



13289 - RXJ0439.8-6809: the hottest pre-white dwarf, or the first double-degenerate supersoft X-ray source?

Cycle: 21, Proposal Category: GO

(UV Initiative)

(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) RXJ0439.8-6809	COS/FUV COS/NUV	3	11-Jul-2013 12:55:29.0	yes

3 Total Orbits Used

ABSTRACT

The supersoft X-ray source RXJ0439.8-6809, identified with a faint ($V=21.7$) very blue star in the direction of the LMC is one of the most extreme stellar objects known. Current models require it to be either: (a) the hottest ($T_{\text{eff}} \sim 300000\text{K}$) and most massive known pre-white dwarf. In this case, it would allow a real-time observational test of stellar evolution theory, as it will evolve along the white dwarf cooling track by measurable amounts within a decade; or: (b) the first known double degenerate supersoft X-ray source, i.e. an interacting binary with a shell-burning accreting white

dwarf and a degenerate donor star, which would make it a very good candidate for a type Ia supernova progenitor. Alas, despite major observational efforts, including an exploratory 1-orbit Cycle 7 HST low-resolution ultraviolet spectrum, it is so far not possible to distinguish between these two scenarios. We propose to invest a modest amount of HST/COS time to finally determine the true nature of RXJ0439.8-6809. Crucially, we will obtain the first high-resolution ultraviolet spectrum of this system to confirm the LMC membership of RXJ0439.8-6809 from the detection of interstellar absorption lines at the LMC systemic velocity. In addition, we will use this spectrum to obtain a second-epoch effective temperature measurement, which we will compare that from Cycle 7. The excellent flux calibration of HST will easily detect a change of a few 10000K, which is predicted for the evolution of a massive white dwarf over the fifteen-year baseline (Cycle 7 to 21)

OBSERVING DESCRIPTION

The aim of this program is to obtain high-resolution far-UV spectroscopy of a hot blue star in the LMC, which is either a hot pre-white dwarf or a stable shell-burning white dwarf in a very compact binary. The co-ordinates are good to $\sim 0.5''$, and the current Phase II implementation includes an ACQ/SEARCH pattern, however, we will endeavour to provide updated and improved ground-based coordinates that will allow to proceed with an ACQ/Image only. The acquisition is followed G130M spectroscopy using all four FP-POS positions. The object is briefly in the CVZ, which greatly improves the efficiency of the observatory.

Proposal 13289 - Visit 01 - RXJ0439.8-6809: the hottest pre-white dwarf, or the first double-degenerate supersoft X-ray source?

Thu Jul 11 16:55:37 GMT 2013

Visit	Proposal 13289, Visit 01 Diagnostic Status: No Diagnostics Scientific Instruments: COS/NUV, COS/FUV Special Requirements: CVZ																																																																															
	Fixed Targets	<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Fluxes</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>RXJ0439.8-6809</td> <td>RA: 04 39 49.5900 (69.9566250d) Dec: -68 09 0.60 (-68.15017d) Equinox: J2000</td> <td>Epoch of Position: 2000</td> <td>V=21.7+/-0.1 F(1300A)=1.5e-15 erg/cm2/s/A, A, F(1528A)=8.3+-0.9e-15 erg/cm2/s/AA and F(2271A)=2.3+-0.07e-16 erg/cm2/s/AA</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td colspan="6"> <i>Comments: This target is either a supersoft X-ray binary (stable shell burning white dwarf) or a hot single pre-white dwarf. We observed it with STIS in November 1998 (data sets O55G01010 & O55G01020). The target has also been observed with GALEX in December 2005, finding it at F(1528A)=8.3+-0.9e-15 erg/cm2/s/AA and F(2271A)=2.3+-0.07e-16 erg/cm2/s/AA, consistent with the STIS observations.</i> </td> </tr> </tbody> </table>										#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous	(1)	RXJ0439.8-6809	RA: 04 39 49.5900 (69.9566250d) Dec: -68 09 0.60 (-68.15017d) Equinox: J2000	Epoch of Position: 2000	V=21.7+/-0.1 F(1300A)=1.5e-15 erg/cm2/s/A, A, F(1528A)=8.3+-0.9e-15 erg/cm2/s/AA and F(2271A)=2.3+-0.07e-16 erg/cm2/s/AA	Reference Frame: ICRS	<i>Comments: This target is either a supersoft X-ray binary (stable shell burning white dwarf) or a hot single pre-white dwarf. We observed it with STIS in November 1998 (data sets O55G01010 & O55G01020). The target has also been observed with GALEX in December 2005, finding it at F(1528A)=8.3+-0.9e-15 erg/cm2/s/AA and F(2271A)=2.3+-0.07e-16 erg/cm2/s/AA, consistent with the STIS observations.</i>																																																								
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