17299 - A detailed far-ultraviolet study of the planetary debris accreting onto the magnetic white dwarf Feige 7

Cycle: 30, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Prof. Boris T. Gaensicke (PI) (ESA Member) (Contact)	**The University of Warwick**
Prof. Stella Stopkowicz (CoI) (ESA Member)	Universität des Saarlandes
Dr. John D. Landstreet (CoI) (CSA Member)	The University of Western Ontario

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(2) FEIGE-7	COS/FUV	4	11-Jun-2024 13:00:22.0	yes
03	(2) FEIGE-7	COS/FUV	4	11-Jun-2024 13:00:23.0	yes
02	(2) FEIGE-7	COS/FUV	4	11-Jun-2024 13:00:25.0	yes

12 Total Orbits Used

ABSTRACT

Both photospheric metal pollution from the accretion of planetary debris, and strong (>MG) fields are, separately, detected among ~20% of all white dwarfs. However, the two features combined have so far only been observed in cool (<10000K) and old (>1Gyr) white dwarfs. The reason for this clustering is not well understood, but it may be related to how planet formation and the formation of magnetic fields depend on the white dwarf progenitor mass. We have identified Feige 7 as the first warm (~20000K) young (~200Myr) and strongly magnetic (~18MG) white dwarf that is

actively accreting the debris of tidally disrupted planetesimals. The discovery of this system opens up the unprecedented opportunity to study atomic physics of C, Si, and potentially O, S, and Fe in an field that is orders of magnitude higher than what can be achieved in a laboratory on Earth. Modelling the Zeeman-split metal transitions, we will measure the photospheric abundances and infer the composition of the planetary debris. Comparison of these results with published composition studies will reveal if Feige 7 is distinct from the well-studied non-magnetic white dwarfs accreting planetary debris. Using spin-phase resolved spectroscopy, we will map both the magnetic field topology (from the Ly alpha Zeeman components) and the surface distribution of the accreted debris. This will represent the first detailed study of the accretion process, and inform our understanding of the lateral spreading of the planetary material accreted onto the white dwarf.

OBSERVING DESCRIPTION

The goal of these COS observations is to obtain phase-resolved COS/G130M FUV spectroscopy of the magnetic white dwarf Feige 77, fully sampling its spin period of 2.2h.

The beat with the 96min HST orbit requires four consecutive orbits to achieve this goal.

We split the observations into two visits, using each 1222A and 1291A as central wavelengths in one of them.

Visit 1 (1291A) only uses FP-POS=3,4 because of the COS 2025 policy, which generates a warning message.

Visit 2 (1222A) uses FP-POS=1,2,3,4.

Apart from impacting the schedulability of this program, we do not foresee any negative effect should HST drop to a 2-gyro mode.

This target (WDJ004345.98-100025.02 = Feige 7) was previously observed with COS/G130M as part of program 16642, the maximum flux level is ~1.5e-13erg/cm2/s/A. We use the same target acquisition as in the previous observation.

https://archive.stsci.edu/cgi-bin/mastpreview?mission=hst&dataid=LEQC20010

Visit

Proposal 17299, Visit 1 (01), failed Tue Jun 11 17:00:26 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: Only two FP-POS settings allowed for the 1291A central wavelength.

Diagnostics

(Visit 1 (01)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

(Visit 1 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 1 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 1 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 1 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

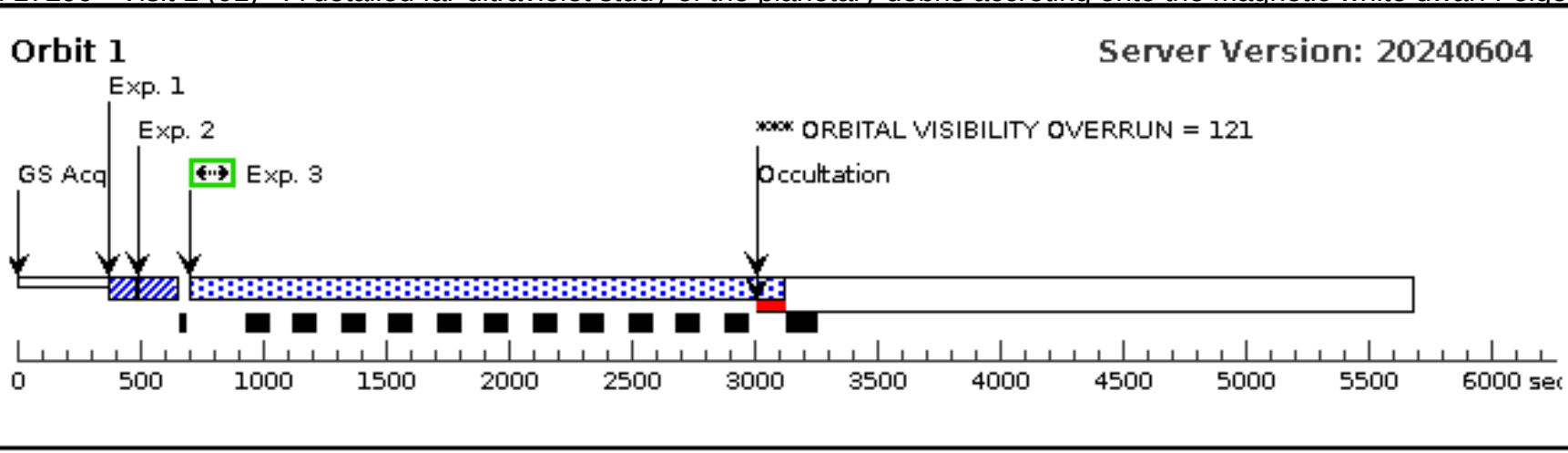
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	FEIGE-7	RA: 00 43 45.8278 (10.9409492d) Dec: -10 00 27.17 (-10.00755d) Equinox: J2000	Proper Motion RA: -145.631 mas/yr Proper Motion Dec: -134.876 mas/yr Epoch of Position: 2016.0	V=14.5+/-0.05	Reference Frame: ICRS

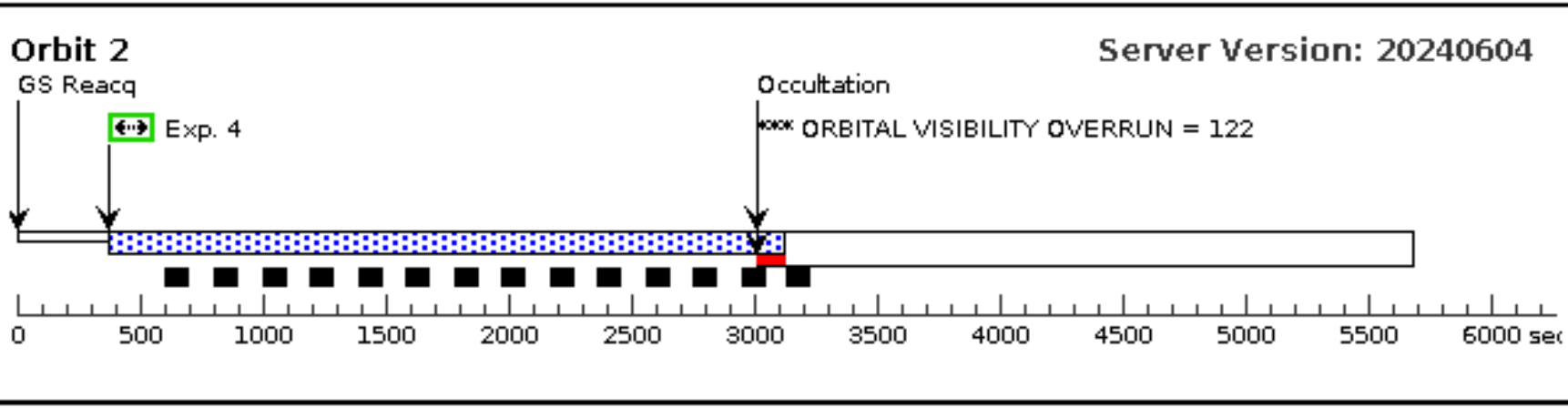
Comments: This target was previously observed with COS/G130M (exposure LEQC20010, https://archive.stsci.edu/cgi-bin/mastpreview?mission=hst&dataid=LEQC20010), the maximum flux level is ~1.5e-13erg/cm2/s/A.
Category=STAR
Description=[DB]
Extended=NO

