



18191 - Multiwavelength Observations of the Highest-Redshift Dynamically Relaxed Galaxy Cluster

Cycle: 33, Proposal Category: GO
(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Anthony M Flores (PI) (Contact)	Rutgers University
Prof. Steven W. Allen (CoI)	Stanford University
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Dr. R. Glenn Morris (CoI)	Stanford University
Prof. Michael A. McDonald (CoI)	Massachusetts Institute of Technology
Dr. Taweewat Somboonpanyakul (CoI)	Chulalongkorn University
Haley Rose Stueber (CoI)	Stanford University
Abby Y Pan (CoI)	Stanford University

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) ACT-CLJ0123.5-0428	WFC3/IR	2	29-Sep-2025 15:02:14.0	yes
02	(1) ACT-CLJ0123.5-0428	WFC3/IR	2	29-Sep-2025 15:02:15.0	yes
03	(1) ACT-CLJ0123.5-0428	WFC3/IR	2	29-Sep-2025 15:02:16.0	yes
04	(1) ACT-CLJ0123.5-0428	WFC3/IR	2	29-Sep-2025 15:02:18.0	yes
05	(1) ACT-CLJ0123.5-0428	WFC3/IR	2	29-Sep-2025 15:02:19.0	yes

10 Total Orbits Used

ABSTRACT

We propose joint Chandra, XMM-Newton, and HST observations of ACT-CL J0123.5-0428, a $z=1.5$ galaxy cluster newly identified as the highest redshift relaxed cool-core cluster known. Deeper X-ray observations from Chandra and XMM, paired with wideband WFC3/IR imaging from Hubble, will allow us to exquisitely characterize the (thermo)dynamics and chemistry of the ICM out to large radius - including a precise gas mass profile for cosmological studies - and constrain the morphologies and stellar histories of member galaxies over the same spatial scale. In combination, these observations will provide a greatly enhanced picture of feedback processes in the early Universe and significantly extend the redshift range probed by studies of ICM/galaxy evolution and cosmology in relaxed systems.

OBSERVING DESCRIPTION

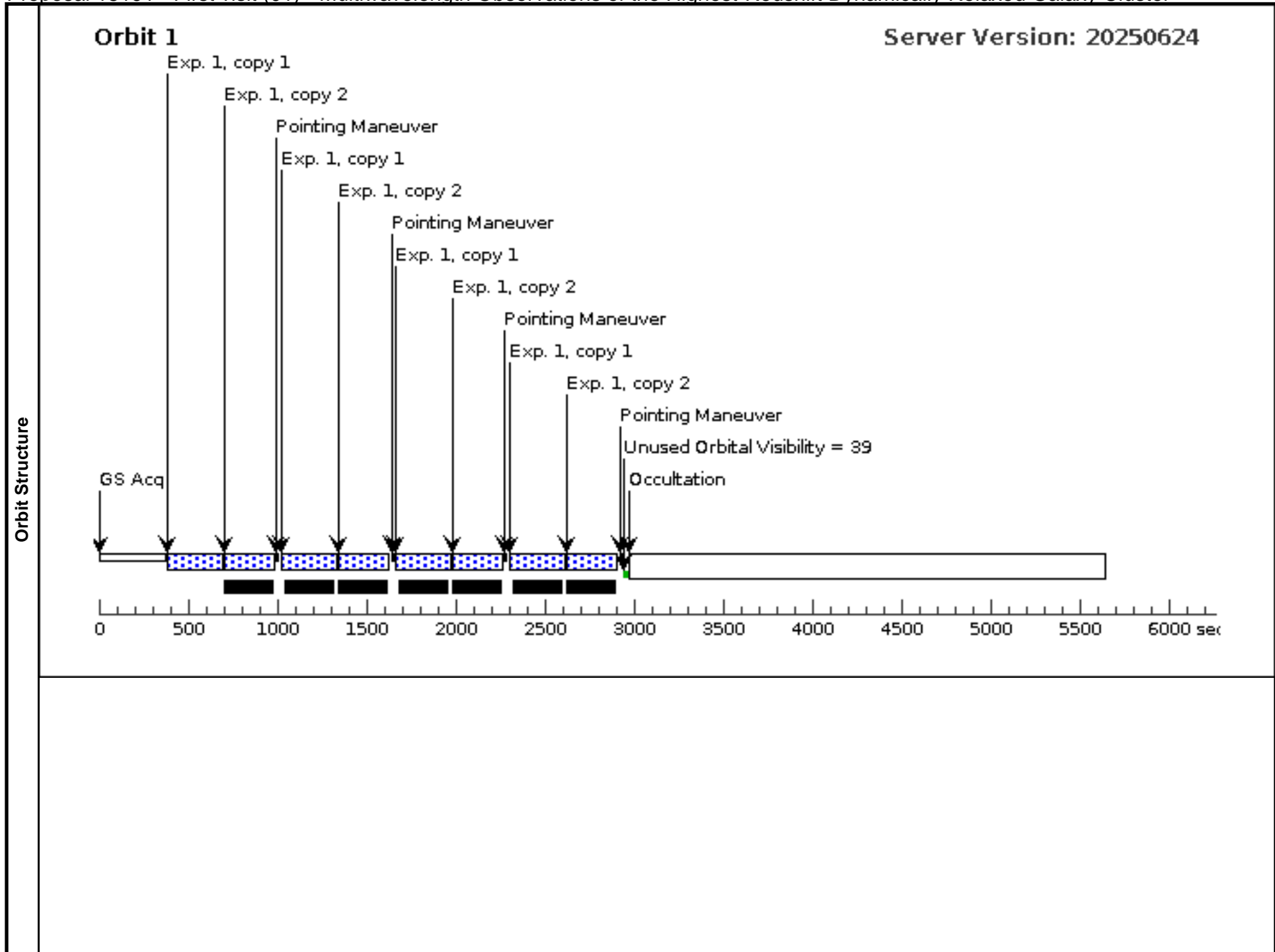
This program consists of 10 total HST orbits using the WFC3 to observe a high redshift ($z=1.5$) galaxy cluster. This system will be observed for 5 total orbits using the F105W IR filter, and 5 total orbits using the F140W IR filter.

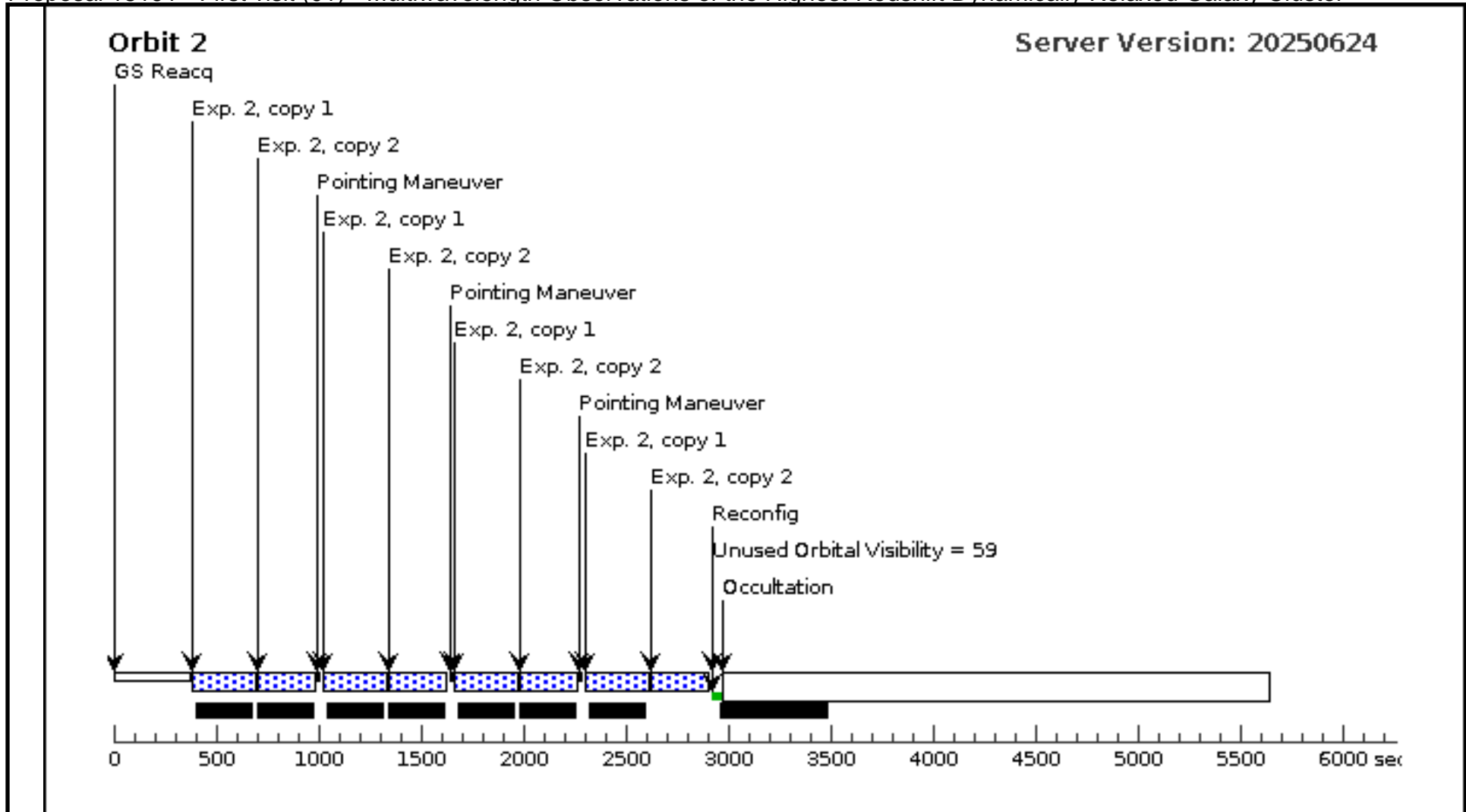
This program contains 5 visits to the object. Each visit will consist of 2 orbits, with one orbit corresponding to each of the above filters. For each visit, the center of the cluster (roughly the position of the BCG) will be used as the coordinates of the target.

Proposal 18191 - First visit (01) - Multiwavelength Observations of the Highest-Redshift Dynamically Relaxed Galaxy Cluster

Mon Sep 29 19:02:20 GMT 2025

Visit	Proposal 18191, First visit (01) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	ACT-CLJ0123.5-0428	RA: 01 23 32.0956 (20.8837317d) Dec: -04 28 26.22 (-4.47395d) Equinox: J2000	Epoch of Position: 2000 Redshift: 1.5	V=(?) 21 (z band), 18.5 (CATWISE W1)	Reference Frame: ICRS				
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[HIGH REDSHIFT CLUSTER] Extended=YES									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F105W_1	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=12; SAMP-SEQ=SPAR S25			Pattern 1, Exps 1-1 in First visit (01) (1)	277.937956 Secs X 2 (2223.504 Secs)
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[1]
	2	F140W_1	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=12; SAMP-SEQ=SPAR S25		Pattern 1, Exps 2-2 in First visit (01) (1)	277.937956 Secs X 2 (2223.504 Secs)	
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[2]

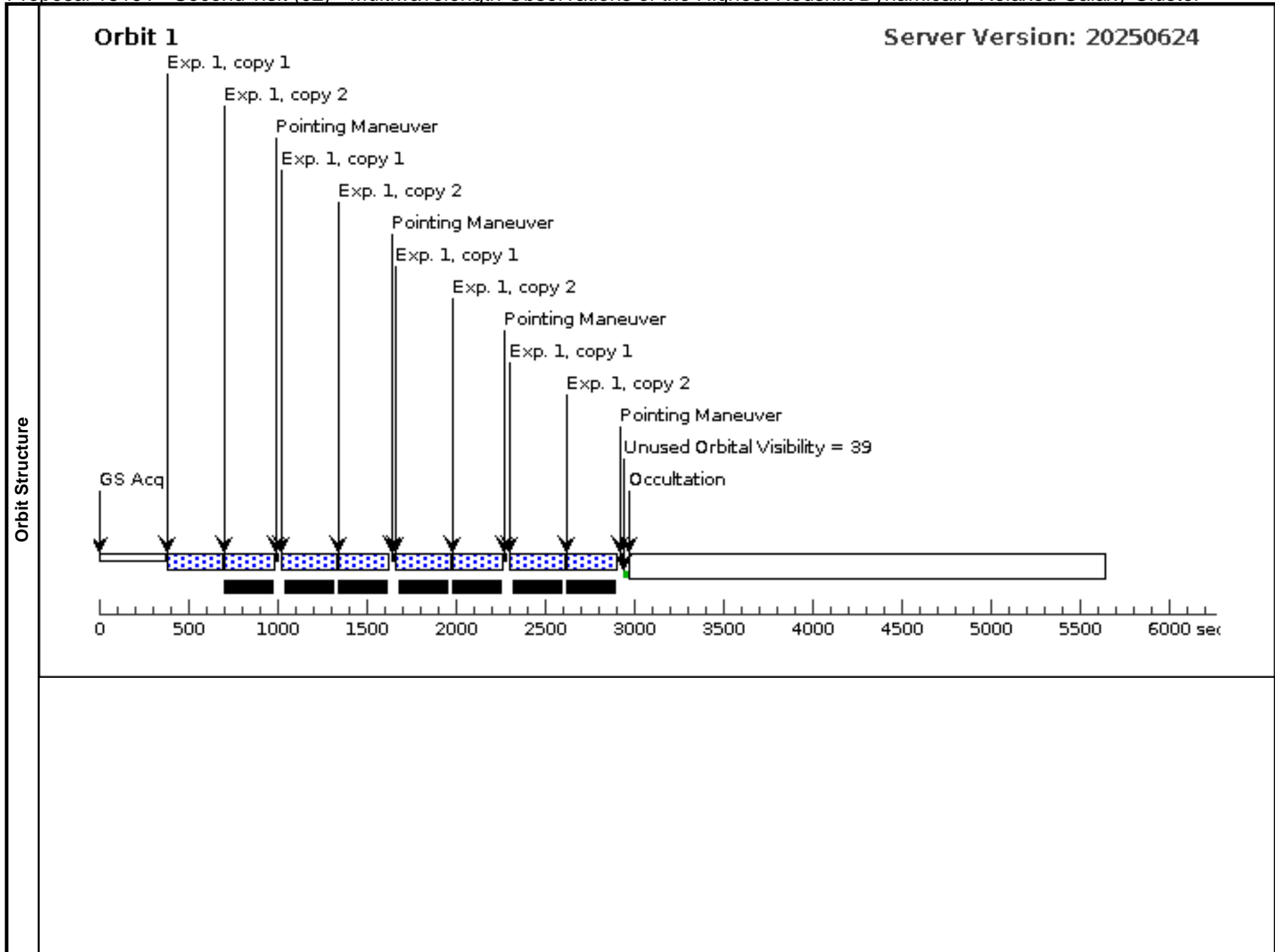


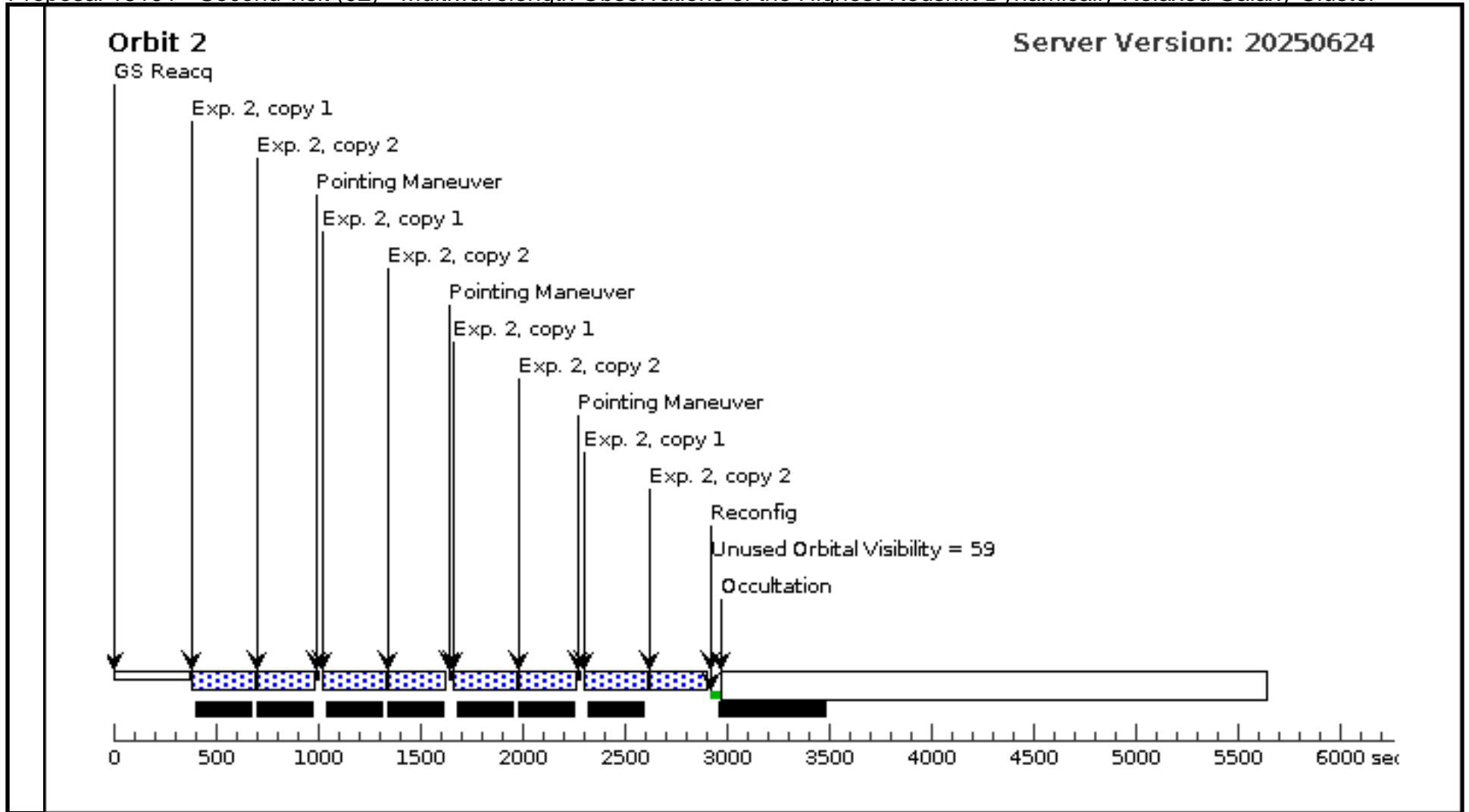


Proposal 18191 - Second visit (02) - Multiwavelength Observations of the Highest-Redshift Dynamically Relaxed Galaxy Cluster

Mon Sep 29 19:02:20 GMT 2025

Visit	Proposal 18191, Second visit (02) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false					(1), (2)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(1)	ACT-CLJ0123.5-0428	RA: 01 23 32.0956 (20.8837317d)	Dec: -04 28 26.22 (-4.47395d)	Epoch of Position: 2000	Redshift: 1.5	V=(?)	21 (z band), 18.5 (CATWISE W1)	Reference Frame: ICRS	
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[HIGH REDSHIFT CLUSTER] Extended=YES									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F105W_2	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=12; SAMP-SEQ=SPAR S25		Pattern 1, Exps 1-1 in Second visit (02) (1)	277.937956 Secs X 2 (2223.504 Secs)	
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[1]
	2	F140W_2	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=12; SAMP-SEQ=SPAR S25		Pattern 1, Exps 2-2 in Second visit (02) (1)	277.937956 Secs X 2 (2223.504 Secs)	
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[2]

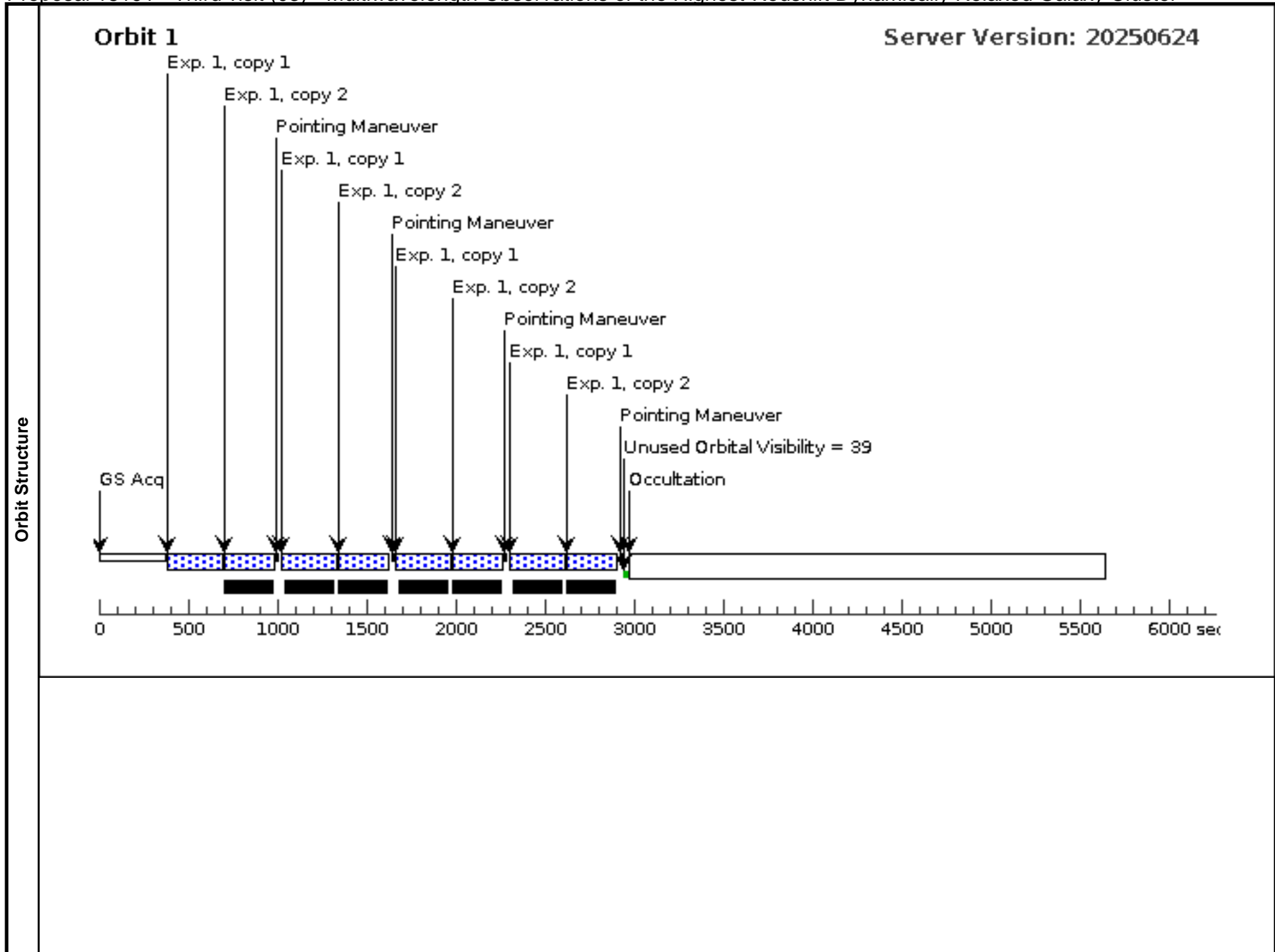


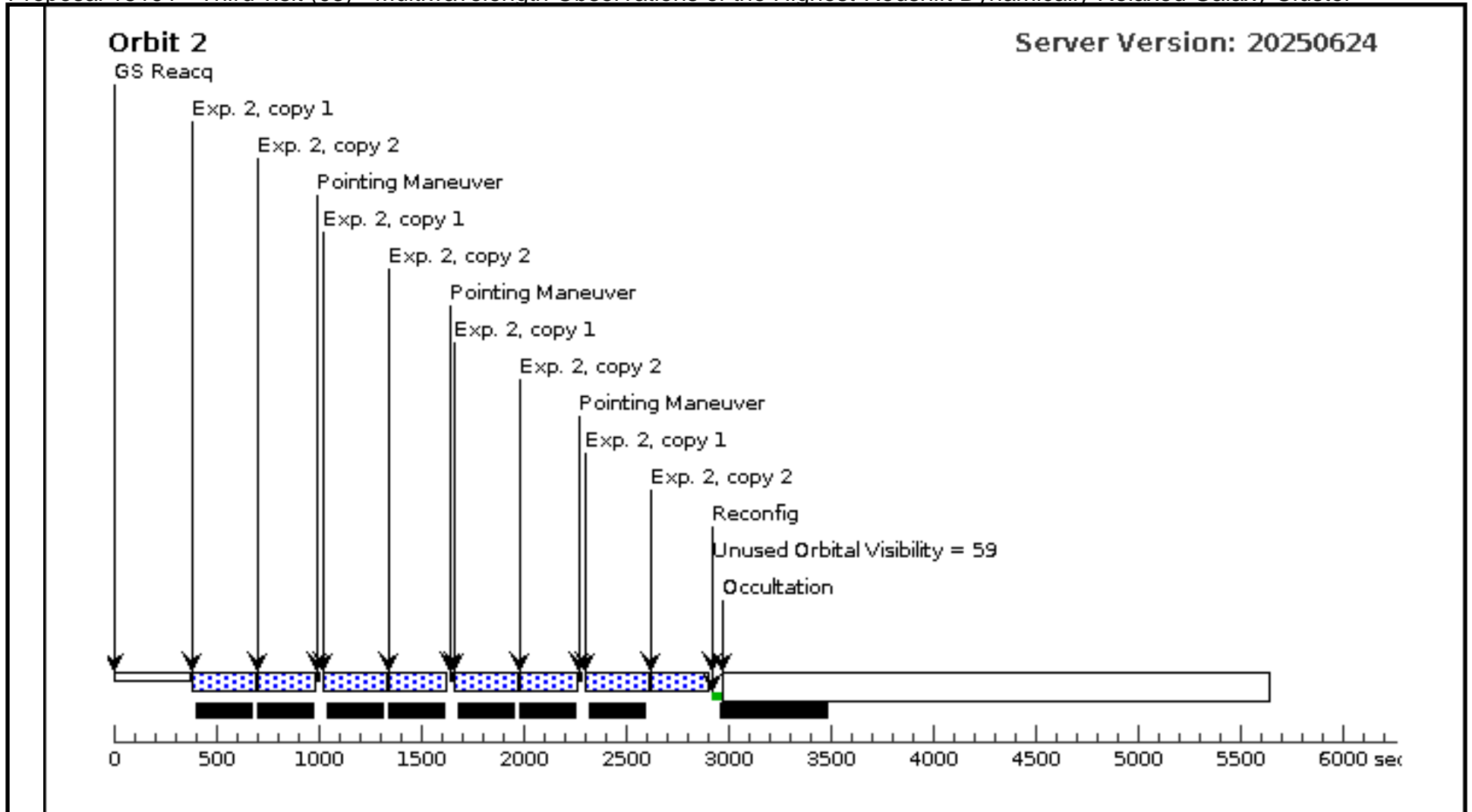


Proposal 18191 - Third visit (03) - Multiwavelength Observations of the Highest-Redshift Dynamically Relaxed Galaxy Cluster

Mon Sep 29 19:02:20 GMT 2025

Visit	Proposal 18191, Third visit (03) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	ACT-CLJ0123.5-0428	RA: 01 23 32.0956 (20.8837317d) Dec: -04 28 26.22 (-4.47395d) Equinox: J2000	Epoch of Position: 2000 Redshift: 1.5	V=(?) 21 (z band), 18.5 (CATWISE W1)	Reference Frame: ICRS				
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[HIGH REDSHIFT CLUSTER] Extended=YES									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F105W_3	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=12; SAMP-SEQ=SPAR S25			Pattern 1, Exps 1-1 in Third visit (03) (1)	277.937956 Secs X 2 (2223.504 Secs)
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[1]
	2	F140W_3	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=12; SAMP-SEQ=SPAR S25		Pattern 1, Exps 2-2 in Third visit (03) (1)	277.937956 Secs X 2 (2223.504 Secs)	
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[2]

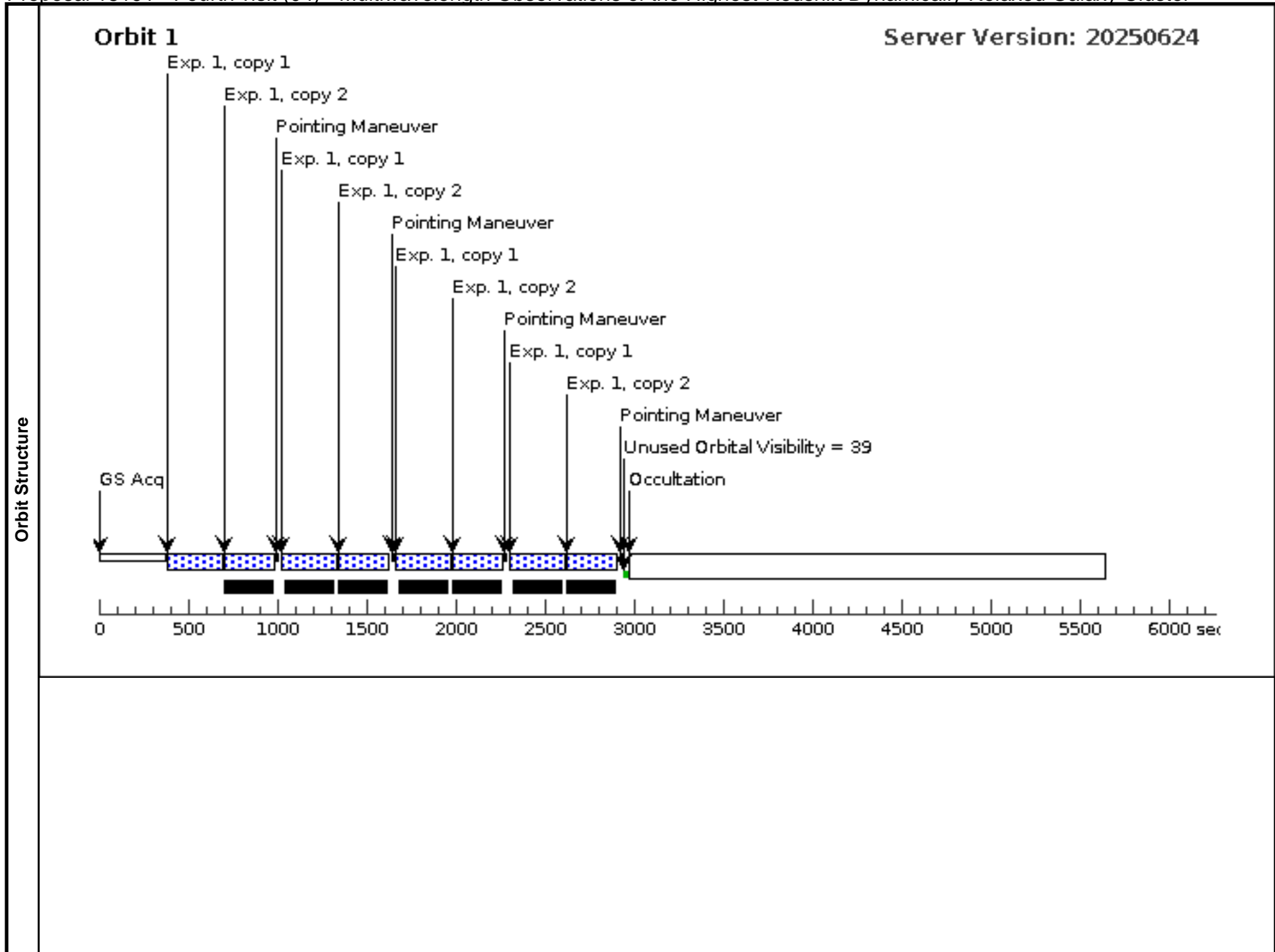


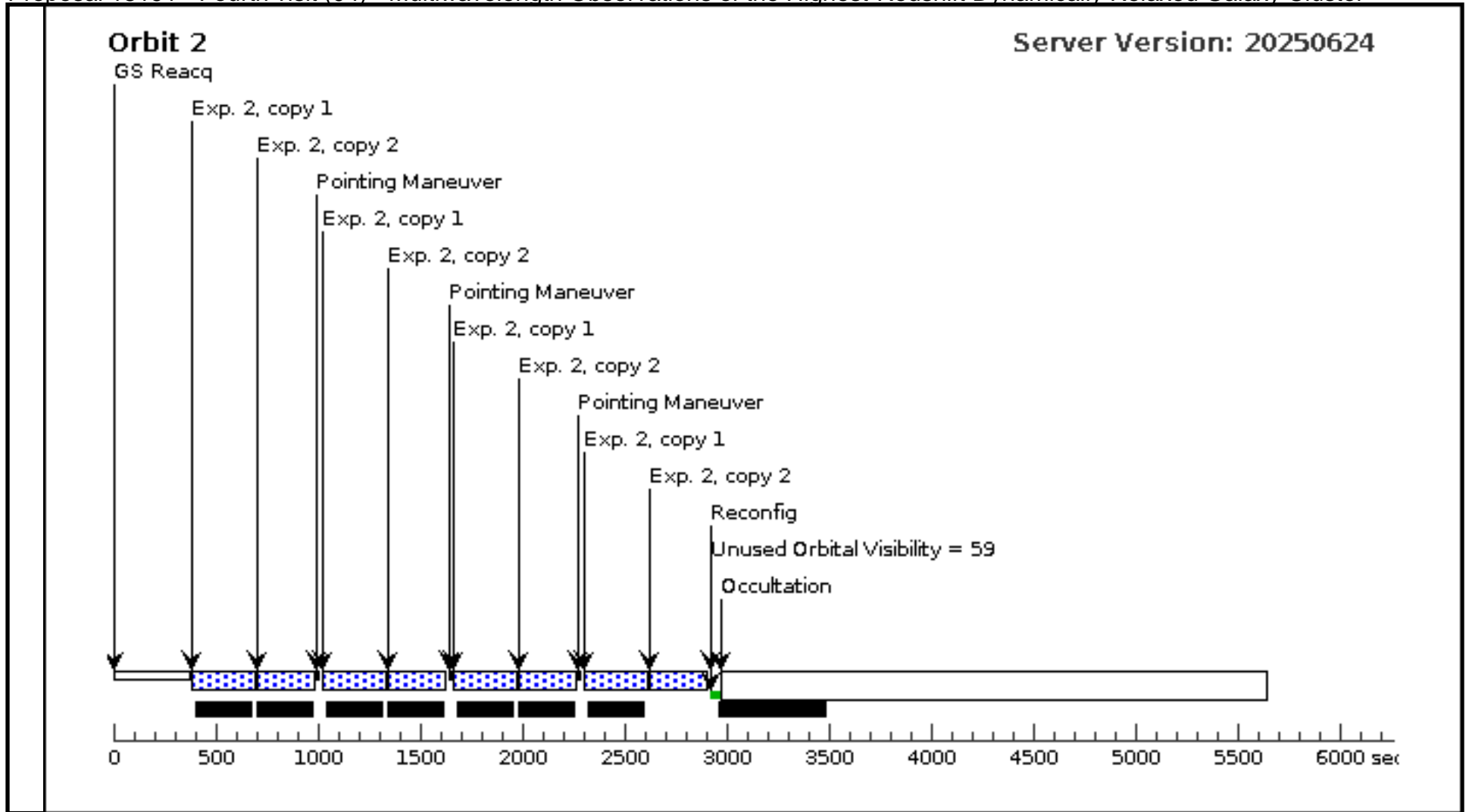


Proposal 18191 - Fourth visit (04) - Multiwavelength Observations of the Highest-Redshift Dynamically Relaxed Galaxy Cluster

Mon Sep 29 19:02:20 GMT 2025

Visit	Proposal 18191, Fourth visit (04) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	ACT-CLJ0123.5-0428	RA: 01 23 32.0956 (20.8837317d) Dec: -04 28 26.22 (-4.47395d) Equinox: J2000	Epoch of Position: 2000 Redshift: 1.5	V=(?) 21 (z band), 18.5 (CATWISE W1)	Reference Frame: ICRS				
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[HIGH REDSHIFT CLUSTER] Extended=YES									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F105W_4	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=12; SAMP-SEQ=SPAR S25			Pattern 1, Exps 1-1 in Fourth visit (04) (1)	277.937956 Secs X 2 (2223.504 Secs)
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[1]
	2	F140W_4	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=12; SAMP-SEQ=SPAR S25		Pattern 1, Exps 2-2 in Fourth visit (04) (1)	277.937956 Secs X 2 (2223.504 Secs)	
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[2]





Proposal 18191 - Fifth visit (05) - Multiwavelength Observations of the Highest-Redshift Dynamically Relaxed Galaxy Cluster

Mon Sep 29 19:02:20 GMT 2025

Visit	Proposal 18191, Fifth visit (05) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	ACT-CLJ0123.5-0428	RA: 01 23 32.0956 (20.8837317d) Dec: -04 28 26.22 (-4.47395d) Equinox: J2000	Epoch of Position: 2000 Redshift: 1.5	V=? 21 (z band), 18.5 (CATWISE W1)	Reference Frame: ICRS				
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[HIGH REDSHIFT CLUSTER] Extended=YES									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F105W_5	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=12; SAMP-SEQ=SPAR S25			Pattern 1, Exps 1-1 in Fifth visit (05) (1)	277.937956 Secs X 2 (2223.504 Secs)
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[1]
	2	F140W_5	(1) ACT-CLJ0123.5-0428	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=12; SAMP-SEQ=SPAR S25		Pattern 1, Exps 2-2 in Fifth visit (05) (1)	277.937956 Secs X 2 (2223.504 Secs)	
									[==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 4, Copy 1)] [==>(Pattern 4, Copy 2)]	[2]

