14711 - A Deep WFC3/IR Bulge Luminosity Function: toward the Hydrogen Burning Limit

Cycle: 24, Proposal Category: GO

(JWST Initative)

(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) SWEEPS-BULGE4-F110W	WFC3/IR	1	07-Sep-2016 18:16:24.0	yes
02	(1) SWEEPS-BULGE4-F110W	WFC3/IR	1	07-Sep-2016 18:16:25.0	yes
03	(2) SWEEPS-BULGE4-F160W	WFC3/IR	1	07-Sep-2016 18:16:26.0	yes
04	(2) SWEEPS-BULGE4-F160W	WFC3/IR	1	07-Sep-2016 18:16:27.0	yes
05	(1) SWEEPS-BULGE4-F110W	WFC3/IR	1	07-Sep-2016 18:16:27.0	yes
06	(1) SWEEPS-BULGE4-F110W	WFC3/IR	1	07-Sep-2016 18:16:28.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
07	(2) SWEEPS-BULGE4-F160W	WFC3/IR	1	07-Sep-2016 18:16:29.0	yes
08	(2) SWEEPS-BULGE4-F160W	WFC3/IR	1	07-Sep-2016 18:16:29.0	yes

8 Total Orbits Used

ABSTRACT

We propose to obtain WFC3/IR imagery in the bulge in the main field studied by the SWEEPS optical programs GO-9750,10466 (and many others), which also has first epoch WFC3/IR imaging (GO-11664). With its increase in area and sensitivity, WFC3 may make it possible to reach past the hydrogen burning limit for stars in the Galactic bulge. We propose to use the first epoch observations to reject foreground disk stars, via proper motion separation. Brown dwarf populations are being increasingly well characterized in the field and even in globular clusters. This will be the first attempt to study the brown dwarf population in the bulge and to define the hydrogen burning limit in the bulge. We will also derive a measure of the IMF derived from infrared photometry, where the lowest mass stars and brown dwarfs emit the bulk of their luminosity. The resulting deep infrared bulge image will also provide a first epoch for eventual deep JWST imaging of the bulge.

OBSERVING DESCRIPTION

We plan to obtain deep second epoch images on the SWEEPS Bulge-4 field, where first epoch (2003) ultradeep exposures in ACS/WFC/F814W are available and also an additional epoch in WFC3/IR imaging is available (from GO-11664). The ETC gives 3400 sec to reach F110=26 at S/N=10, for an M6 dwarf. However, the faintest bulge members may be LT dwarfs, and there is substantial crowding. Therefore, we conservatively propose to request 4 orbits in each of F110W and F160W and we plan to follow closely the successful procedures established in the Dieball et al. (2015) study. There are 2 challenges in planning WFC3/IR observations: (1) the psf is a factor of 2 undersampled, so sub-pixel dithering is mandatory. (2) there are several regions of low sensitivity on the detector, including the "death star" at 358, 51. This requires large step size and possible at least two orientations. We choose two orientations 180 a part at the maximum number of days availables. As co-I Dieball's GO-12602 is successful and offers phase 2 heritage, we are confident that we can obtain the required quality of observations for proper motion measurement and faint photometry. We have assessed the crowding level of the Bulge-4 SWEEPS field by comparing the number of sky pixels (Fig 4) with that of the M4 field that reaches a convincing depth (see Fig 4). Although our team has imaged other bulge fields using NICMOS, we believe that the gains made with WFC3/IR give a huge advantage in terms of using a first epoch image for proper motion cleaning of the bulge CMD. Proper motion measurement is for the purpose of vetoing the foreground disk stars, which would have a large transverse velocity and low velocity dispersion. Proper motions in the bulge population have been well measured and reported in other work. We also do not require the extreme precision of other proper motion programs, since

the disk stars will have a large transverse motion.

Visit

Proposal 14711, F110W-01_A (01), implementation Wed Sep 07 22:16:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 88.5D TO 89.5 D

Comments: We want to duplicate orientation of the WFC3/IR data in GO-11664

Fixed Targets

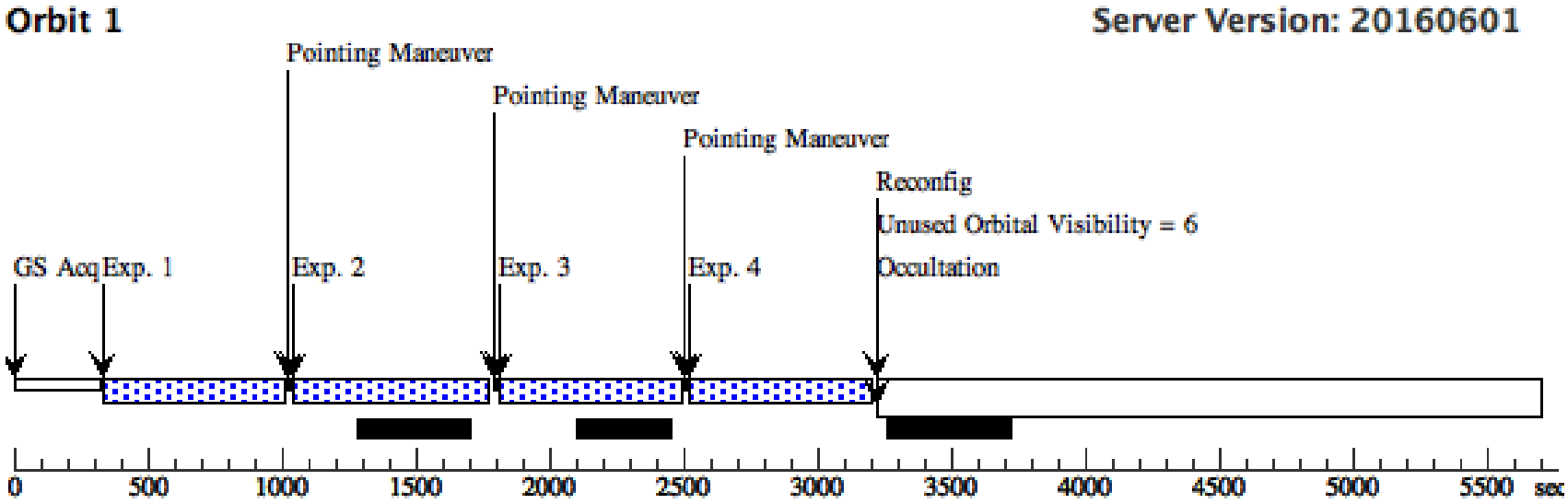
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SWEEPS-BULGE4-F110W	RA: 17 59 0.7960 (269.7533167d) Dec: -29 12 0.00 (-29.20000d) Equinox: J2000		V=25.0+/-5.0 J=26.0	Reference Frame: J2000

Comments: Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -0.5,0.5; GS ACQ SCENARIO BASE1B3		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
2		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG -1,1		702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
3		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -1.5,1.5		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -2,2		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 14711, F110W-02_A (02), implementation Wed Sep 07 22:16:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 88.5D TO 89.5 D

Comments: We want to duplicate orientation of the WFC3/IR data in GO-11664

Fixed Targets

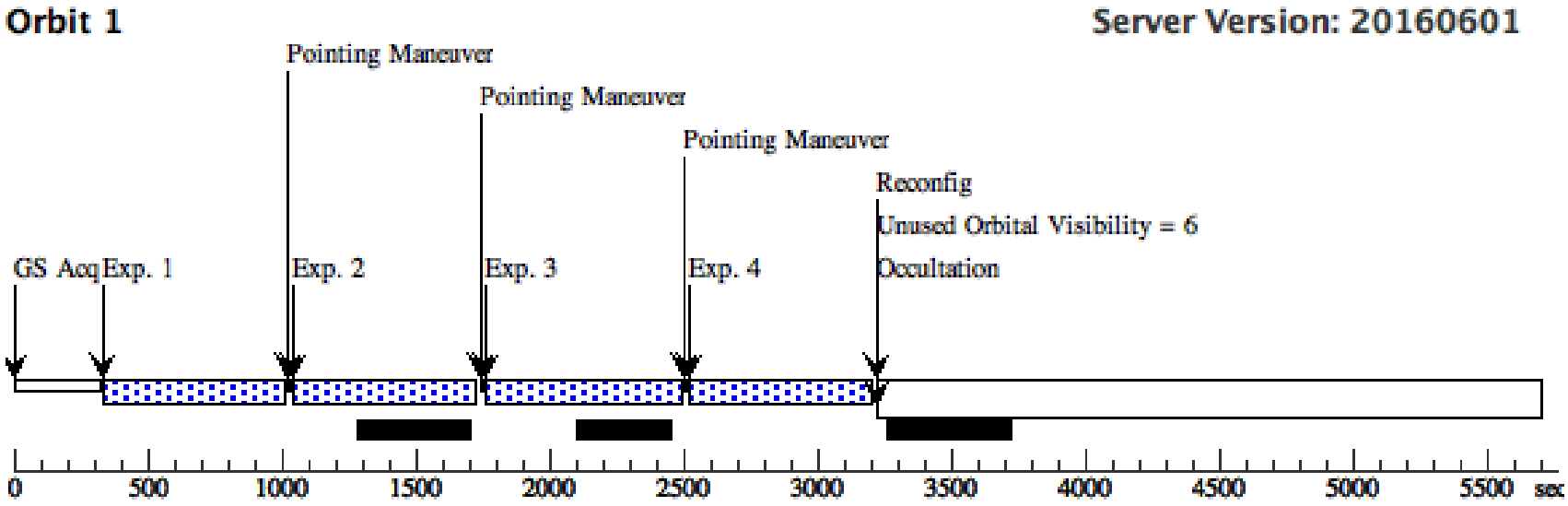
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SWEEPS-BULGE4-F110W	RA: 17 59 0.7960 (269.7533167d) Dec: -29 12 0.00 (-29.20000d) Equinox: J2000		V=25.0+/-5.0 J=26.0	Reference Frame: J2000

Comments: Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG +0.5,-0.5; GS ACQ SCENARIO BASE1B3		652.938154 Secs (652.938 Secs) *[==>]*	 ***[1]***
2		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 1,-1		652.938154 Secs (652.938 Secs) *[==>]*	 ***[1]***
3		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG 1.5,-1.5		702.938605 Secs (702.939 Secs) *[==>]*	 ***[1]***
4		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 2,-2		652.938154 Secs (652.938 Secs) *[==>]*	 ***[1]***

Orbit Structure



Visit

Proposal 14711, F160W-01_A (03), implementation Wed Sep 07 22:16:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 88.5D TO 89.5 D

Comments: We want to duplicate orientation of the WFC3/IR data in GO-11664

Fixed Targets

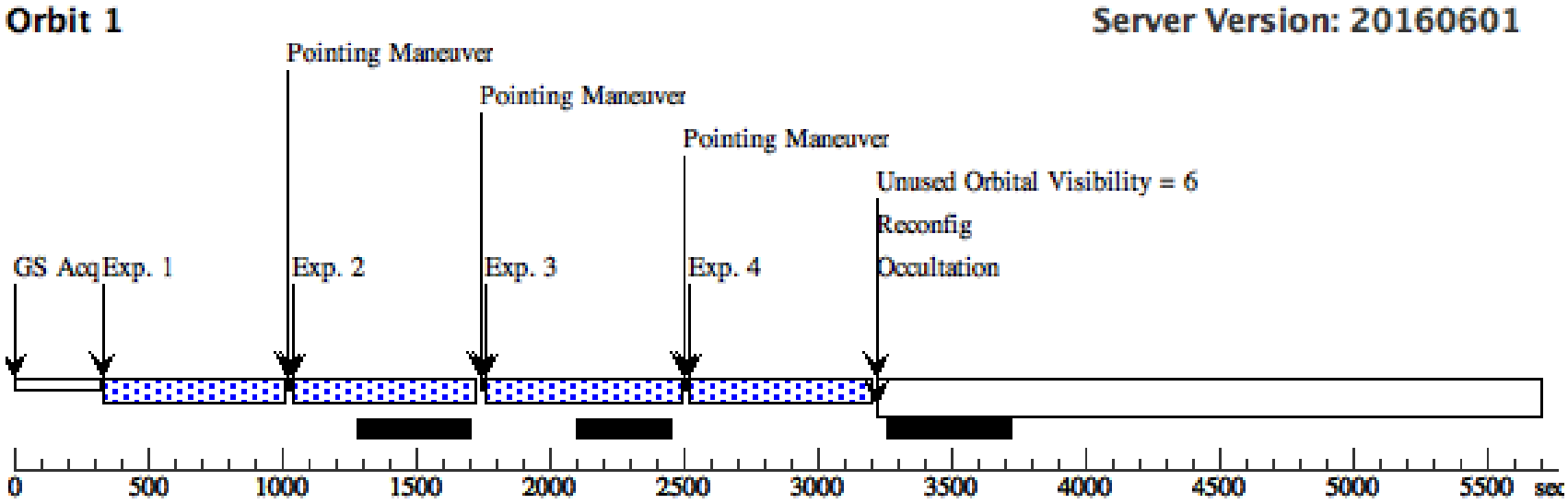
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SWEEPS-BULGE4-F160W	RA: 17 59 0.8000 (269.7533333d) Dec: -29 12 0.14 (-29.20004d) Equinox: J2000		V=25.0+/-5.0 J=26.0	Reference Frame: J2000

Comments: Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -0.5,0.5; GS ACQ SCENARIO BASE1B3		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
2		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -1,1		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG -1.5,1.5		702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
4		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -2,2		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 14711, F160W-02_A (04), implementation Wed Sep 07 22:16:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 88.5D TO 89.5 D

Comments: We want to duplicate orientation of the WFC3/IR data in GO-11664

Fixed Targets

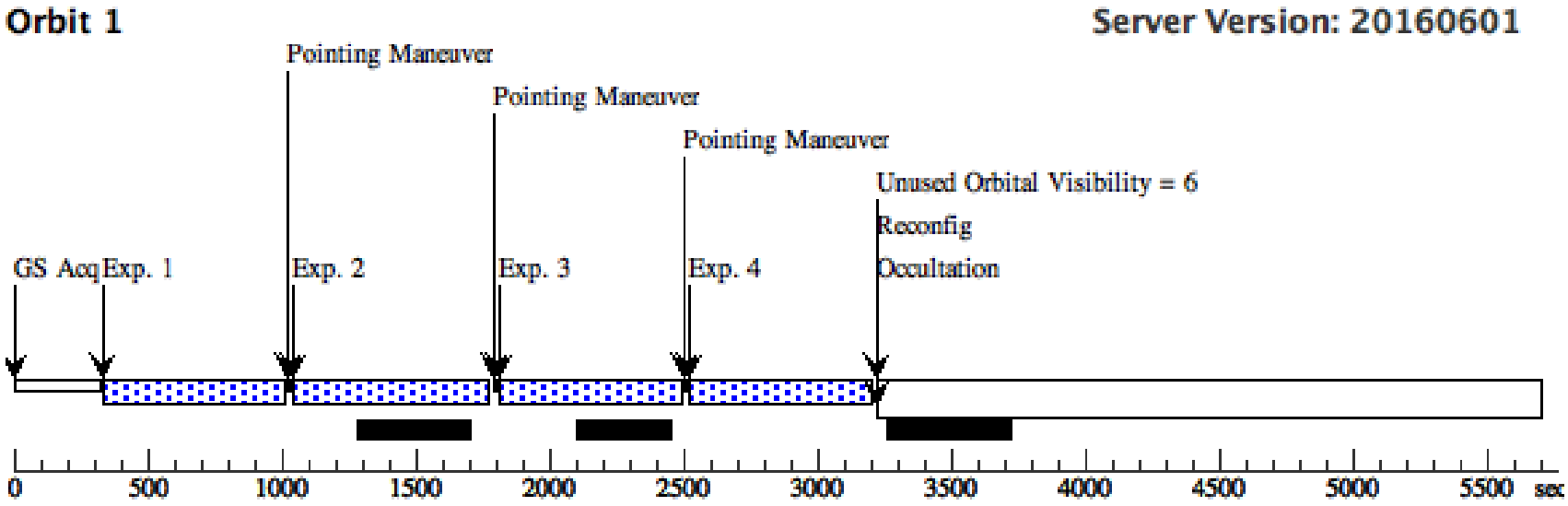
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SWEEPS-BULGE4-F160W	RA: 17 59 0.8000 (269.7533333d) Dec: -29 12 0.14 (-29.20004d) Equinox: J2000		V=25.0+/-5.0 J=26.0	Reference Frame: J2000

Comments: Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG +0.5,-0.5; GS ACQ SCENARIO BASE1B3		652.938154 Secs (652.938 Secs) *[==>]*	 *[1]*
2		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG 1,-1		702.938605 Secs (702.939 Secs) *[==>]*	 *[1]*
3		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 1.5,-1.5		652.938154 Secs (652.938 Secs) *[==>]*	 *[1]*
4		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 2,-2		652.938154 Secs (652.938 Secs) *[==>]*	 *[1]*

Orbit Structure



Visit

Proposal 14711, F110W-03_B (05), implementation Wed Sep 07 22:16:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 268.5D TO 269.5 D

Comments: We want to duplicate orientation of the WFC3/IR data in GO-11664

Fixed Targets

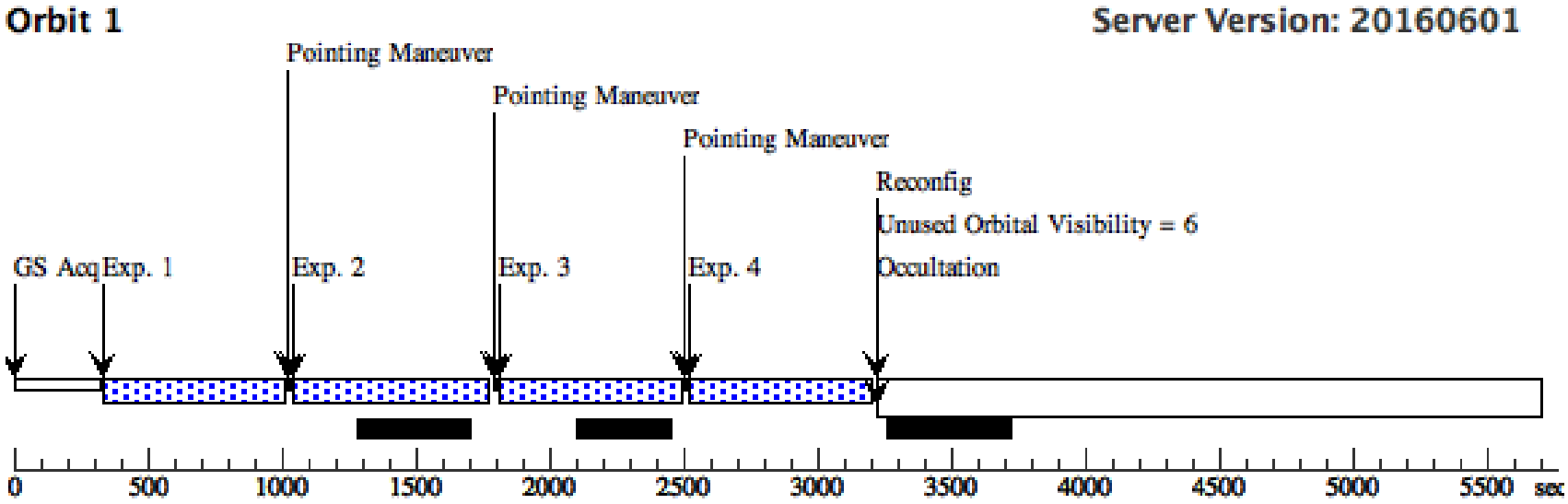
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SWEEPS-BULGE4-F110W	RA: 17 59 0.7960 (269.7533167d) Dec: -29 12 0.00 (-29.20000d) Equinox: J2000		V=25.0+/-5.0 J=26.0	Reference Frame: J2000

