12899 - Emission line imaging of the bipolar shell in the Helium Nova V445 Puppis

Cycle: 20, 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?*
01	(1) V-V445-PUP	WFC3/UVIS	2	09-Jul-2012 21:34:54.0	yes

2 Total Orbits Used

ABSTRACT

Explosive detonations on the surfaces of accreting white dwarfs play a key role in establishing viable progenitor pathways towards Type Ia supernova explosions. If the white dwarf is accreting hydrogen deficient material, helium shell-flash driven eruptions can occur on its surface. Thus far only one such helium nova event has been observed in Nova Puppis 2000 = V445 Pup. We have discovered an expanding bipolar shell involving fast moving ejecta of He-rich material surrounding this binary. This used state of art ground-based AO imaging and IFU spectroscopy. However, we have now reached the limit of what can be done from the ground and therefore request high spatial resolution HST imaging of the ejecta in V445

Pup. We request 2 orbits in Cycle 20 split between three narrow band filters, followed by a repeat epoch two observing cycles later. These narrow band images will allow us to map the expanding ejecta in the [OII], [OIII] and HeI lines, to be directly compared with kinematical measurements based on the same lines. This will allow us to determine a robust distance using the expansion parallax method and study the ionisation structure of the shells and knots we have seen in our broadband AO images. Splitting the observations over two cycles is necessary in order to provide sufficient baseline to accurately measure the on-sky expansion which is estimated to proceed at an angular speed of 0.3"/year.

OBSERVING DESCRIPTION

Our imaging targets an extended source resolving the ejecta of a nova eruption in 2000 using WPFC3/UVIS. The filters are chosen to target previously detected emission lines covering [OIII] with F502N, [OII] with FQ727N and HeI with F680N. We have supporting ground-based data that map the kinematics of these lines using IFU spectroscopy while the target position is accurately known from recent ground-based imaging.

All our exposures use the same 3-point dither pattern to improve sampling and permit cosmic ray rejection. Exposure times are scaled to reflect the observed relative line strengths while at the same time pack the 2-orbit long visit efficiently. Thus F680N receives the longests exposure time and takes up the whole of orbit 1, followed by F502N and some short FQ727N exposures in orbit 2.

We have chosen the optimal UVIS aperture for our F502N and F680N exposures, while the FQ727N exposures will use the quadrant D sub-array only in sync with the filter and to save some overheads.

We have decided to enable the post-FLASH as an extra option, since we believe our relatively short exposure times with narrow-band filters will benefit from this procedure. We verified background levels using the ETC and request a post-flash level of 15e for the F502N and FQ727 exposures as these have the lowest background per exposure (<5e), while 10e is sufficient for the F680N exposure (with ~5e).

REAL TIME JUSTIFICATION

N/A

CALIBRATION JUSTIFICATION

N/A

ADDITIONAL COMMENTS

This set of images will be repeated in Cycle 22

Visit

Proposal 12899, Epoch1 (01) Tue Jul 10 01:35:03 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Comments: Cycle 20 epoch

Diagnostics

(FQ727 (01.003)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.

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=true		(1), (2), (3)

Fixed Targets

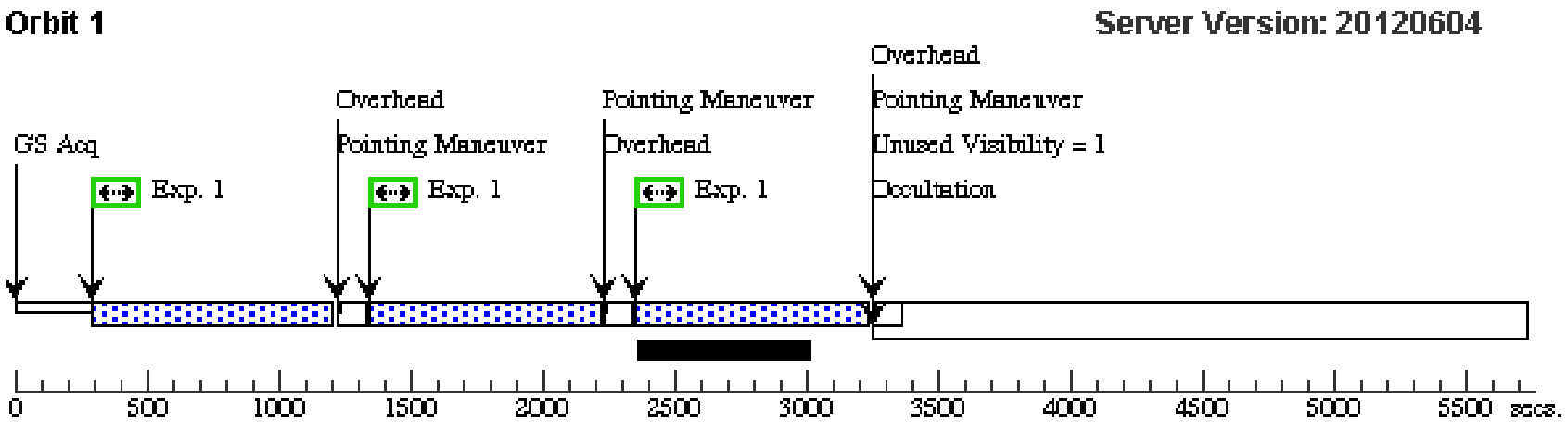
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-V445-PUP	RA: 07 37 56.9000 (114.4870833d) Dec: -25 56 58.90 (-25.94969d) Equinox: J2000		V=19.74+/-0.1 J=17.36 +/- 0.07	Reference Frame: ICRS

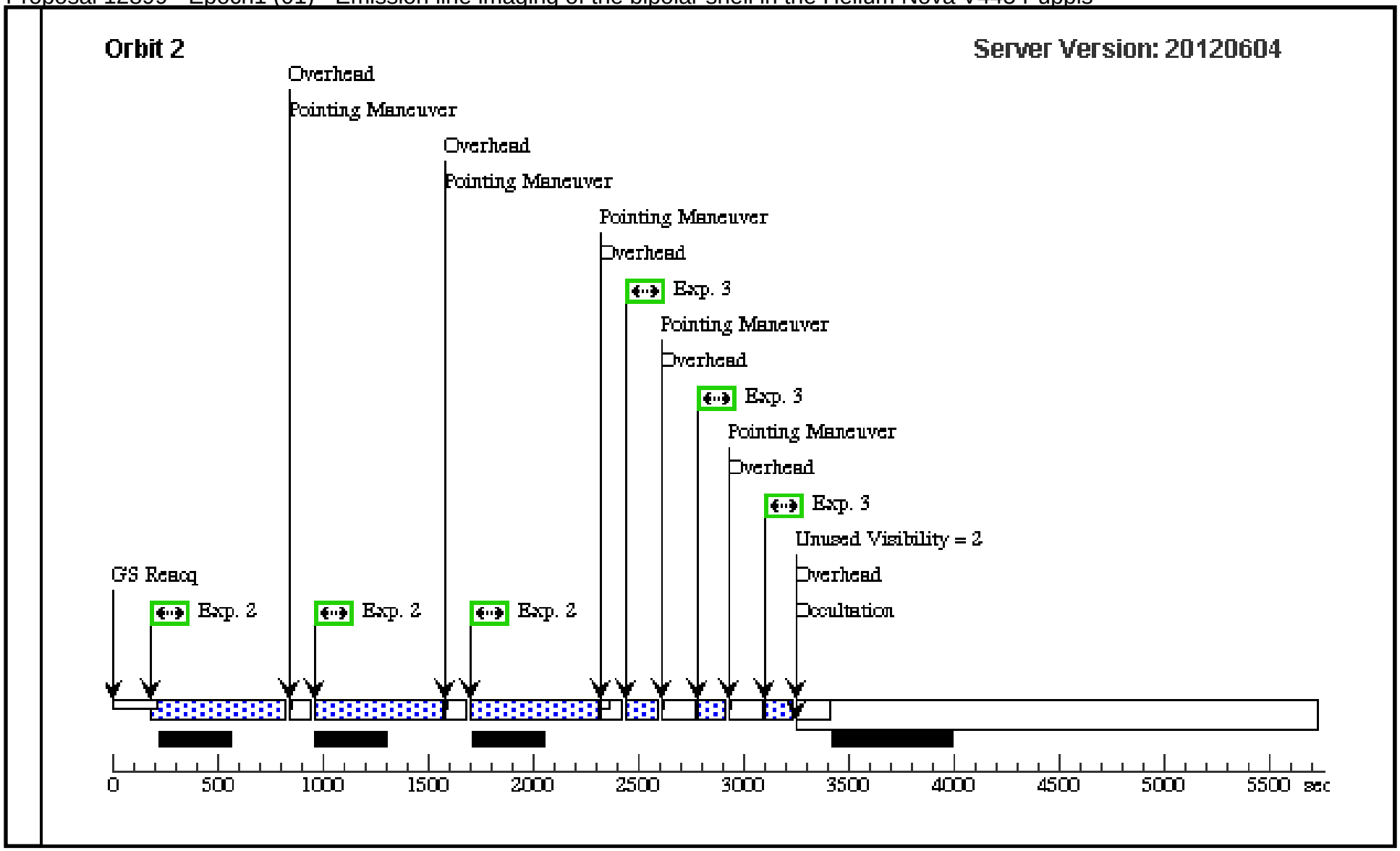
Comments: Position determined from recent good seeing CCD imaging at the Magellan telescope with a WCS referenced to ICRS. Note that target is currently significantly fainter than on DSS plates as the nova eruption casued extensive local extinction.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F680	(1) V-V445-PUP	WFC3/UVIS, ACCUM, UVIS	F680N	FLASH=10.0		Pattern 2, Exps 1-1 in Epoch1 (01) (2)	881 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
	Comments: F680N over 3pt dither *post-FLASH of 10e to reflect low expected background*								
2	F502	(1) V-V445-PUP	WFC3/UVIS, ACCUM, UVIS	F502N	FLASH=15		Pattern 2, Exps 2-2 in Epoch1 (01) (2)	612 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***
	Comments: F502N over 3pt dither *post-FLASH of 15e to reflect low expected background*								
3	FQ727	(1) V-V445-PUP	WFC3/UVIS, ACCUM, UVIS-QUAD-SUB	FQ727N	FLASH=15		Pattern 2, Exps 3-3 in Epoch1 (01) (2)	135 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***
	Comments: FW727 over 3pt dither, quadrant D sub-array *post-FLASH of 15e to reflect low expected background*								

Orbit Structure




Orbit 2
Server Version: 20120604
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Overhead
Exp. 3
Pointing Maneuver
Overhead
Exp. 3
Pointing Maneuver
Overhead
Exp. 3
Unused Visibility = 2
Overhead
Occultation
GS Reacq
Exp. 2
Exp. 2
Exp. 2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec