



12869 - The chemical diversity of extra-solar planetary systems

Cycle: 20, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Prof. Boris T. Gaensicke (PI) (ESA Member) (Contact)	The University of Warwick	boris.gaensicke@warwick.ac.uk
Prof. Detlev G. Koester (CoI) (ESA Member)	Universitat Kiel	koester@astrophysik.uni-kiel.de
Dr. Jay Farihi (CoI) (ESA Member)	University of Leicester	jf123@star.le.ac.uk
Mr. Jonathan Girven (CoI) (ESA Member)	The University of Warwick	j.m.girven@warwick.ac.uk

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) WD0710+741	COS/FUV	1	20-Jun-2012 21:04:39.0	yes
02	(2) WD1013+256	COS/FUV COS/NUV	3	20-Jun-2012 21:04:52.0	yes
03	(3) WD1647+375	COS/FUV	1	20-Jun-2012 21:05:04.0	yes

5 Total Orbits Used

ABSTRACT

Over the past few years, it has become increasingly clear that the most plausible scenario to explain the infrared excess observed at ~30 white dwarfs is accretion from rocky planetary material - suggesting that these white dwarfs may have had, or may still have terrestrial planets as well. This hypothesis is corroborated through the detection of volatile-depleted abundance patterns in the photospheres of these white dwarfs. We are carrying out a large COS snapshot survey of 150 white dwarfs, with the aim to determine the fraction of remnants of planetary systems around young (20-200Myr) white dwarfs. At the time of writing, we have observed 94 white dwarfs, and find pollution by Si, one of the major constituents of the Earth,

Proposal 12869 (STScI Edit Number: 2, Created: Wednesday, June 20, 2012 8:05:11 PM EST) - Overview

in ~25% of them. In about a dozen stars, we detect multiple (up to nine) different elements, and show that their abundance pattern is broadly consistent with that of bulk-Earth: extremely volatile depleted, in particular in C/Si. However, there are two exceptions: WD1013+256 and WD1647+375 show strong lines of both Si and C. We have ruled out accretion from the wind of a nearby low-mass companion, and the only explanation is accretion of planetary debris that is significantly richer in C than the bulk Earth. This discovery is of substantial significance within the current discussion on variations in the exo-planet chemistry. We propose to re-observe these two white dwarfs, doubling the signal-to-noise ratio with respect to our very short Snapshot spectra, to and to determine the abundances of additional elements, including Fe, O, and possibly Ni and N.

OBSERVING DESCRIPTION

These COS FUV observations are a follow-up of three targets that were observed in Cycle 18/19 as part of a COS snapshot survey. We will use the same setup (G130M@1291A), but will use all four FP-POS positions to properly account for fixed pattern noise, and increase the total exposure time per target such that we achieve a S/N~30-40 across the entire wavelength range, i.e. in particular also in the wings of the Ly alpha absorption, where several weak, sharp metal absorption lines of interest are located.

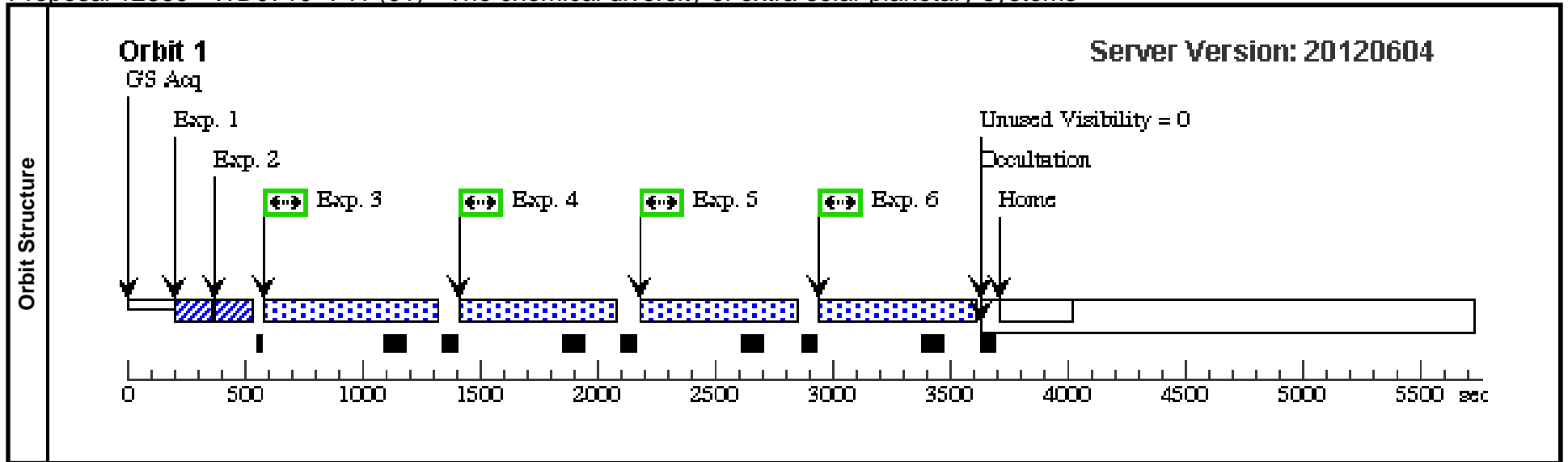
ADDITIONAL COMMENTS

Positions and proper motions for all three targets were taken from the PPMXL catalogue, and the Cycle 18/19 observations were successful without the use of an ACQ/SEARCH. We follow here the same strategy.

Proposal 12869 - WD0710+741 (01) - The chemical diversity of extra-solar planetary systems

Thu Jun 21 01:05:12 GMT 2012

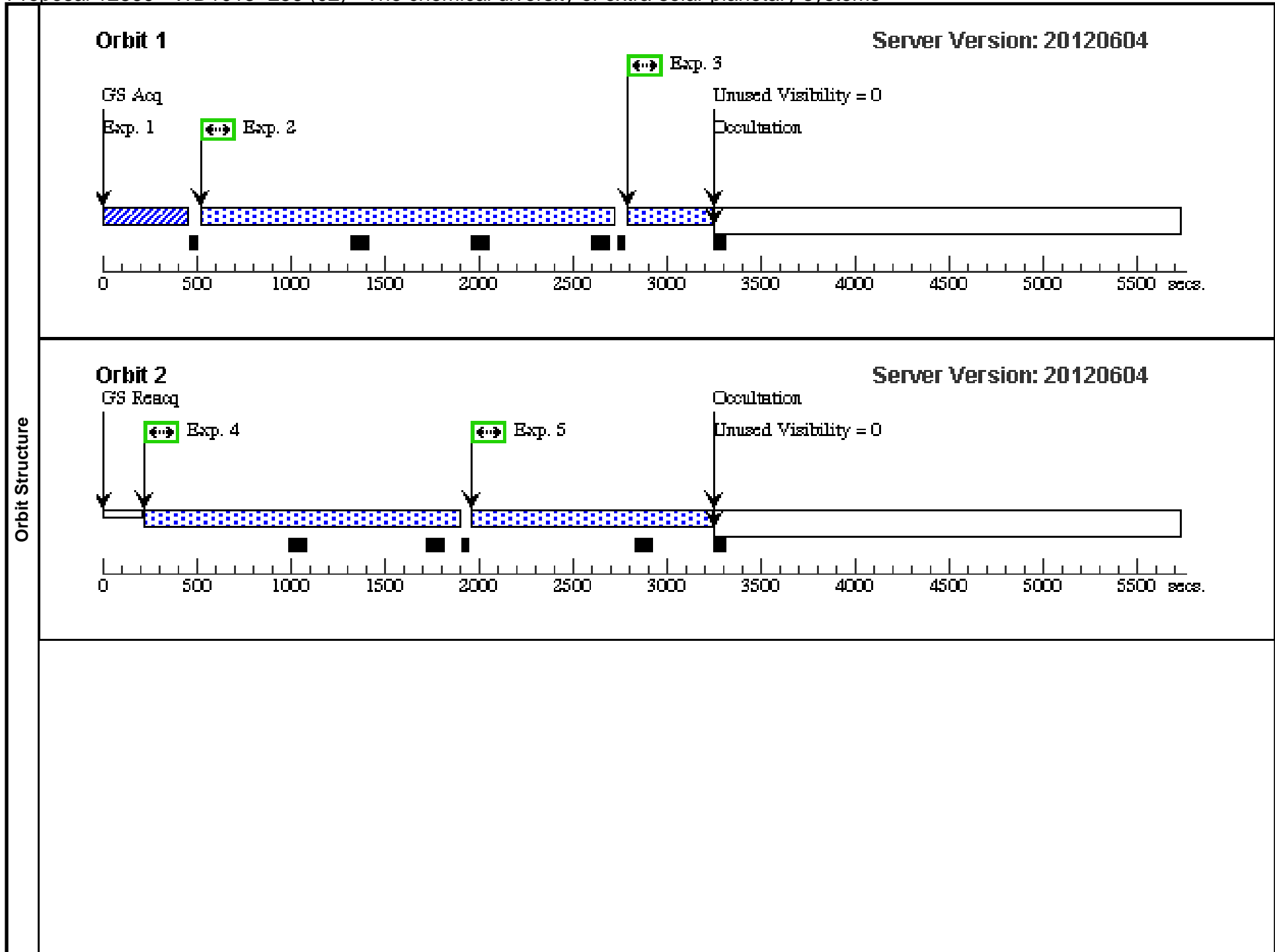
Visit	Proposal 12869, WD0710+741 (01), implementation Diagnostic Status: Warning Scientific Instruments: COS/FUV Special Requirements: (none)									
	(WD0710+741 (01)) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/PEAKXD.									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	WD0710+741	RA: 07 17 9.7800 (109.2907500d) Dec: +74 00 40.50 (74.01125d) Equinox: J2000	Proper Motion RA: 99.8 mas/yr Proper Motion Dec: -86.2 mas/yr Epoch of Position: 2000	V=14.97+/-0.1	Reference Frame: ICRS				
<i>Comments: White dwarf, Teff=19000 logg=7.50. This star has been observed on 2011-12-23 with the same setup (COS/G130M), see data set LBOVNP. The formal error on the position in 2012/13 based on the uncertainty in the historic position and proper motion is ~0.3". The COS observations were successfully acquired without a ACQ/SEARCH.</i> <i>This is also one of the STIS standard stars, and has been observed many times with the G140L / G230L.</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	ACQ/PEAK XD (COS.sa.408 551)	(1) WD0710+741	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A				1 Secs [==>]	[1]
	2	ACQ/PEAK D (COS.sa.408 551)	(1) WD0710+741	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	STEP-SIZE=0.9; NUM-POS=5; CENTER=DEF			1 Secs [==>]	[1]
	3	WD0710+7 41 FP-POS =1 (COS.sp.408 550)	(1) WD0710+741	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=40 0; FLASH=YES; FP-POS=1			621 Secs [==>]	[1]
	4	WD0710+7 41 FP-POS =2 (COS.sp.408 550)	(1) WD0710+741	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=40 0; FLASH=YES; FP-POS=2			621 Secs [==>]	[1]
	5	WD0710+7 41 FP-POS =3 (COS.sp.408 550)	(1) WD0710+741	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=40 0; FLASH=YES; FP-POS=3			621 Secs [==>]	[1]
	6	WD0710+7 41 FP-POS =4 (COS.sp.408 550)	(1) WD0710+741	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=40 0; FLASH=YES; FP-POS=4			622 Secs [==>]	[1]

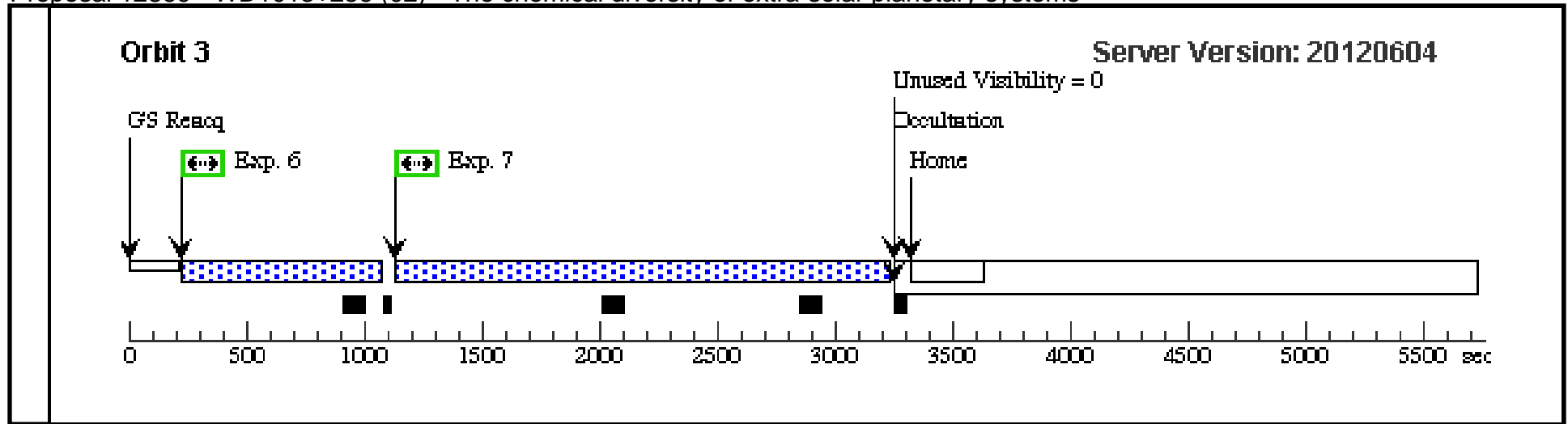


Proposal 12869 - WD1013+256 (02) - The chemical diversity of extra-solar planetary systems

Thu Jun 21 01:05:14 GMT 2012

Visit	Proposal 12869, WD1013+256 (02), implementation Diagnostic Status: Warning Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	(WD1013+256 (02)) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	WD1013+256	RA: 10 16 16.9500 (154.0706250d) Dec: +25 24 56.80 (25.41578d) Equinox: J2000	Proper Motion RA: -31.6 mas/yr Proper Motion Dec: -7.1 mas/yr Epoch of Position: 2000	V=15.97+/-0.1	Reference Frame: ICRS				
<i>Comments: White dwarf, Teff=21990 logg=8.00. This star has been observed on 2011-04-24 with the same setup (COS/G130M), see data set LBIY9C. The formal error on the position in 2012/13 based on the uncertainty in the historic position and proper motion is ~0.3". The COS observations were successfully acquired without a ACQ/SEARCH.</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	ACQ/Image (COS.ta.408 556)	(2) WD1013+256	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				12 Secs [==>]	[1]
	2	WD1013+2 56 FP-POS=1 (COS.sp.408 549)	(2) WD1013+256	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=64 0; FLASH=YES; FP-POS=1			2025 Secs [==>]	[1]
	3	WD1013+2 56 FP-POS=2 (COS.sp.408 549)	(2) WD1013+256	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=84 0; FLASH=YES; FP-POS=2			396 Secs [==>]	[1]
	4	WD1013+2 56 FP-POS=2 (COS.sp.408 549)	(2) WD1013+256	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=73 5; FLASH=YES; FP-POS=2			1628 Secs [==>]	[2]
	5	WD1013+2 56 FP-POS=3 (COS.sp.408 549)	(2) WD1013+256	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=84 0; FLASH=YES; FP-POS=3			1224 Secs [==>]	[2]
	6	WD1013+2 56 FP-POS=3 (COS.sp.408 549)	(2) WD1013+256	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=66 0; FLASH=YES; FP-POS=3			801 Secs [==>]	[3]
	7	WD1013+2 56 FP-POS=4 (COS.sp.408 549)	(2) WD1013+256	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=84 0; FLASH=YES; FP-POS=4			2051 Secs [==>]	[3]





Proposal 12869 - WD1647+375 (03) - The chemical diversity of extra-solar planetary systems

Thu Jun 21 01:05:19 GMT 2012

Visit	Proposal 12869, WD1647+375 (03), implementation Diagnostic Status: Warning Scientific Instruments: COS/FUV Special Requirements: (none)									
	(WD1647+375 (03)) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/PEAKXD.									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	WD1647+375	RA: 16 49 20.2800 (252.3345000d) Dec: +37 28 21.20 (37.47256d) Equinox: J2000	Proper Motion RA: -70.3 mas/yr Proper Motion Dec: -5.6 mas/yr Epoch of Position: 2000	V=15.00+/-0.1	Reference Frame: ICRS				
<i>Comments: White dwarf, Teff=21980 logg=7.89. This star has been observed on 2011-10-05 with the same setup (COS/G130M), see data set LBOVAA. The formal error on the position in 2012/13 based on the uncertainty in the historic position and proper motion is ~0.3". The COS observations were successfully acquired without a ACQ/SEARCH.</i>										
Exposures	#	Label (ETC Run)	Target	Config, Mode, Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	ACQ/PEAK XD (COS.sa.408 278)	(3) WD1647+375	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A				1 Secs [==>]	[1]
	2	ACQ/PEAK D (COS.sa.408 278)	(3) WD1647+375	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	STEP-SIZE=0.9; NUM-POS=5; CENTER=DEF			1 Secs [==>]	[1]
	3	WD1647+3 75 FP-POS=1 (COS.sp.408 279)	(3) WD1647+375	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=22 2; FLASH=YES; FP-POS=1			541 Secs [==>]	[1]
	4	WD1647+3 75 FP-POS=2 (COS.sp.408 279)	(3) WD1647+375	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=22 2; FLASH=YES; FP-POS=2			541 Secs [==>]	[1]
	5	WD1647+3 75 FP-POS=3 (COS.sp.408 279)	(3) WD1647+375	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=22 2; FLASH=YES; FP-POS=3			541 Secs [==>]	[1]
	6	WD1647+3 75 FP-POS=4 (COS.sp.408 279)	(3) WD1647+375	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=22 2; FLASH=YES; FP-POS=4			541 Secs [==>]	[1]

