



11596 - Coronagraphic Imaging of Debris Disks Containing Gas

Cycle: 17, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) HD158352	STIS/CCD	1	10-Mar-2010 15:23:36.0	yes
02	(1) HD158352	STIS/CCD	1	10-Mar-2010 15:23:38.0	yes
03	(2) HD159170-CALIB	STIS/CCD	1	10-Mar-2010 15:23:41.0	yes
04	(3) HD118232	STIS/CCD	1	10-Mar-2010 15:23:42.0	yes
05	(3) HD118232	STIS/CCD	1	10-Mar-2010 15:23:43.0	yes
06	(4) HD119024-CALIB	STIS/CCD	1	10-Mar-2010 15:23:43.0	yes

6 Total Orbits Used

ABSTRACT

We recently found a new sample of edge-on debris disks using the Spitzer Space Telescope. These disks are particularly valuable because they have observable circumstellar gas as well as dust. They double the small number of debris disks that can be used to study gas-dust interactions in optically-thin disks, as well as the evolution of circumstellar gas during the terrestrial planet-forming phase. We propose HST-STIS coronagraphic imaging of the two closest disks from our sample, in order to image light scattered from the dust disks in a broad optical bandpass. These observations will provide a wealth of information about the disks, including their sizes, radial surface brightness profiles, and basic morphologies (ring-like or smooth disk). They may also reveal dust structures (e.g. clumps) that are often seen in optical images of debris disks and may be generated by the influence of unseen planets. This proposed program is a crucial step towards full characterization of the circumstellar material in two important debris disks.

OBSERVING DESCRIPTION

General Strategy: STIS coronagraphic imaging of two known debris disks, HD158352 and HD118232. Each target will be observed at two different telescope roll angles, to allow more accurate removal of scattered and diffracted starlight. A point-spread function (PSF) reference star will also be coronagraphically imaged along with each target star. The sequence of observations for each target is as follows: disk at one arbitrary telescope orientation (1 orbit), disk at telescope orientation roughly 30 degrees from the first (1 orbit), then PSF star (1 orbit). These observations are done in three sequential orbits to minimize telescope thermal changes.

[2009-07-20] We originally planned to use the ACS coronagraph for these observations. Since it is not available, the program was switched to the STIS coronagraph (see our Program Change Request for details). In sum, we found that the STIS observations are feasible without requesting any additional observing time. Our original allocation of 6 orbits will be sufficient to fully achieve our science goals.

The PSF stars (HD159170 for HD158352 and HD119024 for HD118232) are bright, non-variable, single stars. Their B-V colors and spectral types are close to those of the target stars. The PSF stars are near the target stars on the sky and have no other stars within 30 arcsec. The stellar data appear below. In Phase I, we had suggested different PSFs; subsequent investigation revealed other stars that are better suited.

HD158352: A8V, B = 5.697, V = 5.442, B-V = 0.255

HD159170: A5V, B = 5.836, V = 5.631, B-V = 0.205, dist. from HD158352 = 6.2 deg

HD118232: A5V, B = 4.840, V = 4.685, B-V = 0.155

HD119024: A3V, B = 5.602, V = 5.472, B-V = 0.130, dist. from HD118232 = 4.0 deg

[2009-07-20] The STIS 50CCD band is broader than the F606W band we planned for the ACS orbits. Therefore, it is even more important to have a close color match between the target and PSF stars. In both cases, the difference in B-V color between the target and PSF star is less than the maximum recommended value of 0.08.

Observation Details: We will take our science observations with the 50CORON clear aperture, using the WEDGEA1.0 position ($r = 0.5$ arcsecs). The coronagraphic images will be done in two exposures: 1) a short exposure to image bright regions near the wedge without saturating and 2) a long exposure to sensitively image the faint outer regions of the disks.

All ACQ images will be taken with the F28X50OII filter. We have used the STIS ETC to verify that none of the stars saturate with this filter and that we achieve $S/N > 200$ for every target in the requested ACQ exposure times. The ETC ACQ calculations were done with GAIN=4 and CR-SPLIT=1; the results appear below.

	S/N in ACQ image	Exp. time
HD158352	252	0.2 sec
HD159170	232	0.2 sec
HD118232	255	0.1 sec
HD119024	251	0.2 sec

[2010-01-14] The coronagraphic exposures of HD118232 and its PSF reference star executed in Dec. 2009 were badly saturated. Therefore, we have adjusted the planned observations of HD158352 in the following fashion.

- 1) All coronagraphic observations were set to GAIN=4.

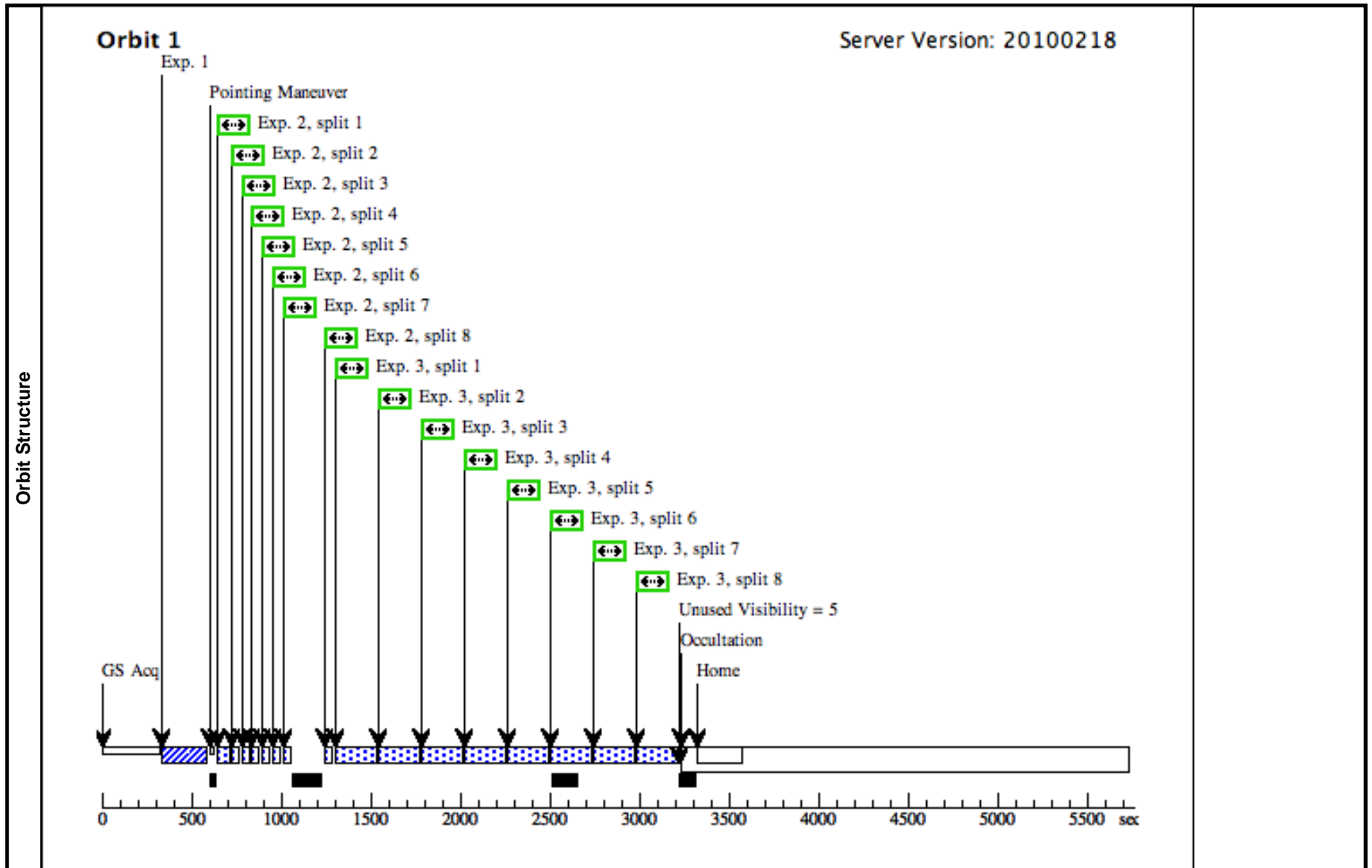
2) For all coronagraphic observations, the CR-SPLIT number was increased. For the short (100 sec) coronagraphic exposure, we set CR-SPLIT=8, giving 12.5 sec sub-exposures. None of the pixels in these sub-exposure should saturate; we estimate that the pixels at the edge of the wedge will have around 80,000 electrons.

This short exposure allows a long exposure of 1568 sec to fit within the same orbit. With CR-SPLIT=8, the sub-exposures will have a duration of 196 sec. We have verified that the expected saturated region of the long sub-exposures is well-detected in the short exposure. Even with the reduced total time for the long exposure, we should detect the disk out to a large distance from the star ($S/N > 3$ out to 7 arcsec in one roll, $S/N > 3$ out to 7.6 arcsec combing both rolls).

Proposal 11596 - Visit 01 - Coronagraphic Imaging of Debris Disks Containing Gas

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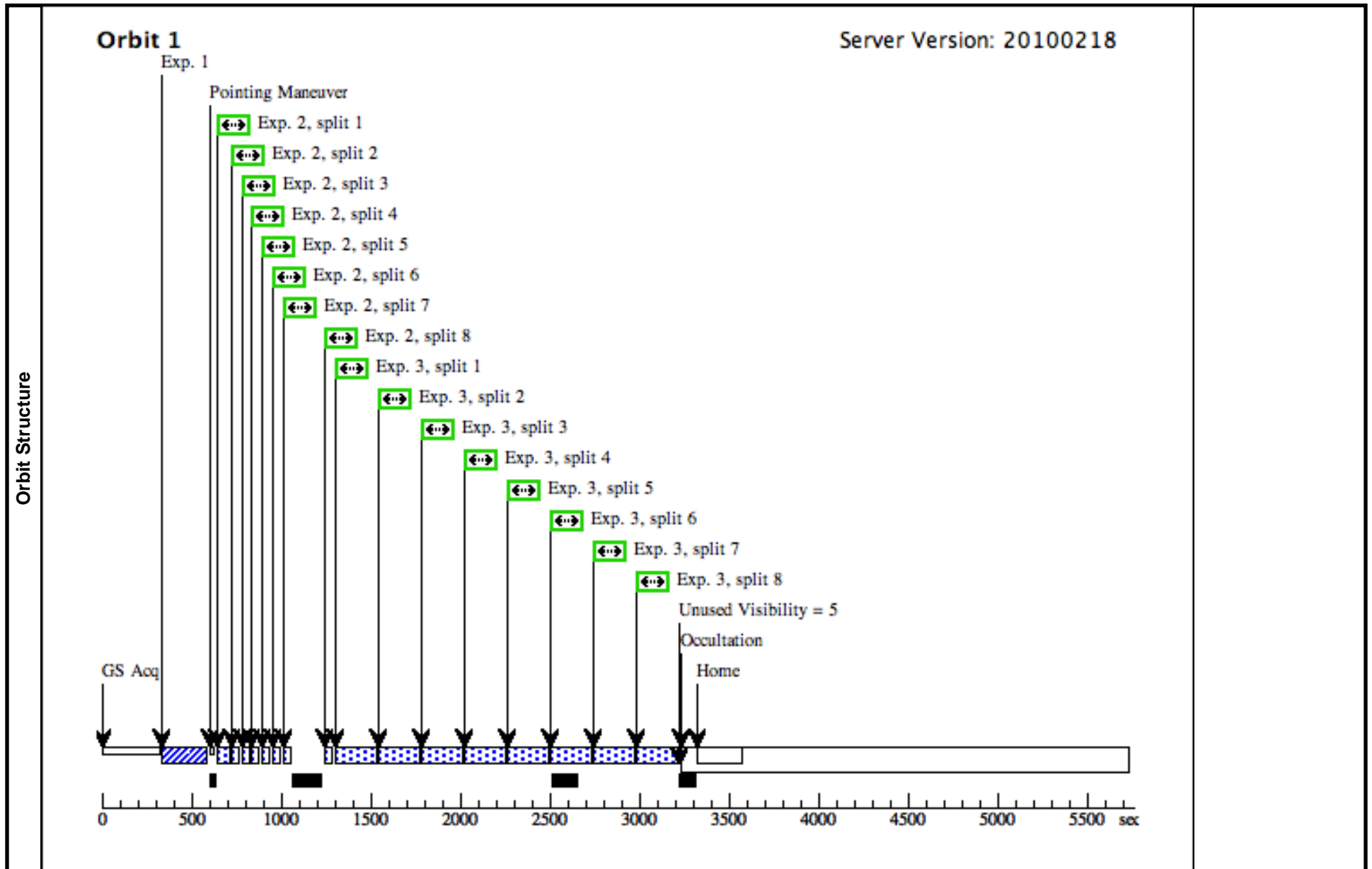
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	(1)	HD158352 Alt Name1: GSC00401-02211 Alt Name2: HIP85537	RA: 17 28 49.6549 (262.2068954d) Dec: +00 19 50.25 (.33062d) Equinox: J2000	Proper Motion RA: -0.004315s/yr Proper Motion Dec: +0.01986"/yr Parallax: 0.01586" Epoch of Position: 2000 Radial Velocity: -36.1 km/sec	V=5.442+/-0.01	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	HD158352-r oll1-acq	(1) HD158352	STIS/CCD, ACQ, F28X500II	MIRROR	ACQTYPE=POINT			0.2 Secs [==>]	[1]
	2	HD158352-r oll1-short	(1) HD158352	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4			100 Secs [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)] [==>(Split 6)] [==>(Split 7)] [==>(Split 8)]	[1]
	3	HD158352-r oll1-long	(1) HD158352	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4			1568 Secs [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)] [==>(Split 6)] [==>(Split 7)] [==>(Split 8)]	[1]



Proposal 11596 - Visit 01 - Coronagraphic Imaging of Debris Disks Containing Gas

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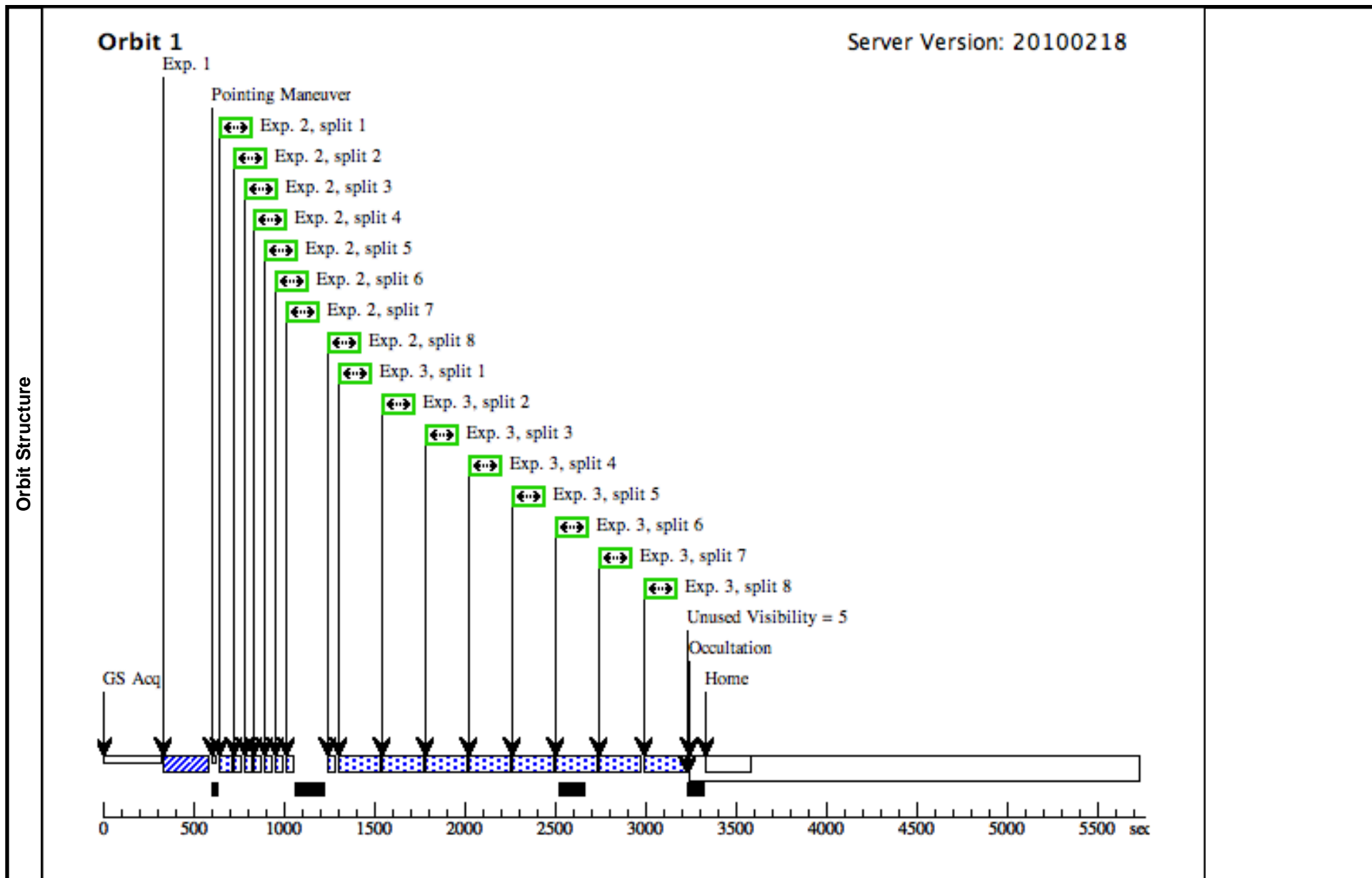
Visit	Proposal 11596, Visit 02, scheduling Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 25D TO 35D FROM 01; AFTER 01 BY 0 Orbits TO 1 Orbits Comments: HD158352 roll 2									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	HD158352 Alt Name1: GSC00401-02211 Alt Name2: HIP85537	RA: 17 28 49.6549 (262.2068954d) Dec: +00 19 50.25 (.33062d) Equinox: J2000	Proper Motion RA: -0.004315s/yr Proper Motion Dec: +0.01986"/yr Parallax: 0.01586" Epoch of Position: 2000 Radial Velocity: -36.1 km/sec	V=5.442+/-0.01	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	HD158352-r oll2-acq	(1) HD158352	STIS/CCD, ACQ, F28X500II	MIRROR	ACQTYPE=POINT			0.2 Secs [==>]	[1]
	2	HD158352-r oll2-short	(1) HD158352	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4			100 Secs [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)] [==>(Split 6)] [==>(Split 7)] [==>(Split 8)]	[1]
	3	HD158352-r oll2-long	(1) HD158352	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4			1568 Secs [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)] [==>(Split 6)] [==>(Split 7)] [==>(Split 8)]	[1]



Proposal 11596 - Visit 02 - Coronagraphic Imaging of Debris Disks Containing Gas

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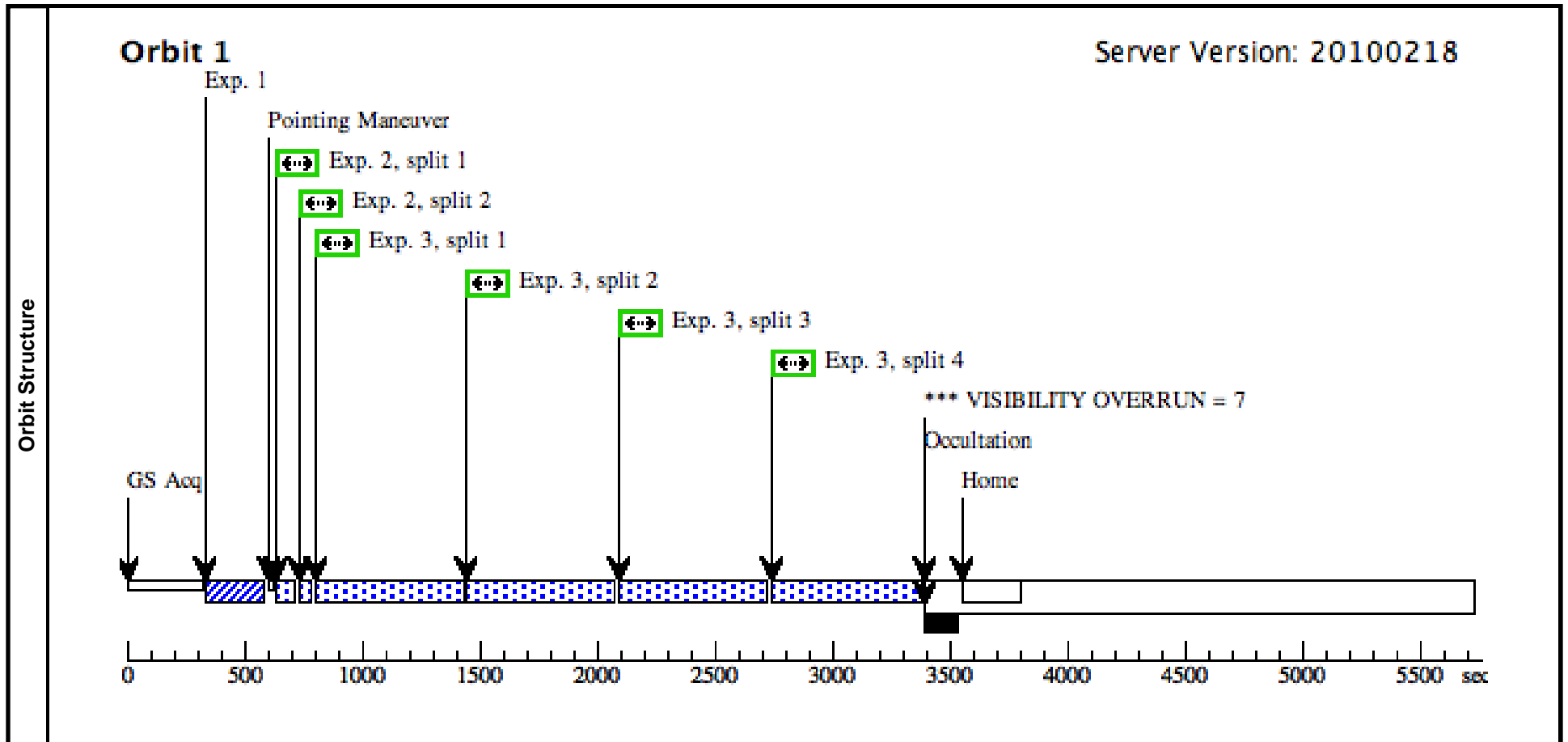
Visit	Proposal 11596, Visit 03, scheduling Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: AFTER 02 BY 0 Orbits TO 1 Orbits Comments: PSF for HD158352																					
	Fixed Targets	<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Fluxes</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(2)</td> <td>HD159170-CALIB Alt Name1: GSC05092-00788 Alt Name2: HIP85922</td> <td>RA: 17 33 29.8449 (263.3743538d) Dec: -05 44 41.29 (-5.74480d) Equinox: J2000</td> <td>Proper Motion RA: -0.002828s/yr Proper Motion Dec: -0.09538"/yr Parallax: 0.02066" Epoch of Position: 2000 Radial Velocity: -26 km/sec</td> <td>V=5.631+/-0.1</td> <td>Reference Frame: ICRS</td> </tr> </tbody> </table> Comments: PSF reference star for HD158352										#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous	(2)	HD159170-CALIB Alt Name1: GSC05092-00788 Alt Name2: HIP85922	RA: 17 33 29.8449 (263.3743538d) Dec: -05 44 41.29 (-5.74480d) Equinox: J2000	Proper Motion RA: -0.002828s/yr Proper Motion Dec: -0.09538"/yr Parallax: 0.02066" Epoch of Position: 2000 Radial Velocity: -26 km/sec	V=5.631+/-0.1
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Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit												
	1	HD159170-acq	(2) HD159170-CALI B	STIS/CCD, ACQ, F28X500II	MIRROR	ACQTYPE=POINT			0.2 Secs [==>]	[1]												
	2	HD159170-s hort	(2) HD159170-CALI B	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4			100 Secs [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)] [==>(Split 6)] [==>(Split 7)] [==>(Split 8)]	[1]												
	3	HD159170-1 ong	(2) HD159170-CALI B	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4			1576 Secs [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)] [==>(Split 6)] [==>(Split 7)] [==>(Split 8)]	[1]												



Proposal 11596 - Visit 03 - Coronagraphic Imaging of Debris Disks Containing Gas

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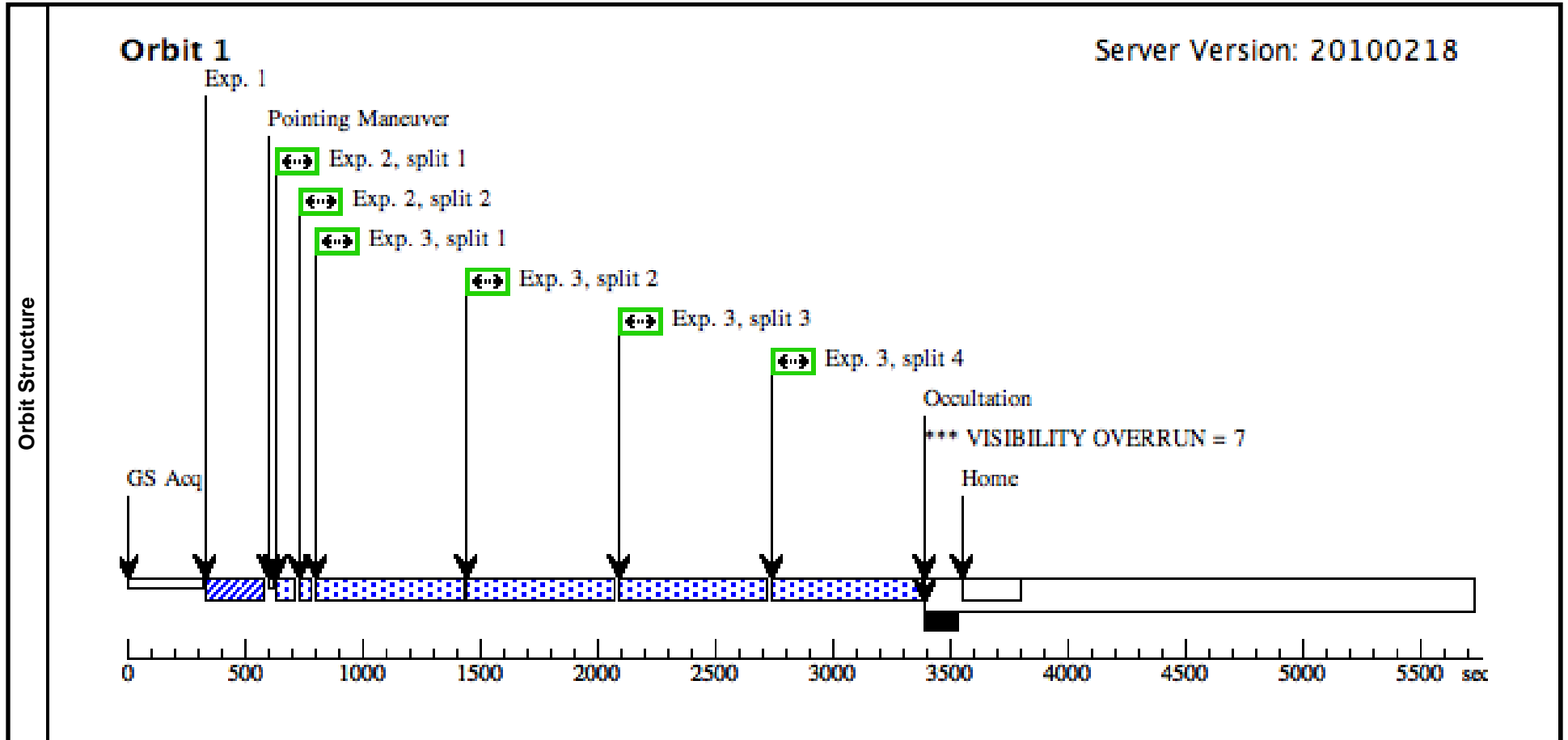
Visit	Proposal 11596, Visit 04, completed Diagnostic Status: Warning Scientific Instruments: STIS/CCD Special Requirements: (none) <i>Comments: HD118232 roll 1</i>									
	(Visit 04) Warning (Orbit Planner): VISIBILITY OVERRUN									
Diagnosics										
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	HD118232 Alt Name1: GSC03466-01270 Alt Name2: 24-CVN	RA: 13 34 27.2593 (203.6135804d) Dec: +49 00 57.50 (49.01597d) Equinox: J2000	Proper Motion RA: -0.01304s/yr Proper Motion Dec: +0.02739"/yr Parallax: 0.01712" Epoch of Position: 2000 Radial Velocity: -18.3 km/sec	V=4.685+/-0.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	HD118232-r oll1-acq	(3) HD118232	STIS/CCD, ACQ, F28X500II	MIRROR	ACQTYPE=POINT			0.1 Secs [==>]	[1]
	2	HD118232-r oll1-short	(3) HD118232	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=2			50 Secs [==>(Split 1)] [==>(Split 2)]	[1]
	3	HD118232-r oll1-long	(3) HD118232	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=4			2416 Secs [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]	[1]



Proposal 11596 - Visit 05 - Coronagraphic Imaging of Debris Disks Containing Gas

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Visit	Proposal 11596, Visit 05, completed Diagnostic Status: Warning Scientific Instruments: STIS/CCD Special Requirements: ORIENT 25D TO 35D FROM 04; AFTER 04 BY 0 Orbits TO 1 Orbits Comments: HD118232 roll 2									
	(Visit 05) Warning (Orbit Planner): VISIBILITY OVERRUN									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	HD118232 Alt Name1: GSC03466-01270 Alt Name2: 24-CVN	RA: 13 34 27.2593 (203.6135804d) Dec: +49 00 57.50 (49.01597d) Equinox: J2000	Proper Motion RA: -0.01304s/yr Proper Motion Dec: +0.02739"/yr Parallax: 0.01712" Epoch of Position: 2000 Radial Velocity: -18.3 km/sec	V=4.685+/-0.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	HD118232-r (3) HD118232 oll2-acq	HD118232	STIS/CCD, ACQ, F28X500II	MIRROR	ACQTYPE=POINT			0.1 Secs [==>]	[1]
	2	HD118232-r (3) HD118232 oll2-short	HD118232	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=2			50 Secs [==>(Split 1)] [==>(Split 2)]	[1]
	3	HD118232-r (3) HD118232 oll2-long	HD118232	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=4			2416 Secs [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]	[1]



Proposal 11596 - Visit 06 - Coronagraphic Imaging of Debris Disks Containing Gas

Wed Mar 10 20:23:45 GMT 2010

Visit	Proposal 11596, Visit 06, completed Diagnostic Status: Warning Scientific Instruments: STIS/CCD Special Requirements: AFTER 05 BY 0 Orbits TO 1 Orbits Comments: PSF for HD118232																																																																																																																			
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