17243 - DECALS J0542-2125: The Dynamical State of an Extraordinary Cluster Merger at z = 0.61

Cycle: 30, 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) DECALSJ0542-2125-1	ACS/WFC	1	27-Sep-2023 13:00:19.0	yes
51	(1) DECALSJ0542-2125-1	ACS/WFC	1	27-Sep-2023 13:00:20.0	yes
02	(1) DECALSJ0542-2125-1	ACS/WFC	1	27-Sep-2023 13:00:20.0	yes
05	(3) DECALSJ0542-2125-3	WFC3/IR	1	27-Sep-2023 13:00:21.0	yes
06	(2) DECALSJ0542-2125-2	WFC3/IR WFC3/UVIS	2	27-Sep-2023 13:00:22.0	yes

6 Total Orbits Used

ABSTRACT

Merging galaxy clusters are rare laboratories to test the nature of dark matter and hierarchical assembly. We propose Chandra observation of DECALS J0542-2125, a candidate cluster merger at z=0.61. Two galaxy clusters of comparable mass are separated by < 500 km/s and 1 Mpc in projection. Additionally, one cluster gravitationally lenses a z=1.84 quasar, the largest-separation lensed quasar known. The proposed Chandra data will provide the necessary resolution to determine the morphology of the X-ray emitting gas and definitely determine the system's dynamical state. Joint Hubble Space Telescope observations will provide the necessary constraints for a robust lens model. Taken together, this program will map the distribution of dark matter, X-ray gas, and stars in DECALS J0542-2125.

OBSERVING DESCRIPTION

This program observes two strong lensing cores separated by ~150 arcsec, less than the ACS field of view. The 5-orbit program includes a combination of ACS and WFC3 observations across five visits. Each visit contains only a single orbit to maximize schedulability - particularly important because 4 of the 5 orbits have roll angle constraints as detailed in the Phase I proposal.

Overall, the program aims to image both cores in F606W and F814W using ACS (single pointing with a particular small range of angles), both cores in F105W and F160W using WFC3-IR (separate pointings), and the primary lensing core (involving a wide-separation lensed quasar) for ~1.5 orbits in F390W.

Visit 1 uses the ACS F606W filter. It employs an orientation constraint of 290-315 degrees to fit both lensing cores on the instrument at once. This visit includes 2068 s of F606W imaging.

Visit 2 uses the ACS F814W filter. Likewise, it employs the same orientation constraint as Visit 1 to simultaneously image both lensing cores. This visit includes 2068 s of F814W imaging.

Visit 3 uses the WFC3-IR F105W and WFC3-IR F160W filters to image the secondary lensing core. This visit includes 1011 s of F105W imaging and 1211 s of F160W imaging.

Visit 4 uses the WFC3-IR F160W, F105W filters and the UVIS-F390W filter to image the primary lensing core, in 2 orbits. An orientation constraint of 25-65 degrees is employed to optimally sample the primary lensing core and region between the two lensing cores.

The primary impact of reduced gyro operations for this program is the effect on the roll angle constraints, and the commensurate reductions in schedulability. Visits 1-2 have roll angle constraints so both lensing cores land on the instrument at once. If this was no longer schedulable, two separate pointings may have to be used to cover both cores. Visits 3 has a roll angle constraints to optimally sample the primary lensing core and the region between the two lensing cores. These roll angle constraints could be relaxed in the event of reduced gyro operations by prioritizing imaging of the primary lensing core. Finally, Visit 4 has no roll angle constraint and therefore would not be very affected by reduced gyro operations.

Visit

Proposal 17243, ACS F606W (01), failed Wed Sep 27 17:00:23 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 290D TO 315 D

Comments: both lensing cores

Diagnostics

(ACS F606W (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Patterns

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

Fixed Targets

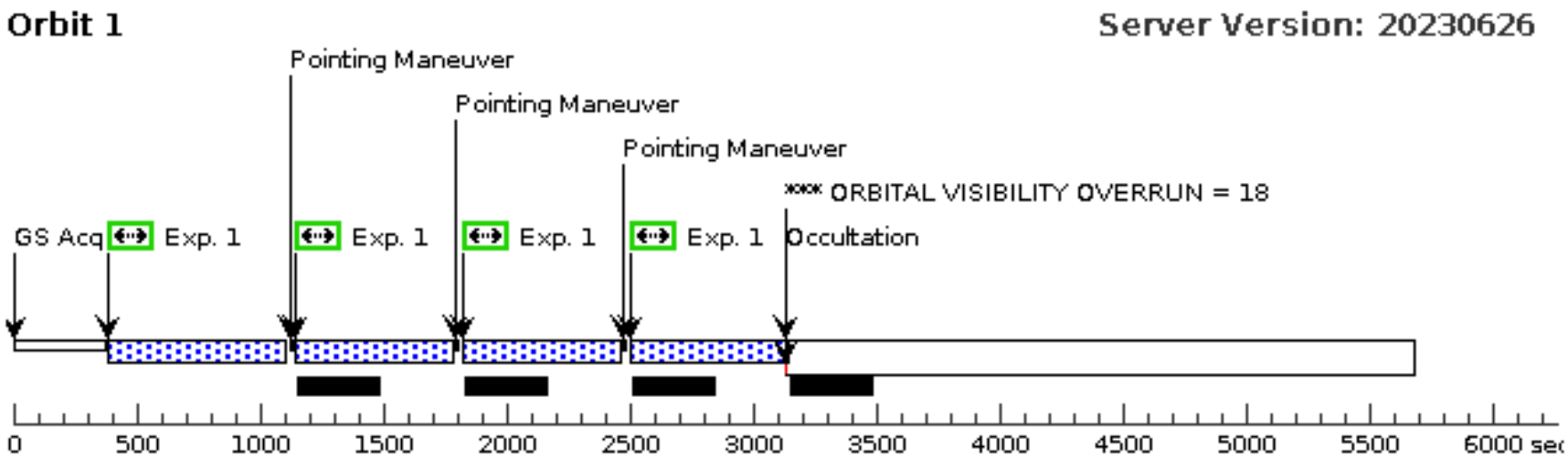
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	DECALSJ0542-2125-1	RA: 05 42 51.6240 (85.7151000d) Dec: -21 25 42.53 (-21.42848d) Equinox: J2000		V=21+/-0.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS, RICH CLUSTER, SUPERCLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) DECALSJ0542-2125-1	ACS/WFC, ACCUM, WFC	F606W			Pattern 2, Exps 1-1 in ACS F606W (01) (2)	530 Secs (2068 Secs) *[==>517.0 Secs (Pattern 1)]* *[==>517.0 Secs (Pattern 2)]* *[==>517.0 Secs (Pattern 3)]* *[==>517.0 Secs (Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 17243, ACS F606W (51) Wed Sep 27 17:00:23 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 290D TO 315 D

Comments: both lensing cores HOPR repeat of visit 1

Diagnostics

(ACS F606W (51)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Patterns

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

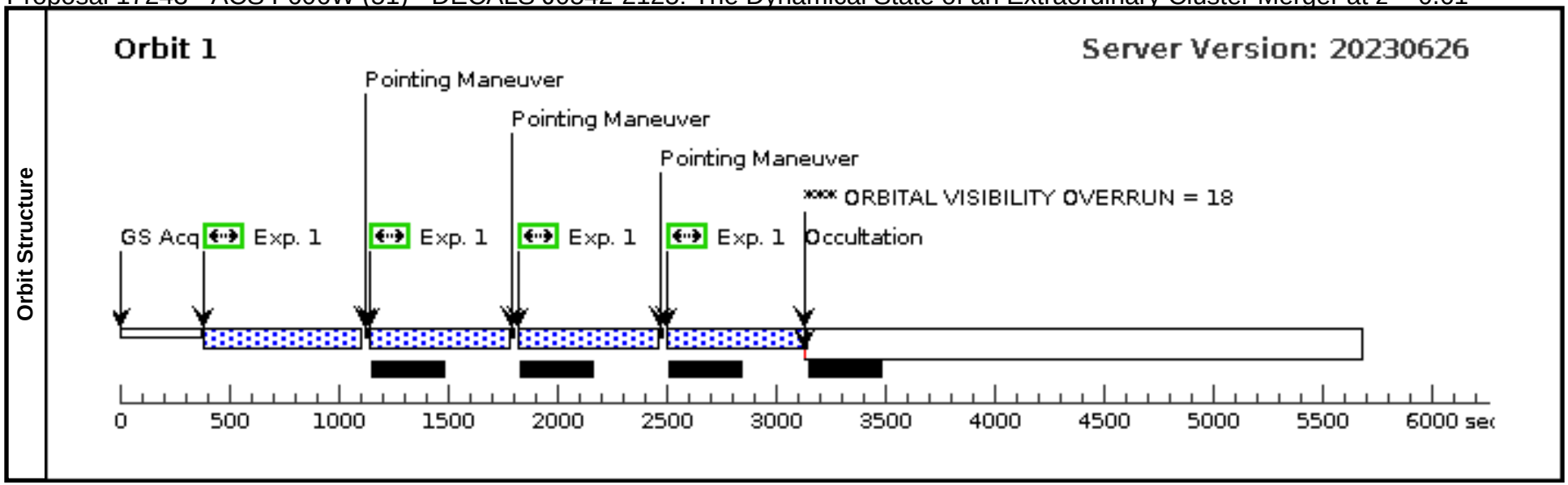
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	DECALSJ0542-2125-1	RA: 05 42 51.6240 (85.7151000d) Dec: -21 25 42.53 (-21.42848d) Equinox: J2000		V=21+/-0.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS, RICH CLUSTER, SUPERCLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) DECALSJ0542-2125-1	ACS/WFC, ACCUM, WFC	F606W			Pattern 2, Exps 1-1 in ACS F606W (51) (2)	530 Secs (2068 Secs) *[==>517.0 Secs (Pattern 1)]* *[==>517.0 Secs (Pattern 2)]* *[==>517.0 Secs (Pattern 3)]* *[==>517.0 Secs (Pattern 4)]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20230626
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
*** ORBITAL VISIBILITY OVERRUN = 18
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 17243, ACS F814W (02), completed Wed Sep 27 17:00:23 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 290D TO 315 D

Comments: both lensing cores

Diagnostics

(ACS F814W (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Patterns

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

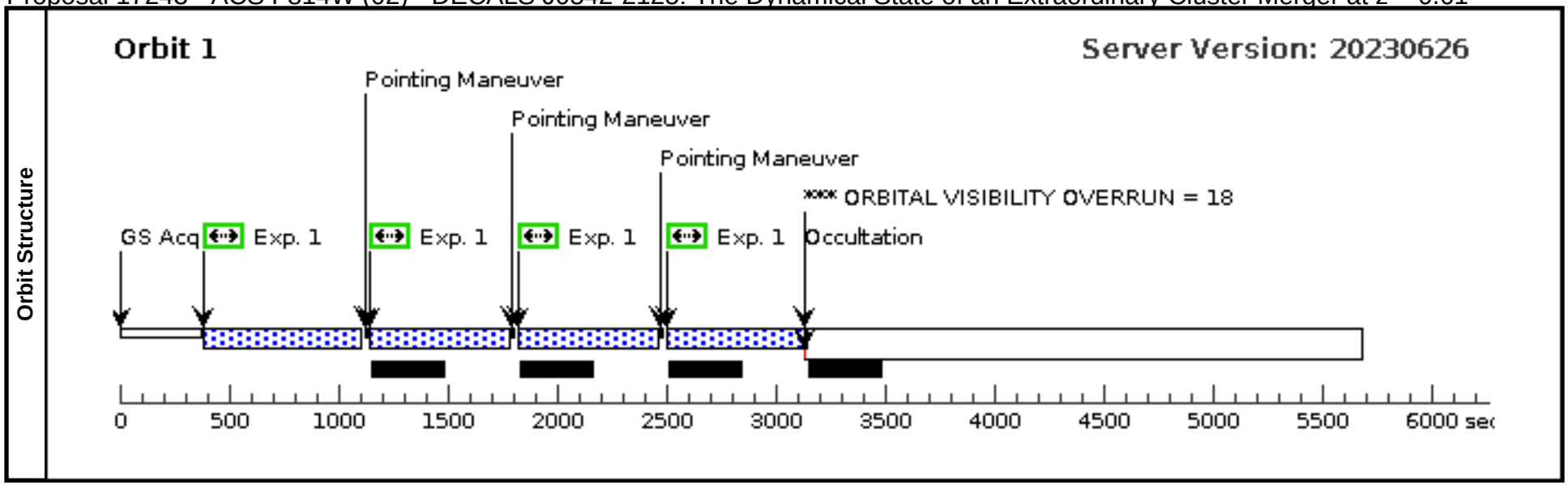
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	DECALSJ0542-2125-1	RA: 05 42 51.6240 (85.7151000d) Dec: -21 25 42.53 (-21.42848d) Equinox: J2000		V=21+/-0.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS, RICH CLUSTER, SUPERCLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) DECALSJ0542-2125-1	ACS/WFC, ACCUM, WFC	F814W			Pattern 2, Exps 1-1 in ACS F814W (02) (2)	530 Secs (2068 Secs) *[==>517.0 Secs (Pattern 1)]* *[==>517.0 Secs (Pattern 2)]* *[==>517.0 Secs (Pattern 3)]* *[==>517.0 Secs (Pattern 4)]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20230626
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
*** ORBITAL VISIBILITY OVERRUN = 18
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 17243, WFC3-IR F1053+F160W (05), completed Wed Sep 27 17:00:23 GMT 2023

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: secondary lensing core

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	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		(3)

Fixed Targets

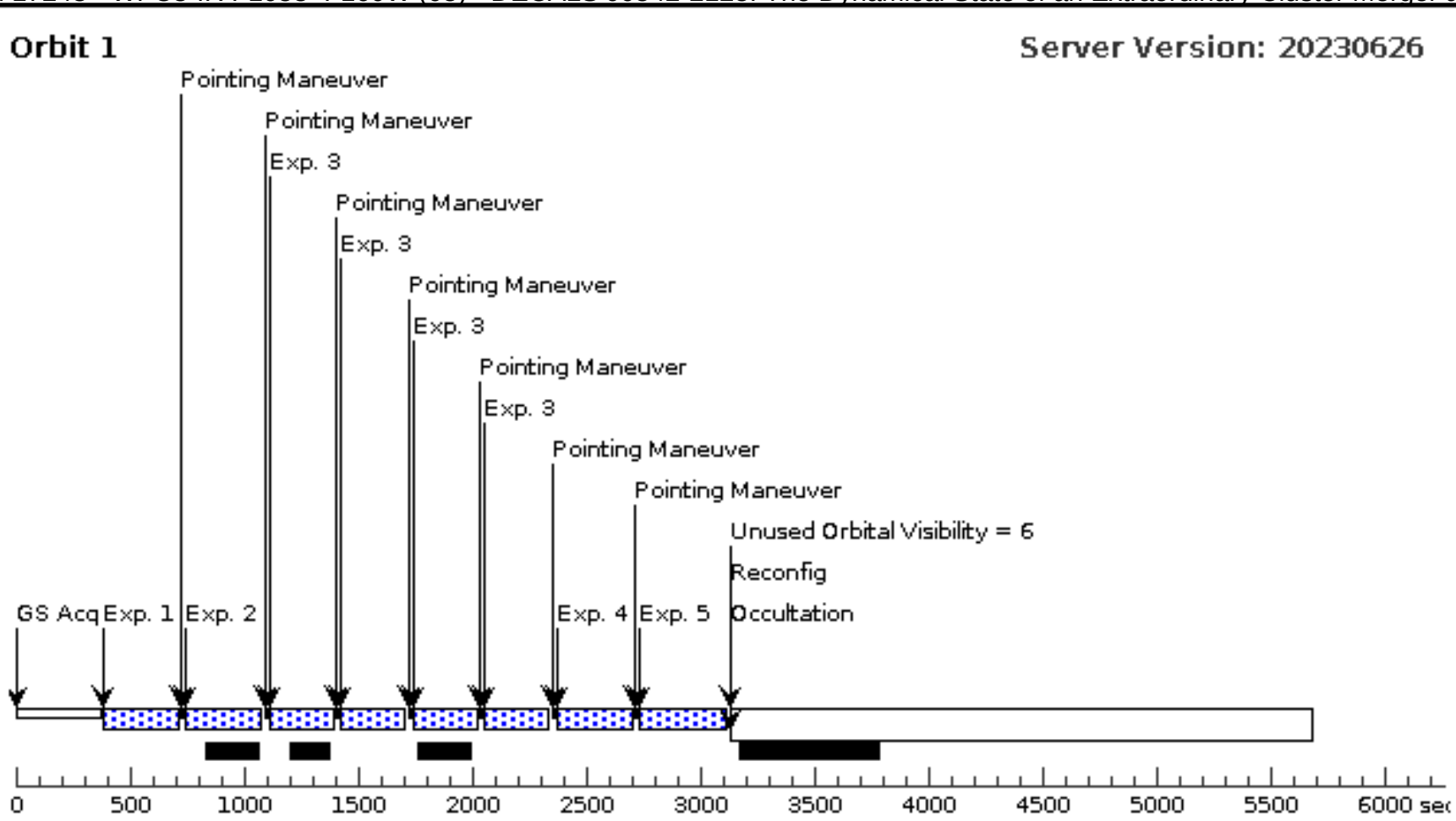
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	DECALSJ0542-2125-3	RA: 05 42 46.9852 (85.6957717d) Dec: -21 25 54.30 (-21.43175d) Equinox: J2000		V=21+/-0.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS, RICH CLUSTER, SUPERCLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) DECALSJ0542-2125-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=7; SAMP-SEQ=SPARS50			302.934997 Secs (302.935 Secs) *[==>]*	 ***[1]***
2		(3) DECALSJ0542-2125-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=7; SAMP-SEQ=SPARS50	POS TARG 0.542,0.182		302.934997 Secs (302.935 Secs) *[==>]*	 ***[1]***
3		(3) DECALSJ0542-2125-3	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=6; SAMP-SEQ=SPARS50		Pattern 4, Exps 3-3 in WFC3-IR F1053+F160W (05) (4)	252.934546 Secs (1011.738 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
4		(3) DECALSJ0542-2125-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=7; SAMP-SEQ=SPARS50	POS TARG 0.339,0.485		302.934997 Secs (302.935 Secs) *[==>]*	 ***[1]***
5		(3) DECALSJ0542-2125-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=8; SAMP-SEQ=SPARS50	POS TARG -0.203,0.303		352.935448 Secs (352.935 Secs) *[==>]*	 ***[1]***

Orbit Structure



Visit

Proposal 17243, WFC3-IR F105W F160W UVIS F390W (06), scheduling Wed Sep 27 17:00:23 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: ORIENT 25D TO 65 D

Diagnostics

(WFC3-IR F105W F160W UVIS F390W (06)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	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)
(5)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.75085 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(3)

Fixed Targets

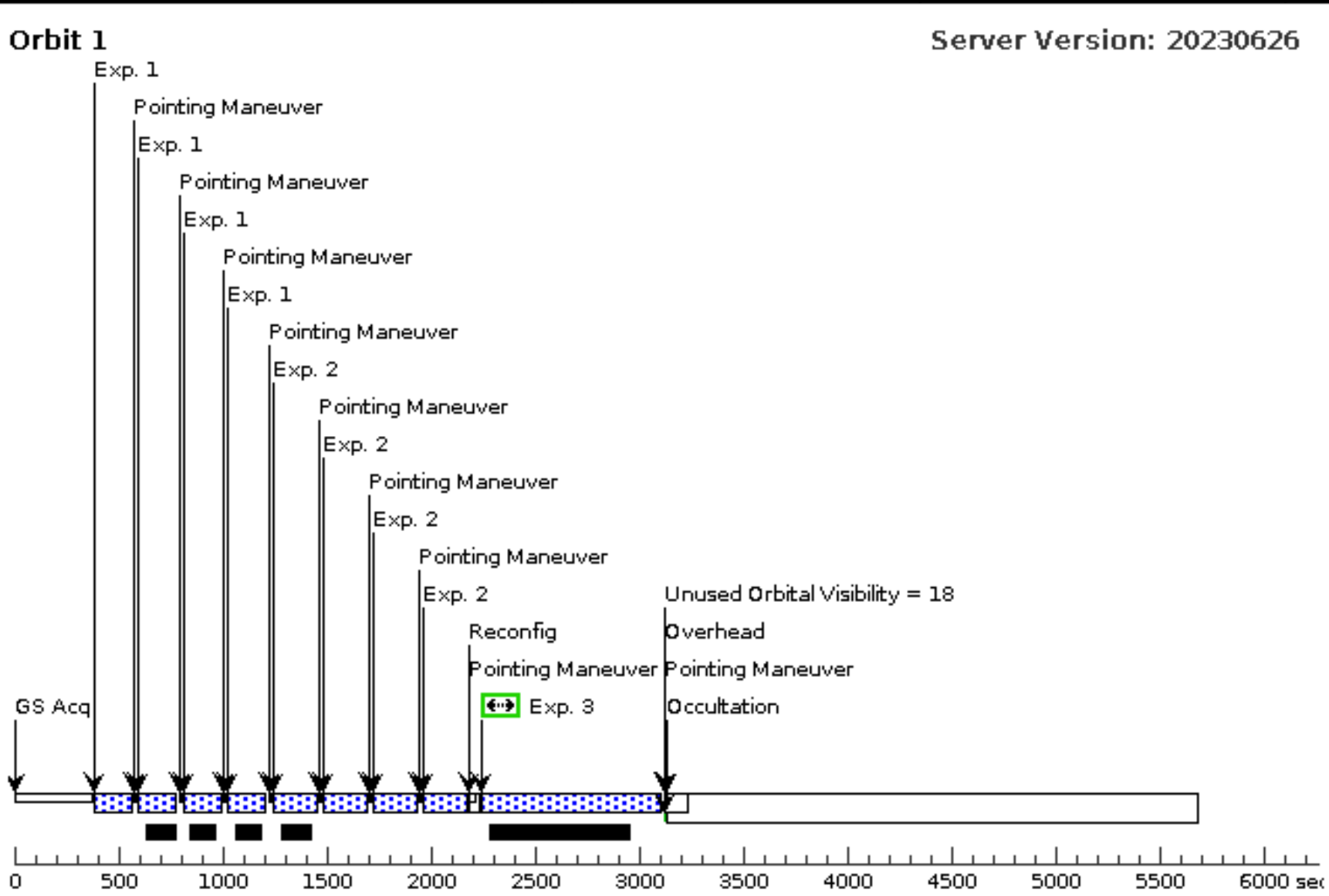
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	DECALSJ0542-2125-2	RA: 05 42 56.7000 (85.7362500d) Dec: -21 25 44.00 (-21.42889d) Equinox: J2000		V=21+/-0.1	Reference Frame: ICRS

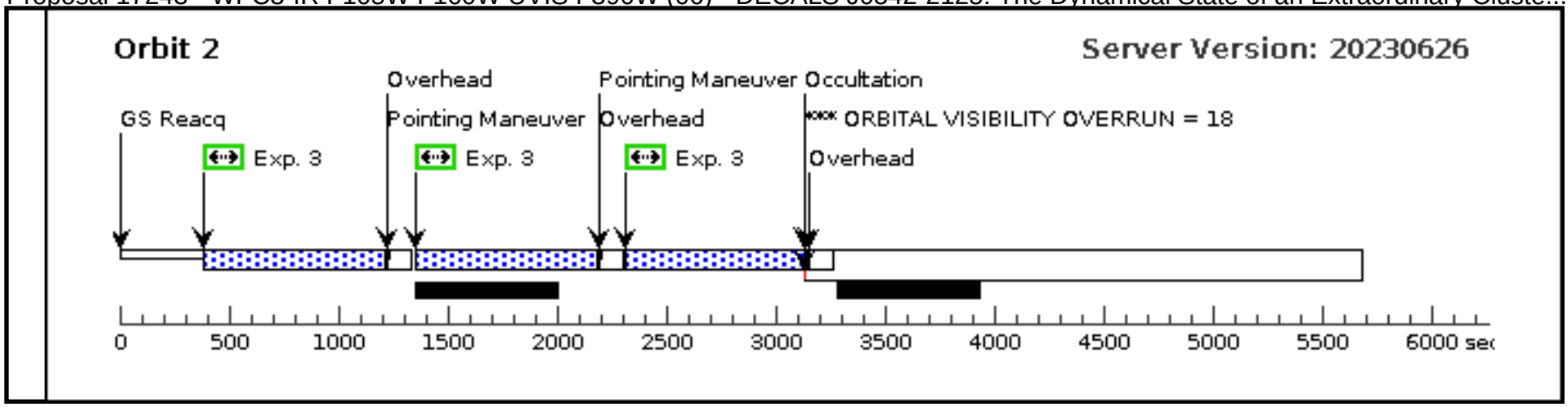
Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS, RICH CLUSTER, SUPERCLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) DECALSJ0542-2125-2	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=4; SAMP-SEQ=SPARS50		Pattern 4, Exps 1-1 in WFC3-IR F105W F160W UVIS F390W (06) (4)	152.933644 Secs (611.735 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2		(2) DECALSJ0542-2125-2	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=8; SAMP-SEQ=SPARS25		Pattern 4, Exps 2-2 in WFC3-IR F105W F160W UVIS F390W (06) (4)	177.935896 Secs (711.744 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
3		(2) DECALSJ0542-2125-2	WFC3/UVIS, ACCUM, UVIS2	F390W	FLASH=10		Pattern 5, Exps 3-3 in WFC3-IR F105W F160W UVIS F390W (06) (5)	829 Secs (3316 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]*** ***[2]***

Orbit Structure




Orbit 2
Server Version: 20230626
GS Reacq
Exp. 3
Overhead
Pointing Maneuver
Exp. 3
Pointing Maneuver
Overhead
Exp. 3
Occultation
**** ORBITAL VISIBILITY OVERRUN = 18
Overhead
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec