18011 - White dwarfs with inconsistent ages in young open clusters

Cycle: 33, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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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) GAIADR3-534740028404333184	ACS/SBC	1	12-Aug-2025 14:00:30.0	yes
02	(2) GAIADR3-1999875247073083648	ACS/SBC	1	12-Aug-2025 14:00:32.0	yes
03	(3) GAIADR3-2174275039828118912	ACS/SBC	1	12-Aug-2025 14:00:32.0	yes
04	(4) GAIADR3-2194332434010280960	ACS/SBC	1	12-Aug-2025 14:00:33.0	yes
05	(5) GAIADR3-2205542917130608512	ACS/SBC	1	12-Aug-2025 14:00:34.0	yes
06	(6) GAIADR3-2919695270059319808	ACS/SBC	1	12-Aug-2025 14:00:35.0	yes

6 Total Orbits Used

ABSTRACT

The third data realse of Gaia has unveiled a large population of white dwarfs with main-sequence companions at orbital separations of ~1AU, indicating a history of mass transfer between the two companions. Recently, a subsample of these systems that are located in open clusters was used in order to estimate the mass of the white dwarf's progenitor, and to constrain its evolutionary history. A few of these systems that are located in young open clusters displayed inconsistencies between the cluster and the white dwarf ages, where the estimated white dwarf cooling age appeared older than the cluster. The UV excess and age measurements relied on single-band GALEX photometry alone (mostly NUV), as the optical and infrared are dominated by the main-sequence companion.

Here we request ACS/SBC FUV photometry for six of these systems, in order to get a more reliable measurement of the flux of the white dwarf, that will confirm/refute the age inconsistency. The SBC filters will allow us to construct the spectral enetry distribution of the targets in the FUV, constraining their effective temperatures and revealing broad absorption features that could contribute to the age estimate inconsistency. If the system is confirmed to be older than the cluster, it would represent the first evidence of a star captured from the field into an open cluster.

OBSERVING DESCRIPTION

For each of our six targets, we request FUV photometry using ACS/SBC long-pass filters: F115LP, F125LP, F140LP, F150LP, and F165LP. As suggested in the ACS instrument handbook, we will subtract the F165LP measurement from each of the other filters, in order to avoid the red flux contamination from the bright MS companion. This will allow us to construct the SED of the system in the FUV. We have verified that exposures of less than 1 min per filter are required in most cases and less than 8 min in the worst case to achieve a minimal signal-to-noise ratio (SNR) of 10 in the F165LP-subtracted bands. We will spend one HST orbit on each target, maximizing the SNR by taking longer exposures. A photometric SNR above 10 in the F165LP-subtracted bands corresponds to a 2.5% error of the WD effective temperature (calculated using a Monte-Carlo experiment covering a wide range of WD masses and compositions, assuming additive and Gaussian white noise and accounts for systematic errors due to the model grids and extinction of 250 K). This error then translates to a WD cooling age precision better than 20%, in most regions of parameter space (also calculated using a Monte-Carlo experiment and represents the typical 5% uncertainty in WD mass and the inherent overlap between models of different internal compositions and atmospheres).

In parallel, we are actively pursuing follow-up ground-based spectroscopic observations of these systems and selected cluster members to further confirm their association with the cluster (some of these are already secured on the Magellan telescope)

Visit

Proposal 18011, Visit 01 Tue Aug 12 18:00:36 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4), (5)

Fixed Targets

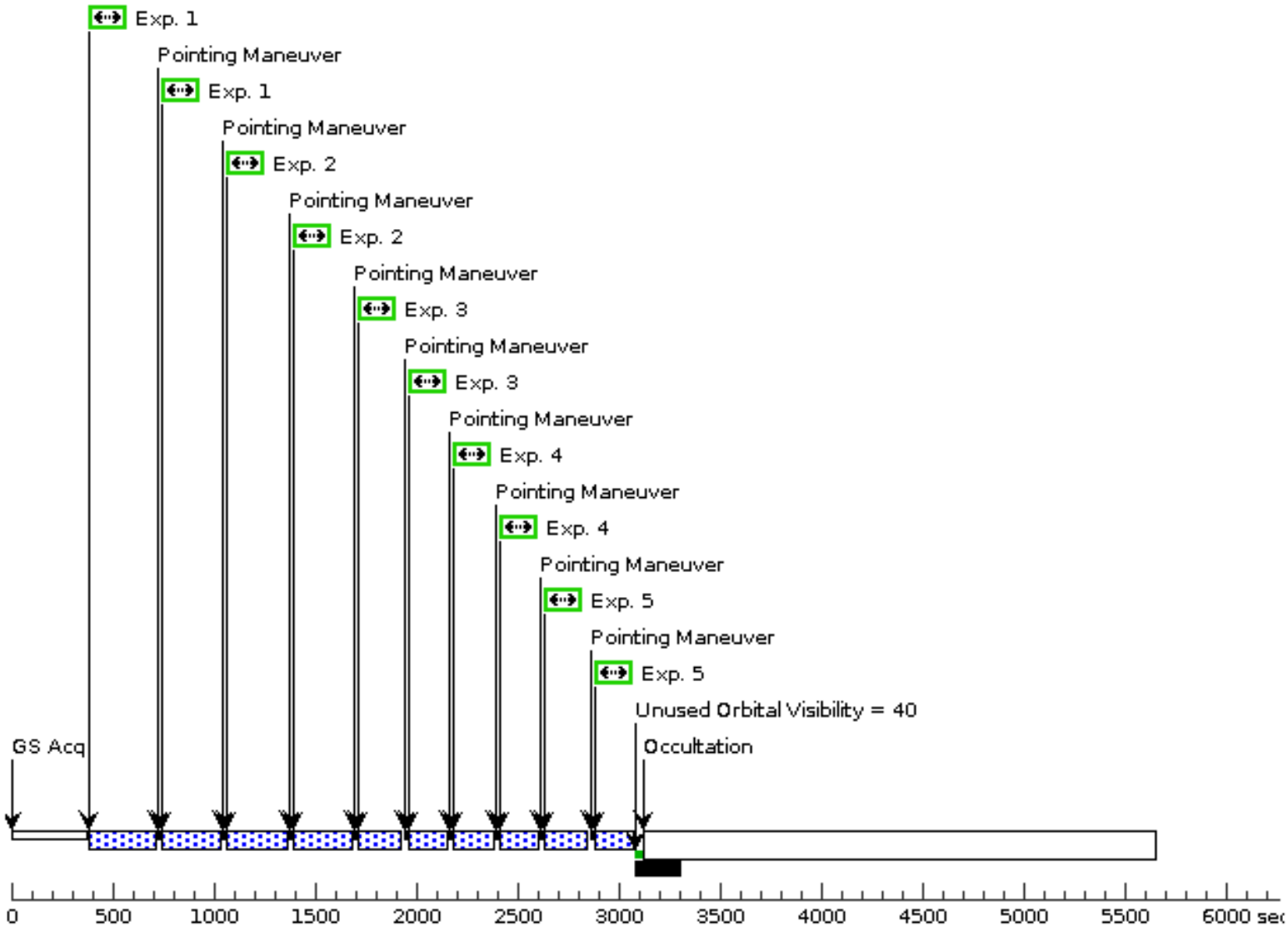
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GAIADR3-5347400284043331 84	RA: 01 38 2.0704 (24.5086267d) Dec: +73 02 15.80 (73.03772d) Equinox: J2000	Proper Motion RA: -1.76009 mas/yr Proper Motion Dec: -0.28948 mas/yr Parallax: 0.00113928" Epoch of Position: 2016.0	V=14.392+/-0.002 NUV=19.89	Reference Frame: ICRS

Comments: Astrometric binary identified by Gaia.
NUV magnitude from Galex.
Astrometry and photometry suggest this is an MS+WD binary.
Category=STAR
Description=[COMPOSITE SPECTRAL TYPE, DA, F3-F9]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	f115 (ACS.im.2023950)	(1) GAIADR3-5347400284043331 84	ACS/SBC, ACCUM, SBC	F115LP			Pattern 1, Exps 1-1 in Visit 01 (1)	260 Secs (520 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	f125 (ACS.im.2023951)	(1) GAIADR3-5347400284043331 84	ACS/SBC, ACCUM, SBC	F125LP			Pattern 1, Exps 2-2 in Visit 01 (1)	260 Secs (520 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
3	f140 (ACS.im.2023952)	(1) GAIADR3-5347400284043331 84	ACS/SBC, ACCUM, SBC	F140LP			Pattern 1, Exps 3-3 in Visit 01 (1)	160 Secs (320 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
4	f150 (ACS.im.2023953)	(1) GAIADR3-5347400284043331 84	ACS/SBC, ACCUM, SBC	F150LP			Pattern 1, Exps 4-4 in Visit 01 (1)	160 Secs (320 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5	f165 (ACS.im.2023954)	(1) GAIADR3-5347400284043331 84	ACS/SBC, ACCUM, SBC	F165LP			Pattern 1, Exps 5-5 in Visit 01 (1)	160 Secs (320 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***

Orbit Structure



Visit

Proposal 18011, Visit 02 Tue Aug 12 18:00:36 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4), (5)

Fixed Targets

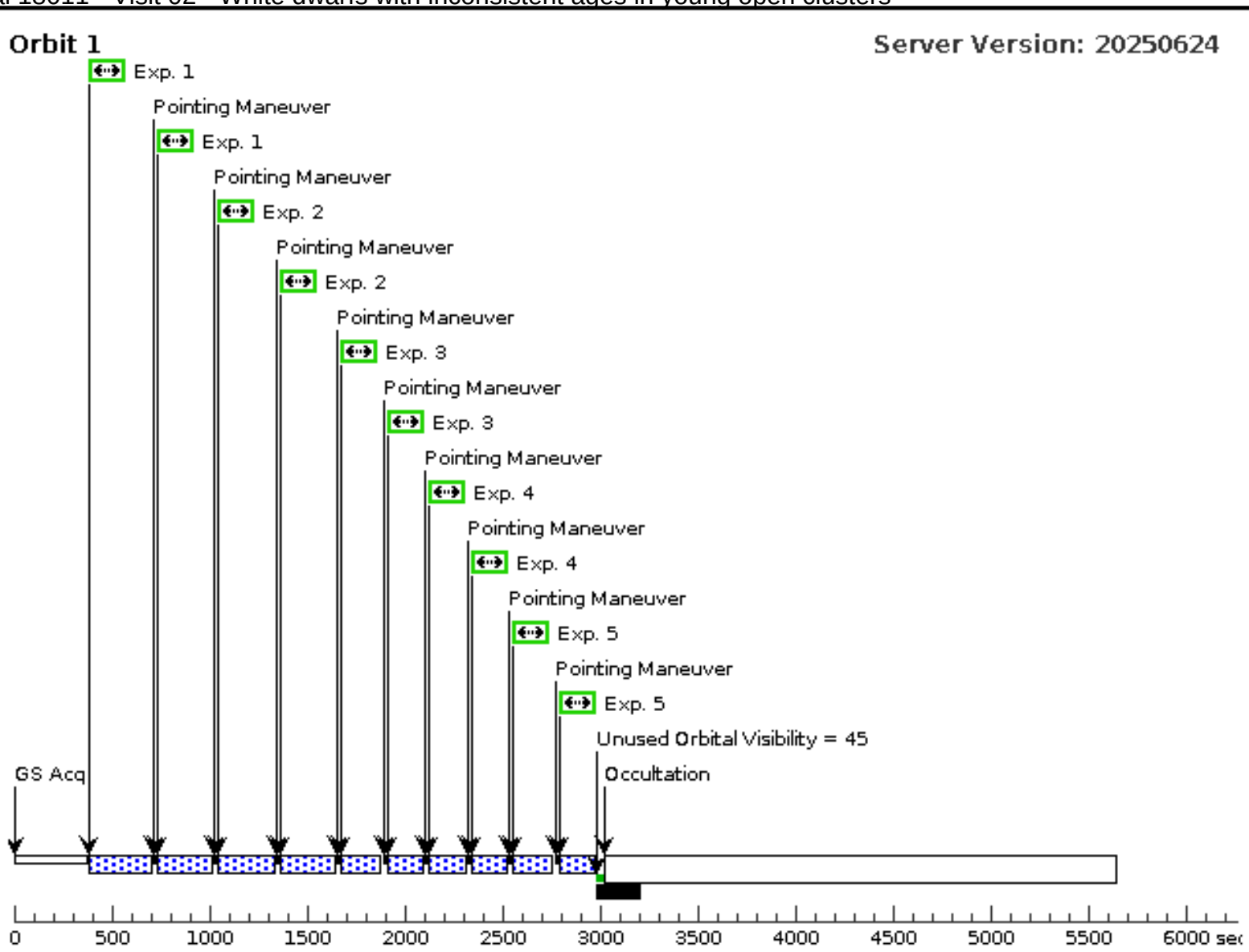
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	GAIADR3-1999875247073083648	RA: 22 25 3.2482 (336.2635342d) Dec: +50 22 9.37 (50.36927d) Equinox: J2000	Proper Motion RA: 5.08013 mas/yr Proper Motion Dec: 0.07119 mas/yr Parallax: 0.00294995" Epoch of Position: 2016.0	V=13.73+/-0.005 NUV=19.61	Reference Frame: ICRS

Comments: Astrometric binary identified by Gaia.
NUV magnitude from Galex.
Astrometry and photometry suggest this is an MS+WD binary.
Category=STAR
Description=[COMPOSITE SPECTRAL TYPE, DA, G V-IV, K III-I]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	f115 (ACS.im.2023955)	(2) GAIADR3-1999875247073083648	ACS/SBC, ACCUM, SBC	F115LP			Pattern 1, Exps 1-1 in Visit 02 (1)	250 Secs (500 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	f125 (ACS.im.2023956)	(2) GAIADR3-1999875247073083648	ACS/SBC, ACCUM, SBC	F125LP			Pattern 1, Exps 2-2 in Visit 02 (1)	250 Secs (500 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
3	f140 (ACS.im.2023957)	(2) GAIADR3-1999875247073083648	ACS/SBC, ACCUM, SBC	F140LP			Pattern 1, Exps 3-3 in Visit 02 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
4	f150 (ACS.im.2023958)	(2) GAIADR3-1999875247073083648	ACS/SBC, ACCUM, SBC	F150LP			Pattern 1, Exps 4-4 in Visit 02 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5	f165 (ACS.im.2023959)	(2) GAIADR3-1999875247073083648	ACS/SBC, ACCUM, SBC	F165LP			Pattern 1, Exps 5-5 in Visit 02 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***

Orbit Structure



Visit

Proposal 18011, Visit 03 Tue Aug 12 18:00:36 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4), (5)

