



15234 - Collecting the Missing Piece of the Puzzle: The Wind Temperatures of Arcturus (K2 III) and Aldeberan (K5 III)

Cycle: 25, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
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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	(3) HD124897 WAVE	STIS/CCD STIS/FUV-MAMA	4	09-May-2019 16:01:02.0	yes
02	(4) HD29139 WAVE	STIS/CCD STIS/FUV-MAMA	3	09-May-2019 16:01:04.0	yes
03	(4) HD29139 WAVE	STIS/CCD STIS/FUV-MAMA	3	09-May-2019 16:01:06.0	yes
51	(3) HD124897 WAVE	STIS/CCD STIS/FUV-MAMA	2	09-May-2019 16:01:07.0	yes

12 Total Orbits Used

ABSTRACT

Unravelling the poorly understood processes that drive mass loss from red giant stars requires that we empirically constrain the intimately coupled momentum and energy balance. Hubble high spectral resolution observations of wind scattered line profiles, from neutral and singly ionized species, have provided measures of wind acceleration, turbulence, terminal speeds, and mass-loss rates. These wind properties inform us about the force-momentum balance, however, the spectra have not yielded measures of the much needed wind temperatures, which constrain the energy balance.

We proposed to remedy this omission with STIS E140H observations of the Si III 1206 Ang. resonance emission line for two of the best studied red giants: Arcturus (alpha Boo: K2 III) and Aldebaran (alpha Tau: K5 III), both of which have detailed semi-empirical wind velocity models. The relative optical depths of wind scattered absorption in Si III 1206 Ang., O I 1303 Ang. triplet., C II 1335 Ang., and existing Mg II h & k and Fe II profiles give the wind temperatures through the thermally controlled ionization balance. The new temperature constraints will be used to test existing semi-empirical models by comparison with multi-frequency JVLA radio fluxes, and also to constrain the flux-tube geometry and wave energy spectrum of magnetic wave-driven winds.

OBSERVING DESCRIPTION

General:

We have been awarded 10 orbits to observe 2 bright K giants at the Si III 1206 Angstrom emission line with the E140H setting. Additional emission line diagnostics lie shortward (C III 1175) and longward (O I 1303, C II 1335, and Si IV 1402) of this region.

Both stars have been observed with HST and IUE in this region, and these spectra are used for the SCIENCE ETC calculations.

Alpha Boo has 4 orbits allocated and alpha Tau, which is slightly fainter in the FUV, has 6 orbits. We schedule a single 4-orbit Visit for alpha Boo (to avoid being too wasteful), and two 3-orbit Visits for alpha Tau to aid scheduling.

We are using 2 E140H settings: i1271 and i1307 to place the Si III 1206 line at different positions on the detector, and to capture as much additional spectra shortward and longward as possible.

We request GO WAVE observations of 50 sec (for both setting) that are deeper than the default exposures. We use the 0.2x0.2 arcsec aperture for SCIENCE and WAVE observations.

Details:

ACQ: we acquire the target using the STIS/CCD with the F25ND5 aperture as these stars are very bright in the optical: alpha Boo $V=-0.05$, alpha Tau=0.86. We use the Pickles K3 III (alpha Boo) and K5 III (alpha Tau) synthetic spectra for the ETC

ACQ/PEAK: For both stars we use the STIS/CCD with the G430M at 3680 Ang. (alpha Boo) and 3960 Ang. (alpha Tau) with the 0.2x0.05ND aperture.

SCIENCE: all science observations use the 0.2x0.2 arcsec aperture. We use 2 settings: i1271 and i1307 splitting the observing time approximately equally between the two.

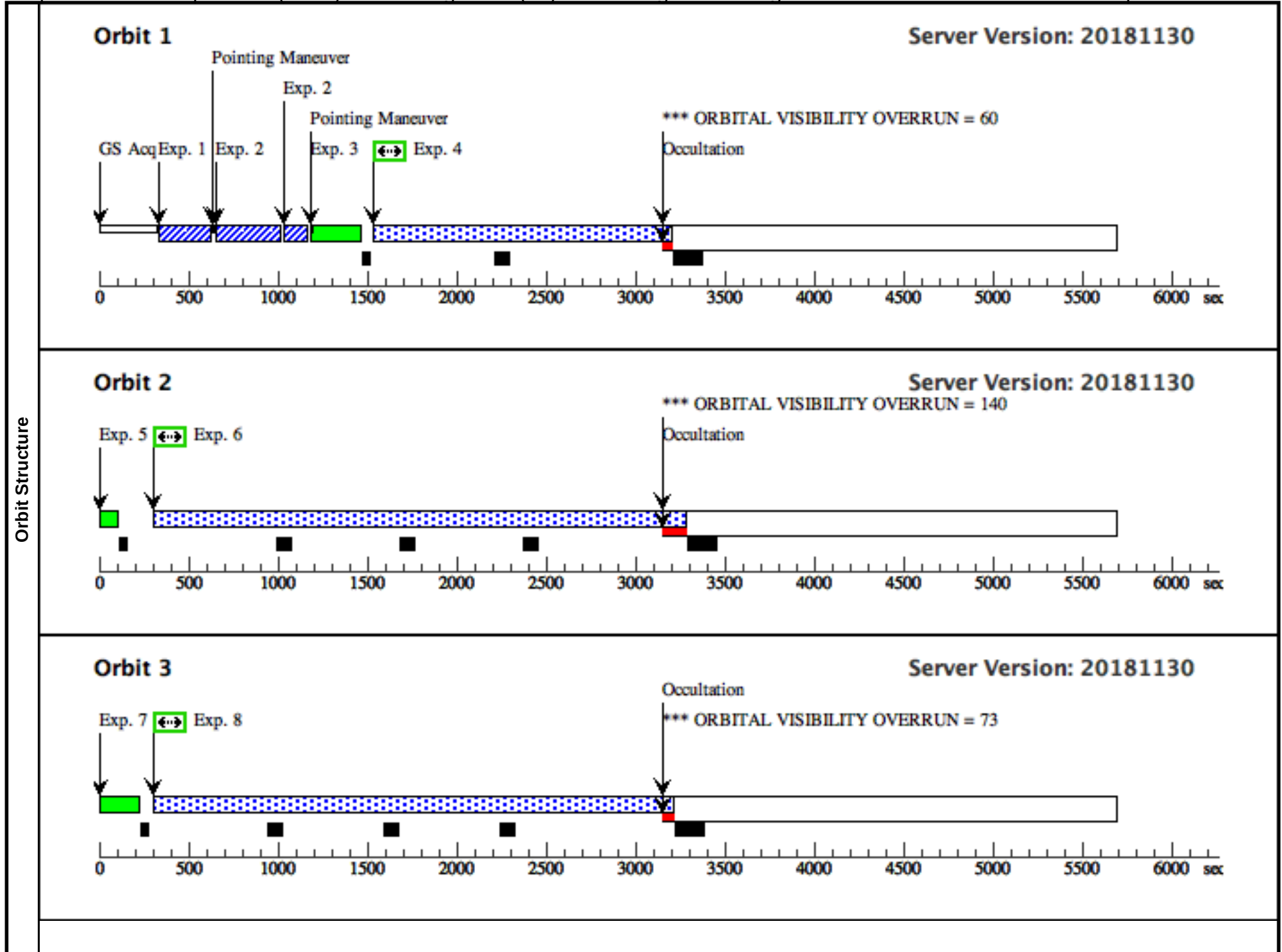
WAVE: we specify 50 sec exposures (with the 0.2x0.2 arcsec aperture). These are deeper than the defaults. Each Visit contains 2 WAVE exposures: one at the beginning of the Visit and one inserted during occultation before a following science observation. This occurs during the GS Reacq.

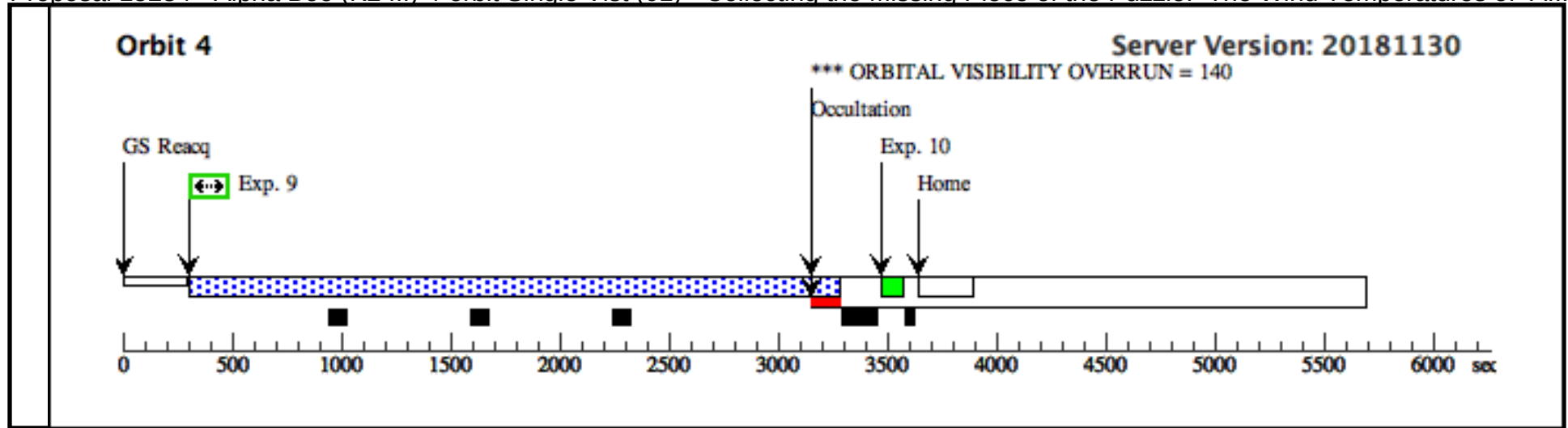
Proposal 15234 - Alpha Boo (K2 III) 4-orbit Single Vist (01) - Collecting the Missing Piece of the Puzzle: The Wind Temperatures of A...

Visit	Proposal 15234, Alpha Boo (K2 III) 4-orbit Single Vist (01), failed Thu May 09 20:01:08 GMT 2019				
	Diagnostic Status: Warning Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: (none)				
Diagnostics	(Alpha Boo (K2 III) 4-orbit Single Vist (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (Alpha Boo (K2 III) 4-orbit Single Vist (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (Alpha Boo (K2 III) 4-orbit Single Vist (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (Alpha Boo (K2 III) 4-orbit Single Vist (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(3)	HD124897 Alt Name1: ALPHA-BOO Alt Name2: ARCTURUS	RA: 14 15 39.6721 (213.9153004d) Dec: +19 10 56.67 (19.18241d) Equinox: J2000	Proper Motion RA: -1093.39 mas/yr Proper Motion Dec: -2000.0 mas/yr Parallax: 0.0888" Epoch of Position: 2000 Radial Velocity: -5.2 km/sec	V=-0.05+/-0.1 Reference Frame: ICRS
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=STAR Description=[K III-I] Extended=NO				

Proposal 15234 - Alpha Boo (K2 III) 4-orbit Single Vist (01) - Collecting the Missing Piece of the Puzzle: The Wind Temperatures of A...

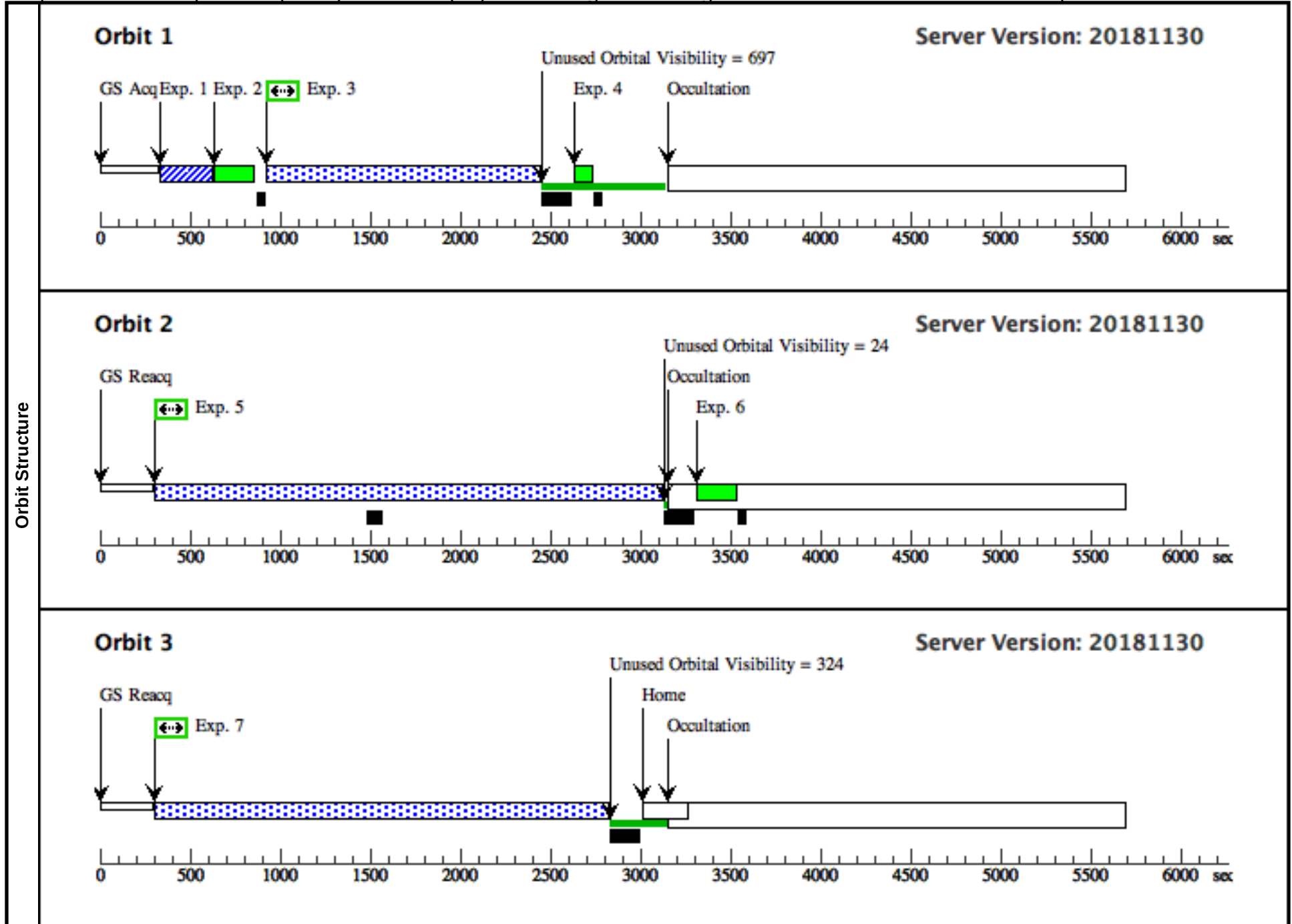
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Target ACQ (STIS.ta.100 9278)	(3) HD124897	STIS/CCD, ACQ, F25ND5	MIRROR				0.1 Secs (0.1 Secs) [==>]	[1]
	Comments: Pickles K3 III Model Global Count Rates Source only 445,758.088 Time to Saturation = 1.57 sec									
	2	ACQ/PEAK (STIS.sp.10 09275)	(3) HD124897	STIS/CCD, ACQ/PEAK, 0.2X0.05ND	G430M 3680 A				0.1 Secs (0.1 Secs) [==>]	[1]
	Comments: Pickles K3 III model Global Count Rates Source only 375,515.122 s-1									
	3	WAVCAL f or H-1271 f or following exposure	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A				50 Secs (50 Secs) [==>]	[1]
	Comments: deeper exposure for optimum wavcal solution									
	4	orbit 1: H-1 271 (STIS.sp.10 09285)	(3) HD124897	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	WAVECAL=NO; BUFFER-TIME=68 9.0			1600.0 Secs (1656 Secs) [==>1656.0 Secs]	[1]
	Comments: Exp approx Using the 4/5 buffer time rule.									
	5	WAVECAL for H-1271 during begin ning occultat ion	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A				50 Secs (50 Secs) [==>]	[2]
	Comments: deeper than default exposure for optimum wavecl									
	6	orbit 2: H-1 271 (STIS.sp.10 09285)	(3) HD124897	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=69 0.0; WAVECAL=NO			2700.0 Secs (2964 Secs) [==>2964.0 Secs]	[2]
	Comments: using the 4/5 Buffer time rule									
	7	WAVECAL for H-1307 during occul tation during GS REACQ	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1307 A				50 Secs (50 Secs) [==>]	[3]
	Comments: deeper than default exposure for optimum wavecl									
	8	orbit 3: H-1 307 (STIS.sp.10 09291)	(3) HD124897	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1307 A	WAVECAL=NO; BUFFER-TIME=64 7.0			2800.0 Secs (2897 Secs) [==>2897.0 Secs]	[3]
	Comments: Using 4/5 buffer-time rule									
	9	orbit 4: H-1 307 (STIS.sp.10 08754)	(3) HD124897	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1307 A	WAVECAL=NO; BUFFER-TIME=64 7.0			2800. Secs (2964 Secs) [==>2964.0 Secs]	[4]
	10	WAVECAL for H-1307	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1307 A				50 Secs (50 Secs) [==>]	[4]
	Comments: Final wavecal during occultation									





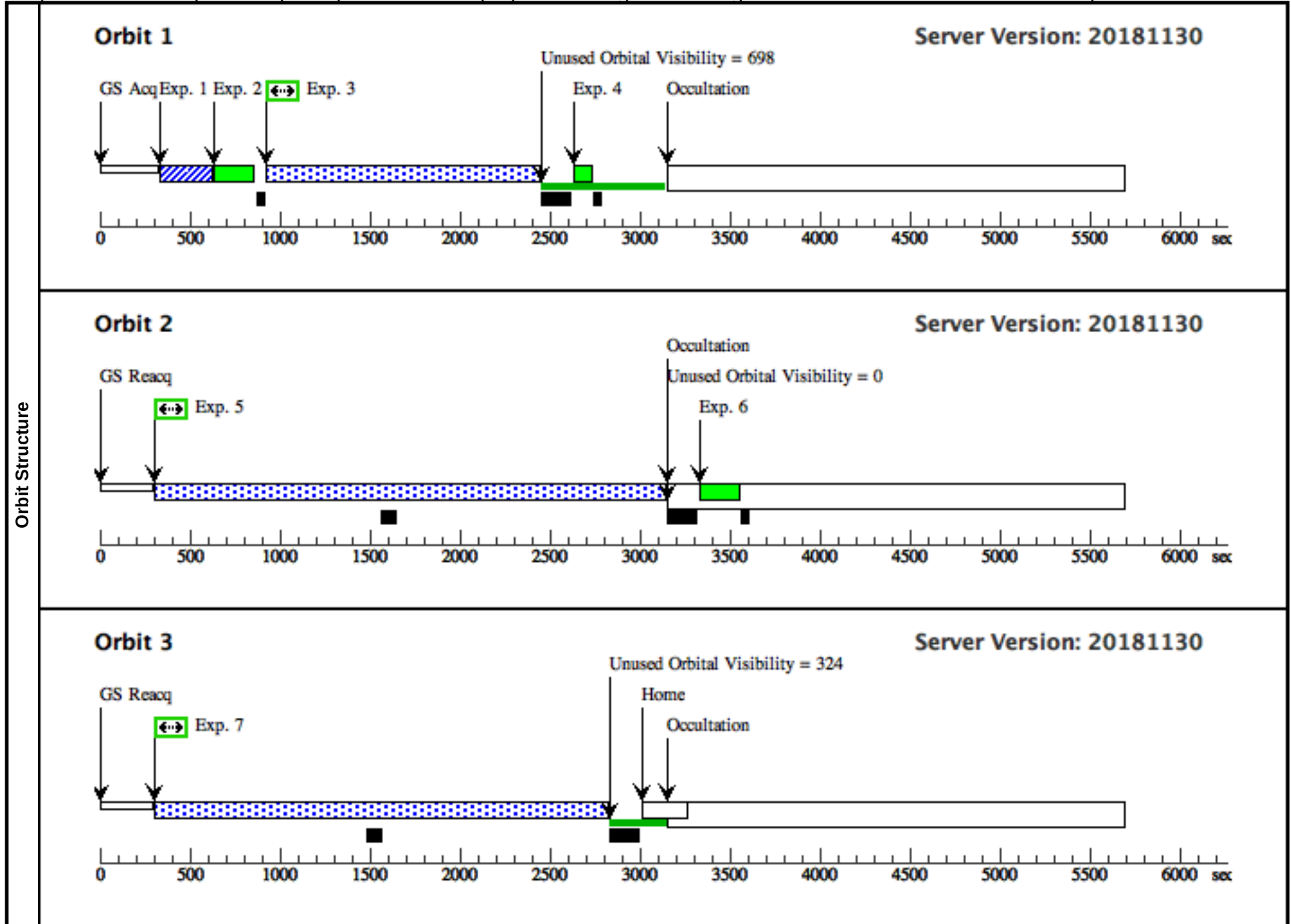
Proposal 15234 - Alpha Tau (K5 III) First Visit (02) - Collecting the Missing Piece of the Puzzle: The Wind Temperatures of Arcturus ...

Visit	Proposal 15234, Alpha Tau (K5 III) First Visit (02), completed								Thu May 09 20:01:08 GMT 2019	
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA									
	Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(4)	HD29139	RA: 04 35 55.2391 (68.9801629d)	Proper Motion RA: 63.45 mas/yr	V=0.86+/-0.1	Reference Frame: ICRS				
		Alt Name1: ALPHA-TAU	Dec: +16 30 33.49 (16.50930d)	Proper Motion Dec: -188.94 mas/yr						
		Alt Name2: ALDEBARAN	Equinox: J2000	Parallax: 0.0489"						
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.										
Category=STAR										
Description=[K III-I]										
Extended=NO										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	TARGET-A (4) HD29139 CQ (STIS.ta.100 9299)		STIS/CCD, ACQ, F25ND5	MIRROR				0.1 Secs (0.1 Secs)	
									[==>]	[1]
	Comments: Pickles K5 III model									
	Global Count Rates									
	Source only 257,844.378									
	2	WAVECAL WAVE for H-1307		STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1307 A				50.0 Secs (50 Secs)	
									[==>]	[1]
	Comments: Deeper than default exposure for optimum wavecal									
	3	orbit 1: H-1 307 (STIS.sp.10 09306)	(4) HD29139	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1307 A	WAVECAL=NO; BUFFER-TIME=11 88.0			1500.0 Secs (1500 Secs)	
									[==>]	[1]
	Comments: 4/5 buffer-time rule used									
	4	WAVECAL WAVE for H-1307		STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1307 A				50.0 Secs (50 Secs)	
									[==>]	[1]
	5	orbit 2: H-1 307 (STIS.sp.10 09308)	(4) HD29139	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1307 A	WAVECAL=NO; BUFFER-TIME=11 88.0			2800.0 Secs (2800 Secs)	
									[==>]	[2]
Comments: Using 4/5 buffer-time rule										
6	WAVECAL WAVE for H-1271		STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A				50.0 Secs (50 Secs)		
								[==>]	[2]	
Comments: Deeper than default exposure for optimum wavecal										
7	orbit 3: H-1 271 (STIS.sp.10 09309)	(4) HD29139	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	WAVECAL=NO; BUFFER-TIME=12 63.0			2500.0 Secs (2500 Secs)		
								[==>]	[3]	
Comments: 4/5 buffer time rule applied										



Proposal 15234 - Alpha Tau (K5 III) Second Visit (03) - Collecting the Missing Piece of the Puzzle: The Wind Temperatures of Arctur...

Visit	Proposal 15234, Alpha Tau (K5 III) Second Visit (03), completed								Thu May 09 20:01:08 GMT 2019	
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA									
	Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(4)	HD29139	RA: 04 35 55.2391 (68.9801629d)	Proper Motion RA: 63.45 mas/yr	V=0.86+/-0.1	Reference Frame: ICRS				
		Alt Name1: ALPHA-TAU	Dec: +16 30 33.49 (16.50930d)	Proper Motion Dec: -188.94 mas/yr						
		Alt Name2: ALDEBARAN	Equinox: J2000	Parallax: 0.0489"						
				Epoch of Position: 2000						
				Radial Velocity: 54.3 km/sec						
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.									
	Category=STAR									
	Description=[K III-I]									
	Extended=NO									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	TARGET-A CQ (STIS.ta.100 9299)	(4) HD29139	STIS/CCD, ACQ, F25ND5	MIRROR				0.1 Secs (0.1 Secs)	
									[==>]	[1]
	2	WAVECAL for H-1271	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A				50.0 Secs (50 Secs)	
									[==>]	[1]
		Comments: Deeper than default exposure for optimum wavecal								
	3	orbit 1: H-1 271 (STIS.sp.10 09309)	(4) HD29139	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	WAVECAL=NO; BUFFER-TIME=12 63.0			1500.0 Secs (1500 Secs)	
									[==>]	[1]
	4	WAVECAL for H-1271	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A				50.0 Secs (50 Secs)	
									[==>]	[1]
		Comments: Deeper than default exposure for optimum wavecal								
	5	orbit 2: H-1 271 (STIS.sp.10 09309)	(4) HD29139	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	WAVECAL=NO; BUFFER-TIME=12 63.0			2824.0 Secs (2824 Secs)	
									[==>]	[2]
	6	WAVECAL for H-1307	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1307 A				50.0 Secs (50 Secs)	
									[==>]	[2]
	Comments: Deeper than default exposure for optimum wavecal									
7	orbit 3: H-1 307 (STIS.sp.10 09308)	(4) HD29139	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1307 A	WAVECAL=NO; BUFFER-TIME=11 88.0			2500.0 Secs (2500 Secs)		
								[==>]	[3]	



Proposal 15234 - Alpha Boo (K2 III) 4-orbit Single Vist (51) - Collecting the Missing Piece of the Puzzle: The Wind Temperatures of A...

Visit	Proposal 15234, Alpha Boo (K2 III) 4-orbit Single Vist (51), implementation								Thu May 09 20:01:08 GMT 2019		
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA										
	Special Requirements: (none)										
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(3)	HD124897	RA: 14 15 39.6721 (213.9153004d)	Proper Motion RA: -1093.39 mas/yr		V=-0.05+/-0.1		Reference Frame: ICRS			
		Alt Name1: ALPHA-BOO	Dec: +19 10 56.67 (19.18241d)	Proper Motion Dec: -2000.0 mas/yr							
		Alt Name2: ARCTURUS	Equinox: J2000	Parallax: 0.0888"							
Epoch of Position: 2000											
Radial Velocity: -5.2 km/sec											
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
Category=STAR											
Description=[K III-I]											
Extended=NO											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	Target ACQ (3) HD124897 (STIS.ta.100 9278)		STIS/CCD, ACQ, F25ND5	MIRROR				0.1 Secs (0.1 Secs)		
									[==>]		[1]
	Comments: Pickles K3 III Model										
	Global Count Rates										
	Source only 445,758.088										
	Time to Saturation = 1.57 sec										
	2	WAVECAL WAVE for H-1307 during occultation during GS REACQ		STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1307 A				50 Secs (50 Secs)		
									[==>]		[1]
	Comments: deeper than default exposure for optimum wavecl										
	3	orbit 3: H-1 307 (STIS.sp.10 09291)	(3) HD124897	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1307 A	WAVECAL=NO; BUFFER-TIME=64 7.0			2800.0 Secs (2137 Secs)		
									[==>2137.0 Secs]		[1]
	Comments: Using 4/5 buffer-time rule										
	4	Second AC Q	(3) HD124897	STIS/CCD, ACQ, F25ND5	MIRROR				0.1 Secs (0.1 Secs)		
								[==>]		[2]	
5	orbit 4: H-1 307 (STIS.sp.10 08754)	(3) HD124897	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1307 A	WAVECAL=NO; BUFFER-TIME=64 7.0			2800. Secs (2277 Secs)			
								[==>2277.0 Secs]		[2]	
6	WAVECAL WAVE for H-1307		STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1307 A				50 Secs (50 Secs)			
								[==>]		[2]	
Comments: Final wavecal during occultation											

