



15431 - GD492: a nearby hypervelocity emissary from a thermonuclear supernova event

Cycle: 25, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Roberto Raddi (PI) (ESA Member) (Contact)	The University of Warwick	r.raddi@warwick.ac.uk
Prof. Detlev G. Koester (CoI) (ESA Member)	Universitat Kiel	koester@astrophysik.uni-kiel.de
Mr. Mark Hollands (CoI) (ESA Member)	The University of Warwick	m.hollands@warwick.ac.uk
Prof. Boris T. Gaensicke (CoI) (ESA Member) (Contact)	The University of Warwick	boris.gaensicke@warwick.ac.uk
Dr. Nicola Gentile-Fusillo (CoI) (ESA Member)	The University of Warwick	n.p.gentile-fusillo@warwick.ac.uk
Dr. Dean Townsley (CoI) (AdminUSPI)	University of Alabama	dean.m.townsley@ua.edu
Dr. JJ Hermes (CoI)	University of North Carolina at Chapel Hill	jjhermes@unc.edu

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>
02	(1) GD-492	STIS/CCD STIS/NUV-MAMA	3	21-Nov-2017 12:02:04.0	yes
03	(1) GD-492	STIS/CCD STIS/NUV-MAMA	2	21-Nov-2017 12:02:06.0	yes

5 Total Orbits Used

ABSTRACT

GD 492 is a nearby hypervelocity white dwarf with a unique chemical composition displaying the nucleosynthesis fingerprints of C-, O-, and Si-burning. From our ground-based optical spectroscopy, we determine a He-dominated atmosphere, but loaded with a large amount of Ne, Mn, O (30, 5, 1%, by mass, respectively) and traces of ten other elements. The large space velocity, exceeding the Galactic escape velocity, and the considerable alpha enhancements strongly suggest that GD 492 is an exotic white dwarf remnant of a failed Type Ia supernova. The super-Solar Mn/Fe ratio provides evidence that this partial thermonuclear explosion occurred in a single-degenerate binary. Through kinematic analysis, we constrained the supernova event to have occurred most likely < 10 Myr ago, at a nearby Galactic disc location towards the Carina arm.

Here we apply for five HST orbits to obtain high-quality STIS near-ultraviolet spectroscopy of GD492 which we will use to:

- (1) accurately measure the effective temperature, which is significantly affected by the currently unconstrained amount of ultraviolet line blanketing. Together with the forthcoming Gaia DR2 parallax, this measurement will also tightly constrain the radius and mass of GD 492.
- (2) unambiguously measure the bulk atmospheric composition, i.e. the Ne/He ratio; determine the degree of C-burning through the detection of (or placing a firm upper limit on) the C-abundance; and derive significantly improved constraints on O- and Si- burning via more accurate abundance measurements of Mn, S, and Ni.

Both scientific goals critically require space-based ultraviolet spectroscopy.

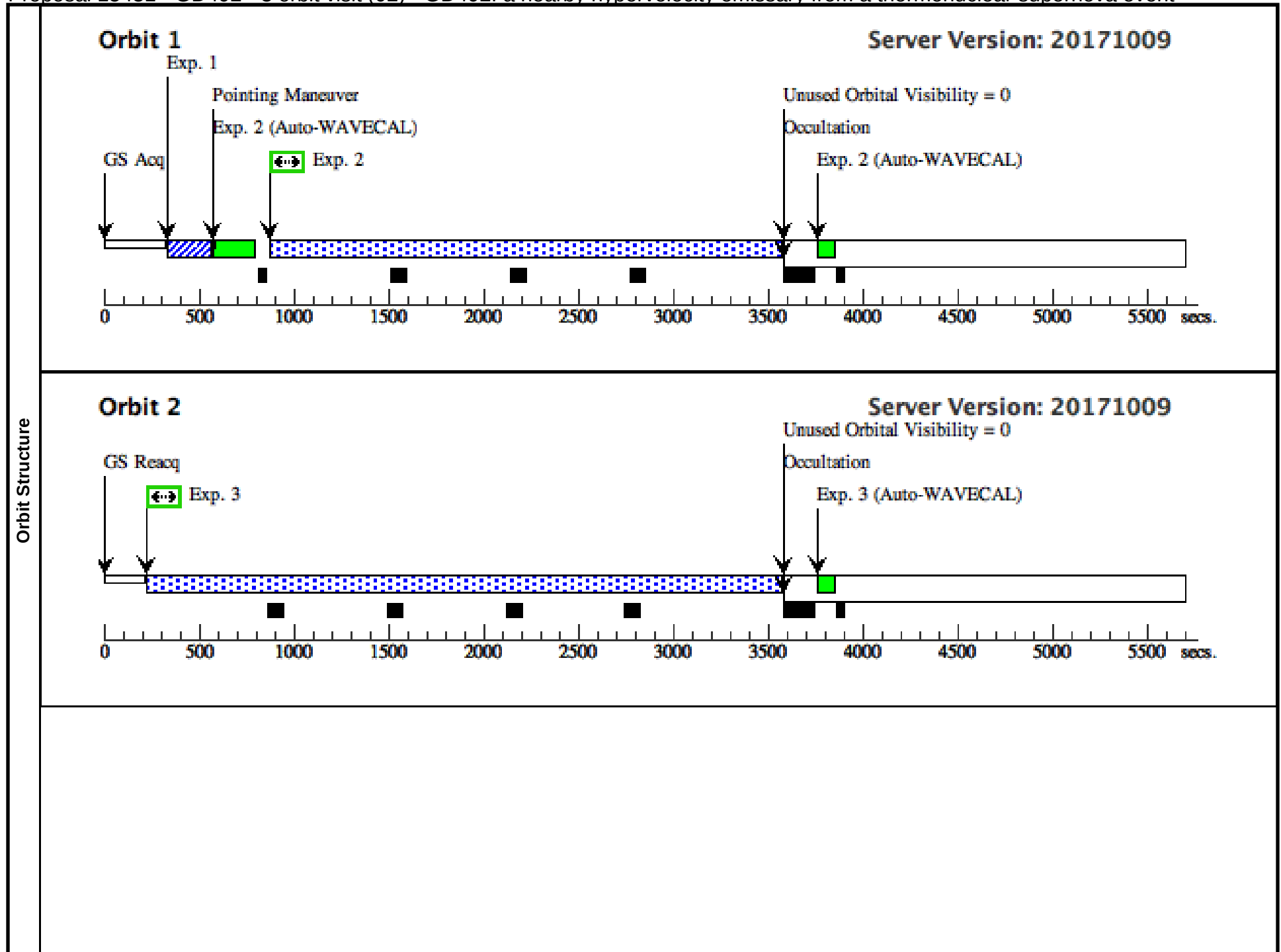
OBSERVING DESCRIPTION

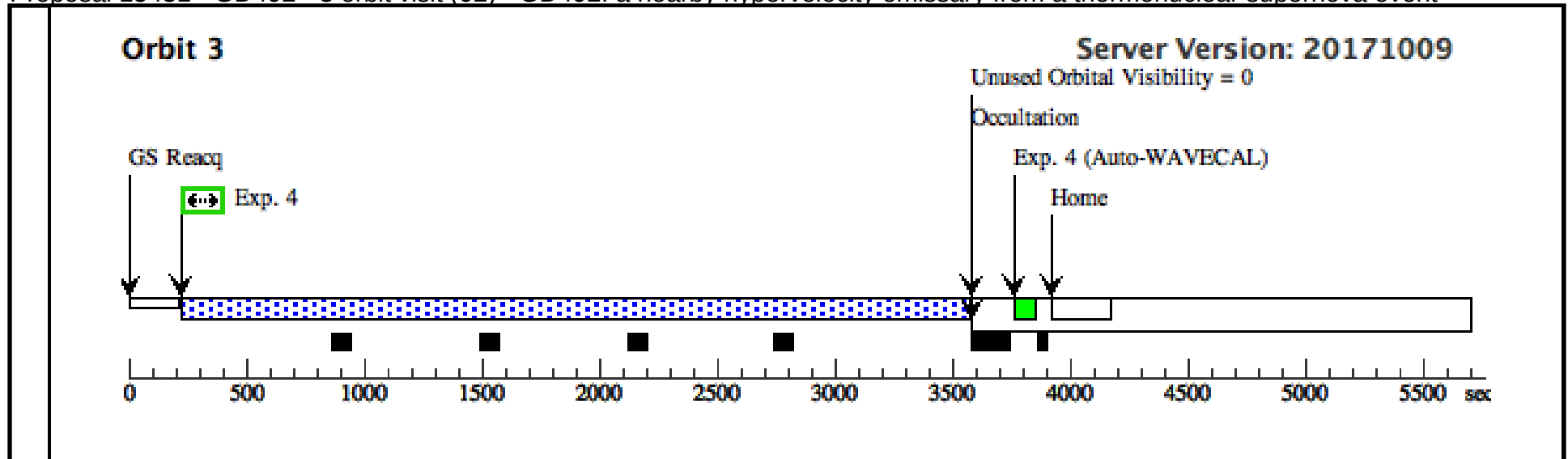
The goal of these observations is to obtain a high S/N spectrum of the target star, GD492. The star has a moderate, but well known proper motion, and is in a sparse field, so acquisition with the STIS CCD should be straightforward. We were awarded five orbits, but as requested, we split the observations into a two and a three-orbit visit to facilitate the scheduling of the observations. We would be equally happy should it be possible to schedule the observations as a single five-orbit visit, as that would give us an extra ~ 650 sec on-target, but the difference in the total S/N is too small to request a single five-orbit visit.

Please attempt to schedule the observations in one of the Dec/Jan/Mar to ensure the spectroscopy is available in time for the Gaia Data Release 2, which will provide an accurate parallax.

Proposal 15431 - GD492 - 3 orbit visit (02) - GD492: a nearby hypervelocity emissary from a thermonuclear supernova event

Visit	Proposal 15431, GD492 - 3 orbit visit (02)										Tue Nov 21 17:02:07 GMT 2017	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: STIS/NUV-MAMA, STIS/CCD											
	Special Requirements: (none)											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	GD-492	RA: 14 06 35.4460 (211.6476917d) Dec: +74 18 58.06 (74.31613d) Equinox: J2000			Proper Motion RA: -57.7 mas/yr Proper Motion Dec: 144.9 mas/yr Epoch of Position: 2000		V=15.506 +/-0.093 GALEX FUV=21.051+-0.299 G ALEX NUV=18.605+-0.058		Reference Frame: ICRS		
	Comments: Extended=NO											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	GD492 Acq (STIS.ta.103 4914)	(1) GD-492	STIS/CCD, ACQ, F28X50LP		MIRROR				1 Secs (1 Secs)		
										[>=>]		[1]
	2	GD492 Scie nce (STIS.sp.10 35611)	(1) GD-492	STIS/NUV-MAMA, TIME-TAG, 52X2		G230L 2376 A	BUFFER-TIME=62 5			2661 Secs (2661 Secs)		
										[>=>]		[1]
	3	GD492 Scie nce (STIS.sp.10 35611)	(1) GD-492	STIS/NUV-MAMA, TIME-TAG, 52X2		G230L 2376 A	BUFFER-TIME=62 5			3310 Secs (3310 Secs)		
										[>=>]		[2]
	4	GD492 Scie nce (STIS.sp.10 35611)	(1) GD-492	STIS/NUV-MAMA, TIME-TAG, 52X2		G230L 2376 A	BUFFER-TIME=62 5			3310 Secs (3310 Secs)		
									[>=>]		[3]	





Proposal 15431 - GD492 - 2 orbit visit (03) - GD492: a nearby hypervelocity emissary from a thermonuclear supernova event

Visit	Proposal 15431, GD492 - 2 orbit visit (03)										Tue Nov 21 17:02:07 GMT 2017	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: STIS/NUV-MAMA, STIS/CCD											
	Special Requirements: (none)											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	GD-492	RA: 14 06 35.4460 (211.6476917d) Dec: +74 18 58.06 (74.31613d) Equinox: J2000			Proper Motion RA: -57.7 mas/yr Proper Motion Dec: 144.9 mas/yr Epoch of Position: 2000		V=15.506 +/-0.093 GALEX FUV=21.051+-0.299 G ALEX NUV=18.605+-0.058		Reference Frame: ICRS		
	Comments: Extended=NO											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	GD492 Acq (STIS.ta.103 4914)	(1) GD-492	STIS/CCD, ACQ, F28X50LP		MIRROR				1 Secs (1 Secs)		
										[>=>]		[1]
	2	GD492 Scie nce (STIS.sp.10 35611)	(1) GD-492	STIS/NUV-MAMA, TIME-TAG, 52X2		G230L 2376 A	BUFFER-TIME=62 5			2661 Secs (2661 Secs)		
										[>=>]		[1]
	3	GD492 Scie nce (STIS.sp.10 35611)	(1) GD-492	STIS/NUV-MAMA, TIME-TAG, 52X2		G230L 2376 A	BUFFER-TIME=62 5			3310 Secs (3310 Secs)		
									[>=>]		[2]	

