



14132 - The spatial distribution of hot stellar populations in M31's globular clusters

Cycle: 23, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) B127-G185	ACS/SBC	1	15-Sep-2015 21:30:49.0	yes
02	(2) B131-G189	ACS/SBC	1	15-Sep-2015 21:30:50.0	yes
03	(3) B178-G229	ACS/SBC	1	15-Sep-2015 21:30:51.0	yes
04	(4) B179-G230	ACS/SBC	1	15-Sep-2015 21:30:52.0	yes
05	(5) B193-G244	ACS/SBC	1	15-Sep-2015 21:30:53.0	yes
06	(6) B205-G256	ACS/SBC	1	15-Sep-2015 21:30:54.0	yes
07	(7) B206-G257	ACS/SBC	1	15-Sep-2015 21:30:55.0	yes
08	(8) B218-G272	ACS/SBC	1	15-Sep-2015 21:30:56.0	yes

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
09	(9) B224-G279	ACS/SBC	1	15-Sep-2015 21:30:57.0	yes
10	(10) B225-G280	ACS/SBC	1	15-Sep-2015 21:30:58.0	yes
11	(11) B232-G286	ACS/SBC	1	15-Sep-2015 21:30:59.0	yes
12	(12) B472-D064	ACS/SBC	1	15-Sep-2015 21:31:00.0	yes

12 Total Orbits Used

ABSTRACT

We propose to utilize HST's unique combination of spatial resolution and UV sensitivity to accurately determine the far-UV (FUV) properties of M31's globular clusters (GCs) via new ACS/SBC F140LP observations. These observations will enable the study of horizontal branch (HB) stars beyond the Milky Way, providing the vital new data needed to understand these stars and the second parameter problem. In particular, we will determine whether stellar interactions enhance the formation of extreme-HB stars, a question still debated based on the limited data provided by the Galactic GCs. These data will also be sensitive to a signature of multiple stellar populations in these clusters - a centrally concentrated population of FUV bright He-enhanced second generation HB stars. Such a population is predicted and its detection would provide the best evidence to date of multiple populations in GCs beyond the Milky Way and its satellites. Our proposed FUV observations leverage existing HST data from the 'Panchromatic Hubble Andromeda Treasury' (PHAT) survey, which already provides near-UV, optical and near-IR photometry of these clusters. By adding the FUV band to these clusters, we can study their interesting hot stellar populations - enabling significant new science, with modest new HST commitment. The combined dataset will produce the best multiwavelength photometry that is (or is likely to become) available for any globular clusters. As such, it will be of lasting benefit in constraining stellar populations models and enable better understanding of rest-frame FUV spectra of galaxies.

OBSERVING DESCRIPTION

We will target 12 globular clusters in M31. The aim to to obtain spatially resolved FUV photometry of each cluster. Each cluster requires a separate pointing and one orbit is assigned to each target. Each orbit will have the same setup: we will use the ACS/SBC with the F140LP filter and the default ACS/SBC four point dither patten to obtain a total exposure time of 2712s.

There are no orientation constraints and the visit planner shows many possible windows for these observations.

Bright source limit for ACS/SBC:

We have FUV magnitudes of our targets from GALEX observations (see target list). The brightest source has an AB magnitude $FUV = 19.5$. Our targets should be slightly resolved - but, assuming the worst case scenario, that they are point sources, the ETC predicts only 3.5 count/s in the brightest pixel ($\ll 50$ count/s safely limit). ECTC run ID: ACS.im.716506

The BOT identifies warnings for 7 of our pointings, however GALEX observations cover all of these targets and no warnings are present in the GALEX BOT check. We have had to shift target 4 slightly from the proposed location to avoid a bright source in the GALEX images to the NW of the target (the image will still cover the same proposed target).

Proposal 14132 - Visit 01 - The spatial distribution of hot stellar populations in M31's globular clusters

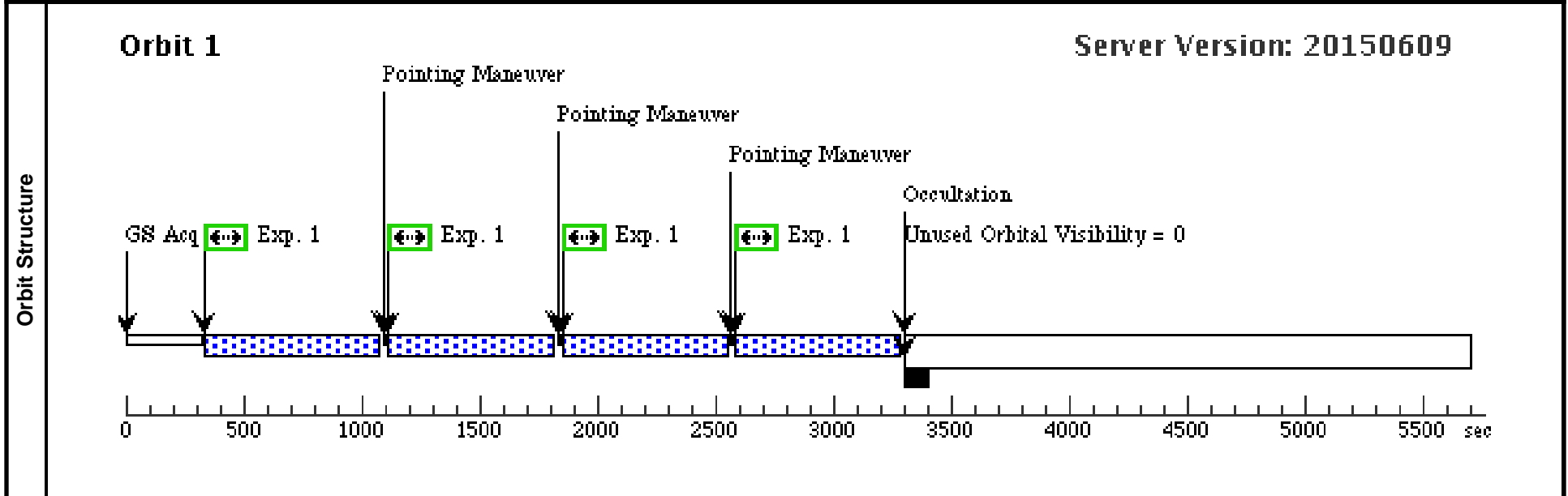
Wed Sep 16 01:31:02 GMT 2015

Visit	Proposal 14132, Visit 01, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	B127-G185	RA: 00 42 44.5200 (10.6855000d) Dec: +41 14 41.50 (41.24486d) Equinox: J2000		V=14.47+/-0.02 FUV = 20.66	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(1) B127-G185	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 01 (1)	678 Secs (2713 Secs)
									[=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>679 Secs (Pattern 4)]	



Proposal 14132 - Visit 02 - The spatial distribution of hot stellar populations in M31's globular clusters

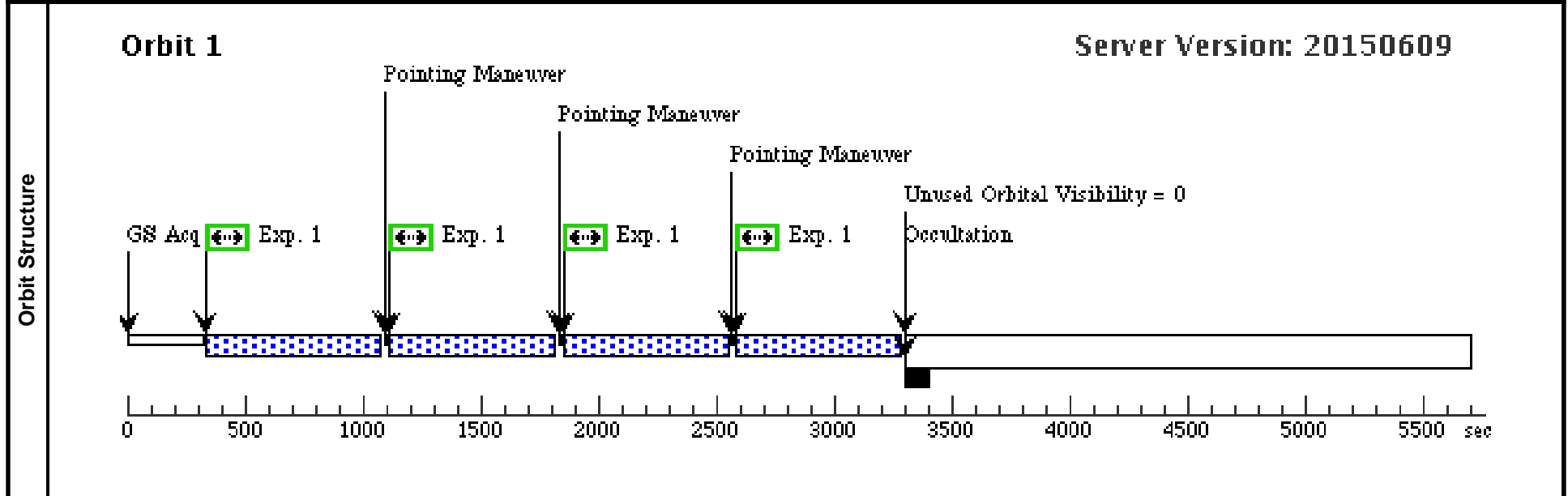
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Visit	Proposal 14132, Visit 02, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	B131-G189	RA: 00 42 50.8008 (10.7116700d) Dec: +41 17 7.51 (41.28542d) Equinox: J2000		V=15.44+/-0.02 FUV = 20.81	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(2) B131-G189	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 02 (1)	678 Secs (2713 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>679 Secs (Pattern 4)]



Proposal 14132 - Visit 03 - The spatial distribution of hot stellar populations in M31's globular clusters

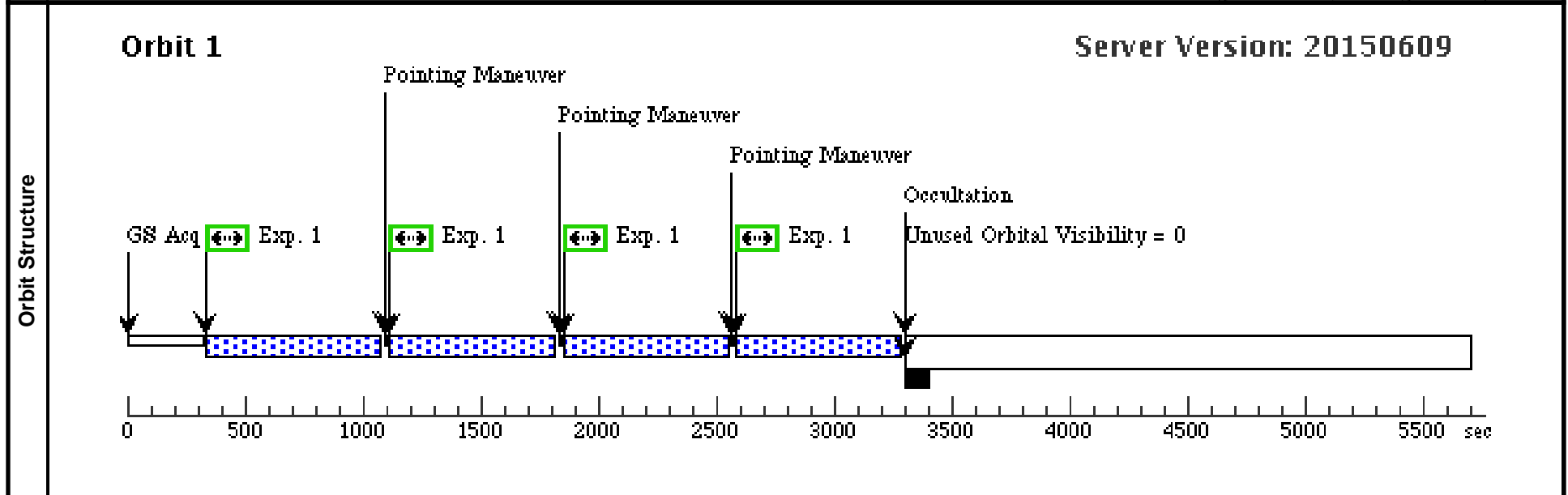
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Visit	Proposal 14132, Visit 03, implementation Diagnostic Status: No Diagnostics Scientific Instruments: ACS/SBC Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(3)	B178-G229	RA: 00 43 30.7800 (10.8782500d) Dec: +41 21 16.52 (41.35459d) Equinox: J2000		V=15.03+/-0.02 FUV = 19.48	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(3) B178-G229	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 03 (1)	678 Secs (2713 Secs)
									[=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>679 Secs (Pattern 4)]	



Proposal 14132 - Visit 04 - The spatial distribution of hot stellar populations in M31's globular clusters

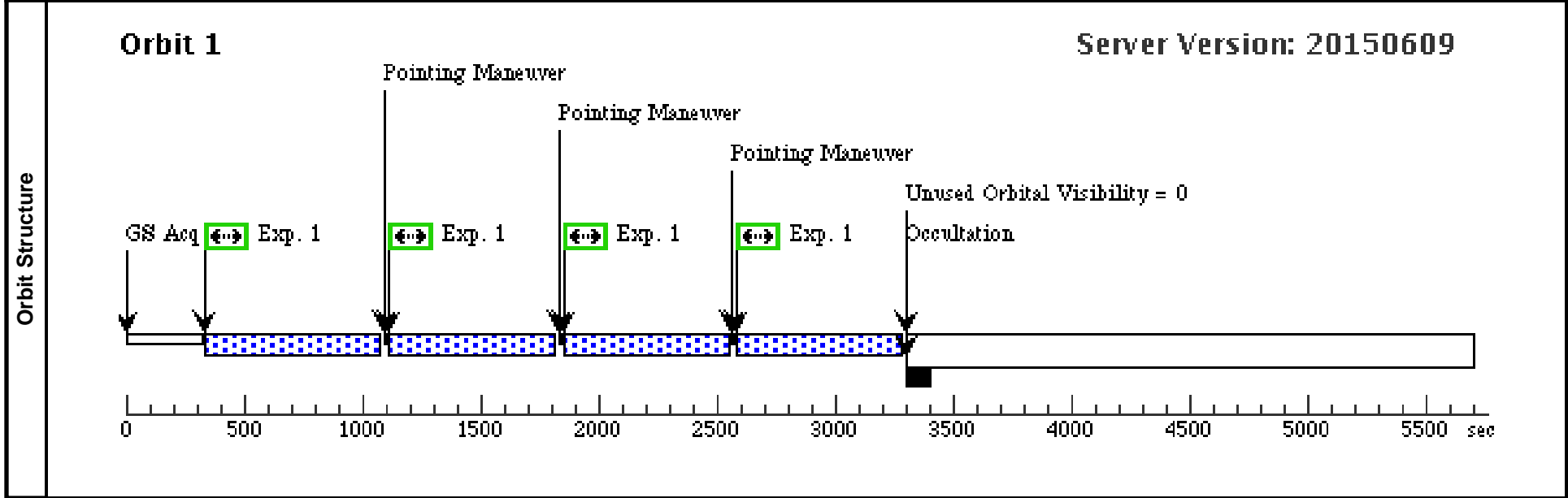
Wed Sep 16 01:31:02 GMT 2015

Visit	Proposal 14132, Visit 04, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(4)	B179-G230	RA: 00 43 31.3000 (10.8804167d) Dec: +41 18 9.00 (41.30250d) Equinox: J2000		V=15.39+/-0.02 FUV = 21.67	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(4) B179-G230	ACS/SBC, ACCUM, SBC-FIX	F140LP				Pattern 1, Exps 1-1 in Visit 04 (1)	678 Secs (2713 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>679 Secs (Pattern 4)]



Proposal 14132 - Visit 05 - The spatial distribution of hot stellar populations in M31's globular clusters

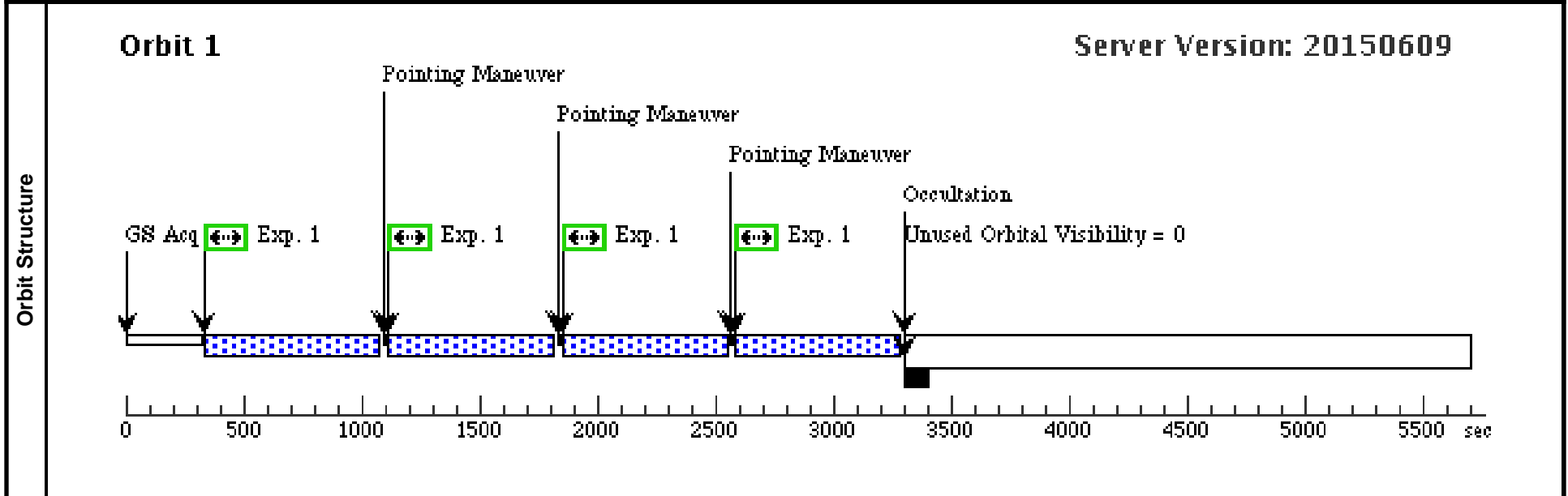
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Visit	Proposal 14132, Visit 05, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(5)	B193-G244	RA: 00 43 45.5088 (10.9396200d) Dec: +41 36 57.64 (41.61601d) Equinox: J2000		V=15.33+/-0.02 FUV = 21.96	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(5) B193-G244	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 05 (1)	678 Secs (2713 Secs)
									[=>(Pattern 1)]	
									[=>(Pattern 2)]	
									[=>(Pattern 3)]	
									[=>679 Secs (Pattern 4)]	



Proposal 14132 - Visit 06 - The spatial distribution of hot stellar populations in M31's globular clusters

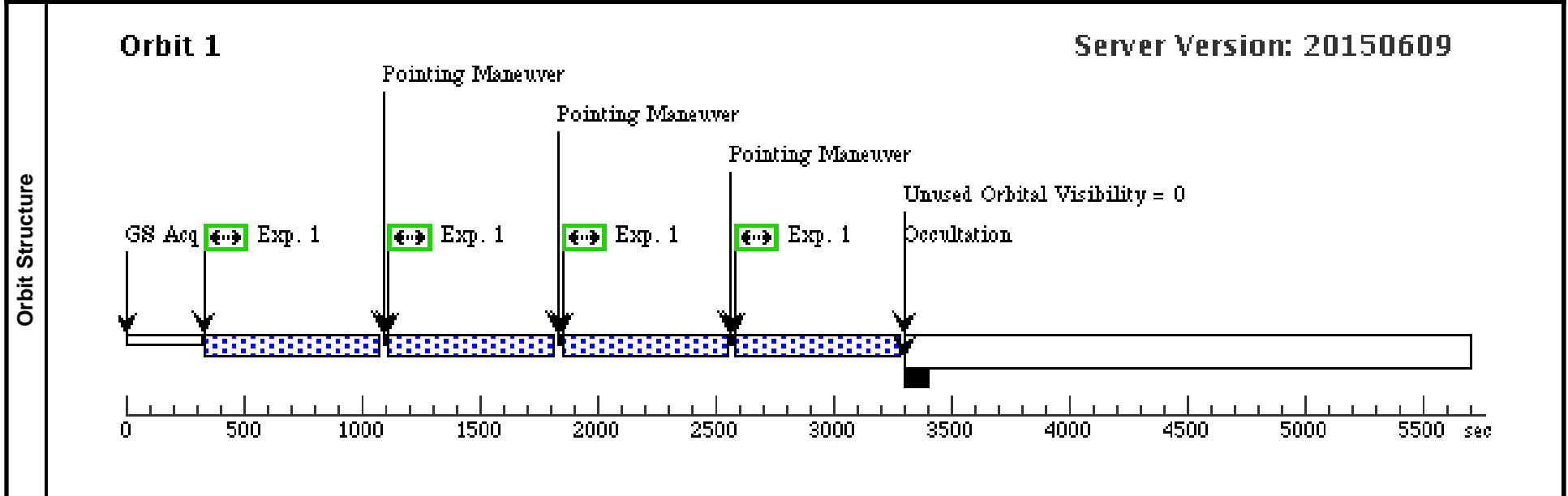
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Visit	Proposal 14132, Visit 06, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(6)	B205-G256	RA: 00 43 58.1736 (10.9923900d) Dec: +41 24 38.34 (41.41065d) Equinox: J2000		V=15.46+/-0.02 FUV = 22.0	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(6) B205-G256	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 06 (1)	678 Secs (2713 Secs)
									[=>(Pattern 1)]	
									[=>(Pattern 2)]	
									[=>(Pattern 3)]	
									[=>679 Secs (Pattern 4)]	



Proposal 14132 - Visit 07 - The spatial distribution of hot stellar populations in M31's globular clusters

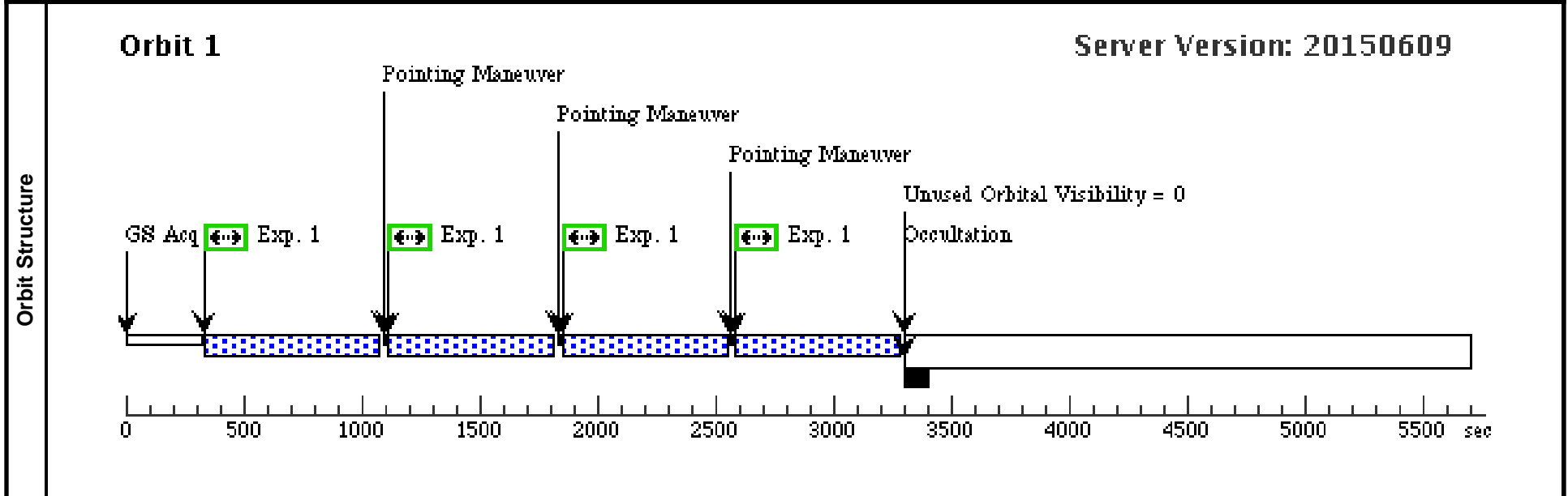
Wed Sep 16 01:31:03 GMT 2015

Visit	Proposal 14132, Visit 07, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(7)	B206-G257	RA: 00 43 58.6176 (10.9942400d) Dec: +41 30 18.07 (41.50502d) Equinox: J2000		V=15.06+/-0.02 FUV = 20.43	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(7) B206-G257	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 07 (1)	678 Secs (2713 Secs)
									[=>(Pattern 1)]	
									[=>(Pattern 2)]	
									[=>(Pattern 3)]	
									[=>679 Secs (Pattern 4)]	



Proposal 14132 - Visit 08 - The spatial distribution of hot stellar populations in M31's globular clusters

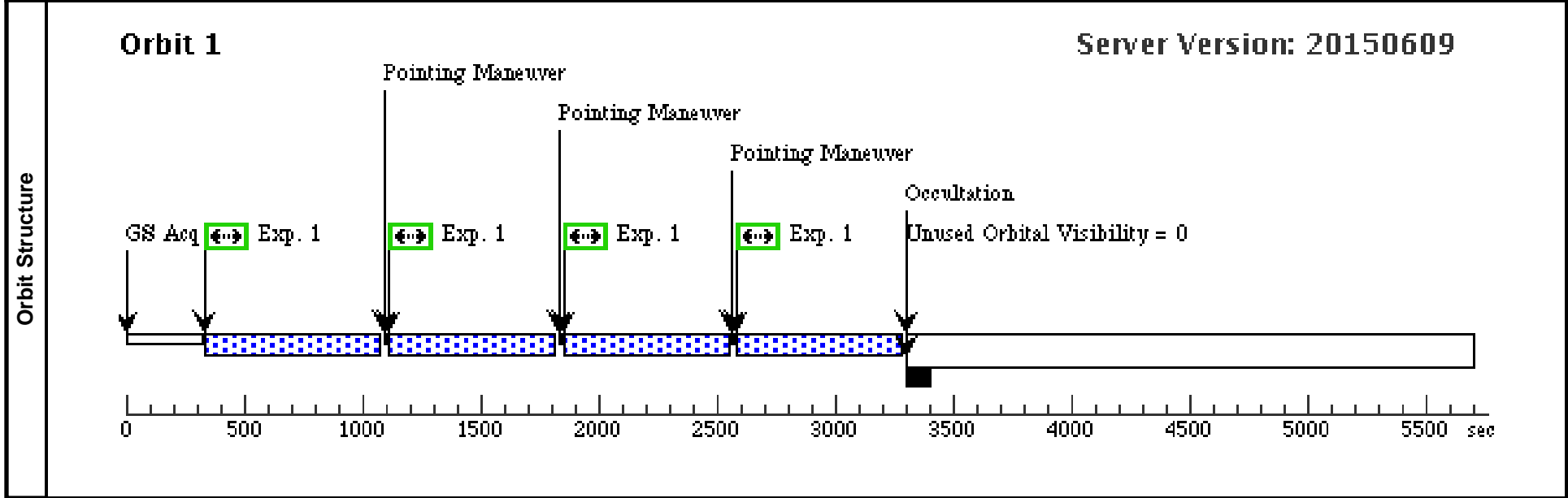
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Visit	Proposal 14132, Visit 08, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(8)	B218-G272	RA: 00 44 14.3232 (11.0596800d) Dec: +41 19 19.42 (41.32206d) Equinox: J2000		V=14.79+/-0.02 FUV = 19.74	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(8) B218-G272	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 08 (1)	678 Secs (2713 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>679 Secs (Pattern 4)]



Proposal 14132 - Visit 09 - The spatial distribution of hot stellar populations in M31's globular clusters

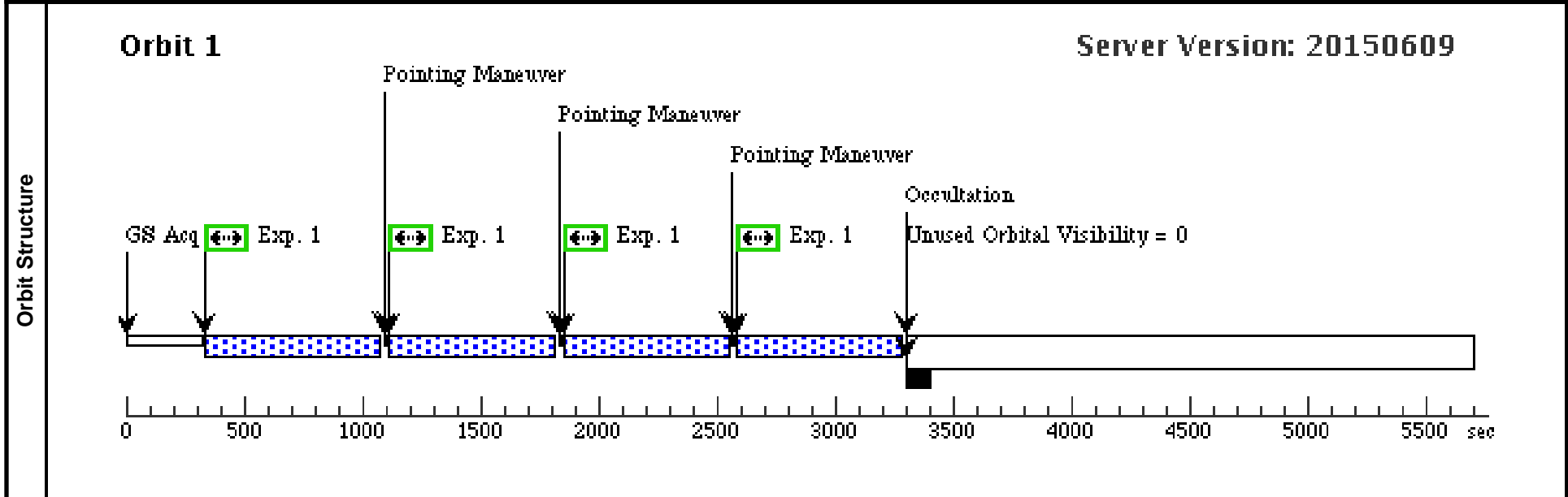
Wed Sep 16 01:31:03 GMT 2015

Visit	Proposal 14132, Visit 09, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(9)	B224-G279	RA: 00 44 27.0864 (11.1128600d) Dec: +41 28 49.76 (41.48049d) Equinox: J2000		V=15.45+/-0.02 FUV = 20.78	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(9) B224-G279	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 09 (1)	678 Secs (2713 Secs)



Proposal 14132 - Visit 10 - The spatial distribution of hot stellar populations in M31's globular clusters

