10571 - The Compact Disk of Blue Stars Orbiting the M31 Black Hole

Cycle: 14, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets*	*Configurations*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) M31NUCLEUS	ACS/HRC	?	?	no

ABSTRACT

We propose ACS/HRC U and B band imaging of the compact cluster of blue stars at the precise center of M31, which hosts the 1.3X10^8 solar-mass nuclear black hole. Analysis of STIS spectra and WFPC2 images suggest that the cluster is actually a disk. Recovering an accurate light distribution of the disk is essential for obtaining a precise estimate of the black hole mass from the STIS spectra, an approach that is attractive as it bypasses modeling the complex structure and dynamics of the M31 double nucleus by using the Keplerian rotation of the blue disk as a direct mass indicator. Dithered ACS/HRC observations in the blue provide the best spatial resolution available from HST, which is ~2X finer than could be obtained by the WFPC2 observations that first elucidated the structure of the blue cluster. The cluster effective radius (barely resolved by WFPC2) is only ~ 0.06",

thus the ultimate resolution and improved S/N offered by re-observation with ACS/HRC are essential to fully understand the disk inclination and radial starlight distribution. Analysis of the "smoothness" of the blue light distribution may also reveal its composition. The low-luminosity of the disk, M(AB)=-5.5 can be produced by only a few hundred A-stars, a small enough number that fluctuation statistics should leave an obvious signature on the light distribution.

OBSERVING DESCRIPTION

The observations comprise ACS/HRC observations of the M31 nucleus. The first orbit consists of 8 F435W exposures in two groups obtained with 2X2 0.5 pixel dithers to ensure Nyquist sampling. The two groups are offset by 3.5 pixels in X and Y to reject hot pixels and CCD defects. The remaining three orbits consist of 12 F330W exposures, again obtained in three groups with 2X2 0.5 pixel dithers. In this case the three groups are offset by increments of 0.125 pixels in X and Y both for rejection of hot pixels and CCD defects, but also to improve sampling in the ACS/WFC parallel observations.

Proposal 10571 - Visit 01 - The Compact Disk of Blue Stars Orbiting the M31 Black Hole

Visit

Proposal 10571, Visit 01 Mon Jun 20 15:58:19 GMT 2005

Diagnostic Status: Error

Scientific Instruments: ACS/HRC

Special Requirements: PCS MODE FINE

Diagnostics

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Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-HRC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.014 Line Spacing=0.012	Coordinate Frame=POS-TARG Pattern Orientation=0 Angle Between Sides=90 Center Pattern=false		(1), (2), (3), (4), (5)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	M31NUCLEUS	RA: 00 42 44.2300 (10.6842917d) Dec: +41 16 8.81 (41.26911d) Equinox: J2000 Plate Id: (?)		V=(?) Mu(V)=13.5	Coordinate Source: HST_IMAGE

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) M31NUCLEUS	ACS/HRC, ACCUM, HRC	F435W	CR-SPLIT=NO		Pattern 1-1 (1)	298.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
2		(1) M31NUCLEUS	ACS/HRC, ACCUM, HRC	F435W	CR-SPLIT=NO	POS TARG 0.0945,0 .0945	Pattern 2-2 (1)	298.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
3		(1) M31NUCLEUS	ACS/HRC, ACCUM, HRC	F330W	CR-SPLIT=NO		Pattern 3-3 (1)	672.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
4		(1) M31NUCLEUS	ACS/HRC, ACCUM, HRC	F330W	CR-SPLIT=NO	POS TARG 0,0.125	Pattern 4-4 (1)	679.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[3]***
5		(1) M31NUCLEUS	ACS/HRC, ACCUM, HRC	F330W	CR-SPLIT=NO	POS TARG 0.125,0. 125	Pattern 5-5 (1)	679.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[4]***

Orbit Structure