



## 9384 - Does the 2175 A extinction bump grains form in dense molecular gas?

Cycle: 4, Proposal Category: GO

### INVESTIGATORS

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### OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
AzV 456				
	1		NIRCam Imaging	(1) AzV-456
SMC B1-1				
	2		NIRCam Imaging	(2) SMC-B1-1
AzV 398				
	3		NIRCam Imaging	(3) AzV-398

### ABSTRACT

Throughout the Local Group, dust extinction curves display an enigmatic "bump" at 2175 angstroms. However, the precise origin of this ubiquitous feature is unclear. Fortunately, the nearby Small Magellanic Cloud provides an excellent laboratory for constraining the origins of the bump, as it is the only known system where the bump is absent from most, but not all sightlines. Where the bump is detected in the SMC, the dust to gas ratio suggests that dust grains have condensed in the ISM. To test the hypothesis that grain condensation is the driver of the 2175 angstrom bump, we propose to observe five SMC fields featuring a mix of bump detections and non-detections in ALMA CO emission -- an excellent tracer of ISM

conditions where dust condensation is most efficient and JWST 3.3 micron carbonaceous/PAH emission -- an excellent tracer of the possible destructive UV radiation field. To fully resolve the CO/3.3 micron cloud structure, and to distinguish between strong bump variations observed on small spatial scales, we require the superb sensitivity and angular resolution capabilities of ALMA and JWST.

### **OBSERVING DESCRIPTION**

The 3.3 micron observations will be taken with the F335M filter, the F300M filter used for continuum subtraction, and 5 groups/int with 4 dither positions.

This follows the setup and depth used for the PID: 4567 program that produced the excellent 3.3 micron maps of the N83 region available in the JWST archive.

As we are focusing on the immediate region around each sightline, we use 4 dithers with the INTRAMODULEX pattern. We have followed the suggested options

(target placement in the module gap with an offset special requirement) for placing the target in the B1 chip as we are observing small regions that fit on

a single short wavelength detector.

As a bonus, we will observe the F212N filter and associated F210M continuum filters in parallel in the NIRCcam short wavelength module providing a measure of the warm H<sub>2</sub>.

Proposal 9384 - Targets - Does the 2175 A extinction bump grains form in dense molecular gas?

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	AzV-456	RA: 01 10 55.7567 (17.7323196d) Dec: -72 42 56.22 (-72.71562d) Equinox: J2000	Proper Motion RA: 2.124 mas/yr Proper Motion Dec: -3.2159999591385713 mas/yr Parallax: 0.002787399999999998" Epoch of Position: 2000	
<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.</i></p> <p>Category=Star Description=[B stars]</p>				
(2)	SMC-B1-1	RA: 00 45 35.1012 (11.3962550d) Dec: -73 18 35.97 (-73.30999d) Equinox: J2000	Proper Motion RA: 0.602 mas/yr Proper Motion Dec: -1.4140000530460384 mas/yr Parallax: 5.3E-5" Epoch of Position: 2000	
<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.</i></p> <p><i>Coordinates are for one of the 3 stars targeted in the SMC B1-1. Specifically this is for MR12-09 aka Gaia DR3 4685849520845458560. This is to ensure that the three sources targeted are well observed. The actual center of SMC B1-1 is slightly offset from these coordinates, but the goal is to observe these three stars in SMC B1-1 (not SMC B1-1 specifically).</i></p> <p>Category=ISM Description=[Molecular clouds]</p>				
(3)	AzV-398	RA: 01 06 9.8135 (16.5408896d) Dec: -71 56 0.75 (-71.93354d) Equinox: J2000	Proper Motion RA: 0.998 mas/yr Proper Motion Dec: -1.1020000783901196 mas/yr Epoch of Position: 2000	
<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.</i></p> <p>Category=Star Description=[B stars]</p>				

Fixed Targets

Proposal 9384 - Observation 1 - Does the 2175 A extinction bump grains form in dense molecular gas?

