14338 - Late nebular stage high resolution UV spectroscopy of classical Galactic novae: a benchmark panchromatic archive for nova evolution

Cycle: 23, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Steve Shore (PI) (ESA Member) (Contact)	**Universita di Pisa**	**shore@df.unipi.it**
Dr. Gregory James Schwarz (CoI) (AdminUSPI) (Contact)	American Astronomical Society	greg.schwarz@aas.org
Dr. Elena Mason (CoI) (ESA Member)	INAF, Osservatorio Astronomico di Trieste	emason@oats.inaf.it
Dr. Charles E. Woodward (CoI)	University of Minnesota - Twin Cities	chelsea@astro.umn.edu
Dr. Jan-Uwe Ness (CoI) (ESA Member)	European Space Agency - ESTEC	juness@sciops.esa.int
Dr. Robert D. Gehrz (CoI)	University of Minnesota - Twin Cities	gehrz@astro.umn.edu
Dr. Sumner G. Starrfield (CoI)	Arizona State University	sumner.starrfield@asu.edu
Dr. Kim Page (CoI) (ESA Member)	University of Leicester	kpa@star.le.ac.uk
Dr. Robert E. Williams (CoI)	Space Telescope Science Institute	wms@stsci.edu
Prof. Michael F. Bode (CoI) (ESA Member)	Liverpool John Moores University	mfb@astro.livjm.ac.uk
Dr. Julian P. Osborne (CoI) (ESA Member)	University of Leicester	julo@star.le.ac.uk
Dr. Jordi Jose' (CoI) (ESA Member)	Universitat Politecnica de Catalunya	jordi.jose@upc.edu
Dr. Massimo Della Valle (CoI) (ESA Member)	INAF, Osservatorio Astronomico di Capodimonte	dellavalle@na.astro.it
Dr. Luca Izzo (CoI) (ESA Member)	Universita di Roma La Sapienza	luca.izzo@gmail.com

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
06	(1) NOVA-CEN-2013	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	2	01-Aug-2015 21:13:51.0	yes

2 Total Orbits Used

ABSTRACT

The major obstacle to understanding the classical nova phenomenon is the lack of systematic observations, primarily spectroscopic, through the various stages of the ejecta and white dwarf evolution. Progress is only possible if long term, coordinated multi-wavelength spectroscopic data at high spectral resolution and high signal to noise are available. Our objective is to use HST/STIS spectra, along with coordinated space- and ground-based observations, to fully characterize three bright recent Galactic classical novae within a panchromatic framework. This proposed data set will be a benchmark sample for any future modeling efforts. All three, V959 Mon (ONe type), V339 Del (CO-type), and V1369 Cen (CO-type), were detected in gamma-rays by Fermi/LAT and well observed in the first months after outburst. We propose to use these data to address fundamental unsolved problems, such as: the origin of the large-scale bipolar structure, the origin and time development of the fragmentation detected in the ejecta, the uniformity of the abundances among the emission knots, and the determination of filling factors and masses for the ejecta. All are essential for understanding the thermonuclear explosion on the white dwarf and its related hydrodynamic events.

OBSERVING DESCRIPTION

Multiple UV visits are required to observe the changes as the ejecta expand and the central source evolves. One E140M and two E230M (c: 1978 A and 2707 A) exposures will provide the continuous UV coverage (1123 A to 3111 A) we require for the spectral sequence. The E140M provides access to resonance transitions of many ionization stages, e.g., C II - C IV, N IV-V, O III], and Ne IV]-V], along with the He II 1640 A and other excited state lines. The E230M short wavelength will provide C II, N III] and C III] emission, and the E230M long will provide Mg II, O III, and the Fe II lines.

For V1369 Cen we request four (4) separate one-orbit HST/STIS visits during cycles 22 and 23 to capture the same epochs obtained with V339 Del. Two exposures will be obtained in the current cycle 21 ending just before the start of the next cycle. We expect that during cycle 22 the brightness will still be sufficient in the UV, without risk to the detectors, to obtain a medium resolution sequence within a single orbit based on our experience with V339 Del. At the moment the source is still increasing in X-rays so we do not yet know when the SSS phase will either start or end. Thus, we

request the longest possible period for the sequence. We expect this source to be observable with STIS for at least two years (to the end of Cycle 23), permitting an extraordinary view of the later stages with only modest observing times.

For V959 Mon, since the nova is now at a steady stage, we request a single epoch/visit with all three settings of the echelle gratings, each lasting two orbits (i.e. a total of 6 orbits). Since HST operation imposes a limit of 5 orbits per visit, the V959 Mon observation can be split into 2 or 3 relatively closely timed visits increasing to 7 the number of requested orbits (due to the extra acquisition). The exposure time is based on scaling from the T Pyx sequence after Day 600 scaled to the higher UV reddening (E(B-V) ~0.8 compared to E(B- V) ~0.5 for T Pyx). Only one sequence is requested, this will suffice to provide a baseline similar to that obtained in T Pyx after outburst. The previous STIS sequence, taken on Day 151, provides a sufficient comparison and baseline, especially for the interstellar spectrum.

For V339 Del, request two (2) additional visits. The period of invisibility of the source should occur in the first half of cycle 22 so we request one immediately after the first appearance (Feb-Mar 2015) and one near the end of the cycle. We expect that at the rate of decline of the nova each sequence will require two orbits for a total of four (4) orbits.

Visit

Proposal 14338, Cen 3rd EPOCH (06), implementation Sun Aug 02 01:13:52 GMT 2015

Diagnostic Status: No Diagnostics

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

Special Requirements: BETWEEN 01-FEB-2016:00:00:00 AND 31-MAR-2016:00:00:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NOVA-CEN-2013	RA: 13 54 45.2600 (208.6885833d)	Epoch of Position: 2000	V=12+/-0.2	Reference Frame: ICRS
	Alt Name1: V1369-CEN	Dec: -59 09 4.23 (-59.15118d)			
		Equinox: J2000			

Comments: The positions are from the observatioons of Nova-Cen-2013 (V1369 Cen) during Cycle 22 GO 13828. Those listed in SIMBAD and used previously as the default are not precise enough.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NOVA-CEN-2013	STIS/CCD, ACQ, 50CCD	MIRROR				1 Secs (1 Secs)	
								[==>]	***[1]***
2	(625971)	(1) NOVA-CEN-2013	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				2679 Secs (2679 Secs)	
								[==>]	***[1]***
Comments: the input spectrum in the ETC is the stis/FUV/E140M spectrum of nova Del 2013 when at 11 mag. Cen 2013 and Del 2013 are two very alike noave in type (CO-WD) and spectral evolution. Cen is supposed to be at the same mag in Dec 2014. Our first obs is in Feb 2015, when it will be even fainter.									
3	(626117)	(1) NOVA-CEN-2013	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 1978 A				1440 Secs (1440 Secs)	
								[==>]	***[2]***
Comments: the input spectrum in the ETC is the stis/NUV/E230M/1978 spectrum of nova Del 2013 when at 11 mag. Cen 2013 and Del 2013 are two very alike noave in type (CO-WD) and spectral evolution. Cen is supposed to be at the same mag in Dec 2014. Our first obs is in Feb 2015, when it will be even fainter.									
4	(626030)	(1) NOVA-CEN-2013	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A				1439 Secs (1439 Secs)	
								[==>]	***[2]***
Comments: the input spectrum in the ETC is the stis/NUV/E230M/2070 spectrum of nova Del 2013 when at 11 mag. Cen 2013 and Del 2013 are two very alike noave in type (CO-WD) and spectral evolution. Cen is supposed to be at the same mag in Dec 2014. Our first obs is in Feb 2015, when it will be even fainter.									

Orbit Structure