16300 - Toward a Spatially-resolved Kennicutt-Schmidt Law in High-redshift Cluster Galaxies: the Interplay Between Molecular Gas, Star Formation, and Stellar Mass with ALMA and HST

Cycle: 28, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) SPARCS-J0224	ACS/WFC	3	06-Oct-2022 21:00:17.0	yes
07	(1) SPARCS-J0224	ACS/WFC	2	06-Oct-2022 21:00:18.0	yes
02	(1) SPARCS-J0224	ACS/WFC	3	06-Oct-2022 21:00:19.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
08	(1) SPARCS-J0224	ACS/WFC	1	06-Oct-2022 21:00:20.0	yes
03	(2) SPARCS-J0225	ACS/WFC	3	06-Oct-2022 21:00:21.0	yes
04	(2) SPARCS-J0225	ACS/WFC	3	06-Oct-2022 21:00:22.0	yes
05	(3) SPARCS-J0330	ACS/WFC	3	06-Oct-2022 21:00:23.0	yes
06	(3) SPARCS-J0330	ACS/WFC	3	06-Oct-2022 21:00:24.0	yes

21 Total Orbits Used

ABSTRACT

Our understanding of how gas is converted into stars on small spatial scales within z > 0.1 main-sequence galaxies has been hindered by a dearth of high-resolution imaging of the molecular gas component. However, a new window into spatially-resolved molecular gas has recently opened through ALMA observations of high-redshift galaxy clusters. These gains have been largely due to the high source density of star forming galaxies in young clusters, which allows for efficient multiplexing. The ALMA observations have yielded exquisite velocity maps and morphological analyses for the first large sample of spatially-resolved molecular gas in high-redshift galaxies. By combining these novel ALMA data with rest-frame UV imaging using ACS/WFC F475W and F625W, we will investigate the interplay between gas, star formation, and stellar mass on kiloparsec scales, for ~30 main-sequence cluster galaxies at z~1.6. This will be the first determination of the spatially-resolved Kennicutt-Schmidt law for a large sample of galaxies at high redshift, and will be a pioneering study of how gas is consumed by star formation on sub-galactic scales near the peak of cosmic star formation.

OBSERVING DESCRIPTION

The goal of this program is to obtain ACS imaging in F475W and F625W over three galaxy clusters, with 3 orbits per target per filter. We have organized threee-orbit visits (one visit per filter per target), for 6 visits total.

For each target, we will obtain 9 exposures per filter. We will use a 3-point line dither (with centering) in each orbit to span the chip gap, augmented by a 3pt-line subdither (also centered) with step 0.12" in postarg frame and orientation=47.6deg. The latter will step ~diagonally in detector space at ~2.5 pixels in each direction. This will allow for removal of cosmic rays and hot pixels, and will fill in the chip gap, while keeping the dither pattern compact.

The observations are designed to cover both in-hand ALMA and WFC3 data, and the pointing coordinates have been choosen to maximize overlap with these images (rather than set to a specific position of a cluster galaxy). The F475W visit for each target thus has some orient constraints, and the F625W filter for the same target is constrained to have the same orientation to maximize coverage.

Visit

Proposal 16300, J0224-F475-O1-O3 (01), failed Fri Oct 07 01:00:25 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 300D TO 52 D; ORIENT 68D TO 87 D; ORIENT 158D TO 238 D; ORIENT 252D TO 272 D

Comments: - 9 exposures over 3 orbits, with a 3-point line dither and additional 3-point line subpattern dither
- Including a few orient ranges to ensure chip gap doesn't fall on the primary cluster galaxy targets within the field
- Constraining the 3 orbits in the F625 visit for this target to have the same orientation as this visit

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=true	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.12 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.6 Angle Between Sides= Center Pattern=true	(1)

Fixed Targets

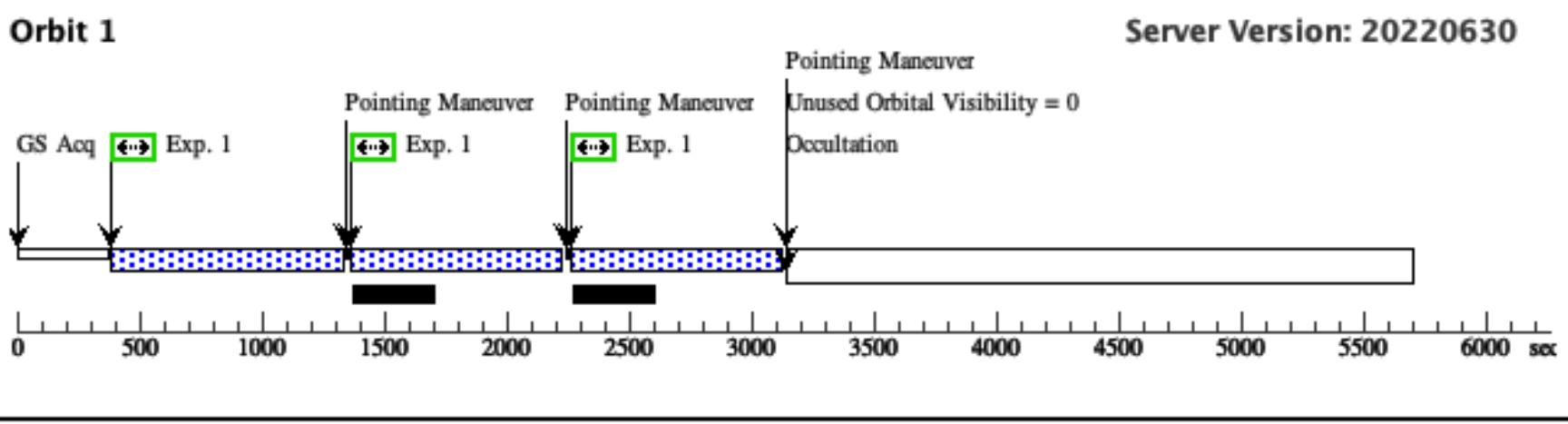
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SPARCS-J0224	RA: 02 24 27.7688 (36.1157033d) Dec: -03 24 13.81 (-3.40384d) Equinox: J2000		V=25	Reference Frame: ICRS

