16449 - Testing the Lyman Alpha reconstructions vital for stellar and exoplanet astronomy

Cycle: 28, Proposal Category: GO

(UV Initiative)

(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-EG-UMA	STIS/CCD STIS/FUV-MAMA	1	07-Apr-2021 17:00:51.0	yes
02	(1) V-EG-UMA	STIS/CCD STIS/FUV-MAMA	1	07-Apr-2021 17:00:52.0	yes
03	(1) V-EG-UMA	STIS/CCD STIS/FUV-MAMA	1	07-Apr-2021 17:00:53.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
53	(1) V-EG-UMA	STIS/CCD STIS/FUV-MAMA	1	07-Apr-2021 17:00:53.0	yes
04	(1) V-EG-UMA	STIS/CCD STIS/FUV-MAMA	1	07-Apr-2021 17:00:54.0	yes

5 Total Orbits Used

ABSTRACT

The HI Lyman alpha line dominates the ultraviolet emission of late type-stars. Observing Lyman alpha is vital for projects that wish to understand the chromospheric structure and behaviour of stars, as well as modeling the chemistry and characteristics of exoplanetary atmospheres. However, observing the Lyman alpha line is extremely difficult due to obscuration from the Interstellar Medium and telluric airglow. The numerous HST programs observing Lyman alpha lines rely on reconstruction models, which take what parts of the line can be observed and, via various recipes, infer the integrated flux and profile of the rest of the line. Testing the accuracy of such reconstruction techniques is difficult, requiring a system where the line can be observed in an obscured state and compared with the unobscured line. We have identified a system where this is possible: A close white dwarf-M dwarf binary where the high radial velocity change over the binary orbit moves the M dwarf Lyman alpha line in and out of obscuration. We propose to obtain phase-resolved STIS spectroscopy of the system to observe the Lyman alpha line at different levels of obscuration, which will then be tested against the maximum velocity, unobscured line. We describe our detailed planning of the experimental set up to calculate the small investment of HST time required and account for complexities such as flaring and coronal heating. This experiment will provide an unprecedented test of the Lyman alpha reconstructions that are at the heart of multiple past, present and (most likely) future HST programs.

OBSERVING DESCRIPTION

The target is EG Uma, a post common envelope binary consisting of a white dwaf and an M dwarf. The four observations will obtain phase-resolved spectroscopy of the M dwarf Lyman alpha line emission line.

The period is given by https://ui.adsabs.harvard.edu/abs/2000MNRAS.312...70B/abstract as HJD = 2449800:79131(58)+66765930(57), where the ephermeris is the blue-to-red crossing time of the radial velocity curve of the M dwarf.

The four observations will observe the Lyman alpha line at four phases, measureing the line at different velocities. The ~16hr orbital period means

that the velocity does not change by much during an HST orbit, increasing the scheduling flexability:

Visit 01 should be obtained between phase 0.95 and 0.05. We expect to detect the wings of the Lyman alpha ine with S/N 10-20.

Visit 02 should be obtained between phase 0.2 and 0.3. We expect to detect most of the Lyman alpha ine with S/N ~30.

Visit 03 should be obtailed between phase 0.45 and 0.55. We expect to detect the wings of the Lyman alpha ine with S/N 10-20.

Vist 04 should be obtained between 0.7 and 0.8, at maxmium radial veloctiy, This is the key observation of the proposal, when the Lyman alpha line will be clear of airglow and ISM absorption. We expect to detect the peak of the Lyman alpha ine with S/N 30-40.

Note that Figure 2 of the proposal is out by phase = 0.5, the numbers here are correct.

The order in which the observations are taken is unimportant.

To increase flexability, Visits 01 and 03 may be obtained at the same phase (either 0.95-0.05 or 0.45-0.55) if scheduling them at different phases is impossible. Visit 02 can also be moved to phase 0.7-0.8 for a minor loss in scientific return.

Visit

Proposal 16449, Visit 01, completed Wed Apr 07 21:00:54 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%; BETWEEN 09-FEB-2021:00:00:00 AND 03-MAY-2021:00:00:00; BETWEEN 09-AUG-2021:00:00:00 AND 11-NOV-2021:00:00:00; Period 0.66765930 D AND ZERO-PHASE HJD2449800.79131

Fixed Targets

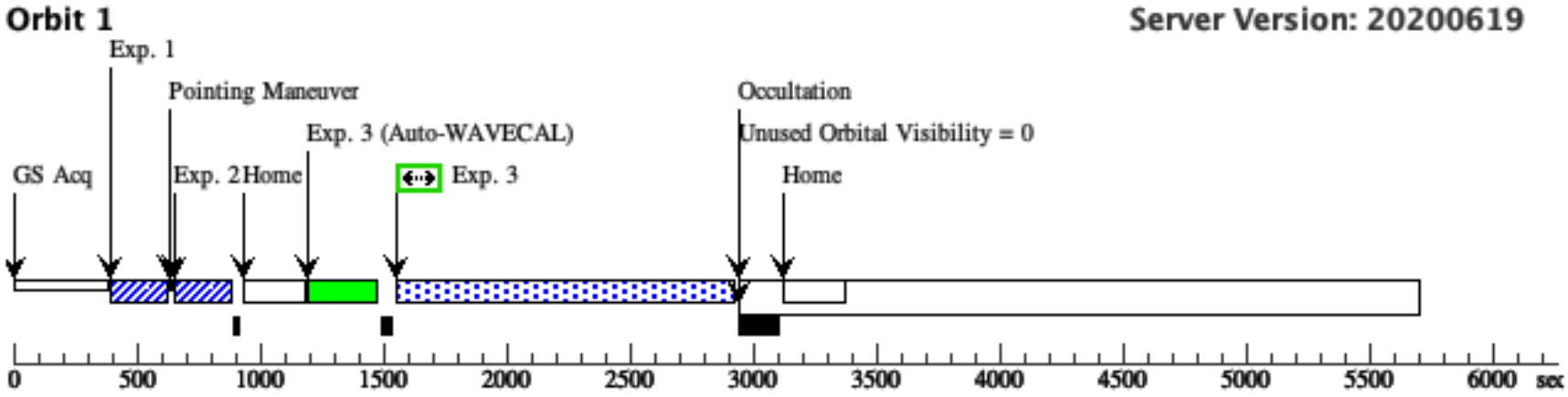
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-EG-UMA	RA: 12 15 43.9444 (183.9331017d) Dec: +52 30 59.24 (52.51646d) Equinox: J2000	Proper Motion RA: -0.009911587420233209 sec of time/yr Proper Motion Dec: -0.13201300000673655 arcsec/yr Epoch of Position: 2015.5	V=13.23	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=EXT-STAR
Description=[DA, M V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1471501)	(1) V-EG-UMA	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs)	
								[==>]	***[1]***
2	(1471502)	(1) V-EG-UMA	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				1 Secs (1 Secs)	
								[==>]	***[1]***
3	(1471505)	(1) V-EG-UMA	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	BUFFER-TIME=7930	PHASE 0.95 TO 0.05		1000 Secs (1358 Secs)	
								[==>1358.0 Secs]	***[1]***

Orbit Structure



Visit

Proposal 16449, Visit 02, completed Wed Apr 07 21:00:55 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%; BETWEEN 09-FEB-2021:00:00:00 AND 03-MAY-2021:00:00:00; BETWEEN 09-AUG-2021:00:00:00 AND 11-NOV-2021:00:00:00; Period 0.66765930 D AND ZERO-PHASE HJD2449800.79131

Fixed Targets

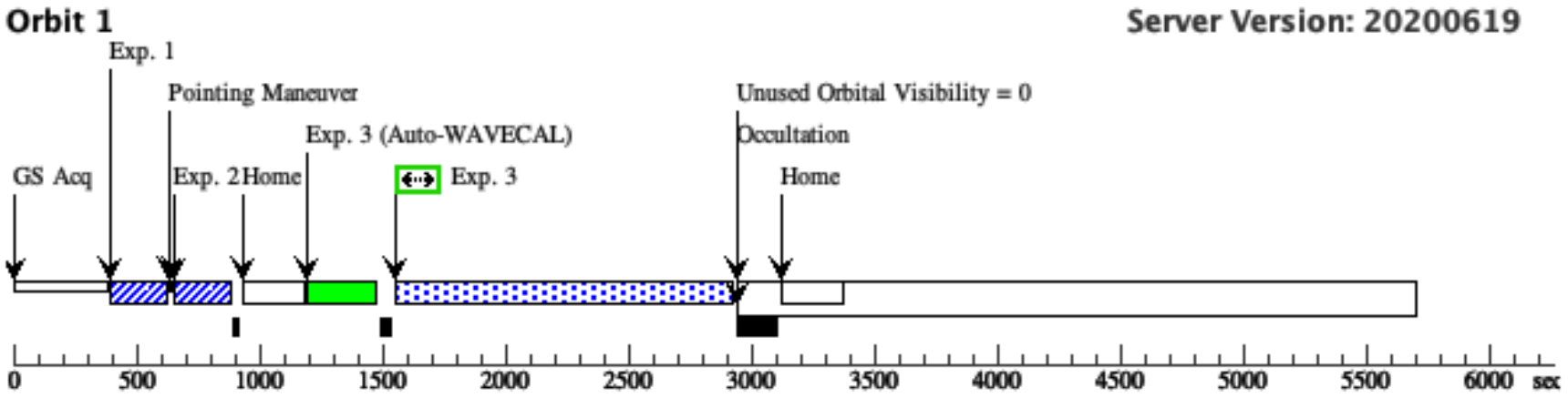
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-EG-UMA	RA: 12 15 43.9444 (183.9331017d) Dec: +52 30 59.24 (52.51646d) Equinox: J2000	Proper Motion RA: -0.009911587420233209 sec of time/yr Proper Motion Dec: -0.13201300000673655 arcsec/yr Epoch of Position: 2015.5	V=13.23	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=EXT-STAR
Description=[DA, M V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1471501)	(1) V-EG-UMA	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs)	
								[==>]	***[1]***
2	(1471502)	(1) V-EG-UMA	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				1 Secs (1 Secs)	
								[==>]	***[1]***
3	(1471505)	(1) V-EG-UMA	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	BUFFER-TIME=7930	PHASE 0.2 TO 0.3		1400 Secs (1358 Secs)	
								[==>1358.0 Secs]	***[1]***

Orbit Structure



Visit

Proposal 16449, Visit 03, failed Wed Apr 07 21:00:55 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%; BETWEEN 09-FEB-2021:00:00:00 AND 03-MAY-2021:00:00:00; BETWEEN 09-AUG-2021:00:00:00 AND 11-NOV-2021:00:00:00; Period 0.66765930 D AND ZERO-PHASE HJD2449800.79131

Fixed Targets

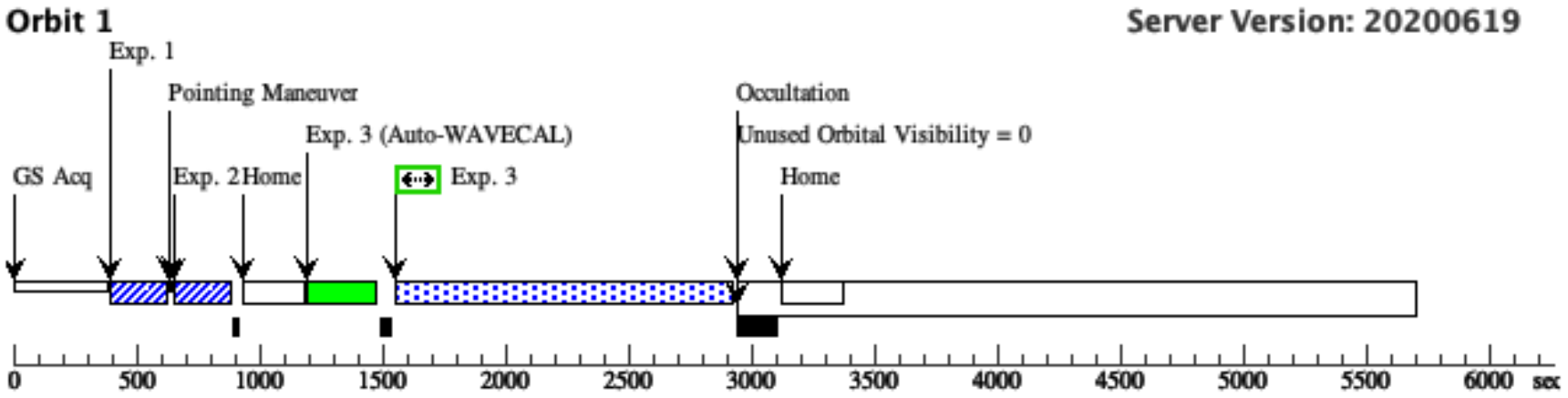
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-EG-UMA	RA: 12 15 43.9444 (183.9331017d) Dec: +52 30 59.24 (52.51646d) Equinox: J2000	Proper Motion RA: -0.009911587420233209 sec of time/yr Proper Motion Dec: -0.13201300000673655 arcsec/yr Epoch of Position: 2015.5	V=13.23	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=EXT-STAR
Description=[DA, M V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1471501)	(1) V-EG-UMA	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs)	
								[==>]	***[1]***
2	(1471502)	(1) V-EG-UMA	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				1 Secs (1 Secs)	
								[==>]	***[1]***
3	(1471505)	(1) V-EG-UMA	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	BUFFER-TIME=7930	PHASE 0.45 TO 0.55		1400 Secs (1358 Secs)	
								[==>1358.0 Secs]	***[1]***

