18184 - A comprehensive diagnostic of tau Ceti's active outer layers

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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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) -TAU-CET	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	2	15-Sep-2025 16:00:14.0	yes

2 Total Orbits Used

ABSTRACT

tau Ceti is the closest single Sun-like star to Earth and, despite being expected to have a similar age as the Sun or alpha Centauri trio, is often described as being significantly less active. We propose a focused observational campaign targeting this inactive star's coronal, EUV, and chromospheric emissions, the first of which shows dramatic variability. This will yield unprecedented insight into the connection between active layers from the lower chromosphere, through the transition region, and into the corona and help elucidate why such different flux levels are seen between the ROSAT and Chandra/XMM-Newton epochs. This exhaustive observational effort will also have legacy value for future Habitable Worlds Observatory characterization of the tau Ceti planetary system.

OBSERVING DESCRIPTION

This observation sequence will obtain NUV and FUV spectra for tau Ceti. The experimental design borrows from past successful observations of this star in the same setups. NUV will use the E230H grating centered on the MgII h+k lines (emission from these transitions is the primary NUV objective). FUV will use the E140M grating and cover the full FUV range of STIS; the stellar continuum will not be detected in the FUV but several strong chromospheric emission lines will be present and are the primary objective.

Acquisition will initially use the narrowband OIII filter and then will peakup in a smaller aperture (0.3x0.05ND) than the science aperture (0.2x0.2). This should provide the best possible wavelength solution and ensure robust absolute flux calibration. We have carefully checked that tau Ceti will not saturate in either the NUV or FUV for the chosen aperture and exposure times and will provide signal-to-noise>~100 (without saturating) for acqusition sequences. NUV will use ACCUM mode as the target star is too bright for TIME-TAG. We will use TIME-TAG for the FUV where we do not expect to detect stellar continuum; only emission lines will be detected and we have confirmed that the brightest emission line (Lyman-alpha) will not overwhelm the buffer for the chosen dump time.

Visit

Proposal 18184, STISacq (01), implementation Mon Sep 15 20:00:15 GMT 2025

Diagnostic Status: No Diagnostics

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

Special Requirements: (none)

Comments: Acqusition

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	-TAU-CET Alt Name1: HD10700	RA: 01 44 2.1732 (26.0090550d) Dec: -15 56 1.25 (-15.93368d) Equinox: J2000	Proper Motion RA: -1721.728 mas/yr Proper Motion Dec: 854.963 mas/yr Parallax: 0.27380970000000004" Epoch of Position: 2016	V=3.5	Reference Frame: ICRS

Comments:
Category=STAR
Description=[G V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	tauCeti-STI Sacq (STIS.ta.2044850)	(1) -TAU-CET	STIS/CCD, ACQ, F28X50OIII	MIRROR	ACQTYPE=POINT			0.1 Secs (0.1 Secs) *[==>]*	***[1]***
2	tauCeti-STI Spkup (STIS.ta.2044851)	(1) -TAU-CET	STIS/CCD, ACQ/PEAK, 0.3X0.05ND	MIRROR				0.1 Secs (0.1 Secs) *[==>]*	***[1]***
3	tauCeti-STI SNUV (STIS.sp.2044853)	(1) -TAU-CET	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230H 2713 A				323 Secs (323 Secs) *[==>]*	***[1]***
4	tauCeti-STI SFUV (STIS.sp.2054972)	(1) -TAU-CET	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=900			842 Secs (842 Secs) *[==>]*	***[1]***
5	tauCeti-STI SFUV (STIS.sp.2054972)	(1) -TAU-CET	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=900			2566 Secs (2566 Secs) *[==>]*	***[2]***

Orbit Structure