15062 - Extending the Search for Multiple Populations in Massive Intermediate Age Clusters

Cycle: 25, Proposal Category: GO

(Availability Mode: SUPPORTED)

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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) NGC-2121	WFC3/UVIS	2	08-Sep-2017 20:01:16.0	yes
02	(2) NGC-2155	WFC3/UVIS	2	08-Sep-2017 20:01:18.0	yes
03	(3) CL-LINDSAY-113	WFC3/UVIS	2	08-Sep-2017 20:01:20.0	yes
04	(4) ESO-51-3	WFC3/UVIS	2	08-Sep-2017 20:01:21.0	yes

8 Total Orbits Used

ABSTRACT

We propose to obtain imaging of 4 massive clusters in the LMC/SMC, spanning an age range of 2-6.5 Gyr, in order to search for chemical abundance spreads (i.e. multiple populations - MPs) within them. This proposal is meant to compliment our Cycle 23 proposal, which had the unexpected result where we found MPs in all clusters older than 6 Gyr (4 clusters) and did not find MPs in any clusters younger than 2 Gyr (8 clusters). Here we will explore this age gap to pinpoint the exact age where MPs begin to occur on the red giant branch (RGB), which will in turn show the stellar mass where MPs can develop. Additionally, we will study one 6.5 Gyr cluster that is a factor of ~3 less massive than previously studied to look for the influence of cluster mass on whether MPs can develop. The proposed sample occupies a critical region of parameter space (age/mass) where there are no Milky Way counterparts.

OBSERVING DESCRIPTION

We propose to obtain imaging of 4 massive star clusters one within the LMC/SMC, spanning a wide range of ages (0.1 - 10 Gyr), in order to search for elemental abundance spreads and multiple populations. The clusters will be observed in the F343N, F336W and F438W WFC3/UVIS filters, which will provide accurate color-magnitude diagrams (CMD) for studies of these phenomena.

A CMD for such a large range of stellar ages covers everything from red and very bright giants down to the main sequence stars of various brightness and colors. To reach our science goals, it is crucial not to saturate the bright giants by using a short exposure and to reach a sufficient depth beyond the main-sequence turn-off using long exposures. Therefore, for each cluster, a short exposure and long exposures with CR-split in each filter are required. To cover the gap between the two WFC3/UVIS CCD chips, we use two dithered pointings. In order to maximize the overlap, we also require a specific orientation to match the orientation of those target clusters which have archival observations with the WFC3/UVIS. This orientation is specified in the Visit Orientation Requirement for these clusters/visits as follows:

Visit1 - ngc419, Min=307, Max=307;

Visit2 - ngc104 (47Tuc), Min=0, Min=1

Visit

Proposal 15062, Visit 01 - NGC2121 (01), implementation Sat Sep 09 00:01:22 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Fixed Targets

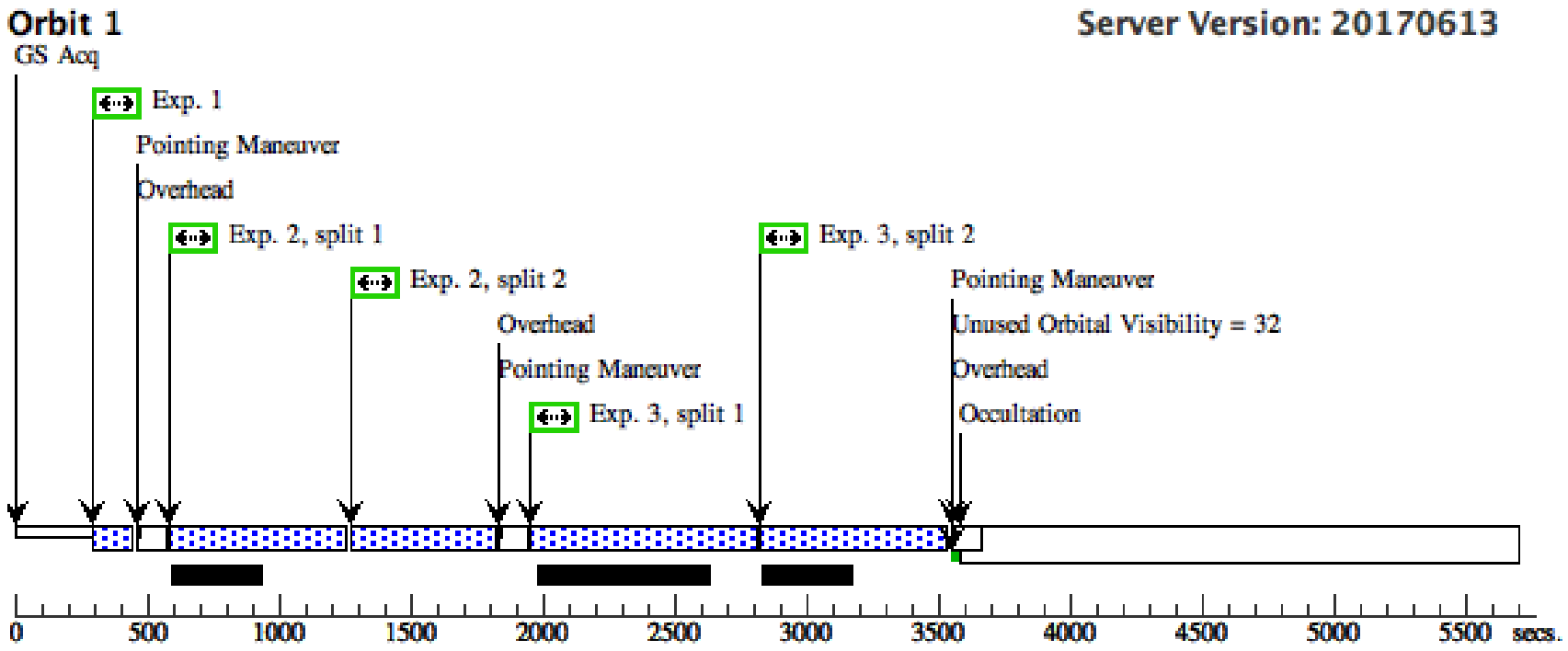
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-2121	RA: 05 48 13.1900 (87.0549583d) Dec: -71 28 52.00 (-71.48111d) Equinox: J2000		V=12.37	Reference Frame: ICRS

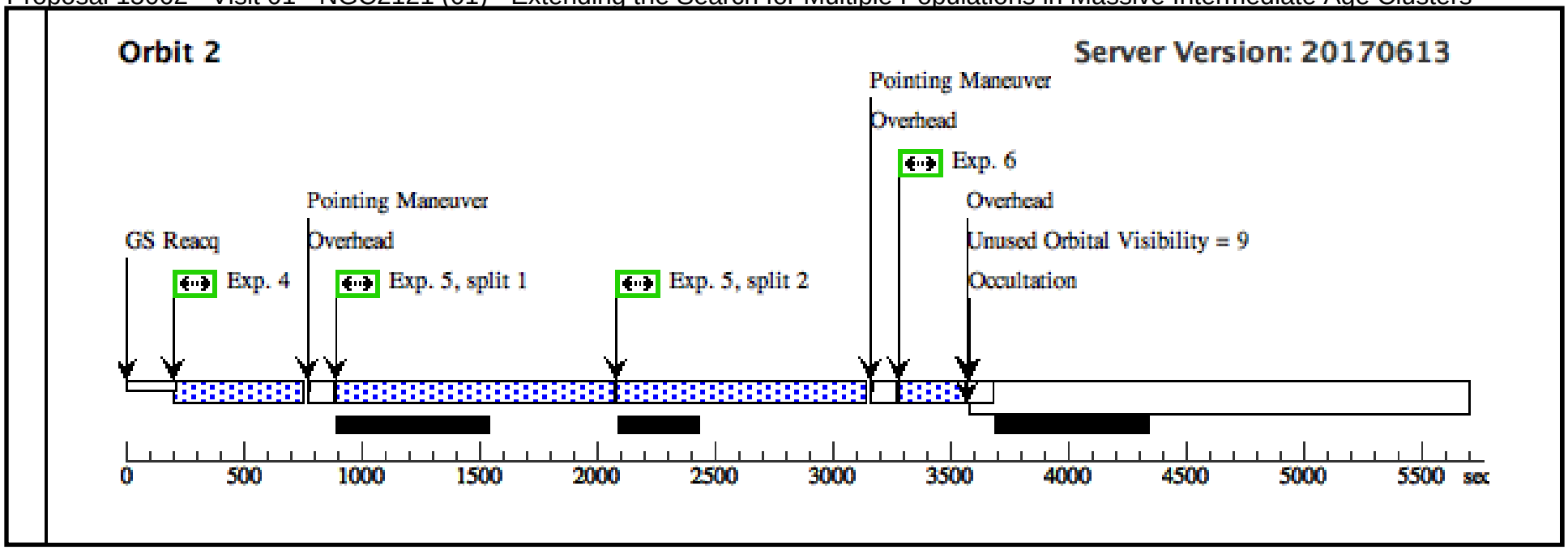
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	NGC2121 - F438W	(1) NGC-2121	WFC3/UVIS, ACCUM, UVIS	F438W	FLASH=12	POS TARG 0.18,2.44		120 Secs (120 Secs) *[==>]*	***[1]***
2	NGC2121 - F438W	(1) NGC-2121	WFC3/UVIS, ACCUM, UVIS	F438W	FLASH=10; CR-SPLIT=2	POS TARG -0.1,-0.06		1100 Secs (1100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
3	NGC2121 - F336W	(1) NGC-2121	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=10; CR-SPLIT=2	POS TARG 0.18,2.44		1430 Secs (1430 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
4	NGC2121 - F343N	(1) NGC-2121	WFC3/UVIS, ACCUM, UVIS	F343N	FLASH=12	POS TARG -0.1,-0.06		540 Secs (540 Secs) *[==>]*	***[2]***
5	NGC2121 - F343N	(1) NGC-2121	WFC3/UVIS, ACCUM, UVIS	F343N	FLASH=12; CR-SPLIT=2	POS TARG 0.18,2.44		2120 Secs (2120 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[2]***
6	NGC2121 - F336W	(1) NGC-2121	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=12	POS TARG -0.1,-0.06		270 Secs (270 Secs) *[==>]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20170613
Pointing Maneuver
Overhead
Exp. 6
Pointing Maneuver
Overhead
GS Reacq
Overhead
Unused Orbital Visibility = 9
Exp. 4
Exp. 5, split 1
Exp. 5, split 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15062, Visit 02 - NGC2155 (02), implementation Sat Sep 09 00:01:22 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Fixed Targets

