



9356 - HZTDE-1: The Highest-Redshift TDE Candidate, Revealing the Origins of Supermassive Black Holes

Cycle: 3, Proposal Category: DD

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Mitchell Karmen (PI)	The Johns Hopkins University
Dr. Suvi Gezari (CoI) (CoPI)	Space Telescope Science Institute
Erini Lambrides (CoI)	NASA Goddard Space Flight Center
Dr. Armin Rest (CoI)	Space Telescope Science Institute
Dr. Micaela Bagley (CoI)	NASA Goddard Space Flight Center
Dr. Seiji Fujimoto (CoI) (CSA Member)	University of Toronto
Yukta Ajay (CoI)	The Johns Hopkins University
Dr. Colin A. Norman (CoI)	The Johns Hopkins University
Dr. Justin Pierel (CoI)	Space Telescope Science Institute
Dr. David Coulter (CoI)	Space Telescope Science Institute
Dr. Melissa Shahbandeh (CoI)	Space Telescope Science Institute

OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1	TDE observation	NIRSpec Fixed Slit Spectroscopy	(1) HZTDE-1

ABSTRACT

The highest-redshift tidal disruption event (TDE) candidate has been discovered -- but to confirm it's nature and characterize its properties, JWST follow-up spectroscopy is urgently needed before it fades below detectability. HZTDE-1 is a candidate $z \sim 5$ TDE, and we propose a PRISM spectroscopy program that will confirm its classification, measure its redshift, and lead to a supermassive black hole (SMBH) mass given 7.2 hours

of science time. TDEs are uniquely sensitive to SMBHs in the mass range of 10^5 - $10^8 M_{\text{sun}}$. At $z \sim 5$, broad line AGN have difficulty in measuring the masses of these lower-mass SMBHs, both in selection effects and systematic errors in virial mass estimates. However, this is also the mass and redshift range at which SMBH seed and growth models begin to diverge. HZTDE-1 offers the first probe of a lower-mass SMBH, estimated at $5 \times 10^5 M_{\text{sun}}$, in the early Universe. These observations will pave the way for a new, independent study of high-redshift black holes through the observation of TDEs.

OBSERVING DESCRIPTION

We request 7.2 hours (science time) of fixed slit PRISM spectroscopy in order to classify and characterize the spectrum of HZTDE-1. This is composed of 8 integrations per exposure with 100 groups per integration and 3 dithers, read out with NRSRAPID. We aim to reach at least signal-to-noise 10 at H-alpha to confirm its spectroscopic redshift. Because of the uncertain brightness of the transient target, we will acquire the target via offset from a nearby star in the COSMOS field, which is in the Gaia catalog.

Proposal 9356 - Targets - HZTDE-1: The Highest-Redshift TDE Candidate, Revealing the Origins of Supermassive Black Holes

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	HZTDE-1	RA: 10 01 14.9765 (150.3124021d) Dec: +02 13 55.59 (2.23211d) Equinox: J2000	Proper Motion RA: 0 mas/yr Proper Motion Dec: 0 mas/yr Epoch of Position: 2016	<i>Comments:</i> Category=Star Description=[Black holes, UV transients] Extended=NO
(2)	J100113.00+021418.0	RA: 10 01 13.0037 (150.3041821d) Dec: +02 14 17.83 (2.23829d) Equinox: J2000	Proper Motion RA: 1.930 mas/yr Proper Motion Dec: -7.015 mas/yr Parallax: 0.009143" Epoch of Position: 2016	<i>Comments: This star is within 50" of the science target coordinates, which is within the visit splitting distance.</i> Category=Star Description=[K dwarfs] Extended=NO	

Proposal 9356 - Observation 1 - HZTDE-1: The Highest-Redshift TDE Candidate, Revealing the Origins of Supermassive Black Holes

Sat May 10 00:00:08 GMT 2025

Observation	<p>Proposal 9356, Observation 1: TDE observation</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec Fixed Slit Spectroscopy</p> <p><i>Comments: Due to the uncertain magnitude of this transient source, we opt for target acquisition via offset from a bright nearby K star ($T_{\text{eff}}= 5,035 \text{ K}$, $\log(g) 4.5 \text{ cm/s}^2$). This star has astrometry from the Gaia catalog, while also observed in the same mosaic that our target was selected in COSMOS-Web. The offset from the target coordinates is within the visit splitting distance.</i></p>																																	
Diagnostics	<p>(Visit 1:1) Warning (Form): Data Excess over middle threshold</p> <p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																																	
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Special Requirements

Before Date 28-MAY-2025:00:00:00