



15332 - Unveiling the extreme nature of the hyper faint galaxy Virgo I

Cycle: 25, 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) VIRGOI ANY	ACS/WFC WFC3/UVIS	2	23-Feb-2018 12:00:34.0	yes

2 Total Orbits Used

ABSTRACT

We request HST/ACS imaging to obtain a deep color-magnitude diagram of the newly discovered candidate Milky Way satellite Virgo I. With an estimated absolute magnitude of only $M_V \sim -0.8$ and a Galactocentric radius of ~ 90 kpc, Virgo I is one of the faintest and most distant dwarfs ever observed, and could be identified as a prototype "hyper" faint galaxy. The detailed characterization of the smallest inhabited dark matter subhalos is crucial to guide hierarchical galaxy formation models, and in particular to constrain reionization, the nature of the dark matter particle, etc. With the advent of deep wide-field, ground-based surveys, the potential of uncovering these lowest-mass galaxies is quickly turning into reality, as demonstrated by the discovery in the past two years of tens of new Local Group members in the ultra-faint regime ($M_V > -8$). Virgo I represents a new record in galaxy physical properties, and urges us to be prepared for the likely emergence of an entirely new class of such objects in the era of future wide-field surveys (e.g., LSST). Only high resolution HST observations can enable us to confirm the nature of Virgo I, providing significantly

more accurate estimates for its distance and structural properties, when compared to the discovery Subaru/HyperSuprimeCam imaging. Our proposed dataset will constitute a fundamental step in the upcoming hunt for galaxies with similarly extreme properties.

OBSERVING DESCRIPTION

The observations are going to be performed with ACS/WFC (primary) and WFC3/UVIS (parallel). We request imaging in F606W and F814W filters (broad V and I) for both instruments, in order to derive an accurate MSTO distance for our target, resolve a significantly larger number of stars and derive improved structural parameters with respect to the ground-based discovery data, while optimizing the exposure times. The parallel pointing will allow us to observe a field region next to our target, which is extended and completely fills the ACS field of view: we will thus be able to estimate more precisely the number of background/foreground contaminants present in our ACS field.

Our goal is to obtain a SNR of ~ 100 at ~ 0.5 mag below the MSTO, i.e. at F814W ~ 23 and F606W ~ 23.5 , in order to derive a precise distance measurement and structural properties for our target. With the requested SNR, we will obtain a photometric uncertainty as low as ~ 0.02 mag at the MSTO, and we will be able to improve the discovery measurements by a factor of ~ 10 . Our goal requires ~ 2400 sec in the F606W filter and ~ 2300 sec in the F814W filter, which nicely fit into one orbit per filter after taking into account overheads, and subdividing the exposures into three dithered observations to remove detector defects and improve the PSF sampling. We combine the two orbits into one visit in order to maintain the same orientation and thus target the same stars in both filters.

Proposal 15332 - Virgo I (01) - Unveiling the extreme nature of the hyper faint galaxy Virgo I

Fri Feb 23 17:00:36 GMT 2018

Visit	Proposal 15332, Virgo I (01), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS, ACS/WFC Special Requirements: ORIENT 330D TO 145 D; ORIENT 165D TO 318 D									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false		(1-2), (3-4)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	VIRGOI	RA: 12 00 12.0000 (180.0500000d) Dec: -00 40 51.60 (-.68100d) Equinox: J2000 <i>Comments: MSTO apparent magnitude.</i> <i>Category=GALAXY</i> <i>Description=[DWARF SPHEROIDAL, UNDESIGNATED]</i> <i>Extended=NO</i>		V=23	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F814W ACS	(1) VIRGOI	ACS/WFC, ACCUM, WFC	F814W			Pattern 1, Exps 1-2 in Virgo I (01) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in Virgo I (01)	1200 Secs (2324 Secs) [==>790.0 Secs (Pattern 1)] [==>830.0 Secs (Pattern 2)] [==>704.0 Secs (Pattern 3)]	[1]
	2	F814W WF C3	ANY	WFC3/UVIS, ACCUM, UVIS1	F814W			Pattern 1, Exps 1-2 in Virgo I (01) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in Virgo I (01)	1200 Secs (2560 Secs) [==>865.0 Secs (Pattern 1)] [==>865.0 Secs (Pattern 2)] [==>830.0 Secs (Pattern 3)]	[1]
	3	F606W ACS	(1) VIRGOI	ACS/WFC, ACCUM, WFC	F606W			Pattern 1, Exps 3-4 in Virgo I (01) (1) Prime + Parallel Group 3-4 in Pattern 1, Exps 3-4 in Virgo I (01)	900 Secs (2428 Secs) [==>860.0 Secs (Pattern 1)] [==>875.0 Secs (Pattern 2)] [==>693.0 Secs (Pattern 3)]	[2]
	4	F606W WF C3	ANY	WFC3/UVIS, ACCUM, UVIS1	F606W			Pattern 1, Exps 3-4 in Virgo I (01) (1) Prime + Parallel Group 3-4 in Pattern 1, Exps 3-4 in Virgo I (01)	900 Secs (2689 Secs) [==>940.0 Secs (Pattern 1)] [==>930.0 Secs (Pattern 2)] [==>819.0 Secs (Pattern 3)]	[2]

