17750 - Tracing the Formation Mechanism Behind the BZ Cam' Bow Shock

Cycle: 32, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

INVESTIGATORS

Name	*Institution*
Dr. Krystian Ilkiewicz (PI) (ESA Member) (Contact)	**Warsaw University Observatory**
Dr. Noel Castro Segura (CoI) (ESA Member) (CoPI) (Contact)	University of Warwick
Simone Scaringi (CoI) (ESA Member)	Durham University
Prof. Christian Knigge (CoI) (ESA Member)	University of Southampton
Dr. Luca Izzo (CoI) (ESA Member)	INAF - Osservatorio Astronomico di Capodimonte

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(2) EGB-4	STIS/CCD STIS/FUV-MAMA	4	04-Jun-2025 09:00:13.0	yes
05	(2) EGB-4	STIS/CCD STIS/FUV-MAMA	4	04-Jun-2025 09:00:14.0	yes
03	(2) EGB-4	STIS/CCD STIS/FUV-MAMA	4	04-Jun-2025 09:00:15.0	yes
04	(2) EGB-4	STIS/CCD STIS/FUV-MAMA	4	04-Jun-2025 09:00:16.0	yes

16 Total Orbits Used

ABSTRACT

BZ Cam is one of only three cataclysmic variables with bow shocks known. Recent observation revealed that the morphology of the BZ Cam bow shock is more complicated than previously thought, posing a challenge to the models of formation and structure of bow shocks. While the BZ Cam bow shock was detected in the UV range, it was never observed with UV spectroscopy. Here we propose to obtain HST STIS spectroscopy of the bow shock, which could reveal the emission mechanism of UV radiation. This will reveal the nature of its complex morphology, and in turn enhance our understanding of bow shocks in general.

Depending on what the observations will reveal, the HST spectrum could shed light on the energy/mass release processes in cataclysmic variables outflows, impacting our models of binary evolution and accretion physics. Alternatively, it may provide insights into the impact of cataclysmic variables on the nearby interstellar medium, influencing our understanding of galactic chemistry and the broader context of galaxy evolution.

OBSERVING DESCRIPTION

We aim to obtain a simultaneous spectrum of the bowshock from BZ Cam, we changed the PA to go trhough the region of highest optical emission. PA = 200- 240. To avoid getting too close to the bright star and facilitate shceduling we select 232-242 PA range

To improve the quality of the spectrum we set a dither pattern leaving the star at 0.8 and 1.8 arsec from the edge of the slit, then -0.2 and -1.2 arsec outside of the slit (hence the - symbol). This will map 4 arminits extending the spatial coverage and minimising the impact of the shadow caused by the shadow of the gird wire.

A NUV exposure was added to one orbit in the second visit G240L to cover the full near to far-UV spectrum.

The buffer dumps for the brigth star are double of the selected buffer dumps, this is to avoid losing data due to exceeding the buffer size.

Visit

Proposal 17750, Frist visit (01), implementation Wed Jun 04 13:00:17 GMT 2025

Diagnostic Status: No Diagnostics

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

Special Requirements: ORIENT 232D TO 242 D

Comments: The orientation of the slit has to be fixed to shift the target close to the edge of the slit

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	EGB-4	RA: 06 29 33.9600 (97.3915000d) Dec: +71 04 36.39 (71.07677d) Equinox: J2000	Proper Motion RA: -2.291 mas/yr Proper Motion Dec: -28.805000010834192 mas/yr Parallax: 0.0026720000000000003" Epoch of Position: 2000	V=13.27	Reference Frame: ICRS

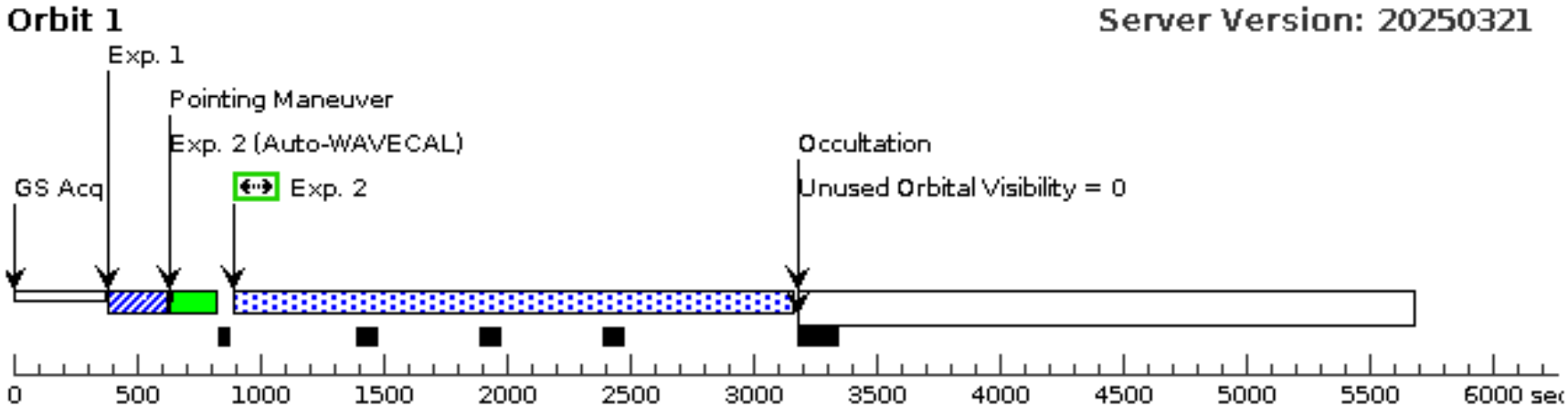
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

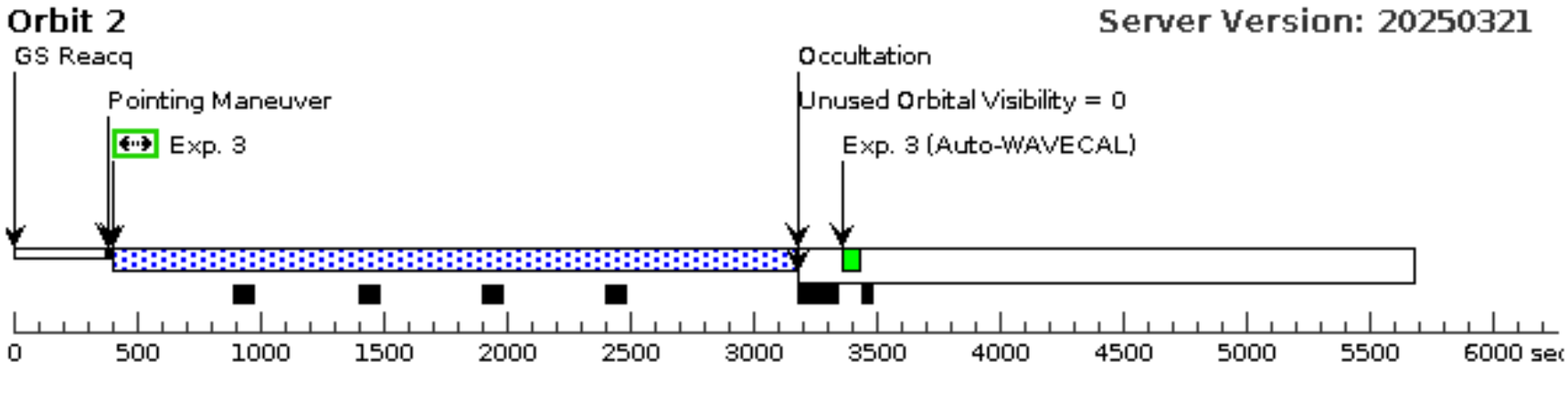
SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR
Description=[ACCRETION DISK, NOVA-LIKE]

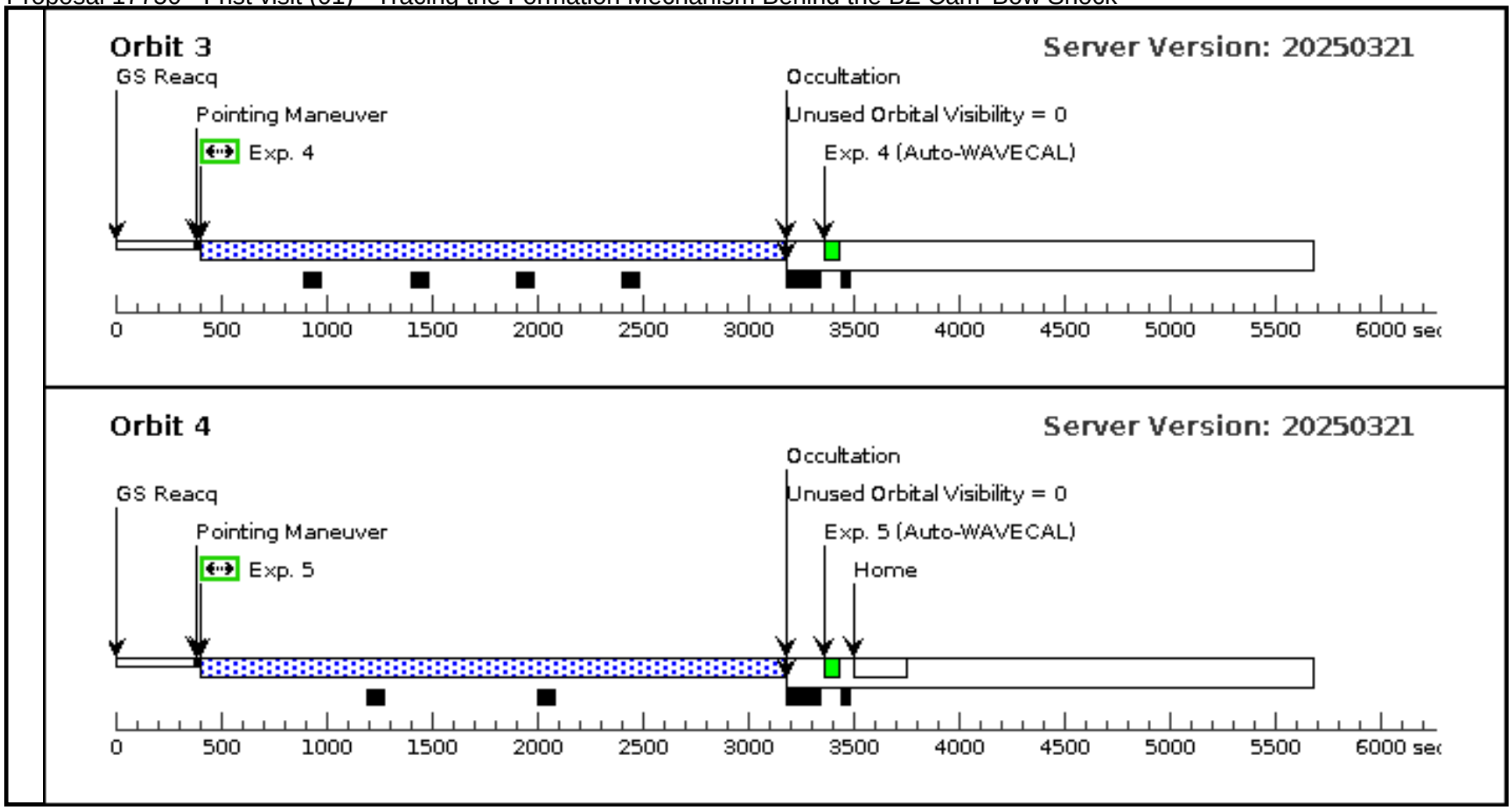
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ BZ CAM (STIS.ta.1934605)	(2) EGB-4	STIS/CCD, ACQ, 50CCD	MIRROR				0.1 Secs (0.1 Secs) *[==>]*	***[1]***
	Comments: S/N = 90 in 0.1s Time to Saturation (for a single exposure) = 2.97 seconds *The magnitude of BZ Cam is usually between 12 and 13.5, sometimes can be found at 11.5 and 14.5. It is a high state source that does eventual excursions to low flux state.* *We ran the ETC for both extremes and in both cases we obtain the minimum required for the target acquisition in both ends. for 0.1 exposure we get S/N~40 (STIS.ta.1935888) while for 11.5 we obtain S/N~180 (STIS.ta.1935889). For a more than extreme of mag=11 we find saturation being 0.46 secons (STIS.ta.1935890)*								
2	Sci Exp 2.5 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG 0,-6.36		2260 Secs (2260 Secs) *[==>]*	***[1]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
3	Sci Exp 1.7a rsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG 0,-7.16		2756 Secs (2756 Secs) *[==>]*	***[2]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
4	Sci Exp 0.8 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG null,-8.06		2756 Secs (2756 Secs) *[==>]*	***[3]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
5	Sci Exp -1 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=800	POS TARG null,-9.86		2754 Secs (2754 Secs) *[==>]*	***[4]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								

Orbit Structure






Orbit 3
Server Version: 20250321
GS Reacq
Pointing Maneuver
Exp. 4
Occultation
Unused Orbital Visibility = 0
Exp. 4 (Auto-WAVECAL)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec
Orbit 4
Server Version: 20250321
GS Reacq
Pointing Maneuver
Exp. 5
Occultation
Unused Orbital Visibility = 0
Exp. 5 (Auto-WAVECAL)
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 17750, Frist visit (05), implementation Wed Jun 04 13:00:17 GMT 2025

Diagnostic Status: No Diagnostics

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

Special Requirements: SAME ORIENT AS 01

Comments: The orientation of the slit has to be fixed to shift the target close to the edge of the slit

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	EGB-4	RA: 06 29 33.9600 (97.3915000d) Dec: +71 04 36.39 (71.07677d) Equinox: J2000	Proper Motion RA: -2.291 mas/yr Proper Motion Dec: -28.805000010834192 mas/yr Parallax: 0.0026720000000000003" Epoch of Position: 2000	V=13.27	Reference Frame: ICRS

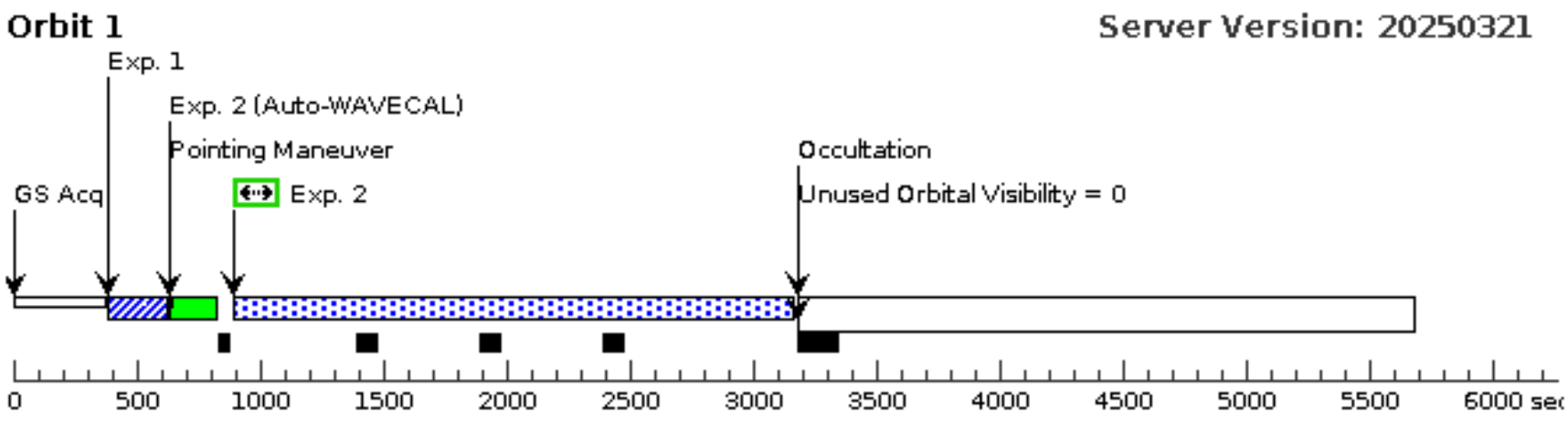
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

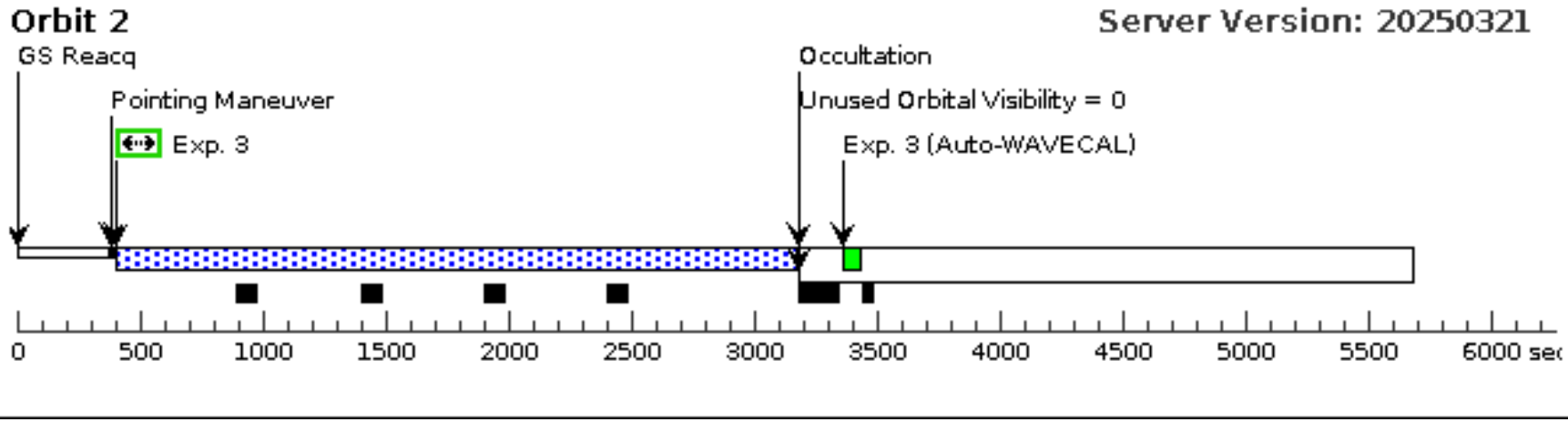
SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR
Description=[ACCRETION DISK, NOVA-LIKE]

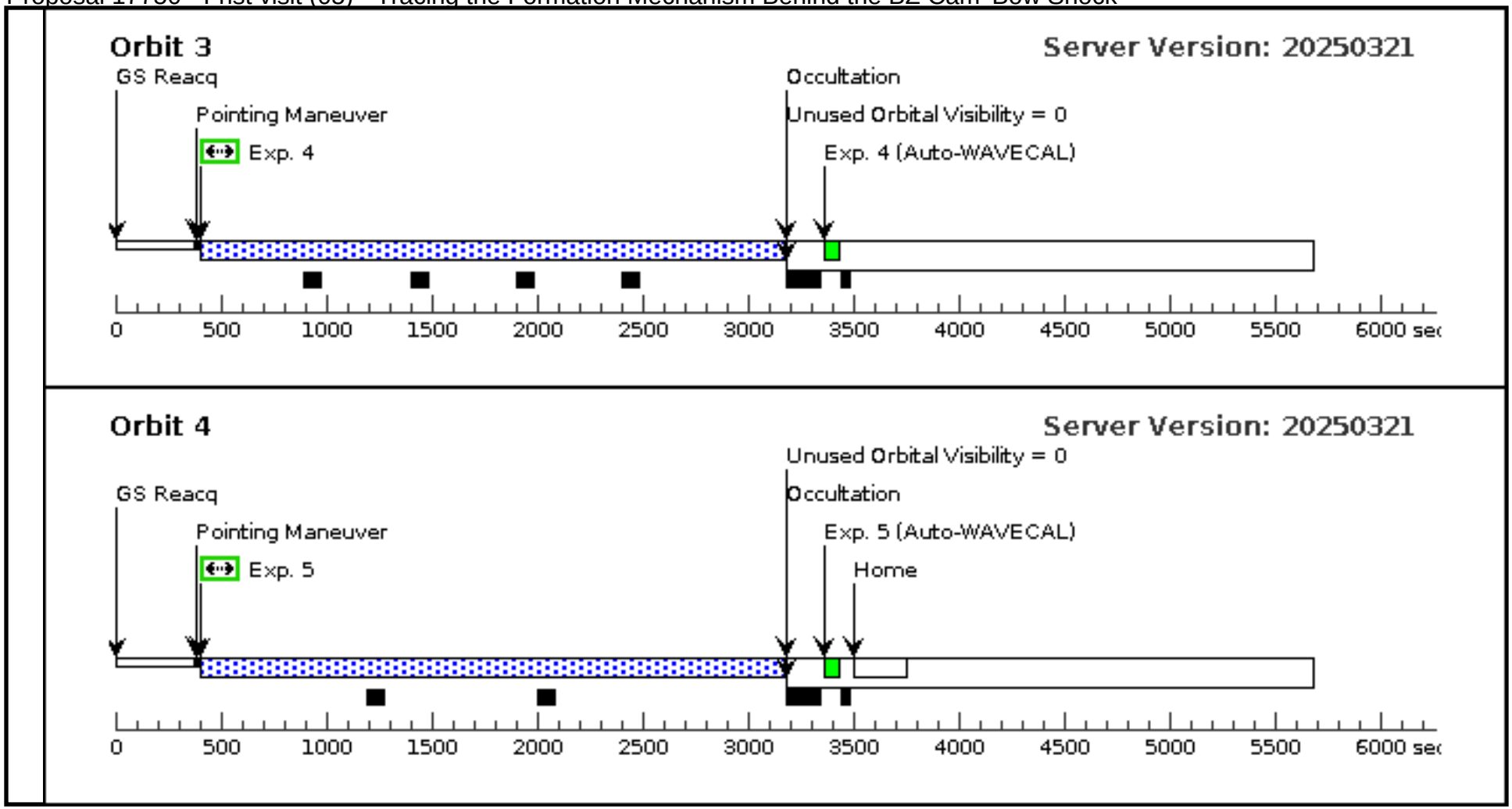
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ BZ CAM (STIS.ta.1934605)	(2) EGB-4	STIS/CCD, ACQ, 50CCD	MIRROR				0.1 Secs (0.1 Secs) *[==>]*	***[1]***
	Comments: S/N = 90 in 0.1s Time to Saturation (for a single exposure) = 2.97 seconds *The magnitude of BZ Cam is usually between 12 and 13.5, sometimes can be found at 11.5 and 14.5. It is a high state source that does eventual excursions to low flux state.* *We ran the ETC for both extremes and in both cases we obtain the minimum required for the target acquisition in both ends. for 0.1 exposure we get S/N~40 (STIS.ta.1935888) while for 11.5 we obtain S/N~180 (STIS.ta.1935889). For a more than extreme of mag=11 we find saturation being 0.46 secons (STIS.ta.1935890)*								
2	Sci Exp 2.5 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG 0,-6.36		2260 Secs (2260 Secs) *[==>]*	***[1]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
3	Sci Exp 1.7a rsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG 0,-7.16		2756 Secs (2756 Secs) *[==>]*	***[2]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
4	Sci Exp 0.8 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG null,-8.06		2756 Secs (2756 Secs) *[==>]*	***[3]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
5	Sci Exp -1 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=800	POS TARG null,-9.86		2754 Secs (2754 Secs) *[==>]*	***[4]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								

Orbit Structure






Orbit 3
Server Version: 20250321
GS Reacq
Pointing Maneuver
Exp. 4
Occultation
Unused Orbital Visibility = 0
Exp. 4 (Auto-WAVECAL)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec
Orbit 4
Server Version: 20250321
Unused Orbital Visibility = 0
GS Reacq
Occultation
Pointing Maneuver
Exp. 5 (Auto-WAVECAL)
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 17750, Frist visit (03), implementation Wed Jun 04 13:00:17 GMT 2025

Diagnostic Status: No Diagnostics

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

Special Requirements: SAME ORIENT AS 01

Comments: The orientation of the slit has to be fixed to shift the target close to the edge of the slit

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	EGB-4	RA: 06 29 33.9600 (97.3915000d) Dec: +71 04 36.39 (71.07677d) Equinox: J2000	Proper Motion RA: -2.291 mas/yr Proper Motion Dec: -28.805000010834192 mas/yr Parallax: 0.0026720000000000003" Epoch of Position: 2000	V=13.27	Reference Frame: ICRS

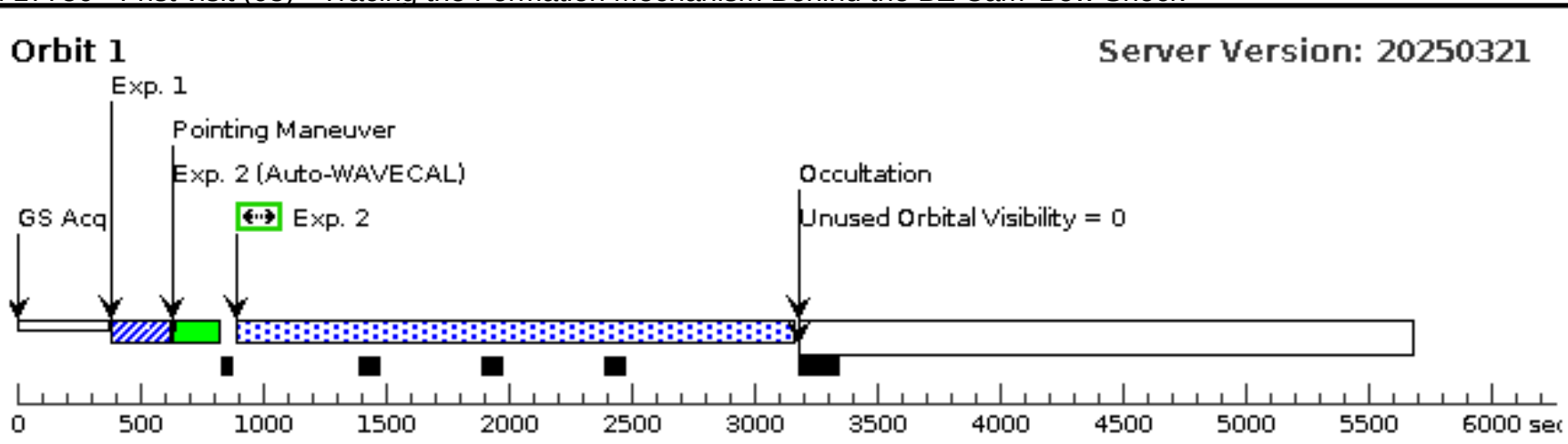
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

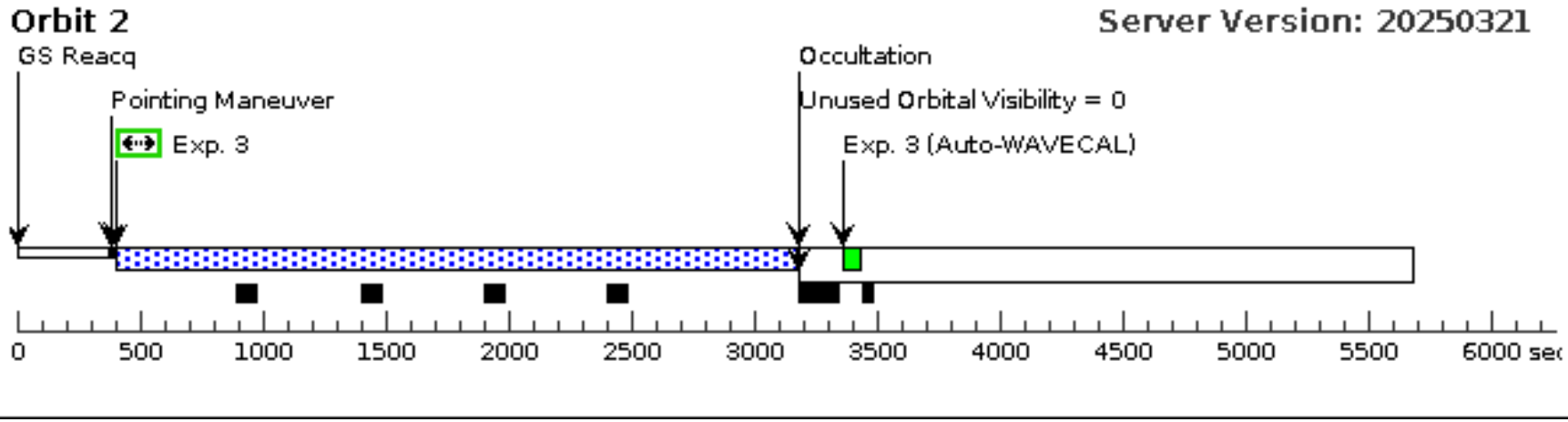
SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR
Description=[ACCRETION DISK, NOVA-LIKE]

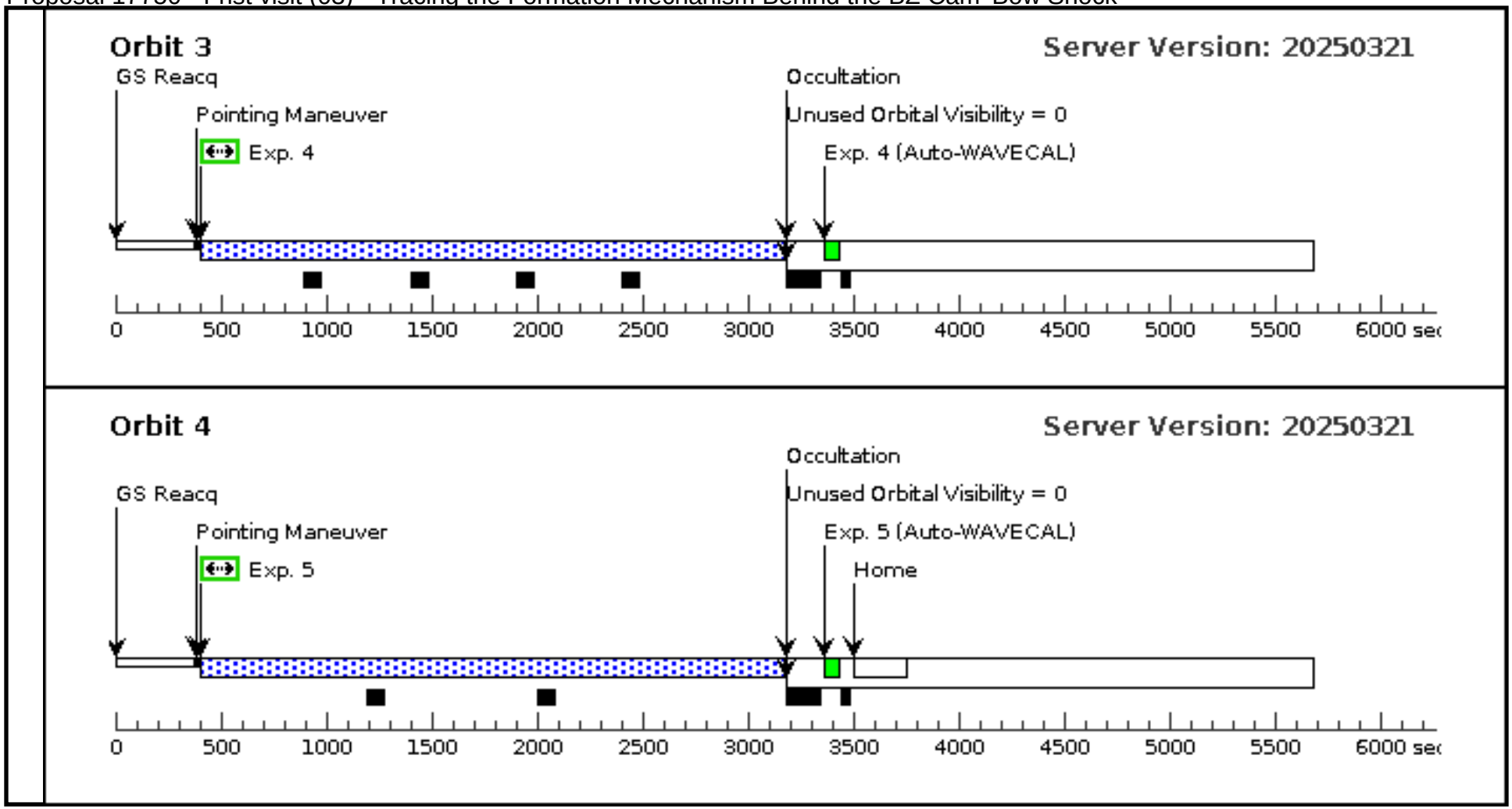
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ BZ CAM (STIS.ta.1934605)	(2) EGB-4	STIS/CCD, ACQ, 50CCD	MIRROR				0.1 Secs (0.1 Secs) *[==>]*	***[1]***
	Comments: S/N = 90 in 0.1s Time to Saturation (for a single exposure) = 2.97 seconds *The magnitude of BZ Cam is usually between 12 and 13.5, sometimes can be found at 11.5 and 14.5. It is a high state source that does eventual excursions to low flux state.* *We ran the ETC for both extremes and in both cases we obtain the minimum required for the target acquisition in both ends. for 0.1 exposure we get S/N~40 (STIS.ta.1935888) while for 11.5 we obtain S/N~180 (STIS.ta.1935889). For a more than extreme of mag=11 we find saturation being 0.46 secons (STIS.ta.1935890)*								
2	Sci Exp 2.5 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG 0,-6.36		2260 Secs (2260 Secs) *[==>]*	***[1]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
3	Sci Exp 1.7a rsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG 0,-7.16		2756 Secs (2756 Secs) *[==>]*	***[2]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
4	Sci Exp 0.8 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG null,-8.06		2756 Secs (2756 Secs) *[==>]*	***[3]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
5	Sci Exp -1 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=800	POS TARG null,-9.86		2754 Secs (2754 Secs) *[==>]*	***[4]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								

Orbit Structure






Orbit 3
Server Version: 20250321
GS Reacq
Pointing Maneuver
Exp. 4
Occultation
Unused Orbital Visibility = 0
Exp. 4 (Auto-WAVECAL)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec
Orbit 4
Server Version: 20250321
GS Reacq
Pointing Maneuver
Exp. 5
Occultation
Unused Orbital Visibility = 0
Exp. 5 (Auto-WAVECAL)
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 17750, Frist visit (04), implementation Wed Jun 04 13:00:17 GMT 2025

Diagnostic Status: No Diagnostics

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

Special Requirements: SAME ORIENT AS 01

Comments: The orientation of the slit has to be fixed to shift the target close to the edge of the slit

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	EGB-4	RA: 06 29 33.9600 (97.3915000d) Dec: +71 04 36.39 (71.07677d) Equinox: J2000	Proper Motion RA: -2.291 mas/yr Proper Motion Dec: -28.805000010834192 mas/yr Parallax: 0.0026720000000000003" Epoch of Position: 2000	V=13.27	Reference Frame: ICRS

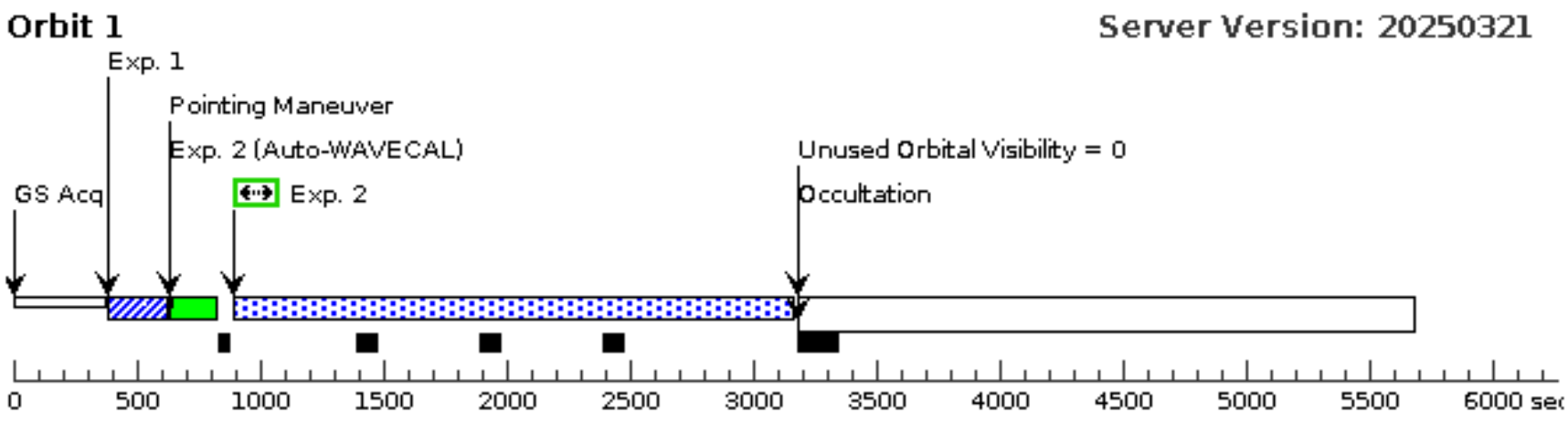
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

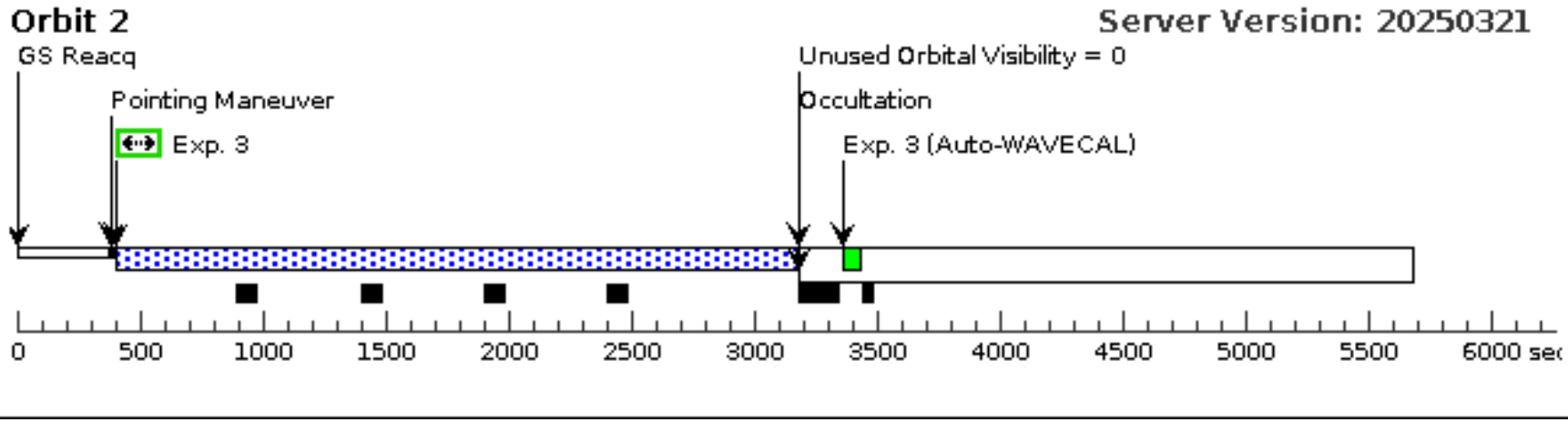
SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR
Description=[ACCRETION DISK, NOVA-LIKE]

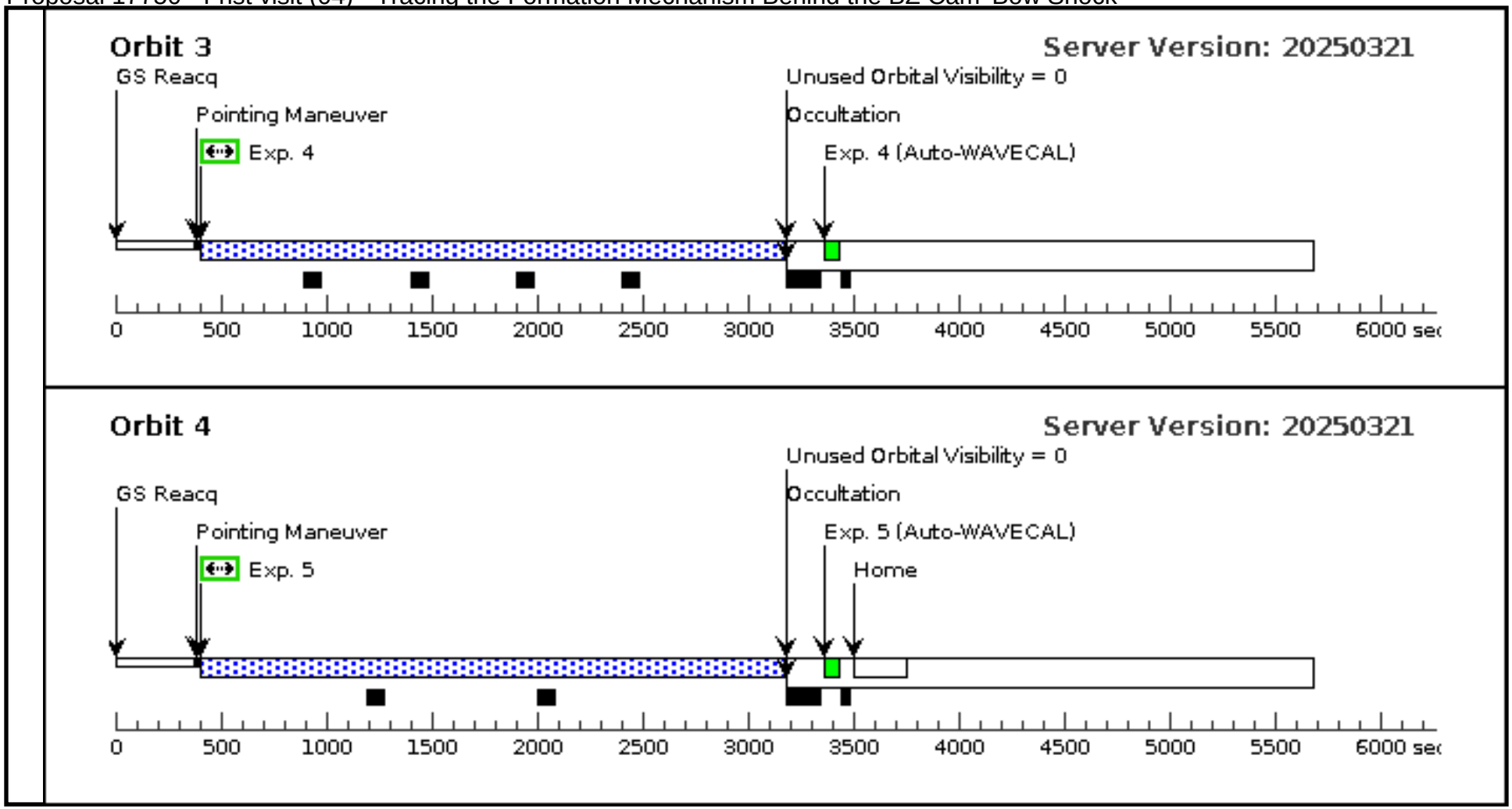
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ BZ CAM (STIS.ta.1934605)	(2) EGB-4	STIS/CCD, ACQ, 50CCD	MIRROR				0.1 Secs (0.1 Secs) *[==>]*	***[1]***
	Comments: S/N = 90 in 0.1s Time to Saturation (for a single exposure) = 2.97 seconds *The magnitude of BZ Cam is usually between 12 and 13.5, sometimes can be found at 11.5 and 14.5. It is a high state source that does eventual excursions to low flux state.* *We ran the ETC for both extremes and in both cases we obtain the minimum required for the target acquisition in both ends. for 0.1 exposure we get S/N~40 (STIS.ta.1935888) while for 11.5 we obtain S/N~180 (STIS.ta.1935889). For a more than extreme of mag=11 we find saturation being 0.46 secons (STIS.ta.1935890)*								
2	Sci Exp 2.5 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG 0,-6.36		2260 Secs (2260 Secs) *[==>]*	***[1]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
3	Sci Exp 1.7arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG 0,-7.16		2756 Secs (2756 Secs) *[==>]*	***[2]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
4	Sci Exp 0.8 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500	POS TARG null,-8.06		2756 Secs (2756 Secs) *[==>]*	***[3]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								
5	Sci Exp -1 arsec from edge (STIS.sp.1934738)	(2) EGB-4	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=800	POS TARG null,-9.86		2754 Secs (2754 Secs) *[==>]*	***[4]***
	Comments: The APT is performed on target, this sets the buffer dump to 600, however we use a shorter buffer dumps to avoid exceeding the buffer due to emission lines in the target and/or the extended emission from the bowshock *The possition of the offset is calculated assuming for ~3.25" nominal offset and -14 low resolution pixels (~34") for the montly offset in November 2025*								

Orbit Structure






Orbit 3
Server Version: 20250321
GS Reacq
Pointing Maneuver
Exp. 4
Unused Orbital Visibility = 0
Occultation
Exp. 4 (Auto-WAVECAL)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec
Orbit 4
Server Version: 20250321
Unused Orbital Visibility = 0
GS Reacq
Occultation
Pointing Maneuver
Exp. 5 (Auto-WAVECAL)
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec