16177 - Digging into the mystery of the Galactic globular clusters M22 and NGC1851

Cycle: 28, 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	(2) M22-OUT ANY	ACS/WFC WFC3/IR	2	21-Jul-2020 10:00:26.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
02	(1) NGC-1851-OUT ANY	ACS/WFC WFC3/IR	3	21-Jul-2020 10:00:29.0	yes

5 Total Orbits Used

ABSTRACT

We propose to collect deep near-infrared (NIR) images of two peculiar Galactic globular clusters (GGCs), NGC1851 and M22, to explore the properties of their multiple stellar populations. These GGCs display multiple sequences along the red-giant and sub-giant branches in ultraviolet-optical color-magnitude diagrams (CMDs), and spectroscopy confirmed they host multiple stellar populations with different light- and heavy-element abundances and total content of CNO. How these populations originated is still a mystery. We plan to solve this puzzle by using NIR photometry of low-mass main-sequence (MS) stars: these are brighter in the NIR regime, and the lower part of the MS is more sensitive to heavy and light-element abundances in NIR compared to optical colors. We plan to compare the observed NIR CMDs to theoretical models that include new bolometric corrections taking into account different chemical patterns to characterize the chemical composition and population ratio of the different sub-populations in the GGCs. The presence of chemical inhomogeneities in MS stars similar to those found in the giant stars through spectroscopy will confirm their primordial origin. Furthermore, we will derive the mass function of each stellar sub-population and investigate for the presence of differences. The new NIR data will be combined with archival HST data to derive accurate proper motions for MS stars and to characterize the kinematical properties of the different sub-populations. This analysis will shed light on the origin of multiple populations in these very peculiar GGCs. This work is preparatory for studies with JWST that will allow us to apply the same technique to farther GGCs.

OBSERVING DESCRIPTION

The first 2-orbit visit is dedicated to M22. We want to collect a series of F110W and F160W exposures of a field at about 5 arcmin from the cluster center that overlaps with previous ACS observations. The ACS parallel is appromitaly centered on the cluster center and overlaps with prevuous WFC3 observaitons. That is why we need an ORIENT constrain. The F160W exposures are at the beginning and at the end of the orbits to mitigate the Heliume line background contamination. To achieve this, we also use a Non-Interruptible Sequence. We dither about ~ 8-10 pixels by using Pos-targs.

The second 3-orbit visit is dedicated to NGC1851. We want to collect deep and short F110W and F160W exposures of a field at about 5 arcmin from the cluster center that overlaps with previous ACS observations. The ACS parallel is appromitaly centered on the cluster center and overlaps with

prevuous WFC3 observaitons. That is why we need an ORIENT constrain. The F160W exposures are at the beginning and at the end of the orbits to mitigate the Heliume line background contamination. To achieve this, we also use a Non-Interruptible Sequence. We dither about ~ 8-10 pixels by using Pos-targs. We also add two parallel ACS F606W observations since we have some time left and since these extra exposures could improve the S/N and the depth of the current ACS F606W, F814W photometric catalog for the center of NGC1851.

Visit

Proposal 16177, Visit 01 Tue Jul 21 14:00:29 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR, ACS/WFC

Special Requirements: ORIENT 70D TO 90 D

Diagnostics

(Visit 01) Warning (Orbit Planner): PARALLELS SIGNIFICANTLY EXTEND ALIGNMENT TIME

(Visit 01) Warning (Orbit Planner): PARALLELS SIGNIFICANTLY EXTEND ALIGNMENT TIME

(Visit 01) Warning (Orbit Planner): PARALLELS SIGNIFICANTLY EXTEND ALIGNMENT TIME

(Visit 01) Warning (Orbit Planner): PARALLELS SIGNIFICANTLY EXTEND ALIGNMENT TIME

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	M22-OUT	RA: 18 36 45.0000 (279.1875000d) Dec: -23 58 10.00 (-23.96944d) Equinox: J2000	Proper Motion RA: 3.4419134212604005E-4 sec of time/yr Proper Motion Dec: -0.0035900000284527778 arcsec/yr Epoch of Position: 2015.5	V=6.17	Reference Frame: ICRS

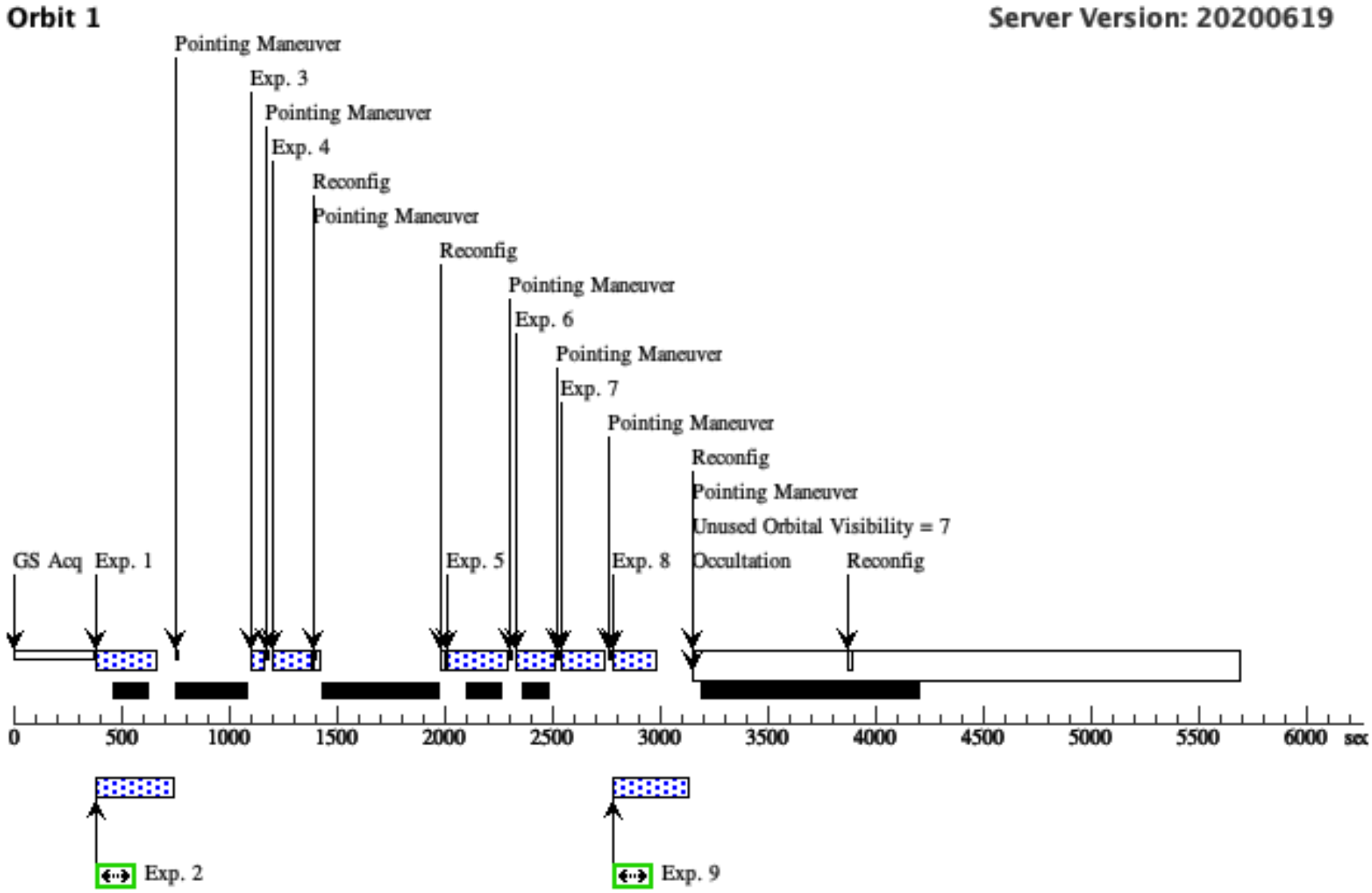
Comments:
Category=STELLAR CLUSTER
Description=[GLOBULAR CLUSTER]

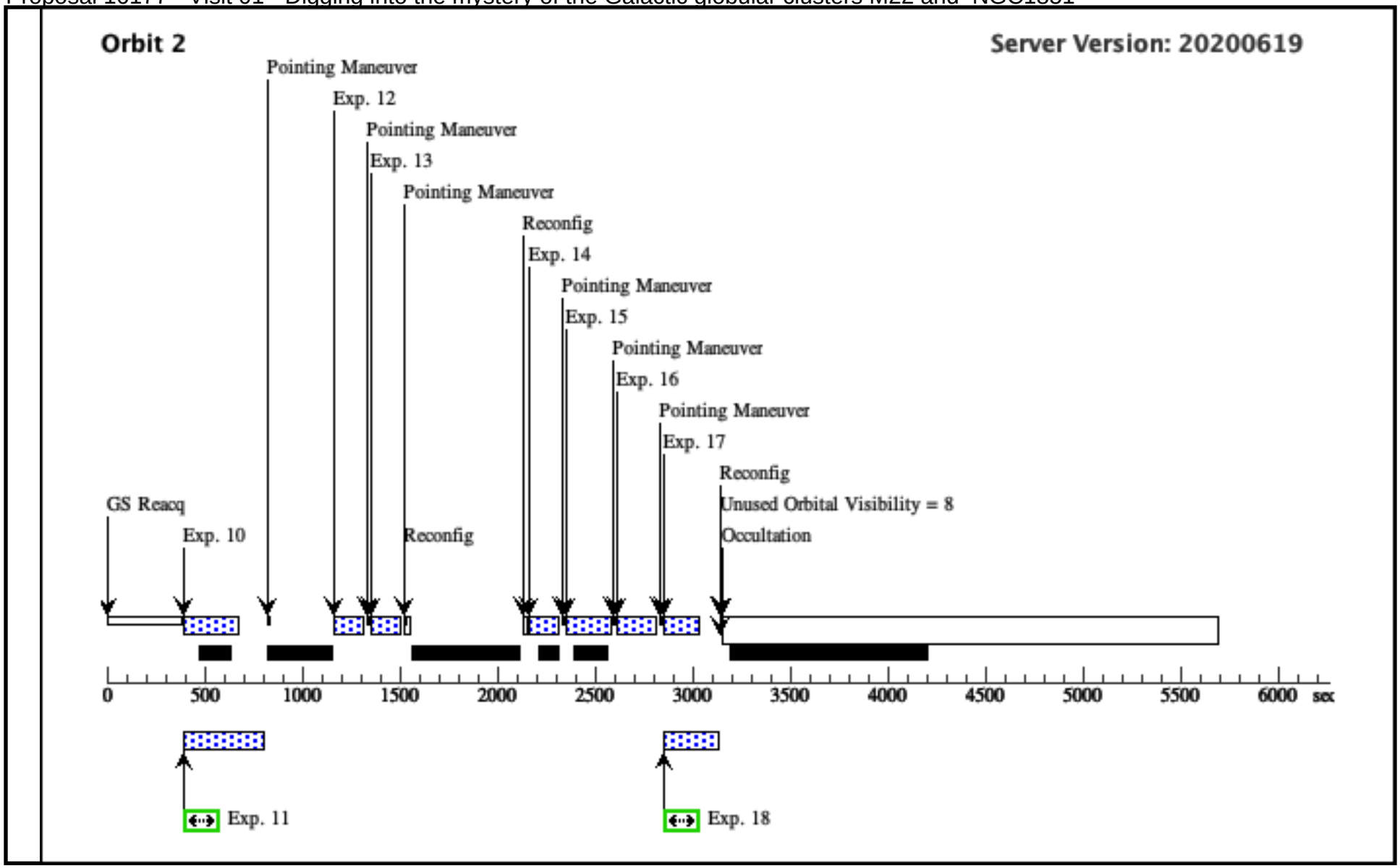
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=STEP25		Sequence 1-7 Non-Int in Visit 01 Prime + Parallel Group 1-2 in Sequence 1-7 Non-Int in Visit 01	249.234346 Secs (249.234 Secs) *[==>]*	***[1]***
2		ANY	ACS/WFC, ACCUM, WFC	F814W			Sequence 1-7 Non-Int in Visit 01 Prime + Parallel Group 1-2 in Sequence 1-7 Non-Int in Visit 01	150 Secs (150 Secs) *[==>]*	***[1]***
3		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=7; SAMP-SEQ=SPARS5	POS TARG 0.92,-0.92	Sequence 1-7 Non-Int in Visit 01	32.936917 Secs (32.937 Secs) *[==>]*	***[1]***
4		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP25	POS TARG -0.97,0.33	Sequence 1-7 Non-Int in Visit 01	149.232286 Secs (149.232 Secs) *[==>]*	***[1]***
5		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP50	POS TARG 0.87,0.87	Sequence 1-7 Non-Int in Visit 01	249.23203 Secs (249.232 Secs) *[==>]*	***[1]***
6		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=10; SAMP-SEQ=STEP25	POS TARG -0.67,-0.67	Sequence 1-7 Non-Int in Visit 01	149.232286 Secs (149.232 Secs) *[==>]*	***[1]***
7		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=11; SAMP-SEQ=STEP25	POS TARG 0.83,-0.33	Sequence 1-7 Non-Int in Visit 01	174.232801 Secs (174.233 Secs) *[==>]*	***[1]***
8		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=11; SAMP-SEQ=STEP25	POS TARG -0.93,0.69	Prime + Parallel Group 8-9 in Visit 01	174.232801 Secs (174.233 Secs) *[==>]*	***[1]***
9		ANY	ACS/WFC, ACCUM, WFC	F814W			Prime + Parallel Group 8-9 in Visit 01	230 Secs (230 Secs) *[==>]*	***[1]***
10		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=STEP25	POS TARG 0.67,0.67	Sequence 10-18 Non-Int in Visit 01 Prime + Parallel Group 10-11 in Sequence 10-18 Non-Int in Visit 01	249.234346 Secs (249.234 Secs) *[==>]*	***[2]***
11		ANY	ACS/WFC, ACCUM, WFC	F475W			Sequence 10-18 Non-Int in Visit 01 Prime + Parallel Group 10-11 in Sequence 10-18 Non-Int in Visit 01	250 Secs (250 Secs) *[==>]*	***[2]***
12		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=9; SAMP-SEQ=STEP25	POS TARG -0.92,-0.87	Sequence 10-18 Non-Int in Visit 01	124.231771 Secs (124.232 Secs) *[==>]*	***[2]***
13		(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=9; SAMP-SEQ=STEP25	POS TARG 0.93,0.33	Sequence 10-18 Non-Int in Visit 01	124.231771 Secs (124.232 Secs) *[==>]*	***[2]***