Thu Aug 07 21:00:31 GMT 2025

<b>Observation</b>	<p><b>Proposal 9384, Observation 1</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCcam Imaging</p>									
<b>Diagnostics</b>	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>		<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>		
	(1)	AzV-456	RA: 01 10 55.7567 (17.7323196d) Dec: -72 42 56.22 (-72.71562d) Equinox: J2000		Proper Motion RA: 2.124 mas/yr Proper Motion Dec: -3.2159999591385713 mas/yr Parallax: 0.0027873999999999998" Epoch of Position: 2000					
	<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.</i></p> <p><i>Category=Star</i>  <i>Description=[B stars]</i></p>									
<b>Template</b>	<b>Module</b>		<b>Subarray</b>			<b>Target Placement</b>				
	ALL		FULL			Module Gap				
<b>Dithers</b>	<b>#</b>	<b>Primary Dither Type</b>		<b>Primary Dithers</b>	<b>Subpixel Dither Type</b>		<b>Dither Size</b>	<b>Subpixel Positions</b>		
	1	INTRAMODULEX		4	STANDARD			1		
<b>Spectral Elements</b>	<b>#</b>	<b>Short Filter</b>	<b>Long Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Dithers</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	F212N	F335M	BRIGHT2	5	1	4	4	429.471	
	2	F210M	F300M	BRIGHT2	5	1	4	4	429.471	
<b>Special Requirements</b>	Offset 120.0 arcsec, 35.0 arcsec									

Proposal 9384 - Observation 2 - Does the 2175 A extinction bump grains form in dense molecular gas?

Thu Aug 07 21:00:31 GMT 2025

<b>Observation</b>	<p><b>Proposal 9384, Observation 2</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRCcam Imaging</p>									
<b>Diagnostics</b>	(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>		<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>		
	(2)	SMC-B1-1	RA: 00 45 35.1012 (11.3962550d) Dec: -73 18 35.97 (-73.30999d) Equinox: J2000		Proper Motion RA: 0.602 mas/yr Proper Motion Dec: -1.4140000530460384 mas/yr Parallax: 5.3E-5" Epoch of Position: 2000					
	<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.</i></p> <p><i>Coordinates are for one of the 3 stars targeted in the SMC B1-1. Specifically this is for MR12-09 aka Gaia DR3 4685849520845458560. This is to ensure that the three sources targeted are well observed. The actual center of SMC B1-1 is slightly offset from these coordinates, but the goal is to observe these three stars in SMC B1-1 (not SMC B1-1 specifically).</i></p> <p><i>Category=ISM</i></p> <p><i>Description=[Molecular clouds]</i></p>									
<b>Template</b>	<b>Module</b>		<b>Subarray</b>			<b>Target Placement</b>				
	ALL		FULL			Module Gap				
<b>Dithers</b>	<b>#</b>	<b>Primary Dither Type</b>		<b>Primary Dithers</b>		<b>Subpixel Dither Type</b>		<b>Dither Size</b>	<b>Subpixel Positions</b>	
	1	INTRAMODULEX		4		STANDARD			1	
<b>Spectral Elements</b>	<b>#</b>	<b>Short Filter</b>	<b>Long Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Dithers</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	F212N	F335M	BRIGHT2	5	1	4	4	429.471	
	2	F210M	F300M	BRIGHT2	5	1	4	4	429.471	

Proposal 9384 - Observation 2 - Does the 2175 A extinction bump grains form in dense molecular gas?

Special Requirements

Offset 120.0 arcsec, 35.0 arcsec

Proposal 9384 - Observation 3 - Does the 2175 A extinction bump grains form in dense molecular gas?

Thu Aug 07 21:00:31 GMT 2025

<b>Observation</b>	<p><b>Proposal 9384, Observation 3</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRCcam Imaging</p>									
<b>Diagnostics</b>	(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>		<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>		
	(3)	AzV-398	RA: 01 06 9.8135 (16.5408896d) Dec: -71 56 0.75 (-71.93354d) Equinox: J2000		Proper Motion RA: 0.998 mas/yr Proper Motion Dec: -1.1020000783901196 mas/yr Epoch of Position: 2000					
	<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.</i></p> <p><i>Category=Star</i></p> <p><i>Description=[B stars]</i></p>									
<b>Template</b>	<b>Module</b>		<b>Subarray</b>			<b>Target Placement</b>				
	ALL		FULL			Module Gap				
<b>Dithers</b>	<b>#</b>	<b>Primary Dither Type</b>		<b>Primary Dithers</b>	<b>Subpixel Dither Type</b>		<b>Dither Size</b>	<b>Subpixel Positions</b>		
	1	INTRAMODULEX		4	STANDARD			1		
<b>Spectral Elements</b>	<b>#</b>	<b>Short Filter</b>	<b>Long Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Dithers</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	F212N	F335M	BRIGHT2	5	1	4	4	429.471	
	2	F210M	F300M	BRIGHT2	5	1	4	4	429.471	
<b>Special Requirements</b>	Offset 120.0 arcsec, 35.0 arcsec									