18238 - AT2018cow: A Unique Laboratory for Super-Eddington Accretion and Black-hole Growth

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Anna Yen Qin Ho (PI) (Contact)	**Cornell University**
Prof. Andrew James Levan (CoI) (ESA Member)	Radboud University Nijmegen
Dr. Daniel Perley (CoI) (ESA Member)	Liverpool John Moores University
Prof. Eliot Quataert (CoI)	Princeton University
Michael Camilo (CoI)	Cornell University
Dr. Rahul Jayaraman (CoI)	Cornell University
Dr. Anne Inkenhaag (CoI) (ESA Member)	University of Bath
Ms. Mila Winter-Granic (CoI)	Princeton University
Dr. Stephen Bradley Cenko (CoI)	NASA Goddard Space Flight Center

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SN-2018COW	WFC3/UVIS	2	28-Apr-2026 22:00:14.0	yes

2 Total Orbits Used

ABSTRACT

Black-hole accretion via a disk plays a fundamental role in astronomy. In the past decade, a number of accretion-powered systems have been discovered that defy standard models, motivating new frameworks for disk evolution that accurately treat the poorly understood regime of super-

Eddington accretion. An ideal test case for new disk-evolution models is AT2018cow, an accretion-powered transient in a galaxy only 60 Mpc away. We propose to observe AT2018cow's accretion disk using JWST and HST. We will model the newly observed UVOIR SED, together with existing X-ray observations, using a new framework for the long-term evolution of accretion disks that takes super-Eddington accretion into account. The observations and modeling will enable us to both refine the modeling framework and infer the black-hole mass (a key degeneracy between competing progenitor models). JWST/NIRCam is essential because its angular resolution will enable AT2018cow to be separated from the background much better than the existing HST measurements. NIRCam's NIR sensitivity also has the potential to detect an underlying compact cluster, which would further help distinguish between progenitor scenarios and enable the cluster contribution to be jointly modeled with the accretion disk emission. A newly formed accretion disk in a very nearby system that underwent super-Eddington accretion is a rare opportunity: AT2018cow is a unique probe of a poorly understood regime of accretion physics that is likely critical for understanding massive BH growth at high redshift, as well as for determining the progenitors of new transient classes.

OBSERVING DESCRIPTION

We request 2613s of exposures in F225W and 1527s in F336W spread across two orbits. To do this, we observe with F225W for all of one orbit and a short portion of the second, and the rest of the second orbit is used for F336W.

We use the UVIS2-C1K1C-SUB as we only need to image the compact source, not the extended emission from the galaxy. This also increases possible exposure time by making the readout faster.

We use a FLASH level of 21 electrons to maintain charge transfer efficiency, and this threshold would set the lamp at a higher setting and reduce overheads.

Visit

Proposal 18238, Visit 01, scheduling Wed Apr 29 02:00:15 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1), (3)

Fixed Targets

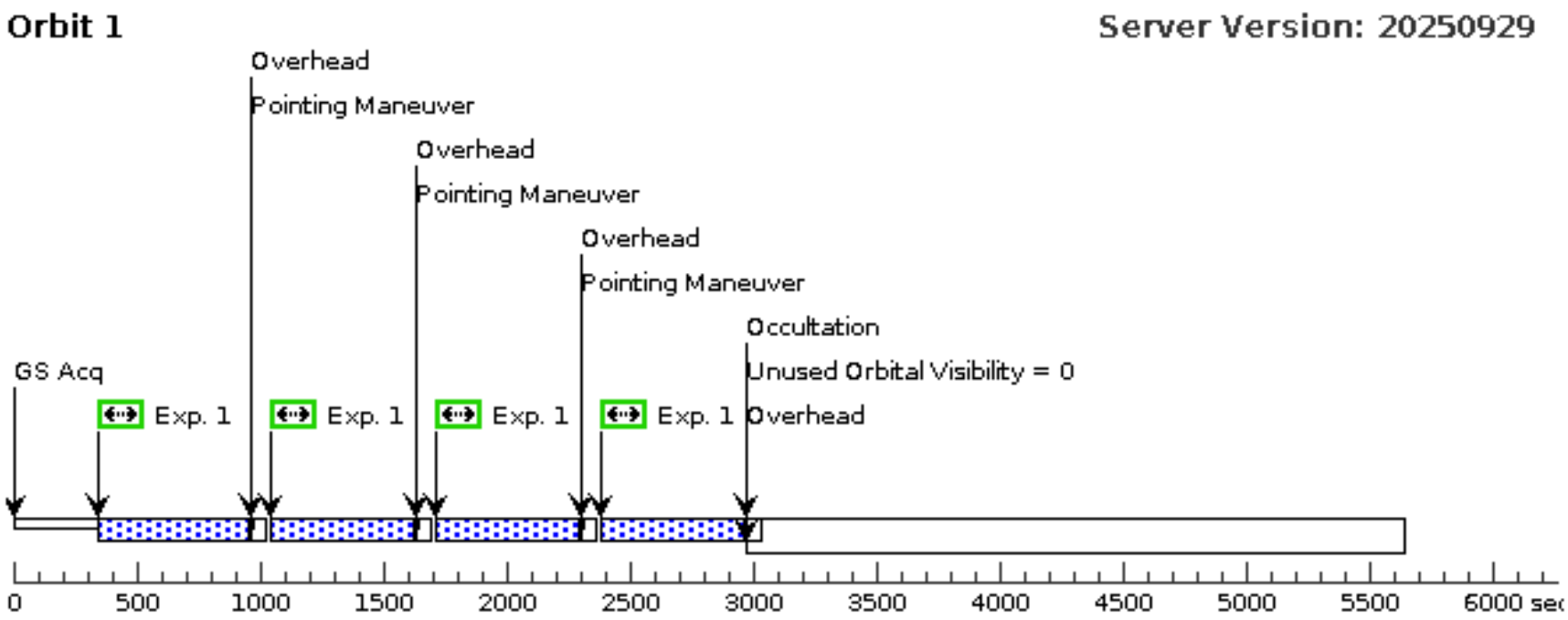
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-2018COW	RA: 16 16 0.2200 (244.0009167d) Dec: +22 16 4.91 (22.26803d) Equinox: J2000	Epoch of Position: 2000	V=25	Reference Frame: ICRS

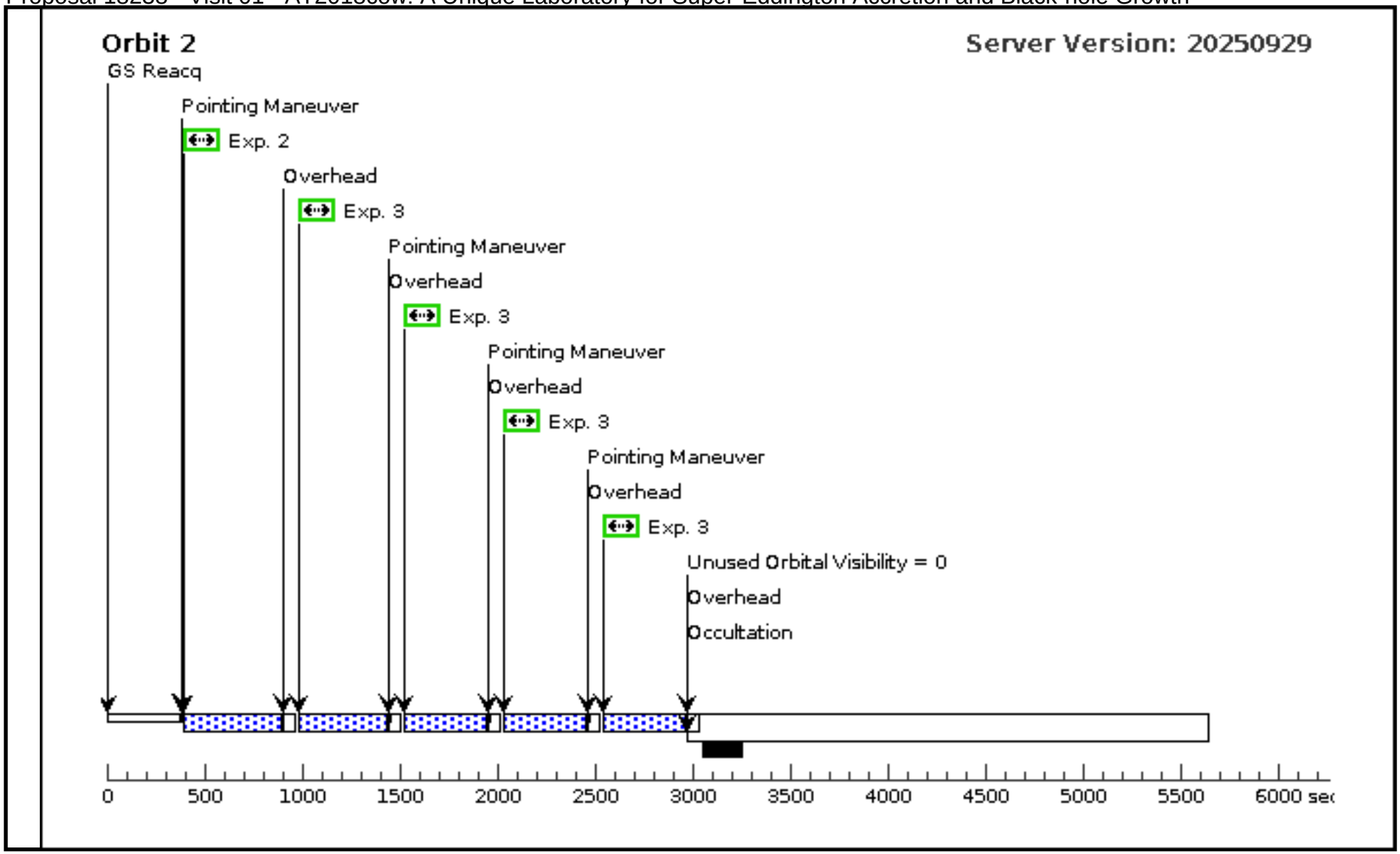
Comments:
Category=UNIDENTIFIED
Description=[ACCRETION DISK, OPTICAL EMITTER, ULTRAVIOLET EMITTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SN-2018COW	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F225W	FLASH=21		Pattern 1, Exps 1-1 in Visit 01 (1)	581 Secs (2324 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) SN-2018COW	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F225W	FLASH=21			501 Secs (501 Secs)	
								[==>]	***[2]***
3		(1) SN-2018COW	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=21		Pattern 1, Exps 3-3 in Visit 01 (1)	422 Secs (1688 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250929
GS Reacq
Pointing Maneuver
Exp. 2
Overhead
Exp. 3
Pointing Maneuver
Overhead
Exp. 3
Pointing Maneuver
Overhead
Exp. 3
Pointing Maneuver
Overhead
Exp. 3
Unused Orbital Visibility = 0
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec