



# 4758 - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved High-contrast Imaging

Cycle: 3, Proposal Category: GO

## INVESTIGATORS

| <i>Name</i>                               | <i>Institution</i>                                      |
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| Dr. Ben Sutcliffe (CoI) (ESA Member)      | University of Edinburgh, Institute for Astronomy        |
| Dr. Beth Biller (CoI) (ESA Member)        | University of Edinburgh, Institute for Astronomy        |
| Dr. Eileen Gonzales (CoI)                 | San Francisco State University                          |
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| Isabel Rebolledo (CoI) (ESA Member)       | ESA-European Space Astronomy Centre                     |
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| Dr. Jason J. Wang (CoI)                   | Northwestern University                                 |
| Jens Kammerer (CoI) (ESA Member)          | European Southern Observatory - Germany                 |
| Dr. Johanna Vos (CoI) (ESA Member)        | University of Dublin, Trinity College                   |
| Julien Girard (CoI)                       | Space Telescope Science Institute                       |
| Dr. Kevin Wagner (CoI)                    | University of Arizona                                   |
| Dr. Marshall Perrin (CoI)                 | Space Telescope Science Institute                       |
| Dr. Marta Bryan (CoI) (CSA Member)        | University of Toronto                                   |
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| Dr. Niall Whiteford (CoI)                 | American Museum of Natural History                      |
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|--|--|
| Dr. Simon Petrus (CoI)                       | University of Valparaiso                 |
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| William Balmer (CoI)                         | Space Telescope Science Institute        |
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| Prof. Daniel Apai (CoI)                      | University of Arizona                    |
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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                  | Roll-1       | NIRCam Coronagraphic Imaging | (1) -bet-Pic          |
|                    | 2                  | Roll-2       | NIRCam Coronagraphic Imaging | (1) -bet-Pic          |
|                    | 3                  | Ref          | NIRCam Coronagraphic Imaging | (2) -alf-Pic          |
|                    | 4                  | Ref          | NIRCam Coronagraphic Imaging | (2) -alf-Pic          |

## ABSTRACT

Rotational modulation is common among brown dwarfs and planetary-mass objects. The periodic light curves reveal heterogeneous atmospheric structures and enable precise measurements of rotation period and spin angular momentum. The observed rotational period, when combined with the projected rotational velocity ( $v \sin i$ ), constrains spin axis orientations and planetary obliquity, which offer unique insights into a planet's formation history and dynamical evolution pathway. The light curves of directly imaged exoplanets can only be precisely measured with JWST/NIRCam coronagraphic imaging.

The super-Jovian planet Beta Pic b, residing in a dynamically interactive system, stands out as an ideal target of time-resolved high-contrast photometry. We propose a photometric monitoring campaign using the JWST NIRCam dual-band coronagraphic mode to observe the rotational modulation in Beta Pic b. These observations will probe the heterogeneous atmosphere of Beta Pic b, precisely constrain the planet's rotation period, uncover the planet's obliquity, and test the alignment between the planet's spin and orbital axes. Beta Pic b will have its maximum angular separation from its host star during JWST Cycle 3. The same opportunity will not repeat until 2035.

## OBSERVING DESCRIPTION

## JWST Proposal 4758 (Created: Tuesday, January 21, 2025, 7:00:10PM Eastern Standard Time) - Overview

We design time-resolved NIRCам dual-band coronagraphic observations following the JWST HCI recommendations and take advantage of JWST's unprecedented photometric stability to achieve a high-precision time series of beta pic b.

### Instrument selection:

NIRCам is favored over MIRI. The debris disk has strong thermal emission in MIRI bandpasses. The disk flux may contaminate the planetary signals and reduce the sensitivity in detecting the variability of the planet.

### Coronagraph/filter selections:

We select Mask335R as our coronagraph because it maximizes the planetary signals. Dual-band coronagraphic observations will be conducted in the F210M band in the short wavelength channel and F410M band in the long wavelength channel. These two filters enclose the peaks of the  $K$  and  $L$  bands, respectively, and avoid water absorption bands. Rotational modulations of brown dwarfs often decrease in the molecular absorption bands because the continuum bandpasses probe a few bars deeper into the atmosphere and are more sensitive to heterogeneous structures. Our filter selections maximize the likelihood of detecting variability.

### Observing sequence:

The observing sequence contains 20 consecutive exposures of beta Pic b and one exposure of the PSF reference star alpha Pic. The reference star is identical to the one used in Cycle-1 observations of beta Pic that resulted in high-S/N detections of beta Pic b (GTO-1411, private communication). To facilitate angular differential imaging (ADI), we request the telescope PA to rotate by 10 to 14 degrees halfway during the beta Pic exposure sequence and keep the telescope PA constant for the rest of the sequence.

Each target star exposure comprises 120 integrations of BRIGHT2 readout x 10 groups, amounting to an exposure time 45 min. A sequence of 20 exposures form a 15-hr baseline. The reference star will be observed with a 9-point SGD to improve pixel sampling. In total, this amounts to a 23.9 hour request.

### Cadence and time baseline justification:

The design of our observations allows us to probe the variability signals with high-cadence observations. The  $P_{\text{rot}}$  of beta Pic b sets the period

JWST Proposal 4758 (Created: Tuesday, January 21, 2025, 7:00:10PM Eastern Standard Time) - Overview

upper limit to be 7.5 hr (if viewed equator-on) and the centrifugal break-up limit sets the lower limit to be 2.0 hr. Our nominal observing cadence (45 min) sufficiently samples the light curve.

Proposal 4758 - Targets - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved High-...

| Fixed Targets  | #        | Name   | Target Coordinates   | Targ. Coord. Corrections  | Miscellaneous |
|--|----------|--|--|---|---------------|
|  | (1)      | -bet-Pic   | RA: 05 47 17.0877 (86.8211988d)<br>Dec: -51 03 59.44 (-51.06651d)<br>Equinox: J2000                                  | Proper Motion RA: 5.16 mas/yr<br>Proper Motion Dec: 84.04 mas/yr<br>Parallax: 0.05093"<br>Epoch of Position: 2000 |               |
| <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i><br/>           Category=Star<br/>           Description=[A stars]<br/>           Extended=NO</p> |          |  |  |   |               |
| (2)  | -alf-Pic | RA: 06 48 11.4551 (102.0477296d)<br>Dec: -61 56 29.00 (-61.94139d)<br>Equinox: J2000 | Proper Motion RA: -66.07 mas/yr<br>Proper Motion Dec: 242.97 mas/yr<br>Parallax: 0.03378"<br>Epoch of Position: 2000 |   |               |
| <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i><br/>           Category=Star<br/>           Description=[A stars]<br/>           Extended=NO</p> |          |  |  |   |               |

Proposal 4758 - Observation 1 - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved...

Wed Jan 22 00:00:10 GMT 2025

|                      |  |                              |   |   |  |                   |                                 |                                  |                            |                            |
|----------------------|--|------------------------------|---|---|--|-------------------|---------------------------------|----------------------------------|----------------------------|----------------------------|
| <b>Observation</b>   | <p><b>Proposal 4758, Observation 1: Roll-1</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRCcam Coronagraphic Imaging</p>   |                              |   |   |  |                   |                                 |                                  |                            |                            |
| <b>Diagnostics</b>   | <p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Roll-1 (Obs 1)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.</p> |                              |   |   |  |                   |                                 |                                  |                            |                            |
| <b>Fixed Targets</b> | <b>#</b>   | <b>Name</b>                  | <b>Target Coordinates</b>   | <b>Targ. Coord. Corrections</b>   |  |                   | <b>Miscellaneous</b>            |                                  |                            |                            |
|                      | (1)  | -bet-Pic                     | RA: 05 47 17.0877 (86.8211988d)<br>Dec: -51 03 59.44 (-51.06651d)<br>Equinox: J2000 | Proper Motion RA: 5.16 mas/yr<br>Proper Motion Dec: 84.04 mas/yr<br>Parallax: 0.05093"<br>Epoch of Position: 2000 |  |                   |                                 |                                  |                            |                            |
|                      | <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>Category=Star</i></p> <p><i>Description=[A stars]</i></p> <p><i>Extended=NO</i></p>                  |                              |   |   |  |                   |                                 |                                  |                            |                            |
| <b>Acquisition</b>   | <b>#</b>   | <b>Target</b>                | <b>Filter</b>   | <b>Target Brightness</b>  | <b>Readout Pattern</b>                         | <b>Groups/Int</b> | <b>Integrations/Exp</b>         | <b>Total Integrations</b>        | <b>Total Exposure Time</b> | <b>ETC Wkbk.Calc ID</b>    |
|                      | 1  | 1 -bet-Pic                   | F335M   | BRIGHT (ND Square)  | RAPID  | 9                 | 1                               | 1                                | 0.504                      | 173578.5                   |
| <b>Template</b>      | <b>Module</b>  |                              | <b>Occulting Mask</b>   |   | <b>Obtain Astrometric Confirmation Images?</b> |                   | <b>Subarray</b>                 | <b>Dither Pattern</b>            |                            |                            |
|                      | A  |                              | MASK335R  |   | true   |                   | SUB320A335R                     | NONE                             |                            |                            |
| <b>Confirmation</b>  | <b>#</b>   | <b>Conf. Readout Pattern</b> |   | <b>Conf. Groups/Int</b>   | <b>Conf. Integrations/Exp</b>                  |                   | <b>Conf. Total Integrations</b> | <b>Conf. Total Exposure Time</b> |                            | <b>Conf. Total Dithers</b> |
|                      | 1  | RAPID                        |   | 3   | 1  |                   | 1                               | 32.21                            |                            | 1                          |

Proposal 4758 - Observation 1 - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved...

|                             | #  | Short Filter | Long Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|-----------------------------|--|--------------|-------------|-----------------|------------|------------------|---------------|--------------------|---------------------|------------------|
| <b>Spectral Elements</b>    | 1  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 2  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 3  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 4  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 5  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 6  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 7  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 8  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 9  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 10   | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
| <b>PSF References</b>       | Ref (Obs 3) (PSF Reference; Filters [F210M/F410M])<br>Ref (Obs 4) (PSF Reference; Filters [F210M/F410M])<br>Additional Justification: false  |              |             |                 |            |                  |               |                    |                     |                  |
| <b>Special Requirements</b> | Offset -0.01 arcsec, -0.018 arcsec<br>No Parallel Attachments<br>Sequence Observations 3, 1, 2, 4 (reordered), Non-interruptible<br>Aperture PA Offset 2 from 1 by 10 to 14 Degrees (Same offsets in V3) |              |             |                 |            |                  |               |                    |                     |                  |

Proposal 4758 - Observation 2 - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved...

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|                      |  |                              |   |                          |   |                   |                                 |                                  |                            |                         |
|----------------------|--|------------------------------|---|--------------------------|---|-------------------|---------------------------------|----------------------------------|----------------------------|-------------------------|
| <b>Observation</b>   | <p><b>Proposal 4758, Observation 2: Roll-2</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRCcam Coronagraphic Imaging</p>   |                              |   |                          |   |                   |                                 |                                  |                            |                         |
| <b>Diagnostics</b>   | <p>(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Roll-2 (Obs 2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.</p> |                              |   |                          |   |                   |                                 |                                  |                            |                         |
| <b>Fixed Targets</b> | <b>#</b>   | <b>Name</b>                  | <b>Target Coordinates</b>   |                          | <b>Targ. Coord. Corrections</b>   |                   |                                 | <b>Miscellaneous</b>             |                            |                         |
|                      | (1)  | -bet-Pic                     | RA: 05 47 17.0877 (86.8211988d)<br>Dec: -51 03 59.44 (-51.06651d)<br>Equinox: J2000 |                          | Proper Motion RA: 5.16 mas/yr<br>Proper Motion Dec: 84.04 mas/yr<br>Parallax: 0.05093"<br>Epoch of Position: 2000 |                   |                                 |                                  |                            |                         |
|                      | <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>Category=Star</i></p> <p><i>Description=[A stars]</i></p> <p><i>Extended=NO</i></p>                  |                              |   |                          |   |                   |                                 |                                  |                            |                         |
| <b>Acquisition</b>   | <b>#</b>   | <b>Target</b>                | <b>Filter</b>   | <b>Target Brightness</b> | <b>Readout Pattern</b>  | <b>Groups/Int</b> | <b>Integrations/Exp</b>         | <b>Total Integrations</b>        | <b>Total Exposure Time</b> | <b>ETC Wkbk.Calc ID</b> |
|                      | 1  | 1 -bet-Pic                   | F335M   | BRIGHT (ND Square)       | RAPID   | 9                 | 1                               | 1                                | 0.504                      | 173578.5                |
| <b>Template</b>      | <b>Module</b>  |                              | <b>Occulting Mask</b>   |                          | <b>Obtain Astrometric Confirmation Images?</b>  |                   | <b>Subarray</b>                 | <b>Dither Pattern</b>            |                            |                         |
|                      | A  |                              | MASK335R  |                          | true  |                   | SUB320A335R                     | NONE                             |                            |                         |
| <b>Confirmation</b>  | <b>#</b>   | <b>Conf. Readout Pattern</b> |   | <b>Conf. Groups/Int</b>  | <b>Conf. Integrations/Exp</b>   |                   | <b>Conf. Total Integrations</b> | <b>Conf. Total Exposure Time</b> | <b>Conf. Total Dithers</b> |                         |
|                      | 1  | RAPID                        |   | 3                        | 1   |                   | 1                               | 32.21                            | 1                          |                         |

Proposal 4758 - Observation 2 - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved...

|                             | #  | Short Filter | Long Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|-----------------------------|--|--------------|-------------|-----------------|------------|------------------|---------------|--------------------|---------------------|------------------|
| <b>Spectral Elements</b>    | 1  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 2  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 3  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 4  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 5  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 6  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 7  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 8  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 9  | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
|                             | 10   | F210M        | F410M       | BRIGHT2         | 10         | 110              | 1             | 110                | 2471.735            | 173578.1         |
| <b>PSF References</b>       | Ref (Obs 3) (PSF Reference; Filters [F210M/F410M])<br>Ref (Obs 4) (PSF Reference; Filters [F210M/F410M])<br>Additional Justification: false  |              |             |                 |            |                  |               |                    |                     |                  |
| <b>Special Requirements</b> | Offset -0.01 arcsec, -0.018 arcsec<br>No Parallel Attachments<br>Sequence Observations 3, 1, 2, 4 (reordered), Non-interruptible<br>Aperture PA Offset 2 from 1 by 10 to 14 Degrees (Same offsets in V3) |              |             |                 |            |                  |               |                    |                     |                  |

Proposal 4758 - Observation 3 - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved...

Wed Jan 22 00:00:10 GMT 2025

|                          |   |              |  |                    |  |                  |                  |                    |                     |                  |
|--------------------------|---|--------------|--|--------------------|--|------------------|------------------|--------------------|---------------------|------------------|
| <b>Observation</b>       | <p><b>Proposal 4758, Observation 3: Ref</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRCcam Coronagraphic Imaging</p>   |              |  |                    |  |                  |                  |                    |                     |                  |
| <b>Diagnostics</b>       | (Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.   |              |  |                    |  |                  |                  |                    |                     |                  |
| <b>Fixed Targets</b>     | #   | Name         | Target Coordinates   |                    | Targ. Coord. Corrections   |                  |                  | Miscellaneous      |                     |                  |
|                          | (2)   | -alf-Pic     | RA: 06 48 11.4551 (102.0477296d)<br>Dec: -61 56 29.00 (-61.94139d)<br>Equinox: J2000 |                    | Proper Motion RA: -66.07 mas/yr<br>Proper Motion Dec: 242.97 mas/yr<br>Parallax: 0.03378"<br>Epoch of Position: 2000 |                  |                  |                    |                     |                  |
|                          | <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>Category=Star</i></p> <p><i>Description=[A stars]</i></p> <p><i>Extended=NO</i></p> |              |  |                    |  |                  |                  |                    |                     |                  |
| <b>Acquisition</b>       | #   | Target       | Filter   | Target Brightness  | Readout Pattern  | Groups/Int       | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|                          | 1   | 2 -alf-Pic   | F335M  | BRIGHT (ND Square) | RAPID  | 9                | 1                | 1                  | 0.504               | 173578.6         |
| <b>Template</b>          | Module  |              | Occulting Mask   |                    | Obtain Astrometric Confirmation Images?  |                  | Subarray         |                    | Dither Pattern      |                  |
|                          | A   |              | MASK335R   |                    | false  |                  | SUB320A335R      |                    | 9-POINT-CIRCLE      |                  |
| <b>Spectral Elements</b> | #   | Short Filter | Long Filter  | Readout Pattern    | Groups/Int   | Integrations/Exp | Total Dithers    | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|                          | 1   | F210M        | F410M  | BRIGHT2            | 5  | 50               | 9                | 450                | 5300.964            | 173578.3         |
| <b>PSF References</b>    | PSF Reference: true   |              |  |                    |  |                  |                  |                    |                     |                  |

Proposal 4758 - Observation 3 - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved...

Special Requirements

Offset -0.01 arcsec, -0.018 arcsec

Sequence Observations 3, 1, 2, 4 (reordered), Non-interruptible

Proposal 4758 - Observation 4 - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved...

Wed Jan 22 00:00:10 GMT 2025

|                          |  |              |  |                    |  |                  |                  |                    |                     |                  |
|--------------------------|--|--------------|--|--------------------|--|------------------|------------------|--------------------|---------------------|------------------|
| <b>Observation</b>       | <p><b>Proposal 4758, Observation 4: Ref</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRCcam Coronagraphic Imaging</p>                              |              |  |                    |  |                  |                  |                    |                     |                  |
| <b>Diagnostics</b>       | (Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.  |              |  |                    |  |                  |                  |                    |                     |                  |
| <b>Fixed Targets</b>     | #  | Name         | Target Coordinates   |                    | Targ. Coord. Corrections   |                  |                  | Miscellaneous      |                     |                  |
|                          | (2)  | -alf-Pic     | RA: 06 48 11.4551 (102.0477296d)<br>Dec: -61 56 29.00 (-61.94139d)<br>Equinox: J2000 |                    | Proper Motion RA: -66.07 mas/yr<br>Proper Motion Dec: 242.97 mas/yr<br>Parallax: 0.03378"<br>Epoch of Position: 2000 |                  |                  |                    |                     |                  |
|                          | <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p>Category=Star<br/>Description=[A stars]<br/>Extended=NO</p> |              |  |                    |  |                  |                  |                    |                     |                  |
| <b>Acquisition</b>       | #  | Target       | Filter   | Target Brightness  | Readout Pattern  | Groups/Int       | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|                          | 1  | 2 -alf-Pic   | F335M  | BRIGHT (ND Square) | RAPID  | 9                | 1                | 1                  | 0.504               | 173578.6         |
| <b>Template</b>          | Module   |              | Occulting Mask   |                    | Obtain Astrometric Confirmation Images?  |                  | Subarray         |                    | Dither Pattern      |                  |
|                          | A  |              | MASK335R   |                    | false  |                  | SUB320A335R      |                    | 9-POINT-CIRCLE      |                  |
| <b>Spectral Elements</b> | #  | Short Filter | Long Filter  | Readout Pattern    | Groups/Int   | Integrations/Exp | Total Dithers    | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|                          | 1  | F210M        | F410M  | BRIGHT2            | 5  | 50               | 9                | 450                | 5300.964            | 173578.3         |
| <b>PSF References</b>    | PSF Reference: true  |              |  |                    |  |                  |                  |                    |                     |                  |

Proposal 4758 - Observation 4 - From Day to Season: Constraining the Rotation Period and Obliquity of Beta Pic b with Time-resolved...

Special Requirements

Offset -0.01 arcsec, -0.018 arcsec

Sequence Observations 3, 1, 2, 4 (reordered), Non-interruptible