Orbit Structure



Visit

Proposal 16449, Visit 53 Wed Apr 07 21:00:55 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%; BETWEEN 09-FEB-2021:00:00:00 AND 03-MAY-2021:00:00:00; BETWEEN 09-AUG-2021:00:00:00 AND 11-NOV-2021:00:00:00; Period 0.66765930 D AND ZERO-PHASE HJD2449800.79131

Comments: Repeat of Visit 03

Fixed Targets

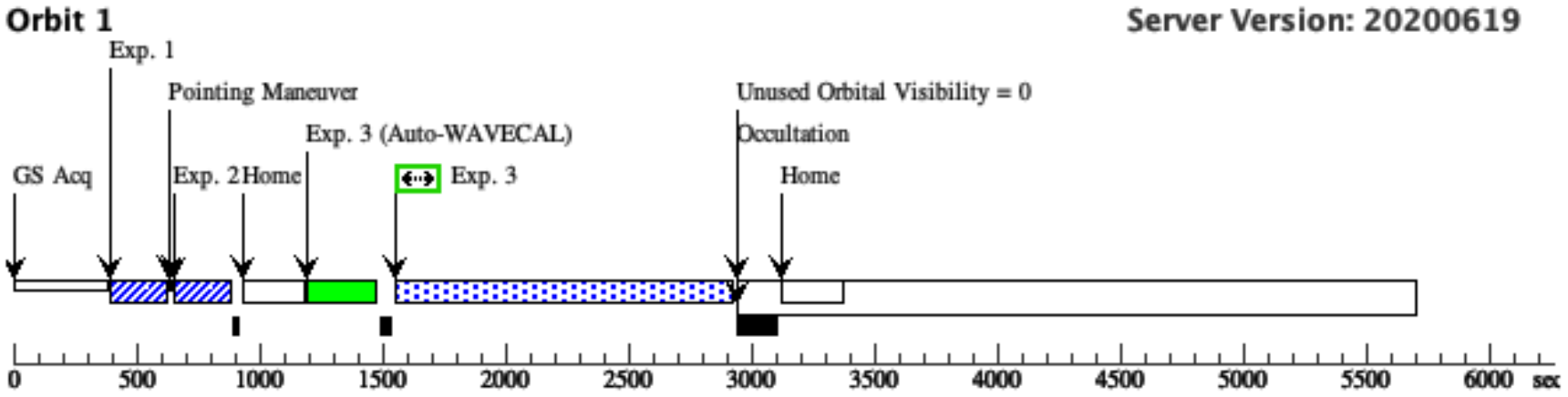
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-EG-UMA	RA: 12 15 43.9444 (183.9331017d) Dec: +52 30 59.24 (52.51646d) Equinox: J2000	Proper Motion RA: -0.009911587420233209 sec of time/yr Proper Motion Dec: -0.13201300000673655 arcsec/yr Epoch of Position: 2015.5	V=13.23	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=EXT-STAR
Description=[DA, M V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1471501)	(1) V-EG-UMA	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	(1471502)	(1) V-EG-UMA	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
3	(1471505)	(1) V-EG-UMA	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	BUFFER-TIME=7930	PHASE 0.45 TO 0.55		1400 Secs (1358 Secs) *[==>1358.0 Secs]*	 ***[1]***

Orbit Structure



Visit

Proposal 16449, Visit 04, completed Wed Apr 07 21:00:55 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%; BETWEEN 09-FEB-2021:00:00:00 AND 03-MAY-2021:00:00:00; BETWEEN 09-AUG-2021:00:00:00 AND 11-NOV-2021:00:00:00; Period 0.66765930 D AND ZERO-PHASE HJD2449800.79131

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-EG-UMA	RA: 12 15 43.9444 (183.9331017d) Dec: +52 30 59.24 (52.51646d) Equinox: J2000	Proper Motion RA: -0.009911587420233209 sec of time/yr Proper Motion Dec: -0.13201300000673655 arcsec/yr Epoch of Position: 2015.5	V=13.23	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=EXT-STAR
Description=[DA, M V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1471501)	(1) V-EG-UMA	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs)	
								[==>]	***[1]***
2	(1471502)	(1) V-EG-UMA	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				1 Secs (1 Secs)	
								[==>]	***[1]***
3	(1471505)	(1) V-EG-UMA	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	BUFFER-TIME=7930	PHASE 0.7 TO 0.8		1400 Secs (1358 Secs)	
								[==>1358.0 Secs]	***[1]***

Orbit Structure