



14702 - The first mass and angular momentum loss measurements for a CV-like binary

Cycle: 24, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

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) QS-VIR	COS/FUV	1	12-Jul-2017 17:02:11.0	yes

1 Total Orbits Used

ABSTRACT

The period distribution of close binaries, cataclysmic variables, novae and single-degenerate SN1a progenitor candidates is largely controlled by magnetically-driven mass and angular momentum loss (AML) from the M dwarf secondary. The mass loss rates for these spun-up stars remain essentially unknown and impossible to observe directly, with likely values in the range $1e-12$ to $1e-15$ M_{sun}/yr . AML prescriptions for CVs differ by orders of magnitude. One way to measure the mass loss rate is to observe the dM wind accrete onto its WD companion in a pre-CV very close to Roche Lobe overflow but lacking the obscuring complications and emission from an accretion disk. The measurement can be combined with

Proposal 14702 (STScI Edit Number: 5, Created: Wednesday, July 12, 2017 4:02:12 PM EST) - Overview

realistic MHD models to understand the accretion fraction, the mass that escapes, and the AML. The best-studied nearby pre-CV is QS Vir (48pc, $P=3.6\text{hr}$). However, its wind accretion rates measured from 1999 HST UV spectra of the WD metal absorption lines and 2006 XMM-Newton CCD spectroscopy differ by a factor of a thousand, pointing to either a dominant CME stochastic component, or a "magnetic switch" found in MHD simulations and driven by cyclic activity on the M dwarf. HST COS spectra combined with XMM-Newton monitoring on timescales from weeks to years will tease out CME vs cyclic accretion variations. UV and X-ray measurements will provide the first consistency check of both accretion rate measurement methods. MHD models tailored to the system will enable the first quasi-direct measurements of the mass loss and AML from a CV-like binary. Our project requires 6 HST/COS orbits in Cycles 22-24, and 60ksec on XMM in Cycle 22

OBSERVING DESCRIPTION

The target of this proposal is QS Vir, a well-studied detached white dwarf plus M-dwarf binary with an orbital period of 3.61h. The aim of this program is to provide measurements of the wind loss rate of an M-dwarf by measuring (quasi)simultaneously the X-ray luminosity generated by the accretion of the wind onto the white dwarf, and the photospheric abundances of the metals ingested into the atmosphere of the white dwarf.

We don't have a date of the XMM observations, so the HST visit is put "on hold"

One additional complication is that QS Vir is eclipsing, and the COS target acquisition has to avoid the eclipse of the white dwarf, as there is no UV flux left to acquire on.

Proposal 14702 - QS Vir (01) - The first mass and angular momentum loss measurements for a CV-like binary

Wed Jul 12 21:02:12 GMT 2017

Visit	Proposal 14702, QS Vir (01), implementation Diagnostic Status: Error Scientific Instruments: COS/FUV Special Requirements: Period 0.15075756940 D AND ZERO-PHASE HJD2448689.6372851; ON HOLD <i>Comments: This visit should be scheduled as close as possible to the XMM observations of QS Vir. We will provide the exact data of the XMM observations as soon as we get to know from the XMM operations team. The target acquisition has to avoid the eclipse of the WD, as there is not sufficient UV flux left during the eclipse.</i> <i>On Hold Comments: On hold until we know the window of the XMM observations</i>																																																																											
	(Exposure 1 (QS Vir (01))) Error (Form): LIFETIME-POS is required with G130M when not in Supported mode. (Exposure 2 (QS Vir (01))) Error (Form): LIFETIME-POS is required with G130M when not in Supported mode. (Exposure 3 (QS Vir (01))) Error (Form): LIFETIME-POS is required with G130M when not in Supported mode. (Exposure 4 (QS Vir (01))) Error (Form): LIFETIME-POS is required with G130M when not in Supported mode. (Exposure 5 (QS Vir (01))) Error (Form): LIFETIME-POS is required with G130M when not in Supported mode. (Exposure 6 (QS Vir (01))) Error (Form): LIFETIME-POS is required with G130M when not in Supported mode. (QS Vir (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (Exposure 3 (QS Vir (01))) Warning (Form): Defaults for SEGMENT have changed in APT25.2 for use of LP4 with G130M. See full description for details. (Exposure 4 (QS Vir (01))) Warning (Form): Defaults for SEGMENT have changed in APT25.2 for use of LP4 with G130M. See full description for details.																																																																											
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