14078 - New Faint Galaxies at the Local Group's Edge: Antlia B and Five Candidate Ultra-Faint Dwarfs

Cycle: 23, 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) G1	ACS/WFC	1	09-Nov-2016 10:42:26.0	yes
02	(2) G5	ACS/WFC	1	09-Nov-2016 10:42:26.0	yes
03	(3) G6	ACS/WFC	1	09-Nov-2016 10:42:27.0	yes
04	(4) G7	ACS/WFC	1	09-Nov-2016 10:42:28.0	yes
05	(5) G8	ACS/WFC	1	09-Nov-2016 10:42:28.0	yes
06	(6) G9	ACS/WFC	1	09-Nov-2016 10:42:29.0	yes

6 Total Orbits Used

ABSTRACT

We propose to use six orbits with HST/ACS to obtain follow-up optical imaging of a newly-discovered Local Group dwarf galaxy (Antlia B; M_V = -9, d ~ 1.3 Mpc) and five candidate ultra-faint dwarf galaxies -- all of which may be satellites of the nearby dwarf irregular galaxy NGC 3109 (M_V = -14.9, d=1.3 Mpc). This may be the first system of satellites observed around a dwarf galaxy in isolation, and the first ultra-faint dwarfs observed in a sub-Milky Way environment. We will use the resolved stellar populations of these objects to (i) obtain a detailed star formation history and improved distance measurement for Antlia B, (ii) resolve the ultra-faint dwarf candidates into stars to confirm their discoveries, and (iii) place meaningful constraints on the presence of young stellar populations in the new ultra-faints. Our discovery data for Antlia B reveals evidence for a population of young stars; Our proposed observations will provide the needed photometric depth and precision to quantify the extent of Antlia B's young stellar population. The confirmation of any new ultra-faint dwarfs will deliver the first such objects in a low density environment. Their presence (or absence) of recent star formation will provide a critical benchmark for improving our understanding the impact of environment on ultra-faint dwarf galaxies; All currently known ultra-faint dwarfs are associated with massive galaxies (e.g. Milky Way, M31) and display little to no star formation in the last 10 Gyr.

OBSERVING DESCRIPTION

Our observing strategy is to obtain deep imaging in two filters (ACS/WFC F606W and F814W) in order to (i) obtain an accurate star formation history for the brightest target (Antlia B, or G1); (ii) resolve stellar populations of the candidate ultra-faint dwarf galaxies; and (iii) obtain a refined tip of the red giant branch (TRGB) distance for Antlia B. To reach these goals, we require two filter observations (F606W and F814W) with S/N ~ 7 at 0.5 mag below the red clump population in the target galaxies. It has been shown (e.g., Dolphin 2000) that imaging of this depth is sufficient to recover the ages and metallicities of dwarf galaxies similar to ones in this program. Such imaging will also resolve stars in the candidate ultra-faints if they are true galaxies at the distances of NGC 3109 (~1.3 Mpc). Our choice of filters and exposure times are motivated by numerous studies and HST programs similar to ours (e.g., ANGST; Tully 2006; Sand et al. 2014; Crnojevic et al. 2014). Briefly, for low metallicity systems, the TRGB can be easily distinguished (using, e.g., a Sobel edge detection filter) due to the quick cutoff at M_I = -4.0 mag if the imaging in the I band (F814W) is sufficiently deep. The use of the V band (F606W) allows us to minimize contamination using photometric colors. We will use one orbit per target galaxy, splitting the observing time into exposures of 932 sec in F606W and 1138 sec in F814W. Each exposure will be split into a two-line dither pattern to cover the ACS/WFC chip gap and facilitate cosmic ray removal. The five ultra-faint galaxy candidates are small enough to fit onto one of the ACS/WFC chips, and given the lack of nearby bright stars, any HST orientation angle is sufficient for observing these targets. For Antlia B (G1), however, the spatial proximity to a bright star (V=11 mag) and extended spiral galaxy severely limit the range of possible orientations.

Visit

Proposal 14078, G1 (01), implementation Wed Nov 09 15:42:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 340D TO 350 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.146 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.17 Angle Between Sides= Center Pattern=false		(1-2)

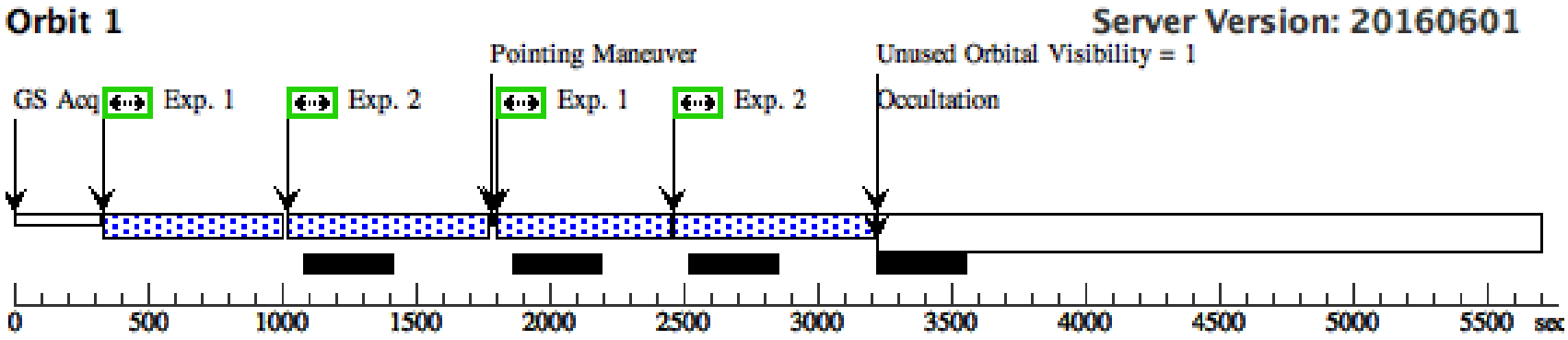
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	G1	RA: 09 48 55.7400 (147.2322500d) Dec: -25 59 25.95 (-25.99054d) Equinox: J2000		V=17.+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	G1-F606W	(1) G1	ACS/WFC, ACCUM, WFC1	F606W		POS TARG null,35	Pattern 2, Exps 1-2 in G1 (01) (2)	467 Secs (934 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	G1-F814W	(1) G1	ACS/WFC, ACCUM, WFC1	F814W		POS TARG null,35	Pattern 2, Exps 1-2 in G1 (01) (2)	571 Secs (1142 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***

Orbit Structure



Visit

Proposal 14078, G5 (02), implementation Wed Nov 09 15:42:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 265D TO 273 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.146 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.17 Angle Between Sides= Center Pattern=false		(1-2)

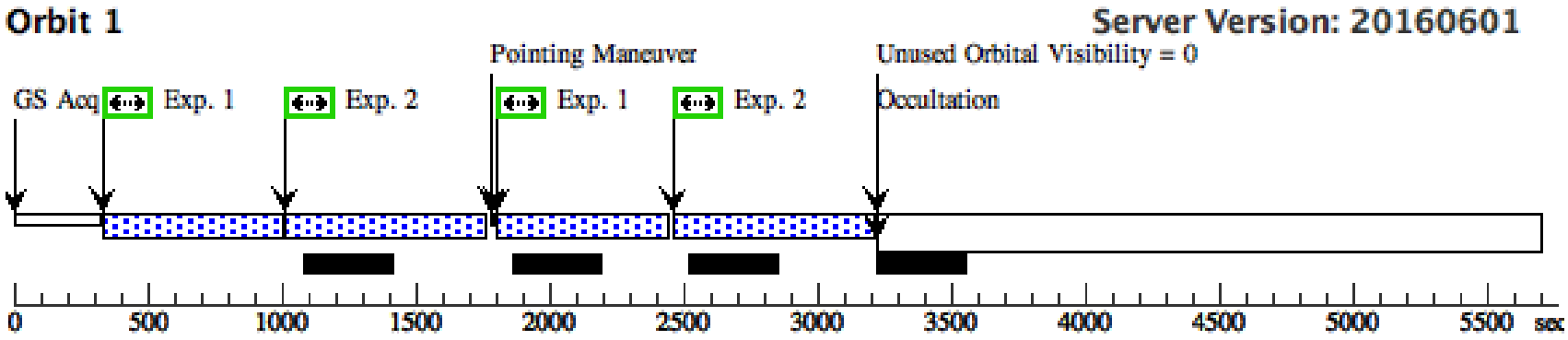
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	G5	RA: 09 57 58.7280 (149.4947000d) Dec: -22 53 29.16 (-22.89143d) Equinox: J2000		V=20.+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	G5-F606W	(2) G5	ACS/WFC, ACCUM, WFC1	F606W		POS TARG 20,null	Pattern 2, Exps 1-2 in G5 (02) (2)	466 Secs (932 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*
2	G5-F814W	(2) G5	ACS/WFC, ACCUM, WFC1	F814W		POS TARG 20,null	Pattern 2, Exps 1-2 in G5 (02) (2)	569 Secs (1138 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*

Orbit Structure



Visit

Proposal 14078, G6 (03), implementation Wed Nov 09 15:42:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.146 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.17 Angle Between Sides= Center Pattern=false		(1-2)

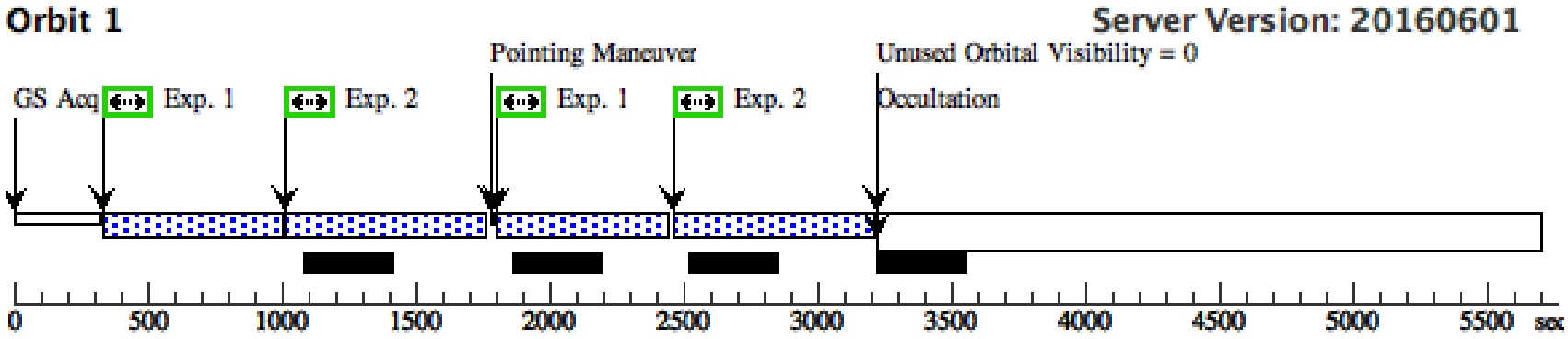
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	G6	RA: 09 54 51.7224 (148.7155100d) Dec: -24 22 45.98 (-24.37944d) Equinox: J2000		V=20.5+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	G6-F606W	(3) G6	ACS/WFC, ACCUM, WFC1	F606W			Pattern 2, Exps 1-2 in G6 (03) (2)	466 Secs (932 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	 ***[1]***
2	G6-F814W	(3) G6	ACS/WFC, ACCUM, WFC1	F814W			Pattern 2, Exps 1-2 in G6 (03) (2)	569 Secs (1138 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	 ***[1]***

Orbit Structure



Visit

Proposal 14078, G7 (04), implementation

Wed Nov 09 15:42:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.146 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.17 Angle Between Sides= Center Pattern=false		(1-2)

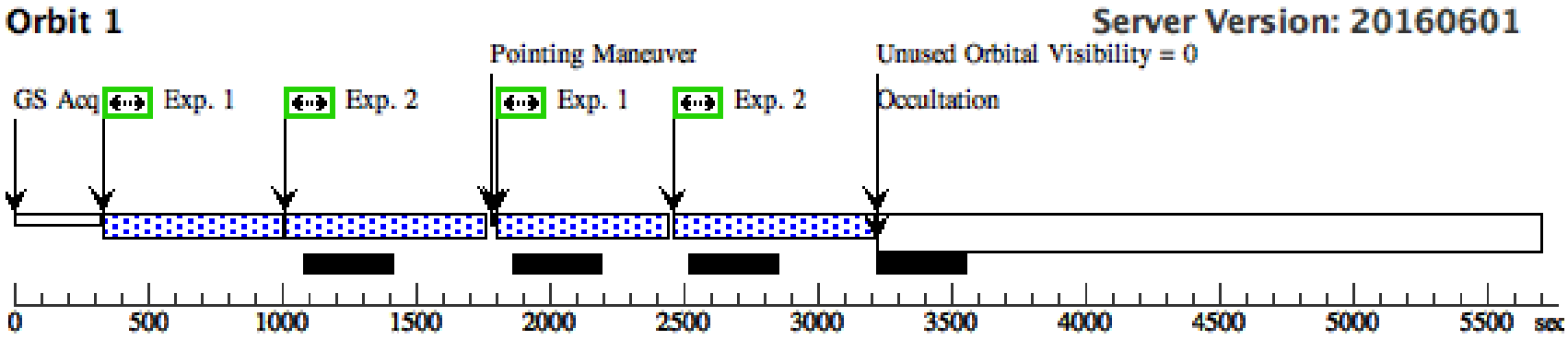
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	G7	RA: 09 51 39.5970 (147.9149875d) Dec: -24 47 5.72 (-24.78492d) Equinox: J2000		V=20.5+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	G7-F606W	(4) G7	ACS/WFC, ACCUM, WFC1	F606W			Pattern 2, Exps 1-2 in G7 (04) (2)	466 Secs (932 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*
2	G7-F814W	(4) G7	ACS/WFC, ACCUM, WFC1	F814W			Pattern 2, Exps 1-2 in G7 (04) (2)	569 Secs (1138 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*

Orbit Structure



Visit

Proposal 14078, G8 (05), implementation

Wed Nov 09 15:42:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.146 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.17 Angle Between Sides= Center Pattern=false		(1-2)

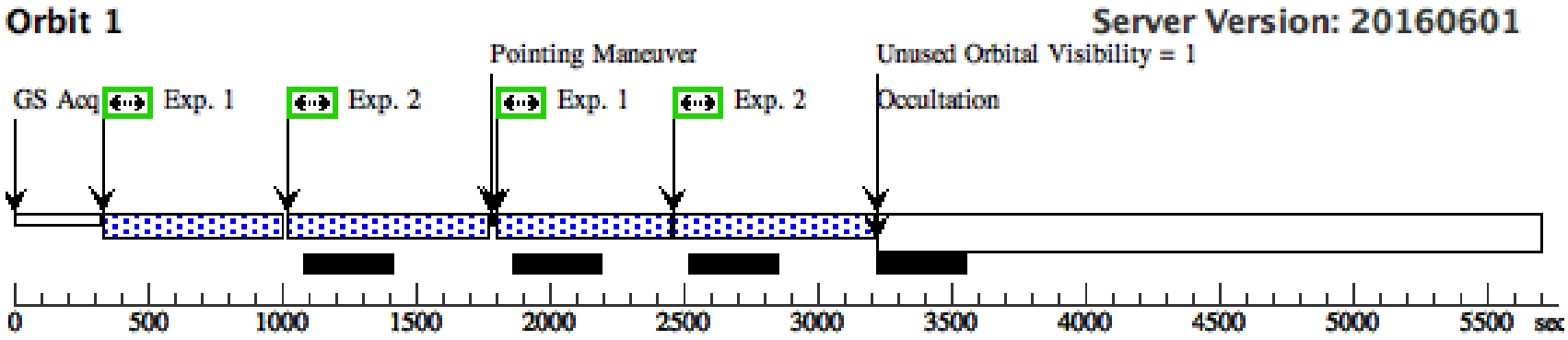
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	G8	RA: 09 51 58.3770 (147.9932375d) Dec: -27 47 40.62 (-27.79462d) Equinox: J2000		V=20.5+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	G8-F606W	(5) G8	ACS/WFC, ACCUM, WFC1	F606W			Pattern 2, Exps 1-2 in G8 (05) (2)	468 Secs (936 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*
2	G8-F814W	(5) G8	ACS/WFC, ACCUM, WFC1	F814W			Pattern 2, Exps 1-2 in G8 (05) (2)	570 Secs (1140 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*

Orbit Structure



Visit

Proposal 14078, G9 (06), implementation Wed Nov 09 15:42:30 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.146 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.17 Angle Between Sides= Center Pattern=false		(1-2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	G9	RA: 10 15 12.2960 (153.8012333d) Dec: -27 45 11.26 (-27.75313d) Equinox: J2000		V=20.5+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	G9-F606W	(6) G9	ACS/WFC, ACCUM, WFC1	F606W			Pattern 2, Exps 1-2 in G9 (06) (2)	468 Secs (936 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*
2	G9-F814W	(6) G9	ACS/WFC, ACCUM, WFC1	F814W			Pattern 2, Exps 1-2 in G9 (06) (2)	570 Secs (1140 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*

Orbit Structure