



15679 - Searching for Outflow Signatures in the Tidal Disruption Event

ZTF18abxftqm

Cycle: 26, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) ZTF18ABXFTQM	STIS/CCD STIS/FUV-MAMA	2	25-Jan-2019 18:00:13.0	yes
02	(1) ZTF18ABXFTQM	STIS/CCD STIS/NUV-MAMA	1	25-Jan-2019 18:00:15.0	yes

3 Total Orbits Used

ABSTRACT

Wide-field optical transient surveys have discovered about a dozen of tidal disruption events (TDEs), which belong to a rare class of transient phenomena that occur when an unlucky star is tidally disrupted by a supermassive black hole (SMBH). In recent years, two emission mechanisms (circularization v.s. reprocessing) have been put forward to explain the excess in the UV and optical emission in TDEs, which is unexpected

according to the classical TDE framework. UV spectroscopy is critical to disentangling these scenarios, as most strong atomic features fall in this bandpass, and emission and absorption line diagnostics can shed light on the physical state (velocity, density, composition) of the emitting gas (in analogy with quasars). However, despite its important diagnostic capabilities, UV spectroscopy has only been obtained for 5 TDEs so far, each of which have yielded important insights on the presence of an outflow and/or an intriguing nitrogen-rich chemical composition.

Here we propose to obtain an epoch of FUV and NUV HST/STIS spectroscopic observations of the most recent TDE discovered by ZTF: ZTF18abxftqm (AT2018hco) at $z=0.088$. The slow UV evolution of ZTF18abxftqm confirmed by Swift observations, provides an excellent opportunity to get insights of the physical conditions in a TDE with high S/N UV spectroscopy. The proposed observations will allow us to test whether outflow is ubiquitous amongst TDEs, and if so, whether their velocities are consistent with current models.

OBSERVING DESCRIPTION

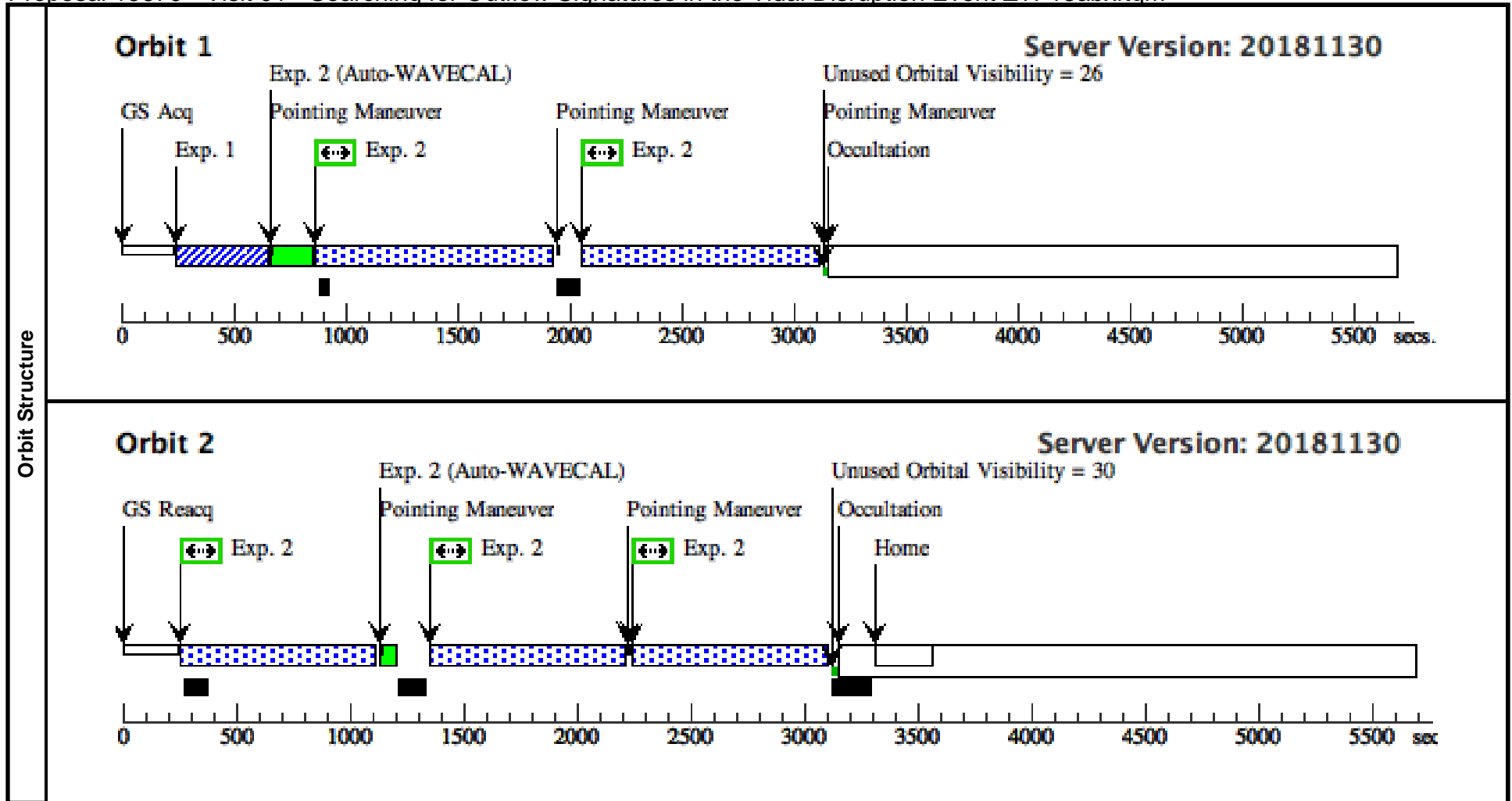
We request a single epoch (that could be split into multiple visits, if necessary) of UV spectroscopy of the TDE ZTF18abxftqm, over the wavelength range from 1200 - 3000Å. HST, with its sensitive UV spectrographs and exquisite angular resolution, is the only facility that can conduct such observations (the source is much too faint for the UV grism on Swift). We take the most recent UVW2 (~1928 Å) magnitude measured by the Swift-UVOT, 18.3 (AB) on 28 Dec 2018, and the inferred blackbody temperature from the UV+optical photometry ($T\sim 20,000$ K) to estimate the expected SNR in different instrumental configurations. We find we can achieve the largest SNR in the near-UV using STIS with the NUV-MAMA detector and the G230L (1570-3180Å) grating. Assuming an orbital visibility of 53 minutes and including overheads for guide-star acquisition (6 min for the first orbit, 4 min for the subsequent orbits), target acquisition (8 min for an extended source, no peak-up required for 0.2" slit width), and wavelength calibration (4 min per orbit), we find that we can obtain 35 min of exposure in the first orbit (43 in subsequent orbits). According to the exposure time calculator, we would expect a SNR per resolution element > 5 for the range from 1650 to 3150Å for the continuum emission for a single orbit. This should allow us to easily detect strong narrow ($W_r > 1\text{Å}$) absorption lines, as well as emission lines as were observed from, e.g., ASASSN-14li and iPTF15af.

In the far UV, we have compared the throughput possible with both COS (G140L grating) and STIS (G140L grating) and find that they are roughly comparable. To enable isolation of the transient emission from the underlying host (via the greater spatial resolution), we have chosen STIS with the FUV-MAMA detector. Using similar overheads as above, with a two orbits we find a SNR > 5 over the range from 1150 to 1700Å for the continuum. To summarize, in total we request a single epoch of STIS spectroscopy of ZTF18abxftqm, for a total of 3 orbits (2 FUV + 1 NUV).

Proposal 15679 - Visit 01 - Searching for Outflow Signatures in the Tidal Disruption Event ZTF18abxftgm

Fri Jan 25 23:00:15 GMT 2019

Visit	Proposal 15679, Visit 01, implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: BEFORE 21-FEB-2019:00:00:00									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(2)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG						
		Purpose=DITHER	Pattern Orientation=90.0							
		Number Of Points=5	Angle Between Sides=							
		Point Spacing=0.4165	Center Pattern=false							
		Line Spacing=								
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	ZTF18ABXFTQM	RA: 01 07 33.6100 (16.8900417d) Dec: +23 28 34.39 (23.47622d) Equinox: J2000	Redshift: 0.088	V=17.9+/-0.2 UVW2 = 18.3	Reference Frame: ICRS				
	<i>Comments:</i> Category=GALAXY Description=[ACCRETION DISK, NUCLEUS, WIND]									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) ZTF18ABXFTQ M	STIS/CCD, ACQ, F28X50LP	MIRROR		GS ACQ SCENARI O SINGLE		45 Secs (45 Secs) [==>]	[1]
	2	(1308715)	(1) ZTF18ABXFTQ M	STIS/FUV-MAMA, ACCUM, 52X0.2	G140L 1425 A			Pattern 2, Exps 2-2 i n Visit 01 (2)	850 Secs (4650 Secs) [==>1050.0 Secs (Pattern 1)] [==>1050.0 Secs (Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)] [==>(Pattern 5)]	[1] [2]



Proposal 15679 - Visit 02 - Searching for Outflow Signatures in the Tidal Disruption Event ZTF18abxftgm

Fri Jan 25 23:00:15 GMT 2019

Visit	Proposal 15679, Visit 02		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: STIS/NUV-MAMA, STIS/CCD		
	Special Requirements: BEFORE 21-FEB-2019:00:00:00		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=3 Point Spacing=0.4165 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	ZTF18ABXFTQM	RA: 01 07 33.6100 (16.8900417d) Dec: +23 28 34.39 (23.47622d) Equinox: J2000	Redshift: 0.088	V=17.9+/-0.2 UVW2 = 18.3	Reference Frame: ICRS

Comments:
 Category=GALAXY
 Description=[ACCRETION DISK, NUCLEUS, WIND]

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) ZTF18ABXFTQ M	STIS/CCD, ACQ, F28X50LP	MIRROR			GS ACQ SCENARI O SINGLE		45 Secs (45 Secs)
2	(1308714)	(1) ZTF18ABXFTQ M	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A			Pattern 1, Exps 2-2 i n Visit 02 (1)		680 Secs (2040 Secs)	

[==>]
 [==(Pattern 1)]
 [==(Pattern 2)]
 [==(Pattern 3)]

