



18066 - Discovery of Very Low-Mass Galaxy Candidates within the Local Group

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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Cody Leishman (CoI)	University of Utah
Alexis Brown (CoI)	University of Utah

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) PHOENIX-K	WFC3/UVIS	1	11-Aug-2025 14:00:35.0	yes
02	(2) GEMINI-M	WFC3/UVIS	1	11-Aug-2025 14:00:35.0	yes
03	(3) CETUS-L	WFC3/UVIS	1	11-Aug-2025 14:00:35.0	yes
04	(4) VIRGO-B	WFC3/UVIS	1	11-Aug-2025 14:00:36.0	yes

4 Total Orbits Used

ABSTRACT

The discoveries of ultra-faint dwarf satellites of the Milky Way and M31 were a paradigm shift for our understanding of hierarchical structure formation and helped frame our thinking of how reionization impacts the growth of low-mass structures. That paradigm is now changing again as more ultra-faint dwarfs are detected at farther distances and in different environments. For example, we now have evidence that **isolated** ultra-faint dwarfs are not necessarily quenched by reionization and there are tentative detections of ultra-faint dwarfs that are gas-rich. Despite these advances, interpretations are limited as these types of systems are very faint and hard to find, and therefore sample sizes are still quite small.

Here, we report the discovery of 4 ultra-faint dwarf galaxy candidates found via ground-based optical surveys. Each system is visible by-eye in the optical images and the color-magnitude diagrams of the resolved stars suggest they are very low-mass galaxies within the Local Group. These intriguing systems appear to be outside the virial radius of the Milky Way and M31 (i.e., are likely isolated) and are an opportunity to further probe the regime of ultra-faint dwarfs as a function of different environments. We are requesting 1-orbit of HST WFC3 imaging for each candidate to confirm and characterize these systems. The data will enable robust measurements of distances, structural parameters, integrated magnitudes, and star formation histories.

OBSERVING DESCRIPTION

The observations include WFC3/UVIS imaging in the F606W and F814W filters. The data will be used to confirm that the targets are galaxies, measure the distances to the systems from resolved stars (TRGB and/or Horizontal Branch methods), characterize the stellar properties (star formation histories and metallicities), and measure the structural parameters of the galaxies.

Each of the 4 targets will be observed for 1 orbit. We use a 2.5x2.5 pixel dither implemented using pos-targ (equivalent to the WFC3 UVIS DITHER LINE pattern) to improve PSF sampling and handle hot pixels. The first pointing is executed with both filters in WFC3. After the dither, the observations are then repeated. The exposure time per orbit is split roughly equally between the F606W and F814W filters.

Each visit is 1-orbit. We have placed ORIENT constraints to ensure we maximize coverage of the stellar disk and prevent the galaxy centers from falling in the WFC3 chip gap, while avoiding nearby bright stars.

Proposal 18066 - PHOENIX-K (01) - Discovery of Very Low-Mass Galaxy Candidates within the Local Group

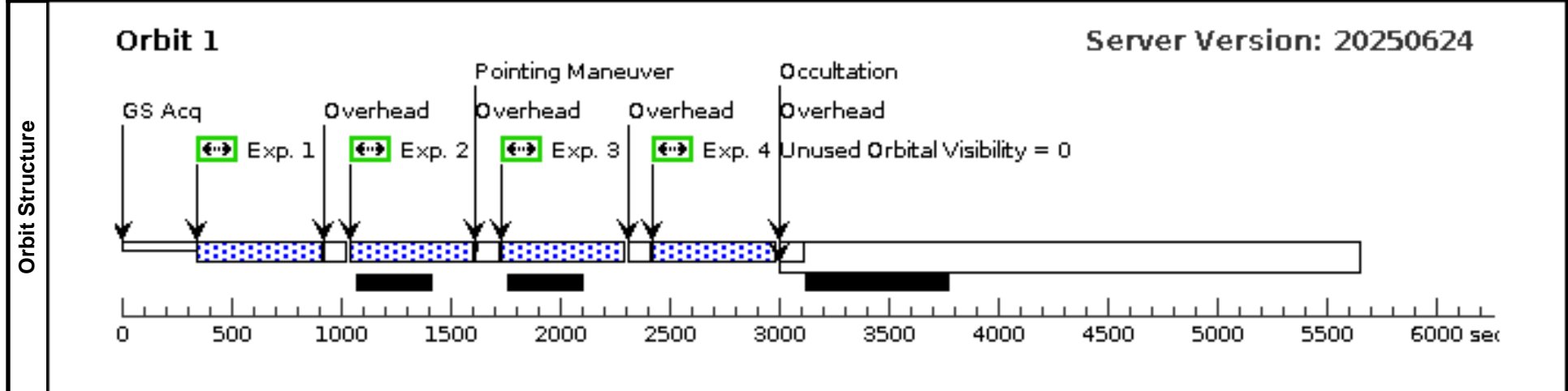
Mon Aug 11 18:00:36 GMT 2025

Visit	Proposal 18066, PHOENIX-K (01)				
	Diagnostic Status: No Diagnostics				
	Scientific Instruments: WFC3/UVIS				
	Special Requirements: ORIENT 240D TO 278 D				

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	PHOENIX-K	RA: 01 46 55.8279 (26.7326162d) Dec: -41 26 7.01 (-41.43528d) Equinox: J2000		V=17	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	F606W-1	(1) PHOENIX-K	WFC3/UVIS, ACCUM, UVIS	F606W					538 Secs (538 Secs) [==>]
2	F814W-1	(1) PHOENIX-K	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=8				538 Secs (538 Secs) [==>]	[1]
3	F606W-2	(1) PHOENIX-K	WFC3/UVIS, ACCUM, UVIS	F606W			POS TARG 0.099,0.106		539 Secs (539 Secs) [==>]	[1]
4	F814W-2	(1) PHOENIX-K	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=8		SAME POS AS 3		539 Secs (539 Secs) [==>]	[1]



Proposal 18066 - GEMINI-M (02) - Discovery of Very Low-Mass Galaxy Candidates within the Local Group

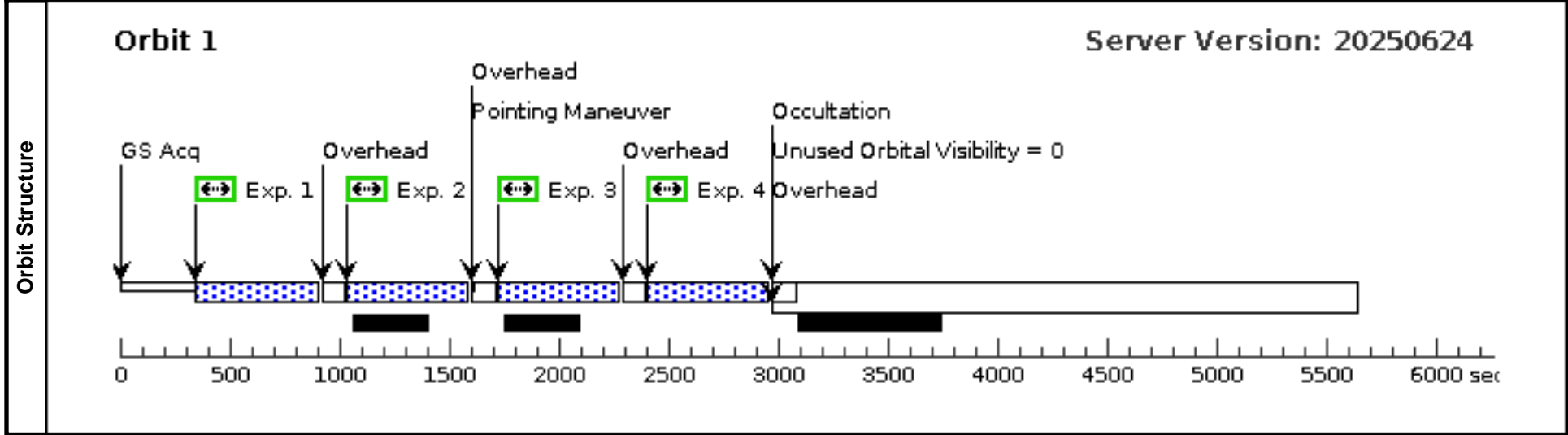
Mon Aug 11 18:00:36 GMT 2025

Visit	Proposal 18066, GEMINI-M (02)				
	Diagnostic Status: No Diagnostics				
	Scientific Instruments: WFC3/UVIS				
	Special Requirements: ORIENT 250D TO 289 D				

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	GEMINI-M	RA: 07 53 30.8858 (118.3786908d) Dec: +15 59 41.86 (15.99496d) Equinox: J2000		V=17	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	F606W-1	(2) GEMINI-M	WFC3/UVIS, ACCUM, UVIS	F606W					532 Secs (532 Secs) [==>]
2	F814W-1	(2) GEMINI-M	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=8				532 Secs (532 Secs) [==>]	[1]
3	F606W-2	(2) GEMINI-M	WFC3/UVIS, ACCUM, UVIS	F606W			POS TARG 0.099,0.106		532 Secs (532 Secs) [==>]	[1]
4	F814W-2	(2) GEMINI-M	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=8		SAME POS AS 3		533 Secs (533 Secs) [==>]	[1]



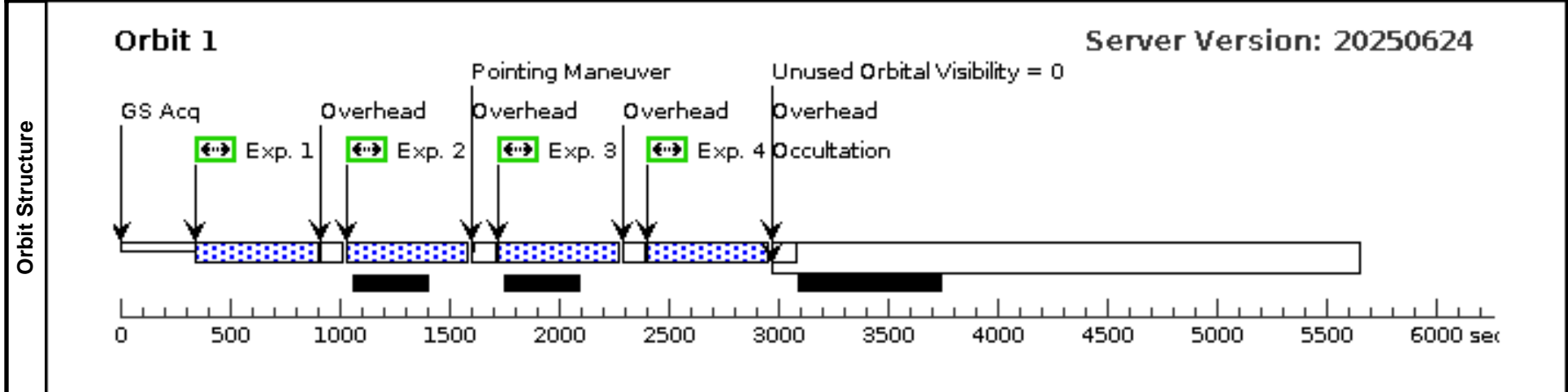
Proposal 18066 - CETUS-L (03) - Discovery of Very Low-Mass Galaxy Candidates within the Local Group

Mon Aug 11 18:00:36 GMT 2025

Visit	Proposal 18066, CETUS-L (03)				
	Diagnostic Status: No Diagnostics				
	Scientific Instruments: WFC3/UVIS				
	Special Requirements: ORIENT 235D TO 257 D				

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(3)	CETUS-L	RA: 00 13 40.0711 (3.4169629d) Dec: -14 34 26.22 (-14.57395d) Equinox: J2000		V=17	Reference Frame: ICRS
<i>Comments:</i> 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	F606W-1	(3) CETUS-L	WFC3/UVIS, ACCUM, UVIS	F606W				531 Secs (531 Secs)	[1]
	2	F814W-1	(3) CETUS-L	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=8			532 Secs (532 Secs)	[1]
	3	F606W-2	(3) CETUS-L	WFC3/UVIS, ACCUM, UVIS	F606W		POS TARG 0.099,0.106		532 Secs (532 Secs)	[1]
	4	F814W-2	(3) CETUS-L	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=8	SAME POS AS 3		532 Secs (532 Secs)	[1]



Proposal 18066 - VIRGO-B (04) - Discovery of Very Low-Mass Galaxy Candidates within the Local Group

Mon Aug 11 18:00:36 GMT 2025

Visit	Proposal 18066, VIRGO-B (04)				
	Diagnostic Status: No Diagnostics				
	Scientific Instruments: WFC3/UVIS				
	Special Requirements: ORIENT 272D TO 300 D				

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(4)	VIRGO-B	RA: 11 58 16.1502 (179.5672925d) Dec: +06 55 59.14 (6.93309d) Equinox: J2000		V=17	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	F606W-1	(4) VIRGO-B	WFC3/UVIS, ACCUM, UVIS	F606W				532 Secs (532 Secs) [==>]
	2	F814W-1	(4) VIRGO-B	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=8			532 Secs (532 Secs) [==>]	[1]
	3	F606W-2	(4) VIRGO-B	WFC3/UVIS, ACCUM, UVIS	F606W		POS TARG 0.099,0.106		533 Secs (533 Secs) [==>]	[1]
	4	F814W-2	(4) VIRGO-B	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=8	SAME POS AS 3		533 Secs (533 Secs) [==>]	[1]

