15871 - UV properties of the first known surviving companions of Type Ia supernovae

Cycle: 27, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Ken Shen (PI) (Contact)	**University of California - Berkeley**	**kenshen@astro.berkeley.edu**
Prof. Boris T. Gaensicke (CoI) (ESA Member)	The University of Warwick	boris.gaensicke@warwick.ac.uk
Dr. Odette Fabiola Toloza Castillo (CoI) (ESA Member)	The University of Warwick	o.f.c.toloza@warwick.ac.uk
Prof. Detlev G. Koester (CoI) (ESA Member)	Universitat Kiel	koester@astrophysik.uni-kiel.de
Dr. Roberto Raddi (CoI) (ESA Member)	Universitat Erlangen-Nurnberg	roberto.raddi@fau.de
Prof. Ulrich Heber (CoI) (ESA Member)	Universitat Erlangen-Nurnberg	heber@sternwarte.uni-erlangen.de
Dr. JJ Hermes (CoI)	Boston University	jjhermes@bu.edu
Dr. Mark Hollands (CoI) (ESA Member)	The University of Warwick	m.hollands@warwick.ac.uk

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) D6-2	STIS/CCD STIS/NUV-MAMA	3	15-Jul-2019 14:02:08.0	yes
02	(1) D6-2	STIS/CCD STIS/NUV-MAMA	3	15-Jul-2019 14:02:10.0	yes

6 Total Orbits Used

ABSTRACT

The study of Type Ia supernovae (SNe Ia) has undergone a revolution within the last year following the discovery of three extremely unique stars in Gaia's Data Release 2. Their hypervelocities (1000-2500 km/s), atmospheric compositions (predominantly C/O with contributions from Mg, Si, S, and Fe-group elements), inflated radii, and the kinematic association of one of the stars with a known SN remnant are all strong evidence that they are the former white dwarf (WD) secondaries in merging double WD systems in which the primary WD exploded as a SN Ia. While analysis of these paradigm-shifting stars in the optical is ongoing, a complete understanding is currently limited by degeneracies in the effective temperatures, surface gravities, and metal abundances. Near-ultraviolet spectroscopy is crucial to break these degeneracies. Our proposed ultraviolet observations of the brightest of these stars will allow for the derivation of its radius, mass, and bulk atmospheric composition, enabling constraints on the precise nucleosynthetic yields of the nearby explosion that polluted the surviving companion's surface as well as characterization of its current stellar structure. This will enable modeling of the future evolution of these stars, which will facilitate searches for more SN Ia survivors that will answer the decades-old mystery of the nature of SN Ia progenitors.

OBSERVING DESCRIPTION

The primary goal of this proposal is to obtain the near-ultraviolet spectral energy distribution of this star.

We choose the STIS G230L grating and the widest slit, 52x2, to ensure that we optimise the throughput and minimise possible slit flux losses.

The observation sequence is straight-foward: two identical three-orbit visits, composed of an acquisition with the optical CCD and the FP28x50LP broadband filter, followed by G230L spectroscopy.

Visit

Proposal 15871, STIS spectroscopy of D6-2 (01) Mon Jul 15 18:02:11 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/NUV-MAMA, STIS/CCD

Special Requirements: (none)

Fixed Targets

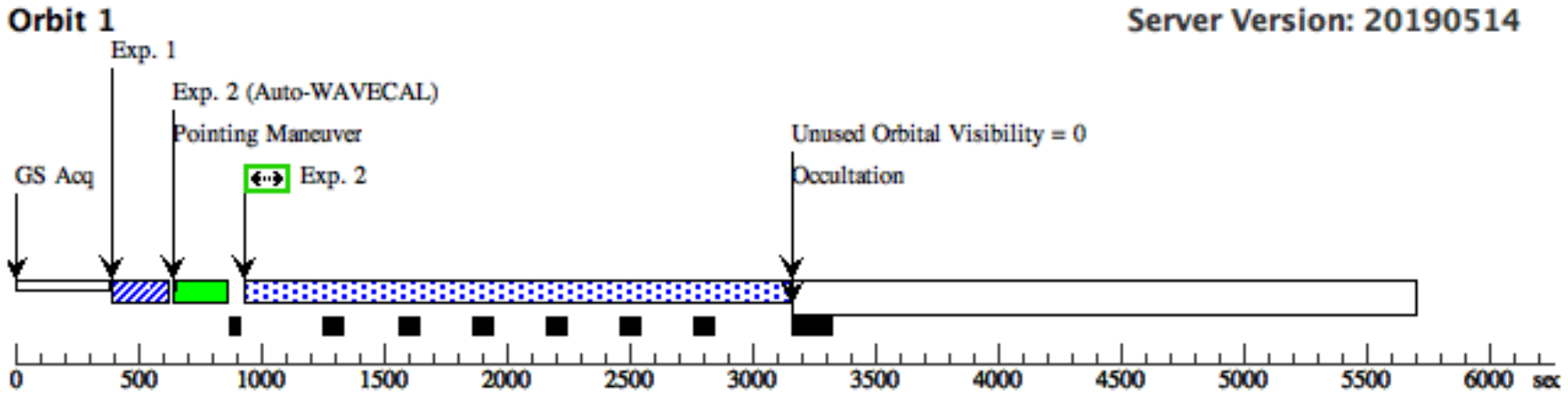
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	D6-2	RA: 21 38 26.9972 (324.6124883d) Dec: +25 22 25.36 (25.37371d) Equinox: J2000	Proper Motion RA: 98.385 mas/yr Proper Motion Dec: 240.352 mas/yr Epoch of Position: 2015.5	V=17.0+/-0.1 GALEX NUV=19.57	Reference Frame: ICRS

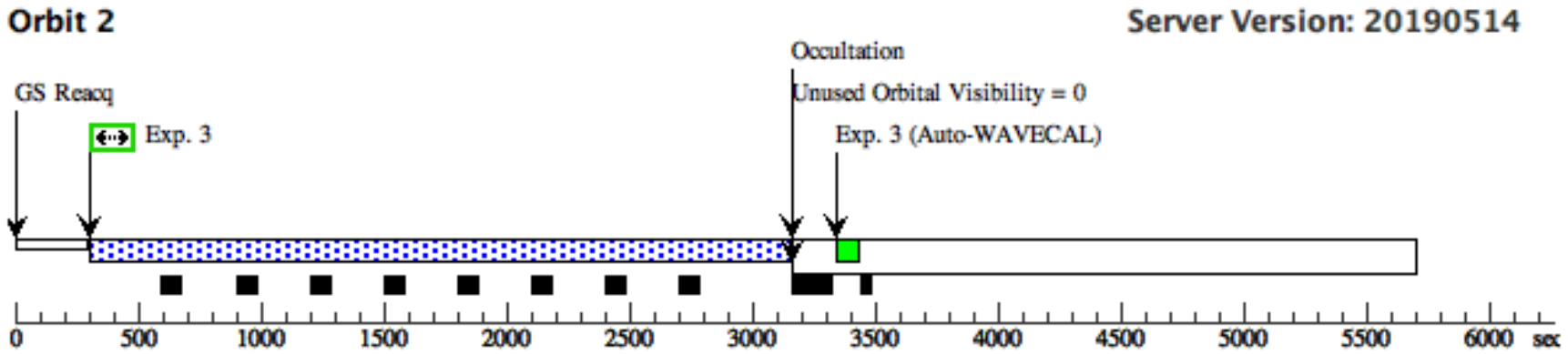
Comments:
Category=STAR
Description=[SDB]
Extended=NO

