13436 - Ion Temperatures in a Collisionless Supernove Remnant Shock Wave

Cycle: 21, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. John C. Raymond (PI) (Contact)	**Smithsonian Institution Astrophysical Observatory**	**jraymond@cfa.harvard.edu**
Dr. Parviz Ghavamian (CoI)	Towson University	pghavamian@towson.edu
Dr. William P. Blair (CoI)	The Johns Hopkins University	wpb@pha.jhu.edu
Dr. Richard Edgar (CoI)	Smithsonian Institution Astrophysical Observatory	edgar@head-cfa.harvard.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) CYGNUSLOOP-P1	COS/FUV	5	11-Jul-2013 20:25:11.0	yes
02	(1) CYGNUSLOOP-P1	COS/FUV	4	11-Jul-2013 20:25:20.0	yes
03	(2) NGC6853	COS/FUV	1	11-Jul-2013 20:25:26.0	yes

10 Total Orbits Used

ABSTRACT

Electrons, protons and heavy ions can all have different temperatures behind a collisionless shock. The temperatures are important for understanding the physics of the shock and for correctly interpreting observations in terms of shock parameters. They also bear upon the acceleration of different species in the Cosmic Ray population. We propose to obtain a deep enough integration to measure the kinetic temperatures of C IV and He II in a 350 km/s non-radiative shock in the northern Cygnus Loop where we have extensive complementary H alpha and X-ray data.

OBSERVING DESCRIPTION

We wish to observe a position in the Cygnus Loop that we observed for 1 orbit under a Cycle 19 proposal for 9 additional orbits in order to obtain high enough signal-to-noise to measure the line widths of the He II 1640 and C IV 1550 lines. All the observations will be made with th COS 160M grating, 1577 tilt.

We also wish to observe the planetary nebula NGC 6853 for one orbit in order to obtain a reliable measurement of the instrument profile of COS when the PSA is filled with diffuse emission.

Visit

Proposal 13436, Cygnus P7-1 Visit 1 (01) Fri Jul 12 00:25:33 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: This is the first visit to Cygnus Loop P7, Position 1 to obtain 5 orbits with COS , G160M, centered at 1577 A Each orbit is divided into 4 FP-positions.

Diagnostics

(Cygnus P7-1 Visit 1 (01)) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronography with STIS or COS.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CYGNUSLOOP-P1	RA: 20 54 43.6220 (313.6817583d) Dec: +32 15 57.00 (32.26583d) Equinox: J2000		V=35+/-0 C IV 1550 and He II 1640 fluxes observed with COS are 1.12e-15 and 1.01e-15 erg/(cm2 s), respectively.	Reference Frame: ICRS

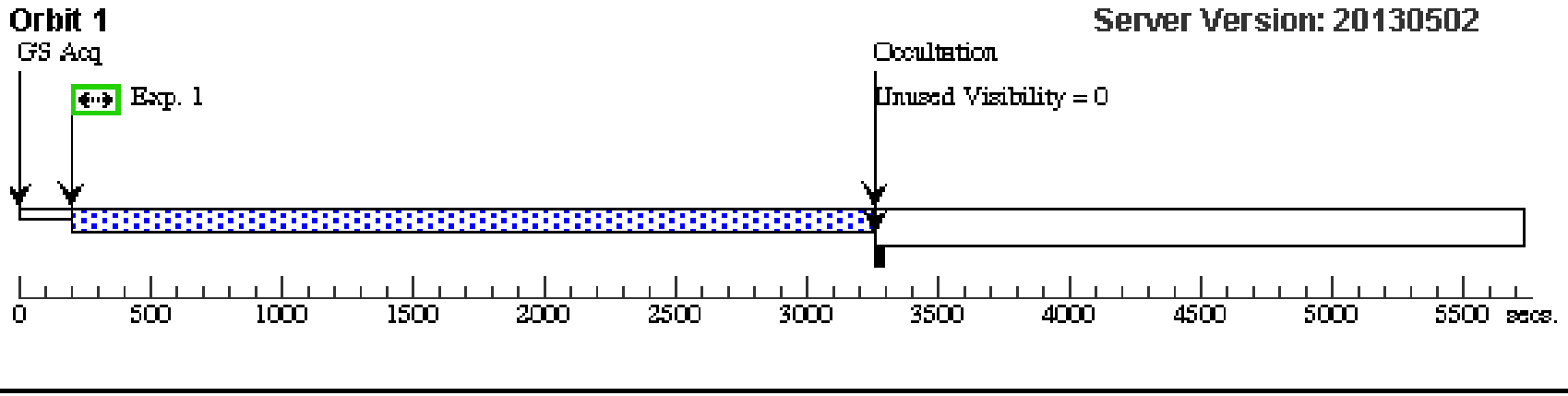
Comments: The Cygnus Loop position is slightly different (10 arcsec) than that listed in the proposal. We have decided that Position 1 from our Cycle 19 HST program is a better option than Position 2 listed in Table 1 of the proposal because the He II line (the more challenging observation) is brighter at Position 1 and because there is less possibility of confusion with C IV produced by carbon ions that come from sputtering of dust grains. Positions 1 and 2 are separated by 10", so this is a very slight change. Also, we have added the 0.2" proper motion appropriate for an observation next year. As the emission fills the aperture, this proper motion correction does not have to be precise.

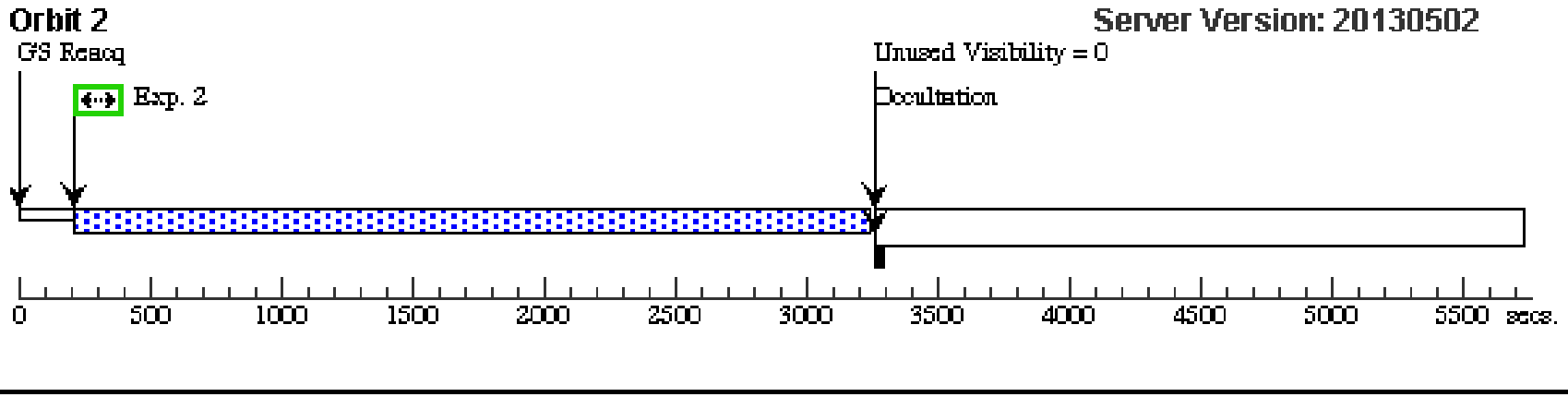
APT warns that acquisitions should be performed. This is an extended source, and acquisition is not feasible.

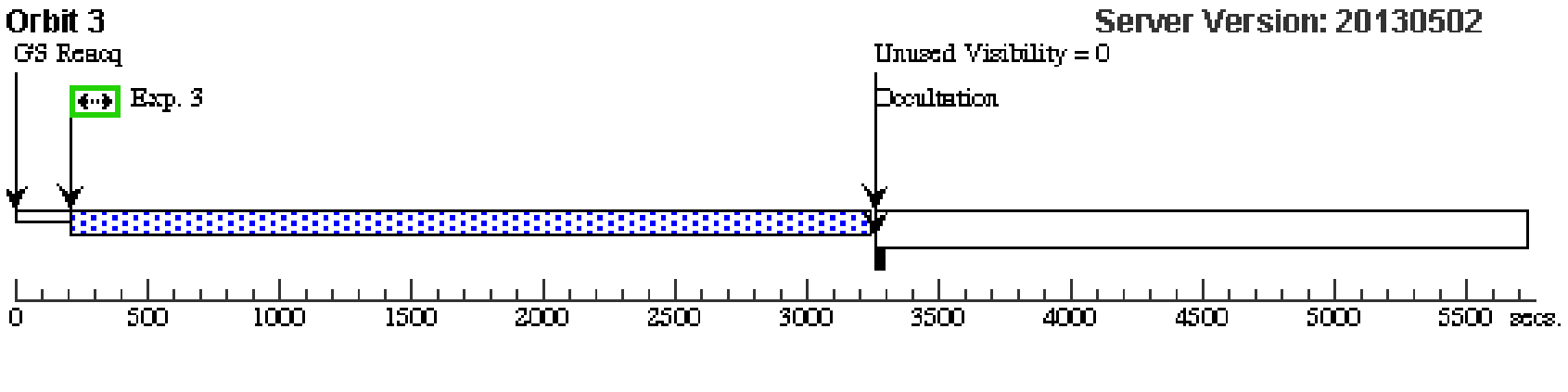
Exposures

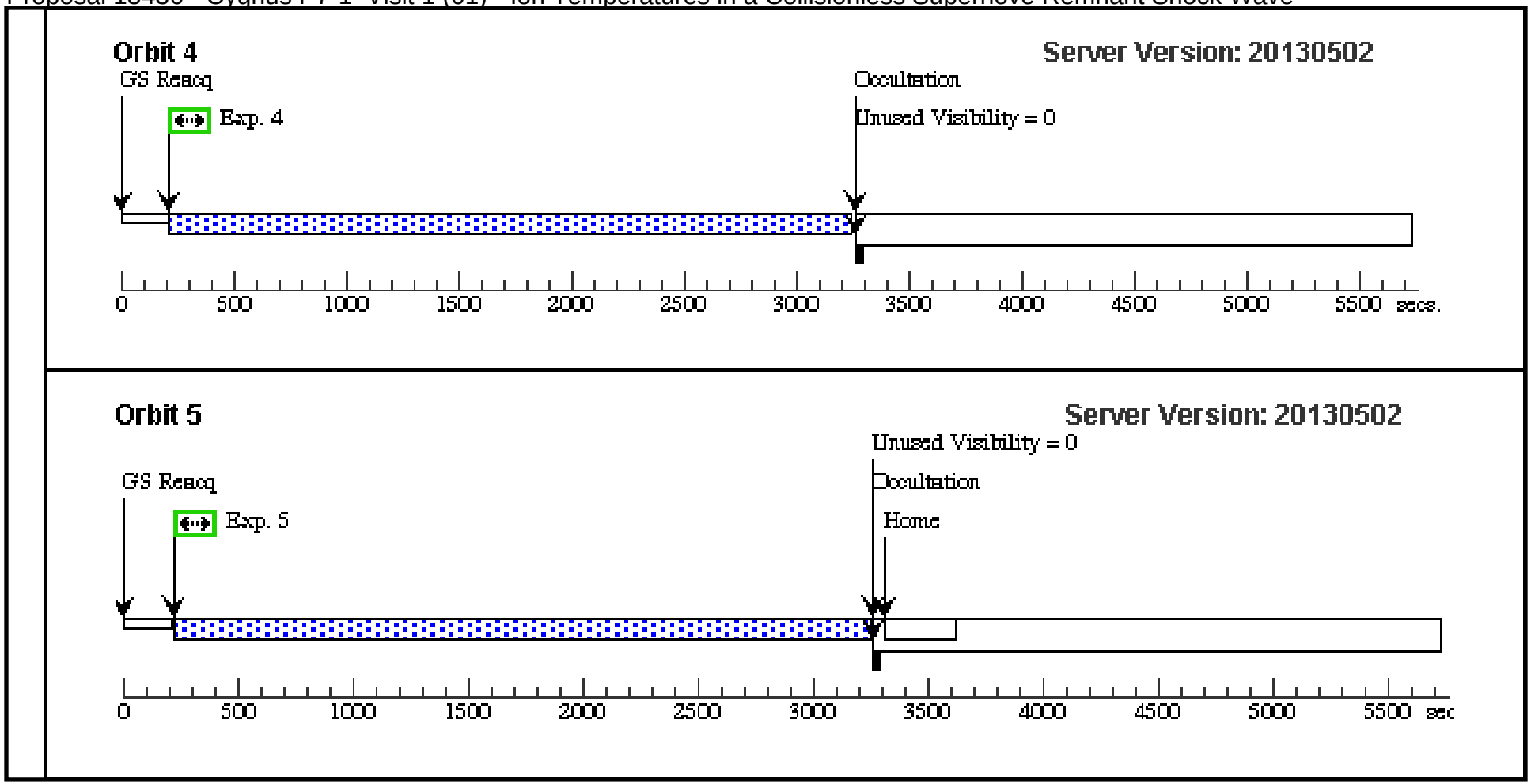
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(512166)	(1) CYGNUSLOOP-P1	COS/FUV, TIME-TAG, PSA	G160M 1577 A	EXTENDED=YES; BUFFER-TIME=15000; FP-POS=1			625 Secs (2868 Secs) *[==>2868.0 Secs]*	*[1]*
2	(512166)	(1) CYGNUSLOOP-P1	COS/FUV, TIME-TAG, PSA	G160M 1577 A	EXTENDED=YES; BUFFER-TIME=15000; FP-POS=2			625 Secs (2981 Secs) *[==>2981.0 Secs]*	*[2]*
3	(512166)	(1) CYGNUSLOOP-P1	COS/FUV, TIME-TAG, PSA	G160M 1577 A	EXTENDED=YES; BUFFER-TIME=15000; FP-POS=3			625 Secs (2981 Secs) *[==>2981.0 Secs]*	*[3]*
4	(512166)	(1) CYGNUSLOOP-P1	COS/FUV, TIME-TAG, PSA	G160M 1577 A	EXTENDED=YES; BUFFER-TIME=15000; FP-POS=4			625 Secs (2981 Secs) *[==>2981.0 Secs]*	*[4]*
5	(512166)	(1) CYGNUSLOOP-P1	COS/FUV, TIME-TAG, PSA	G160M 1577 A	EXTENDED=YES; BUFFER-TIME=15000; FP-POS=4			625 Secs (2981 Secs) *[==>2981.0 Secs]*	*[5]*

Orbit Structure








Orbit 4
Server Version: 20130502
GS Reacq
Exp. 4
Occultation
Unused Visibility = 0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 5
Server Version: 20130502
Unused Visibility = 0
GS Reacq
Occultation
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13436, Visit 02 Fri Jul 12 00:25:36 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: This is the second visit to Position 1 of Cygnus P-7 to obtain 4 orbits, each split into 4 FP-positions.

Diagnostics

(Visit 02) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronography with STIS or COS.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CYGNUSLOOP-P1	RA: 20 54 43.6220 (313.6817583d) Dec: +32 15 57.00 (32.26583d) Equinox: J2000		V=35+/-0 C IV 1550 and He II 1640 fluxes observed with COS are 1.12e-15 and 1.01e-15 erg/(cm2 s), respectively.	Reference Frame: ICRS

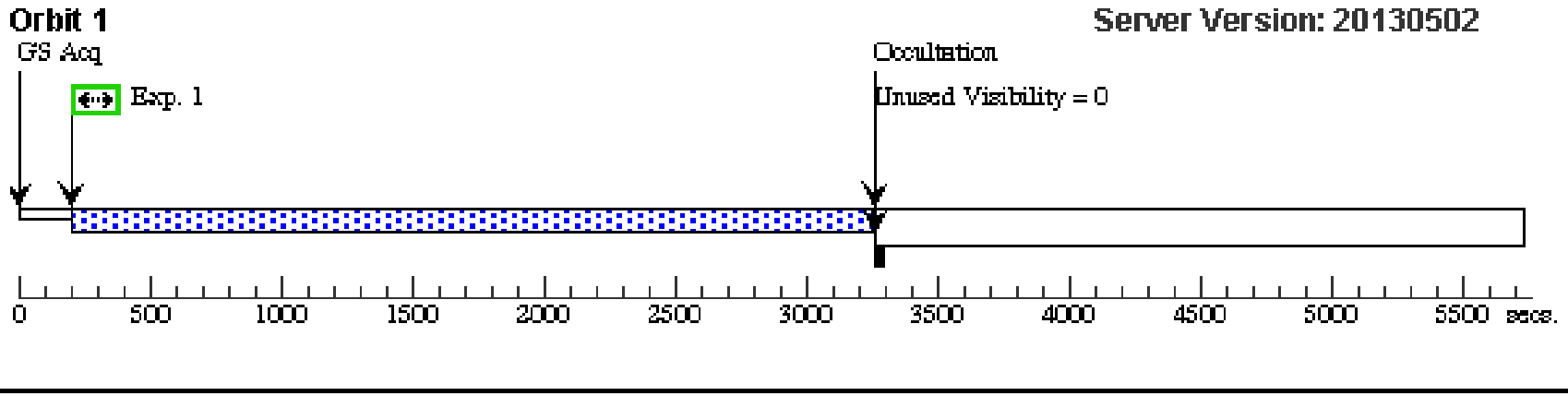
Comments: The Cygnus Loop position is slightly different (10 arcsec) than that listed in the proposal. We have decided that Position 1 from our Cycle 19 HST program is a better option than Position 2 listed in Table 1 of the proposal because the He II line (the more challenging observation) is brighter at Position 1 and because there is less possibility of confusion with C IV produced by carbon ions that come from sputtering of dust grains. Positions 1 and 2 are separated by 10", so this is a very slight change. Also, we have added the 0.2" proper motion appropriate for an observation next year. As the emission fills the aperture, this proper motion correction does not have to be precise.

