17574 - Spin Me Right Round: Testing Accretion Spin-up in Wide Binary Main-Sequence Carbon Stars

Cycle: 31, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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Dr. Jeremy J. Drake (CoI)	Lockheed Martin Space
Prof. Scott F. Anderson (CoI)	University of Washington

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) HE-2115-0709	ACS/SBC WFC3/UVIS	3	11-Jun-2024 18:02:06.0	yes
02	(2) LP-758-43	ACS/SBC WFC3/UVIS	3	11-Jun-2024 18:02:07.0	yes
03	(3) LP-225-12	ACS/SBC WFC3/UVIS	3	11-Jun-2024 18:02:08.0	yes

9 Total Orbits Used

ABSTRACT

The dwarf carbon stars are a class of post-mass transfer binaries that have accreted a significant amount of C-rich mass and angular momentum from a former AGB companion (now a white dwarf, usually undetected in the optical). We aim to use these dwarf carbon stars to better understand the physics behind mass and angular momentum transfer in binary systems, and the resulting spin-up and activity lifetimes of rejuvenated dwarfs. We propose to use joint Chandra+HST observations of 5 nearby dwarf carbon stars in wide binary systems to (1) probe the dC X-ray magnetic activity and diagnose mass-transfer spin-up, (2) constrain the coronal temperature of the dC, and (3) assess the remnant white dwarf companion cooling age through UV photometry.

OBSERVING DESCRIPTION

We plan observations of 3 interesting dwarf carbon (dC) stars, utilizing both the ACS-SBC and WFC3-UVIS detectors. This will allow us to obtain stronger UV constraints than allowed by the 1 weak GALEX NUV detection. The dCs must have (from an evolutionary perspective) a WD component. Since no WD features are evident in the optical spectrum the WD must be relatively cool, implying Gyr since its AGB phase. We seek to detect and constrain its age using these NUV and FUV HST observations.

The WFC3 ETC predcits (assuming WD T=3000K):

HE 2115-0709 -- S/N=14.5 in the NUV with UVIS+[F225W] in 2333s
LP 758-43 -- S/N=17.0 in the NUV with UVIS+[F225W] in 2334s
LP 225-12 -- S/N=11.0 in the NUV with UVIS+[F225W] in 2414s

For the UVIS observations we include a post-FLASH of 15e to aid with CTE issues as recommended.
For the UVIS observations we utilize a BOX dither.
The UVIS observations pass saturation checks with the BOT and GSC2.

The ACS ETC predicts (assuming WD T=4500K):

HE 2115-0709 -- S/N= 3.5 in the FUV with SBC+[F140LP] in 2482s
LP 758-43 -- S/N= 4.0 in the FUV with SBC+[F140LP] in 2483s
LP 225-12 -- S/N= 2.7 in the FUV with SBC+[F140LP] in 2545s

HE 2115-0709 -- S/N= 6.3 in the FUV with SBC+[F165LP] in 2496s

LP 758-43 -- S/N= 7.0 in the FUV with SBC+[F165LP] in 2497s

LP 225-12 -- S/N= 5.4 in the FUV with SBC+[F165LP] in 2577s

For the FUV observations, we use both the [F140LP] and [F165LP] filters in order to account for the red leak of the SBC as recommneded.

The SBC observation passes the BOT using the GALEX catalog with all SAFE objects.

For the SBC observations we utilize a BOX dither.

Visit

Proposal 17574, HE 2115-0709 (01), implementation Tue Jun 11 22:02:09 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1)
(2)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false		(2), (3)

Fixed Targets

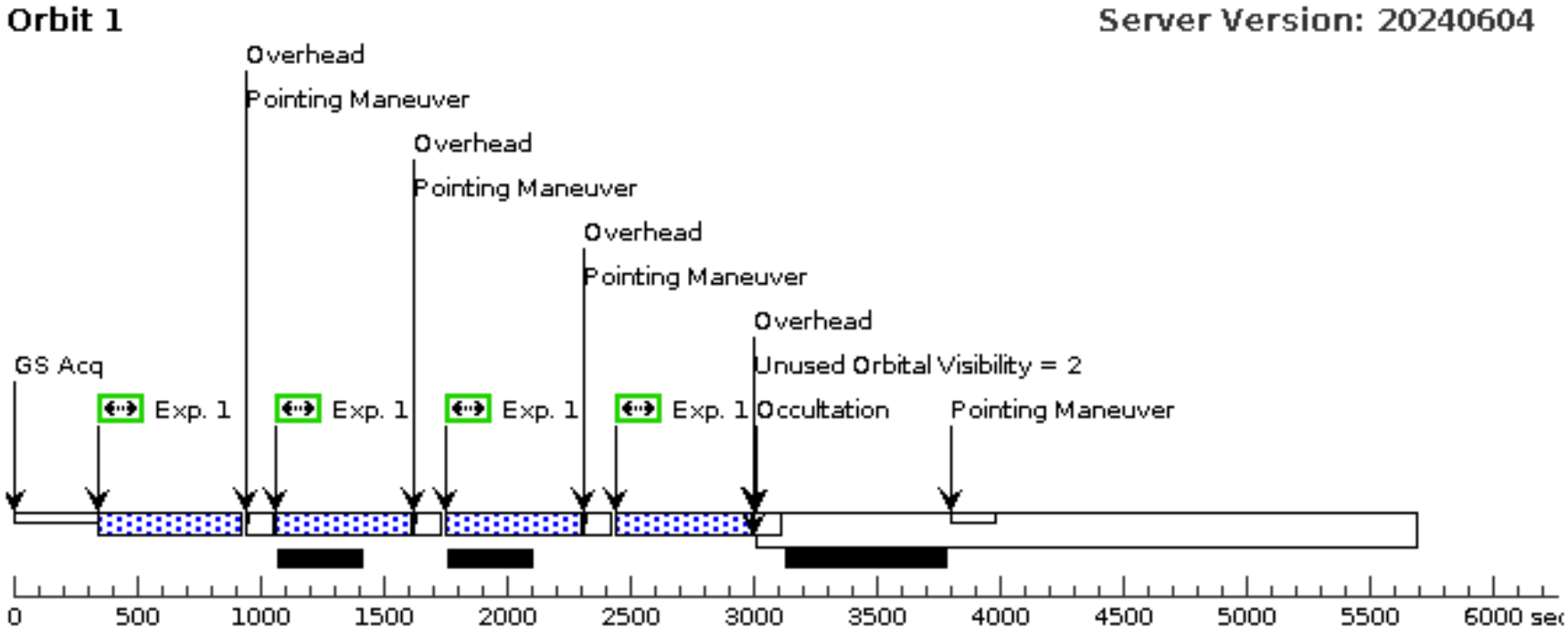
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HE-2115-0709	RA: 21 17 42.1969 (319.4258204d) Dec: -06 57 11.86 (-6.95329d) Equinox: J2000	Proper Motion RA: 55.15097476654407 mas/yr Proper Motion Dec: -45.06193506897677 mas/yr Parallax: 0.005714750374423056" Epoch of Position: 2016.0	V=16.2 B=17.88, J=12.673, H=12.0, K=11.808, G=14.81, BP=15.69 RP=13.90	Reference Frame: ICRS

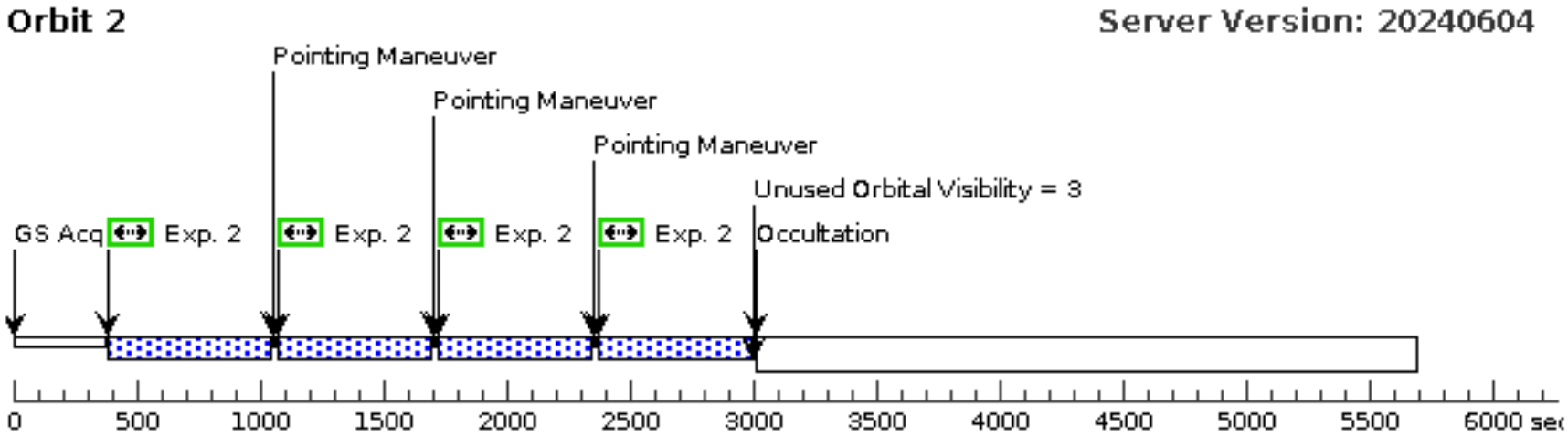
Comments: This object was matched into Gaia DR3.
Category=STAR
Description=[CARBON STAR, COMPOSITE SPECTRAL TYPE, DA]
Extended=NO

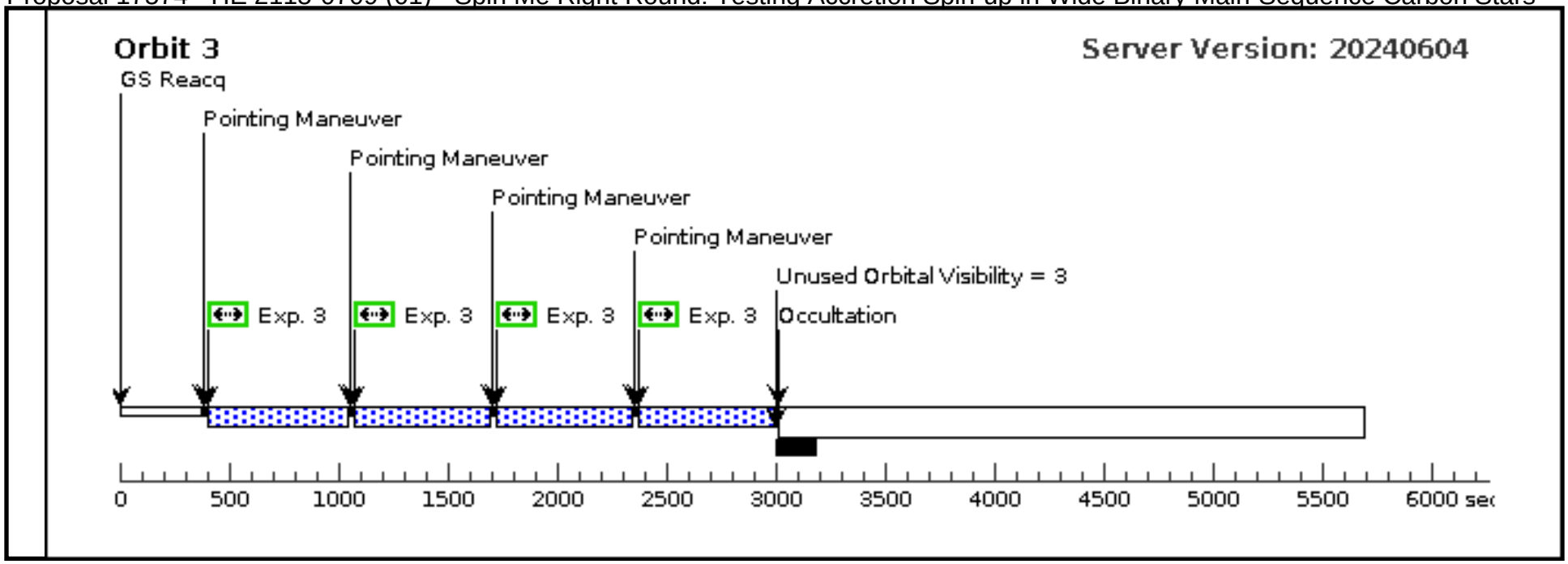
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	UVIS (NUV) (WFC3UVIS.im.1891128)	(1) HE-2115-0709	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=15.0		Pattern 1, Exps 1-1 in HE 2115-0709 (01) (1)	2327 Secs (2209 Secs) *[==>552.0 Secs (Pattern 1)]* *[==>552.0 Secs (Pattern 2)]* *[==>552.0 Secs (Pattern 3)]* *[==>553.0 Secs (Pattern 4)]*	***[1]***
2	SBC (FUV1) (ACS.im.1891136)	(1) HE-2115-0709	ACS/SBC, ACCUM, SBC	F140LP			Pattern 2, Exps 2-2 in HE 2115-0709 (01) (2)	2482 Secs (2366 Secs) *[==>591.0 Secs (Pattern 1)]* *[==>591.0 Secs (Pattern 2)]* *[==>592.0 Secs (Pattern 3)]* *[==>592.0 Secs (Pattern 4)]*	***[2]***
3	SBC (FUV2) (ACS.im.1891138)	(1) HE-2115-0709	ACS/SBC, ACCUM, SBC	F165LP			Pattern 2, Exps 3-3 in HE 2115-0709 (01) (2)	2496 Secs (2360 Secs) *[==>590.0 Secs (Pattern 1)]* *[==>590.0 Secs (Pattern 2)]* *[==>590.0 Secs (Pattern 3)]* *[==>590.0 Secs (Pattern 4)]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20240604
GS Reacq
Pointing Maneuver
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Exp. 3
Exp. 3
Exp. 3
Occultation
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Visit

Proposal 17574, LP 758-43 (02), implementation Tue Jun 11 22:02:09 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1)
(2)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false		(2), (3)

Fixed Targets

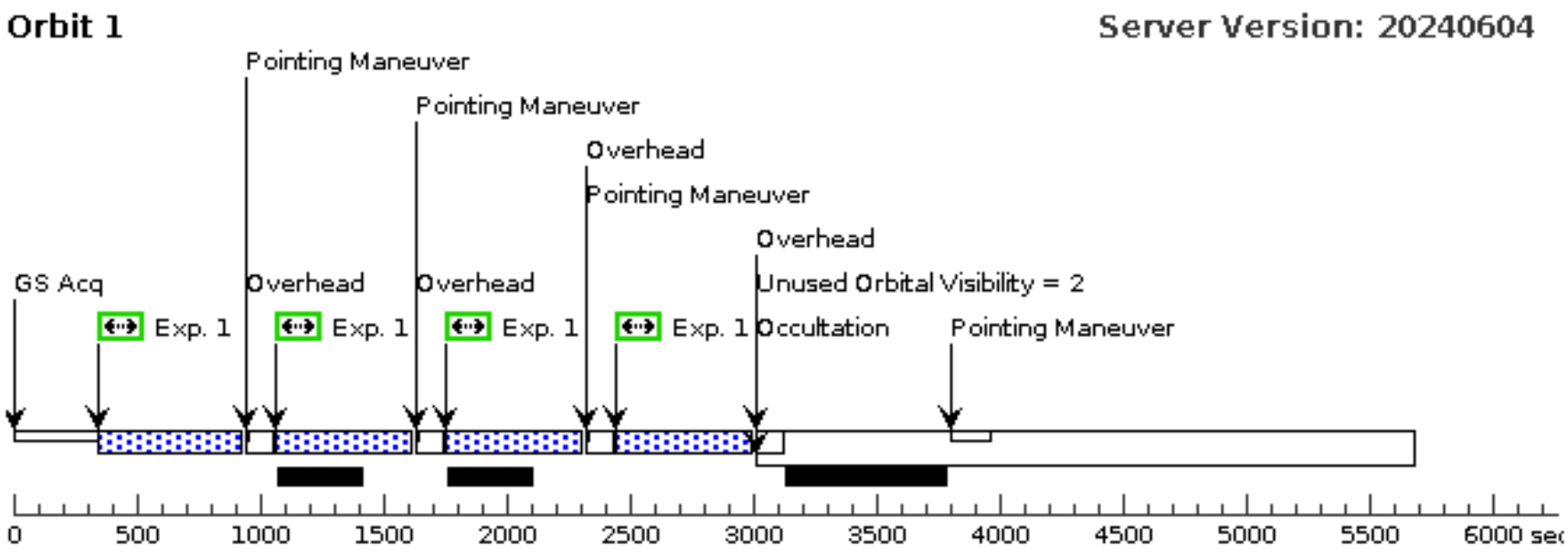
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	LP-758-43	RA: 21 49 38.1564 (327.4089850d) Dec: -11 38 28.40 (-11.64122d) Equinox: J2000	Proper Motion RA: 260.6084489855716 mas/yr Proper Motion Dec: -2.934654099649388 mas/yr Parallax: 0.006723484031388449" Epoch of Position: 2016.0	V=15.97 J=13.0, H=12.26, K=11.90, G=15.12, BP=16.08, RP=14.12	Reference Frame: ICRS

