



# 15937 - Focusing The Next Generation of Extraordinary Cluster Lenses for JWST

Cycle: 27, Proposal Category: GO

(JWST Initiative)

(Availability Mode: SUPPORTED)

## INVESTIGATORS

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## 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) SPT-CLJ2325-4111	WFC3/IR	1	14-Nov-2019 13:00:45.0	yes
02	(1) SPT-CLJ2325-4111	ACS/WFC	2	14-Nov-2019 13:00:46.0	yes
52	(1) SPT-CLJ2325-4111	ACS/WFC	1	14-Nov-2019 13:00:47.0	yes
03	(2) SPT-CLJ0512-3848	WFC3/IR	1	14-Nov-2019 13:00:48.0	yes
04	(2) SPT-CLJ0512-3848	ACS/WFC	2	14-Nov-2019 13:00:49.0	yes
05	(3) SPT-CLJ0049-2440	WFC3/IR	1	14-Nov-2019 13:00:50.0	yes
06	(3) SPT-CLJ0049-2440	ACS/WFC	2	14-Nov-2019 13:00:51.0	yes

10 Total Orbits Used

## **ABSTRACT**

We propose to observe 3 new extraordinary lensing clusters showing extensive strong lensing evidence. These clusters are massive ( $M_{500c} > 6.0 \times 10^{14} M_{\odot}$ ) and reveal a large lensing cross-section, having an Einstein radii of 46", 49", 52" and showing multiple concentric arcs. Our proposed use of HST data will allow us to suitably map the dark matter and build a reliable strong lensing model due to their apparently smooth mass distribution (as opposed to most of HFF clusters) and significant number of lensing constraints. In addition, giant arcs (e.g. 21" in extent, and some very bright) promise significant science impact once the lensing model has been "focused". By observing those targets we will calibrate new cosmic telescopes for JWST. In our proposed observations, we lay the groundwork for the best outcome possible by targeting obviously spectacular lensing cluster promoting high-redshift studies of the magnified background universe with JWST.

## **OBSERVING DESCRIPTION**

To be Reviewed:

We request to observe each cluster with four filters, using in 3 orbits of HST time: one orbit each with the ACS/F606W filter, one orbit with the ACS/F814W filter, and one orbit with WFC3/IR split between two filters, F105W and F140W. This brings the total request to 9 orbits.

Using the ETC, we

conservatively estimate a 5 point source detection of 27.1 mag in F606W, 26.5 mag in F814W, and 26 mag in each of the IR filters

The exact magnitudes depend on the actual visibility time and source spectral energy distribution; For our targets, the APT estimates 53-54 minutes per orbit, and we made these estimates for a flat spectrum.

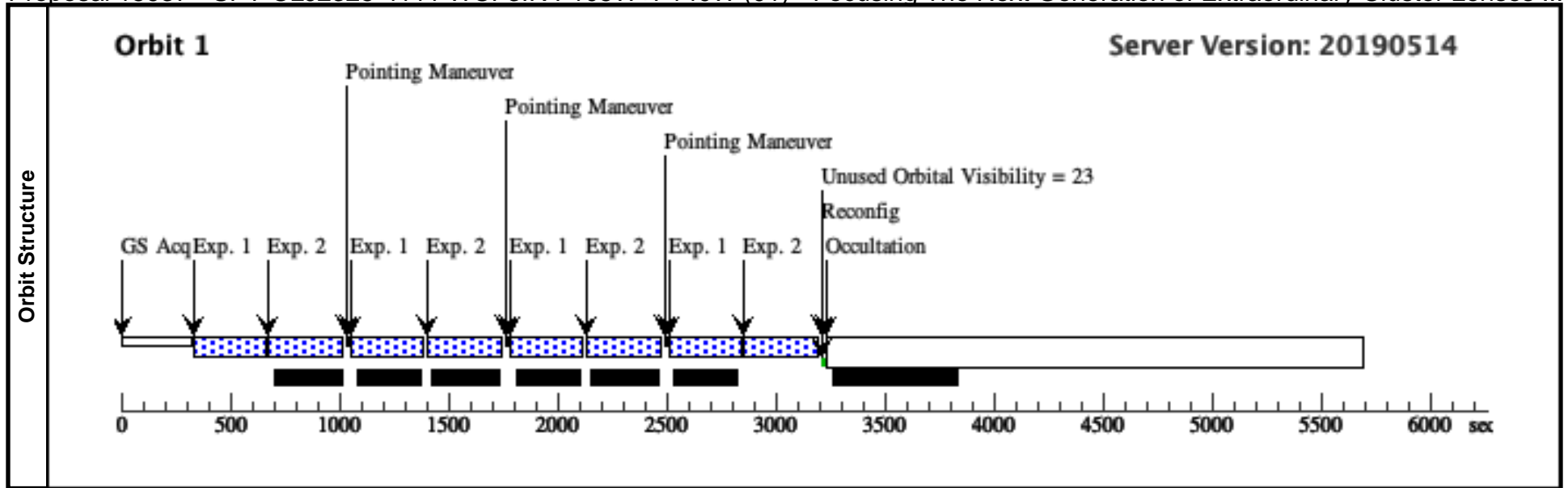
3 filters, requiring

at least 4 images (dithers) per filter (for good PSF reconstruction)

Proposal 15937 - SPT-CLJ2325-4111 WCF3IR F105W+F140W (01) - Focusing The Next Generation of Extraordinary Cluster Lenses ...

