



1267 - NIRSpec+MIRI IFU Observations of Arp220

Cycle: 1, Proposal Category: GTO

INVESTIGATORS

| <i>Name</i> | <i>Institution</i> |
|--|---|
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OBSERVATIONS

| <i>Folder</i> | <i>Observation</i> | <i>Label</i> | <i>Observing Template</i> | <i>Science Target</i> |
|---------------|--------------------|-----------------|-------------------------------------|----------------------------|
| Arp220 | | | | |
| | 1 | INT_NIRSpec | NIRSpec IFU Spectroscopy | (1) ARP220-INT |
| | 2 | Shell_NIRSpec | NIRSpec IFU Spectroscopy | (3) ARP220-SHELL |
| | 3 | INT_MIRI | MIRI Medium Resolution Spectroscopy | (2) ARP220-INT-MIRI |
| | 4 | Background_MIRI | MIRI Medium Resolution Spectroscopy | (4) ARP220-BACKGROUND-MIRI |

ABSTRACT

NIRSpec and MIRI IFU observations of the nucleus of Arp220.

The MIRI IFU observations will provide unprecedented high-resolution, high sensitivity view of dust-obscured Star Formation around the double nucleus of this gas-rich, late stage galaxy merger. The detection of high-excitation coronal lines in the mid-IR would provide a diagnostic for the power source of the far-IR luminosity of this archetypal object.

The spatially resolved NIRSpec IFU observations will allow us to characterize the stellar populations, the unobscured star formation distribution, the dust structure, the different phases of the ISM (e.g., ionized, warm molecular, coronal), and possible gas flows in the vicinity of the two nuclei, as well as in the shell located towards the NW.

FERRUIT_4530 NIRSpec IFU Arp220_int
FERRUIT_4531 NIRSpec IFU Arp220_shell

WRIGHT_7500 MIRI MRS Arp 220_int
WRIGHT_7501 MIRI MRS Arp 220_bg

OBSERVING DESCRIPTION

NIRSpec IFU observations include three high resolution grating settings to cover the spectral range from 1 to 5.3 microns.

"no TA" option is used, as there is plenty of guide stars with Gaia astrometry.

A four-point dither pattern (cycling/medium, 1-4) is used. This provides a common area of 2.5"x2.5", and good subpixel sampling.

The NRSIRS2RAPID optimizes S/N and facilitates the detection and rejection of CR.

We have constrained the PA-V3 to minimize leakage through the MSA due to nearby bright objects.

Observation 1

NIRSpec IFU Spectroscopy - INT

The pointing here is at an intermediate location set between the coordinates of the East and West nuclei.

G140H/F100LP NRSIRS2RAPID

G235H/F170LP NRSIRS2RAPID

G395H/F290LP NRSIRS2RAPID

Observation 2

NIRSpec IFU Spectroscopy - SHELL

This pointing covers the shell of H α emission at the NW from the nuclei.

G140H/F100LP NRSIRS2RAPID

G235H/F170LP NRSIRS2RAPID

G395H/F290LP NRSIRS2RAPID

Observation 3

MIRI Medium Resolution Spectroscopy - INT

As for the NIRSspec observations the target is an intermediate location set between the coordinates of the East and West Nuclei. Both Nuclei will be in the field of view of the MRS in all channels with a single pointing.

Target acquisition will not be used in this observation.

Wavelength - all

Primary channel - all

simultaneous imaging - yes at F560W

Observation 4

MIRI Medium Resolution Spectroscopy - BACKGROUND

Because ARP220 will fill the FOV of the MRS we have to take an off target spectroscopic background image. A target background region to the North East of ARP220 has been selected. The background observations match the on source observations in integration time but with a reduced number of dither positions.

Target acquisition will not be used in this observation.

Wavelength - all

Primary channel - all

simultaneous imaging - yes at F560W

Proposal 1267 - Targets - NIRSpec+MIRI IFU Observations of Arp220

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|------------------------|---|--------------------------|---------------|
| (1) | ARP220-INT | RA: 15 34 57.2550 (233.7385625d) Dec: +23 30 11.40 (23.50317d) Equinox: J2000 | | |
| <p><i>Comments: Inter-nuclei position. Coordinates are for the mid-point between the two nuclei, as measured from ALMA data by Scoville et al. (2017) ApJ 836:66 Category=Galaxy Description=[Galaxy nuclei, Ultraluminous infrared galaxies]</i></p> | | | | |
| (2) | ARP220-INT-MIRI | RA: 15 34 57.2550 (233.7385625d) Dec: +23 30 11.40 (23.50317d) Equinox: J2000 | | |
| <p><i>Comments: Inter-nuclei position. Coordinates are for the mid-point between the two nuclei, as measured from ALMA data by Scoville et al. (2017) ApJ 836:66 Target 2 is identical to target 1, but needed to be created to associate the background observation for the MIRI visit. Category=Galaxy Description=[Galaxy nuclei, Ultraluminous infrared galaxies]</i></p> | | | | |
| (3) | ARP220-SHELL | RA: 15 34 57.1750 (233.7382292d) Dec: +23 30 12.40 (23.50344d) Equinox: J2000 | | |
| <p><i>Comments: this is an offset position of 1" towards the N and 1.2" towards the W with respect to "ARP220-INT" pointing Category=Galaxy Description=[Starburst galaxies, Ultraluminous infrared galaxies] Extended=YES</i></p> | | | | |
| (4) | ARP220-BACKGROUND-MIRI | RA: 15 34 58.5000 (233.7437500d) Dec: +23 30 47.70 (23.51325d) Equinox: J2000 | | |
| <p><i>Comments: Category=Calibration Description=[Telescope/sky background]</i></p> | | | | |

Fixed Targets

Proposal 1267 - Observation 1 - NIRSpec+MIRI IFU Observations of Arp220

Tue Feb 28 21:00:53 GMT 2023

| | | | | | | | | | | | | |
|-----------------------------|---|-----------------------|---|-------------------|--------------------------|---------------------------------|---------------|-------------------------|----------------------|---------------------------|----------------------------|-------------------------|
| Observation | <p>Proposal 1267, Observation 1: INT_NIRSpec</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p> | | | | | | | | | | | |
| Diagnostics | <p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:1) Warning (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.</p> | | | | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | | | Targ. Coord. Corrections | | | Miscellaneous | | | |
| | (1) | ARP220-INT | RA: 15 34 57.2550 (233.7385625d) Dec: +23 30 11.40 (23.50317d) Equinox: J2000 | | | | | | | | | |
| | <p><i>Comments: Inter-nuclei position.</i></p> <p><i>Coordinates are for the mid-point between the two nuclei, as measured from ALMA data by Scoville et al. (2017) ApJ 836:66</i></p> <p><i>Category=Galaxy</i></p> <p><i>Description=[Galaxy nuclei, Ultraluminous infrared galaxies]</i></p> | | | | | | | | | | | |
| Template | TA Method | | | | | | | | | | | |
| | NONE | | | | | | | | | | | |
| Dithers | # | Dither Type | | Size | Starting Point | | | Number of Points | Points | | | |
| | 1 | CYCLING | | MEDIUM | 1 | | | 4 | | | | |
| Spectral Elements | # | Grating/Filter | Readout Pattern | Groups/Int | Integrations/Ex p | Leakcal | Dither | Autocal | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
| | 1 | G140H/F100LP | NRSIRS2RAPI D | 15 | 1 | false | true | NONE | 4 | 4 | 933.689 | |
| | 2 | G235H/F170LP | NRSIRS2RAPI D | 15 | 1 | false | true | NONE | 4 | 4 | 933.689 | |
| | 3 | G395H/F290LP | NRSIRS2RAPI D | 15 | 1 | false | true | NONE | 4 | 4 | 933.689 | |
| Special Requirements | <p>Aperture PA Range 26 to 76 Degrees (V3 247.02746582 to 297.02746582)</p> <p>Aperture PA Range 255 to 263 Degrees (V3 116.02746582 to 124.02746582)</p> <p>Sequence Observations 1, 2, 3, 4 within 30 Days</p> | | | | | | | | | | | |

Proposal 1267 - Observation 2 - NIRSpec+MIRI IFU Observations of Arp220

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| | | | | | | | | | | | | |
|--|---|-----------------------|---|-------------------|--------------------------|---------------------------------|-------------------------|----------------|----------------------|---------------------------|----------------------------|-------------------------|
| Observation | Proposal 1267, Observation 2: Shell_NIRSpec Diagnostic Status: Warning Observing Template: NIRSpec IFU Spectroscopy <i>Comments: i) the restricted PA range for the NIRSpec observations is driven by the need to avoid some bright stars falling on the MSA field of view, which may cause increased leakage signal. ii) we want to have this program completed within as short a timespan as possible, in order to avoid any issues with the potential time variability of the AGN when comparing the MIRI and NIRSpec data. For this reason, we put in the SR of completing all visits within 30 days, which should be considered an upper limit.</i> | | | | | | | | | | | |
| | (Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 2:1) Warning (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements. | | | | | | | | | | | |
| Diagnosics | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | | | Targ. Coord. Corrections | | | Miscellaneous | | | |
| | (3) | ARP220-SHELL | RA: 15 34 57.1750 (233.7382292d) Dec: +23 30 12.40 (23.50344d) Equinox: J2000 | | | | | | | | | |
| <i>Comments: this is an offset position of 1" towards the N and 1.2" towards the W with respect to "ARP220-INT" pointing</i> Category=Galaxy Description=[Starburst galaxies, Ultraluminous infrared galaxies] Extended=YES | | | | | | | | | | | | |
| Template | TA Method | | | | | | | | | | | |
| | NONE | | | | | | | | | | | |
| Dithers | # | Dither Type | | Size | Starting Point | | Number of Points | Points | | | | |
| | 1 | CYCLING | | MEDIUM | 1 | | 4 | | | | | |
| Spectral Elements | # | Grating/Filter | Readout Pattern | Groups/Int | Integrations/Ex p | Leakcal | Dither | Autocal | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
| | 1 | G140H/F100LP | NRSIRS2RAPI D | 15 | 1 | false | true | NONE | 4 | 4 | 933.689 | |
| | 2 | G235H/F170LP | NRSIRS2RAPI D | 15 | 1 | false | true | NONE | 4 | 4 | 933.689 | |
| | 3 | G395H/F290LP | NRSIRS2RAPI D | 15 | 1 | false | true | NONE | 4 | 4 | 933.689 | |
| Special Requirements | Aperture PA Range 26 to 76 Degrees (V3 247.02746582 to 297.02746582) Aperture PA Range 255 to 263 Degrees (V3 116.02746582 to 124.02746582) Sequence Observations 1, 2, 3, 4 within 30 Days | | | | | | | | | | | |
| | | | | | | | | | | | | |

Proposal 1267 - Observation 3 - NIRSpec+MIRI IFU Observations of Arp220

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|--|--|-------------------------|---|---------------|------------------------|-----------------------------|---------------------------------|------------------------|------------------------|----------------------|---------------------------|----------------------------|-------------------------|
| Observation | Proposal 1267, Observation 3: INT_MIRI Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observations:[Background_MIRI (Obs 4)] | | | | | | | | | | | | |
| | (Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | | | | Targ. Coord. Corrections | | | Miscellaneous | | | |
| | (2) | ARP220-INT-MIRI | RA: 15 34 57.2550 (233.7385625d) Dec: +23 30 11.40 (23.50317d) Equinox: J2000 | | | | | | | | | | |
| <i>Comments: Inter-nuclei position.</i> <i>Coordinates are for the mid-point between the two nuclei, as measured from ALMA data by Scoville et al. (2017) ApJ 836:66</i> <i>Target 2 is identical to target 1, but needed to be created to associate the background observation for the MIRI visit.</i> <i>Category=Galaxy</i> <i>Description=[Galaxy nuclei, Ultraluminous infrared galaxies]</i> | | | | | | | | | | | | | |
| Acquisition | # | | | | | | | | | | | Target | |
| | 1 | | | | | | | | | | | NONE | |
| Template | AcqFilter | Primary Channel | | | | Simultaneous Imaging | | | Imager Subarray | | | | |
| | F560W | ALL | | | | YES | | | FULL | | | | |
| Dithers | # | Dither Type | | | | Optimized For | | | Direction | | | | |
| | 1 | 4-Point | | | | EXTENDED SOURCE | | | NEGATIVE | | | | |
| Spectral Elements | # | Wavelength Range | Detector | Filter | Readout Pattern | Groups/Int | Integrations/E xp | Exposures/Dit h | Dither | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
| | 1 | | IMAGER | F1130W | FASTR1 | 24 | 4 | 1 | Dither 1 | 4 | 16 | 1098.916 | |
| | 1 | LONG(C) | MRSLONG | | FASTR1 | 50 | 2 | 1 | Dither 1 | 4 | 8 | 1121.116 | |
| | 1 | LONG(C) | MRSSHORT | | FASTR1 | 50 | 2 | 1 | Dither 1 | 4 | 8 | 1121.116 | |
| | 2 | | IMAGER | F770W | FASTR1 | 24 | 4 | 1 | Dither 1 | 4 | 16 | 1098.916 | |
| | 2 | MEDIUM(B) | MRSLONG | | FASTR1 | 50 | 2 | 1 | Dither 1 | 4 | 8 | 1121.116 | |
| | 2 | MEDIUM(B) | MRSSHORT | | FASTR1 | 50 | 2 | 1 | Dither 1 | 4 | 8 | 1121.116 | |
| | 3 | | IMAGER | F560W | FASTR1 | 33 | 3 | 1 | Dither 1 | 4 | 12 | 1121.116 | |
| | 3 | SHORT(A) | MRSLONG | | FASTR1 | 33 | 3 | 1 | Dither 1 | 4 | 12 | 1121.116 | |
| | 3 | SHORT(A) | MRSSHORT | | FASTR1 | 33 | 3 | 1 | Dither 1 | 4 | 12 | 1121.116 | |

Proposal 1267 - Observation 3 - NIRSpec+MIRI IFU Observations of Arp220

Special Requirements

Sequence Observations 3, 4, Non-interruptible
Sequence Observations 1, 2, 3, 4 within 30 Days

Proposal 1267 - Observation 4 - NIRSpec+MIRI IFU Observations of Arp220

Tue Feb 28 21:00:53 GMT 2023

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|---|--|------------------------|---|--------|--------------------------|------------|-------------------|-----------------|-----------------|---------------|--------------------|---------------------|------------------|
| Observation | Proposal 1267, Observation 4: Background_MIRI Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observation For: [INT_MIRI (Obs 3)] | | | | | | | | | | | | |
| | (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) | ARP220-BACKGROUND-MIRI | RA: 15 34 58.5000 (233.7437500d) Dec: +23 30 47.70 (23.51325d) Equinox: J2000 | | | | | | | | | | |
| Comments: Category=Calibration Description=[Telescope/sky background] | | | | | | | | | | | | | |
| Acquisition | # | Target | | | | | | | | | | | |
| | 1 | NONE | | | | | | | | | | | |
| Template | AcqFilter | Primary Channel | | | Simultaneous Imaging | | | | Imager Subarray | | | | |
| | F560W | ALL | | | YES | | | | FULL | | | | |
| Dithers | # | Dither Type | | | Optimized For | | | | Direction | | | | |
| | 1 | 2-Point | | | EXTENDED SOURCE | | | | NEGATIVE | | | | |
| | 2 | 4-Point | | | EXTENDED SOURCE | | | | NEGATIVE | | | | |
| Spectral Elements | # | Wavelength Range | Detector | Filter | Readout Pattern | Groups/Int | Integrations/E xp | Exposures/Dit h | Dither | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
| | 1 | | IMAGER | F1130W | FASTR1 | 24 | 2 | 1 | Dither 1 | 2 | 4 | 271.954 | |
| | 1 | LONG(C) | MRSLONG | | FASTR1 | 50 | 1 | 1 | Dither 1 | 2 | 2 | 277.504 | |
| | 1 | LONG(C) | MRSSHORT | | FASTR1 | 50 | 1 | 1 | Dither 1 | 2 | 2 | 277.504 | |
| | 2 | | IMAGER | F770W | FASTR1 | 24 | 2 | 1 | Dither 1 | 2 | 4 | 271.954 | |
| | 2 | MEDIUM(B) | MRSLONG | | FASTR1 | 50 | 1 | 1 | Dither 1 | 2 | 2 | 277.504 | |
| | 2 | MEDIUM(B) | MRSSHORT | | FASTR1 | 50 | 1 | 1 | Dither 1 | 2 | 2 | 277.504 | |
| | 3 | | IMAGER | F560W | FASTR1 | 33 | 3 | 1 | Dither 2 | 4 | 12 | 1121.116 | |
| | 3 | SHORT(A) | MRSLONG | | FASTR1 | 33 | 3 | 1 | Dither 2 | 4 | 12 | 1121.116 | |
| | 3 | SHORT(A) | MRSSHORT | | FASTR1 | 33 | 3 | 1 | Dither 2 | 4 | 12 | 1121.116 | |

Proposal 1267 - Observation 4 - NIRSpec+MIRI IFU Observations of Arp220

Special Requirements

Sequence Observations 3, 4, Non-interruptible
Sequence Observations 1, 2, 3, 4 within 30 Days