



2747 - The Volatile Content of Oort Cloud Comet C/2014 UN271

Cycle: 1, Proposal Category: DD

INVESTIGATORS

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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	NIRSpecIFU-UN271	NIRSpec IFU Spectroscopy	(1) C2014UN271
	2	NIRSpecIFU-SHADOW	NIRSpec IFU Spectroscopy	(3) C2014UN271-OFFSET
	6	NIRSpecIFU-UN271	NIRSpec IFU Spectroscopy	(4) C2014UN271-COPY
	7	NIRSpecIFU-SHADOW	NIRSpec IFU Spectroscopy	(5) C2014UN271-OFFSET-COPY
	5	NIRSPEC-SW1/LW1-UN271	NIRCam Imaging	(6) C2014UN271-NO-OFFSET

ABSTRACT

Oort Cloud comets are remnants of the original planetesimals that were ejected from the planetary region in the late stages of planetary formation. The Oort Cloud comet C/2014 UN271, hereafter UN271, is ~140 km in diameter, large enough that it could be an intact example of a planetesimal

that formed in the protoplanetary disk before being ejected into the Oort Cloud. UN271 has been at >20 au from the Sun. Given its large heliocentric distance, it is likely that its activity is driven by hypervolatiles such as CO or CO₂ and not H₂O. UN271 is on its first inbound trip to the Solar System's planetary region providing the rare opportunity to study the volatile contents of one of the original planetesimals in a pristine state. We propose NIRSpec IFU observations of UN271 covering the spectral range where vibrational bands of gas-phase hypervolatiles (such as CO/CO₂) as well as solid-phase water-ice grains can be detected. Our observations will provide constraints on the comet's CO and CO₂ production rates, the activity driving mechanism, and the presence and nature of water-ice grains in its coma. We request observations now so the comet's behavior can be established before rapid changes occur in the comet's activity due to the increasing thermal pulse from the Sun. The detection of volatiles and constraints on the activity of the largest known Oort Cloud comet and one of the original planetesimals will be tremendously exciting and useful for placing constraints on the volatile contents and timing of the formation of the original planetesimals. These observations will be combined with observations from HST to maximize the science of both datasets spanning the visible and NIR.

OBSERVING DESCRIPTION

Our science program requires the spectral coverage and high spatial resolution IFU capability of NIRSpec that provides a wavelength coverage of 1-5 microns in Prism/CLEAR mode and covers an area of 3 arcsec x 3 arcsec centered on the comet (corresponding to a spatial scale of 40,000 km at the comet in late 2022) at a resolution of 0.1 arcseconds. We will observe UN271 in a single visit using the NRS readout mode taking 21 groups/integrations, 1 integration per exposure with a 4-point dither with a total of 4 integrations for a total exposure time of ~3605 seconds. This will provide a spectrum in each spaxel that has SNR of at least 20 per spectral bin in our relevant wavelength region. The total duration of our observations is ~8,200 s or 2.3 h. We will not use a target acquisition method because the ephemeris uncertainty of the comet is less than 1 arcsecond so the comet's optocenter will fit comfortably within the 3 arcsec field of view of the NIRSpec IFU. We will observe our target with non-sidereal tracking. We will request shadow observations after our main science observations for background removal. The total time of our observation request for both science and shadow observations is 15,840 s or 4.4 h.

Proposal 2747 - Targets - The Volatile Content of Oort Cloud Comet C/2014 UN271

#	Name	Level 1	Level 2	Level 3
(1)	C2014UN271	TYPE=COMET,Q=10.95093114425826,E=0.9992699 283681892,I=95.5628567511893 .O=190.0955788912832,W=326.287618620302,T=24- JAN- 2031:19:30:40,TTIMEscale=TDB,EQUINOX=J2000,E POCH=29-JUN-2017:00:00:00,EpochTimeScale=TDB		
<i>Comments: Extended=YES</i>				
(3)	C2014UN271-OFFSET	TYPE=COMET,Q=10.95093114425826,E=0.9992699 283681892,I=95.5628567511893 .O=190.0955788912832,W=326.287618620302,T=24- JAN- 2031:19:30:40,TTIMEscale=TDB,EQUINOX=J2000,E POCH=29-JUN-2017:00:00:00,EpochTimeScale=TDB	TYPE=POS_ANGLE,RAD=480,ANG=90,REF=SUN	
<i>Comments: Extended=YES</i>				
(4)	C2014UN271-COPY	TYPE=COMET,Q=10.94502883884481,E=0.9986730 649305881,I=95.55281152182954 .O=190.0839891433294,W=326.333330163034,T=26- JAN- 2031:11:12:05,TTIMEscale=TDB,EQUINOX=J2000,E POCH=22-JAN-2018:00:00:00,EpochTimeScale=TDB		
<i>Comments: Extended=YES</i>				
(5)	C2014UN271-OFFSET-COPY	TYPE=COMET,Q=10.94502883884481,E=0.9986730 649305881,I=95.55281152182954 .O=190.0839891433294,W=326.333330163034,T=26- JAN- 2031:11:12:05,TTIMEscale=TDB,EQUINOX=J2000,E POCH=22-JAN-2018:00:00:00,EpochTimeScale=TDB	TYPE=POS_ANGLE,RAD=480,ANG=90,REF=SUN	
<i>Comments: Extended=YES</i>				
(6)	C2014UN271-NO-OFFSET	TYPE=COMET,Q=10.94502883884481,E=0.9986730 649305881,I=95.55281152182954 .O=190.0839891433294,W=326.333330163034,T=26- JAN- 2031:11:12:05,TTIMEscale=TDB,EQUINOX=J2000,E POCH=22-JAN-2018:00:00:00,EpochTimeScale=TDB		
<i>Comments: Extended=YES</i>				

Solar System Targets

Proposal 2747 - Observation 1 - The Volatile Content of Oort Cloud Comet C/2014 UN271

Fri May 26 19:06:14 GMT 2023

Observation	<p>Proposal 2747, Observation 1: NIRSpecIFU-UN271</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p> <p>Background Observations:[NIRSpecIFU-SHADOW (Obs 2)]</p>											
	<p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(NIRSpecIFU-UN271 (Obs 1)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.</p>											
Diagnostics												
Solar System Targets	#	Name	Level 1				Level 2				Level 3	
	(1)	C2014UN271	TYPE=COMET,Q=10.95093114425826,E=0.9992699 283681892,I=95.5628567511893 ,O=190.0955788912832,W=326.287618620302,T=24- JAN- 2031:19:30:40,TimeScale=TDB,EQUINOX=J2000,E POCH=29-JUN-2017:00:00:00,EpochTimeScale=TDB									
<p><i>Comments: Extended=YES</i></p>												
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point			Number of Points	Points			
	1	4-POINT-DITHER										
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRS	25	1	false	true	NONE	4	4	4337.655	118062
Special Requirements	Sequence Observations 1, 2, Non-interruptible											
	DEFAULT WINDOW: ANGULAR RATE C2014UN271 FROM JWST LESS THAN 0.03											

Proposal 2747 - Observation 2 - The Volatile Content of Oort Cloud Comet C/2014 UN271

Fri May 26 19:06:14 GMT 2023

Observation	<p>Proposal 2747, Observation 2: NIRSpecIFU-SHADOW</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p> <p>Background Observation For: [NIRSpecIFU-UN271 (Obs 1)]</p>											
	<p>(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(NIRSpecIFU-SHADOW (Obs 2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.</p>											
Diagnostics												
Solar System Targets	#	Name	Level 1				Level 2				Level 3	
	(3)	C2014UN271-OFFSET	TYPE=COMET,Q=10.95093114425826,E=0.9992699 283681892,I=95.5628567511893 ,O=190.0955788912832,W=326.287618620302,T=24- JAN- 2031:19:30:40,TimeScale=TDB,EQUINOX=J2000,E POCH=29-JUN-2017:00:00:00,EpochTimeScale=TDB				TYPE=POS_ANGLE,RAD=480,ANG=90,REF=SUN					
<p><i>Comments: Extended=YES</i></p>												
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size		Starting Point		Number of Points		Points		
	1	4-POINT-DITHER										
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRS	25	1	false	true	NONE	4	4	4337.655	
Special Requirements	<p>On Hold Shadow observation for a Solar System target.</p> <p>Sequence Observations 1, 2, Non-interruptible</p> <p>DEFAULT WINDOW: ANGULAR RATE C2014UN271-OFFSET FROM JWST LESS THAN 0.03</p>											

Proposal 2747 - Observation 6 - The Volatile Content of Oort Cloud Comet C/2014 UN271

Fri May 26 19:06:14 GMT 2023

Observation	<p>Proposal 2747, Observation 6: NIRSpecIFU-UN271</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p> <p>Background Observations:[NIRSpecIFU-SHADOW (Obs 7)]</p>											
	<p>(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(NIRSpecIFU-UN271 (Obs 6)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.</p>											
Diagnostics												
Solar System Targets	#	Name	Level 1				Level 2				Level 3	
	(4)	C2014UN271-COPY	TYPE=COMET,Q=10.94502883884481,E=0.9986730649305881,I=95.55281152182954,O=190.0839891433294,W=326.333330163034,T=26-JAN-2031:11:12:05,TimeScale=TDB,EQUINOX=J2000,EPOCH=22-JAN-2018:00:00:00,EpochTimeScale=TDB									
<p><i>Comments: Extended=YES</i></p>												
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point			Number of Points	Points			
	1	4-POINT-DITHER										
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRS	25	1	false	true	NONE	4	4	4337.655	118062
Special Requirements	Sequence Observations 5, 6, 7, Non-interruptible											
	DEFAULT WINDOW: ANGULAR RATE C2014UN271-COPY FROM JWST LESS THAN 0.075											

Proposal 2747 - Observation 7 - The Volatile Content of Oort Cloud Comet C/2014 UN271

Fri May 26 19:06:14 GMT 2023

Observation	<p>Proposal 2747, Observation 7: NIRSpecIFU-SHADOW</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p> <p>Background Observation For: [NIRSpecIFU-UN271 (Obs 6)]</p>											
	<p>(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(NIRSpecIFU-SHADOW (Obs 7)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.</p>											
Diagnostics												
Solar System Targets	#	Name	Level 1				Level 2				Level 3	
	(5)	C2014UN271-OFFSET-COPY	TYPE=COMET,Q=10.94502883884481,E=0.9986730649305881,I=95.55281152182954,O=190.0839891433294,W=326.333330163034,T=26-JAN-2031:11:12:05,TimeScale=TDB,EQUINOX=J2000,EPOCH=22-JAN-2018:00:00:00,EpochTimeScale=TDB				TYPE=POS_ANGLE,RAD=480,ANG=90,REF=SUN					
<p><i>Comments: Extended=YES</i></p>												
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point			Number of Points	Points			
	1	4-POINT-DITHER										
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRS	25	1	false	true	NONE	4	4	4337.655	
Special Requirements	<p>On Hold Shadow observation for a Solar System target.</p> <p>Sequence Observations 5, 6, 7, Non-interruptible</p> <p>DEFAULT WINDOW: ANGULAR RATE C2014UN271-OFFSET-COPY FROM JWST LESS THAN 0.075</p>											

Proposal 2747 - Observation 5 - The Volatile Content of Oort Cloud Comet C/2014 UN271

Fri May 26 19:06:14 GMT 2023

Observation	Proposal 2747, Observation 5: NIRSPEC-SW1/LW1-UN271 Diagnostic Status: Warning Observing Template: NIRCam Imaging									
Diagnostics	(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (NIRSPEC-SW1/LW1-UN271 (Obs 5)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.									
Solar System Targets	#	Name	Level 1	Level 2	Level 3					
	(6)	C2014UN271-NO-OFFSET	TYPE=COMET,Q=10.94502883884481,E=0.9986730 649305881,I=95.55281152182954 .O=190.0839891433294,W=326.333330163034,T=26- JAN- 2031:11:12:05,TimeScale=TDB,EQUINOX=J2000,E POCH=22-JAN-2018:00:00:00,EpochTimeScale=TDB							
	<i>Comments: Extended=YES</i>									
Template	Module	Subarray			Target Placement					
	ALL	FULL			Module Gap					
Dithers	#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions				
	1	INTRAMODULEX	6	STANDARD		1				
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
	1	F070W	F460M	RAPID	2	2	12	6	322.103	145685
	2	F115W	F300M	BRIGHT1	2	3	18	6	708.627	145685
	3	F150W	F360M	RAPID	2	2	12	6	322.103	145685
	4	F200W	F430M	RAPID	2	2	12	6	322.103	145685
	5	F150W2	F322W2	RAPID	2	1	6	6	128.841	145685
Special Requirements	Offset -55.0 arcsec, -35.0 arcsec Sequence Observations 5, 6, 7, Non-interruptible DEFAULT WINDOW: ANGULAR RATE C2014UN271-NO-OFFSET FROM JWST LESS THAN 0.075									