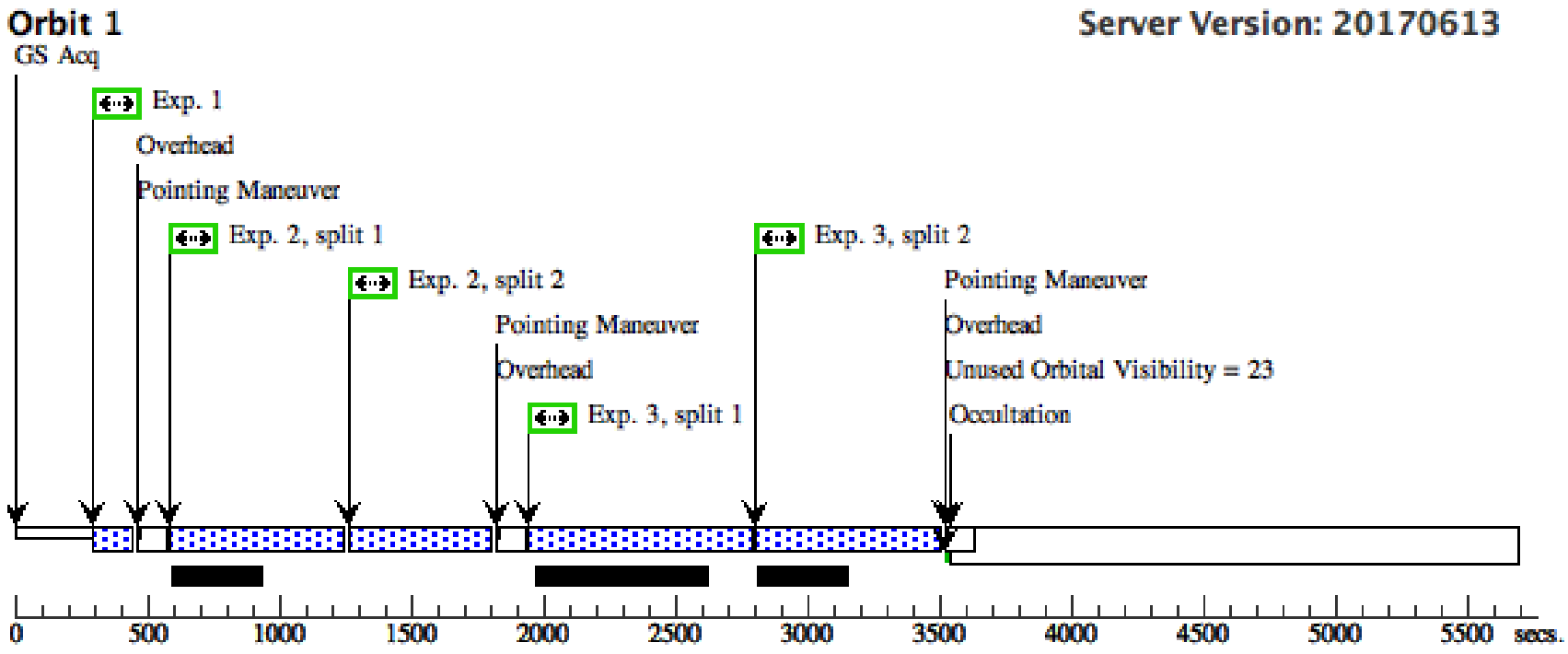
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC-2155	RA: 05 58 32.0700 (89.6336250d) Dec: -65 28 38.62 (-65.47739d) Equinox: J2000		V=12.6	Reference Frame: ICRS

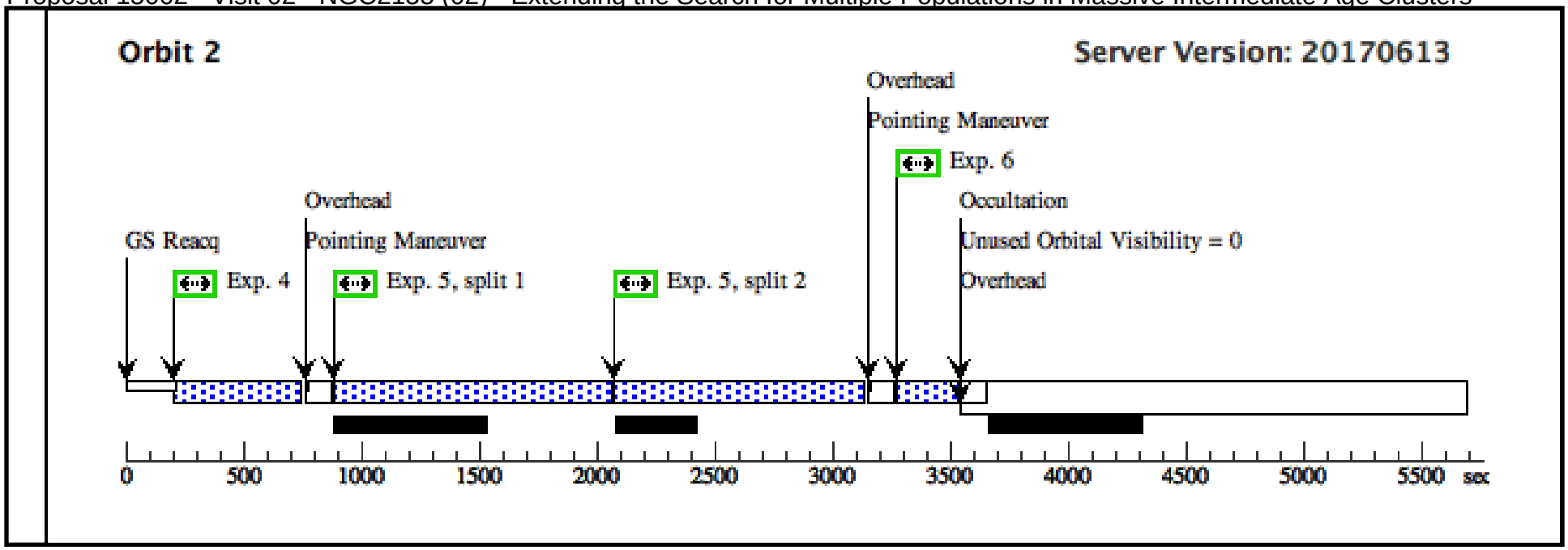
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	NGC2155 - F438W	(2) NGC-2155	WFC3/UVIS, ACCUM, UVIS	F438W	FLASH=12	POS TARG 0.18,2.44		120 Secs (120 Secs) *[==>]*	 ***[1]***
2	NGC2155 - F438W	(2) NGC-2155	WFC3/UVIS, ACCUM, UVIS	F438W	FLASH=10; CR-SPLIT=2	POS TARG -0.1,-0.06		1090 Secs (1090 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
3	NGC2155 - F336W	(2) NGC-2155	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=10; CR-SPLIT=2	POS TARG 0.18,2.44		1410 Secs (1410 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
4	NGC2155 - F343N	(2) NGC-2155	WFC3/UVIS, ACCUM, UVIS	F343N	FLASH=12	POS TARG -0.1,-0.06		530 Secs (530 Secs) *[==>]*	 ***[2]***
5	NGC2155 - F343N	(2) NGC-2155	WFC3/UVIS, ACCUM, UVIS	F343N	FLASH=12; CR-SPLIT=2	POS TARG 0.18,2.44		2120 Secs (2120 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[2]***
6	NGC2155 - F336W	(2) NGC-2155	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=12	POS TARG -0.1,-0.06		250 Secs (250 Secs) *[==>]*	 ***[2]***

Orbit Structure




Orbit 2
Server Version: 20170613
Overhead
Pointing Maneuver
Exp. 6
Occultation
Unused Orbital Visibility = 0
Overhead
Overhead
Pointing Maneuver
GS Reacq
Exp. 4
Exp. 5, split 1
Exp. 5, split 2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15062, Visit 03 - Lindsay113 (03), implementation Sat Sep 09 00:01:22 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Fixed Targets

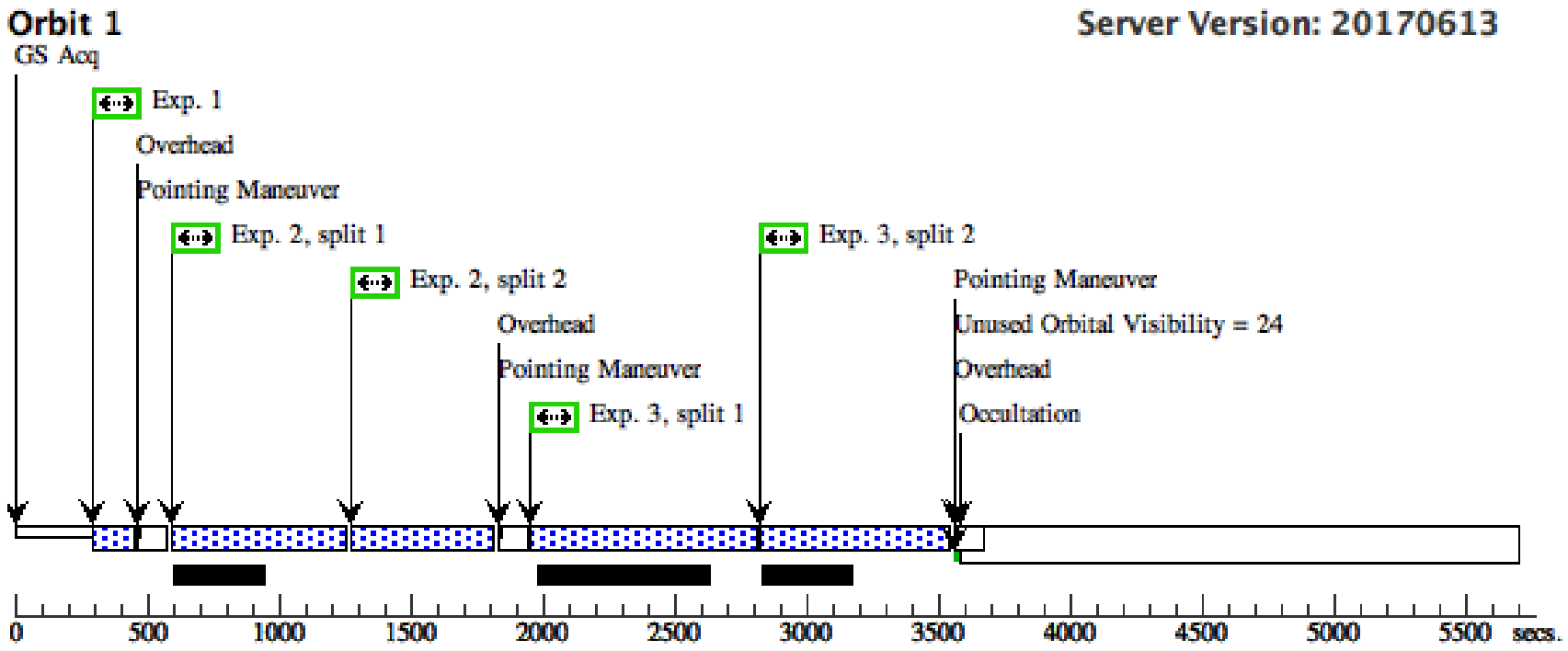
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	CL-LINDSAY-113	RA: 01 49 30.0000 (27.3750000d) Dec: -73 43 40.00 (-73.72778d) Equinox: J2000		V=14.5	Reference Frame: ICRS

