



12908 - What Causes Extended Main Sequence Turn-offs in Intermediate-Age Star Clusters?

Cycle: 20, Proposal Category: GO
(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) NGC-2209 ANY	ACS/WFC WFC3/UVIS	1	29-Jun-2012 21:57:25.0	yes
02	(2) NGC-2249 ANY	ACS/WFC WFC3/UVIS	1	29-Jun-2012 21:57:38.0	yes
03	(3) NGC-152 ANY	ACS/WFC WFC3/UVIS	1	29-Jun-2012 21:57:49.0	yes

3 Total Orbits Used

ABSTRACT

Recently, deep images from the ACS camera aboard HST provided conclusive evidence that several massive intermediate-age star clusters in the Magellanic Clouds present extended main-sequence turn-off regions (eMSTOs), and in some cases also dual red clumps. These observations challenge the notion that star clusters are simple stellar populations, and pose serious questions regarding the mechanisms responsible for star cluster formation. We propose to collect HST imaging that should lead to an understanding of the nature of the eMSTO phenomenon. We will perform deep WFC3 imaging in F438W and F814W for 3 Magellanic Cloud star clusters whose ages and dynamical properties (mass, radius) will allow a critical study of the physical conditions that cause the eMSTO phenomenon. The data will allow us to derive detailed star formation histories via CMD reconstruction methods. The underlying field population will be characterized by means of ACS images of nearby areas obtained in parallel. Without high-quality HST imaging data for these three pivotal clusters, the discussion regarding the onset of multiple stellar populations in star clusters may persist for years.

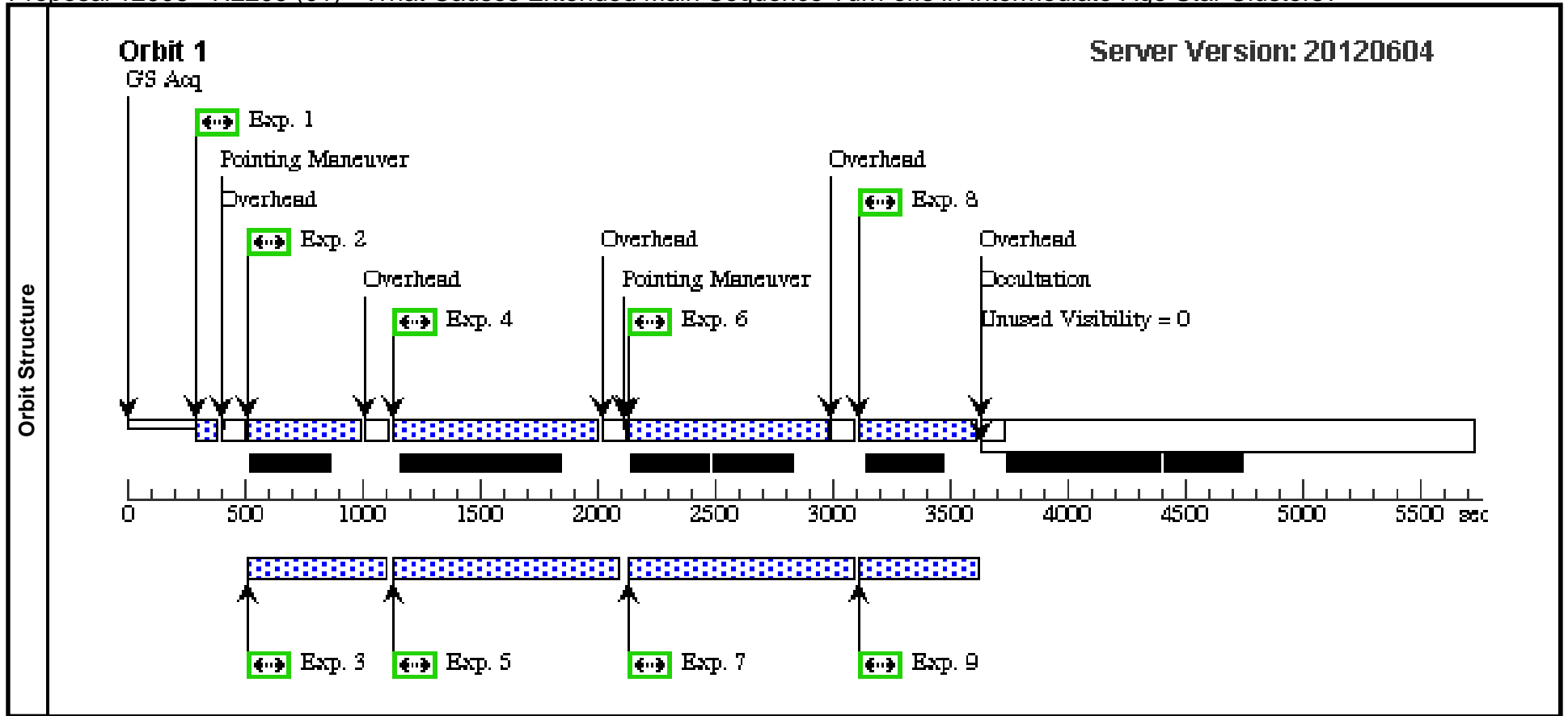
OBSERVING DESCRIPTION

The target star clusters are observed with WFC3 using the F438W and F814W filters. Since the shape and position of the red giant branch (RGB) in the color-magnitude diagram (CMD) is used to determine metallicities, we include exposures in each filter that do not saturate the bright giants. On the other hand, we need color uncertainties less than 0.05 mag down to well beyond the estimated magnitude of the main sequence turnoff to achieve an accurate age determination and to enable a robust identification of multiple turnoff structures if the target cluster in question has multiple stellar populations. Hence, at least one short exposure is used in each filter to avoid saturation of the giants and red clump stars, while at least two longer exposures are used to achieve deep photometry. At least two dither positions are used for each target star cluster to allow a robust elimination of hot pixels and cosmic ray hits during the analysis. ACS is used in parallel to the primary WFC3 exposures, using the filters F435W and F814W. This will allow a robust determination of the field population contribution to the star cluster pointings.

Proposal 12908 - N2209 (01) - What Causes Extended Main Sequence Turn-offs in Intermediate-Age Star Clusters?

Sat Jun 30 01:57:56 GMT 2012

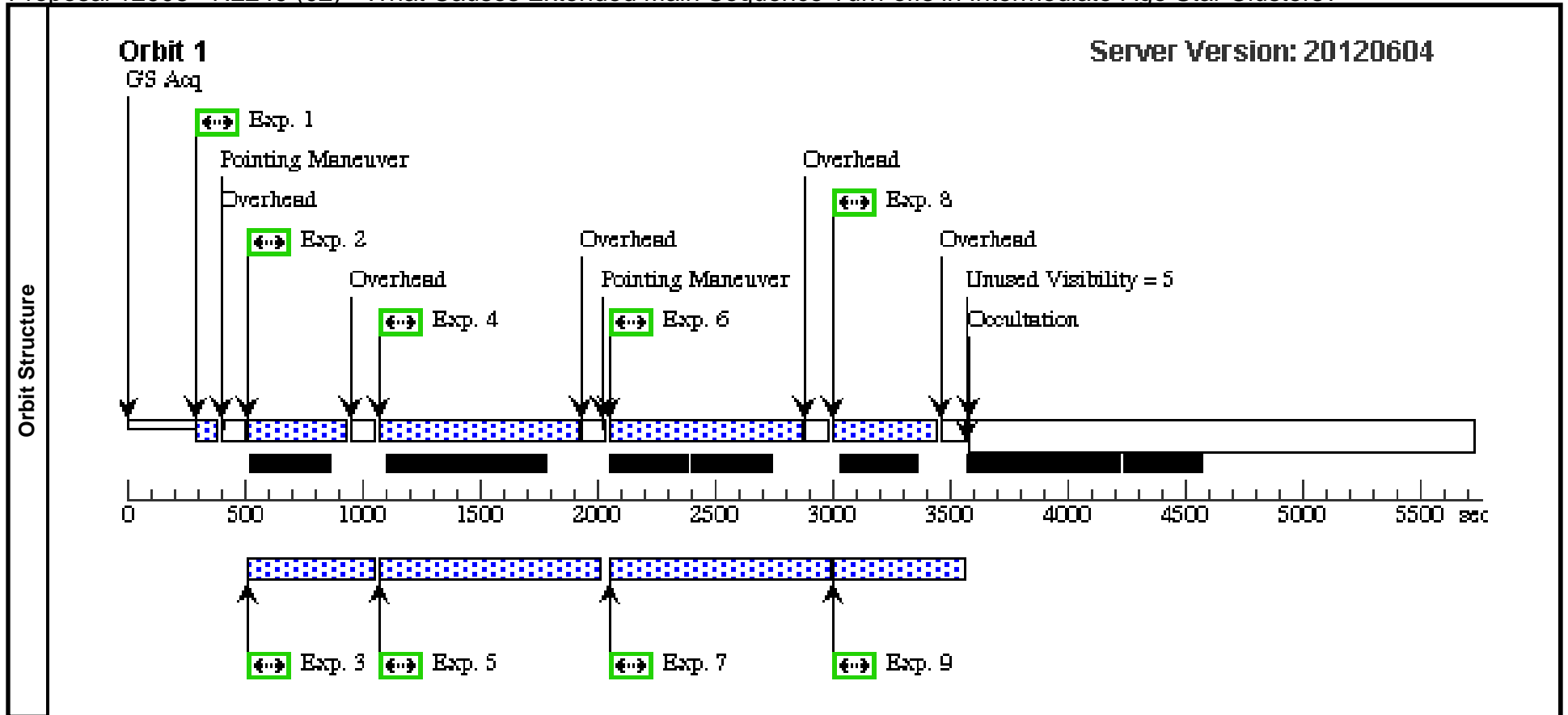
Visit	Proposal 12908, N2209 (01) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS, ACS/WFC Special Requirements: SCHED 30%; ORIENT 0.0D TO 28.8 D; ORIENT 59D TO 167 D; ORIENT 219D TO 250 D; ORIENT 272D TO 359.9 D Comments: Applies to NGC 2209. Visit orientation constraints to avoid bright stars close to the edges of the ACS FOV.									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	NGC-2209	RA: 06 08 35.9000 (92.1495833d) Dec: -73 50 18.00 (-73.83833d) Equinox: J2000		V=13.1+/-0.1	Reference Frame: ICRS	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	(1) NGC-2209	WFC3/UVIS, ACCUM, UVIS1	F814W	CR-SPLIT=NO	POS TARG -0.1,-0.1		60 Secs [==>]	[1]	
	2	(1) NGC-2209	WFC3/UVIS, ACCUM, UVIS1	F814W	CR-SPLIT=NO		Prime + Parallel Group 2-3 in N2209 (01)	485 Secs [==>]	[1]	
	3	ANY	ACS/WFC, ACCUM, WFC	F814W			Prime + Parallel Group 2-3 in N2209 (01)	450 Secs [==>383.0 Secs]	[1]	
	4	(1) NGC-2209	WFC3/UVIS, ACCUM, UVIS1	F438W	CR-SPLIT=NO		Prime + Parallel Group 4-5 in N2209 (01)	850 Secs [==>]	[1]	
	5	ANY	ACS/WFC, ACCUM, WFC	F435W			Prime + Parallel Group 4-5 in N2209 (01)	500 Secs [==>820.0 Secs]	[1]	
	6	(1) NGC-2209	WFC3/UVIS, ACCUM, UVIS1	F438W	CR-SPLIT=NO	POS TARG 0.18,2.4 14	Prime + Parallel Group 6-7 in N2209 (01)	850 Secs [==>]	[1]	
	7	ANY	ACS/WFC, ACCUM, WFC	F435W			Prime + Parallel Group 6-7 in N2209 (01)	500 Secs [==>840.0 Secs]	[1]	
	8	(1) NGC-2209	WFC3/UVIS, ACCUM, UVIS1	F814W	CR-SPLIT=NO	SAME POS AS 6	Prime + Parallel Group 8-9 in N2209 (01)	485 Secs [==>]	[1]	
	9	ANY	ACS/WFC, ACCUM, WFC	F814W			Prime + Parallel Group 8-9 in N2209 (01)	480 Secs [==>361.0 Secs]	[1]	



Proposal 12908 - N2249 (02) - What Causes Extended Main Sequence Turn-offs in Intermediate-Age Star Clusters?

