14920 - Precision Measurement of the Black Hole Mass in NGC 3258

Cycle: 24, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) NGC-3258	WFC3/IR	1	17-Mar-2017 21:06:54.0	yes

1 Total Orbits Used

ABSTRACT

We have obtained ALMA CO(2-1) observations of a sample of early-type galaxies which reveal circumnuclear molecular disks with rotation-dominated kinematics. Three show central velocity upturns that indicate the gravitational influence of a supermassive black hole (BH). Of these, the galaxy NGC 3258 shows the strongest velocity upturn and is the best known candidate for a highly accurate BH mass measurement from CO kinematics. However, the presence of highly opaque dust that accompanies the molecular gas introduces large uncertainties in the inner slope of the stellar surface brightness profile when using archival ACS/WFC optical images. When modeling the dynamics of this molecular disk, uncertainties in the inner stellar mass profile (due to dust extinction) introduce the primary (~10%) source of uncertainty in the BH mass. Upcoming higher-

resolution ALMA observations of NGC 3258 will allow for a gas-dynamical BH mass measurement of unprecedented statistical accuracy, and our goal with these new data is to measure the BH mass with a total uncertainty of only a few percent. To reduce the systematic modeling uncertainties associated with an optically opaque central disk, we request a single orbit for WFC3/IR imaging of NGC 3258 to measure its near-IR surface brightness profile. These HST near-IR observations along with archival ACS/WFC images will allow us to model the dust extinction and recover the galaxy's intrinsic stellar mass profile. Together with our ALMA observations, these WFC3/IR images will produce possibly the most accurate BH mass measurements for any early-type galaxy to date.

OBSERVING DESCRIPTION

We propose to obtain WFC3/IR F110W and F160W observations to measure the NGC 3258 stellar surface brightness profile and determine the background. At a declination of -35 degrees, this galaxy has a visibility period of 54 minutes. This project will be completed in a single orbit. The primary overhead will be six minutes for guide star acquisition, along with small breaks to dither the telescope. We will mosaic the field around NGC 3258 in a 2x2 pattern with offsets of ~30 arcsec. This mosaic places the central bright region of the galaxy within the overlap region between all four pointings and covers a total 3.5x3.5 arcmin^2 field. To fully fill the orbit, we will obtain the F160W observations with NSAMP=9 in the STEP100 mode and the F110W observations with NSAMP=11 or 12 in the SPARS25 mode; this configuration will allow up-the-ramp sampling to reject cosmic rays while avoiding any unnecessary lost time to buffer dump overheads. One image per filter will be obtained at each pointing, resulting in a single-pointing exposure of between 250 and 350 s and when mosaiced together a combined 1200 s exposure of the galaxy center in each filter. These NSAMP values will be sufficient to remove any saturation in the nucleus as the total integration times are slightly above the galaxy nucleus saturation time, estimated to be ~128 s (~210 s) for the F110W (F160W) filter based on archival F814W data and an elliptical galaxy template. At the outskirts of the mosaic, these observations will probe down to a limiting H-band surface brightness of ~22.5 mag/arcsec^2 in a 5x5pixel region. To best utilize the single orbit, we will obtain an exposure in each filter at each pointing before moving to the next mosaic location.

Visit

Proposal 14920, NGC 3258 (01) Sat Mar 18 01:06:56 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-3258	RA: 10 28 53.5880 (157.2232833d) Dec: -35 36 19.98 (-35.60555d) Equinox: J2000		V=11.72	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F110W-1	(1) NGC-3258	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=12; SAMP-SEQ=SPARS25	POS TARG -33.38,-30.81		277.937956 Secs (277.938 Secs) *[==>]*	*[1]*
2	F160W-1	(1) NGC-3258	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	SAME POS AS 1		349.232932 Secs (349.233 Secs) *[==>]*	*[1]*
3	F110W-2	(1) NGC-3258	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=12; SAMP-SEQ=SPARS25	POS TARG -33.38,30.81		277.937956 Secs (277.938 Secs) *[==>]*	*[1]*
4	F160W-2	(1) NGC-3258	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	SAME POS AS 3		349.232932 Secs (349.233 Secs) *[==>]*	*[1]*
5	F110W-3	(1) NGC-3258	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=11; SAMP-SEQ=SPARS25	POS TARG 33.38,-30.81		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
6	F160W-3	(1) NGC-3258	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	SAME POS AS 5		349.232932 Secs (349.233 Secs) *[==>]*	*[1]*
7	F110W-4	(1) NGC-3258	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=11; SAMP-SEQ=SPARS25	POS TARG 33.38,30.81		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
8	F160W-4	(1) NGC-3258	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	SAME POS AS 7		349.232932 Secs (349.233 Secs) *[==>]*	*[1]*

Orbit Structure