16293 - Near Field Cosmology with Ultra-faint Dwarfs: Patchy Reionization and Sub-Solar Initial Mass Function

Cycle: 28, Proposal Category: GO

(Availability Mode: SUPPORTED)

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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) CARINA2-1 ANY	ACS/WFC WFC3/UVIS	1	16-Jul-2020 18:00:58.0	yes
02	(2) CARINA2-2 ANY	ACS/WFC WFC3/UVIS	1	16-Jul-2020 18:00:59.0	yes
03	(3) CARINA2-3 ANY	ACS/WFC WFC3/UVIS	1	16-Jul-2020 18:01:00.0	yes
04	(5) HYDRUS1-1 ANY	ACS/WFC WFC3/UVIS	1	16-Jul-2020 18:01:02.0	yes
05	(6) HYDRUS1-2 ANY	ACS/WFC WFC3/UVIS	1	16-Jul-2020 18:01:03.0	yes

5 Total Orbits Used

ABSTRACT

Observations of the ultra-faint dwarfs (UFDs), as relics of the epoch of reionization, allow us to probe the earliest epochs of star formation (SF). In particular, the UFDs in low density environments for most of their lifetimes provide unique tools to probe the effects of early environmental conditions on the SF histories (SFHs) of the UFDs and their sub-solar initial mass function (IMF) because they likely maintain the best `fossil' record of early local environments.

We propose to obtain deep ACS and UVIS imaging in F606W and F814W for 2 LMC satellite UFDs that are on their first approach to our Galaxy, and thus resided in the outskirts of the Local Group at high redshift. This program is designed to identify systematic differences in the stellar populations of recently captured UFDs vs. long-term MW satellites (data available from previous programs) by using high-fidelity color-magnitude diagrams constructed from deep HST imaging as well as spectroscopically measured metallicity distribution functions. We will: (1) Establish whether SF is quenched at different times with different rate in UFDs in low density environment at early times, probing the patchiness of reionization by directly comparing with theoretical predictions; (2) Identify variations in the sub-Solar IMF across UFDs born in different environments; (3) Pave the way for a more accurate constraint on the MW halo mass.

OBSERVING DESCRIPTION

Our basic observing strategy is to reach S/N of > 100 at the oMSTO in F606W and F814W filters in ACS/WFC, allowing us to measure the detailed ancient SFHs and to explore the sub-Solar (down to a half solar) stellar IMF. Both Carina 2 and Hydrus 1 have half-light radii greater than the ACS FOV, and thus we add an extra one pointing for Hydrus 1 and two pointings for Carina 2 with parallel observations with WFC3/UVIS to observe sufficient number of member stars in each galaxy.

Each pointing is made up of 2 dithered F606W exposures, and 2 dithered F814W exposures to eliminate hot pixels and CR hits in the combined images. We need two filter data to make CMDs to measure SFHs and to separate target stars from foreground/background contaminants. Our choice of filters (F606W and F814W) is the same as previous SFH programs of MW satellites, enabling us to use stellar population templates observed in these same filters to minimize systematic errors for relative ages when comparing populations and thus facilitating direct comparison with other MW satellites from previous programs. The depth of our data will be comparable to ohter HST observations used for MW satellites' sub-solar IMF studies.

Visit

Proposal 16293, CARINA2-1 (01), implementation Thu Jul 16 22:01:03 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: ORIENT 0D TO 65 D; ORIENT 140D TO 245 D; ORIENT 320D TO 359.999 D

Diagnostics

(Parallel Exposure 2 (Prime + Parallel Group 1-2 in CARINA2-1 (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 8 (Prime + Parallel Group 7-8 in CARINA2-1 (01))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

Fixed Targets

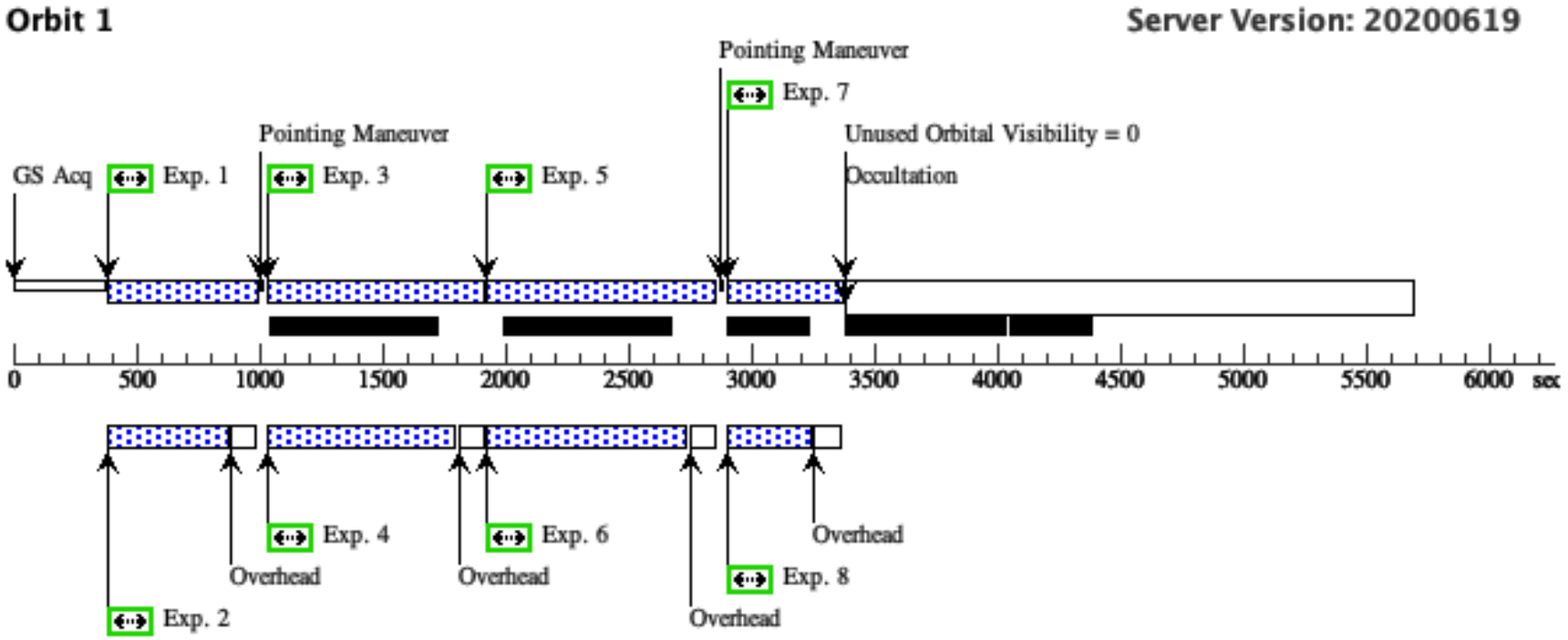
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CARINA2-1	RA: 07 36 39.5502 (114.1647925d) Dec: -58 00 44.15 (-58.01226d) Equinox: J2000		V=-4.5+/-0.1	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[DWARF SPHEROIDAL]
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) CARINA2-1	ACS/WFC, ACCUM, WFC	F606W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 1-2 in CARINA2-1 (01)	400 Secs (406 Secs) *[==>406.0 Secs]*	 ***[1]***
2		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	CR-SPLIT=NO; FLASH=2		Prime + Parallel Group 1-2 in CARINA2-1 (01)	400 Secs (456 Secs) *[==>456.0 Secs]*	 ***[1]***
3		(1) CARINA2-1	ACS/WFC, ACCUM, WFC	F606W	CR-SPLIT=NO	POS TARG 0.247,2.984	Prime + Parallel Group 3-4 in CARINA2-1 (01)	750 Secs (756 Secs) *[==>756.0 Secs]*	 ***[1]***
4		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	CR-SPLIT=NO		Prime + Parallel Group 3-4 in CARINA2-1 (01)	750 Secs (766 Secs) *[==>766.0 Secs]*	 ***[1]***
5		(1) CARINA2-1	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO	POS TARG 0.247,2.984	Prime + Parallel Group 5-6 in CARINA2-1 (01)	750 Secs (756 Secs) *[==>756.0 Secs]*	 ***[1]***
6		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	CR-SPLIT=NO		Prime + Parallel Group 5-6 in CARINA2-1 (01)	750 Secs (792 Secs) *[==>792.0 Secs]*	 ***[1]***
7		(1) CARINA2-1	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 7-8 in CARINA2-1 (01)	345 Secs (351 Secs) *[==>351.0 Secs]*	 ***[1]***
8		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	CR-SPLIT=NO; FLASH=13		Prime + Parallel Group 7-8 in CARINA2-1 (01)	345 Secs (345 Secs) *[==>]*	 ***[1]***

Orbit Structure



Visit

Proposal 16293, CARINA2-2 (02), implementation Thu Jul 16 22:01:04 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: SAME ORIENT AS 01

Diagnostics

(Parallel Exposure 2 (Prime + Parallel Group 1-2 in CARINA2-2 (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 8 (Prime + Parallel Group 7-8 in CARINA2-2 (02))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

Fixed Targets

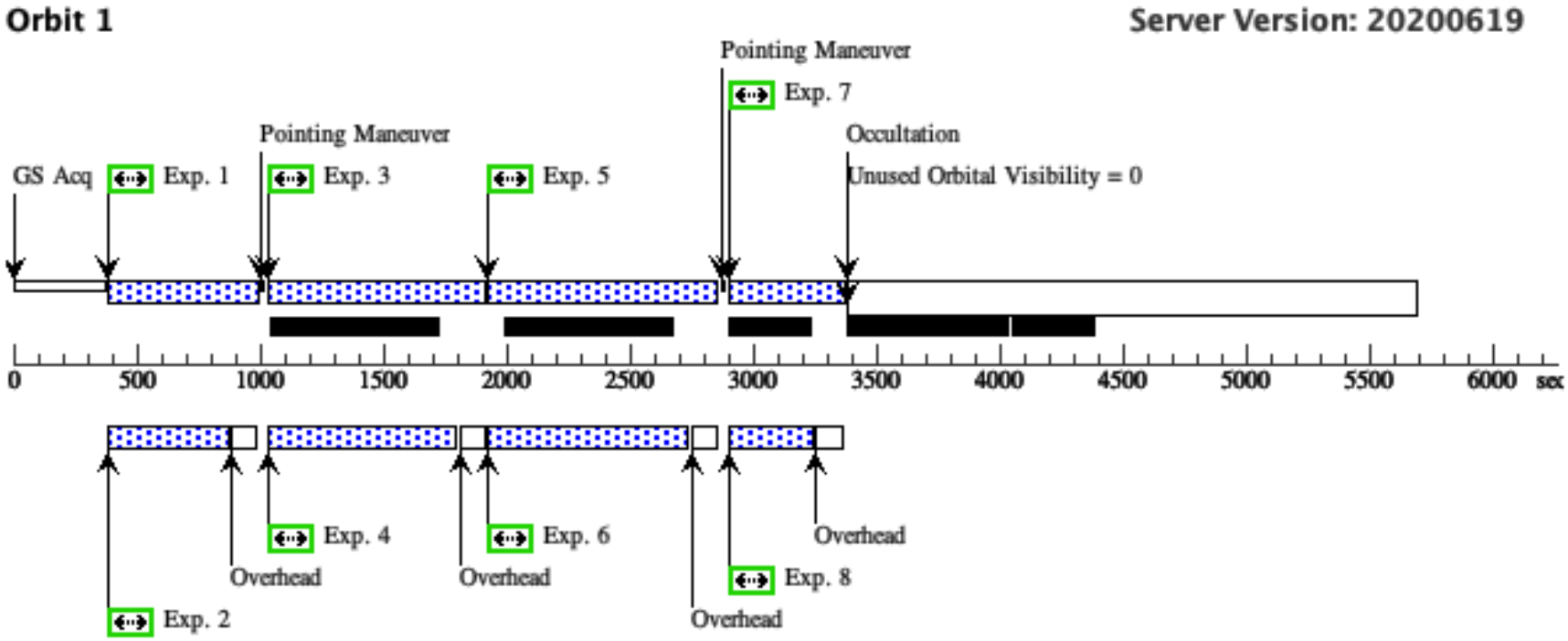
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CARINA2-2	RA: 07 36 24.9822 (114.1040925d) Dec: -57 57 42.12 (-57.96170d) Equinox: J2000		V=-4.5+/-0.1	Reference Frame: ICRS

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) CARINA2-2	ACS/WFC, ACCUM, WFC	F606W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 1-2 in CARINA2-2 (02)	400 Secs (406 Secs) *[==>406.0 Secs]*	***[1]***
2		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	CR-SPLIT=NO; FLASH=2		Prime + Parallel Group 1-2 in CARINA2-2 (02)	400 Secs (456 Secs) *[==>456.0 Secs]*	***[1]***
3		(2) CARINA2-2	ACS/WFC, ACCUM, WFC	F606W	CR-SPLIT=NO	POS TARG 0.247,2.984	Prime + Parallel Group 3-4 in CARINA2-2 (02)	750 Secs (756 Secs) *[==>756.0 Secs]*	***[1]***
4		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	CR-SPLIT=NO		Prime + Parallel Group 3-4 in CARINA2-2 (02)	750 Secs (766 Secs) *[==>766.0 Secs]*	***[1]***
5		(2) CARINA2-2	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO	POS TARG 0.247,2.984	Prime + Parallel Group 5-6 in CARINA2-2 (02)	750 Secs (756 Secs) *[==>756.0 Secs]*	***[1]***
6		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	CR-SPLIT=NO		Prime + Parallel Group 5-6 in CARINA2-2 (02)	750 Secs (792 Secs) *[==>792.0 Secs]*	***[1]***
7		(2) CARINA2-2	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 7-8 in CARINA2-2 (02)	345 Secs (351 Secs) *[==>351.0 Secs]*	***[1]***
8		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	CR-SPLIT=NO; FLASH=13		Prime + Parallel Group 7-8 in CARINA2-2 (02)	345 Secs (345 Secs) *[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16293, CARINA2-3 (03), implementation Thu Jul 16 22:01:04 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: SAME ORIENT AS 01

Diagnostics

(Parallel Exposure 2 (Prime + Parallel Group 1-2 in CARINA2-3 (03))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Parallel Exposure 8 (Prime + Parallel Group 7-8 in CARINA2-3 (03))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

Fixed Targets

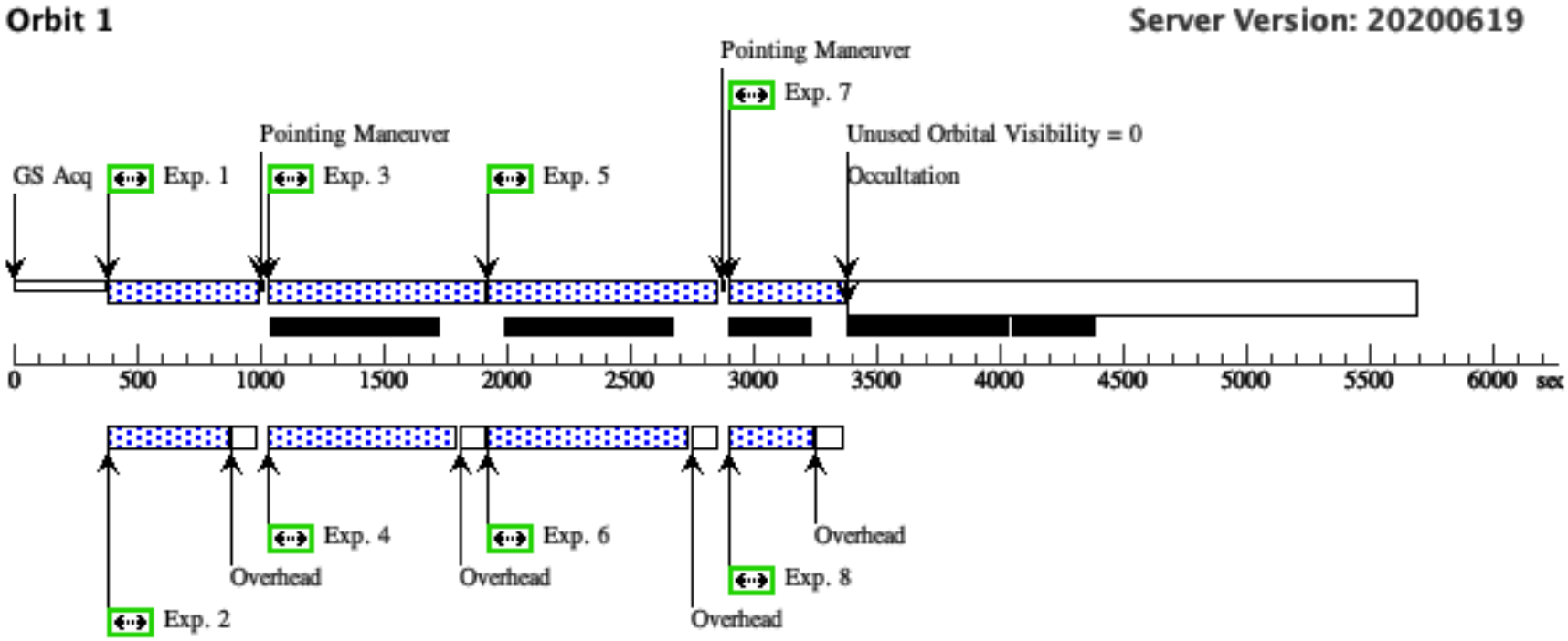
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	CARINA2-3	RA: 07 36 13.9799 (114.0582496d) Dec: -57 54 56.26 (-57.91563d) Equinox: J2000		V=-4.5+/-0.1	Reference Frame: ICRS

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		(3) CARINA2-3	ACS/WFC, ACCUM, WFC	F606W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 1-2 in CARINA2-3 (03)	400 Secs (406 Secs) *[==>406.0 Secs]*	***[1]***
2		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	CR-SPLIT=NO; FLASH=2		Prime + Parallel Group 1-2 in CARINA2-3 (03)	400 Secs (456 Secs) *[==>456.0 Secs]*	***[1]***
3		(3) CARINA2-3	ACS/WFC, ACCUM, WFC	F606W	CR-SPLIT=NO	POS TARG 0.247,2.984	Prime + Parallel Group 3-4 in CARINA2-3 (03)	750 Secs (756 Secs) *[==>756.0 Secs]*	***[1]***
4		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	CR-SPLIT=NO		Prime + Parallel Group 3-4 in CARINA2-3 (03)	750 Secs (766 Secs) *[==>766.0 Secs]*	***[1]***
5		(3) CARINA2-3	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO	POS TARG 0.247,2.984	Prime + Parallel Group 5-6 in CARINA2-3 (03)	750 Secs (756 Secs) *[==>756.0 Secs]*	***[1]***
6		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	CR-SPLIT=NO		Prime + Parallel Group 5-6 in CARINA2-3 (03)	750 Secs (792 Secs) *[==>792.0 Secs]*	***[1]***
7		(3) CARINA2-3	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 7-8 in CARINA2-3 (03)	345 Secs (351 Secs) *[==>351.0 Secs]*	***[1]***
8		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	CR-SPLIT=NO; FLASH=13		Prime + Parallel Group 7-8 in CARINA2-3 (03)	345 Secs (345 Secs) *[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16293, Hydrus1-1 (04), implementation Thu Jul 16 22:01:04 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: (none)

Diagnostics

(Parallel Exposure 2 (Prime + Parallel Group 1-2 in Hydrus1-1 (04))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Parallel Exposure 8 (Prime + Parallel Group 7-8 in Hydrus1-1 (04))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

Fixed Targets

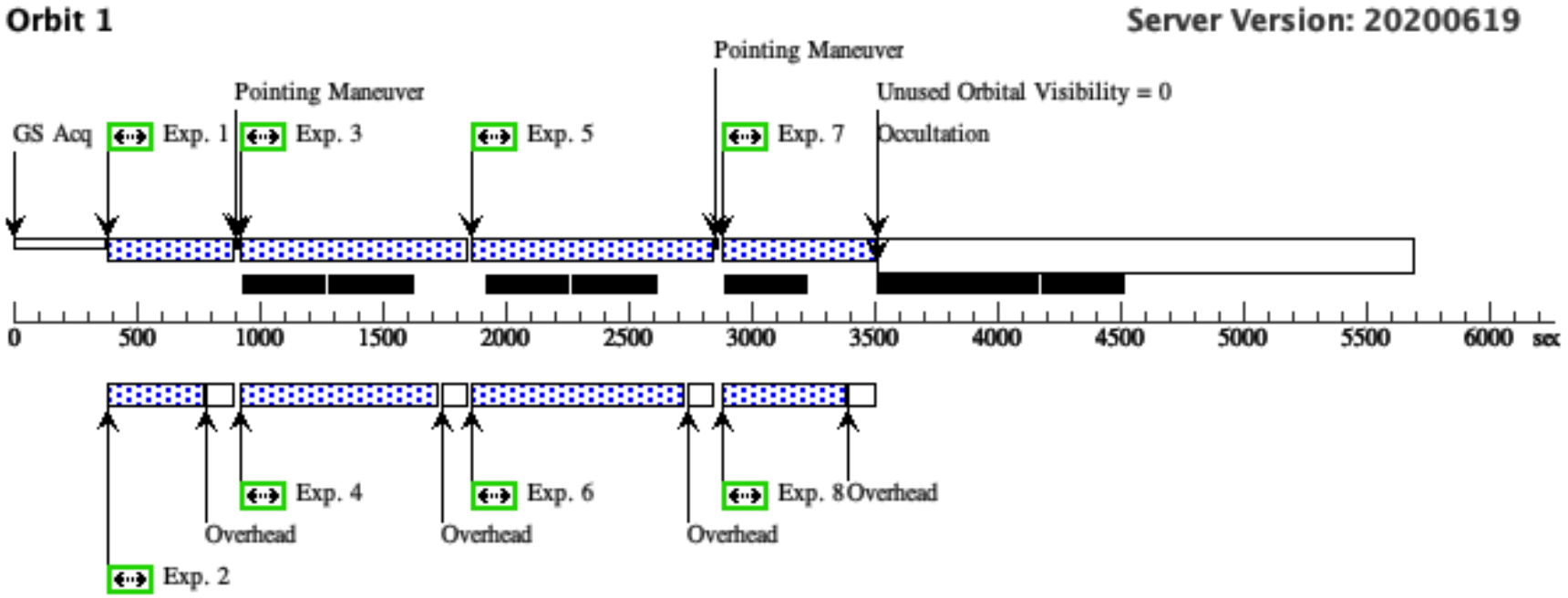
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	HYDRUS1-1	RA: 02 30 7.7856 (37.5324400d) Dec: -79 18 14.99 (-79.30416d) Equinox: J2000		V=-4.71+/-0.08	Reference Frame: ICRS

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		(5) HYDRUS1-1	ACS/WFC, ACCUM, WFC	F606W		POS TARG 0,0	Prime + Parallel Group 1-2 in Hydrus1-1 (04)	303 Secs (302 Secs) *[==>302.0 Secs]*	 ***[1]***
2		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	FLASH=6		Prime + Parallel Group 1-2 in Hydrus1-1 (04)	303 Secs (356 Secs) *[==>356.0 Secs]*	 ***[1]***
3		(5) HYDRUS1-1	ACS/WFC, ACCUM, WFC	F606W		POS TARG 0.247,2.984	Prime + Parallel Group 3-4 in Hydrus1-1 (04)	800 Secs (799 Secs) *[==>799.0 Secs]*	 ***[1]***
4		ANY	WFC3/UVIS, ACCUM, UVIS	F606W			Prime + Parallel Group 3-4 in Hydrus1-1 (04)	800 Secs (800 Secs) *[==>]*	 ***[1]***
5		(5) HYDRUS1-1	ACS/WFC, ACCUM, WFC	F814W		POS TARG 0.247,2.984	Prime + Parallel Group 5-6 in Hydrus1-1 (04)	800 Secs (799 Secs) *[==>799.0 Secs]*	 ***[1]***
6		ANY	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 5-6 in Hydrus1-1 (04)	800 Secs (841 Secs) *[==>841.0 Secs]*	 ***[1]***
7		(5) HYDRUS1-1	ACS/WFC, ACCUM, WFC	F814W		POS TARG 0,0	Prime + Parallel Group 7-8 in Hydrus1-1 (04)	500 Secs (499 Secs) *[==>499.0 Secs]*	 ***[1]***
8		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=9		Prime + Parallel Group 7-8 in Hydrus1-1 (04)	500 Secs (500 Secs) *[==>]*	 ***[1]***

Orbit Structure



Visit

Proposal 16293, Hydrus1-2 (05), implementation Thu Jul 16 22:01:04 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: SAME ORIENT AS 04

Diagnostics

(Parallel Exposure 2 (Prime + Parallel Group 1-2 in Hydrus1-2 (05))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Parallel Exposure 8 (Prime + Parallel Group 7-8 in Hydrus1-2 (05))) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	HYDRUS1-2	RA: 02 28 56.2561 (37.2344004d) Dec: -79 16 52.07 (-79.28113d) Equinox: J2000		V=-4.71+/-0.08	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		(6) HYDRUS1-2	ACS/WFC, ACCUM, WFC	F606W		POS TARG 0,0	Prime + Parallel Group 1-2 in Hydrus1-2 (05)	300 Secs (300 Secs) *[==>]*	*[1]*
2		ANY	WFC3/UVIS, ACCUM, UVIS	F606W	FLASH=9		Prime + Parallel Group 1-2 in Hydrus1-2 (05)	300 Secs (354 Secs) *[==>354.0 Secs]*	*[1]*
3		(6) HYDRUS1-2	ACS/WFC, ACCUM, WFC	F606W		POS TARG 0.247,2.984	Prime + Parallel Group 3-4 in Hydrus1-2 (05)	800 Secs (800 Secs) *[==>]*	*[1]*
4		ANY	WFC3/UVIS, ACCUM, UVIS	F606W			Prime + Parallel Group 3-4 in Hydrus1-2 (05)	700 Secs (810 Secs) *[==>810.0 Secs]*	*[1]*
5		(6) HYDRUS1-2	ACS/WFC, ACCUM, WFC	F814W		POS TARG 0.247,2.984	Prime + Parallel Group 5-6 in Hydrus1-2 (05)	800 Secs (800 Secs) *[==>]*	*[1]*
6		ANY	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 5-6 in Hydrus1-2 (05)	700 Secs (842 Secs) *[==>842.0 Secs]*	*[1]*
7		(6) HYDRUS1-2	ACS/WFC, ACCUM, WFC	F814W		POS TARG 0,0	Prime + Parallel Group 7-8 in Hydrus1-2 (05)	499 Secs (499 Secs) *[==>]*	*[1]*
8		ANY	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=9		Prime + Parallel Group 7-8 in Hydrus1-2 (05)	499 Secs (499 Secs) *[==>]*	*[1]*

Orbit Structure