



15295 - Revealing the birth environment of circumbinary exoplanets with STIS

BAR5

Cycle: 25, Proposal Category: GO
(Availability Mode: AVAILABLE)

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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) HD-34700	STIS/CCD	1	03-Nov-2017 12:05:20.0	yes
02	(1) HD-34700	STIS/CCD	1	03-Nov-2017 12:05:22.0	yes
03	(2) HD-34135-CALIB	STIS/CCD	1	03-Nov-2017 12:05:24.0	yes

<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>
04	(1) HD-34700	STIS/CCD	1	03-Nov-2017 12:05:25.0	yes

4 Total Orbits Used

ABSTRACT

We propose to use four orbits of HST/STIS coronagraphy with the bent finger occulter (BAR5) to image the circumbinary disk around the spectroscopic binary HD 34700. This disk was recently discovered by our team both with NICMOS and Keck-NIRC2 in the IR. We propose to probe it, for the first time in visible scattered light, down to as close as 0.2" (65 AU). HD 34700 has an eccentric 23-day orbit and may resemble the birth environment of circumbinary planets like the ones discovered by the Kepler mission. The eccentricity of the binary and the possible presence of additional companions make HD 34700 a unique testbed for studies of perturbed disk evolution. Previous observations by our team in the infrared show evidence for asymmetric features in both the inner and outer part of the disk. Possible interpretation is the presence of streamers and at least one spiral arm. New observations of this disk are required to confirm the nature and the cause of these features. Are they the result of stellar interactions, forming planets, or gravitational instabilities? We will probe the disk at high fidelity, with the goal of discriminating between these possibilities. We will look for signs of planet-disk interaction, with the aim to better understand the birth environment of dynamically extreme planetary systems. These observations are essential to unveil the very nature of this disk and will provide an anchor for future exploration with JWST and ALMA.

OBSERVING DESCRIPTION

We propose to follow the same overall strategy that has been successfully implemented in other programs that have dealt with the high-contrast imaging of circumstellar disks, namely a series of four total orbits that images the disk at three separate spacecraft orientations while also using a spectrally matched PSF reference star. We emphasize that the spectroscopic binary will not be resolved and thus for all practical coronagraphic considerations, the system is effectively a single star. Multiple orientations are required to realize the full potential of STIS high-contrast imaging. As demonstrated for previous STIS observations, a non-negligible fraction of azimuthal coverage in the disk is blocked by the stellar diffraction spikes and occulting wedges. The near face-on nature of the system does require 3 orients for full azimuthal coverage. We plan observations at 3 orientations oriented at 0 degree, +30 degrees, -30 degrees in roll. Relatively loose absolute orientation constraints will be specified to position the outer disks faint features near orthogonal to the STIS occulting wedge in the 0 degree visit. We will also obtain contemporaneously color-matched reference star observed in the same manner at one orientation for speckle calibration. The 3 observations of the target plus the reference star require 4 orbits total.

