16696 - A dormant black hole or a stripped Helium star in a massive binary system

Cycle: 29, 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) HD-130298 WAVE	STIS/CCD STIS/FUV-MAMA	1	07-Sep-2021 12:00:17.0	yes
02	(1) HD-130298 WAVE	STIS/CCD STIS/FUV-MAMA	1	07-Sep-2021 12:00:18.0	yes
03	(1) HD-130298 WAVE	STIS/CCD STIS/FUV-MAMA	1	07-Sep-2021 12:00:19.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
04	(1) HD-130298 WAVE	STIS/CCD STIS/FUV-MAMA	1	07-Sep-2021 12:00:20.0	yes
05	(1) HD-130298 WAVE	STIS/CCD STIS/FUV-MAMA	1	07-Sep-2021 12:00:21.0	yes
06	(1) HD-130298 WAVE	STIS/CCD STIS/FUV-MAMA	1	07-Sep-2021 12:00:21.0	yes
07	(1) HD-130298 WAVE	STIS/CCD STIS/FUV-MAMA	1	07-Sep-2021 12:00:22.0	yes
08	(1) HD-130298 WAVE	STIS/CCD STIS/FUV-MAMA	1	07-Sep-2021 12:00:23.0	yes

8 Total Orbits Used

ABSTRACT

The quest for dormant stellar-mass black holes (BHs) in massive binaries (i.e., OB+BH systems) is raging. All the candidates proposed so far have been heavily disputed in the weeks following their report. Combining a literature search and archival spectroscopic data with innovative analysis techniques, we have identified two promising massive binaries harboring unseen companions with masses above the BH-mass limit, and for which simulations could discard the presence of a 5Msun main-sequence stellar companion. Here we request STIS/FUV spectroscopy of the best candidate (that with the heaviest companion mass) to unveil or discard the presence of a hot, Helium stripped star as the unseen companion. A Helium stripped star would indeed contribute very little to the system optical flux, but its contribution would become more significant in the far-UV. Should the proposed observations fail to reveal such hot companion, this project will prove beyond doubt the presence of a BH, with important consequences on the evolution of gravitational-wave progenitors and the debated presence of a kick accompanying BH formation. Either outcome -- either a Helium stripped star or a dormant BH -- will result in a significant leap forward in our understanding of the evolution of massive stars, but only the FUV capabilities of HST can discriminate between both scenarios.

OBSERVING DESCRIPTION

8-epoch FUV/STIS spectroscopy of a single target. 8 visits (1epoch per visit).

Phase constraint are given for each observations of this 14d-period binary

GA WAVECAL have been manually placed after the science exposure to optimize science exposure duration

Impact of reduced-gyro operations on the program: none expected unless the visibility of the visits are strongly reduced

BOT: Galex observations are available. Both the GSC&Galex BOT as well as ETC computations confirm the target is safe

Visit

Proposal 16696, Visit 01, implementation Tue Sep 07 16:00:24 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: Period 14.6316221 D AND ZERO-PHASE HJD2454217.78206

Fixed Targets

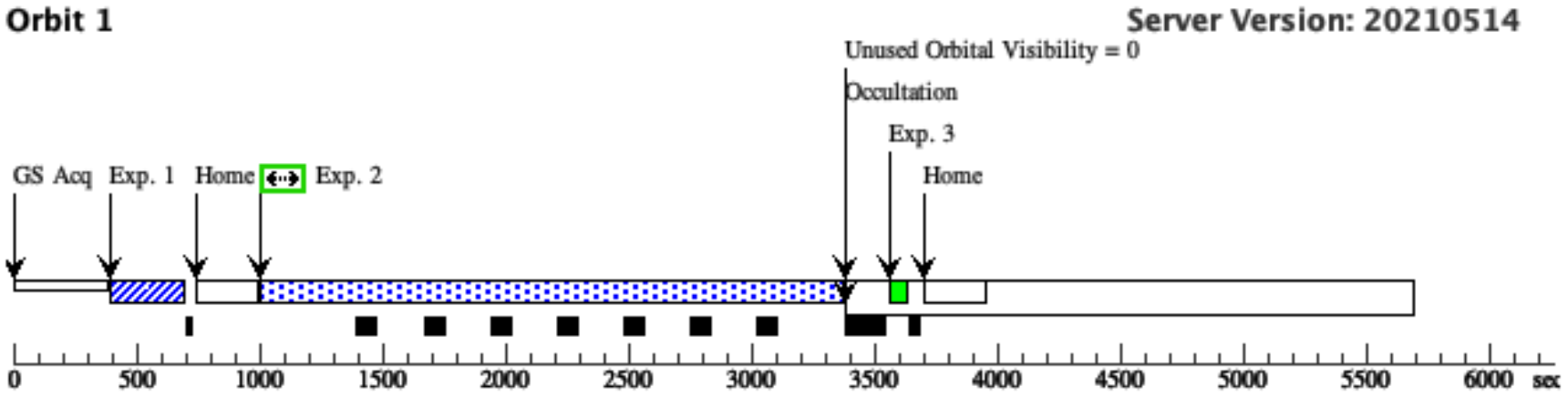
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-130298	RA: 14 49 33.7650 (222.3906875d) Dec: -56 25 38.47 (-56.42735d) Equinox: J2000	Proper Motion RA: -0.006458 arcsec/yr Proper Motion Dec: -0.001290 arcsec/yr Epoch of Position: 2000	V=9.83 U=9.14, G=9.1143	Reference Frame: ICRS

Comments:
Category=STAR
Description=[GIANT O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1476033)	(1) HD-130298	STIS/CCD, ACQ, F25ND3	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	(STIS.sp.1476058)	(1) HD-130298	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=2700; WAVECAL=NO	PHASE .97 TO 0.03		2400 Secs (2232 Secs) *[==>2232.0 Secs]*	 ***[1]***
3		WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16696, Visit 02, implementation Tue Sep 07 16:00:24 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: Period 14.6316221 D AND ZERO-PHASE HJD2454217.78206

Fixed Targets

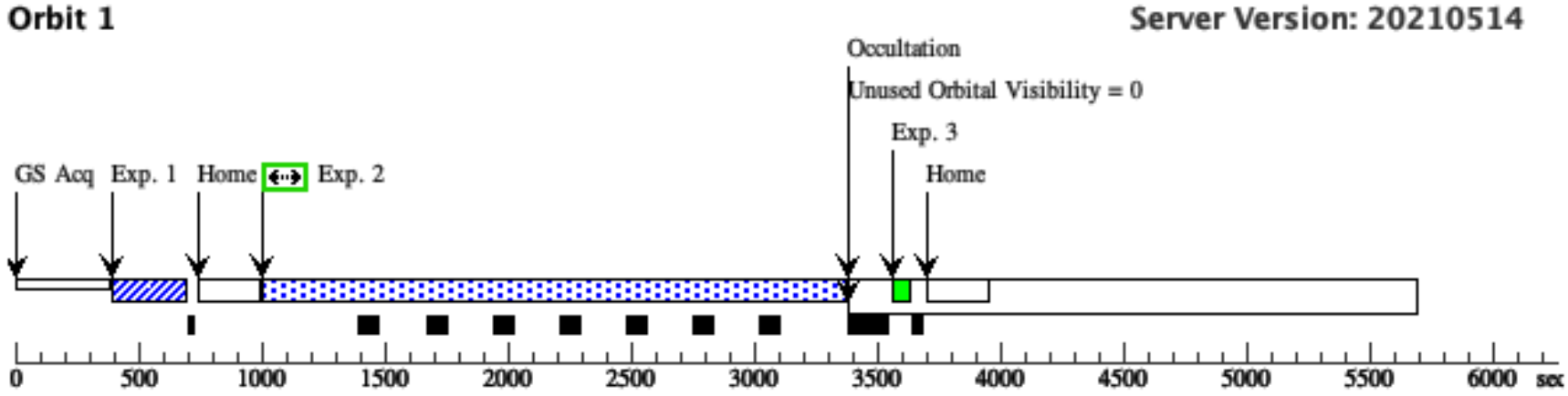
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-130298	RA: 14 49 33.7650 (222.3906875d) Dec: -56 25 38.47 (-56.42735d) Equinox: J2000	Proper Motion RA: -0.006458 arcsec/yr Proper Motion Dec: -0.001290 arcsec/yr Epoch of Position: 2000	V=9.83 U=9.14, G=9.1143	Reference Frame: ICRS

Comments:
Category=STAR
Description=[GIANT O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1476033)	(1) HD-130298	STIS/CCD, ACQ, F25ND3	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	(STIS.sp.1476058)	(1) HD-130298	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=2700; WAVECAL=NO	PHASE .03 TO 0.08		2400 Secs (2232 Secs) *[==>2232.0 Secs]*	 ***[1]***
3		WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16696, Visit 03, implementation Tue Sep 07 16:00:24 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: Period 14.6316221 D AND ZERO-PHASE HJD2454217.78206

Fixed Targets

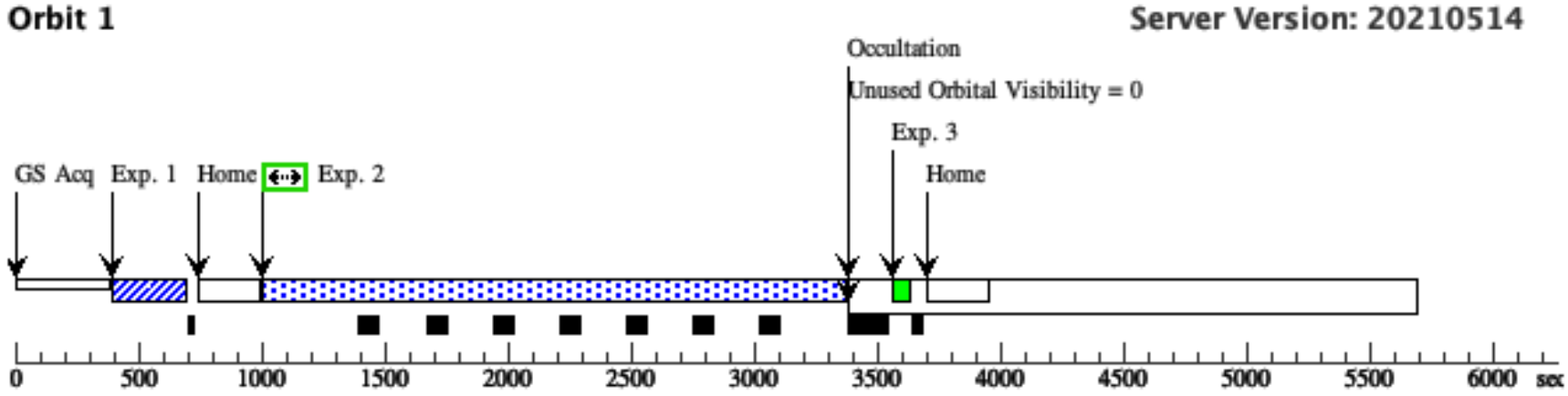
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-130298	RA: 14 49 33.7650 (222.3906875d) Dec: -56 25 38.47 (-56.42735d) Equinox: J2000	Proper Motion RA: -0.006458 arcsec/yr Proper Motion Dec: -0.001290 arcsec/yr Epoch of Position: 2000	V=9.83 U=9.14, G=9.1143	Reference Frame: ICRS

Comments:
Category=STAR
Description=[GIANT O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1476033)	(1) HD-130298	STIS/CCD, ACQ, F25ND3	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	(STIS.sp.1476058)	(1) HD-130298	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=2700; WAVECAL=NO	PHASE .08 TO 0.2		2400 Secs (2232 Secs) *[==>2232.0 Secs]*	 ***[1]***
3		WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16696, Visit 04, implementation Tue Sep 07 16:00:24 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: Period 14.6316221 D AND ZERO-PHASE HJD2454217.78206

