



12485 - Multiwavelength JWST and HST observations of the off-nuclear TDE AT 2025abcr

Cycle: 4, Proposal Category: DD

INVESTIGATORS

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
JWST Observations of AT 2025abcr				
	1	NIRSpec IFU	NIRSpec IFU Spectroscopy	(1) 2025abcr
	2	MIRI LRS	MIRI Low Resolution Spectroscopy	(3) 2025abcr_MIRI
	3	MIRI Pre Imaging	MIRI Imaging	(1) 2025abcr

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, alongside HST 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

NIRSpec IFU, MIRI imaging, and MIRI LRS spectroscopy is requested for the off-nuclear TDE AT 2025abcr.

MIRI imaging will be done before LRS to determine the best TA method for LRS.

NIRSpec IFU will be performed using three disperser-filter combinations to cover the full NIRSpec wavelength range:

G140H + F100LP

G235H + F170LP

G395M + F290LP

Proposal 12485 - Targets - Multiwavelength JWST and HST observations of the off-nuclear TDE AT 2025abcr

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	2025abcr	RA: 01 46 55.3875 (26.7307812d) Dec: -15 22 15.74 (-15.37104d) Equinox: J2000	Epoch of Position: 2000	
<p><i>Comments:</i> <i>Category=Unidentified</i> <i>Description=[Infrared sources, Ultraviolet sources, Variable radiation sources, Visible sources, X-ray sources]</i> <i>Extended=NO</i></p>				
Fixed Targets	(2)	Offset-star RA: 01 46 54.2745 (26.7261437d) Dec: -15 22 14.50 (-15.37069d) Equinox: J2000	Proper Motion RA: 2.73227 mas/yr Proper Motion Dec: -75.06911 mas/yr Parallax: 0.0033" Epoch of Position: 2016	
	<p><i>Comments:</i> <i>Category=Star</i> <i>Description=[M stars]</i> <i>Extended=NO</i></p>			
	(3)	2025abcr_MIRI	RA: 01 46 55.4000 (26.7308333d) Dec: -15 22 15.87 (-15.37108d) Equinox: J2000	Epoch of Position: 2000
<p><i>Comments:</i> <i>Category=Unidentified</i> <i>Description=[Infrared sources, Ultraviolet sources, Variable radiation sources, Visible sources, X-ray sources]</i> <i>Extended=NO</i></p>				

Proposal 12485 - Observation 1 - Multiwavelength JWST and HST observations of the off-nuclear TDE AT 2025abcr

Fri Dec 19 15:00:16 GMT 2025

Observation	<p>Proposal 12485, Observation 1: NIRSpec IFU</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
Diagnostics	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(1)	2025abcr	RA: 01 46 55.3875 (26.7307812d) Dec: -15 22 15.74 (-15.37104d) Equinox: J2000			Epoch of Position: 2000						
	<p><i>Comments:</i> <i>Category=Unidentified</i> <i>Description=[Infrared sources, Ultraviolet sources, Variable radiation sources, Visible sources, X-ray sources]</i> <i>Extended=NO</i></p>											
Template	TA Method						HFF Readout Mode					
	NONE						false					
Dithers	#	Dither Type		Size	Starting Point		Number of Points		Points			
	1	4-POINT-DITHER										
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	G140H/F100LP	NRSIRS2	12	1	false	true	NONE	4	4	3559.689	281342
	2	G235H/F170LP	NRSIRS2	18	1	false	true	NONE	4	4	5310.356	281342
	3	G395M/F290LP	NRSIRS2	15	1	false	true	NONE	4	4	4435.023	281342

Proposal 12485 - Observation 2 - Multiwavelength JWST and HST observations of the off-nuclear TDE AT 2025abcr

Fri Dec 19 15:00:16 GMT 2025

Observation	<p>Proposal 12485, Observation 2: MIRI LRS</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: MIRI Low Resolution Spectroscopy</p>									
Diagnostics	(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections			Miscellaneous			
	(3)	2025abcr_MIRI	RA: 01 46 55.4000 (26.7308333d) Dec: -15 22 15.87 (-15.37108d) Equinox: J2000	Epoch of Position: 2000						
	<p><i>Comments:</i> Category=Unidentified Description=[Infrared sources, Ultraviolet sources, Variable radiation sources, Visible sources, X-ray sources] Extended=NO</p>									
Acquisition	#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID	
	1	2 Offset-star	F560W	FAST	4	1	1	11.1	281342	
Template	Subarray				Obtain Verification Image?					
	FULL				true					
Dithers	#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset				
	1	ALONG SLIT NOD								
Pointing Verification	#	PV Readout Pattern	PV Groups/Int	PV Integrations/Exp	PV Total Integrations	PV Exposures/Dith	PV Total Dithers	PV Total Exposure Time	Optional ETC ID	Filter
	1	FASTR1	32	5	5	1	1	455.107		F560W

Proposal 12485 - Observation 2 - Multiwavelength JWST and HST observations of the off-nuclear TDE AT 2025abcr

Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	Optional ETC ID
		1	FASTR1	35	35	70	1	2	6987.551

Proposal 12485 - Observation 3 - Multiwavelength JWST and HST observations of the off-nuclear TDE AT 2025abcr

Fri Dec 19 15:00:16 GMT 2025

Observation	<p>Proposal 12485, Observation 3: MIRI Pre Imaging</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: MIRI Imaging</p>										
Diagnostics	(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous		
	(1)	2025abcr	RA: 01 46 55.3875 (26.7307812d) Dec: -15 22 15.74 (-15.37104d) Equinox: J2000			Epoch of Position: 2000					
	<p><i>Comments:</i> <i>Category=Unidentified</i> <i>Description=[Infrared sources, Ultraviolet sources, Variable radiation sources, Visible sources, X-ray sources]</i> <i>Extended=NO</i></p>										
Template	<p>Subarray</p> <p>FULL</p>										
Dithers	#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size	
	1	CYCLING	1	4						LARGE	
Spectral Elements	#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	F560W	FASTR1	20	3	1	Dither 1	4	12	688.21	
Special Requirements	Between Dates 15-DEC-2025:00:00:00 and 21-DEC-2025:00:00:00										