14124 - Pushing to Sub-Gyr Globular Cluster Ages: the IR CMD of NGC 6397

Cycle: 23, Proposal Category: GO

(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	(1) NGC-6397	WFC3/IR	1	25-Jul-2015 21:16:26.0	yes

1 Total Orbits Used

ABSTRACT

Globular Clusters (GCs) in the Milky Way are the primary laboratories for establishing the ages of the oldest stellar populations and for measuring the color-magnitude relation of stars. The gold standard for these studies has involved high-precision visible light investigations with the Hubble Space Telescope. However, the shape of the color-magnitude relation in the visible bandpasses offers little leverage to disentangle the effects of distance, reddening, and metallicity, and these uncertainties impact our derived age measurements for GCs. Recently, a new feature has been observed in several HST WFC3-IR CMDs of nearby GCs. At low stellar masses, the stellar main sequence in an infrared (IR) CMD exhibits a sharp "kink" (due to opacity effects in M dwarfs), such that lower mass and cooler dwarfs become bluer in the F110W - F160W color baseline and not redder. This inversion of the color-magnitude relation offers a new opportunity to fit GC properties in the IR baseline, and to reduce their uncertainties. Here, we propose a 1 orbit HST WFC3-IR program to obtain the first IR color-magnitude relation of stars for a truly metal-poor GC,

NGC 6397. We will establish the most accurate age for the cluster to date, with sub-Gyr precision. Combining this observation with our analysis of publicly available data of 4 other more metal-rich GCs from MAST will establish an independent and sensitive test to the age-metallicity relation of clusters.

OBSERVING DESCRIPTION

The target globular cluster NGC6397 is observed with WFC3 using the F110W and F160W broad-band filters. In the target cluster, we expect the absolute magnitude of the kink to occur at M_F110W ~ 6.2 mag and M_F160W ~ 5.5 mag which translates to an apparent magnitude of F110W ~ 18 mag at the distance of the cluster. To accurately map the shape of the main sequence and the color-magnitude relation below the kink we need high signal-to-noise photmetry ~ 4 magnitudes below this limit. To resample the PSF, mitigate hot pixels, and minimize errors from flat fielding we apply a 4 point dither pattern. To ensure that the confusion limit does not truncate the photometric depth reached in the cluster we point at ~ 1.3 arcmin from the cluster center (i.e.: the cluster core is just outside the fov) .

Visit

Proposal 14124, Visit 01, implementation Sun Jul 26 01:16:27 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)

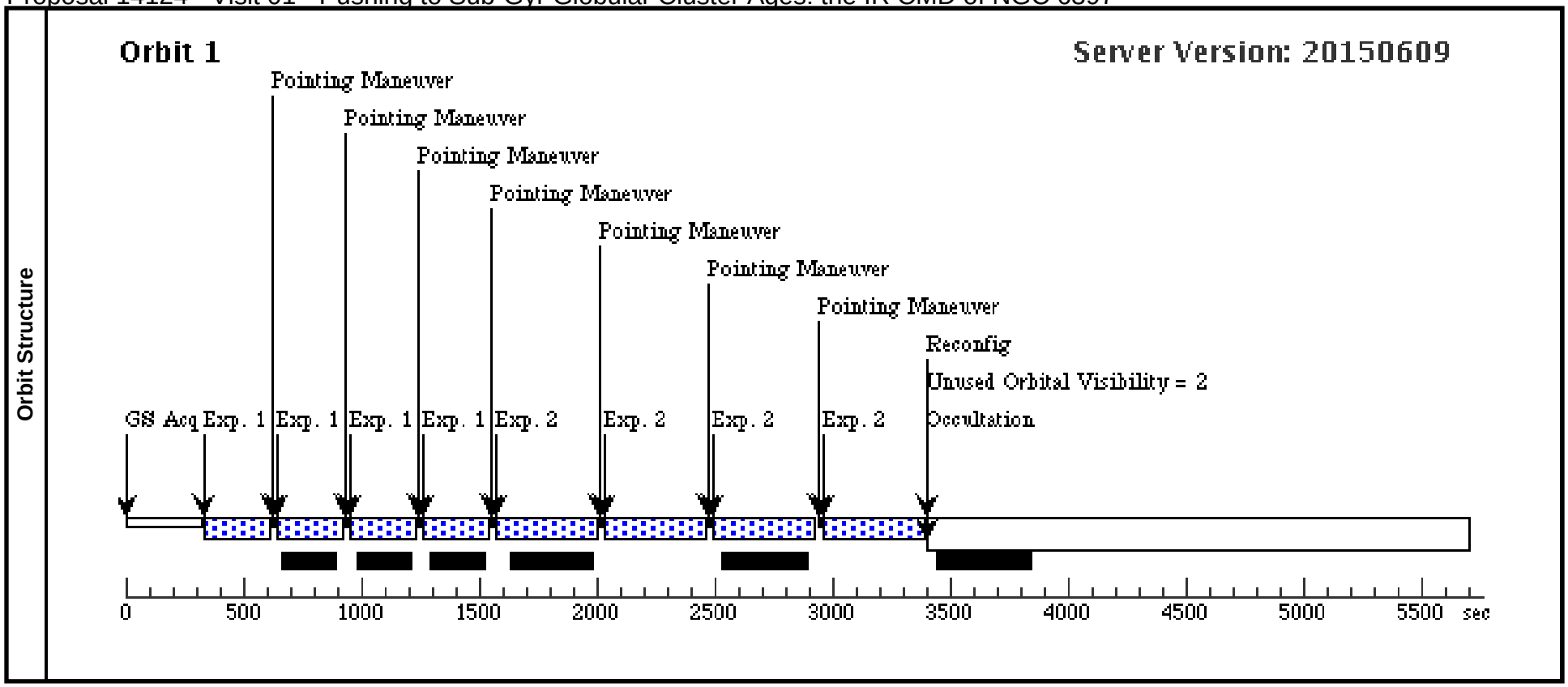
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-6397	RA: 17 40 46.4600 (265.1935833d) Dec: -53 39 21.00 (-53.65583d) Equinox: J2000		V=5.17	Reference Frame: SIMBAD

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 (Total)/[Actual Dur.]	Orbit
1		(1) NGC-6397	WFC3/IR, MULTIACCUM, IR-FIX	F110W	NSAMP=10; SAMP-SEQ=STEP50		Pattern 1, Exps 1-1 in Visit 01 (1)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2		(1) NGC-6397	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=10; SAMP-SEQ=STEP100		Pattern 1, Exps 2-2 in Visit 01 (1)	399.231646 Secs (1596.927 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20150609
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Unused Orbital Visibility = 2
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Exp. 2
Exp. 2
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec