12362 - The Bullet Cluster Reloaded? An in-depth study of two post-collision cluster mergers

Cycle: 18, 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) MACSJ0553.4-3342	ACS/WFC	5	20-Sep-2010 21:37:44.0	yes

5 Total Orbits Used

ABSTRACT

Detailed X-ray/lensing studies of the massive X-ray selected galaxy clusters 1E0657-56 (the "Bullet Cluster") and MACSJ0025.4-1222 have exploited the segregation of collisional and collisionless matter in cluster mergers to obtain first constraints on the self-interaction cross section of dark matter. We here propose a similar study of two newly discovered very X-ray luminous galaxy clusters from the MACS sample that have been

confirmed as linear, post-collision mergers of similar or higher mass. The proposed ACIS-I and HST/ACS observations will allow an accurate mapping of collisional (X-ray gas) and collisionless matter (galaxies and, presumably, dark matter) and thus yield improved constraints on the properties of dark matter.

OBSERVING DESCRIPTION

The depth of the proposed observations is dictated by the requirements of an accurate measurement of the gravitational shear field. Resolved colour information from non-overlapping passbands is critical for the secure identification of faint, multiply imaged background objects and thus an unambiguously determined lens model, as well as for the elimination of unlensed galaxies in the cluster and the foreground, which cause a dilution of the measured shear. We note that several strong-lensing features have already been tentatively identified in the existing HST snapshot. The weak-lensing analysis of the large-scale mass distribution will be conducted in the F814W passband which provides the greatest depth. Since this requires high-precision measurements of the ellipticity of faint background galaxies across the full field of view, we request LOW SKY mode. Earth glow would drastically reduce the sensitivity of these observations by raising the limiting magnitude, and thus lower the number of background galaxies for which accurate shape measurements can be obtained. A single pointing with ACS will suffice since the mass-sheet degeneracy of the weak-lensing shear field can be broken with strong-lensing constraints. However, coverage of the full ACS/WFC field of view is critical to probe the gravitational shear field to a radius of at least 400 kpc. We request SAME ORIENTATION for all observations, as random orientations of the ACS field of view for observations in different passbands would severely compromise the availability of colour information (important to mitigate dilution of the weak-shear signal from unlensed foreground and cluster galaxies) in the outer cluster regions.

Visit

Proposal 12362, Visit 01 Tue Sep 21 01:37:51 GMT 2010

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=2 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.28 Angle Between Sides= Center Pattern=true	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.138 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=32.99 Angle Between Sides= Center Pattern=true	(1), (2)
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.28 Angle Between Sides= Center Pattern=true	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.138 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=32.99 Angle Between Sides= Center Pattern=true	(3)

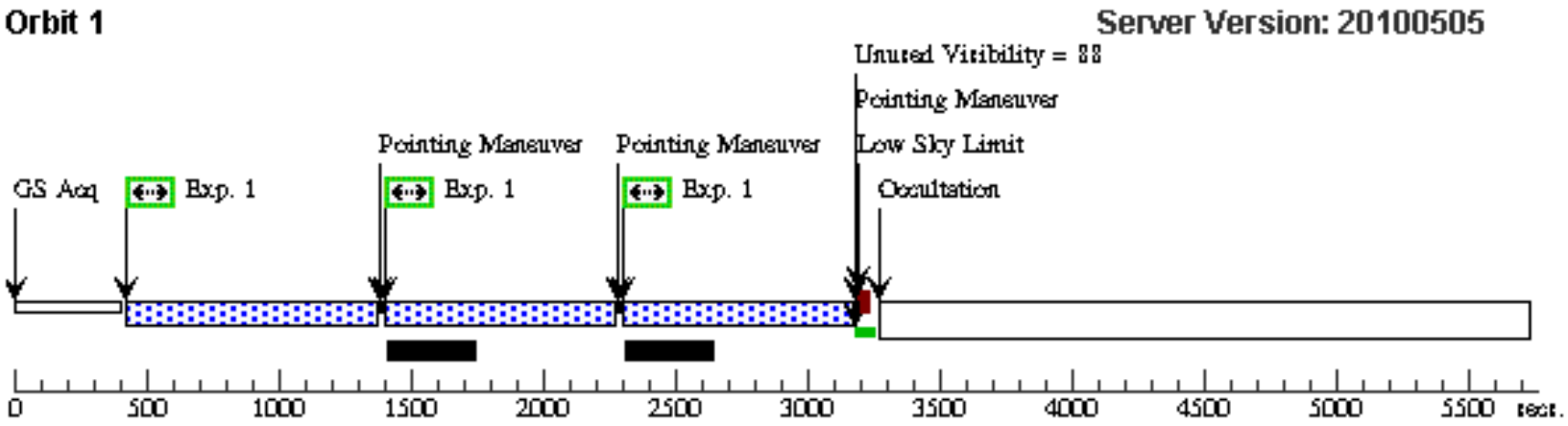
Fixed Targets

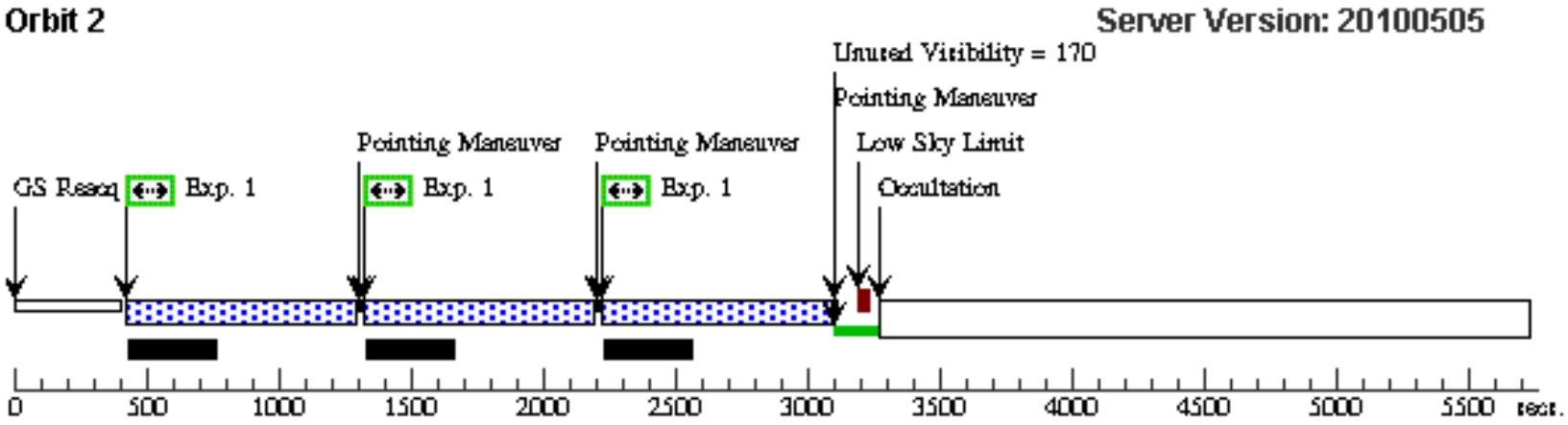
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MACSJ0553.4-3342	RA: 05 53 24.0000 (88.3500000d) Dec: -33 42 30.00 (-33.70833d) Equinox: J2000		V=14+/-0.1	Reference Frame: ICRS

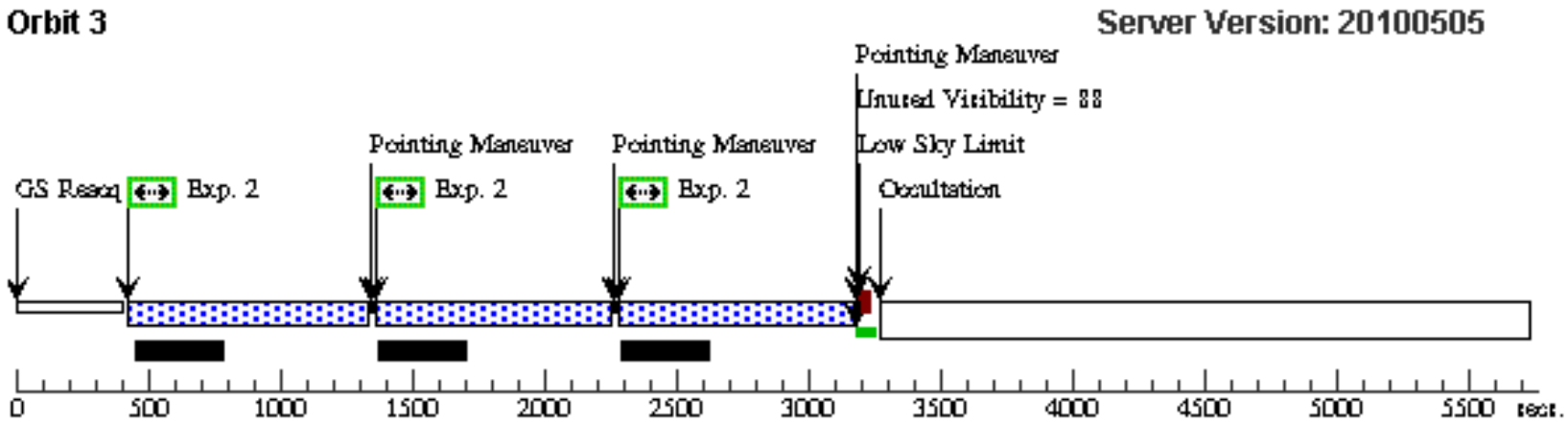
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	0553-F435	(1) MACSJ0553.4-3342	ACS/WFC, ACCUM, WFC	F435W	CR-SPLIT=NO	LOW-SKY	Pattern 1, Exps 1-1 (1)	742 Secs	
								[==>(Pattern 1,1)] *[==>(Pattern 1,2)]* *[==>(Pattern 1,3)]*	***[1]***
								[==>(Pattern 2,1)] *[==>(Pattern 2,2)]* *[==>(Pattern 2,3)]*	***[2]***
2	0553-F814	(1) MACSJ0553.4-3342	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO	LOW-SKY	Pattern 1, Exps 2-2 (1)	762 Secs	
								[==>(Pattern 1,1)] *[==>(Pattern 1,2)]* *[==>(Pattern 1,3)]*	***[3]***
								[==>(Pattern 2,1)] *[==>(Pattern 2,2)]* *[==>(Pattern 2,3)]*	***[4]***
3	0553-F606	(1) MACSJ0553.4-3342	ACS/WFC, ACCUM, WFC	F606W	CR-SPLIT=NO	LOW-SKY	Pattern 2, Exps 3-3 (2)	523 Secs	
								[==>(Pattern 1,1)] *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[5]***

Orbit Structure






Orbit 3
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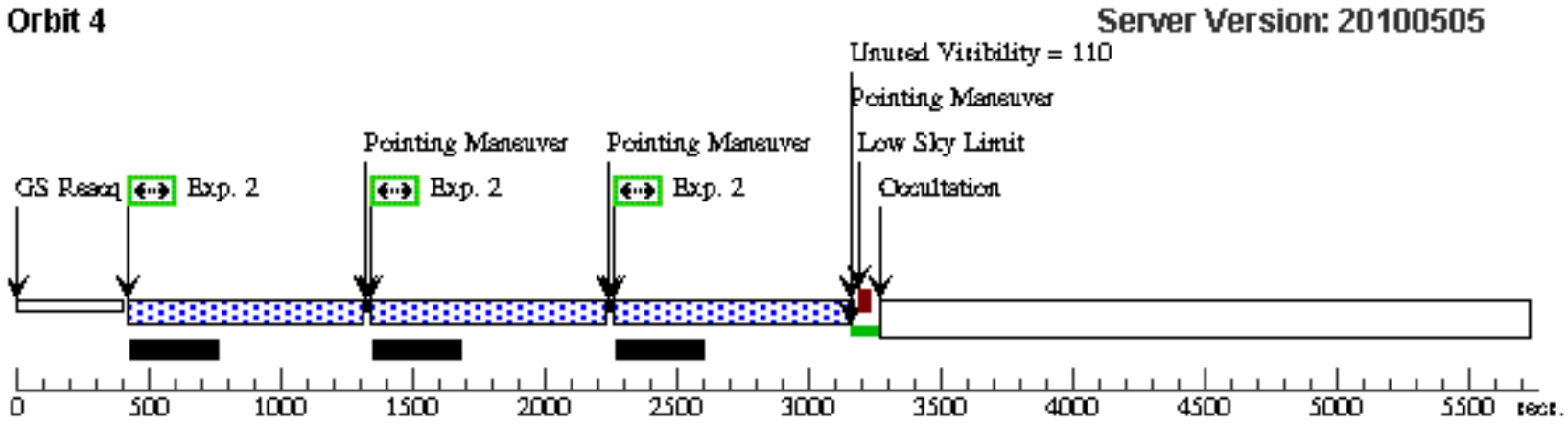
Pointing Maneuver
Unused Visibility = 88
Pointing Maneuver
Pointing Maneuver
Low Sky Limit
GS Reacq
Exp. 2
Exp. 2
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.


Orbit 4
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Unused Visibility = 110
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Low Sky Limit
GS Reacq
Exp. 2
Exp. 2
Exp. 2
Occultation
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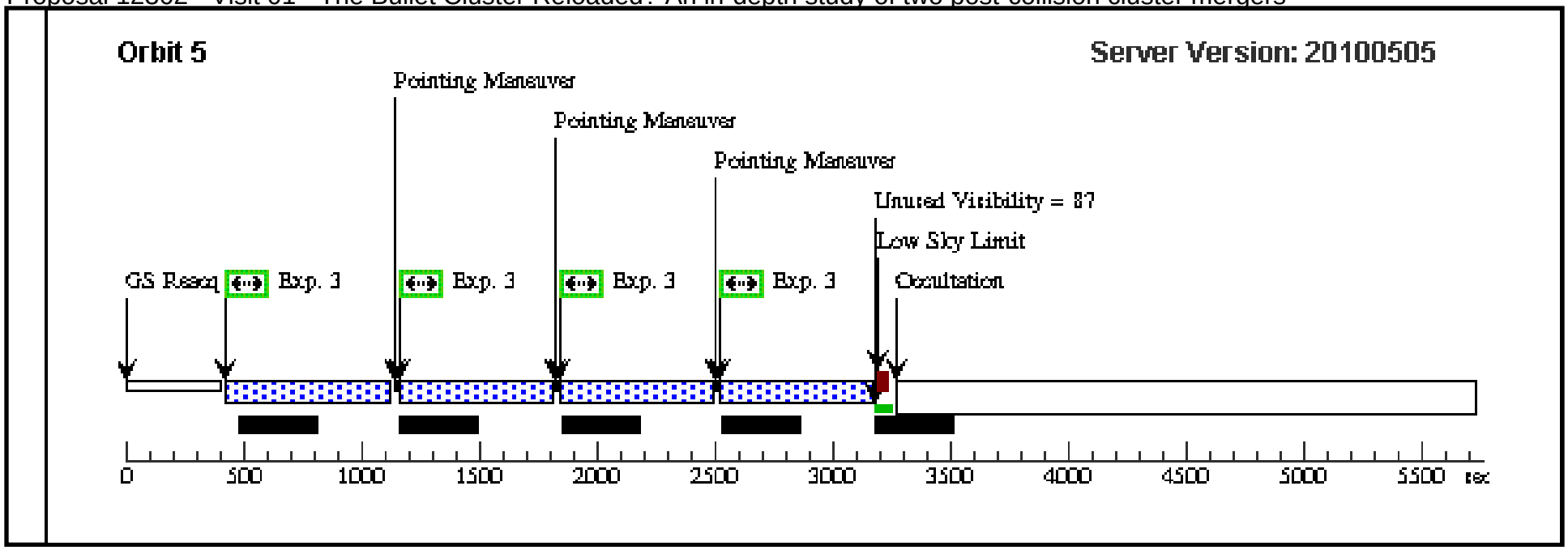
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.


Orbit 5
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Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Visibility = 87
Low Sky Limit
GS Reacq
Exp. 3
Exp. 3
Exp. 3
Exp. 3
Occultation
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sec