13290 - The hypervelocity hot subdwarf US 708 - remnant of a double-detonation SN Ia?

Cycle: 21, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Stephan Geier (PI) (ESA Member) (Contact)	**European Southern Observatory - Germany**	**geier@sternwarte.uni-erlangen.de**
Dr. Ulrich Heber (CoI) (ESA Member)	Universitat Erlangen-Nurnberg	heber@sternwarte.uni-erlangen.de

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) BGK2006-HV-2	COS/FUV	2	05-Aug-2013 21:01:04.0	yes
02	(2) CD-314800	COS/FUV	1	05-Aug-2013 21:01:18.0	yes

3 Total Orbits Used

ABSTRACT

Type Ia supernovae (SN Ia) are the most important standard candles for measuring the expansion history of the universe. The thermonuclear explosion of a white dwarf can explain their observed properties, but neither the progenitor systems nor any stellar remnants have been conclusively identified. Underluminous SN Ia have been proposed to originate from a so-called double-detonation of a white dwarf. After a critical amount of helium is deposited on the surface through accretion from a close companion, the helium is ignited causing a detonation wave that triggers the explosion of the white dwarf itself. The helium star will then be ejected at so large a velocity that it will escape the Galaxy. The predicted properties of this remnant are an excellent match to the so-called hypervelocity star US 708, a hot, helium-rich star moving at more than 750 km/s, sufficient to leave the Galaxy.

Here we propose medium-resolution COS spectroscopy to measure the vsini of the hypervelocity He-sdO US 708 for the first time and to search for abundance anomalies caused by pollution through an SN Ia event. This will allow us to test the double-detonation scenario with sdB donor empirically.

OBSERVING DESCRIPTION

Using COS in spectroscopic FUV mode with the G140L grating, we aim at taking 2 orbits of spectroscopy of US\,708 ($V=18.8\,{\rm mag}$) to achieve an S/N of ~60 sufficient to perform a full quantitative spectral analysis. At a resolution of $\sim1\,{\rm \AA}$ we will be able to measure $v_{\rm rot}\sin{i}$ with sufficient accuracy, if it exceeds about $100\,{\rm km\,s^{-1}}$. In addition, we will observe the bright, single He-sdO WD\,0958$-$118 ($V=13.8\,{\rm mag}$) as comparison star. It has similar atmospheric parameters as US\,708, but is a slow rotator. Using the same setup, we will easily achieve an S/N of >100 within one orbit splitting the observation into short single exposures to avoid saturation. There are no scheduling constraints and both sources are non-variable.

Visit

Proposal 13290, Visit 01, implementation Tue Aug 06 01:01:27 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV

Special Requirements: (none)

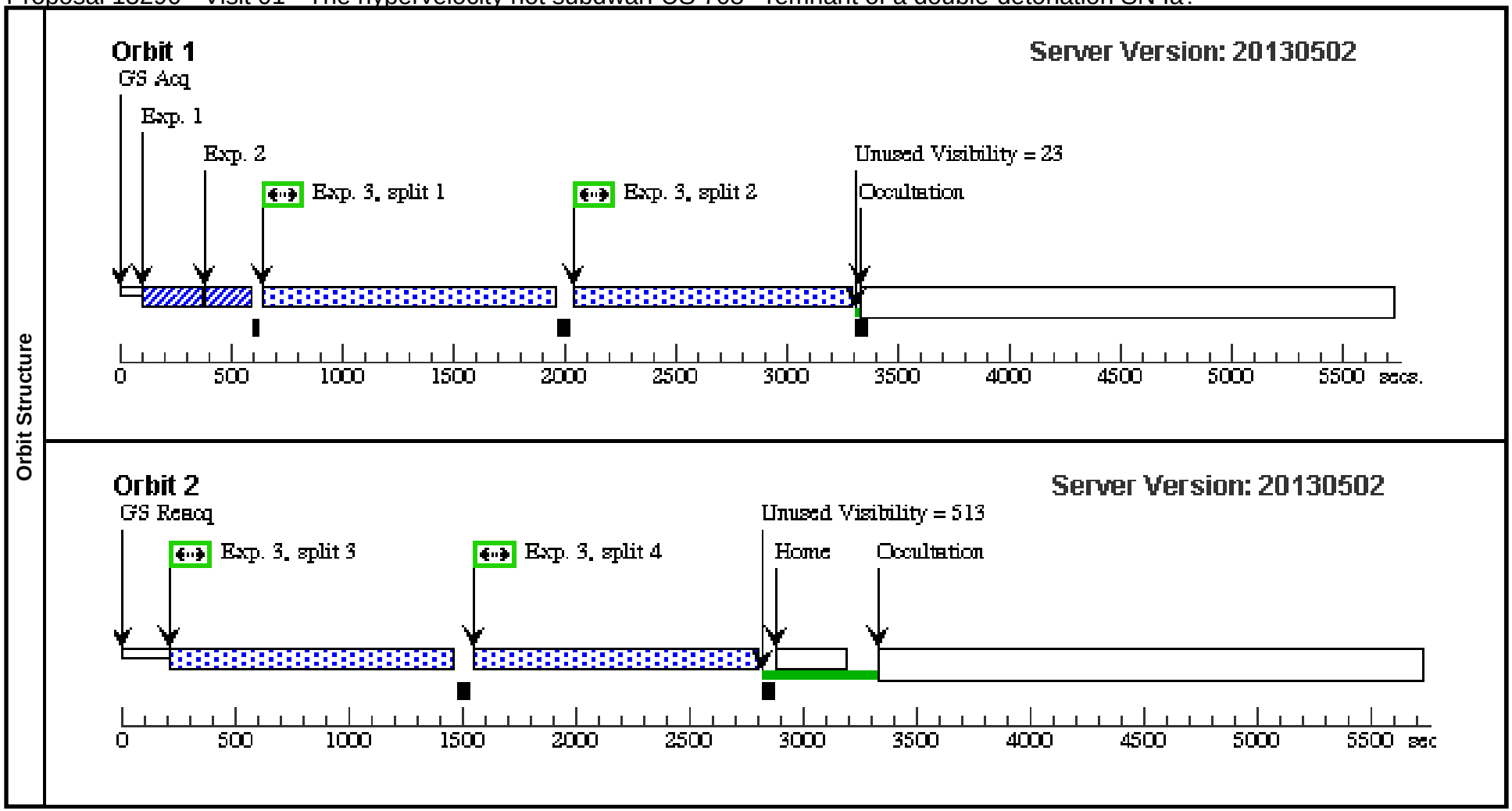
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	BGK2006-HV-2	RA: 09 33 20.8650 (143.3369375d) Dec: +44 17 5.52 (44.28487d) Equinox: J2000		V=18.8	Reference Frame: ICRS

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

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.sa.514650)	(1) BGK2006-HV-2	COS/FUV, ACQ/PEAKXD, PSA	G140L 1105 A				5 Secs (5 Secs) *[==>]*	 ***[1]***
2	(COS.sa.514650)	(1) BGK2006-HV-2	COS/FUV, ACQ/PEAKD, PSA	G140L 1105 A	CENTER=FLUX-WT-FLR; NUM-POS=5; STEP-SIZE=0.9			12 Secs (12 Secs) *[==>]*	 ***[1]***
3	(COS.sp.515722)	(1) BGK2006-HV-2	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FLASH=YES; BUFFER-TIME=2740; FP-POS=ALL			1200 Secs (4800 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	 ***[1]*** ***[2]***


Orbit Structure
Orbit 1
Server Version: 20130502
GS Acq
Exp. 1
Exp. 2
Exp. 3, split 1
Exp. 3, split 2
Unused Visibility = 23
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 2
Server Version: 20130502
GS Reacq
Exp. 3, split 3
Exp. 3, split 4
Unused Visibility = 513
Home
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13290, Visit 02, implementation Tue Aug 06 01:01:29 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV

Special Requirements: (none)

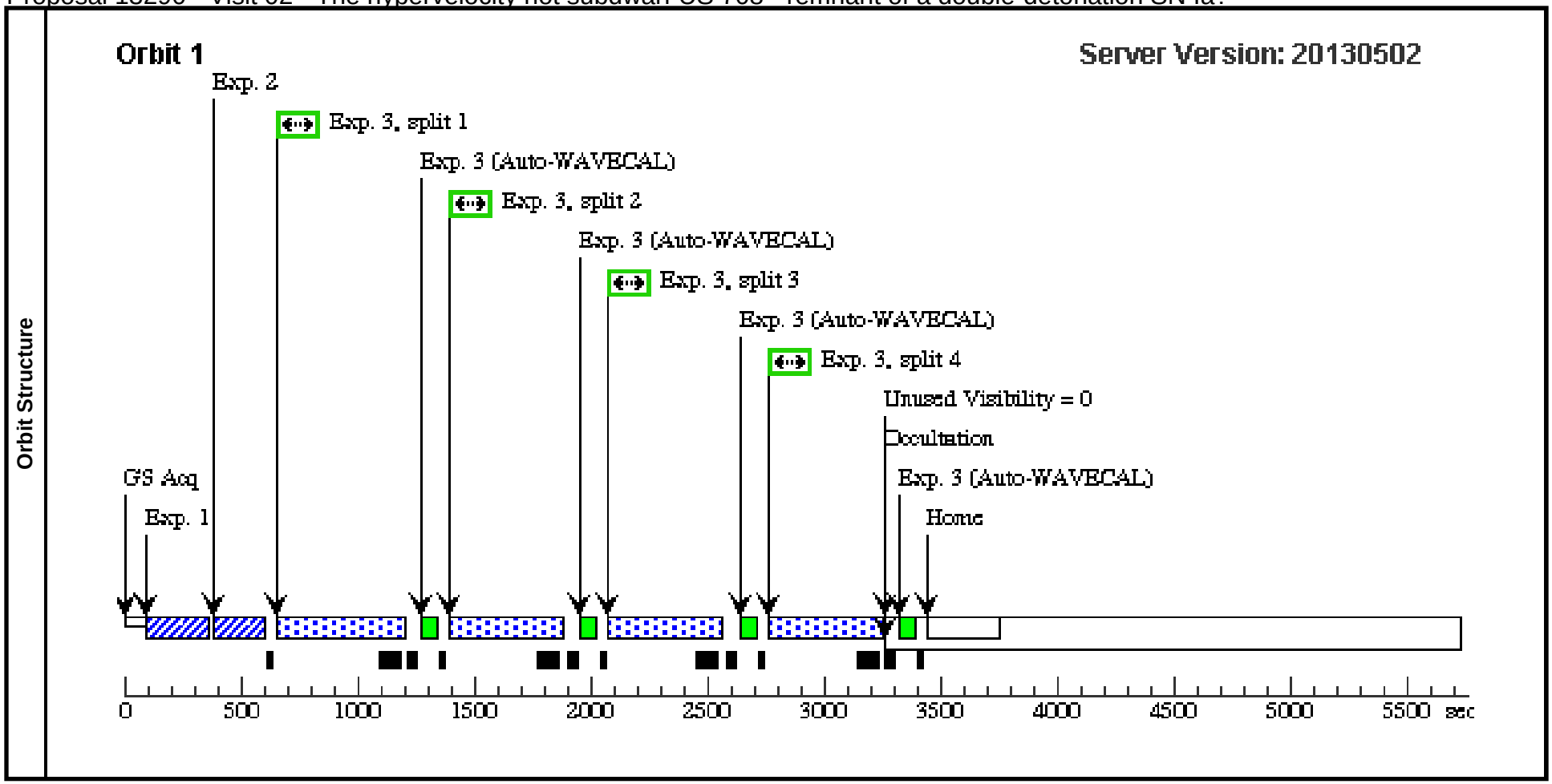
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CD-314800	RA: 07 36 30.1966 (114.1258192d) Dec: -32 12 43.68 (-32.21213d) Equinox: J2000	Proper Motion RA: -23.31 mas/yr Proper Motion Dec: 41.41 mas/yr Epoch of Position: 1991.25	V=10.56+/-0.003	Reference Frame: ICRS

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

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.sa.523 009)	(2) CD-314800	COS/FUV, ACQ/PEAKXD, BOA	G140L 1105 A				2.6 Secs (2.6 Secs) *[==>]*	 ***[1]***
2	(COS.sa.523 009)	(2) CD-314800	COS/FUV, ACQ/PEAKD, BOA	G140L 1105 A	CENTER=FLUX-WT-FLR; NUM-POS=5; STEP-SIZE=0.9			15 Secs (15 Secs) *[==>]*	 ***[1]***
3	(COS.sp.523 007)	(2) CD-314800	COS/FUV, TIME-TAG, BOA	G140L 1105 A	FP-POS=ALL; BUFFER-TIME=336			50 Secs (1732 Secs) *[==>433.0 Secs (Split 1)]* *[==>433.0 Secs (Split 2)]* *[==>433.0 Secs (Split 3)]* *[==>433.0 Secs (Split 4)]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20130502
Exp. 2
Exp. 3, split 1
Exp. 3 (Auto-WAVECAL)
Exp. 3, split 2
Exp. 3 (Auto-WAVECAL)
Exp. 3, split 3
Exp. 3 (Auto-WAVECAL)
Exp. 3, split 4
Unused Visibility = 0
Occultation
Exp. 3 (Auto-WAVECAL)
GS Acq
Exp. 1
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec