15427 - Exploring the Nature of Dark Matter Through Near-IR CMD's of LSB Galaxies

Cycle: 25, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) F575-3	WFC3/IR	1	12-Dec-2017 14:01:29.0	yes
02	(1) F575-3	WFC3/IR	1	12-Dec-2017 14:01:30.0	yes
03	(1) F575-3	WFC3/IR	1	12-Dec-2017 14:01:31.0	yes
04	(1) F575-3	WFC3/IR	1	12-Dec-2017 14:01:32.0	yes
05	(2) F615-1	WFC3/IR	1	12-Dec-2017 14:01:32.0	yes
06	(2) F615-1	WFC3/IR	1	12-Dec-2017 14:01:33.0	yes
07	(2) F615-1	WFC3/IR	1	12-Dec-2017 14:01:34.0	yes
08	(2) F615-1	WFC3/IR	1	12-Dec-2017 14:01:35.0	yes

8 Total Orbits Used

ABSTRACT

The coupling between mass and light (i.e., M/L) is critical to understanding the behavior of dark matter in galaxies, the process of galaxy formation in the LCDM paradigm and cosmology. Our program to understand the missing mass problem in rotating galaxies is highly dependent on using a proper M/L to convert near-IR luminosities into stellar masses (where the baryonic mass of a disk galaxy is primary HI gas mass plus stellar mass). The recently discovered radial acceleration relation (RAR) for disk galaxies correlates the baryonic acceleration with the acceleration due to the total mass (i.e., dark matter). This is the first new scaling relation related to dark matter in over a decade, but depends critically on the value of M/L extracted from population models.

This proposal is to measure the near-IR M/L directly in two calibrating galaxies, the LSB dwarfs F575-3 and F615-1, by obtaining a F110W-F160W CMD. The greatest uncertainty in our current stellar population models is the contribution from AGB stars in the low metallicity environment typical to LSB galaxies. These observations will allow us to map, and count, the AGB population (M_F160W > -5). This will also allow us a peek into the star formation history of LSB galaxies between 2 and 8 Gyrs (complimenting H-alpha and UV measurements of the current SFR).

These observations are timely in that we have been awarded Director's Discretionary time on Spitzer to complete a full range of imaging from GALEX to Spitzer. The Spitzer data are critical to measuring the near-IR luminosity of galaxies, but lacks the resolution to provide any information about the stars that generate it.

OBSERVING DESCRIPTION

We are guided but the successful F110W-F160W CMD's from Dalcanton et al. (2009, see Figure 2 taken directly from their publication). Short exposures of 600 and 900 secs achieved

MF160W = -3 for IC2574 which has a distance modulus of 27.7. Our targets are at a distance modulus of 30.0; however, we only need to achieve a depth of -5 for our science goal. Therefore, we need to extend the exposure times by a factor of eight (4,800 secs in F110W and 7,200 secs in F160W). F110W and F160W are selected for direct comparison to the ANGST CMD's, over a dozen nearby star-forming dwarfs. As both targets are in the Arecibo declination range, than its orbital visibility is 54 minutes per orbit. Thus, our request for 2x4 orbits.

All targets are between 2 to 9 Mpc in distance, which produces a plate scale (on the high end) of 2.3 pc per pixel which was shown in the cycle 20 galaxies to be sucient to resolve small star clusters in the galaxies. CMB distances place them at 7 to 9 Mpc, this is confirmed by their location on various scaling relations. Although in the general direction of Virgo, it is highly unlikely that they are Virgo dwarfs given their position on luminosity versus scalelength diagrams.

Visit

Proposal 15427, Visit 01, implementation Tue Dec 12 19:01:36 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

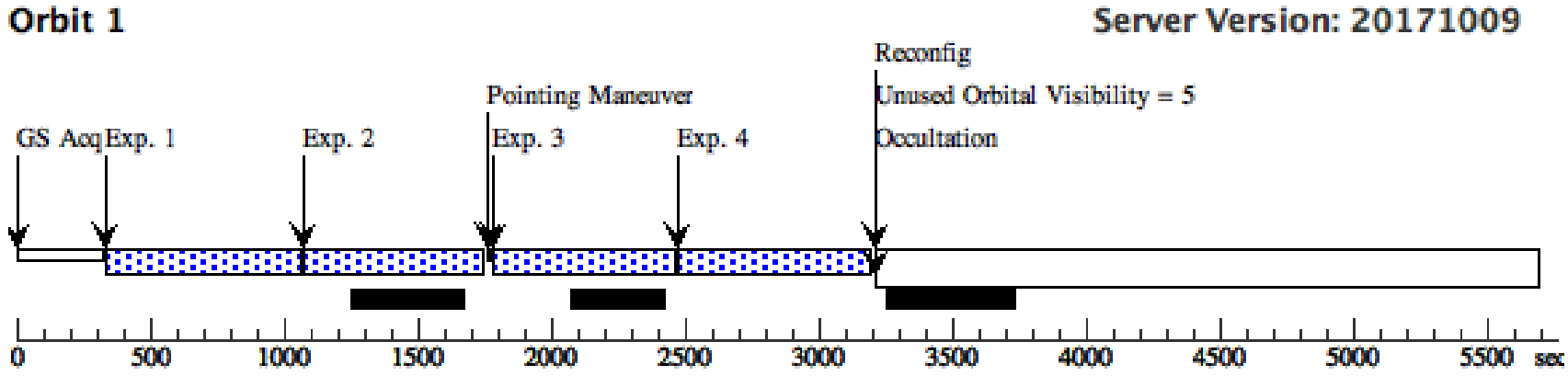
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	F575-3	RA: 12 55 41.1000 (193.9212500d) Dec: +19 12 34.30 (19.20953d) Equinox: J2000		V=18	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[LSB]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W_1	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50		Sequence 1-4 Non-Int in Visit 01	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
2	F110W_01	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50		Sequence 1-4 Non-Int in Visit 01	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3	F110W_2	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	POS TARG 0.542,0.182	Sequence 1-4 Non-Int in Visit 01	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4	F160W_2	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	SAME POS AS 3	Sequence 1-4 Non-Int in Visit 01	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15427, Visit 02, implementation Tue Dec 12 19:01:36 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

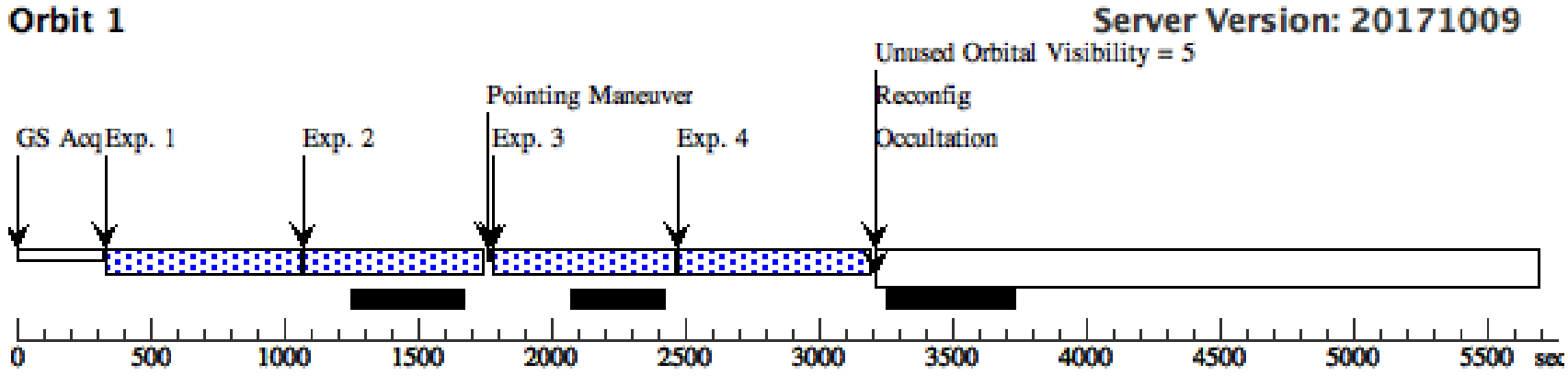
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	F575-3	RA: 12 55 41.1000 (193.9212500d) Dec: +19 12 34.30 (19.20953d) Equinox: J2000		V=18	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[LSB]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W_3	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	POS TARG 0.339,0.485	Sequence 1-4 Non-Int in Visit 02	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
2	F110W_3	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	SAME POS AS 1	Sequence 1-4 Non-Int in Visit 02	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3	F110W_4	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	POS TARG -0.203,0.303	Sequence 1-4 Non-Int in Visit 02	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4	F160W_4	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	SAME POS AS 3	Sequence 1-4 Non-Int in Visit 02	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15427, Visit 03, implementation Tue Dec 12 19:01:36 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

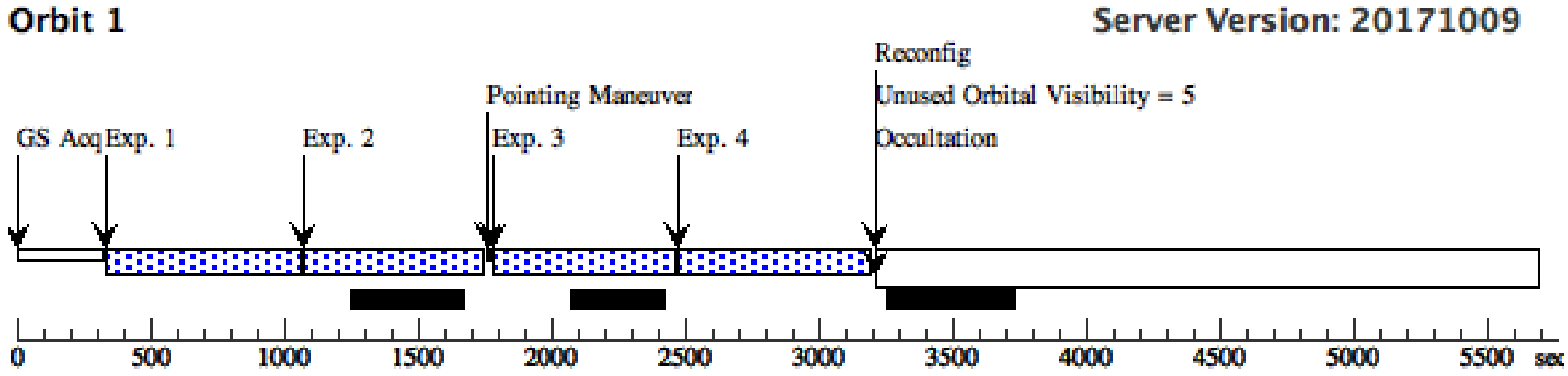
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	F575-3	RA: 12 55 41.1000 (193.9212500d) Dec: +19 12 34.30 (19.20953d) Equinox: J2000		V=18	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[LSB]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W_5	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	POS TARG 1.,1.	Sequence 1-4 Non-Int in Visit 03	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
2	F110W_5	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	SAME POS AS 1	Sequence 1-4 Non-Int in Visit 03	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3	F110W_6	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	POS TARG 1.542,1.182	Sequence 1-4 Non-Int in Visit 03	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4	F160W_6	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	SAME POS AS 3	Sequence 1-4 Non-Int in Visit 03	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15427, Visit 04, implementation Tue Dec 12 19:01:36 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

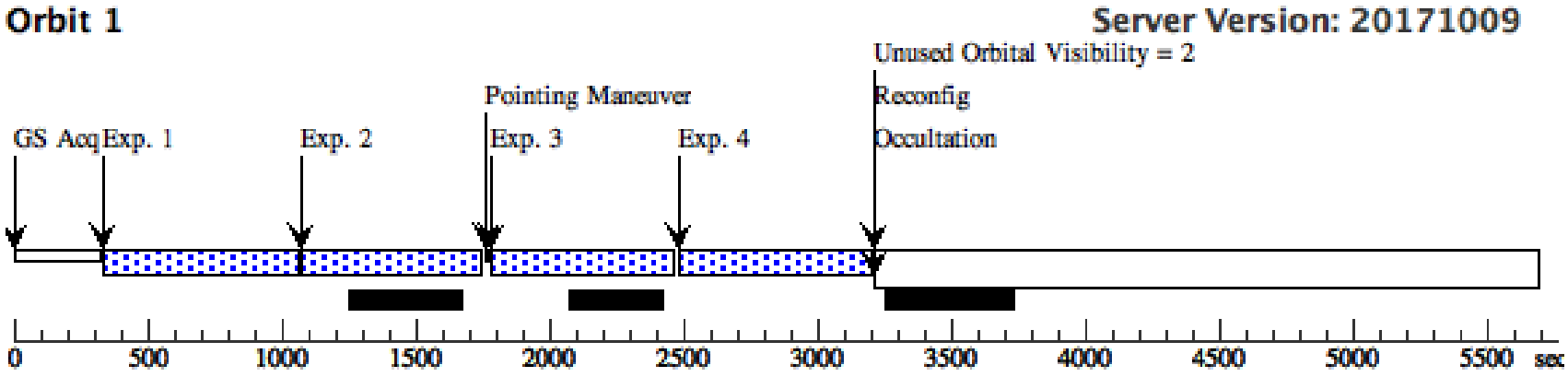
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	F575-3	RA: 12 55 41.1000 (193.9212500d) Dec: +19 12 34.30 (19.20953d) Equinox: J2000		V=18	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[LSB]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W_7	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	POS TARG 1.339,1.485	Sequence 1-4 Non-Int in Visit 04	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
2	F110W_7	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	SAME POS AS 1	Sequence 1-4 Non-Int in Visit 04	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3	F110W_8	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	POS TARG -1.203,1.303	Sequence 1-4 Non-Int in Visit 04	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4	F160W_8	(1) F575-3	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	SAME POS AS 3	Sequence 1-4 Non-Int in Visit 04	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15427, Visit 05 Tue Dec 12 19:01:36 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

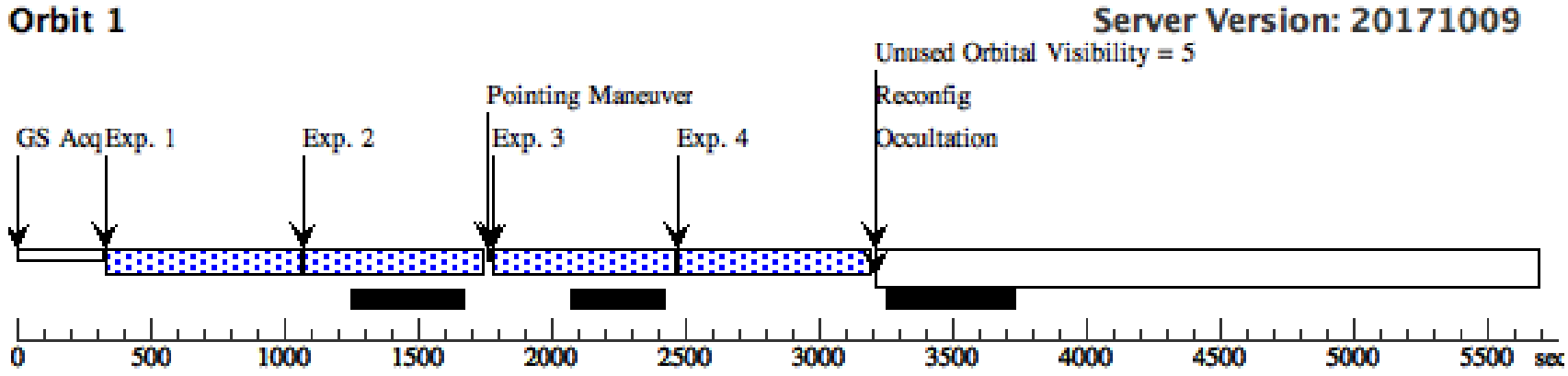
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	F615-1	RA: 02 43 25.6800 (40.8570000d) Dec: +16 43 58.10 (16.73281d) Equinox: J2000		V=17	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[LSB]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W_1	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50		Sequence 1-4 Non-Int in Visit 05	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
2	F110W_01	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50		Sequence 1-4 Non-Int in Visit 05	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3	F110W_2	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	POS TARG 0.542,0.182	Sequence 1-4 Non-Int in Visit 05	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4	F160W_2	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	SAME POS AS 3	Sequence 1-4 Non-Int in Visit 05	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15427, Visit 06

Tue Dec 12 19:01:36 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

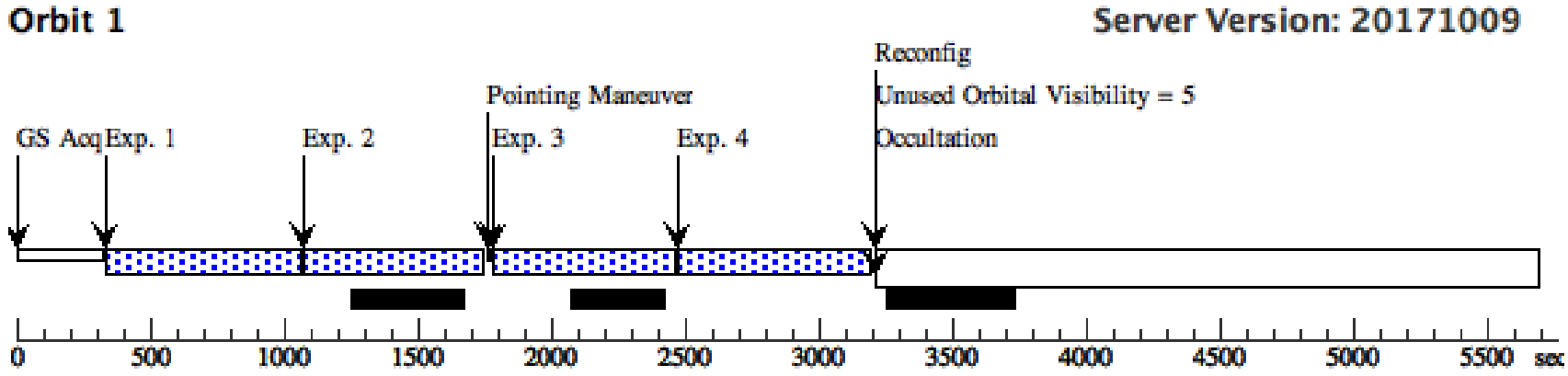
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	F615-1	RA: 02 43 25.6800 (40.8570000d) Dec: +16 43 58.10 (16.73281d) Equinox: J2000		V=17	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[LSB]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W_3	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	POS TARG 0.339,0.485	Sequence 1-4 Non-Int in Visit 06	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
2	F110W_3	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	SAME POS AS 1	Sequence 1-4 Non-Int in Visit 06	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3	F110W_4	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	POS TARG -0.203,0.303	Sequence 1-4 Non-Int in Visit 06	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4	F160W_4	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	SAME POS AS 3	Sequence 1-4 Non-Int in Visit 06	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15427, Visit 07

Tue Dec 12 19:01:36 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

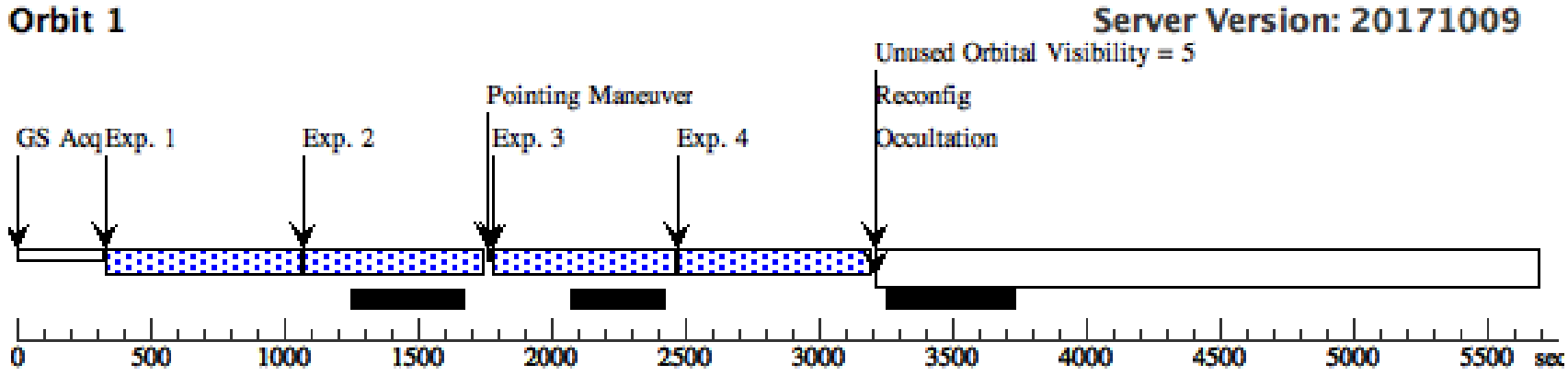
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	F615-1	RA: 02 43 25.6800 (40.8570000d) Dec: +16 43 58.10 (16.73281d) Equinox: J2000		V=17	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[LSB]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W_5	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	POS TARG 1.,1.	Sequence 1-4 Non-Int in Visit 07	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
2	F110W_5	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	SAME POS AS 1	Sequence 1-4 Non-Int in Visit 07	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3	F110W_6	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	POS TARG 1.542,1.182	Sequence 1-4 Non-Int in Visit 07	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4	F160W_6	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	SAME POS AS 3	Sequence 1-4 Non-Int in Visit 07	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15427, Visit 08 Tue Dec 12 19:01:36 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	F615-1	RA: 02 43 25.6800 (40.8570000d) Dec: +16 43 58.10 (16.73281d) Equinox: J2000		V=17	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[LSB]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W_7	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	POS TARG 1.339,1.485	Sequence 1-4 Non-Int in Visit 08	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
2	F110W_7	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	SAME POS AS 1	Sequence 1-4 Non-Int in Visit 08	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3	F110W_8	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50	POS TARG -1.203,1.303	Sequence 1-4 Non-Int in Visit 08	652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4	F160W_8	(2) F615-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=SPARS50	SAME POS AS 3	Sequence 1-4 Non-Int in Visit 08	702.938605 Secs (702.939 Secs) *[==>]*	*[1]*

Orbit Structure