Comments: Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -0.5,0.5		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
2		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG -1,1		702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
3		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -1.5,1.5		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -2,2		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 14711, F110W-04_B (06), implementation Wed Sep 07 22:16:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 268.5D TO 269.5 D

Comments: We want to duplicate orientation of the WFC3/IR data in GO-11664

Fixed Targets

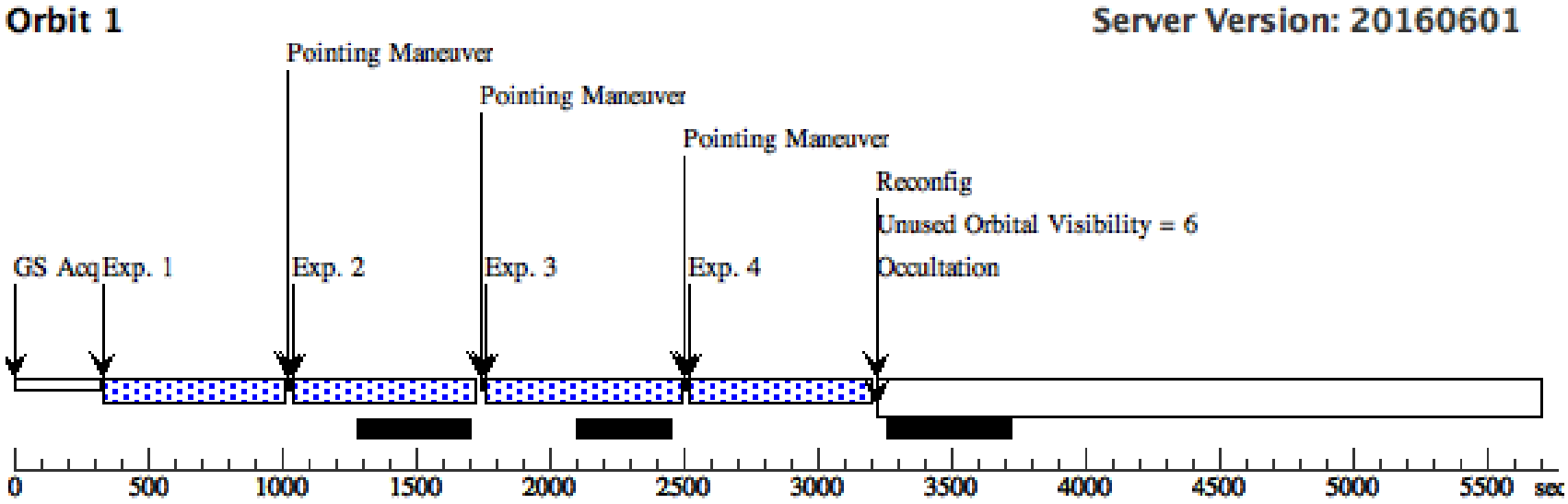
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SWEEPS-BULGE4-F110W	RA: 17 59 0.7960 (269.7533167d) Dec: -29 12 0.00 (-29.20000d) Equinox: J2000		V=25.0+/-5.0 J=26.0	Reference Frame: J2000

Comments: Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG +0.5,-0.5		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
2		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 1,-1		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG 1.5,-1.5		702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
4		(1) SWEEPS-BULGE4-F110W	WFC3/IR, MULTIACCUM, IR-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 2,-2		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 14711, F160W-03_B (07), implementation Wed Sep 07 22:16:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 268.5D TO 269.5 D

Comments: We want to duplicate orientation of the WFC3/IR data in GO-11664

Fixed Targets

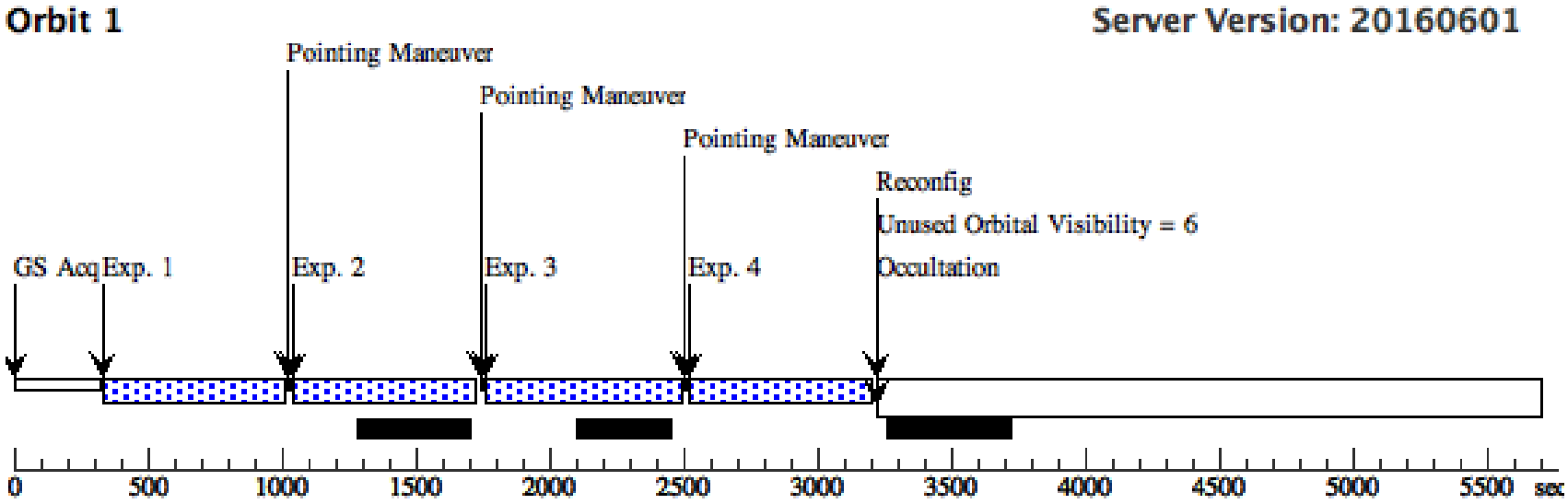
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SWEEPS-BULGE4-F160W	RA: 17 59 0.8000 (269.7533333d) Dec: -29 12 0.14 (-29.20004d) Equinox: J2000		V=25.0+/-5.0 J=26.0	Reference Frame: J2000

Comments: Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -0.5,0.5		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
2		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -1,1		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG -1.5,1.5		702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
4		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -2,2		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 14711, F160W-04_B (08), implementation Wed Sep 07 22:16:31 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 268.5D TO 269.5 D

Comments: We want to duplicate orientation of the WFC3/IR data in GO-11664

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SWEEPS-BULGE4-F160W	RA: 17 59 0.8000 (269.7533333d) Dec: -29 12 0.14 (-29.20004d) Equinox: J2000		V=25.0+/-5.0 J=26.0	Reference Frame: J2000

Comments: Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG +0.5,-0.5		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
2		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG 1,-1		702.938605 Secs (702.939 Secs) *[==>]*	*[1]*
3		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 1.5,-1.5		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
4		(2) SWEEPS-BULGE4-F160W	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 2,-2		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*

Orbit Structure