



13416 - The most massive black hole in a compact galaxy UGC2698

Cycle: 21, Proposal Category: GO

(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	(19) UGC2698	WFC3/IR WFC3/UVIS	1	05-Aug-2013 21:10:24.0	yes

1 Total Orbits Used

ABSTRACT

Massive galaxies represent the extreme of galaxy formation and contain the most massive black holes (BH), as reflected in the scaling relations of BH masses with galaxy velocity dispersions (M-sigma) and luminosities (M-L). Our spectroscopic survey of 900 nearby galaxies has already yielded one of the most massive black holes in a remarkably compact galaxy NGC1277. Now we propose to obtain imaging of a nearby galaxy which may host the most massive black hole found to date. This galaxy, UGC2698, lies nearby at a distance of 89 Mpc and has an average size and luminosity, and a extremely high central velocity dispersion of 440 km/s, indicative of black hole mass in excess 10 billion solar masses. With one orbit, we can

resolve its small bulge and put accurate constraints on its black hole mass (in combination with our spectroscopy). If this system also contains a very high black hole mass, it would be in stark conflict with the popular co-evolution picture.

OBSERVING DESCRIPTION

Imaging of UGC2698 a nearby (~ 90 Mpc) early-type galaxy. We expect this systems to be extremely cuspy and have high central surface brightnesses ($V \sim 13.7$ Mag/arcsec²), half-light radii of a 3-6 arcseconds and a total diameter of ~ 60 arcseconds, based on archival HST observations of two prototypical galaxies (NGC1277 and NGC4486B) and our cycle 20 program 13050. The exposures are driven by the following:

- 1 Obtain a high resolution image of the galaxy (nucleus). This allows us to make a stellar luminosity (mass) model of the whole galaxy, which is needed as input for the dynamical model.
- 2 Obtain an image in a second band to constrain the color (gradient), which allows us to look for nuclear dust & clusters and stellar population gradients.
- 3 Given the large extent, we need full frame read outs to determine the background levels, especially in the IR.
- 4 Obtain a surface brightness fluctuation (SBF) distance.

CHOICE OF FILTERS:

Given that these targets are further away than the Virgo cluster, we chose F160W in the proposal as the SB fluctuations are strongest in this band (Blakeslee et al.). To augment the F160W band we chose F814W as there are SBF calibrations available in the F814W-F160W color and F814W is a very efficient filter.

EXPOSURE TIMES:

To probe the outer part of the galaxies (~ 24.7 Vmag/arcsec²) we need at least 700+ seconds with F814W.

To determine SBF distances for distances over 80 Mpc, exposure times over 1500 seconds in F160W are needed (Blakeslee priv. comm.).

Saturation in the F160W is a concern. If these galaxies have bright central cusps (Like N1277 and N4486B), we expect the IR detector to saturate in ~ 3 seconds.

OBSERVING PLAN:

3 dithers (STEP50,NSAMP=14) with F160W to cover the whole galaxy and estimate the background. To avoid saturation in the subsequent exposures, we use the WFC3-IR-DITHER-BOX-UVIS pattern.

4 RAPID NSAMP=15 SUB128 dithers with the WFC3-IR-DITHER-BOX-MIN pattern to obtain a high resolution, to be able to determine the color-profile of the nucleus.

3 dithers (165+300+350sec, pattern B3) in F814W to obtain (nearly) diffraction limited of the galaxy.

Proposal 13416 - UGC2698 (01) - The most massive black hole in a compact galaxy UGC2698

Tue Aug 06 01:10:33 GMT 2013

Visit	Proposal 13416, UGC2698 (01) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: (none)									
	#	Primary Pattern	Secondary Pattern	Exposures						
Patterns	(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false	(3)						
	(2)	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=23.02 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=0.713 Angle Between Sides= Center Pattern=false	(1)						
	(3)	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=2.6234 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.8195 Angle Between Sides= Center Pattern=false	(4)						
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(19)	UGC2698	RA: 03 22 2.8800 (50.5120000d) Dec: +40 51 50.00 (40.86389d) Equinox: J2000	Redshift: 0.01	V=13	Reference Frame: NED				
<i>Comments: This object was generated by the targetselector and retrieved from the NED database.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(19) UGC2698	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14;	POS TARG -11.071, -17.744	Pattern 2, Exps 1-1 in UGC2698 (01) (2)	449.233834 Secs (898.468 Secs)	
									[==>(Pattern 1)]	[1]
									[==>(Pattern 2)]	
	2		(19) UGC2698	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14;	POS TARG -11.947, 17.457		449.233834 Secs (449.234 Secs)	
								[==>]	[1]	
3		(19) UGC2698	WFC3/IR, MULTIACCUM, IRSUB128	F160W	NSAMP=15;			Pattern 1, Exps 3-3 in UGC2698 (01) (1)	1.690575 Secs (6.762 Secs)	
						SAMP-SEQ=RAPID			[==>(Pattern 1)]	[1]
									[==>(Pattern 2)]	
									[==>(Pattern 3)]	
									[==>(Pattern 4)]	
4		(19) UGC2698	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=7		POS TARG 0,0	Pattern 3, Exps 4-4 in UGC2698 (01) (3)	350 Secs (805 Secs)	
									[==>290.0 Secs (Pattern 1)]	
									[==>(Pattern 2)]	[1]
									[==>165.0 Secs (Pattern 3)]	

