



3823 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Cycle: 2, Proposal Category: GO

INVESTIGATORS

| <i>Name</i> | <i>Institution</i> |
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| Dr. Andre-Nicolas Chene (CoI) | NOIRLab - Gemini North (HI) |

OBSERVATIONS

| <i>Folder</i> | <i>Observation</i> | <i>Label</i> | <i>Observing Template</i> | <i>Science Target</i> |
|------------------|--------------------|--------------|----------------------------------|-----------------------|
| LRS Spectroscopy | | | | |
| | 5 | Shell2 | MIRI Low Resolution Spectroscopy | (3) WR140-SHELL-2 |
| | 6 | Shell3 | MIRI Low Resolution Spectroscopy | (4) WR140-SHELL-3 |
| | 7 | Shell4 | MIRI Low Resolution Spectroscopy | (5) WR140-SHELL-4 |
| | 8 | Shell5 | MIRI Low Resolution Spectroscopy | (6) WR140-SHELL-5 |
| | 9 | Shell6 | MIRI Low Resolution Spectroscopy | (7) WR140-SHELL-6 |
| | 10 | Shell7 | MIRI Low Resolution Spectroscopy | (8) WR140-SHELL-7 |
| | 2 | Background | MIRI Low Resolution Spectroscopy | (2) WR140BACKGROUND |
| MIRI Imaging | | | | |
| | 4 | WR140_2023 | MIRI Imaging | (9) WR140 |

ABSTRACT

Polycyclic Aromatic Hydrocarbons (PAHs) are a key component of the interstellar medium (ISM) as thermal regulators and tracers of star formation and the chemical enrichment of galaxies. Despite the important role of PAHs, there are still major open questions on their evolution, chemical and structural composition, and origin(s). Recent JWST DD-ERS observations (ERS 1349) have opened a new window into addressing these outstanding issues: MIRI revealed and resolved emission from PAHs formed in the colliding winds of the massive and evolved carbon-rich Wolf-Rayet (WC) binary WR 140. These results have thrust these systems into the spotlight as a potential PAH and carbonaceous dust factories. The JWST observations from ERS 1349 held another surprising result: the past two dust shells formed by WR 140, which are separated by 7.93 years in age, exhibit dramatic changes in their 6 – 9 micron PAH features. Observations of more distant shells around JWST enabled by the mid-IR sensitivity of the MIRI LRS and Imager may therefore hold clues on the evolution of PAHs. In this JWST Cycle 2 GO proposal, we request 6.3 hours of 5 – 14 micron spectroscopic and 7.7, 15, and 21 um imaging observations of the dust shells around WR 140 with the MIRI LRS and Imager to trace the evolution of PAH features over its past 7 dust-formation episodes. The key goals are to (1) potentially unify the four distinct classes of PAHs by testing the resulting spectra against theoretical and laboratory prediction of PAH evolution, and (2) to identify the evolved spectral profile of PAHs formed by WC binaries that enrich the ISM of the Milky Way and galaxies beyond.

OBSERVING DESCRIPTION

We request a total of 6.3 hours of JWST observations using the MIRI LRS and the MIRI Imager with the F770W, F1500W, and F2100W filters of the dust shells around WR 140. The goal of the observations is to obtain spectra of the PAH features from Shells 2 - 7, where Shell 7 is the most

distant and faintest shell around WR 140 that can be observed with the LRS in a reasonable amount of time.

Using on the F770W observation from Cycle 1 DD-ERS (ERS 1349), we define 6 slit positions centered on the predicted locations of the brightest region of Shells 2 - 7. The slit positions were adjusted by ~ 3 pixels ($=330$ mas) from the brightest region of the dust shells to account for their ~ 300 mas/yr proper motion (Williams et al. 2009). Exposure times ranging from 111 sec - 1665 sec at each shell were tuned to achieve an $\text{SNR} > 20$ for wavelengths < 10 μm using the JWST Exposure Time Calculator (v. 2.0), where the 7.7 μm MIRI image of WR 140 from July 2022 was used to estimate the dust continuum emission. Given the extended nature of the dust emission in the circumstellar environment around WR 140, a designated sky background position with the same exposure time as the longest exposure (Shell 7) is requested. No target acquisition is requested for any LRS observation since the dust shells are partially extended.

Imaging of WR 140 with the standard 4-pt dither pattern using the MIRI F770W, F1500W, and F2100W filters is requested to obtain 7.7, 15 and 21 μm photometry of the 6 proposed positions for LRS spectroscopy of the surrounding shells. We request Imager observations with exposure times (1432 sec per filter) that will provide detections of the LRS shell regions with an $\text{SNR} > 20$. Based on the successful MIRI observations of WR 140 taken in Cycle 1 DD-ERS, we are confident that our proposed Imager and LRS observations will achieve our science goals.

Due to the variations in dust temperature and continuum IR emission of WR 140's circumstellar dust with time, we request non-interruptible group observations for all of our proposed MIRI LRS and Imager observations. We also request specific aperture PA ranges (V3 123 - 126 degrees) in order to avoid dithering/nodding along the dust shell. These special requirements are essential to achieve our science goals.

As mentioned above, due to variations in dust temperature and continuum IR emission from WR 140's dust shells, we are requesting MIRI Imager observations WR 140 with the F770W, F1500W, and F2100W filters that have also been conducted as a part of ERS 1349 in JWST Cycle 1.

Proposal 3823 - Targets - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|--|-----------------|---|---|---------------|
| (2) | WR140BACKGROUND | RA: 20 20 25.4680 (305.1061167d) Dec: +43 51 9.88 (43.85274d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Calibration Description=[Telescope/sky background]</i> | | | | |
| (3) | WR140-SHELL-2 | RA: 20 20 27.6926 (305.1153858d) Dec: +43 51 12.85 (43.85357d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=ISM Description=[Dust nebulae, Interstellar dust]</i> | | | | |
| (4) | WR140-SHELL-3 | RA: 20 20 27.5425 (305.1147604d) Dec: +43 51 10.79 (43.85300d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=ISM Description=[Dust nebulae, Interstellar dust]</i> | | | | |
| (5) | WR140-SHELL-4 | RA: 20 20 27.3849 (305.1141037d) Dec: +43 51 8.73 (43.85243d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=ISM Description=[Dust nebulae, Interstellar dust]</i> | | | | |
| (6) | WR140-SHELL-5 | RA: 20 20 27.2196 (305.1134150d) Dec: +43 51 6.58 (43.85183d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=ISM Description=[Dust nebulae, Interstellar dust]</i> | | | | |
| (7) | WR140-SHELL-6 | RA: 20 20 27.0645 (305.1127687d) Dec: +43 51 4.52 (43.85126d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=ISM Description=[Dust nebulae, Interstellar dust]</i> | | | | |
| (8) | WR140-SHELL-7 | RA: 20 20 26.9095 (305.1121229d) Dec: +43 51 2.48 (43.85069d) Equinox: J2000 | Epoch of Position: 2015.5 | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=ISM Description=[Dust nebulae, Interstellar dust]</i> | | | | |
| (9) | WR140 | RA: 20 20 27.9697 (305.1165404d) Dec: +43 51 16.26 (43.85452d) Equinox: J2000 | Proper Motion RA: -3.9522877718304683E-4 sec of time/yr Proper Motion Dec: -0.0018739999632089166 arcsec/yr Epoch of Position: 2015.5 | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[WC stars, Wolf-Rayet stars]</i> | | | | |

Fixed Targets

Proposal 3823 - Observation 5 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Wed Jul 02 16:00:11 GMT 2025

| | | | | | | | | |
|---|--|------------------------|---|-----------------------------|---------------------------------|-----------------------------------|----------------------|---|
| Observation | Proposal 3823, Observation 5: Shell2 Diagnostic Status: Warning Observing Template: MIRI Low Resolution Spectroscopy | | | | | | | |
| | (Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | | Targ. Coord. Corrections | | Miscellaneous | |
| | (3) | WR140-SHELL-2 | RA: 20 20 27.6926 (305.1153858d) Dec: +43 51 12.85 (43.85357d) Equinox: J2000 | | Epoch of Position: 2015.5 | | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> <i>Category=ISM</i> <i>Description=[Dust nebulae, Interstellar dust]</i> | | | | | | | | |
| Acquisition | # | Target | | | | | | |
| | 1 | NONE | | | | | | |
| Template | AcqFilter | Subarray | | | | Obtain Verification Image? | | |
| | | FULL | | | | false | | |
| Dithers | # | Dither Type | No. Spectral Steps | Spectral Step Offset | No. Spatial Steps | Spatial Step Offset | | |
| | 1 | MAPPING | 1 | 0.0 | 2 | 1.0 | | |
| Spectral Elements | # | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Exposures/Dith | Total Dithers | Total Exposure Time ETC Wkbk.Calc ID |
| | 1 | FASTR1 | 20 | 1 | 2 | 1 | 2 | 111.002 |

Proposal 3823 - Observation 5 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Special Requirements

Aperture PA Range 127.75797 to 130.75797 Degrees (V3 123.0 to 126.0)

Group Observations 2, 4, 5, 6, 7, 8, 9, 10, Non-interruptible

Proposal 3823 - Observation 6 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Wed Jul 02 16:00:11 GMT 2025

| | | | | | | | | |
|---|--|------------------------|---|-----------------------------|---------------------------------|-----------------------------------|----------------------|---|
| Observation | Proposal 3823, Observation 6: Shell3 Diagnostic Status: Warning Observing Template: MIRI Low 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 | |
| | (4) | WR140-SHELL-3 | RA: 20 20 27.5425 (305.1147604d) Dec: +43 51 10.79 (43.85300d) Equinox: J2000 | | Epoch of Position: 2015.5 | | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> <i>Category=ISM</i> <i>Description=[Dust nebulae, Interstellar dust]</i> | | | | | | | | |
| Acquisition | # | Target | | | | | | |
| | 1 | NONE | | | | | | |
| Template | AcqFilter | Subarray | | | | Obtain Verification Image? | | |
| | | FULL | | | | false | | |
| Dithers | # | Dither Type | No. Spectral Steps | Spectral Step Offset | No. Spatial Steps | Spatial Step Offset | | |
| | 1 | MAPPING | 1 | 0.0 | 2 | 1.0 | | |
| Spectral Elements | # | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Exposures/Dith | Total Dithers | Total Exposure Time ETC Wkbk.Calc ID |
| | 1 | FASTR1 | 40 | 1 | 2 | 1 | 2 | 222.003 |

Proposal 3823 - Observation 6 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Special Requirements

Aperture PA Range 127.75797 to 130.75797 Degrees (V3 123.0 to 126.0)

Group Observations 2, 4, 5, 6, 7, 8, 9, 10, Non-interruptible

Proposal 3823 - Observation 7 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Wed Jul 02 16:00:11 GMT 2025

| | | | | | | | | |
|---|--|------------------------|--|---------------------------------|---------------------------|----------------------------|----------------------|---|
| Observation | Proposal 3823, Observation 7: Shell4 Diagnostic Status: Warning Observing Template: MIRI Low 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 | | |
| | (5) | WR140-SHELL-4 | RA: 20 20 27.3849 (305.1141037d) Dec: +43 51 8.73 (43.85243d) Equinox: J2000 | Epoch of Position: 2015.5 | | | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=ISM Description=[Dust nebulae, Interstellar dust] | | | | | | | | |
| Acquisition | # | Target | | | | | | |
| | 1 | NONE | | | | | | |
| Template | AcqFilter | Subarray | Obtain Verification Image? | | | | | |
| | | FULL | false | | | | | |
| Dithers | # | Dither Type | No. Spectral Steps | Spectral Step Offset | No. Spatial Steps | Spatial Step Offset | | |
| | 1 | MAPPING | 1 | 0.0 | 2 | 1.0 | | |
| Spectral Elements | # | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Exposures/Dith | Total Dithers | Total Exposure Time ETC Wkbk.Calc ID |
| | 1 | FASTR1 | 50 | 1 | 2 | 1 | 2 | 277.504 |

Proposal 3823 - Observation 7 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Special Requirements

Aperture PA Range 127.75797 to 130.75797 Degrees (V3 123.0 to 126.0)

Group Observations 2, 4, 5, 6, 7, 8, 9, 10, Non-interruptible

Proposal 3823 - Observation 8 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Wed Jul 02 16:00:11 GMT 2025

| Observation | Proposal 3823, Observation 8: Shell5 Diagnostic Status: Warning Observing Template: MIRI Low Resolution Spectroscopy | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|--|--|----------------------------|----------------------------|--------------------------|---------------------|---------------------|---------------------|--|---------------------------|-----|---|-----|---|---|---|---|---------|--|--|--|--|--|--|--|--|--|
| | (Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Diagnosics | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fixed Targets | <table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(6)</td> <td>WR140-SHELL-5</td> <td>RA: 20 20 27.2196 (305.1134150d) Dec: +43 51 6.58 (43.85183d) Equinox: J2000</td> <td>Epoch of Position: 2015.5</td> <td></td> </tr> </tbody> </table> | # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous | (6) | WR140-SHELL-5 | RA: 20 20 27.2196 (305.1134150d) Dec: +43 51 6.58 (43.85183d) Equinox: J2000 | Epoch of Position: 2015.5 | | <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> <i>Category=ISM</i> <i>Description=[Dust nebulae, Interstellar dust]</i> | | | | | | | | | | | | | | | |
| | # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous | | | | | | | | | | | | | | | | | | | | | | |
| (6) | WR140-SHELL-5 | RA: 20 20 27.2196 (305.1134150d) Dec: +43 51 6.58 (43.85183d) Equinox: J2000 | Epoch of Position: 2015.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acquisition | <table border="1"> <thead> <tr> <th>#</th> <th>Target</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>NONE</td> </tr> </tbody> </table> | # | Target | 1 | NONE | | | | | | | | | | | | | | | | | | | | | | |
| | # | Target | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | NONE | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Template | <table border="1"> <thead> <tr> <th>AcqFilter</th> <th>Subarray</th> <th>Obtain Verification Image?</th> </tr> </thead> <tbody> <tr> <td></td> <td>FULL</td> <td>false</td> </tr> </tbody> </table> | AcqFilter | Subarray | Obtain Verification Image? | | FULL | false | | | | | | | | | | | | | | | | | | | | |
| | AcqFilter | Subarray | Obtain Verification Image? | | | | | | | | | | | | | | | | | | | | | | | | |
| | FULL | false | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dithers | <table border="1"> <thead> <tr> <th>#</th> <th>Dither Type</th> <th>No. Spectral Steps</th> <th>Spectral Step Offset</th> <th>No. Spatial Steps</th> <th>Spatial Step Offset</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MAPPING</td> <td>1</td> <td>0.0</td> <td>2</td> <td>1.0</td> </tr> </tbody> </table> | # | Dither Type | No. Spectral Steps | Spectral Step Offset | No. Spatial Steps | Spatial Step Offset | 1 | MAPPING | 1 | 0.0 | 2 | 1.0 | | | | | | | | | | | | | | |
| | # | Dither Type | No. Spectral Steps | Spectral Step Offset | No. Spatial Steps | Spatial Step Offset | | | | | | | | | | | | | | | | | | | | | |
| 1 | MAPPING | 1 | 0.0 | 2 | 1.0 | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spectral Elements | <table border="1"> <thead> <tr> <th>#</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Total Integrations</th> <th>Exposures/Dith</th> <th>Total Dithers</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>FASTR1</td> <td>100</td> <td>1</td> <td>2</td> <td>1</td> <td>2</td> <td>555.008</td> <td></td> </tr> </tbody> </table> | # | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Exposures/Dith | Total Dithers | Total Exposure Time | ETC Wkbk.Calc ID | 1 | FASTR1 | 100 | 1 | 2 | 1 | 2 | 555.008 | | | | | | | | | |
| | # | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Exposures/Dith | Total Dithers | Total Exposure Time | ETC Wkbk.Calc ID | | | | | | | | | | | | | | | | | | |
| 1 | FASTR1 | 100 | 1 | 2 | 1 | 2 | 555.008 | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Proposal 3823 - Observation 8 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Special Requirements

Aperture PA Range 127.75797 to 130.75797 Degrees (V3 123.0 to 126.0)

Group Observations 2, 4, 5, 6, 7, 8, 9, 10, Non-interruptible

Proposal 3823 - Observation 9 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Wed Jul 02 16:00:11 GMT 2025

| | | | | | | | | | |
|---|--|------------------------|--|---------------------------------|---------------------------|----------------------------|----------------------|----------------------------|-------------------------|
| Observation | Proposal 3823, Observation 9: Shell6 Diagnostic Status: Warning Observing Template: MIRI Low Resolution Spectroscopy | | | | | | | | |
| | (Visit 9:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | | Miscellaneous | | | |
| | (7) | WR140-SHELL-6 | RA: 20 20 27.0645 (305.1127687d) Dec: +43 51 4.52 (43.85126d) Equinox: J2000 | Epoch of Position: 2015.5 | | | | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=ISM Description=[Dust nebulae, Interstellar dust] | | | | | | | | | |
| Acquisition | # | Target | | | | | | | |
| | 1 | NONE | | | | | | | |
| Template | AcqFilter | Subarray | Obtain Verification Image? | | | | | | |
| | | FULL | false | | | | | | |
| Dithers | # | Dither Type | No. Spectral Steps | Spectral Step Offset | No. Spatial Steps | Spatial Step Offset | | | |
| | 1 | MAPPING | 1 | 0.0 | 2 | 1.0 | | | |
| Spectral Elements | # | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Exposures/Dith | Total Dithers | Total Exposure Time | ETC Wkbk.Calc ID |
| | 1 | FASTR1 | 150 | 1 | 2 | 1 | 2 | 832.512 | |

Proposal 3823 - Observation 9 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Special Requirements

Aperture PA Range 127.75797 to 130.75797 Degrees (V3 123.0 to 126.0)

Group Observations 2, 4, 5, 6, 7, 8, 9, 10, Non-interruptible

Proposal 3823 - Observation 10 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Wed Jul 02 16:00:11 GMT 2025

| | | | | | | | | |
|--------------------------|---|-----------------|--|----------------------------|--------------------|-------------------|---------------------|--------------------------------------|
| Observation | <p>Proposal 3823, Observation 10: Shell7</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: MIRI Low Resolution Spectroscopy</p> | | | | | | | |
| Diagnostics | (Visit 10:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | | Miscellaneous | | |
| | (8) | WR140-SHELL-7 | RA: 20 20 26.9095 (305.1121229d) Dec: +43 51 2.48 (43.85069d) Equinox: J2000 | Epoch of Position: 2015.5 | | | | |
| | <p>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=ISM Description=[Dust nebulae, Interstellar dust]</p> | | | | | | | |
| Acquisition | # | Target | | | | | | |
| | 1 | NONE | | | | | | |
| Template | AcqFilter | Subarray | | Obtain Verification Image? | | | | |
| | | FULL | | false | | | | |
| Dithers | # | Dither Type | No. Spectral Steps | Spectral Step Offset | | No. Spatial Steps | Spatial Step Offset | |
| | 1 | MAPPING | 1 | 0.0 | | 2 | 1.0 | |
| Spectral Elements | # | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Exposures/Dith | Total Dithers | Total Exposure Time ETC Wkbk.Calc ID |
| | 1 | FASTR1 | 300 | 1 | 2 | 1 | 2 | 1665.024 |

Proposal 3823 - Observation 10 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Special Requirements

Aperture PA Range 127.75797 to 130.75797 Degrees (V3 123.0 to 126.0)

Group Observations 2, 4, 5, 6, 7, 8, 9, 10, Non-interruptible

Proposal 3823 - Observation 2 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Wed Jul 02 16:00:11 GMT 2025

| | | | | | | | | | |
|--|--|------------------------|--|---------------------------------|---------------------------|-----------------------------------|----------------------------|---|--|
| Observation | Proposal 3823, Observation 2: Background Diagnostic Status: Warning Observing Template: MIRI Low Resolution Spectroscopy | | | | | | | | |
| | (Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. | | | | | | | | |
| Diagnosics | | | | | | | | | |
| | | | | | | | | | |
| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | | | Miscellaneous | | |
| | (2) | WR140BACKGROUND | RA: 20 20 25.4680 (305.1061167d) Dec: +43 51 9.88 (43.85274d) Equinox: J2000 | Epoch of Position: 2015.5 | | | | | |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Calibration Description=[Telescope/sky background] | | | | | | | | | |
| Acquisition | # | Target | | | | | | | |
| | 1 | NONE | | | | | | | |
| Template | AcqFilter | Subarray | | | | Obtain Verification Image? | | | |
| | | FULL | | | | false | | | |
| Dithers | # | Dither Type | No. Spectral Steps | Spectral Step Offset | | No. Spatial Steps | Spatial Step Offset | | |
| | 1 | MAPPING | 1 | 0.0 | | 2 | 1.0 | | |
| Spectral Elements | # | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Exposures/Dith | Total Dithers | Total Exposure Time ETC Wkbk.Calc ID | |
| | 1 | FASTR1 | 300 | 1 | 2 | 1 | 2 | 1665.024 | |

Proposal 3823 - Observation 2 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Special Requirements

Aperture PA Range 127.75797 to 130.75797 Degrees (V3 123.0 to 126.0)

Group Observations 2, 4, 5, 6, 7, 8, 9, 10, Non-interruptible

Proposal 3823 - Observation 4 - Dusting for PAH Fossil Records from Circumstellar Shells around WR 140

Wed Jul 02 16:00:11 GMT 2025

| | | | | | | | | | | | |
|-----------------------------|---|--------------------|---|-------------------------|-------------------------|---|-----------------------|----------------------|---------------------------|----------------------------|-------------------------|
| Observation | <p>Proposal 3823, Observation 4: WR140_2023</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: MIRI Imaging</p> | | | | | | | | | | |
| 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 | | |
| | (9) | WR140 | RA: 20 20 27.9697 (305.1165404d) Dec: +43 51 16.26 (43.85452d) Equinox: J2000 | | | Proper Motion RA: -3.9522877718304683E-4 sec of time/yr Proper Motion Dec: -0.0018739999632089166 arcsec/yr Epoch of Position: 2015.5 | | | | | |
| | <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> <i>Category=Star</i> <i>Description=[WC stars, Wolf-Rayet stars]</i> | | | | | | | | | | |
| Template | <p>Subarray</p> <p>FULL</p> | | | | | | | | | | |
| Dithers | # | Dither Type | Starting Point | Number of Points | Points | Starting Set | Number of Sets | Optimized For | Direction | Pattern Size | |
| | 1 | 4-Point-Sets | | | | 5 | 3 | EXTENDED SOURCE | NEGATIVE | DEFAULT | |
| Spectral Elements | # | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Exposures/Dith | Dither | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
| | 1 | F770W | FASTR1 | 43 | 1 | 1 | Dither 1 | 12 | 12 | 1431.921 | |
| | 2 | F1500W | FASTR1 | 43 | 1 | 1 | Dither 1 | 12 | 12 | 1431.921 | |
| | 3 | F2100W | FASTR1 | 43 | 1 | 1 | Dither 1 | 12 | 12 | 1431.921 | |
| Special Requirements | Group Observations 2, 4, 5, 6, 7, 8, 9, 10, Non-interruptible | | | | | | | | | | |