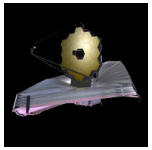

2128 - The First Resolved View of Individual Star Formation Across a Spiral Arm

Cycle: 1, Proposal Category: GO

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Erik Rosolowsky (PI) (CSA Member)	**University of Alberta**	**rosolowsky@ualberta.ca**
Dr. Eric Koch (CoI)	Smithsonian Institution Astrophysical Observatory	eric.koch@cfa.harvard.edu
Dr. Adam Leroy (CoI) (US Admin CoI)	The Ohio State University	leroy.42@osu.edu
Dr. Karin Marie Sandstrom (CoI)	University of California - San Diego	kmsandstrom@ucsd.edu
Dr. Julianne Dalcanton (CoI)	University of Washington	jd@astro.washington.edu
Dr. Benjamin F. Williams (CoI)	University of Washington	ben@astro.washington.edu
Dr. Adam Smercina (CoI)	University of Washington	asmerci@uw.edu
Dr. Lent Clifton Johnson (CoI)	Northwestern University	lcj@northwestern.edu
Dr. Thomas Williams (CoI) (ESA Member)	Max-Planck-Institut fur Astronomie, Heidelberg	williams@mpia.de
Dyas Utomo (CoI)	Associated Universities, Inc.	dutomo@nrao.edu
Dr. Jeremy Chastenet (CoI) (ESA Member)	Ghent University	jeremy.chastenet@ugent.be
Margaret Lazzarini (CoI)	University of Washington	mlazz@uw.edu
I-Da Chiang (CoI)	University of California - San Diego	idchiang@ucsd.edu

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	MIRI mosaic (On Source)	MIRI Imaging	(1) M-33
	2	MIRI mosaic (Off)	MIRI Imaging	(2) M33-OFF-POSITION

ABSTRACT

We propose parallel MIRI and NIRCam observations of M33, the nearest low-inclination spiral galaxy to the Milky Way (d=840 kpc). Our primary science goal is to produce the first-ever high resolution view of star formation across a propagating spiral arm. This view allows us to quantify the timescales of star formation and stellar cluster assembly. Our observational strategy uses two-band MIRI observations (F560W and F2100W) over a 5.5 sq. kpc region spanning the southwest spiral arm of the galaxy to detect YSOs in a region with rich ISM and HST data. Parallel NIRCam observations in four bands (F090W, F200W, F360M, F444W) will simultaneously map a 6.5 sq. kpc area in center of the galaxy, resolving the full stellar population to measure spatially-resolved star formation histories, PAH cooling, and embedded stellar cluster populations. We will be able to directly answer several long-standing questions about the star formation process including: Do extragalactic and galactic approaches to measuring star formation rates agree in spiral galaxies? How long are molecular clouds quiescent? How long are they dark? Does low mass star formation precede high mass star formation? (How much) Do molecular clouds continue grow after star formation begins?

OBSERVING DESCRIPTION

We request mapping of a 5x5 dithered MIRI mosaic in F560W and F2100W toward the southwest arm of the nearby spiral galaxy M33. We will collect snapshots from NIRCam in parallel in four different filters (F090W, F200W, F360M, F444W) and our visit timing is structured so that NIRCam observations will fall on the center of the galaxy and the mosaic orientations in MIRI will efficiently cover the up and downstream regions near spiral arm. We use select parallel modes for NIRCam observations to remain under the data rate limit for observations.

Our observations include 1 off-target MIRI integration to facilitate detector calibration for any extended structure since M33 is an extended target.

Proposal 2128 - Targets - The First Resolved View of Individual Star Formation Across a Spiral Arm

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	M-33	RA: 01 33 45.6690 (23.4402875d) Dec: +30 34 34.64 (30.57629d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Dwarf galaxies, Spiral arms, Spiral galaxies]* *Extended=YES*				
(2)	M33-OFF-POSITION	RA: 01 36 31.9109 (24.1329621d) Dec: +30 33 47.61 (30.56322d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: This is the blank field MIRI observation needed for calibration of extended structure. *Category=Calibration* *Description=[External flat field, Photometric]* *Extended=NO*				

Observation

Proposal 2128, Observation 1: MIRI mosaic (On Source) Wed Jun 15 20:00:26 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Background Observations:[MIRI mosaic (Off) (Obs 2)]

Coordinated Parallel Template(s): NIRCam Imaging

Diagnostics

(MIRI mosaic (On Source) (Obs 1)) Warning (Form): Use of background targets not expected with this template

(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.

(Visit 1:9) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:10) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:11) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:12) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:13) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:14) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:15) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:16) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:17) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:18) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:19) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:20) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:21) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:22) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:23) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:24) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:25) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	M-33	RA: 01 33 45.6690 (23.4402875d) Dec: +30 34 34.64 (30.57629d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Dwarf galaxies, Spiral arms, Spiral galaxies]
Extended=YES

Template

MIRI Imaging	NIRCam Imaging
Subarray: FULL	Module: B Subarray: FULL

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift	Column shift	Tile Order
5	5	10.0	10.0	0.0	0.0	DEFAULT

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-POINT-MIRI-F2100W-WITH-NIRCam				1	1			DEFAULT
2	4-POINT-MIRI-F770W-WITH-NIRCam				1	1			DEFAULT

Spectral Elements

MIRI Imaging	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F2100W	FASTR1	25	2	1	Dither 1	4	8	566.108	59436.2
2	F560W	FASTR1	25	2	1	Dither 2	4	8	566.108	59436.3

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	F335M	BRIGHT1	2	1	4	4	128.841	59436.6
2	F200W	F444W	SHALLOW2	2	1	4	4	300.63	59436.7

Special Requirements

Group Visits within 53.0 Days
Aperture PA Range 244.83425324 to 254.83425324 Degrees (V3 239.99880427 to 249.99880427)
Visits Same PA
No Parallel

Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 2128, Observation 2: MIRI mosaic (Off) Wed Jun 15 20:00:26 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Background Observation For: [MIRI mosaic (On Source) (Obs 1)]

Coordinated Parallel Template(s): NIRCam 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)	M33-OFF-POSITION	RA: 01 36 31.9109 (24.1329621d) Dec: +30 33 47.61 (30.56322d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This is the blank field MIRI observation needed for calibration of extended structure.
Category=Calibration
Description=[External flat field, Photometric]
Extended=NO

Template

MIRI Imaging	NIRCam Imaging
Subarray: FULL	Module: B Subarray: FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-POINT-MIRI-F2100W-WITH-NIRCam				1	1			DEFAULT
2	4-POINT-MIRI-F770W-WITH-NIRCam				1	1			DEFAULT

Spectral Elements

MIRI Imaging	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F2100W	FASTR1	25	2	1	Dither 1	4	8	566.108	59436.2
2	F560W	FASTR1	25	2	1	Dither 2	4	8	566.108	59436.3

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	F335M	BRIGHT1	2	1	4	4	128.841	59436.6
2	F200W	F444W	SHALLOW2	2	1	4	4	300.63	59436.7

Special Requirements	
	Aperture PA Range 244.83425324 to 254.83425324 Degrees (V3 239.99880427 to 249.99880427) No Parallel Sequence Observations 1, 2, Non-interruptible