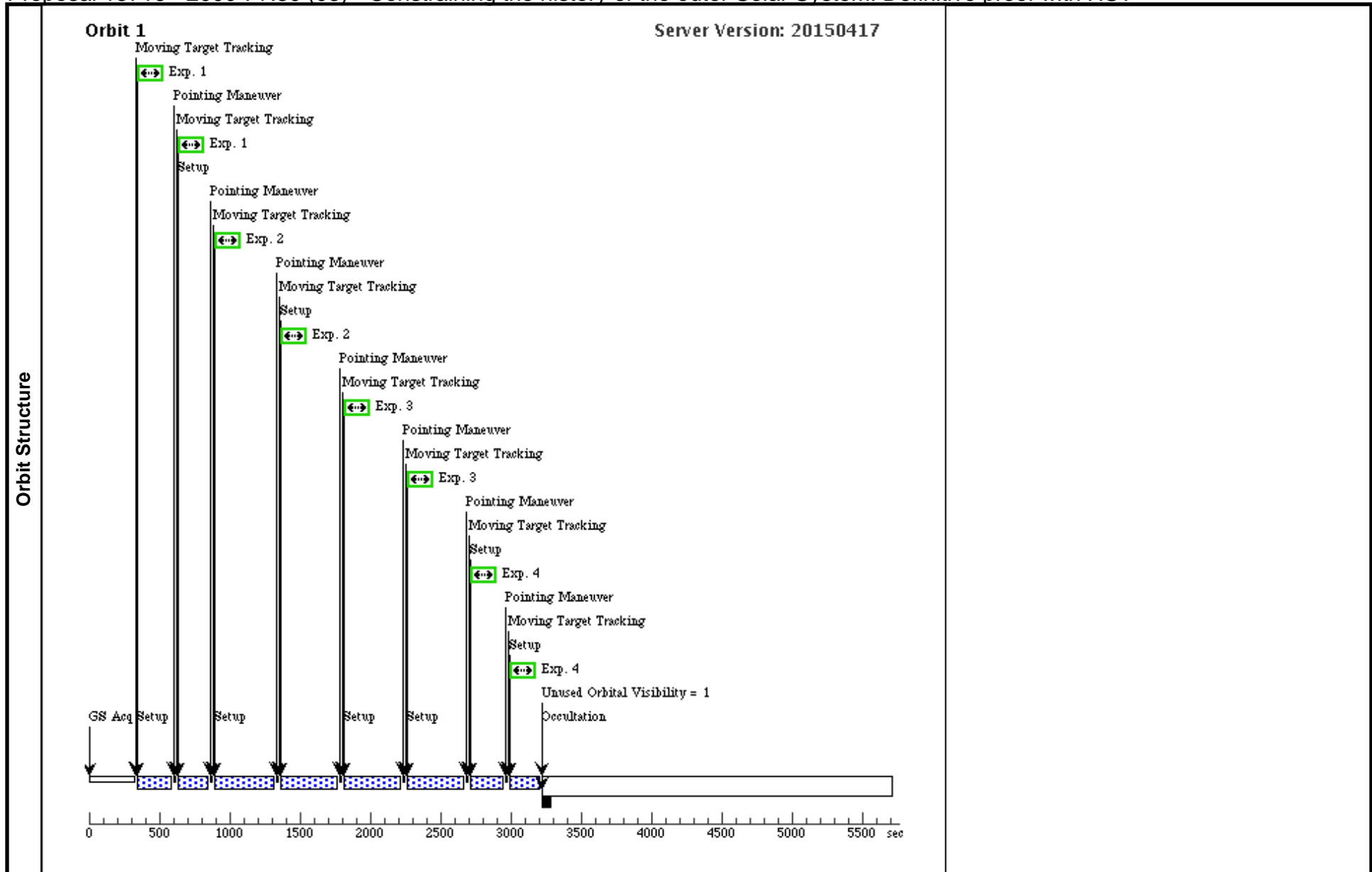
Visit	Proposal 13716, 2000-FC8 (02), pi Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 30%: BETWEEN 01-MAY-2015:00:00:00 AND 31-JUL-2015:23:59:00									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG					(1), (2), (3), (4)	
		Purpose=DITHER	Pattern Orientation=46.84							
		Number Of Points=2	Angle Between Sides=							
		Point Spacing=0.145	Center Pattern=false							
		Line Spacing=								
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
	(2)	2000-FC8	TYPE=ASTEROID,A=44.0935530334 332,E=0.05994109059962618,I=0.711 9090149437264,O=332.411535473070 3,W=29.83588670051765,M=201.499 0485058602,EQUINOX=J2000,EPOC H=09-DEC- 2014,EpochTimeScale=UTC					EARTH		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) 2000-FC8	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG -.1582,0 .0289867	Pattern 1, Exps 1-1 i n 2000-FC8 (02) (1)	170 Secs (340 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	2		(2) 2000-FC8	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG -0.1532 56,-0.144537	Pattern 1, Exps 2-2 i n 2000-FC8 (02) (1)	365 Secs (730 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	3		(2) 2000-FC8	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG 0.05418 35,0.0385166	Pattern 1, Exps 3-3 i n 2000-FC8 (02) (1)	365 Secs (730 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	4		(2) 2000-FC8	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG 0.04943 75,-0.145331	Pattern 1, Exps 4-4 i n 2000-FC8 (02) (1)	170 Secs (340 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]



Proposal 13716 - 2000-PN30 (03) - Constraining the history of the outer Solar System: Definitive proof with HST

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Visit	Proposal 13716, 2000-PN30 (03), completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 30%										
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures		
		(1)	Pattern Type=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), (2), (3), (4)		
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
	(3)	2000-PN30	TYPE=ASTEROID,A=45.0465308200 ,E=0.1073728200,I=1.512680000,O=1 6.043320000,W=277.158460000,M=1 7.884550000,EQUINOX=J2000,EPOC H=11-JUL- 1999,EpochTimeScale=UTC					EARTH			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1		(3) 2000-PN30	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG -.1582,0 .0289867	Pattern 1, Exps 1-1 i n 2000-PN30 (03) (1 )	170 Secs (340 Secs)		[1]
									[==>(Pattern 1)] [==>(Pattern 2)]		
	2		(3) 2000-PN30	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG -0.1532 56,-0.144537	Pattern 1, Exps 2-2 i n 2000-PN30 (03) (1 )	365 Secs (730 Secs)		[1]
									[==>(Pattern 1)] [==>(Pattern 2)]		
3		(3) 2000-PN30	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG 0.05418 35,0.0385166	Pattern 1, Exps 3-3 i n 2000-PN30 (03) (1 )	365 Secs (730 Secs)		[1]	
								[==>(Pattern 1)] [==>(Pattern 2)]			
4		(3) 2000-PN30	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG 0.04943 75,-0.145331	Pattern 1, Exps 4-4 i n 2000-PN30 (03) (1 )	170 Secs (340 Secs)		[1]	
								[==>(Pattern 1)] [==>(Pattern 2)]			

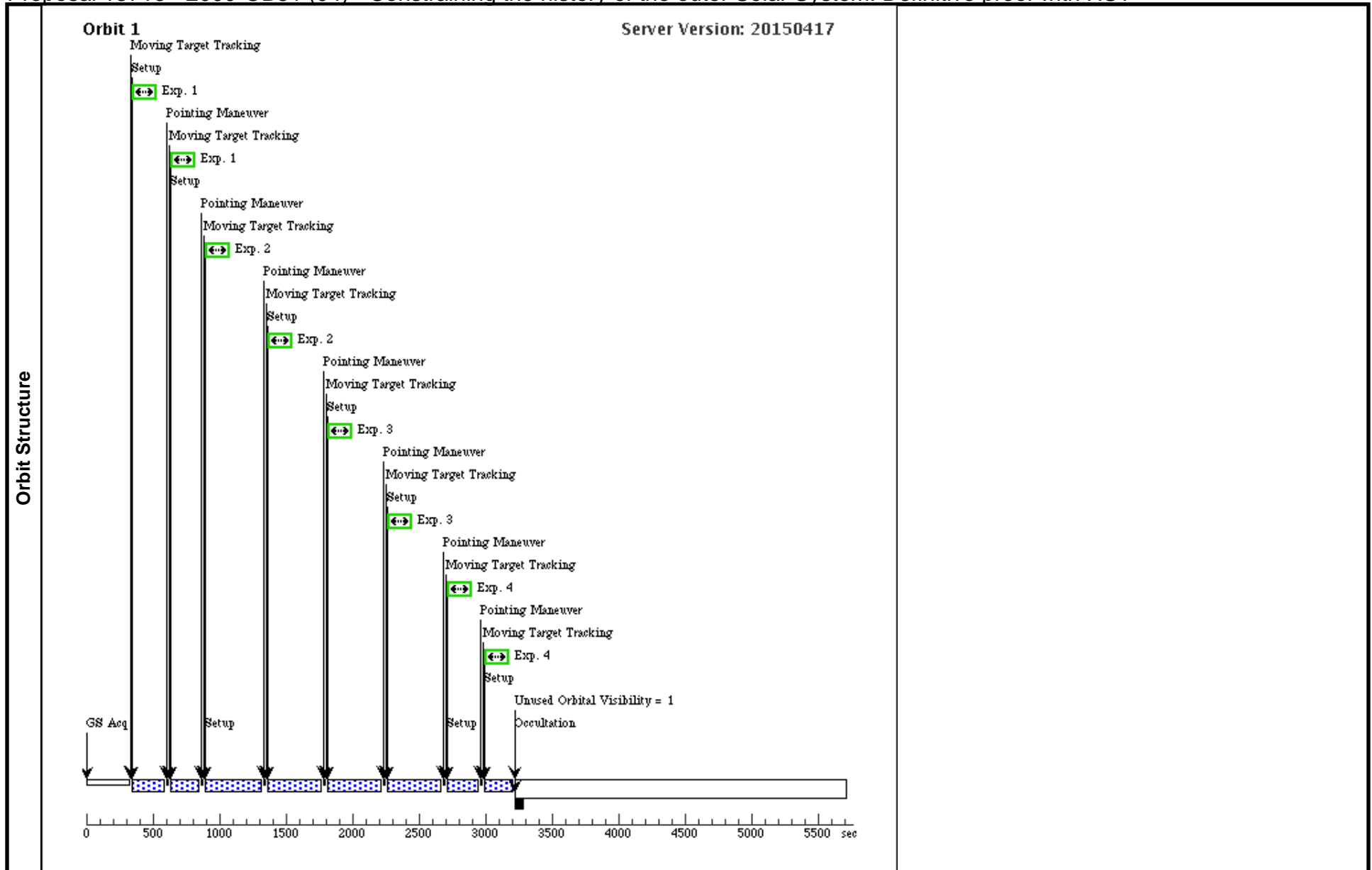




Proposal 13716 - 2000-OB51 (04) - Constraining the history of the outer Solar System: Definitive proof with HST

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Visit	<b>Proposal 13716, 2000-OB51 (04), completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 30%									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(1)	Pattern Type=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), (2), (3), (4)					
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
	(4)	2000-OB51	TYPE=ASTEROID,A=37.9948476600 00,E=0.0398840300,I=4.4533400000, O=126.853230000,W=208.318470000, M=340.265980000,EQUINOX=J2000, EPOCH=11-JUL- 1999,EpochTimeScale=UTC				EARTH			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(4) 2000-OB51	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG -.1582,0 .0289867	Pattern 1, Exps 1-1 i n 2000-OB51 (04) (1 )	170 Secs (340 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	2		(4) 2000-OB51	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG -0.1532 56,-0.144537	Pattern 1, Exps 2-2 i n 2000-OB51 (04) (1 )	365 Secs (730 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	3		(4) 2000-OB51	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG 0.05418 35,0.0385166	Pattern 1, Exps 3-3 i n 2000-OB51 (04) (1 )	365 Secs (730 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	4		(4) 2000-OB51	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG 0.04943 75,-0.145331	Pattern 1, Exps 4-4 i n 2000-OB51 (04) (1 )	170 Secs (340 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]



Proposal 13716 - 2011-JX31 (05) - Constraining the history of the outer Solar System: Definitive proof with HST

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Visit	Proposal 13716, 2011-JX31 (05), completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 30%									
	#	Primary Pattern	Secondary Pattern	Exposures						
Patterns	(1)	Pattern Type=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), (2), (3), (4)						
	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
Solar System Targets	(5)	2011-JX31	TYPE=ASTEROID,A=44.9307361900 ,E=0.108133680000,I=3.3065300,O=1 39.160670000000,W=19.45019000000 0,M=106.399370000000,EQUINOX=J 2000,EPOCH=19-APR- 2011,EpochTimeScale=UTC				EARTH			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(5) 2011-JX31	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG -.1582,0 .0289867	Pattern 1, Exps 1-1 i n 2011-JX31 (05) (1)	170 Secs (340 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	2		(5) 2011-JX31	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG -0.1532 56,-0.144537	Pattern 1, Exps 2-2 i n 2011-JX31 (05) (1)	365 Secs (730 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	3		(5) 2011-JX31	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F814W	CR-SPLIT=NO	POS TARG 0.05418 35,0.0385166	Pattern 1, Exps 3-3 i n 2011-JX31 (05) (1)	365 Secs (730 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	4		(5) 2011-JX31	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	CR-SPLIT=NO	POS TARG 0.04943 75,-0.145331	Pattern 1, Exps 4-4 i n 2011-JX31 (05) (1)	170 Secs (340 Secs) [==>(Pattern 1)] [==>(Pattern 2)]	[1]

