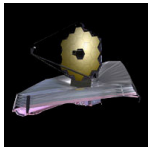

2918 - Does the Stellar Initial Mass Function Depend on Metallicity?

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	SW+LW	NIRCam Imaging	(1) SMC-IMF-JWST

ABSTRACT

The universality of the stellar initial mass function (IMF) is one of the most pervasive unsolved problems in astrophysics, with implications ranging from star formation to galaxy evolution and beyond. Incredibly, the question of whether the low-mass (<1 Msun) IMF depends on metallicity remains unanswered, with both observations and simulations providing ambiguous evidence. We propose the deepest and most precise IMF measurement ever made outside the solar neighborhood, enabling us to confirm or refute the metallicity dependence of the low-mass IMF.

We will use a single NIRCam pointing to image N>18k individually resolved stars down to 0.15 Msun in the Small Magellanic Cloud. We have harnessed extant imaging and spectroscopy to carefully select a field with a spectroscopically verified metallicity of 8% solar. The resulting imaging will allow us to:

1) Measure the lognormal characteristic IMF mass (setting the peak of the IMF) to 10% precision, and lognormal IMF width to 20% precision, for direct empirical comparison to the local Milky Way disk IMF;

2) Statistically discriminate between an IMF that is intrinsically lognormal versus a power-law, with broad implications for star formation theory.

Such an IMF measurement is uniquely feasible with JWST: The simultaneous SW+LW imaging capability of NIRCam is critical for selecting against compact background galaxies that have thwarted previous attempts to measure the low-mass stellar IMF using optical and/or near-infrared colors alone.

OBSERVING DESCRIPTION

We use a single NIRcam pointing towards a carefully-selected location in the SMC, performing simultaneous SW+LW imaging in F150W and F322W2. We opt against large dithers since maximizing S/N is more important than filling chip gaps. As a compromise between the need for cosmic ray rejection while keeping data volume reasonable, we use 8 groups/integration and 1 integrations/exposure, performing 16 STANDARD subpixel dithers to reach the desired S/N. We have verified that the background is not time variable, and we have also verified that our science goals are robust to choice of ORIENT.

Proposal 2918 - Targets - Does the Stellar Initial Mass Function Depend on Metallicity?

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SMC-IMF-JWST	RA: 01 00 36.0000 (15.1500000d) Dec: -74 59 42.00 (-74.99500d) Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Unidentified
Description=[Infrared sources, Visible sources]

Observation

Proposal 2918, Observation 1: SW+LW

Wed May 10 23:04:21 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

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
(1)	SMC-IMF-JWST	RA: 01 00 36.0000 (15.1500000d) Dec: -74 59 42.00 (-74.99500d) Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Unidentified
Description=[Infrared sources, Visible sources]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		STANDARD		16

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F150W	F322W2	MEDIUM8	8	1	16	16	13399.489	