13439 - Gas Physics in Cool-Core Clusters: the Virgo Cluster

Cycle: 21, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(2) M87-FILAMENTS-COS (3) M87-FILAMENTS-COS-OFFSET	COS/FUV COS/NUV	5	07-Jun-2013 00:55:44.0	yes
02	(2) M87-FILAMENTS-COS (3) M87-FILAMENTS-COS-OFFSET	COS/FUV COS/NUV	5	07-Jun-2013 00:56:05.0	yes
03	(1) M87-FILAMENTS-SBC	ACS/SBC	2	07-Jun-2013 00:56:16.0	yes

12 Total Orbits Used

ABSTRACT

We have detected and confirmed the presence of high temperature gas at 10^5K associated with the low excitation 10^4K line emission filaments of M87. This is a profoundly important observation bearing on the physics of transport processes in cool-core clusters, mergers and feedback from AGN into the surrounding ISM. We propose to obtain a deep FUV COS spectrum in order to (1) detect lines that are characteristic of gas at a wide range of temperatures and (2) measure the FUV CIV and HeII line widths and velocity. The additional emission lines will allow us to empirically determine the temperature distribution across the critical region between 10^4K ("optical") and 10^7K ("X-ray") in the filament and understand how these two very different components of the ISM are connected, and which theoretical scenario is viable. The line widths and velocity further offer a direct discrimination between competing physical processes that include turbulence, condensation and evaporation - observationally broadening, inflow and outflow respectively. We will also acquire a two orbit ACS/SBC image to image the HeII line, which has a higher mean emission temperature than CIV, in isolation from CIV. In conjunction with our existing FUV deep image, we will be able to study the structure of the filaments in these two lines, and hence reveal the character of spatial variations of the interface between hot and cool gas.

OBSERVING DESCRIPTION

We will obtain 10 orbits of COS G140L spectra, mimicing the target acquisition procedure from proposal 12271. We will also acquire two orbits using the ACS/SBC F165LP filter.

Visit

Proposal 13439, Visit 01 Fri Jun 07 04:56:23 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Exposure 1 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.
(Exposure 2 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.
(Exposure 3 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.
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(Exposure 5 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.
(Exposure 6 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.
(Exposure 7 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.
(Exposure 8 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.
(Exposure 9 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.
(Exposure 10 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.
(Exposure 11 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	M87-FILAMENTS-COS	RA: 12 30 50.9900 (187.7124583d) Dec: +12 23 25.50 (12.39042d) Equinox: J2000		V=16.7+/-0.5 mag given is nucleus	Reference Frame: ICRS
(3)	M87-FILAMENTS-COS-OFFSET	RA: 12 30 49.4230 (187.7059292d) Dec: +12 23 28.04 (12.39112d) Equinox: J2000		V=16	Reference Frame: ICRS

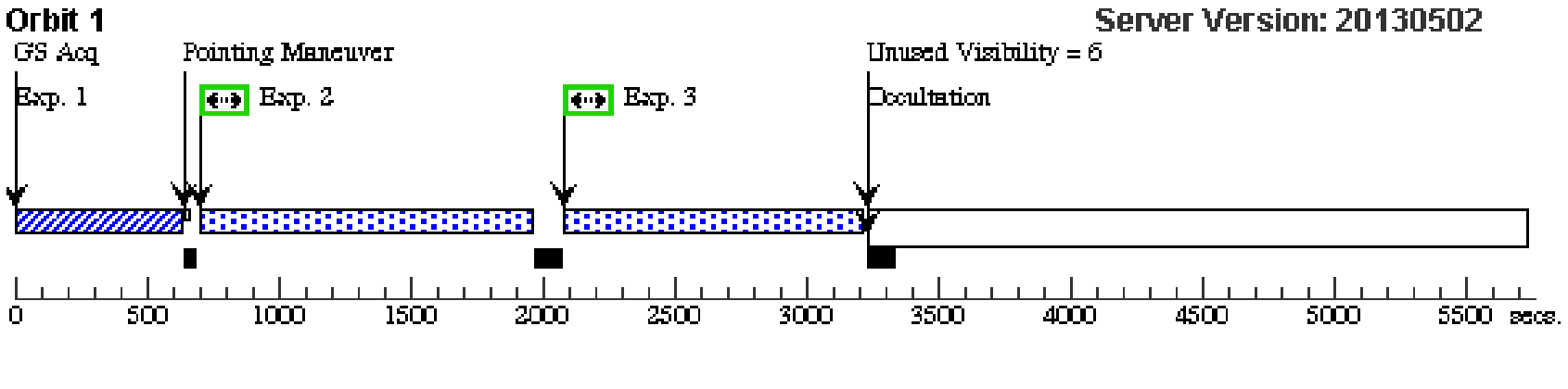
Comments: This is the position of the nucleus of M87

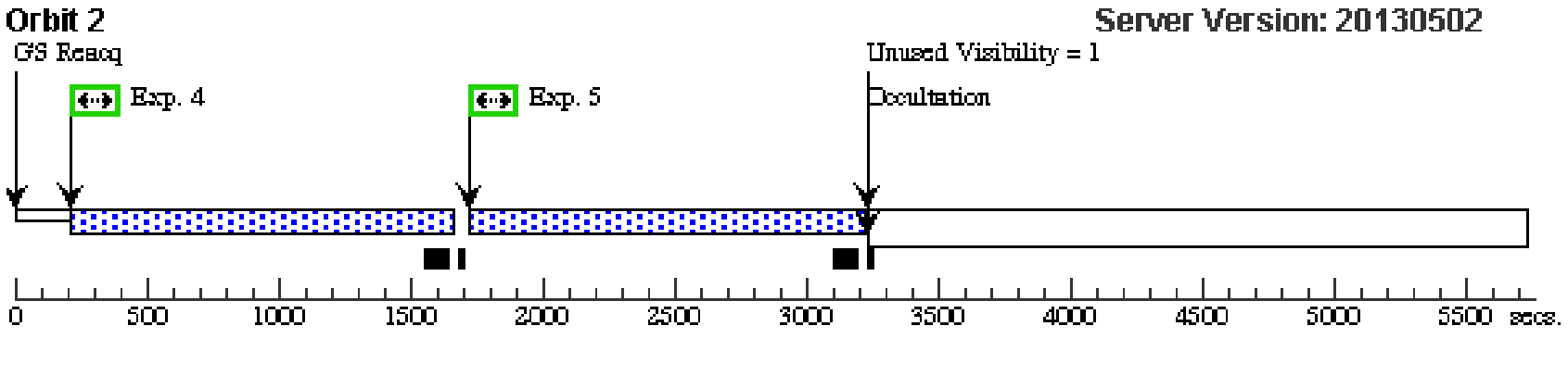
Exposures

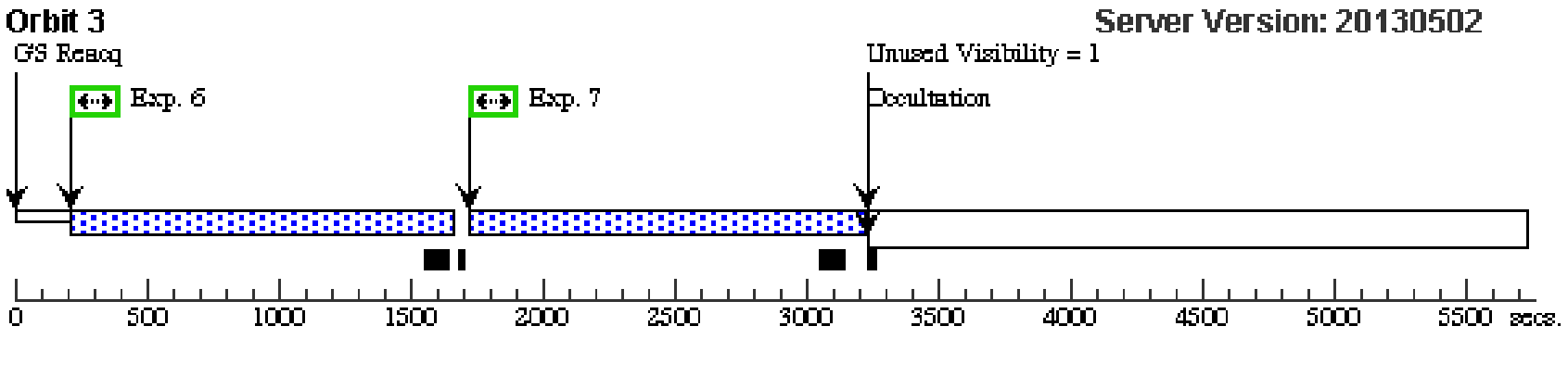
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) M87-FILAMENTS-COS-OFFSET	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				100 Secs (100 Secs) *[==>]*	***[1]***
2		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1100; FLASH=YES; FP-POS=1; EXTENDED=YES			1080 Secs (1080 Secs) *[==>]*	***[1]***
3		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1100; FLASH=YES; FP-POS=1; EXTENDED=YES			1080 Secs (1080 Secs) *[==>]*	***[1]***
4		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=2			1400 Secs (1400 Secs) *[==>]*	***[2]***
5		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1350; FLASH=YES; EXTENDED=YES; FP-POS=2			1450 Secs (1450 Secs) *[==>]*	***[2]***
6		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=3			1400 Secs (1400 Secs) *[==>]*	***[3]***
7		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=3			1450 Secs (1450 Secs) *[==>]*	***[3]***
8		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1350; FLASH=YES; EXTENDED=YES; FP-POS=3			1360 Secs (1360 Secs) *[==>]*	***[4]***
9		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=4			1400 Secs (1400 Secs) *[==>]*	***[4]***
10		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1350; FLASH=YES; EXTENDED=YES; FP-POS=4			1365 Secs (1365 Secs) *[==>]*	***[5]***

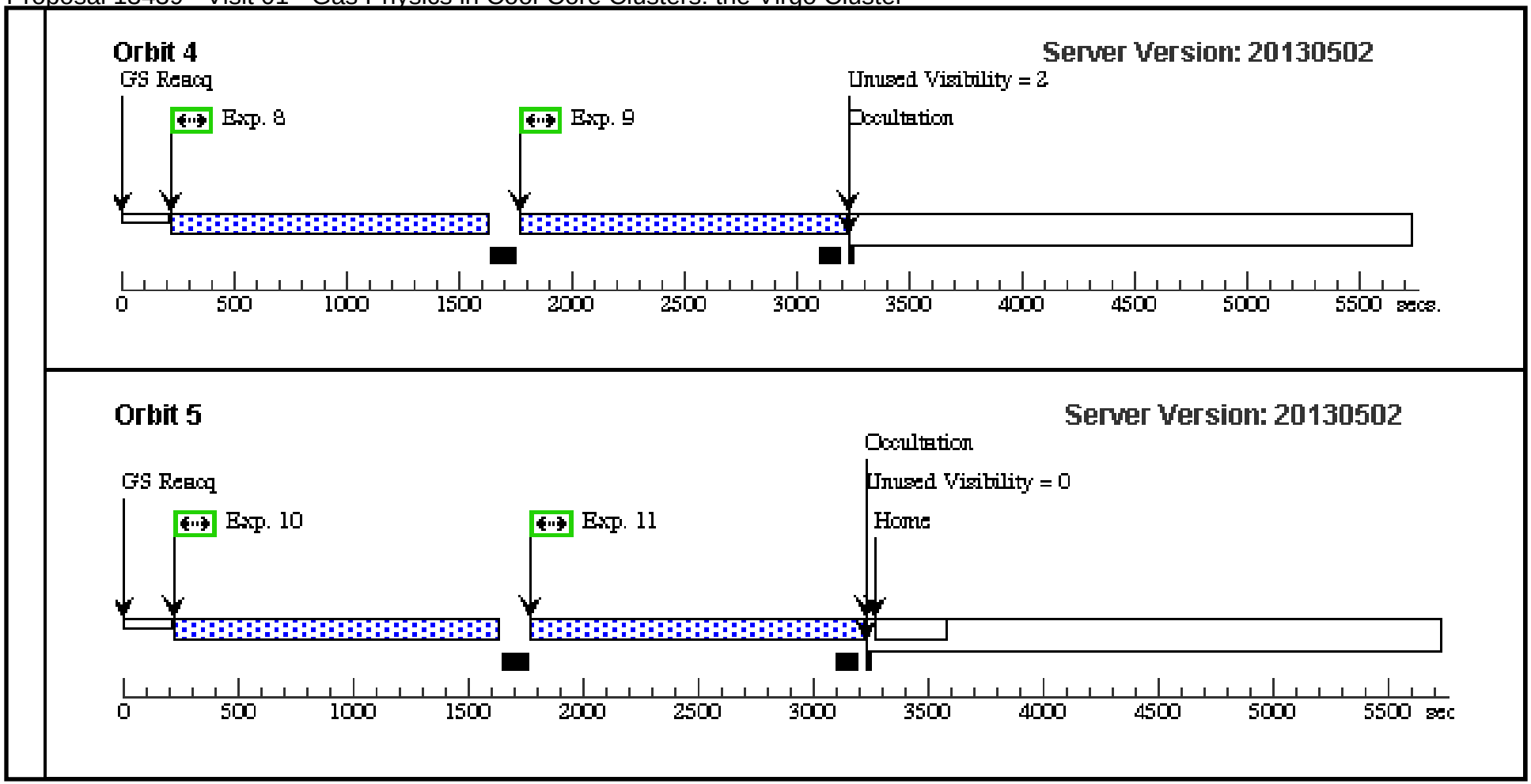
	11	(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=4	1400 Secs (1400 Secs) *[==>]*	***[5]***

Orbit Structure





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secs.
Orbit 5
Server Version: 20130502
Occultation
GS Reacq
Unused Visibility = 0
Exp. 10
Exp. 11
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5500
sec

Visit

Proposal 13439, Visit 02 Fri Jun 07 04:56:30 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Exposure 1 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 2 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 3 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 4 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 5 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 6 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 7 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 8 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 9 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 10 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 11 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	M87-FILAMENTS-COS	RA: 12 30 50.9900 (187.7124583d) Dec: +12 23 25.50 (12.39042d) Equinox: J2000		V=16.7+/-0.5 mag given is nucleus	Reference Frame: ICRS
(3)	M87-FILAMENTS-COS-OFFSET	RA: 12 30 49.4230 (187.7059292d) Dec: +12 23 28.04 (12.39112d) Equinox: J2000		V=16	Reference Frame: ICRS

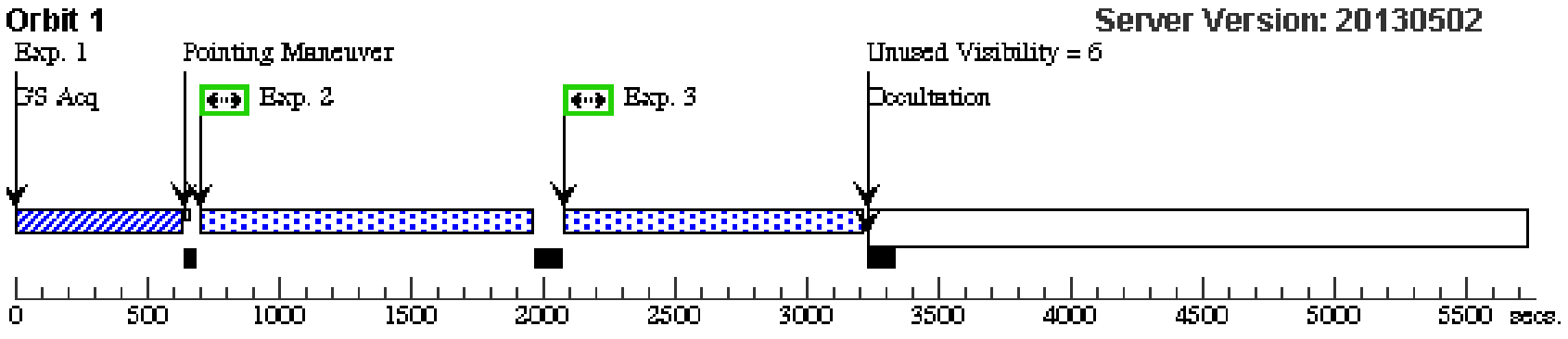
Comments: This is the position of the nucleus of M87

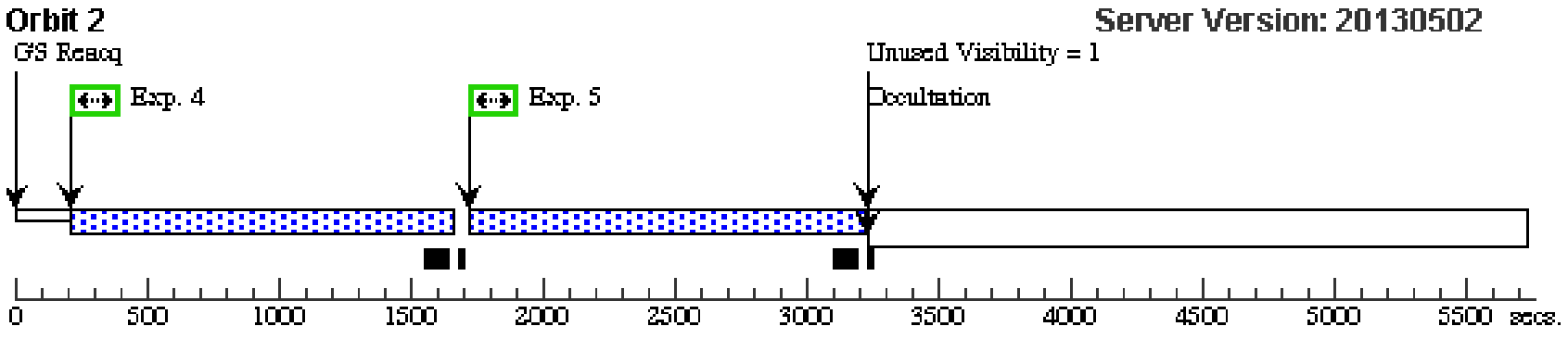
Exposures

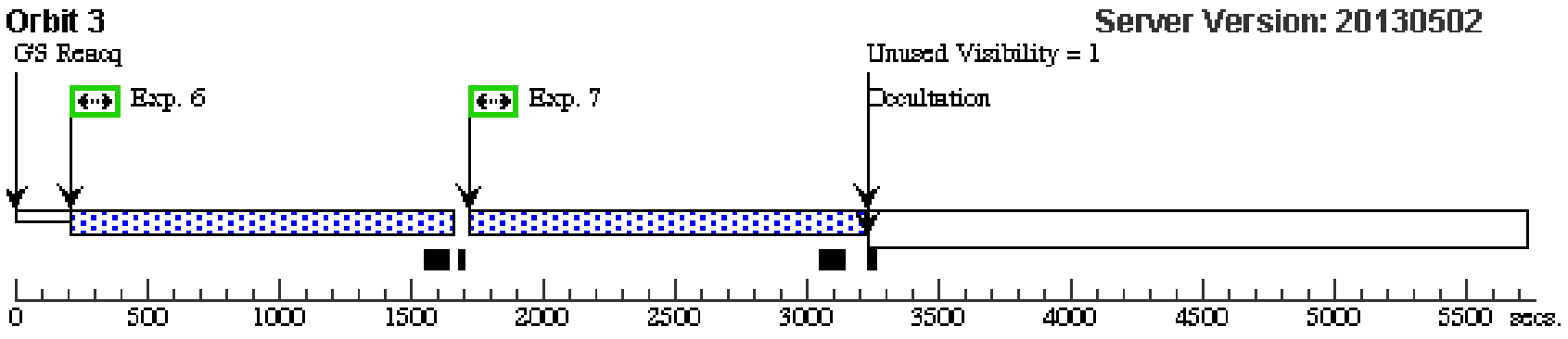
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) M87-FILAMENTS-COS-OFFSET	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				100 Secs (100 Secs) *[==>]*	*[1]*
2		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1100; FLASH=YES; FP-POS=1; EXTENDED=YES			1080 Secs (1080 Secs) *[==>]*	*[1]*
3		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1100; FLASH=YES; FP-POS=1; EXTENDED=YES			1080 Secs (1080 Secs) *[==>]*	*[1]*
4		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=2			1400 Secs (1400 Secs) *[==>]*	*[2]*
5		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1350; FLASH=YES; EXTENDED=YES; FP-POS=2			1450 Secs (1450 Secs) *[==>]*	*[2]*
6		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=3			1400 Secs (1400 Secs) *[==>]*	*[3]*
7		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=3			1450 Secs (1450 Secs) *[==>]*	*[3]*
8		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1350; FLASH=YES; EXTENDED=YES; FP-POS=3			1360 Secs (1360 Secs) *[==>]*	*[4]*
9		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=4			1400 Secs (1400 Secs) *[==>]*	*[4]*
10		(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1350; FLASH=YES; EXTENDED=YES; FP-POS=4			1365 Secs (1365 Secs) *[==>]*	*[5]*

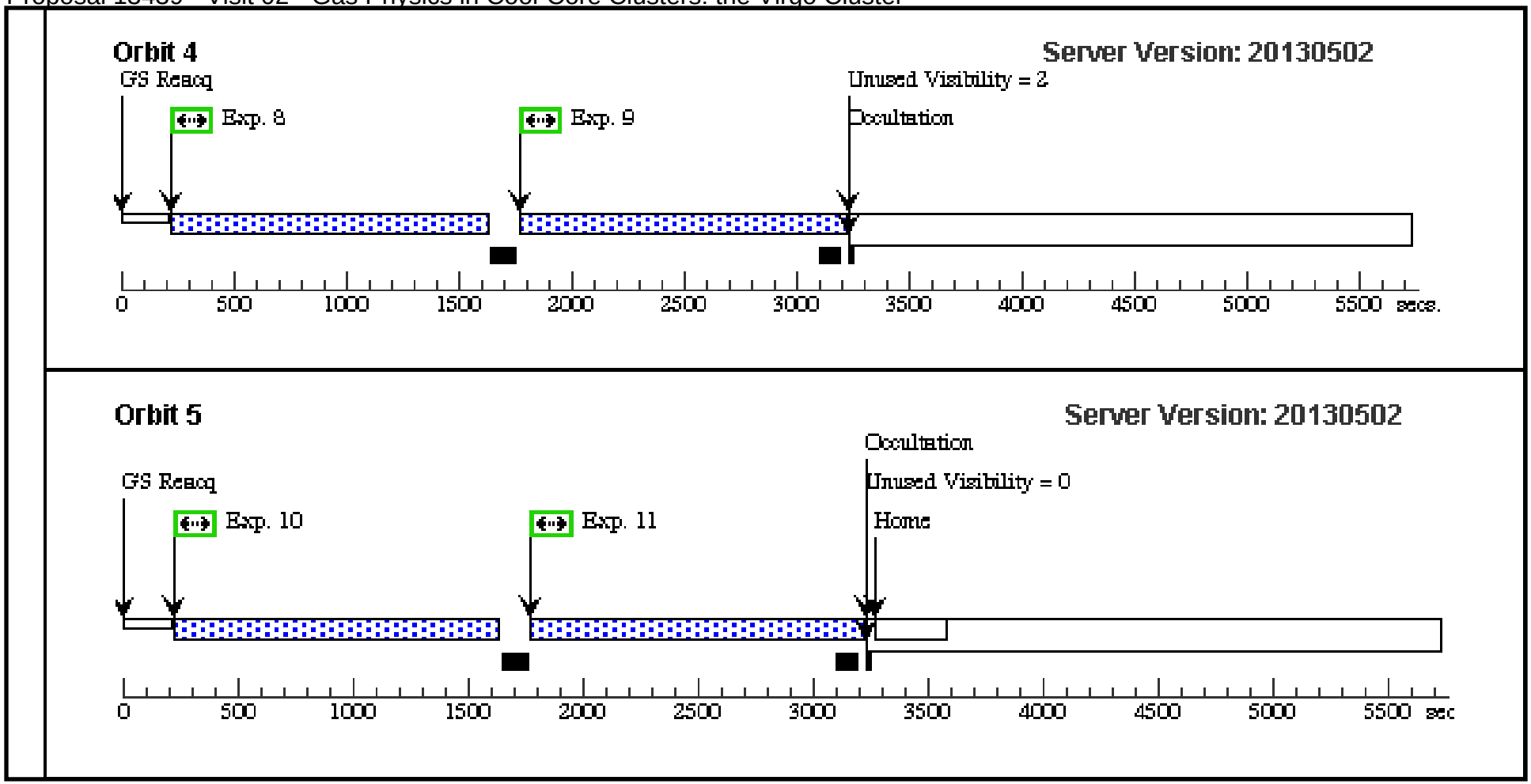
	11	(2) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=4	1400 Secs (1400 Secs) *[==>]*	 ***[5]***

Orbit Structure





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5500
secs.
Orbit 5
Server Version: 20130502
Occultation
GS Reacq
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Exp. 10
Exp. 11
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4500
5000
5500
sec

Visit

Proposal 13439, Visit 03 Fri Jun 07 04:56:35 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: ACS/SBC

Special Requirements: PCS MODE FINE

Diagnostics

(1 (03.001)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(2 (03.002)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Patterns

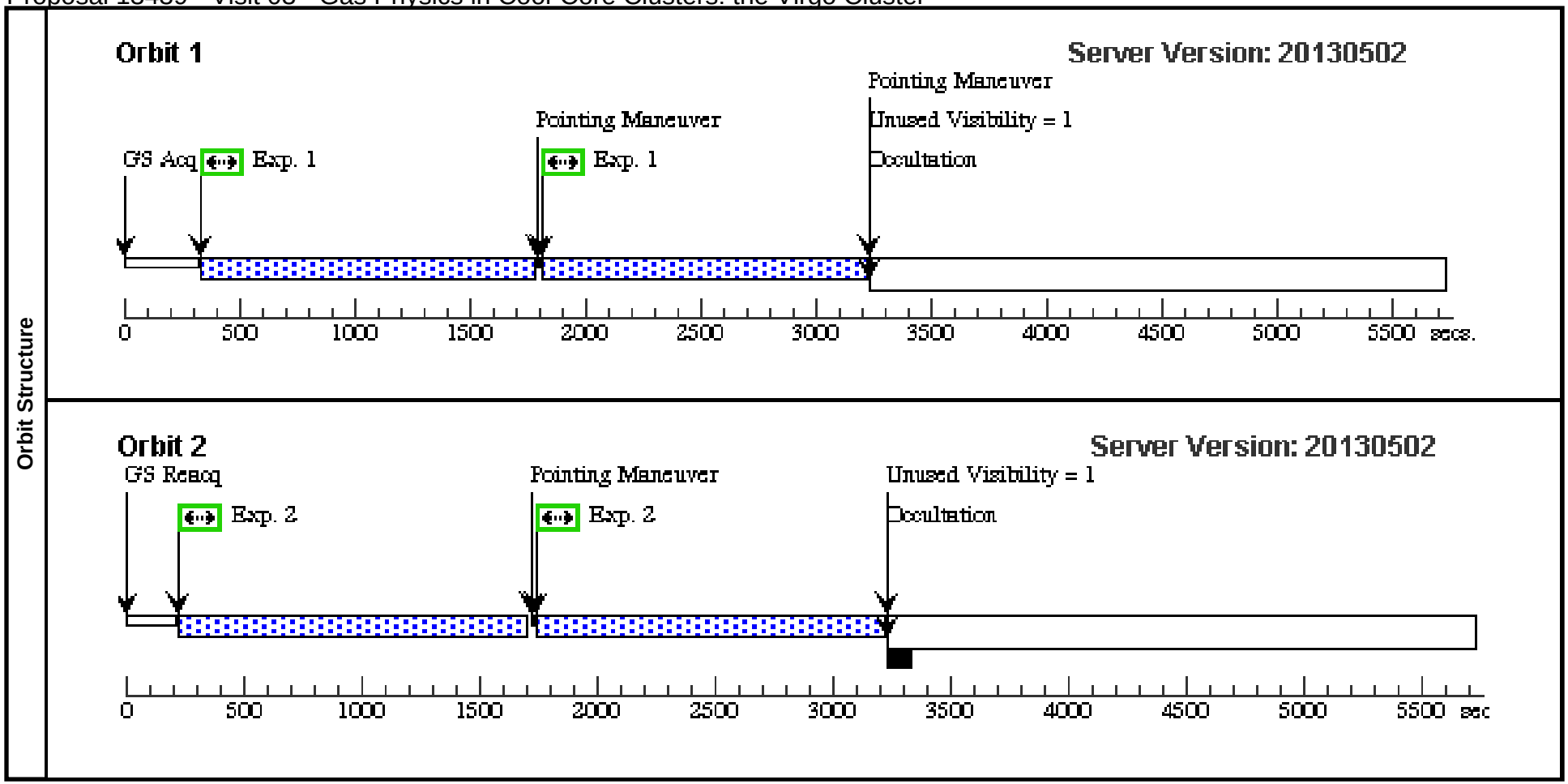
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	M87-FILAMENTS-SBC	RA: 12 30 51.0000 (187.7125000d) Dec: +12 23 19.00 (12.38861d) Equinox: J2000		V=16.7+/-0.5 mag given is nucleus	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	1	(1) M87-FILAMENTS-SBC	ACS/SBC, ACCUM, SBC-FIX	F165LP			Pattern 1, Exps 1-1 in Visit 03 (1)	1382 Secs (2764 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	2	(1) M87-FILAMENTS-SBC	ACS/SBC, ACCUM, SBC-FIX	F165LP		POS TARG 0.0,0.5	Pattern 1, Exps 2-2 in Visit 03 (1)	1458 Secs (2916 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***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Exp. 1
GS Acq
Exp. 1
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3500
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5500
secs.
Orbit 2
Server Version: 20130502
Pointing Maneuver
Unused Visibility = 1
Occultation
GS Reacq
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Exp. 2
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sec