17403 - Astrometric search for Planets orbiting the closest Y Dwarf

Cycle: 31, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Luigi R. Bedin (PI) (ESA Member) (Contact)	**INAF - Osservatorio Astronomico di Padova**
Prof. Adam J. Burgasser (CoI) (AdminUSPI)	University of California - San Diego
Prof. Daniel Apai (CoI)	University of Arizona
Dr. Clemence Fontanive (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(1) WISEA-J085510.74-071442.5	WFC3/IR	2	30-Oct-2025 18:00:14.0	yes
04	(1) WISEA-J085510.74-071442.5	WFC3/IR	2	30-Oct-2025 18:00:15.0	yes
05	(4) WISEA-J0855YEAR2025.8542	WFC3/IR	2	30-Oct-2025 18:00:17.0	yes

6 Total Orbits Used

ABSTRACT

Located at 2.2 pc, the ~250K Y2 (sub-)brown dwarf WISE J085510.83-071442.5 is the fourth closest known system to Earth. Studying this object provides unique insights into brown dwarf (and exoplanet) atmospheric properties, thermal evolution, multiplicity, and planet-hosting prospects.

We propose to use HST to obtain one the most accurate annual parallax of this - or any - planetary-mass brown dwarf to date, achieving an unprecedented accuracy of 200 micro-arcseconds, and constraining its absolute space motion to equivalent accuracy. More importantly, we will be able to search for faint companions co-moving with the target, either resolved or through astrometric perturbations of its linear motion, the latter

probing down to a few Earth masses.

HST is the optimal facility for precision astrometric measurement of WISE 0855-0714, as this source is too cool and faint at optical and near-infrared wavelengths to observe with ground-based facilities or Gaia. Our observations will improve current astrometric precision of this source by a factor of 40 and anchor future JWST measurements of this and other cold brown dwarfs, while providing high-precision distance and motion measurements and tight constraints on planetary-mass companions for one of the closest ``stellar object'' to the Sun.

OBSERVING DESCRIPTION

This is an astrometric project.

Visit

Proposal 17403, 01 (03), completed Thu Oct 30 22:00:17 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 70%; BETWEEN 06-NOV-2024:00:00:00 AND 13-NOV-2024:00:00:00

Comments: around Nov 9th, 2024

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WISEA-J085510.74-071442.5	RA: 08 55 10.8317 (133.7951321d)	Proper Motion RA: -8118.9 mas/yr	V=25+/-0.5	Reference Frame: ICRS
		Dec: -07 14 42.53 (-7.24515d)	Proper Motion Dec: 679.3 mas/yr	H	
		Equinox: J2000	Epoch of Position: 2000		

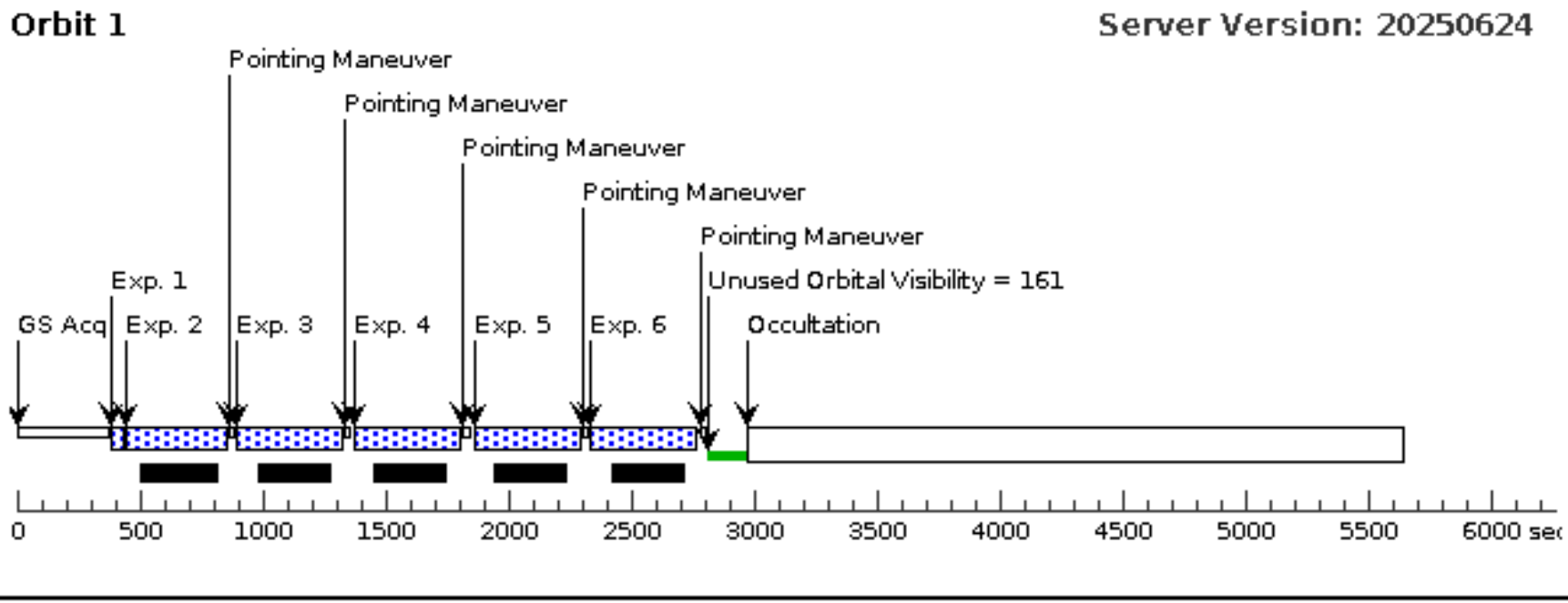
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

