15700 - Down the Tube: A 21st Century Study of a Unique Stellar Jet

Cycle: 26, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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	(2) S3UE001085	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	3	01-May-2019 11:00:14.0	yes

3 Total Orbits Used

ABSTRACT

The symbiotic system MWC 560 has the only known spectroscopically observable stellar jet in which we are looking "down the tube" because the jet is oriented directly toward Earth. This orientation, when we take advantage of one of MWC 560's infrequent outbursts to obtain high-resolution UV spectra, offers a unique opportunity to get information about the temperatures, densities, and velocity structure of a stellar jet, probing structures on scales orders of magnitude smaller than can be resolved spatially in any other jet. MWC 560 is having one of the three brightest outbursts in its century-long photometric history. The only other high-resolution UV spectra of MWC 560 were obtained during its 1990 outburst by the IUE satellite. The IUE spectra revealed a rich spectrum of absorption features displaying complext blueshifted absorption up to -6000 km/s with short-timecale variations. These spectra supported a surge of stellar jet modeling. We will obtain UV spectra of MWC 560 using STIS, giving two orders

of magnitude improvement over the IUE data in resolution and time sampling. The vastly improved quality of the STIS data will test and constrain the jet models which were based on the lower-resolution IUE data, and probe jet structure on small scales impossible to resolve spatially in any stellar jet by examining a number of features which were too faint and narrow to be used in the IUE data. Stellar jets are considered physically analogous enough that a detailed study of any jet is valuable and applicable to models of all jets from compact stellar remnants to QSOs. This new data set will support a new generation of jet modeling.

OBSERVING DESCRIPTION

We will use the E140M and E230M to sample the complex spectrum of the "jet" of MWC560. The spectrum shows long and short timescale variability both in the continuum and in the line profiles that sometimes show velocity displacements up to -6000 km/s.

Consequently, we are using the E140M and E230M (centered at 2415 and spanning 2011-2819Ang) in time-tag mode to detect these variations. Of our three orbits, we are devoting 2 orbits to the E140M and 1 orbit to the E230M. Because we want photometric reliability, we are using the 0.2" x 0.2" aperture with no dithering.

Based upon a recent very low resolution Swift spectrum (within the past few weeks) we use a flat continuum with 3.5 to 4.5E-13 ergs/cm^2/s/A in the 2000-2200A region. The continuum has a complex spectrum of strong absorption lines supperposed upon it.

We will take multiple 1030 to 1035 sec time-tag exposures with the E140M in two orbits, and 400s exposures with the E230M in the remaining orbit.

We stress that this object is an irregular variable. We continue to monitor the AAVSO data. And we will try to obtain another Swift exposure closer to time of the scheduled observations. Fluxes can vary by +/- 50%.

Our source is bright. we use buffer times of 100 sec and 467 sec for the E230M and e140M, respectively. To estimate conservative buffer times, we have used an upper limit assuming a constant continnum flux level of 7E-13. The buffer times were derived using the STIS ETC.

Previous IUE spectra of MWC560 obtainied in the 1990 outburst, over a range of flux levels, can be found in Michalitsianos et al (1991), ApJ, 371, 761

Visit

Proposal 15700, Visit 01, implementation Wed May 01 15:00:15 GMT 2019

Diagnostic Status: No Diagnostics

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

Special Requirements: (none)

Fixed Targets

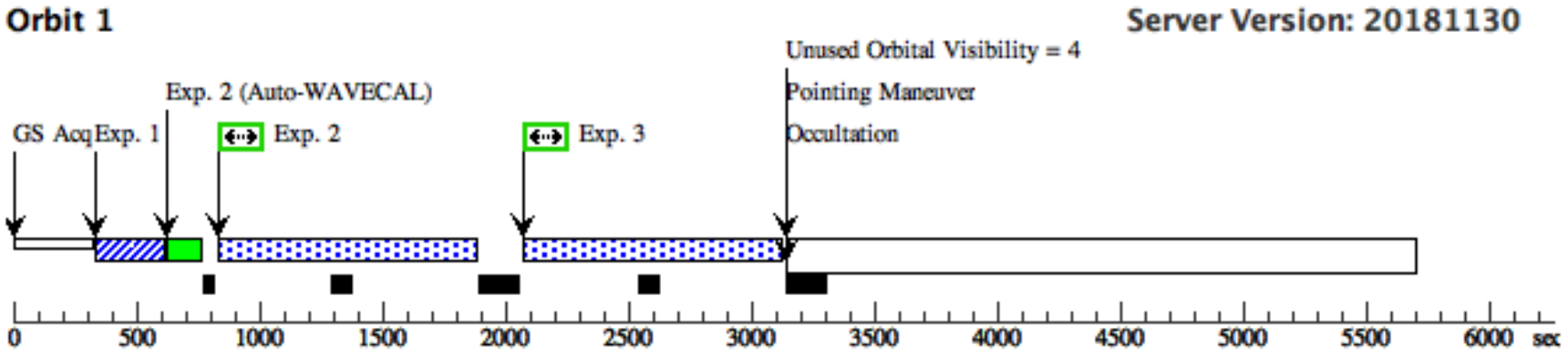
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	S3UE001085	RA: 07 25 51.2842 (111.4636842d) Dec: -07 44 8.15 (-7.73560d) Equinox: J2000	Proper Motion RA: 1.0764627333931312E-4 sec of time/yr Proper Motion Dec: -0.004699999999999989 arcsec/yr Epoch of Position: 2000	V=9.71294	Reference Frame: ICRS

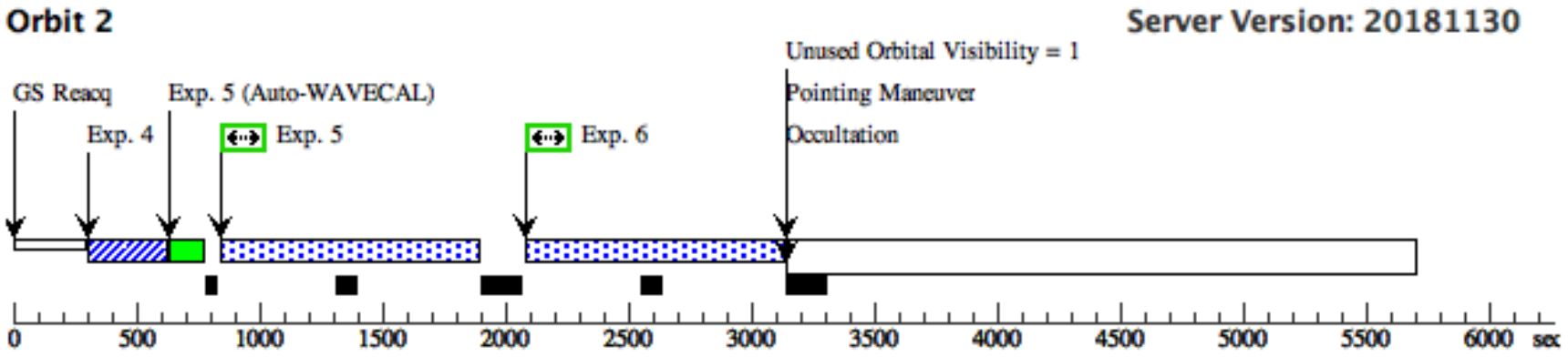
Comments: This object was generated by the targetselector and retrieved from the GSC 2.3 database.
Category=STAR
Description=[CIRCUMSTELLAR MATTER, INTERACTING BINARY, JET, M III-I, SYMBIOTIC STAR]

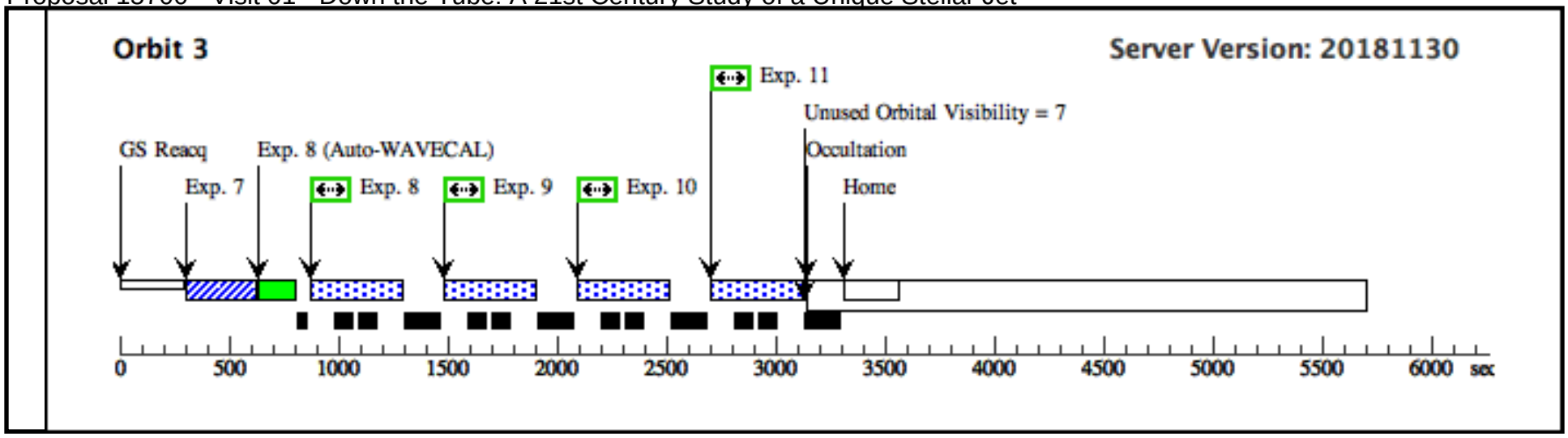
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1351125)	(2) S3UE001085	STIS/CCD, ACQ, F28X50OIII	MIRROR				1.0 Secs (1 Secs) *[==>]*	 ***[1]***
Comments: ACQ for Orbit 1 and E140M Observations.									
2	(1351112)	(2) S3UE001085	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=467			1035 Secs (1035 Secs) *[==>]*	 ***[1]***
Comments: First in a series of two E140M exposures for Orbit 1.									
3	(1351112)	(2) S3UE001085	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=467			1035 Secs (1035 Secs) *[==>]*	 ***[1]***
4	(1351112)	(2) S3UE001085	STIS/CCD, ACQ, F28X50OIII	MIRROR				1.0 Secs (1 Secs) *[==>]*	 ***[2]***
Comments: ACQ for orbit 2 and the continuation of the E140M exposures									
5	(1351112)	(2) S3UE001085	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=467			1030 Secs (1030 Secs) *[==>]*	 ***[2]***
6	(1351112)	(2) S3UE001085	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=467			1030 Secs (1030 Secs) *[==>]*	 ***[2]***
7	(1351125)	(2) S3UE001085	STIS/CCD, ACQ, F28X50OIII	MIRROR				1.0 Secs (1 Secs) *[==>]*	 ***[3]***
Comments: ACQ for Orbit 3 and the E230M exposures.									
8	(135115)	(2) S3UE001085	STIS/NUV-MAMA, TIME-TAG, 0.2X0.2	E230M 2415 A	BUFFER-TIME=110			402 Secs (402 Secs) *[==>]*	 ***[3]***
Comments: First in a series of four E230M exposures									
9	(135115)	(2) S3UE001085	STIS/NUV-MAMA, TIME-TAG, 0.2X0.2	E230M 2415 A	BUFFER-TIME=110			402 Secs (402 Secs) *[==>]*	 ***[3]***
Comments: One of a series of E230M exposures									
10	(135115)	(2) S3UE001085	STIS/NUV-MAMA, TIME-TAG, 0.2X0.2	E230M 2415 A	BUFFER-TIME=110			402 Secs (402 Secs) *[==>]*	 ***[3]***
Comments: One of a series of E230M exposures									
11	(135115)	(2) S3UE001085	STIS/NUV-MAMA, TIME-TAG, 0.2X0.2	E230M 2415 A	BUFFER-TIME=110			402 Secs (402 Secs) *[==>]*	 ***[3]***
Comments: One of a series of E230M exposures									

Orbit Structure






Orbit 3
Server Version: 20181130
Exp. 11
Unused Orbital Visibility = 7
GS Reacq
Exp. 8 (Auto-WAVECAL)
Occultation
Exp. 7
Exp. 8
Exp. 9
Exp. 10
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec