



1860 - Disentangling the Origin of Dust in Type II_n Supernovae

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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| <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> |
|---------------|--------------------|----------------|-------------------------------------|--------------------------|
| SN 2005ip | | | | |
| | 3 | MRS | MIRI Medium Resolution Spectroscopy | (2) SN-2005IP |
| SN 1978K | | | | |
| | 4 | MRS | MIRI Medium Resolution Spectroscopy | (3) SN-1978K |
| SN 2010jl | | | | |
| | 5 | MRS Target | MIRI Medium Resolution Spectroscopy | (4) SN-2010JL |
| | 8 | MRS Background | MIRI Medium Resolution Spectroscopy | (7) SN-2010JL-BACKGROUND |
| SN 2017hcc | | | | |
| | 6 | MRS | MIRI Medium Resolution Spectroscopy | (5) SN-2017HCC |
| SN 1995N | | | | |
| | 7 | MRS | MIRI Medium Resolution Spectroscopy | (6) SN-1995N |

ABSTRACT

Supernovae (SNe) Type II_n are known for their bright mid-IR luminosities and large dust masses. Inferred masses of newly formed SN dust can inform our understanding of the origin of dust in the high redshift Universe, particularly at the Epoch of Reionization. Pre-existing dust offers an independent measurement of the circumstellar medium (CSM) and, therefore, the pre-SN mass-loss history of the Type II_n progenitors, which remain largely unknown. The origin and heating mechanism of the dust, however, remains mostly ambiguous since a majority of the Spitzer observations contain only 3.6/4.5 micron photometry, which is insufficient to identify multiple dust components, detect colder (<500 K) dust reservoirs, and measure the dust composition. Unlike most other SN subclasses, SNe II_n dust (both newly formed and pre-existing) tends to remain radiatively heated by ongoing CSM shock interaction for years post-explosion, so that it will be warm enough (>200 K) to be detected by JWST. Here we propose MIRI/MRS spectroscopy of five well-studied SNe II_n from the Spitzer era that span a range of epochs (5-40 years) to constrain the origin, mass, and heating mechanism of dust in these systems. Cycle 1 is critical for these observations given the growing gap in time since their most recent Spitzer detection. No other telescopes, including SOFIA and ALMA, can make measurements of such dust in other extragalactic SNe due to sensitivity. Given the relative brightness of SNe II_n, we can complete this sample in 12.36 hours (including overhead).

OBSERVING DESCRIPTION

These observations will obtain MIRMI MRS spectroscopy of 5 nearby SNe Type II_n to characterize dust. Observations will include all 4 channels and all 3 wavelength ranges. A dedicated background offset is necessary for SN 2010jl.

Proposal 1860 - Targets - Disentangling the Origin of Dust in Type II In Supernovae

| | # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|--|--|--|--|---------------------------|---------------|
| Fixed Targets | (2) | SN-2005IP | RA: 09 32 6.4200 (143.0267500d) Dec: +08 26 44.40 (8.44567d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| | <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] Extended=NO | | | | |
| | (3) | SN-1978K | RA: 03 17 38.6200 (49.4109167d) Dec: -66 33 3.40 (-66.55094d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| | <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] Extended=NO | | | | |
| | (4) | SN-2010JL | RA: 09 42 53.3300 (145.7222083d) Dec: +09 29 41.80 (9.49494d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| | <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] Extended=NO | | | | |
| | (5) | SN-2017HCC | RA: 00 03 50.5800 (.9607500d) Dec: -11 28 28.78 (-11.47466d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] Extended=NO | | | | | |
| (6) | SN-1995N | RA: 14 49 28.2900 (222.3678750d) Dec: -10 10 14.00 (-10.17056d) Equinox: J2000 | Epoch of Position: 2015.5 | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] Extended=NO | | | | | |
| (7) | SN-2010JL-BACKGROUND | RA: 09 42 52.0989 (145.7170787d) Dec: +09 29 47.26 (9.49646d) Equinox: J2000 | Epoch of Position: 2015.5 | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] | | | | | |
| Generic Targets | # | Name | Criteria | Description | |
| | (1) | SNSAMPLE | Survey | | |

Proposal 1860 - Observation 3 - Disentangling the Origin of Dust in Type II_n Supernovae

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|--|--|------------------|---|--------|----------------------|---------------------------|------------------|-----------------|---------------|-------------------------|--------------------|---------------------|------------------|
| Observation | Proposal 1860, Observation 3: MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy | | | | | | | | | | | | |
| | (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) | SN-2005IP | RA: 09 32 6.4200 (143.0267500d) Dec: +08 26 44.40 (8.44567d) Equinox: J2000 | | | Epoch of Position: 2015.5 | | | | | | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] Extended=NO | | | | | | | | | | | | | |
| Acquisition | # | Target | | | | | | | | | | | |
| | 1 | NONE | | | | | | | | | | | |
| Template | AcqFilter | Primary Channel | | | Simultaneous Imaging | | | Imager Subarray | | Grating Wheel Direction | | | |
| | | ALL | | | YES | | | FULL | | NEUTRAL | | | |
| Dithers | # | Dither Type | | | Optimized For | | | Direction | | | | | |
| | 1 | 4-Point | | | POINT SOURCE | | | 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 | F1000W | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 1 | LONG(C) | MRSLONG | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 1 | LONG(C) | MRSSHORT | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 2 | | IMAGER | F770W | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 2 | MEDIUM(B) | MRSLONG | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 2 | MEDIUM(B) | MRSSHORT | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 3 | | IMAGER | F560W | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | 62324 |
| | 3 | SHORT(A) | MRSLONG | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 3 | SHORT(A) | MRSSHORT | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |

Proposal 1860 - Observation 4 - Disentangling the Origin of Dust in Type IIa Supernovae

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|--|--|------------------|--|--------|----------------------|---------------------------|-------------------|-----------------|---------------|-------------------------|--------------------|---------------------|------------------|
| Observation | Proposal 1860, Observation 4: MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy | | | | | | | | | | | | |
| | (Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | | | Targ. Coord. Corrections | | | Miscellaneous | | | | |
| | (3) | SN-1978K | RA: 03 17 38.6200 (49.4109167d) Dec: -66 33 3.40 (-66.55094d) Equinox: J2000 | | | Epoch of Position: 2015.5 | | | | | | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] Extended=NO | | | | | | | | | | | | | |
| Acquisition | # | Target | | | | | | | | | | | |
| | 1 | NONE | | | | | | | | | | | |
| Template | AcqFilter | Primary Channel | | | Simultaneous Imaging | | | Imager Subarray | | Grating Wheel Direction | | | |
| | | ALL | | | YES | | | FULL | | NEUTRAL | | | |
| Dithers | # | Dither Type | | | Optimized For | | | Direction | | | | | |
| | 1 | 4-Point | | | POINT 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 | F1000W | FASTR1 | 45 | 1 | 1 | Dither 1 | 4 | 4 | 499.507 | |
| | 1 | LONG(C) | MRSLONG | | FASTR1 | 45 | 1 | 1 | Dither 1 | 4 | 4 | 499.507 | |
| | 1 | LONG(C) | MRSSHORT | | FASTR1 | 45 | 1 | 1 | Dither 1 | 4 | 4 | 499.507 | |
| | 2 | | IMAGER | F770W | FASTR1 | 45 | 1 | 1 | Dither 1 | 4 | 4 | 499.507 | |
| | 2 | MEDIUM(B) | MRSLONG | | FASTR1 | 45 | 1 | 1 | Dither 1 | 4 | 4 | 499.507 | |
| | 2 | MEDIUM(B) | MRSSHORT | | FASTR1 | 45 | 1 | 1 | Dither 1 | 4 | 4 | 499.507 | |
| | 3 | | IMAGER | F560W | FASTR1 | 45 | 1 | 1 | Dither 1 | 4 | 4 | 499.507 | 62324 |
| | 3 | SHORT(A) | MRSLONG | | FASTR1 | 45 | 1 | 1 | Dither 1 | 4 | 4 | 499.507 | |
| | 3 | SHORT(A) | MRSSHORT | | FASTR1 | 45 | 1 | 1 | Dither 1 | 4 | 4 | 499.507 | |

Proposal 1860 - Observation 5 - Disentangling the Origin of Dust in Type IIa Supernovae

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|--|---|------------------|--|----------------------|---------------------------|-----------------|------------------|-------------------------|----------|---------------|--------------------|---------------------|------------------|
| Observation | Proposal 1860, Observation 5: MRS Target Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observations:[MRS Background (Obs 8)] | | | | | | | | | | | | |
| | (Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | | Targ. Coord. Corrections | | | Miscellaneous | | | | | |
| | (4) | SN-2010JL | RA: 09 42 53.3300 (145.7222083d) Dec: +09 29 41.80 (9.49494d) Equinox: J2000 | | Epoch of Position: 2015.5 | | | | | | | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] Extended=NO | | | | | | | | | | | | | |
| Acquisition | # | Target | | | | | | | | | | | |
| | 1 | NONE | | | | | | | | | | | |
| Template | AcqFilter | Primary Channel | | Simultaneous Imaging | | Imager Subarray | | Grating Wheel Direction | | | | | |
| | | ALL | | YES | | FULL | | NEUTRAL | | | | | |
| Dithers | # | Dither Type | | | Optimized For | | | Direction | | | | | |
| | 1 | 4-Point | | | POINT SOURCE | | | 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 | F1000W | SLOWR1 | 14 | 1 | 1 | Dither 1 | 4 | 4 | 1337.836 | |
| | 1 | LONG(C) | MRSLONG | | SLOWR1 | 14 | 1 | 1 | Dither 1 | 4 | 4 | 1337.836 | |
| | 1 | LONG(C) | MRSSHORT | | SLOWR1 | 14 | 1 | 1 | Dither 1 | 4 | 4 | 1337.836 | |
| | 2 | | IMAGER | F770W | SLOWR1 | 14 | 1 | 1 | Dither 1 | 4 | 4 | 1337.836 | |
| | 2 | MEDIUM(B) | MRSLONG | | SLOWR1 | 14 | 1 | 1 | Dither 1 | 4 | 4 | 1337.836 | |
| | 2 | MEDIUM(B) | MRSSHORT | | SLOWR1 | 14 | 1 | 1 | Dither 1 | 4 | 4 | 1337.836 | |
| | 3 | | IMAGER | F560W | SLOWR1 | 14 | 1 | 1 | Dither 1 | 4 | 4 | 1337.836 | 62324 |
| | 3 | SHORT(A) | MRSLONG | | SLOWR1 | 14 | 1 | 1 | Dither 1 | 4 | 4 | 1337.836 | |
| | 3 | SHORT(A) | MRSSHORT | | SLOWR1 | 14 | 1 | 1 | Dither 1 | 4 | 4 | 1337.836 | |

Proposal 1860 - Observation 5 - Disentangling the Origin of Dust in Type II_n Supernovae

Special Requirements

Sequence Observations 5, 8, Non-interruptible

Proposal 1860 - Observation 8 - Disentangling the Origin of Dust in Type IIa Supernovae

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|--|---|----------------------|--|--------|----------------------|---------------|---------------------------|-----------------|--------|-------------------------|--------------------|---------------------|------------------|
| Observation | Proposal 1860, Observation 8: MRS Background Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observation For: [MRS Target (Obs 5)] | | | | | | | | | | | | |
| | (Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | | | | Targ. Coord. Corrections | | | Miscellaneous | | | |
| | (7) | SN-2010JL-BACKGROUND | RA: 09 42 52.0989 (145.7170787d) Dec: +09 29 47.26 (9.49646d) Equinox: J2000 | | | | Epoch of Position: 2015.5 | | | | | | |
| Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Supernovae] | | | | | | | | | | | | | |
| Acquisition | # | Target | | | | | | | | | | | |
| | 1 | NONE | | | | | | | | | | | |
| Template | AcqFilter | Primary Channel | | | Simultaneous Imaging | | | Imager Subarray | | Grating Wheel Direction | | | |
| | | ALL | | | YES | | | FULL | | NEUTRAL | | | |
| Dithers | # | Dither Type | | | | Optimized For | | | | Direction | | | |
| | 1 | 4-Point | | | | POINT SOURCE | | | | 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 | F1000W | SLOWR1 | 14 | 1 | 1 | None | 1 | 1 | 334.459 | |
| | 1 | LONG(C) | MRSLONG | | SLOWR1 | 14 | 1 | 1 | None | 1 | 1 | 334.459 | |
| | 1 | LONG(C) | MRSSHORT | | SLOWR1 | 14 | 1 | 1 | None | 1 | 1 | 334.459 | |
| | 2 | | IMAGER | F770W | SLOWR1 | 14 | 1 | 1 | None | 1 | 1 | 334.459 | |
| | 2 | MEDIUM(B) | MRSLONG | | SLOWR1 | 14 | 1 | 1 | None | 1 | 1 | 334.459 | |
| | 2 | MEDIUM(B) | MRSSHORT | | SLOWR1 | 14 | 1 | 1 | None | 1 | 1 | 334.459 | |
| | 3 | | IMAGER | F560W | SLOWR1 | 14 | 1 | 1 | None | 1 | 1 | 334.459 | 62324 |
| | 3 | SHORT(A) | MRSLONG | | SLOWR1 | 14 | 1 | 1 | None | 1 | 1 | 334.459 | |
| | 3 | SHORT(A) | MRSSHORT | | SLOWR1 | 14 | 1 | 1 | None | 1 | 1 | 334.459 | |

Proposal 1860 - Observation 8 - Disentangling the Origin of Dust in Type II_n Supernovae

Special Requirements

Sequence Observations 5, 8, Non-interruptible

Proposal 1860 - Observation 6 - Disentangling the Origin of Dust in Type IIIn Supernovae

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|---|--|------------------|---|--------|----------------------|---------------------------|-------------------|-----------------|---------------|-------------------------|--------------------|---------------------|------------------|
| Observation | Proposal 1860, Observation 6: MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy | | | | | | | | | | | | |
| | (Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | | | Targ. Coord. Corrections | | | Miscellaneous | | | | |
| | (5) | SN-2017HCC | RA: 00 03 50.5800 (.9607500d) Dec: -11 28 28.78 (-11.47466d) Equinox: J2000 | | | Epoch of Position: 2015.5 | | | | | | | |
| Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Supernovae] Extended=NO | | | | | | | | | | | | | |
| Acquisition | # | Target | | | | | | | | | | | |
| | 1 | NONE | | | | | | | | | | | |
| Template | AcqFilter | Primary Channel | | | Simultaneous Imaging | | | Imager Subarray | | Grating Wheel Direction | | | |
| | | ALL | | | YES | | | FULL | | NEUTRAL | | | |
| Dithers | # | Dither Type | | | Optimized For | | | Direction | | | | | |
| | 1 | 4-Point | | | POINT 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 | F560W | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | 62324 |
| | 1 | SHORT(A) | MRSLONG | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 1 | SHORT(A) | MRSSHORT | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 2 | | IMAGER | F770W | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 2 | MEDIUM(B) | MRSLONG | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 2 | MEDIUM(B) | MRSSHORT | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 3 | | IMAGER | F1000W | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 3 | LONG(C) | MRSLONG | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 3 | LONG(C) | MRSSHORT | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |

Proposal 1860 - Observation 7 - Disentangling the Origin of Dust in Type II_n Supernovae

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|--|--|------------------|--|----------------------|---------------------------|-----------------|-------------------|-------------------------|---------------|---------------|--------------------|---------------------|------------------|
| Observation | Proposal 1860, Observation 7: MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy | | | | | | | | | | | | |
| | (Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | | Targ. Coord. Corrections | | | | Miscellaneous | | | | |
| | (6) | SN-1995N | RA: 14 49 28.2900 (222.3678750d) Dec: -10 10 14.00 (-10.17056d) Equinox: J2000 | | Epoch of Position: 2015.5 | | | | | | | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Supernovae] Extended=NO | | | | | | | | | | | | | |
| Acquisition | # | Target | | | | | | | | | | | |
| | 1 | NONE | | | | | | | | | | | |
| Template | AcqFilter | Primary Channel | | Simultaneous Imaging | | Imager Subarray | | Grating Wheel Direction | | | | | |
| | | ALL | | YES | | FULL | | NEUTRAL | | | | | |
| Dithers | # | Dither Type | | | Optimized For | | | | Direction | | | | |
| | 1 | 4-Point | | | POINT 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 | F1000W | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 1 | LONG(C) | MRSLONG | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 1 | LONG(C) | MRSSHORT | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 2 | | IMAGER | F770W | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 2 | MEDIUM(B) | MRSLONG | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 2 | MEDIUM(B) | MRSSHORT | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 3 | | IMAGER | F560W | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | 62324 |
| | 3 | SHORT(A) | MRSLONG | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |
| | 3 | SHORT(A) | MRSSHORT | | FASTR1 | 120 | 1 | 1 | Dither 1 | 4 | 4 | 1332.019 | |