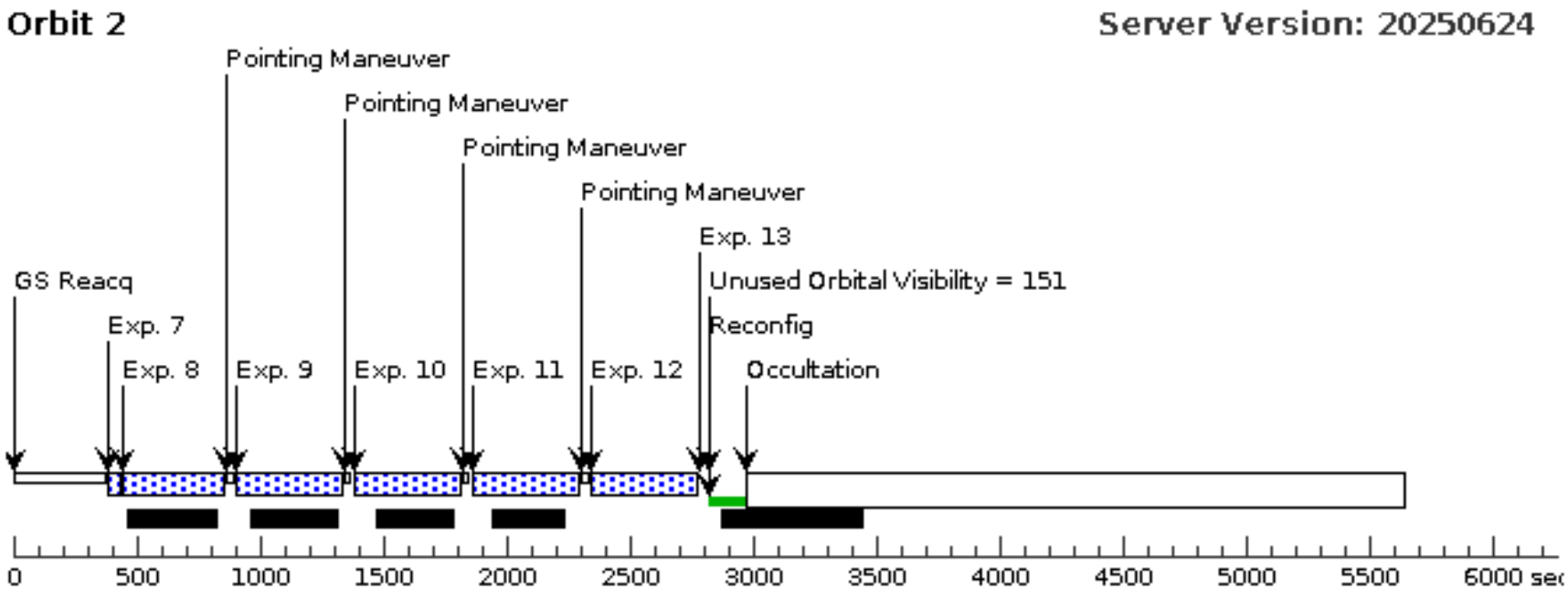
SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR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

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	short	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=RAPID; NSAMP=7	POS TARG -19,+19; GS ACQ SCENARIO BASE1O3		20.526037 Secs (20.526 Secs) *[==>]*	***[1]***
2	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -19,+19		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
3	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -20,-1		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
4	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -21,-21		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
5	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +1,+20		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
6	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +0,+0		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
7	short	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=RAPID; NSAMP=7	POS TARG -1,-20		20.526037 Secs (20.526 Secs) *[==>]*	***[2]***
8	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -1,-20		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
9	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +19,+21		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
10	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +20,+0		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
11	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +21,-19		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
12	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -1,+1		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
13	short	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=RAPID; NSAMP=7	POS TARG -1,+1		20.526037 Secs (20.526 Secs) *[==>]*	***[2]***

Orbit Structure





Visit

Proposal 17403, 02 (04), scheduled Thu Oct 30 22:00:17 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 70%; BETWEEN 06-NOV-2025:00:00:00 AND 13-NOV-2025:00:00:00

Comments: around May 10th, 2025

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WISEA-J085510.74-071442.5	RA: 08 55 10.8317 (133.7951321d)	Proper Motion RA: -8118.9 mas/yr	V=25+/-0.5	Reference Frame: ICRS
		Dec: -07 14 42.53 (-7.24515d)	Proper Motion Dec: 679.3 mas/yr	H	
		Equinox: J2000	Epoch of Position: 2000		

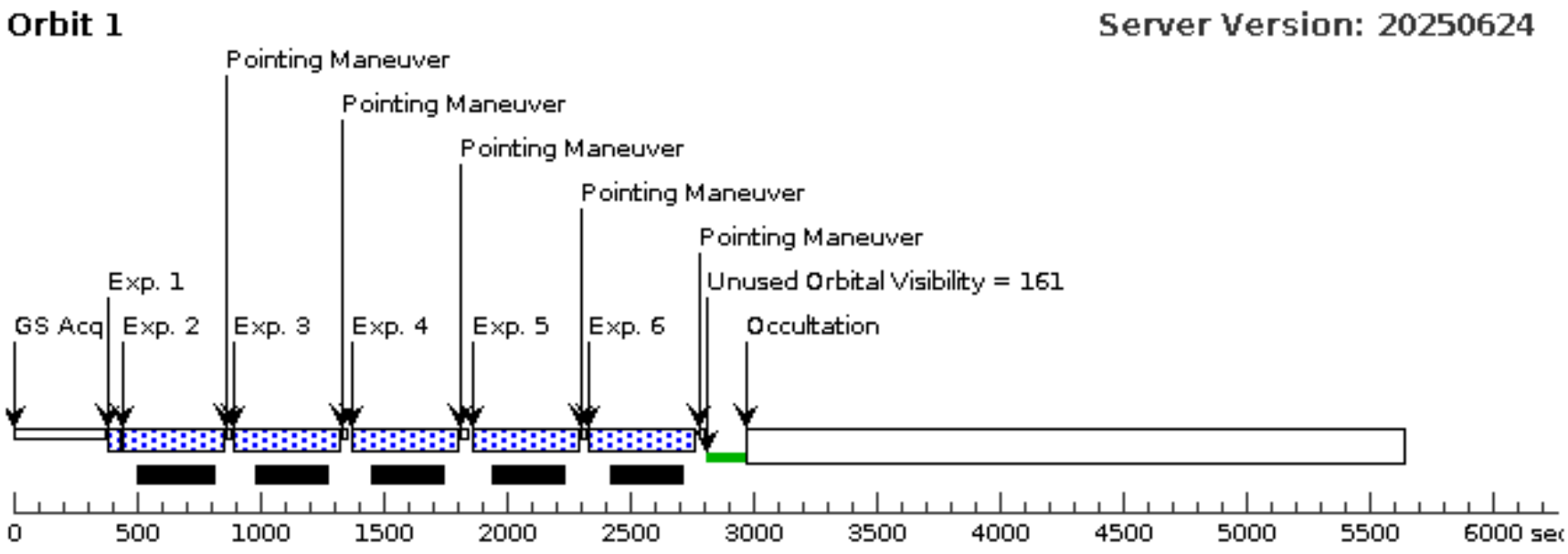
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

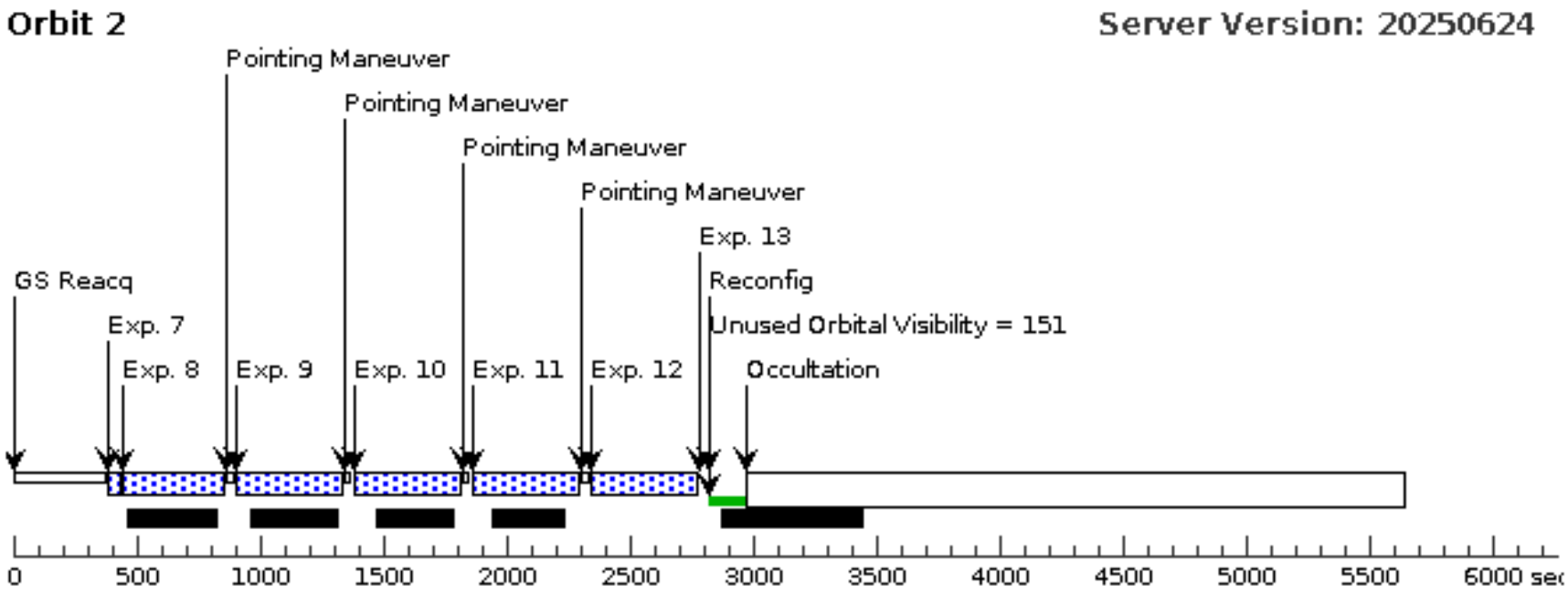
SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR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

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	short	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=RAPID; NSAMP=7	POS TARG -19,+19; GS ACQ SCENARIO BASE1O3		20.526037 Secs (20.526 Secs) *[==>]*	***[1]***
2	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -19,+19		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
3	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -20,-1		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
4	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -21,-21		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
5	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +1,+20		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
6	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +0,+0		399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
7	short	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=RAPID; NSAMP=7	POS TARG -1,-20		20.526037 Secs (20.526 Secs) *[==>]*	***[2]***
8	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -1,-20		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
9	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +19,+21		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
10	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +20,+0		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
11	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +21,-19		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
12	long	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -1,+1		399.233383 Secs (399.233 Secs) *[==>]*	***[2]***
13	short	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=RAPID; NSAMP=7	POS TARG -1,+1		20.526037 Secs (20.526 Secs) *[==>]*	***[2]***

Orbit Structure





Visit

Proposal 17403, 05 (05), implementation Thu Oct 30 22:00:17 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 70%; BETWEEN 06-NOV-2025:00:00:00 AND 13-NOV-2025:00:00:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	WISEA-J0855YEAR2025.8542	RA: 08 55 2.4481 (133.7602004d) Dec: -07 14 32.10 (-7.24225d) Equinox: J2000		V=25 H	Reference Frame: ICRS

Comments: position calculated by me at epoch 2025.8542 because I do not understand how the APT moving target works
Category=STAR
Description=[BROWN DWARF]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	short	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=RAPID; NSAMP=7	POS TARG -19,+19; GS ACQ SCENARIO BASE1O3		20.526037 Secs (20.526 Secs)	
								[==>]	***[1]***
2	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -19,+19		399.233383 Secs (399.233 Secs)	
								[==>]	***[1]***
3	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -20,-1		399.233383 Secs (399.233 Secs)	
								[==>]	***[1]***
4	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -21,-21		399.233383 Secs (399.233 Secs)	
								[==>]	***[1]***
5	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +1,+20		399.233383 Secs (399.233 Secs)	
								[==>]	***[1]***
6	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +0,+0		399.233383 Secs (399.233 Secs)	
								[==>]	***[1]***
7	short	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=RAPID; NSAMP=7	POS TARG -1,-20		20.526037 Secs (20.526 Secs)	
								[==>]	***[2]***
8	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -1,-20		399.233383 Secs (399.233 Secs)	
								[==>]	***[2]***
9	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +19,+21		399.233383 Secs (399.233 Secs)	
								[==>]	***[2]***
10	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +20,+0		399.233383 Secs (399.233 Secs)	
								[==>]	***[2]***
11	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG +21,-19		399.233383 Secs (399.233 Secs)	
								[==>]	***[2]***
12	long	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=13	POS TARG -1,+1		399.233383 Secs (399.233 Secs)	
								[==>]	***[2]***
13	short	(4) WISEA-J0855Y EAR2025.8542	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=RAPID; NSAMP=7	POS TARG -1,+1		20.526037 Secs (20.526 Secs)	
								[==>]	***[2]***

Orbit Structure