Fixed Targets

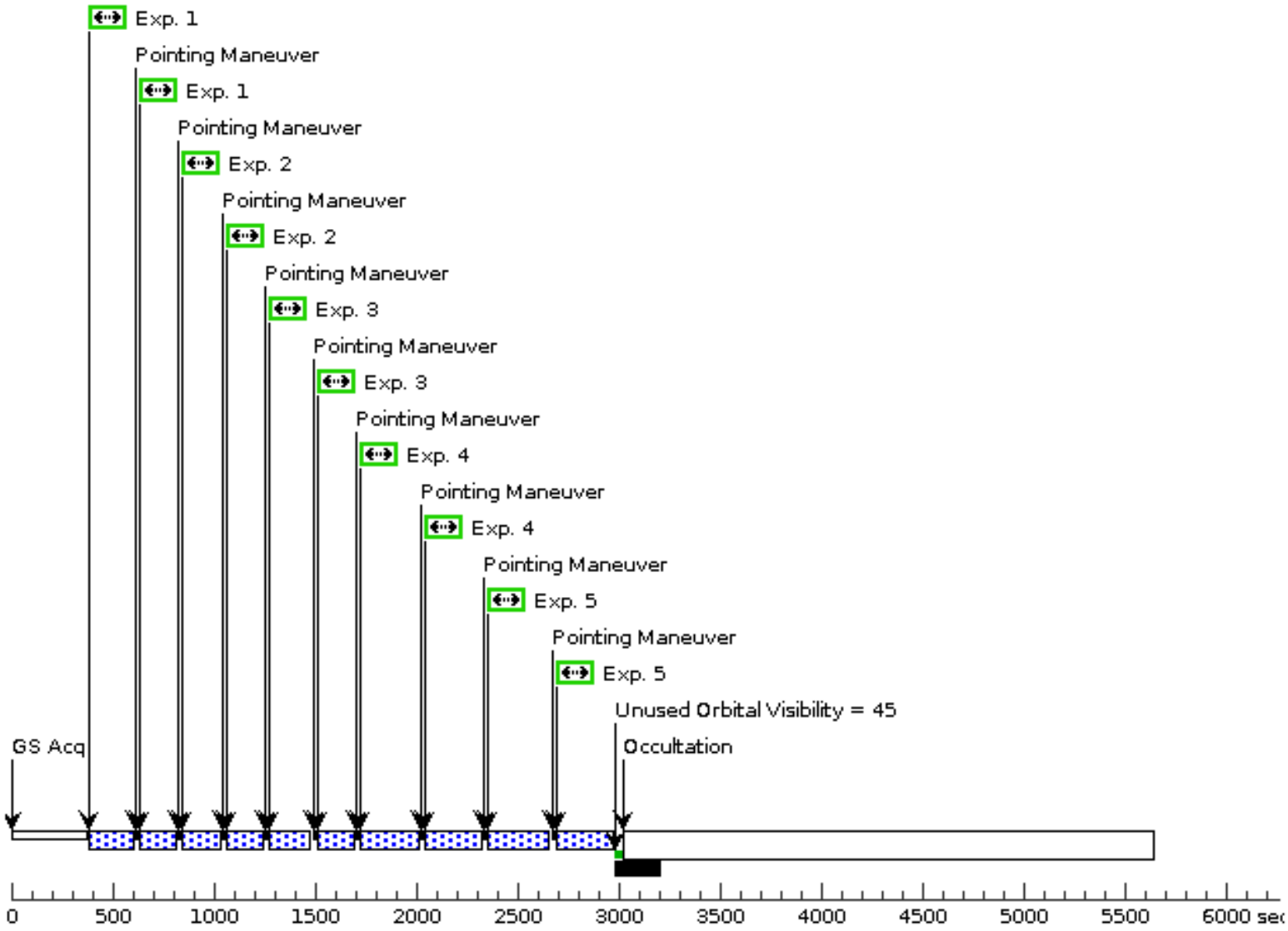
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	GAIADR3-2174275039828118912	RA: 21 40 30.3817 (325.1265904d) Dec: +53 59 18.35 (53.98843d) Equinox: J2000	Proper Motion RA: -3.83857 mas/yr Proper Motion Dec: -3.60309 mas/yr Parallax: 0.0010411" Epoch of Position: 2016.0	V=13.085+/-0.002 NUV=17.49	Reference Frame: ICRS

Comments: Astrometric binary identified by Gaia.
NUV magnitude from Galex.
Astrometry and photometry suggest this is an MS+WD binary.
Category=STAR
Description=[A4-A9 III-I, COMPOSITE SPECTRAL TYPE, DA]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	f115 (ACS.im.2023960)	(3) GAIADR3-2174275039828118912	ACS/SBC, ACCUM, SBC	F115LP			Pattern 1, Exps 1-1 in Visit 03 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	f125 (ACS.im.2023961)	(3) GAIADR3-2174275039828118912	ACS/SBC, ACCUM, SBC	F125LP			Pattern 1, Exps 2-2 in Visit 03 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
3	f140 (ACS.im.2023962)	(3) GAIADR3-2174275039828118912	ACS/SBC, ACCUM, SBC	F140LP			Pattern 1, Exps 3-3 in Visit 03 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
4	f150 (ACS.im.2023964)	(3) GAIADR3-2174275039828118912	ACS/SBC, ACCUM, SBC	F150LP			Pattern 1, Exps 4-4 in Visit 03 (1)	250 Secs (500 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5	f165 (ACS.im.2023965)	(3) GAIADR3-2174275039828118912	ACS/SBC, ACCUM, SBC	F165LP			Pattern 1, Exps 5-5 in Visit 03 (1)	250 Secs (500 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***

Orbit Structure



Visit

Proposal 18011, Visit 04 Tue Aug 12 18:00:36 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4), (5)

Fixed Targets

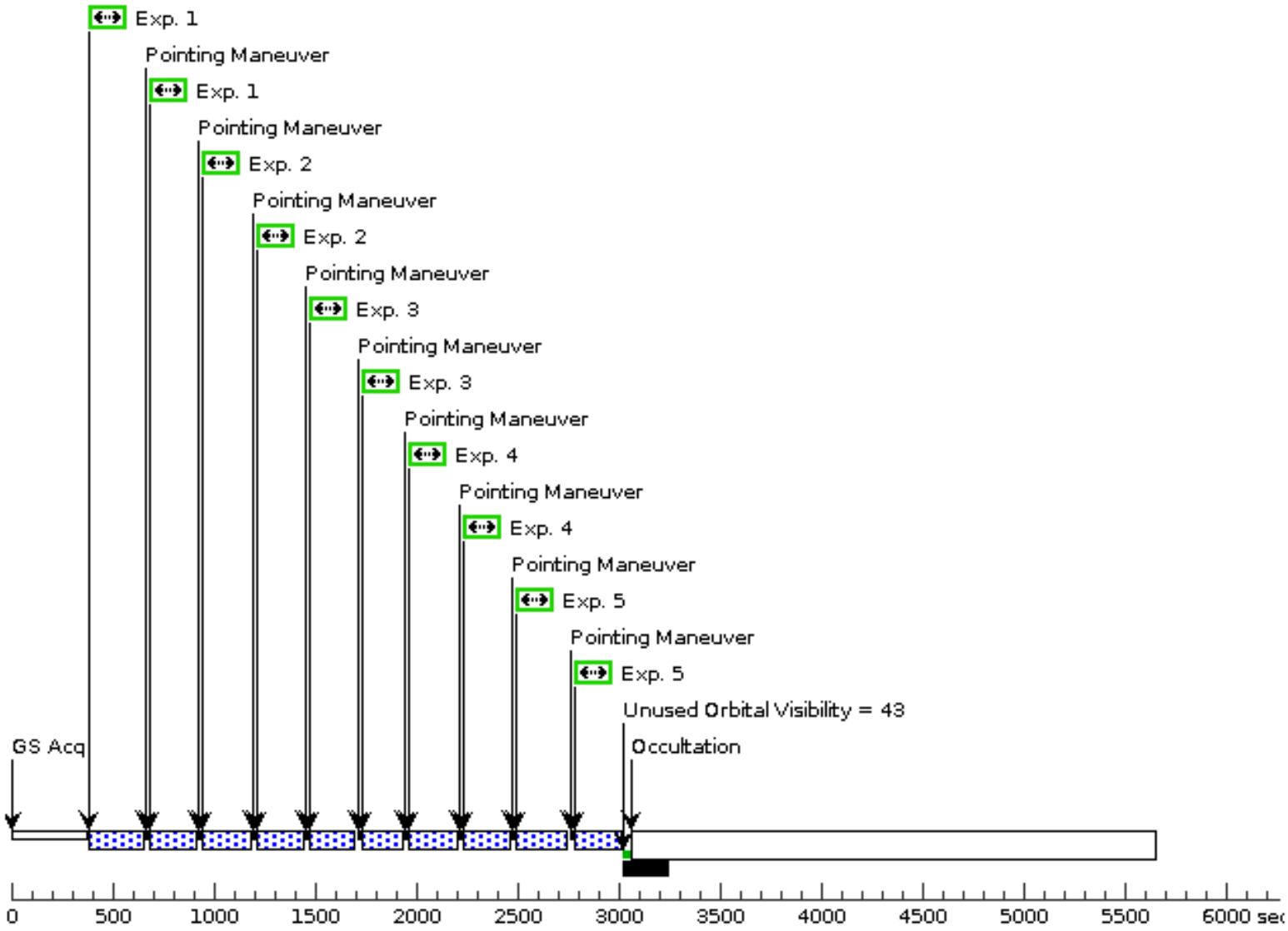
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	GAIADR3-2194332434010280960	RA: 20 46 53.2082 (311.7217008d) Dec: +61 14 33.87 (61.24274d) Equinox: J2000	Proper Motion RA: -2.0914 mas/yr Proper Motion Dec: -3.72157 mas/yr Parallax: 0.00112036" Epoch of Position: 2016.0	V=14.763+/-0.003 NUV=21.21	Reference Frame: ICRS

Comments: Astrometric binary identified by Gaia.
NUV magnitude from Galex.
Astrometry and photometry suggest this is an MS+WD binary.
Category=STAR
Description=[COMPOSITE SPECTRAL TYPE, DA, F3-F9]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	f115 (ACS.im.2023967)	(4) GAIADR3-2194332434010280960	ACS/SBC, ACCUM, SBC	F115LP			Pattern 1, Exps 1-1 in Visit 04 (1)	200 Secs (400 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	f125 (ACS.im.2023968)	(4) GAIADR3-2194332434010280960	ACS/SBC, ACCUM, SBC	F125LP			Pattern 1, Exps 2-2 in Visit 04 (1)	200 Secs (400 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
3	f140 (ACS.im.2023969)	(4) GAIADR3-2194332434010280960	ACS/SBC, ACCUM, SBC	F140LP			Pattern 1, Exps 3-3 in Visit 04 (1)	170 Secs (340 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
4	f150 (ACS.im.2023970)	(4) GAIADR3-2194332434010280960	ACS/SBC, ACCUM, SBC	F150LP			Pattern 1, Exps 4-4 in Visit 04 (1)	200 Secs (400 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5	f165 (ACS.im.2023971)	(4) GAIADR3-2194332434010280960	ACS/SBC, ACCUM, SBC	F165LP			Pattern 1, Exps 5-5 in Visit 04 (1)	200 Secs (400 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***

Orbit Structure



Visit

Proposal 18011, Visit 05 Tue Aug 12 18:00:36 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4), (5)

Fixed Targets

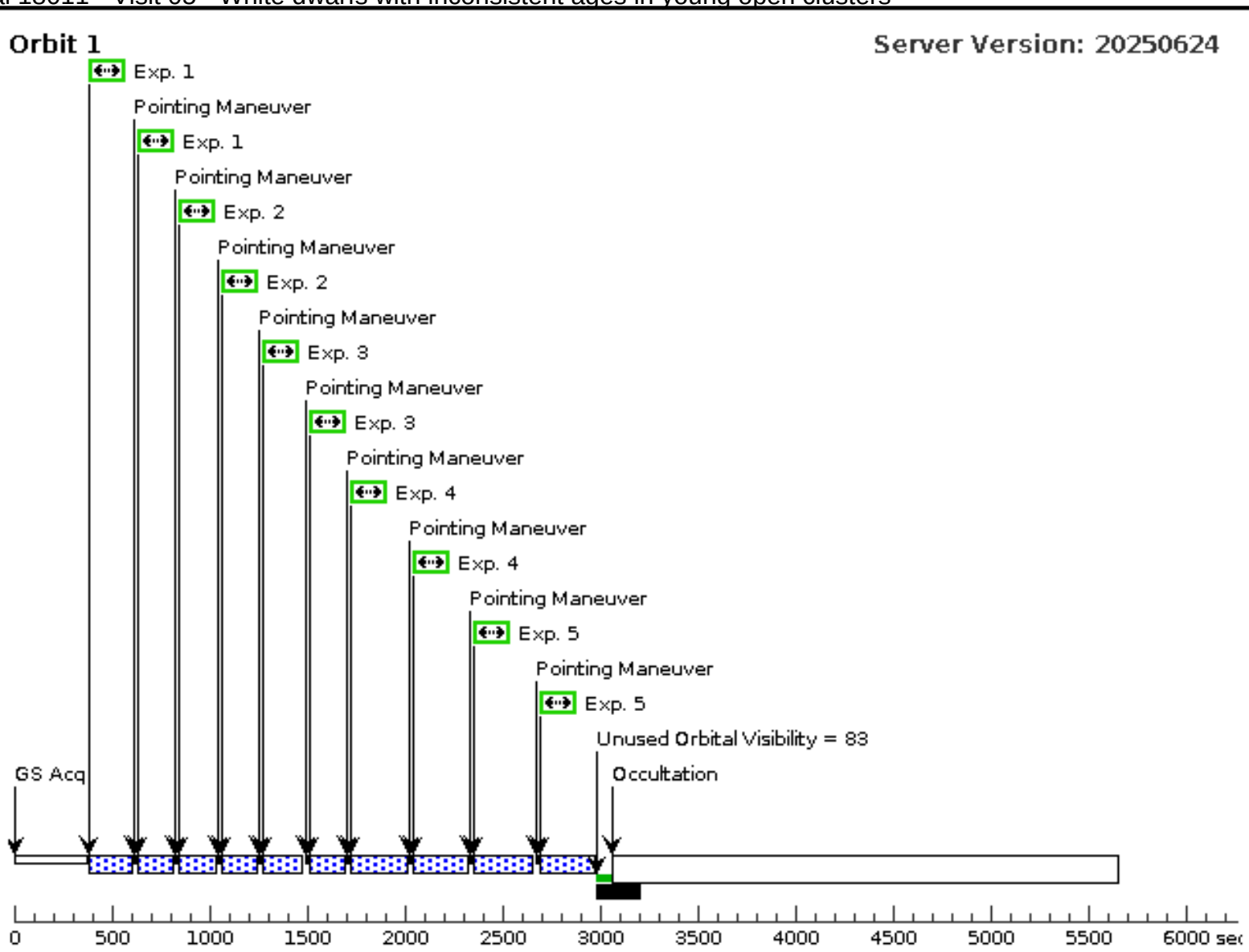
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	GAIADR3-2205542917130608512	RA: 22 36 11.7921 (339.0491338d) Dec: +64 08 3.95 (64.13443d) Equinox: J2000	Proper Motion RA: -3.0063 mas/yr Proper Motion Dec: -1.2533 mas/yr Parallax: 0.00109239" Epoch of Position: 2016.0	V=12.962+/-0.002 NUV=17.43	Reference Frame: ICRS

Comments: Astrometric binary identified by Gaia.
NUV magnitude from Galex.
Astrometry and photometry suggest this is an MS+WD binary.
Category=STAR
Description=[A0-A3 III-I, COMPOSITE SPECTRAL TYPE, DA]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	f115 (ACS.im.2023972)	(5) GAIADR3-2205542917130608512	ACS/SBC, ACCUM, SBC	F115LP			Pattern 1, Exps 1-1 in Visit 05 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	f125 (ACS.im.2023973)	(5) GAIADR3-2205542917130608512	ACS/SBC, ACCUM, SBC	F125LP			Pattern 1, Exps 2-2 in Visit 05 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
3	f140 (ACS.im.2023974)	(5) GAIADR3-2205542917130608512	ACS/SBC, ACCUM, SBC	F140LP			Pattern 1, Exps 3-3 in Visit 05 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
4	f150 (ACS.im.2023975)	(5) GAIADR3-2205542917130608512	ACS/SBC, ACCUM, SBC	F150LP			Pattern 1, Exps 4-4 in Visit 05 (1)	250 Secs (500 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5	f165 (ACS.im.2023976)	(5) GAIADR3-2205542917130608512	ACS/SBC, ACCUM, SBC	F165LP			Pattern 1, Exps 5-5 in Visit 05 (1)	250 Secs (500 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***

Orbit Structure



Visit

Proposal 18011, Visit 06 Tue Aug 12 18:00:36 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4), (5)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	GAIADR3-2919695270059319808	RA: 06 39 55.6932 (99.9820550d) Dec: -27 11 9.21 (-27.18589d) Equinox: J2000	Proper Motion RA: -2.81194 mas/yr Proper Motion Dec: 3.25043 mas/yr Parallax: 0.00111767" Epoch of Position: 2016.0	V=12.698+/-0.002 FUV=20.06	Reference Frame: ICRS

Comments: Astrometric binary identified by Gaia.
NUV magnitude from Galex.
Astrometry and photometry suggest this is an MS+WD binary.
Category=STAR
Description=[A4-A9 V-IV, COMPOSITE SPECTRAL TYPE, DA]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	f115 (ACS.im.2023977)	(6) GAIADR3-2919695270059319808	ACS/SBC, ACCUM, SBC	F115LP			Pattern 1, Exps 1-1 in Visit 06 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	f125 (ACS.im.2023978)	(6) GAIADR3-2919695270059319808	ACS/SBC, ACCUM, SBC	F125LP			Pattern 1, Exps 2-2 in Visit 06 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
3	f140 (ACS.im.2023979)	(6) GAIADR3-2919695270059319808	ACS/SBC, ACCUM, SBC	F140LP			Pattern 1, Exps 3-3 in Visit 06 (1)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
4	f150 (ACS.im.2023980)	(6) GAIADR3-2919695270059319808	ACS/SBC, ACCUM, SBC	F150LP			Pattern 1, Exps 4-4 in Visit 06 (1)	250 Secs (500 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5	f165 (ACS.im.2023983)	(6) GAIADR3-2919695270059319808	ACS/SBC, ACCUM, SBC	F165LP			Pattern 1, Exps 5-5 in Visit 06 (1)	250 Secs (500 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***

Orbit Structure