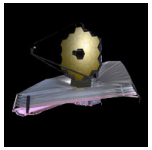

3293 - JWST's GLIMPSE: gravitational lensing & NIRCam imaging to probe early galaxy formation and sources of reionization

Cycle: 2, Proposal Category: GO

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OBSERVATIONS

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
AS1063				
	1		NIRCam Imaging	(1) ACO-S-1063

ABSTRACT

Low-mass galaxies hold the key to the formation process of the first galaxies: the interplay between gas accretion which fuels star formation and the subsequent stellar feedback which inhibits further star formation is likely reflected in the prevalence of low-mass galaxies at early epochs, a few hundred million years after the Big Bang. We propose to combine the power of strong gravitational lensing with ultra-deep NIRCam imaging to achieve three main goals: (1) to measure the prevalence of faint galaxies at z>6 to establish, for the first time, key observational benchmarks for galaxy formation models, which have never been confronted to this uncharted territory; (2) strongly constrain the contribution of the faintest galaxies towards cosmic reionization; (3) probe the typical galaxy population during the Dark Ages, that remains out of reach of current programs.

Despite heroic integration times, current deep JWST programs achieve at best the same intrinsic depth as the Hubble Frontier Fields (HFF, ~31 mag). Here, we propose to extend this observational frontier into the JWST era by using the best HFF lensing cluster AS1063 to push down to 30.6-31 mag, which corresponds to an intrinsic depth of 33-35 mag. We will detect galaxies at z>6 more than a thousand times fainter than the Milky Way. Combined with increasingly powerful numerical simulations, this body of work will radically transform our understanding of galaxy formation and the epoch of reionization.

This unprecedented dataset will showcase the full potential of JWST. In the spirit of the HFF and deep JWST programs, our team commits to rapidly releasing high-quality data products and catalogs to the community.

OBSERVING DESCRIPTION

We will obtain deep NIRCam imaging of the best Frontier Fields lensing cluster Abell S1063 in seven broadband filters and two medium-band filters. The goal is to reach an absolute magnitude limit of M(UV)=-12 for galaxies at z>6. Using multiple independent lensing models, we simulate the lensing power of AS1063 through our NIRCam pointing, with the corresponding uncertainties. Our modeling results in an observed depth of 30.6-31AB mag.

The compact morphology and the size of the high-magnification region fits well within one NIRCam module. Therefore, the center coordinates will be determined according to the position angle of the allocated observing window. AS 1063 has an excellent visibility window, especially regarding the Micrometeoroid Avoidance Zone.

We will obtain the deepest imaging in F090W (39h) and F115W (39h) to constrain the Lyman break of galaxies during the reionization epoch (z=6-9). We will combine dropout color-color selection techniques and photometric redshifts estimates with SED-fitting tools. To achieve the most accurate estimate, we will also obtain longer wavelength imaging in the F150W/F277W pair (23h) and the F200W/F356W pair (19h). This combination of filters will be also essential for the selection of Dark Ages galaxies, whose Lyman break is shifted to F115W and F150W filters. While the F44W exposure will be simultaneous to F115W, we split the LW channel exposure corresponding to F090W into two exposures for the medium-band filters F410M (16h) and F480M (23h). By bracketing rest-frame optical emission lines, these medium-band filters dramatically improve the constraints on redshift and physical properties of galaxies. We estimated their exposure times assuming a typical flux of 2e-19 erg s-1 cm-2 , which results in SNR=7. We use the DEEP8 readout pattern for all exposures. The total science time is 120h, and the total charged time is 148h.

We adopt a compact INTRAMODULEBOX dither pattern with 4 positions to cover the short wavelength intra-module gaps while maximizing the full-depth area. In addition, we use a subpixel dither with 4 positions to best sample the PSF. The higher spatial resolution that will be achieved will be important for the size measurements of faint galaxies.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ACO-S-1063	RA: 22 48 44.1306 (342.1838775d) Dec: -44 31 57.50 (-44.53264d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Clusters of Galaxies
Description=[Abell clusters]

Observation

Proposal 3293, Observation 1

Tue Apr 23 21:01:37 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:5) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:6) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:7) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

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Template

Module	Subarray	Target Placement
ALL	FULL	B Short (on B4)

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEBOX	6	SMALL-GRID-DITHER		4

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	F410M	MEDIUM8	8	1	24	24	20099.233	
2	F090W	F410M	MEDIUM8	8	1	24	24	20099.233	
3	F090W	F410M	MEDIUM8	8	1	24	24	20099.233	
4	F090W	F480M	MEDIUM8	8	1	24	24	20099.233	
5	F090W	F480M	MEDIUM8	8	1	24	24	20099.233	
6	F090W	F480M	MEDIUM8	8	1	24	24	20099.233	
7	F090W	F480M	MEDIUM8	8	1	24	24	20099.233	
8	F115W	F444W	MEDIUM8	8	1	24	24	20099.233	
9	F115W	F444W	MEDIUM8	8	1	24	24	20099.233	
10	F115W	F444W	MEDIUM8	8	1	24	24	20099.233	
11	F115W	F444W	MEDIUM8	8	1	24	24	20099.233	
12	F115W	F444W	MEDIUM8	8	1	24	24	20099.233	
13	F115W	F444W	MEDIUM8	8	1	24	24	20099.233	
14	F115W	F444W	MEDIUM8	8	1	24	24	20099.233	
15	F150W	F277W	MEDIUM8	8	1	24	24	20099.233	
16	F150W	F277W	MEDIUM8	8	1	24	24	20099.233	
17	F150W	F277W	MEDIUM8	8	1	24	24	20099.233	
18	F150W	F277W	MEDIUM8	8	1	24	24	20099.233	
19	F200W	F356W	MEDIUM8	7	1	24	24	17522.409	
20	F200W	F356W	MEDIUM8	7	1	24	24	17522.409	
21	F200W	F356W	MEDIUM8	7	1	24	24	17522.409	
22	F200W	F356W	MEDIUM8	7	1	24	24	17522.409	

Special Requirements

Sequence Visits within 53 Days
Aperture PA Range 136.05262691 to 141.05262691 Degrees (V3 136.0 to 141.0)
Aperture PA Range 145.55262691 to 153.05262691 Degrees (V3 145.5 to 153.0)
Aperture PA Range 169.55262691 to 173.55262691 Degrees (V3 169.5 to 173.5)
Aperture PA Range 179.05262691 to 181.05262691 Degrees (V3 179.0 to 181.0)
Aperture PA Range 193.05262691 to 236.55262691 Degrees (V3 193.0 to 236.5)
Aperture PA Range 238.05262691 to 246.55262691 Degrees (V3 238.0 to 246.5)
Aperture PA Range 251.55262691 to 254.05262691 Degrees (V3 251.5 to 254.0)
Aperture PA Range 265.55262691 to 267.55262691 Degrees (V3 265.5 to 267.5)
Aperture PA Range 299.05262691 to 134.05262691 Degrees (V3 299.0 to 134.0)
Visits Same PA
Background Limited. Background no more than 30th percentile above minimum
Fiducial Point Override NRCBS_FULL