13806 - UV spectroscopy of the most massive overcontact binary known to date: on the verge of coalescence ?

Cycle: 22, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Hugues Sana (PI) (ESA Member) (Contact)	**Space Telescope Science Institute - ESA**	**hsana@stsci.edu**
Dr. Leonardo Almeida (CoI)	The Johns Hopkins University	leonardodealmeida.andrade@gmail.com
Dr. Selma E. de Mink (CoI)	Carnegie Institution of Washington	demink@obs.carnegiescience.edu
Dr. Alexander W. Fullerton (CoI) (AdminUSPI)	Space Telescope Science Institute	fullerton@stsci.edu
Dr. Norbert Langer (CoI) (ESA Member)	Universitat Bonn, Argelander Institute for Astronomy	nlanger@astro.uni-bonn.de
Mr. Frank Tramper (CoI) (ESA Member)	Universiteit van Amsterdam	f.tramper@uva.nl
Dr. Alex De Koter (CoI) (ESA Member)	Universiteit van Amsterdam	a.dekoter@uva.nl
Mr. Oscar Ramirez-Agudelo (CoI) (ESA Member)	Universiteit van Amsterdam	o.h.ramirezagudelo@uva.nl
Dr. Alceste Z. Bonanos (CoI) (ESA Member)	National Observatory of Athens	bonanos@astro.noa.gr
Dr. Elena Sabbi (CoI)	Space Telescope Science Institute	sabbi@stsci.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) VFTS352	COS/FUV COS/NUV	1	24-Jul-2014 21:55:58.0	yes
02	(1) VFTS352	COS/FUV COS/NUV	1	24-Jul-2014 21:56:00.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(1) VFTS352	COS/FUV COS/NUV	1	24-Jul-2014 21:56:01.0	yes
04	(1) VFTS352	COS/FUV COS/NUV	1	24-Jul-2014 21:56:02.0	yes
05	(1) VFTS352	COS/FUV COS/NUV	1	24-Jul-2014 21:56:04.0	yes
06	(1) VFTS352	COS/FUV COS/NUV	1	24-Jul-2014 21:56:05.0	yes
07	(1) VFTS352	COS/FUV COS/NUV	1	24-Jul-2014 21:56:06.0	yes
08	(1) VFTS352	COS/FUV COS/NUV	1	24-Jul-2014 21:56:07.0	yes

8 Total Orbits Used

ABSTRACT

Binary interaction dominates the evolution of massive stars. Because of the abundance of short period systems, about a quarter of all massive stars are thought to merge with their companion. The short-lived contact phase preceding coalescence is poorly understood due to the lack of observational constraints: only two overcontact O-type binaries are known so far. Yet, these systems provide crucial observational testbeds to understand the elusive formation and evolution of the most massive stars, the complex physics of stellar mergers and the role that the coalescence products play as progenitors of supernovae and gamma-ray bursts. We recently discovered VFTS 352, the most massive, earliest spectral type and shortest period (P = 1.12 d) overcontact O-type binary known to date. With an estimated combined mass of 130 Msun, this truly unique system is expected to merge into a rapidly rotating, very massive, single star. Initial estimates of the physical parameters were derived from high-quality ground-based optical spectra and photometry. Yet, optical analyses of overcontact systems can overestimate the radial-velocity amplitudes, hence the masses, by up to 40% because optical lines are susceptible to irradiation effects. Here we propose a limited 8-epochs COS monitoring of VFTS 352. The G130M and G160M spectra will allow us to side step the uncertainties affecting optical determination of the masses and to constrain the mass loss rate and CNO surface abundances. These constraints are crucial to identify the complex mixing processes, to reveal signs of mass exchange and mass loss from the system, and to enable a comparison with massive binary evolution models.

OBSERVING DESCRIPTION

We perform G130m/1291 and G160M/1611 COS FUV spectroscopy of the same object at 8 different orbital phase (exposure centered on phases 0.0, 0.125, 0.25, 0.375, 0.5, 0.625, 0.75 and 0.875). Kind request that all observations are done within 2 weeks and at the same LP position.

Visit

Proposal 13806, Visit 01, implementation Fri Jul 25 01:56:09 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: Period 1.124147 D AND ZERO-PHASE HJD2457023.218; GROUP 01,02,03,04,05,06,07,08 WITHIN 12D

Diagnostics

(Visit 01) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

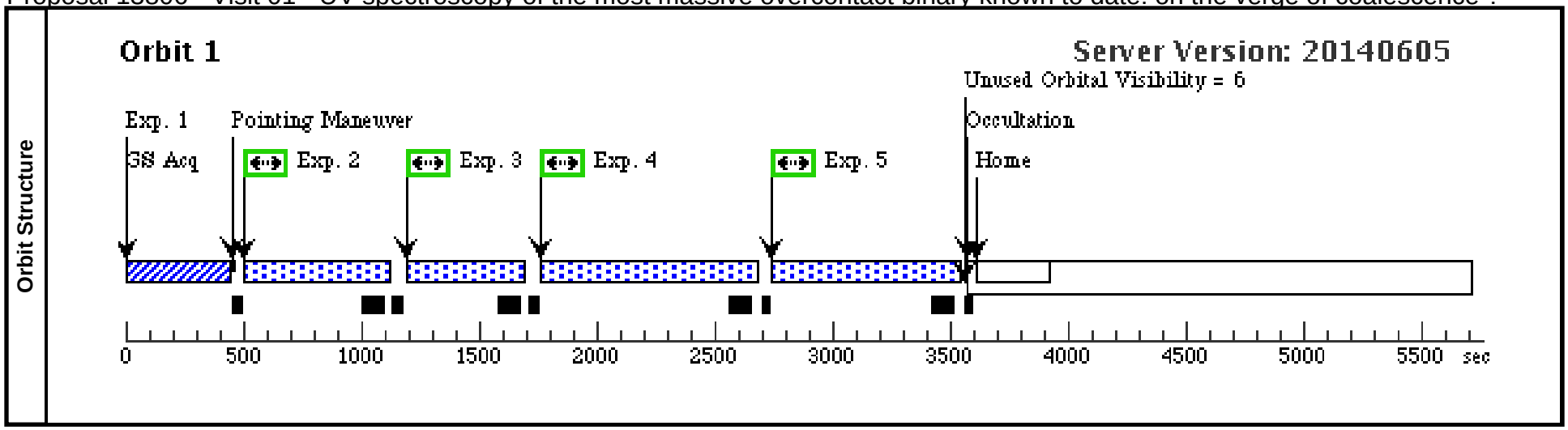
(Visit 01) Warning (Form): If the target coordinates are not known to 0.4" (or better), an ACQ/SEARCH should precede the ACQ/IMAGE.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VFTS352	RA: 05 38 28.4253 (84.6184388d) Dec: -69 11 18.96 (-69.18860d) Equinox: J2000		V=14.4 F275W = 13.3mag	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.624332)	(1) VFTS352	COS/NUV, ACQ/IMAGE, PSA	MIRRORB		PHASE 0.965 TO 0.995		5.3 Secs (5.3 Secs) *[==>]*	*[1]*
2	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=1; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
3	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
4	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=1; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*
5	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=3; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*


Orbit Structure
Orbit 1
Server Version: 20140605
Unused Orbital Visibility = 6
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Pointing Maneuver
Occultation
GS Acq
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13806, Visit 02 Fri Jul 25 01:56:09 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: Period 1.124147 D AND ZERO-PHASE HJD2457023.218; GROUP 02,01,03,04,05,06,07,08 WITHIN 12D

Diagnostics

(Visit 02) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

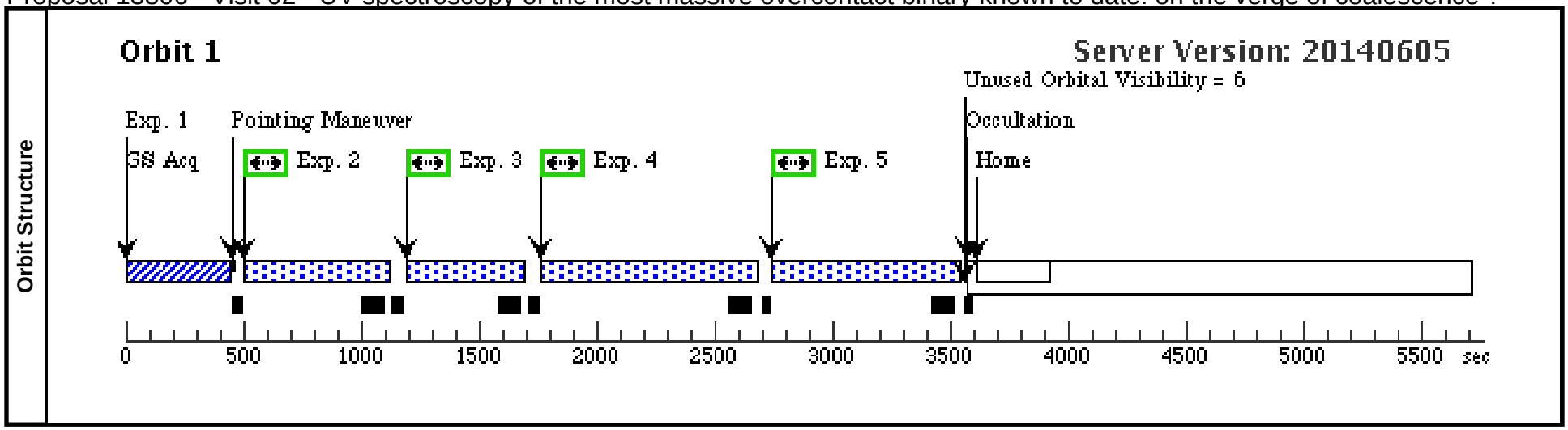
(Visit 02) Warning (Form): If the target coordinates are not known to 0.4" (or better), an ACQ/SEARCH should precede the ACQ/IMAGE.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VFTS352	RA: 05 38 28.4253 (84.6184388d) Dec: -69 11 18.96 (-69.18860d) Equinox: J2000		V=14.4 F275W = 13.3mag	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.624332)	(1) VFTS352	COS/NUV, ACQ/IMAGE, PSA	MIRRORB		PHASE 0.09 TO 0.12		5.3 Secs (5.3 Secs) *[==>]*	*[1]*
2	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=2; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
3	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
4	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=2; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*
5	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=4; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*


Orbit Structure
Orbit 1
Server Version: 20140605
Unused Orbital Visibility = 6
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Pointing Maneuver
Occultation
GS Acq
Exp. 2
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Exp. 4
Exp. 5
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2000
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3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13806, Visit 03 Fri Jul 25 01:56:09 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: Period 1.124147 D AND ZERO-PHASE HJD2457023.218; GROUP 03,01,02,04,05,06,07,08 WITHIN 12D

Diagnostics

(Visit 03) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

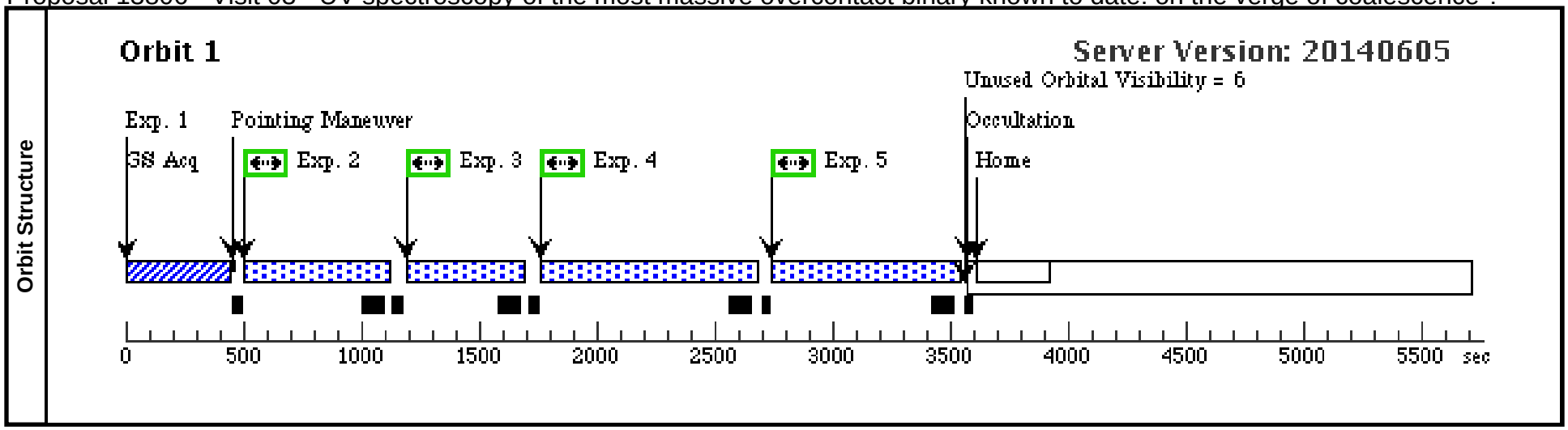
(Visit 03) Warning (Form): If the target coordinates are not known to 0.4" (or better), an ACQ/SEARCH should precede the ACQ/IMAGE.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VFTS352	RA: 05 38 28.4253 (84.6184388d) Dec: -69 11 18.96 (-69.18860d) Equinox: J2000		V=14.4 F275W = 13.3mag	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.624332)	(1) VFTS352	COS/NUV, ACQ/IMAGE, PSA	MIRRORB		PHASE 0.215 TO 0.245		5.3 Secs (5.3 Secs) *[==>]*	*[1]*
2	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=1; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
3	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
4	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=1; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*
5	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=3; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*


Orbit Structure
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Server Version: 20140605
Unused Orbital Visibility = 6
Exp. 1
Pointing Maneuver
Occultation
GS Acq
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Home
0
500
1000
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sec

Visit

Proposal 13806, Visit 04 Fri Jul 25 01:56:09 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: Period 1.124147 D AND ZERO-PHASE HJD2457023.218; GROUP 04,01,02,03,05,06,07,08 WITHIN 12D

Diagnostics

(Visit 04) Warning (Form): If the target coordinates are not known to 0.4" (or better), an ACQ/SEARCH should precede the ACQ/IMAGE.

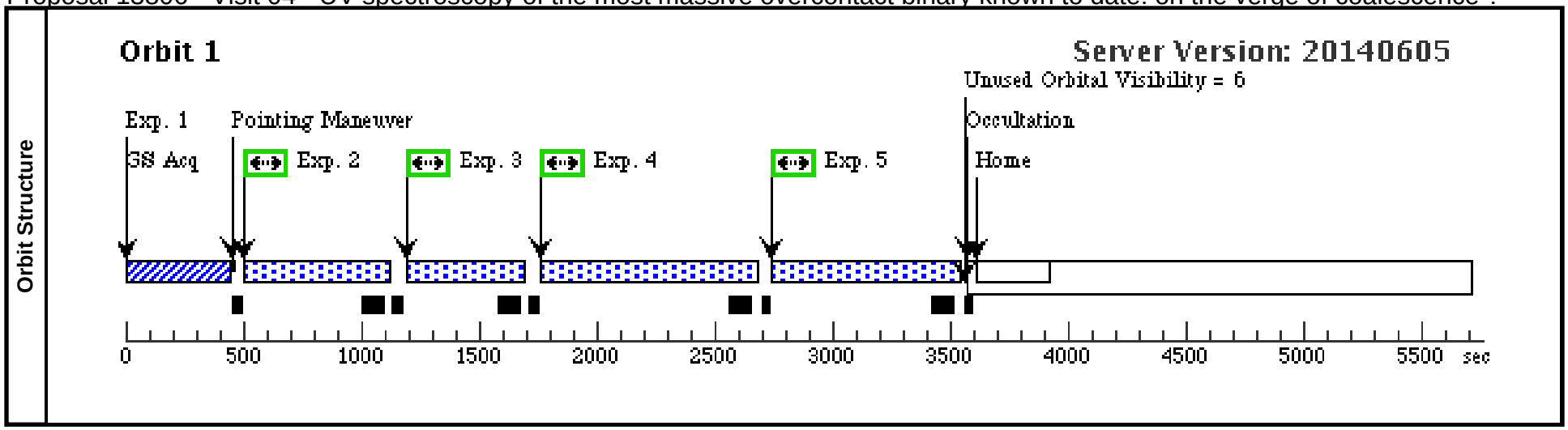
(Visit 04) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VFTS352	RA: 05 38 28.4253 (84.6184388d) Dec: -69 11 18.96 (-69.18860d) Equinox: J2000		V=14.4 F275W = 13.3mag	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.624 332)	(1) VFTS352	COS/NUV, ACQ/IMAGE, PSA	MIRRORB		PHASE 0.340 TO 0. 37		5.3 Secs (5.3 Secs) *[==>]*	*[1]*
2	(COS.sp.625 615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=2; BUFFER-TIME=35 0			450 Secs (450 Secs) *[==>]*	*[1]*
3	(COS.sp.625 615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=35 0			450 Secs (450 Secs) *[==>]*	*[1]*
4	(COS.sp.625 621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=2; BUFFER-TIME=64 0			750 Secs (750 Secs) *[==>]*	*[1]*
5	(COS.sp.625 621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=4; BUFFER-TIME=64 0			750 Secs (750 Secs) *[==>]*	*[1]*


Orbit Structure
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Unused Orbital Visibility = 6
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GS Acq
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Exp. 3
Exp. 4
Exp. 5
Home
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sec

Visit

Proposal 13806, Visit 05 Fri Jul 25 01:56:09 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: Period 1.124147 D AND ZERO-PHASE HJD2457023.218; GROUP 05,01,02,03,04,06,07,08 WITHIN 12D

Diagnostics

(Visit 05) Warning (Form): If the target coordinates are not known to 0.4" (or better), an ACQ/SEARCH should precede the ACQ/IMAGE.

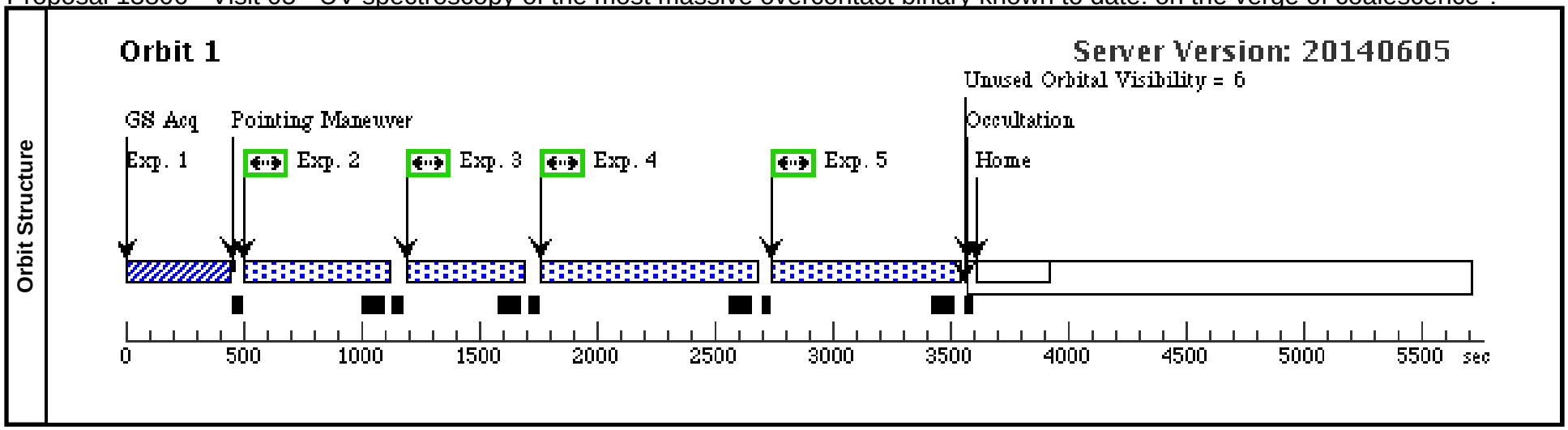
(Visit 05) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VFTS352	RA: 05 38 28.4253 (84.6184388d) Dec: -69 11 18.96 (-69.18860d) Equinox: J2000		V=14.4 F275W = 13.3mag	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.624332)	(1) VFTS352	COS/NUV, ACQ/IMAGE, PSA	MIRRORB		PHASE 0.465 TO 0.495		5.3 Secs (5.3 Secs) *[==>]*	*[1]*
2	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=2; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
3	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
4	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=2; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*
5	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=4; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*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Server Version: 20140605
Unused Orbital Visibility = 6
GS Acq
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Exp. 5
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Visit

Proposal 13806, Visit 06 Fri Jul 25 01:56:09 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: Period 1.124147 D AND ZERO-PHASE HJD2457023.218; GROUP 06,01,02,03,04,05,07,08 WITHIN 12D

Diagnostics

(Visit 06) Warning (Form): If the target coordinates are not known to 0.4" (or better), an ACQ/SEARCH should precede the ACQ/IMAGE.

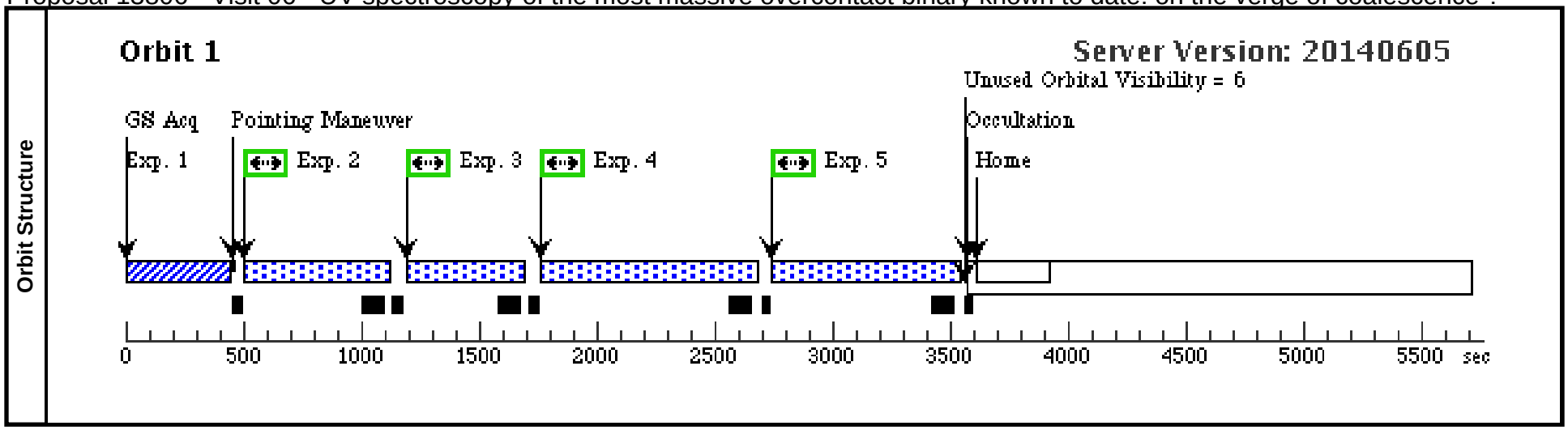
(Visit 06) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VFTS352	RA: 05 38 28.4253 (84.6184388d) Dec: -69 11 18.96 (-69.18860d) Equinox: J2000		V=14.4 F275W = 13.3mag	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.624332)	(1) VFTS352	COS/NUV, ACQ/IMAGE, PSA	MIRRORB		PHASE 0.59 TO 0.62		5.3 Secs (5.3 Secs) *[==>]*	*[1]*
2	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=1; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
3	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
4	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=1; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*
5	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=3; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*


Orbit Structure
Orbit 1
Server Version: 20140605
Unused Orbital Visibility = 6
GS Acq
Pointing Maneuver
Occultation
Exp. 1
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Exp. 3
Exp. 4
Exp. 5
Home
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Visit

Proposal 13806, Visit 07 Fri Jul 25 01:56:09 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: Period 1.124147 D AND ZERO-PHASE HJD2457023.218; GROUP 07,01,02,03,04,05,06,08 WITHIN 12D

Diagnostics

(Visit 07) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

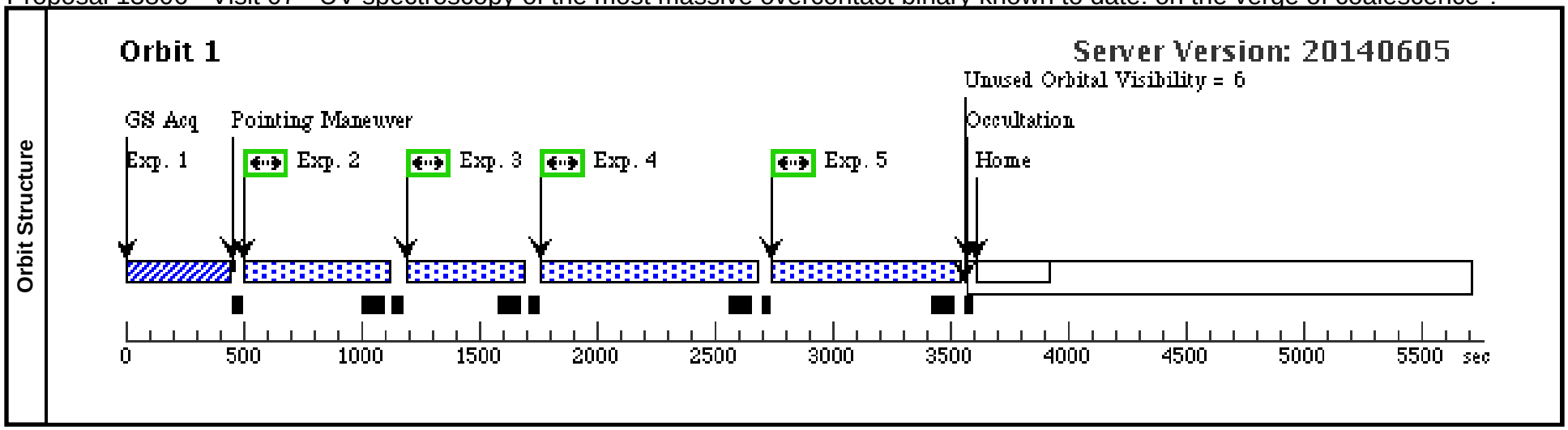
(Visit 07) Warning (Form): If the target coordinates are not known to 0.4" (or better), an ACQ/SEARCH should precede the ACQ/IMAGE.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VFTS352	RA: 05 38 28.4253 (84.6184388d) Dec: -69 11 18.96 (-69.18860d) Equinox: J2000		V=14.4 F275W = 13.3mag	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.624 332)	(1) VFTS352	COS/NUV, ACQ/IMAGE, PSA	MIRRORB		PHASE 0.715 TO 0. 745		5.3 Secs (5.3 Secs) *[==>]*	*[1]*
2	(COS.sp.625 615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=2; BUFFER-TIME=35 0			450 Secs (450 Secs) *[==>]*	*[1]*
3	(COS.sp.625 615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=35 0			450 Secs (450 Secs) *[==>]*	*[1]*
4	(COS.sp.625 621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=2; BUFFER-TIME=64 0			750 Secs (750 Secs) *[==>]*	*[1]*
5	(COS.sp.625 621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=4; BUFFER-TIME=64 0			750 Secs (750 Secs) *[==>]*	*[1]*


Orbit Structure
Orbit 1
Server Version: 20140605
Unused Orbital Visibility = 6
GS Acq
Pointing Maneuver
Occultation
Exp. 1
Exp. 2
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Exp. 4
Exp. 5
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3000
3500
4000
4500
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5500
sec

Visit

Proposal 13806, Visit 08 Fri Jul 25 01:56:09 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: Period 1.124147 D AND ZERO-PHASE HJD2457023.218; GROUP 08,01,02,03,04,05,06,07 WITHIN 12D

Diagnostics

(Visit 08) Warning (Form): If the target coordinates are not known to 0.4" (or better), an ACQ/SEARCH should precede the ACQ/IMAGE.

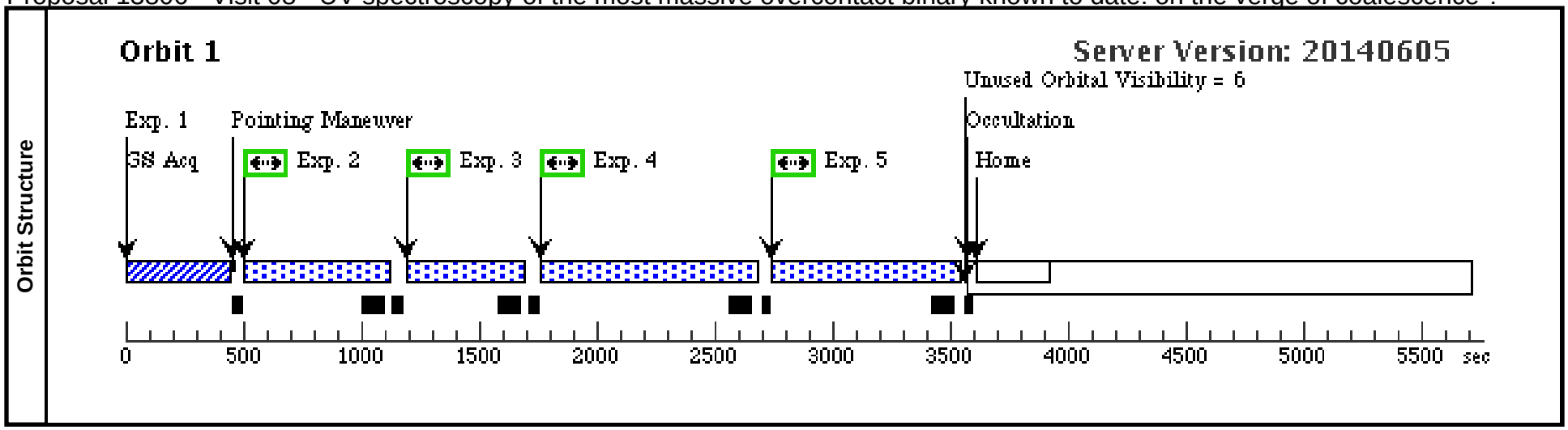
(Visit 08) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VFTS352	RA: 05 38 28.4253 (84.6184388d) Dec: -69 11 18.96 (-69.18860d) Equinox: J2000		V=14.4 F275W = 13.3mag	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.624332)	(1) VFTS352	COS/NUV, ACQ/IMAGE, PSA	MIRRORB		PHASE 0.840 TO 0.870		5.3 Secs (5.3 Secs) *[==>]*	*[1]*
2	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=1; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
3	(COS.sp.625615)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=350			450 Secs (450 Secs) *[==>]*	*[1]*
4	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=1; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*
5	(COS.sp.625621)	(1) VFTS352	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=3; BUFFER-TIME=640			750 Secs (750 Secs) *[==>]*	*[1]*


Orbit Structure
Orbit 1
Server Version: 20140605
Unused Orbital Visibility = 6
Exp. 1
Pointing Maneuver
Occultation
GS Acq
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec