



2774 - The Environment of ULAS J1120+0641

Cycle: 2, Proposal Category: GTO

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. George Rieke (PI)	University of Arizona
Dr. Stacey Alberts (CoI) (Contact)	University of Arizona
Dr. Jianwei Lyu (CoI)	University of Arizona
Meredith Stone (CoI)	University of Arizona
Dr. Michael Florian (CoI)	University of Arizona
Dr. Irene Shivaiei (CoI)	University of Arizona

OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1	ULAS J1120	NIRCam Imaging	(2) ULASJ1120+0641-host

ABSTRACT

The existence of luminous quasars associated with intense star formation in the early Universe requires a rapid build up of both super massive black holes and host galaxies. At these early times, it is likely that these quasars are associated with highly overdense regions, young proto-clusters which may collapse to the most massive clusters at present day. However, due to several observational limitations, the literature is currently conflicted on whether quasars at high- z occupy galaxy overdensities. We propose to observe ULAS J1120+0641, a spectroscopically-confirmed quasar at $z=7.0842$, with NIRCam narrow and medium band imaging to identify or rule out a surrounding overdensity of faint emission line galaxies. We will use multiple bands centered on the redshifted wavelength of [OIII]5007, which will allow us to probe for a protocluster at the exact redshift of the quasar (1% bandwidth in F405N) and also for a larger overdensity (10% bandwidth in F410M). Combined with previous measurements (deep HST), this will probe whether the quasar has a host galaxy that has grown by what is considered the "normal" process, e.g., mergers with other members of an overdensity.

OBSERVING DESCRIPTION

ULAS J1120+0641 will be centered in NIRCcam module B, with module A providing a flanking field. The INTRAMODULEBOX pattern with four primary dithers will be used to cover the short wavelength detector gaps. Imaging will be obtained in three filter sets: F405N(+F444W) and F090W, F410M and F150W, and F360M and F200W. F405N and F410M will contain the [OIII]5007 emission line at the redshift of the quasar, which will be identified as color excess compared to the other long wave bands measuring continuum. At $z \sim 7$, these emission lines are known to have large equivalent widths and assuming this, we have determined exposures times which will be detected down to $SFR \sim 1 M_{\odot}/yr$.

For the short wave bands, F090W will contain the Ly-alpha emission line and refine photometric redshifts, while F150W and F277W will measure the continuum and help remove interlopers. HST will further be used to identify interlopers, primarily from the H-alpha line at $z \sim 5$, [SII] at $z \sim 3.5$ and [SIII] at $z \sim 3.3$. Galaxies at higher redshifts than ULAS J1120+0641 may enter the band with [OIII]4959 ($z \sim 7.2$), H-beta ($z \sim 7.3$), and H-gamma ($z \sim 8.3$); however, these lines are weaker than [OIII]5007 and/or should have clear Lyman breaks in HST+F090W.

Proposal 2774 - Targets - The Environment of ULAS J1120+0641

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	ULASJ1120+0641	RA: 11 20 1.4800 (170.0061667d) Dec: +06 41 24.30 (6.69008d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000	
Fixed Targets	<i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei, Quasars]</i>				
	(2)	ULASJ1120+0641-host	RA: 11 20 1.4500 (170.0060417d) Dec: +06 41 24.10 (6.69003d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000	
	<i>Comments: The host of ULASJ1120 is offset from the quasar by ~0.5".</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei, Quasars]</i>				

Proposal 2774 - Observation 1 - The Environment of ULAS J1120+0641

Tue Oct 10 23:00:09 GMT 2023

Observation	<p>Proposal 2774, Observation 1: ULAS J1120</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Imaging</p> <p><i>Comments: This program requires that the quasar be centered in NIRCcam Module B.</i></p>									
Diagnostics	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections			Miscellaneous		
	(2)	ULASJ1120+0641-host	RA: 11 20 1.4500 (170.0060417d) Dec: +06 41 24.10 (6.69003d) Equinox: J2000		Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000					
	<p><i>Comments: The host of ULASJ1120 is offset from the quasar by ~0.5".</i></p> <p><i>Category=Galaxy</i></p> <p><i>Description=[Active galactic nuclei, Quasars]</i></p>									
Template	Module		Subarray			Target Placement				
	ALL		FULL			Module Gap				
Dithers	#	Primary Dither Type		Primary Dithers	Subpixel Dither Type		Dither Size	Subpixel Positions		
	1	INTRAMODULEBOX		4	STANDARD			1		
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
	1	F090W	F405N+F444W	DEEP2	7	2	8	4	10522.035	121351
	2	F150W	F410M	DEEP2	7	1	4	4	5239.544	121351
	3	F200W	F360M	DEEP2	7	1	4	4	5239.544	121351
Special Requirements	Offset 98.0 arcsec, 11.0 arcsec									