Fixed Targets

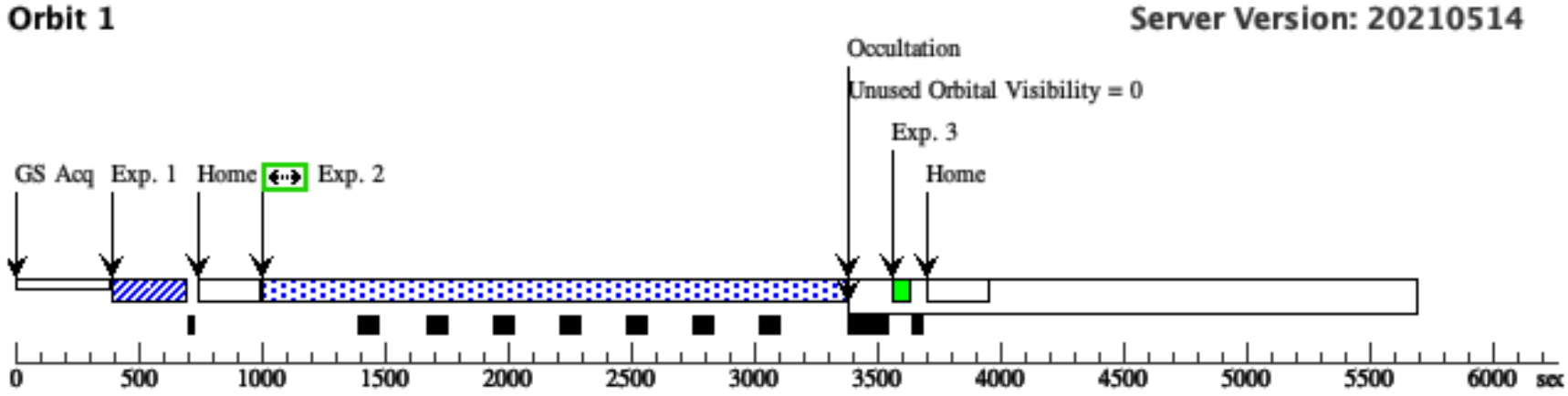
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-130298	RA: 14 49 33.7650 (222.3906875d) Dec: -56 25 38.47 (-56.42735d) Equinox: J2000	Proper Motion RA: -0.006458 arcsec/yr Proper Motion Dec: -0.001290 arcsec/yr Epoch of Position: 2000	V=9.83 U=9.14, G=9.1143	Reference Frame: ICRS

Comments:
Category=STAR
Description=[GIANT O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1476033)	(1) HD-130298	STIS/CCD, ACQ, F25ND3	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	(STIS.sp.1476058)	(1) HD-130298	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=2700; WAVECAL=NO	PHASE .2 TO 0.4		2400 Secs (2232 Secs) *[==>2232.0 Secs]*	 ***[1]***
3		WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16696, Visit 05, implementation Tue Sep 07 16:00:24 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: Period 14.6316221 D AND ZERO-PHASE HJD2454217.78206

Fixed Targets

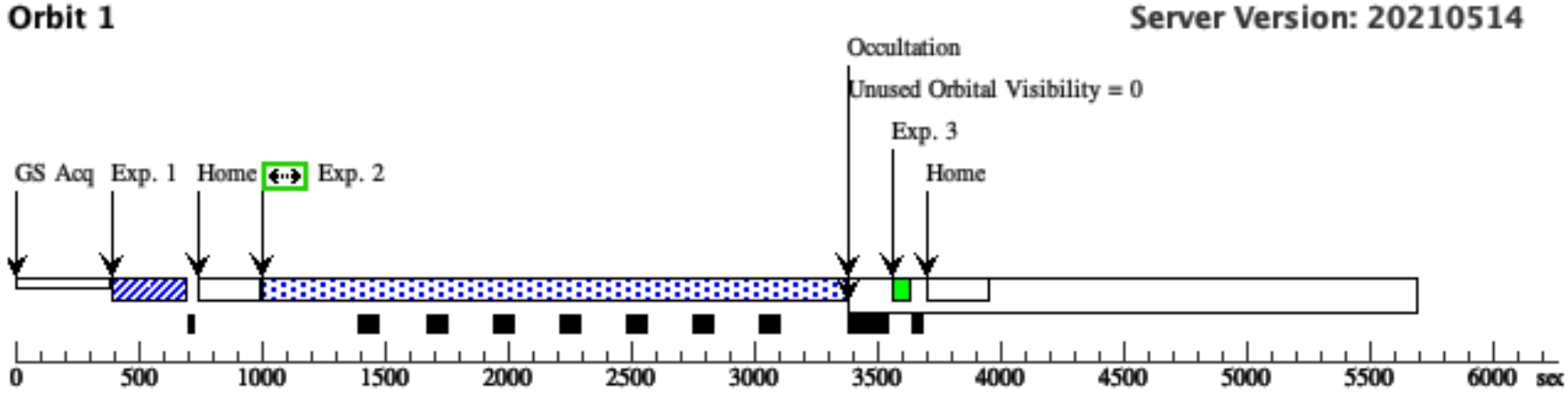
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-130298	RA: 14 49 33.7650 (222.3906875d) Dec: -56 25 38.47 (-56.42735d) Equinox: J2000	Proper Motion RA: -0.006458 arcsec/yr Proper Motion Dec: -0.001290 arcsec/yr Epoch of Position: 2000	V=9.83 U=9.14, G=9.1143	Reference Frame: ICRS

