18075 - Multiple intermediate-mass black holes in the local dwarf galaxy UGCA320

Cycle: 33, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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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) SBC-1	ACS/SBC	1	23-Sep-2025 17:00:14.0	yes
02	(2) SBC-2 (3) SBC-2-BACKGROUND	ACS/SBC	2	23-Sep-2025 17:00:14.0	yes
03	(4) UVIS-HOST	WFC3/UVIS	1	23-Sep-2025 17:00:15.0	yes
04	(4) UVIS-HOST	WFC3/UVIS	1	23-Sep-2025 17:00:15.0	yes

5 Total Orbits Used

ABSTRACT

Identifying and studying intermediate-mass black holes (IMBHs; BH mass < 10^5 solar mass) in local dwarf galaxies offers crucial insights into the formation and growth of supermassive black holes (SMBHs), as IMBHs are believed to represent an early evolutionary stage. Determining their abundance and accretion properties is key to understanding how SMBHs assemble, and the UV emission is crucial in identifying IMBH and

constraining the accretion disk properties. However, only a few IMBHs have been identified so far, and no more than one IMBH has been confirmed in any single dwarf galaxy, leaving their demographics and properties uncertain. In the dwarf galaxy UGCA 320, we identified two off-disk IMBH candidates with multiple evidence, and an off-center candidate in the disk but with inconclusive evidence. Although they have previous UV detection by Galex and Swift, large uncertainties prevent constraining the intrinsic UV slopes of the two off-disk candidates, and the broad PSF prevents resolving the candidate located in the disk. We propose HST observations using SBC/F140LP, UVIS/F225W, and UVIS/F300X to obtain cleaner AGN UV emission and construct high spatial resolution SEDs at three parsecs. These data will allow us to study IMBH accretion disk properties and provide robust evidence for them as IMBHs.

OBSERVING DESCRIPTION

1. Visit01: ACS/SBC F140LP observation for SBC-1. The pointing can cover two targets of interest simultaneously, regardless of orientation. The four-step dithering pattern is used to improve photometric accuracy, considering flat-field variation and PSF sampling. Each exposure lasting 500s, balancing the orbits' utilization and visibility.

2. Visit02: ACS/SBC F140LP observation for SBC-2. The pointing covers the target of interest and its surrounding environment. The "DITHER-BOX" main pattern is to improve photometric accuracy, and the "DITHERC-LINE" subpattern offsets the pointing by 3" to slightly increase FOV. We also set a pointing named SBC2-BACKGROUND to obtain one dedicated background observation.
Considering the orbit utilization and the visibity, the first orbit without background observation with 450s per exposure, and the second orbit with 360s per exposure. The background observation will carried out at end of source exposure, with 360s observing time. Thus, this observation needs two consecutive orbits.

3. Vist03 and Vist04: WFC3/UVIS F225W and F300X observations for UVIS-HOST. The pointing covers all three targets of interest at the same time, regardless of orientation. The "UVIS2-C1K2C-CTE" aperture and a "FLASH=15" are used to migrate the CTE effects for the three targets. The "DITHER-BOX" pattern is to improve the accuracy of photometry. Each exposure lasting 450s considering the required S/N, orbit utilization, and visibility.

For UVIS observation, while the orientation is unconstrained to avoid decreasing visibility, it would be better if the aperture covers as much of the host galaxy as possible.

Visit

Proposal 18075, Visit 01, implementation

Tue Sep 23 21:00:16 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false		(1)

Fixed Targets

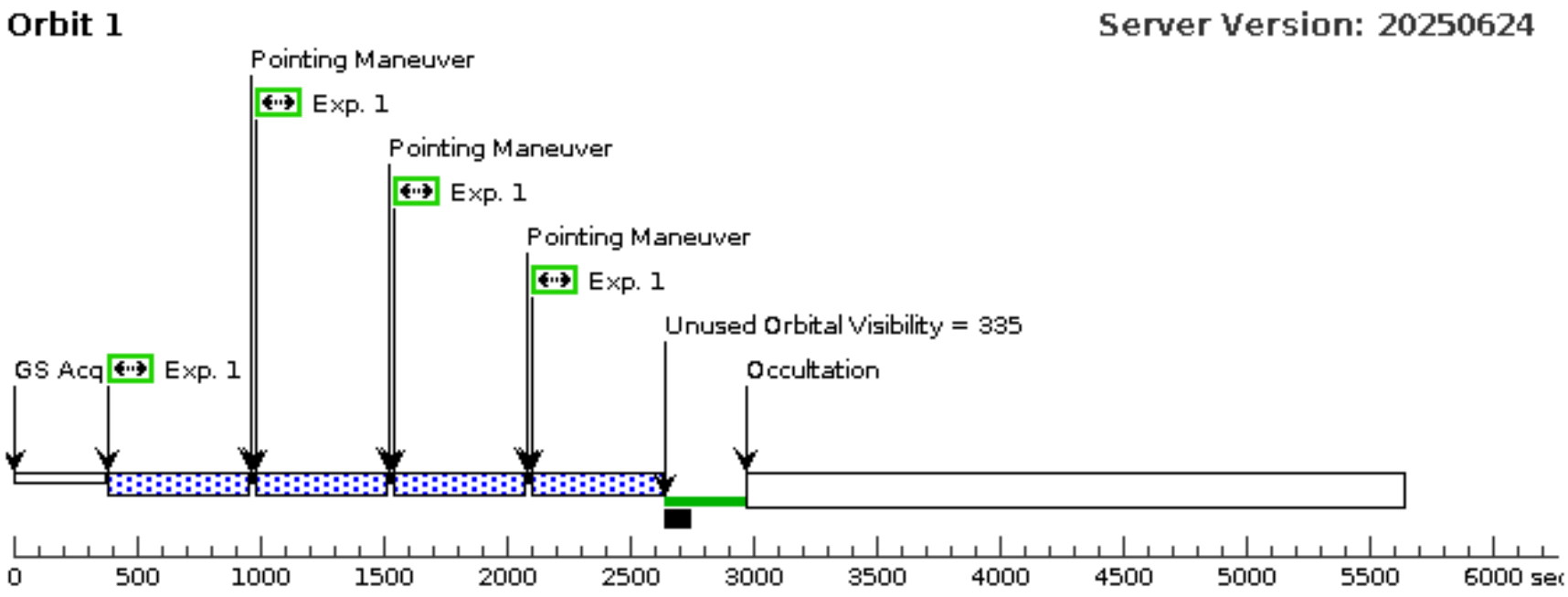
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SBC-1	RA: 13 03 15.7052 (195.8154383d) Dec: -17 25 38.08 (-17.42724d) Equinox: J2000	Epoch of Position: 2000	V=18.7	Reference Frame: ICRS

Comments:
Category=ISM
Description=[NUCLEUS]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(2026133)	(1) SBC-1	ACS/SBC, ACCUM, SBC	F140LP			Pattern 1, Exps 1-1 in Visit 01 (1)	500 Secs (2000 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 18075, Visit 02, implementation Tue Sep 23 21:00:16 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(4)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false	(1)

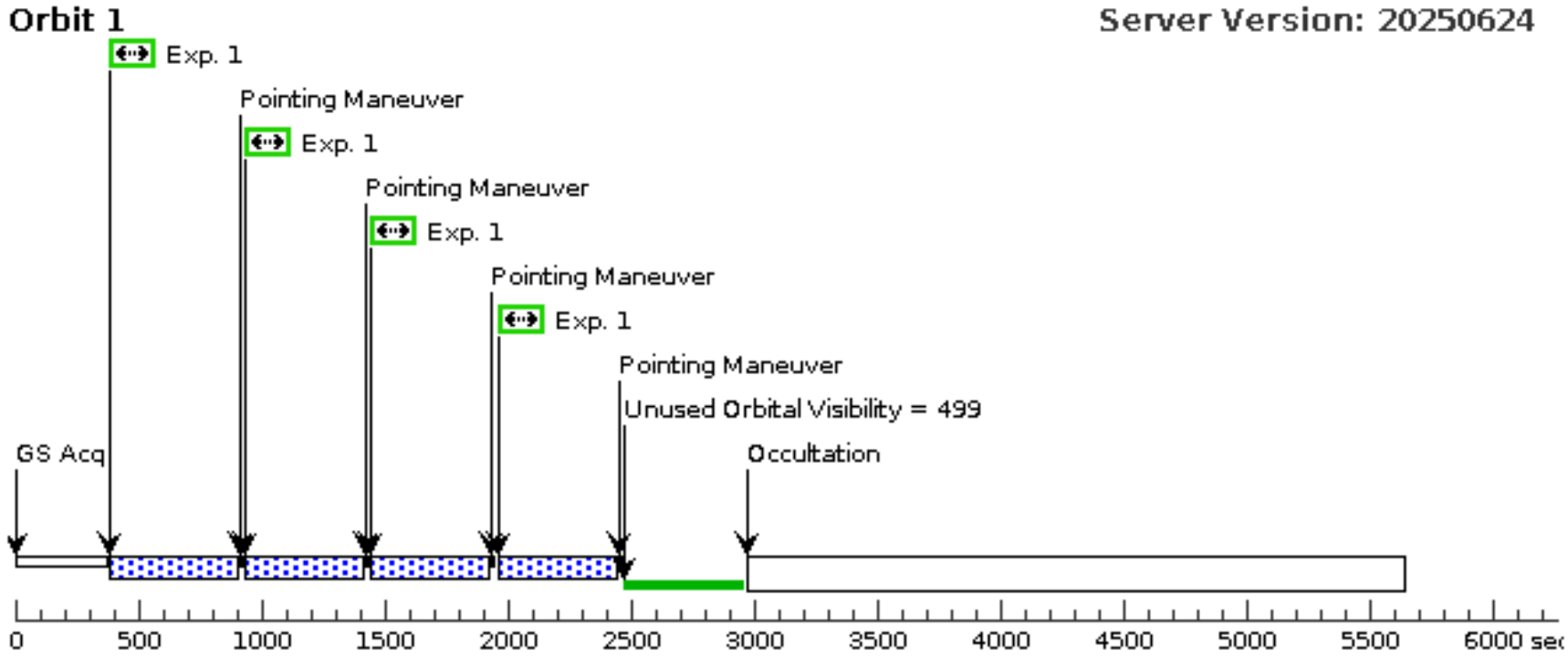
Fixed Targets

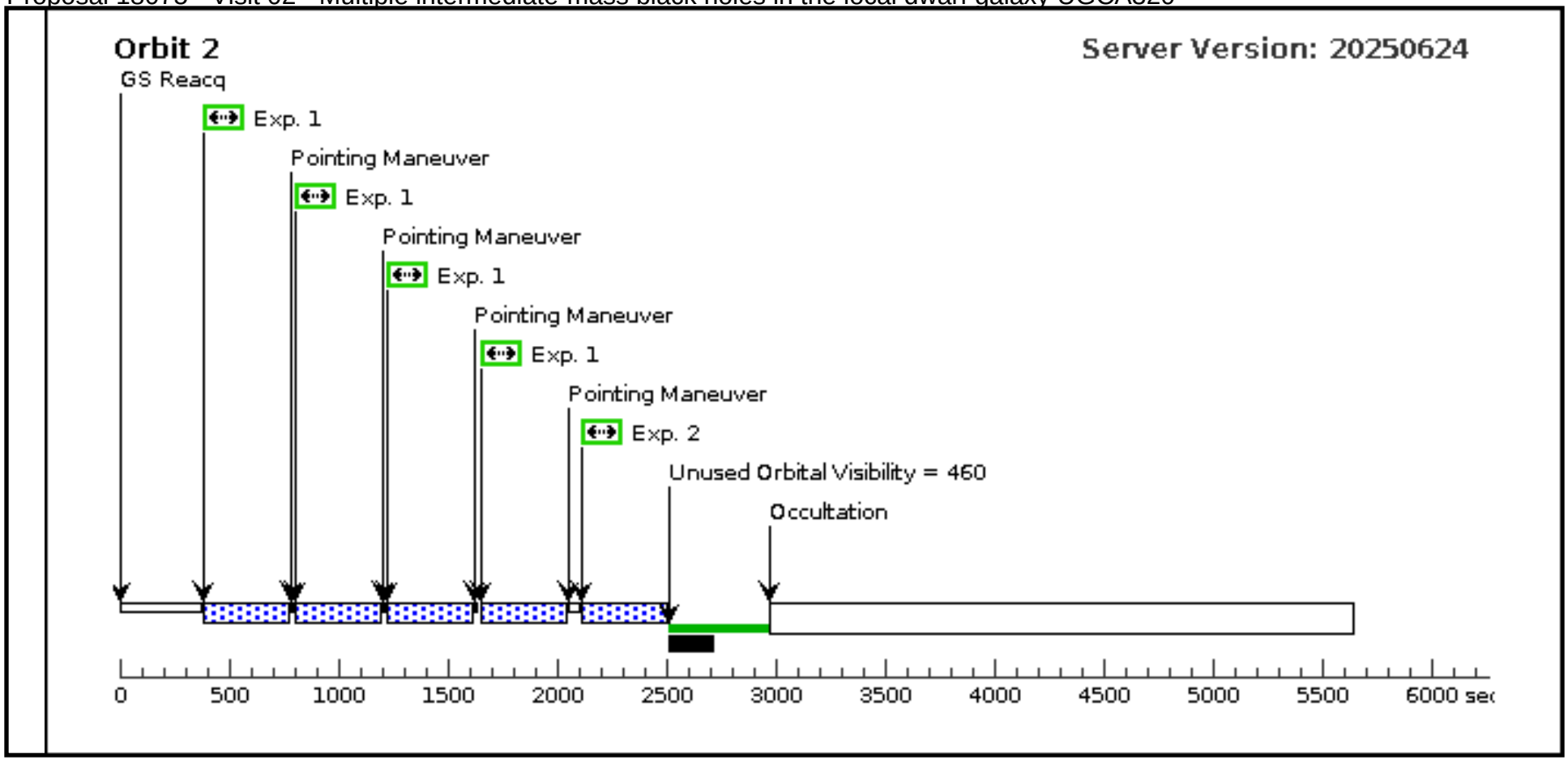
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SBC-2	RA: 13 03 15.1717 (195.8132154d) Dec: -17 25 13.76 (-17.42049d) Equinox: J2000	Epoch of Position: 2000	V=19.93	Reference Frame: ICRS
Comments: *Category=ISM* *Description=[NUCLEUS]*					
(3)	SBC-2-BACKGROUND	RA: 13 03 7.4697 (195.7811238d) Dec: -17 25 48.55 (-17.43015d) Equinox: J2000	Epoch of Position: 2000	V=19.93	Reference Frame: ICRS
Comments: *Category=CALIBRATION* *Description=[SKY BACKGROUND]* *Extended=YES*					

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(2026131)	(2) SBC-2	ACS/SBC, ACCUM, SBC	F140LP			Pattern 4, Exps 1-1 in Visit 02 (4)	800 Secs (3240 Secs)	
								[==>450.0 Secs (Pattern 1,1)] *[==>450.0 Secs (Pattern 1,2)]* *[==>450.0 Secs (Pattern 2,1)]* *[==>450.0 Secs (Pattern 2,2)]*	***[1]***
								[==>360 Secs (Pattern 3,1)] *[==>360 Secs (Pattern 3,2)]* *[==>360 Secs (Pattern 4,1)]* *[==>360 Secs (Pattern 4,2)]*	***[2]***
2	(2026131)	(3) SBC-2-BACKGROUND	ACS/SBC, ACCUM, SBC	F140LP				360 Secs (360 Secs)	
								[==>]	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250624
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Exp. 2
Unused Orbital Visibility = 460
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18075, Visit 03, implementation Tue Sep 23 21:00:16 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=WFC3-UVIS-DITHER-BOX 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=false		(1)

Fixed Targets

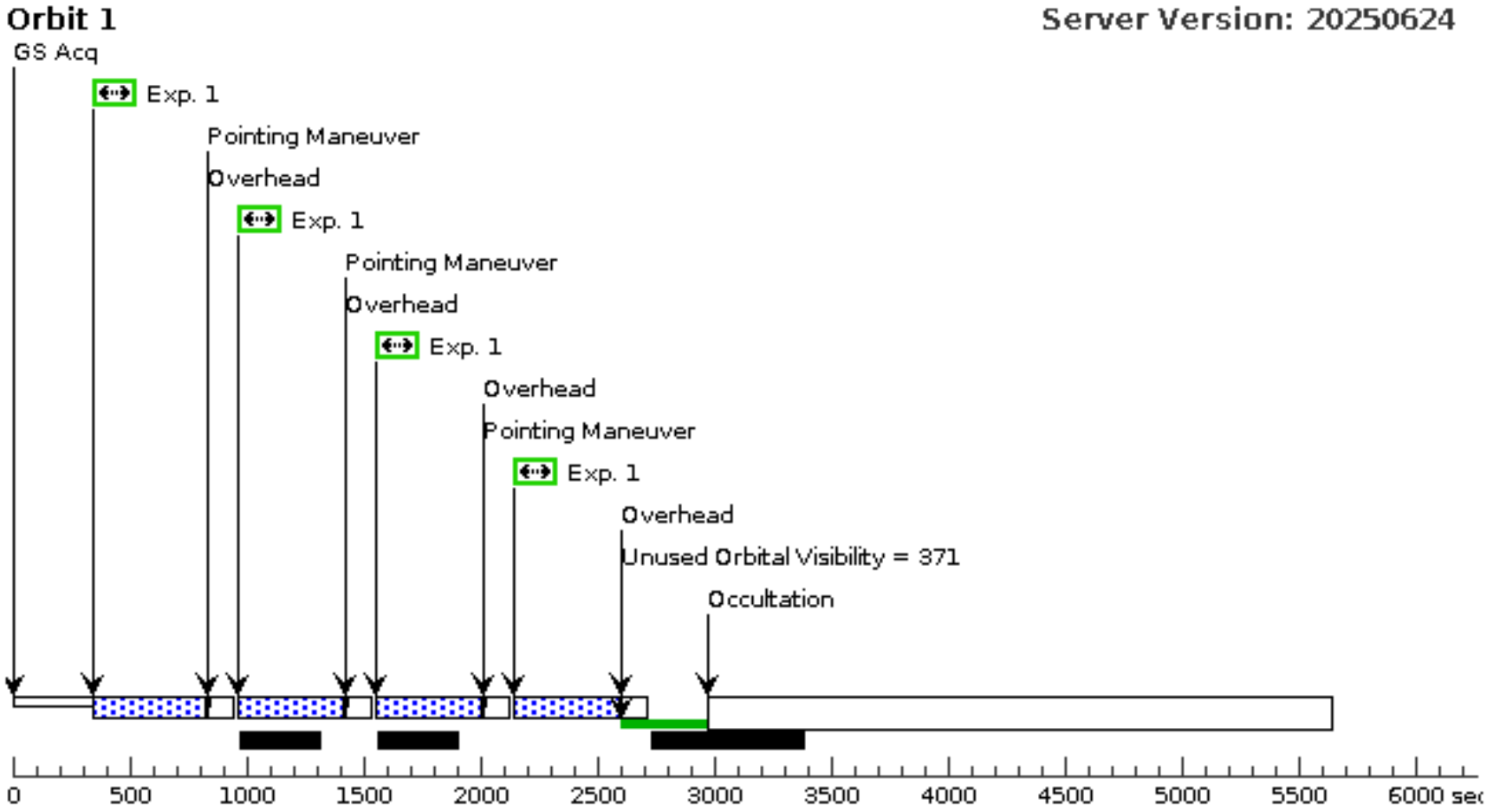
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	UVIS-HOST	RA: 13 03 15.6108 (195.8150450d) Dec: -17 25 36.47 (-17.42680d) Equinox: J2000	Epoch of Position: 2000	V=13.05	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[MULTIPLE NUCLEI]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) UVIS-HOST	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=20		Pattern 3, Exps 1-1 in Visit 03 (3)	450 Secs (1800 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	

Orbit Structure



Visit

Proposal 18075, Visit 04, implementation Tue Sep 23 21:00:16 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=WFC3-UVIS-DITHER-BOX 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=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	UVIS-HOST	RA: 13 03 15.6108 (195.8150450d) Dec: -17 25 36.47 (-17.42680d) Equinox: J2000	Epoch of Position: 2000	V=13.05	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[MULTIPLE NUCLEI]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) UVIS-HOST	WFC3/UVIS, ACCUM, UVIS2	F300X	FLASH=20		Pattern 3, Exps 1-1 in Visit 04 (3)	450 Secs (1800 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure