



17114 - Four New Dissociative Merging Clusters

Cycle: 30, Proposal Category: GO

(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	(4) WHL-J024808.3-021637	ACS/WFC	2	15-Nov-2022 09:01:14.0	yes
02	(1) WHL-J121917.6+505432	ACS/WFC	2	15-Nov-2022 09:01:15.0	yes
03	(2) WHL-J130558.9+263048	ACS/WFC	2	15-Nov-2022 09:01:16.0	yes
04	(3) WHL-J001938.7+033557	ACS/WFC	2	15-Nov-2022 09:01:17.0	yes

8 Total Orbits Used

ABSTRACT

We propose ACS imaging of four exciting new merging clusters with "dissociative" morphology---two galaxy subclusters on either side of a central gas concentration, indicative of a recent head-on collision. The imaging will enable a weak lensing analysis that will (i) determine the dark matter halo locations relative to the galaxy subcluster locations; (ii) measure the subcluster masses; and (iii) place limits on the presence of any additional substructures. In conjunction with existing X-ray data and a scheduled spectroscopic survey, the dark matter halo locations and masses will enable

Proposal 17114 (STScI Edit Number: 0, Created: Tuesday, November 15, 2022 at 9:01:17 AM Eastern Standard Time) - Overview

accurate modeling of the merger scenario. Upper limits on galaxy-dark matter offsets will be translated to upper limits on the momentum exchanged between the dark matter halos. Together with accurate modeling of the merger scenario, this will place upper limits on the dark matter scattering cross section. These four systems are promising in that respect because their modest separations suggest that they are seen not long after first pericenter.

OBSERVING DESCRIPTION

For each target, we request two-band ACS imaging, one orbit per band, to provide color selection of background galaxies. The total request is thus 8 orbits for four clusters.

Filter selection: The best color selection is obtained when filters straddle the 4000 Å break. We thus treat separately the three targets at redshifts 0.24-0.31, where the break is observed at 4960-5240 Å, and the target at $z = 0.55$ where the break is observed at 6200 Å. In both cases we use the F606W filter because it is generally the most sensitive filter, but it plays a different role at different redshifts. For three targets, F606W is longward of the break and is complemented by F475W shortward of the break. For the $z = 0.55$ target, the 4000 Å break occurs in the middle of the F606W filter, hence reducing the F606W flux for early-type cluster members: F606W can play the role of the shorter filter. We propose to use F814W as the long filter.

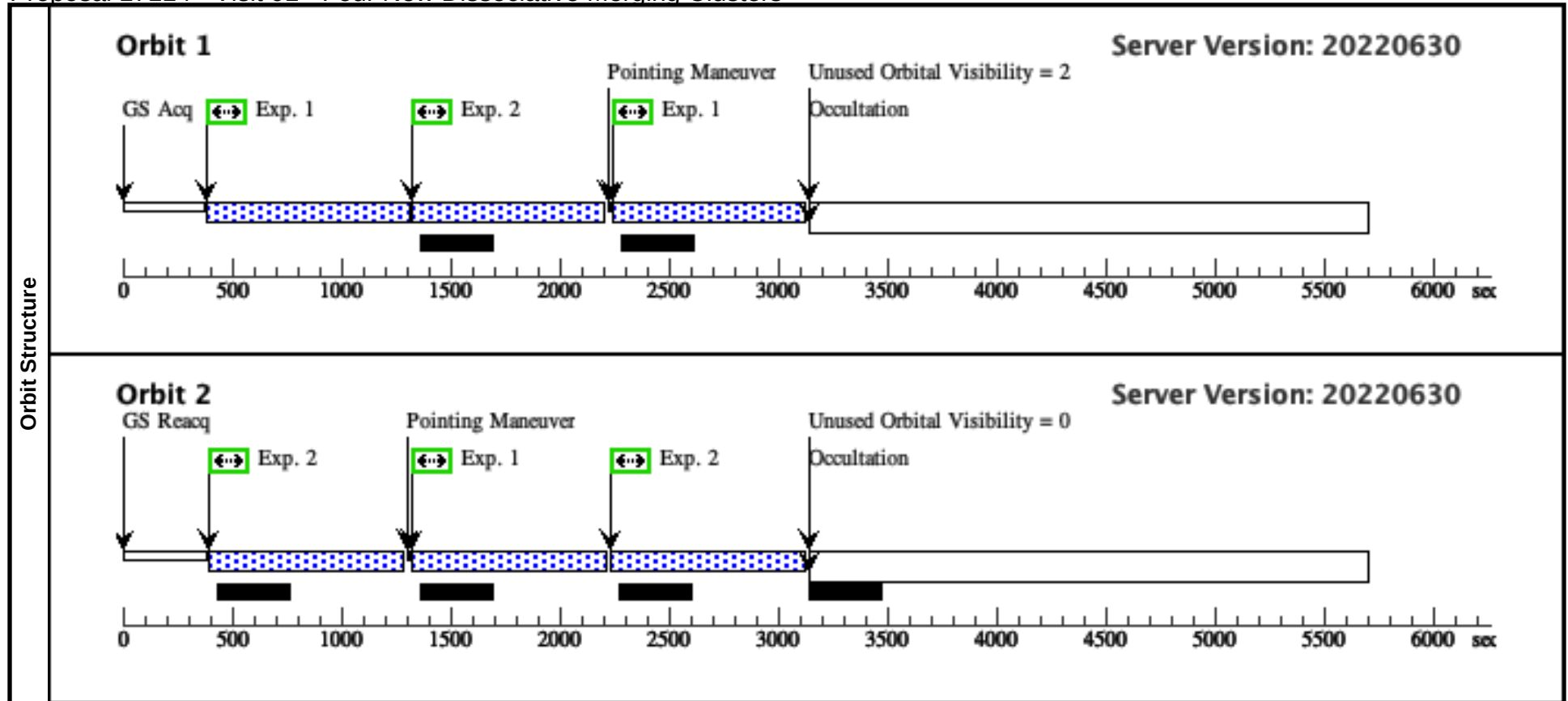
Depth: the source densities and convergence map angular resolutions cited in the scientific justification correspond to a single orbit of F606W and/or F814W at these redshifts (eg, Dawson et al. 2012). An angular resolution of 10 arcsec positional uncertainty on the dark matter halos is an appropriate goal because it corresponds to 38-65 kpc for these clusters; for comparison, the separation between BCGs ranges from 335-544 kpc, and the smallest separation between X-ray peak and BCG is 16 arcsec or 74 kpc.

We can rely on previous results mapping exposure time to dark matter positional uncertainty because our targets have masses similar to those in the above-cited works. Simet et al. (2017) calibrated the relation between weak lensing mass and redMaPPer richness; using that relation and the known target richness we find M_{200} ranging from $4.6\text{--}14 \times 10^{14} h^{-1}$ solar masses.

Footprint: the targets are compact enough to fit in the ACS field without any constraints on the roll angle or any need to mosaic. We request small dithers to fill gaps.

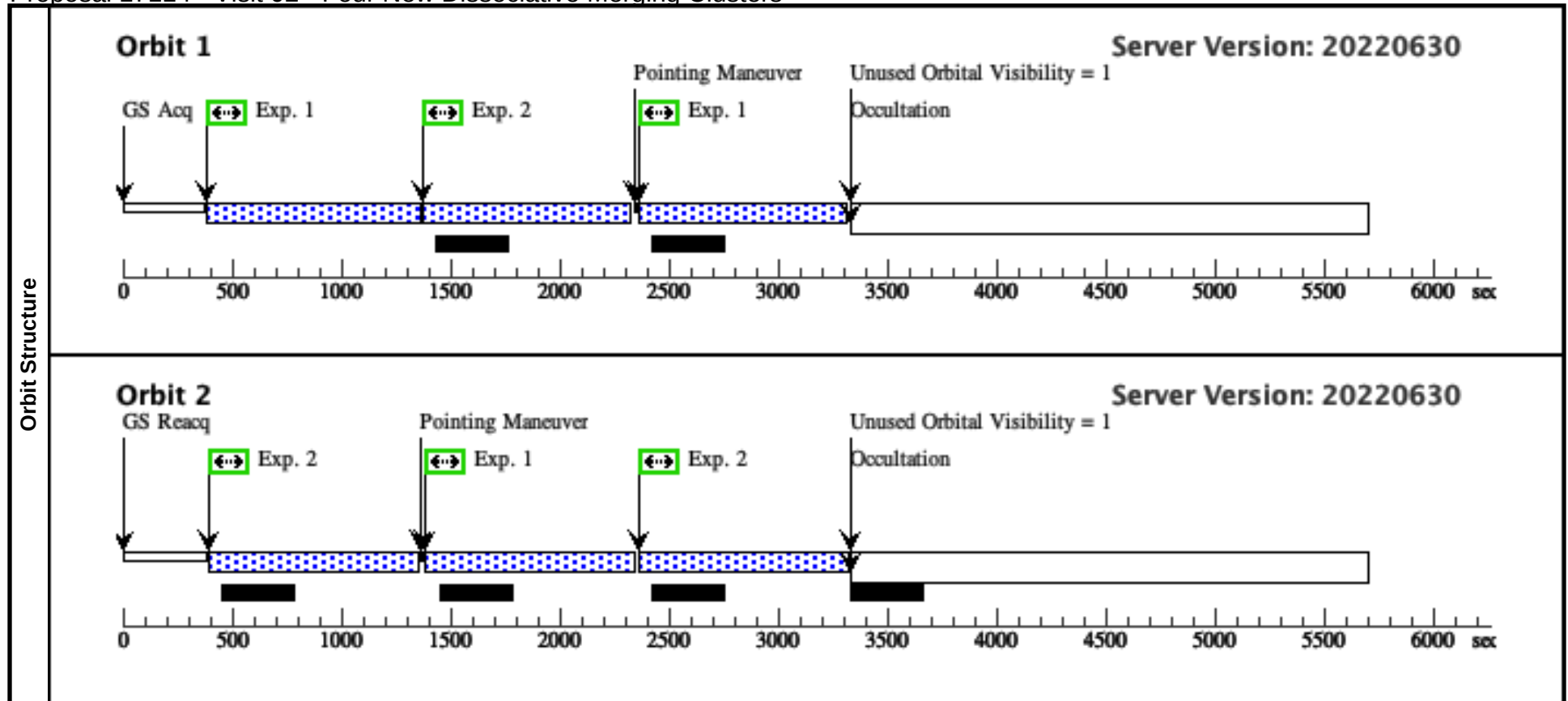
Proposal 17114 - Visit 01 - Four New Dissociative Merging Clusters

Visit	Proposal 17114, Visit 01, implementation										Tue Nov 15 14:01:17 GMT 2022		
	Diagnostic Status: No Diagnostics												
	Scientific Instruments: ACS/WFC												
	Special Requirements: (none)												
Patterns	#	Primary Pattern					Secondary Pattern					Exposures	
	(1)	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=false							(1-2)	
Fixed Targets	#	Name		Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(4)	WHL-J024808.3-021637		RA: 02 48 11.3678 (42.0473658d) Dec: -02 16 26.68 (-2.27408d) Equinox: J2000				V=18.4+/-1		Reference Frame: NED			
	Comments: This object was generated by the targetselector and retrieved from the NED database.												
	Category=CLUSTER OF GALAXIES Description=[RICH CLUSTER]												
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1		(4) WHL-J024808.3-021637	ACS/WFC, ACCUM, WFCENTER		F606W			Pattern 1, Exps 1-2 in Visit 01 (1)	500 Secs (2193 Secs)			
										[==>726.0 Secs (Pattern 1)]		[1]	
										[==>726.0 Secs (Pattern 2)]			
										[==>741.0 Secs (Pattern 3)]		[2]	
	2		(4) WHL-J024808.3-021637	ACS/WFC, ACCUM, WFCENTER		F475W			Pattern 1, Exps 1-2 in Visit 01 (1)	500 Secs (2208 Secs)			
										[==>726.0 Secs (Pattern 1)]		[1]	
										[==>741.0 Secs (Pattern 2)]			
									[==>741.0 Secs (Pattern 3)]		[2]		



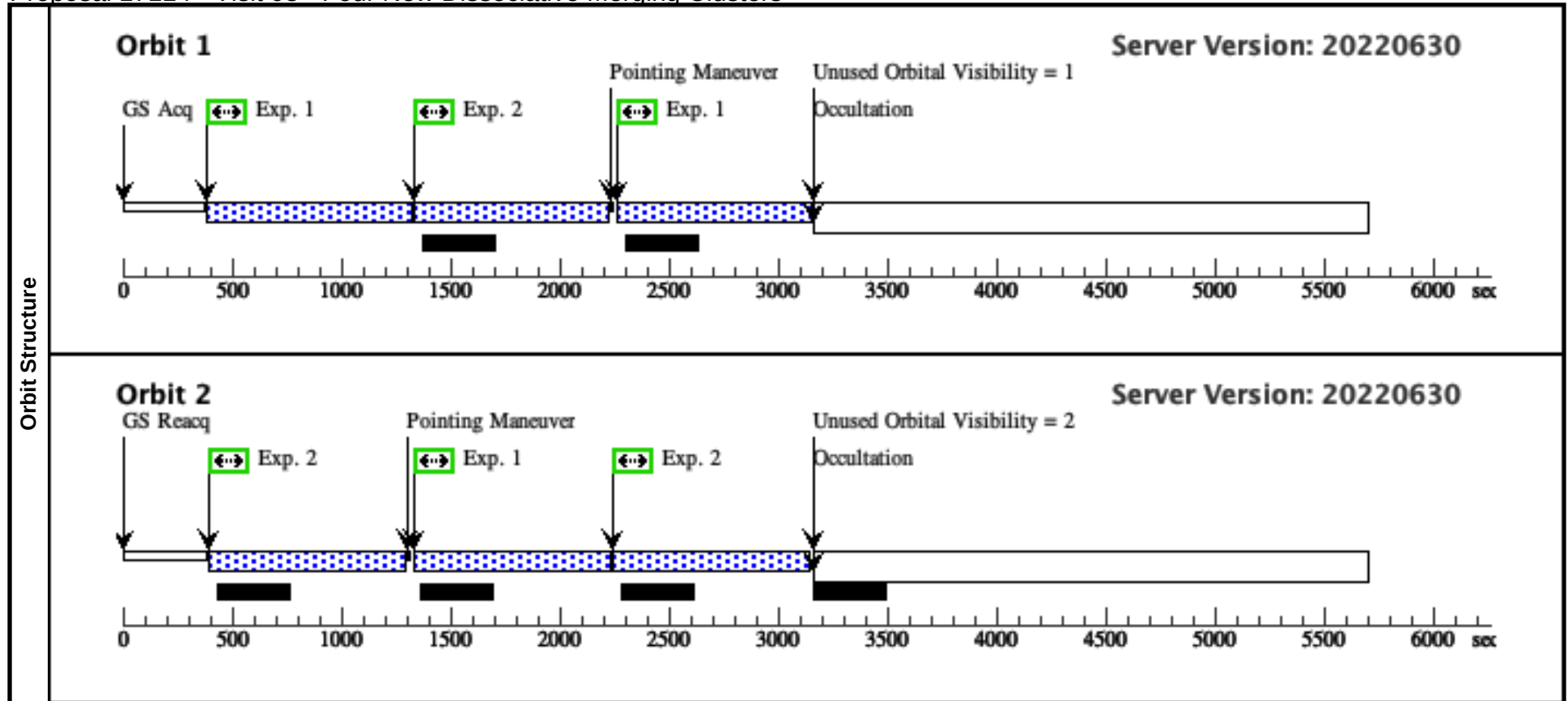
Proposal 17114 - Visit 02 - Four New Dissociative Merging Clusters

Visit	Proposal 17114, Visit 02, implementation										Tue Nov 15 14:01:17 GMT 2022		
	Diagnostic Status: No Diagnostics												
	Scientific Instruments: ACS/WFC												
	Special Requirements: (none)												
Patterns	#	Primary Pattern					Secondary Pattern					Exposures	
	(1)	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=false							(1-2)	
Fixed Targets	#	Name		Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(1)	WHL-J121917.6+505432		RA: 12 19 9.3455 (184.7889396d) Dec: +50 54 43.31 (50.91203d) Equinox: J2000				V=22+/-1		Reference Frame: NED			
	Comments: This object was generated by the targetselector and retrieved from the NED database.												
	Category=CLUSTER OF GALAXIES Description=[RICH CLUSTER]												
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1		(1) WHL-J121917.6+505432	ACS/WFC, ACCUM, WFCENTER		F606W			Pattern 1, Exps 1-2 in Visit 02 (1)	500 Secs (2325 Secs)			
										[==>773.0 Secs (Pattern 1)]		[1]	
										[==>773.0 Secs (Pattern 2)]			
										[==>779.0 Secs (Pattern 3)]		[2]	
	2		(1) WHL-J121917.6+505432	ACS/WFC, ACCUM, WFCENTER		F814W			Pattern 1, Exps 1-2 in Visit 02 (1)	500 Secs (2331 Secs)			
										[==>773.0 Secs (Pattern 1)]		[1]	
										[==>779.0 Secs (Pattern 2)]			
									[==>779.0 Secs (Pattern 3)]		[2]		



Proposal 17114 - Visit 03 - Four New Dissociative Merging Clusters

Visit	Proposal 17114, Visit 03, implementation										Tue Nov 15 14:01:18 GMT 2022		
	Diagnostic Status: No Diagnostics												
	Scientific Instruments: ACS/WFC												
	Special Requirements: (none)												
Patterns	#	Primary Pattern					Secondary Pattern					Exposures	
	(1)	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=false								(1-2)
Fixed Targets	#	Name		Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(2)	WHL-J130558.9+263048		RA: 13 06 0.1358 (196.5005658d) Dec: +26 30 56.28 (26.51563d) Equinox: J2000				V=18.6+/-1		Reference Frame: NED			
	Comments: This object was generated by the targetselector and retrieved from the NED database.												
	Category=CLUSTER OF GALAXIES Description=[RICH CLUSTER]												
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1		(2) WHL-J130558.9+263048	ACS/WFC, ACCUM, WFCENTER		F606W			Pattern 1, Exps 1-2 in Visit 03 (1)	500 Secs (2216 Secs)			
										[==>734.0 Secs (Pattern 1)]		[1]	
										[==>734.0 Secs (Pattern 2)]			
										[==>748.0 Secs (Pattern 3)]		[2]	
	2		(2) WHL-J130558.9+263048	ACS/WFC, ACCUM, WFCENTER		F475W			Pattern 1, Exps 1-2 in Visit 03 (1)	500 Secs (2230 Secs)			
										[==>734.0 Secs (Pattern 1)]		[1]	
									[==>748.0 Secs (Pattern 2)]				
									[==>748.0 Secs (Pattern 3)]		[2]		



Proposal 17114 - Visit 04 - Four New Dissociative Merging Clusters

Visit	Proposal 17114, Visit 04, implementation										Tue Nov 15 14:01:18 GMT 2022		
	Diagnostic Status: No Diagnostics												
	Scientific Instruments: ACS/WFC												
	Special Requirements: (none)												
Patterns	#	Primary Pattern					Secondary Pattern					Exposures	
	(1)	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=false							(1-2)	
Fixed Targets	#	Name		Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(3)	WHL-J001938.7+033557		RA: 00 19 38.7675 (4.9115312d) Dec: +03 36 47.17 (3.61310d) Equinox: J2000				V=18.4+/-1		Reference Frame: NED			
	Comments: This object was generated by the targetselector and retrieved from the NED database.												
	Category=CLUSTER OF GALAXIES Description=[RICH CLUSTER]												
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1		(3) WHL-J001938.7+033557	ACS/WFC, ACCUM, WFCENTER	F606W				Pattern 1, Exps 1-2 in Visit 04 (1)	500 Secs (2193 Secs)			
										[==>726.0 Secs (Pattern 1)]		[1]	
										[==>726.0 Secs (Pattern 2)]			
										[==>741.0 Secs (Pattern 3)]		[2]	
	2		(3) WHL-J001938.7+033557	ACS/WFC, ACCUM, WFCENTER	F475W				Pattern 1, Exps 1-2 in Visit 04 (1)	500 Secs (2208 Secs)			
										[==>726.0 Secs (Pattern 1)]		[1]	
										[==>741.0 Secs (Pattern 2)]			
[==>741.0 Secs (Pattern 3)]										[2]			