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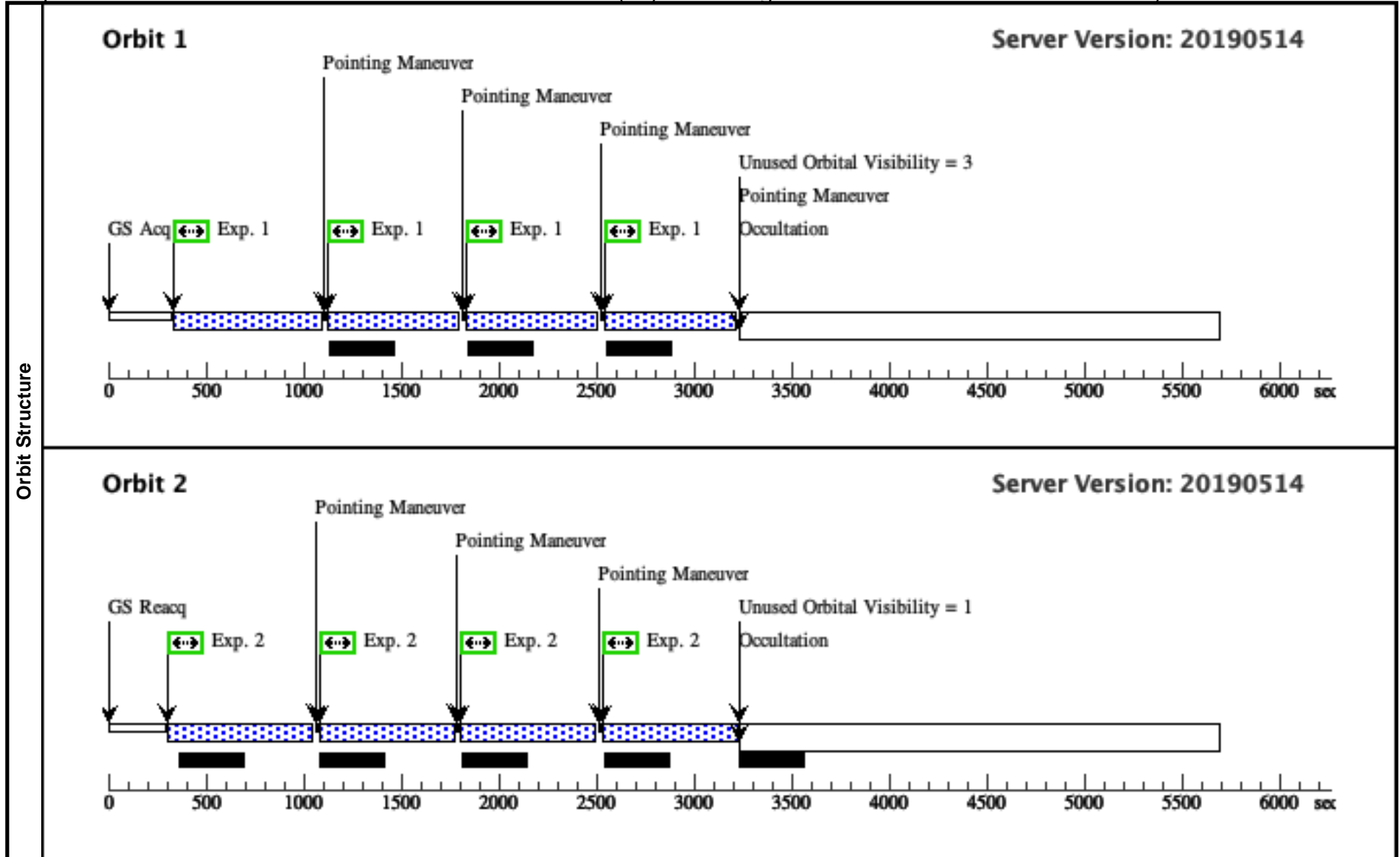
Visit	<b>Proposal 15937, SPT-CLJ2325-4111 WCF3IR F105W+F140W (01), completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	(1-2)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	SPT-CLJ2325-4111	RA: 23 25 12.7193 (351.3029971d) Dec: -41 12 3.44 (-41.20096d) Equinox: J2000	Redshift: 0.358	V=20+/-2	Reference Frame: ICRS				
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[GRAVITATIONAL LENS]									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F105W	(1) SPT-CLJ2325-4111	WFC3/IR, MULTIACCUM, IR-FIX	F105W	SAMP-SEQ=SPARS 25; NSAMP=13		Pattern 1, Exps 1-2 in SPT-CLJ2325-4111 WCF3IR F105W+F140W (01) (1)	302.938471 Secs (1211.754 Secs) [=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 2,1)] [=>(Pattern 2,2)]	[1]
	2	F140W	(1) SPT-CLJ2325-4111	WFC3/IR, MULTIACCUM, IR-FIX	F140W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 1-2 in SPT-CLJ2325-4111 WCF3IR F105W+F140W (01) (1)	327.938986 Secs (1311.756 Secs) [=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 2,1)] [=>(Pattern 2,2)]	[1]



Proposal 15937 - SPT-CLJ2325-4111 ACS F606W/F814W (02) - Focusing The Next Generation of Extraordinary Cluster Lenses for J...

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Visit	<b>Proposal 15937, SPT-CLJ2325-4111 ACS F606W/F814W (02), failed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/WFC Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(2)	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=false	Pattern Type=ACS-WFC-DITHER- LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=true	(1), (2)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	SPT-CLJ2325-4111	RA: 23 25 12.7193 (351.3029971d) Dec: -41 12 3.44 (-41.20096d) Equinox: J2000	Redshift: 0.358	V=20+/-2	Reference Frame: ICRS				
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[GRAVITATIONAL LENS]									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACS 606 SP T2325	(1) SPT-CLJ2325-4111	ACS/WFC, ACCUM, WFC-FIX	F606W				Pattern 2, Exps 1-1 i n SPT-CLJ2325-411 1 ACS F606W/F814 W (02) (2)	600 Secs (2204 Secs) [==>551.0 Secs (Pattern 1,1)] [==>551.0 Secs (Pattern 1,2)] [==>551.0 Secs (Pattern 2,1)] [==>551.0 Secs (Pattern 2,2)]
2	ACS 814 SP T2325	(1) SPT-CLJ2325-4111	ACS/WFC, ACCUM, WFC-FIX	F814W				Pattern 2, Exps 2-2 i n SPT-CLJ2325-411 1 ACS F606W/F814 W (02) (2)	600 Secs (2264 Secs) [==>566.0 Secs (Pattern 1,1)] [==>566.0 Secs (Pattern 1,2)] [==>566.0 Secs (Pattern 2,1)] [==>566.0 Secs (Pattern 2,2)]	[2]



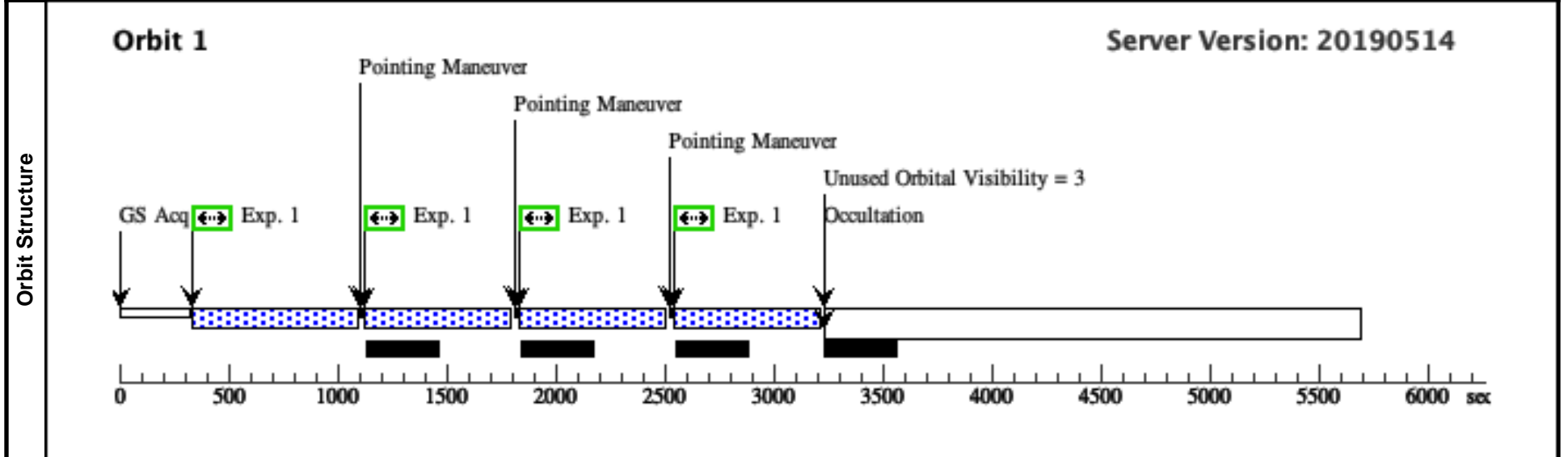
<b>Visit</b>	<b>Proposal 15937, SPT-CLJ2325-4111 ACS F606W/F814W (52)</b>				
	<b>Diagnostic Status: No Diagnostics</b>				
	Scientific Instruments: ACS/WFC				
	Special Requirements: (none)				

<b>Patterns</b>	#	Primary Pattern	Secondary Pattern	Exposures
	(2)	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=false	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=

<b>Fixed Targets</b>	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	SPT-CLJ2325-4111	RA: 23 25 12.7193 (351.3029971d) Dec: -41 12 3.44 (-41.20096d) Equinox: J2000	Redshift: 0.358	V=20+/-2	Reference Frame: ICRS

*Comments:*  
 Category=CLUSTER OF GALAXIES  
 Description=[GRAVITATIONAL LENS]

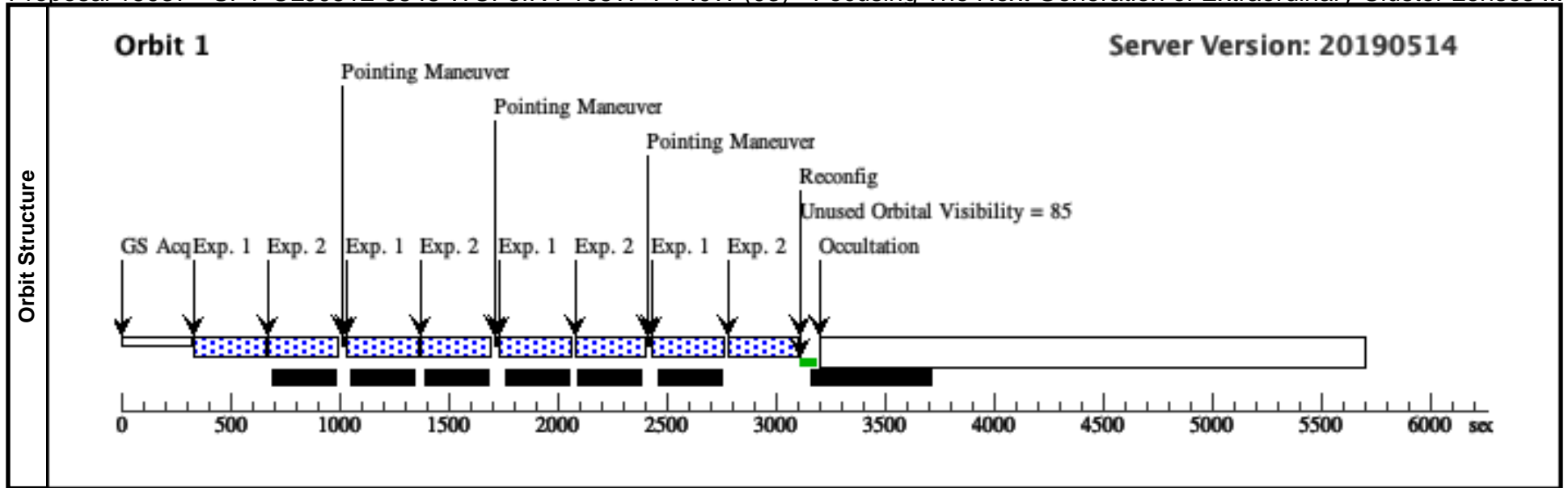
<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACS 814 SP T2325	(1) SPT-CLJ2325-4111	ACS/WFC, ACCUM, WFC-FIX	F814W				Pattern 2, Exps 1-1 in SPT-CLJ2325-4111 1 ACS F606W/F814W (52) (2)	600 Secs (2204 Secs) [=>551.0 Secs (Pattern 1,1)] [=>551.0 Secs (Pattern 1,2)] [=>551.0 Secs (Pattern 2,1)] [=>551.0 Secs (Pattern 2,2)]



Proposal 15937 - SPT-CLJ0512-3848 WCF3IR F105W+F140W (03) - Focusing The Next Generation of Extraordinary Cluster Lenses ...

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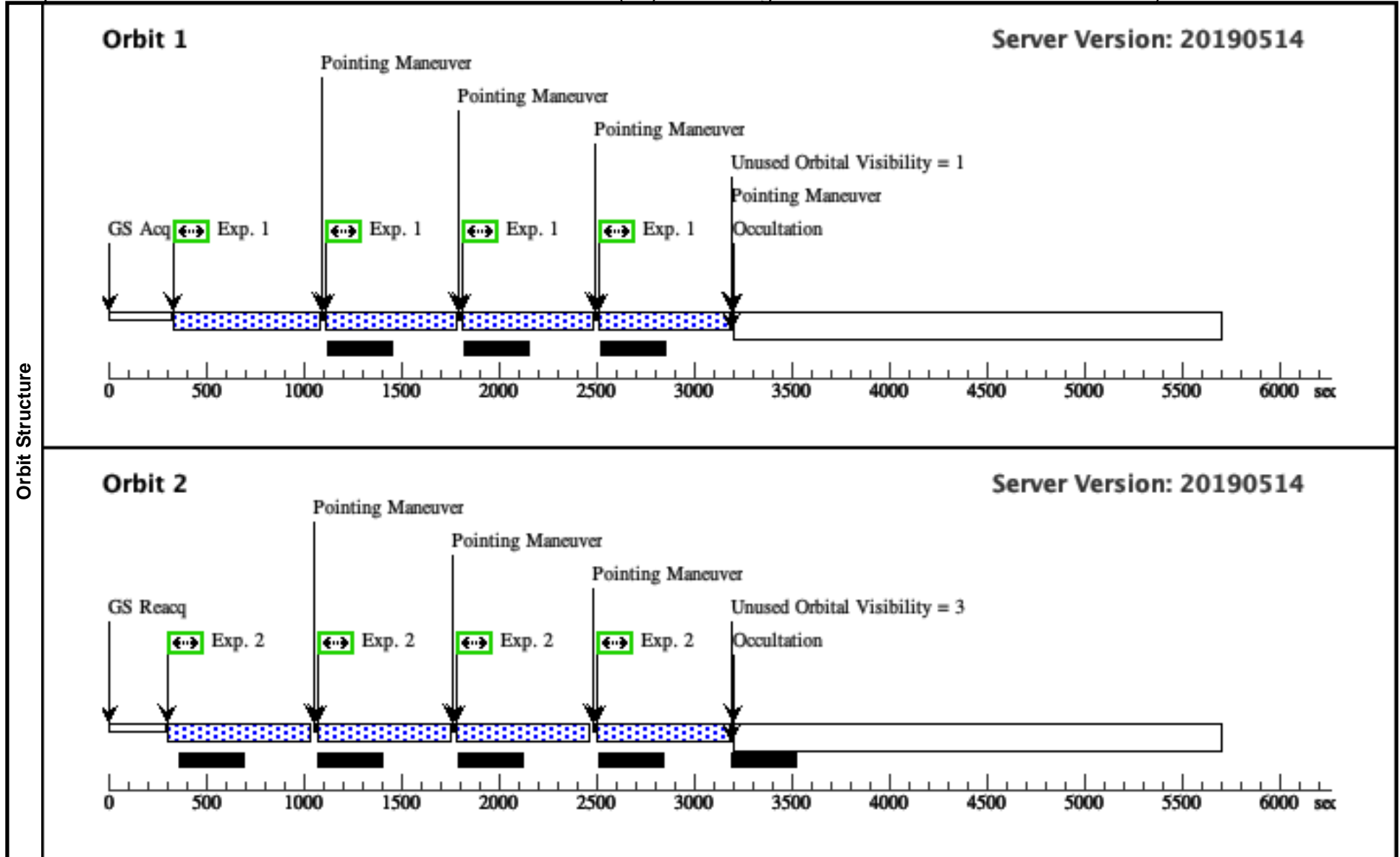
Visit	<b>Proposal 15937, SPT-CLJ0512-3848 WCF3IR F105W+F140W (03), completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WCF3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(1)	Pattern Type=WCF3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	Pattern Type=WCF3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	(1-2)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes	Miscellaneous			
	(2)	SPT-CLJ0512-3848	RA: 05 12 57.6031 (78.2400129d) Dec: -38 47 11.26 (-38.78646d) Equinox: J2000			V=20+/-2	Reference Frame: ICRS			
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[GRAVITATIONAL LENS]									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F105W	(2) SPT-CLJ0512-3848	WCF3/IR, MULTIACCUM, IR-FIX	F105W	SAMP-SEQ=SPARS 25; NSAMP=13		Pattern 1, Exps 1-2 in SPT-CLJ0512-3848 WCF3IR F105W+F140W (03) (1)	302.938471 Secs (1211.754 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 2,1)] [==>(Pattern 2,2)]	[1]
2	F140W	(2) SPT-CLJ0512-3848	WCF3/IR, MULTIACCUM, IR-FIX	F140W	NSAMP=13; SAMP-SEQ=SPAR S25		Pattern 1, Exps 1-2 in SPT-CLJ0512-3848 WCF3IR F105W+F140W (03) (1)	302.938471 Secs (1211.754 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 2,1)] [==>(Pattern 2,2)]	[1]	



Proposal 15937 - SPT-CLJ0512-3848 ACS F606W/F814W (04) - Focusing The Next Generation of Extraordinary Cluster Lenses for J...

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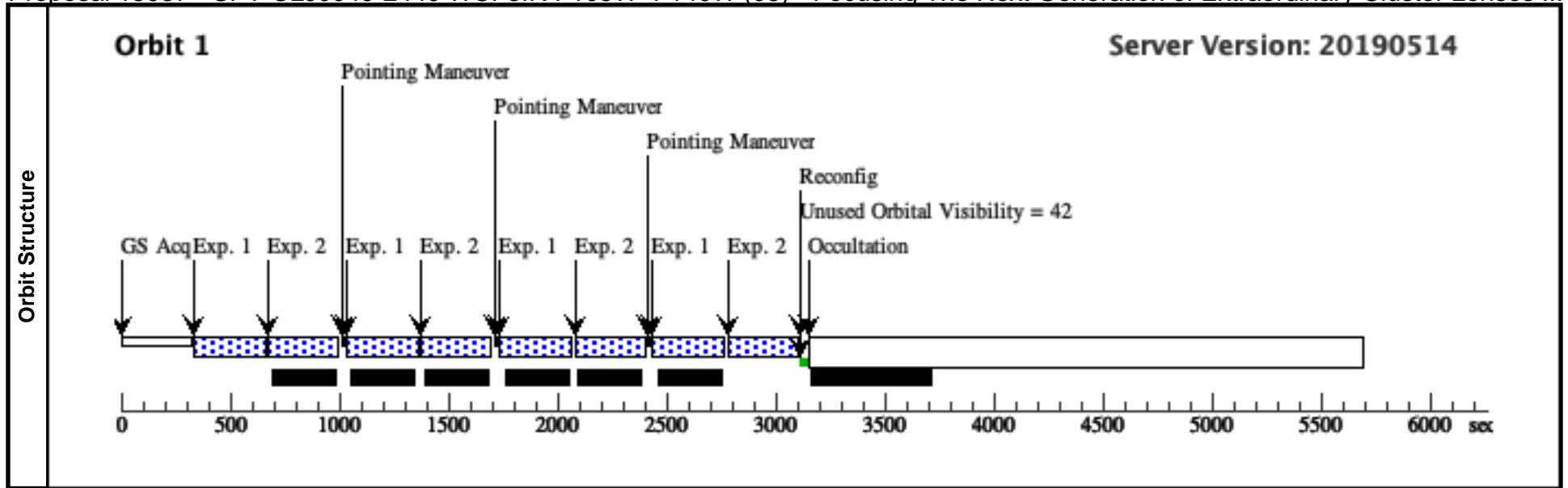
Visit	<b>Proposal 15937, SPT-CLJ0512-3848 ACS F606W/F814W (04), completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/WFC Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=true	(1), (2)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	SPT-CLJ0512-3848	RA: 05 12 57.6031 (78.2400129d) Dec: -38 47 11.26 (-38.78646d) Equinox: J2000		V=20+/-2	Reference Frame: ICRS				
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[GRAVITATIONAL LENS]									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACS 606 SP T0512	(2) SPT-CLJ0512-3848	ACS/WFC, ACCUM, WFC-FIX	F606W				Pattern 2, Exps 1-1 in SPT-CLJ0512-3848 ACS F606W/F814W (04) (2)	600 Secs (2168 Secs) [=>542.0 Secs (Pattern 1,1)] [=>542.0 Secs (Pattern 1,2)] [=>542.0 Secs (Pattern 2,1)] [=>542.0 Secs (Pattern 2,2)]
2	ACS 814 SP T0512	(2) SPT-CLJ0512-3848	ACS/WFC, ACCUM, WFC-FIX	F814W				Pattern 2, Exps 2-2 in SPT-CLJ0512-3848 ACS F606W/F814W (04) (2)	600 Secs (2224 Secs) [=>556.0 Secs (Pattern 1,1)] [=>556.0 Secs (Pattern 1,2)] [=>556.0 Secs (Pattern 2,1)] [=>556.0 Secs (Pattern 2,2)]	[2]



Proposal 15937 - SPT-CLJ0049-2440 WCF3IR F105W+F140W (05) - Focusing The Next Generation of Extraordinary Cluster Lenses ...

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Visit	<b>Proposal 15937, SPT-CLJ0049-2440 WCF3IR F105W+F140W (05), completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	(1-2)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	SPT-CLJ0049-2440	RA: 00 49 10.7814 (12.2949225d) Dec: -24 40 43.54 (-24.67876d) Equinox: J2000		V=20+/-2	Reference Frame: ICRS				
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[GRAVITATIONAL LENS]									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F105W	(3) SPT-CLJ0049-2440	WFC3/IR, MULTIACCUM, IR-FIX	F105W	SAMP-SEQ=SPARS 25; NSAMP=13			Pattern 1, Exps 1-2 in SPT-CLJ0049-2440 WCF3IR F105W+F140W (05) (1)	302.938471 Secs (1211.754 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 2,1)] [==>(Pattern 2,2)]
2	F140W	(3) SPT-CLJ0049-2440	WFC3/IR, MULTIACCUM, IR-FIX	F140W	NSAMP=13; SAMP-SEQ=SPAR S25			Pattern 1, Exps 1-2 in SPT-CLJ0049-2440 WCF3IR F105W+F140W (05) (1)	302.938471 Secs (1211.754 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 2,1)] [==>(Pattern 2,2)]	[1]



Proposal 15937 - SPT-CLJ0049-2440 ACS F606W/F814W (06) - Focusing The Next Generation of Extraordinary Cluster Lenses for J...

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Visit	<b>Proposal 15937, SPT-CLJ0049-2440 ACS F606W/F814W (06), completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/WFC Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(2)	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=false	Pattern Type=ACS-WFC-DITHER- LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=true	(1), (2)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	SPT-CLJ0049-2440	RA: 00 49 10.7814 (12.2949225d) Dec: -24 40 43.54 (-24.67876d) Equinox: J2000		V=20+/-2	Reference Frame: ICRS				
	<i>Comments:</i> Category=CLUSTER OF GALAXIES Description=[GRAVITATIONAL LENS]									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACS 606 SP T0049	(3) SPT-CLJ0049-24 40	ACS/WFC, ACCUM, WFC-FIX	F606W				Pattern 2, Exps 1-1 i n SPT-CLJ0049-244 0 ACS F606W/F814 W (06) (2)	600 Secs (2124 Secs) [==>531.0 Secs (Pattern 1,1)] [==>531.0 Secs (Pattern 1,2)] [==>531.0 Secs (Pattern 2,1)] [==>531.0 Secs (Pattern 2,2)]
2	ACS 814 SP T0049	(3) SPT-CLJ0049-24 40	ACS/WFC, ACCUM, WFC-FIX	F814W				Pattern 2, Exps 2-2 i n SPT-CLJ0049-244 0 ACS F606W/F814 W (06) (2)	600 Secs (2184 Secs) [==>546.0 Secs (Pattern 1,1)] [==>546.0 Secs (Pattern 1,2)] [==>546.0 Secs (Pattern 2,1)] [==>546.0 Secs (Pattern 2,2)]	[2]

