15506 - Measuring the structure of Fomalhaut's dusty debris belt via a fortuitous stellar occultation

Cycle: 26, Proposal Category: GO

(JWST Initative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) FOMALHAUT-BACKGROUND-SOURCE-OFF (2) FOMALHAUT CCDFLAT	STIS/CCD	1	06-May-2019 13:00:16.0	yes

1 Total Orbits Used

ABSTRACT

Fomalhaut, a young nearby A4V star, is surrounded by an inclined dust debris belt, directly imaged in optical scattered light with HST. The proper motion and parallax of Fomalhaut will move this belt across an 18.5 magnitude background star in the next decade. This presents a unique and fortuitous opportunity to probe the dust structure and confirm disk dynamical theory to unprecedented resolution. In Cycle-21 we obtained

HST/STIS spectra of the background star during the diffuse phase of the debris disk occultation. We propose obtaining HST/STIS spectra during the thick (Cycle-24 to 26), and pristine (~2021 with JWST) phases of occultation as the debris disk moves across the target background star. This is a rare opportunity to measure - for the first time - the dust optical depth structure in a known planet-forming system, providing a valuable constraint on current planet formation theories. This experiment will act as a pathfinder for this type of science for future observations with JWST and future ELTs.

OBSERVING DESCRIPTION

We will use STIS] in Cycle-24, 25, and 26 to observe a 18.5 magnitude background star as it passes behind the Fomalhaut debris disk. We will obtain a quick (2 s) image with STIS 50CORON MIRVIS for preimaging photometry of the background star. In the same orbit, we will switch to STIS G750L for the remaining time (~31 minutes).

Visit

Proposal 15506, Orbit 1: Cycle 26 (01), implementation Mon May 06 17:00:17 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 270D TO 281 D

Comments: First we will acquire Fomalhaut and then offset to the 18.5 magnitude background star.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	FOMALHAUT-BACKGROUND-SOURCE-OFF	Offset from FOMALHAUT RA Offset: 0.526 Secs Dec Offset: -13.94 Arcsec		V=18.5+/-0.5	Offset Position (FOMALHAUT-BACKGROUND-SOURCE-OFF)
	Comments: The offset of this target may be updated, depending on when the observation is scheduled. *Category=STAR* *Description=[G V-IV]*				
(2)	FOMALHAUT	RA: 22 57 39.0463 (344.4126929d) Dec: -29 37 20.05 (-29.62224d) Equinox: J2000	Proper Motion RA: 0.0255 sec of time/yr Proper Motion Dec: -164.67 mas/yr Parallax: 0.13008" Epoch of Position: 2000.0	V=1.16	Reference Frame: ICRS
	Comments: *Category=STAR* *Description=[A0-A3 V-IV]*				

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Fomalhaut Acquisition	(2) FOMALHAUT	STIS/CCD, ACQ, F25ND5	MIRROR				0.5 Secs (0.5 Secs) *[==>]*	***[1]***
	Comments: Acquire Fomalhaut								
2	BG Source p reimaging	(2) FOMALHAUT	STIS/CCD, ACCUM, WEDGEA1.8	MIRROR	CR-SPLIT=NO; GAIN=4			.5 Secs X 4 (0.4 Secs) *[==>0.1 Secs (Copy 1)]* *[==>0.1 Secs (Copy 2)]* *[==>0.1 Secs (Copy 3)]* *[==>0.1 Secs (Copy 4)]*	***[1]***
	Comments: This is following the proposal ID 8788 pre-imaging of the same background star.								
3	BG Source G750L	(1) FOMALHAUT-BACKGROUND-SOURCE-OFF	STIS/CCD, ACCUM, 52X2	G750L 7751 A	CR-SPLIT=NO			369 Secs X 5 (1835 Secs) *[==>367.0 Secs (Copy 1)]* *[==>367.0 Secs (Copy 2)]* *[==>367.0 Secs (Copy 3)]* *[==>367.0 Secs (Copy 4)]* *[==>367.0 Secs (Copy 5)]*	***[1]***
	Comments: The spectrum of the background star will be compared with ID:13434 and ID:8788 datasets.								
4	Fring Flat C alibration	CCDFLAT	STIS/CCD, ACCUM, 52X2	G750L 7751 A				*[==>(Copy 1)]* *[==>(Copy 2)]*	***[1]***
5	Fring Flat C alibration	CCDFLAT	STIS/CCD, ACCUM, 0.3X0.09	G750L 7751 A				*[==>(Copy 1)]* *[==>(Copy 2)]*	***[1]***

Orbit Structure