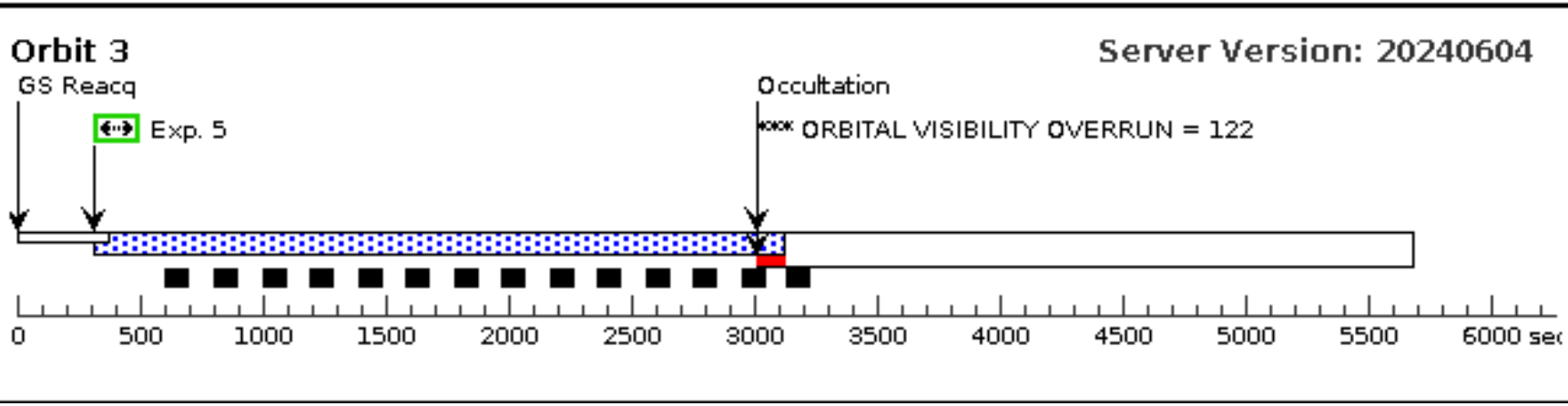
Exposures

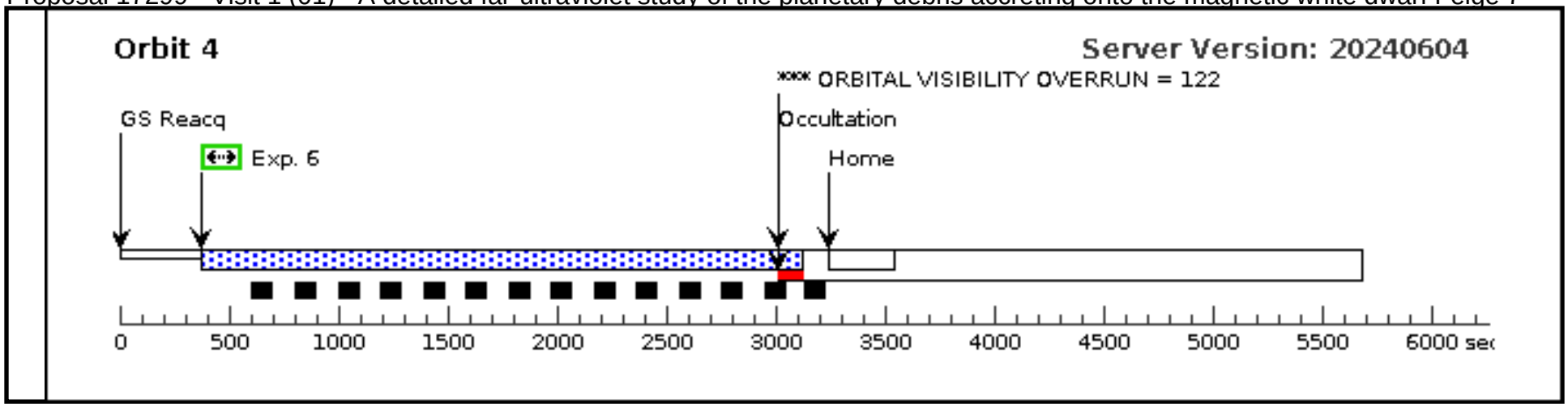
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/PEAKXD (COS.sp.1527981)	(2) FEIGE-7	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A				2 Secs (2 Secs) *[==>]*	***[1]***
2	ACQ/PEAKD (COS.sp.1527981)	(2) FEIGE-7	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	STEP-SIZE=0.9; NUM-POS=5; CENTER=DEF			2 Secs (2 Secs) *[==>]*	***[1]***
3	G130M @ 1291A, FP-POS=3 (COS.sp.1843016)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=195; FP-POS=3			2368 Secs (2368 Secs) *[==>]*	***[1]***
4	G130M @ 1291A, FP-POS=4 (COS.sp.1843016)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=195; FP-POS=4			2693 Secs (2693 Secs) *[==>]*	***[2]***
5	G130M @ 1291A, FP-POS=3 (COS.sp.1843016)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=195; FP-POS=3			2693 Secs (2693 Secs) *[==>]*	***[3]***
6	G130M @ 1291A, FP-POS=4 (COS.sp.1843016)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=195; FP-POS=4			2693 Secs (2693 Secs) *[==>]*	***[4]***

Orbit Structure





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Visit

Proposal 17299, Repeat of Visit 01 (03), implementation Tue Jun 11 17:00:26 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: Only two FP-POS settings allowed for the 1291A central wavelength.

Diagnostics

(Repeat of Visit 01 (03)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

Fixed Targets

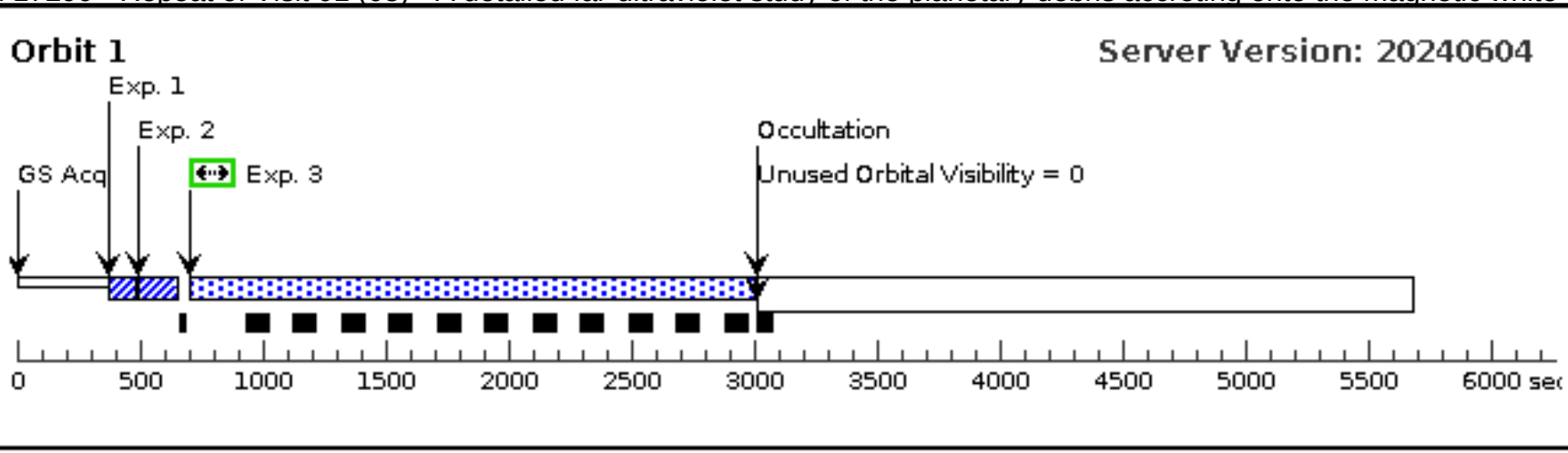
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	FEIGE-7	RA: 00 43 45.8278 (10.9409492d) Dec: -10 00 27.17 (-10.00755d) Equinox: J2000	Proper Motion RA: -145.631 mas/yr Proper Motion Dec: -134.876 mas/yr Epoch of Position: 2016.0	V=14.5+/-0.05	Reference Frame: ICRS

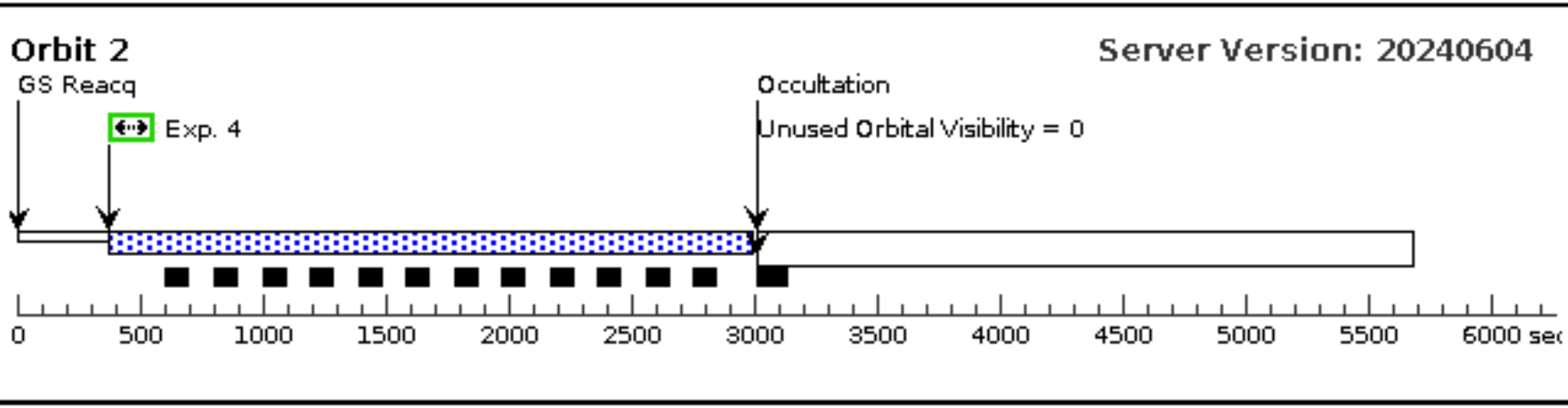
Comments: This target was previously observed with COS/G130M (exposure LEQC20010, https://archive.stsci.edu/cgi-bin/mastpreview?mission=hst&dataid=LEQC20010), the maximum flux level is ~1.5e-13erg/cm2/s/A.
Category=STAR
Description=[DB]
Extended=NO

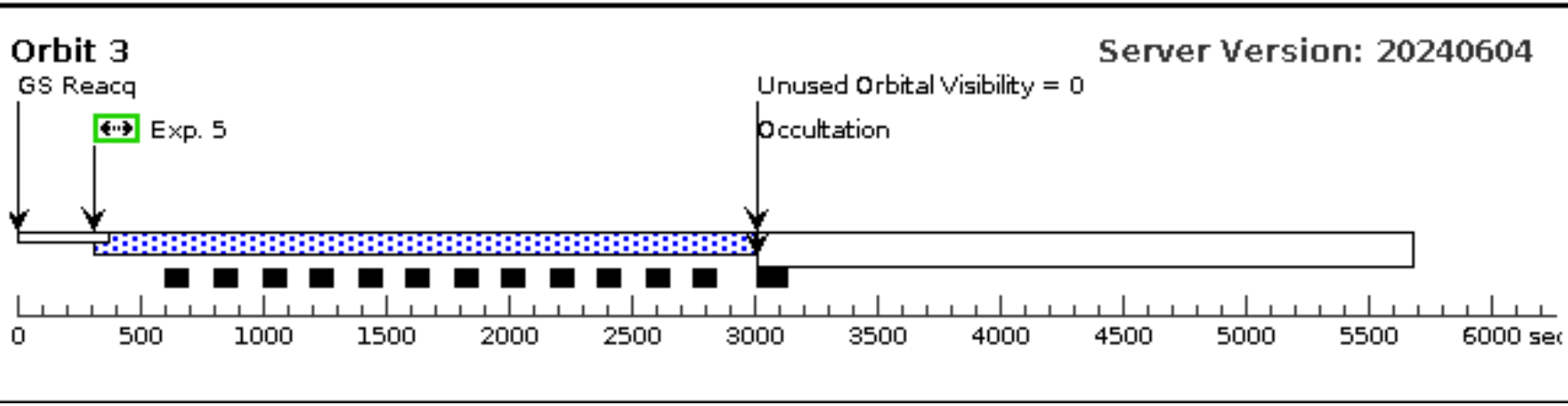
Exposures

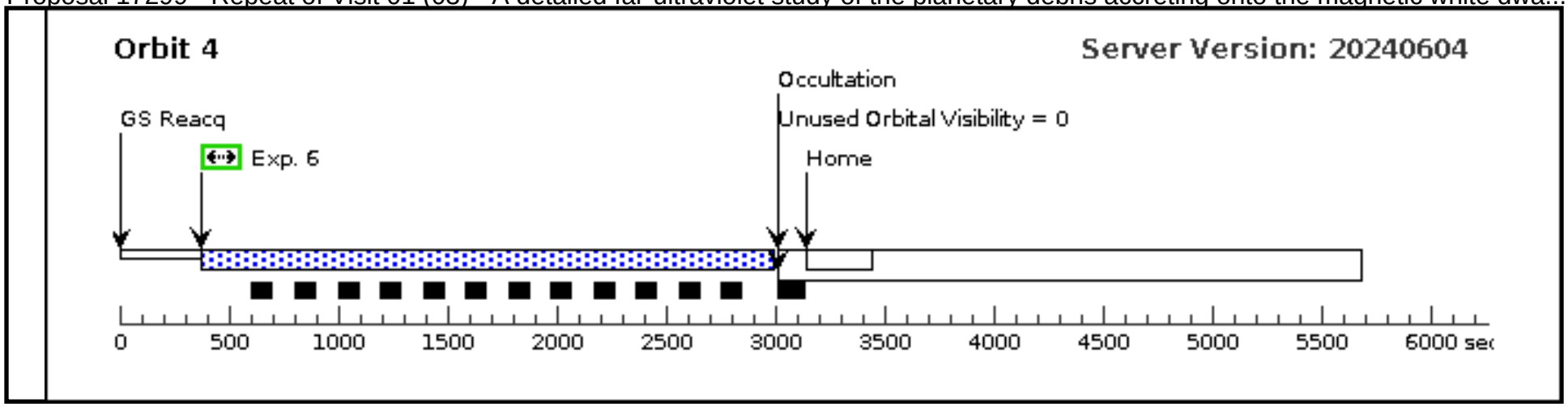
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/PEAKXD (COS.sp.1527981)	(2) FEIGE-7	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A				2 Secs (2 Secs) *[==>]*	***[1]***
2	ACQ/PEAKD (COS.sp.1527981)	(2) FEIGE-7	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	STEP-SIZE=0.9; NUM-POS=5; CENTER=DEF			2 Secs (2 Secs) *[==>]*	***[1]***
3	G130M @ 1291A, FP-POS=3 (COS.sp.1843016)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=195; FP-POS=3			2305 Secs (2247 Secs) *[==>2247.0 Secs]*	***[1]***
4	G130M @ 1291A, FP-POS=4 (COS.sp.1843016)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=195; FP-POS=4			2680 Secs (2571 Secs) *[==>2571.0 Secs]*	***[2]***
5	G130M @ 1291A, FP-POS=3 (COS.sp.1843016)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=195; FP-POS=3			2680 Secs (2571 Secs) *[==>2571.0 Secs]*	***[3]***
6	G130M @ 1291A, FP-POS=4 (COS.sp.1843016)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=195; FP-POS=4			2680 Secs (2571 Secs) *[==>2571.0 Secs]*	***[4]***

Orbit Structure





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Visit

Proposal 17299, Visit 2 (02), completed Tue Jun 11 17:00:26 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: Only two FP-POS settings allowed for the 1291A central wavelength.

Diagnostics

(Visit 2 (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 2 (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 2 (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 2 (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

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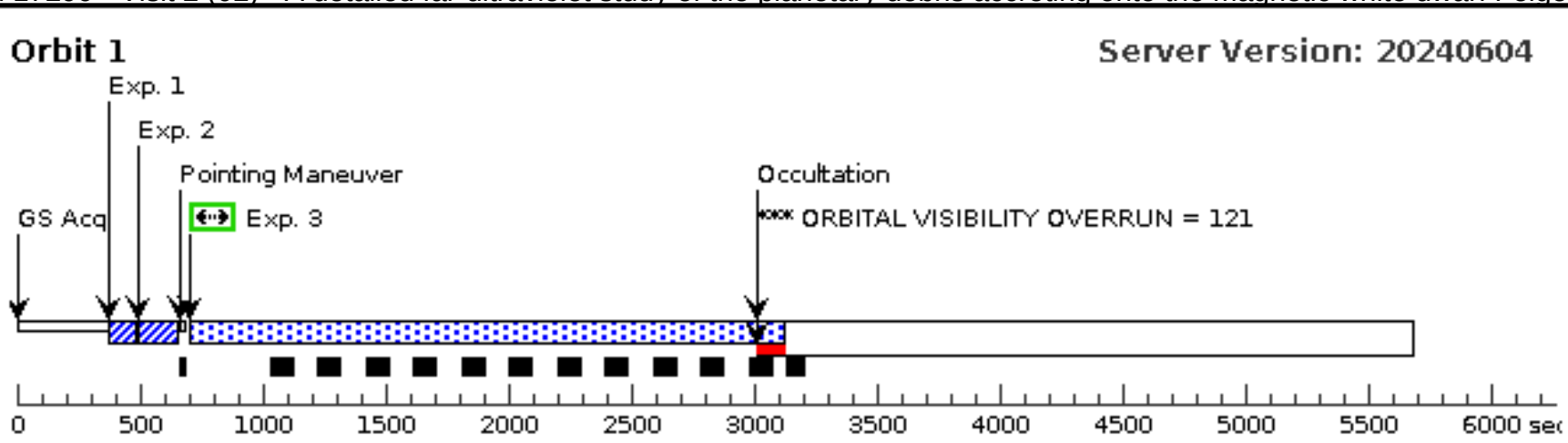
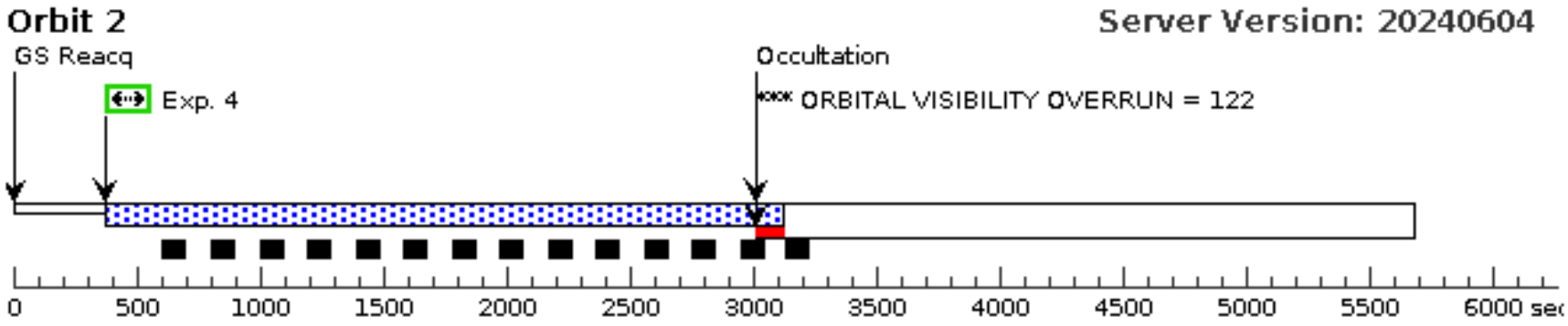
Comments: This target was previously observed with COS/G130M (exposure LEQC20010, https://archive.stsci.edu/cgi-bin/mastpreview?mission=hst&dataid=LEQC20010), the maximum flux level is ~1.5e-13erg/cm2/s/A.
Category=STAR
Description=[DB]
Extended=NO

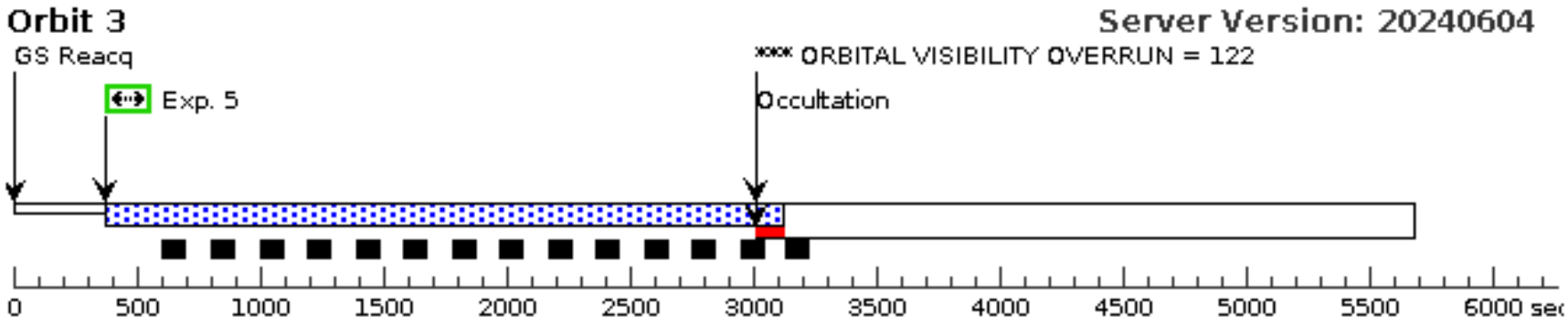
Exposures

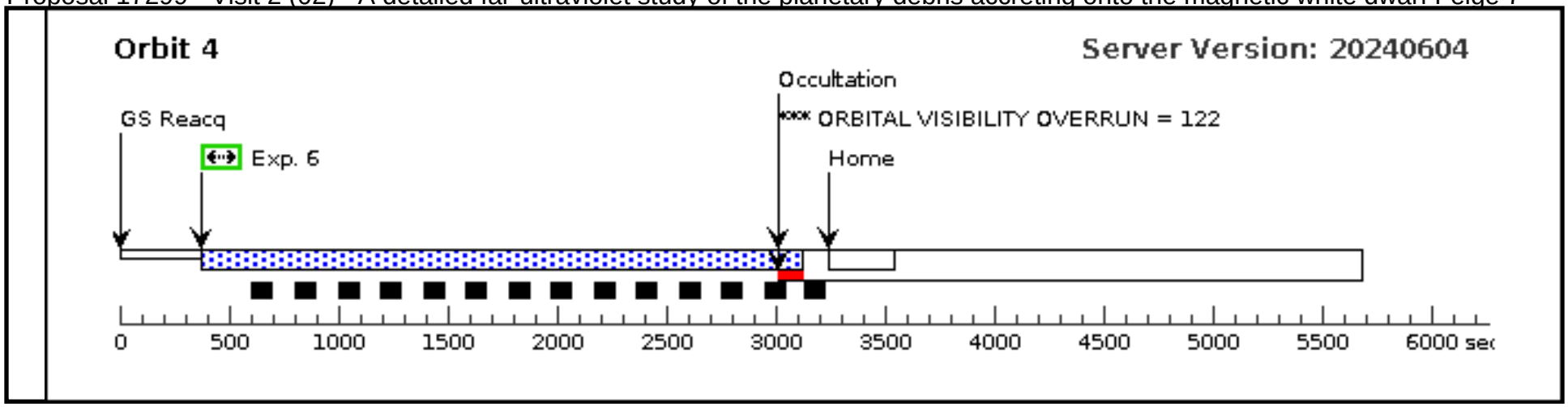
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/PEAKXD (COS.sp.1527981)	(2) FEIGE-7	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A				2 Secs (2 Secs) *[==>]*	***[1]***
2	ACQ/PEAKD (COS.sp.1527981)	(2) FEIGE-7	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	STEP-SIZE=0.9; NUM-POS=5; CENTER=DEF			2 Secs (2 Secs) *[==>]*	***[1]***
3	G130M @ 1222A, FP-POS=1 (COS.sp.1843014)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=195; FP-POS=1			2270 Secs (2270 Secs) *[==>]*	***[1]***
4	G130M @ 1222A, FP-POS=2 (COS.sp.1843014)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=195; FP-POS=2			2693 Secs (2693 Secs) *[==>]*	***[2]***
5	G130M @ 1222A, FP-POS=2 (COS.sp.1843014)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=195; FP-POS=3			2693 Secs (2693 Secs) *[==>]*	***[3]***
6	G130M @ 1222A, FP-POS=2 (COS.sp.1843014)	(2) FEIGE-7	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=195; FP-POS=4			2693 Secs (2693 Secs) *[==>]*	***[4]***

Orbit Structure





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Server Version: 20240604
Occultation
GS Reacq
**** ORBITAL VISIBILITY OVERRUN = 122
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