14187 - Studying the nuclear morphology of a dwarf galaxy with a 50,000 solar mass black hole

Cycle: 23, 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) SDSS-J152304.97+114553.6	WFC3/IR WFC3/UVIS	3	22-Oct-2015 21:13:08.0	yes

3 Total Orbits Used

ABSTRACT

Active galactic nuclei in dwarf galaxies represent a new class of objects in which to study the physics of black hole growth and black hole-galaxy coevolution. We recently discovered an active 50,000 solar mass black hole in the nucleus of RGG 118, a dwarf disk galaxy ~100 Mpc away. Here, we describe WFC3/IR and UVIS observations that we will use to study the detailed nuclear morphology of the host galaxy. Such systems are still relatively rare compared to the population of active galactic nuclei as a whole, and sensitive, high resolution observations are necessary to determine whether these systems have special structural properties (i.e. bulges, nuclear bars) compared to the general dwarf galaxy population. Additionally, these observations will allow us to measure bulge mass and luminosity to test whether RGG 118 follows well-known black hole-galaxy scaling

relations.

OBSERVING DESCRIPTION

We will use WFC3 UVIS and IR observations to analyze its structure, measure colors, and characterize star formation in RGG 118. At the distance of RGG 118 (~100 Mpc), 1 arcsecond corresponds to roughly 500 parsecs.

We will use a combination of WFC3/IR F160W and the WFC3/UVIS F475W and F775W filters (H, g, and i band, respectively) to study the structure of RGG 118 and measure colors. We will use one orbit for each filter for a total of 3 orbits. The use of (g-i) and (i-H) colors to derive an H-band mass-to-light ratio has been shown to be the most robust and accurate combination for determining masses (Zibetti et al. 2009). The use of H-band mitigates the effect of dust extinction, and the large span in wavelength makes this mass estimator sensitive to the presence of young stellar populations.

UVIS/F475W:

We will achieve a 10-sigma surface brightness of at least mu_r = 23 mag/arcsec^2 in a 5x5 box (approximately 2x2 WFC3/IR pixels). Our total exposure time for this filter will be ~2500 seconds. This will be broken into four exposures, and we'll use a 4-point box dither pattern to improve PSF sampling and remove bad pixels. We will place the galaxy on Chip 2, since it is more sensitive.

UVIS/F775W:

We will achieve a 10-sigma surface brightness of at least mu_r = 23 mag/arcsec^2 in a 5x5 box (approximately 2x2 WFC3/IR pixels). Our total exposure time for this filter will be ~2600 seconds. We'll use a 4-point box dither pattern to improve PSF sampling and remove bad pixels, and use Chip 2.

IR/F160W:

The high throughput of WFC3/IR makes it ideal for studying the detailed structure of the nucleus of RGG 118. With our observations, we will

achieve a 10-sigma surface brightness sensitivity of at least mu_r = 23.5 mag/arcsec^2 in a given pixel; with radial averaging, we should be able to probe at least an order of magnitude deeper. This ensures that we will be able to sensitively probe the morphology of the galaxy out to 10 arcsec, i.e. where the bulge is dominant. We will first use a 4-point dither pattern combined with the STEP200 timing sequence and NSAMP=10 to give four exposures of ~600 seconds each. We will also take an additional ~300 second exposure (with NSAMP=9 and the STEP100 timing sequence).

Visit

Proposal 14187, Visit 01, implementation Fri Oct 23 01:13:10 GMT 2015

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Exposure 3 (Pattern 1, Exps 3-3 in Visit 01)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

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=true		(1), (3)
(2)	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=true		(5)

Fixed Targets

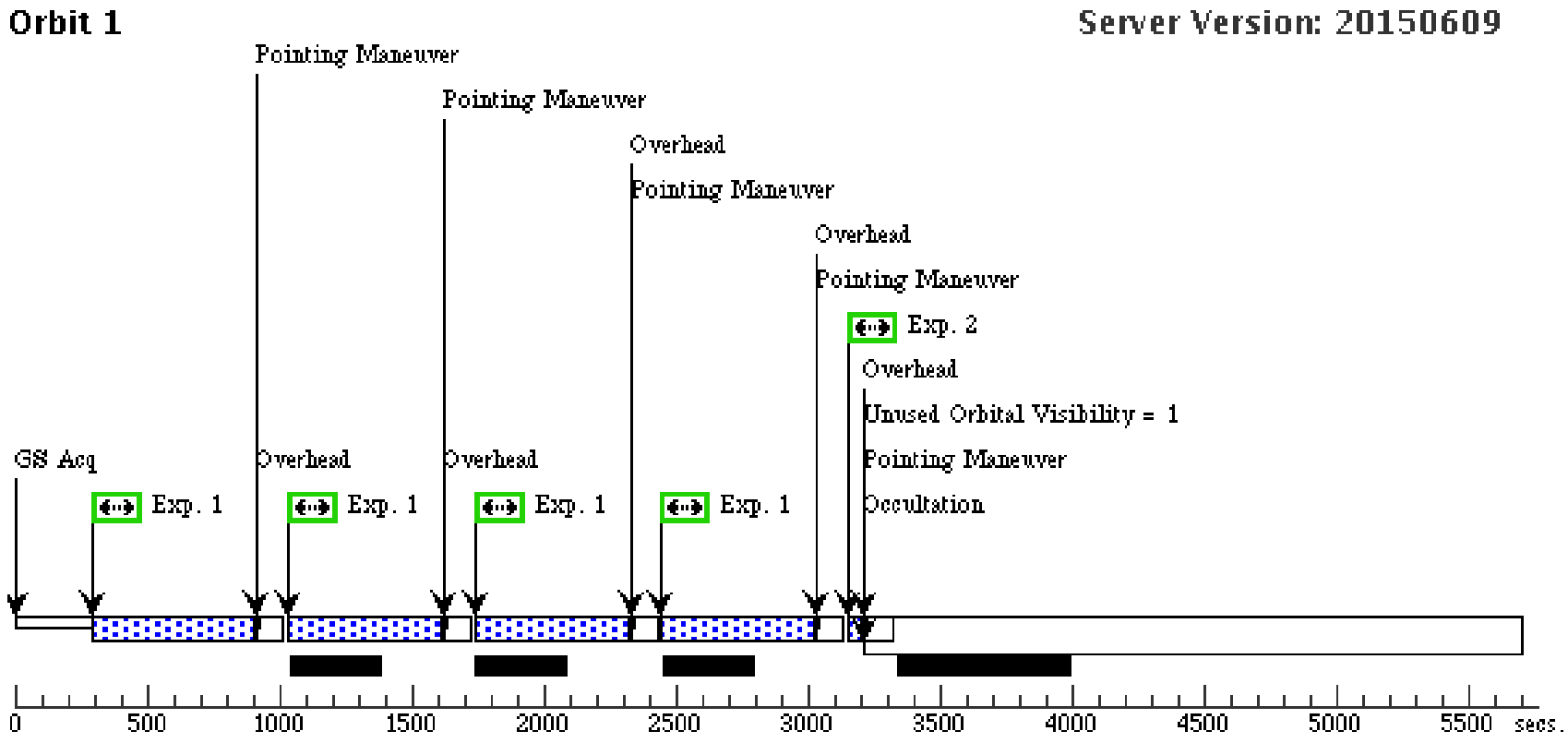
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS-J152304.97+114553.6	RA: 15 23 4.9728 (230.7707200d) Dec: +11 45 53.60 (11.76489d) Equinox: J2000	Redshift: 0.0243	V=16.76	Reference Frame: ICRS

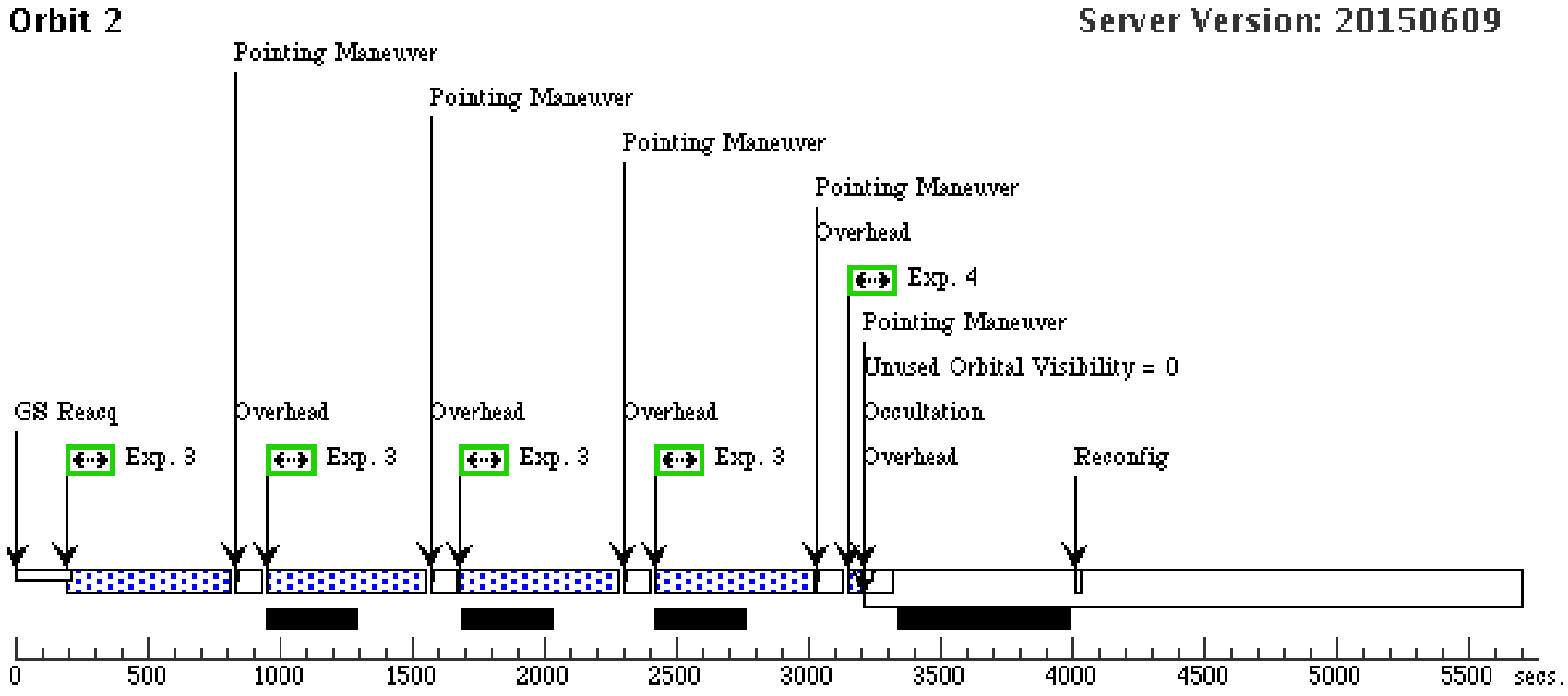
Comments: This object was generated by the targetselector and retrieved from the NED database.

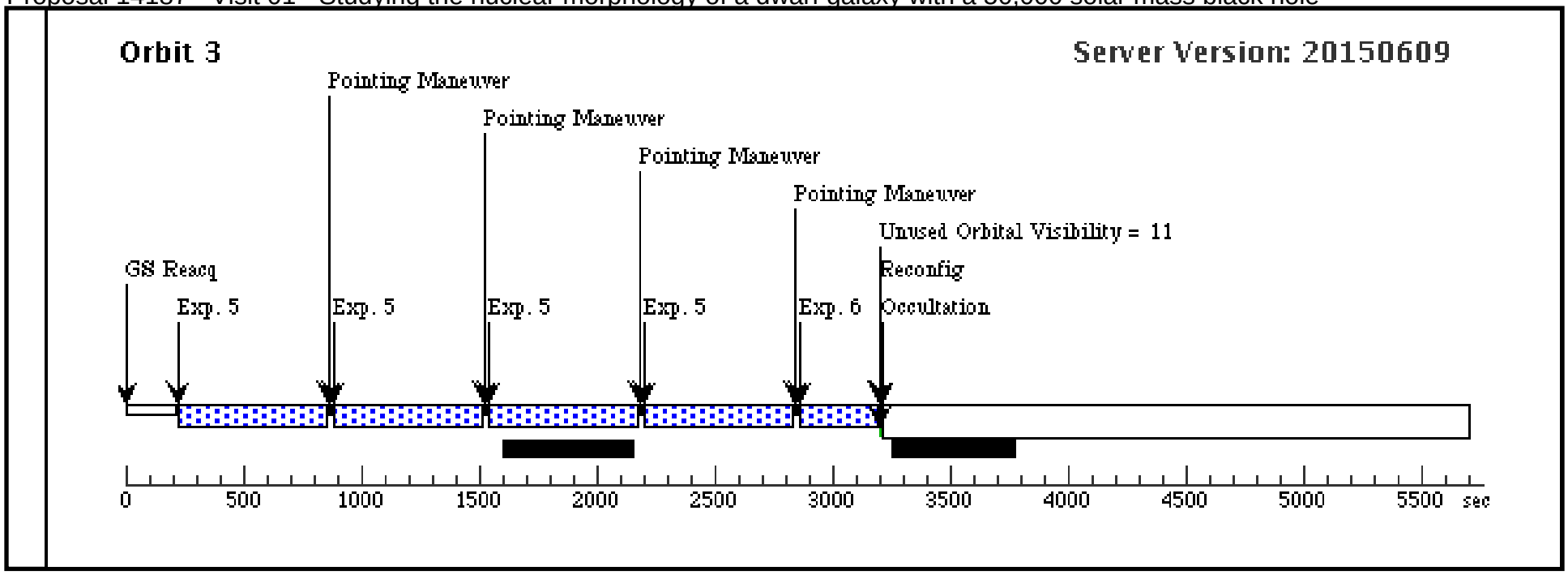
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SDSS-J152304.97+114553.6	WFC3/UVIS, ACCUM, UVIS2	F475W			Pattern 1, Exps 1-1 in Visit 01 (1)	578 Secs (2312 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) SDSS-J152304.97+114553.6	WFC3/UVIS, ACCUM, UVIS2	F475W	FLASH=11			50 Secs (50 Secs) *[==>]*	***[1]***
3		(1) SDSS-J152304.97+114553.6	WFC3/UVIS, ACCUM, UVIS2	F775W			Pattern 1, Exps 3-3 in Visit 01 (1)	606 Secs (2424 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
4		(1) SDSS-J152304.97+114553.6	WFC3/UVIS, ACCUM, UVIS2	F775W	FLASH=11			50 Secs (50 Secs) *[==>]*	***[2]***
5		(1) SDSS-J152304.97+114553.6	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=10; SAMP-SEQ=STEP200		Pattern 2, Exps 5-5 in Visit 01 (2)	599.231134 Secs (2396.925 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[3]***
6		(1) SDSS-J152304.97+114553.6	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=STEP100			299.231323 Secs (299.231 Secs) *[==>]*	***[3]***

Orbit Structure




Orbit 2
Server Version: 20150609
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Overhead
Exp. 4
Pointing Maneuver
Unused Orbital Visibility = 0
GS Reacq
Overhead
Overhead
Overhead
Occultation
Exp. 3
Exp. 3
Exp. 3
Exp. 3
Overhead
Reconfig
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20150609
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 11
GS Reacq
Exp. 5
Exp. 5
Exp. 5
Exp. 5
Exp. 6
Reconfig
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec