



17145 - Clearing a Window Into Galaxy Formation: The Impact of Globular Cluster Metallicity Distributions

Cycle: 30, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. William Edgar Harris (PI) (CSA Member) (Contact)	McMaster University
Kate Hartman (CoI) (CSA Member)	McMaster University

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) NGC-4874-WFC3	WFC3/UVIS	2	19-Feb-2024 15:00:57.0	yes
51	(1) NGC-4874-WFC3	WFC3/UVIS	1	19-Feb-2024 15:00:58.0	yes
06	(2) NGC-4874-ACS	ACS/WFC	2	19-Feb-2024 15:00:58.0	yes
07	(2) NGC-4874-ACS	ACS/WFC	2	19-Feb-2024 15:00:59.0	yes
08	(2) NGC-4874-ACS	ACS/WFC	2	19-Feb-2024 15:01:00.0	yes
05	(2) NGC-4874-ACS	ACS/WFC	1	19-Feb-2024 15:01:00.0	yes

10 Total Orbits Used

ABSTRACT

The MAST archive holds a rich legacy of imaging data for globular cluster (GC) systems in external galaxies that represents an investment of hundreds of HST orbits. But its full impact to make GCs key tracers of galaxy formation has yet to be realized. To achieve that, their true metallicity distribution functions (MDFs) must be established on an internally consistent base. Such MDF parameters as the mean metallicity, and the relative

Proposal 17145 (STScI Edit Number: 0, Created: Monday, February 19, 2024 at 3:01:01 PM Eastern Standard Time) - Overview

numbers of `blue' (metal-poor) and `red' (metal-rich) GCs are key predictions from current galaxy and GC formation theories that help decode the history of accretions versus in-situ formation.

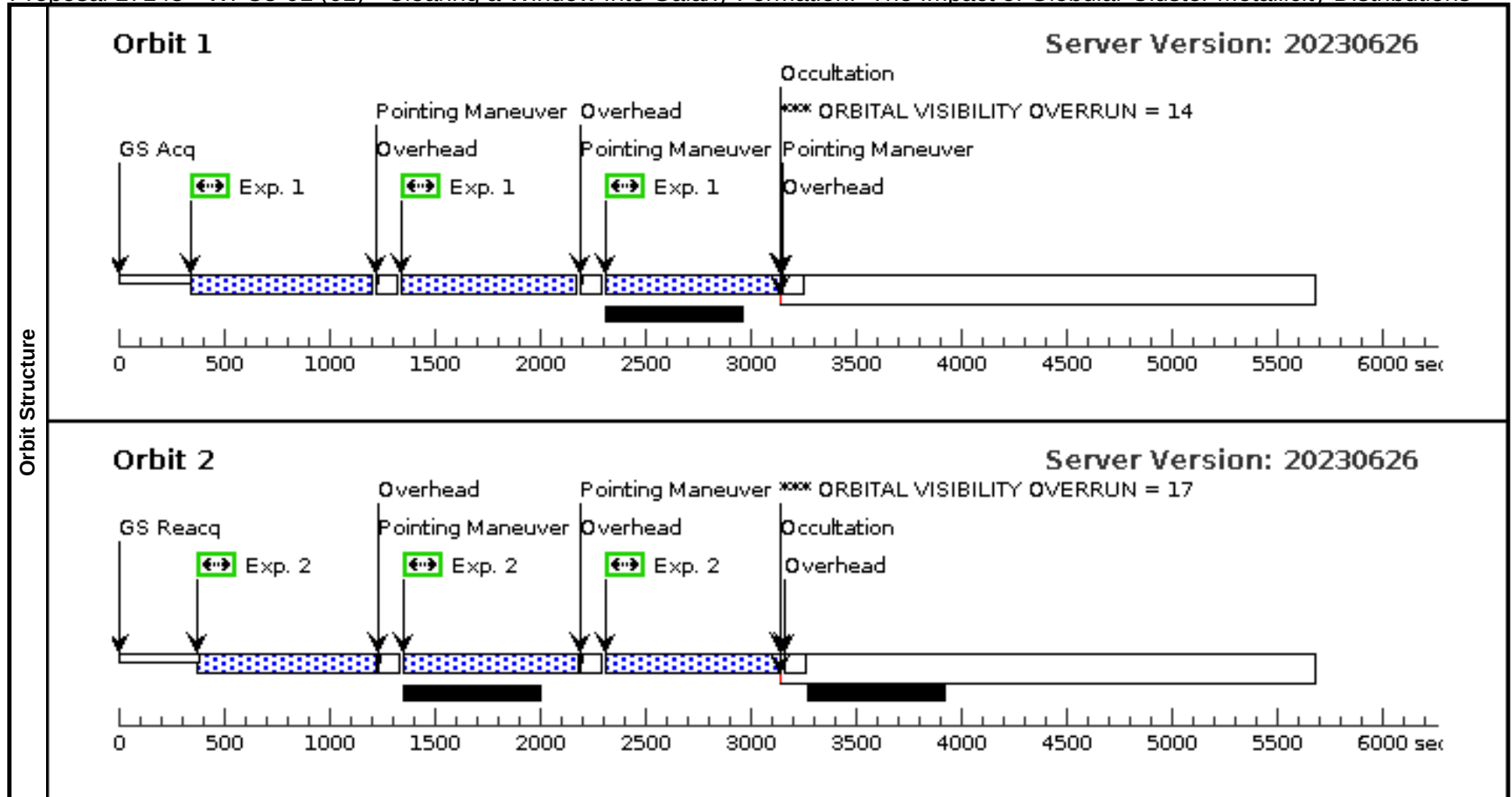
The observational barrier is that direct spectroscopic metallicities for GCs are hard to obtain in large numbers and are beyond reach for very distant galaxies. In most cases we have to work instead with the GC color distribution function (CDF), the photometric proxy for the MDF. But the many optical/NIR color indices that have been used to generate CDFs are all nonlinear functions of metallicity and give biased, misleading impressions of the true MDFs. We propose an efficient program of multifilter imaging of the Coma BCG NGC 4874, the richest GC system in the local universe, to measure all the commonly used GC color indices in a single system. Direct empirical transformations will be derived for every color into the fiducial index (g-z), which is the only one with a well established conversion into [Fe/H] based directly on spectroscopic metallicities. This program will take a major step towards defining the true MDFs for GC systems in almost 200 galaxies, and a new level of comparison with theory.

OBSERVING DESCRIPTION

ACS/WFC and WFC/UVIS are used to image the region around NGC 4874, the central giant galaxy in the Coma cluster. The goal is to complete photometry of the globular cluster population in NGC 4874 in six different filters and thus to generate accurate, empirical transformations between color indices. These will be used as a basis for producing self-consistent metallicity distribution functions for globular clusters in a large number of galaxies.

Proposal 17145 - WFC3-01 (01) - Clearing a Window Into Galaxy Formation: The Impact of Globular Cluster Metallicity Distributions

Visit	Proposal 17145, WFC3-01 (01), failed										Mon Feb 19 20:01:01 GMT 2024		
	Diagnostic Status: Warning												
	Scientific Instruments: WFC3/UVIS												
	Special Requirements: (none)												
Diagnostics	(WFC3-01 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN												
	(WFC3-01 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN												
Patterns	#	Primary Pattern					Secondary Pattern					Exposures	
	(2)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.145 Line Spacing=					Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false					(1), (2)	
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Fluxes		Miscellaneous		
	(1)	NGC-4874-WFC3	RA: 12 59 37.2936 (194.9053900d) Dec: +27 58 25.99 (27.97389d) Equinox: J2000			Epoch of Position: 2015.5			V=11.4		Reference Frame: SIMBAD		
	Comments: Matches field selected by Cho et al. 2016, ApJ 822, 95.												
	Category=GALAXY Description=[BCM, ELLIPTICAL, HALO]												
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1		(1) NGC-4874-WFC3	WFC3/UVIS, ACCUM, UVIS		F438W	FLASH=14		Pattern 2, Exps 1-1 in WFC3-01 (01) (2)	835 Secs (2505 Secs)			
										[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]		[1]	
	2		(1) NGC-4874-WFC3	WFC3/UVIS, ACCUM, UVIS		F475X			Pattern 2, Exps 2-2 in WFC3-01 (01) (2)	835 Secs (2505 Secs)			
										[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]		[2]	



Proposal 17145 - WFC3-01-repeat (51) - Clearing a Window Into Galaxy Formation: The Impact of Globular Cluster Metallicity Distrib...

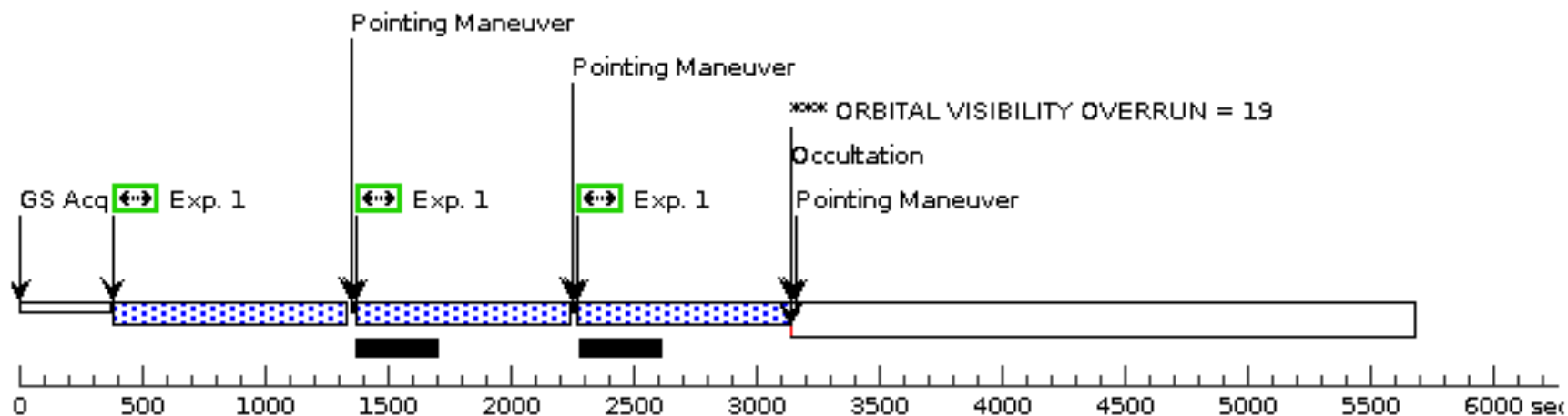
Visit	Proposal 17145, WFC3-01-repeat (51)										Mon Feb 19 20:01:01 GMT 2024												
	Diagnostic Status: No Diagnostics																						
	Scientific Instruments: WFC3/UVIS																						
	Special Requirements: (none)																						
Patterns	#	Primary Pattern										Secondary Pattern										Exposures	
	(2)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.145 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false																				(1)	
Fixed Targets	#	Name		Target Coordinates				Targ. Coord. Corrections				Fluxes				Miscellaneous							
	(1)	NGC-4874-WFC3		RA: 12 59 37.2936 (194.9053900d) Dec: +27 58 25.99 (27.97389d) Equinox: J2000				Epoch of Position: 2015.5				V=11.4				Reference Frame: SIMBAD							
	Comments: Matches field selected by Cho et al. 2016, ApJ 822, 95.																						
	Category=GALAXY Description=[BCM, ELLIPTICAL, HALO]																						
Exposures	#	Label	Target	Config,Mode,Aperture			Spectral Els.		Opt. Params.		Special Reqs.		Groups		Exp. Time (Total)/[Actual Dur.]				Orbit				
	1		(1) NGC-4874-WFC3	WFC3/UVIS, ACCUM, UVIS			F475X						Pattern 2, Exps 1-1 in WFC3-01-repeat (51) (2)		835 Secs (2496 Secs)								
			3													[==>832.0 Secs (Pattern 1)] [==>832.0 Secs (Pattern 2)] [==>832.0 Secs (Pattern 3)]				[1]			
Orbit Structure	Orbit 1 Server Version: 20230626 Timeline labels: GS Acq, Exp. 1, Overhead, Pointing Maneuver, Exp. 1, Overhead, Pointing Maneuver, Exp. 1, Overhead, Occultation, Unused Orbital Visibility = 1.																						

Proposal 17145 - ACS-F435W (06) - Clearing a Window Into Galaxy Formation: The Impact of Globular Cluster Metallicity Distributions

Visit	Proposal 17145, ACS-F435W (06), scheduling										Mon Feb 19 20:01:01 GMT 2024			
	Diagnostic Status: Warning													
	Scientific Instruments: ACS/WFC													
	Special Requirements: (none)													
Diagnostics	(ACS-F435W (06)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN													
	(ACS-F435W (06)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN													
Patterns	#	Primary Pattern						Secondary Pattern				Exposures		
	(3)	Pattern Type=SPIRAL		Coordinate Frame=POS-TARG						(1)				
		Purpose=DITHER		Pattern Orientation=47.0										
		Number Of Points=6		Angle Between Sides=										
		Point Spacing=0.33		Center Pattern=false										
		Line Spacing=												
Fixed Targets	#	Name		Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous				
	(2)	NGC-4874-ACS		RA: 12 59 36.1118 (194.9004658d)				V=11.4		Reference Frame: SIMBAD				
				Dec: +27 57 41.11 (27.96142d)										
				Equinox: J2000										
	Comments: Matches previous ACS exposures of NGC 4874													
	Category=GALAXY													
	Description=[BCM, ELLIPTICAL, HALO]													
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit		
	1		(2) NGC-4874-ACS	ACS/WFC, ACCUM, WFCENTER		F435W			Pattern 3, Exps 1-1 in ACS-F435W (06) (3)	745 Secs (4563 Secs)				
										[==>748.0 Secs (Pattern 1)]		[1]		
										[==>748.0 Secs (Pattern 2)]				
										[==>748.0 Secs (Pattern 3)]				
										[==>773.0 Secs (Pattern 4)]		[2]		
									[==>773.0 Secs (Pattern 5)]					
									[==>773.0 Secs (Pattern 6)]					

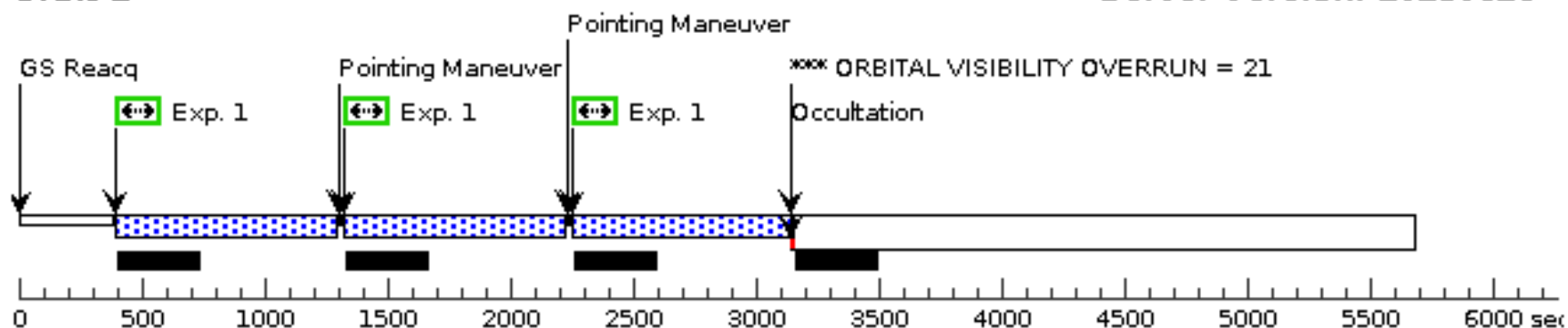
Orbit 1

Server Version: 20230626



Orbit 2

Server Version: 20230626

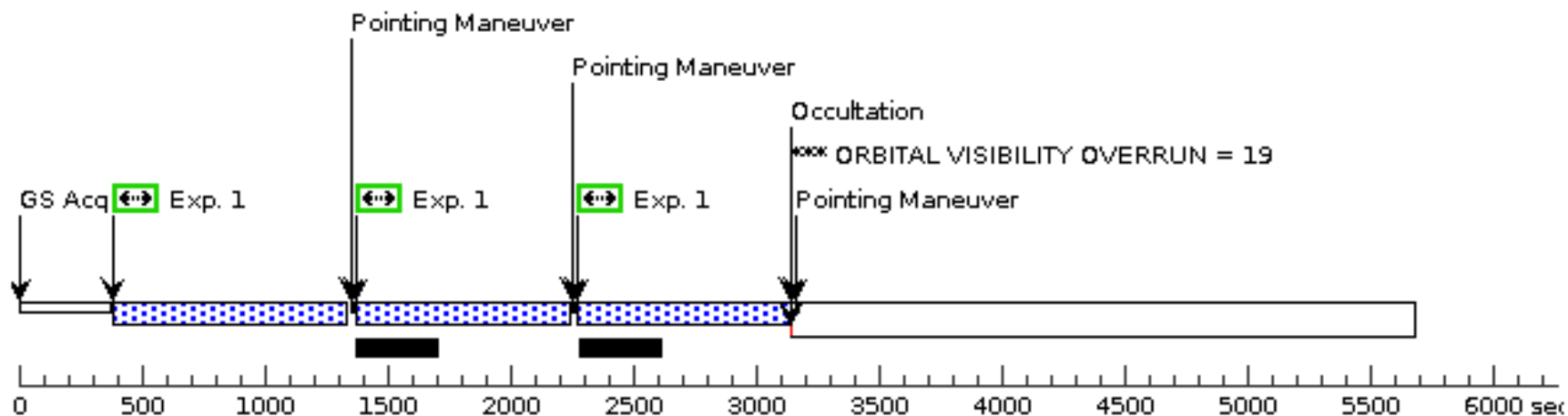


Proposal 17145 - ACS-F555W (07) - Clearing a Window Into Galaxy Formation: The Impact of Globular Cluster Metallicity Distributions

Visit	Proposal 17145, ACS-F555W (07), completed										Mon Feb 19 20:01:01 GMT 2024		
	Diagnostic Status: Warning												
	Scientific Instruments: ACS/WFC												
	Special Requirements: (none)												
Diagnostics	(ACS-F555W (07)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN												
	(ACS-F555W (07)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN												
Patterns	#	Primary Pattern					Secondary Pattern					Exposures	
	(3)	Pattern Type=SPIRAL Purpose=DITHER Number Of Points=6 Point Spacing=0.33 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=47.0 Angle Between Sides= Center Pattern=false										(1)	
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Fluxes		Miscellaneous		
	(2)	NGC-4874-ACS	RA: 12 59 36.1118 (194.9004658d) Dec: +27 57 41.11 (27.96142d) Equinox: J2000						V=11.4		Reference Frame: SIMBAD		
	Comments: Matches previous ACS exposures of NGC 4874												
	Category=GALAXY												
Exposures	Description=[BCM, ELLIPTICAL, HALO]												
	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1		(2) NGC-4874-ACS	ACS/WFC, ACCUM, WFCENTER		F555W			Pattern 3, Exps 1-1 i n ACS-F555W (07) (3)	745 Secs (4563 Secs)			
										[==>748.0 Secs (Pattern 1)] [==>748.0 Secs (Pattern 2)] [==>748.0 Secs (Pattern 3)]		[1]	
										[==>773.0 Secs (Pattern 4)] [==>773.0 Secs (Pattern 5)] [==>773.0 Secs (Pattern 6)]		[2]	

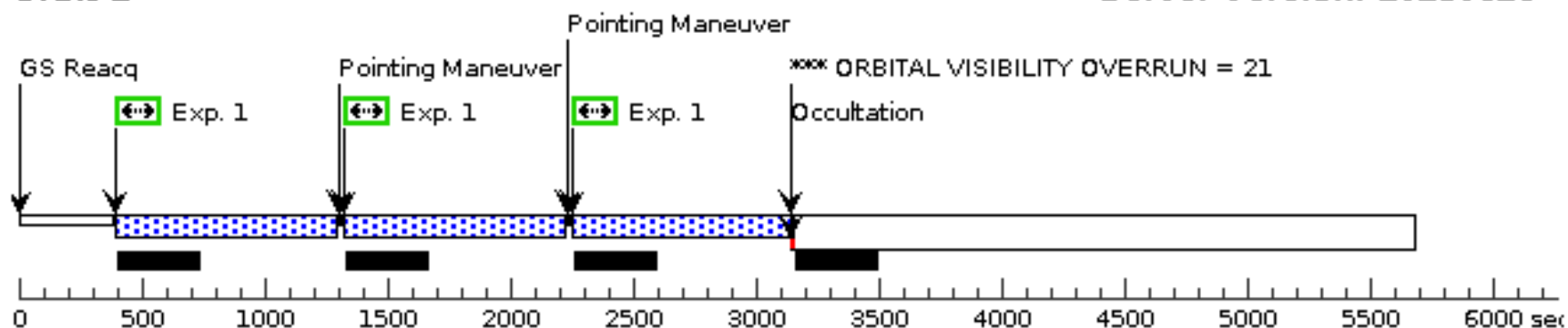
Orbit 1

Server Version: 20230626



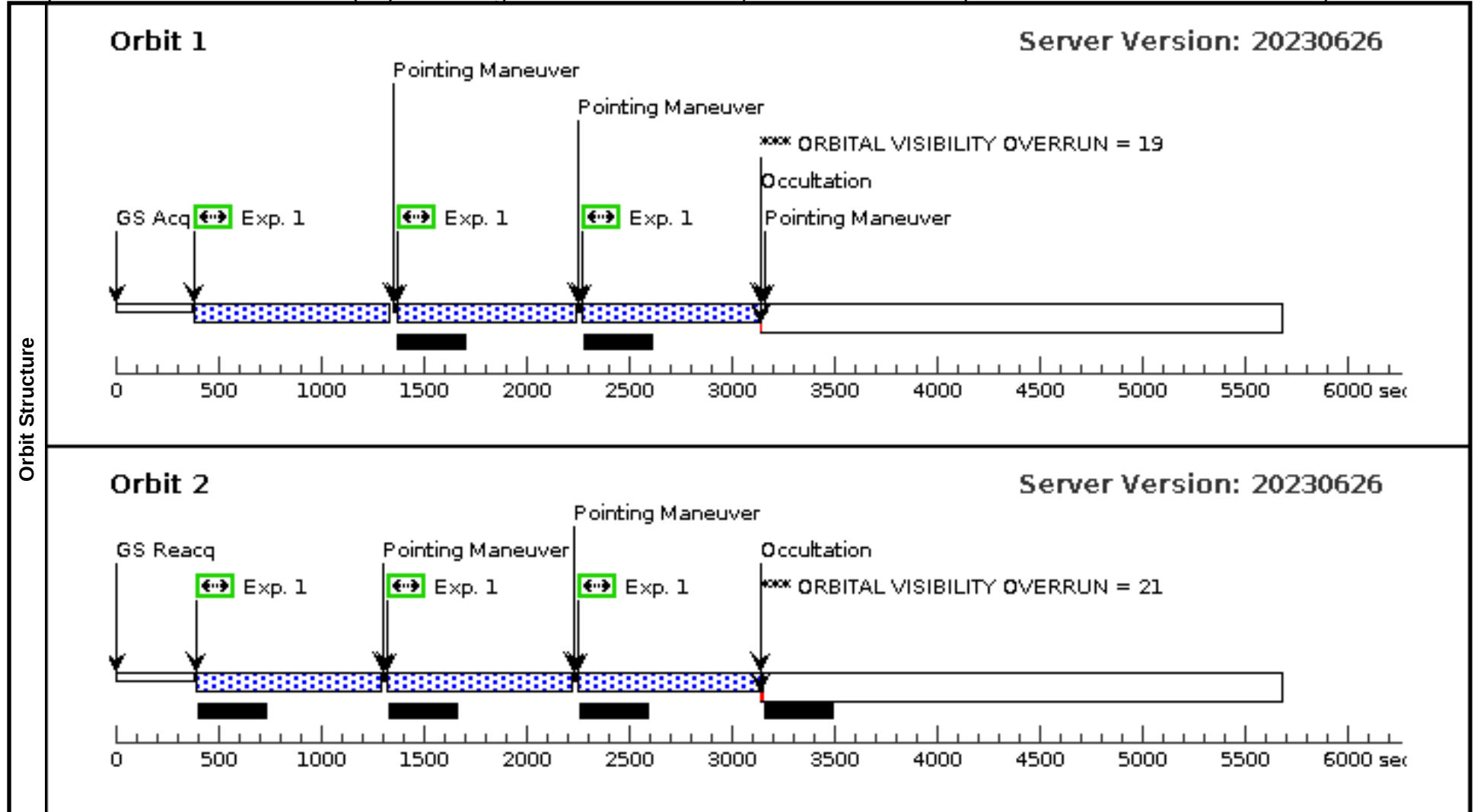
Orbit 2

Server Version: 20230626



Proposal 17145 - ACS-F850LP (08) - Clearing a Window Into Galaxy Formation: The Impact of Globular Cluster Metallicity Distributions

Visit	Proposal 17145, ACS-F850LP (08), scheduling										Mon Feb 19 20:01:01 GMT 2024	
	Diagnostic Status: Warning											
	Scientific Instruments: ACS/WFC											
	Special Requirements: (none)											
Diagnostics	(ACS-F850LP (08)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN											
	(ACS-F850LP (08)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN											
Patterns	#	Primary Pattern					Secondary Pattern				Exposures	
	(3)	Pattern Type=SPIRAL		Coordinate Frame=POS-TARG							(1)	
		Purpose=DITHER		Pattern Orientation=47.0								
		Number Of Points=6		Angle Between Sides=								
		Point Spacing=0.33		Center Pattern=false								
		Line Spacing=										
Fixed Targets	#	Name		Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(2)	NGC-4874-ACS		RA: 12 59 36.1118 (194.9004658d)				V=11.4		Reference Frame: SIMBAD		
				Dec: +27 57 41.11 (27.96142d)								
				Equinox: J2000								
	Comments: Matches previous ACS exposures of NGC 4874											
	Category=GALAXY											
	Description=[BCM, ELLIPTICAL, HALO]											
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1		(2) NGC-4874-ACS	ACS/WFC, ACCUM, WFCENTER		F850LP			Pattern 3, Exps 1-1 in ACS-F850LP (08) (3)	745 Secs (4563 Secs)		
										[==>748.0 Secs (Pattern 1)]		
										[==>748.0 Secs (Pattern 2)]		
										[==>748.0 Secs (Pattern 3)]		[1]
										[==>773.0 Secs (Pattern 4)]		
									[==>773.0 Secs (Pattern 5)]			
									[==>773.0 Secs (Pattern 6)]		[2]	



Proposal 17145 - ACS-F606W (05) - Clearing a Window Into Galaxy Formation: The Impact of Globular Cluster Metallicity Distributions

Visit	Proposal 17145, ACS-F606W (05), completed										Mon Feb 19 20:01:01 GMT 2024												
	Diagnostic Status: Warning																						
	Scientific Instruments: ACS/WFC																						
	Special Requirements: (none)																						
Diagnostics	(ACS-F606W (05)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN																						
Patterns	#	Primary Pattern										Secondary Pattern										Exposures	
	(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.17 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false																				(1)	
Fixed Targets	#	Name		Target Coordinates				Targ. Coord. Corrections				Fluxes				Miscellaneous							
	(2)	NGC-4874-ACS		RA: 12 59 36.1118 (194.9004658d) Dec: +27 57 41.11 (27.96142d) Equinox: J2000 Comments: Matches previous ACS exposures of NGC 4874 Category=GALAXY Description=[BCM, ELLIPTICAL, HALO]								V=11.4				Reference Frame: SIMBAD							
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.		Opt. Params.		Special Reqs.		Groups		Exp. Time (Total)/[Actual Dur.]						Orbit			
	1		(2) NGC-4874-ACS	ACS/WFC, ACCUM, WFCENTER		F606W						Pattern 1, Exps 1-1 in ACS-F606W (05) (1)		745 Secs (2235 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]						[1]			
Orbit Structure	Orbit 1 Server Version: 20230626 GS Acq Exp. 1 Pointing Maneuver Exp. 1 Pointing Maneuver Exp. 1 Occultation ORBITAL VISIBILITY OVERRUN = 10 <																						