	14	(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=9; SAMP-SEQ=STEP25	POS TARG -0.33,0.97	Sequence 10-18 Non-Int in Visit 01	124.231771 Secs (124.232 Secs) *[==>]*	 ***[2]***
	15	(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP25	POS TARG 0.92,-0.92	Sequence 10-18 Non-Int in Visit 01	199.233316 Secs (199.233 Secs) *[==>]*	 ***[2]***
	16	(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=11; SAMP-SEQ=STEP25	POS TARG -0.97,0.33	Sequence 10-18 Non-Int in Visit 01	174.232801 Secs (174.233 Secs) *[==>]*	 ***[2]***
	17	(2) M22-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=10; SAMP-SEQ=STEP25	POS TARG 0.93,0.87	Sequence 10-18 Non-Int in Visit 01 Prime + Parallel Group 17-18 in Sequence 10-18 Non-Int in Visit 01	149.232286 Secs (149.232 Secs) *[==>]*	 ***[2]***
	18	ANY	ACS/WFC, ACCUM, WFC	F475W			Sequence 10-18 Non-Int in Visit 01 Prime + Parallel Group 17-18 in Sequence 10-18 Non-Int in Visit 01	150 Secs (150 Secs) *[==>]*	 ***[2]***

Orbit Structure

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Exp. 14
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Exp. 15
Pointing Maneuver
Exp. 16
Pointing Maneuver
Exp. 17
Reconfig
Unused Orbital Visibility = 8
Occultation
GS Reacq
Exp. 10
Reconfig
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec
Exp. 11
Exp. 18

Visit

Proposal 16177, Visit 02 Tue Jul 21 14:00:30 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR, ACS/WFC

Special Requirements: ORIENT 150D TO 250 D

Diagnostics

(Visit 02) Warning (Orbit Planner): PARALLELS SIGNIFICANTLY EXTEND ALIGNMENT TIME

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-1851-OUT	RA: 05 13 53.0000 (78.4708333d) Dec: -40 04 27.00 (-40.07417d) Equinox: J2000	Proper Motion RA: 1.114707938811718E-4 sec of time/yr Proper Motion Dec: 0.00239 arcsec/yr Epoch of Position: 2015.5	V=7.23	Reference Frame: ICRS

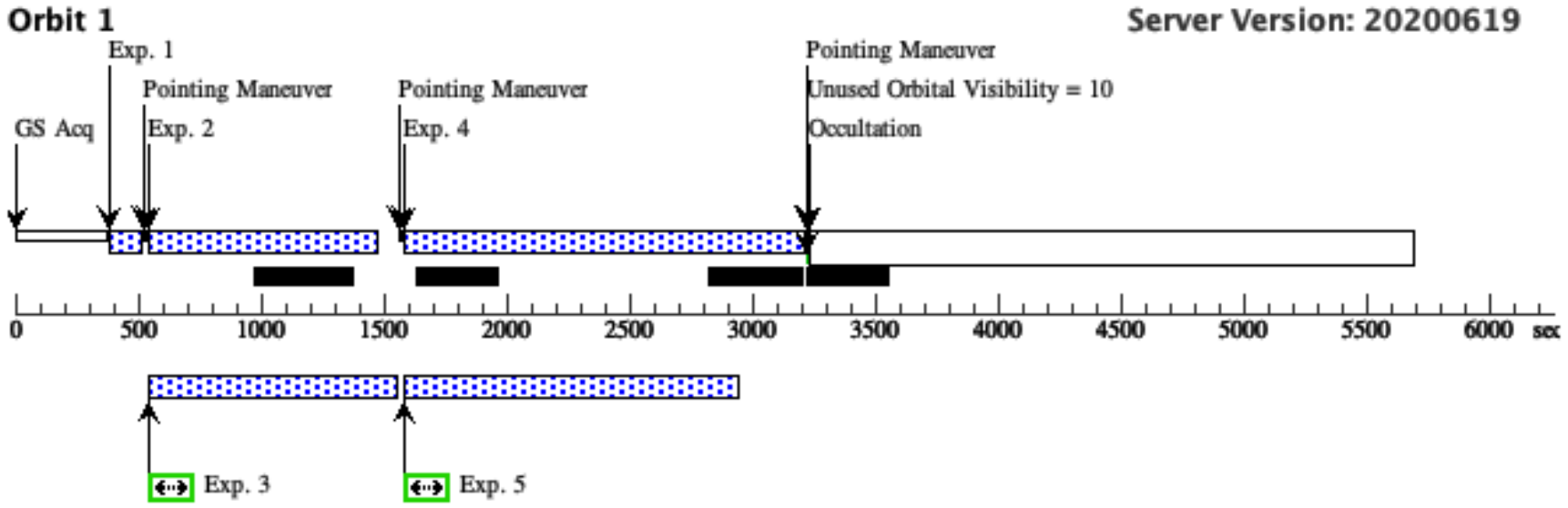
Comments:
Category=STELLAR CLUSTER
Description=[GLOBULAR CLUSTER]

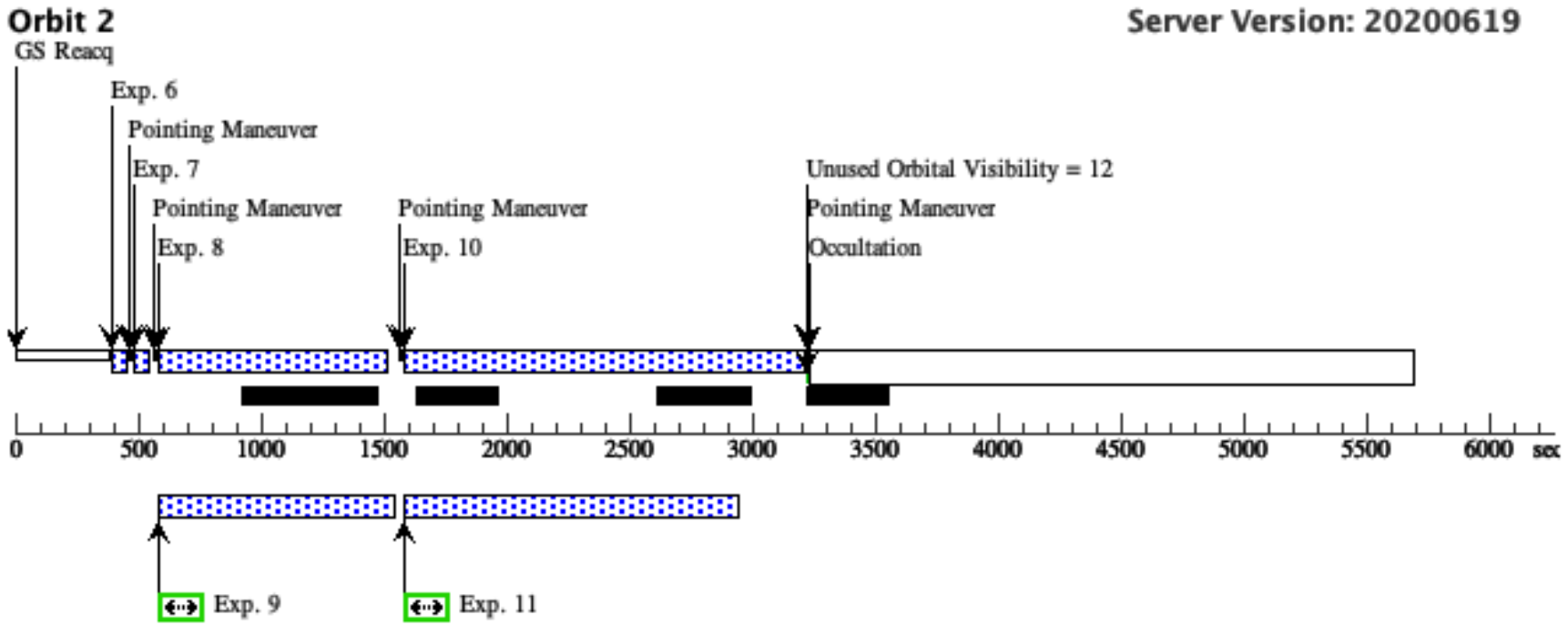
Exposures

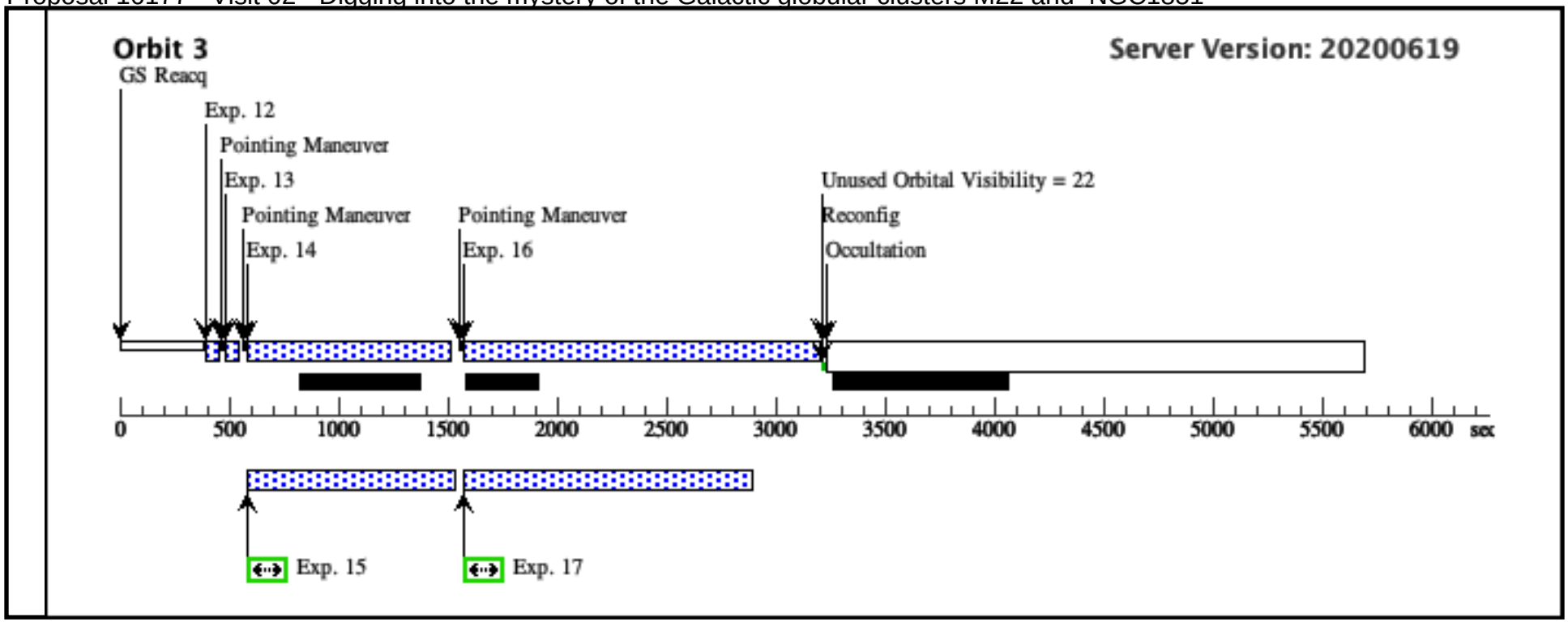
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=8; SAMP-SEQ=STEP25		Sequence 1-5 Non-Int in Visit 02	99.231256 Secs (99.231 Secs) *[==>]*	***[1]***
2		(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG 0.92,0.92	Sequence 1-5 Non-Int in Visit 02 Prime + Parallel Group 2-3 in Sequence 1-5 Non-Int in Visit 02	899.233261 Secs (899.233 Secs) *[==>]*	***[1]***
3		ANY	ACS/WFC, ACCUM, WFC	F814W			Sequence 1-5 Non-Int in Visit 02 Prime + Parallel Group 2-3 in Sequence 1-5 Non-Int in Visit 02	800 Secs (800 Secs) *[==>]*	***[1]***
4		(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=STEP200	POS TARG -0.97,0.33	Sequence 1-5 Non-Int in Visit 02 Prime + Parallel Group 4-5 in Sequence 1-5 Non-Int in Visit 02	1599.231469 Secs (1599.231 Secs) *[==>]*	***[1]***
5		ANY	ACS/WFC, ACCUM, WFC	F475W			Sequence 1-5 Non-Int in Visit 02 Prime + Parallel Group 4-5 in Sequence 1-5 Non-Int in Visit 02	1200 Secs (1200 Secs) *[==>]*	***[1]***
6		(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=7; SAMP-SEQ=SPARS5	POS TARG 0.87,0.67	Sequence 6-11 Non-Int in Visit 02	32.936917 Secs (32.937 Secs) *[==>]*	***[2]***
7		(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=7; SAMP-SEQ=SPARS5	POS TARG 0.33,-0.92	Sequence 6-11 Non-Int in Visit 02	32.936917 Secs (32.937 Secs) *[==>]*	***[2]***
8		(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG 0.92,0.93	Sequence 6-11 Non-Int in Visit 02 Prime + Parallel Group 8-9 in Sequence 6-11 Non-Int in Visit 02	899.233261 Secs (899.233 Secs) *[==>]*	***[2]***
9		ANY	ACS/WFC, ACCUM, WFC	F814W			Sequence 6-11 Non-Int in Visit 02 Prime + Parallel Group 8-9 in Sequence 6-11 Non-Int in Visit 02	800 Secs (800 Secs) *[==>]*	***[2]***
10		(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=STEP200	POS TARG -0.87,0.33	Sequence 6-11 Non-Int in Visit 02 Prime + Parallel Group 10-11 in Sequence 6-11 Non-Int in Visit 02	1599.231469 Secs (1599.231 Secs) *[==>]*	***[2]***

	11	ANY	ACS/WFC, ACCUM, WFC	F475W			Sequence 6-11 Non-Int in Visit 02 Prime + Parallel Group 10-11 in Sequence 6-11 Non-Int in Visit 02	1200 Secs (1200 Secs) *[==>]*	***[2]***
	12	(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=7; SAMP-SEQ=SPARS5	POS TARG 0.87,0.67	Sequence 12-17 Non-Int in Visit 02	32.936917 Secs (32.937 Secs) *[==>]*	***[3]***
	13	(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=7; SAMP-SEQ=SPARS5	POS TARG 0.33,-0.92	Sequence 12-17 Non-Int in Visit 02	32.936917 Secs (32.937 Secs) *[==>]*	***[3]***
	14	(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG 0.92,0.93	Sequence 12-17 Non-Int in Visit 02 Prime + Parallel Group 14-15 in Sequence 12-17 Non-Int in Visit 02	899.233261 Secs (899.233 Secs) *[==>]*	***[3]***
	15	ANY	ACS/WFC, ACCUM, WFC	F606W			Sequence 12-17 Non-Int in Visit 02 Prime + Parallel Group 14-15 in Sequence 12-17 Non-Int in Visit 02	800 Secs (800 Secs) *[==>]*	***[3]***
	16	(1) NGC-1851-OUT	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=STEP200	POS TARG -0.87,0.33	Sequence 12-17 Non-Int in Visit 02 Prime + Parallel Group 16-17 in Sequence 12-17 Non-Int in Visit 02	1599.231469 Secs (1599.231 Secs) *[==>]*	***[3]***
	17	ANY	ACS/WFC, ACCUM, WFC	F606W			Sequence 12-17 Non-Int in Visit 02 Prime + Parallel Group 16-17 in Sequence 12-17 Non-Int in Visit 02	1200 Secs (1200 Secs) *[==>]*	***[3]***

Orbit Structure



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Server Version: 20200619
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Pointing Maneuver
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Reconfig
Occultation
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sec
Exp. 15
Exp. 17