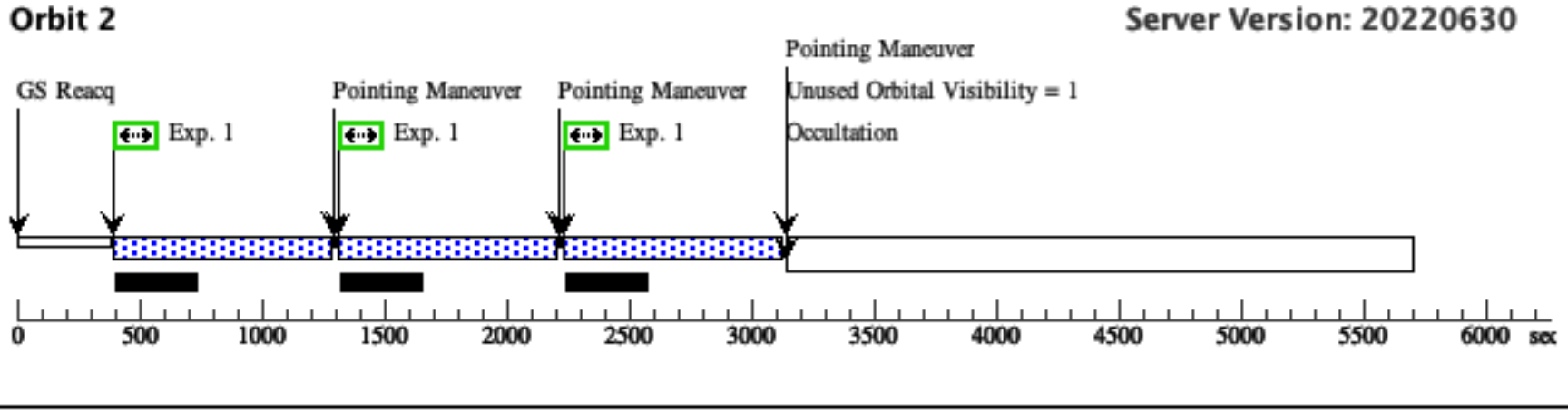
Comments:
Category=CLUSTER OF GALAXIES
Description=[HIGH REDSHIFT CLUSTER, RICH CLUSTER]

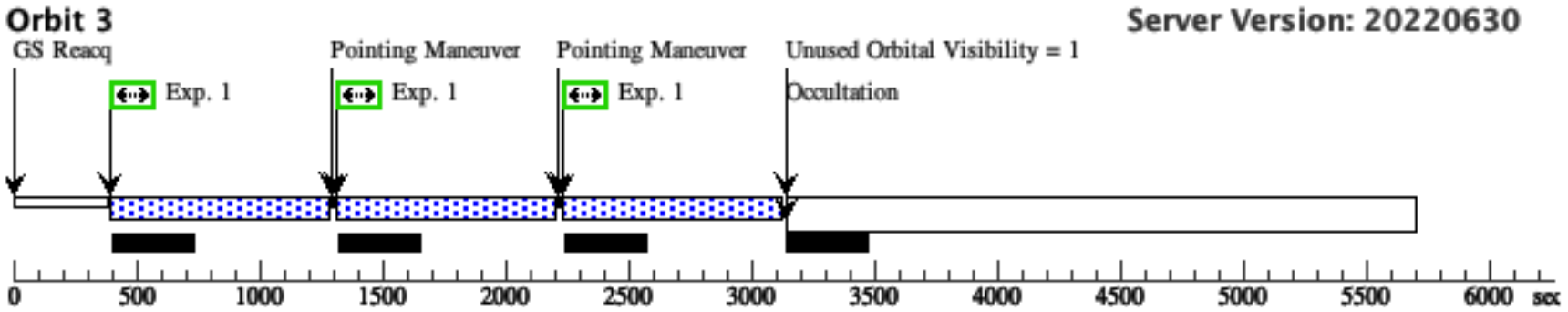
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SPARCS-J0224	ACS/WFC, ACCUM, WFCENTER	F475W			Pattern 2, Exps 1-1 in J0224-F475-O1-O3 (01) (2)	1 Secs (6813 Secs)	
								[==>741.0 Secs (Pattern 1,1)]	
								[==>741.0 Secs (Pattern 1,2)]	***[1]***
								[==>741.0 Secs (Pattern 1,3)]	
								[==>765.0 Secs (Pattern 2,1)]	
								[==>765.0 Secs (Pattern 2,2)]	***[2]***
								[==>765.0 Secs (Pattern 2,3)]	
								[==>765.0 Secs (Pattern 3,1)]	
								[==>765.0 Secs (Pattern 3,2)]	***[3]***
								[==>765.0 Secs (Pattern 3,3)]	

Orbit Structure







Visit

Proposal 16300, J0224-F475-O1-O2-new (07), completed Fri Oct 07 01:00:25 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 254.07814D TO 254.07814 D

Comments: - redo for visit 1, with 2 orbits
- 6 exposures over 2 orbits, with a 2-point line dither and additional 3-point line subpattern dither
- Constraining the 2 orbits in this visit to have the same orientation as the one successful orbit in Visit 1 for the same target

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(3)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=true	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.12 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.6 Angle Between Sides= Center Pattern=true	(1)

Fixed Targets

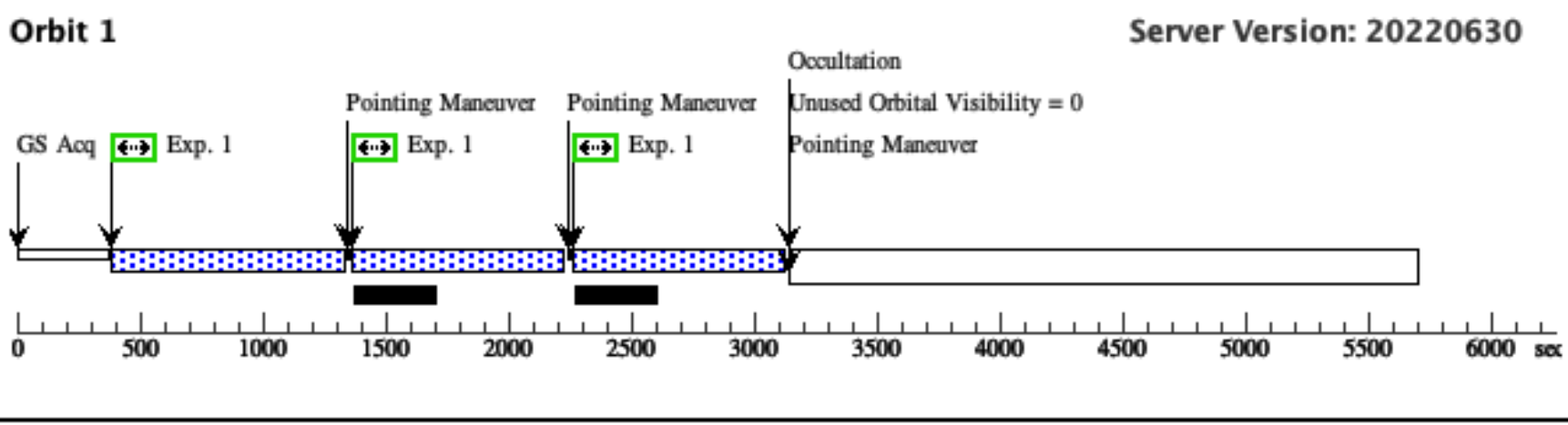
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SPARCS-J0224	RA: 02 24 27.7688 (36.1157033d) Dec: -03 24 13.81 (-3.40384d) Equinox: J2000		V=25	Reference Frame: ICRS

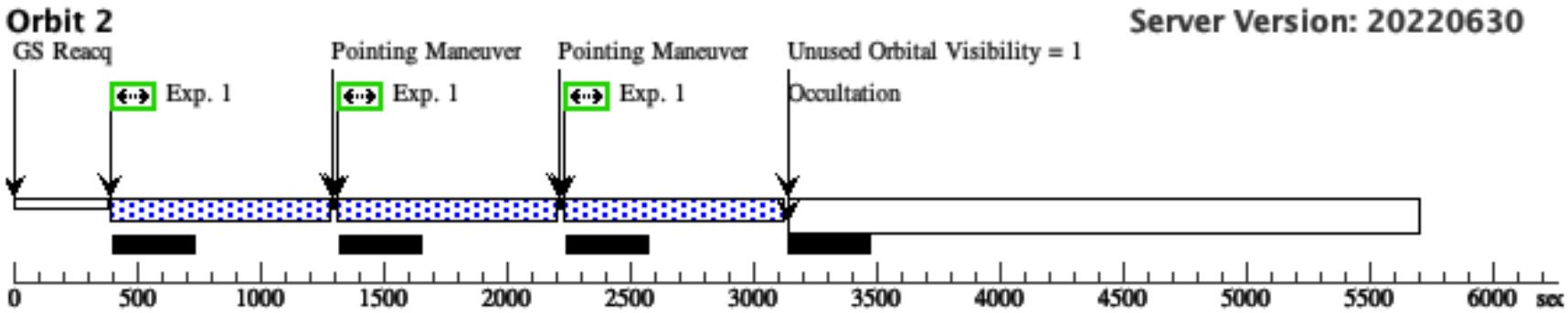
Comments:
Category=CLUSTER OF GALAXIES
Description=[HIGH REDSHIFT CLUSTER, RICH CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SPARCS-J0224	ACS/WFC, ACCUM, WFCENTER	F475W			Pattern 3, Exps 1-1 in J0224-F475-O1-O2-new (07) (3)	1 Secs (4518 Secs)	
								[==>741.0 Secs (Pattern 1,1)]	***[1]***
								[==>741.0 Secs (Pattern 1,2)]	
								[==>741.0 Secs (Pattern 1,3)]	
								[==>765.0 Secs (Pattern 2,1)]	***[2]***
								[==>765.0 Secs (Pattern 2,2)]	
								[==>765.0 Secs (Pattern 2,3)]	

Orbit Structure





Visit

Proposal 16300, J0224-F625-O1-O3 (02), failed Fri Oct 07 01:00:25 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SAME ORIENT AS 01

Comments: - Same pointing position and orientation as visit J0224-F475
- 9 exposures over 3 orbits, with a 3-point line dither and additional 3-point line subpattern dither

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=true	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.12 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.6 Angle Between Sides= Center Pattern=true	(1)

Fixed Targets

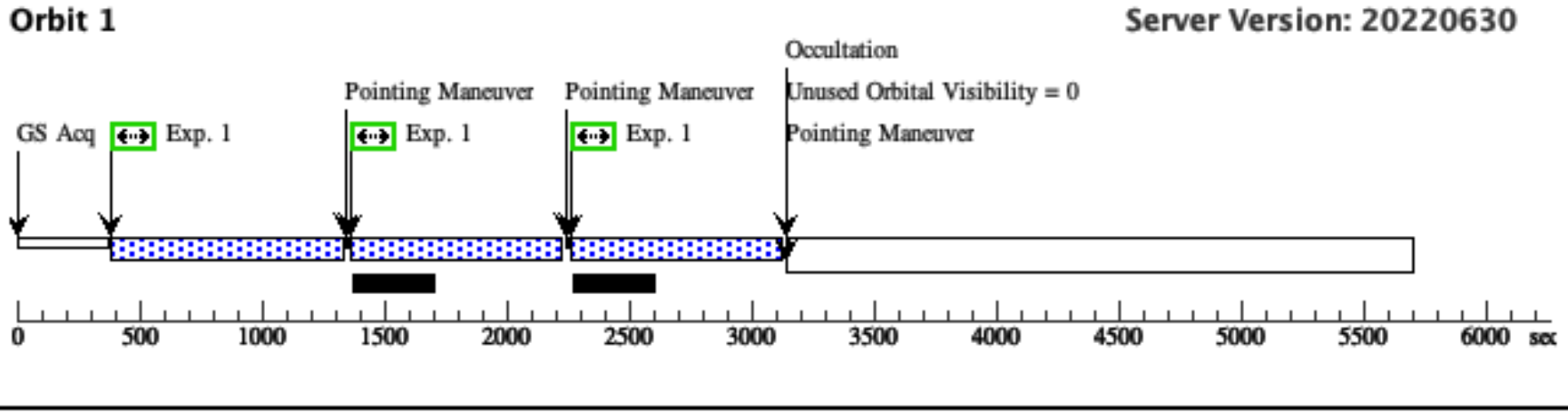
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SPARCS-J0224	RA: 02 24 27.7688 (36.1157033d) Dec: -03 24 13.81 (-3.40384d) Equinox: J2000		V=25	Reference Frame: ICRS

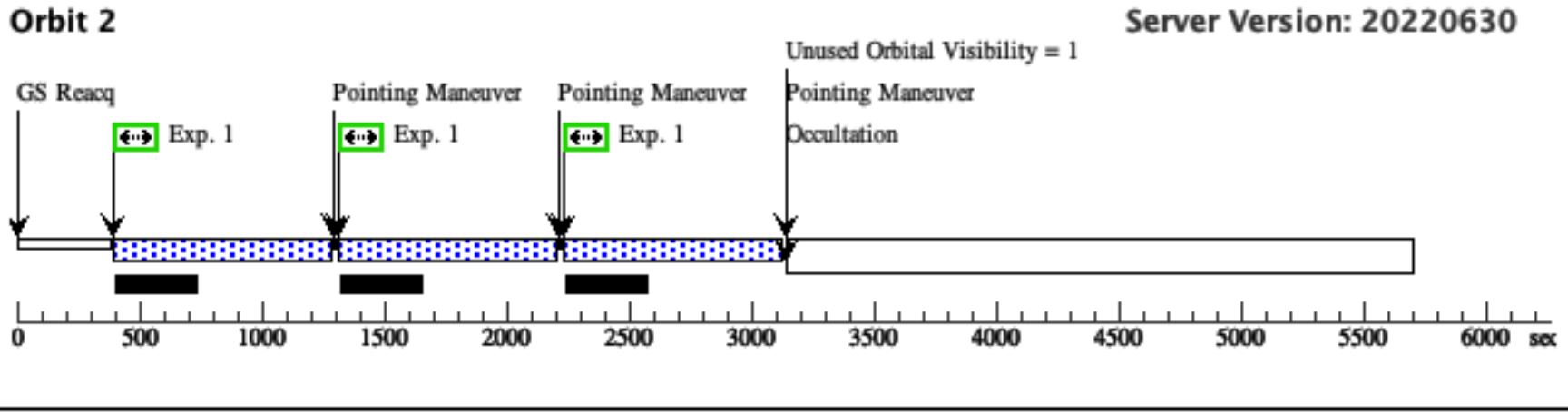
Comments:
Category=CLUSTER OF GALAXIES
Description=[HIGH REDSHIFT CLUSTER, RICH CLUSTER]

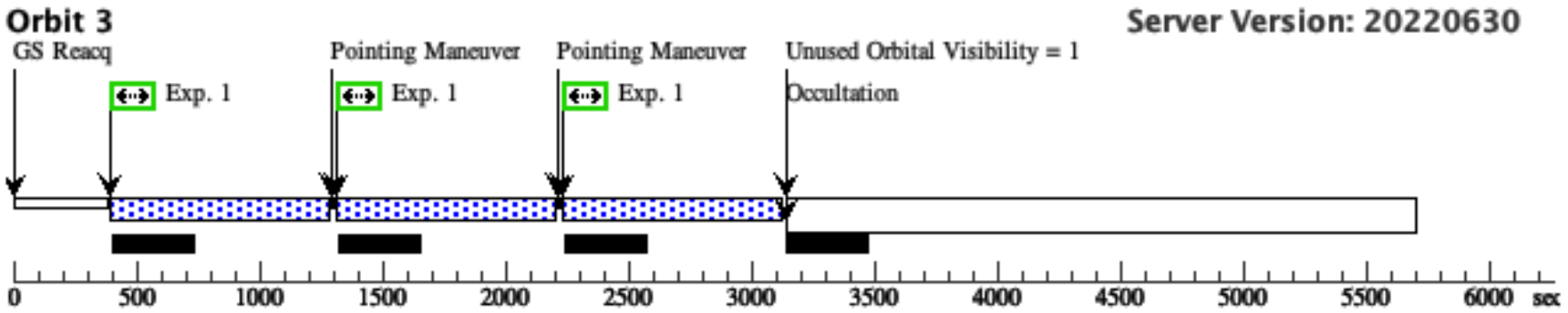
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SPARCS-J0224	ACS/WFC, ACCUM, WFCENTER	F625W			Pattern 2, Exps 1-1 in J0224-F625-O1-O3 (02) (2)	1 Secs (6813 Secs)	
								[==>741.0 Secs (Pattern 1,1)]	
								[==>741.0 Secs (Pattern 1,2)]	***[1]***
								[==>741.0 Secs (Pattern 1,3)]	
								[==>765.0 Secs (Pattern 2,1)]	
								[==>765.0 Secs (Pattern 2,2)]	***[2]***
								[==>765.0 Secs (Pattern 2,3)]	
								[==>765.0 Secs (Pattern 3,1)]	
								[==>765.0 Secs (Pattern 3,2)]	***[3]***
								[==>765.0 Secs (Pattern 3,3)]	

Orbit Structure







Visit

Proposal 16300, J0224-F625-O1-O3 (08) Fri Oct 07 01:00:25 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Comments: - redo for visit 2, with 1 orbits
- 4 exposures over 1 orbit, with a 2-point line dither and additional 2-point line subpattern dither
- No orient constraints to help with schedubility.

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(4)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=true	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.12 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.6 Angle Between Sides= Center Pattern=true	(1)

Fixed Targets

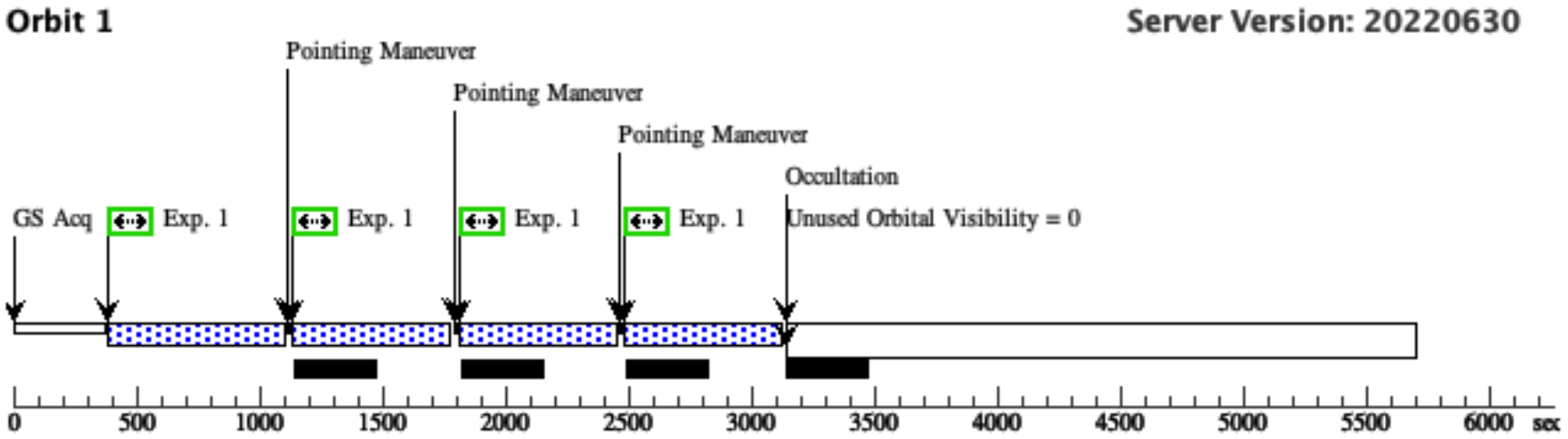
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SPARCS-J0224	RA: 02 24 27.7688 (36.1157033d) Dec: -03 24 13.81 (-3.40384d) Equinox: J2000		V=25	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[HIGH REDSHIFT CLUSTER, RICH CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SPARCS-J0224	ACS/WFC, ACCUM, WFCENTER	F625W			Pattern 4, Exps 1-1 in J0224-F625-O1-O3 (08) (4)	1 Secs (2061 Secs) *[==>516.0 Secs (Pattern 1,1)]* *[==>515.0 Secs (Pattern 1,2)]* *[==>515.0 Secs (Pattern 2,1)]* *[==>515.0 Secs (Pattern 2,2)]*	***[1]***

Orbit Structure



Visit

Proposal 16300, J0225-F475-O1-O3 (03), completed Fri Oct 07 01:00:25 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 315D TO 50 D; ORIENT 140D TO 220 D

Comments: - 9 exposures over 3 orbits, with a 3-point line dither and additional 3-point line subpattern dither
- Including a few orient ranges to ensure chip gap doesn't fall on the primary cluster galaxy targets within the field
- Constraining the 3 orbits in the F625 visit for this target to have the same orientation as this visit

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=true	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.12 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.6 Angle Between Sides= Center Pattern=true	(1)

Fixed Targets

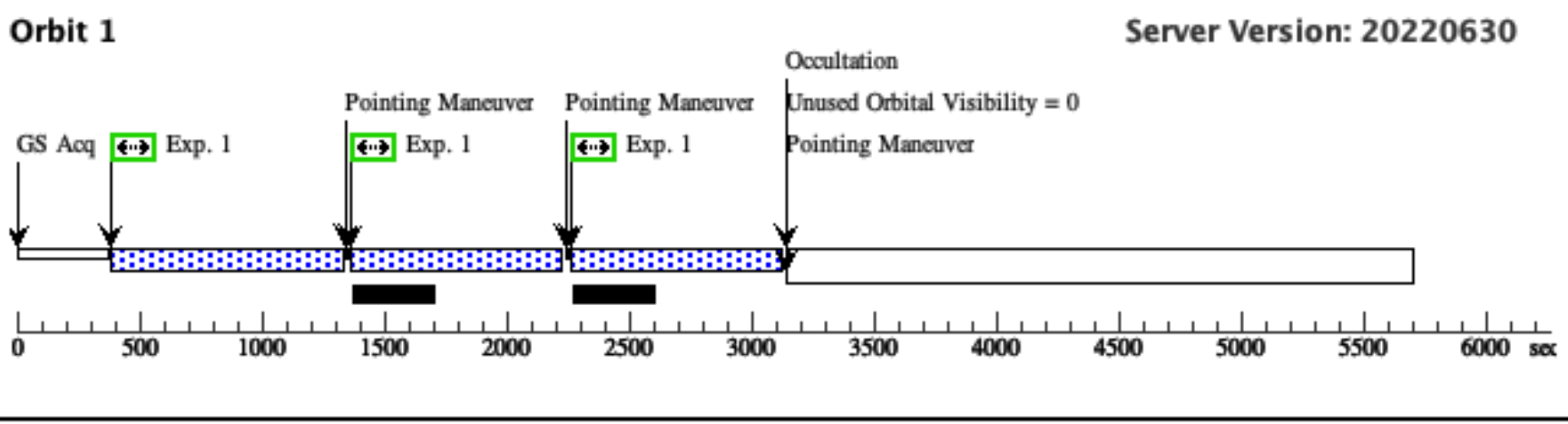
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SPARCS-J0225	RA: 02 25 45.9043 (36.4412679d) Dec: -03 56 5.55 (-3.93487d) Equinox: J2000		V=25	Reference Frame: ICRS

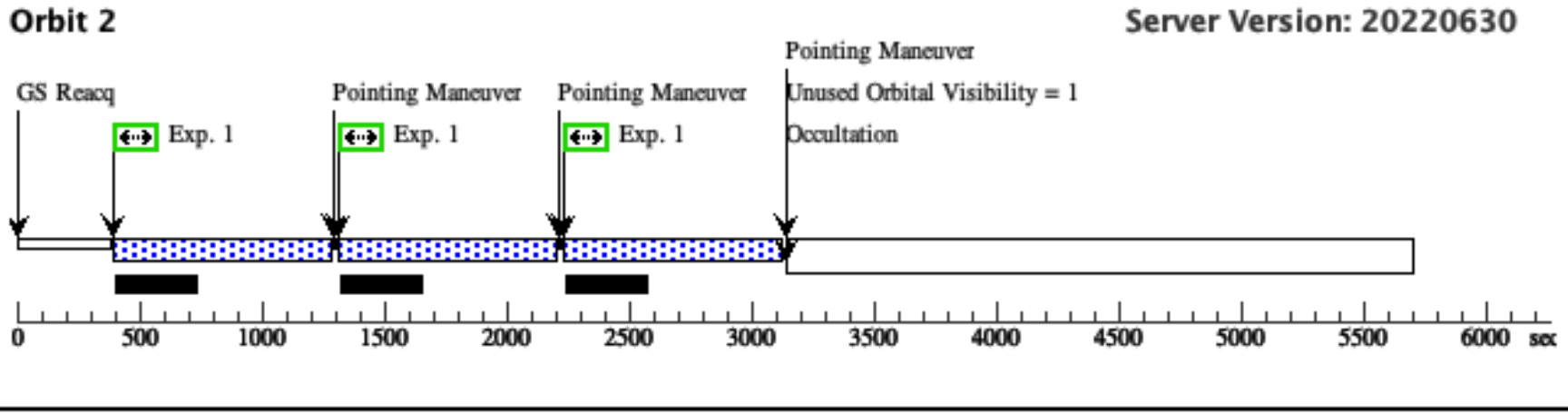
Comments:
Category=CLUSTER OF GALAXIES
Description=[HIGH REDSHIFT CLUSTER, RICH CLUSTER]

