10528 - Ram Pressure Stripping and Dense Cloud Ablation in the Virgo Spiral NGC 4402

Cycle: 14, Proposal Category: GO
(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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VISITS

Visit	*Targets*	*Configurations*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) NGC4402	ACS/WFC	5	20-Jun-2005 12:48:36.0	yes

5 Total Orbits Used

ABSTRACT

We propose to image in BVI with HST ACS the highly inclined Virgo cluster spiral galaxy NGC 4402, which is an outstanding example of a galaxy undergoing stripping of its ISM by an ICM-ISM interaction. Ground-based images at 0.5" resolution appear to show active dust stripping, triggered star formation, and ablation of dense molecular clouds by the ICM wind. The near side of NGC 4402 contains the leading edge of interaction, giving us a relatively unobscured view of the processes which occur as the ICM wind impacts the ISM. High resolution HST B-I images of dust in NGC 4402 can reveal the fate of giant molecular clouds during a stripping event, including whether clouds above some size get left behind as the rest of the ISM is stripped from around them, how decoupled clouds become ablated by the ICM wind, and how the survival time varies with cloud mass. We will identify and estimate the ages of stars and star clusters in the stripped outer disk and halo, and from the spatial distributions of the younger

objects, constrain the stripping history of the galaxy. Its proximity, orientation, stage of evolution, and direction of travel through the ICM make NGC 4402 an outstanding subject for a detailed HST study of ICM-ISM stripping. An in-depth study of this galaxy will provide new insight into the physical processes of ISM-ICM interactions and give us greater understanding of cluster galaxy evolution, both in Virgo and at higher redshifts.

OBSERVING DESCRIPTION

We propose to image NGC~4402 with ACS WFC in 3 bands: F435W (Johnson B), F606W (Broad V), and F814W (Broad I). The 202"x202" field of view of the WFC is well-suited for imaging the entire active stripping region of NGC 4402. It includes all the HI and H-alpha emission detected in the galaxy, which has a total extent of 160.

In order to detect enough star clusters to be statistically meaningful, we need to reach ~3 magnitudes fainter than the peak of the globular cluster luminosity function in each of BVI. This is about the same depth which will allow us to detect enough isolated young stars to enable mapping of distinct concentrations. Going ~0.5 magnitude deeper in V than the other bands, and given the various constraints of HST, we have settled on the following request. To reach magnitudes of F435W (B)=27.8, F606W (V)=27.5, and F814W (I)=26.3 with a signal-to-noise of 10 requires integration times of 120, 40 and 40 minutes respectively, according to the Exposure Time Calculator. At 2 exposures per orbit, there are about 40 minutes of exposure time per orbit, given 52 minutes of visibility time at the low declination of Virgo, minus 5-6 minutes for guide star acquisition time and 6.5 minutes of overhead.
This corresponds to 5 orbits.

Visit

Proposal 10528, Visit 01 Mon Jun 20 16:48:40 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 10.0D TO 350.0 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2), (3)

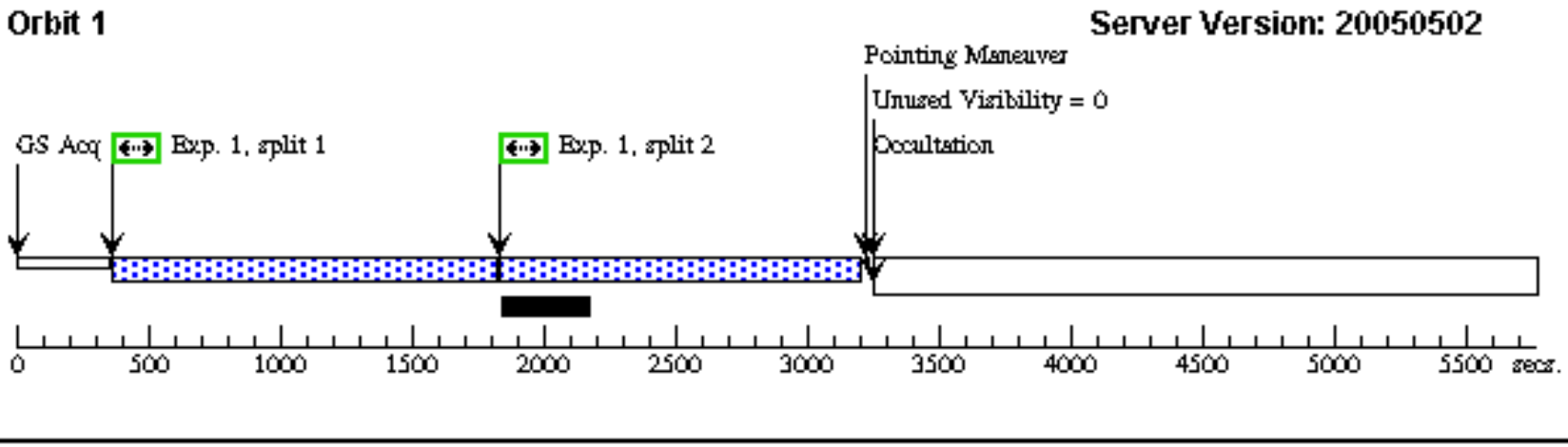
Fixed Targets

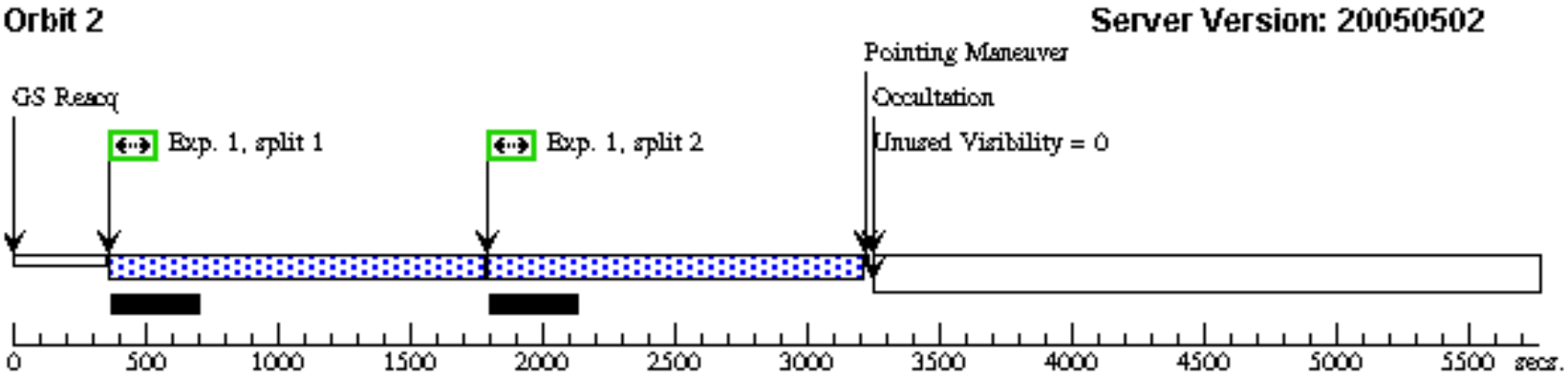
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC4402	RA: 12 26 7.5000 (186.5312500d) Dec: +13 06 46.00 (13.11278d) Equinox: J2000 Plate Id: (?)		V=12.55+/-0.1	Coordinate Source: 2MASS

Exposures

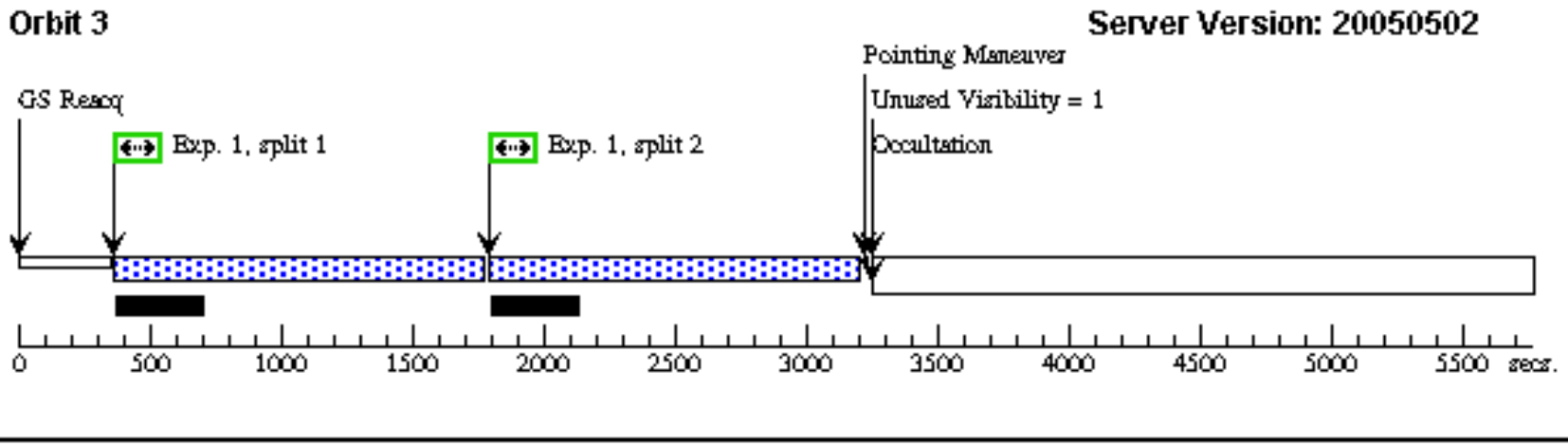
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	B	(1) NGC4402	ACS/WFC, ACCUM, WFC	F435W			Pattern 1-1 (1)	2400.0 Secs	
								[==>1253.0 Secs (Pattern 1, Split 1)] *[==>1253.0 Secs (Pattern 1, Split 2)]*	***[1]***
								[==>1294.0 Secs (Pattern 2, Split 1)] *[==>1294.0 Secs (Pattern 2, Split 2)]*	***[2]***
								[==>1292.0 Secs (Pattern 3, Split 1)] *[==>1292.0 Secs (Pattern 3, Split 2)]*	***[3]***
2	V	(1) NGC4402	ACS/WFC, ACCUM, WFC	F606W	CR-SPLIT=NO		Pattern 2-2 (1)	800.0 Secs	
								[==>779.0 Secs (Pattern 1)] *[==>779.0 Secs (Pattern 2)]* *[==>779.0 Secs (Pattern 3)]*	***[4]***
3	I	(1) NGC4402	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO		Pattern 3-3 (1)	800.0 Secs	
								[==>791.0 Secs (Pattern 1)] *[==>791.0 Secs (Pattern 2)]* *[==>791.0 Secs (Pattern 3)]*	***[5]***

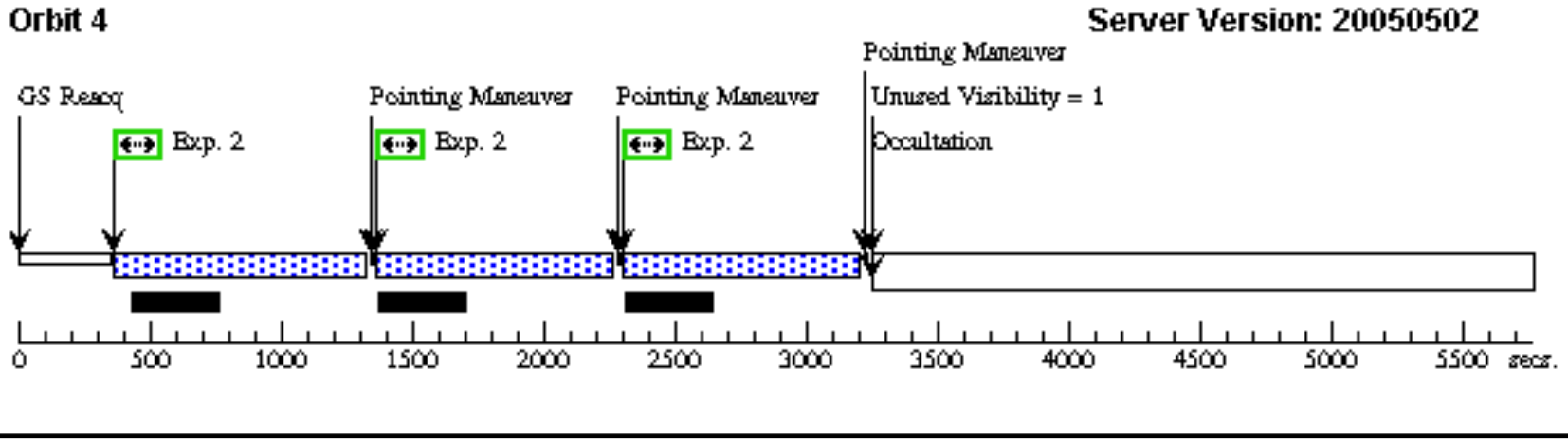
Orbit Structure





Orbit Structure (continued)





Orbit Structure (continued)