13373 - The changing wind structure of the WR/LBV star in HD 5980

Cycle: 21, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Gloria Koenigsberger (PI) (Contact)	**Universidad Nacional Autonoma de Mexico (UNAM)**	**gloria@astro.unam.mx**
Dr. Rodolfo H. Barba (CoI)	Universidad de La Serena	rbarba@dfuls.cl
Dr. Roberto C. Gamen (CoI)	Universidad Nacional de La Plata (UNLP)	rgamen@fcaglp.unlp.edu.ar
Dr. Nidia Morrell (CoI)	Carnegie Institution of Washington	nmorrell@lco.cl
Dr. D. John Hillier (CoI) (AdminUSPI)	University of Pittsburgh	hillier@pitt.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) HD-5980 CCDFLAT	STIS/CCD STIS/FUV-MAMA	2	21-Oct-2013 21:15:26.0	yes

2 Total Orbits Used

ABSTRACT

HD 5980 is an extraordinary system of massive stars that is located in the Small Magellanic Cloud. It contains an eclipsing binary (P=19.3 d) consisting of a luminous blue variable (LBV) and its Wolf-Rayet (WR) companion. The LBV underwent a major eruptive event in 1994 during which its bolometric luminosity increased by a factor of ~5 and it is currently approaching its minimum state of activity. The primary objective of this proposal is to determine the wind velocity and mass-loss rate of the LBV in its current state. With these observations and our earlier observations and analyses, HD 5980 offers the unprecedented opportunity of deriving all the fundamental parameters of an LBV system throughout its activity cycle, parameters which are required in order to constrain the sources of the instabilities that lead to the eruptive phenomena. To

accomplish these goals, we request 2 HST orbits to observe HD 5980 with STIS in order to obtain one set of FUV MAMA and CCD spectra at the eclipse, when the LBV occults its WR companion.

The study of HD 5980 and the UV spectrum that we propose to acquire are relevant to a broad range of problems including wind-wind collision phenomena, the formation of circumstellar structures powered by stellar winds and the evolution of supernova progenitors.

OBSERVING DESCRIPTION

We plan to observe HD 5980 in the 1170--1730 A spectral interval with STIS using the FUV- MAMA detector, the E140M grating and the 0.2x0.2 slit. To calculate the exposure time we used the STIS spectrum obtained on 2009 Sept 9. The Exposure Time Calculator (516777) indicates that with a 4678s exposure time we will attain S/N= 47 per resolution element at 1500 A, allowing a very good measurement of the edge and saturated portions of the P Cygni profiles. We will obtain the first part of this observation with a 2608s exposure in the first orbit and then a 2070s exposure in the second orbit.

We will also obtain exposures using the CCD detector and the G230LB, G430L and G750L gratings and 52x0.2 aperture. These will provide a full spectral energy distribution for the CMFGEN model fits. Using the CCD spectra obtained by STIS in the year 2000, we find that S/N>100 is attained with exposure times of 300s, 60s and 60 , respectively. The total exposure time+overheads for the CCD spectra is less than 25 min.

The first orbit will contain the target acquisition and the first FUV-MAMA exposure. The second orbit will contain the second FUV-MAMA exposure and the CCD spectra. The mixture of MAMA and CCD observations in the same orbit is justified by the short exposure time required for the CCD spectra (HST Primer sec. 6.2.2). A CCD-FLAT will be acquired during occultation after the G750L exposure in order to correct for the fringing in this spectral region.

The visit is to be carried out when the binary system is at orbital phase 0.00+/-0.01. This is the eclipse of Star B (=WR) by Star A (=LBV). The orbital period and initial epoch are P=19.2654 d (Breysacher & Sterken 1997) and T0=HJD 2443158.873 (Koenigsberger et al. 2013). Within the time slots given by the Visit Planner, windows of opportunity in 2013 for phase=0.00 for this visit are on: HJD 2456509.795, 2456567.592, 2456586.856 and 2456625.388.

Visit

Proposal 13373, Visit 01, implementation Tue Oct 22 01:15:37 GMT 2013

Diagnostic Status: No Diagnostics

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

Special Requirements: Period 19.2654 D AND ZERO-PHASE HJD2443158.873

Fixed Targets

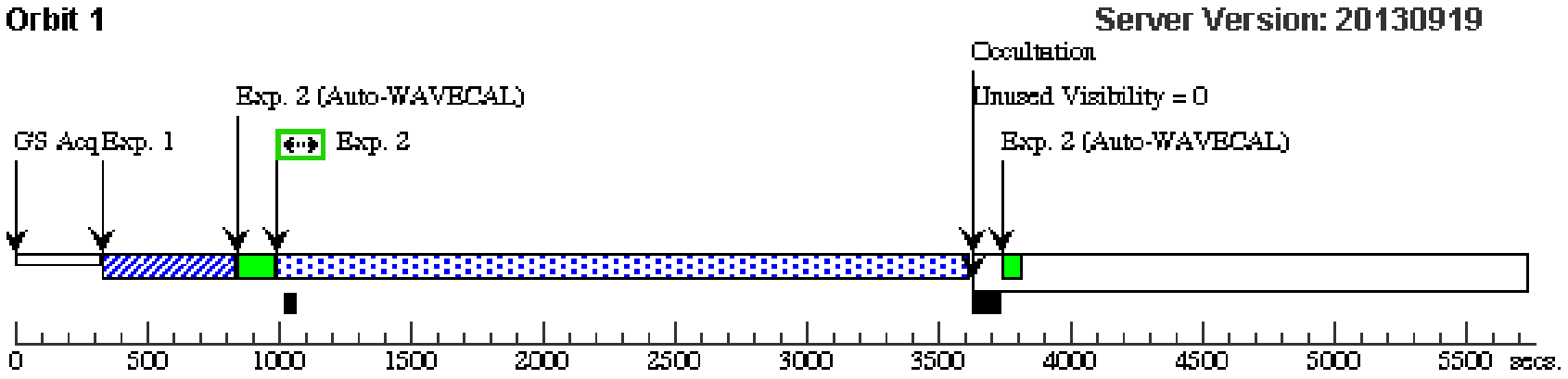
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-5980	RA: 00 59 26.5687 (14.8607029d) Dec: -72 09 53.91 (-72.16498d) Equinox: J2000	Proper Motion RA: -3.50 mas/yr Proper Motion Dec: -2.40 mas/yr Epoch of Position: 2000 Radial Velocity: +150 km/sec	V=11.5+/-0.2 1.0e-11erg/cm^2-s-A @ NV 1240; 1.7e-11 erg/cm^2-s-A @ HeII 1640	Reference Frame: ICRS

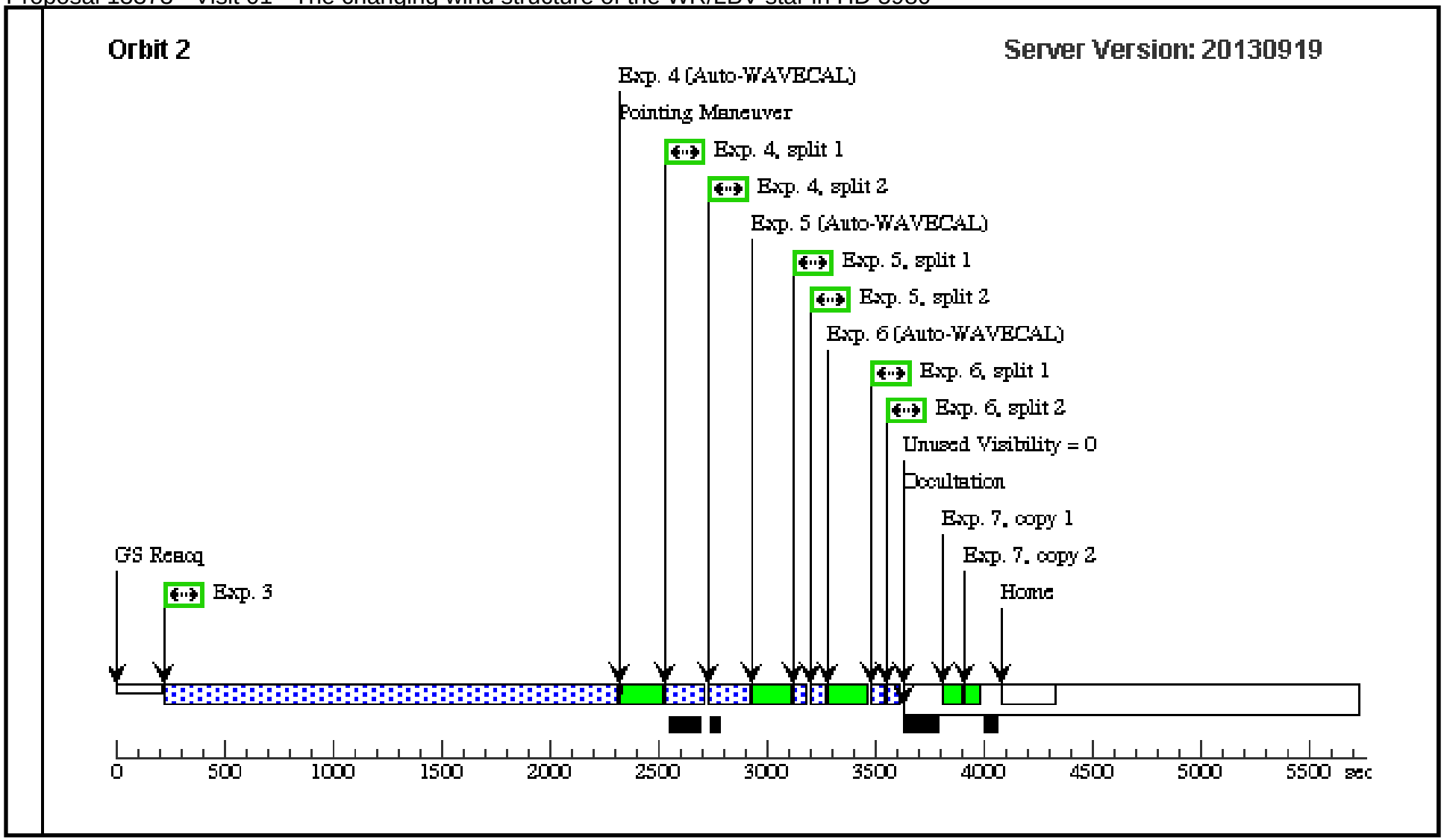
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (515774)	(1) HD-5980	STIS/CCD, ACQ, F28X50OII	MIRROR	ACQTYPE=POINT	PHASE 0.99 TO 0.01		60 Secs (60 Secs) *[==>]*	***[1]***
2	MAMA-E140M (516295)	(1) HD-5980	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A	BINAXIS1=DEF; BINAXIS2=DEF			2608 Secs (2608 Secs) *[==>]*	***[1]***
3	MAMA-E140M-part2 (516822)	(1) HD-5980	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A	BINAXIS1=DEF; BINAXIS2=DEF			2070 Secs (2070 Secs) *[==>]*	***[2]***
4	CCD-G230LB (516293)	(1) HD-5980	STIS/CCD, ACCUM, 52X0.2	G230LB 2375 A				300 Secs (300 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[2]***
5	CCD-G430L (516290)	(1) HD-5980	STIS/CCD, ACCUM, 52X0.2	G430L 4300 A				60 Secs (60 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[2]***
6	CCD-G750L (516289)	(1) HD-5980	STIS/CCD, ACCUM, 52X0.2	G750L 7751 A				60 Secs (60 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[2]***
7	CCD-FLAT	CCDFLAT	STIS/CCD, ACCUM, 0.3X0.09	G750L 7751 A				0.1 Secs X 2 (0.2 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20130919
Exp. 4 (Auto-WAVECAL)
Pointing Maneuver
Exp. 4, split 1
Exp. 4, split 2
Exp. 5 (Auto-WAVECAL)
Exp. 5, split 1
Exp. 5, split 2
Exp. 6 (Auto-WAVECAL)
Exp. 6, split 1
Exp. 6, split 2
Unused Visibility = 0
Occultation
Exp. 7, copy 1
Exp. 7, copy 2
Home
GS Reacq
Exp. 3
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec