15945 - A two orbits proposal to solve the age spread dilemma in young Magellanic Clouds clusters

Cycle: 27, 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-1818 ANY	ACS/WFC WFC3/UVIS	2	23-Jul-2019 13:00:15.0	yes

2 Total Orbits Used

ABSTRACT

This is a two-orbits proposal to explore pre-main sequence (pre-MS) stars in Large Magellanic Cloud young clusters to assess, once and for all, if multiple bursts of star formation can be supported by these systems. The discovery that nearly all star clusters younger than 2Gyr in both Magellanic Clouds exhibit double/extended main-sequence turn offs (eMSTOs) has been one of the major advances made by HST in stellar astrophysics. Despite

a huge effort has been undertaken to understand these observations, the mechanism responsible for the eMSTO is still controversial.
It has been suggested that the eMSTO is due to coeval stellar populations with different rotation, but it seems that rotation alone is not able to reproduce the eMSTOs. On the other hand, the eMSTO could be due to a spread in age, so that these clusters would be the younger counterparts of old globular clusters with multiple populations.
We propose a novel approach to disentangle between age and rotation by using the Turn-On (TOn), where the pre-MS reaches the main sequence in the color-magnitude diagram (CMD). The most remarkable feature introduced by different ages on this region of the CMD would be the appearance of multiple or broaden TOn peaks in the luminosity function. Specifically a single narrow peak is expected in the case of a single generation, whereas multiple/broaden TOn peaks would imply multiple stellar generations.
The proposed observations will allow us, to understand, whether the age spread contributes to eMSTO in young clusters or not, and will be surely seminal for future investigation of the still-eluding multiple stellar populations phenomenon.

OBSERVING DESCRIPTION

We plan deep photometry to reach a S/N of about 50, at a magnitude of 24.0 in the F814W band and study the luminosity function (LF).
Since deep observations are needed to well sample the LF and the CMD at the faintest magnitudes, we need filters that provide a high S/N in a limited exposure time, and the F606W and F814W filters fulfill exactly these requirements. According to the WFC3 Exposure Time Calculator (ETC), to reach a S/N sim 50, needed for our goal, at a magnitude of 24.0 in the F814W band we need an exposure time of at least 3000 seconds. On the other hand, the F606W requires a shorter exposure time to reach the same S/N. To achieve the desired S/N we, therefore, need a total of two orbits. We plan to observe NGC 1818 for 2268 seconds (724s+772s+772s) and 2400 seconds (795s+795s+810s) in the F606W and F814W respectively. All exposures will be optimally dithered to ensure the best possible photometric accuracy. We request therefore a total of only two orbits.
Parallel fields will be taken through the WFC/ACS F606W for a total of 1820 seconds (560s+630s+630s) and F814W, for 1990 seconds (650s+690s+650s). They will serve the purpose of field decontamination, allowing us to subtract non-cluster members in our cluster field. Specifically, the statistical subtraction technique exploits the comparison of the color-magnitude diagram in the cluster field with that of a reference field. Data reduction Photometry and astrometry will be derived with the software developed by Jay Anderson for ACS/WFC and WFC3/UVIS cameras.

Reduced Gyro Mode (RGM) operations

According to the report "Science Implications of Operating HST Reduced Gyro Mode" of May 6th, the largest science imparts of operating in RGM

is the reduction in the number of orbits per week (from ~84/week to ~73/week), and a longer search time for the "Target acquisition", with a consequent reduction of the science observing time during visibility periods by ~ 120 seconds.

Given these premises, operating in RGM will have a non-negligible impact on our observations, nonetheless, they will provide the required accuracy to reach our scientific goal.

Visit

Proposal 15945, NGC1818 (01), implementation Tue Jul 23 17:00:16 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: SCHED 100%

Comments: NGC-1818

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-1818	RA: 05 04 18.3900 (76.0766250d) Dec: -66 25 46.70 (-66.42964d) Equinox: J2000	Epoch of Position: 2015.5	V=9.7	Reference Frame: SIMBAD

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=EXT-CLUSTER
Description=[GLOBULAR CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W		POS TARG 0,0	Prime + Parallel Group 1-2 in NGC1818 (01)	795 Secs (795 Secs) *[==>]*	 ***[1]***
2		ANY	ACS/WFC, ACCUM, WFCENTER	F814W			Prime + Parallel Group 1-2 in NGC1818 (01)	650 Secs (650 Secs) *[==>]*	 ***[1]***
3		(1) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W		POS TARG 3,3	Prime + Parallel Group 3-4 in NGC1818 (01)	795 Secs (795 Secs) *[==>]*	 ***[1]***
4		ANY	ACS/WFC, ACCUM, WFCENTER	F814W			Prime + Parallel Group 3-4 in NGC1818 (01)	690 Secs (690 Secs) *[==>]*	 ***[1]***
5		(1) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W		POS TARG 0,0	Prime + Parallel Group 5-6 in NGC1818 (01)	724 Secs (724 Secs) *[==>]*	 ***[1]***
6		ANY	ACS/WFC, ACCUM, WFCENTER	F606W			Prime + Parallel Group 5-6 in NGC1818 (01)	560 Secs (560 Secs) *[==>]*	 ***[1]***
7		(1) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W		POS TARG -3,-3	Prime + Parallel Group 7-8 in NGC1818 (01)	810 Secs (810 Secs) *[==>]*	 ***[2]***
8		ANY	ACS/WFC, ACCUM, WFCENTER	F814W			Prime + Parallel Group 7-8 in NGC1818 (01)	650 Secs (650 Secs) *[==>]*	 ***[2]***
9		(1) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W		POS TARG 3,3	Prime + Parallel Group 9-10 in NGC1818 (01)	772 Secs (772 Secs) *[==>]*	 ***[2]***
10		ANY	ACS/WFC, ACCUM, WFCENTER	F606W			Prime + Parallel Group 9-10 in NGC1818 (01)	630 Secs (630 Secs) *[==>]*	 ***[2]***
11		(1) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W		POS TARG -3,-3	Prime + Parallel Group 11-12 in NGC1818 (01)	772 Secs (772 Secs) *[==>]*	 ***[2]***
12		ANY	ACS/WFC, ACCUM, WFCENTER	F606W			Prime + Parallel Group 11-12 in NGC1818 (01)	630 Secs (630 Secs) *[==>]*	 ***[2]***

Orbit Structure