17720 - Confirming the first strongly asynchronous polar

Cycle: 32, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Ilaria Caiazzo (PI) (ESA Member) (Contact)	**Institute of Science and Technology Austria**
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Prof. Boris T. Gaensicke (CoI) (ESA Member)	University of Warwick
Prof. Paula Szkody (CoI)	University of Washington
Mr. Antonio C. Rodriguez (CoI)	California Institute of Technology
Dr. Thomas A Prince (CoI)	California Institute of Technology
Mr. Andrei Alexandru Cristea (CoI) (ESA Member)	Institute of Science and Technology Austria
Dr. Kevin Burdge (CoI)	Massachusetts Institute of Technology

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) ZTFJ2008+4449	COS/FUV	5	24-Oct-2024 16:01:54.0	yes
02	(1) ZTFJ2008+4449	STIS/CCD STIS/NUV-MAMA	4	24-Oct-2024 16:01:55.0	yes

9 Total Orbits Used

ABSTRACT

We have discovered a new exotic binary system containing an accreting highly magnetized white dwarf. The peculiar variability in the hydrogen emission lines and the high magnetic field of the white dwarf hint to a very exciting explanation for the current observations: we might have caught

the system in a rare evolutionary stage, in which the highly magnetized white dwarf has only recently started accreting from the companion and therefore its rotation period is not yet synchronized with the orbital period of the binary. We here propose a joint HST-XMM program to confirm the nature of this system as a strongly asynchronous polar, to constrain the magnetic field strength and temperature of the white dwarf, and to measure the accretion rate of the system. If confirmed, this system promises to become a keystone for our understanding of the evolution of cataclysmic variables and of binary evolution in general.

OBSERVING DESCRIPTION

The purpose of this program is to study the SED and lightcurve of the white dwarf ZTF J2008+4449 in the UV. ZTF J12008+449 is a new exotic binary system containing an accreting highly magnetized white dwarf, which could be the first highly asynchronous polar observed. If confirmed, this system promises to become a keystone for our understanding of the evolution of cataclysmic variables. The proposed HST observations will allow us to constrain the magnetic field strength and temperature of the white dwarf, and possibly detect cyclotron emission humps.

We ask for 5 orbits of COS spectroscopy and 4 orbits of STIS spectroscopy in the time-tag mode, so that we will obtain high signal-to-noise phase resolved spectra and UV lightcurves. For the COS observations, we ask for a different FP-POS in each orbit. There are no time constraints on the observations, and the visits can be scheduled separately.

Visit

Proposal 17720, Visit 01, implementation Thu Oct 24 20:01:56 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV

Special Requirements: (none)

Fixed Targets

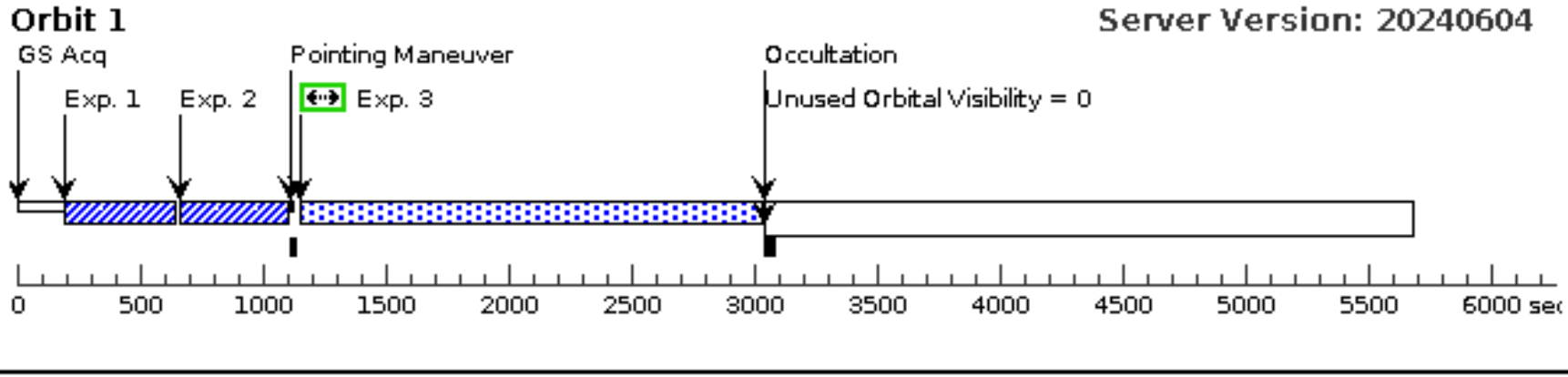
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ZTFJ2008+4449	RA: 20 08 32.7891 (302.1366213d) Dec: +44 49 39.67 (44.82769d) Equinox: J2000	Proper Motion RA: 3.217 mas/yr Proper Motion Dec: 1.328 mas/yr Parallax: 0.0029149" Epoch of Position: 2016.0	V=18.8 Galex FUV 17.9	Reference Frame: ICRS

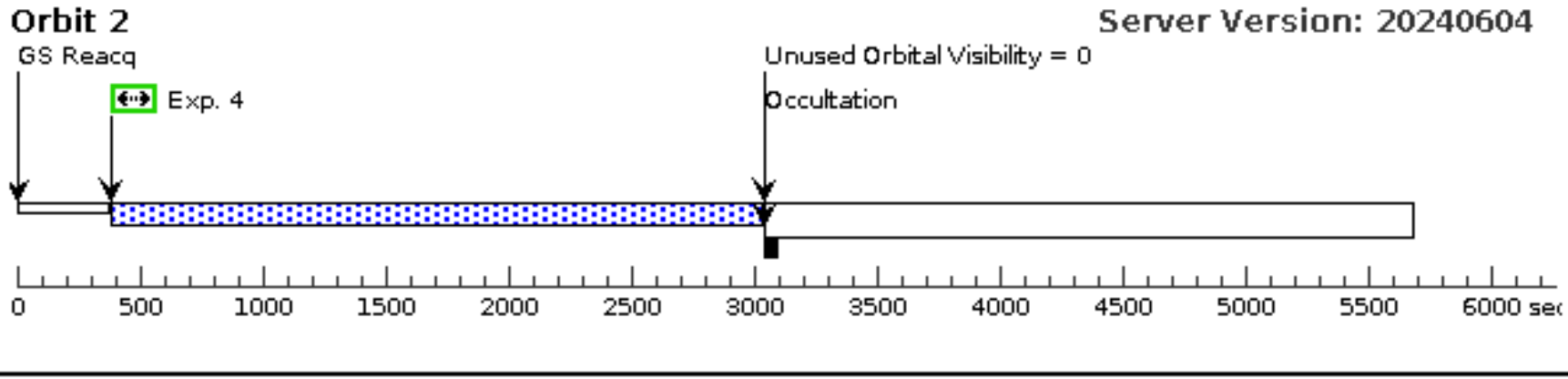
Comments:
Category=STAR
Description=[POLAR]
Extended=NO

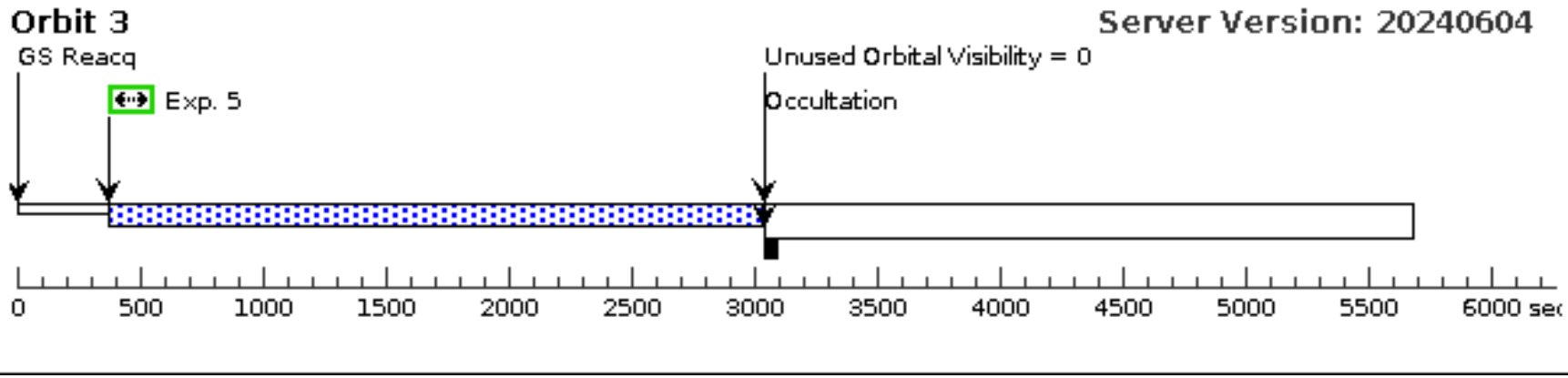
Exposures

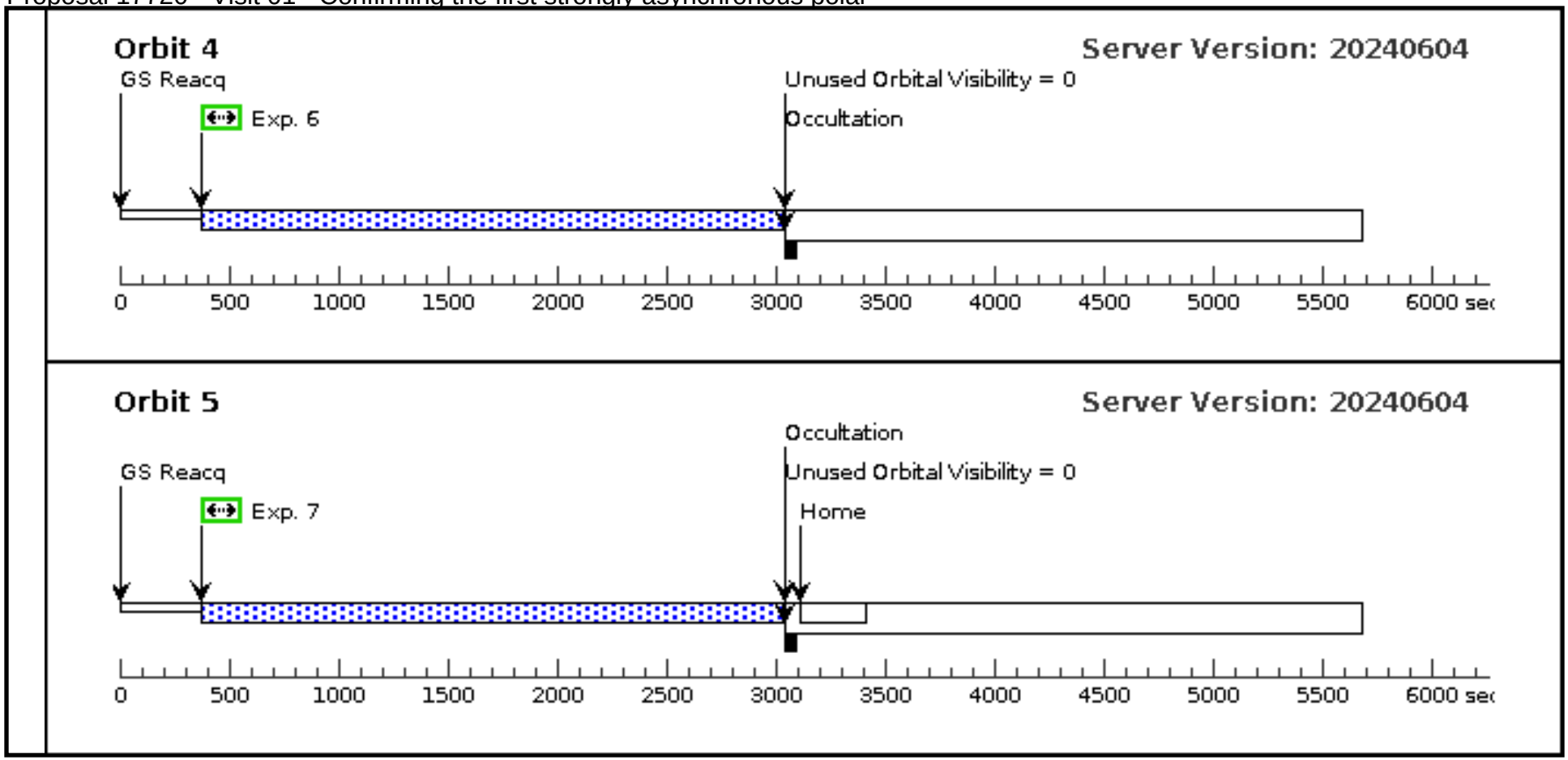
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1932676)	(1) ZTFJ2008+4449	COS/FUV, ACQ/PEAKXD, PSA	G140L 1105 A				59 Secs (59 Secs) *[==>]*	***[1]***
Comments: As there could be some cyclotron emission in the FUV, the emission itself could be up to a magnitude brighter. We therefore run the ETC with the normalization magnitude smaller by 1 to check that the local cout rate is ok. Also, we included the brightest emission lines that we can expect from previous COS observations of polars. ETC number: 1939816									
2	(1932676)	(1) ZTFJ2008+4449	COS/FUV, ACQ/PEAKD, PSA	G140L 1105 A	NUM-POS=5; STEP-SIZE=0.9; CENTER=FLUX-WT-FLR			59 Secs (59 Secs) *[==>]*	***[1]***
Comments: As there could be some cyclotron emission in the FUV, the emission itself could be up to a magnitude brighter. We therefore run the ETC with the normalization magnitude smaller by 1 to check that the local cout rate is ok. Also, we included the brightest emission lines that we can expect from previous COS observations of polars. ETC number: 1939816									
3	(1932677)	(1) ZTFJ2008+4449	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=1; BUFFER-TIME=6200			1722 Secs (1722 Secs) *[==>]*	***[1]***
Comments: As there could be some cyclotron emission in the FUV, the emission itself could be up to a magnitude brighter. We therefore run the ETC with the normalization magnitude smaller by 1 to check that the local cout rate is ok. Also, we included the brightest emission lines that we can expect from previous COS observations of polars. ETC number: 1939817									
4	(1932678)	(1) ZTFJ2008+4449	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=1; BUFFER-TIME=6200			2605 Secs (2605 Secs) *[==>]*	***[2]***
Comments: As there could be some cyclotron emission in the FUV, the emission itself could be up to a magnitude brighter. We therefore run the ETC with the normalization magnitude smaller by 1 to check that the local cout rate is ok. Also, we included the brightest emission lines that we can expect from previous COS observations of polars. ETC number: 1939815									
5	(1932678)	(1) ZTFJ2008+4449	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=2; BUFFER-TIME=6200			2605 Secs (2605 Secs) *[==>]*	***[3]***
Comments: As there could be some cyclotron emission in the FUV, the emission itself could be up to a magnitude brighter. We therefore run the ETC with the normalization magnitude smaller by 1 to check that the local cout rate is ok. Also, we included the brightest emission lines that we can expect from previous COS observations of polars. ETC number: 1939815									
6	(1932678)	(1) ZTFJ2008+4449	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=3; BUFFER-TIME=6200			2605 Secs (2605 Secs) *[==>]*	***[4]***
Comments: As there could be some cyclotron emission in the FUV, the emission itself could be up to a magnitude brighter. We therefore run the ETC with the normalization magnitude smaller by 1 to check that the local cout rate is ok. Also, we included the brightest emission lines that we can expect from previous COS observations of polars. ETC number: 1939815									
7	(1932678)	(1) ZTFJ2008+4449	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=4; BUFFER-TIME=6200			2605 Secs (2605 Secs) *[==>]*	***[5]***
Comments: As there could be some cyclotron emission in the FUV, the emission itself could be up to a magnitude brighter. We therefore run the ETC with the normalization magnitude smaller by 1 to check that the local cout rate is ok. Also, we included the brightest emission lines that we can expect from previous COS observations of polars. ETC number: 1939815									

Orbit Structure





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Orbit 5
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GS Reacq
Unused Orbital Visibility = 0
Exp. 7
Home
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Visit

Proposal 17720, Visit 02, implementation Thu Oct 24 20:01:56 GMT 2024

Diagnostic Status: No Diagnostics

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

Special Requirements: (none)

Fixed Targets

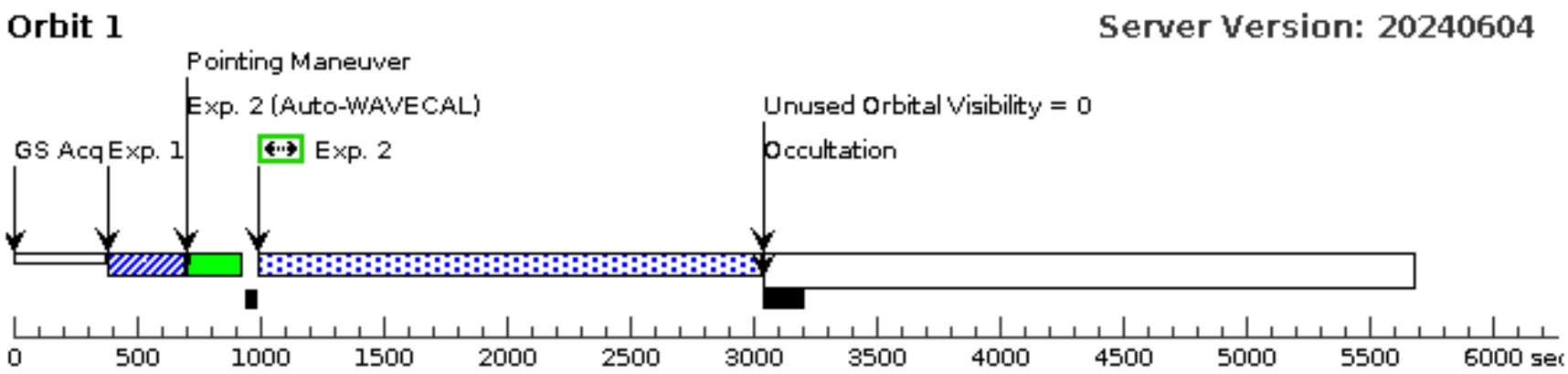
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ZTFJ2008+4449	RA: 20 08 32.7891 (302.1366213d) Dec: +44 49 39.67 (44.82769d) Equinox: J2000	Proper Motion RA: 3.217 mas/yr Proper Motion Dec: 1.328 mas/yr Parallax: 0.0029149" Epoch of Position: 2016.0	V=18.8 Galex FUV 17.9	Reference Frame: ICRS

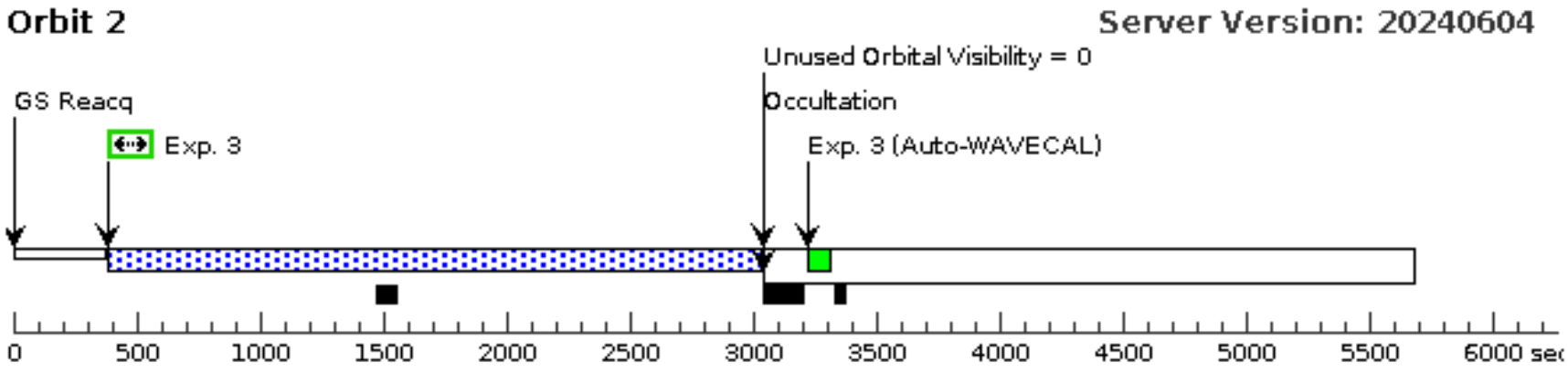
Comments:
Category=STAR
Description=[POLAR]
Extended=NO

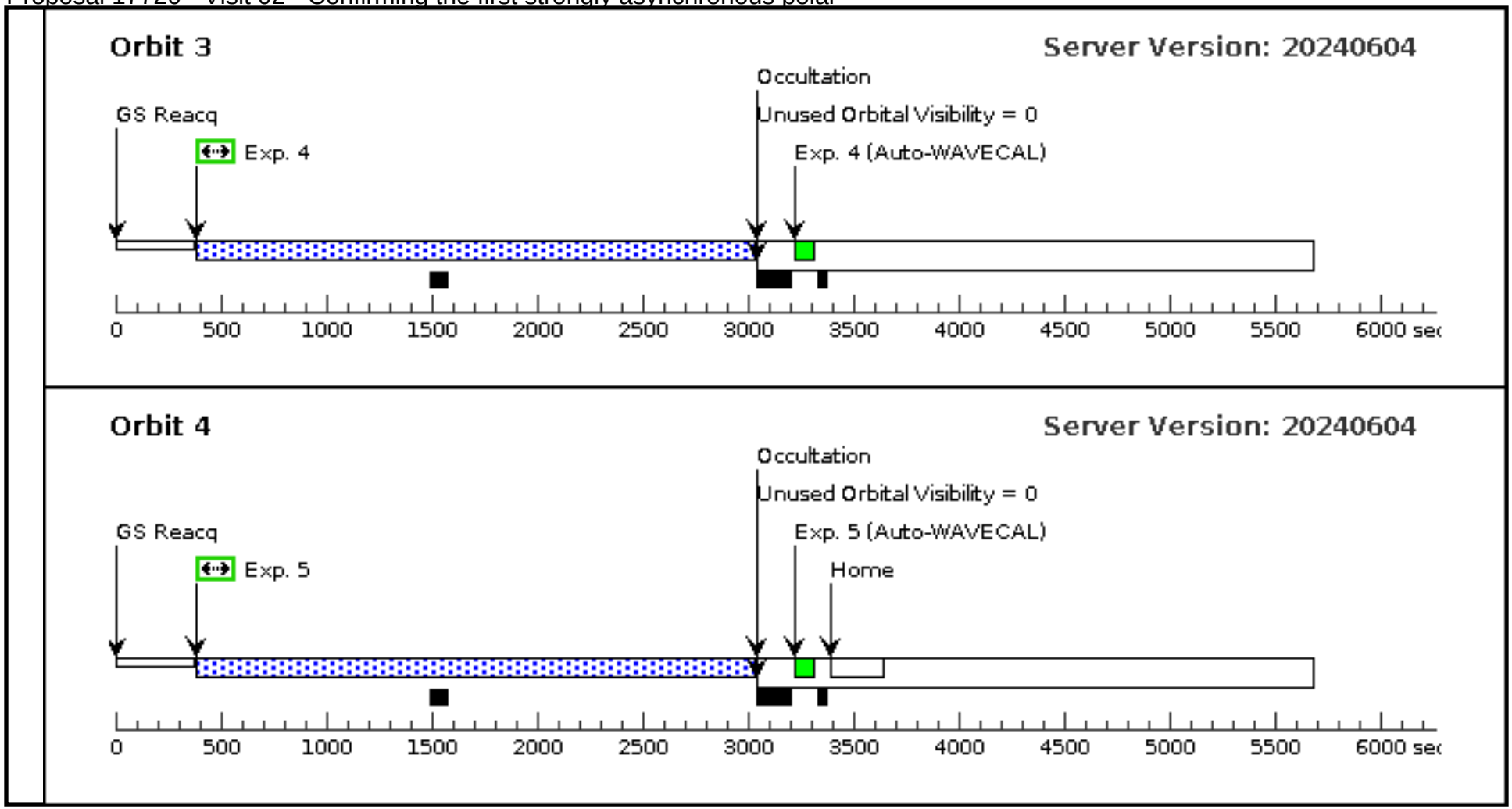
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1932679)	(1) ZTFJ2008+4449	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			21 Secs (21 Secs) *[==>]*	*[1]*
2	(1932683)	(1) ZTFJ2008+4449	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=1096			1998 Secs (1998 Secs) *[==>]*	*[1]*
3	(1932684)	(1) ZTFJ2008+4449	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=1096			2641 Secs (2641 Secs) *[==>]*	*[2]*
4	(1932685)	(1) ZTFJ2008+4449	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=1096			2616 Secs (2616 Secs) *[==>]*	*[3]*
5	(1932685)	(1) ZTFJ2008+4449	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=1096			2616 Secs (2616 Secs) *[==>]*	*[4]*

Orbit Structure



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6000 sec
Orbit 4
Server Version: 20240604
Occultation
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GS Reacq
Exp. 5
Exp. 5 (Auto-WAVECAL)
Home
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