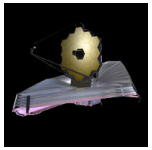

4111 - Medium bands, Mega Science: spatially-resolved R~15 spectrophotometry of 50,000 sources at z=0.3-12

Cycle: 2, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
NIRCam prime + NIRISS parallel				
	1		NIRCam Imaging	(1) ABELL2744
	2		NIRCam Imaging	(2) ABELL2744-PREIMG-REPEAT2

ABSTRACT

Early JWST observations have already catalyzed a paradigm shift in our understanding of the distant universe. However, many of these surprising discoveries are based on broad-band photometry, which can often permit contradictory physical interpretations. Here we propose to break these broad-band degeneracies and move towards a new physical understanding of the distant universe by leveraging the transformative power of medium-band imaging to efficiently map both stellar continuum and nebular line emission for large, unbiased galaxy samples. By observing the well-studied Abell 2744 field with all available medium-band NIRCam filters, we will map strong emission features from the cluster itself through the era of reionization. We will simultanously probe multiple emission lines to directly map both star formation and dust obscuration and chart the growth of galaxies across >10 Gyr of cosmic history. Our data will also yield high-fidelity measurements of photometric redshifts (~3x improvement over existing data) and stellar masses (~2x improvement). Lensing from the cluster boosts our effective integration time by up to a factor of 10 and allows

us to map emission lines at the highest possible resolution with JWST. Our proposed science can only be done with medium-band imaging: grism is not sensitive enough for continuum emission, and has difficulty disentangling spectral and spatial variations; meanwhile, spectroscopy is subject to small sample sizes and slit losses. This public dataset will add to the legacy value of JWST Cycle 1 observations of Abell 2744 and create the ideal field in which to refine our physical models of the distant universe.

OBSERVING DESCRIPTION

Strategy & filters: we propose a 4-pointing gap-filled NIRCam mosaic of the Abell 2744 field using all available medium-band filters. Abell 2744 already has existing NIRCam data in the F115W, F150W, F200W, F277W, F356W, F410M, and F444W filters from the GO-UNCOVER program. We exactly replicate the mosaic settings of GO-UNCOVER to ensure uniform coverage of both broad and medium-band imaging across the field. We require 7 filter sets to cover all remaining NIRCam red-side medium bands F250M, F300M, F335M, F360M, F430M, F460M, and F480M. We pair these with the four blue-side medium bands F140M, F162M, F182M, and F210M. We additionally add F070W and double-depth imaging in F090W, which were not observed by GO-UNCOVER. These blue bands can be used for dropout science at z>5; testing shows that this strategy provides more accurate and precise EAZY photo-zs than doubling up on any of our blue medium-band filters or observing F090W alone.

Depth: Our required depth is set by our primary science goals of (a) detecting emission lines via medium-band flux excesses, and (b) detecting stellar continuum emission in line-free regions. We quantify our sensitivity to emission lines using the Jaguar catalog of simulated galaxies (Williams+18). Given our 5sigma imaging depths from the ETC, we expect to reliably detect color excesses due to Halpha emission to limiting SFRs of ~0.3Msun/yr at z~2 and ~2Msun/yr at z~5. We additionally quantify the expected improvement in photo-zs from this program by running EAZY on both the public UNCOVER catalog and a catalog where we add our proposed observations at our proposed depth, following the best-fit broad-band model of each galaxy. The resulting photo-zs are expected to be to be 2.7x more accurate from $0.3 < z < 12$ (3.0x more accurate at $0.3 < z < 8.5$, where F430M probes Hb+[OIII]), and for 1sigma photo-z uncertainties to decrease by 3.5x.

Coordinated parallels: We propose to use NIRISS in parallel to add additional imaging bands to the existing deep GO-UNCOVER parallel field. This strategy builds on JWST's existing investment in this field and allows us to expand the area over which we can do our proposed science. Photo-z analysis shows that we gain the most constraining power by observing F090W*2, F277W, F140M, F158M, F430M, and F480M; therefore, we request these observations in parallel to NIRCam.

Proposal 4111 - Targets - Medium bands, Mega Science: spatially-resolved R~15 spectrophotometry of 50,000 sources at z=0.3-12

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ABELL2744	RA: 00 14 18.2514 (3.5760475d) Dec: -30 22 46.04 (-30.37946d) Equinox: J2000		
Comments: *Category=Clusters of Galaxies* *Description=[Abell clusters]*				
(2)	ABELL2744-PREIMG-REPEAT2	RA: 00 14 21.5594 (3.5898308d) Dec: -30 21 35.99 (-30.36000d) Equinox: J2000		
Comments: *Category=Clusters of Galaxies* *Description=[Abell clusters]*				

Observation

Proposal 4111, Observation 1 Fri Nov 10 01:00:27 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Coordinated Parallel Template(s): NIRISS 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.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ABELL2744	RA: 00 14 18.2514 (3.5760475d) Dec: -30 22 46.04 (-30.37946d) Equinox: J2000		

Comments:
Category=Clusters of Galaxies
Description=[Abell clusters]

Template

NIRCam Imaging	NIRISS Imaging
Module: ALL	
Subarray: FULL	
Target Placement: Module Gap	

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
2	2	5.0	84.0	0.0	0.0	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Dither Size	Subpixel Positions	Coordinated Parallel Subpixel Selector	Dither Direct Images Primes
1	INTRAMODULEX	8		1	NIRCam Only	NO_DITHERING

Spectral Elements

NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F250M	MEDIUM8	5	1	8	8	4122.92	140863
2	F090W	F300M	MEDIUM8	5	1	8	8	4122.92	
3	F140M	F335M	MEDIUM8	5	1	8	8	4122.92	
4	F162M+F150W2	F360M	MEDIUM8	5	1	8	8	4122.92	
5	F182M	F430M	MEDIUM8	5	1	8	8	4122.92	
6	F210M	F460M	MEDIUM8	5	1	8	8	4122.92	
7	F070W	F480M	MEDIUM8	5	1	8	8	4122.92	

Spectral Elements

NIRISS Imaging	Filter	Grism	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F140M		NIS	11	1	8	8	3865.237	64244
2	F158M		NIS	11	1	8	8	3865.237	
3	F090W		NIS	11	1	8	8	3865.237	
4	F090W		NIS	11	1	8	8	3865.237	
5	F480M		NIS	11	1	8	8	3865.237	
6	F430M		NIS	11	1	8	8	3865.237	
7	F277W		NIS	11	1	8	8	3865.237	

Special Requirements

Group Visits within 28.0 Days
Aperture PA Range 35.0 to 45.0 Degrees (V3 35.0713531 to 45.0713531)
Visits Same PA
No Parallel Attachments
Background Limited. Background no more than 20th percentile above minimum

Observation

Proposal 4111, Observation 2 Fri Nov 10 01:00:27 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Coordinated Parallel Template(s): NIRISS Imaging

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	ABELL2744-PREIMG-REPEAT2	RA: 00 14 21.5594 (3.5898308d) Dec: -30 21 35.99 (-30.36000d) Equinox: J2000		

Comments:
Category=Clusters of Galaxies
Description=[Abell clusters]

Template

NIRCam Imaging	NIRISS Imaging
Module: ALL	
Subarray: FULL	
Target Placement: Module Gap	

Dithers

#	Primary Dither Type	Primary Dithers	Dither Size	Subpixel Positions	Coordinated Parallel Subpixel Selector	Dither Direct Images Primes
1	INTRAMODULEX	8		1	NIRCam Only	NO_DITHERING

Spectral Elements

NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F250M	MEDIUM8	5	1	8	8	4122.92	64243
2	F090W	F300M	MEDIUM8	5	1	8	8	4122.92	
3	F140M	F335M	MEDIUM8	5	1	8	8	4122.92	
4	F162M+F150W2	F360M	MEDIUM8	5	1	8	8	4122.92	
5	F182M	F430M	MEDIUM8	5	1	8	8	4122.92	
6	F210M	F460M	MEDIUM8	5	1	8	8	4122.92	
7	F070W	F480M	MEDIUM8	5	1	8	8	4122.92	

Spectral Elements

NIRISS Imaging	Filter	Grism	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F140M		NIS	11	1	8	8	3865.237	64244
2	F158M		NIS	11	1	8	8	3865.237	
3	F090W		NIS	11	1	8	8	3865.237	
4	F090W		NIS	11	1	8	8	3865.237	
5	F480M		NIS	11	1	8	8	3865.237	
6	F430M		NIS	11	1	8	8	3865.237	
7	F277W		NIS	11	1	8	8	3865.237	

Special Requirements	
	Aperture PA Range 35 to 50 Degrees (V3 35.0713531 to 50.0713531) No Parallel Attachments Background Limited. Background no more than 50th percentile above minimum