13939 - The nature of the transient X-ray binary Swift J1910.2-0546

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Nathalie Degenaar (PI) (Contact)	**University of Michigan**	**degenaar@umich.edu**
Dr. Mark Reynolds (CoI)	University of Michigan	markrey@umich.edu
Dr. Jon Matthew Miller (CoI)	University of Michigan	jonmm@umich.edu
Ashley King (CoI)	University of Michigan	ashking@umich.edu
Dr. Dipankar Maitra (CoI)	Wheaton College	maitra_dipankar@wheatoncollege.edu
Dr. Edward M. Cackett (CoI)	Wayne State University	ecackett@wayne.edu
Dr. Rudy Wijnands (CoI) (ESA Member)	Universiteit van Amsterdam	r.a.d.wijnands@uva.nl

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SWIFT-J1910.2-0546	WFC3/UVIS	2	27-Oct-2014 21:04:43.0	yes

2 Total Orbits Used

ABSTRACT

Swift J1910.2-0546 is a newly discovered transient X-ray binary that exhibited a ~1 yr long outburst in 2012-2013. Owing to its low hydrogen column density and fair proximity, it is one of the few sources for which X-ray/UV quiescent studies are feasible. This provides the opportunity to verify the nature of the compact primary (black hole versus neutron star), and to investigate the properties of the quiescent accretion flow. Such a study would provide an important perspective to understand the intriguing outburst phenomena observed for this source. To this end, we request a 45 ks Chandra/ACIS-S observation and 2 orbits of HST/WFC3-UVIS time for Swift J1910.2-0546.

OBSERVING DESCRIPTION

UV emission from quiescent LMXBs is thought to be the prime tracer of the quiescent accretion stream that provides important insight into the physics of quiescent accretion flows. Such studies are highly challenging, however, given that most LMXBs are located in the Galactic plane and hence their intrinsically faint UV emission further suffers from substantial interstellar extinction. Owing to its low extinction, Swift J1910.2-0546 is one of the few LMXBs for which quiescent UV studies are feasible.

To make a direct comparison with other LMXBs studied in quiescence in the UV band (see e.g., Hynes & Robinson 2012, ApJ 749, 3), we chose to perform near-UV photometry (~2000-4000 A). The most sensitive imaging instrument in this range is the WFC3/UVIS. To obtain the spectral-energy distribution, we propose to use three filters (similar to those used in studies of other LMXBs): F225W (lambda_c~2359 A), F275W (lambda_c~2704 A), and F336W (lambda_c~3355 A). We propose to perform the science exposures in sequences of F336W-F275W-F225W-F336W, so that we can average over possible variability (and are able to search for such variability if the source is bright enough).

We used the online WFC3/UVIS exposure time calculator (v. 22.2). Our target is located at ~6.9 kpc and the reddening is E(B-V)=0.66. A recent XMM-Newton/OM observation (dd 2014 October 5; PI Degenaar) did not detect the source in the UV band, providing an upper limit of <1E-17 erg/cm2/s/A (measured at lambda_c ~ 2298 A). The faintest quiescent LMXBs observed in the UV have luminosities of ~1E31 erg/s (Hynes & Jones 2012). At the distance of our target this translates into a flux of ~3E-18 erg/cm2/s/A.

Based on UV studies of other quiescent LMXBs (e.g., Hynes & Jones 2012), we model our point source as a blackbody with a temperature of 10,000 K, where we normalized the continuum flux to our lowest expected level of 3E-18 erg/cm2/s/A. We impose a S/N ratio of 25 at this minimum flux level. We use dither patterns (2 dithers for exposures <1000s, 3 dithers for longer exposures) and lamp flashes are applied to ensure that the minimum background for proper CTE is reached (12 e-/pixel). The exposure times range from ~700-2000 s per filter. A total of two orbits are required, which are combined into a single visit (only one instrument is used).

Our target is a transient X-ray source, but its outburst recurrence time is very low: only one outburst (in 2012-2013) has been detected so far in the history of X-ray astronomy. The maximum UV flux reached during that outburst was ~18 mag at lambda_c~2246 A (~3E-16 erg/cm2/s/A; Degenaar et al. 2014, ApJ 784, 122). The probability that the source goes into outburst in the next year is very low. Nevertheless, should the source go into outburst, that will be readily picked up by all-sky monitors such as Swift/BAT (15-50 keV) and MAXI (2-20 keV), which cover the position of our

target every day. The rise of accretion outbursts in transient LMXBs typically takes a few days.

Visit

Proposal 13939, visit1 (01) Tue Oct 28 01:04:45 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(2), (3)
(3)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1), (4)

Fixed Targets

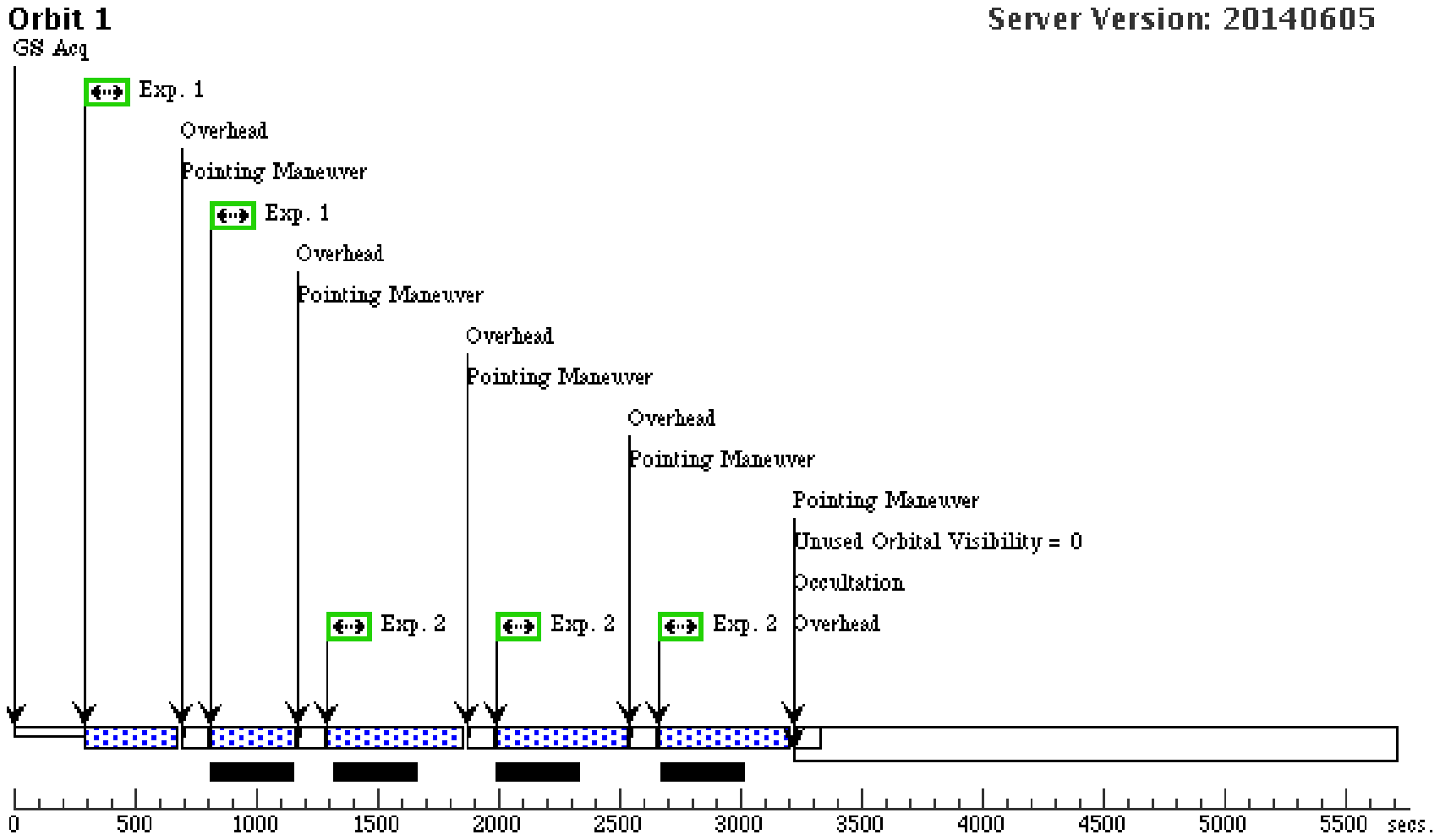
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SWIFT-J1910.2-0546	RA: 19 10 22.8000 (287.5950000d) Dec: -05 47 58.00 (-5.79944d) Equinox: J2000		V=(?) <1E-17 erg/cm/s/A at lambda_c ~ 2298 A	Reference Frame: SIMBAD

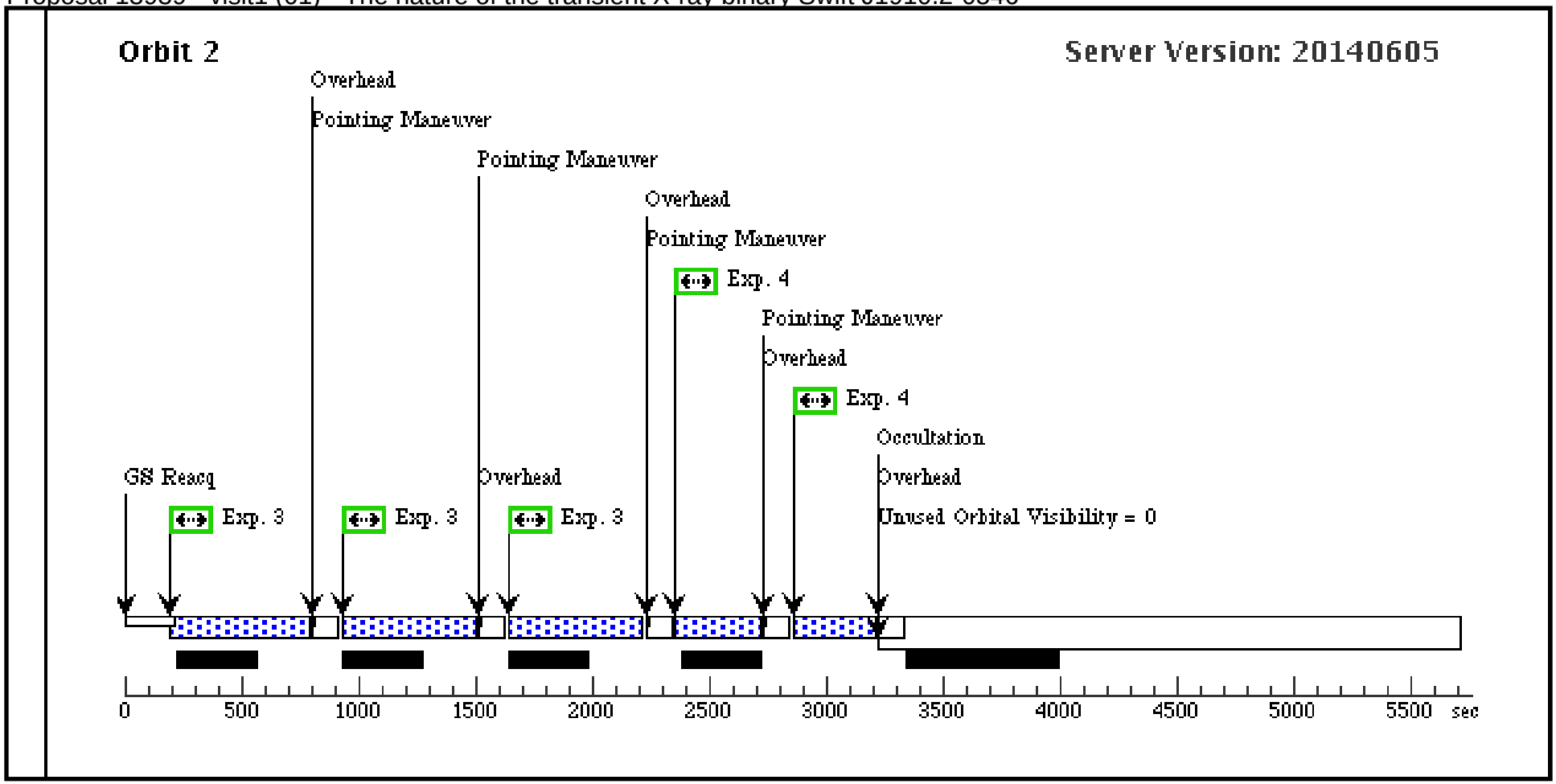
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(642948)	(1) SWIFT-J1910.2-0546	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=11		Pattern 3, Exps 1-1 in visit1 (01) (3)	349 Secs (698 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	(642953)	(1) SWIFT-J1910.2-0546	WFC3/UVIS, ACCUM, UVIS	F225W	FLASH=11		Pattern 2, Exps 2-2 in visit1 (01) (2)	541 Secs (1623 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
3	(642951)	(1) SWIFT-J1910.2-0546	WFC3/UVIS, ACCUM, UVIS	F275W	FLASH=11		Pattern 2, Exps 3-3 in visit1 (01) (2)	577 Secs (1731 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***
4	(642948)	(1) SWIFT-J1910.2-0546	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=11		Pattern 3, Exps 4-4 in visit1 (01) (3)	349 Secs (698 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***

Orbit Structure

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Server Version: 20140605
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Pointing Maneuver
Pointing Maneuver
Overhead
Pointing Maneuver
Exp. 4
Pointing Maneuver
Overhead
Exp. 4
Occultation
Overhead
Unused Orbital Visibility = 0
GS Reacq
Exp. 3
Exp. 3
Overhead
Exp. 3
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1500
2000
2500
3000
3500
4000
4500
5000
5500
sec