



18113 - UV Exo-Aurorae: Multi-Wavelength Observations of a Radio Emitting T-dwarf to confirm Auroral Activity in the Ultraviolet.

Cycle: 33, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Mr. Cian O'Toole (PI) (ESA Member) (Contact)	Trinity College Dublin
Dr. Johanna Vos (CoI) (ESA Member)	Trinity College Dublin
Dr. Evert Nasedkin (CoI) (ESA Member)	Trinity College Dublin
Dr. Melodie Kao (CoI) (AdminUSPI)	Lowell Observatory
Anna D. Zuckerman (CoI)	University of Colorado at Boulder
Dr. Michael P. Fitzgerald (CoI)	University of California - Los Angeles
Mr. Aidan Gibbs (CoI)	University of California - Los Angeles
Dr. John Sebastian Pineda (CoI)	University of Colorado at Boulder
Dr. Yifan Zhou (CoI)	The University of Virginia
Dr. Robert Kavanagh (CoI) (ESA Member)	Stichting Astronomisch Onderzoek in Nederland (ASTRON)
Dr. Allison McCarthy (CoI)	Boston University

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) 2MASSW-J1047539+212423	STIS/CCD STIS/FUV-MAMA	3	09-Feb-2026 16:00:26.0	yes
02	(1) 2MASSW-J1047539+212423	STIS/CCD STIS/FUV-MAMA	3	09-Feb-2026 16:00:27.0	yes

6 Total Orbits Used

ABSTRACT

We propose simultaneous UV and radio observations with HST/STIS and the VLA of 2M1047+21, a cool, radio-emitting brown dwarf, to measure the first UV auroral emission from an extrasolar world. Over the last two decades, brown dwarfs have been discovered to emit powerful radio signatures indicative of aurorae. However, a conclusive detection of auroral UV emission on a brown dwarf has remained elusive. This program will constrain electron precipitation energies, resolve the magnetosphere structure and verify if auroral processes in brown dwarfs follow similar scaling relations to planetary aurorae. Detecting auroral emission in the UV would bridge the gap between the stellar and planetary regimes and complete picture of extrasolar auroral emission.

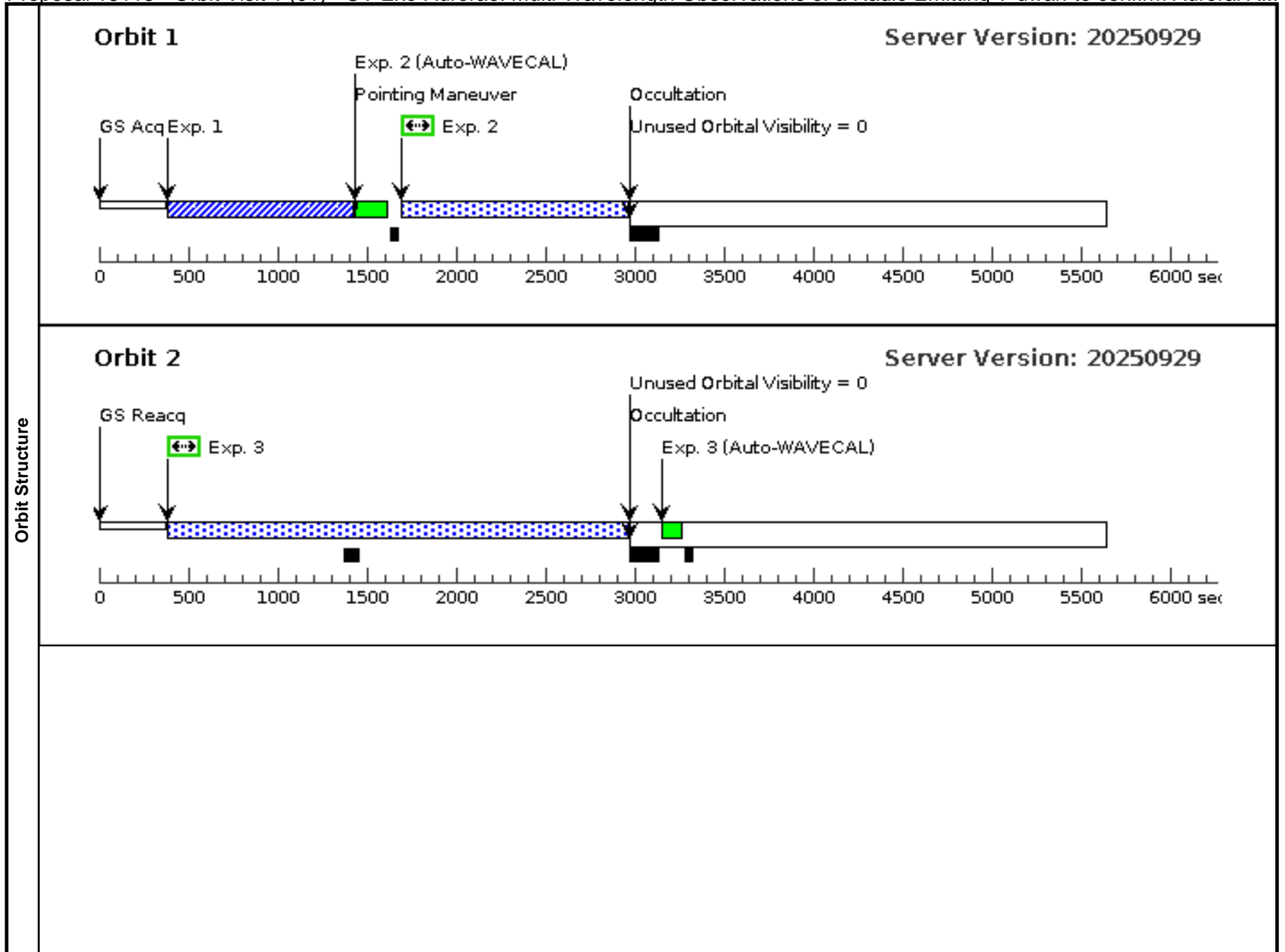
OBSERVING DESCRIPTION

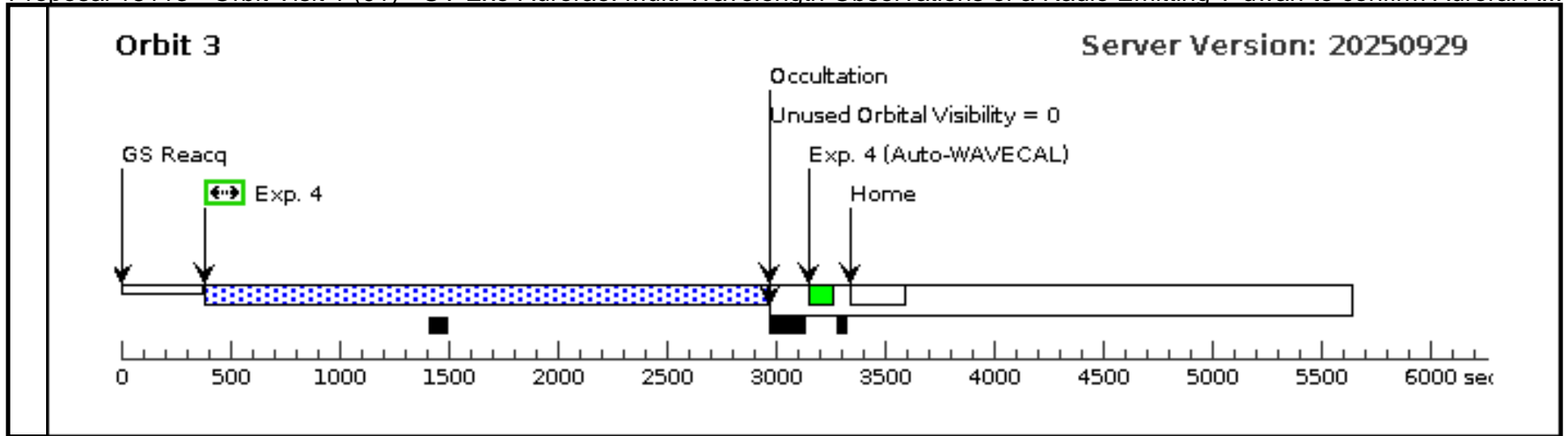
We will observe the first ultraviolet aurora outside the solar system by stacking observations of 6 consecutive orbits with HST STIS G140L. While previous attempts to observe UV exo-aurorae have been tentative so far, this will provide the longest observations yet of a brown dwarf in the UV. We aim to obtain a $S/N > 5$ by stacking these observations over the 6 orbits between 1400-1600 Angstroms. This along with simultaneous VLA observations will allow us to confirm that the UV detection is auroral in nature.

Proposal 18113 - Orbit Visit 1 (01) - UV Exo-Aurorae: Multi-Wavelength Observations of a Radio Emitting T-dwarf to confirm Auroral A...

Mon Feb 09 21:00:27 GMT 2026

Visit		Proposal 18113, Orbit Visit 1 (01), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: (none)										
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes	Miscellaneous					
	(1)	2MASSW-J1047539+212423	RA: 10 47 51.7874 (161.9657808d) Dec: +21 24 14.92 (21.40414d) Equinox: J2000	Proper Motion RA: -1684.390396 mas/yr Proper Motion Dec: -495.854149 mas/yr Parallax: 0.09473" Epoch of Position: 2015.405	V=25 Spectral Type: T6.5; 2MASS J : 15.819 [0.059], 2MASS H: 15.797 [0.120], 2MASS K: 16.20 [0.03] (Flux values in order of: filter-name: flux-value [error]; reference: SIMBAD)	Reference Frame: ICRS						
Comments: Category=STAR Description=[BROWN DWARF] Extended=NO												
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1	Acquisition (STIS.ta.2024755)	(1) 2MASSW-J1047539+212423	STIS/CCD, ACQ, 50CCD	MIRROR				200 Secs (200 Secs)			
	Comments: I used the T2 Phoenix 1200K model for the target acquisition. This is approx 300K hotter than this object, however, I normalised it to realistic T6.5 dwarf values. An exposure time of 200 seconds should be ok, and is greater than the exposure time for the previous UV auroral observation of 2M1237 by HST PID 15870 (150 seconds). This should be ok.											
	2	FUV Exposure (STIS.sp.2021550)	(1) 2MASSW-J1047539+212423	STIS/FUV-MAMA, TIME-TAG, 52X0.5D1	G140L 1425 A		BUFFER-TIME=1000			1215 Secs (1215 Secs)		
	3	FUV Exposure 2 (STIS.sp.2021550)	(1) 2MASSW-J1047539+212423	STIS/FUV-MAMA, TIME-TAG, 52X0.5D1	G140L 1425 A		BUFFER-TIME=1000			2571 Secs (2571 Secs)		[2]
4	FUV Exposure 3 (STIS.sp.2021550)	(1) 2MASSW-J1047539+212423	STIS/FUV-MAMA, TIME-TAG, 52X0.5D1	G140L 1425 A		BUFFER-TIME=1000			2529 Secs (2529 Secs)		[3]	





Proposal 18113 - Visit 2 (02) - UV Exo-Aurorae: Multi-Wavelength Observations of a Radio Emitting T-dwarf to confirm Auroral Activity...

Mon Feb 09 21:00:28 GMT 2026

Visit		Proposal 18113, Visit 2 (02), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: AFTER 01 BY 17 Orbits TO 19 Orbits									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes	Miscellaneous				
	(1)	2MASSW-J1047539+212423	RA: 10 47 51.7874 (161.9657808d) Dec: +21 24 14.92 (21.40414d) Equinox: J2000	Proper Motion RA: -1684.390396 mas/yr Proper Motion Dec: -495.854149 mas/yr Parallax: 0.09473" Epoch of Position: 2015.405	V=25 Spectral Type: T6.5; 2MASS J : 15.819 [0.059], 2MASS H: 15.797 [0.120], 2MASS K: 16.20 [0.03] (Flux values in order of: filter-name: flux-value [error]; reference: SIMBAD)	Reference Frame: ICRS					
<i>Comments:</i> Category=STAR Description=[BROWN DWARF] Extended=NO											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	Acquisition (STIS.ta.2024755)	(1) 2MASSW-J1047539+212423	STIS/CCD, ACQ, 50CCD	MIRROR				200 Secs (200 Secs)		
	<i>Comments: I used the T2 Phoenix 1200K model for the target acquisition. This is approx 300K hotter than this object, however, I normalised it to realistic T6.5 dwarf values. An exposure time of 200 seconds should be ok, and is greater than the exposure time for the previous UV auroral observation of 2M1237 by HST PID 15870 (150 seconds). This should be ok.</i>										
	2	FUV Exposure (STIS.sp.2021550)	(1) 2MASSW-J1047539+212423	STIS/FUV-MAMA, TIME-TAG, 52X0.5D1	G140L 1425 A	BUFFER-TIME=10 00			1215 Secs (1215 Secs)		
	3	FUV Exposure 2 (STIS.sp.2021550)	(1) 2MASSW-J1047539+212423	STIS/FUV-MAMA, TIME-TAG, 52X0.5D1	G140L 1425 A	BUFFER-TIME=10 00			2571 Secs (2571 Secs)		[2]
4	FUV Exposure 3 (STIS.sp.2021550)	(1) 2MASSW-J1047539+212423	STIS/FUV-MAMA, TIME-TAG, 52X0.5D1	G140L 1425 A	BUFFER-TIME=80 00			2529 Secs (2529 Secs)		[3]	