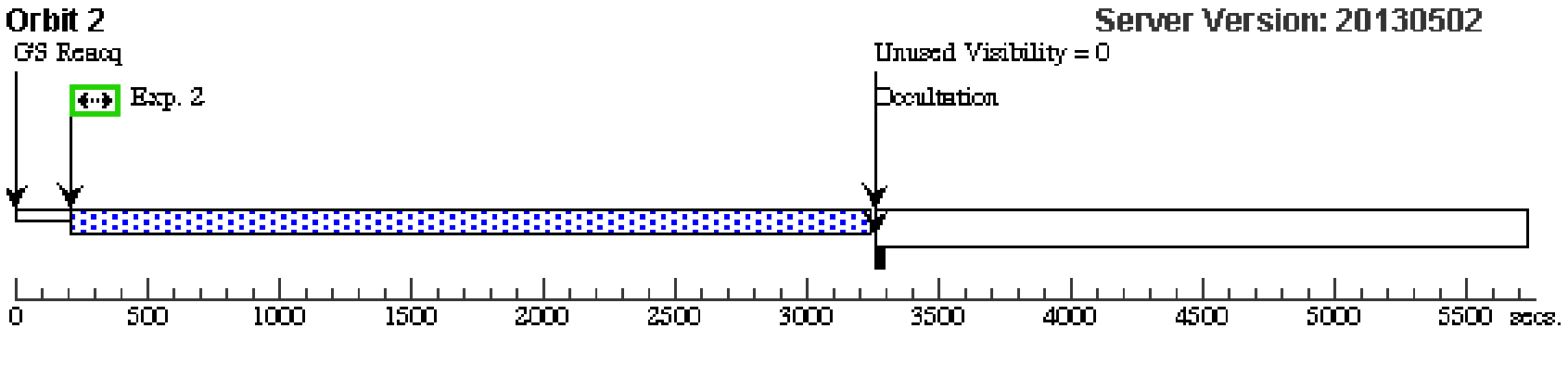
APT warns that acquisitions should be performed. This is an extended source, and acquisition is not feasible.

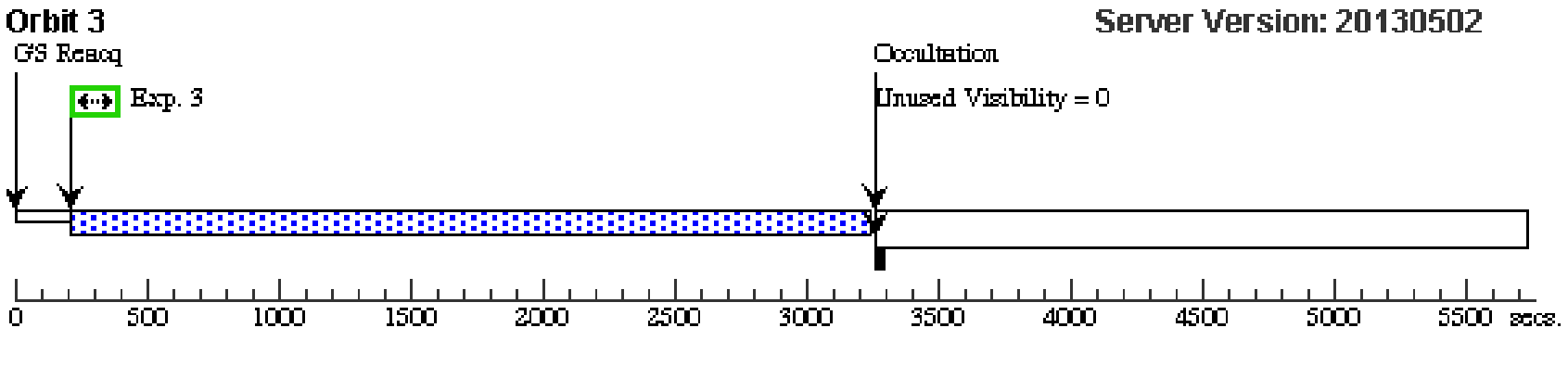
Exposures

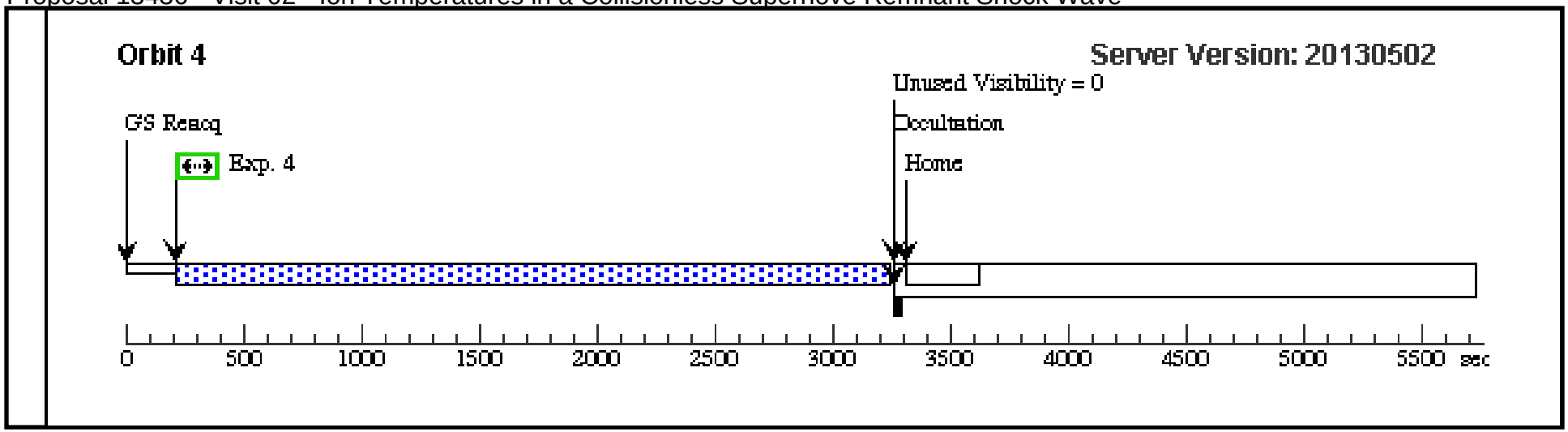
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(512166)	(1) CYGNUSLOOP-P1	COS/FUV, TIME-TAG, PSA	G160M 1577 A	EXTENDED=YES; BUFFER-TIME=15000; FP-POS=1			625 Secs (2868 Secs) *[==>2868.0 Secs]*	***[1]***
2	(512166)	(1) CYGNUSLOOP-P1	COS/FUV, TIME-TAG, PSA	G160M 1577 A	EXTENDED=YES; BUFFER-TIME=15000; FP-POS=2			625 Secs (2981 Secs) *[==>2981.0 Secs]*	***[2]***
3	(512166)	(1) CYGNUSLOOP-P1	COS/FUV, TIME-TAG, PSA	G160M 1577 A	EXTENDED=YES; BUFFER-TIME=15000; FP-POS=3			625 Secs (2981 Secs) *[==>2981.0 Secs]*	***[3]***
4	(512166)	(1) CYGNUSLOOP-P1	COS/FUV, TIME-TAG, PSA	G160M 1577 A	EXTENDED=YES; BUFFER-TIME=15000; FP-POS=4			625 Secs (2981 Secs) *[==>2981.0 Secs]*	***[4]***

Orbit Structure








Orbit 4
Server Version: 20130502
Unused Visibility = 0
GS Reacq
Occultation
Exp. 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13436, Visit 03 Fri Jul 12 00:25:38 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: This a one orbit broken in to 4 FP-positions to obtain an observation of a planetary nebula with narrow emission lines that fill the COS PSA aperture. The purpose is to obtain an accurate instrument profile that can be used to deconvolve the profile of the Cygnus Loop shock wave. The position selected is based on IUE Small Aperture exposure SWP17420, and it is 49" W and 27" S of the central star.

Diagnostics

(Visit 03) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronography with STIS or COS.

Fixed Targets

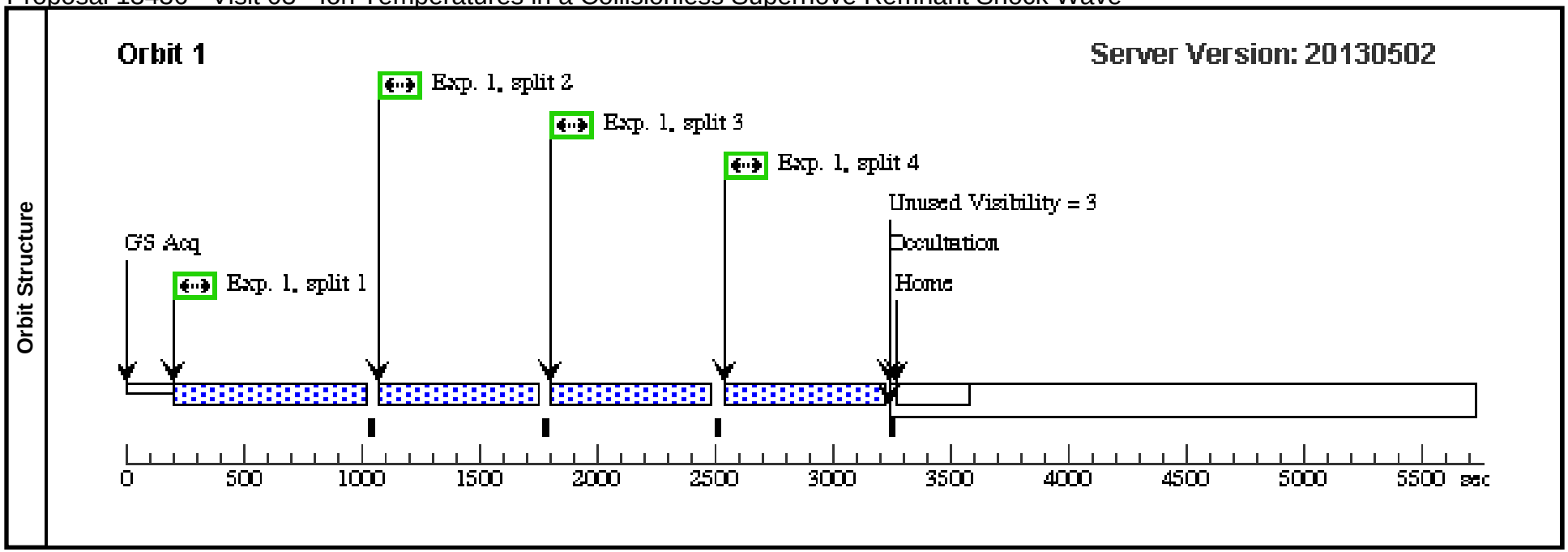
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC6853	RA: 19 59 36.5500 (299.9022917d) Dec: +22 42 48.20 (22.71339d) Equinox: J2000		V=35+/-0 C IV 1550 and He II 1640 are 1.4e-14 and 3.0e-14 ergs/(cm2 s) in the COS aperture respectively	Reference Frame: ICRS

Comments: This observation is designed to obtain the instrument profile of COS with the G160M grating for an extended source that fills the aperture. The line width in this planetary nebula is small compared to the roughly 200 km/s resolution of COS with the PSA aperture filled.

APT warns that target acquistion is recommended, but this is a very large extended source, so acquistion is not feasible.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(512189)	(2) NGC6853	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=15000; EXTENDED=YES; FP-POS=ALL			625 Secs (2527 Secs) *[==>637.0 Secs (Split 1)]* *[==>630.0 Secs (Split 2)]* *[==>630.0 Secs (Split 3)]* *[==>630.0 Secs (Split 4)]*	***[1]***


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