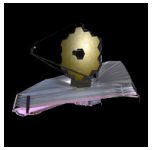

1678 - Calibrating Billions of SPHEREx Spectra from 2.4 to 5.0 um

Cycle: 1, Proposal Category: GO

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Matthew L. N. Ashby (PI)	**Smithsonian Institution Astrophysical Observatory**	**mashby@cfa.harvard.edu**
Brendan P Crill (CoI)	Jet Propulsion Laboratory	bcrill@jpl.nasa.gov
Dr. Michael Werner (CoI)	Jet Propulsion Laboratory	michael.w.werner@jpl.nasa.gov
Dr. Gary Melnick (CoI)	Smithsonian Institution Astrophysical Observatory	gmelnick@cfa.harvard.edu
Dr. Joseph L. Hora (CoI)	Smithsonian Institution Astrophysical Observatory	jhora@cfa.harvard.edu

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Spectrophotometry of 1757132				
	5		NIRSpec Fixed Slit Spectroscopy	(2) 1757132
Spectrophotometry of 1812095				
	6		NIRSpec Fixed Slit Spectroscopy	(3) 1812095
Spectrophotometry of 1802271				
	7		NIRSpec Fixed Slit Spectroscopy	(6) 1802271
Spectrophotometry of 1805292				
	8		NIRSpec Fixed Slit Spectroscopy	(5) 1805292

ABSTRACT

NASA's upcoming SPHEREx mission will carry out an all-sky 0.75 to 5.0 um spectroscopic survey at 6" resolution, yielding literally billions of infrared spectra of galaxies, stars, and solar system objects. This proposal seeks NIRSPEC FS spectra of four relatively bright spectrophotometric standards, to significantly reduce systematic uncertainties in the three long-wavelength SPHEREx spectral Bands

from 2.4 to 5.0 um, and increase the science return from the mission. Approved JWST Cycle 1 calibration spectra are insufficient for this purpose. Our proposed NIRSPEC FS spectrophotometry will offer two key benefits. First, by cross-calibrating SPHEREx and JWST directly using standards in a brightness regime that both facilities can observe at high SNR, our proposed observations will tie the NIRSPEC calibration to billions of sources of all kinds covering the entire sky. Second, the resulting spectrophotometric calibration will enable model-free interpretations of narrow emission and absorption features in long-wavelength SPHEREx ice spectra -- features that are fundamental to its scientific mission -- greatly reducing systematic uncertainties and putting the community's understanding of the Milky Way's interstellar ice content on a firmer footing.
Only JWST can carry out the observations proposed here.

OBSERVING DESCRIPTION

This proposal implements NIRSPEC FS observations of four spectrophotometric standards from the CALSPEC database. The observations are to be carried out in a manner modeled as closely as possible on approved Cycle 1 Calibration proposal 1536 (PI K. Gordon; the A-star calibration program) of A star 1743045, so as to enable identical reductions of both datasets. The goal is to calibrate the three longest-wavelength SPHEREx spectral Bands, from 2.4 to 5.0 microns, in a manner that is as free from systematic effects as possible. Thus, the proposed observations will tightly tie the NIRSPEC spectral calibration to all the literally billions of celestial sources of all types to be surveyed by the upcoming SPHEREx mission over the entire infrared sky.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	1757132	RA: 17 57 13.2500 (269.3052083d) Dec: +67 03 40.90 (67.06136d) Equinox: J2000	Proper Motion RA: 0.408 mas/yr Proper Motion Dec: -14.027 mas/yr Parallax: 0.0011260" Epoch of Position: 2018	
Comments: *Category=Star* *Description=[A stars]* *Extended=NO*				
(3)	1812095	RA: 18 12 9.5600 (273.0398333d) Dec: +63 29 42.30 (63.49508d) Equinox: J2000	Epoch of Position: 2000	
Comments: *Category=Star* *Description=[A stars]* *Extended=NO*				
(4)	1808347	RA: 18 08 34.7500 (272.1447917d) Dec: +69 27 28.70 (69.45797d) Equinox: J2000		
Comments: *Category=Star* *Description=[A dwarfs]* *Extended=NO*				
(5)	1805292	RA: 18 05 29.3000 (271.3720833d) Dec: +64 27 52.10 (64.46447d) Equinox: J2000	Epoch of Position: 2000	
Comments: *Category=Star* *Description=[A stars]* *Extended=NO*				
(6)	1802271	RA: 18 02 27.1700 (270.6132083d) Dec: +60 43 35.65 (60.72657d) Equinox: J2000	Proper Motion RA: 2.768 mas/yr Proper Motion Dec: -2.301 mas/yr Parallax: 0.0007094" Epoch of Position: 2000	
Comments: *Category=Star* *Description=[A stars]* *Extended=NO*				

Observation

Proposal 1678, Observation 5

Fri Nov 05 19:00:13 GMT 2021

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	1757132	RA: 17 57 13.2500 (269.3052083d) Dec: +67 03 40.90 (67.06136d) Equinox: J2000	Proper Motion RA: 0.408 mas/yr Proper Motion Dec: -14.027 mas/yr Parallax: 0.0011260" Epoch of Position: 2018	

Comments:
Category=Star
Description=[A stars]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	56214

Template

Slit	Subarray
S1600A1	SUB2048

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	5	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G235M/F170LP	S1600A1	NRSRAPID	50	1	1	NONE	5	5	230.112	56214
2	G395M/F290LP	S1600A1	NRSRAPID	100	1	2	NONE	5	5	455.612	56214
3	G395H/F290LP	S1600A1	NRSRAPID	275	1	3	NONE	5	5	1244.862	56214
4	G235H/F170LP	S1600A1	NRSRAPID	120	1	4	NONE	5	5	545.812	56214

Observation

Proposal 1678, Observation 6

Fri Nov 05 19:00:13 GMT 2021

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	1812095	RA: 18 12 9.5600 (273.0398333d) Dec: +63 29 42.30 (63.49508d) Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Star
Description=[A stars]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	56214

Template

Slit	Subarray
S1600A1	SUB2048

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	5	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G235M/F170LP	S1600A1	NRS	50	1	1	NONE	5	5	906.612	56214
2	G395M/F290LP	S1600A1	NRS	100	1	2	NONE	5	5	1808.612	56214
3	G395H/F290LP	S1600A1	NRS	300	1	3	NONE	5	5	5416.612	56214
4	G235H/F170LP	S1600A1	NRS	120	1	4	NONE	5	5	2169.412	56214

Observation

Proposal 1678, Observation 7

Fri Nov 05 19:00:13 GMT 2021

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	1802271	RA: 18 02 27.1700 (270.6132083d) Dec: +60 43 35.65 (60.72657d) Equinox: J2000	Proper Motion RA: 2.768 mas/yr Proper Motion Dec: -2.301 mas/yr Parallax: 0.0007094" Epoch of Position: 2000	

Comments:
Category=Star
Description=[A stars]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	56214

Template

Slit	Subarray
S1600A1	SUB2048

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	5	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G235M/F170LP	S1600A1	NRSRAPID	60	1	1	NONE	5	5	275.212	56214
2	G395M/F290LP	S1600A1	NRSRAPID	125	1	2	NONE	5	5	568.362	56214
3	G395H/F290LP	S1600A1	NRSRAPID	400	1	3	NONE	5	5	1808.612	56214
4	G235H/F170LP	S1600A1	NRSRAPID	200	1	4	NONE	5	5	906.612	56214

Observation

Proposal 1678, Observation 8

Fri Nov 05 19:00:13 GMT 2021

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	1805292	RA: 18 05 29.3000 (271.3720833d) Dec: +64 27 52.10 (64.46447d) Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Star
Description=[A stars]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	56214

Template

Slit	Subarray
S1600A1	SUB2048

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	5	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G235M/F170LP	S1600A1	NRSRAPID	100	1	1	NONE	5	5	455.612	56214
2	G395M/F290LP	S1600A1	NRSRAPID	200	1	2	NONE	5	5	906.612	56214
3	G235H/F170LP	S1600A1	NRSRAPID	100	1	3	NONE	5	5	455.612	56214
4	G395H/F290LP	S1600A1	NRSRAPID	300	2	4	NONE	5	10	2715.225	56214