



17933 - Turn-on AGN or IMBH-TDE? UV Spectroscopic Observations May Tell

Cycle: 32, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. Ning Jiang (PI) (Contact)	University of Science and Technology of China
Dr. Tinggui Wang (CoI)	University of Science and Technology of China
Mr. Jiazheng Zhu (CoI)	University of Science and Technology of China
Yibo Wang (CoI)	University of Science and Technology of China
Mr. Wenkai Li (CoI)	University of Science and Technology of China
Dr. Shifeng Huang (CoI)	University of Science and Technology of China

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) SDSSJ1335+0728	STIS/CCD STIS/NUV-MAMA	2	29-Apr-2025 11:00:11.0	yes
02	(1) SDSSJ1335+0728	STIS/CCD STIS/FUV-MAMA	2	29-Apr-2025 11:00:12.0	yes

4 Total Orbits Used

ABSTRACT

The quasi-periodic eruptions (QPEs) are an intriguing transient phenomenon associated with supermassive black holes (SMBHs) discovered in the past few years. There is growing observational evidence that some (if not all) QPEs are connected with tidal disruption events (TDEs), which has promoted the "EMRI+TDE=QPE" model. Very recently, another remarkable QPE source has been reported after an optical outburst in the nearby galaxy SDSSJ1335+0728. It is suggested that the QPEs in this galaxy are linked to a turn-on active galactic nuclei (AGN) rather than a TDE as its

slow decay and AGN-like variability differ greatly from normal TDEs. Therefore, this discovery may broaden the possible formation channels for QPEs. However, its blue optical color, soft X-ray emission and lack of broad emissions are unusual for AGNs, but could be consistent with a TDE scenario. In fact, such a long, blue and faint optical outburst can be a strong evidence for TDEs by intermediate-mass black holes (IMBHs). To further explore the nature of the intriguing outburst (turn-on AGN or IMBH-TDE), we propose to conduct STIS UV spectroscopic observations on SDSSJ1335+0728 with 4 orbits time. The immediate objectives are mainly in two folds: 1) to detect possible characteristic UV emission lines; 2) to better characterize the outburst SED down to 1000 Å, both of which may help to distinguish between the AGN and TDE scenarios. If it is indeed an IMBH-TDE, it provides another representative example of QPE-TDE associations in a rare IMBH-TDE system while in the case of a turn-on AGN, it also provides valuable, yet rarely studied, SED information for a newly formed AGN disk.