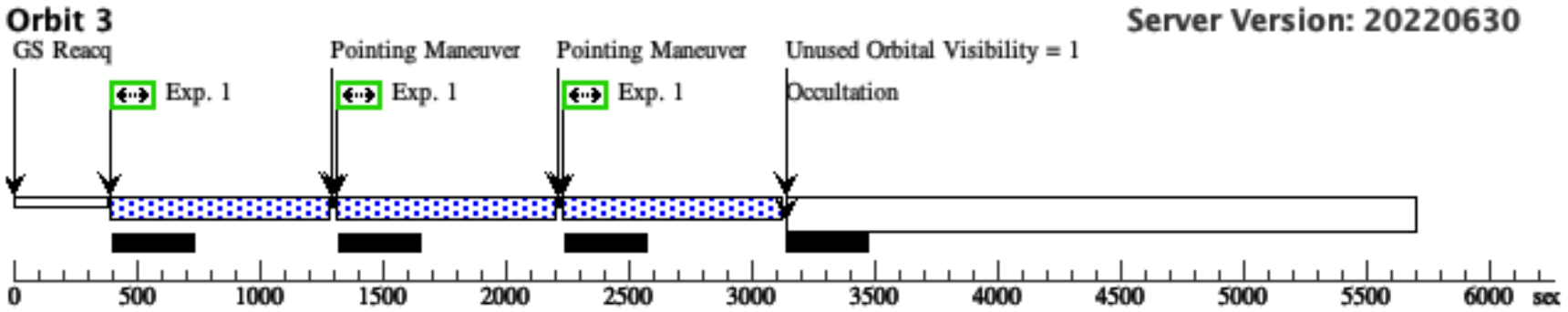
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SPARCS-J0225	ACS/WFC, ACCUM, WFCENTER	F475W			Pattern 2, Exps 1-1 in J0225-F475-O1-O3 (03) (2)	1 Secs (6813 Secs)	
								[==>741.0 Secs (Pattern 1,1)]	
								[==>741.0 Secs (Pattern 1,2)]	***[1]***
								[==>741.0 Secs (Pattern 1,3)]	
								[==>765.0 Secs (Pattern 2,1)]	
								[==>765.0 Secs (Pattern 2,2)]	***[2]***
								[==>765.0 Secs (Pattern 2,3)]	
								[==>765.0 Secs (Pattern 3,1)]	
								[==>765.0 Secs (Pattern 3,2)]	***[3]***
								[==>765.0 Secs (Pattern 3,3)]	

Orbit Structure







Visit

Proposal 16300, J0225-F625-O1-O3 (04), completed Fri Oct 07 01:00:25 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SAME ORIENT AS 03

Comments: - Same pointing position and orientation as visit J0225-F475
- 9 exposures over 3 orbits, with a 3-point line dither and additional 3-point line subpattern dither

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=true	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.12 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.6 Angle Between Sides= Center Pattern=true	(1)

Fixed Targets

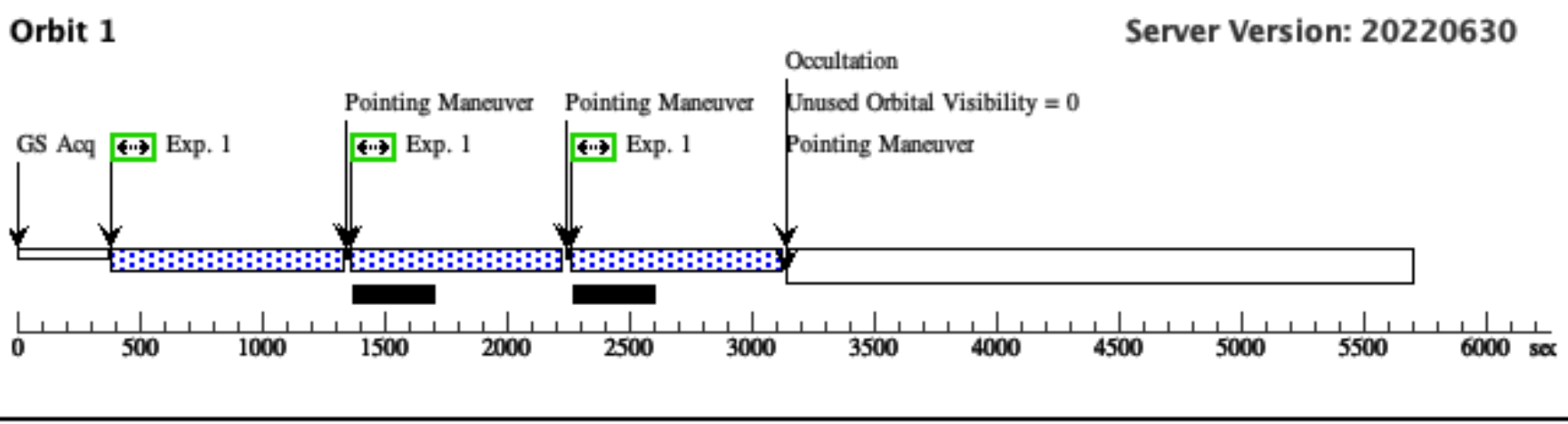
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SPARCS-J0225	RA: 02 25 45.9043 (36.4412679d) Dec: -03 56 5.55 (-3.93487d) Equinox: J2000		V=25	Reference Frame: ICRS

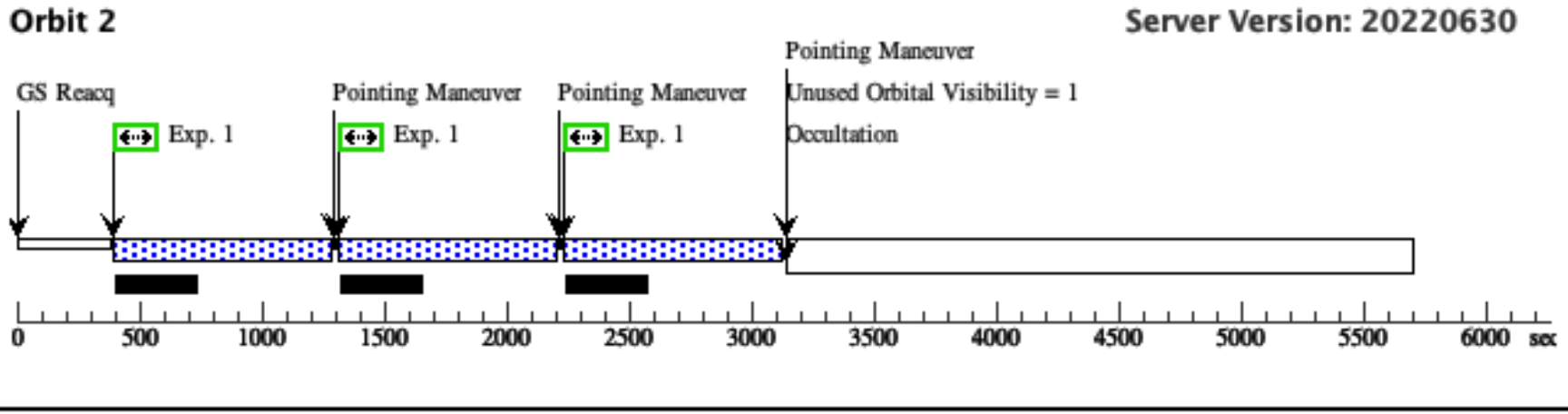
Comments:
Category=CLUSTER OF GALAXIES
Description=[HIGH REDSHIFT CLUSTER, RICH CLUSTER]

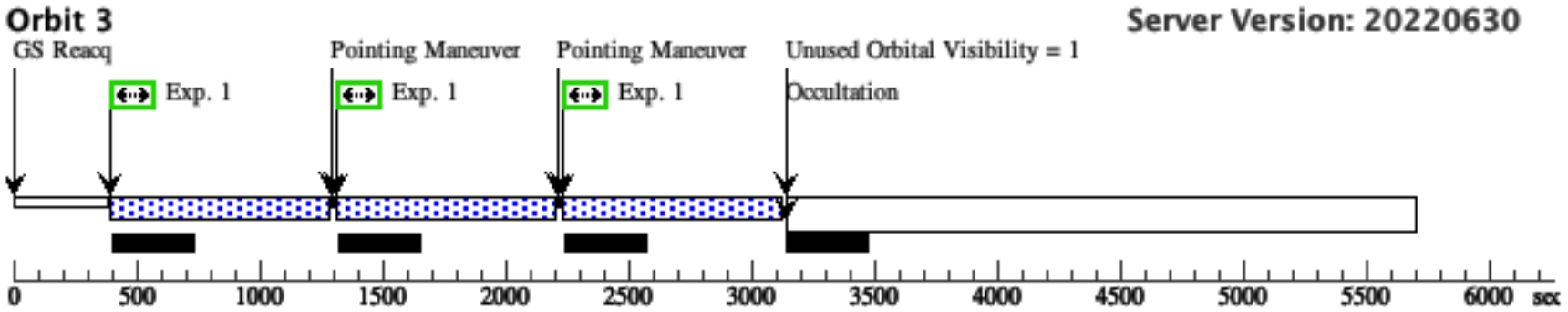
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SPARCS-J0225	ACS/WFC, ACCUM, WFCENTER	F625W			Pattern 2, Exps 1-1 in J0225-F625-O1-O3 (04) (2)	1 Secs (6813 Secs)	
								[==>741.0 Secs (Pattern 1,1)]	
								[==>741.0 Secs (Pattern 1,2)]	***[1]***
								[==>741.0 Secs (Pattern 1,3)]	
								[==>765.0 Secs (Pattern 2,1)]	
								[==>765.0 Secs (Pattern 2,2)]	***[2]***
								[==>765.0 Secs (Pattern 2,3)]	
								[==>765.0 Secs (Pattern 3,1)]	
								[==>765.0 Secs (Pattern 3,2)]	***[3]***
								[==>765.0 Secs (Pattern 3,3)]	

Orbit Structure







Visit

Proposal 16300, J0330-F475-O1-03 (05), completed Fri Oct 07 01:00:25 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 15D TO 110 D; ORIENT 230D TO 280 D

Comments: - 9 exposures over 3 orbits, with a 3-point line dither and additional 3-point line subpattern dither
- Including a few orient ranges to ensure chip gap doesn't fall on the primary cluster galaxy targets within the field
- Constraining the 3 orbits in the F625 visit for this target to have the same orientation as this visit

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=true	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.12 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.6 Angle Between Sides= Center Pattern=true	(1)

Fixed Targets

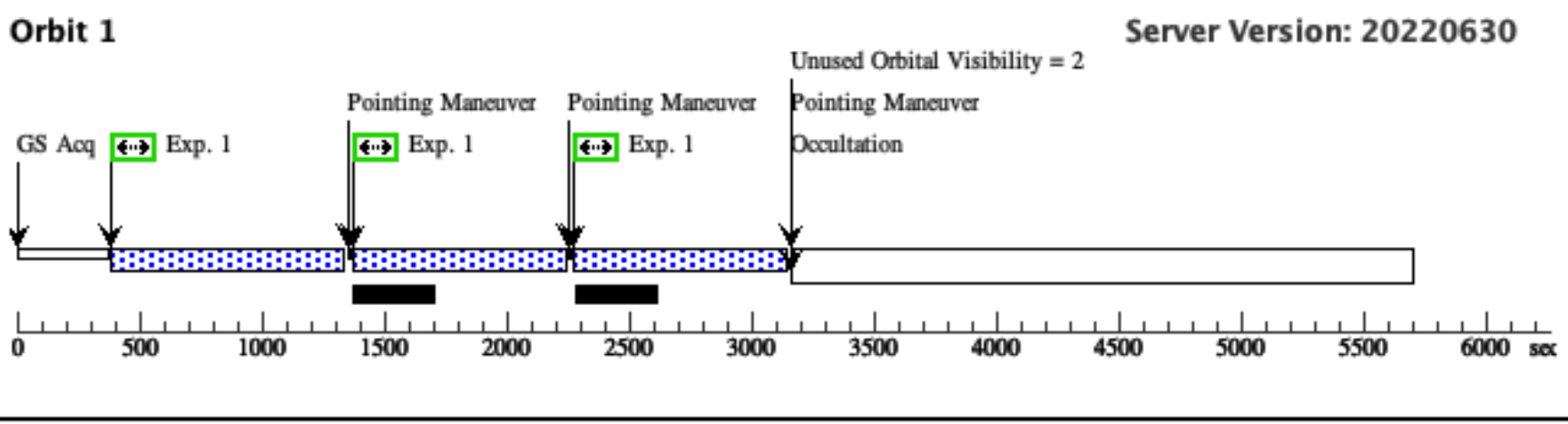
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SPARCS-J0330	RA: 03 30 53.8527 (52.7243863d) Dec: -28 43 9.90 (-28.71942d) Equinox: J2000		V=25	Reference Frame: ICRS

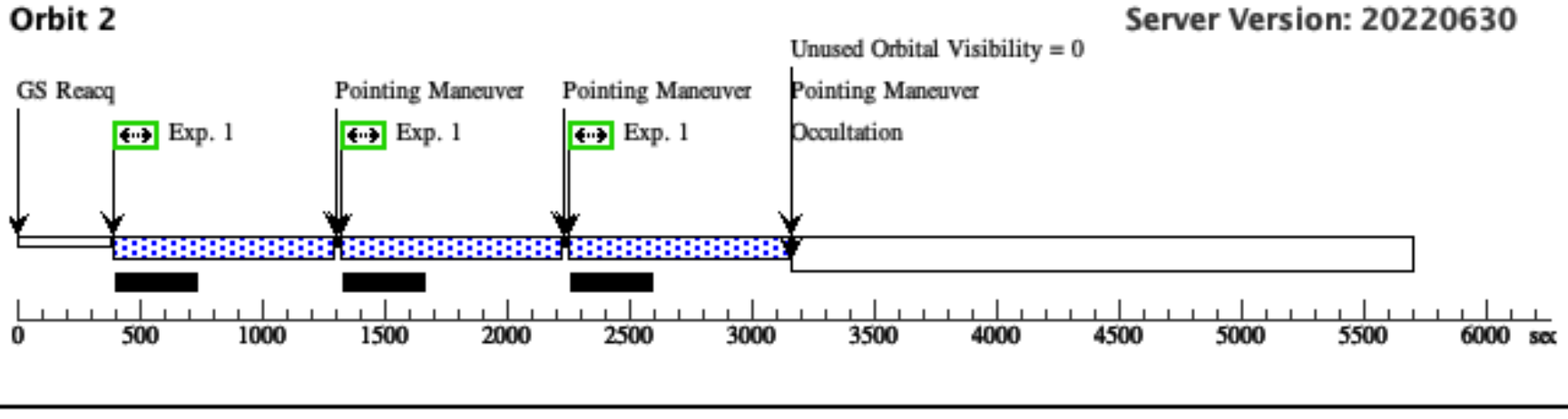
Comments:
Category=CLUSTER OF GALAXIES
Description=[HIGH REDSHIFT CLUSTER, RICH CLUSTER]

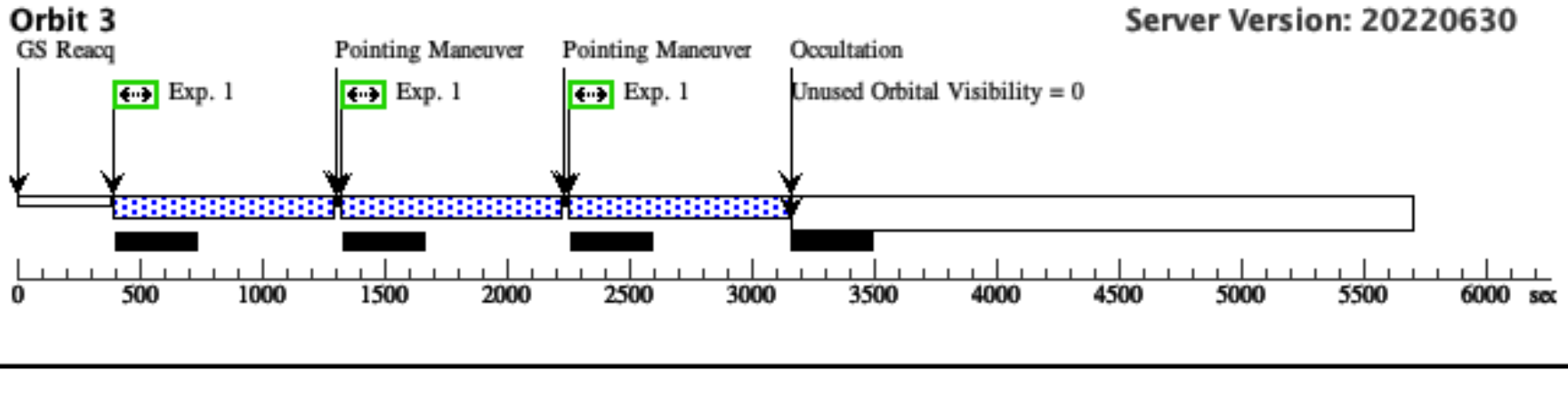
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) SPARCS-J0330	ACS/WFC, ACCUM, WFCENTER	F475W			Pattern 2, Exps 1-1 in J0330-F475-O1-03 (05) (2)	1 Secs (6882 Secs)	
								[==>748.0 Secs (Pattern 1,1)]	
								[==>748.0 Secs (Pattern 1,2)]	***[1]***
								[==>748.0 Secs (Pattern 1,3)]	
								[==>773.0 Secs (Pattern 2,1)]	
								[==>773.0 Secs (Pattern 2,2)]	***[2]***
								[==>773.0 Secs (Pattern 2,3)]	
								[==>773.0 Secs (Pattern 3,1)]	
								[==>773.0 Secs (Pattern 3,2)]	***[3]***
								[==>773.0 Secs (Pattern 3,3)]	

Orbit Structure







Visit

Proposal 16300, J0330-F625-O1-O3 (06), completed Fri Oct 07 01:00:26 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SAME ORIENT AS 05

Comments: - Same pointing position and orientation as visit J0330-F475
- 9 exposures over 3 orbits, with a 3-point line dither and additional 3-point line subpattern dither

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=true	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.12 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.6 Angle Between Sides= Center Pattern=true	(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SPARCS-J0330	RA: 03 30 53.8527 (52.7243863d) Dec: -28 43 9.90 (-28.71942d) Equinox: J2000		V=25	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[HIGH REDSHIFT CLUSTER, RICH CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) SPARCS-J0330	ACS/WFC, ACCUM, WFCENTER	F625W			Pattern 2, Exps 1-1 in J0330-F625-O1-O3 (06) (2)	1 Secs (6882 Secs)	
								[==>748.0 Secs (Pattern 1,1)]	
								[==>748.0 Secs (Pattern 1,2)]	***[1]***
								[==>748.0 Secs (Pattern 1,3)]	
								[==>773.0 Secs (Pattern 2,1)]	
								[==>773.0 Secs (Pattern 2,2)]	***[2]***
								[==>773.0 Secs (Pattern 2,3)]	
								[==>773.0 Secs (Pattern 3,1)]	
								[==>773.0 Secs (Pattern 3,2)]	***[3]***
								[==>773.0 Secs (Pattern 3,3)]	

Orbit Structure