



1568 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Cycle: 1, Proposal Category: GO

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. John A. Stansberry (PI)	Space Telescope Science Institute	jstans@stsci.edu
Dr. David E. Trilling (CoI) (CoPI) (Contact)	Northern Arizona University	david.trilling@nau.edu
Dr. Wesley C Fraser (CoI) (CSA Member) (CoPI) (Contact)	Dominion Astrophysical Observatory	wesley.fraser@nrc.ca
Dr. Gary Bernstein (CoI)	University of Pennsylvania	garyb@physics.upenn.edu
Dr. Will M. Grundy (CoI)	Lowell Observatory	w.grundy@lowell.edu
Dr. Matthew Holman (CoI)	Smithsonian Institution Astrophysical Observatory	mholman@cfa.harvard.edu

OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
RA = 12 hours observations				
	1	TNO Pencil Beam epoch 1 12hr	NIRCam Imaging	(2) ECLIPTIC-RA12H
	2	TNO Pencil Beam epoch 2 12hr	NIRCam Imaging	(2) ECLIPTIC-RA12H
	3	TNO Pencil Beam epoch 3 12hr	NIRCam Imaging	(2) ECLIPTIC-RA12H
RA = 0 hours observations				
	4	TNO Pencil Beam epoch 1 0hr	NIRCam Imaging	(1) ECLIPTIC-RA0H
	5	TNO Pencil Beam epoch 2 0hr	NIRCam Imaging	(1) ECLIPTIC-RA0H
	6	TNO Pencil Beam epoch 3 0hr	NIRCam Imaging	(1) ECLIPTIC-RA0H

ABSTRACT

We propose to use JWST and NIRCcam to carry out a search for the faintest trans-Neptunian objects (TNOs) ever detected. We will detect 30 objects as small as 7 km at distances up to 45 AU, placing strong constraints on the small size distribution, and thereby testing competing models for the formation and collisional evolution of trans-Neptunian objects. We will also probe deep into the size regime of Centaurs and Jupiter Family Comets, empirically measuring the size distribution of similarly-sized TNOs where Centaurs and JFCs are sourced. The result of this program will be a huge advance in our understanding of the dynamical and chemical evolution currently occurring in the distant Solar System. This experiment can only be carried out with JWST.

OBSERVING DESCRIPTION

Three NIRCcam mosaics must be executed at epochs separated by about 5 days, with the middle epoch occurring when the target is within ± 1 deg of solar elongation 100deg.

As submitted, the Special Requirements satisfy the above conditions for the ECLIPTIC-RA12H target for its May-Jun 2022 apparition. If the program is not executed then, or if there are scheduling reasons to switch to the ECLIPTIC-RA0H target, the special requirements will have to be updated to achieve the science.

While the purpose of these observations is to detect moving targets, our pointings are defined in terms of fixed targets. We will employ post-processing of the data in order to detect objects that move through the field

Proposal 1568 - Targets - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ECLIPTIC-RA0H	RA: 00 36 25.1000 (9.1045833d) Dec: +01 29 3.00 (1.48417d) Equinox: J2000		
<i>Comments: This is one of 2 targets that would be good for this program. We are only proposing to observe 1 of the 2, the other target being included for flexibility in scheduling.</i>				
<i>Allowed PA is ~ 66 or 246 +/- 5 degrees.</i>				
<i>No JWST duplicate observations identified in MAST for search radius 15 armin</i>				
<i>Category=Unidentified</i>				
<i>Description=[Blank field]</i>				
(2)	ECLIPTIC-RA12H	RA: 13 57 33.6778 (209.3903242d) Dec: -10 51 55.60 (-10.86544d) Equinox: J2000		
<i>Comments: This is one of 2 targets that would be good for this program. We are only proposing to observe 1 of the 2, the other target being included for flexibility in scheduling.</i>				
<i>Allowed PA is ~113 / 293 +/- 5 deg.</i>				
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<i>Category=Unidentified</i>				
<i>Description=[Blank field]</i>				

Fixed Targets

Proposal 1568 - Observation 1 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Mon Jan 23 20:01:42 GMT 2023

Observation	<p>Proposal 1568, Observation 1: TNO Pencil Beam epoch 1 12hr</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Imaging</p> <p><i>Comments: The "Timing - Between Dates SR" on this observation is only appropriate for observations of the target Ecliptic-RA12H target, and restrict it to the May - Jun apparition of that target in the FOR. The purpose of this constraint is to execute Obs. 1 at a solar elongation of ~105 degrees +/- 0.5 degree.</i></p> <p><i>These observations can also be executed using the Ecliptic-RHA0 target, and for different apparitions of either target, but the "Timing - Between Dates SR" must be adjusted according to target and whether that target is in the leading or trailing direction in the FOR.</i></p> <p><i>The width of the 'between' part could perhaps be increased to 2 days if needed, but 1 day is optimal for the science. We have not quantitatively evaluated the impact of wider windows on science, in particular on accuracy with which we can determine distance to the objects.</i></p>														
	Diagnostics	<p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:5) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:6) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:7) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:8) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:9) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:10) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:11) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:12) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:13) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:14) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:15) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:16) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:17) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:18) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:19) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 1:20) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>													
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Proposal 1568 - Observation 1 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Mosaic	Rows	Columns	Row Overlap %	Column Overlap %	Row shift	Column shift	Tile Order			
		10	2	5.0	5.0	0.0	0.0	DEFAULT		
Dithers	#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions				
	1	NONE		STANDARD		2				
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
	1	F150W2	F322W2	BRIGHT1	10	3	6	2	1266.939	
Special Requirements	<p>Between Dates 24-JAN-2023:00:00:00 and 25-JAN-2023:00:00:00 Sequence Visits within 53.0 Days Aperture PA Range 290.9286469 to 291.9286469 Degrees (V3 291.0 to 292.0) Visits Same PA</p> <p>2 After 1 by 89 Hours to 6 Days Same Aperture PA 1, 2, 3</p>									

Proposal 1568 - Observation 2 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Mon Jan 23 20:01:42 GMT 2023

Observation	Proposal 1568, Observation 2: TNO Pencil Beam epoch 2 12hr Diagnostic Status: Warning Observing Template: NIRCcam Imaging <i>Comments: The Timing -- After Observation links between observations 2 & 1, and 3 & 2, are required in order to re-image the target field at elongation angle increments of 5 +/-1 degrees. That spacing is optimal for the science, but could be relaxed somewhat to aid in scheduling if necessary.</i> <i>The Timing -- After Observation links assume an apparition in the JWST-trailing FOR, so would have to be updated (order reversed) if the apparition were in the leading FOR.</i>																				
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Proposal 1568 - Observation 2 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Dithers	#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions			
		1	NONE		STANDARD		2		

Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
		1	F150W2	F322W2	BRIGHT1	10	3	6	2	1266.939

Special Requirements	
	Sequence Visits within 53.0 Days Visits Same PA 2 After 1 by 89 Hours to 6 Days 3 After 2 by 5 Days to 7 Days Same Aperture PA 1, 2, 3

Proposal 1568 - Observation 3 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Mon Jan 23 20:01:42 GMT 2023

Observation	Proposal 1568, Observation 3: TNO Pencil Beam epoch 3 12hr Diagnostic Status: Warning Observing Template: NIRCcam Imaging <i>Comments: The Timing -- After Observation links between observations 2 & 1, and 3 & 2, are required in order to re-image the target field at elongation angle increments of 5 +/-1 degrees. That spacing is optimal for the science, but could be relaxed somewhat to aid in scheduling if necessary.</i> <i>The Timing -- After Observation links assume an apparition in the JWST-trailing FOR, so would have to be updated (order reversed) if the apparition were in the leading FOR.</i>																				
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Proposal 1568 - Observation 3 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Dithers	#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions			
		1	NONE		STANDARD		2		

Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
		1	F150W2	F322W2	BRIGHT1	10	3	6	2	1266.939

Special Requirements
Sequence Visits within 53.0 Days Visits Same PA 3 After 2 by 5 Days to 7 Days Same Aperture PA 1, 2, 3

Proposal 1568 - Observation 4 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Mon Jan 23 20:01:43 GMT 2023

Observation	Proposal 1568, Observation 4: TNO Pencil Beam epoch 1 0hr Diagnostic Status: Warning Observing Template: NIRCcam Imaging <i>Comments: The "Timing - Between Dates SR" on this observation is only appropriate for observations of the target Ecliptic-RA12H target, and restrict it to the May - Jun apparition of that target in the FOR. The purpose of this constraint is to execute Obs. 1 at a solar elongation of ~105 degrees +/- 0.5 degree.</i> <i>These observations can also be executed using the Ecliptic-RHA0 target, and for different apparitions of either target, but the "Timing - Between Dates SR" must be adjusted according to target and whether that target is in the leading or trailing direction in the FOR.</i> <i>The width of the 'between' part could perhaps be increased to 2 days if needed, but 1 day is optimal for the science. We have not quantitatively evaluated the impact of wider windows on science, in particular on accuracy with which we can determine distance to the objects.</i>													
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Proposal 1568 - Observation 4 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

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Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
	1	F150W2	F322W2	BRIGHT1	10	3	6	2	1266.939	
Special Requirements	Between Dates 22-DEC-2022 and 26-DEC-2022 Between Dates 27-JUN-2023 and 01-JUL-2023 Sequence Visits within 53.0 Days Visits Same PA On Hold Alternative to Obs. 1 at RA=12hr field									
	5 After 4 by 4 Days to 6 Days Same Aperture PA 4, 5, 6									

Proposal 1568 - Observation 5 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Mon Jan 23 20:01:43 GMT 2023

Observation	Proposal 1568, Observation 5: TNO Pencil Beam epoch 2 0hr Diagnostic Status: Warning Observing Template: NIRCcam Imaging <i>Comments: The Timing -- After Observation links between observations 2 & 1, and 3 & 2, are required in order to re-image the target field at elongation angle increments of 5 +/-1 degrees. That spacing is optimal for the science, but could be relaxed somewhat to aid in scheduling if necessary.</i> <i>The Timing -- After Observation links assume an apparition in the JWST-trailing FOR, so would have to be updated (order reversed) if the apparition were in the leading FOR.</i>																				
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Proposal 1568 - Observation 5 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Dithers	#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions			
		1	NONE		STANDARD		2		

Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
		1	F150W2	F322W2	BRIGHT1	10	3	6	2	1266.939

Special Requirements	
	Sequence Visits within 53.0 Days Visits Same PA On Hold Alternative to Obs. 2 at RA=012hr field 5 After 4 by 4 Days to 6 Days 6 After 5 by 4 Days to 6 Days Same Aperture PA 4, 5, 6

Proposal 1568 - Observation 6 - An Ultra-Sensitive Pencil Beam Search for 10 km Trans-Neptunian Objects

Mon Jan 23 20:01:43 GMT 2023

Observation	Proposal 1568, Observation 6: TNO Pencil Beam epoch 3 0hr Diagnostic Status: Warning Observing Template: NIRCcam Imaging <i>Comments: The Timing -- After Observation links between observations 2 & 1, and 3 & 2, are required in order to re-image the target field at elongation angle increments of 5 +/-1 degrees. That spacing is optimal for the science, but could be relaxed somewhat to aid in scheduling if necessary.</i> <i>The Timing -- After Observation links assume an apparition in the JWST-trailing FOR, so would have to be updated (order reversed) if the apparition were in the leading FOR.</i>																				
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