Sat Jun 30 01:57:59 GMT 2012

Visit	Proposal 12908, N2249 (02) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS, ACS/WFC Special Requirements: SCHED 30%; ORIENT 0.0D TO 35 D; ORIENT 49D TO 57 D; ORIENT 76D TO 114 D; ORIENT 120D TO 171 D; ORIENT 183D TO 198.5 D; ORIENT 220D TO 246 D; ORIENT 253D TO 274 D; ORIENT 292.5D TO 359.9 D <i>Comments: Applies to NGC 2249. Visit orientation constraints to avoid bright stars close to the edges of the ACS FOV.</i>									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
(2)		NGC-2249	RA: 06 25 49.4440 (96.4560167d) Dec: -68 55 13.10 (-68.92031d) Equinox: J2000		V=12.23+/-0.15	Reference Frame: ICRS				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	(2) NGC-2249	WFC3/UVIS, ACCUM, UVIS1	F814W	CR-SPLIT=NO	POS TARG -0.1,-0.1		60 Secs [==>]	[1]	
	2	(2) NGC-2249	WFC3/UVIS, ACCUM, UVIS1	F814W	CR-SPLIT=NO		Prime + Parallel Group 2-3 in N2249 (02)	425 Secs [==>]	[1]	
	3	ANY	ACS/WFC, ACCUM, WFC	F814W			Prime + Parallel Group 2-3 in N2249 (02)	450 Secs [==>333.0 Secs]	[1]	
	4	(2) NGC-2249	WFC3/UVIS, ACCUM, UVIS1	F438W	CR-SPLIT=NO		Prime + Parallel Group 4-5 in N2249 (02)	825 Secs [==>]	[1]	
	5	ANY	ACS/WFC, ACCUM, WFC	F435W			Prime + Parallel Group 4-5 in N2249 (02)	500 Secs [==>795.0 Secs]	[1]	
	6	(2) NGC-2249	WFC3/UVIS, ACCUM, UVIS1	F438W	CR-SPLIT=NO	POS TARG 0.18,2.4 14	Prime + Parallel Group 6-7 in N2249 (02)	825 Secs [==>]	[1]	
	7	ANY	ACS/WFC, ACCUM, WFC	F435W			Prime + Parallel Group 6-7 in N2249 (02)	500 Secs [==>815.0 Secs]	[1]	
	8	(2) NGC-2249	WFC3/UVIS, ACCUM, UVIS1	F814W	CR-SPLIT=NO	SAME POS AS 6	Prime + Parallel Group 8-9 in N2249 (02)	425 Secs [==>]	[1]	
	9	ANY	ACS/WFC, ACCUM, WFC	F814W			Prime + Parallel Group 8-9 in N2249 (02)	480 Secs [==>413.0 Secs]	[1]	



Proposal 12908 - N152 (03) - What Causes Extended Main Sequence Turn-offs in Intermediate-Age Star Clusters?

Sat Jun 30 01:58:00 GMT 2012

Visit	Proposal 12908, N152 (03) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS, ACS/WFC Special Requirements: SCHED 100%; ORIENT 0.0D TO 20 D; ORIENT 27D TO 235 D; ORIENT 241D TO 250 D; ORIENT 257D TO 336 D; ORIENT 341D TO 359.9 D Comments: Applies to NGC 152. Visit orientation constraints to avoid bright stars close to the edges of the ACS FOV.									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(3)	NGC-152	RA: 00 32 54.9220 (8.2288417d) Dec: -73 07 2.10 (-73.11725d) Equinox: J2000		V=12.33+/-0.05	Reference Frame: ICRS				
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(3) NGC-152	WFC3/UVIS, ACCUM, UVIS1	F814W	CR-SPLIT=NO		Prime + Parallel Group 1-2 in N152 (03)	200 Secs [==>]	[1]
	2		ANY	ACS/WFC, ACCUM, WFC	F814W			Prime + Parallel Group 1-2 in N152 (03)	300 Secs [==>136.0 Secs]	[1]
	3		(3) NGC-152	WFC3/UVIS, ACCUM, UVIS1	F438W	CR-SPLIT=NO		Prime + Parallel Group 3-4 in N152 (03)	750 Secs [==>]	[1]
	4		ANY	ACS/WFC, ACCUM, WFC	F435W			Prime + Parallel Group 3-4 in N152 (03)	500 Secs [==>720.0 Secs]	[1]
	5		(3) NGC-152	WFC3/UVIS, ACCUM, UVIS1	F438W	CR-SPLIT=NO	POS TARG 0.18,2.4 14	Prime + Parallel Group 5-6 in N152 (03)	750 Secs [==>]	[1]
	6		ANY	ACS/WFC, ACCUM, WFC	F435W			Prime + Parallel Group 5-6 in N152 (03)	500 Secs [==>740.0 Secs]	[1]
	7		(3) NGC-152	WFC3/UVIS, ACCUM, UVIS1	F814W	CR-SPLIT=NO	SAME POS AS 5	Prime + Parallel Group 7-8 in N152 (03)	500 Secs [==>]	[1]
	8		ANY	ACS/WFC, ACCUM, WFC	F814W			Prime + Parallel Group 7-8 in N152 (03)	480 Secs [==>438.0 Secs]	[1]

