13700 - Confirming the most water-rich extrasolar rocky body

Cycle: 22, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) WD-1041+092	COS/FUV COS/NUV	2	11-Jul-2014 21:02:09.0	yes

2 Total Orbits Used

ABSTRACT

Most theories of exobiology require liquid water for a planet to be considered as habitable. Yet, very little is known about the prevalence of water for mature rocky objects in extrasolar planetary systems. A unique method of probing the existence, characteristics, and frequency of extrasolar water-bearing rocky bodies is through examining their bulk composition after they have been accreted by their host white dwarf star. Results to date show that water-rich extrasolar rocky bodies are rare. Evidence for oxygen in ground-based spectroscopy of SDSSJ104341.53+085558.2 suggests that it could be accreting the most water-rich extrasolar rocky object currently known. We propose COS ultraviolet spectroscopy to confirm the water-rich nature and characterize the mineralogy of the rocky body being accreted by this white dwarf star.

OBSERVING DESCRIPTION

Detecting or constraining the absorption lines which inform our science goals requires observations in the 1130-1433 Ang range. Medium spectral resolution ultraviolet spectroscopy with COS and the G130M grating and a central wavelength of 1291 Ang will satisfy the observational requirements. ALL FP-POS positions will be used to mitigate fixed pattern noise.

For the GALEX measured FUV flux of SDSS J1043 (FUV AB magnitude of 16.91+/-0.05) it should be possible to obtain average S/N~15 in the 1130-1433 Ang wavelength range with a total on-source exposure time of ~4,000 seconds. Signal-to-noise ratio of ~15 for the 1130- 1433 Ang wavelength range will enable detection or tight limits on the abundances of oxygen, iron, carbon, and aluminum (the main science goals). Such a signal-to-noise ratio will also enable the detection or constraint of other elements (e.g., nitrogen, sulfur, or phosphorus).

These estimates are made using the COS ETC assuming standard background parameters and with a white dwarf spectral energy distribution matched to the parameters and flux level of SDSS J1043 (reddened by E_B-V=0.03 to match the GALEX data points). Our requested time estimates for COS are increased assuming 20 minutes of instrument overhead (including all acquisition and exposure overheads as suggested in the COS manual) per visit and 6 minutes of observatory overhead per orbit (spacecraft acquisition). In sum, our request adds up to 2 orbits for COS observations of SDSS J1043.

Observations will be done in the TIME-TAG mode using TAG-FLASH wavelength calibration.

SDSS J1043 is an ICRS object (SDSS position with less than 0.4" positional uncertainty), has measured GALEX FUV and NUV fluxes, and is safe for the COS detectors in our desired setups.

Visit

Proposal 13700, WD1041+092 (01) Sat Jul 12 01:02:10 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WD-1041+092 Alt Name1: SDSSJ104341.53+085558.2	RA: 10 43 41.5490 (160.9231208d) Dec: +08 55 58.08 (8.93280d) Equinox: J2000	Proper Motion RA: 38 mas/yr Proper Motion Dec: -46 mas/yr Epoch of Position: 2006.3933	V=17.12+/-0.02 GALEX FUV=16.91+/-0.05 AB magnitudes, GALEX NUV=17.12+/-0.03 AB magnitudes	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (COS.ta.619572)	(1) WD-1041+092	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				45 Secs (45 Secs) *[==>]*	*[1]*
2	WD1041+092 COS/FUV (COS.sp.619574)	(1) WD-1041+092	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=ALL; BUFFER-TIME=2520; FLASH=YES			1000 Secs (5104 Secs) *[==>1156.0 Secs (Split 1)]* *[==>1156.0 Secs (Split 2)]* *[==>1396.0 Secs (Split 3)]* *[==>1396.0 Secs (Split 4)]*	*[1]* *[2]*

Orbit Structure