



11140 - Can mass-ejections from late He-shell flash stars constrain convective/reactive flow modeling of stellar interiors?

Cycle: 16, Proposal Category: GO

(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) LONGMORE-4	WFPC2	1	21-May-2007 21:21:08.0	yes
02	(2) NGC-246	WFPC2	1	21-May-2007 21:21:13.0	yes
03	(3) K1-16	WFPC2	1	21-May-2007 21:21:17.0	yes
04	(4) RXSJ211707.9+341220	WFPC2	1	21-May-2007 21:21:19.0	yes
05	(5) PG1144+005	WFPC2	1	21-May-2007 21:21:21.0	yes

5 Total Orbits Used

ABSTRACT

The existence of H-deficient knots around the central stars of the planetary nebulae Abell 30 and Abell 78 is still unexplained. We hypothesize that these knots were ejected during a very late helium-shell flash (= very late thermal pulse, VLTP) suffered by the precursor white dwarf stars. If this is true, then the characteristics of these knots (mass, velocity, density, spatial distribution) allow to draw conclusions on the course of the hydrogen-ingestion flash detonation that is triggered by the He-shell flash. This provides important, otherwise inaccessible constraints for the hydrodynamical modeling of convective/reactive flows in stellar interiors. Understanding the physics of these flows is not only important for the understanding of these particular central stars, but also for the frequent, very similar convective/reactive events that determine the nucleosynthesis in Pop. III stars.

With this proposal we want to proof or discard the idea that the H-deficient knots are resulting from a VLTP. If true, then they can be exploited for flash-physics diagnostics. We propose a simple test. We search for such knots around five H-deficient central stars (PG1159 stars). Our models predict, that only those stars with residual nitrogen in the atmosphere have suffered a VLTP and, hence, should have expelled knots. We therefore want to take [O III] images of stars which have photospheric N and those which do not.

OBSERVING DESCRIPTION

We want to image faint nebular emission in the close vicinity of our five targets. The images shall be taken with WFPC2/PC1 and the F502N filter. We aim to fill the complete orbit. In order to avoid blooming, the exposures of targets 2 and 4 have to be split up into short exposures. The exposures of targets 1, 3, and 5 are split into two subexposures. This is sufficient for our purpose in order to correct for cosmic-particle contamination. Dithering is used for all targets.

We used the WFPC2 ETC for point sources - v4.0 and determined the maximum exposure time to stay below the saturation level. For targets 2 and 4, the orbit planner is used then to get the maximum total exposure time.

The target stars are the brightest objects in the FOV.

REAL TIME JUSTIFICATION

N/A

CALIBRATION JUSTIFICATION

Standard calibration is sufficient for our purpose.

ADDITIONAL COMMENTS

N/A

Proposal 11140 - Visit 01 - Can mass-ejections from late He-shell flash stars constrain convective/reactive flow modeling of stellar interiors?

Visit	Proposal 11140, Visit 01, implementation					Tue May 22 01:21:23 GMT 2007				
	Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2 Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	LONGMORE-4	RA: 10 05 45.7790 (151.4407458d) Dec: -44 21 33.27 (-44.35924d) Equinox: J2000		V=16.6	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Lo4_1	(1) LONGMORE-4	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO			1100.0 Secs	
									[=>]	[1]
	2	Lo4_2	(1) LONGMORE-4	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO	POS TARG 0.23,0.2 3			1100.0 Secs
									[=>]	[1]
Orbit Structure	<p>Orbit 1 Server Version: 20070325</p> <p>The diagram shows a horizontal timeline from 0 to 5500 seconds. A blue checkered bar represents the observation period, starting at approximately 400 seconds and ending at approximately 3100 seconds. Key events are marked with arrows and labels: 'GS Acq' at 0s, 'Exp. 1' at ~400s, 'Pointing Maneuver' and 'Overhead' at ~1600s, 'Exp. 2' at ~1800s, 'Unread Visibility = 114' at ~3000s, and 'Occultation' at ~3100s. Green boxes with double-headed arrows highlight the exposure times for Exp. 1 and Exp. 2.</p>									

Proposal 11140 - Visit 02 - Can mass-ejections from late He-shell flash stars constrain convective/reactive flow modeling of stellar interiors?

Visit	Proposal 11140, Visit 02, implementation Tue May 22 01:21:24 GMT 2007 Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2 Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(2)	NGC-246	RA: 00 47 3.3383 (11.7639096d) Dec: -11 52 18.92 (-11.87192d) Equinox: J2000			V=11.95	Reference Frame: ICRS			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	NGC246_1	(2) NGC-246	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO			100.0 Secs X 4 [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)]	[1]
	2	NGC246_2	(2) NGC-246	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO	POS TARG 0.23,0.2 3		100.0 Secs X 4 [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)]	[1]
	3	NGC246_3	(2) NGC-246	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO	POS TARG -0.23,-0. 23		100.0 Secs X 4 [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)]	[1]

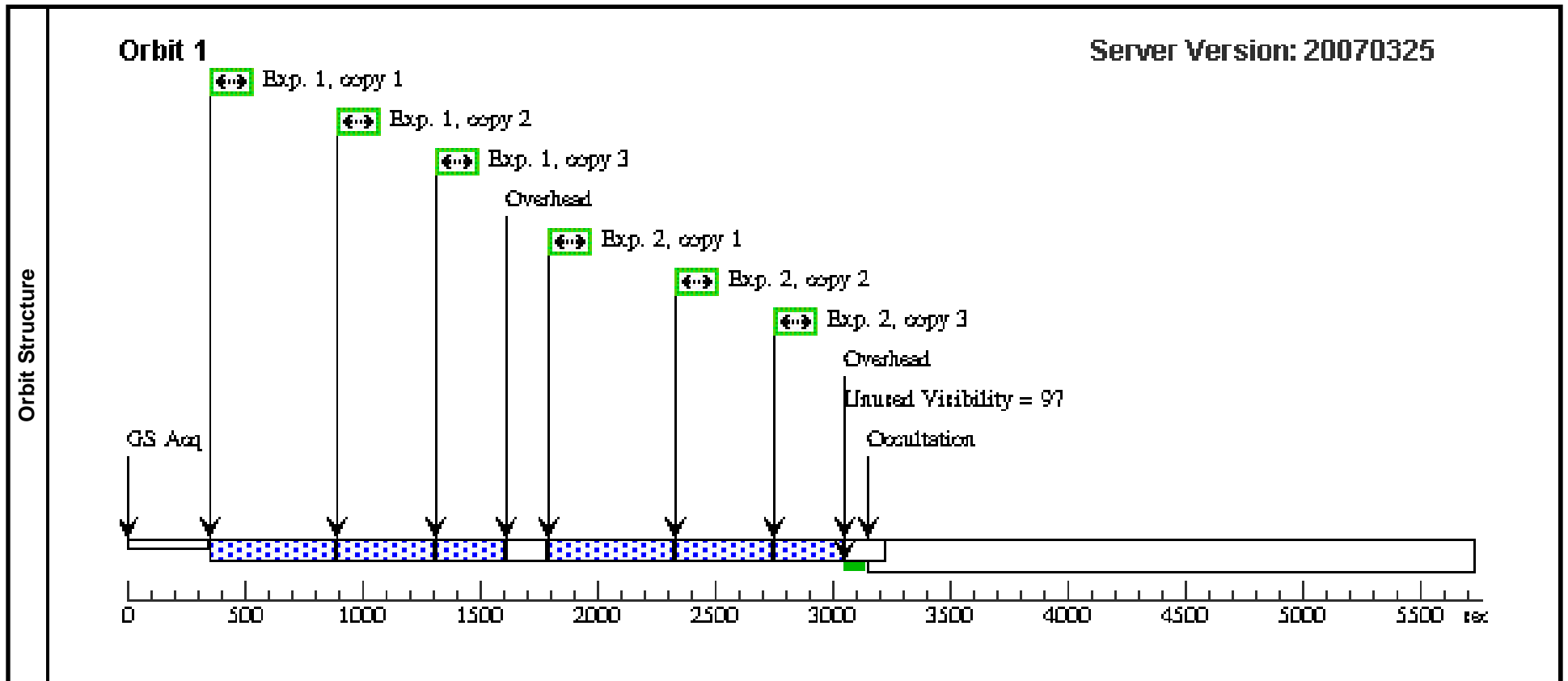
Proposal 11140 - Visit 02 - Can mass-ejections from late He-shell flash stars constrain convective/reactive flow modeling of stellar interiors?

Proposal 11140 - Visit 03 - Can mass-ejections from late He-shell flash stars constrain convective/reactive flow modeling of stellar interiors?

Visit	Proposal 11140, Visit 03, implementation					Tue May 22 01:21:25 GMT 2007				
	Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2 Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	K1-16	RA: 18 21 52.2110 (275.4675458d) Dec: +64 21 54.31 (64.36509d) Equinox: J2000		V=15.4	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	K1-16_1	(3) K1-16	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO			1200.0 Secs [=>]	[1]
	2	K1-16_2	(3) K1-16	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO	POS TARG 0.23,0.2 3		1100.0 Secs [=>]	[1]
Orbit Structure	<p>Orbit 1 Server Version: 20070325</p> <p>Timeline labels: GS Acq, Exp. 1, Pointing Maneuver, Overhead, Exp. 2, Overhead, Occultation, Unused Visibility = 68%</p> <p>X-axis: 0, 500, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500 sec</p>									

Proposal 11140 - Visit 04 - Can mass-ejections from late He-shell flash stars constrain convective/reactive flow modeling of stellar interiors?

Visit	Proposal 11140, Visit 04, implementation					Tue May 22 01:21:26 GMT 2007				
	Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2 Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
		(4)	RXSJ211707.9+341220 Alt Name1: RXJ2117.1+3412	RA: 21 17 8.2910 (319.2845458d) Dec: +34 12 27.22 (34.20756d) Equinox: J2000		V=13.2	Reference Frame: ICRS			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	RXJ2117_1	(4) RXSJ211707.9+341220	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO			260.0 Secs X 3	
									[==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)]	[1]
	2	RXJ2117_2	(4) RXSJ211707.9+341220	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO			260.0 Secs X 3	
								[==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)]	[1]	



Proposal 11140 - Visit 05 - Can mass-ejections from late He-shell flash stars constrain convective/reactive flow modeling of stellar interiors?

Visit	Proposal 11140, Visit 05, implementation					Tue May 22 01:21:26 GMT 2007				
	Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2 Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(5)	PG1144+005	RA: 11 46 35.2300 (176.6467917d) Dec: +00 12 33.60 (.20933d) Equinox: J2000		V=16.2	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	PG1144_1	(5) PG1144+005	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO			1100.0 Secs	
	2	PG1144_2	(5) PG1144+005	WFPC2, IMAGE, PC1	F502N	ATD-GAIN=15; CR-SPLIT=NO			1100.0 Secs	[1]
Orbit Structure	<p>Orbit 1 Server Version: 20070325</p>									
	<p>Diagram illustrating the Orbit Structure for Orbit 1. The x-axis represents time in seconds (0 to 5500). Key events are marked: GS Acq, Exp. 1 (green box), Overhead, Exp. 2 (green box), Overhead, Occultation, and Unused Visibility = 77. The observation period is indicated by a blue checkered bar.</p>									