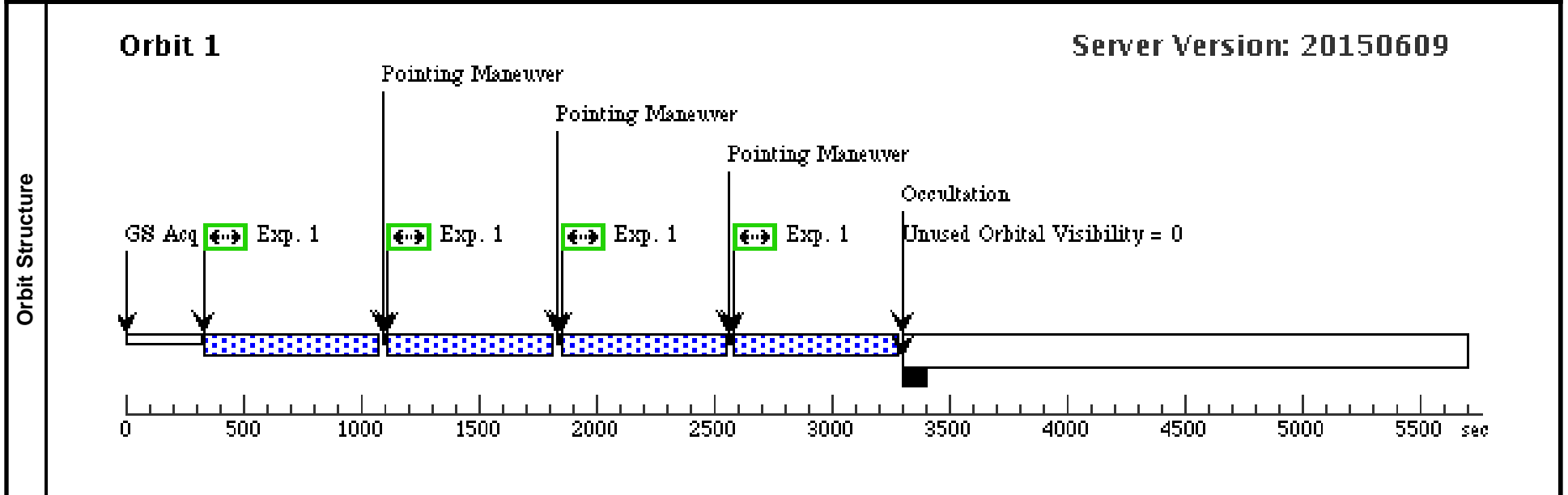
Wed Sep 16 01:31:03 GMT 2015

Visit	Proposal 14132, Visit 10, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(10)	B225-G280	RA: 00 44 29.5584 (11.1231600d) Dec: +41 21 35.75 (41.35993d) Equinox: J2000		V=15.16+/-0.02 FUV = 20.17	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(10) B225-G280	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 10 (1)	678 Secs (2713 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>679 Secs (Pattern 4)]



Proposal 14132 - Visit 11 - The spatial distribution of hot stellar populations in M31's globular clusters

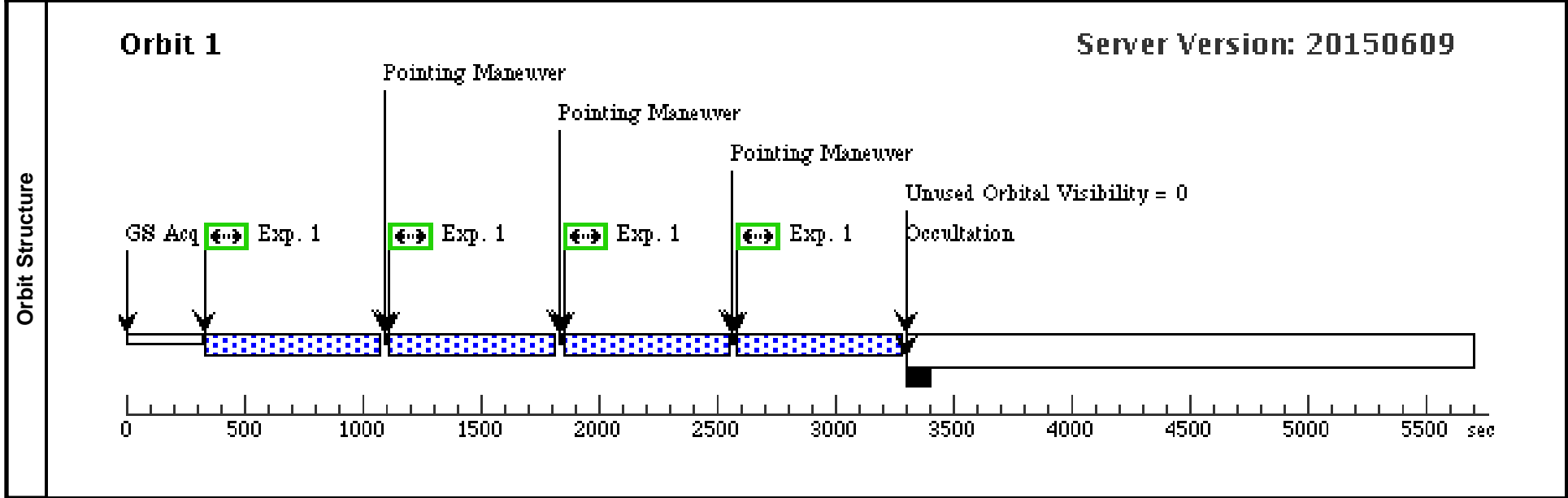
Wed Sep 16 01:31:03 GMT 2015

Visit	Proposal 14132, Visit 11, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(11)	B232-G286	RA: 00 44 40.2288 (11.1676200d) Dec: +41 15 0.43 (41.25012d) Equinox: J2000		V=16.39+/-0.02 FUV = 20.67	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(11) B232-G286	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 11 (1)	678 Secs (2713 Secs)



Proposal 14132 - Visit 12 - The spatial distribution of hot stellar populations in M31's globular clusters

Wed Sep 16 01:31:03 GMT 2015

Visit	Proposal 14132, Visit 12, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/SBC		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=ACS-SBC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.179 Line Spacing=0.116	Coordinate Frame=POS-TARG Pattern Orientation=20.02 Angle Between Sides=63.65 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(12)	B472-D064	RA: 00 43 48.4152 (10.9517300d) Dec: +41 26 53.12 (41.44809d) Equinox: J2000		V=15.97+/-0.02 FUV = 19.94	Reference Frame: ICRS

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(ACS.im.71 6506)	(12) B472-D064	ACS/SBC, ACCUM, SBC	F140LP				Pattern 1, Exps 1-1 in Visit 12 (1)	678 Secs (2713 Secs)

