



18442 - Illuminating the Dark Universe with Strong Gravitational Lensing

Cycle: 34, Proposal Category: GO

(Hubble-Roman Science (HRS))

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. Rodrigo Cordova Rosado (PI) (Contact)	Smithsonian Institution Astrophysical Observatory
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Dr. Courtney B Watson (CoI)	Smithsonian Institution Astrophysical Observatory
Dr. Tania Barone (CoI)	Center for Astrophysics Harvard & Smithsonian
Dr. Daniel Ballard (CoI)	University of Sydney
Dr. Keerthi Vasan G.C. (CoI)	Carnegie Institution of Washington
Prof. Tucker Jones (CoI)	University of California - Davis
Prof. Glenn G. Kacprzak (CoI)	Swinburne University of Technology
Giovanni Ferrami (CoI) (ESA Member)	Max Planck Institute for Astrophysics
Dr. Anowar J Shajib (CoI)	University of Chicago
Prof. Karl Glazebrook (CoI)	Swinburne University of Technology
Dr. Leo Yvonne Alcorn (CoI)	California Association for Research in Astronomy (CARA)

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) AGEL012441-015734	WFC3/IR WFC3/UVIS	2	17-Aug-2026 10:02:13.0	yes
02	(2) AGEL082017+643112	WFC3/IR WFC3/UVIS	2	17-Aug-2026 10:02:14.0	yes

<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>
03	(3) AGEL104041+185052	WFC3/IR WFC3/UVIS	2	17-Aug-2026 10:02:15.0	yes
04	(4) AGEL143408-001311	WFC3/IR WFC3/UVIS	2	17-Aug-2026 10:02:16.0	yes
05	(5) AGEL225607+012534	WFC3/IR WFC3/UVIS	2	17-Aug-2026 10:02:17.0	yes
06	(6) AGEL014359+125610	WFC3/IR WFC3/UVIS	2	17-Aug-2026 10:02:17.0	yes
07	(8) AGEL131231+725054	WFC3/IR WFC3/UVIS	2	17-Aug-2026 10:02:18.0	yes
08	(10) AGEL113723+602220	WFC3/IR WFC3/UVIS	2	17-Aug-2026 10:02:20.0	yes
09	(11) AGEL020613-011417A	WFC3/UVIS	2	17-Aug-2026 10:02:20.0	yes
10	(12) AGEL233610-020735A	WFC3/UVIS	2	17-Aug-2026 10:02:21.0	yes

20 Total Orbits Used

ABSTRACT

We use strong gravitational lenses as formidable probes to measure deflector mass profiles and constrain cosmological parameter spaces unexplored by the CMB and galaxy clustering. We propose a GO+Archival program to observe 10 galaxy-scale compound lenses to deliver a foundational measurement of Ω_{matter} and the dark energy equation of state parameter w . We now have the tools and systems in hand to build a legacy measurement of dark energy, uniquely enabled by Hubble.

We couple high-resolution Hubble imaging and deep ground-based spectroscopy to find and characterize these powerful new standard rulers. By building on the public AGEL (ASTRO3D Galaxy Evolution with Lenses) survey, we measure the expansion rate of the Universe using an independent and complementary method to CMB and BAO constraints. We request imaging in WFC3/UVIS F200LP and WFC3/IR F140W to model the compound lenses using pixelated-source reconstructions. We will achieve sufficient S/N to measure faint arcs from high-redshifts secondary sources, those that help us best constrain the expansion history of the Universe. Stellar velocity dispersions from ongoing Keck/KCWI and Magellan/LLAMAS campaigns break the multi-plane mass-sheet degeneracy.

This proposal will deliver an order-of-magnitude improvement in the number of compound lenses with deep UV imaging. Combining Hubble imaging for precise lens models and IFU spectroscopy for redshifts and kinematics is key to achieving a baseline measurement of dark energy that will soon rival supernovae constraints. Our Hubble-trained pipeline will be released publicly and used to validate cosmological studies using Roman's High Latitude Wide Area Survey.

OBSERVING DESCRIPTION

We use strong gravitational lenses as formidable probes to measure deflector mass profiles and constrain cosmological parameter spaces unexplored by the CMB and galaxy clustering. We propose a GO+Archival program to observe 10 galaxy-scale compound lenses to deliver a foundational measurement of Ω_{matter} and the dark energy equation of state parameter w . We now have the tools and systems in hand to build a legacy measurement of dark energy, uniquely enabled by Hubble.

We couple high-resolution Hubble imaging and deep ground-based spectroscopy to find and characterize these powerful new standard rulers. By building on the public AGEL (ASTRO3D Galaxy Evolution with Lenses) survey, we measure the expansion rate of the Universe using an independent and complementary method to CMB and BAO constraints. We request imaging in WFC3/UVIS F200LP and WFC3/IR F140W to model the compound lenses using pixelated-source reconstructions. We will achieve sufficient S/N to measure faint arcs from high-redshifts secondary sources, those that help us best constrain the expansion history of the Universe. Stellar velocity dispersions from ongoing Keck/KCWI and Magellan/LLAMAS campaigns break the multi-plane mass-sheet degeneracy.

This proposal will deliver an order-of-magnitude improvement in the number of compound lenses with deep UV imaging. Combining Hubble imaging for precise lens models and IFU spectroscopy for redshifts and kinematics is key to achieving a baseline measurement of dark energy that will soon rival supernovae constraints. Our Hubble-trained pipeline will be released publicly and used to validate cosmological studies using Roman's High Latitude Wide Area Survey.

Proposal 18442 - Visit 01 - Illuminating the Dark Universe with Strong Gravitational Lensing

Visit	Proposal 18442, Visit 01					Mon Aug 17 14:02:22 GMT 2026				
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR, WFC3/UVIS									
	Special Requirements: (none)									
Patterns	#	Primary Pattern			Secondary Pattern			Exposures		
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false	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		(1)		
	(2)	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					(2)		
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	AGEL012441-015734	RA: 01 24 41.2608 (21.1719200d) Dec: -01 57 33.98 (-1.95944d) Equinox: J2000 Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]		V=21.3	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) AGEL012441-015734	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 1, Exps 1-1 in Visit 01 (1)	417.8 Secs (2816 Secs)	
									[==>430.8 Secs (Pattern 1,1)] [==>430.8 Secs (Pattern 1,2)] [==>430.8 Secs (Pattern 1,3)] [==>430.8 Secs (Pattern 2,1)] [==>430.8 Secs (Pattern 2,2)] [==>662.0 Secs (Pattern 2,3)]	[1]
										[2]
	2		(1) AGEL012441-015734	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=9; SAMP-SEQ=SPAR S50		Pattern 2, Exps 2-2 in Visit 01 (2)	402.935899 Secs (1611.744 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]

Server Version: 20260618

Orbit Structure

Orbit 1

GS Acq

Exp. 1

Overhead

Pointing Maneuver

Exp. 1

Overhead

Pointing Maneuver

Exp. 1

Pointing Maneuver

Overhead

Exp. 1

Pointing Maneuver

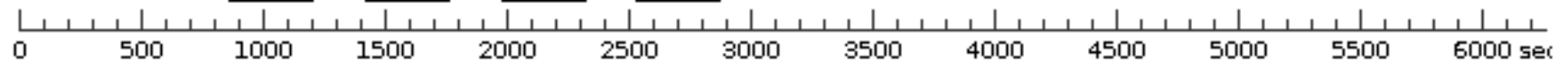
Overhead

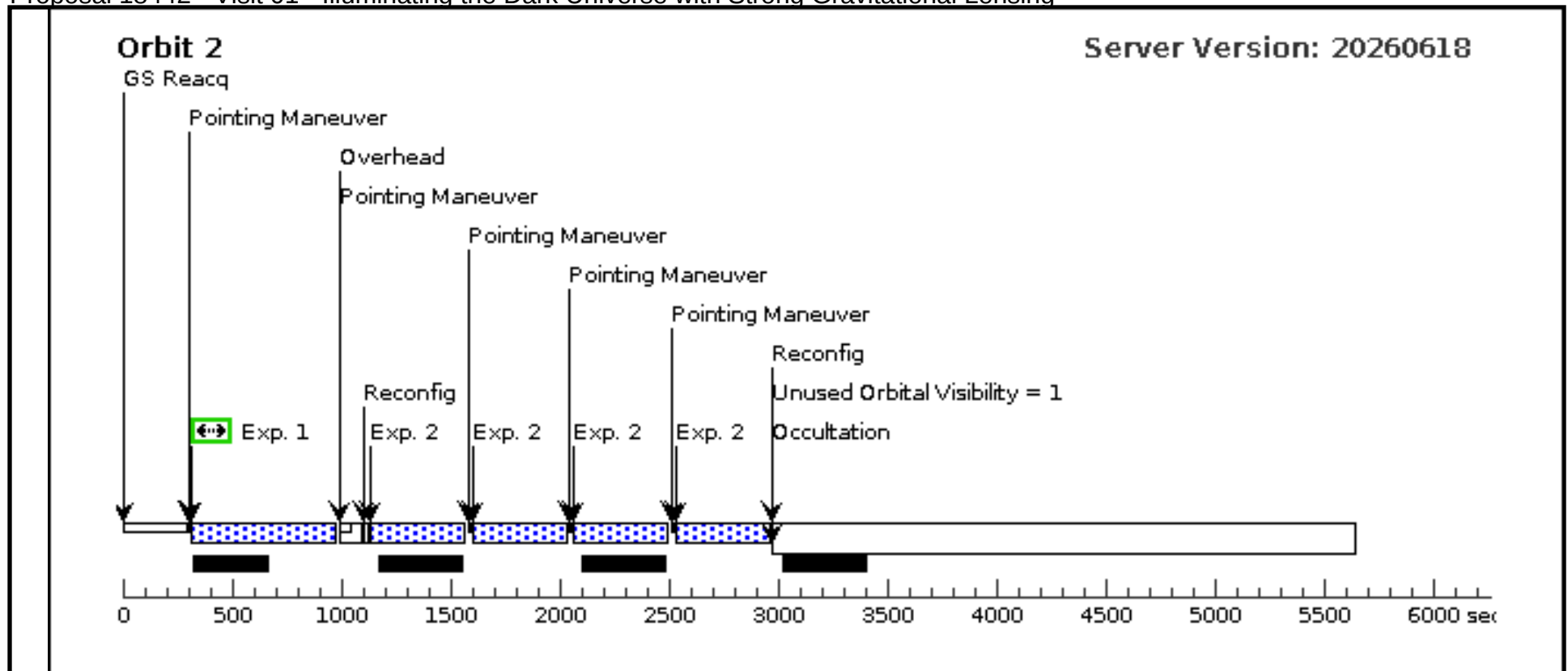
Exp. 1

Overhead

Unused Orbital Visibility = 3

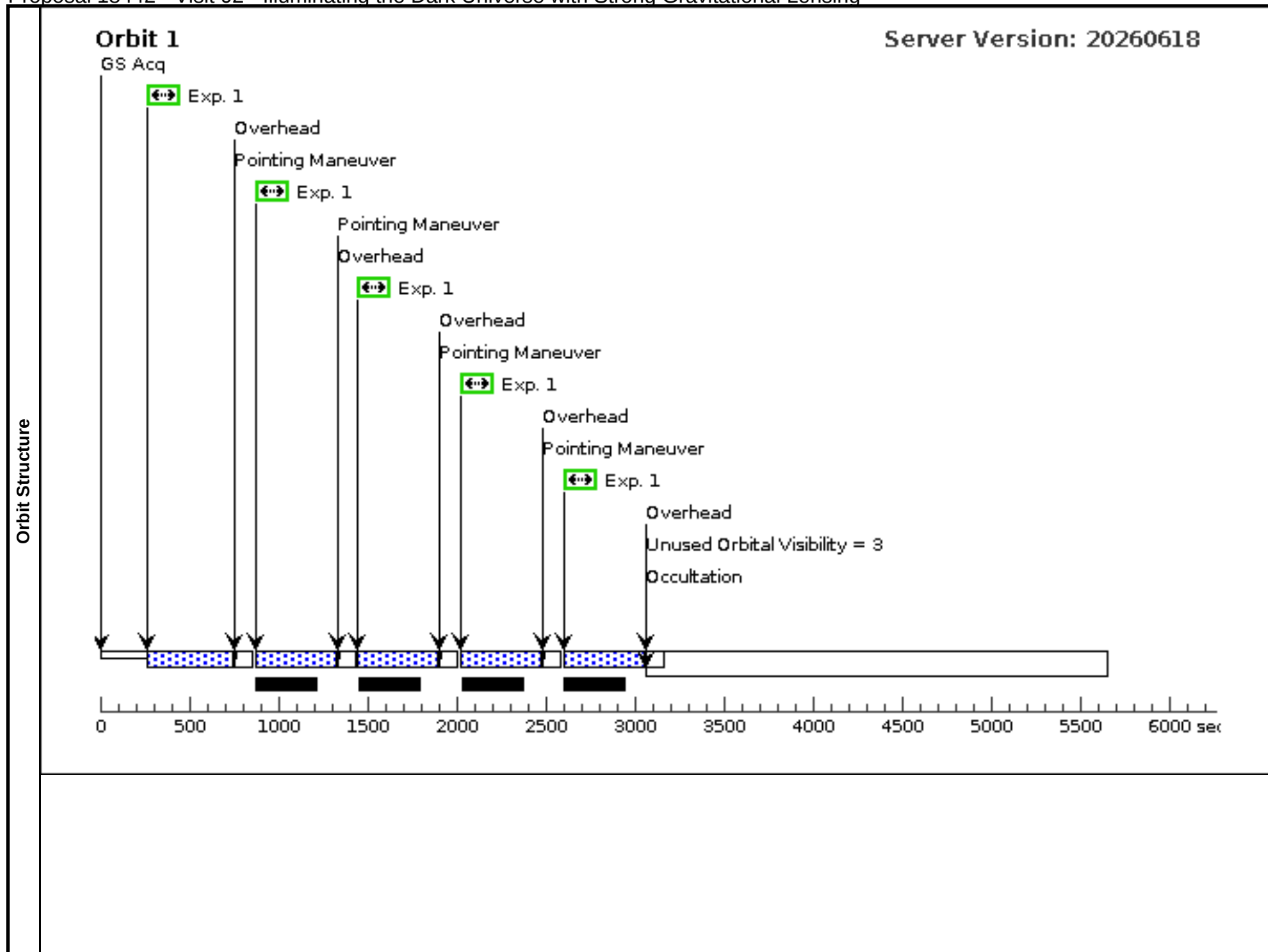
Occultation

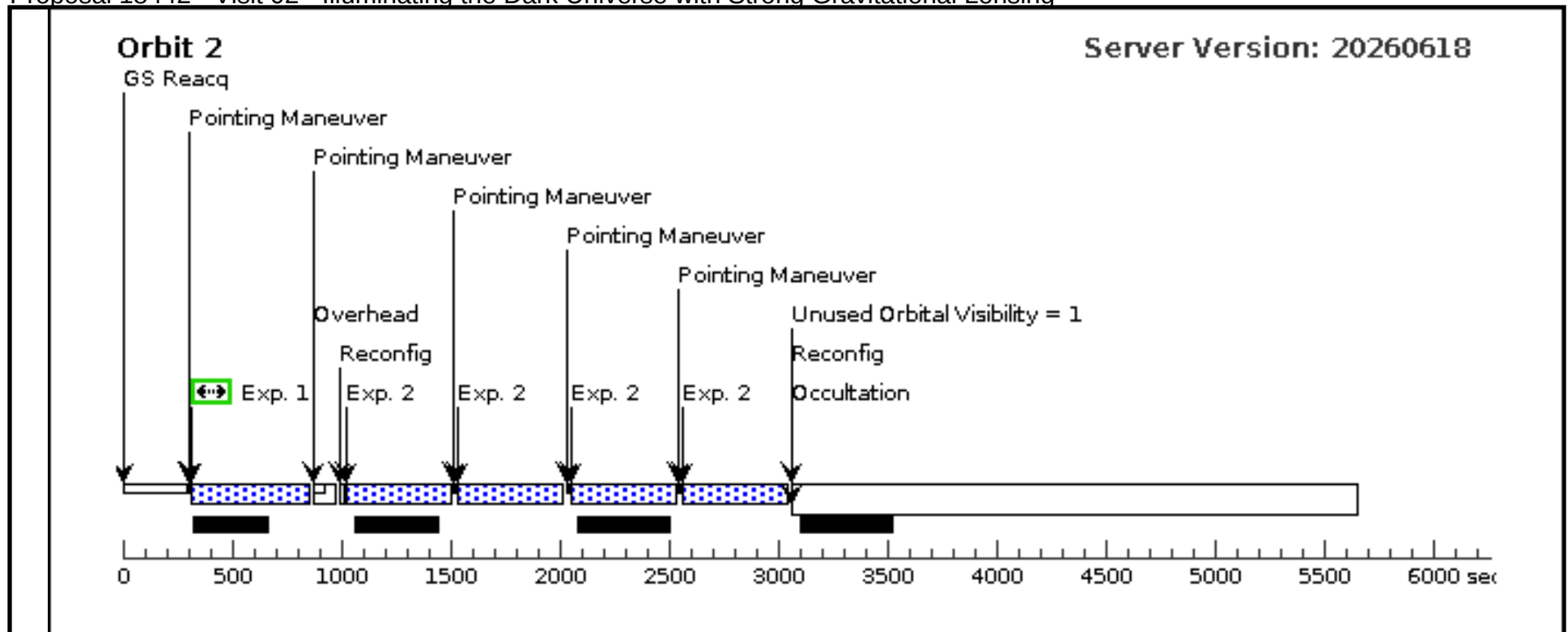




Proposal 18442 - Visit 02 - Illuminating the Dark Universe with Strong Gravitational Lensing

Visit	Proposal 18442, Visit 02										Mon Aug 17 14:02:22 GMT 2026		
	Diagnostic Status: No Diagnostics												
	Scientific Instruments: WFC3/IR, WFC3/UVIS												
	Special Requirements: (none)												
Patterns	#	Primary Pattern				Secondary Pattern				Exposures			
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false		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		(1)			
	(2)	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						(2)			
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous				
	(2)	AGEL082017+643112	RA: 08 20 17.1792 (125.0715800d) Dec: +64 31 12.40 (64.52011d) Equinox: J2000				V=20.4		Reference Frame: ICRS				
Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]													
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit		
	1		(2) AGEL082017+643112	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 1, Exps 1-1 in Visit 02 (1)	417.8 Secs (2786 Secs)				
									[==>447.8 Secs (Pattern 1,1)] [==>447.8 Secs (Pattern 1,2)] [==>447.8 Secs (Pattern 1,3)] [==>447.8 Secs (Pattern 2,1)] [==>447.8 Secs (Pattern 2,2)]		[1]		
									[==>547.0 Secs (Pattern 2,3)]		[2]		
	2		(2) AGEL082017+643112	WFC3/IR, MULTIACCUM, IR	F140W		NSAMP=10; SAMP-SEQ=SPAR S50		Pattern 2, Exps 2-2 in Visit 02 (2)	452.93635 Secs (1811.745 Secs)			
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]		[2]		





Proposal 18442 - Visit 03 - Illuminating the Dark Universe with Strong Gravitational Lensing

Visit	Proposal 18442, Visit 03					Mon Aug 17 14:02:22 GMT 2026				
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR, WFC3/UVIS									
	Special Requirements: (none)									
Patterns	#	Primary Pattern			Secondary Pattern			Exposures		
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false	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		(1)		
	(2)	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					(2)		
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	AGEL104041+185052	RA: 10 40 41.1792 (160.1715800d) Dec: +18 50 51.68 (18.84769d) Equinox: J2000		V=19	Reference Frame: ICRS				
Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) AGEL104041+185052	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 1, Exps 1-1 in Visit 03 (1)	417.8 Secs (2813 Secs)	
									[==>430.8 Secs (Pattern 1,1)] [==>430.8 Secs (Pattern 1,2)] [==>430.8 Secs (Pattern 1,3)] [==>430.8 Secs (Pattern 2,1)] [==>430.8 Secs (Pattern 2,2)]	[1]
									[==>659.0 Secs (Pattern 2,3)]	[2]
	2		(3) AGEL104041+185052	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=9; SAMP-SEQ=SPAR S50		Pattern 2, Exps 2-2 in Visit 03 (2)	402.935899 Secs (1611.744 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]

Server Version: 20260618

Orbit Structure

Orbit 1

GS Acq

Exp. 1

Overhead

Pointing Maneuver

Exp. 1

Pointing Maneuver

Overhead

Exp. 1

Overhead

Pointing Maneuver

Exp. 1

Pointing Maneuver

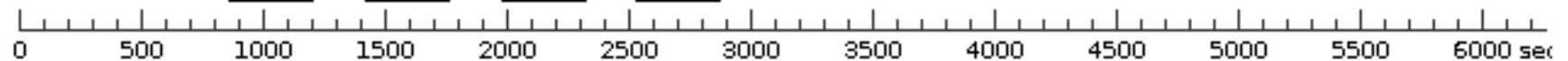
Overhead

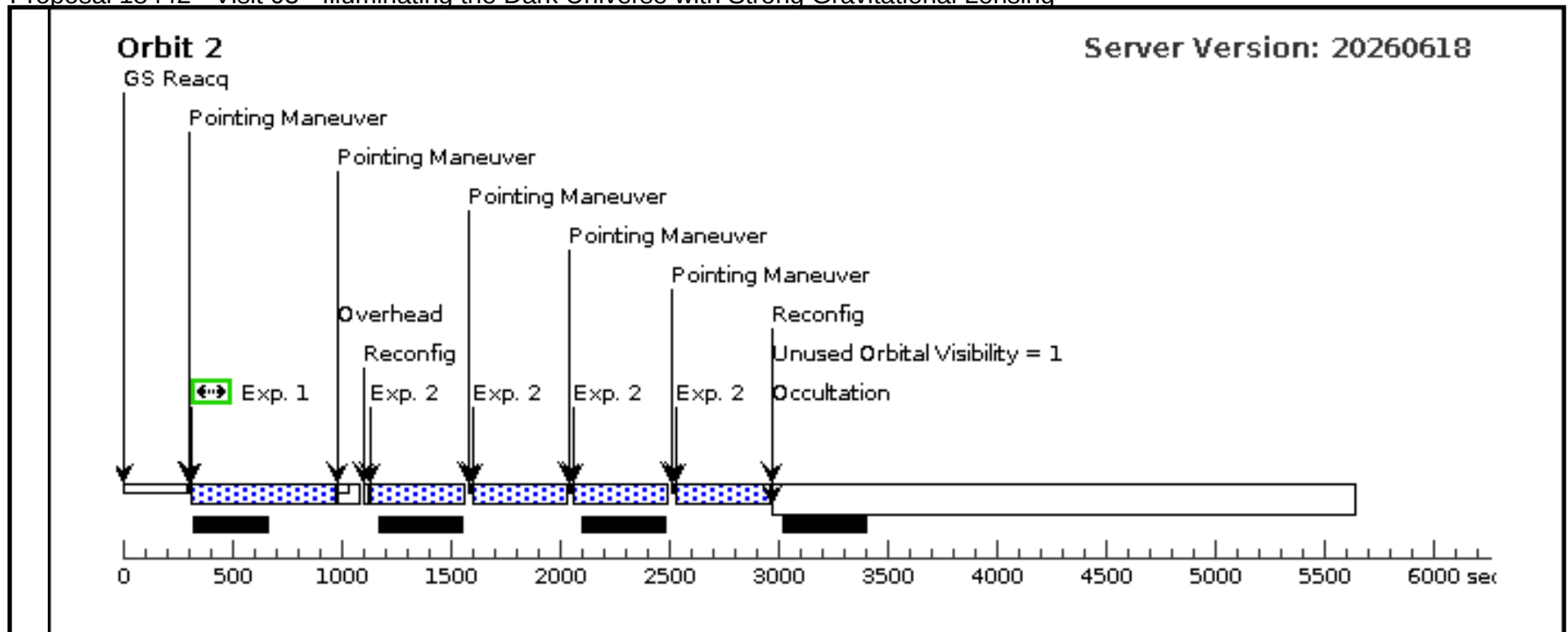
Exp. 1

Unused Orbital Visibility = 0

Overhead

Occultation





Proposal 18442 - Visit 04 - Illuminating the Dark Universe with Strong Gravitational Lensing

Visit	Proposal 18442, Visit 04										Mon Aug 17 14:02:22 GMT 2026	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: WFC3/IR, WFC3/UVIS											
	Special Requirements: (none)											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false		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		(1)		
	(2)	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						(2)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(4)	AGEL143408-001311	RA: 14 34 8.9280 (218.5372000d) Dec: -00 13 11.75 (-.21993d) Equinox: J2000				V=21.3		Reference Frame: ICRS			
	Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1		(4) AGEL143408-001311	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 1, Exps 1-1 in Visit 04 (1)	417.8 Secs (2816 Secs)			
									[==>430.8 Secs (Pattern 1,1)]		[1]	
									[==>430.8 Secs (Pattern 1,2)]			
									[==>430.8 Secs (Pattern 1,3)]			
									[==>430.8 Secs (Pattern 2,1)]			
									[==>430.8 Secs (Pattern 2,2)]			
								[==>662.0 Secs (Pattern 2,3)]		[2]		
2		(4) AGEL143408-001311	WFC3/IR, MULTIACCUM, IR	F140W		NSAMP=9; SAMP-SEQ=SPAR S50		Pattern 2, Exps 2-2 in Visit 04 (2)	402.935899 Secs (1611.744 Secs)			
									[==>(Pattern 1)]		[2]	
									[==>(Pattern 2)]			
									[==>(Pattern 3)]			
									[==>(Pattern 4)]			

Server Version: 20260618

Orbit Structure

Orbit 1

GS Acq

Exp. 1

Pointing Maneuver

Overhead

Exp. 1

Overhead

Pointing Maneuver

Exp. 1

Overhead

Pointing Maneuver

Exp. 1

Overhead

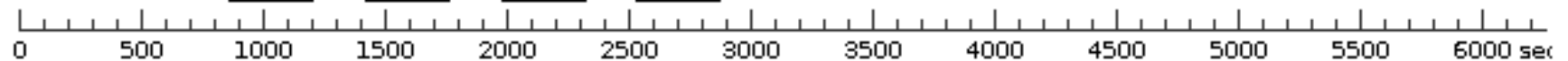
Pointing Maneuver

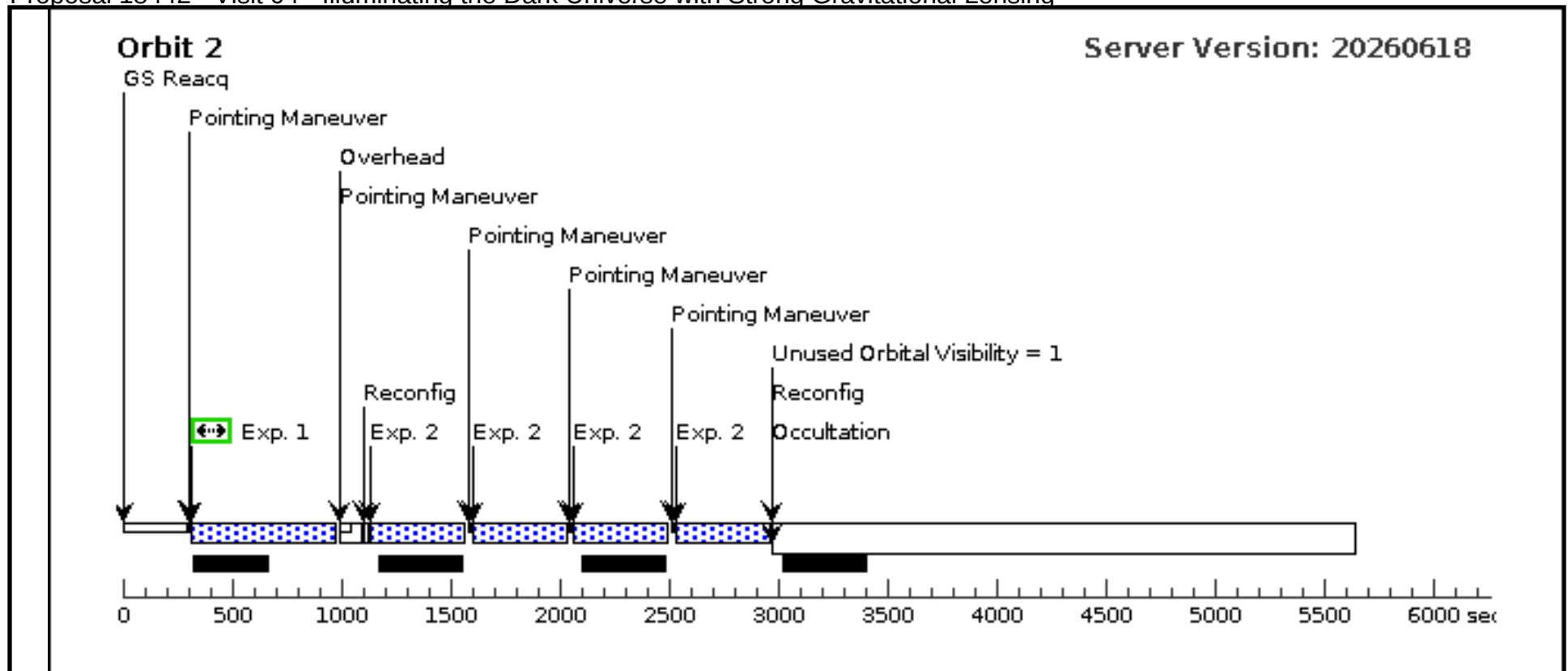
Exp. 1

Overhead

Unused Orbital Visibility = 3

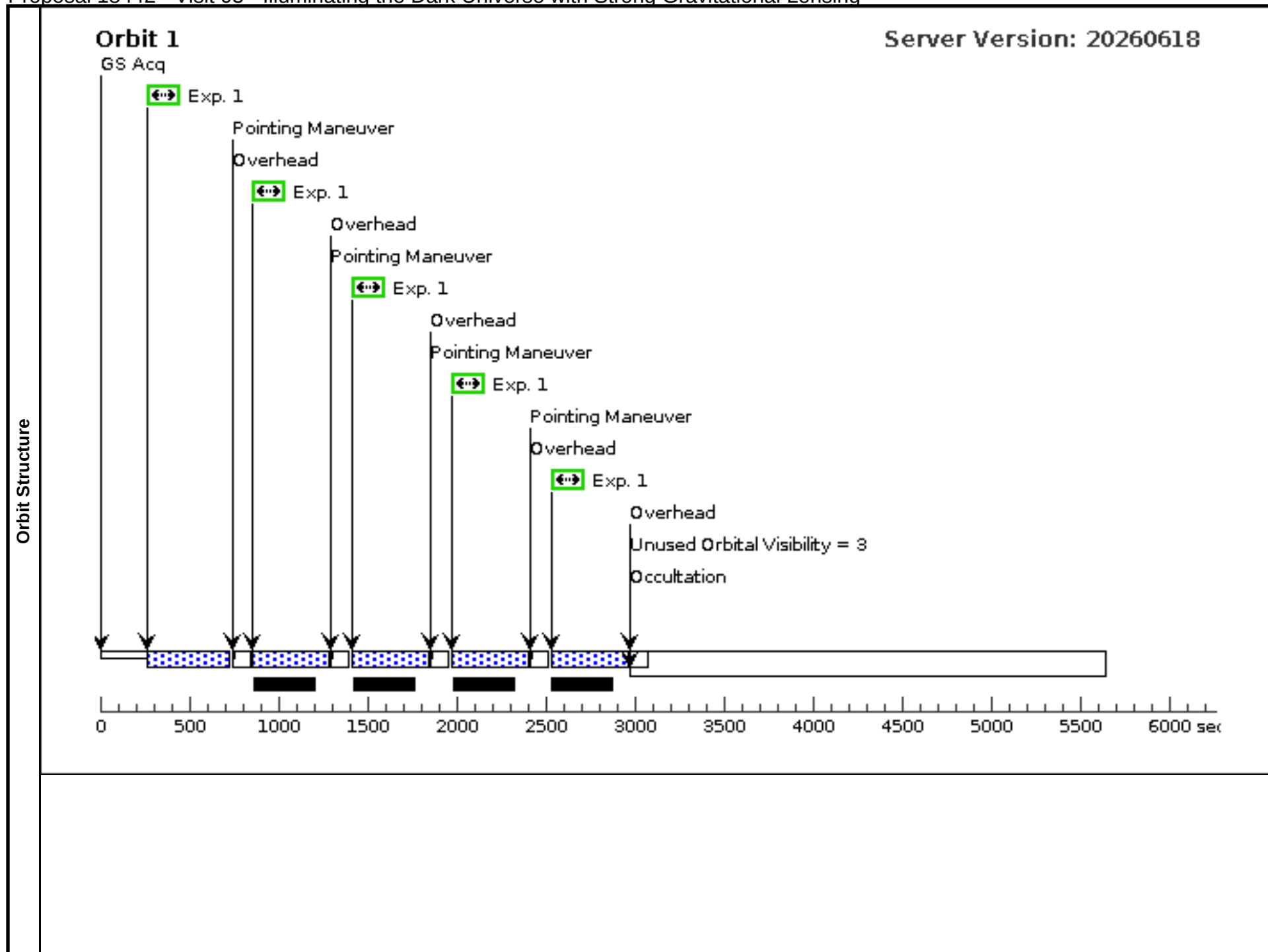
Occultation

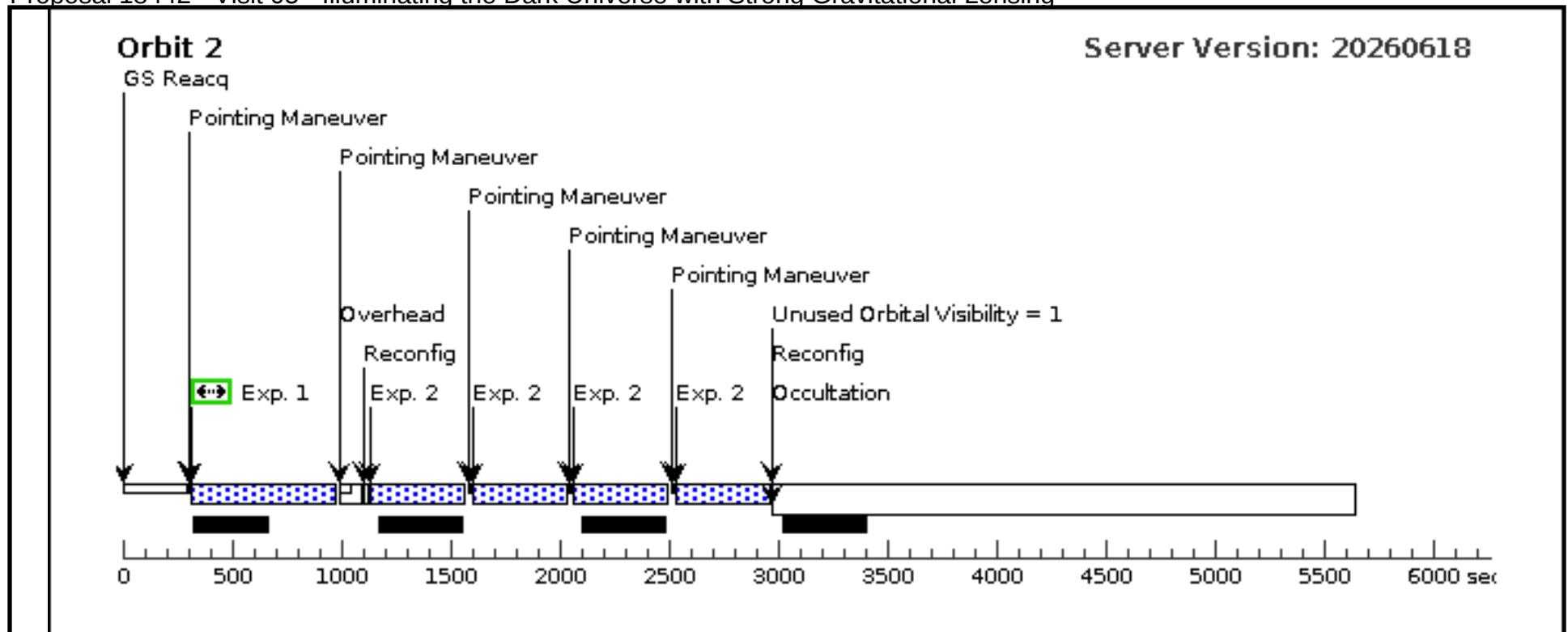




Proposal 18442 - Visit 05 - Illuminating the Dark Universe with Strong Gravitational Lensing

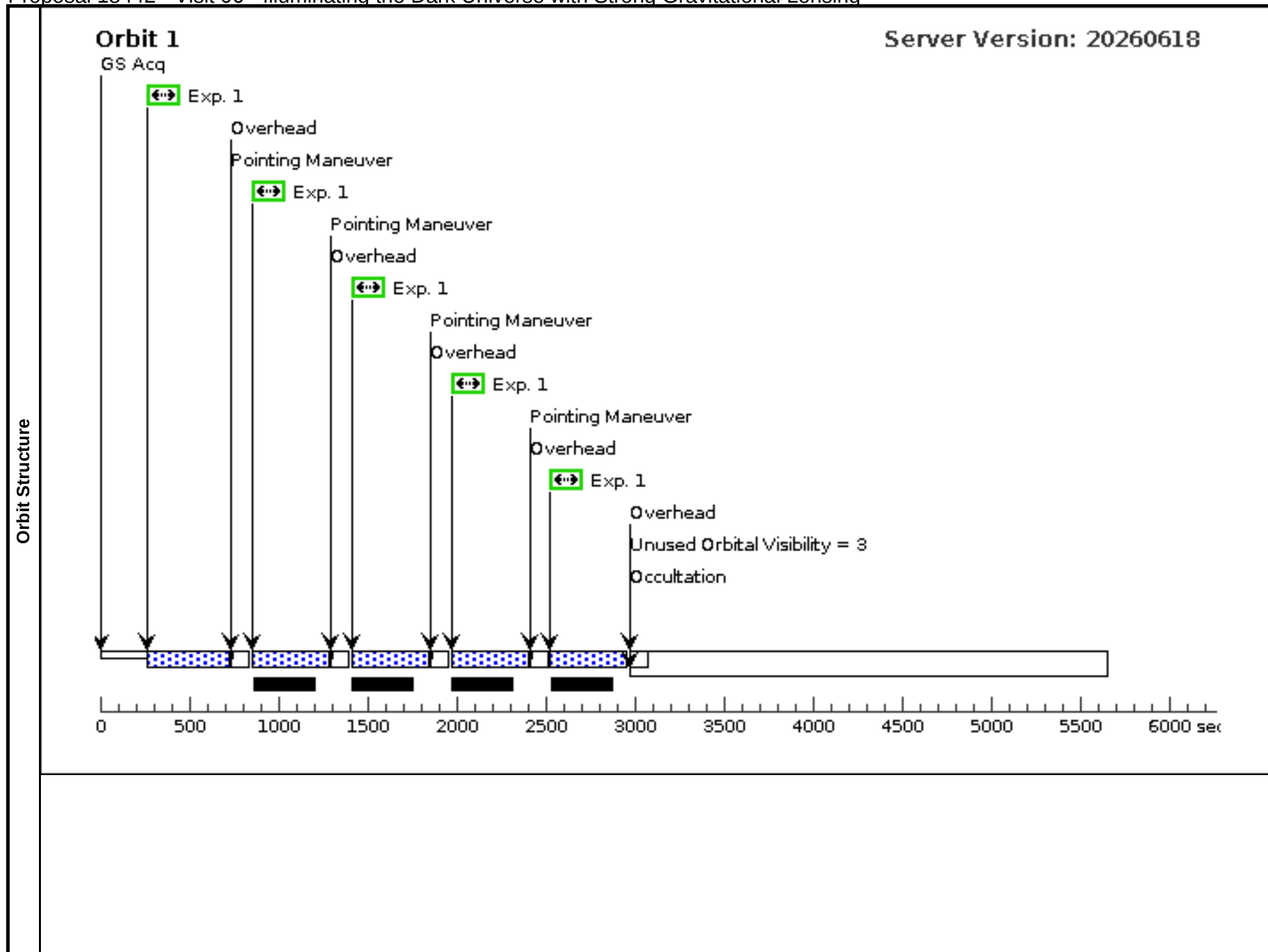
Visit	Proposal 18442, Visit 05					Mon Aug 17 14:02:22 GMT 2026				
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR, WFC3/UVIS									
	Special Requirements: (none)									
Patterns	#	Primary Pattern			Secondary Pattern			Exposures		
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false	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		(1)		
	(2)	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					(2)		
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(5)	AGEL225607+012534	RA: 22 56 7.4688 (344.0311200d) Dec: +01 25 35.00 (1.42639d) Equinox: J2000			V=20.8		Reference Frame: ICRS		
Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(5) AGEL225607+012534	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 1, Exps 1-1 in Visit 05 (1)	417.8 Secs (2816 Secs)	
									[==>430.8 Secs (Pattern 1,1)] [==>430.8 Secs (Pattern 1,2)] [==>430.8 Secs (Pattern 1,3)] [==>430.8 Secs (Pattern 2,1)] [==>430.8 Secs (Pattern 2,2)]	[1]
									[==>662 Secs (Pattern 2,3)]	[2]
	2		(5) AGEL225607+012534	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=9; SAMP-SEQ=SPAR S50		Pattern 2, Exps 2-2 in Visit 05 (2)	402.935899 Secs (1611.744 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]

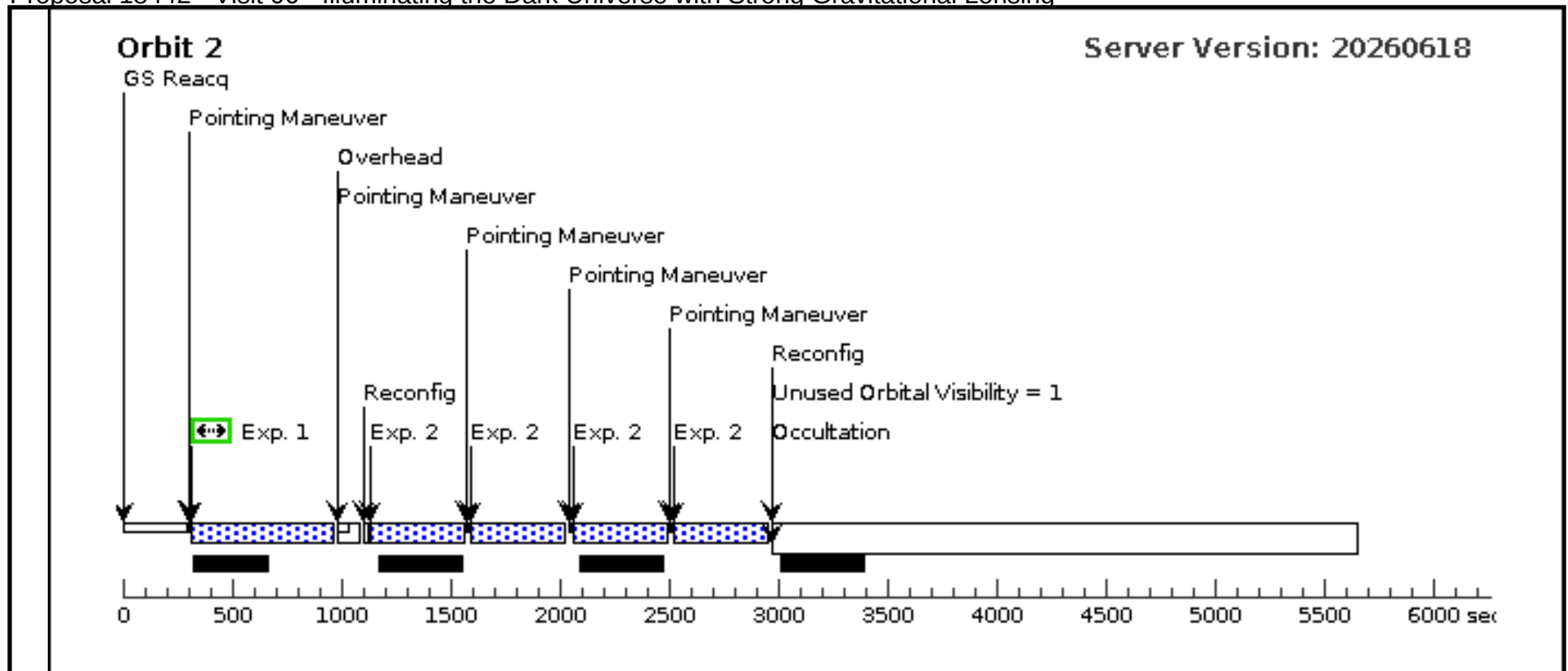




Proposal 18442 - Visit 06 - Illuminating the Dark Universe with Strong Gravitational Lensing

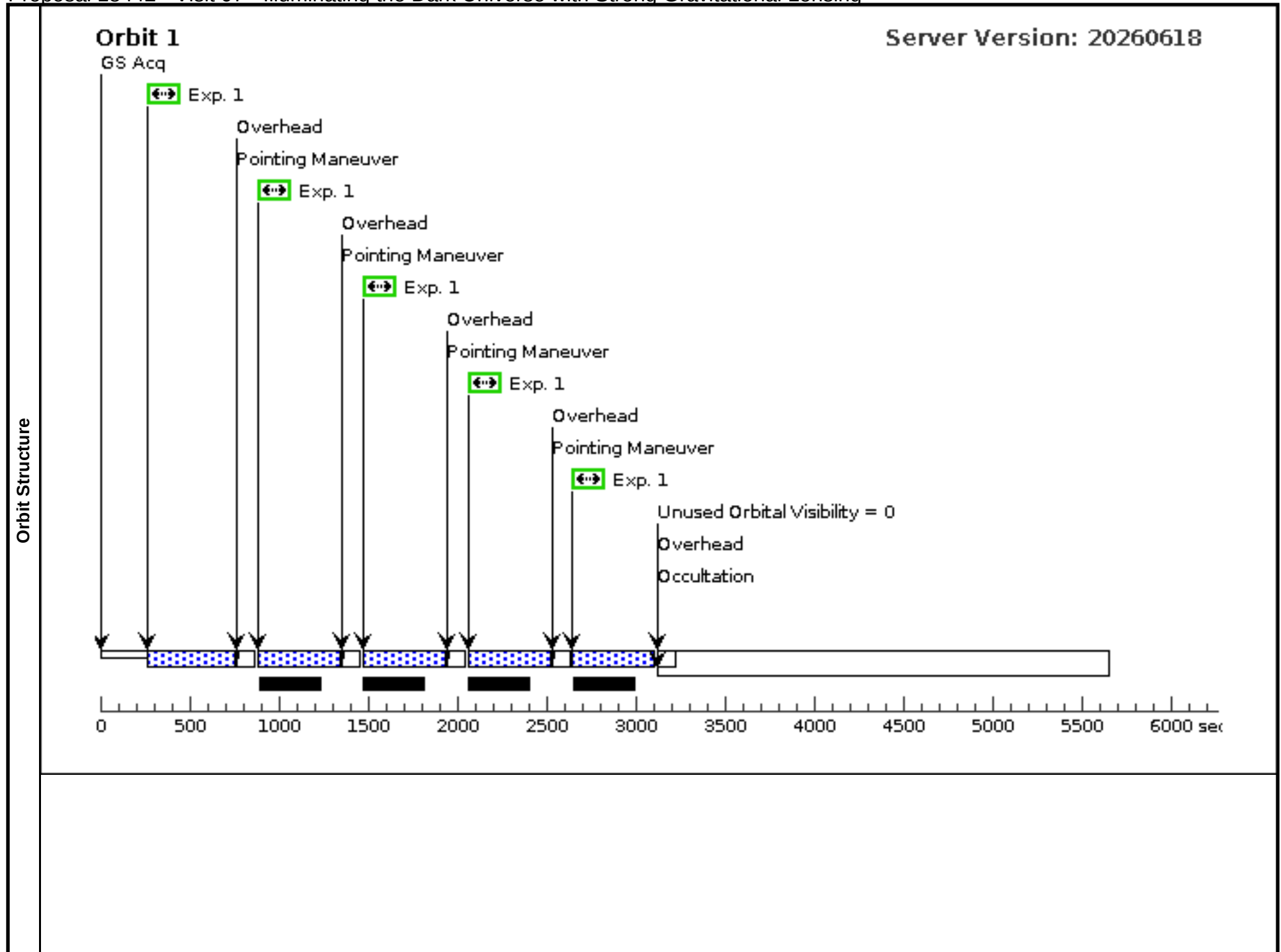
Visit	Proposal 18442, Visit 06					Mon Aug 17 14:02:22 GMT 2026				
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR, WFC3/UVIS									
	Special Requirements: (none)									
Patterns	#	Primary Pattern			Secondary Pattern				Exposures	
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false	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		(1)		
	(2)	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					(2)		
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(6)	AGEL014359+125610	RA: 01 43 58.7808 (25.9949200d) Dec: +12 56 10.10 (12.93614d) Equinox: J2000 Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]			V=20.3		Reference Frame: ICRS		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(6) AGEL014359+125610	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 1, Exps 1-1 in Visit 06 (1)	417.8 Secs (2806 Secs)	
									[==>429.8 Secs (Pattern 1,1)]	[1]
									[==>429.8 Secs (Pattern 1,2)]	
									[==>429.8 Secs (Pattern 1,3)]	
									[==>429.8 Secs (Pattern 2,1)]	
								[==>429.8 Secs (Pattern 2,2)]		
								[==>657 Secs (Pattern 2,3)]	[2]	
	2		(6) AGEL014359+125610	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=9; SAMP-SEQ=SPAR S50		Pattern 2, Exps 2-2 in Visit 06 (2)	402.935899 Secs (1611.744 Secs)	
									[==>(Pattern 1)]	[2]
									[==>(Pattern 2)]	
									[==>(Pattern 3)]	
									[==>(Pattern 4)]	

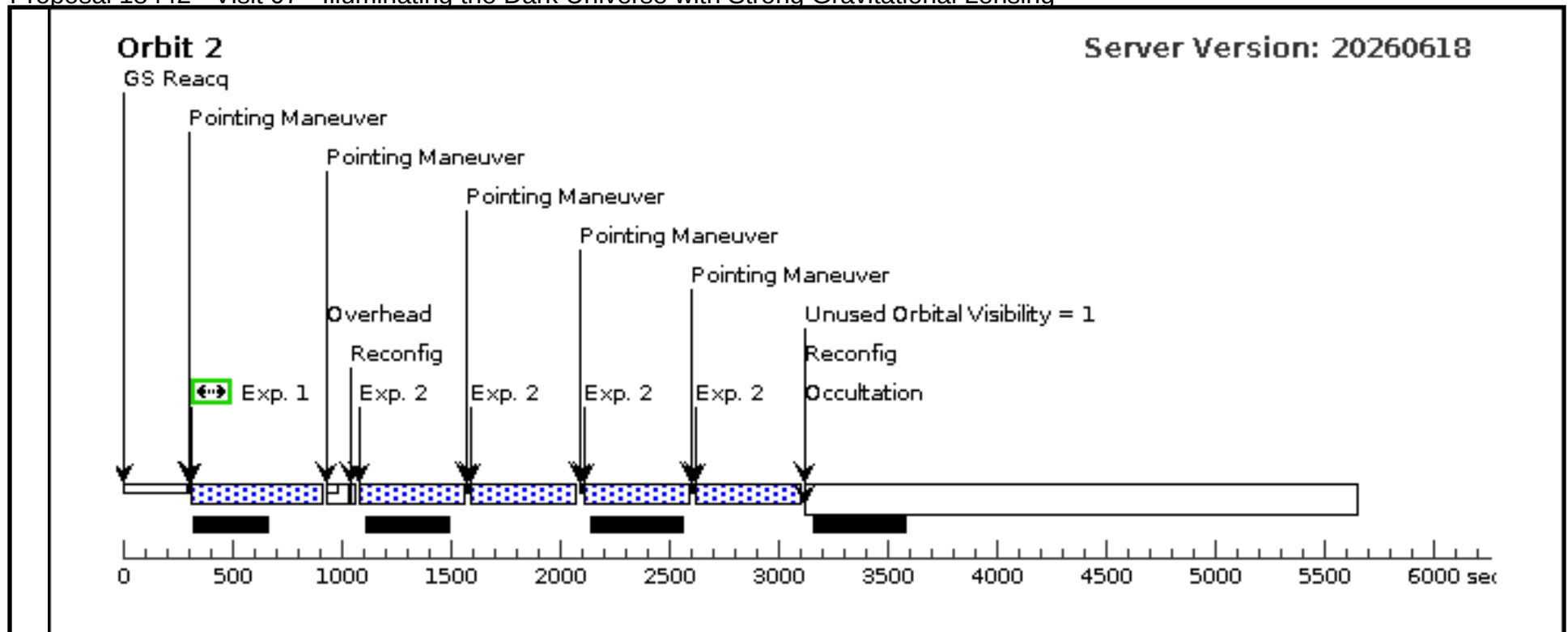




Proposal 18442 - Visit 07 - Illuminating the Dark Universe with Strong Gravitational Lensing

Visit	Proposal 18442, Visit 07					Mon Aug 17 14:02:22 GMT 2026				
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR, WFC3/UVIS									
	Special Requirements: (none)									
Patterns	#	Primary Pattern			Secondary Pattern			Exposures		
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false	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		(1)		
	(2)	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					(2)		
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(8)	AGEL131231+725054	RA: 13 12 31.0560 (198.1294000d) Dec: +72 50 54.24 (72.84840d) Equinox: J2000 Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]		V=20.8	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(8) AGEL131231+725054	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 1, Exps 1-1 in Visit 07 (1)	417.8 Secs (2903 Secs)	
									[==>459.8 Secs (Pattern 1,1)] [==>459.8 Secs (Pattern 1,2)] [==>459.8 Secs (Pattern 1,3)] [==>459.8 Secs (Pattern 2,1)] [==>459.8 Secs (Pattern 2,2)] [==>604.0 Secs (Pattern 2,3)]	[1]
										[2]
	2		(8) AGEL131231+725054	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=10; SAMP-SEQ=SPAR S50		Pattern 2, Exps 2-2 in Visit 07 (2)	452.93635 Secs (1811.745 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]





Proposal 18442 - Visit 08 - Illuminating the Dark Universe with Strong Gravitational Lensing

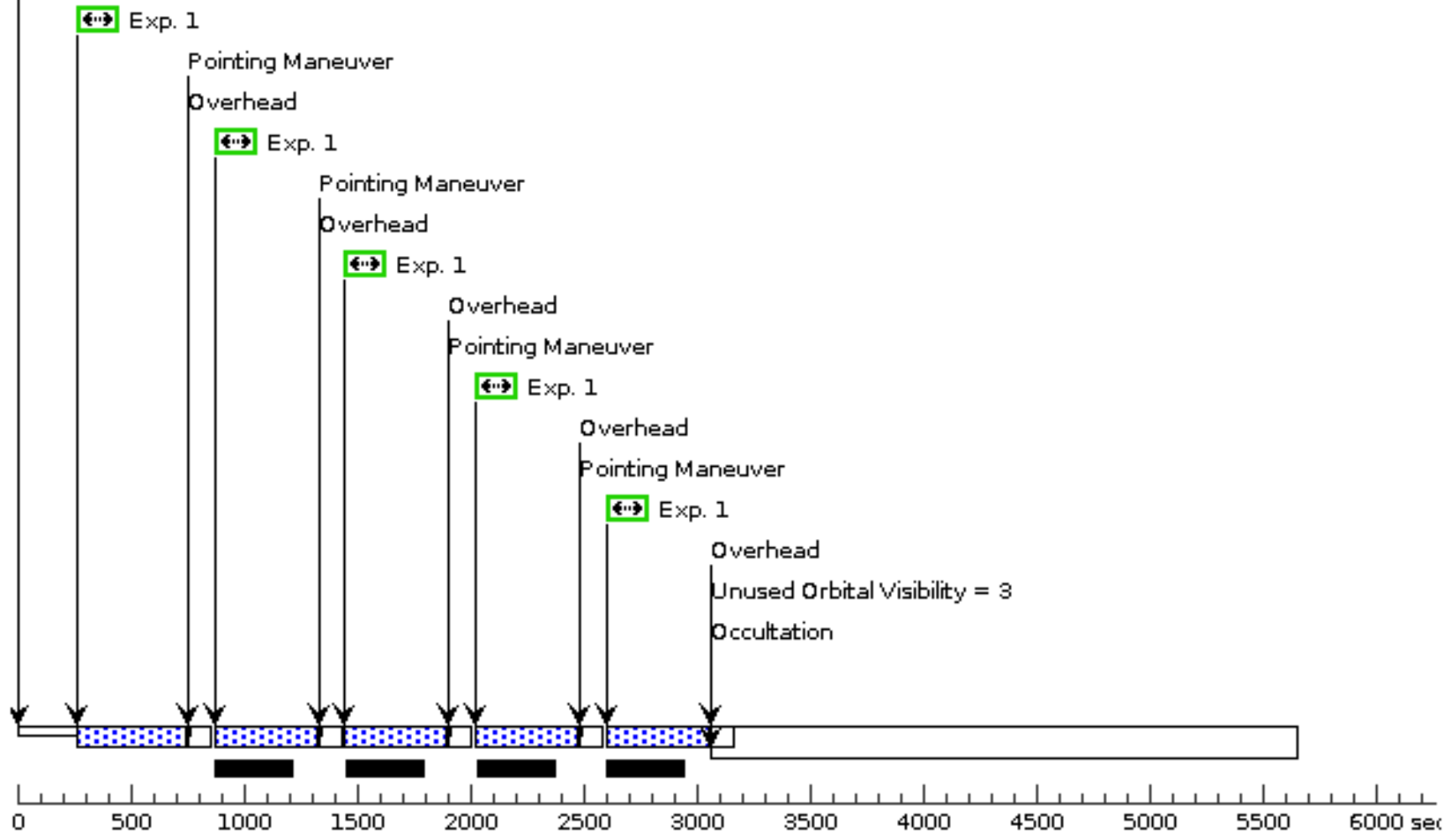
Visit	Proposal 18442, Visit 08					Mon Aug 17 14:02:22 GMT 2026				
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR, WFC3/UVIS									
	Special Requirements: (none)									
Patterns	#	Primary Pattern			Secondary Pattern			Exposures		
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false	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		(1)		
	(2)	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					(2)		
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(10)	AGEL113723+602220	RA: 11 37 22.6800 (174.3445000d) Dec: +60 22 20.28 (60.37230d) Equinox: J2000			V=20.7		Reference Frame: ICRS		
	Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(10) AGEL113723+602220	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 1, Exps 1-1 i n Visit 08 (1)	417.8 Secs (2786 Secs) [==>447.8 Secs (Pattern 1,1)] [==>447.8 Secs (Pattern 1,2)] [==>447.8 Secs (Pattern 1,3)] [==>447.8 Secs (Pattern 2,1)] [==>447.8 Secs (Pattern 2,2)] [==>547 Secs (Pattern 2,3)]	 [1] [2]
	2		(10) AGEL113723+602220	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=10; SAMP-SEQ=SPAR S50		Pattern 2, Exps 2-2 i n Visit 08 (2)	452.93635 Secs (1811.745 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	 [2]

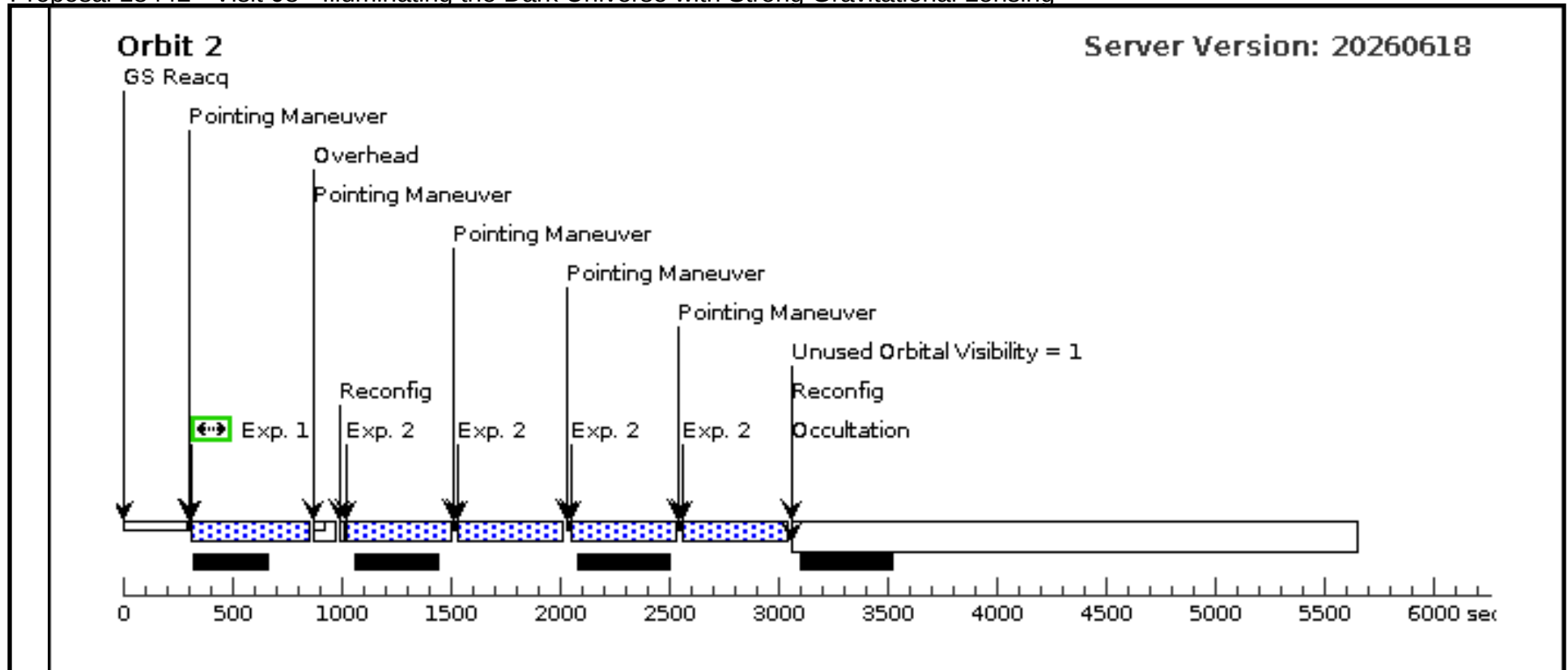
Server Version: 20260618

Orbit Structure

Orbit 1

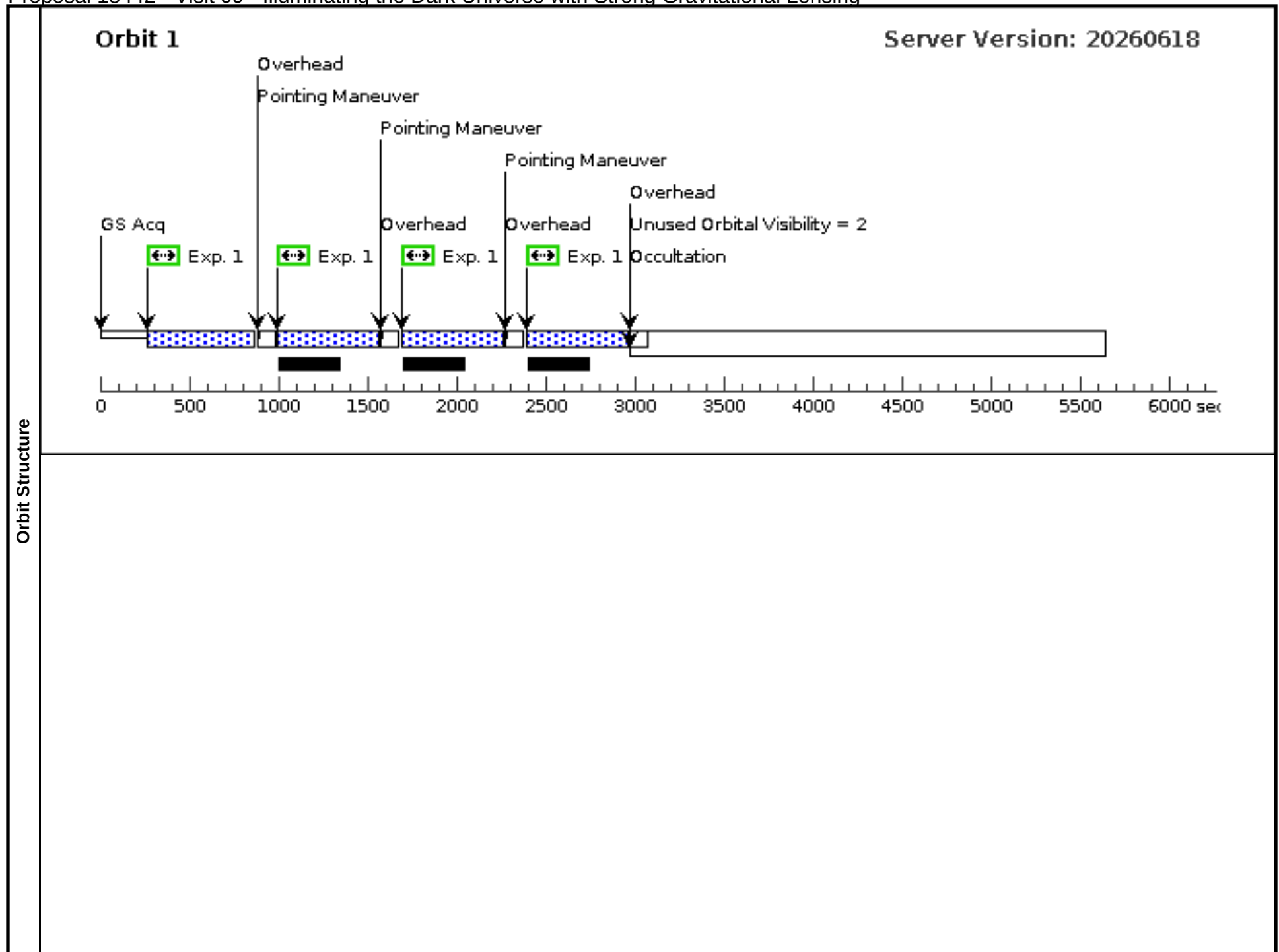
GS Acq

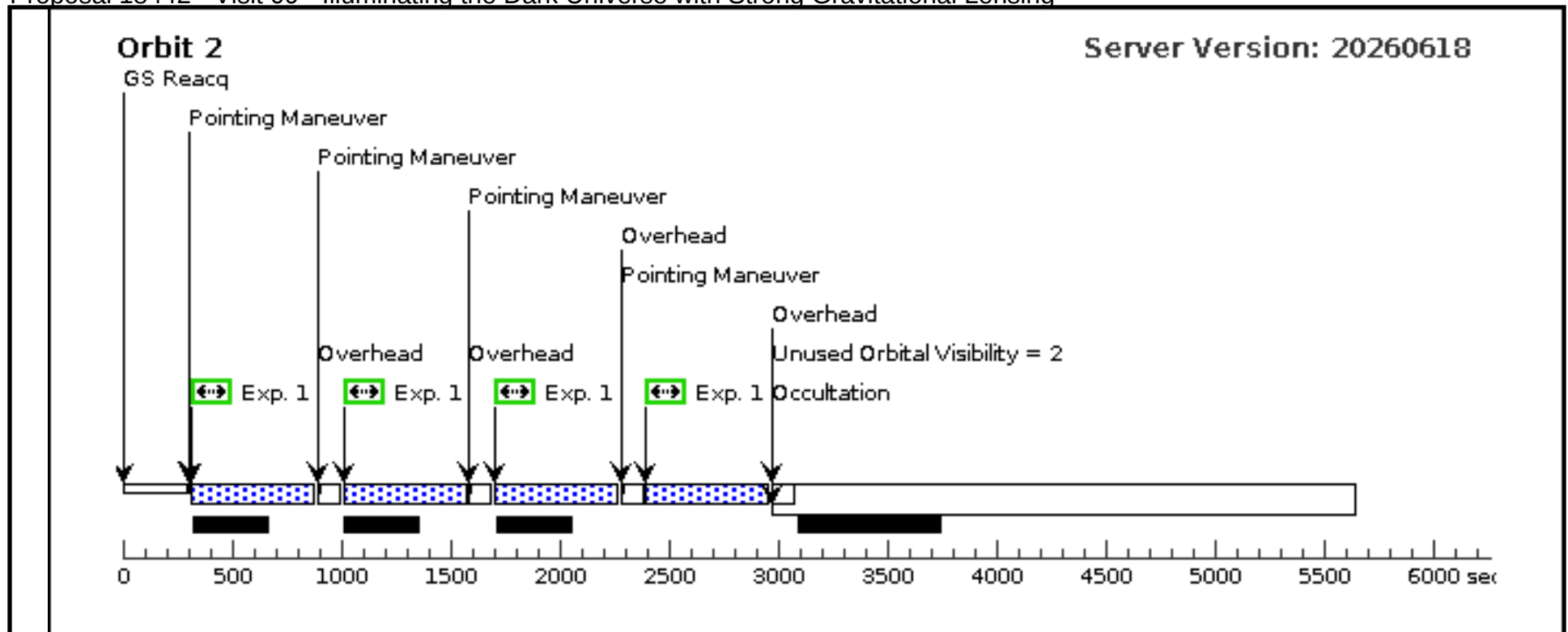




Proposal 18442 - Visit 09 - Illuminating the Dark Universe with Strong Gravitational Lensing

Visit	Proposal 18442, Visit 09										Mon Aug 17 14:02:22 GMT 2026	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: WFC3/UVIS											
	Special Requirements: (none)											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(3)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false	Pattern Type=WFC3-IR-DITHER-BOX-UVIS Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=true	(1)						
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous						
	(11)	AGEL020613-011417A	RA: 02 06 13.4660 (31.5561083d) Dec: -01 14 17.41 (-1.23817d) Equinox: J2000		V=20.0	Reference Frame: ICRS						
	Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit		
	1		(11) AGEL020613-011417A	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 3, Exps 1-1 in Visit 09 (3)	560 Secs (4548 Secs)			
									[==>571.0 Secs (Pattern 1,1)]	[1]		
									[==>571.0 Secs (Pattern 1,2)]			
									[==>571.0 Secs (Pattern 1,3)]			
								[==>571.0 Secs (Pattern 1,4)]	[2]			
								[==>566.0 Secs (Pattern 2,1)]				
								[==>566.0 Secs (Pattern 2,2)]				
								[==>566.0 Secs (Pattern 2,3)]				
									[==>566.0 Secs (Pattern 2,4)]			





Proposal 18442 - Visit 10 - Illuminating the Dark Universe with Strong Gravitational Lensing

Visit	Proposal 18442, Visit 10										Mon Aug 17 14:02:22 GMT 2026	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: WFC3/UVIS											
	Special Requirements: (none)											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(3)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.5 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=136.84 Angle Between Sides= Center Pattern=false	Pattern Type=WFC3-IR-DITHER-BOX-UVIS Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=true	(1)						
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous						
	(12)	AGEL233610-020735A	RA: 23 36 10.2520 (354.0427167d) Dec: -02 07 35.05 (-2.12640d) Equinox: J2000		V=19.4	Reference Frame: ICRS						
	Comments: Category=GALAXY Description=[GRAVITATIONAL LENS]											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1		(12) AGEL233610-020735A	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F200LP			Pattern 3, Exps 1-1 in Visit 10 (3)	560 Secs (4548 Secs)			
									[==>571.0 Secs (Pattern 1,1)] [==>571.0 Secs (Pattern 1,2)] [==>571.0 Secs (Pattern 1,3)] [==>571.0 Secs (Pattern 1,4)]		[1]	
									[==>566.0 Secs (Pattern 2,1)] [==>566.0 Secs (Pattern 2,2)] [==>566.0 Secs (Pattern 2,3)] [==>566.0 Secs (Pattern 2,4)]		[2]	