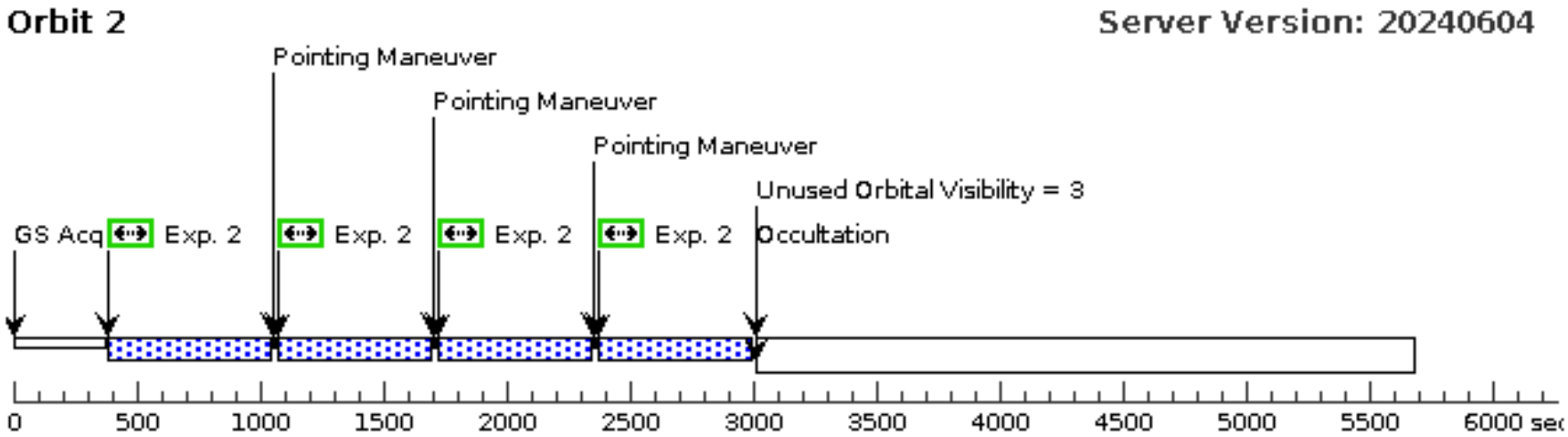
Comments: This object was matched into Gaia DR3.
Category=STAR
Description=[CARBON STAR, COMPOSITE SPECTRAL TYPE, DA]
Extended=NO

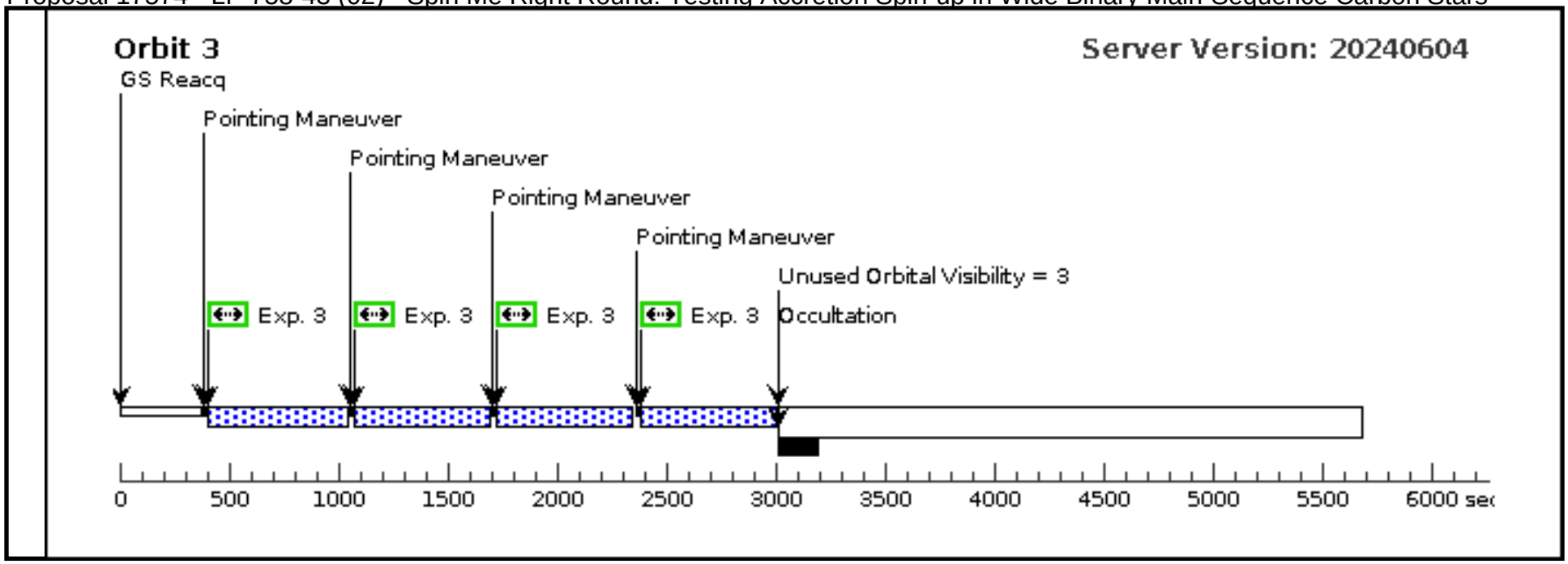
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	UVIS (NUV) (WFC3UVIS.im.1891129)	(2) LP-758-43	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=15.0		Pattern 1, Exps 1-1 in LP 758-43 (02) (1)	2327 Secs (2214 Secs) *[==>553.0 Secs (Pattern 1)]* *[==>553.0 Secs (Pattern 2)]* *[==>554.0 Secs (Pattern 3)]* *[==>554.0 Secs (Pattern 4)]*	***[1]***
2	SBC (FUV1) (ACS.im.1891142)	(2) LP-758-43	ACS/SBC, ACCUM, SBC	F140LP			Pattern 2, Exps 2-2 in LP 758-43 (02) (2)	2482 Secs (2371 Secs) *[==>592.0 Secs (Pattern 1)]* *[==>593.0 Secs (Pattern 2)]* *[==>593.0 Secs (Pattern 3)]* *[==>593.0 Secs (Pattern 4)]*	***[2]***
3	SBC (FUV2) (ACS.im.1891144)	(2) LP-758-43	ACS/SBC, ACCUM, SBC	F165LP			Pattern 2, Exps 3-3 in LP 758-43 (02) (2)	2496 Secs (2365 Secs) *[==>591.0 Secs (Pattern 1)]* *[==>591.0 Secs (Pattern 2)]* *[==>591.0 Secs (Pattern 3)]* *[==>592.0 Secs (Pattern 4)]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20240604
GS Reacq
Pointing Maneuver
Pointing Maneuver
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Pointing Maneuver
Unused Orbital Visibility = 3
Exp. 3
Exp. 3
Exp. 3
Exp. 3
Occultation
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Visit

Proposal 17574, LP 225-12 (03), implementation Tue Jun 11 22:02:09 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1)
(2)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false		(2), (3)

Fixed Targets

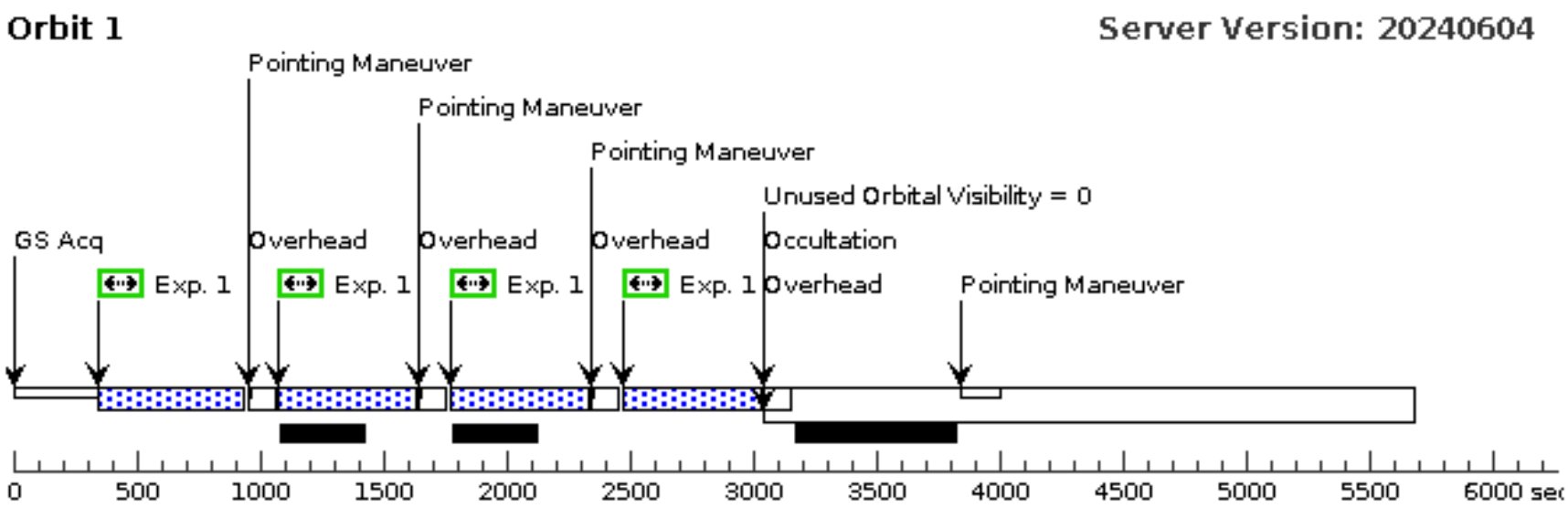
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	LP-225-12	RA: 16 22 32.7158 (245.6363158d) Dec: +42 37 56.42 (42.63234d) Equinox: J2000	Proper Motion RA: -105.34783906098407 mas/yr Proper Motion Dec: 146.9109540652787 mas/yr Parallax: 0.0079002798022676055" Epoch of Position: 2016.0	V=16.5+/-0.5 GALEX NUV=19.5931, B=17.2, R=15.1, G=15.52, BP=16.42, RP=14.59	Reference Frame: ICRS

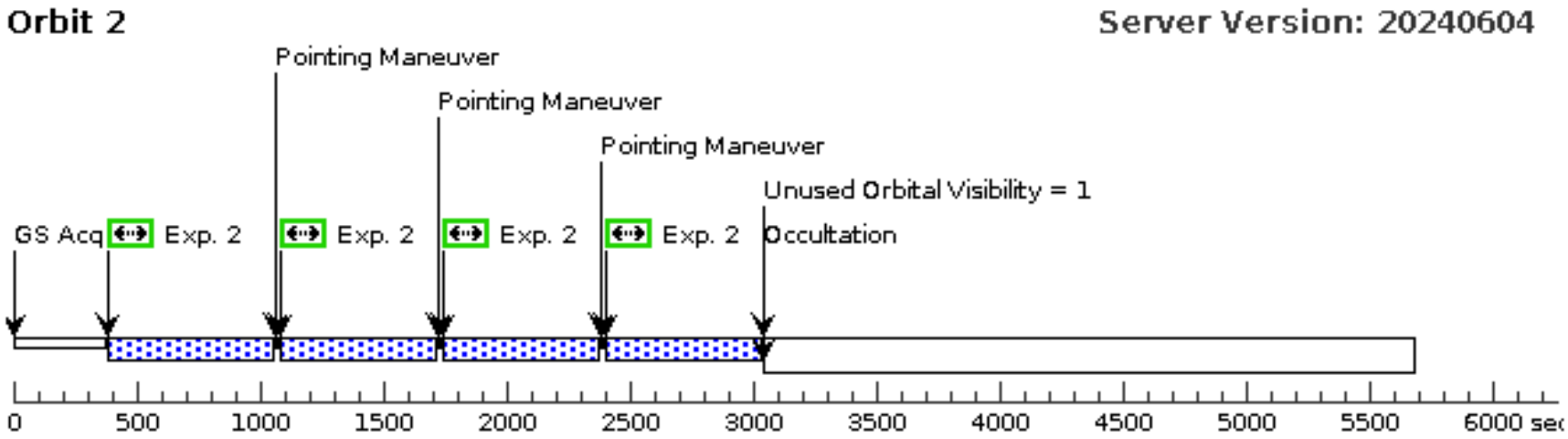
Comments: This object was matched into Gaia DR3.
Category=STAR
Description=[CARBON STAR, COMPOSITE SPECTRAL TYPE, DA]
Extended=NO

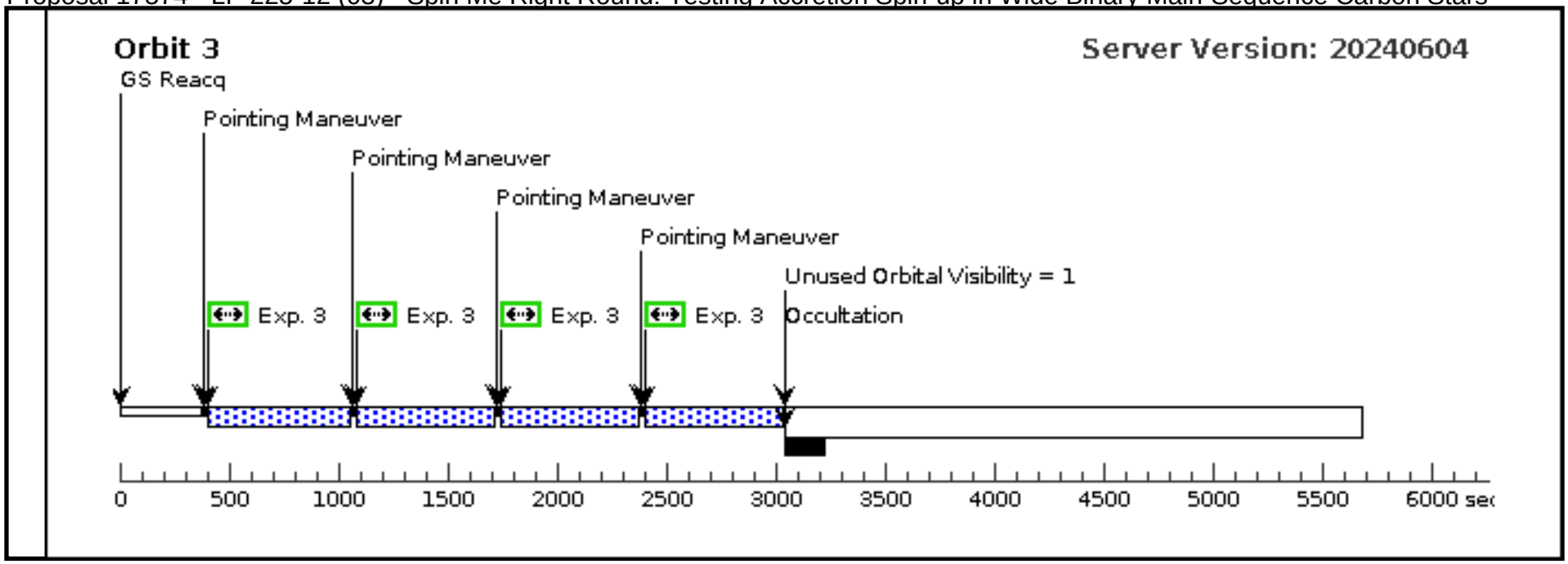
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	UVIS (NUV)	(3) LP-225-12	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=15.0		Pattern 1, Exps 1-1 in LP 225-12 (03) (1)	2327 Secs (2250 Secs) *[==>562.0 Secs (Pattern 1)]* *[==>562.0 Secs (Pattern 2)]* *[==>563.0 Secs (Pattern 3)]* *[==>563.0 Secs (Pattern 4)]*	***[1]***
2	SBC (FUV1) (ACS.im.1891145)	(3) LP-225-12	ACS/SBC, ACCUM, SBC	F140LP			Pattern 2, Exps 2-2 in LP 225-12 (03) (2)	2482 Secs (2407 Secs) *[==>601.0 Secs (Pattern 1)]* *[==>602.0 Secs (Pattern 2)]* *[==>602.0 Secs (Pattern 3)]* *[==>602.0 Secs (Pattern 4)]*	***[2]***
3	SBC (FUV2) (ACS.im.1891146)	(3) LP-225-12	ACS/SBC, ACCUM, SBC	F165LP			Pattern 2, Exps 3-3 in LP 225-12 (03) (2)	2496 Secs (2401 Secs) *[==>600.0 Secs (Pattern 1)]* *[==>600.0 Secs (Pattern 2)]* *[==>600.0 Secs (Pattern 3)]* *[==>601.0 Secs (Pattern 4)]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20240604
GS Reacq
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 1
Exp. 3
Exp. 3
Exp. 3
Exp. 3
Occultation
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