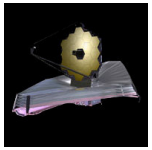

1895 - FRESCO: The First Reionization Epoch Spectroscopic COmplete Survey

Cycle: 1, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
GS-GrismR				
	1	NIRCam Grism GS	NIRCam Wide Field Slitless Spectroscopy	(2) GOODS-S-CENTER
GN-GrismR				
	2	NIRCam Grism GN	NIRCam Wide Field Slitless Spectroscopy	(4) GOODS-N-CENTER

ABSTRACT

Revealing the dramatic build-up of galaxies during the first 1 billion years to the peak of star formation at z~2-3 is one of Hubble's greatest achievements. Yet huge gaps in our understanding remain since our galaxy samples are incomplete due to the uncertainties of photometric selection. The highly-incomplete spectroscopic information at z>6 means that we lack physical understanding of the processes driving early galaxy assembly. To date, less than 1% of known galaxies in the epoch of reionization at z>6 have confirmed redshifts, and basic quantities such as mass-to-light ratios can be uncertain by factors of 5-10 — due to the unknown contributions of strong emission lines in the photometry used to derive stellar masses. As a result, we still only have a broad, phenomenological picture of early galaxy formation and growth. FRESCO exploits JWST's remarkable new spectroscopic capabilities to remedy this situation in a maximally-efficient way. By obtaining 2 hr deep NIRCam/grism observations with just the F444W filter, FRESCO will yield redshifts over a wide redshift range for a complete sample of ~330 z~7-9 galaxies, as well as ~1200 z~5-6.5 galaxies, in the Deep CANDELS areas of the GOODS-S and GOODS-N fields. FRESCO will yield an unprecedented Legacy archive, for the first time, of spectroscopic redshifts and emission line measurements from [OIII]+H-beta, H-alpha, and even Pa-alpha at low redshifts. FRESCO's grism observations provide the total line fluxes for estimating galaxy stellar mass and critically-needed slit-loss calibrations of NIRSpec/MSA spectra. We are not requesting proprietary time to ensure that FRESCO will be a key Legacy dataset for the community.

OBSERVING DESCRIPTION

FRESCO will obtain spectroscopy at 4-5 microns for a complete sample of ~330 z~7-9 galaxies, as well as ~1200 z~5-6.5 galaxies, over two ~60arcmin^2 fields, one on the Deep CANDELS-S area of the GOODS-S, and one on the Deep CANDELS-N area of GOODS-N. This is achieved with two 2x4 mosaics of NIRCam/grism observations in the F444W filter. Each mosaic is taken with significant column overlap in order to maximize the wavelength coverage over the field. We chose the NIRCam grism over the use of NIRSpec/MSA since it allows us to be complete in a way that cannot be done with NIRSpec, while also providing total line fluxes. The GTO NIRSpec/MSA observations in the same fields can only

reach completeness levels of ~30-40%, and then only if they prioritize z>6 galaxies. FRESCO's total fluxes measurements from the use of the grism will allow slit-loss calibrations for MSA observations by GTOs and GOs.

FRESCO will reach a 6-sigma emission-line sensitivity for NIRCam/grism observations of 3.3x10^{-18} erg/s/cm^2, which is the expected [OIII]5007 flux of sources at 1 mag below L* at z=7-9. Based on the ETC, we can reach such depths in 8x880s (MEDIUM2, Ngroups=9, Nint=1) in the F444W filter for each pointing. The two 2x4 mosaics in the grism, together with 15min direct and out-of-field images amount to a total requested science integration time of 35.5 hours for a high efficiency of 63%.

We will only use one dispersion direction, GRISMR, to save significantly on overhead costs, as was done by the only GTO program to use the NIRCam grism. We will build on the toolset, and the strong expertise of the community with the WFC3/IR grisms, to fully model the contamination of all galaxies within the field of view. We will obtain our exposures with 4-point large scale dithers, but no sub-pixel dithering. Since no parallels are requested, the sub-pixel dithers are not needed, and this maximizes efficiency. Direct images are taken after the last grism exposures. At the same time, we will take short-wavelength imaging over the same field. Images are taken with the SHALLOW4 and MEDIUM2 readout modes (6 and 9 groups) for the direct images and grism exposures, respectively. These needed shallow images are much shorter than the GTO imaging and not a duplication. The exposure times of the direct images are set to produce a 5 sigma detection for every single galaxy for which we expect an emission-line detection. This ensures that we can accurately associate spectra with the imaged galaxies in the field, despite only taking one dispersion direction.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	GOODS-S-CENTER	RA: 03 32 30.5790 (53.1274125d) Dec: -27 48 4.32 (-27.80120d) Equinox: J2000		
Comments: *Category=Unidentified* *Description=[Blank field]*				
(4)	GOODS-N-CENTER	RA: 12 36 45.9293 (189.1913721d) Dec: +62 14 45.70 (62.24603d) Equinox: J2000		
Comments: *Category=Unidentified* *Description=[Blank field]*				

Observation

Proposal 1895, Observation 1: NIRCam Grism GS Tue Feb 07 00:01:02 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Wide Field Slitless Spectroscopy

Diagnostics

(NIRCam Grism GS (Obs 1)) Warning (Form): Use of only one of GRISMR or GRISMC may result in spectral overlap from multiple sources that can't be corrected. Users should address this issue in their proposal text.

(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.

(Visit 1:8) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	GOODS-S-CENTER	RA: 03 32 30.5790 (53.1274125d) Dec: -27 48 4.32 (-27.80120d) Equinox: J2000		

Comments:
Category=Unidentified
Description=[Blank field]

Template

Module	Subarray	Grism (Long Wavelength)
ALL	FULL	GRISMR

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift	Column shift	Tile Order
4	2	3.0	64.7	0.0	0.0	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Positions
1	INTRAMODULEBOX	4	NONE

Direct Image

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	Grism (Long Wavelength)	Exposure Type	Total Dithers
1	F182M	F444W	SHALLOW4	6	1	1	311.366		GRISMR	Direct Image	1

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	Grism (Long Wavelength)	Exposure Type	Total Dithers
1	F210M	F444W	MEDIUM2	9	1	4	3521.661		GRISMR	Grism (Long Wavelength)	4
2	F182M	F444W	MEDIUM2	9	1	4	3521.661		GRISMR	Grism (Long Wavelength)	4
3	F182M	F444W	SHALLOW4	6	1	2	622.733			Out of Field	2

Special Requirements

Group Visits within 53.0 Days
Aperture PA Range 285 to 36 Degrees (V3 285.0 to 36.0)
Visits Same PA
Background Limited. Background no more than 10th percentile above minimum

Observation

Proposal 1895, Observation 2: NIRCam Grism GN Tue Feb 07 00:01:02 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Wide Field Slitless Spectroscopy

Diagnostics

(NIRCam Grism GN (Obs 2)) Warning (Form): Use of only one of GRISMR or GRISMC may result in spectral overlap from multiple sources that can't be corrected. Users should address this issue in their proposal text.

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

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

(Visit 2:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 2:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 2:5) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 2:6) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 2:7) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 2:8) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	GOODS-N-CENTER	RA: 12 36 45.9293 (189.1913721d) Dec: +62 14 45.70 (62.24603d) Equinox: J2000		

Comments:
Category=Unidentified
Description=[Blank field]

Template

Module	Subarray	Grism (Long Wavelength)
ALL	FULL	GRISMR

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift	Column shift	Tile Order
4	2	3.0	64.7	0.0	0.0	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Positions
1	INTRAMODULEBOX	4	NONE

Direct Image

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	Grism (Long Wavelength)	Exposure Type	Total Dithers
1	F182M	F444W	SHALLOW4	6	1	1	311.366		GRISMR	Direct Image	1

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	Grism (Long Wavelength)	Exposure Type	Total Dithers
1	F210M	F444W	MEDIUM2	9	1	4	3521.661		GRISMR	Grism (Long Wavelength)	4
2	F182M	F444W	MEDIUM2	9	1	4	3521.661		GRISMR	Grism (Long Wavelength)	4
3	F182M	F444W	SHALLOW4	6	1	2	622.733			Out of Field	2

Special Requirements

Group Visits within 53.0 Days
Visits Same PA
Background Limited. Background no more than 30th percentile above minimum