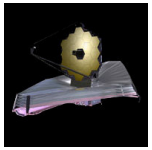

3131 - The nature of the compact object in SN 1987A

Cycle: 2, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
NIRSpec				
	1	G140H/F100LP	NIRSpec IFU Spectroscopy	(1) SN-1987A-NIRSPEC

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	2	G235H	NIRSpec IFU Spectroscopy	(1) SN-1987A-NIRSPEC
	3	G395H	NIRSpec IFU Spectroscopy	(1) SN-1987A-NIRSPEC
	4	G140H/F070LP	NIRSpec IFU Spectroscopy	(1) SN-1987A-NIRSPEC

ABSTRACT

JWST GTO observations of Supernova (SN) 1987A in Cycle 1 have dramatically improved our understanding of this iconic event. The observations show the presence of narrow lines from highly ionised argon at the very center of the remnant, which provides the first clear electromagnetic signal from the compact object created in the explosion. However, the nature of the ionising emission and the properties of the compact object are poorly constrained from the existing medium-resolution NIRSpec observations. We propose to observe SN 1987A with the high-resolution mode of the NIRSpec IFU to determine the properties of the compact object. This will be done by searching for additional weak lines from the compact object and by measuring the detailed line profile and temporal evolution of the detected [Ar VI] line. Only JWST offers spatially resolved spectroscopy with sufficient angular resolution to detect faint narrow lines overlapping with the ejecta emission. The observations will also be used to determine the 3D distribution of ejecta, which reveals the properties of the explosion itself, and to follow the time evolution of the shock interaction. SN 1987A will be the first SN where the properties of the progenitor star, neutrino burst, explosion, and resulting compact object can be connected.

OBSERVING DESCRIPTION

We will observe SN 1987A at high resolution with the NIRSpec IFU to determine the nature of the compact object and map the 3D morphology of the ejecta and time evolution. Only NIRSpec has sufficient angular resolution and wavelength coverage to achieve these goals.

Observations with the NIRSpec IFU consist of the following grating/filter combinations: G140H/F070LP, G140H/F100LP, G235H/F170LP, G395H/F290LP. A small four-point dither cycling pattern will be used. We also require leakcal observations in all gratings at the same dither positions and using the same exposure parameters as for the data obtained when the IFU aperture is open. This will ensure the best subtraction of contaminating emission arising from leakage through the MSA.

Proposal 3131 - Targets - The nature of the compact object in SN 1987A

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN-1987A-NIRSPEC	RA: 05 35 27.9875 (83.8666146d) Dec: -69 16 11.11 (-69.26975d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae]
Extended=YES

Observation

Proposal 3131, Observation 1: G140H/F100LP

Fri Jan 19 17:01:01 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: We ask for a "group within 14 days" special requirement because we want a 1-5 micron spectrum of SN 1987A obtained as close together in time as possible for the whole 0.95-5 micron wavelength range, but if we change it to a group/non-interruptible special requirement, then we get an error in the Observation Links: "Data Excess over upper threshold".

Diagnostics

(Visit 1:1) Warning (Form): Data Excess over lower threshold

(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)	SN-1987A-NIRSPEC	RA: 05 35 27.9875 (83.8666146d) Dec: -69 16 11.11 (-69.26975d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae]
Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G140H/F100LP	NRSIRS2RAPID	105	1	false	true	NONE	4	4	6185.689	
2	G140H/F100LP	NRSIRS2RAPID	105	1	true	true	NONE	4	4	6185.689	

Special Requirements

Group Observations 1, 2, 3, 4 within 14 Days

Observation

Proposal 3131, Observation 2: G235H Fri Jan 19 17:01:01 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: We ask for a "group within 14 days" special requirement because we want a 1-5 micron spectrum of SN 1987A obtained as close together in time as possible for the whole 0.95-5 micron wavelength range, but if we change it to a group/non-interruptible special requirement, then we get an error in the Observation Links: "Data Excess over upper threshold".

Diagnostics

(Visit 2:1) Warning (Form): Data Excess over lower threshold

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN-1987A-NIRSPEC	RA: 05 35 27.9875 (83.8666146d) Dec: -69 16 11.11 (-69.26975d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae]
Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G235H/F170LP	NRSIRS2RAPID	77	1	false	true	NONE	4	4	4551.734	
2	G235H/F170LP	NRSIRS2RAPID	77	1	true	true	NONE	4	4	4551.734	

Special Requirements

Group Observations 1, 2, 3, 4 within 14 Days

Observation

Proposal 3131, Observation 3: G395H Fri Jan 19 17:01:01 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: We ask for a "group within 14 days" special requirement because we want a 1-5 micron spectrum of SN 1987A obtained as close together in time as possible for the whole 0.95-5 micron wavelength range, but if we change it to a group/non-interruptible special requirement, then we get an error in the Observation Links: "Data Excess over upper threshold".

Diagnostics

(Visit 3:1) Warning (Form): Data Excess over lower threshold

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN-1987A-NIRSPEC	RA: 05 35 27.9875 (83.8666146d) Dec: -69 16 11.11 (-69.26975d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae]
Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSIRS2RAPID	63	2	false	true	NONE	4	8	7469.512	
2	G395H/F290LP	NRSIRS2RAPID	63	2	true	true	NONE	4	8	7469.512	

Special Requirements

Group Observations 1, 2, 3, 4 within 14 Days

Observation

Proposal 3131, Observation 4: G140H/F070LP Fri Jan 19 17:01:01 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: We ask for a "group within 14 days" special requirement because we want a 1-5 micron spectrum of SN 1987A obtained as close together in time as possible for the whole 0.95-5 micron wavelength range, but if we change it to a group/non-interruptible special requirement, then we get an error in the Observation Links: "Data Excess over upper threshold".

Diagnostics

(Visit 4:1) Warning (Form): Data Excess over lower threshold

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN-1987A-NIRSPEC	RA: 05 35 27.9875 (83.8666146d) Dec: -69 16 11.11 (-69.26975d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae]
Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G140H/F070LP	NRSIRS2RAPID	105	1	false	true	NONE	4	4	6185.689	
2	G140H/F070LP	NRSIRS2RAPID	105	1	true	true	NONE	4	4	6185.689	

Special Requirements

Group Observations 1, 2, 3, 4 within 14 Days