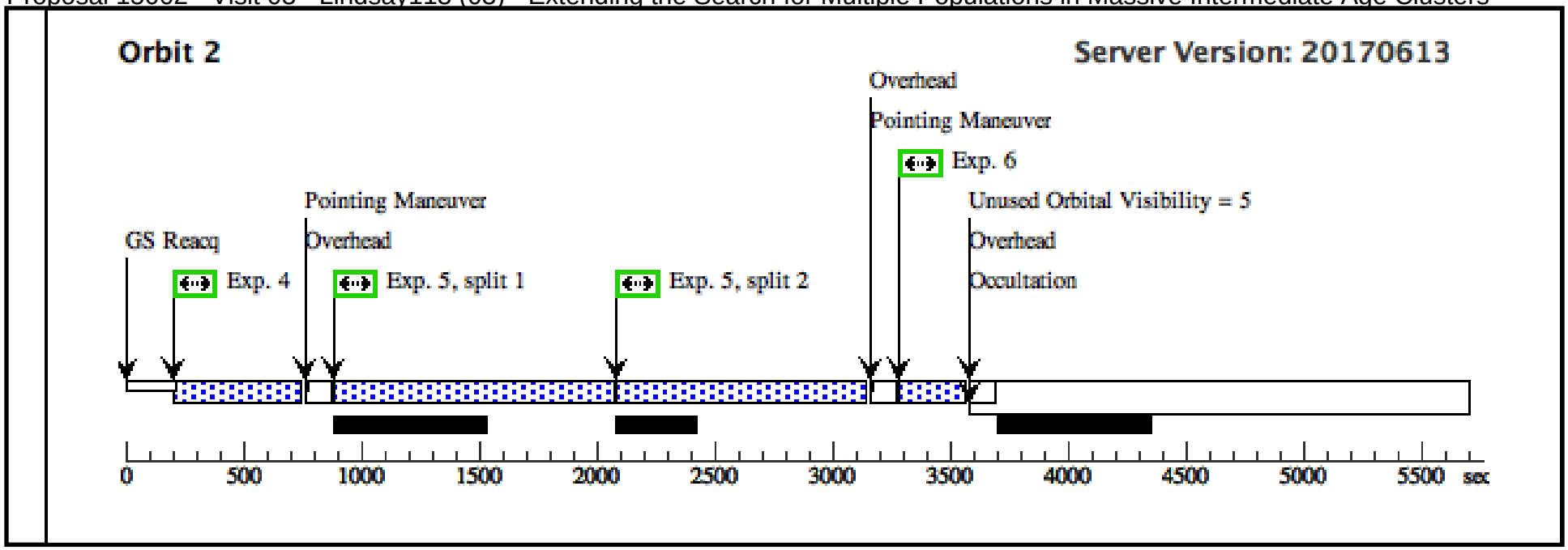
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Lindsay 113 - F438W	(3) CL-LINDSAY-113	WFC3/UVIS, ACCUM, UVIS	F438W	FLASH=12	POS TARG 0.18,2.44		128 Secs (128 Secs) *[==>]*	***[1]***
2	Lindsay 113 - F438W	(3) CL-LINDSAY-113	WFC3/UVIS, ACCUM, UVIS	F438W	FLASH=10; CR-SPLIT=2	POS TARG -0.1,-0.06		1090 Secs (1090 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
3	Lindsay 113 - F336W	(3) CL-LINDSAY-113	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=10; CR-SPLIT=2	POS TARG 0.18,2.44		1440 Secs (1440 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
4	Lindsay 113 - F343N	(3) CL-LINDSAY-113	WFC3/UVIS, ACCUM, UVIS	F343N	FLASH=12	POS TARG -0.1,-0.06		530 Secs (530 Secs) *[==>]*	***[2]***
5	Lindsay 113 - F343N	(3) CL-LINDSAY-113	WFC3/UVIS, ACCUM, UVIS	F343N	FLASH=12; CR-SPLIT=2	POS TARG 0.18,2.44		2130 Secs (2130 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[2]***
6	Lindsay 113 - F336W	(3) CL-LINDSAY-113	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=12	POS TARG -0.1,-0.06		274 Secs (274 Secs) *[==>]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20170613
Overhead
Pointing Maneuver
Exp. 6
Pointing Maneuver
Unused Orbital Visibility = 5
GS Reacq
Overhead
Overhead
Exp. 4
Exp. 5, split 1
Exp. 5, split 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15062, Visit 04 - ESO-51-3 (04), implementation Sat Sep 09 00:01:23 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Fixed Targets

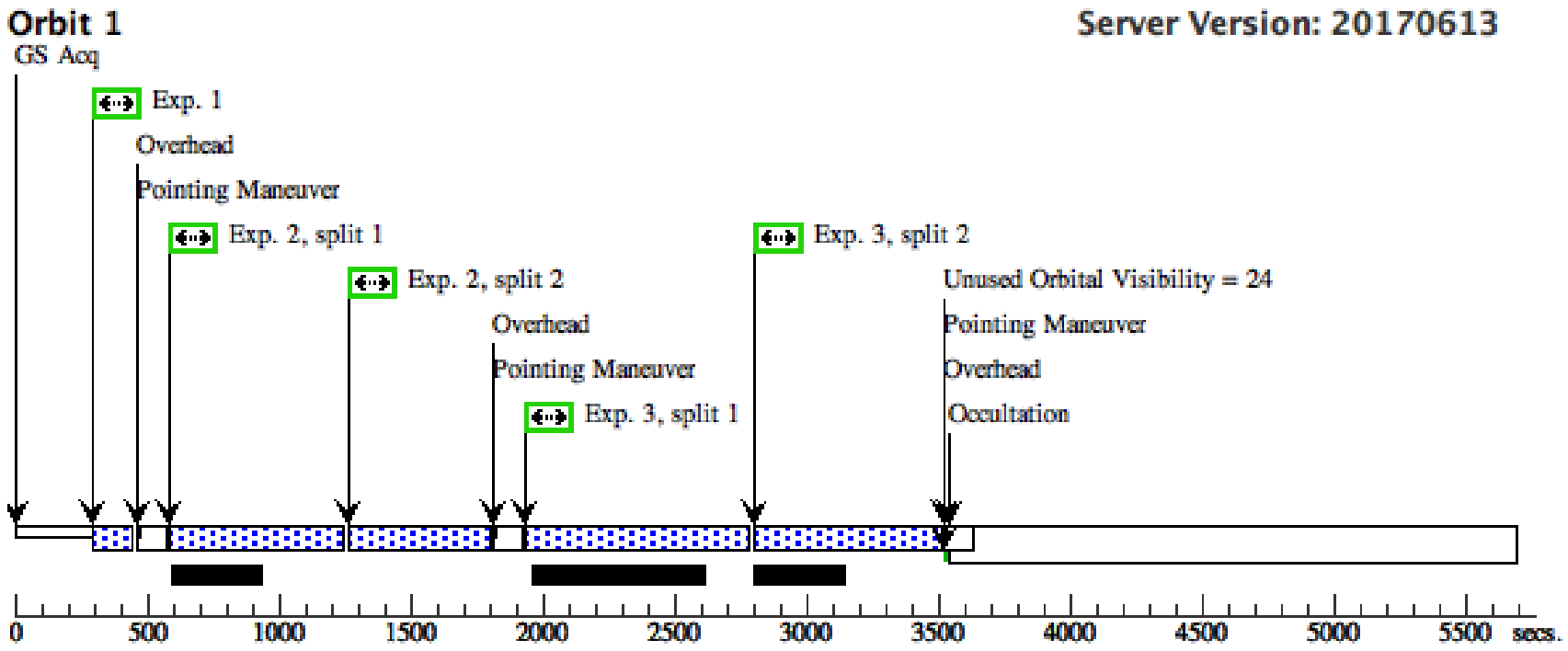
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	ESO-51-3	RA: 00 48 50.0000 (12.2083333d) Dec: -69 52 12.00 (-69.87000d) Equinox: J2000		V=14.5	Reference Frame: ICRS

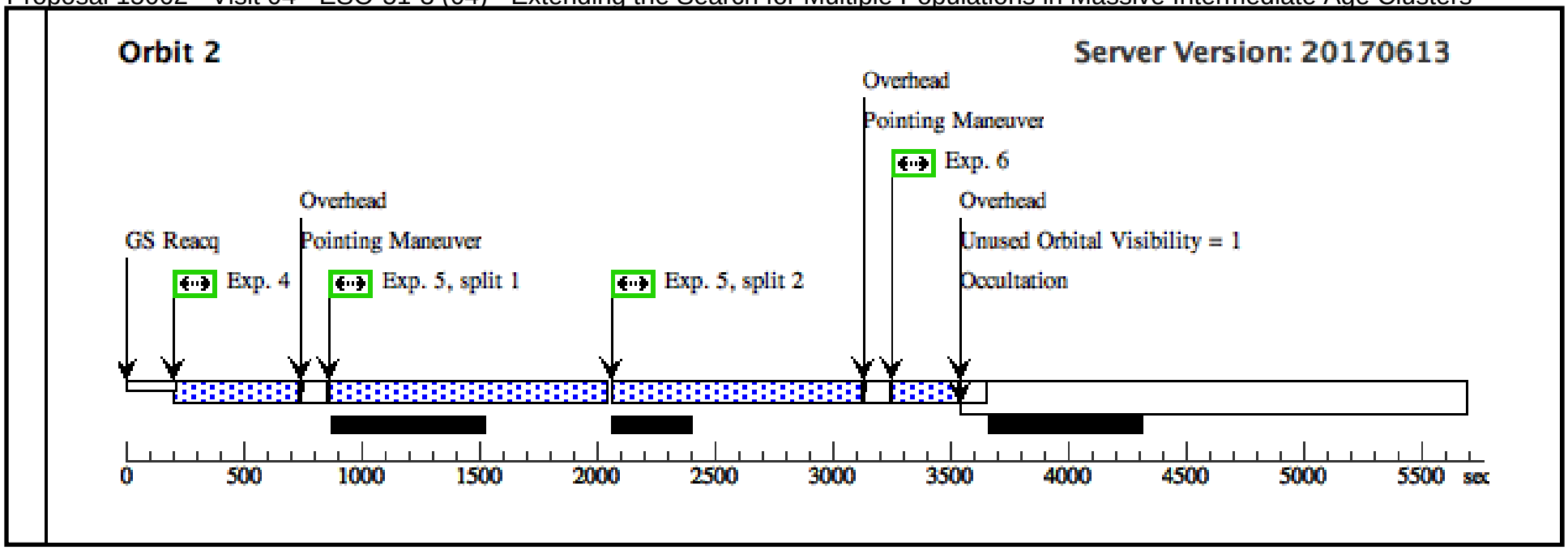
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ESO-51-3 - F438W	(4) ESO-51-3	WFC3/UVIS, ACCUM, UVIS	F438W	FLASH=12	POS TARG 0.18,2.44		123 Secs (123 Secs) *[==>]*	*[1]*
2	ESO-51-3 - F438W	(4) ESO-51-3	WFC3/UVIS, ACCUM, UVIS	F438W	FLASH=10; CR-SPLIT=2	POS TARG -0.1,-0.06		1076 Secs (1076 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
3	ESO-51-3 - F336W	(4) ESO-51-3	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=10; CR-SPLIT=2	POS TARG 0.18,2.44		1420 Secs (1420 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
4	ESO-51-3 - F343N	(4) ESO-51-3	WFC3/UVIS, ACCUM, UVIS	F343N	FLASH=12	POS TARG -0.1,-0.06		515 Secs (515 Secs) *[==>]*	*[2]*
5	ESO-51-3 - F343N	(4) ESO-51-3	WFC3/UVIS, ACCUM, UVIS	F343N	FLASH=12; CR-SPLIT=2	POS TARG 0.18,2.44		2115 Secs (2115 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[2]*
6	ESO-51-3 - F336W	(4) ESO-51-3	WFC3/UVIS, ACCUM, UVIS	F336W	FLASH=12	POS TARG -0.1,-0.06		268 Secs (268 Secs) *[==>]*	*[2]*

Orbit Structure




Orbit 2
Server Version: 20170613
Overhead
Pointing Maneuver
Exp. 6
Overhead
Unused Orbital Visibility = 1
Occultation
Overhead
Pointing Maneuver
GS Reacq
Exp. 4
Exp. 5, split 1
Exp. 5, split 2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec