



16222 - Extinction Mapping in Leo P: Resolving the Dust Properties of the Lowest-Metallicity ISM in the Local Universe

Cycle: 28, Proposal Category: GO

(UV Initiative)

(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) LEO-P	WFC3/UVIS	3	15-Mar-2021 19:00:14.0	yes
02	(1) LEO-P	WFC3/IR WFC3/UVIS	2	15-Mar-2021 19:00:15.0	yes
03	(1) LEO-P	WFC3/IR	1	15-Mar-2021 19:00:16.0	yes

6 Total Orbits Used

ABSTRACT

Leo P is the closest extremely metal poor galaxy that is still forming stars - only 1.62 Mpc away, with a metallicity of only 0.03 Zsol. This makes it a unique object, able to provide insights onto the ISM at these extreme metallicities, and acting as a local laboratory for understanding primitive systems at high redshift. We propose using 6 orbits of HST imaging to obtain observations of Leo P in 4 UV-NIR filters. This data will enable us to perform panchromatic extinction mapping in Leo P - fitting the multiwavelength SEDs of its stars, and modelling the dust along the line-of-sight to each. We will thereby produce a resolved map of the dust extinction in Leo P - the first ever map of the cold star-forming ISM in an extremely metal poor galaxy. This dust map will tell us the amount, location, and properties, of the dust in Leo P - providing invaluable constraints on how the ISM evolves at the lowest metallicities, and supporting the calibration of metallicity corrections for primitive systems at high redshift.

OBSERVING DESCRIPTION

Our proposal is to observe the extremely metal poor nearby (1.62 Mpc) dwarf galaxy Leo P in four filters: F275W, F336W, F110W, and F160W. We will be observed the resolved stellar populations in Leo P, aiming to maximise the numbers of stars detected in all four bands. The integration times for each band are distributed accordingly. (Our observations will be used in conjunction with deep archival F475W and F814W data in our analysis.)

In F275W, we plan to conduct 3 orbits of exposures. These 3 exposures will be arranged in a WFC3-UVIS 3-point dither line. These observations should allow 5-sigma detection of stars down to 25.75 vegamag.

In F336W, we plan to conduct 1.6 orbits of exposure; one exposure lasting a full orbit, and a second orbit that will be partially spent performing a further F336W exposure (followed by our F110W exposures). The two F336 exposures will be arranged in a WFC3-UVIS 2-point dither line. These observations should allow 5-sigma detection of stars down to 26.14 vegamag.

In F110W, we plan to conduct 0.4 orbits of exposures (~16 mins), performed during the same orbit as the second F336W exposure described above. The two F110W exposures will be arranged in a WFC3-IR 2-point dither line. These observations should allow 5-sigma detection of stars down to 26.05 vegamag.

In F160W, we plan to perform 1 orbit of exposures. These two F160W exposures will be arranged in a WFC3-IR 2-point dither line. These

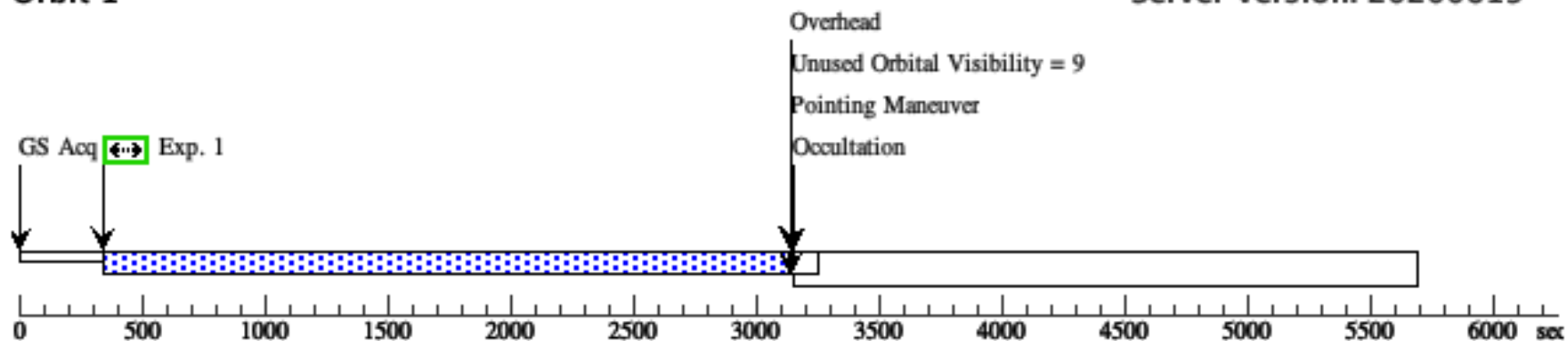
Proposal 16222 (STScI Edit Number: 1, Created: Monday, March 15, 2021 at 6:00:16 PM Eastern Standard Time) - Overview
observations should allow 5-sigma detection of stars down to 25.55 vegamag.

Proposal 16222 - Visit 01 - Extinction Mapping in Leo P: Resolving the Dust Properties of the Lowest-Metallicity ISM in the Local Univ...

Visit	Proposal 16222, Visit 01, implementation										Mon Mar 15 23:00:16 GMT 2021			
	Diagnostic Status: Warning													
	Scientific Instruments: WFC3/UVIS													
	Special Requirements: (none)													
Diagnostics	(Exposure 1 (Pattern 1, Exps 1-1 in Visit 01)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser													
Patterns	#	Primary Pattern					Secondary Pattern					Exposures		
	(1)	Pattern Type=WFC3-UVIS-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=					Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false					(1)		
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Fluxes			Miscellaneous		
	(1)	LEO-P	RA: 10 21 44.5698 (155.4357075d) Dec: +18 05 24.53 (18.09015d) Equinox: J2000			Epoch of Position: 2015.5 Radial Velocity: 260 km/sec			V=16.78+/-0.2			Reference Frame: ICRS		
Comments: Category=GALAXY Description=[LSB] Extended=YES														
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]			Orbit	
	1		(1) LEO-P	WFC3/UVIS, ACCUM, UVIS2-FIX		F275W	FLASH=10	GS ACQ SCENARI O BASE1B3	Pattern 1, Exps 1-1 i n Visit 01 (1)	2756 Secs (8268 Secs)				
										[==>(Pattern 1)]			[1]	
										[==>(Pattern 2)]			[2]	
										[==>(Pattern 3)]			[3]	
Comments: According to the HST ETC (Request ID: WFC3UVIS.im.1447512), each of the exposures in this pattern should have 10 e- pixel due to background, so the post-flash of 10 e- should bring this up to the requested 20 e-.														

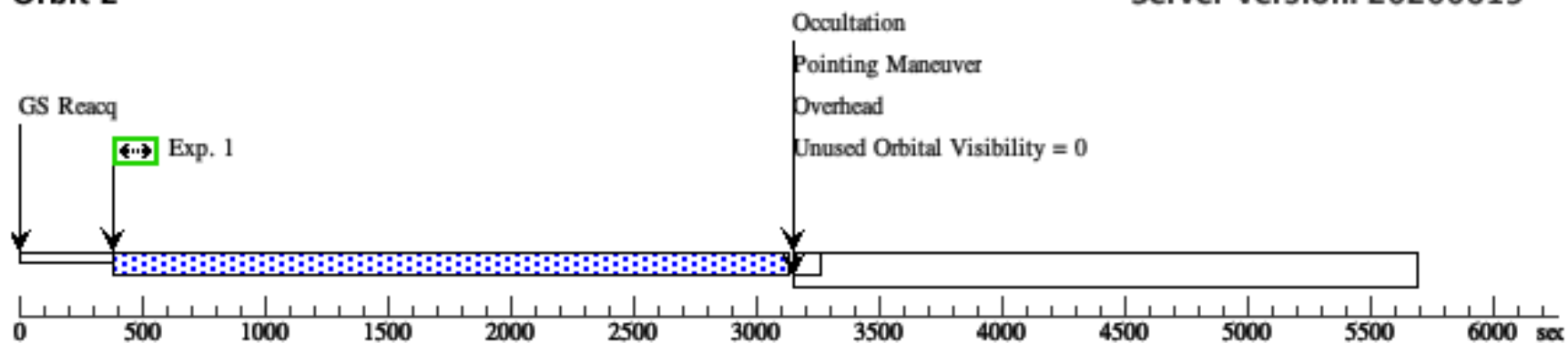
Orbit 1

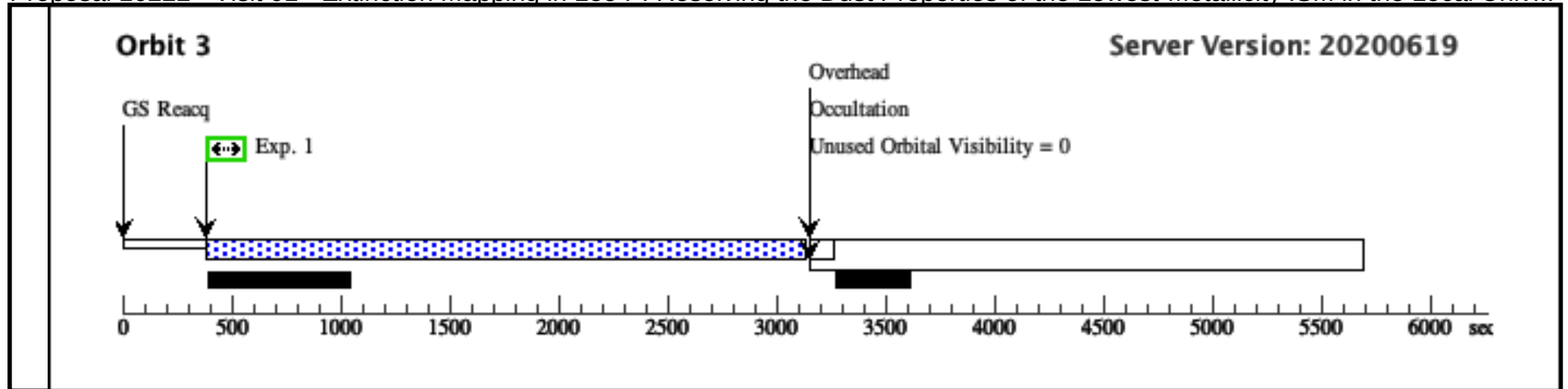
Server Version: 20200619



Orbit 2

Server Version: 20200619



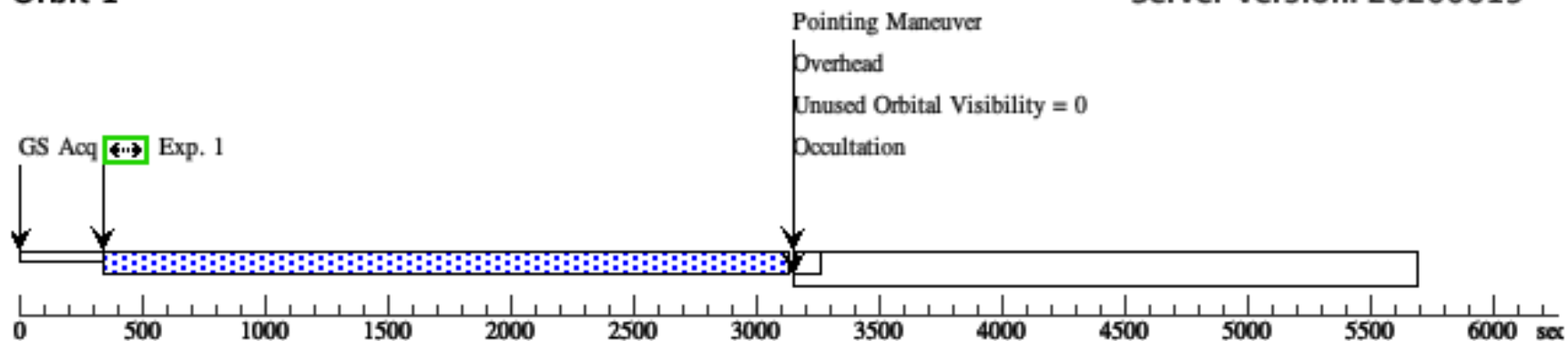


Proposal 16222 - Visit 02 - Extinction Mapping in Leo P: Resolving the Dust Properties of the Lowest-Metallicity ISM in the Local Univ...

Visit	Proposal 16222, Visit 02, scheduling										Mon Mar 15 23:00:17 GMT 2021
	Diagnostic Status: Warning										
	Scientific Instruments: WFC3/IR, WFC3/UVIS										
	Special Requirements: (none)										
Diagnostics	(Exposure 2 (Visit 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			
	(1)	LEO-P	RA: 10 21 44.5698 (155.4357075d) Dec: +18 05 24.53 (18.09015d) Equinox: J2000	Epoch of Position: 2015.5 Radial Velocity: 260 km/sec		V=16.78+/-0.2		Reference Frame: ICRS			
Comments: Category=GALAXY Description=[LSB] Extended=YES											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1		(1) LEO-P	WFC3/UVIS, ACCUM, UVIS2-FIX	F336W	FLASH=7			2640 Secs (2765 Secs)		
									[==>2765.0 Secs]		[1]
	Comments: Becuase this exposure is long enough to exceed the old 12 e- per pixel due to background CTE threshold, the HST ETC does not give the background e- value for it. However, extrapolating from our other F336W exposure, which is a factor of 1.73 shorter and had background of 7 e-, this exposure should have 13 e- pixel due to background so the post-flash of 7 e- should bring this up to the requested 20 e-.										
	2		(1) LEO-P	WFC3/UVIS, ACCUM, UVIS2-FIX	F336W	FLASH=13	POS TARG 0.1,0.1		1560 Secs (1597 Secs)		
									[==>1597 Secs]		[2]
	Comments: According to the HST ETC (Request ID: WFC3UVIS.im.1447515), this exposure should have 7.1 e- pixel due to background, so the post-flash of 13 e- should bring this up to the requested 20 e-.										
	3		(1) LEO-P	WFC3/IR, MULTIACCUM, IR-FIX	F110W	NSAMP=14; SAMP-SEQ=STEP5 0			449.233834 Secs (449.234 Secs)		
									[==>]		[2]
	4		(1) LEO-P	WFC3/IR, MULTIACCUM, IR-FIX	F110W	NSAMP=14; SAMP-SEQ=STEP5 0	POS TARG 1.422,1. 272		449.233834 Secs (449.234 Secs)		
								[==>]		[2]	

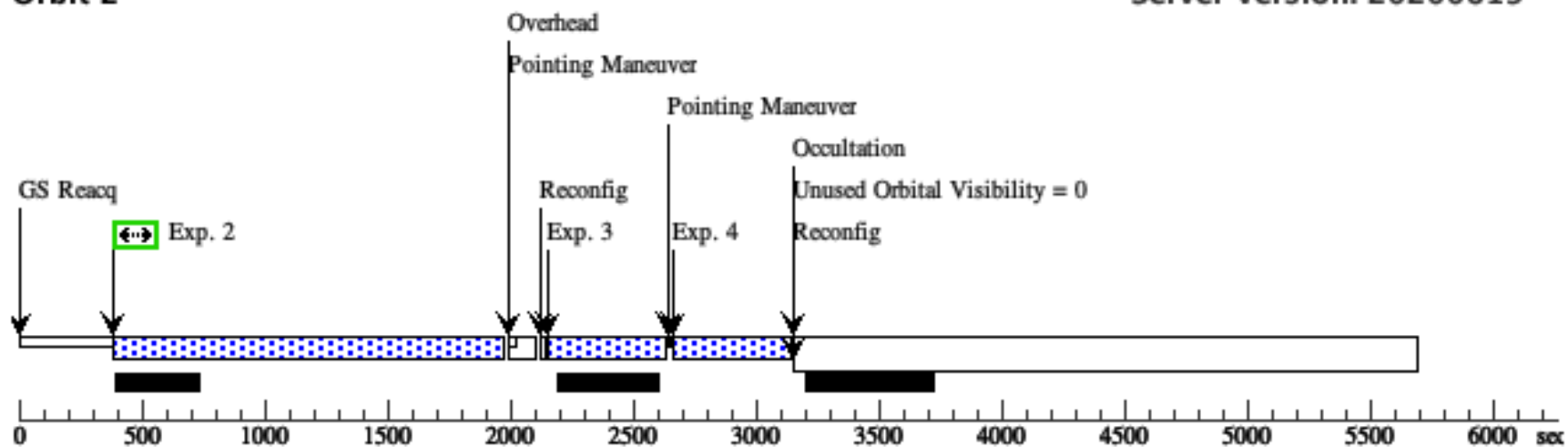
Orbit 1

Server Version: 20200619



Orbit 2

Server Version: 20200619



Visit	Proposal 16222, Visit 03, scheduling									
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR									
	Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(1)	LEO-P	RA: 10 21 44.5698 (155.4357075d)		Epoch of Position: 2015.5		V=16.78+/-0.2		Reference Frame: ICRS	
			Dec: +18 05 24.53 (18.09015d)		Radial Velocity: 260 km/sec					
			Equinox: J2000							
	Comments: Category=GALAXY Description=[LSB] Extended=YES									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) LEO-P	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=15; SAMP-SEQ=STEP1 00			899.233261 Secs (899.233 Secs) [==>]	[1]
	2		(1) LEO-P	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=14; SAMP-SEQ=STEP1 00	POS TARG 1.77,0.2 4		799.232938 Secs (799.233 Secs) [==>]	[1]
	3		(1) LEO-P	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG 0.684,0. 849		899.233261 Secs (899.233 Secs) [==>]	[1]
Orbit Structure	Orbit 1 Server Version: 20200619 GS Acq Exp. 1 Pointing Maneuver Exp. 2 Pointing Maneuver Exp. 3 Reconfig Unused Orbital Visibility = 8 Occultation									