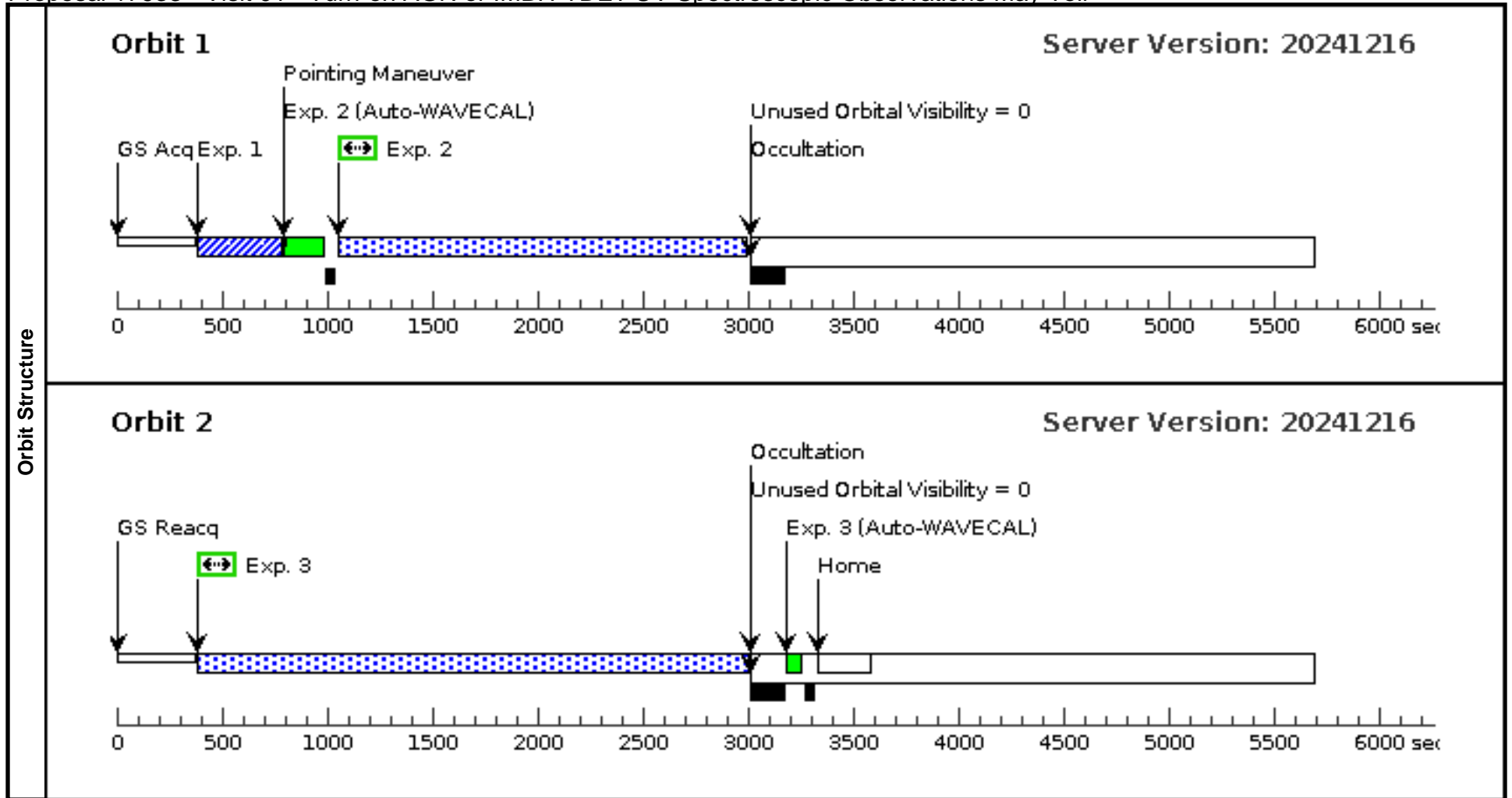
OBSERVING DESCRIPTION

We propose to observe the UV spectrum of SDSSJ1335+0728 with STIS. We require to use G140L and G230L gratings to obtain a continuous wavelength coverage from 1120 to 3100 Å in the rest frame. A slit width of 0.2" is preferred to cover the galactic nucleus and minimize the starlight contamination. The magnitudes in UVW1, UVM2, UVW2 bands measured from the latest Swift/UVOT observations on March 12 are 17.91±0.05, 18.17±0.05 and 18.05±0.10, respectively. After subtracting the host contribution from the host galaxy, the UVM2 (with a central wavelength of 2246Å) magnitude is around 18.9. We expect the magnitude to be comparable after a few months, since its evolution is rather slow. We try to estimate the needed exposure time using the Exposure Time Calculator (ETC) of HST/STIS. We assume a blackbody spectrum with a temperature of 30,000K, and an AB magnitude of 18.9 in the UVM2 band. To reliably detect a possible N III]1750 line, a continuum signal-to-noise ratio (SNR) of 10 at 1792Å is required. This requires an exposure time of about 5000 seconds (~2 orbits) with the G230L grating. Based on our previous experience in analyzing the STIS data, a similar time is required in G140L. Therefore, a total of 4 orbits is sufficient for both gratings, including overheads.

Proposal 17933 - Visit 01 - Turn-on AGN or IMBH-TDE? UV Spectroscopic Observations May Tell

Tue Apr 29 15:00:13 GMT 2025

Visit	Proposal 17933, Visit 01, implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/NUV-MAMA, STIS/CCD Special Requirements: BEFORE 01-JUN-2025:00:00:00									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
		(1)	SDSSJ1335+0728	RA: 13 35 19.9356 (203.8330650d) Dec: +07 28 7.74 (7.46882d) Equinox: J2000		V=19	Reference Frame: ICRS			
	<i>Comments:</i> Category=GALAXY Description=[SEYFERT]									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	acquisition	(1) SDSSJ1335+0728 8	STIS/CCD, ACQ, 50CCD	MIRROR				40 Secs (40 Secs)	
									[==>]	[1]
	2	science (1981227)	(1) SDSSJ1335+0728 8	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=13 37			1926 Secs (1926 Secs)	
								[==>]	[1]	
3	science (1981227)	(1) SDSSJ1335+0728 8	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=13 37			2602 Secs (2602 Secs)		
								[==>]	[2]	



Proposal 17933 - Visit 02 - Turn-on AGN or IMBH-TDE? UV Spectroscopic Observations May Tell

Tue Apr 29 15:00:13 GMT 2025

Visit	Proposal 17933, Visit 02, implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: BEFORE 01-JUN-2025:00:00:00									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
		(1)	SDSSJ1335+0728	RA: 13 35 19.9356 (203.8330650d) Dec: +07 28 7.74 (7.46882d) Equinox: J2000		V=19	Reference Frame: ICRS			
	<i>Comments:</i> Category=GALAXY Description=[SEYFERT]									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	acquisition	(1) SDSSJ1335+0728 8	STIS/CCD, ACQ, 50CCD	MIRROR				40 Secs (40 Secs)	
									[==>]	[1]
	2	science (1981229)	(1) SDSSJ1335+0728 8	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=69 96			1926 Secs (1926 Secs)	
								[==>]	[1]	
3	science (1981229)	(1) SDSSJ1335+0728 8	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=69 96			2602 Secs (2602 Secs)		
								[==>]	[2]	