Comments:
Category=STAR
Description=[GIANT O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1476033)	(1) HD-130298	STIS/CCD, ACQ, F25ND3	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	(STIS.sp.1476058)	(1) HD-130298	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=2700; WAVECAL=NO	PHASE .4 TO 0.6		2400 Secs (2232 Secs) *[==>2232.0 Secs]*	 ***[1]***
3		WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16696, Visit 06, implementation Tue Sep 07 16:00:24 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: Period 14.6316221 D AND ZERO-PHASE HJD2454217.78206

Fixed Targets

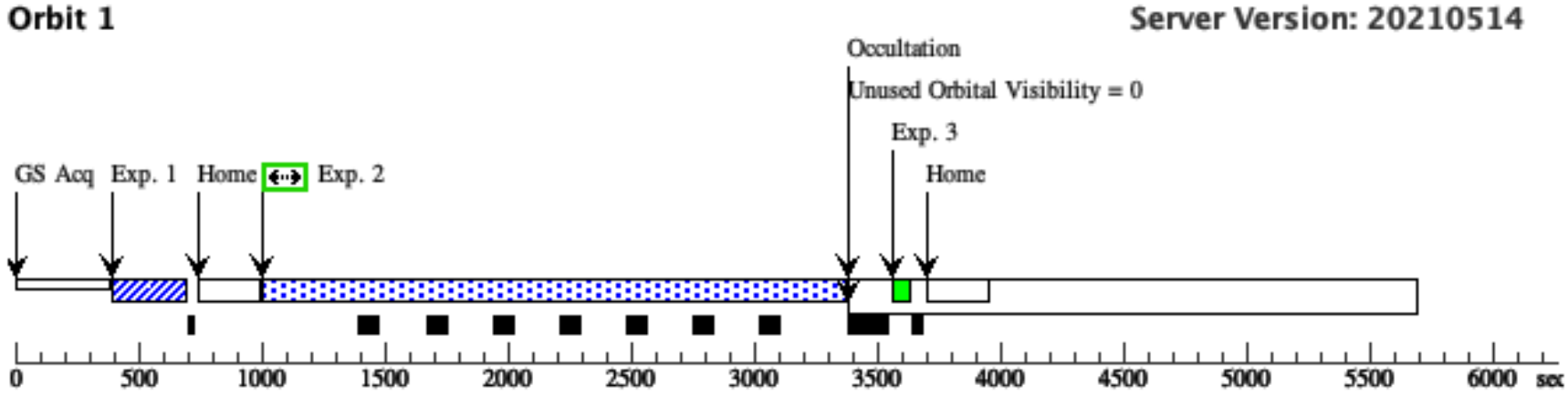
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-130298	RA: 14 49 33.7650 (222.3906875d) Dec: -56 25 38.47 (-56.42735d) Equinox: J2000	Proper Motion RA: -0.006458 arcsec/yr Proper Motion Dec: -0.001290 arcsec/yr Epoch of Position: 2000	V=9.83 U=9.14, G=9.1143	Reference Frame: ICRS

Comments:
Category=STAR
Description=[GIANT O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1476033)	(1) HD-130298	STIS/CCD, ACQ, F25ND3	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	(STIS.sp.1476058)	(1) HD-130298	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=2700; WAVECAL=NO	PHASE .6 TO 0.85		2400 Secs (2232 Secs) *[==>2232.0 Secs]*	 ***[1]***
3		WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16696, Visit 07, implementation Tue Sep 07 16:00:24 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: Period 14.6316221 D AND ZERO-PHASE HJD2454217.78206

Fixed Targets

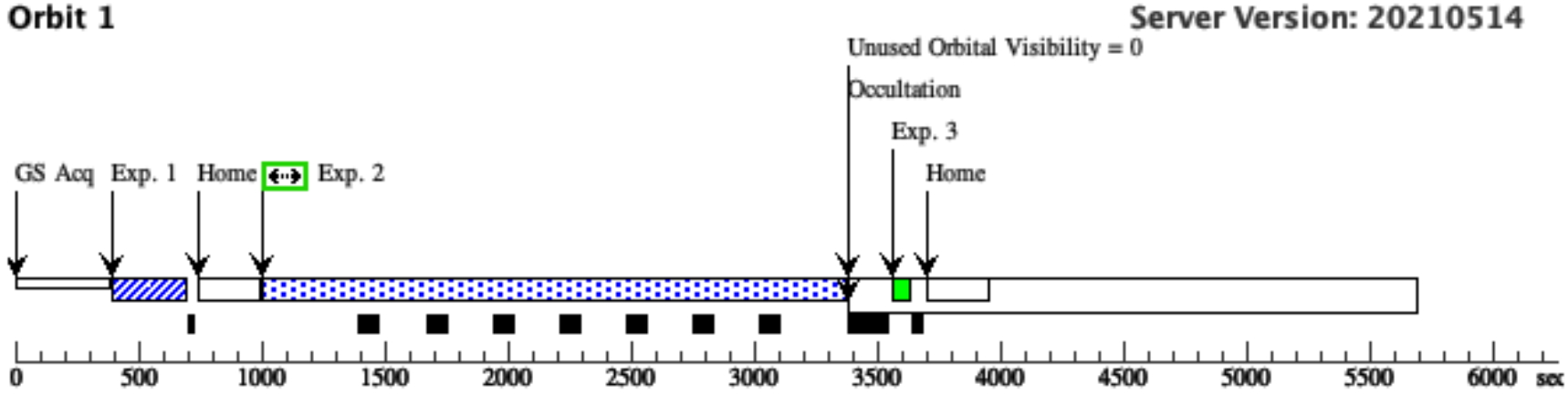
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-130298	RA: 14 49 33.7650 (222.3906875d) Dec: -56 25 38.47 (-56.42735d) Equinox: J2000	Proper Motion RA: -0.006458 arcsec/yr Proper Motion Dec: -0.001290 arcsec/yr Epoch of Position: 2000	V=9.83 U=9.14, G=9.1143	Reference Frame: ICRS

Comments:
Category=STAR
Description=[GIANT O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1476033)	(1) HD-130298	STIS/CCD, ACQ, F25ND3	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	(STIS.sp.1476058)	(1) HD-130298	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=2700; WAVECAL=NO	PHASE .85 TO 0.92		2400 Secs (2232 Secs) *[==>2232.0 Secs]*	 ***[1]***
3		WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16696, Visit 08, implementation Tue Sep 07 16:00:24 GMT 2021

Diagnostic Status: No Diagnostics

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

Special Requirements: Period 14.6316221 D AND ZERO-PHASE HJD2454217.78206

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-130298	RA: 14 49 33.7650 (222.3906875d) Dec: -56 25 38.47 (-56.42735d) Equinox: J2000	Proper Motion RA: -0.006458 arcsec/yr Proper Motion Dec: -0.001290 arcsec/yr Epoch of Position: 2000	V=9.83 U=9.14, G=9.1143	Reference Frame: ICRS

Comments:
Category=STAR
Description=[GIANT O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1476033)	(1) HD-130298	STIS/CCD, ACQ, F25ND3	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	(STIS.sp.1476058)	(1) HD-130298	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=2700; WAVECAL=NO	PHASE .92 TO 0.97		2400 Secs (2232 Secs) *[==>2232.0 Secs]*	 ***[1]***
3		WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***

Orbit Structure