11817 - Detecting the upper atmosphere of a transiting hot Neptune: A feasibility study

Cycle: 17, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

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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) GJ-436	STIS/CCD STIS/FUV-MAMA	1	23-Nov-2009 21:23:18.0	yes

1 Total Orbits Used

ABSTRACT

Atmospheric escape is a phenomenon that shapes planetary atmospheres, from telluric planets in the Solar System to extrasolar 'hot Jupiters'. It dramatically enhances the detectability of a heavily irradiated hydrogen atmosphere, providing the planet is transiting its star and the transits are observed in the ultraviolet, at Lyman alpha. The 'hot Neptune' transiting the M dwarf GJ436 is the best analog we have to a transiting super-Earth. Internal structure and atmospheric models predict that it bears an extended hydrogen/helium atmosphere subject to evaporation. It is detectable with the Space Telescope Imaging Spectrograph, providing the background Lyman-alpha source -- the star -- is bright enough or, alternatively, the emission line profile spans over a large velocity range. To date, no spectra of GJ436 exist at this wavelength. Using 1 orbit of Director's Discretionary Time, we aim at properly estimating the stellar Lyman-alpha flux and line profile. This DDT will serve as a basis for a Cycle-18 program aimed at detecting the atmosphere of hot-Neptune GJ436b and constraining both internal structure and atmospheric models.

OBSERVING DESCRIPTION

We will observe the exoplanet host-star GJ 436 (a M dwarf) during 1 visit of 1 HST orbit in order to quantify its Lyman alpha flux with the STIS/FUV-MAMA. We will use the thinnest first-order slit 52x0.05 and the G140M grating. The first two exposures (exp#01.001 and exp#01.002) are acquisition (ACQ and ACQ/PEAK). The target is to be acquired during the ACQ/PEAK exposure using the 52x0.05 first-order slit. The science exposure (exp#01.003) will then be performed after an auto-WAVECAL and will last for the remaining orbit time available.

ADDITIONAL COMMENTS

The goal of this DD observation is to prepare a Cycle-18 program. Therefore, it has to be performed before Cycle-18 proposal submission deadline. This date is not known yet and so far we have based ourselves on the deadline for the Cycle 17 (beginning of March). The January window seems

mostly appropriated for this purpose.

Visit

Proposal 11817, Visit 01, pi Tue Nov 24 02:23:22 GMT 2009

Diagnostic Status: No Diagnostics

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

Special Requirements: (none)

Comments: This visit consists in 1 HST orbit.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GJ-436	RA: 11 42 11.0941 (175.5462254d) Dec: +26 42 23.65 (26.70657d) Equinox: J2000	Proper Motion RA: 0.059756s/yr Proper Motion Dec: -0.81370"/yr Parallax: 0.09773" Epoch of Position: 2000 Radial Velocity: 10 km/sec	V=10.68	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Acquisition	(1) GJ-436	STIS/CCD, ACQ, F28X50OII	MIRROR	ACQTYPE=POINT			13 Secs *[==>]*	 ***[1]***
Comments: Exposure time of 13s needed to reach S/N=40 with the F28X50OII aperture.									
2	Acquisition/ Peak	(1) GJ-436	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A				7 Secs *[==>]*	 ***[1]***
Comments: Exposure time of 7s (well below saturation) needed to reach S/N=40 with G430L grism and first-order slit 52x0.05 (total counts = 7e5 with gain=4 and cr-split=0).									
3	Science	(1) GJ-436	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=90 0			1762 Secs *[==>]*	 ***[1]***

Orbit Structure