18220 - Multiwavelength JWST and HST observations of the off-nuclear TDE AT 2025abcr

Cycle: 33, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) 2025ABCR (2) 2025ABCR-OFFSET-STAR1	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	3	28-Nov-2025 08:00:13.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
02	(1) 2025ABCR	WFC3/UVIS	1	28-Nov-2025 08:00:14.0	yes

4 Total Orbits Used

ABSTRACT

Tidal disruption events (TDEs) are luminous, multiwavelength flares that occur when a star is torn apart by a massive black hole (MBH). Most TDEs originate in galactic nuclei, where MBHs typically reside, but galaxy-merger simulations predict a substantial population of off-nuclear, wandering MBHs. AT 2025abcr is only the second optically selected off-nuclear TDE, and initial estimates suggest it may be powered by an intermediate-mass black hole (IMBH).

We propose multiwavelength JWST+HST Director's Discretionary observations using JWST NIRSpec IFU and MIRI LRS, alongsideHST STIS UV spectroscopy and WFC3 imaging, with three primary science goals: (1) robustly measure the BH mass and test for the presence of a nuclear star cluster (NSC) around the wandering BH; (2) probe early-time accretion physics and outflows via UV spectroscopy; and (3) use spatially resolved stellar kinematics to determine the origin of the off-nuclear BH.

These observations will address fundamental questions about the demographics of wandering BHs (including IMBHs) the origin of offset MBHs, and the evolutionary fate of their accompanying NSCs.

OBSERVING DESCRIPTION

We will use 3 orbits for STIS FUV and NUV MAMA spectroscopy with the following set up:

1) 2 orbits for STIS/FUV-MAMA, TIME-TAG, 52x0.2" slit, G140L
2) 1 orbit for STIS/NUV-MAMA, TIME-TAG, 52x0.2" slit, G230L

Target Acquisition will be done with an offset star.

We will use 1 orbit for WFC3/UVIS imaging in F336W, F621M, F775W.

Visit

Proposal 18220, STIS UV Spectroscopy (01) Fri Nov 28 13:00:14 GMT 2025

Diagnostic Status: No Diagnostics

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

Special Requirements: (none)

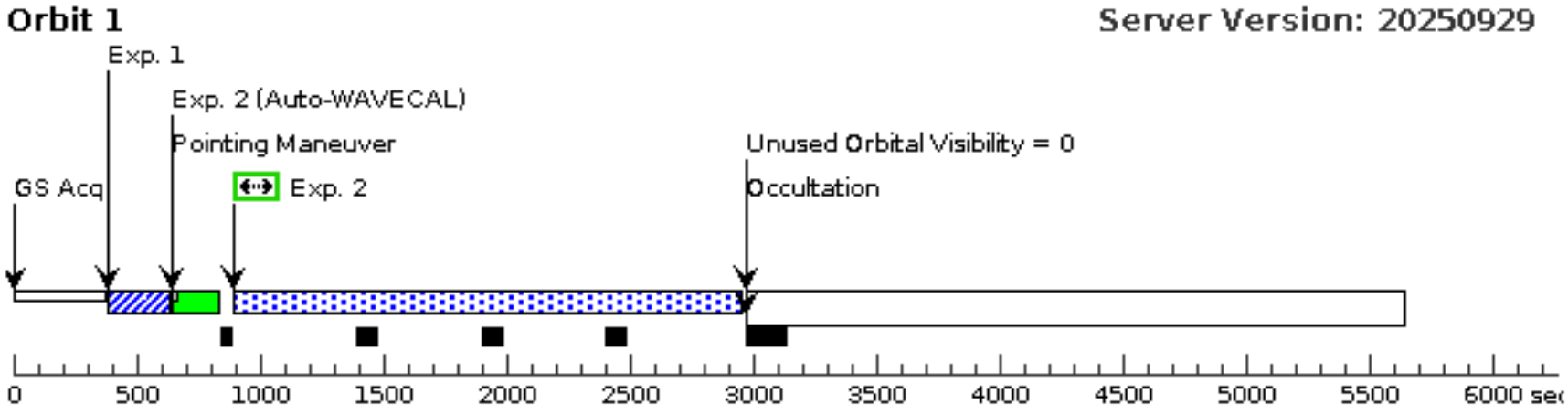
Fixed Targets

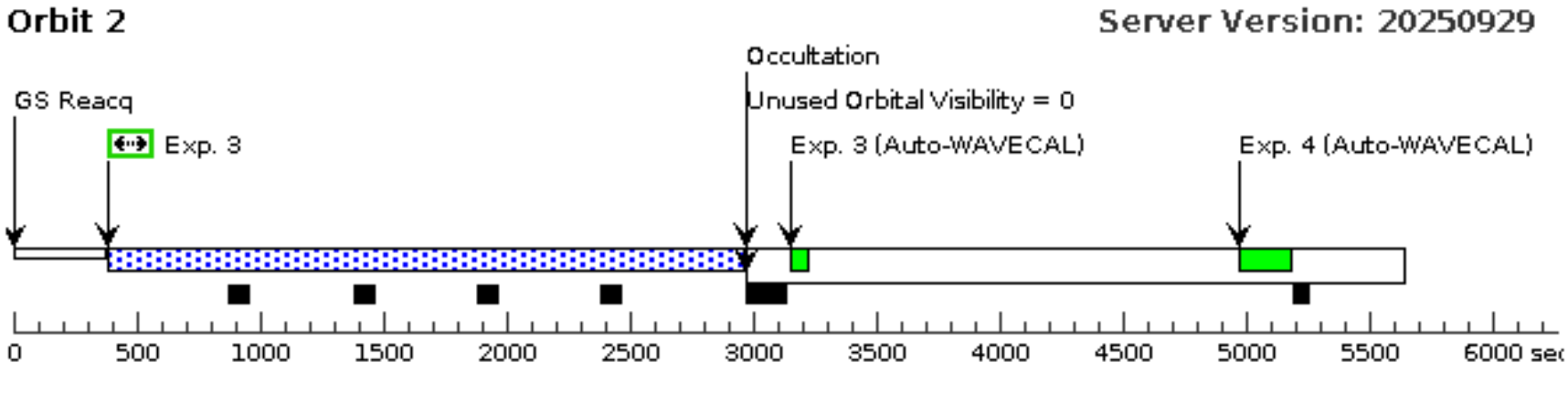
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	2025ABCR	RA: 01 46 55.3860 (26.7307750d) Dec: -15 22 15.60 (-15.37100d) Equinox: J2000	Parallax: 0" Epoch of Position: 2000 Redshift: 0.05	V=19.5+/-0.4 UV flux expected to be 19 +/- 0.4 AB mag	Reference Frame: ICRS
Comments: *Category=UNIDENTIFIED* *Description=[ACCRETION DISK, INFRARED EMITTER, OPTICAL EMITTER, ULTRAVIOLET EMITTER, X-RAY EMITTER]* *Extended=NO*					
(2)	2025ABCR-OFFSET-STAR1 Alt Name1: GAIA-DR3-2452799545790172672	RA: 01 46 54.2745 (26.7261437d) Dec: -15 22 14.50 (-15.37069d) Equinox: J2000	Proper Motion RA: 2.7322 mas/yr Proper Motion Dec: -75.0691 mas/yr Parallax: 0.0033" Epoch of Position: 2016	V=16.5+/-0.05	Reference Frame: ICRS
Comments: Offset star 1 for TA *Category=STAR* *Description=[M III-I]* *Extended=NO*					

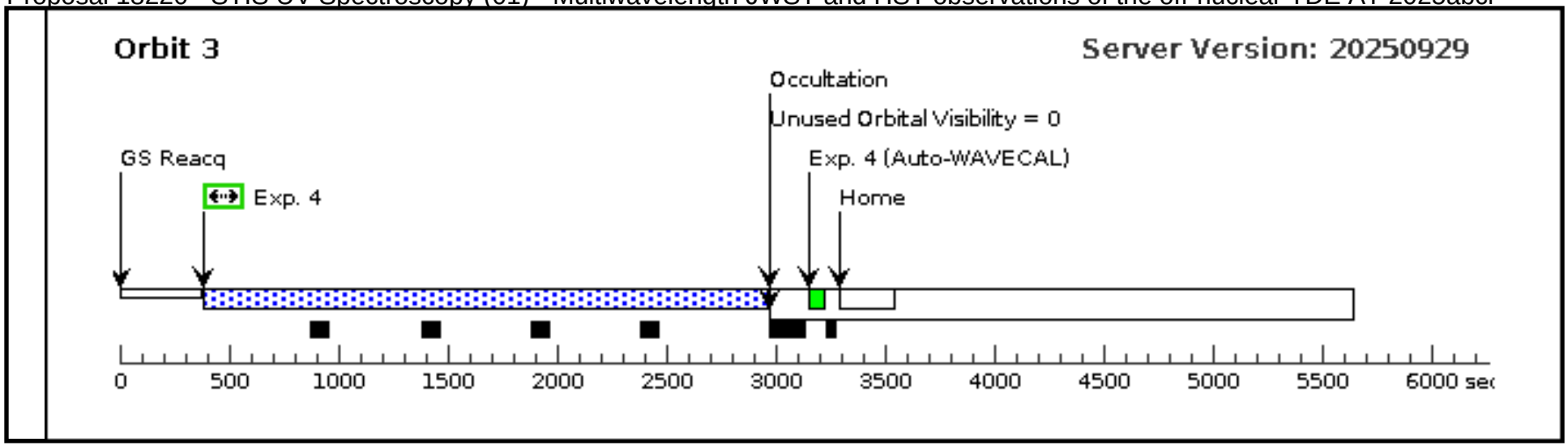
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Target Acquistion (2244400)	(2) 2025ABCR-OFFSET-STAR1	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs) *[==>]*	***[1]***
Comments: This is an offset star for target acquistion									
2	FUV Orbit 1 (2244383)	(1) 2025ABCR	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500			2000 Secs (2049 Secs) *[==>2049.0 Secs]*	***[1]***
3	FUV Orbit 2 (2244383)	(1) 2025ABCR	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=500			2000 Secs (2568 Secs) *[==>2568.0 Secs]*	***[2]***
4	NUV Orbit 1 (2244384)	(1) 2025ABCR	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=500			2000 Secs (2568 Secs) *[==>2568.0 Secs]*	***[3]***

Orbit Structure






Orbit 3
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Occultation
Unused Orbital Visibility = 0
GS Reacq
Exp. 4 (Auto-WAVECAL)
Exp. 4
Home
0
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1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18220, WFC3 Imaging (02) Fri Nov 28 13:00:14 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1-3)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	2025ABCR	RA: 01 46 55.3860 (26.7307750d) Dec: -15 22 15.60 (-15.37100d) Equinox: J2000	Parallax: 0" Epoch of Position: 2000 Redshift: 0.05	V=19.5+/-0.4 UV flux expected to be 19 +/- 0.4 AB mag	Reference Frame: ICRS

Comments:
Category=UNIDENTIFIED
Description=[ACCRETION DISK, INFRARED EMITTER, OPTICAL EMITTER, ULTRAVIOLET EMITTER, X-RAY EMITTER]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(2244378)	(1) 2025ABCR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=16		Pattern 1, Exps 1-3 in WFC3 Imaging (02) (1)	180 Secs (537 Secs) *[==>177.0 Secs (Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2	(2244380)	(1) 2025ABCR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F621M	FLASH=15		Pattern 1, Exps 1-3 in WFC3 Imaging (02) (1)	180 Secs (540 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
3	(2244381)	(1) 2025ABCR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F775W	FLASH=13		Pattern 1, Exps 1-3 in WFC3 Imaging (02) (1)	180 Secs (540 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***

Orbit Structure