17458 - Spatially Resolving the Baryon Cycle at z~2-3

Cycle: 31, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Prof. Dawn K. Erb (PI) (Contact)	**University of Wisconsin - Milwaukee**
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Prof. Max Pettini (CoI) (ESA Member)	University of Cambridge

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) J0201+3228	WFC3/UVIS	1	13-Sep-2023 12:00:18.0	yes
02	(1) J0201+3228	WFC3/IR	1	13-Sep-2023 12:00:19.0	yes
03	(2) J0918+5104	WFC3/IR	1	13-Sep-2023 12:00:20.0	yes
04	(3) J1429+1202	WFC3/UVIS	1	13-Sep-2023 12:00:21.0	yes
05	(4) J1514+3636	WFC3/IR	1	13-Sep-2023 12:00:21.0	yes

5 Total Orbits Used

ABSTRACT

Galactic outflows powered by star formation are a key driver of the baryon cycle, regulating star formation in galaxies and the gaseous content of the circumgalactic medium across cosmic time. We propose to combine high resolution, spatially resolved stellar population measurements from

broadband HST imaging with spatially resolved measurements of gas flows from the Keck Cosmic Web Imager (KCWI; all data is already in hand), in order to assess the relationships between star-formation-driven outflows, galactic structure and stellar populations at the peak epoch of star formation. Our sample consists of ten gravitationally lensed galaxies at z~2-3, including some of the brightest lensed galaxies known. We have already obtained and analyzed the necessary HST imaging for three objects in the sample, and this combined archival + GO proposal completes the wavelength coverage with five orbits of new WFC3 imaging and extensive leverage of the archive for the remaining galaxies. The exquisite spatial resolution of HST combined with both the magnification of gravitational lensing and the power of Keck to probe the rest-frame UV will provide important new constraints on the baryon cycle, enabling us to discriminate between local outflows that depend on the properties of individual star-forming regions and global outflows that cover the entire source. The proposed new observations will also increase the legacy value of the existing data for these template galaxies.

OBSERVING DESCRIPTION

The goal of this proposal is to use WFC3-UVIS/IR to obtain both broadband imaging of four gravitationally lensed galaxies. The program consists of 5 orbits, with each orbit observing with either the UVIS or IR instrument. When the IR instrument is used, observations in two filters will be obtained.

We will use the UVIS-C1K1C-CTE aperture for the WFC3-UVIS F606W and F814W observations. We will employ the UVIS-DITHER-BOX pattern in order to enable rejection of cosmic rays and detector artifacts. For the F814W observations the ETC predicts 19 background e- for a 596s exposure, and we therefore add FLASH=1 to reach the recommended level of 20. Note that this differs from the APT background prediction, which is lower and therefore recommends more FLASH. As advised by the APT warning, we use the
ETC predictions.

We will also use a four-point box dither for the IR observations in F125W and F160W. Both filters will be observed in the same orbit, and we employ the SPARS25 sampling sequence to maximise exposure times.

Impacts of reduced gyro operations on this program are relatively minimal, since this is a short and simple imaging program with no orient or timing constraints and one target per orbit.

Visit

Proposal 17458, Visit 01 Wed Sep 13 16:00:22 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 1, Exps 1-1 in Visit 01)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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

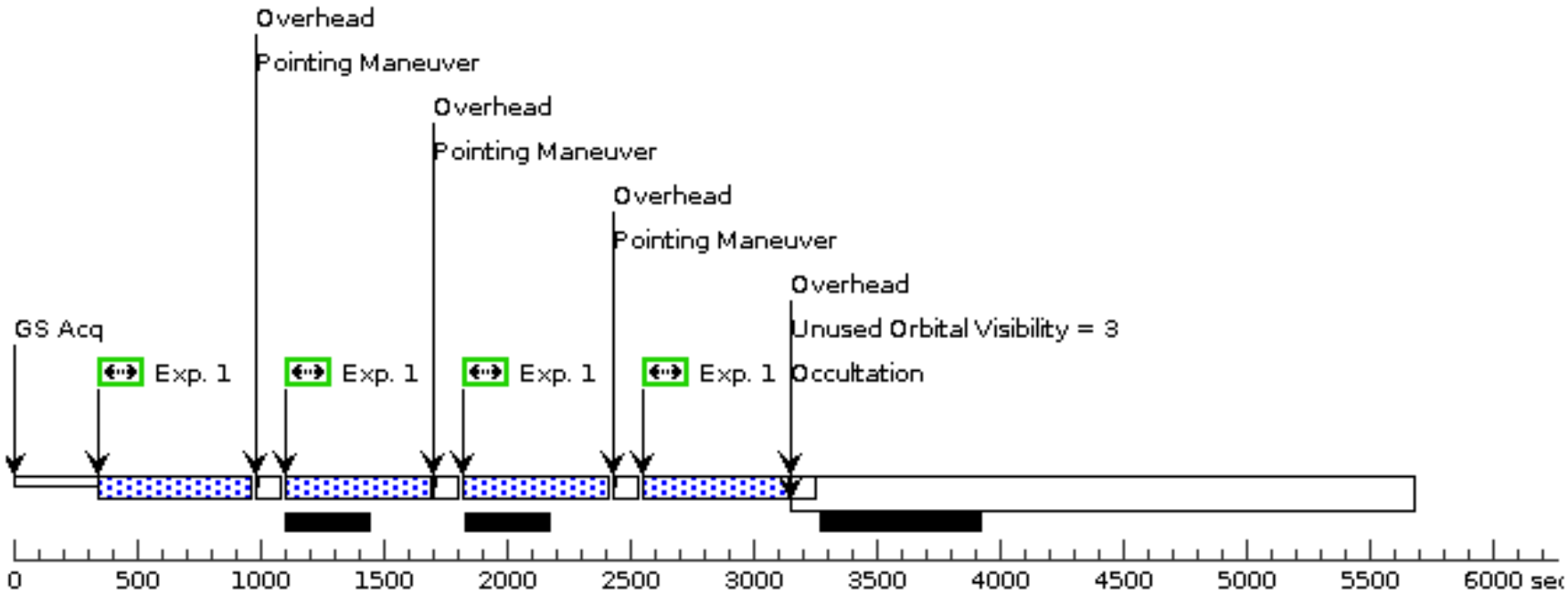
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J0201+3228	RA: 02 01 21.3900 (30.3391250d) Dec: +32 28 29.70 (32.47492d) Equinox: J2000		V=20.5	Reference Frame: ICRS

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		(1) J0201+3228	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W	FLASH=1		Pattern 1, Exps 1-1 in Visit 01 (1)	590 Secs (2372 Secs)	
								[==>593.0 Secs (Pattern 1)]	***[1]***
								[==>593.0 Secs (Pattern 2)]	
								[==>593.0 Secs (Pattern 3)]	
								[==>593.0 Secs (Pattern 4)]	

Orbit Structure



Visit

Proposal 17458, Visit 02 Wed Sep 13 16:00:22 GMT 2023

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(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		(1), (2)

Fixed Targets

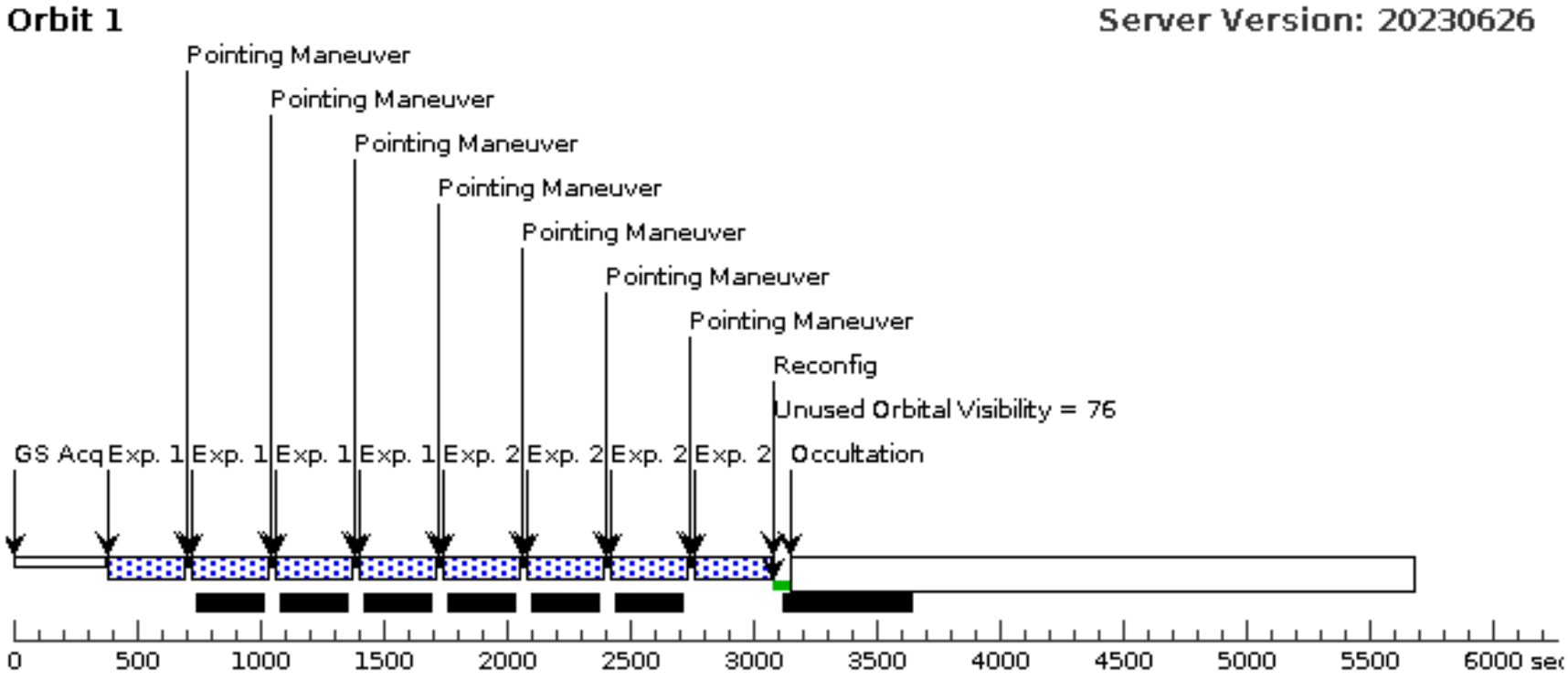
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J0201+3228	RA: 02 01 21.3900 (30.3391250d) Dec: +32 28 29.70 (32.47492d) Equinox: J2000		V=20.5	Reference Frame: ICRS

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		(1) J0201+3228	WFC3/IR, MULTIACCUM, IR-FIX	F125W	NSAMP=12; SAMP-SEQ=SPARS25		Pattern 2, Exps 1-1 in Visit 02 (2)	277.937956 Secs (1111.752 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) J0201+3228	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=12; SAMP-SEQ=SPARS25		Pattern 2, Exps 2-2 in Visit 02 (2)	277.937956 Secs (1111.752 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 17458, Visit 03 Wed Sep 13 16:00:22 GMT 2023

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(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		(1), (2)

Fixed Targets

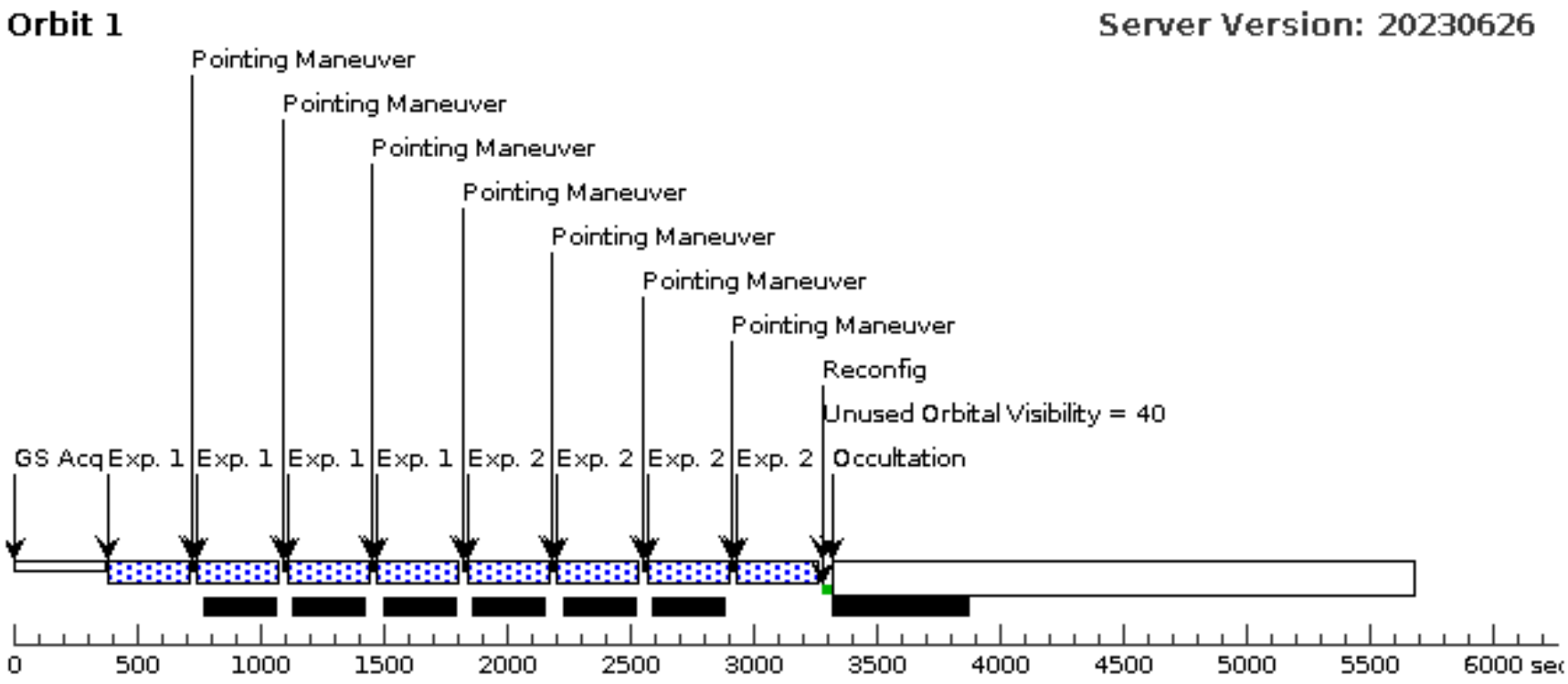
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	J0918+5104	RA: 09 18 59.2100 (139.7467083d) Dec: +51 04 52.60 (51.08128d) Equinox: J2000		V=20.5	Reference Frame: ICRS

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) J0918+5104	WFC3/IR, MULTIACCUM, IR-FIX	F125W	NSAMP=13; SAMP-SEQ=SPARS25		Pattern 2, Exps 1-1 in Visit 03 (2)	302.938471 Secs (1211.754 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(2) J0918+5104	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=13; SAMP-SEQ=SPARS25		Pattern 2, Exps 2-2 in Visit 03 (2)	302.938471 Secs (1211.754 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 17458, Visit 04 Wed Sep 13 16:00:22 GMT 2023

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=23.884		
	Number Of Points=4	Angle Between Sides=81.785		
	Point Spacing=0.173	Center Pattern=false		
	Line Spacing=0.112			

Fixed Targets

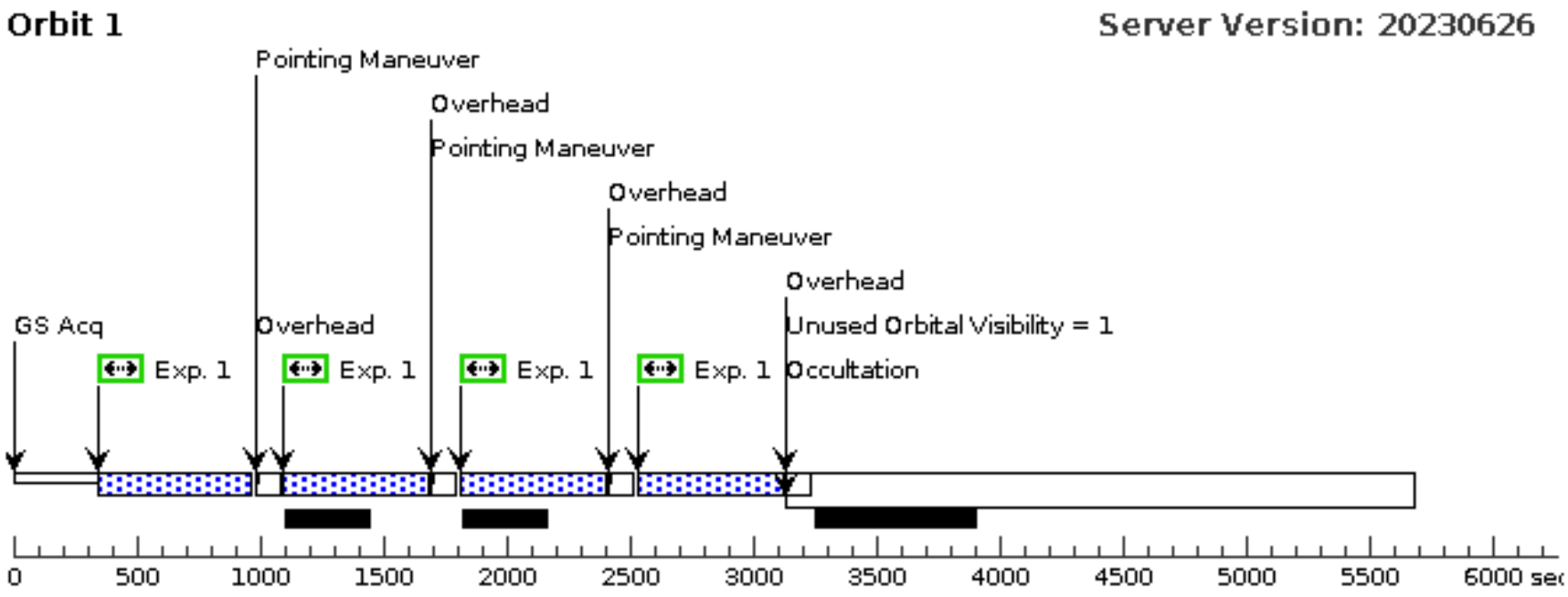
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	J1429+1202	RA: 14 29 54.8000 (217.4783333d)		V=20.5	Reference Frame: ICRS
		Dec: +12 02 35.60 (12.04322d)			
		Equinox: J2000			

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) J1429+1202	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F606W			Pattern 1, Exps 1-1 in Visit 04 (1)	596 Secs (2360 Secs)	
								[==>590.0 Secs (Pattern 1)]	***[1]***
								[==>590.0 Secs (Pattern 2)]	
								[==>590.0 Secs (Pattern 3)]	
								[==>590.0 Secs (Pattern 4)]	

Orbit Structure



Visit

Proposal 17458, Visit 05 Wed Sep 13 16:00:22 GMT 2023

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(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		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	J1514+3636	RA: 15 14 22.2700 (228.5927917d) Dec: +36 36 25.20 (36.60700d) Equinox: J2000		V=20.5	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) J1514+3636	WFC3/IR, MULTIACCUM, IR-FIX	F125W	NSAMP=12; SAMP-SEQ=SPARS25		Pattern 2, Exps 1-1 in Visit 05 (2)	277.937956 Secs (1111.752 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2		(4) J1514+3636	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=12; SAMP-SEQ=SPARS25		Pattern 2, Exps 2-2 in Visit 05 (2)	277.937956 Secs (1111.752 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***

Orbit Structure