



18243 - Spatially Resolving A HMXB Stellar Population at Cosmic Noon With Strong Lensing

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. Matthew Bayliss (PI) (Contact)	University of Cincinnati Main Campus
Dr. Joshua Aaron Roberson (CoI)	University of Cincinnati Main Campus
Dr. Taylor Alexandra Hutchison (CoI)	NASA Goddard Space Flight Center
Prof. Keren Sharon (CoI)	University of Michigan
Dr. Jane R. Rigby (CoI)	NASA Goddard Space Flight Center
Prof. Michael A. McDonald (CoI)	Massachusetts Institute of Technology
M. Riley Owens (CoI)	University of California - Berkeley
Dr. Gourav Khullar (CoI)	University of Washington
Dr. Michael Florian (CoI)	Eureka Scientific Inc.
Dr. Haakon Dahle (CoI) (ESA Member)	University of Oslo
Prof. Michael D. Gladders (CoI)	University of Chicago
Dr. Keunho J. Kim (CoI)	California Institute of Technology
Dr. Guillaume Mahler (CoI) (ESA Member)	Universite de Liege
Dr. Catherine Cerny (CoI)	University of Michigan
Erik Solhaug (CoI)	University of Chicago
Ms. Aleena Ebey (CoI)	University of Cincinnati Main Campus
Cole Panzer (CoI)	University of Cincinnati Main Campus

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-XRAY-ARC	WFC3/UVIS	3	22-Apr-2026 15:00:14.0	yes
02	(1) PHOENIX-XRAY-ARC	WFC3/UVIS	2	22-Apr-2026 15:00:15.0	yes

5 Total Orbits Used

ABSTRACT

High Mass X-ray Binaries (HMXBs) trace some of the youngest, most extreme, stellar populations. They produce large amounts of high energy emission and feedback in galaxies that are dominated by young stellar populations, a stage that describes all galaxies at some point in their evolutionary history. Furthermore, these extreme but short-lived X-ray sources can clear out the interstellar medium (mechanically), and ionize gas - both important processes for driving cosmic re-ionization. However, HMXBs and their associated stellar populations are not well-understood, especially in the distant universe. Characterizing these sources and the stellar populations that host them is crucial for a wide range of problems in observational astrophysics, from high-mass stars to galaxy evolution to re-ionization. We propose a unique study of the only highly magnified X-ray emitting dwarf starburst galaxy known. Hubble imaging and ground based spectroscopy reveal that the lensed dwarf ($\log M/M_{\text{Sun}} < 8$) galaxy hosts an X-ray bright HMXB population. The strong lensing magnification enables a zoomed-in, spatially resolved study of the HMXB-hosting region within the lensed galaxy. These data will measure the isolated emission from the HMXB population, undiluted by other regions of the galaxy, enabling a study that connects star-formation, nebular gas in the ISM, stellar populations, and HMXBs on the star cluster scale during the epoch of peak star-formation in the Universe. Joint HST UV imaging and archival MIRI imaging will multiply the science value of the JWST observations, constraining the gas and stellar populations. This HST program was awarded jointly with JWST program JWST-GO-10329.

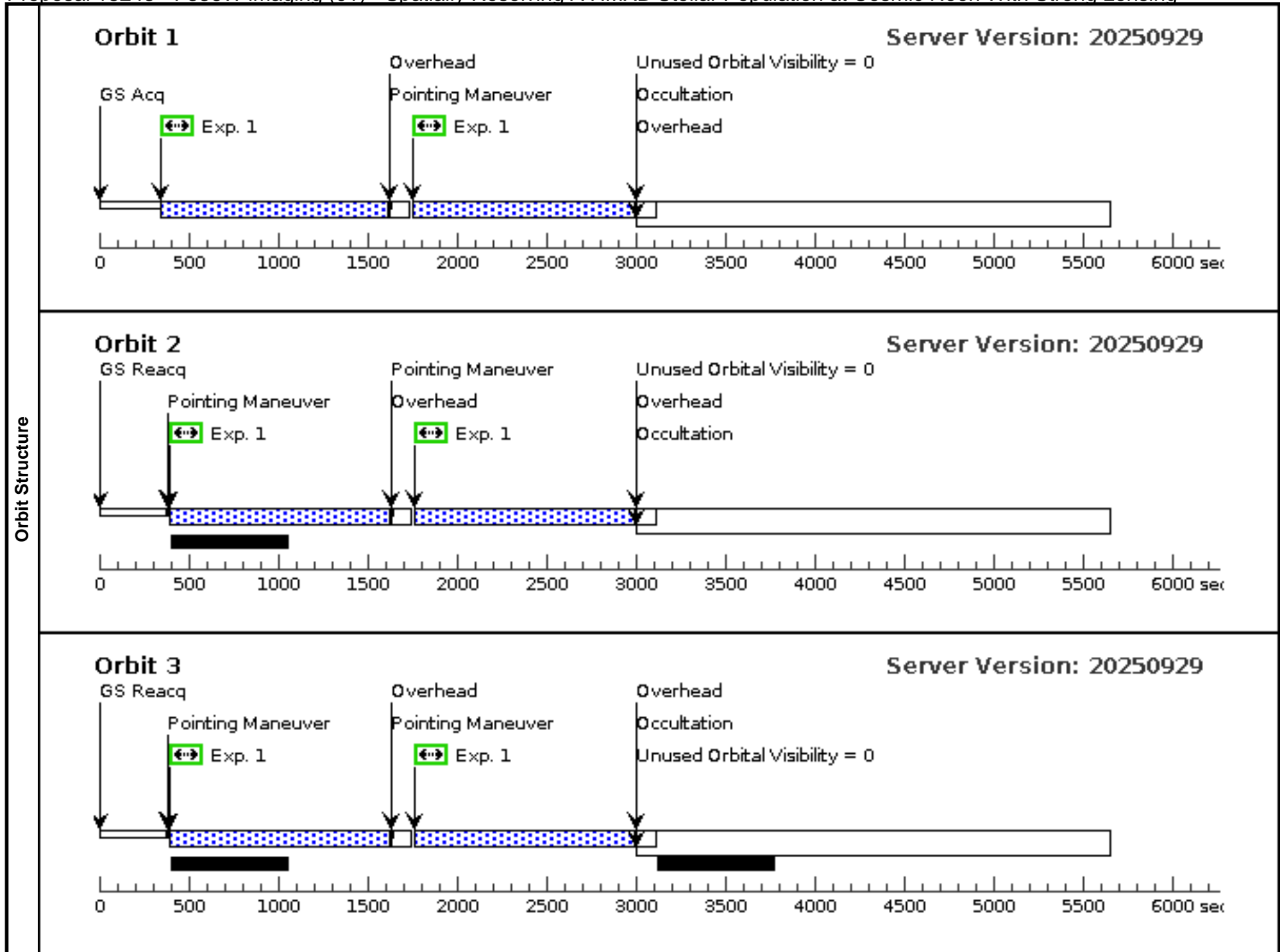
OBSERVING DESCRIPTION

This is a program awarded jointly with a cycle 5 JWST program that is targeting a highly magnified, strongly lensed dwarf galaxy with confirmed low-luminosity X-ray emission, believed to originate from a high mass X-ray binary population in the lensed galaxy. The goal of the observations is to measure the spatially resolved properties of the stellar populations and nebular gas across the lensed galaxy, and in particular to zero in on the properties of the region of the galaxy that produces the X-ray emission. The JWST data will deliver rest-frame optical through-NIR imaging and spectroscopy of the lensed galaxy, which will be combined with HST imaging spanning the rest-frame UV. Three archival HST imaging bands for this field cover $\sim 4800\text{-}8000$ angstroms, immediately blueward of the JWST data. This HST program will obtain new imaging in two blue WFC3/UVIS filters (F336W and F390W) that provide complementary coverage of the lensed galaxy's spectral energy distribution extending to the far rest-frame UV, where the hottest, most massive stars dominate the continuum emission.

Proposal 18243 - F336W imaging (01) - Spatially Resolving A HMXB Stellar Population at Cosmic Noon With Strong Lensing

Wed Apr 22 19:00:15 GMT 2026

Visit	Proposal 18243, F336W imaging (01) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	#	Primary Pattern				Secondary Pattern				Exposures
		(1)	Pattern Type=WFC3-UVIS-GAP-LINE Purpose=MOSAIC Number Of Points=2 Point Spacing=2.414 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.759 Angle Between Sides= Center Pattern=true	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)	PHOENIX-XRAY-ARC	RA: 23 44 46.4507 (356.1935446d) Dec: -42 43 5.43 (-42.71817d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0	V=24.0+/-0.05	Reference Frame: ICRS				
Comments: Category=GALAXY Description=[STARBURST]										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) PHOENIX-XRAY-ARC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F336W	FLASH=15		Pattern 1, Exps 1-1 in F336W imaging (01) (1)	1100 Secs (7388 Secs) [=>1238.0 Secs (Pattern 1,1)] [=>1238.0 Secs (Pattern 1,2)] [=>1228.0 Secs (Pattern 1,3)] [=>1228.0 Secs (Pattern 2,1)] [=>1228.0 Secs (Pattern 2,2)] [=>1228.0 Secs (Pattern 2,3)]	[1] [2] [3]



Orbit Structure

Proposal 18243 - F390W imaging (02) - Spatially Resolving A HMXB Stellar Population at Cosmic Noon With Strong Lensing

Wed Apr 22 19:00:15 GMT 2026

Visit	Proposal 18243, F390W imaging (02) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	Patterns	#	Primary Pattern				Secondary Pattern			
(2)		Pattern Type=WFC3-UVIS-GAP-LINE Purpose=MOSAIC Number Of Points=2 Point Spacing=2.414 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.759 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 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)	PHOENIX-XRAY-ARC	RA: 23 44 46.4507 (356.1935446d) Dec: -42 43 5.43 (-42.71817d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0	V=24.0+/-0.05	Reference Frame: ICRS				
	<i>Comments:</i> Category=GALAXY Description=[STARBURST]									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(1) PHOENIX-XRAY-ARC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F390W	FLASH=12			Pattern 2, Exps 1-1 in F390W imaging (02) (2)	1200 Secs (4932 Secs)	
									[=>1239.0 Secs (Pattern 1,1)]	[1]
									[=>1239.0 Secs (Pattern 1,2)]	
								[=>1227.0 Secs (Pattern 2,1)]		
								[=>1227.0 Secs (Pattern 2,2)]	[2]	

