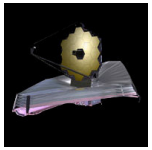

4665 - Constraining the origin and dynamical evolution of extreme trans-Neptunian objects through NIR spectroscopy

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	2012 VP113	NIRSpec IFU Spectroscopy	(1) 2012VP113
	2	2016 QV89	NIRSpec IFU Spectroscopy	(2) 2016QV89
	3	2014 OS394	NIRSpec IFU Spectroscopy	(3) 2014OS394
	4	2013 RA109	NIRSpec IFU Spectroscopy	(4) 2013RA109

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	5	Alicanto	NIRSpec IFU Spectroscopy	(5) ALICANTO
	6	2013 SL102	NIRSpec IFU Spectroscopy	(6) 2013SL102

ABSTRACT

We propose to obtain low-resolving power (R~100) near-infrared spectra of 6 extreme trans-Neptunian Objects (ETNOs) using the NIRSpec IFU and the Prism/CLEAR combination to constrain ETNO origins. The ETNOs are a unique and understudied population of trans-Neptunian objects with large perihelia (> 37 au) and semi-major axes (> 150 au) that could not have been placed on their current orbits via Neptune on its current orbit. The majority of the members of this population were only discovered within the past 10 years due to their faintness and no observations of ETNOs were approved in Cycle 1 or 2, representing a large gap in our understanding of the trans-Neptunian region. In this investigation, we will compare the spectra of the 6 ETNO targets to each other to determine if the population is compositionally heterogeneous and therefore formed in different regions of the solar nebula. We will also compare the ETNOs to objects in other TNO sub-populations to constrain their possible origins. The excellent sensitivity of JWST will provide us with an unparalleled opportunity to study these extreme and poorly understood objects as a stepping stone to addressing larger questions about the era of planetary migration, the possible presence of a distant outer planet, and the structure and formation of debris disks around other stars.

OBSERVING DESCRIPTION

This program is composed of 6 observations, all using the NIRSpec IFU and the Prism/CLEAR combination. Each observation has a different target (listed below). None of the observations require target acquisition. There are no scheduling constraints placed on any of these observations. The only Solar System Target Window specified for each observation is the default 75 mas/s speed limit. These are all extreme trans-Neptunian objects (ETNOs) and therefore move at extremely low apparent rates (they do not approach the speed limit). All targets have at least 1 visibility window within the Cycle 3 period (July 1, 2024 - June 30, 2025) while outside the MAZ.

Observations of all objects are on-hold, except 2014 OS394 (which has a much smaller orbital uncertainty), pending updates to ephemeris precision.

The total charged time of the program is 18.75 hours. The total science time is 10.28 hours. The breakdown for each observation is below (ordered by the observation number in this APT file):

1. 2012 VP113: 2.27 hours (science), 3.78 hours (total)
2. 2016 QV89: 1.17 hours (science), 2.48 hours (total)

3. 2014 OS394: 0.68 hours (science), 1.91 hours (total)
4. 2013 RA109: 1.78 hours (science), 3.21 hours (total)
5. Alicanto: 2.27 hours (science), 3.78 hours (total)
6. 2013 SL102: 2.11 hours (science), 3.59 hours (total)

Observations 1 & 5 have data volumes over the lower threshold, which does not require any action, per JDOX.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	2012VP113	TYPE=ASTEROID,A=266.8318192905238,E=0.6979453502062112,I=24.01159356443002,O=90.8992319830878,W=294.2134647718661,M=2.816489810293489,EQUINOX=J2000,EPOCH=31-OCT-2013:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(2)	2016QV89	TYPE=ASTEROID,A=168.4871450326805,E=0.7632322870588401,I=21.41466735693495,O=173.2857701747597,W=281.3011315805054,M=354.6180067818649,EQUINOX=J2000,EPOCH=15-OCT-2017:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(3)	2014OS394	TYPE=ASTEROID,A=147.6890237996838,E=0.7491901928362918,I=14.14827746509861,O=194.3827075416531,W=251.8559566883685,M=356.3831092555429,EQUINOX=J2000,EPOCH=23-APR-2017:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(4)	2013RA109	TYPE=ASTEROID,A=439.1516284093594,E=0.8952403053665449,I=12.40058830467026,O=104.8016279294152,W=262.8733013286828,M=0.3650530286069494,EQUINOX=J2000,EPOCH=28-SEP-2016:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(5)	ALICANTO	TYPE=ASTEROID,A=347.2341454184538,E=0.8636920039330643,I=25.5089692833582,O=66.06990992148708,W=327.0812706999194,M=0.1659306483347604,EQUINOX=J2000,EPOCH=17-SEP-2012:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(6)	2013SL102	TYPE=ASTEROID,A=303.0765218333476,E=0.8742090387112236,I=6.505264315716275,O=94.73533661757396,W=265.4623670419621,M=0.4082568176125468,EQUINOX=J2000,EPOCH=22-APR-2016:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				

Observation

Proposal 4665, Observation 1: 2012 VP113

Mon Dec 16 14:00:11 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 1:1) Warning (Form): Data Excess over lower threshold

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(2012 VP113 (Obs 1)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	2012VP113	TYPE=ASTEROID,A=266.8318192905238,E=0.6979453502062112,I=24.01159356443002,O=90.8992319830878,W=294.2134647718661,M=2.816489810293489,EQUINOX=J2000,EPOCH=31-OCT-2013:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Template

TA Method	HFF Readout Mode
NONE	false

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	NRSIRS2RAPID	70	2	false	true	NONE	4	8	8286.49	

Special Requirements

DEFAULT WINDOW: ANGULAR RATE 2012VP113 FROM JWST LESS THAN 0.075

Observation

Proposal 4665, Observation 2: 2016 QV89

Mon Dec 16 14:00:11 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(2016 QV89 (Obs 2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(2)	2016QV89	TYPE=ASTEROID,A=168.4871450326805,E=0.7632322870588401,I=21.41466735693495,O=173.2857701747597,W=281.3011315805054,M=354.6180067818649,EQUINOX=J2000,EPOCH=15-OCT-2017:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Template

TA Method	HFF Readout Mode
NONE	false

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	NRSIRS2RAPID	72	1	false	true	NONE	4	4	4259.956	

Special Requirements

DEFAULT WINDOW: ANGULAR RATE 2016QV89 FROM JWST LESS THAN 0.075

Observation

Proposal 4665, Observation 3: 2014 OS394

Mon Dec 16 14:00:11 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(2014 OS394 (Obs 3)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(3)	2014OS394	TYPE=ASTEROID,A=147.6890237996838,E=0.7491901928362918,I=14.14827746509861,O=194.3827075416531,W=251.8559566883685,M=356.3831092555429,EQUINOX=J2000,EPOCH=23-APR-2017:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Template

TA Method	HFF Readout Mode
NONE	false

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	NRSIRS2RAPID	42	1	false	true	NONE	4	4	2509.289	

Special Requirements

DEFAULT WINDOW: ANGULAR RATE 2014OS394 FROM JWST LESS THAN 0.075

Observation

Proposal 4665, Observation 4: 2013 RA109

Mon Dec 16 14:00:11 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(2013 RA109 (Obs 4)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(4)	2013RA109	TYPE=ASTEROID,A=439.1516284093594,E=0.8952403053665449,I=12.40058830467026,O=104.8016279294152,W=262.8733013286828,M=0.3650530286069494,EQUINOX=J2000,EPOCH=28-SEP-2016:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Template

TA Method	HFF Readout Mode
NONE	false

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	NRSIRS2RAPID	55	2	false	true	NONE	4	8	6535.823	

Special Requirements

DEFAULT WINDOW: ANGULAR RATE 2013RA109 FROM JWST LESS THAN 0.075

Observation

Proposal 4665, Observation 5: Alicanto Mon Dec 16 14:00:11 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 5:1) Warning (Form): Data Excess over lower threshold

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Alicanto (Obs 5)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(5)	ALICANTO	TYPE=ASTEROID,A=347.2341454184538,E=0.8636920039330643,I=25.5089692833582,O=66.06990992148708,W=327.0812706999194,M=0.1659306483347604,EQUINOX=J2000,EPOCH=17-SEP-2012:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Template

TA Method	HFF Readout Mode
NONE	false

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	NRSIRS2RAPID	70	2	false	true	NONE	4	8	8286.49	

Special Requirements

DEFAULT WINDOW: ANGULAR RATE ALICANTO FROM JWST LESS THAN 0.075

Observation

Proposal 4665, Observation 6: 2013 SL102

Mon Dec 16 14:00:11 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(2013 SL102 (Obs 6)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(6)	2013SL102	TYPE=ASTEROID,A=303.0765218333476,E=0.8742090387112236,I=6.505264315716275,O=94.73533661757396,W=265.4623670419621,M=0.4082568176125468,EQUINOX=J2000,EPOCH=22-APR-2016:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Template

TA Method	HFF Readout Mode
NONE	false

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	NRSIRS2RAPID	65	2	false	true	NONE	4	8	7702.934	

Special Requirements

DEFAULT WINDOW: ANGULAR RATE 2013SL102 FROM JWST LESS THAN 0.075