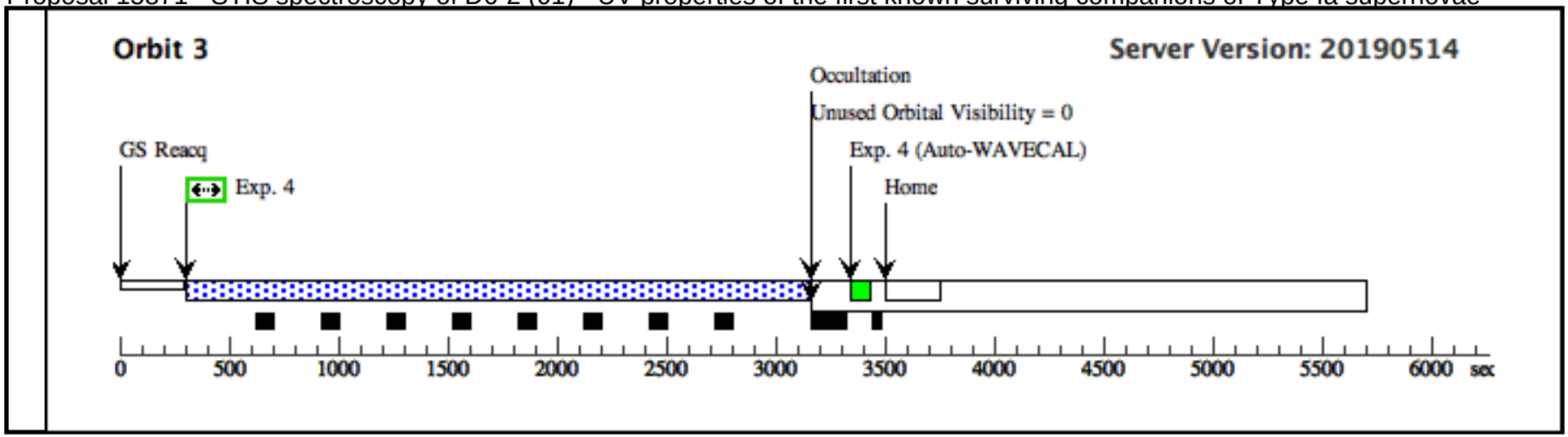
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1367866)	(1) D6-2	STIS/CCD, ACQ, F28X50LP	MIRROR				2 Secs (2 Secs) *[==>]*	***[1]***
2	(STIS.sp.1367868)	(1) D6-2	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=300			2177 Secs (2177 Secs) *[==>]*	***[1]***
3	(STIS.sp.1367868)	(1) D6-2	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=300			2835 Secs (2835 Secs) *[==>]*	***[2]***
4	(STIS.sp.1367868)	(1) D6-2	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=300			2810 Secs (2810 Secs) *[==>]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20190514
Occultation
Unused Orbital Visibility = 0
GS Reacq
Exp. 4
Exp. 4 (Auto-WAVECAL)
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15871, STIS spectroscopy of D6-2 (02) Mon Jul 15 18:02:11 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/NUV-MAMA, STIS/CCD

Special Requirements: (none)

Fixed Targets

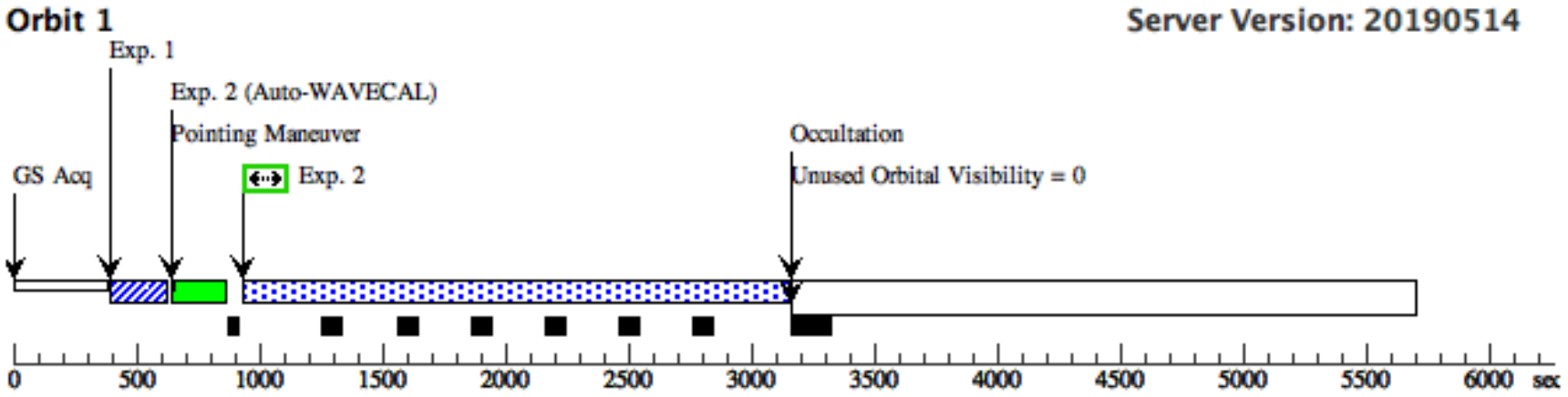
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	D6-2	RA: 21 38 26.9972 (324.6124883d) Dec: +25 22 25.36 (25.37371d) Equinox: J2000	Proper Motion RA: 98.385 mas/yr Proper Motion Dec: 240.352 mas/yr Epoch of Position: 2015.5	V=17.0+/-0.1 GALEX NUV=19.57	Reference Frame: ICRS

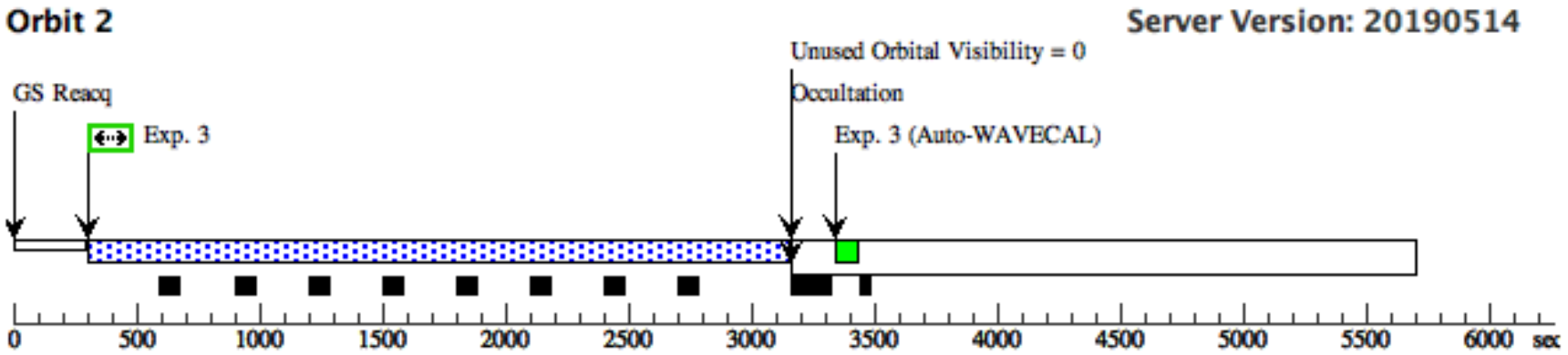
Comments:
Category=STAR
Description=[SDB]
Extended=NO

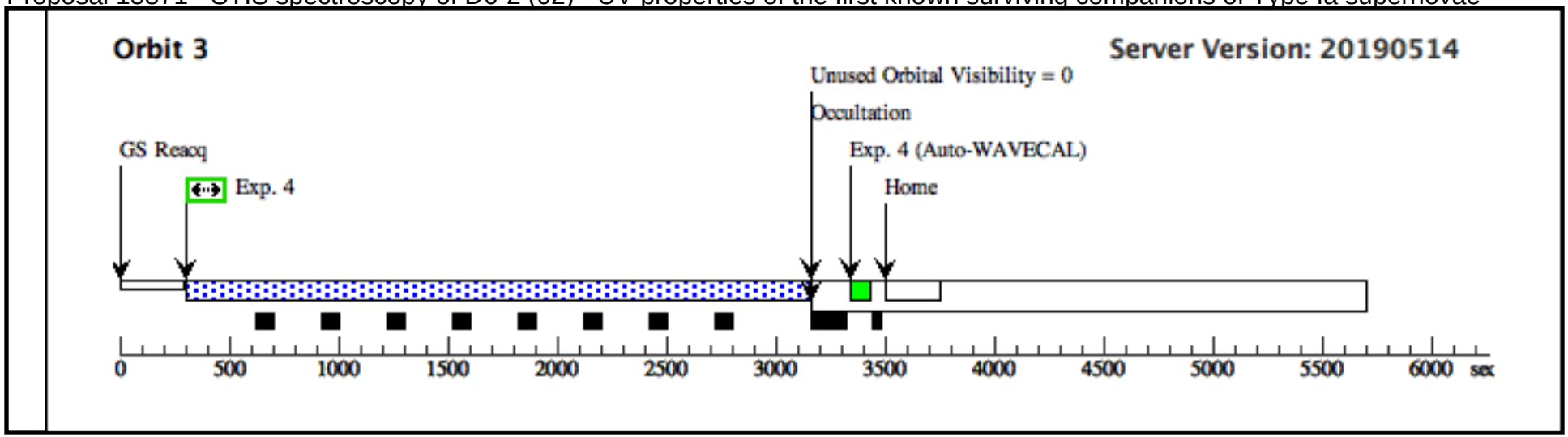
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1367866)	(1) D6-2	STIS/CCD, ACQ, F28X50LP	MIRROR				2 Secs (2 Secs) *[==>]*	***[1]***
2	(STIS.sp.1367868)	(1) D6-2	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=300			2177 Secs (2177 Secs) *[==>]*	***[1]***
3	(STIS.sp.1367868)	(1) D6-2	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=300			2835 Secs (2835 Secs) *[==>]*	***[2]***
4	(STIS.sp.1367868)	(1) D6-2	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=300			2810 Secs (2810 Secs) *[==>]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20190514
Unused Orbital Visibility = 0
Occultation
GS Reacq
Exp. 4
Exp. 4 (Auto-WAVECAL)
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec