17316 - Quenching in the lowest mass galaxies at the edge of the Local Group

Cycle: 31, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Michael Gordon Jones (PI) (Contact)	**University of Arizona**
Prof. David J. Sand (CoI)	University of Arizona
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Dr. Paul Bennet (CoI)	Space Telescope Science Institute
Dr. Denija Crnojevic (CoI)	University of Tampa

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) PEGASUS-V ANY	ACS/WFC WFC3/UVIS	1	02-Jun-2023 13:00:16.0	yes
02	(2) PISCES-VII ANY	ACS/WFC WFC3/UVIS	1	02-Jun-2023 13:00:17.0	yes

2 Total Orbits Used

ABSTRACT

We request 10.5 h of VLA D-array time and 2 HST orbits in order to constrain the neutral gas content and stellar populations of three recently discovered ultra-faint dwarf galaxies (UFDs) at the edge of the Local Group. UFDs are the lowest mass galaxies that exist and our standard

framework of galaxy evolution and cosmology predicts that they should be permanently quenched by cosmic reionization. However, the discovery of Pegasus W, a UFD that has evidence for recent star formation, has called this longstanding prediction into question. Here we target Pegasus W and two other recently discovered UFDs to conclusively address whether or not they contain HI gas, which could provide fuel for ongoing star formation, and whether there is evidence for populations of young stars in their color--magnitude diagrams. If they do contain gas, these UFDs may be fainter analogs of the Phoenix dwarf, which appears to be in the process of losing its gas. Discovering HI gas or young stellar populations in (or around) any of these systems would reinforce the recent findings for Pegasus W and would force a rethink of our longstanding assumptions about reionization and the evolution of the lowest mass galaxies.

OBSERVING DESCRIPTION

These observations focus on two ultra-faint dwarf galaxies at the edge of the Local Group, and near M31's virial radius in particular. The goal is to study their star formation history with HST and improve our understanding of quenching of the smallest galaxies in this unique environment. We model our strategy after the recent successful observations of Pegasus W. We request the ACS/WFC imager for its wider field of view than WFC3 and its better sensitivity in our chosen imaging bands. Also, we will image in the F606W and F814W filters to produce a color magnitude diagram (CMD) of our dwarfs; these filters are the standard for nearby resolved stellar population work, and are identical to those used in Pegasus W. We also request WFC3-UVIS parallel imaging in the same filters (F606W, F814W). This will allow us to observe a field region next to our two dwarf targets (albeit to slightly brighter limits), and get a better statistical handle on the number of background/foreground contaminants in the CMD (which we know will have some Milky Way contamination, given the galactic latitude of -30 degrees). To get both bands in a single orbit (with ~1200s total integration per filter), we will obtain two exposures per filter, with a standard dither line offset between them to aid with cosmic ray and chip defect removal. If a given stellar system can safely fit on a single chip, we will position it accordingly. We may place orient constraints on our ACS imaging to avoid bright stars and potential image artifacts.

Visit

Proposal 17316, PEGASUS-V (01) Fri Jun 02 17:00:18 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: ORIENT 122D TO 82.5 D

Diagnostics

(Parallel Exposure 2 (Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in PEGASUS-V (01))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Parallel Exposure 2 (Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in PEGASUS-V (01))) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

(Parallel Exposure 4 (Prime + Parallel Group 3-4 in Pattern 1, Exps 3-4 in PEGASUS-V (01))) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 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

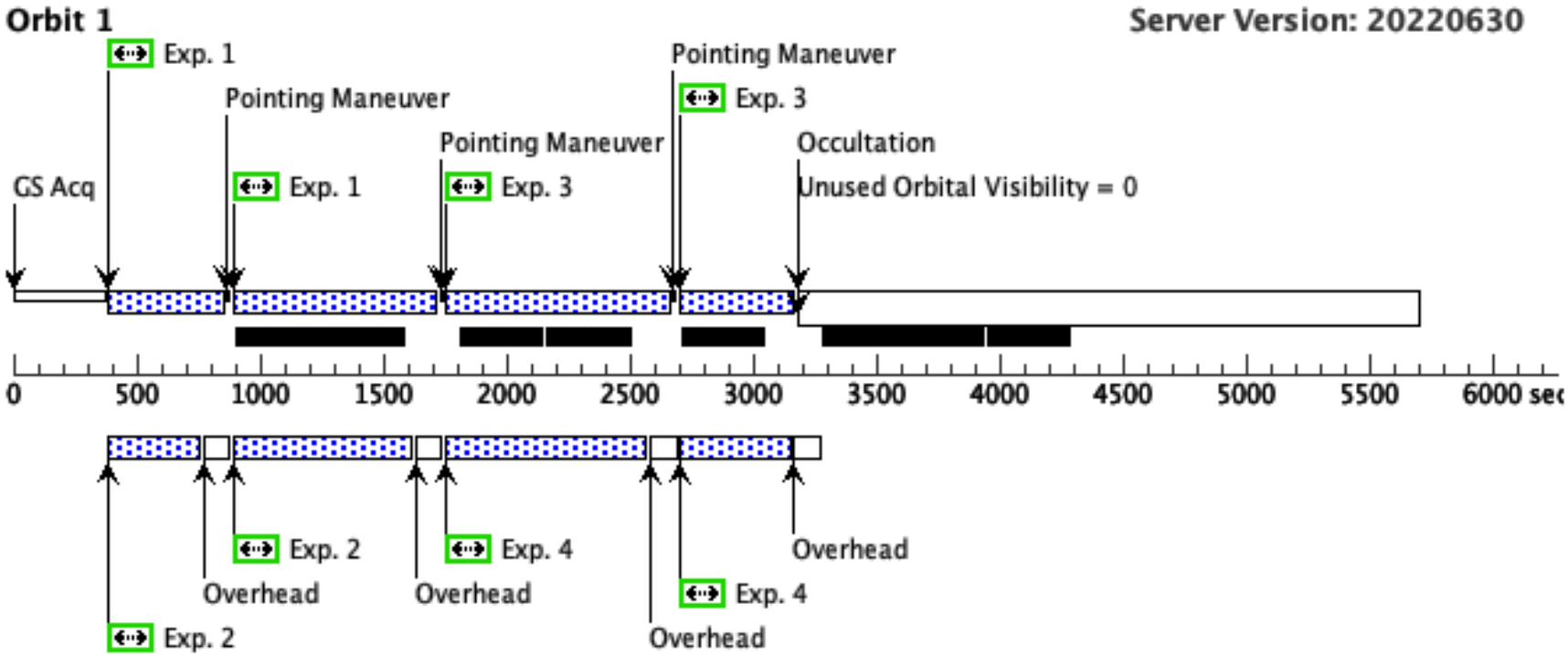
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PEGASUS-V	RA: 23 18 27.8000 (349.6158333d) Dec: +33 21 32.00 (33.35889d) Equinox: J2000		V=23.0+/-0.2	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) PEGASUS-V	ACS/WFC, ACCUM, WFC	F606W		POS TARG -0.4890 0434527053316,31.92974319633446	Pattern 1, Exps 1-2 in PEGASUS-V (01) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in PEGASUS-V (01)	550 Secs (966 Secs) *[==>266.0 Secs (Pattern 1)]* *[==>700.0 Secs (Pattern 2)]*	***[1]***
2		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	FLASH=2		Pattern 1, Exps 1-2 in PEGASUS-V (01) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in PEGASUS-V (01)	550 Secs (1070 Secs) *[==>345.0 Secs (Pattern 1)]* *[==>725.0 Secs (Pattern 2)]*	***[1]***
3		(1) PEGASUS-V	ACS/WFC, ACCUM, WFC	F814W		POS TARG -0.4890 0434527053316,31.92974319633446	Pattern 1, Exps 3-4 in PEGASUS-V (01) (1) Prime + Parallel Group 3-4 in Pattern 1, Exps 3-4 in PEGASUS-V (01)	550 Secs (1070 Secs) *[==>730.0 Secs (Pattern 1)]* *[==>340.0 Secs (Pattern 2)]*	***[1]***
4		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=5		Pattern 1, Exps 3-4 in PEGASUS-V (01) (1) Prime + Parallel Group 3-4 in Pattern 1, Exps 3-4 in PEGASUS-V (01)	550 Secs (1240 Secs) *[==>790.0 Secs (Pattern 1)]* *[==>450.0 Secs (Pattern 2)]*	***[1]***

Orbit Structure



Visit

Proposal 17316, PISCES-VII (02) Fri Jun 02 17:00:18 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: (none)

Diagnostics

(Parallel Exposure 2 (Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in PISCES-VII (02))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Parallel Exposure 2 (Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in PISCES-VII (02))) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

(Parallel Exposure 4 (Prime + Parallel Group 3-4 in Pattern 1, Exps 3-4 in PISCES-VII (02))) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 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
(2)	PISCES-VII	RA: 01 21 40.5000 (20.4187500d) Dec: +26 23 24.00 (26.39000d) Equinox: J2000		V=23.9+/-0.2	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) PISCES-VII	ACS/WFC, ACCUM, WFC	F606W		POS TARG -1.150775495882805,32.936119900745707	Pattern 1, Exps 1-2 in PISCES-VII (02) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in PISCES-VII (02)	550 Secs (951 Secs) *[==>251.0 Secs (Pattern 1)]* *[==>700.0 Secs (Pattern 2)]*	***[1]***
2		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	FLASH=2		Pattern 1, Exps 1-2 in PISCES-VII (02) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in PISCES-VII (02)	550 Secs (1055 Secs) *[==>330.0 Secs (Pattern 1)]* *[==>725.0 Secs (Pattern 2)]*	***[1]***
3		(2) PISCES-VII	ACS/WFC, ACCUM, WFC	F814W		POS TARG -1.150775495882805,32.936119900745707	Pattern 1, Exps 3-4 in PISCES-VII (02) (1) Prime + Parallel Group 3-4 in Pattern 1, Exps 3-4 in PISCES-VII (02)	550 Secs (1070 Secs) *[==>730.0 Secs (Pattern 1)]* *[==>340.0 Secs (Pattern 2)]*	***[1]***
4		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=5		Pattern 1, Exps 3-4 in PISCES-VII (02) (1) Prime + Parallel Group 3-4 in Pattern 1, Exps 3-4 in PISCES-VII (02)	550 Secs (1240 Secs) *[==>790.0 Secs (Pattern 1)]* *[==>450.0 Secs (Pattern 2)]*	***[1]***

Orbit Structure