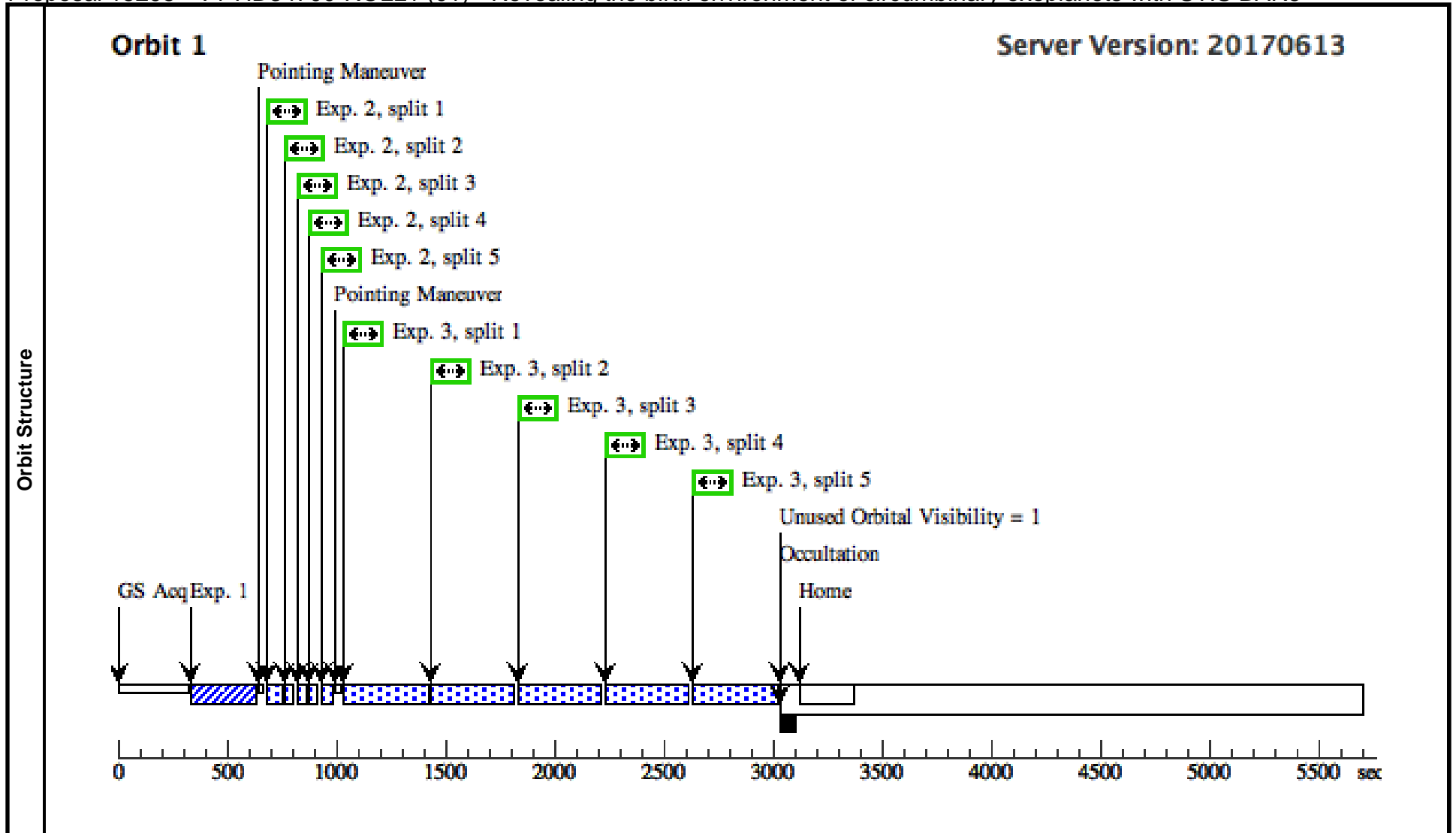
Proposal 15295 - V1-HD34700-ROLL1 (01) - Revealing the birth environment of circumbinary exoplanets with STIS BAR5

Fri Nov 03 16:05:26 GMT 2017

Visit	<p>Proposal 15295, V1-HD34700-ROLL1 (01), implementation</p> <p>Diagnostic Status: No Diagnostics</p> <p>Scientific Instruments: STIS/CCD</p> <p>Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 80%; ORIENT -30D TO -15D FROM 02</p> <p><i>Comments: HD 34700 (V=9.15, B-V=0.638)</i></p> <p><i>First of three visits of HD 34700. Each of the three visits will be done at different relative orientations with one PSF calibration observation interleaved. This is the first HD 34700 visit.</i></p> <p><i>The four visits (HD 34700 + PSF calibration) must be executed sequentially in contiguous orbits interrupted only for Earth occultation.</i></p> <p><i>Orientation: We wish to schedule this visit (1) at a relative angle of -30 from visit (2).</i></p> <p><i>We allow a relative orientation tolerance from -30 deg to -15 deg to assist in guide star selection and scheduling.</i></p> <p><i>Relative Timing: This visit (1) should immediately precede visit (2). I.e., They should be executed sequentially in "back-to-back" orbits.</i></p>																																	
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Proposal 15295 - V1-HD34700-ROLL1 (01) - Revealing the birth environment of circumbinary exoplanets with STIS BAR5

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
Exposures	1	HD34700_A (1) HD-34700 CQ (STIS.ta.103 2433)	STIS/CCD, ACQ, F25ND3	MIRROR			Sequence 1-3 Non-Int in V1-HD34700-ROLL1 (01)	1.8 Secs (1.8 Secs) [==>]	[1]	
	<p><i>Comments: F25ND3 Aperture Exposure time needed to obtain a S/N ratio of 100 Kurucz Model G2V 5860 4.4 vegmag = 9.15 Requested Signal/Noise Ratio = 100.000 gives: Time = 1.78 seconds Time to Saturation (for a single exposure) = 49.55 seconds => so to get signal to noise ratio of 100, need 1.8 seconds exposure time</i></p>									
	2	HD34700_B (1) HD-34700 AR5 (STIS.im.10 12647)	STIS/CCD, ACCUM, BAR5	MIRROR	SIZEAXIS2=100; CR-SPLIT=5; GAIN=4; CENTERAXIS2=70 0	POS TARG 0,0	Sequence 1-3 Non-Int in V1-HD34700-ROLL1 (01)	180 Secs (180 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)]	[1]	
<p><i>Comments: Here we use the BAR5 occulter (Aperture). He we attempt to place the target on the mid-line of BAR5. We then use a subarray readout of CENERAXIS2 = 700 appropriate for BAR5 with a SIZEAXIS2 = 100.</i></p> <p><i>SCALABLE BENCHMARK: 14426 reached ~80% full well in 0.2s for a V=3.6 F star. GOV is close in SED to this, and target is V=9.15. We expect to hit 80% full well in 36s.</i></p>										
3	HD34700_L (1) HD-34700 ONG_1 (STIS.im.10 12647)	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	SIZEAXIS2=427; CR-SPLIT=5; GAIN=4		Sequence 1-3 Non-Int in V1-HD34700-ROLL1 (01)	1840 Secs (1840 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)]	[1]		
<p><i>Comments: Here we use the WEDGE1.0 occulter (Aperture). We then use a SIZEAXIS2 = 427.</i></p> <p><i>SCALABLE BENCHMARK: 14426 reached ~80% full well in 0.2s for a V=3.6 F star. GOV is close in SED to this, and target is V=9.15. We expect to hit 80% full well in 396s.</i></p>										



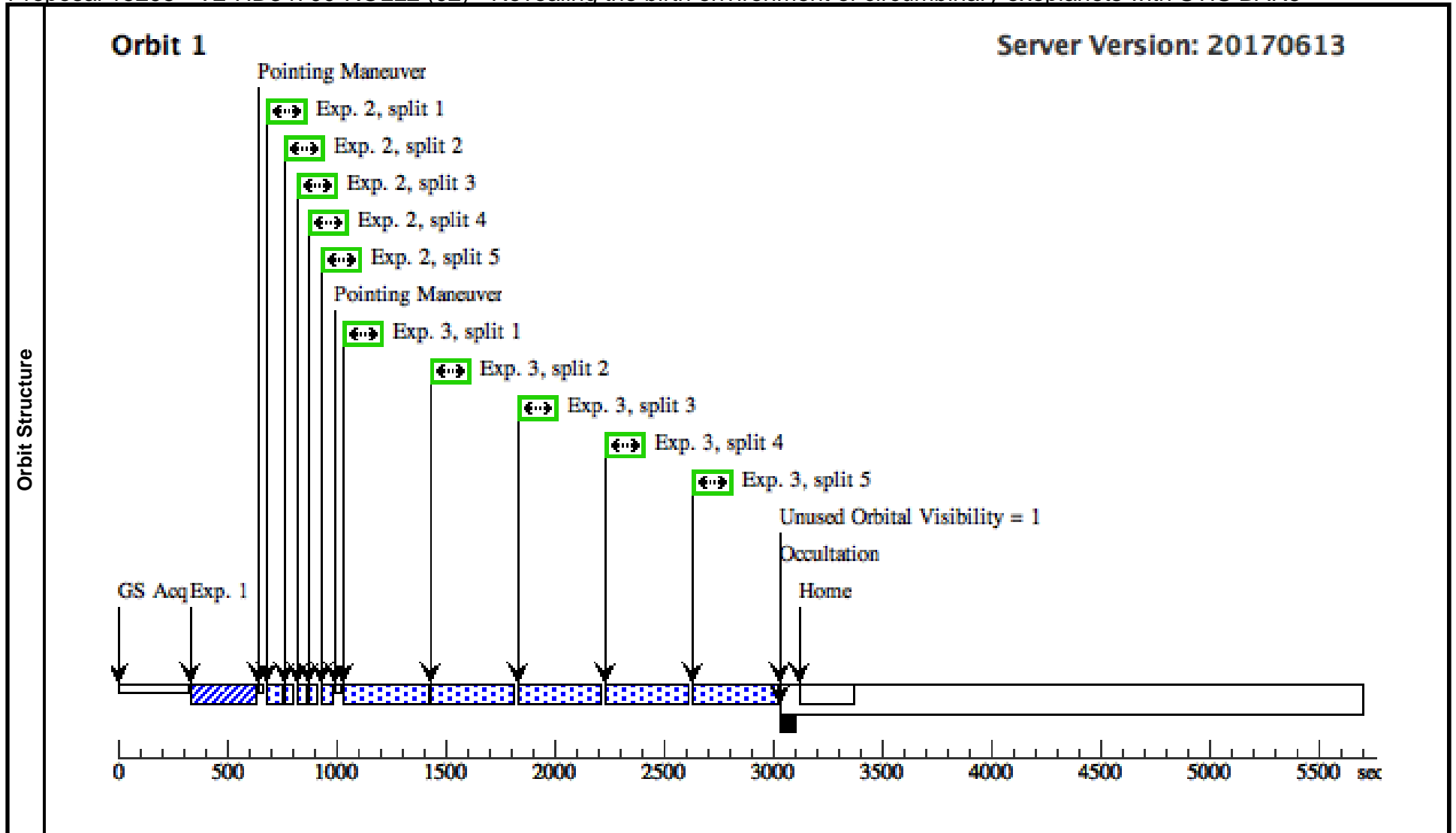
Proposal 15295 - V2-HD34700-ROLL2 (02) - Revealing the birth environment of circumbinary exoplanets with STIS BAR5

Fri Nov 03 16:05:26 GMT 2017

Visit	<p>Proposal 15295, V2-HD34700-ROLL2 (02), implementation</p> <p>Diagnostic Status: No Diagnostics</p> <p>Scientific Instruments: STIS/CCD</p> <p>Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 80%; ORIENT 340D TO 20 D; AFTER 01 BY .5 Orbits TO 1.5 Orbits</p> <p><i>Comments: HD 34700 (V=9.15, B-V=0.638)</i> <i>Second of three visits of HD 34700. Each of the three visits will be done at different relative orientations with one PSF calibration observation interleaved.</i> <i>This is the second HD 34700 visit.</i> <i>The four visits (HD 34700 + PSF calibration) must be executed sequentially in contiguous orbits interrupted only for Earth occultation.</i></p> <p><i>Orientation: We wish to schedule this visit (2) at an absolute orientation 5 deg.</i> <i>We allow an absolute orientation tolerance from 330 deg to 30 deg to assist in guide star selection and scheduling. The orientation is constrained by the program goal which is to confirm the presence of spiral arms in the disk. With this absolute constraint, we ensure that the features previously identified with NICMOS don't fall under the wedge or the diffraction pattern.</i></p> <p><i>Relative Timing: This visit (2) should immediately follow Visit 1 and immediately precede Visit 3 in back-to-back orbits.</i></p>																																	
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Proposal 15295 - V2-HD34700-ROLL2 (02) - Revealing the birth environment of circumbinary exoplanets with STIS BAR5

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
Exposures	1	HD34700_A (1) HD-34700 CQ	STIS/CCD, ACQ, F25ND3	MIRROR			Sequence 1-3 Non-Int in V2-HD34700-ROLL2 (02)	1.8 Secs (1.8 Secs) [==>]	[1]	
	<p><i>Comments: F25ND3 Aperture Exposure time needed to obtain a S/N ratio of 100 Kurucz Model G2V 5860 4.4 vegamag = 9.15 Requested Signal/Noise Ratio = 100.000 gives: Time = 1.78 seconds Time to Saturation (for a single exposure) = 49.55 seconds => so to get signal to noise ratio of 100, need 1.8 seconds exposure time</i></p>									
	2	HD34700_B (1) HD-34700 AR5 (STIS.im.10 12647)	STIS/CCD, ACCUM, BAR5	MIRROR	SIZEAXIS2=100; CR-SPLIT=5; GAIN=4; CENTERAXIS2=70 0	POS TARG 0,0	Sequence 1-3 Non-Int in V2-HD34700-ROLL2 (02)	180 Secs (180 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)]	[1]	
<p><i>Comments: Here we use the BAR5 occulter (Aperture). He we attempt to place the target on the mid-line of BAR5. We then use a subarray readout of CENERAXIS2 = 700 appropriate for BAR5 with a SIZEAXIS2 = 100.</i></p> <p><i>SCALABLE BENCHMARK: 14426 reached ~80% full well in 0.2s for a V=3.6 F star. GOV is close in SED to this, and target is V=9.15. We expect to hit 80% full well in 36s.</i></p>										
3	HD34700_L (1) HD-34700 ONG_1 (STIS.im.10 12647)	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	SIZEAXIS2=427; CR-SPLIT=5; GAIN=4		Sequence 1-3 Non-Int in V2-HD34700-ROLL2 (02)	1840 Secs (1840 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)]	[1]		
<p><i>Comments: Here we use the WEDGE1.0 occulter (Aperture). We then use a SIZEAXIS2 = 427.</i></p> <p><i>SCALABLE BENCHMARK: 14426 reached ~80% full well in 0.2s for a V=3.6 F star. GOV is close in SED to this, and target is V=9.15. We expect to hit 80% full well in 396s.</i></p>										



Proposal 15295 - V3-PSF-HD34135 (03) - Revealing the birth environment of circumbinary exoplanets with STIS BAR5

Fri Nov 03 16:05:26 GMT 2017

Visit	<p>Proposal 15295, V3-PSF-HD34135 (03), implementation</p> <p>Diagnostic Status: No Diagnostics</p> <p>Scientific Instruments: STIS/CCD</p> <p>Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 80%; AFTER 02 BY .5 Orbits TO 1.5 Orbits</p> <p>Comments: PSF (HD 34135). PSF calibration target for HD 34700. $V = 8.37$ B - $V = +0.5$ Spec Type F5</p> <p><i>This is the PSF star calibrator for the flanking visits (1-4). We levy no orientation constraints on this visit (3). However, we choose this target since it has been used in the past for our HD 34700 observations with Keck. So as Visits 2 and 3 must be scheduled in sequential contiguous orbits, if scheduled at nominal roll (as we expect also Visit 2 will be) then we expect absolute orientations of Visits 2 and 3 to be very similar (within a few degrees). This is important so we maintain similar Sun and Beta angles for the science target and its PSF calibrator.</i></p> <p><i>Relative Timing: This visit (3) should immediately follow visit 2 and immediately precede visit 4. I.e., they should be executed sequentially in "back-to-back" orbits.</i></p>																														
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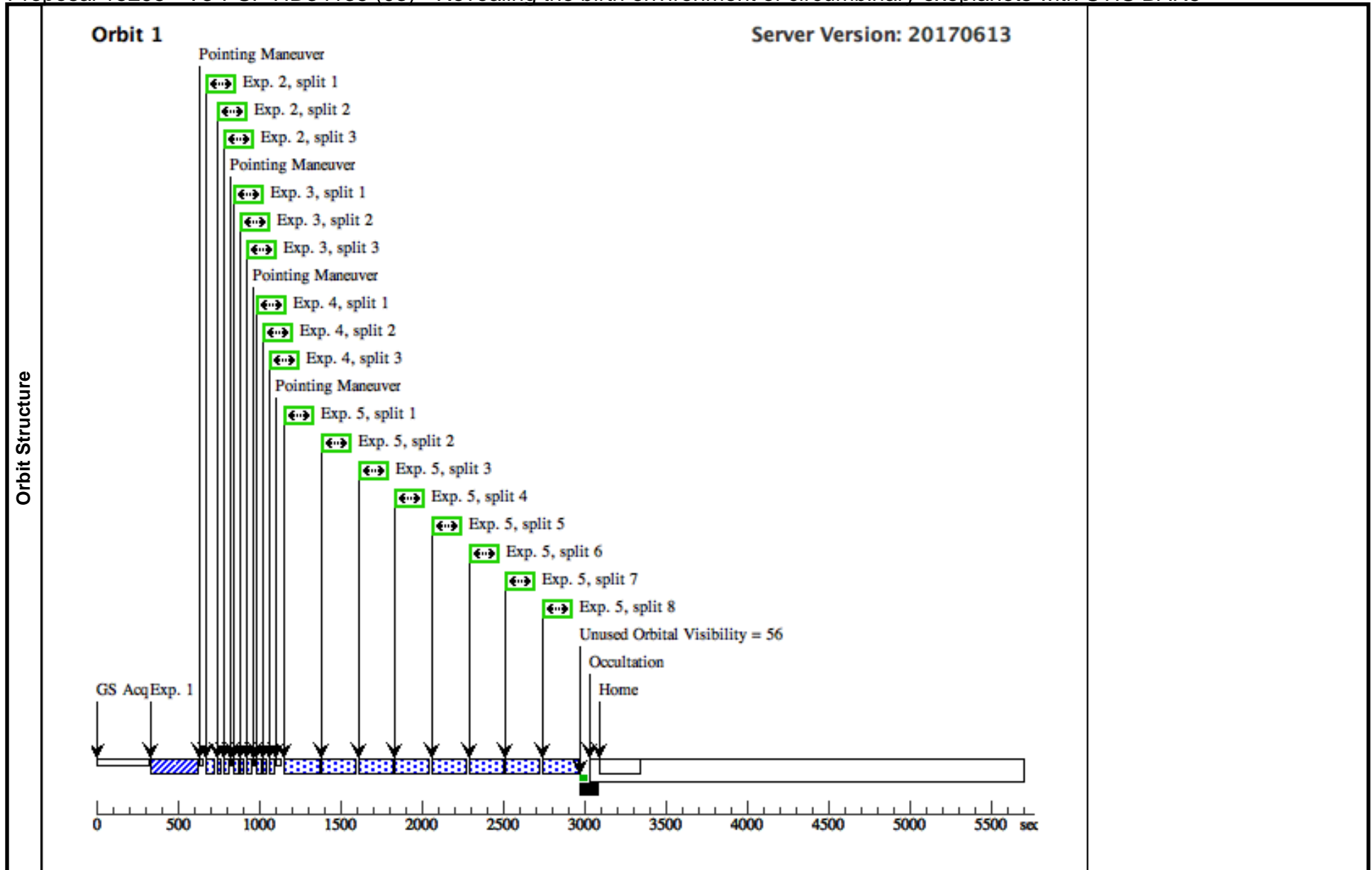
Proposal 15295 - V3-PSF-HD34135 (03) - Revealing the birth environment of circumbinary exoplanets with STIS BAR5

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	HD34135_A CQ (STIS.ta.103 2422)	(2) HD-34135-CALI B	STIS/CCD, ACQ, F25ND3	MIRROR			Sequence 1-5 Non-Int in V3-PSF-HD34135 (03)	0.9 Secs (0.9 Secs) [==>]	[1]
<p><i>Comments: F25ND3 Aperture Exposure time needed to obtain a S/N ratio of 100 Kurucz Model F5V 6440 4.3 vegmag = 8.37 Requested Signal/Noise Ratio = 100.000 gives: Time = 0.92 seconds Time to Saturation (for a single exposure) = 24.65 seconds => so to get signal to noise ratio of 100, need 0.9 seconds exposure time</i></p>									
2	HD34135_B AR5_CENT (STIS.im.10 12644)	(2) HD-34135-CALI B	STIS/CCD, ACCUM, BAR5	MIRROR	SIZEAXIS2=100; CR-SPLIT=3; GAIN=4; CENTERAXIS2=70 0		Sequence 1-5 Non-Int in V3-PSF-HD34135 (03)	54 Secs (54 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)]	[1]
<p><i>Comments: Here we use the BAR5 occulter (Aperture). He we attempt to place the target on the mid-line of BAR5. We then use a subarray readout of CENERAXIS2 = 700 appopriate for BAR5 with a SIZEAXIS2 = 100. Reference psf is V=8.37. We expect to hit 80% full well in 18s. We choose 3x1 dither pattern perpendicular to BAR5 position to mitigate centering mismatches.</i></p>									
3	HD34135_B AR5_PLUS (STIS.im.10 12644)	(2) HD-34135-CALI B	STIS/CCD, ACCUM, BAR5	MIRROR	SIZEAXIS2=100; CR-SPLIT=3; GAIN=4; CENTERAXIS2=70 0	POS TARG 0.00248, 0.01245	Sequence 1-5 Non-Int in V3-PSF-HD34135 (03)	54 Secs (54 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)]	[1]
<p><i>Comments: Here we use the BAR5 occulter (Aperture). He we attempt to place the target on the mid-line of BAR5. We then use a subarray readout of CENERAXIS2 = 700 appopriate for BAR5 with a SIZEAXIS2 = 100. Reference psf is V=8.37. We expect to hit 80% full well in 18s. We choose 3x1 dither pattern perpendicular to BAR5 position to mitigate centering mismatches.</i></p>									
4	HD34135_B AR5_MINU S (STIS.im.10 12644)	(2) HD-34135-CALI B	STIS/CCD, ACCUM, BAR5	MIRROR	SIZEAXIS2=100; CR-SPLIT=3; GAIN=4; CENTERAXIS2=70 0	POS TARG -0.0024 8,-0.01245	Sequence 1-5 Non-Int in V3-PSF-HD34135 (03)	54 Secs (54 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)]	[1]
<p><i>Comments: Here we use the BAR5 occulter (Aperture). He we attempt to place the target on the mid-line of BAR5. We then use a subarray readout of CENERAXIS2 = 700 appopriate for BAR5 with a SIZEAXIS2 = 100. Reference psf is V=8.37. We expect to hit 80% full well in 18s. We choose 3x1 dither pattern perpendicular to BAR5 position to mitigate centering mismatches.</i></p>									

Exposures

Proposal 15295 - V3-PSF-HD34135 (03) - Revealing the birth environment of circumbinary exoplanets with STIS BAR5

5	HD34135_L (2) HD-34135-CALI STIS/CCD, ACCUM, WEDGEA1.0 MIRROR ONG_1 B (STIS.im.10 12644)	SIZEAXIS2=427; CR-SPLIT=8; GAIN=4	Sequence 1-5 Non-Int in V3-PSF-HD34135 (03)	1584 Secs (1584 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)] [==>(Split 6)] [==>(Split 7)] [==>(Split 8)]	[1]
<p>Comments: Here we use the WEDGE1.0 occulter (Aperture). We then use a SIZEAXIS2 = 427. We expect to hit 80% full well in 198 sec for the reference PSF.</p>					



Proposal 15295 - V4-HD34700-ROLL3 (04) - Revealing the birth environment of circumbinary exoplanets with STIS BAR5

Fri Nov 03 16:05:27 GMT 2017

Visit	<p>Proposal 15295, V4-HD34700-ROLL3 (04), implementation</p> <p>Diagnostic Status: No Diagnostics</p> <p>Scientific Instruments: STIS/CCD</p> <p>Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 80%; ORIENT 15D TO 30D FROM 02; AFTER 03 BY 0.5 Orbits TO 1.5 Orbits</p> <p><i>Comments: HD 34700 (V=9.15, B-V=0.638)</i></p> <p><i>Third of three visits of HD 34700. Each of the three visits will be done at different relative orientations with one PSF calibration observation interleaved. This is the third HD 34700 visit.</i></p> <p><i>The four visits (HD 34700 + PSF calibration) must be executed sequentially in contiguous orbits interrupted only for Earth occultation.</i></p> <p><i>Orientation: We wish to schedule this visit (4) at a relative angle of 30 from visit (2).</i></p> <p><i>We allow a relative orientation tolerance from 15 deg to 30 deg to assist in guide star selection and scheduling.</i></p> <p><i>Relative Timing: This visit (4) should immediately follow Visit 3. I.e., They should be executed sequentially in "back-to-back" orbits.</i></p>																																		
	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>(1)</td> <td>HD-34700</td> <td>RA: 05 19 41.4081 (79.9225337d)</td> <td>Proper Motion RA: -0.77 mas/yr</td> <td>V=9.15+/-0.02</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td></td> <td>Alt Name1: HIP-24855</td> <td>Dec: +05 38 42.77 (5.64521d)</td> <td>Proper Motion Dec: -0.16 mas/yr</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>Equinox: J2000</td> <td>Parallax: 0.00309781410281364"</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>Epoch of Position: 2000.0</td> <td></td> <td></td> </tr> </tbody> </table> <p><i>Comments: This object was generated by the target selector and retrieved from the SIMBAD database.</i></p> <p><i>Manual update of coordinates precision values using Simbad.</i></p> <p><i>Manual entry of Proper Motion values using Simbad.</i></p> <p><i>Manual entry of Annual Parallax value using Gaia catalog.</i></p> <p><i>Manual entry of V-Magnitude error.</i></p> <p><i>Changed Reference Frame from Simbad to ICRS.</i></p> <p><i>Extended=NO</i></p>					#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous	(1)	HD-34700	RA: 05 19 41.4081 (79.9225337d)	Proper Motion RA: -0.77 mas/yr	V=9.15+/-0.02	Reference Frame: ICRS		Alt Name1: HIP-24855	Dec: +05 38 42.77 (5.64521d)	Proper Motion Dec: -0.16 mas/yr					Equinox: J2000	Parallax: 0.00309781410281364"						Epoch of Position: 2000.0	
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Proposal 15295 - V4-HD34700-ROLL3 (04) - Revealing the birth environment of circumbinary exoplanets with STIS BAR5

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	HD34700_A (1) HD-34700 CQ	STIS/CCD, ACQ, F25ND3	MIRROR			Sequence 1-3 Non-Int in V4-HD34700-ROLL3 (04)	1.8 Secs (1.8 Secs) [==>]	[1]
	<p><i>Comments: F25ND3 Aperture Exposure time needed to obtain a S/N ratio of 100 Kurucz Model G2V 5860 4.4 vegamag = 9.15 Requested Signal/Noise Ratio = 100.000 gives: Time = 1.78 seconds Time to Saturation (for a single exposure) = 49.55 seconds => so to get signal to noise ratio of 100, need 1.8 seconds exposure time</i></p>								
	2	HD34700_B (1) HD-34700 AR5 (STIS.im.10 12647)	STIS/CCD, ACCUM, BAR5	MIRROR	SIZEAXIS2=100; CR-SPLIT=5; GAIN=4; CENTERAXIS2=70 0	POS TARG 0,0	Sequence 1-3 Non-Int in V4-HD34700-ROLL3 (04)	180 Secs (180 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)]	[1]
<p><i>Comments: Here we use the BAR5 occulter (Aperture). He we attempt to place the target on the mid-line of BAR5. We then use a subarray readout of CENERAXIS2 = 700 appropriate for BAR5 with a SIZEAXIS2 = 100.</i></p> <p><i>SCALABLE BENCHMARK: 14426 reached ~80% full well in 0.2s for a V=3.6 F star. GOV is close in SED to this, and target is V=9.15. We expect to hit 80% full well in 36s.</i></p>									
3	HD34700_L (1) HD-34700 ONG_1 (STIS.im.10 12647)	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	SIZEAXIS2=427; CR-SPLIT=5; GAIN=4		Sequence 1-3 Non-Int in V4-HD34700-ROLL3 (04)	1840 Secs (1840 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)] [==>(Split 5)]	[1]	
<p><i>Comments: Here we use the WEDGE1.0 occulter (Aperture). We then use a SIZEAXIS2 = 427.</i></p> <p><i>SCALABLE BENCHMARK: 14426 reached ~80% full well in 0.2s for a V=3.6 F star. GOV is close in SED to this, and target is V=9.15. We expect to hit 80% full well in 396s.</i></p>									

