15080 - Is SDSSJ195750.83+340404.4 accreting a planetary core?

Cycle: 25, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Carl Melis (PI) (Contact)	**University of California - San Diego**	**cmelis@ucsd.edu**
Dr. Patrick Dufour (CoI) (CSA Member)	Universite de Montreal	dufourpa@astro.umontreal.ca

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SDSSJ1957+3404	COS/FUV COS/NUV	2	09-Aug-2018 16:00:11.0	yes
Z1	(1) SDSSJ1957+3404	COS/FUV COS/NUV	2	09-Aug-2018 16:00:12.0	yes

4 Total Orbits Used

ABSTRACT

White dwarf stars are now known to regularly accrete material from their extant planetary systems. We have identified a new polluted white dwarf star that is accreting extremely iron-rich material, suggesting that it is being polluted by the core of a massive, differentiated rocky body. We propose COS FUV spectroscopic observations of SDSSJ1957+3404 that will allow us to peer into the heart of Earth-like rocky exoplanets. These observations will address questions pertaining to terrestrial planet structure and formation processes and the question of what mixture of elements is responsible for Earth's under-dense outer core.

OBSERVING DESCRIPTION

Our primary goal is to confirm the Fe-rich nature of SDSSJ1957+3404 and simultaneously ensure that the Fe originates from an O-poor core-like environment. Our secondary goal is then to characterize additional elements. Modeling of absorption lines shows that the desired elements can be measured or sufficiently strongly constrained with observations in the 1130-1433 Angstrom range. We will perform medium spectral resolution ultraviolet spectroscopy with COS and the G130M grating to cover the 1130-1433 Angstrom range. In accordance with the COS2025 policies, we will only use two FP-POS positions (3 and 4).

For the GALEX-measured NUV flux of SDSS J1957+3404 (NUV AB magnitude of 16.66+/-0.03) and FUV-NUV colors for comparable temperature white dwarf stars we estimate the FUV AB magnitude to be 16.5 (GALEX observations of SDSS J1957+3404 were performed after the failure of the FUV channel, hence why only an NUV measurement is available). With such a magnitude, it should be possible to obtain average S/N~15 in the 1130-1433 Angstrom wavelength range with total on-source exposure time of approximately 4,000 seconds. 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 our target. A signal-to-noise ratio of ~15 for the 1130-1433 Angstrom wavelength range will enable detection or tight limits on the abundances of oxygen and iron. Such a signal-to-noise ratio will also enable the detection or constraint of other elements (e.g., carbon, aluminum, phosphorus, sulfur, chromium, manganese, or nickel). 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, we request 2 orbits total for COS observations of SDSS J1957+3404.

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

SDSSJ1957+3404 is an ICRS object (SDSS position with less than 0.4" positional uncertainty), has a measured GALEX UV flux, and is safe for the COS detectors in our desired setups.

Visit

Proposal 15080, SDSSJ1957FUV (01), failed Thu Aug 09 20:00:12 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Comments: COS/FUV observations of SDSSJ1957+3404.

Diagnostics

(SDSSJ1957FUV (01)) Warning (Form): For the best data quality, it is strongly recommended that the maximum number of allowed FP-POS positions is used when observing at a given COS CENWAVE setting. See full description for details.

(SDSSJ1957FUV (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

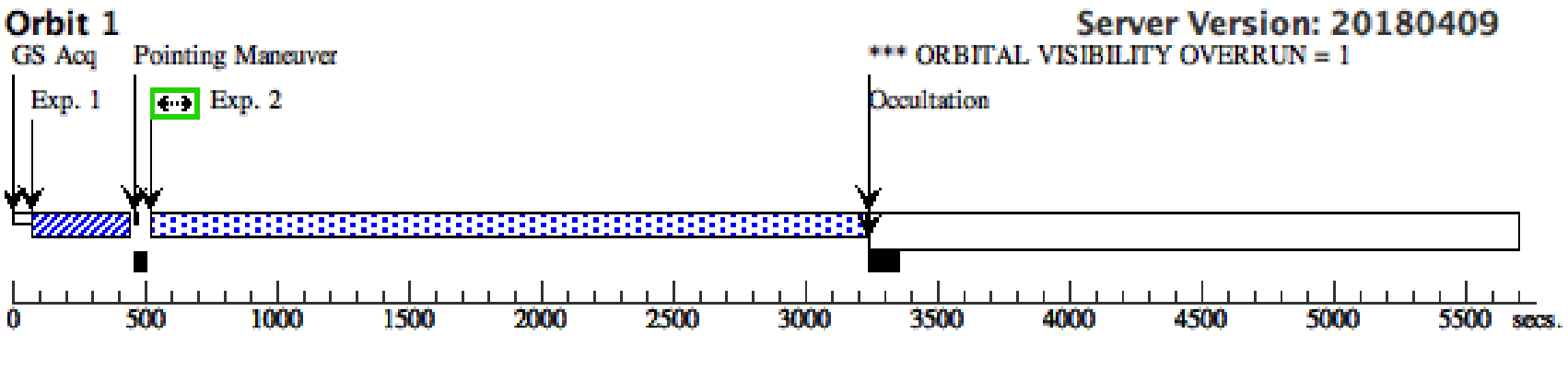
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ1957+3404 Alt Name1: SDSSJ195750.83+340404.4	RA: 19 57 50.8313 (299.4617971d) Dec: +34 04 4.41 (34.06789d) Equinox: J2000	Proper Motion RA: -16 mas/yr Proper Motion Dec: -13 mas/yr Epoch of Position: 2006.4019	V=16.58+/-0.02 GALEX NUV = 16.66	Reference Frame: ICRS

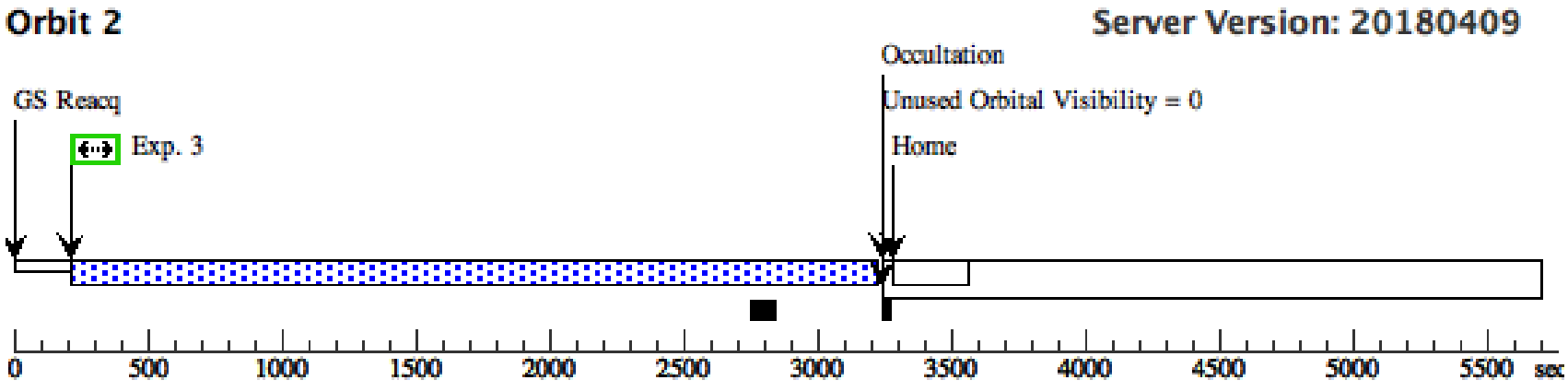
Comments:
Category=STAR
Description=[DA]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (COS.ta.1009479)	(1) SDSSJ1957+3404	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				30 Secs (30 Secs) *[==>]*	 ***[1]***
2	SCI1 (COS.sp.1009696)	(1) SDSSJ1957+3404	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=2495; FLASH=YES			2537 Secs (2537 Secs) *[==>]*	 ***[1]***
3	SCI2 (COS.sp.1009696)	(1) SDSSJ1957+3404	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=2495; FLASH=YES			2954 Secs (2954 Secs) *[==>]*	 ***[2]***

Orbit Structure





Visit

Proposal 15080, SDSSJ1957FUV (Z1) Thu Aug 09 20:00:12 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Comments: THis is a HOPR repeat of failed visit 01

Diagnostics

(SDSSJ1957FUV (Z1)) Warning (Form): For the best data quality, it is strongly recommended that the maximum number of allowed FP-POS positions is used when observing at a given COS CENWAVE setting. See full description for details.

(SDSSJ1957FUV (Z1)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

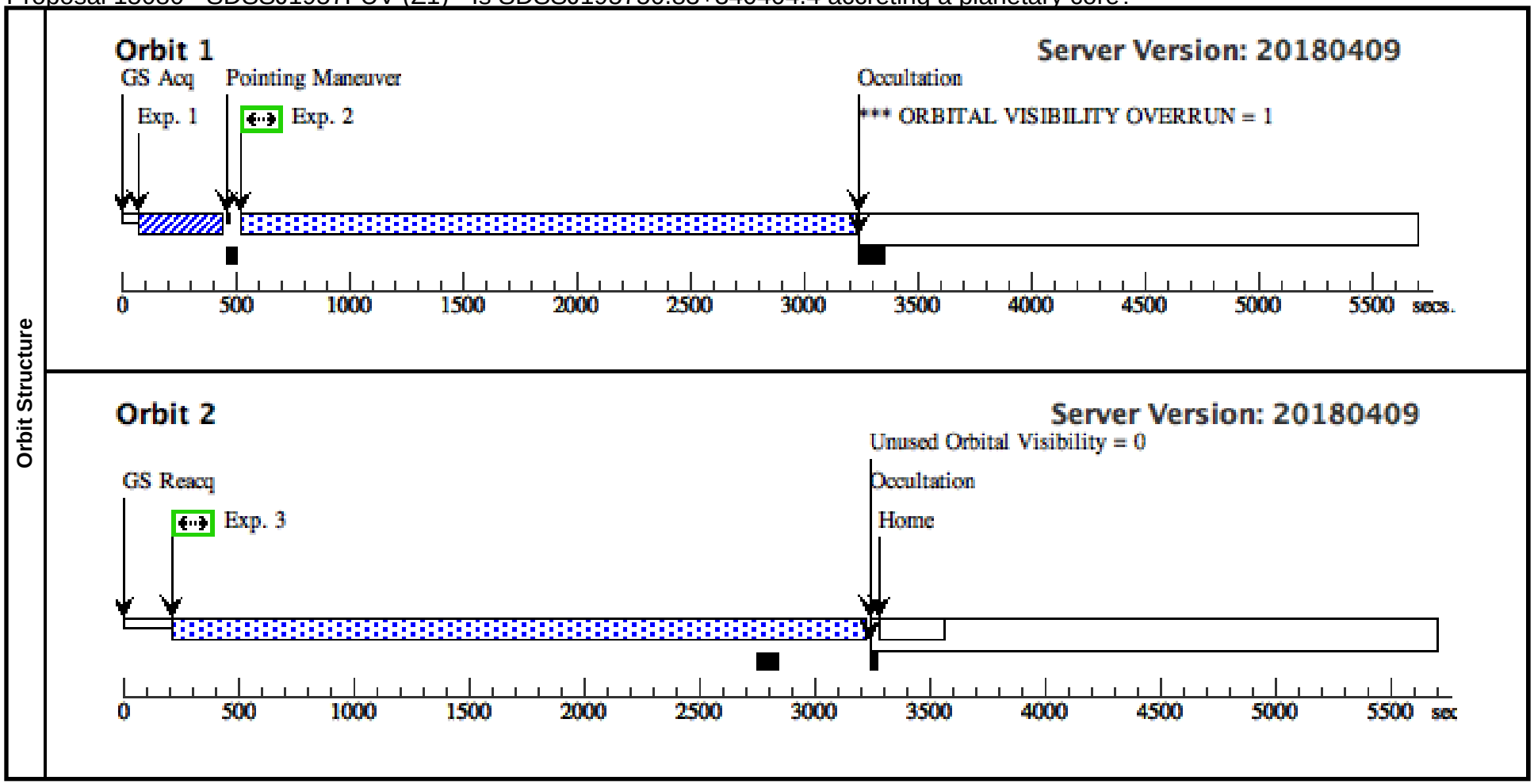
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ1957+3404 Alt Name1: SDSSJ195750.83+340404.4	RA: 19 57 50.8313 (299.4617971d) Dec: +34 04 4.41 (34.06789d) Equinox: J2000	Proper Motion RA: -16 mas/yr Proper Motion Dec: -13 mas/yr Epoch of Position: 2006.4019	V=16.58+/-0.02 GALEX NUV = 16.66	Reference Frame: ICRS

Comments:
Category=STAR
Description=[DA]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (COS.ta.1009479)	(1) SDSSJ1957+3404	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				30 Secs (30 Secs) *[==>]*	***[1]***
2	SCI1 (COS.sp.1009696)	(1) SDSSJ1957+3404	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=2495; FLASH=YES			2537 Secs (2537 Secs) *[==>]*	***[1]***
3	SCI2 (COS.sp.1009696)	(1) SDSSJ1957+3404	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=2495; FLASH=YES			2954 Secs (2954 Secs) *[==>]*	***[2]***


Orbit Structure
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Server Version: 20180409
GS Acq
Pointing Maneuver
Occultation
Exp. 1
Exp. 2
*** ORBITAL VISIBILITY OVERRUN = 1
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 2
Server Version: 20180409
Unused Orbital Visibility = 0
GS Reacq
Occultation
Exp. 3
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec