13434 - Transmission spectroscopy through the debris disk of Fomalhaut

Cycle: 21, Proposal Category: GO

(UV Initiative)

(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 STIS/FUV-MAMA	1	23-Apr-2015 21:00:50.0	yes
03	(2) FOMALHAUT (4) FOMALHAUT-BACKGROUND-SOURCE	STIS/CCD	1	23-Apr-2015 21:00:51.0	yes
04	(1) FOMALHAUT-BACKGROUND-SOURCE-OFF (2) FOMALHAUT CCDFLAT	STIS/CCD	1	23-Apr-2015 21:00:53.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
05	(1) FOMALHAUT-BACKGROUND-SOURCE-OFF (2) FOMALHAUT CCDFLAT	STIS/CCD	1	23-Apr-2015 21:00:54.0	yes

4 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 the HST. The proper motion and parallax of Fomalhaut will move this belt across an 18th magnitude background white dwarf star in the next decade. This presents a unique and fortuitous opportunity to probe the presence of gas and dust in the debris disk through spatially resolved transmission spectroscopy. We propose obtaining an HST/COS spectrum of the absorption during the diffuse (Cycle-21), thick (Cycle-23), and pristine (~2021) phase of occultation as the debris disk moves across the target background source. This is a rare opportunity to measure - for the first time - refractory elements and dust properties 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 and COS in Cycle-21. We will obtain a quick (1000 s) spectrum with the STIS G140M to ensure the scattered light does not violate the bright object limit of COS. In the same orbit, we will switch to STIS G750L for the remaining time (~26 minutes).

Once our target is confirmed to not violate the COS bright object limit, we will use three orbits with the COS grating G130M 1222 A to observe the 18th magnitude background source.

Visit

Proposal 13434, Orbit 1: STIS (01), completed Fri Apr 24 01:00:55 GMT 2015

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: ORIENT 253D TO 313 D; ORIENT 58D TO 148 D

Comments: First we will acquire Fomalhaut and then offset to the 18th magnitude faint target.

Diagnostics

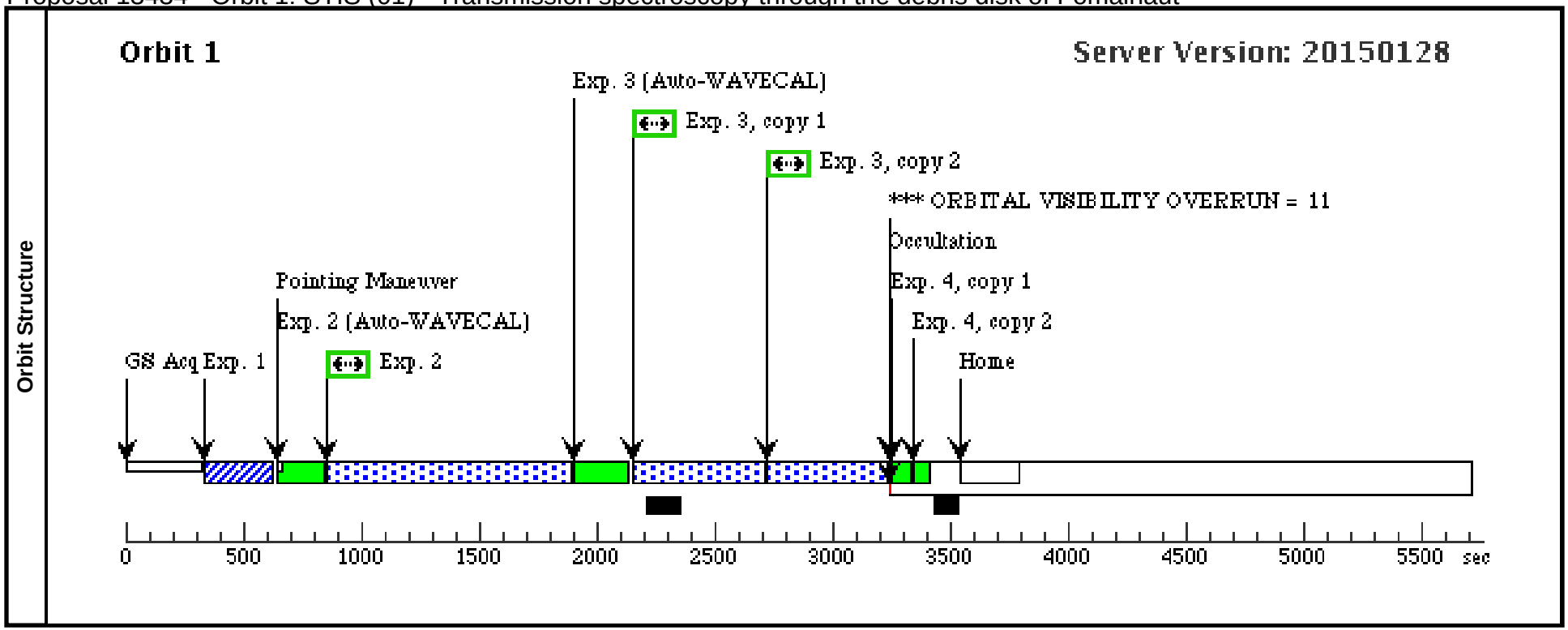
(Orbit 1: STIS (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	FOMALHAUT-BACKGROUND-SOURCE-OFF Alt Name1: OFFSET	Offset from FOMALHAUT RA Offset: 0.6 Secs Dec Offset: -14.7 Arcsec		V=18.0+/-0.5	Offset Position (FOMALHAUT-BACKGROUND-SOURCE-OFF)
(2)	FOMALHAUT	RA: 22 57 39.0465 (344.4126938d) 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

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Fom Acquisition	(2) FOMALHAUT	STIS/CCD, ACQ, F25ND5	MIRROR				0.5 Secs (0.5 Secs) *[==>]*	***[1]***
Comments: Acquire Fomalhaut									
2	BG Source G140M (STIS.sp.513845)	(1) FOMALHAUT-BACKGROUND-SOURCE-OFF	STIS/FUV-MAMA, ACCUM, 52X2	G140M 1272 A				1000 Secs (978 Secs) *[==>978.0 Secs]*	***[1]***
Comments: Spectrum to ensure this target does not violate the COS bright object limits.									
3	BG Source G750L	(1) FOMALHAUT-BACKGROUND-SOURCE-OFF	STIS/CCD, ACCUM, 52X2	G750L 7751 A	CR-SPLIT=NO			500 Secs X 2 (956 Secs) *[==>478.0 Secs (Copy 1)]* *[==>478.0 Secs (Copy 2)]*	***[1]***
Comments: Spectrum to compare with previous STIS observations and obtain an extinction curve.									
4	Fring Flat Calibration	CCDFLAT	STIS/CCD, ACCUM, 52X2	G750L 7751 A				*[==>(Copy 1)]* *[==>(Copy 2)]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20150128
Exp. 3 (Auto-WAVECAL)
Exp. 3, copy 1
Exp. 3, copy 2
*** ORBITAL VISIBILITY OVERRUN = 11
Occultation
Exp. 4, copy 1
Exp. 4, copy 2
Home
Pointing Maneuver
Exp. 2 (Auto-WAVECAL)
GS Acq Exp. 1
Exp. 2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13434, Orbit 2: STIS G430L (03), completed Fri Apr 24 01:00:56 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 253D TO 313 D; ORIENT 58D TO 148 D

Comments: 1 orbit with STIS G430L.

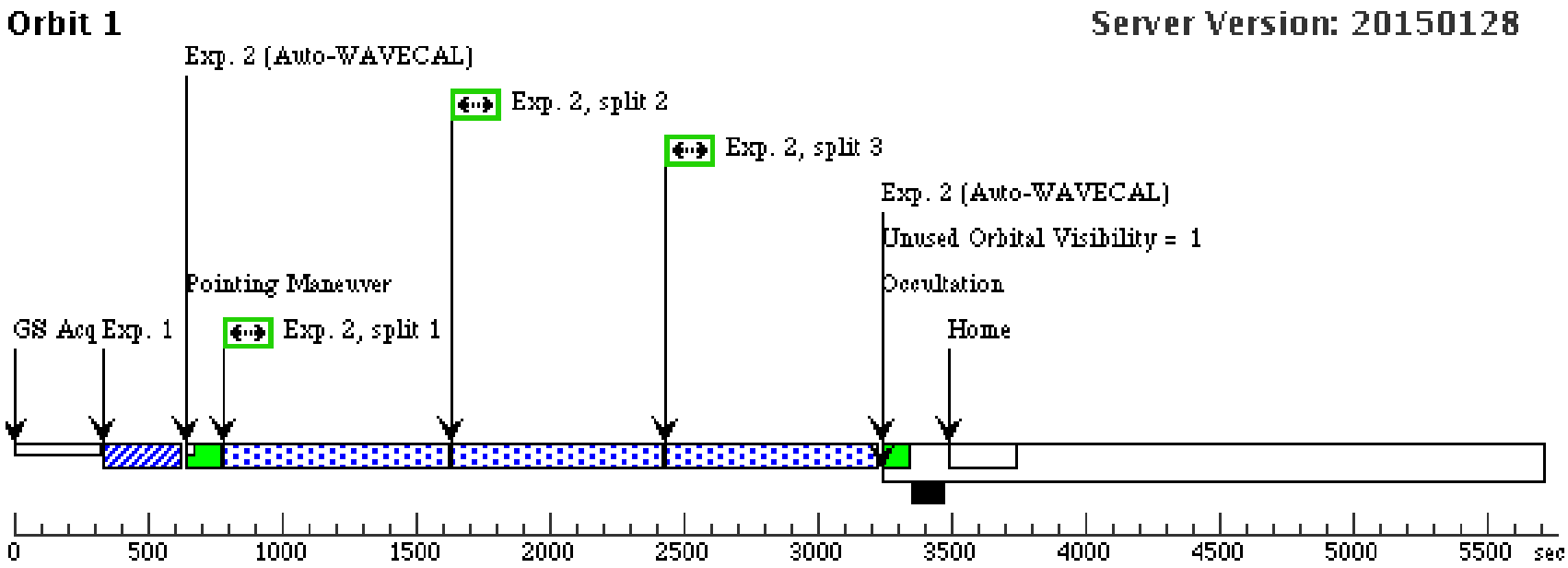
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	FOMALHAUT	RA: 22 57 39.0465 (344.4126938d) 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
(4)	FOMALHAUT-BACKGROUND-SOURCE Alt Name1: OFFSET	Offset from FOMALHAUT RA Offset: 0.66 Secs Dec Offset: -14.7 Arcsec		V=18.5+/-0.5	Offset Position (FOMALHAUT-BACKGROUND-SOURCE)

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Fom Acquisition	(2) FOMALHAUT	STIS/CCD, ACQ, F25ND5	MIRROR				0.5 Secs (0.5 Secs) *[==>]*	*[1]*
Comments: Acquire Fomalhaut.									
2	BG Source G430L	(4) FOMALHAUT-BACKGROUND-SOURCE	STIS/CCD, ACCUM, 52X2E1	G430L 4300 A	CR-SPLIT=3			2268 Secs (2268 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	*[1]*

Orbit Structure



Visit

Proposal 13434, Orbit 3: STIS G750L (04), implementation Fri Apr 24 01:00:56 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 253D TO 313 D; ORIENT 58D TO 148 D

Comments: This orbit will be with G750L STIS to measure dust attenuation on a background star from the Fomalhaut debris disk. First we acquire Fomalhaut and then offset to the faint background star.

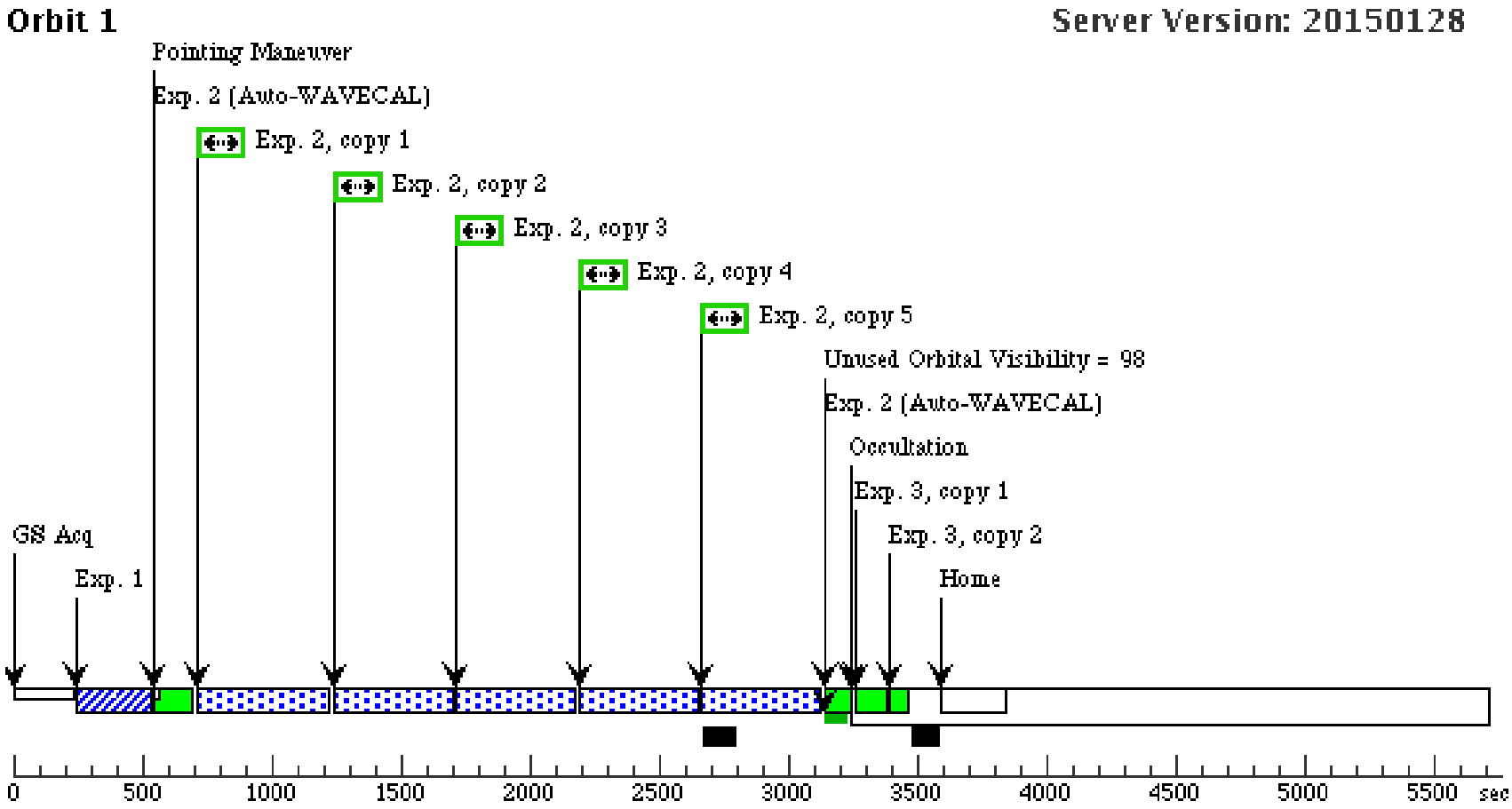
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	FOMALHAUT-BACKGROUND-SOURCE-OFF Alt Name1: OFFSET	Offset from FOMALHAUT RA Offset: 0.6 Secs Dec Offset: -14.7 Arcsec		V=18.0+/-0.5	Offset Position (FOMALHAUT-BACKGROUND-SOURCE-OFF)
(2)	FOMALHAUT	RA: 22 57 39.0465 (344.4126938d) 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

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Fom Acqusition	(2) FOMALHAUT	STIS/CCD, ACQ, F25ND5	MIRROR		GS ACQ SCENARIO SINGLE		0.5 Secs (0.5 Secs) *[==>]*	***[1]***
Comments: Acquire Fomalhaut									
2	BG Source G750L	(1) FOMALHAUT-BACKGROUND-SOURCE-OFF	STIS/CCD, ACCUM, 52X2	G750L 7751 A	CR-SPLIT=NO			369 Secs X 5 (2155 Secs) *[==>431.0 Secs (Copy 1)]* *[==>431.0 Secs (Copy 2)]* *[==>431.0 Secs (Copy 3)]* *[==>431.0 Secs (Copy 4)]* *[==>431.0 Secs (Copy 5)]*	***[1]***
Comments: Comparison with orbit 1 and archival data (ID:8788) will allow us to measure dust attenuation from the Fomalhaut disk on a background star.									
3	Fring Flat Calibration	CCDFLAT	STIS/CCD, ACCUM, 52X2	G750L 7751 A				*[==>(Copy 1)]* *[==>(Copy 2)]*	***[1]***

Orbit Structure



Visit

Proposal 13434, Orbit 4: STIS G750L (05), implementation Fri Apr 24 01:00:56 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 253D TO 313 D; ORIENT 58D TO 148 D

Comments: This orbit will be with G750L STIS to measure dust attenuation on a background star from the Fomalhaut debris disk. First we acquire Fomalhaut and then offset to the faint background star.

Please execute this orbit as far as possible after "Orbit 3: STIS G750L (04)". This allows us to compare the dust attenuation on the background star in different parts of the Fomalhaut debris disk.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	FOMALHAUT-BACKGROUND-SOURCE-OFF Alt Name1: OFFSET	Offset from FOMALHAUT RA Offset: 0.6 Secs Dec Offset: -14.7 Arcsec		V=18.0+/-0.5	Offset Position (FOMALHAUT-BACKGROUND-SOURCE-OFF)
(2)	FOMALHAUT	RA: 22 57 39.0465 (344.4126938d) 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

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Fom Acquisition	(2) FOMALHAUT	STIS/CCD, ACQ, F25ND5	MIRROR		GS ACQ SCENARIO SINGLE		0.5 Secs (0.5 Secs) *[==>]*	*[1]*
Comments: Acquire Fomalhaut									
2	BG Source G750L	(1) FOMALHAUT-BACKGROUND-SOURCE-OFF	STIS/CCD, ACCUM, 52X2	G750L 7751 A	CR-SPLIT=NO			369 Secs X 5 (2155 Secs) *[==>431.0 Secs (Copy 1)]* *[==>431.0 Secs (Copy 2)]* *[==>431.0 Secs (Copy 3)]* *[==>431.0 Secs (Copy 4)]* *[==>431.0 Secs (Copy 5)]*	*[1]*
Comments: Comparison with orbit 1 and archival data (ID:8788) will allow us to measure dust attenuation from the Fomalhaut disk on a background star.									
3	Fring Flat Calibration	CCDFLAT	STIS/CCD, ACCUM, 52X2	G750L 7751 A				*[==>(Copy 1)]* *[==>(Copy 2)]*	*[1]*

Orbit Structure