



17149 - Characterizing the unusual star cluster population in a candidate dark matter free galaxy

Cycle: 30, 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) FCC224	WFC3/UVIS	2	13-Oct-2022 12:02:43.0	yes

2 Total Orbits Used

ABSTRACT

We propose to characterize the star cluster population of the Fornax cluster low-surface brightness dwarf galaxy FCC 224. Current data suggest that the clusters are over-luminous relative to a standard globular cluster luminosity function (GCLF) -- missing the bulk of the expected clusters at faint magnitudes. This top-heavy LF has been seen previously in two old, dark matter free galaxies, NGC 1052-DF2 and -DF4, and is understood to be closely connected to the formation of these galaxies without dark matter. FCC 224 may therefore be only the third known example of this puzzling class of galaxies, and the first in a different environment from the NGC 1052 group. We will test definitively the resemblance of this galaxy's cluster population to those of DF2/DF4, where the clusters also have unusually large sizes and are further accompanied by a smaller population of "normal" clusters with a GCLF peak at the standard luminosity. Confirming these peculiarities in FCC 224 would complement deeper spectroscopic follow-up to test for the presence of dark matter, would potentially pave the way for using GCLF photometry to efficiently identify more dark-matter-free galaxy candidates, and would provide additional leverage on understanding star cluster formation in general.

OBSERVING DESCRIPTION

This program studies the low-surface-brightness dwarf galaxy FCC 224 in the Fornax cluster with two-band imaging (WFC3UVIS F475X, F814W). The primary goals relate to its system of star clusters: their luminosities, colors, sizes, and radial density profile. The diffuse starlight will also be studied (density profile, color, surface brightness fluctuations as a distance metric).

The goal of the star cluster photometry is $S/N \sim 20$ for magnitude and size measurements down to F475X ~ 26.5 and F814W ~ 25.2 (corresponding to ~ 1.5 mags fainter than the standard GCLF peak). For the brightest clusters (F555W $\sim 22.5-24$), an additional goal is to be able to measure a color spread at the ~ 0.01 mag level, requiring $S/N \sim 100$ or better, with well-controlled flat-fielding.

Exposures in each field consist of one orbit per filter, using a four-point dither pattern with unrestricted orient ranges.

The galaxy is placed on the UVIS1 chip with POS TARG offsets to prevent Dragon's Breath from stars close to the FOV, given an anticipated March 2023 observing window.

A change in the observing window may require a different offset.

The offset into the A quadrant also minimizes potential problems from droplets, although these are not expected to impact differential photometry.

FLASH is included to allow for low sky backgrounds in the ~ 600 sec exposures.

Proposal 17149 - FCC 224 single visit (01) - Characterizing the unusual star cluster population in a candidate dark matter free galaxy

Thu Oct 13 16:02:44 GMT 2022

Visit	Proposal 17149, FCC 224 single visit (01), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(4)	Pattern Type=WFC3-UVIS-MOS-DITH-LINE Purpose=DITHER Number Of Points=2 Point Spacing=2.4 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.754 Angle Between Sides= Center Pattern=false	Pattern Type=WFC3-UVIS-MOS-DITH-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.119 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=33.606 Angle Between Sides= Center Pattern=false	(1), (2)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	FCC224	RA: 03 39 32.7060 (54.8862750d) Dec: -31 47 31.08 (-31.79197d) Equinox: J2000 <i>Comments: Object coordinates from Legacy g-band imaging.</i> Category=GALAXY Description=[DWARF ELLIPTICAL, DWARF SPHEROIDAL]	Epoch of Position: 2015.5	V=17 star cluster magnitudes F555W ~ 22 - 27	Reference Frame: SIMBAD				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) FCC224	WFC3/UVIS, ACCUM, UVIS1	F475X	FLASH=5	POS TARG -25,-5	Pattern 4, Exps 1-1 in FCC 224 single visit (01) (4)	597 Secs (2388 Secs) [=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 2,1)] [=>(Pattern 2,2)]	[1]
	2		(1) FCC224	WFC3/UVIS, ACCUM, UVIS1	F814W	FLASH=10		Pattern 4, Exps 2-2 in FCC 224 single visit (01) (4)	593 Secs (2372 Secs) [=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 2,1)] [=>(Pattern 2,2)]	[2]



