



12313 - An in-depth study of dark matter in the massive cluster merger

MACSJ0358.8-2955

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Harald Ebeling (PI)	University of Hawaii	ebeling@ifa.hawaii.edu
Dr. Johan Richard (CoI) (ESA Member)	University of Durham	johan.richard@durham.ac.uk
Prof. Marusa Bradac (CoI)	University of California - Davis	Marusa@physics.ucdavis.edu
Dr. Marceau Limousin (CoI) (ESA Member)	Laboratoire d'Astrophysique de Marseille	marceau.limousin@oamp.fr
Prof. Priyamvada Natarajan (CoI)	Yale University	priyamvada.natarajan@yale.edu
Prof. Jean-Paul Kneib (CoI) (ESA Member)	Laboratoire d'Astrophysique de Marseille	jean-paul.kneib@oamp.fr
Dr. Alastair C. Edge (CoI) (ESA Member)	University of Durham	Alastair.Edge@Durham.ac.uk
Mr. Cheng-Jiun Ma (CoI)	University of Hawaii	cjma@ifa.hawaii.edu

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) MACSJ0358.8-2955	ACS/WFC	5	29-Jun-2010 23:41:20.0	yes

5 Total Orbits Used

ABSTRACT

We propose multi-passband observations with HST/ACS (F435W, F606W, and F814W) and moderately deep X-ray observations with Chandra/ACIS-I of the massive cluster merger MACSJ0358.8-2955 at $z=0.434$. The combination of existing HST/ACS and Chandra/ACIS-I snapshots shows strong evidence for a segregation of luminous and dark matter in a linear cluster merger, making this system a prime candidate for a

quantitative study of the properties of dark matter. We have already identified and spectroscopically confirmed two sets of strongly lensed multiple-image systems. The resulting tentative model of the mass distribution shows a highly elongated critical line and further supports a linear, post-collision geometry that may enable a third, independent measurement of the self-interaction cross section of dark matter from cluster mergers. The colour and morphological information provided by the proposed HST/ACS observations will allow us to unambiguously identify additional multiple-image systems to refine our mass model, and to obtain further independent constraints on the mass profile from a weak-lensing analysis. The proposed Chandra/ACIS-I will provide complementary information on the intra-cluster gas, most importantly an accurate mapping of its distribution, but also spatially resolved gas temperatures. In combination with groundbased spectroscopy (underway), these observations will permit us to reconstruct the three-dimensional geometry and dynamics of this merger and to perform an independent test of the results on the existence and properties of dark matter obtained for the Bullet Cluster and MACSJ0025.4-1222.

OBSERVING DESCRIPTION

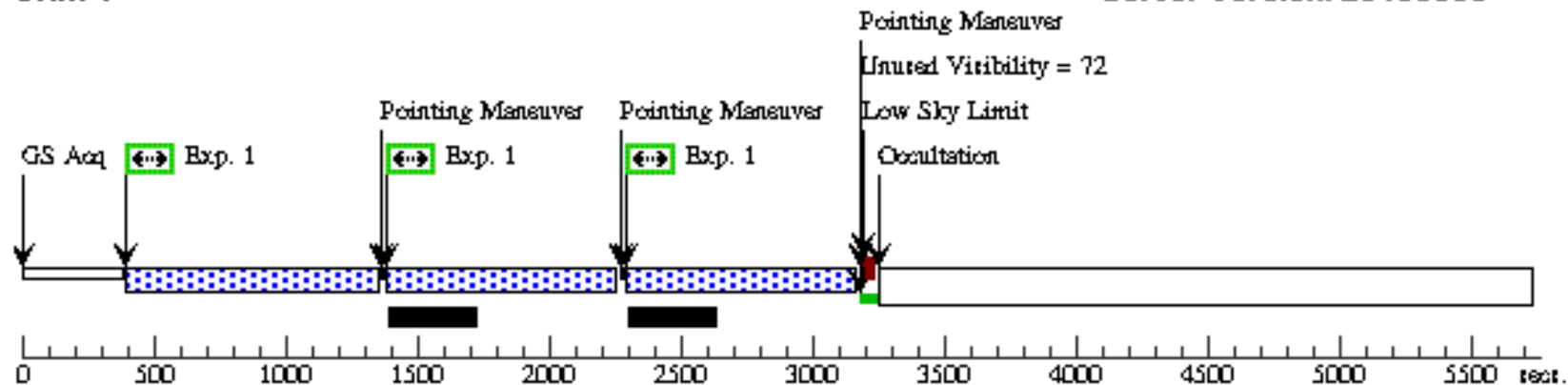
We propose moderately deep ACS observations in three passbands (two orbits in each of F435W and F814W, one in F606W) of the massive merger MACSJ0358.8–2955. The depth of the proposed observations is dictated by the requirements of an accurate measurement of the gravitational shear field. Resolved colour 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. Resolved colours are also crucial for our science bonus, the study of the cluster galaxy population (colours and morphology) and its evolution as a function of static and dynamic environment. Our strategy follows closely the one used successfully by us before (GO-11100; PI Brada c) for the analysis of MACSJ0025.4–1222 but goes deeper in F435W, accounting for the narrower width of the filter compared to F606W and F814W, the spectral sensitivity of ACS, and the SED of typical galaxies. We will make use of the existing ACS/F606W data which add about 0.5 orbits to the depth in this passband.

Proposal 12313 (STScI Edit Number: 0, Created: Tuesday, June 29, 2010 10:41:28 PM EST) - Overview

Visit	Proposal 12313, Visit 01					Wed Jun 30 03:41:28 GMT 2010				
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: ACS/WFC									
	Special Requirements: (none)									
Patterns	#	Primary Pattern			Secondary Pattern			Exposures		
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	(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)	MACSJ0358.8-2955	RA: 03 58 53.0800 (59.7211667d) Dec: -29 55 51.60 (-29.93100d) Equinox: J2000		V=20	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	0358-F435	(1) MACSJ0358.8-2955	ACS/WFC, ACCUM, WFC	F435W	CR-SPLIT=NO	LOW-SKY	Pattern 1, Exps 1-1 (1)	750 Secs	
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	2	0358-F814	(1) MACSJ0358.8-2955	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO	LOW-SKY	Pattern 1, Exps 2-2 (1)	770 Secs	
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									[==>(Pattern 2,1)] [==>(Pattern 2,2)] [==>(Pattern 2,3)]	[4]
	3	0358-F606	(1) MACSJ0358.8-2955	ACS/WFC, ACCUM, WFC	F606W	CR-SPLIT=NO	LOW-SKY	Pattern 2, Exps 3-3 (2)	530 Secs	
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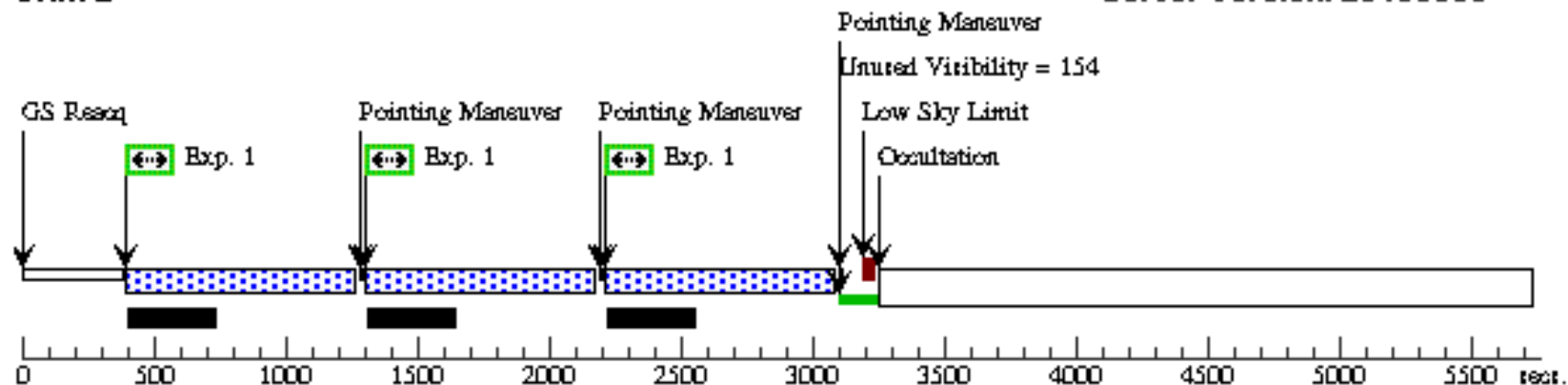
Orbit 1

Server Version: 20100505



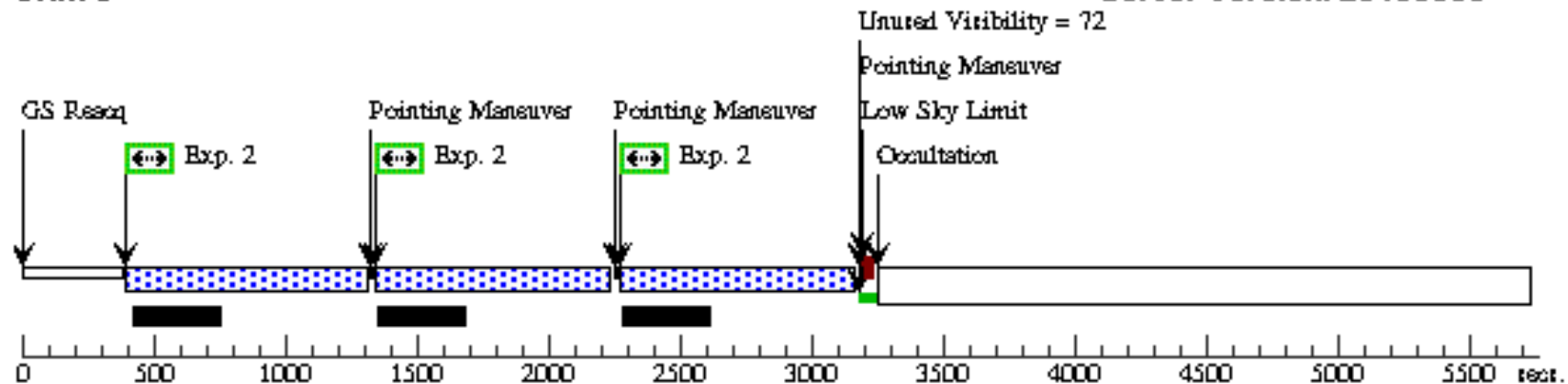
Orbit 2

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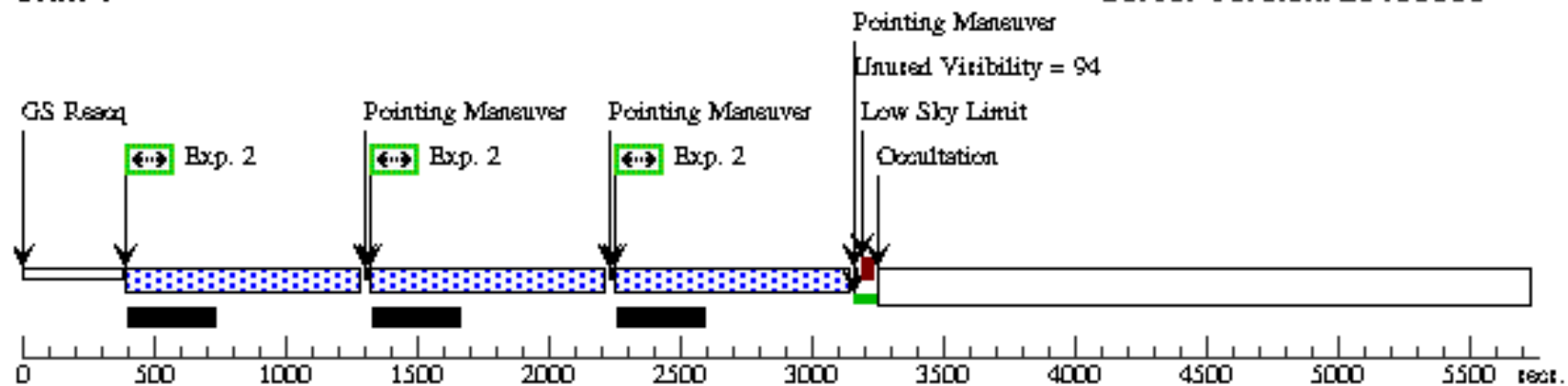
Orbit 3

Server Version: 20100505



Orbit 4

Server Version: 20100505



Orbit 5

Server Version: 20100505

