12271 - Probing the Physics of Gas in Cool Core Clusters: Virgo

Cycle: 18, Proposal Category: GO

(Availability Mode: AVAILABLE)

INVESTIGATORS

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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	(5) M87-FILAMENTS-SBC	ACS/SBC	4	16-Dec-2010 21:11:24.0	yes
02	(1) M87-FILAMENTS-WFC	ACS/WFC	3	16-Dec-2010 21:11:39.0	yes
03	(1) M87-FILAMENTS-WFC	ACS/WFC	3	16-Dec-2010 21:11:51.0	yes
04	(3) M87-FILAMENTS-COS (4) M87-FILAMENTS-COS-OFFSET	COS/FUV COS/NUV	2	16-Dec-2010 21:12:04.0	yes

12 Total Orbits Used

ABSTRACT

We recently detected 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. We propose to delve deeper into the physics of cool core

clusters. We propose to use ACS to compare the spatial extent and morphology of the low and high temperature gas, to use the timely presence of COS to obtain a sensitive FUV spectrum of the hot gas, and, by introducing the notion of emission line polarimetry, seek a a potentially revolutionary new plasma diagnostic. The spatial distributions will reveal whether the hotter material is more spatially extended than the cooler; the FUV spectrum will permit derivation of the emission measure (essentially amount of gas) at each temperature between the 10^4K Halpha filaments and coronal gas at 10^7K. Together these strongly constrain plausible transport processes relating the hot and cool gas phases in this cool core cluster region, and hence the dominant physical processes at work. A novel ingredient is to obtain the optical images in polarimetric mode to probe emission line polarization levels, a diagnostic used in Solar physics to determine the relevance of collisional excitation processes such as electron impact polarization in thermal conduction or shocks. With this suite of straightforward, uniquely HST observations we may dramatically change the landscape of our understanding of the physics of cool core clusters

OBSERVING DESCRIPTION

We will image the emission filaments using the F50LP SBC and F656N optical narrow band filter together with polarizing filters. We will also acquire COS spectroscopy in the FUV.

Visit

Proposal 12271, Visit 01, implementation Fri Dec 17 02:12:10 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: PCS MODE FINE

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), (3), (4)

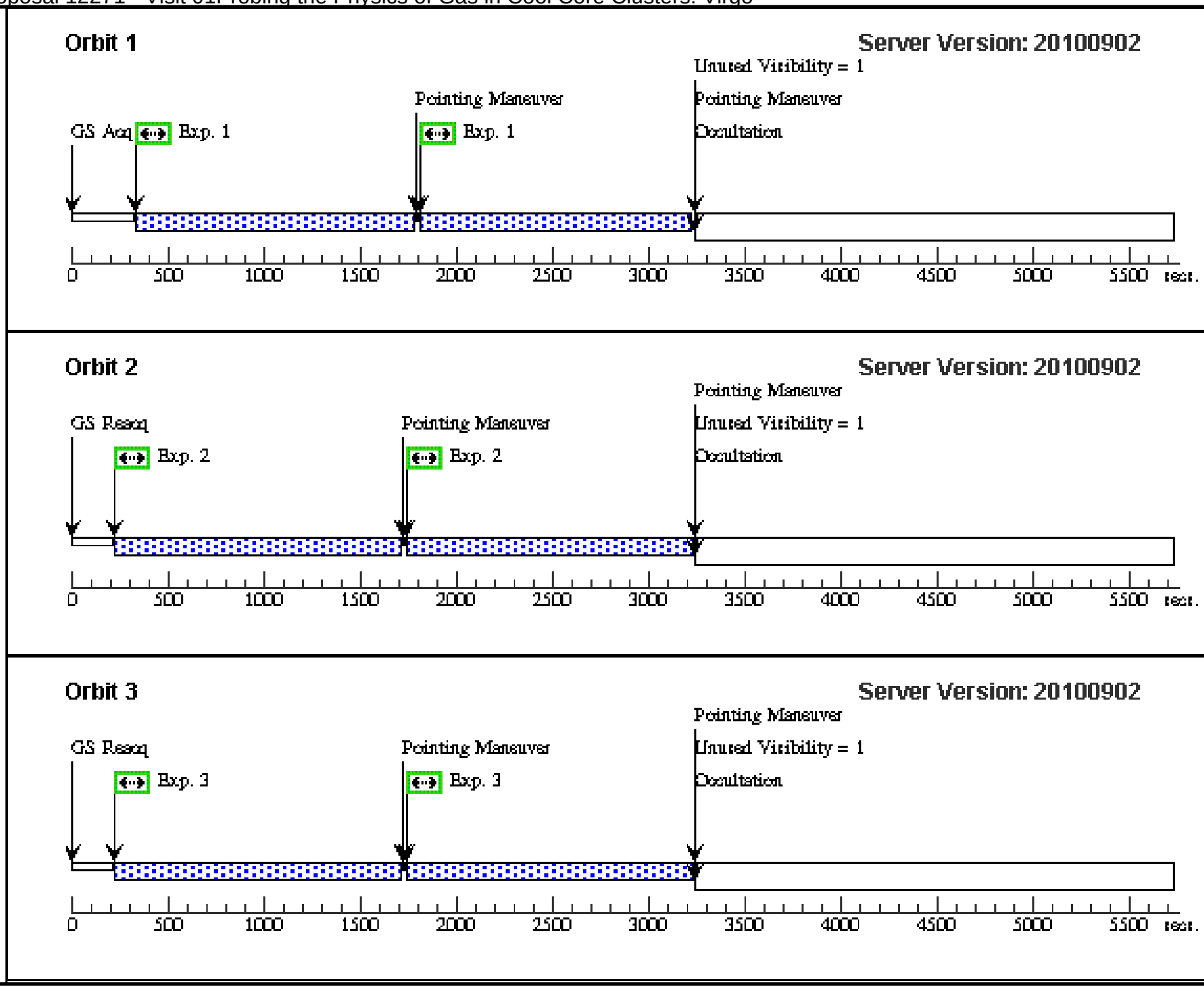
Fixed Targets

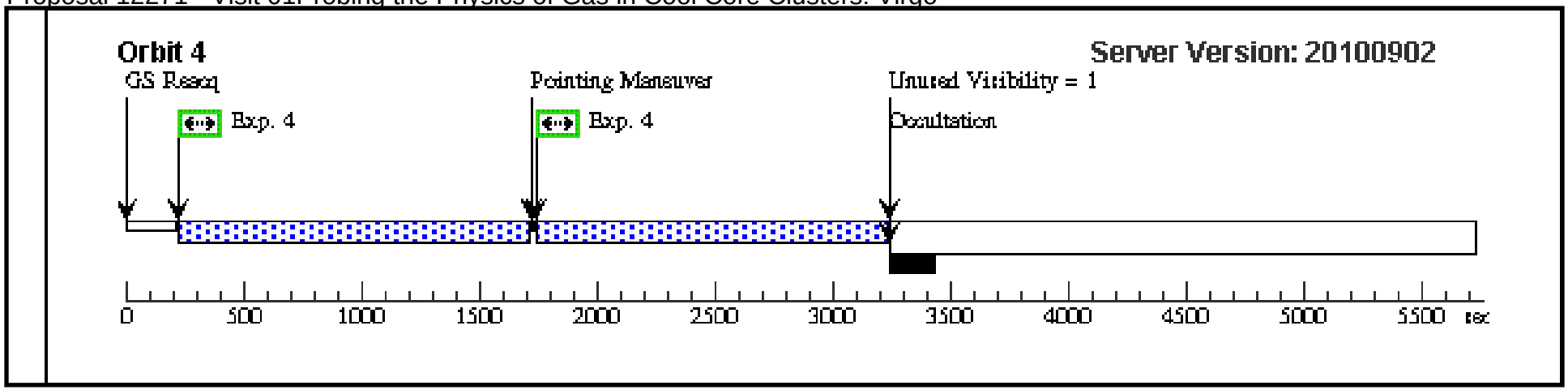
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	M87-FILAMENTS-SBC	RA: 12 30 51.0000 (187.7125000d) Dec: +12 23 19.00 (12.38861d) Equinox: J2000	Proper Motion RA: null Proper Motion Dec: null Epoch of Position:	V=16.7+/-0.5 mag given is nucleus	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	1	(5) M87-FILAMENTS-SBC	ACS/SBC, ACCUM, SBC-FIX	F150LP			Pattern 1, Exps 1-1 in Visit 01 (1)	1200 Secs *[==>1385.0 Secs (Pattern 1)]* *[==>1385.0 Secs (Pattern 2)]*	***[1]***
2	2	(5) M87-FILAMENTS-SBC	ACS/SBC, ACCUM, SBC-FIX	F150LP		POS TARG 0.0,0.5	Pattern 1, Exps 2-2 in Visit 01 (1)	1250 Secs *[==>1461.0 Secs (Pattern 1)]* *[==>1461.0 Secs (Pattern 2)]*	***[2]***
3	3	(5) M87-FILAMENTS-SBC	ACS/SBC, ACCUM, SBC-FIX	F150LP		POS TARG 0.5,0.5	Pattern 1, Exps 3-3 in Visit 01 (1)	1250 Secs *[==>1461.0 Secs (Pattern 1)]* *[==>1461.0 Secs (Pattern 2)]*	***[3]***
4	4	(5) M87-FILAMENTS-SBC	ACS/SBC, ACCUM, SBC-FIX	F150LP		POS TARG 0.5,0.0	Pattern 1, Exps 4-4 in Visit 01 (1)	1250 Secs *[==>1461.0 Secs (Pattern 1)]* *[==>1461.0 Secs (Pattern 2)]*	***[4]***

Orbit Structure




Orbit 4
Server Version: 20100902
GS Reacq
Exp. 4
Pointing Maneuver
Exp. 4
Unused Vitibility = 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12271, Visit 02, implementation Fri Dec 17 02:12:13 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

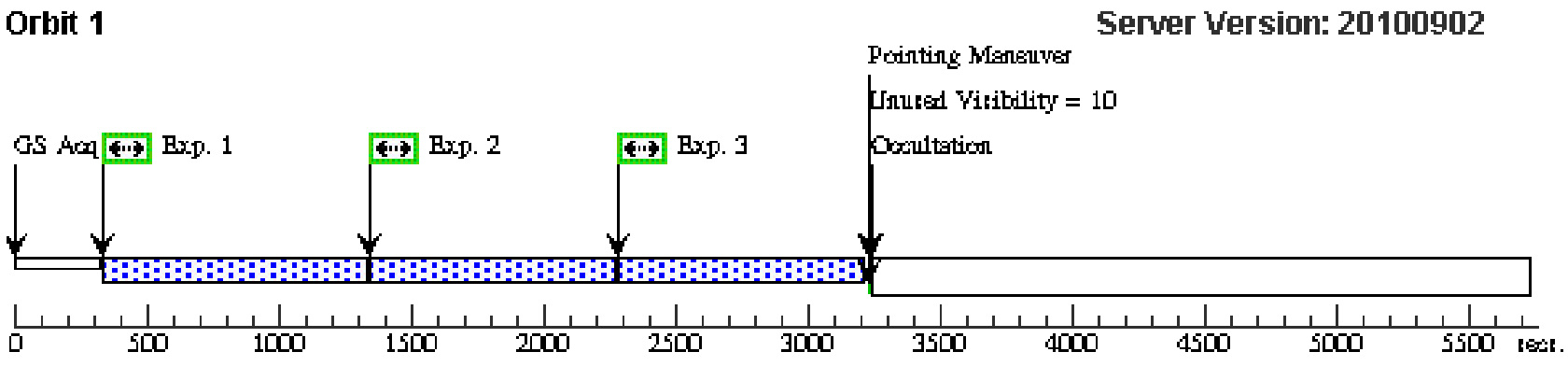
Fixed Targets

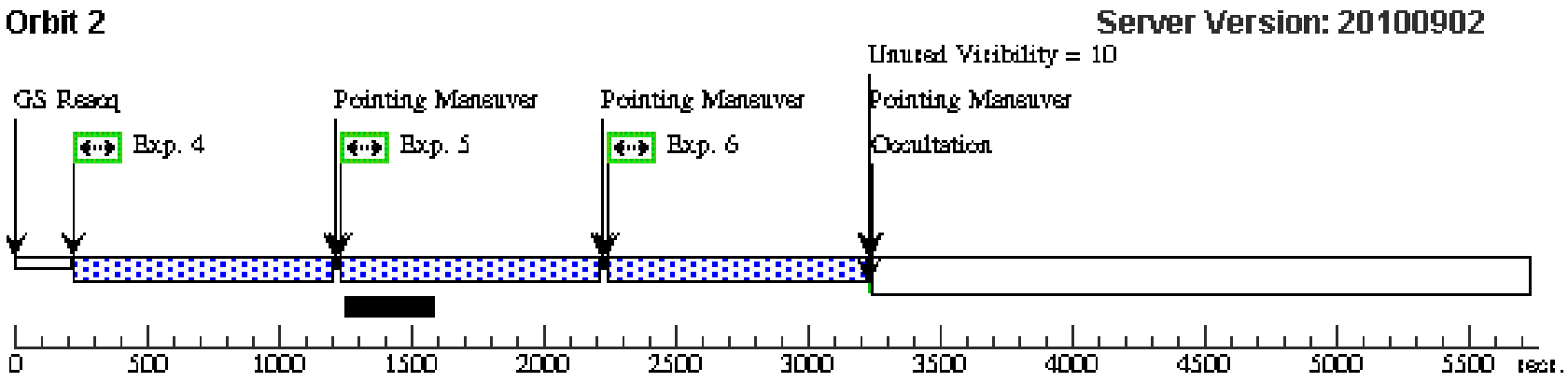
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	M87-FILAMENTS-WFC	RA: 12 30 49.6100 (187.7067083d) Dec: +12 23 26.32 (12.39064d) Equinox: J2000	Proper Motion RA: null Proper Motion Dec: null Epoch of Position:	V=16.7+/-0.5 mag given is nucleus	Reference Frame: ICRS

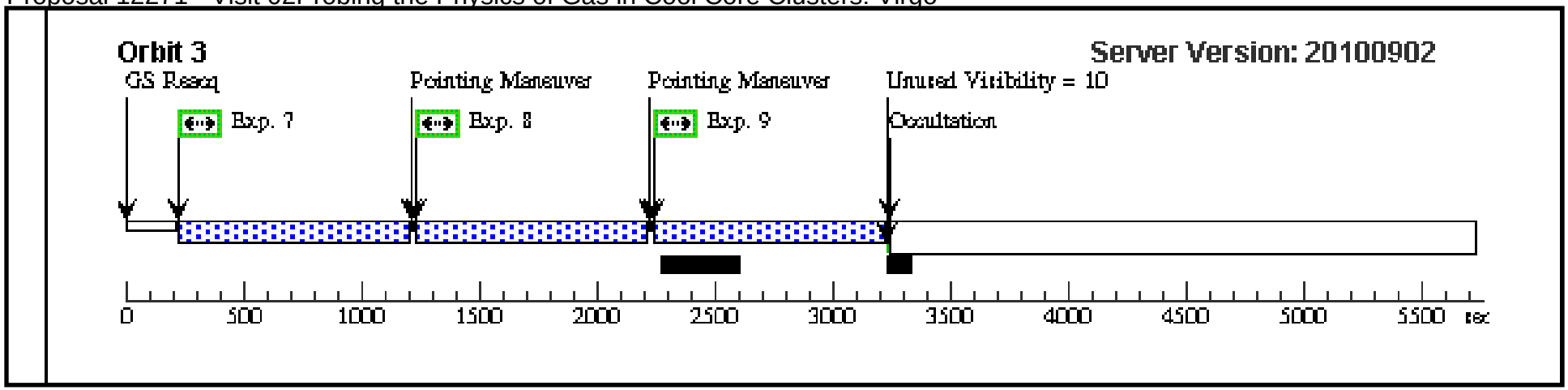
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL0UV				740 Secs *[==>]*	 ***[1]***
2		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL60UV				740 Secs *[==>]*	 ***[1]***
3		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL120UV				740 Secs *[==>]*	 ***[1]***
4		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL0UV		POS TARG 0.247,0.094		785 Secs *[==>]*	 ***[2]***
5		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL60UV		POS TARG 0.247,0.094		785 Secs *[==>]*	 ***[2]***
6		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL120UV		POS TARG 0.247,0.094		785 Secs *[==>]*	 ***[2]***
7		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL0UV		POS TARG 0.124,0.232		785 Secs *[==>]*	 ***[3]***
8		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL60UV		POS TARG 0.124,0.232		785 Secs *[==>]*	 ***[3]***
9		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL120UV		POS TARG 0.124,0.232		785 Secs *[==>]*	 ***[3]***

Orbit Structure






Orbit 3
Server Version: 20100902
GS Reacq
Pointing Maneuver
Pointing Maneuver
Unused Vitibility = 10
Exp. 7
Exp. 8
Exp. 9
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12271, Visit 03, implementation Fri Dec 17 02:12:14 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

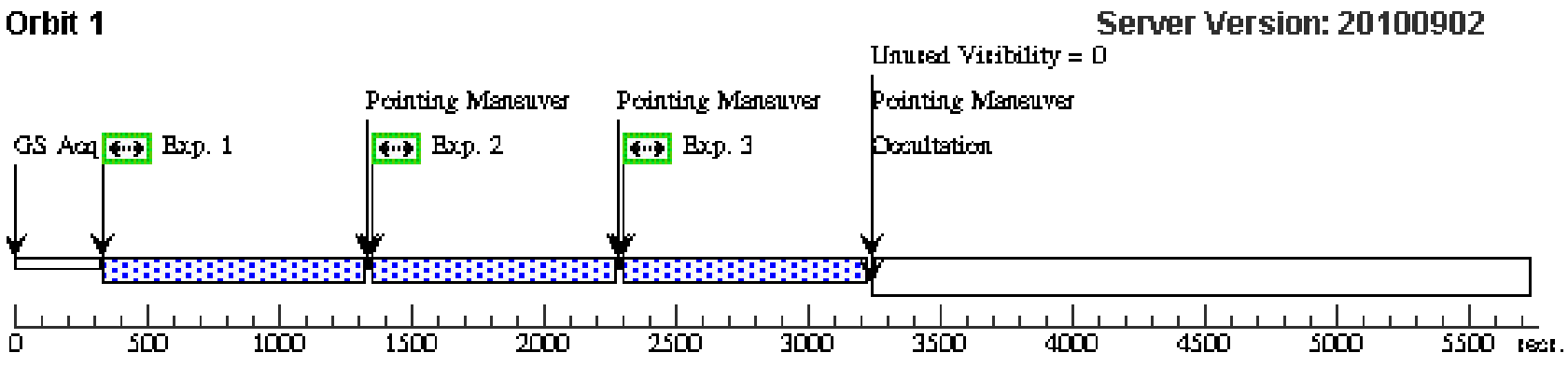
Fixed Targets

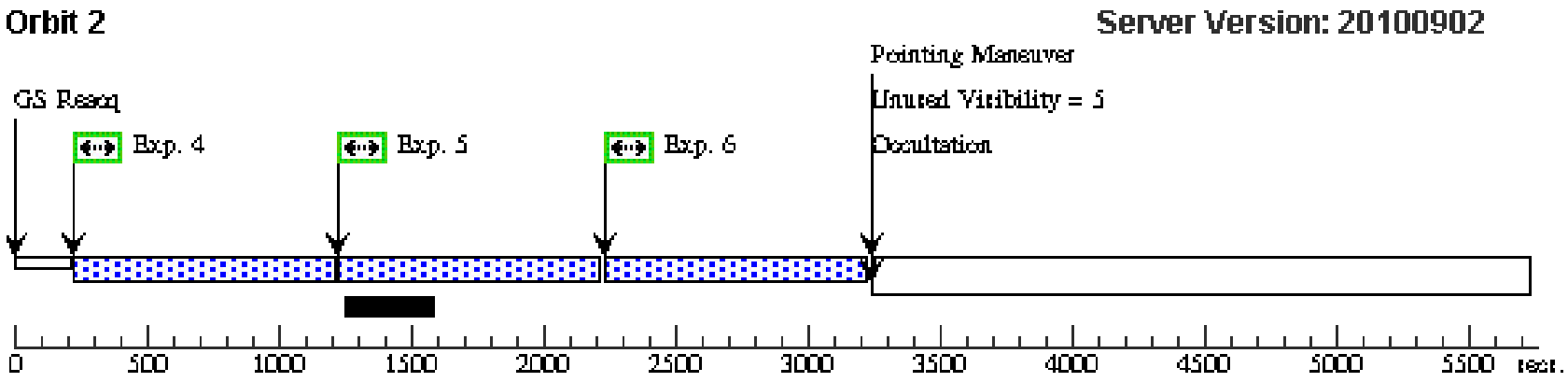
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	M87-FILAMENTS-WFC	RA: 12 30 49.6100 (187.7067083d) Dec: +12 23 26.32 (12.39064d) Equinox: J2000	Proper Motion RA: null Proper Motion Dec: null Epoch of Position:	V=16.7+/-0.5 mag given is nucleus	Reference Frame: ICRS

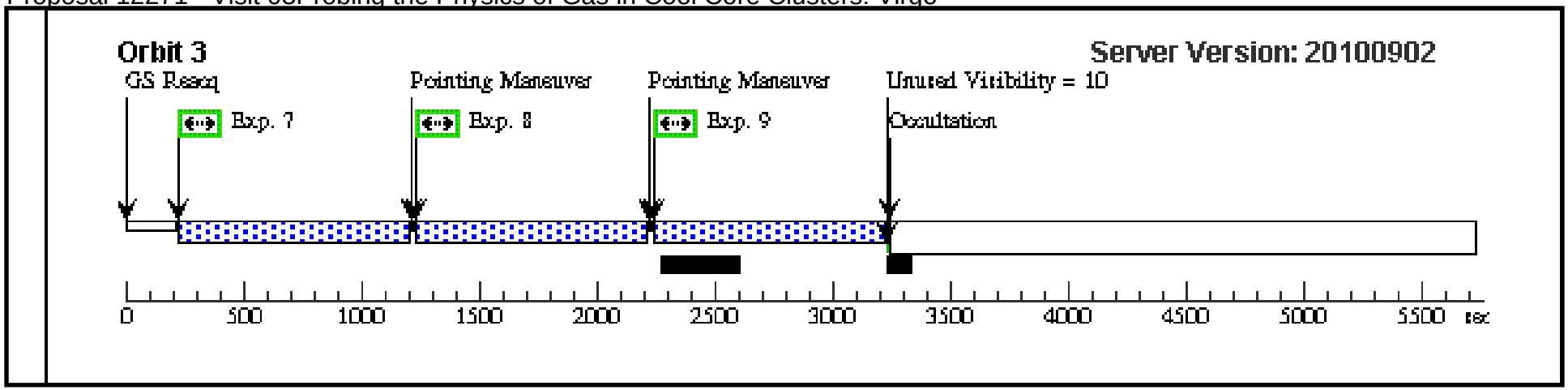
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL0UV		POS TARG -0.124,0.138		730 Secs *[==>]*	***[1]***
2		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL60UV		POS TARG -0.124,0.138		730 Secs *[==>]*	***[1]***
3		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL120UV		POS TARG -0.124,0.138		730 Secs *[==>]*	***[1]***
4		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL0UV				800 Secs *[==>]*	***[2]***
5		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL60UV				800 Secs *[==>]*	***[2]***
6		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL120UV				800 Secs *[==>]*	***[2]***
7		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL0UV		POS TARG 0.247,0.094		785 Secs *[==>]*	***[3]***
8		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL60UV		POS TARG 0.247,0.094		785 Secs *[==>]*	***[3]***
9		(1) M87-FILAMENTS-WFC	ACS/WFC, ACCUM, WFC	F660N POL120UV		POS TARG 0.247,0.094		785 Secs *[==>]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20100902
GS Reacq
Pointing Maneuver
Pointing Maneuver
Unused Visibility = 10
Exp. 7
Exp. 8
Exp. 9
Occultation
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1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12271, Visit 04, implementation Fri Dec 17 02:12:16 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

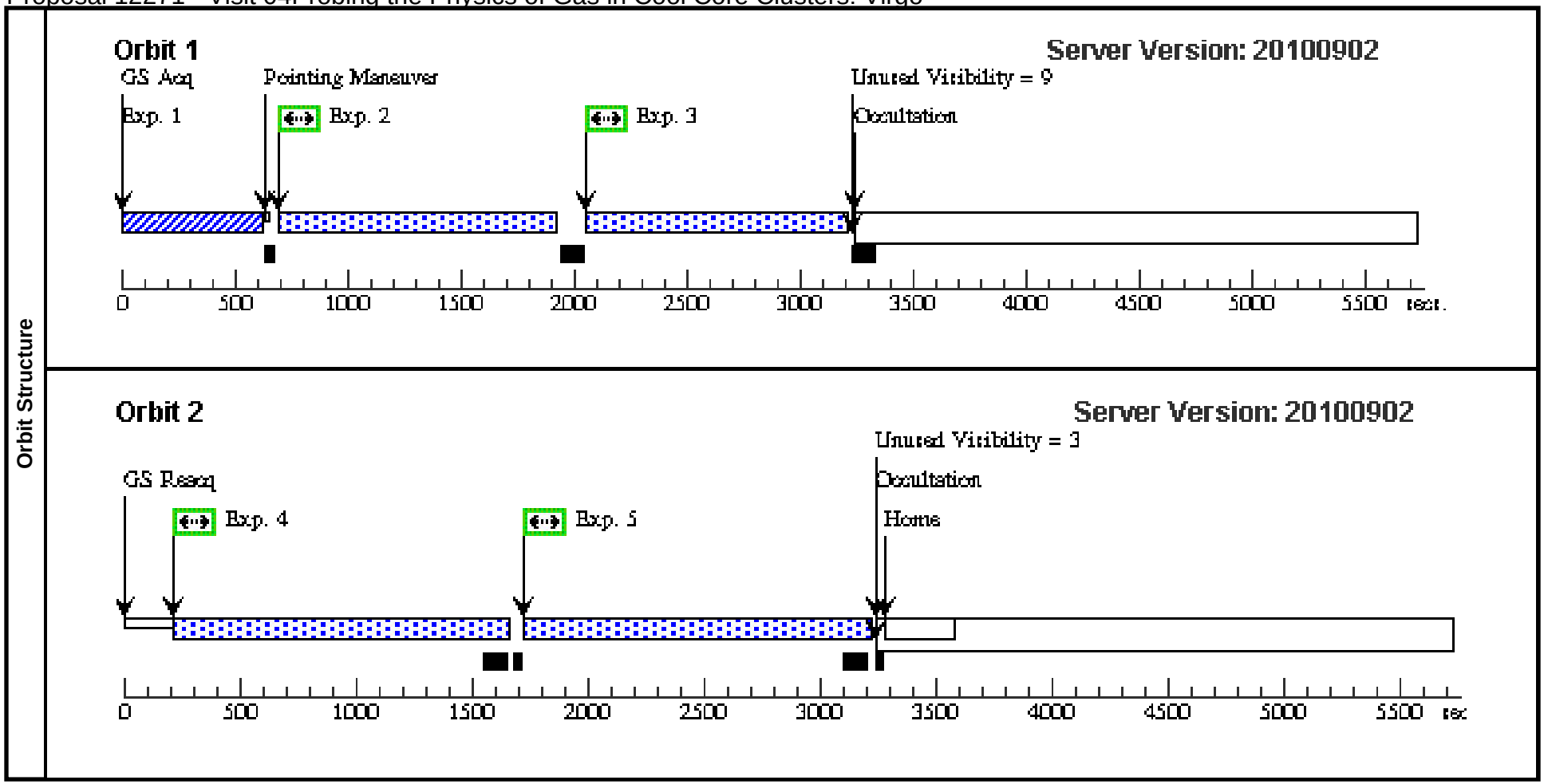
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	M87-FILAMENTS-COS	RA: 12 30 50.9900 (187.7124583d) Dec: +12 23 25.50 (12.39042d) Equinox: J2000	Proper Motion RA: null Proper Motion Dec: null Epoch of Position:	V=16.7+/-0.5 mag given is nucleus	Reference Frame: ICRS
(4)	M87-FILAMENTS-COS-OFFSET	RA: 12 30 49.4230 (187.7059292d) Dec: +12 23 28.04 (12.39112d) Equinox: J2000	Proper Motion RA: null Proper Motion Dec: null Epoch of Position:	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/[Actual Dur.]	Orbit
1		(4) M87-FILAMENTS-COS-OFFSET	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				100 Secs *[==>]*	***[1]***
2		(3) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1100; FLASH=YES; FP-POS=3; EXTENDED=YES			1200 Secs *[==>1062.0 Secs]*	***[1]***
3		(3) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1150; FLASH=YES; FP-POS=3; EXTENDED=YES			1250 Secs *[==>1112.0 Secs]*	***[1]***
4		(3) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1300; FLASH=YES; EXTENDED=YES; FP-POS=4			1400 Secs *[==>]*	***[2]***
5		(3) M87-FILAMENTS-COS	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1350; FLASH=YES; EXTENDED=YES; FP-POS=4			1450 Secs *[==>]*	***[2]***


Orbit Structure
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Server Version: 20100902
GS Acq
Pointing Maneuver
Unused Visibility = 9
Exp. 1
Exp. 2
Exp. 3
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.
Orbit 2
Server Version: 20100902
Unused Visibility = 3
GS Reacq
Occultation
Exp. 4
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec