16422 - Probing Super-Eddington Outflows via Accreting Galactic BeXRBs

Cycle: 28, 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?*
02	(1) 1A0535+262 WAVE	STIS/CCD STIS/FUV-MAMA	1	16-Nov-2020 10:00:44.0	yes

1 Total Orbits Used

ABSTRACT

Observations of the population of ultra luminous X-ray sources has revealed that at least a subset of this group contains a neutron star primary. Thus, dramatically demonstrating the viability of super-Eddington accretion for this source class. However, the physics of these super-Eddington accretion flows are poorly understood with the sources typically lying at Mpc distances. The population of Galactic Be/X-ray binaries (BeXRBs) are known to have giant outbursts that enter the super-Eddington regime and promise the opportunity to learn much about this mode of accretion. Herein, we propose to obtain simultaneous high resolution X-ray, UV and radio spectroscopy of the next bright Galactic BeXRB to enter a giant outburst when the neutron star will be accreting in the super-Eddington regime.

OBSERVING DESCRIPTION

Studies of giant outbursts of other BeXRBs are highly warranted to determine that winds and jets indeed occur simultaneously in the super-Eddington regime. We note that ULXs are too distant to detect a compact radio jet, so determining the co-existence of winds and jets at highly super-Eddington accretion rates can ONLY be achieved with Galactic BeXRBs, as we aim to target with this proposal. To be able to confirm the presence of both winds and jets in the super-Eddington regime, we therefore proposed for and were granted (quasi-simultaneous) Chandra/HETGS, HST/STIS and JVLA observations of the next giant outburst of a BeXRB.

In a BeXRB accreting a super Eddington luminosities, we expect the UV emission to evolve when the accretion envelope develops and shields the outer disk from the inner X-ray emitting region, e.g., Shakura & Sunyaev (1973). In this regime we might expect the UV emission to be dominated by the re-reprocessing component detected in soft X-rays. The high S/N and spectral resolution of STIS will be key here as the kinematics of the accretion inflow and wind will be encoded in the spectral lines. Obtaining observational evidence for wind outflows in ULXs is highly challenging due to the high absorption and distance to these systems. However, low resolution HST/ACS prism spectroscopy has had some limited success and demonstrated the presence of a complex highly ionized outflow at these accretion rates (e.g. M81 X-1, Bregman et al., 2012).

We are requesting observations with STIS with the MAMA detector and the E140M grating, which will provide wavelength coverage from 1150 - 1800 Ang . The high dispersion provided by this grating will ensure the safety of the MAMA detector as these sources can be very bright (> 0.06 Jy; lambda_c ~ 2200Ang). In the event of a fainter UV counterpart, a lower resolution grating will be utilized.

Accurate flux estimates will be provided by Swift/UVOT observations in support of this program.

GYRO MODE: As our program is a joint ToO w/ Chandra & JVLA, reduced gyro mode observations would reduce our ability to observe a quasi-random outburst from an unknown source (though likely in Galactic plane). Fingers crossed!

Visit

Proposal 16422, ToO (1A 0535+262) (02), implementation Mon Nov 16 15:00:44 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SCHED 100%

Comments: Source is bright (<10 Vega or >50mJy) at 2200 Ang

Template for original proopsal, trigger target is below.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	1A0535+262	RA: 05 38 54.5749 (84.7273954d) Dec: +26 18 56.84 (26.31579d) Equinox: J2000	Proper Motion RA: -4.611219896513134E-5 sec of time/yr Proper Motion Dec: -0.002803000097628683 arcsec/yr Parallax: 0.4424e-3" Epoch of Position: 2000	V=9.39	Reference Frame: ICRS

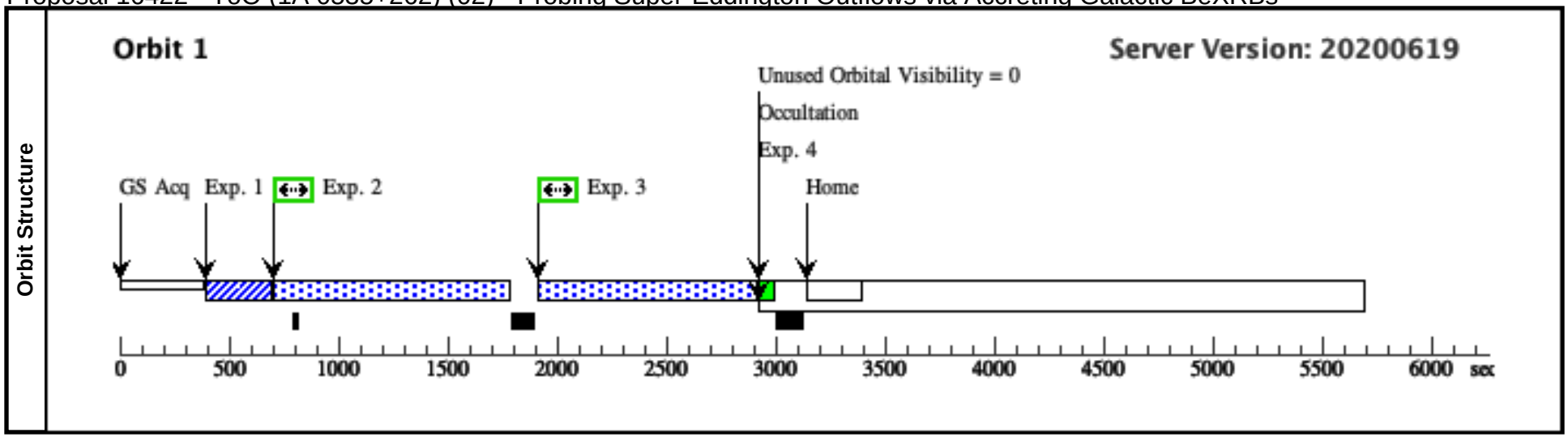
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Coords are ICRS from GAIA DR2.

Observation awarded through CXO program. Observation to occur quasi-simultaneously with CXO (+\- 1 day).

The source is currently undergoing a large type-II outburst. The program has been triggered. Further trigger details should come via CXO.
Category=STAR
Description=[ACCRETION DISK, BE, X-RAY TRANSIENT]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acquisation (ACQ) (1471687)	(1) 1A0535+262	STIS/CCD, ACQ, F25ND3	MIRROR				1.0 Secs (1 Secs) *[==>]*	 ***[1]***
2	Science exposure I (STIS.sp.1379906)	(1) 1A0535+262	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				996 Secs (996 Secs) *[==>]*	 ***[1]***
Comments: Grating changed to E140M as the source is bright and has measured Swift/UVOT fluxes during this outburst of >50mJy @2200 Ang.									
3	Science exposure II (STIS.sp.1379906)	(1) 1A0535+262	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A	WAVECAL=NO			990 Secs (990 Secs) *[==>]*	 ***[1]***
4	Final wavecal	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20200619
Unused Orbital Visibility = 0
Occultation
Exp. 4
GS Acq
Exp. 1
Exp. 2
Exp. 3
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec