17066 - Unprecedented Light Element Abundances: Planetary Crusts or Icy Moons?

Cycle: 30, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) GALEXJ2339-0424	COS/FUV	2	01-Jul-2022 15:01:22.0	yes
02	(1) GALEXJ2339-0424	COS/FUV	2	01-Jul-2022 15:01:23.0	yes

4 Total Orbits Used

ABSTRACT

The recent first-ever detections of the light elements, lithium and beryllium, in planetary bodies accreted by 'polluted' white dwarf stars, has prompted varied explanations regarding their origin. A remarkable aspect of the observations is that the abundance ratios of Li and Be relative to major elements are significantly overabundant -- for Be the overabundance is two orders of magnitude. On the one hand, these elements are dosimeters for radiation environments and may be giving us a measure of the degree of spallation production that has occurred while the

exoplanetary bodies were forming. On the other hand, chemical processes such as igneous differentiation (i.e. crust formation) could be responsible. The last member of the set of light elements, boron, has never yet been observed in white dwarfs. We propose to conduct observations of the most promising WD that would be expected to display boron, and we can use the relative abundances of B and Be to discern between the possible formation scenarios. Furthermore, the proposed observations are expected to easily measure the volatiles, C and N, in our target stars, and provide important constraints on the planetary formation scenarios being tested. Only HST/COS can provide the required UV spectroscopy to observe B, C, and N, which are critical for this science.

OBSERVING DESCRIPTION

The target is a single white dwarf, and is sufficiently faint that COS safety is not a problem.

Key absorption lines for our study are: B II 1362.46 Ang, C II 1334.53/1335.71 A, and N I 1243.18/1243.31 A. Our model calculations also suggest that we are likely to detect additional important elements through transitions at Al II 1191.81, P II 1154.00/1249.83A, S I 1425.03A, S II 1253.81A, and Ni II 1317.22A. Thus we use the COS G130M grating and 1291 central wavelength setting, with both segments B and A active, providing coverage of 1137-1274 A and 1292-1432 A, respectively. In this mode only two FP-POS (3 & 4) are available, which we employ to reduce fixed pattern noise.

Our criterion for a spectrum that can clearly distinguish between the proposed models, is a SNR of 20 near the B II 1362 A line. From the COS ETC and our model spectrum calibrated to the GALEX FUV measured flux, this goal is achieved in four orbits.

To facilitate scheduling, we split our observations into two separate visits of two orbits each.

Visit

Proposal 17066, Visit 01 Fri Jul 01 19:01:24 GMT 2022

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 01) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions when observing at a given COS cenwave. See the COS Instrument Handbook for exceptions that may apply to observations with G130M/1291 or G160M.

Fixed Targets

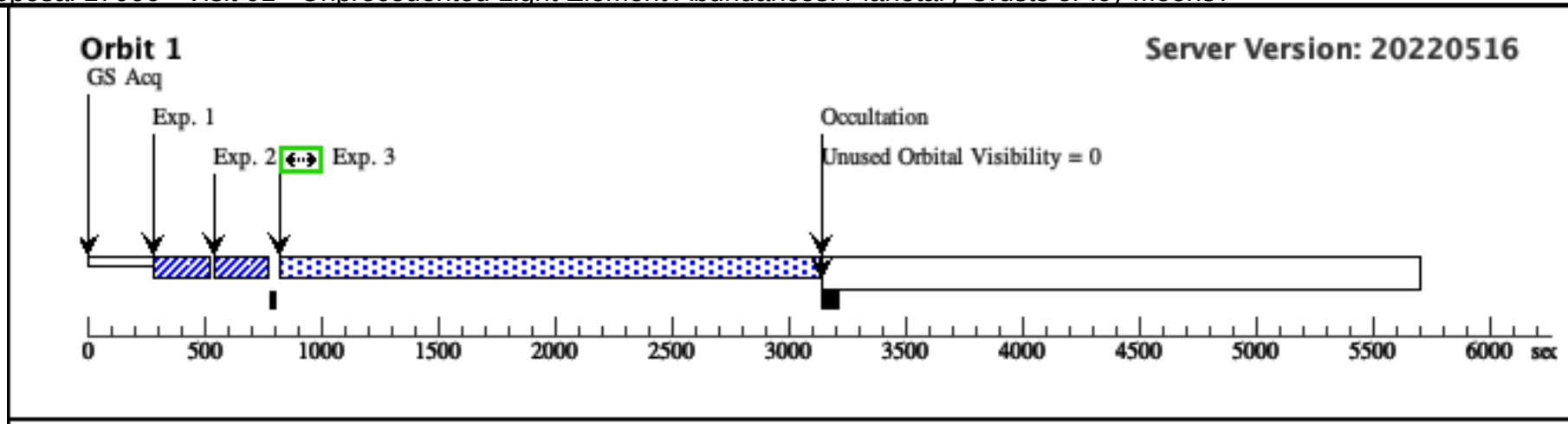
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GALEXJ2339-0424 Alt Name1: GALEX2667197548689621056	RA: 23 39 17.0285 (354.8209521d) Dec: -04 24 24.66 (-4.40685d) Equinox: J2000	Proper Motion RA: 24.50 mas/yr Proper Motion Dec: -32.293 mas/yr Parallax: 0.0112" Epoch of Position: 2000.0	V=16.16 FUV=16.83	Reference Frame: ICRS

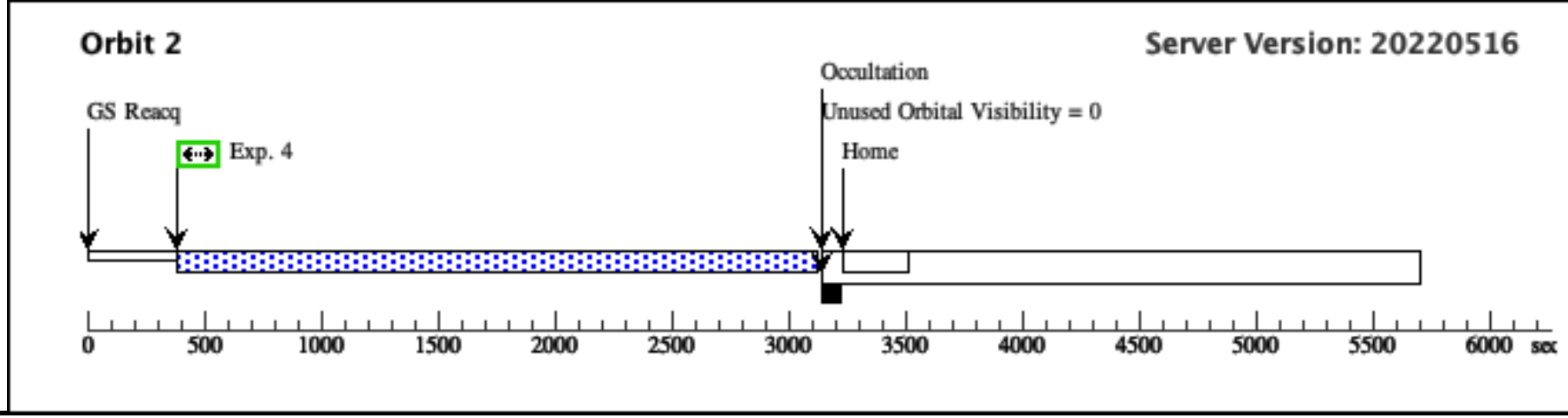
Comments:
Category=STAR
Description=[DB]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/PEAKXD (1809859)	(1) GALEXJ2339-0424	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A	NUM-POS=3; STEP-SIZE=1.3; CENTER=DEF; SEGMENT=BOTH			15 Secs (15 Secs) *[==>]*	***[1]***
2	ACQ/PEAKD (1809859)	(1) GALEXJ2339-0424	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	CENTER=DEF; NUM-POS=5; STEP-SIZE=0.9; SEGMENT=BOTH			15 Secs (15 Secs) *[==>]*	***[1]***
3	TIME-TAG Science (1809909)	(1) GALEXJ2339-0424	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=3724; FP-POS=3; SEGMENT=BOTH			2257 Secs (2257 Secs) *[==>]*	***[1]***
4	TIME-TAG Science (1809910)	(1) GALEXJ2339-0424	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=3724; FP-POS=4; SEGMENT=BOTH			2686 Secs (2686 Secs) *[==>]*	***[2]***

Orbit Structure





Visit

Proposal 17066, Visit 02

Fri Jul 01 19:01:24 GMT 2022

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 02) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions when observing at a given COS cenwave. See the COS Instrument Handbook for exceptions that may apply to observations with G130M/1291 or G160M.

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

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
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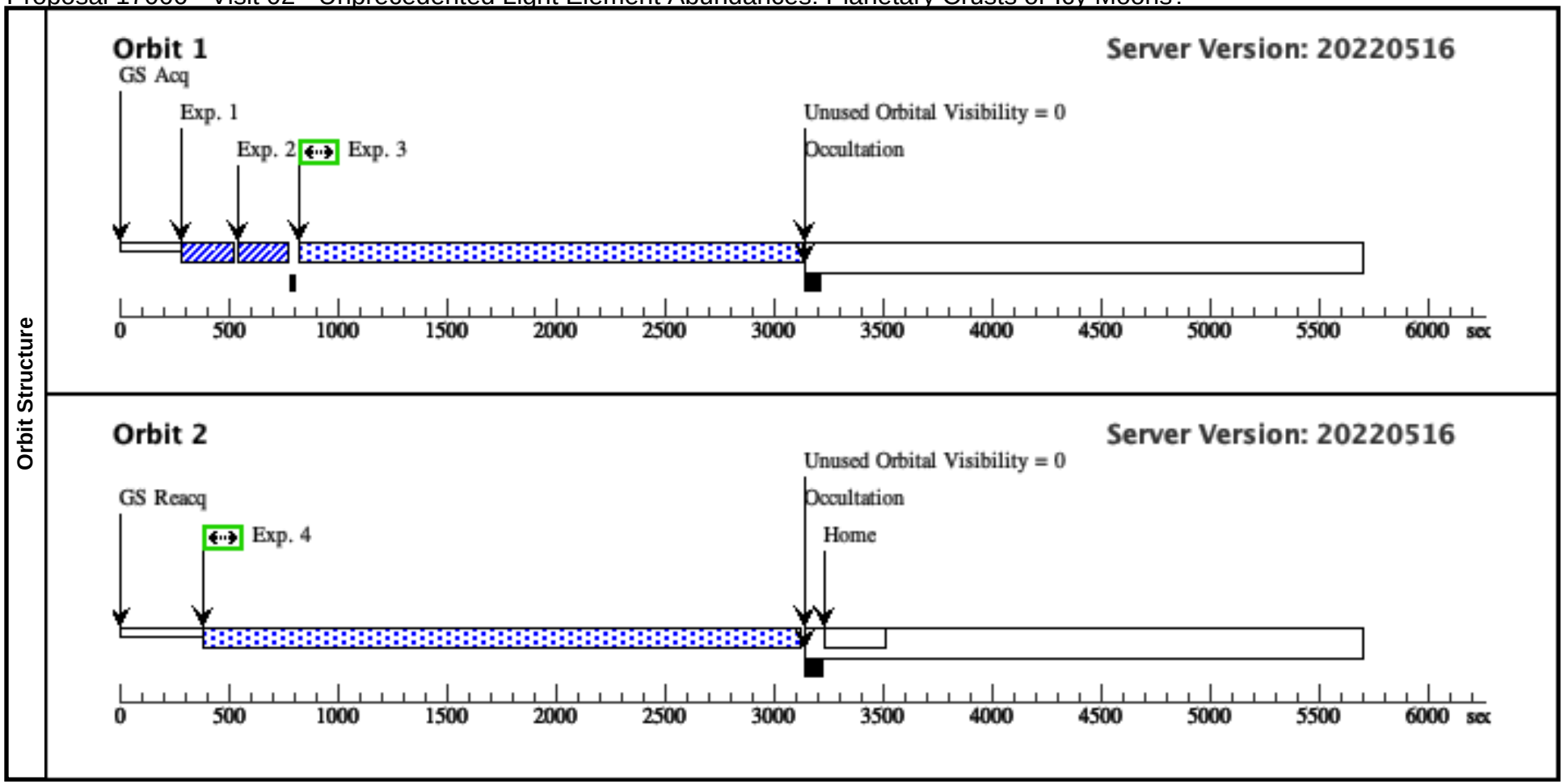
2	ACQ/PEAKD (1809859)	(1) GALEXJ2339-0424	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	CENTER=DEF; NUM-POS=5; STEP-SIZE=0.9; SEGMENT=BOTH			15 Secs (15 Secs) *[==>]*	***[1]***
3	TIME-TAG Science (1809909)	(1) GALEXJ2339-0424	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=3724; FP-POS=3; SEGMENT=BOTH			2257 Secs (2257 Secs) *[==>]*	***[1]***
4	TIME-TAG Science (1809910)	(1) GALEXJ2339-0424	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=3724; FP-POS=4; SEGMENT=BOTH			2686 Secs (2686 Secs) *[==>]*	***[2]***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Exp. 3
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Orbit 2
Server Version: 20220516
Unused Orbital Visibility = 0
GS Reacq
Exp. 4
Occultation
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sec