



14932 - Optical counterpart of high-speed ejecta from the gamma-ray binary LS 2883

Cycle: 24, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. George G. Pavlov (PI) (Contact)	The Pennsylvania State University	pavlov@astro.psu.edu
Dr. Oleg Y. Kargaltsev (CoI)	George Washington University	kargaltsev@gwu.edu
Mr. Jeremy Hare (CoI)	George Washington University	jeh86@gwmail.gwu.edu

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>
02	(1) CPD-63-2495	STIS/CCD	1	17-May-2017 21:02:53.0	yes
03	(1) CPD-63-2495	STIS/CCD	1	17-May-2017 21:02:54.0	yes
04	(1) CPD-63-2495	STIS/CCD	1	17-May-2017 21:02:55.0	yes
05	(1) CPD-63-2495	STIS/CCD	1	17-May-2017 21:02:56.0	yes

4 Total Orbits Used

ABSTRACT

We propose to look for an optical counterpart of a remarkable extended X-ray feature ejected from the famous gamma-ray binary LS 2883 close to the most recent periastron passage. LS 2883 is a colliding-wind binary with a young pulsar B1259-63 in a 3.4-yr eccentric orbit around a fast-rotating massive O9 star. Chandra observations have shown that the feature is moving from the binary with an extremely high speed (0.07c in projection onto the sky), changing its shape and brightness. In the most recent Chandra observation (2017 April 24) the feature showed a hint of acceleration and an

unexpected brightening. We detected a similarly fast-moving (but fainter and less extended) X-ray feature during the previous binary orbital cycle. The nature of the feature is puzzling. If it is a clump of the O-star's dense wind, the clump is most likely ablated and pushed away by the highly relativistic pulsar wind. In this case we expect to see both thermal emission from the heated stellar wind matter and nonthermal emission from shocked relativistic electrons. To understand the origin of the feature and the mechanisms driving its extremely fast motion, we need to detect it in the optical. We propose a coronagraphic HST observation, which should be carried out before the next periastron passage, when the binary system may become too bright to discern the nearby extended feature. The unique capabilities of the HST are required to resolve the faint feature in a close proximity to the bright O star.

OBSERVING DESCRIPTION

We are using four STIS/CCD orbits to detect (or set an upper limit on) optical emission from the extended clump of ejecta near the binary LS 2883/B1259-63. The clump's center is about 6 arcsec away from the the binary (GSC2.3 identifier is S7KQ000205; Vmag=10.15, Bmag=10.80) that will be used for acquisition but then will be occulted by the coronagraph. We will use WEDGE2.5 aperture. Observations are organized in four consecutive visits. At the beginning of each orbit the star will be re-acquired (using the F25ND3 filter) and then it will be occulted by the coronagraph for the rest of the orbit. Acquisition images are 2 sec long (SNR=68; time to saturation 103 sec). The science exposures are divided into 4 CR-SPLIT subexposures (each 648 s long) to remove cosmic ray events.

The first visit is restricted to two pre-determined roll angle (ORIENT) ranges to avoid blocking the science target by the coronagraph wedge and to avoid placing it within the diffraction spikes of the bright binary. These restrictions have a margin of 15 degrees to accommodate for the incremental ORIENT increase in the subsequent visits by 3-5 degrees compared to the previous visit. The increments are needed to better separate the faint extended emission from the PSF wings of the bright binary with the aid of differential images. The four visits will happen during consecutive four orbits.

Proposal 14932 - Visit 02 - Optical counterpart of high-speed ejecta from the gamma-ray binary LS 2883

Thu May 18 01:02:57 GMT 2017

Visit	Proposal 14932, Visit 02									
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD									
	Special Requirements: ORIENT 75D TO 125 D; ORIENT 255D TO 300 D									
Comments: This is the first visit in a series of four visits in four consecutive orbits.										
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	CPD-63-2495	RA: 13 02 47.6550 (195.6985625d) Dec: -63 50 8.67 (-63.83574d) Equinox: J2000			V=10.1+/-0.1		Reference Frame: ICRS		
	Comments: This object was generated by the target selector and retrieved from the SIMBAD database. The coordinates are taken from the GSC2.3.2 catalog; GSC2.3 identifier is S7KQ000205.									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.ta.994 477)	(1) CPD-63-2495	STIS/CCD, ACQ, F25ND3	MIRROR				2 Secs (2 Secs)	
									[==>]	[1]
	2		(1) CPD-63-2495	STIS/CCD, ACCUM, WEDGE2.5	MIRROR	CR-SPLIT=4			3000 Secs (2588 Secs)	
									[==>647.0 Secs (Split 1)] [==>647.0 Secs (Split 2)] [==>647.0 Secs (Split 3)] [==>647.0 Secs (Split 4)]	[1]
Orbit Structure	Orbit 1 Server Version: 20170109 05001000150020002500300035004000450050005500 sec									

Proposal 14932 - Visit 03 - Optical counterpart of high-speed ejecta from the gamma-ray binary LS 2883

Visit	Proposal 14932, Visit 03										Thu May 18 01:02:57 GMT 2017
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: STIS/CCD										
	Special Requirements: ORIENT 3D TO 5D FROM 02; AFTER 02 BY 0.5 Orbits TO 1.5 Orbits										
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	CPD-63-2495	RA: 13 02 47.6550 (195.6985625d) Dec: -63 50 8.67 (-63.83574d) Equinox: J2000				V=10.1+/-0.1		Reference Frame: ICRS		
	Comments: This object was generated by the target selector and retrieved from the SIMBAD database. The coordinates are taken from the GSC2.3.2 catalog; GSC2.3 identifier is S7KQ000205.										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	(STIS.ta.994 477)	(1) CPD-63-2495	STIS/CCD, ACQ, F25ND3	MIRROR				2 Secs (2 Secs)		
									[==>]		[1]
	2		(1) CPD-63-2495	STIS/CCD, ACCUM, WEDGE2.5	MIRROR	CR-SPLIT=4			3000 Secs (2588 Secs) [==>647.0 Secs (Split 1)] [==>647.0 Secs (Split 2)] [==>647.0 Secs (Split 3)] [==>647.0 Secs (Split 4)]		[1]
Orbit Structure	Orbit 1 Server Version: 20170109 The diagram illustrates the orbital structure over a 5500-second period. Key events include: GS Acq (0-100s), Exp. 1 (100-350s, blue hatched), Pointing Maneuver (350-400s), Exp. 2 split 1 (400-650s, green dotted), Exp. 2 split 2 (650-1150s, green dotted), Exp. 2 split 3 (1150-1650s, green dotted), Exp. 2 split 4 (1650-2150s, green dotted), Unused Orbital Visibility = 3 (2150-2350s, white), Occultation (2350-2550s, black), and Home (2550-3500s, white). The timeline is marked from 0 to 5500 seconds.										

Proposal 14932 - Visit 04 - Optical counterpart of high-speed ejecta from the gamma-ray binary LS 2883

Visit	Proposal 14932, Visit 04										Thu May 18 01:02:57 GMT 2017
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: STIS/CCD										
	Special Requirements: ORIENT 3D TO 5D FROM 03; AFTER 03 BY 0.5 Orbits TO 1.5 Orbits										
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	CPD-63-2495	RA: 13 02 47.6550 (195.6985625d) Dec: -63 50 8.67 (-63.83574d) Equinox: J2000				V=10.1+/-0.1		Reference Frame: ICRS		
	Comments: This object was generated by the target selector and retrieved from the SIMBAD database. The coordinates are taken from the GSC2.3.2 catalog; GSC2.3 identifier is S7KQ000205.										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	(STIS.ta.994 477)	(1) CPD-63-2495	STIS/CCD, ACQ, F25ND3	MIRROR				2 Secs (2 Secs)		
									[==>]	[1]	
	2		(1) CPD-63-2495	STIS/CCD, ACCUM, WEDGE2.5	MIRROR	CR-SPLIT=4			3000 Secs (2588 Secs)		
									[==>647.0 Secs (Split 1)] [==>647.0 Secs (Split 2)] [==>647.0 Secs (Split 3)] [==>647.0 Secs (Split 4)]	[1]	
Orbit Structure	Orbit 1 Server Version: 20170109										

Proposal 14932 - Visit 05 - Optical counterpart of high-speed ejecta from the gamma-ray binary LS 2883

Visit	Proposal 14932, Visit 05										Thu May 18 01:02:57 GMT 2017
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: STIS/CCD										
	Special Requirements: ORIENT 3D TO 5D FROM 04; AFTER 04 BY 0.5 Orbits TO 1.5 Orbits										
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	CPD-63-2495	RA: 13 02 47.6550 (195.6985625d) Dec: -63 50 8.67 (-63.83574d) Equinox: J2000				V=10.1+/-0.1		Reference Frame: ICRS		
	Comments: This object was generated by the target selector and retrieved from the SIMBAD database. The coordinates are taken from the GSC2.3.2 catalog; GSC2.3 identifier is S7KQ000205.										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	(STIS.ta.994 477)	(1) CPD-63-2495	STIS/CCD, ACQ, F25ND3	MIRROR				2 Secs (2 Secs)		
									[==>]	[1]	
	2		(1) CPD-63-2495	STIS/CCD, ACCUM, WEDGE2.5	MIRROR	CR-SPLIT=4			3000 Secs (2588 Secs)		
									[==>647.0 Secs (Split 1)] [==>647.0 Secs (Split 2)] [==>647.0 Secs (Split 3)] [==>647.0 Secs (Split 4)]	[1]	
Orbit Structure	Orbit 1 Server Version: 20170109										