



6852 - Calibrating Stellar Evolutionary Models using M31 Clusters

Cycle: 4, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1		MIRI Medium Resolution Spectroscopy	(1) M31-CLUSTER-2710
	2		MIRI Medium Resolution Spectroscopy	(2) M31-CLUSTER-1282
	3		MIRI Medium Resolution Spectroscopy	(3) M31-CLUSTER-445
	4		MIRI Medium Resolution Spectroscopy	(4) M31-CLUSTER-881
	5		MIRI Medium Resolution Spectroscopy	(5) M31-CLUSTER-1969
	6		MIRI Medium Resolution Spectroscopy	(6) BACKGROUND-FIELD

ABSTRACT

Accurate stellar evolutionary models are critical for estimating properties in high-redshift galaxies like mass, metallicity, and star formation history. These models have been calibrated using cluster AGB stars within the Magellanic Clouds; however, it is now known that using these clusters as benchmarks introduces systematic errors in modelling, due to these clusters' unique star formation histories. To finally obtain a robust sample of AGB stars with measured ages and metallicities, we will target the clusters within M31 with the MRS on MIRI. M31 avoids the biases in the

Magellanic Clouds, while also probing new metallicity regimes, more typical of massive galaxies. AGB candidates have already been identified in these clusters which have measured ages and metallicities. However, their chemical and dust composition and mass-loss rate are unknown. These are critical for constraining the two leading uncertainties in models, the mass loss and third dredge up. In addition to constraining the derived properties of high-redshift galaxies, these results will allow us to study the effect of metallicity and age (main sequence turn off mass) on AGB dust properties, their lifetimes and evolution, and their still unexplained wind-driving and mass-loss mechanisms. Each of these constraints have large implications for stellar and chemical evolutionary models, dust budget calculations, and cosmological simulations.

OBSERVING DESCRIPTION

We are targeting five clusters in M31 with the MIRI IFU. We will simultaneously observe all channels in each wavelength range using a 4-point dither pattern (optimized for channel 1). We will use the SLOWR1 readout pattern with 50 groups to limit data excess and avoid saturation. Due to the crowded field of our targets, we will also need to observe a background field for removing the sky+telescope. We will observe one undithered frame in the outskirts of M31 with the same readout ramp length as our targets. We will also do simultaneous MIRI imaging in the F560W, F770W, and F1000W filters for each field.

Proposal 6852 - Targets - Calibrating Stellar Evolutionary Models using M31 Clusters

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	M31-CLUSTER-2710	RA: 00 43 45.4965 (10.9395688d) Dec: +41 36 57.64 (41.61601d) Equinox: J2000 <i>Comments:</i> <i>Category=Stellar Cluster</i> <i>Description=[Globular star clusters]</i> <i>Extended=NO</i>		
	(2)	M31-CLUSTER-1282	RA: 00 43 42.3952 (10.9266467d) Dec: +41 35 23.36 (41.58982d) Equinox: J2000 <i>Comments:</i> <i>Category=Stellar Cluster</i> <i>Description=[Globular star clusters]</i> <i>Extended=NO</i>		
	(3)	M31-CLUSTER-445	RA: 00 43 48.4615 (10.9519229d) Dec: +41 26 53.65 (41.44824d) Equinox: J2000 <i>Comments:</i> <i>Category=Stellar Cluster</i> <i>Description=[Globular star clusters]</i> <i>Extended=NO</i>		
	(4)	M31-CLUSTER-881	RA: 00 44 14.3177 (11.0596571d) Dec: +41 19 20.06 (41.32224d) Equinox: J2000 <i>Comments:</i> <i>Category=Stellar Cluster</i> <i>Description=[Globular star clusters]</i> <i>Extended=NO</i>		
	(5)	M31-CLUSTER-1969	RA: 00 44 29.5737 (11.1232237d) Dec: +41 21 35.23 (41.35979d) Equinox: J2000 <i>Comments:</i> <i>Category=Stellar Cluster</i> <i>Description=[Globular star clusters]</i> <i>Extended=NO</i>		
	(6)	BACKGROUND-FIELD	RA: 00 46 7.1425 (11.5297604d) Dec: +40 42 24.76 (40.70688d) Equinox: J2000 <i>Comments:</i> <i>Category=Calibration</i> <i>Description=[Telescope/sky background]</i> <i>Extended=YES</i>		

Proposal 6852 - Observation 1 - Calibrating Stellar Evolutionary Models using M31 Clusters

Observation	Proposal 6852, Observation 1													Tue Jun 17 22:00:15 GMT 2025
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
	Background Observations:[Observation 6]													
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)	M31-CLUSTER-2710	RA: 00 43 45.4965 (10.9395688d) Dec: +41 36 57.64 (41.61601d) Equinox: J2000											
	Comments: Category=Stellar Cluster Description=[Globular star clusters] Extended=NO													
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	F560W	All MRS				YES			FULL		Allow Auto Reorder			
Dithers	#	Dither Type					Optimized For			Direction				
	1	4-Point					POINT SOURCE			POSITIVE				
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F560W	SLOWR1	52	1	1	Dither 1	4	4	4969.103	219943	
	1	SHORT(A)	MRSLONG		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	1	SHORT(A)	MRSSHORT		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	2		IMAGER	F770W	SLOWR1	52	1	1	Dither 1	4	4	4969.103	219943	
	2	MEDIUM(B)	MRSLONG		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	2	MEDIUM(B)	MRSSHORT		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	3		IMAGER	F1000W	SLOWR1	52	1	1	Dither 1	4	4	4969.103	219943	
	3	LONG(C)	MRSLONG		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	3	LONG(C)	MRSSHORT		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	

Proposal 6852 - Observation 1 - Calibrating Stellar Evolutionary Models using M31 Clusters

Special Requirements	Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible
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Proposal 6852 - Observation 2 - Calibrating Stellar Evolutionary Models using M31 Clusters

Observation	Proposal 6852, Observation 2												Tue Jun 17 22:00:15 GMT 2025	
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
	Background Observations:[Observation 6]													
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)	M31-CLUSTER-1282	RA: 00 43 42.3952 (10.9266467d) Dec: +41 35 23.36 (41.58982d) Equinox: J2000											
	Comments: Category=Stellar Cluster Description=[Globular star clusters] Extended=NO													
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray			Grating Wheel Direction		
	F560W	All MRS				YES			FULL			Allow Auto Reorder		
Dithers	#	Dither Type					Optimized For				Direction			
	1	4-Point					POINT SOURCE				POSITIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F560W	SLOWR1	52	1	1	Dither 1	4	4	4969.103	219943	
	1	SHORT(A)	MRSLONG		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	1	SHORT(A)	MRSSHORT		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	2		IMAGER	F770W	SLOWR1	52	1	1	Dither 1	4	4	4969.103	219943	
	2	MEDIUM(B)	MRSLONG		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	2	MEDIUM(B)	MRSSHORT		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	3		IMAGER	F1000W	SLOWR1	52	1	1	Dither 1	4	4	4969.103	219943	
	3	LONG(C)	MRSLONG		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	3	LONG(C)	MRSSHORT		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	

Proposal 6852 - Observation 2 - Calibrating Stellar Evolutionary Models using M31 Clusters

Special Requirements	Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible
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Proposal 6852 - Observation 3 - Calibrating Stellar Evolutionary Models using M31 Clusters

Observation	Proposal 6852, Observation 3												Tue Jun 17 22:00:15 GMT 2025	
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
	Background Observations:[Observation 6]													
Diagnostics	(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.													
Fixed Targets	#	Name			Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(3)	M31-CLUSTER-445			RA: 00 43 48.4615 (10.9519229d) Dec: +41 26 53.65 (41.44824d) Equinox: J2000									
	Comments: Category=Stellar Cluster Description=[Globular star clusters] Extended=NO													
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray			Grating Wheel Direction			
	F560W	All MRS			YES			FULL			Allow Auto Reorder			
Dithers	#	Dither Type					Optimized For				Direction			
	1	4-Point					POINT SOURCE				POSITIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F560W	SLOWR1	52	1	1	Dither 1	4	4	4969.103	219943	
	1	SHORT(A)	MRSLONG		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	1	SHORT(A)	MRSSHORT		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	2		IMAGER	F770W	SLOWR1	52	1	1	Dither 1	4	4	4969.103	219943	
	2	MEDIUM(B)	MRSLONG		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	2	MEDIUM(B)	MRSSHORT		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	3		IMAGER	F1000W	SLOWR1	52	1	1	Dither 1	4	4	4969.103	219943	
	3	LONG(C)	MRSLONG		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	
	3	LONG(C)	MRSSHORT		SLOWR1	52	1	1	Dither 1	4	4	4969.103	219942	

Proposal 6852 - Observation 3 - Calibrating Stellar Evolutionary Models using M31 Clusters

Special Requirements	Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible
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Proposal 6852 - Observation 4 - Calibrating Stellar Evolutionary Models using M31 Clusters

Observation	Proposal 6852, Observation 4													Tue Jun 17 22:00:15 GMT 2025
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
	Background Observations:[Observation 6]													
Diagnostics	(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.													
Fixed Targets	#	Name	Target Coordinates					Targ. Coord. Corrections			Miscellaneous			
	(4)	M31-CLUSTER-881	RA: 00 44 14.3177 (11.0596571d) Dec: +41 19 20.06 (41.32224d) Equinox: J2000											
	Comments: Category=Stellar Cluster Description=[Globular star clusters] Extended=NO													
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	F560W	All MRS				YES			FULL		Allow Auto Reorder			
Dithers	#	Dither Type					Optimized For			Direction				
	1	4-Point					POINT SOURCE			POSITIVE				
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F560W	SLOWR1	51	1	1	Dither 1	4	4	4873.544	219943	
	1	SHORT(A)	MRSLONG		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942	
	1	SHORT(A)	MRSSHORT		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942	
	2		IMAGER	F770W	SLOWR1	51	1	1	Dither 1	4	4	4873.544	219943	
	2	MEDIUM(B)	MRSLONG		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942	
	2	MEDIUM(B)	MRSSHORT		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942	
	3		IMAGER	F1000W	SLOWR1	51	1	1	Dither 1	4	4	4873.544	219943	
	3	LONG(C)	MRSLONG		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942	
	3	LONG(C)	MRSSHORT		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942	

Proposal 6852 - Observation 4 - Calibrating Stellar Evolutionary Models using M31 Clusters

Special Requirements	Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible
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Proposal 6852 - Observation 5 - Calibrating Stellar Evolutionary Models using M31 Clusters

Observation	Proposal 6852, Observation 5													Tue Jun 17 22:00:15 GMT 2025		
	Diagnostic Status: Warning															
	Observing Template: MIRI Medium Resolution Spectroscopy															
	Background Observations:[Observation 6]															
Diagnostics	(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.															
Fixed Targets	#	Name	Target Coordinates					Targ. Coord. Corrections				Miscellaneous				
	(5)	M31-CLUSTER-1969	RA: 00 44 29.5737 (11.1232237d) Dec: +41 21 35.23 (41.35979d) Equinox: J2000													
	Comments: Category=Stellar Cluster Description=[Globular star clusters] Extended=NO															
Acquisition	#	Target														
	1	NONE														
Template	AcqFilter	Primary Channel				Simultaneous Imaging				Imager Subarray				Grating Wheel Direction		
	F560W	All MRS				YES				FULL				Allow Auto Reorder		
Dithers	#	Dither Type					Optimized For				Direction					
	1	4-Point					POINT SOURCE				POSITIVE					
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID			
	1		IMAGER	F560W	SLOWR1	51	1	1	Dither 1	4	4	4873.544	219943			
	1	SHORT(A)	MRSLONG		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942			
	1	SHORT(A)	MRSSHORT		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942			
	2		IMAGER	F770W	SLOWR1	51	1	1	Dither 1	4	4	4873.544	219943			
	2	MEDIUM(B)	MRSLONG		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942			
	2	MEDIUM(B)	MRSSHORT		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942			
	3		IMAGER	F1000W	SLOWR1	51	1	1	Dither 1	4	4	4873.544	219943			
	3	LONG(C)	MRSLONG		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942			
	3	LONG(C)	MRSSHORT		SLOWR1	51	1	1	Dither 1	4	4	4873.544	219942			

Proposal 6852 - Observation 5 - Calibrating Stellar Evolutionary Models using M31 Clusters

Special Requirements	Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible
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Proposal 6852 - Observation 6 - Calibrating Stellar Evolutionary Models using M31 Clusters

Observation	Proposal 6852, Observation 6													Tue Jun 17 22:00:15 GMT 2025
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
	Background Observation For: [Observation 1, Observation 2, Observation 3, Observation 4, Observation 5]													
Diagnostics	(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.													
Fixed Targets	#	Name	Target Coordinates					Targ. Coord. Corrections			Miscellaneous			
	(6)	BACKGROUND-FIELD	RA: 00 46 7.1425 (11.5297604d) Dec: +40 42 24.76 (40.70688d) Equinox: J2000											
	Comments: Category=Calibration Description=[Telescope/sky background] Extended=YES													
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	F560W	Imager				YES			FULL		Allow Auto Reorder			
Dithers	#	Dither Type					Optimized For			Direction				
	1	2-Point					BACKGROUND			NEGATIVE				
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F560W	SLOWR1	51	1	1	Dither 1	2	2	2436.772	219943	
	1	SHORT(A)	MRSLONG		SLOWR1	51	1	1	Dither 1	2	2	2436.772	219942	
	1	SHORT(A)	MRSSHORT		SLOWR1	51	1	1	Dither 1	2	2	2436.772	219942	
	2		IMAGER	F770W	SLOWR1	51	1	1	Dither 1	2	2	2436.772	219943	
	2	MEDIUM(B)	MRSLONG		SLOWR1	51	1	1	Dither 1	2	2	2436.772	219942	
	2	MEDIUM(B)	MRSSHORT		SLOWR1	51	1	1	Dither 1	2	2	2436.772	219942	
	3		IMAGER	F1000W	SLOWR1	51	1	1	Dither 1	2	2	2436.772	219943	
	3	LONG(C)	MRSLONG		SLOWR1	51	1	1	Dither 1	2	2	2436.772	219942	
	3	LONG(C)	MRSSHORT		SLOWR1	51	1	1	Dither 1	2	2	2436.772	219943	

Proposal 6852 - Observation 6 - Calibrating Stellar Evolutionary Models using M31 Clusters

Special Requirements	Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible
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