



18040 - First UV Observations of the Negative Extremum of xi1 CMa's Complex Magnetic Field

Cycle: 33, Proposal Category: GO

(UV Initiative)

(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) -KSI01-CMA	STIS/CCD STIS/FUV-MAMA	1	15-Aug-2025 11:00:54.0	yes
02	(1) -KSI01-CMA	STIS/CCD STIS/FUV-MAMA	1	15-Aug-2025 11:00:55.0	yes
03	(1) -KSI01-CMA	STIS/CCD STIS/FUV-MAMA	1	15-Aug-2025 11:00:55.0	yes
04	(1) -KSI01-CMA	STIS/CCD STIS/FUV-MAMA	1	15-Aug-2025 11:00:56.0	yes

4 Total Orbits Used

ABSTRACT

The magnetic pulsating star xi1 CMa has the longest rotation period of any known magnetic B-type star (about 30 yr). It is also the only magnetic hot star for which pulsationally-induced modulations have been observed in both its X-ray light curve and its H α emission. Archival spectra from IUE and HST, obtained at different rotation phases, suggest xi1 CMa's UV resonance lines are also modulated on the pulsation period, a phenomenon that has not previously been observed for any magnetic hot star. A decade-long spectropolarimetric monitoring effort has now revealed xi1 CMa's complex magnetic topology; as a result, its asymmetric magnetosphere is expected to produce unique UV line profiles at the positive and negative extrema of the longitudinal field curve. xi1 CMa is currently passing through the negative magnetic extremum, a key phase in its rotation cycle that has never before been observed at UV wavelengths.

We propose 4 new HST/STIS observations during Cycle 33 to obtain the first high-resolution UV spectra of xi1 CMa near its negative magnetic extremum and to measure the pulsation-induced modulation in its UV wind lines. This novel dataset will be paired with ancillary ground-based optical spectropolarimetry and X-ray spectroscopy obtained near xi1 CMa's negative magnetic extremum. Ultraviolet spectroscopy is the only way to complete a characterization of the velocity and density structure of xi1 CMa's complex magnetosphere, and HST is the only instrument with which these observations can be obtained. UV spectra are critically needed now, since an observation at this rotation phase will not be available again for at least a generation.

OBSERVING DESCRIPTION

Our goal is to observe xi1 CMa near its negative magnetic extremum while sampling the ~ 5 hr pulsation period. The visibility period for each orbit covers about 16% of the pulsation period, so that 4 consecutive orbits cover a full pulsation cycle with minimal gaps. These four orbits must be obtained consecutively to facilitate monitoring of the pulsation cycle. The observations are achievable at any time during Cycle 33, but must be completed before the scheduled end of Cycle 33 (2026 Oct 31) in order to remain near the star's projected negative magnetic extremum. Scheduling early in Cycle 33 is preferred if possible.

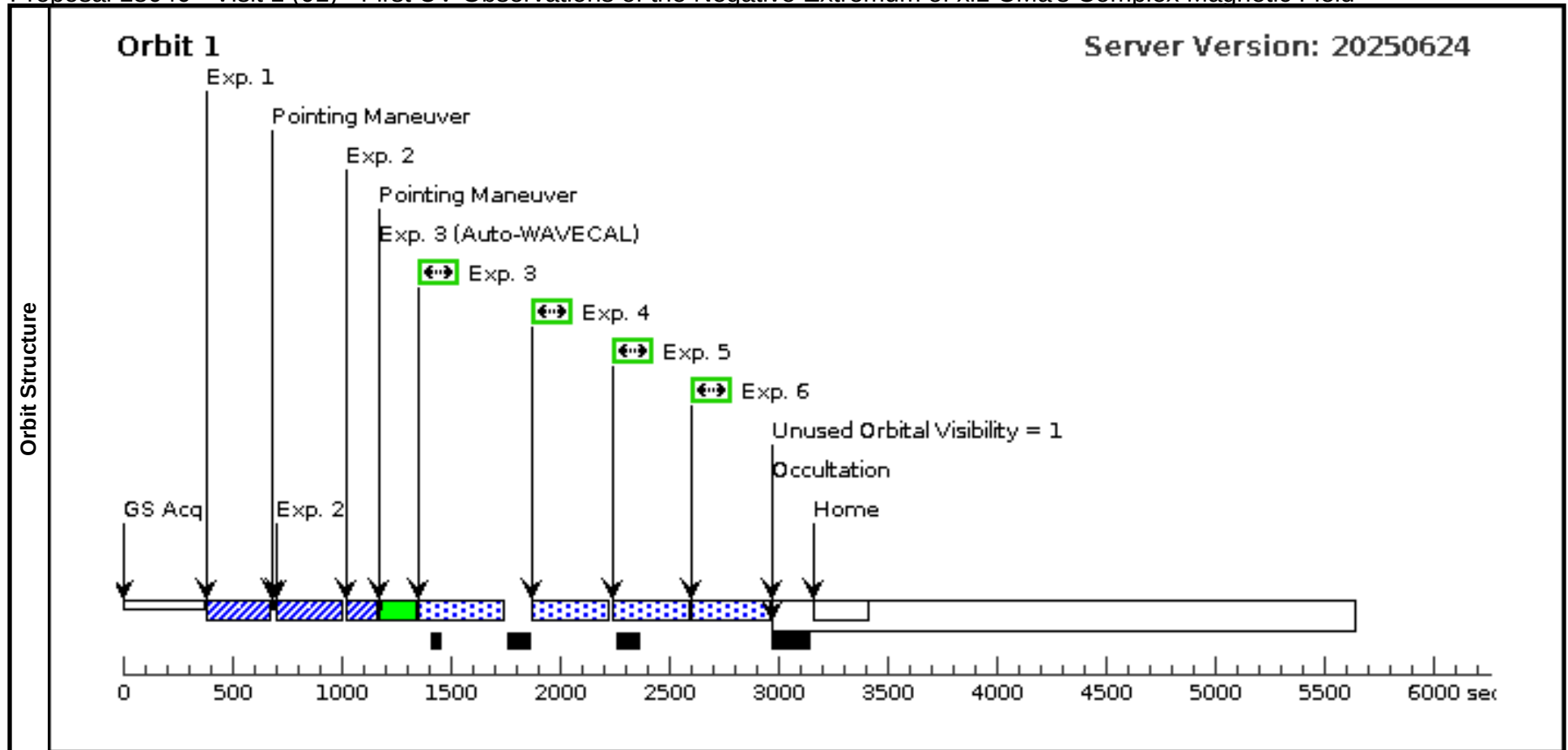
The target was observed previously at a different rotation phase = position of the stellar magnetosphere with HST/STIS/E140M during Cycle 24 GO Program 14567 (PI Oskinova). We have adopted a similar observing strategy, but have updated the ACQ strategy and exposure times to reflect the science goals of this work. Due to the brightness of the target, we will use the F25ND5 neutral density filter for the target acquisition and the narrow 0.3X0.05ND aperture (which requires a peak-up) for the scientific exposures. We plan to use the E140M grating for the science exposures. 4 FUV-

Proposal 18040 (STScI Edit Number: 0, Created: Friday, August 15, 2025, 10:00:57AM Eastern Standard Time) - Overview

MAMA integrations of 340 s duration in ACCUM mode through the 0.3X0.05ND aperture will enable us to sample the stellar pulsation period and wind structure at sufficient S/N ~ 10 .

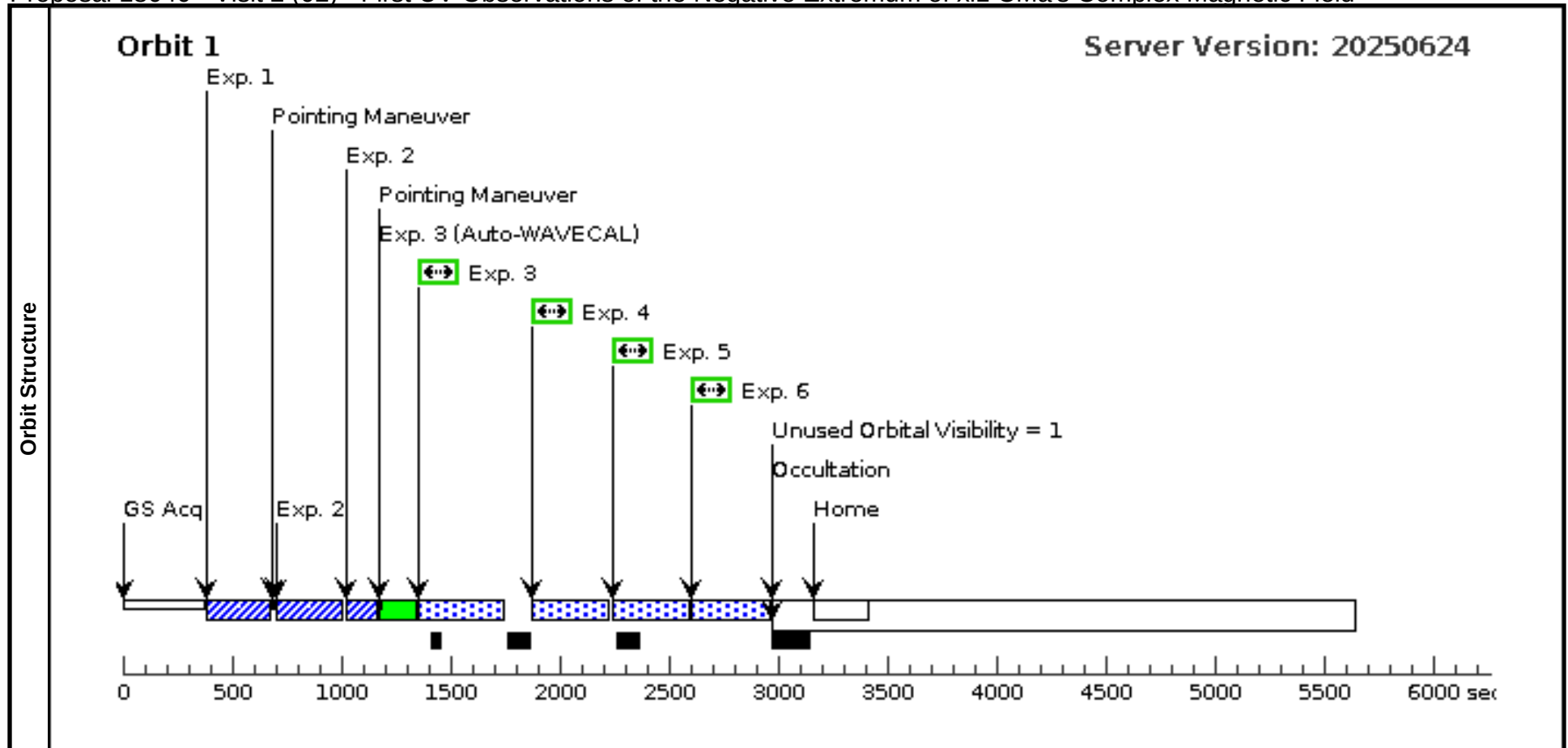
Proposal 18040 - Visit 1 (01) - First UV Observations of the Negative Extremum of xi1 CMa's Complex Magnetic Field

Visit	Proposal 18040, Visit 1 (01)										Fri Aug 15 15:00:57 GMT 2025	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA											
	Special Requirements: BEFORE 31-OCT-2026:00:00:00; SEQ 01,02,03,04 WITHIN 7 H											
	Comments: Scheduling early in Cycle 33 is preferred, if possible, to maintain the best proximity to the star's negative magnetic extremum.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Fluxes		Miscellaneous	
	(1)	-KSI01-CMA	RA: 06 31 51.3663 (97.9640263d)			Proper Motion RA: -3.352 mas/yr			V=4.33		Reference Frame: ICRS	
			Dec: -23 25 6.32 (-23.41842d)			Proper Motion Dec: 6.157 mas/yr						
			Equinox: J2000			Parallax: .0021660"						
						Epoch of Position: 2000						
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
	Category=STAR											
	Description=[B0-B2 V-IV, CIRCUMSTELLAR MATTER, PULSATING VARIABLE]											
	Extended=NO											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	(STIS.ta.202 6061)	(1) -KSI01-CMA	STIS/CCD, ACQ, F25ND5		MIRROR				1.4 Secs (1.4 Secs)		
										[==>]		[1]
	2	(STIS.ta.202 6062)	(1) -KSI01-CMA	STIS/CCD, ACQ/PEAK, 0.3X0.05ND		MIRROR				0.1 Secs (0.1 Secs)		
										[==>]		[1]
	3	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND		E140M				340 Secs (343 Secs)		
						1425 A				[==>343.0 Secs]		[1]
	4	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND		E140M				340 Secs (343 Secs)		
						1425 A				[==>343.0 Secs]		[1]
	5	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND		E140M				340 Secs (343 Secs)		
						1425 A				[==>343.0 Secs]		[1]
	6	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND		E140M				340 Secs (343 Secs)		
						1425 A				[==>343.0 Secs]		[1]



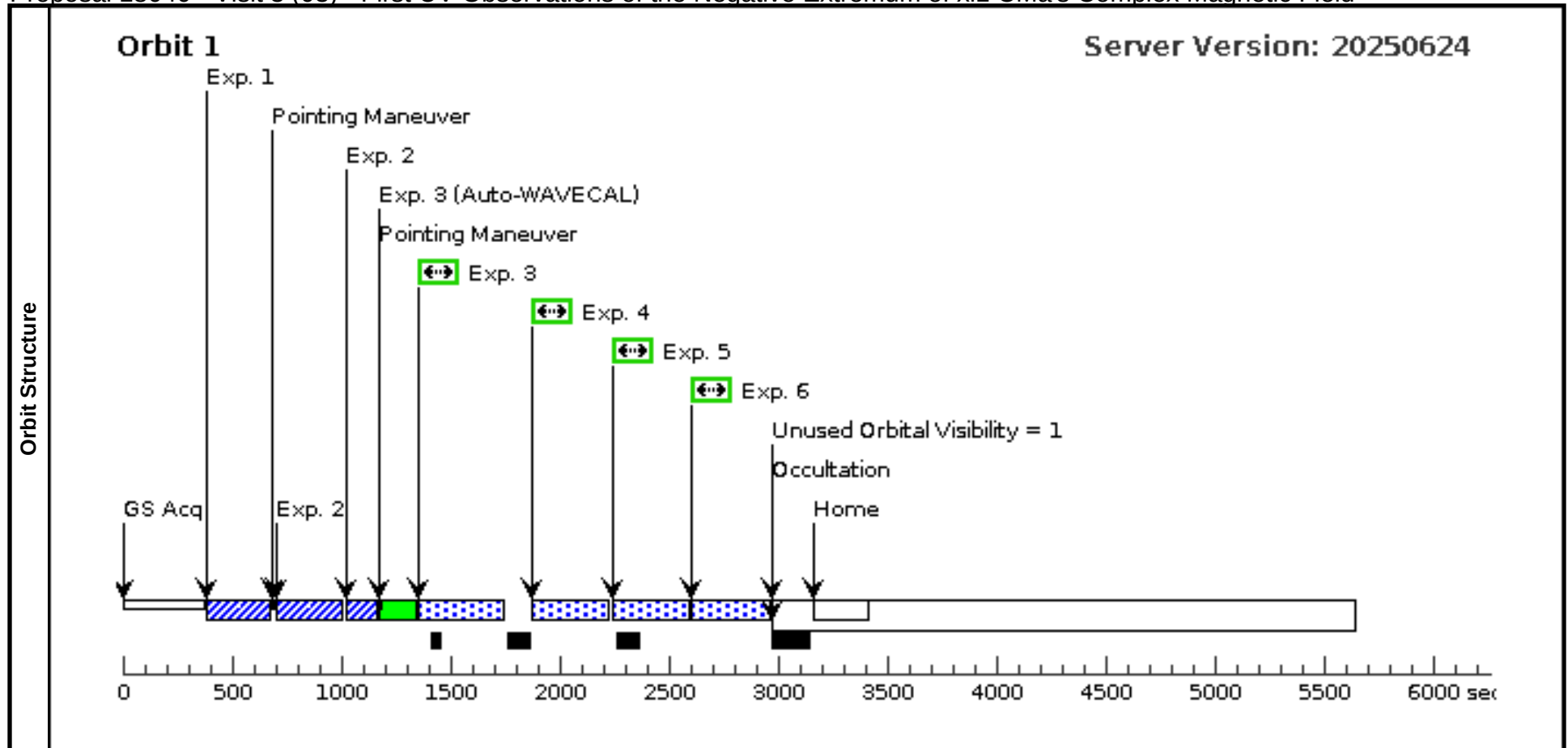
Proposal 18040 - Visit 2 (02) - First UV Observations of the Negative Extremum of xi1 CMa's Complex Magnetic Field

Visit	Proposal 18040, Visit 2 (02)									Fri Aug 15 15:00:57 GMT 2025
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA									
	Special Requirements: AFTER 01 BY 0.9 Orbits TO 1.1 Orbits									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	-KSI01-CMA	RA: 06 31 51.3663 (97.9640263d) Dec: -23 25 6.32 (-23.41842d) Equinox: J2000	Proper Motion RA: -3.352 mas/yr Proper Motion Dec: 6.157 mas/yr Parallax: .0021660" Epoch of Position: 2000	V=4.33	Reference Frame: ICRS				
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.									
	Category=STAR									
	Description=[B0-B2 V-IV, CIRCUMSTELLAR MATTER, PULSATING VARIABLE] Extended=NO									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.ta.202 6061)	(1) -KSI01-CMA	STIS/CCD, ACQ, F25ND5	MIRROR				1.4 Secs (1.4 Secs)	
									[==>]	[1]
	2	(STIS.ta.202 6062)	(1) -KSI01-CMA	STIS/CCD, ACQ/PEAK, 0.3X0.05ND	MIRROR				0.1 Secs (0.1 Secs)	
									[==>]	[1]
	3	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
					1425 A				[==>343.0 Secs]	[1]
	4	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
					1425 A				[==>343.0 Secs]	[1]
	5	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
				1425 A				[==>343.0 Secs]	[1]	
6	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)		
				1425 A				[==>343.0 Secs]	[1]	



Proposal 18040 - Visit 3 (03) - First UV Observations of the Negative Extremum of xi1 CMa's Complex Magnetic Field

Visit	Proposal 18040, Visit 3 (03)									Fri Aug 15 15:00:57 GMT 2025
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA									
	Special Requirements: AFTER 02 BY 0.9 Orbits TO 1.1 Orbits									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	-KSI01-CMA	RA: 06 31 51.3663 (97.9640263d) Dec: -23 25 6.32 (-23.41842d) Equinox: J2000	Proper Motion RA: -3.352 mas/yr Proper Motion Dec: 6.157 mas/yr Parallax: .0021660" Epoch of Position: 2000	V=4.33	Reference Frame: ICRS				
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.									
	Category=STAR									
	Description=[B0-B2 V-IV, CIRCUMSTELLAR MATTER, PULSATING VARIABLE] Extended=NO									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.ta.202 6061)	(1) -KSI01-CMA	STIS/CCD, ACQ, F25ND5	MIRROR				1.4 Secs (1.4 Secs)	
									[==>]	[1]
	2	(STIS.ta.202 6062)	(1) -KSI01-CMA	STIS/CCD, ACQ/PEAK, 0.3X0.05ND	MIRROR				0.1 Secs (0.1 Secs)	
									[==>]	[1]
	3	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
					1425 A				[==>343.0 Secs]	[1]
	4	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
					1425 A				[==>343.0 Secs]	[1]
	5	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
				1425 A				[==>343.0 Secs]	[1]	
6	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)		
				1425 A				[==>343.0 Secs]	[1]	



Proposal 18040 - Visit 4 (04) - First UV Observations of the Negative Extremum of xi1 CMa's Complex Magnetic Field

Visit	Proposal 18040, Visit 4 (04)									Fri Aug 15 15:00:57 GMT 2025
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA									
	Special Requirements: AFTER 03 BY 0.9 Orbits TO 1.1 Orbits									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	-KSI01-CMA	RA: 06 31 51.3663 (97.9640263d)	Proper Motion RA: -3.352 mas/yr		V=4.33		Reference Frame: ICRS		
			Dec: -23 25 6.32 (-23.41842d)	Proper Motion Dec: 6.157 mas/yr						
			Equinox: J2000	Parallax: .0021660"						
				Epoch of Position: 2000						
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.									
	Category=STAR									
	Description=[B0-B2 V-IV, CIRCUMSTELLAR MATTER, PULSATING VARIABLE]									
	Extended=NO									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.ta.202 6061)	(1) -KSI01-CMA	STIS/CCD, ACQ, F25ND5	MIRROR				1.4 Secs (1.4 Secs)	
									[==>]	[1]
	2	(STIS.ta.202 6062)	(1) -KSI01-CMA	STIS/CCD, ACQ/PEAK, 0.3X0.05ND	MIRROR				0.1 Secs (0.1 Secs)	
									[==>]	[1]
	3	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
					1425 A				[==>343.0 Secs]	[1]
	4	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
					1425 A				[==>343.0 Secs]	[1]
	5	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
					1425 A				[==>343.0 Secs]	[1]
	6	(STIS.sp.20 26064)	(1) -KSI01-CMA	STIS/FUV-MAMA, ACCUM, 0.3X0.05ND	E140M				340 Secs (343 Secs)	
					1425 A				[==>343.0 Secs]	[1]

