



12259 - A Mysterious Unseen Companion Lurking at 30 Parsecs

Cycle: 18, 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	(1) 2MA18XX-68XX	STIS/NUV-MAMA	4	01-Jul-2010 23:09:29.0	yes

4 Total Orbits Used

ABSTRACT

Astrometric perturbations are the result of unseen, sometimes mysterious, companions. When resolved, the systems provide crucial mass measurements for the components. Here we propose to use HST/STIS to image an unseen companion that causes the largest astrometric perturbation among 500 nearby stars observed using the CTIO 0.9m telescope since 1999. The primary is a red dwarf at 30 pc with $V=16.86$ and spectral type M5.0V, while the system has been detected by GALEX in the near-UV. From the astrometry and photometry, we can rule out that the companion is red dwarf, a brown dwarf, or a normal white dwarf. All three of the remaining possibilities are extraordinary --- a very cool white dwarf, a neutron star, or a black hole

--- making the companion one of the most unusual objects in the solar neighborhood. We propose to use HST/STIS imaging at NUV and FUV wavelengths to resolve this intriguing system to confirm its nature and constrain its mass.

OBSERVING DESCRIPTION

Our primary goal is to use HST/STIS+MAMA to resolve this unseen companion. This binary system, with a M5.0V primary, shows the largest astrometric perturbation (~ 200 mas) detected in the CTIOPI (Cerro Tololo Inter-american Observatory Parallax Investigation) program in the past 5 years. It also shows abnormally larger near-UV flux than usual M5.0V dwarfs. This unseen companion could be a cool white dwarf, a neutron star or a black hole, from initial analysis of ground-based photometry and astrometry data.

We propose to utilize STIS/NUV+MAMA imaging mode with a resolution of $0.0243''/\text{pixel}$ to resolve this binary system. We plan to use two filters, F25CN270 and F25CN182 at NUV. For each filter, we plan to observe a two-pointing line dithering pattern in the X-axis with an offset about 10 pixels. Because we would like to have enough signals on both components, we request the longest exposure it can have in one orbit. Furthermore, a well-exposed image allows us to centroid on both components to get accurate separation and position angle. For example, according to the ETC for STIS imaging mode, a single 3000-sec exposure at F25CN270 for a M5.0V and a 4500K white dwarf at 30 pc yield S/N of about 4 and 30, respectively. At the short wavelength region with F25CN182 filter, we expect only this white dwarf secondary could show up, and it could have a S/N about 8 with a single 3000 sec

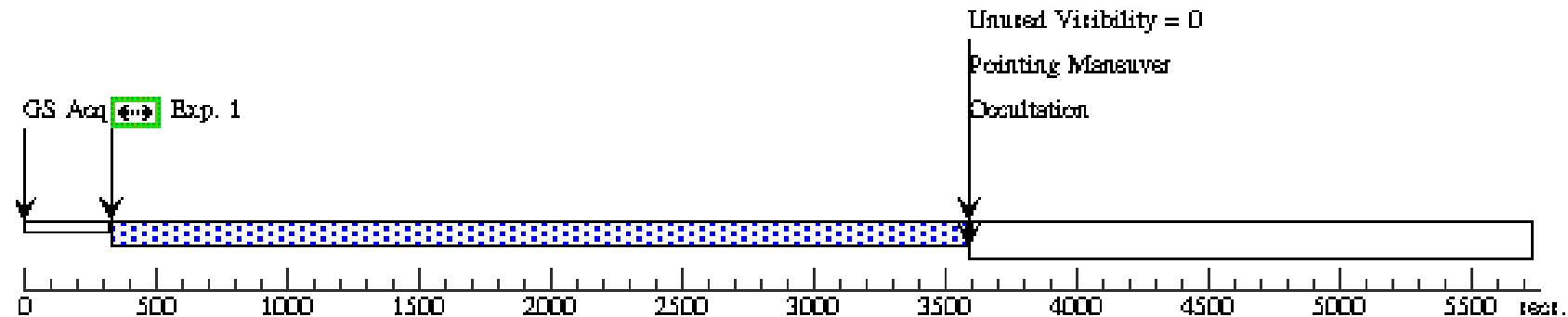
exposure. The color of this unseen companions allow us to compare with white dwarf models or black body to constrain the spectral type or flavor of it.

Proposal 12259 (STScI Edit Number: 0, Created: Thursday, July 1, 2010 10:09:34 PM EST) - Overview

Visit	Proposal 12259, Visit 01										Fri Jul 02 03:09:34 GMT 2010	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: STIS/NUV-MAMA											
	Special Requirements: (none)											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.2433 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=0 Angle Between Sides= Center Pattern=false						(1), (2)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(1)	2MA18XX-68XX	RA: 18 48 21.0100 (282.0875417d) Dec: -68 55 34.10 (-68.92614d) Equinox: J2000		Proper Motion RA: -0.0593484769403671s/yr Proper Motion Dec: -1.2466"/yr Parallax: 0.03392" Epoch of Position: 2000.0		V=16.86		Reference Frame: ICRS			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit	
	1		(1) 2MA18XX-68X X	STIS/NUV-MAMA, ACCUM, F25CN270	MIRROR			Pattern 1, Exps 1-1 (1)	3086 Secs			
									[==>(Pattern 1)]		[1]	
									[==>3349.0 Secs (Pattern 2)]		[2]	
	2		(1) 2MA18XX-68X X	STIS/NUV-MAMA, ACCUM, F25CN182	MIRROR			Pattern 1, Exps 2-2 (1)	3330 Secs			
									[==>(Pattern 1)]		[3]	
									[==>3349.0 Secs (Pattern 2)]		[4]	

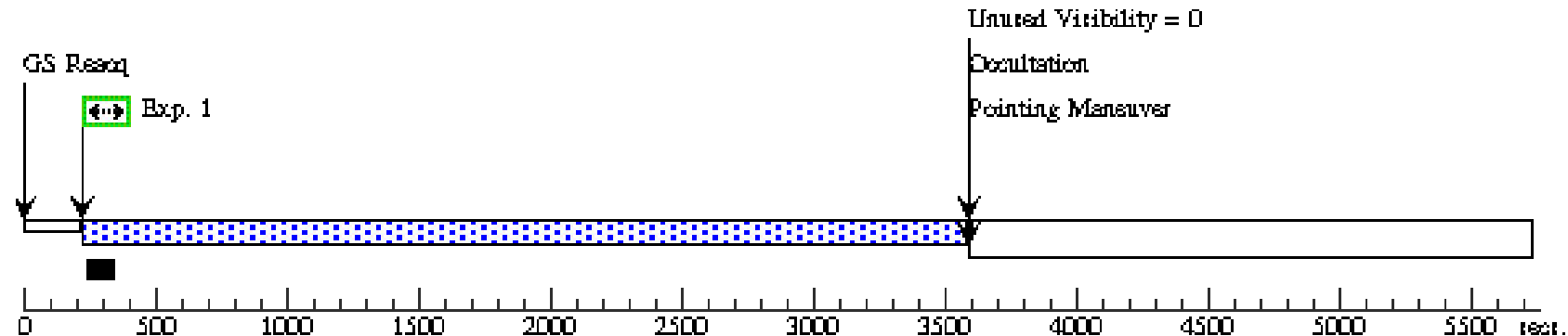
Orbit 1

Server Version: 20100505



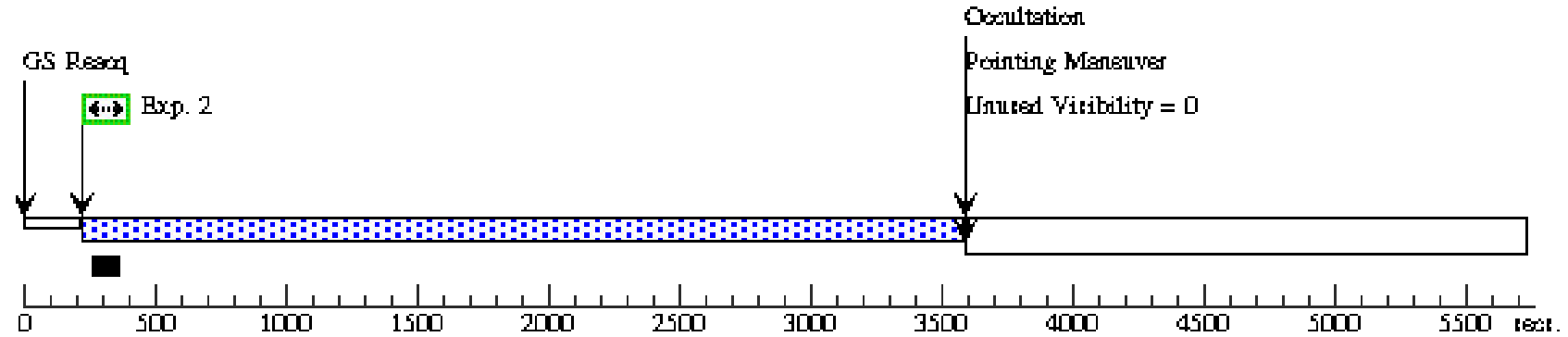
Orbit 2

Server Version: 20100505



Orbit 3

Server Version: 20100505



Orbit 4

Server Version: 20100505

