



12552 - Shock Energy in Merging Systems: The Elephant in the Room.

Cycle: 19, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) ARP220	WFC3/UVIS	3	12-Jul-2011 22:17:10.0	yes
02	(1) ARP220	WFC3/UVIS	4	12-Jul-2011 22:17:19.0	yes
03	(2) NGC6240	WFC3/UVIS	4	12-Jul-2011 22:17:31.0	yes
04	(2) NGC6240	WFC3/UVIS	4	12-Jul-2011 22:17:41.0	yes

15 Total Orbits Used

ABSTRACT

The relationship between shocks, star formation and the evolution of merging galaxies is not well understood. We are now poised to gain major insight in this area, thanks to the high resolution narrow-band imaging capabilities of WFC3 and recent major advances in theoretical shock and

photoionization models. Shocks and star formation in merging galaxies are regulated by fundamental physical properties of the ISM such as dust, gas density, ionized gas structure, and the presence of galactic winds and outflows. We aim to uncover the relationship between shocks, galactic winds, and the fundamental ISM properties in two famous mergers NGC 6240 and Arp 220. These two galaxies are currently transitioning from disk galaxies into spheroids and they are close enough to achieve the spatial scales required to resolve individual supernova remnants with WFC3 imaging. We propose to image NGC 6240 and Arp 220 in key shock and photoionization sensitive diagnostic lines [OII], [OIII], H-beta, [NII]+H-alpha, [SII], and (where possible) [OI] to (1) resolve the source of the ionizing radiation field (shocks versus photoionization by hot stars) at spatial scales of 25-35 pc, and (2) map the distribution of the star formation and ionized gas to search for links with merger-driven shocks and large-scale gas flows.

OBSERVING DESCRIPTION

Our total exposure time estimates to reach a $S/N = 5$ per $0.07''$ resolution element are given in the following Table, as calculated with the WFC3 UVIS imaging Exposure Time Calculator. We used the H images of Heckman (1987) plus the HST image of NGC 6240 by Gerssen et al. (2004) to measure the limiting fluxes of prominent emission-line structures. We then used ground-based long-slit data (Kim et al. 1995, Kewley et al. 2000, Rupke et al. 2005, Moustakas & Kennicutt 2006) to scale these H fluxes and estimate the expected fluxes of other emission lines. Overhead estimates shown in the Table below include setup, readout, dithering, and filter change overheads, plus 2-3 exposures per filter (3 exposures for total exposure times > 1000 , and 2 exposures for total exposure times < 1000) to ensure robust cosmic-ray removal. Due to the short exposures in the red and narrow-band filters, we expect there to be at least 2, and at most 4 buffer dumps. We will try to minimize the effect of these dumps by placing the short exposures at the beginning or end of orbits. Our total overhead includes the time required for 4 buffer dumps as shown in the table. Including overheads, we request 7 orbits for Arp 220, and 8 orbits for NGC 6240, for a total of 15 orbits.

REAL TIME JUSTIFICATION

n/a

CALIBRATION JUSTIFICATION

n/a

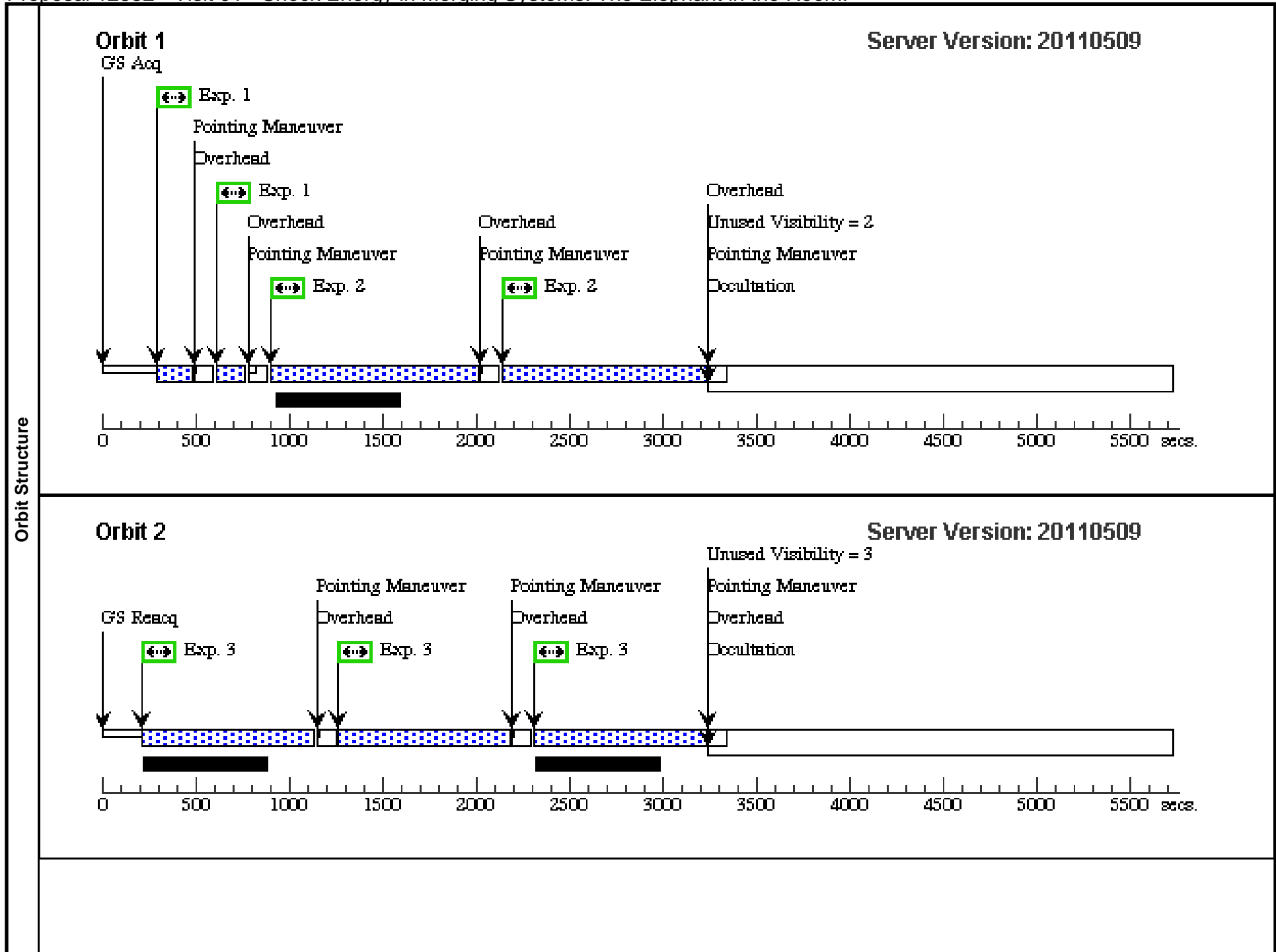
ADDITIONAL COMMENTS

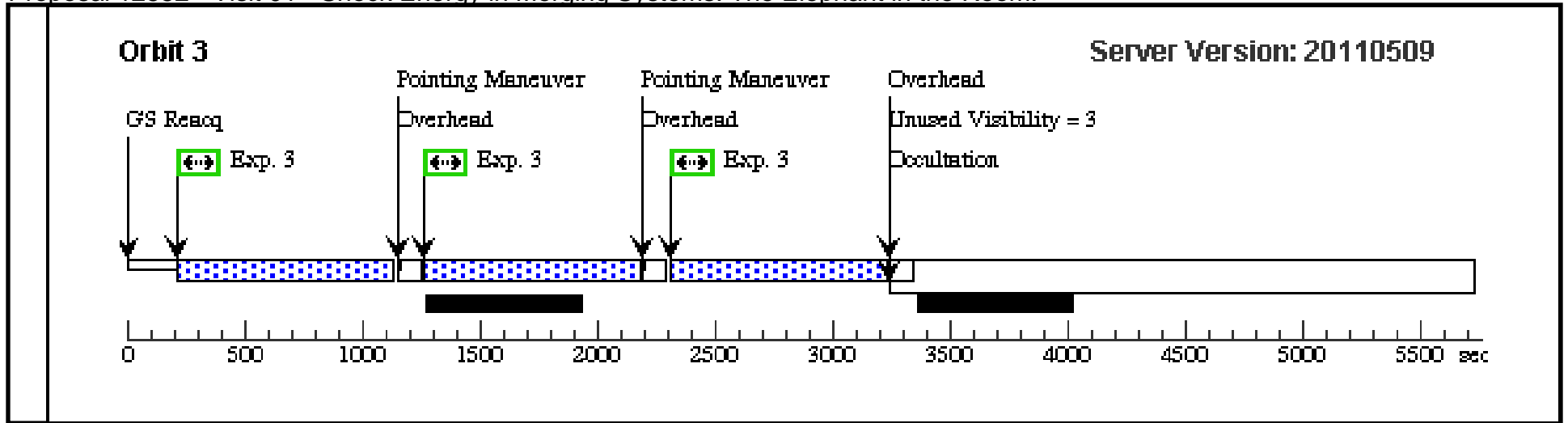
None.

Proposal 12552 - Visit 01 - Shock Energy in Merging Systems: The Elephant in the Room.

Wed Jul 13 02:17:46 GMT 2011

Visit	Proposal 12552, Visit 01 Diagnostic Status: Warning Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	Diagnosics	(FQ492N-Part1 (01.002)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (FQ492N-Part2 (01.003)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.								
Patterns		#	Primary Pattern				Secondary Pattern			
	(1)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=								(1), (2)
(2)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=MOSAIC Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=				Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=46.84 Number Of Points=3 Angle Between Sides= Point Spacing=0.135 Center Pattern=false Line Spacing=				(3)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes	Miscellaneous		
	(1)	ARP220	RA: 15 34 57.1000 (233.7379167d) Dec: +23 30 11.00 (23.50306d) Equinox: J2000		Redshift: 0.018116		V=13.2	Reference Frame: ICRS		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	F621M	(1) ARP220	WFC3/UVIS, ACCUM, UVIS	F621M			Pattern 1, Exps 1-1 in Visit 01 (1)	155 Secs	
									[==>(Pattern 1)] [==>(Pattern 2)]	[1]
	2	FQ492N-Par t1	(1) ARP220	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ492N			Pattern 1, Exps 2-2 in Visit 01 (1)	1090 Secs	
								[==>(Pattern 1)] [==>(Pattern 2)]	[1]	
3	FQ492N-Par t2	(1) ARP220	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ492N			Pattern 2, Exps 3-3 in Visit 01 (2)	920 Secs		
								[==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 1,3)] [==>(Pattern 2,1)] [==>(Pattern 2,2)] [==>(Pattern 2,3)]	[2] [3]	





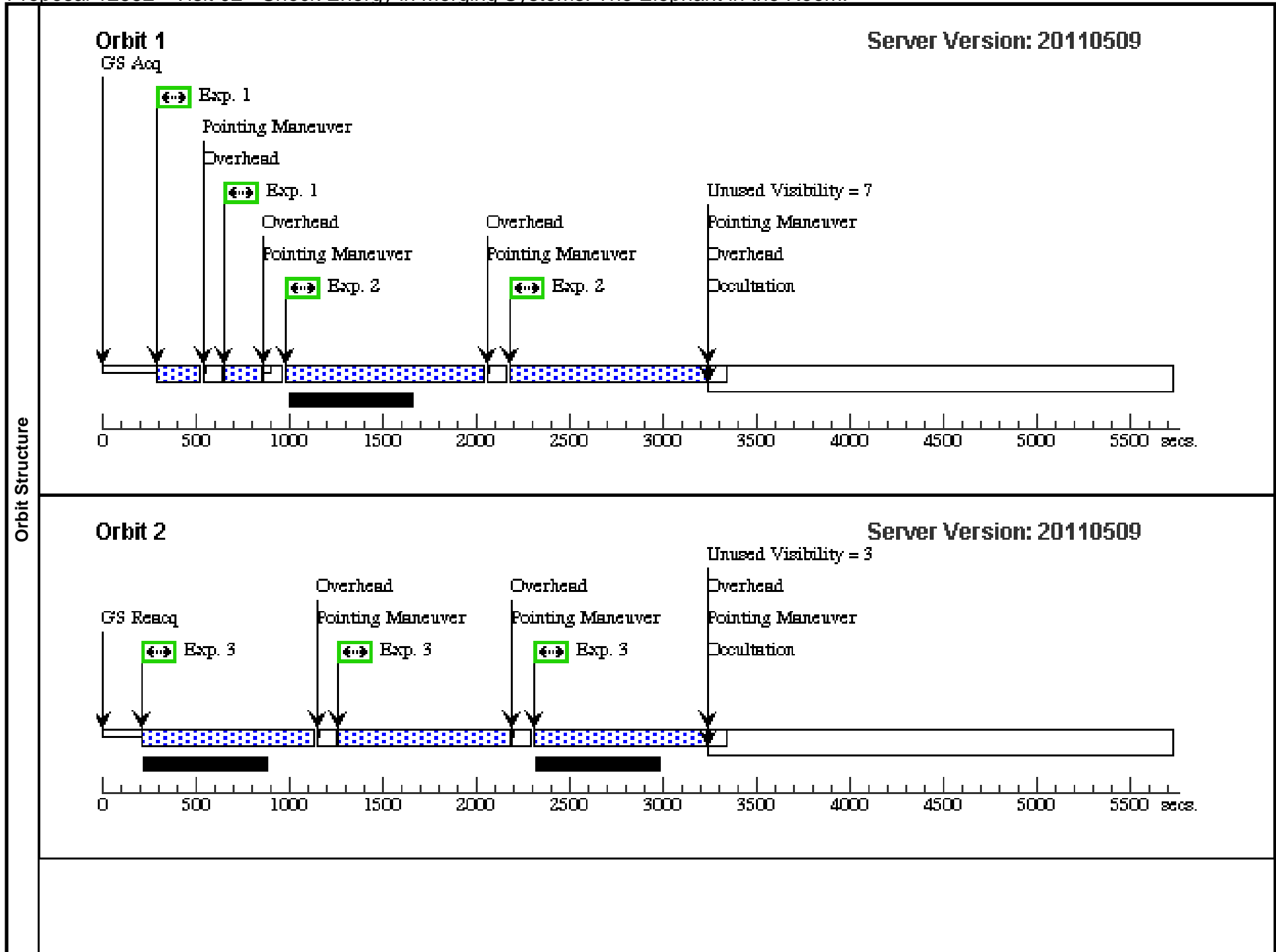
Proposal 12552 - Visit 02 - Shock Energy in Merging Systems: The Elephant in the Room.

Wed Jul 13 02:17:47 GMT 2011

Visit	Proposal 12552, Visit 02 Diagnostic Status: Warning Scientific Instruments: WFC3/UVIS Special Requirements: SAME ORIENT AS 01					
	Diagnosics (FQ508N-Part1 (02.002)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (FQ508N-Part2 (02.003)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.					
Patterns	#	Primary Pattern	Secondary Pattern	Exposures		
	(1)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=		(1), (2), (4), (5)		
(2)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=MOSAIC Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=	Pattern Type=WFC3-UVIS-DITHER- Coordinate Frame=POS-TARG LINE-3PT Pattern Orientation=46.84 Purpose=DITHER Angle Between Sides= Number Of Points=3 Center Pattern=false Point Spacing=0.135 Line Spacing=	(3)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	ARP220	RA: 15 34 57.1000 (233.7379167d) Dec: +23 30 11.00 (23.50306d) Equinox: J2000	Redshift: 0.018116	V=13.2	Reference Frame: ICRS

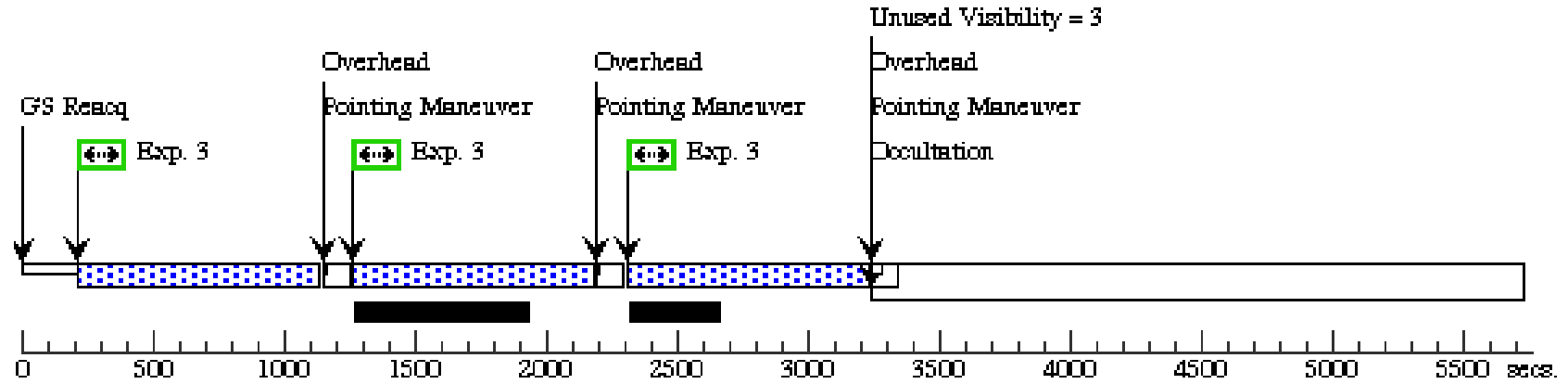
Proposal 12552 - Visit 02 - Shock Energy in Merging Systems: The Elephant in the Room.

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	F665N	(1) ARP220	WFC3/UVIS, ACCUM, UVIS	F665N			Pattern 1, Exps 1-1 in Visit 02 (1)	200 Secs [=>(Pattern 1)] [=>(Pattern 2)]	[1]
	2	FQ508N-Par t1	(1) ARP220	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ508N			Pattern 1, Exps 2-2 in Visit 02 (1)	1050 Secs [=>(Pattern 1)] [=>(Pattern 2)]	[1]
	3	FQ508N-Par t2	(1) ARP220	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ508N			Pattern 2, Exps 3-3 in Visit 02 (2)	920 Secs [=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 1,3)] [=>(Pattern 2,1)] [=>(Pattern 2,2)] [=>(Pattern 2,3)]	[2] [3]
	4	F680N	(1) ARP220	WFC3/UVIS, ACCUM, UVIS	F680N			Pattern 1, Exps 4-4 in Visit 02 (1)	525 Secs [=>(Pattern 1)] [=>(Pattern 2)]	[4]
	5	F467M	(1) ARP220	WFC3/UVIS, ACCUM, UVIS	F467M			Pattern 1, Exps 5-5 in Visit 02 (1)	775 Secs [=>(Pattern 1)] [=>(Pattern 2)]	[4]



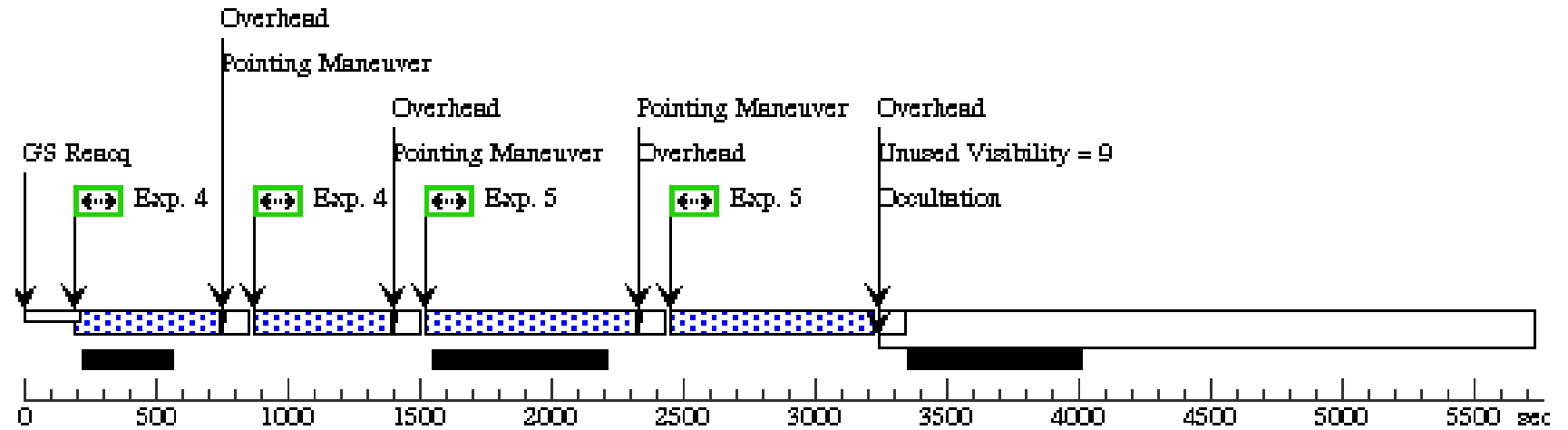
Orbit 3

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Orbit 4

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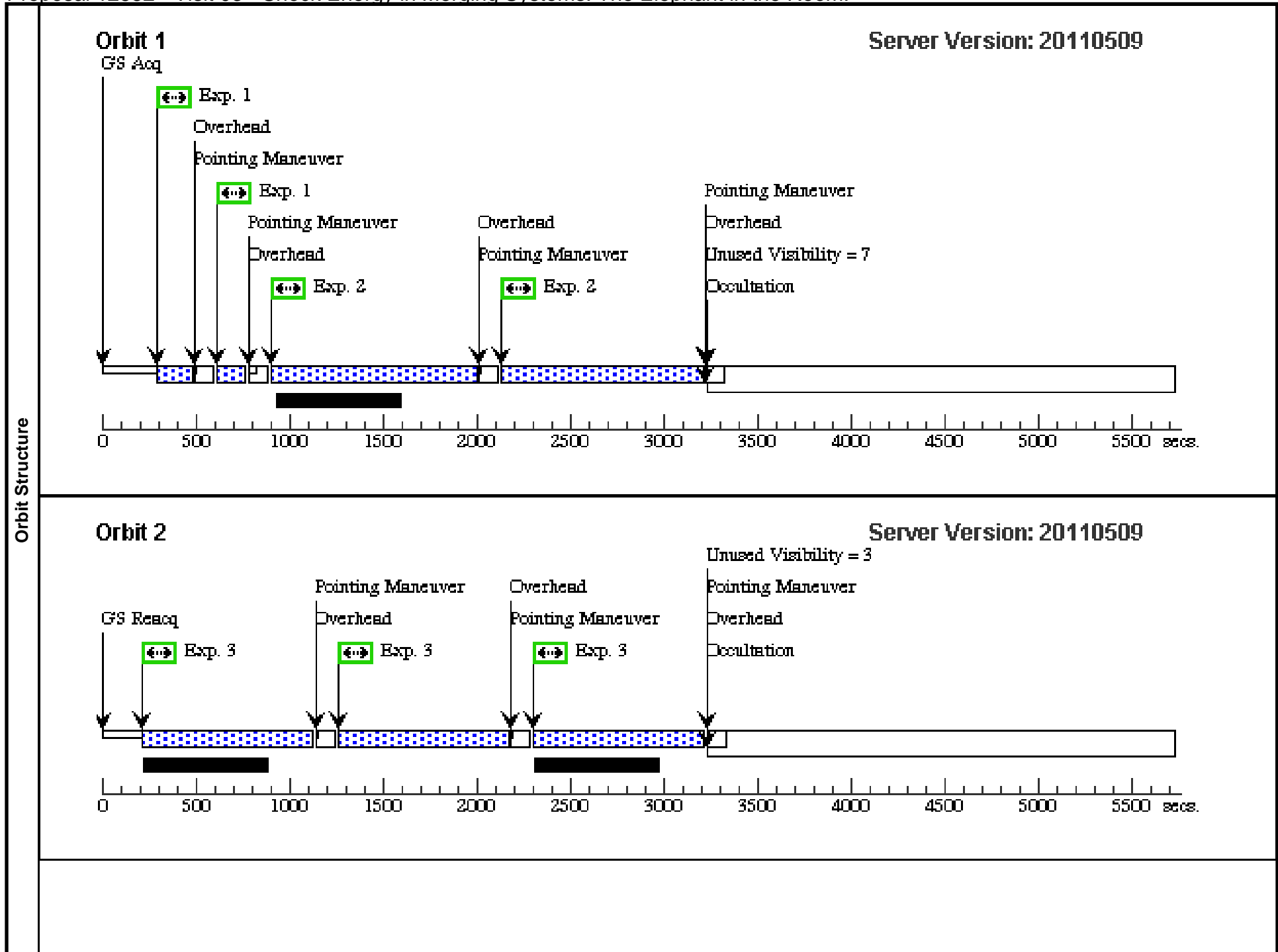
Proposal 12552 - Visit 03 - Shock Energy in Merging Systems: The Elephant in the Room.

Wed Jul 13 02:17:48 GMT 2011

Visit	Proposal 12552, Visit 03 Diagnostic Status: Warning Scientific Instruments: WFC3/UVIS Special Requirements: (none)					
	Diagnosics (FQ492N-Part1 (03.002)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (FQ492N-Part2 (03.003)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.					
Patterns	#	Primary Pattern	Secondary Pattern	Exposures		
	(1)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=		(1), (2)		
(2)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=MOSAIC Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=	Pattern Type=WFC3-UVIS-DITHER- Coordinate Frame=POS-TARG LINE-3PT Pattern Orientation=46.84 Purpose=DITHER Angle Between Sides= Number Of Points=3 Center Pattern=false Point Spacing=0.135 Line Spacing=	(3), (4)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	NGC6240	RA: 16 52 58.9000 (253.2454167d) Dec: +02 24 3.00 (2.40083d) Equinox: J2000	Redshift: 0.024323	V=16.3	Reference Frame: ICRS

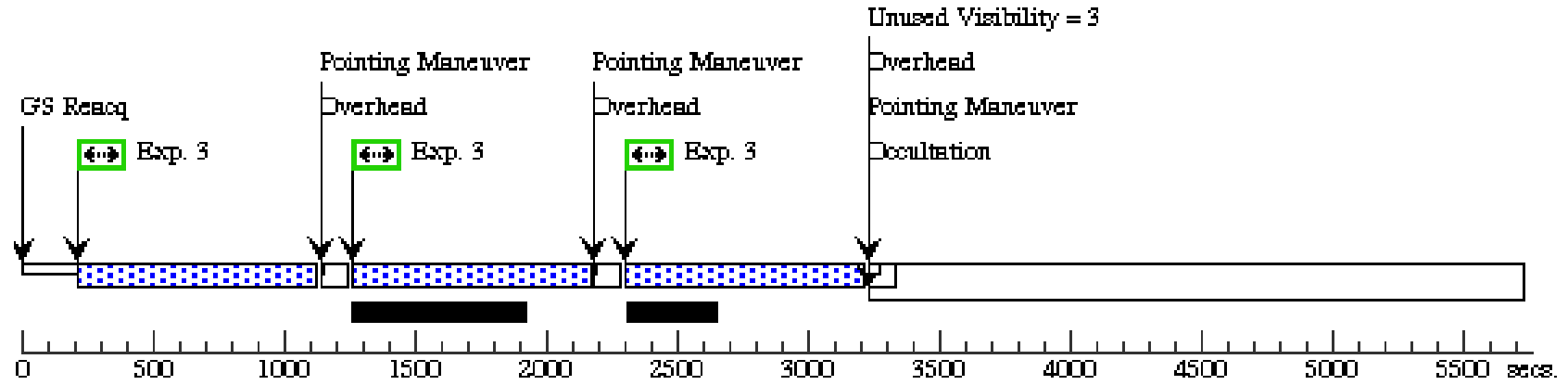
Proposal 12552 - Visit 03 - Shock Energy in Merging Systems: The Elephant in the Room.

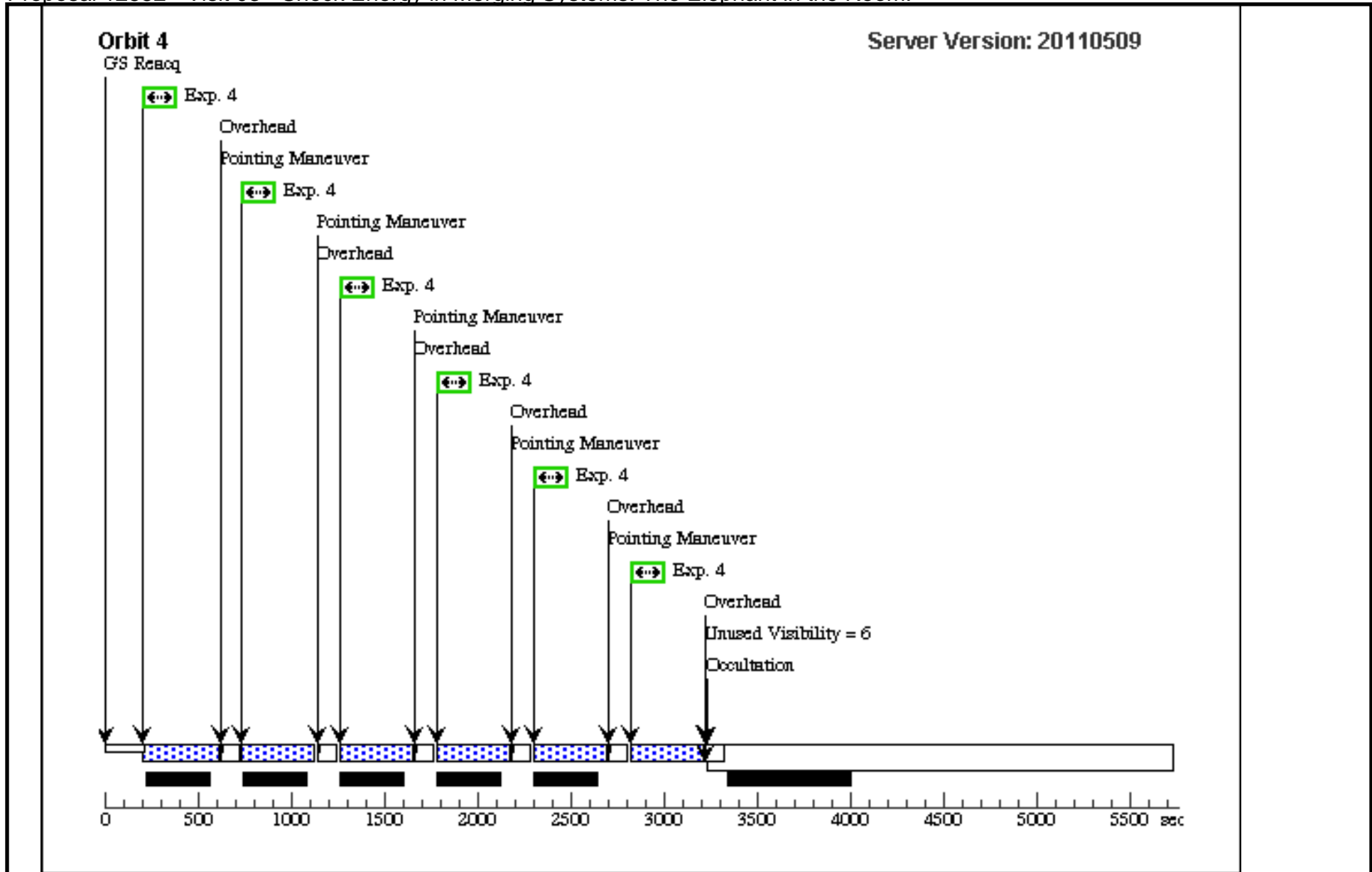
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	F621M	(2) NGC6240	WFC3/UVIS, ACCUM, UVIS	F621M			Pattern 1, Exps 1-1 in Visit 03 (1)	155 Secs	
									[==>(Pattern 1)]	[1]
									[==>(Pattern 2)]	
	2	FQ492N-Par t1	(2) NGC6240	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ492N			Pattern 1, Exps 2-2 in Visit 03 (1)	1080 Secs	
								[==>(Pattern 1)]	[1]	
								[==>(Pattern 2)]		
3	FQ492N-Par t2	(2) NGC6240	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ492N			Pattern 2, Exps 3-3 in Visit 03 (2)	915 Secs		
								[==>(Pattern 1,1)]	[2]	
								[==>(Pattern 1,2)]		
								[==>(Pattern 1,3)]		
								[==>(Pattern 2,1)]	[3]	
								[==>(Pattern 2,2)]		
								[==>(Pattern 2,3)]		
4	F645N	(2) NGC6240	WFC3/UVIS, ACCUM, UVIS	F645N			Pattern 2, Exps 4-4 in Visit 03 (2)	393 Secs		
								[==>(Pattern 1,1)]	[4]	
								[==>(Pattern 1,2)]		
								[==>(Pattern 1,3)]		
								[==>(Pattern 2,1)]		
								[==>(Pattern 2,2)]		
								[==>(Pattern 2,3)]		



Orbit 3

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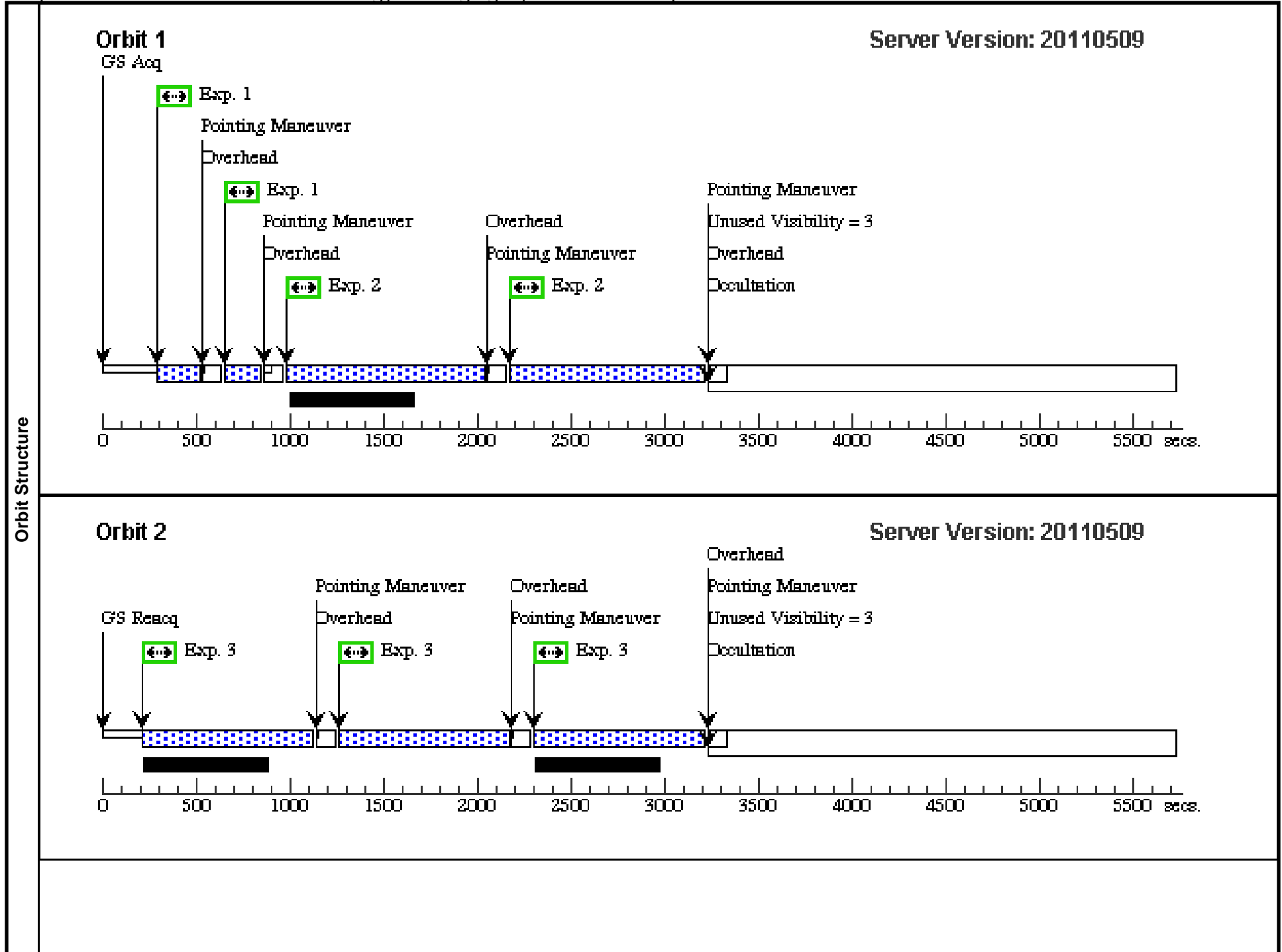
Proposal 12552 - Visit 04 - Shock Energy in Merging Systems: The Elephant in the Room.

Wed Jul 13 02:17:49 GMT 2011

Visit	Proposal 12552, Visit 04 Diagnostic Status: Warning Scientific Instruments: WFC3/UVIS Special Requirements: SAME ORIENT AS 03					
	(FQ508N-Part1 (04.002)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (FQ508N-Part2 (04.003)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.					
Diagnosics						
Patterns	#	Primary Pattern	Secondary Pattern	Exposures		
	(1)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=		(1), (2), (4), (5)		
(2)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=MOSAIC Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=	Pattern Type=WFC3-UVIS-DITHER- Coordinate Frame=POS-TARG LINE-3PT Pattern Orientation=46.84 Purpose=DITHER Angle Between Sides= Number Of Points=3 Center Pattern=false Point Spacing=0.135 Line Spacing=	(3)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	NGC6240	RA: 16 52 58.9000 (253.2454167d) Dec: +02 24 3.00 (2.40083d) Equinox: J2000	Redshift: 0.024323	V=16.3	Reference Frame: ICRS

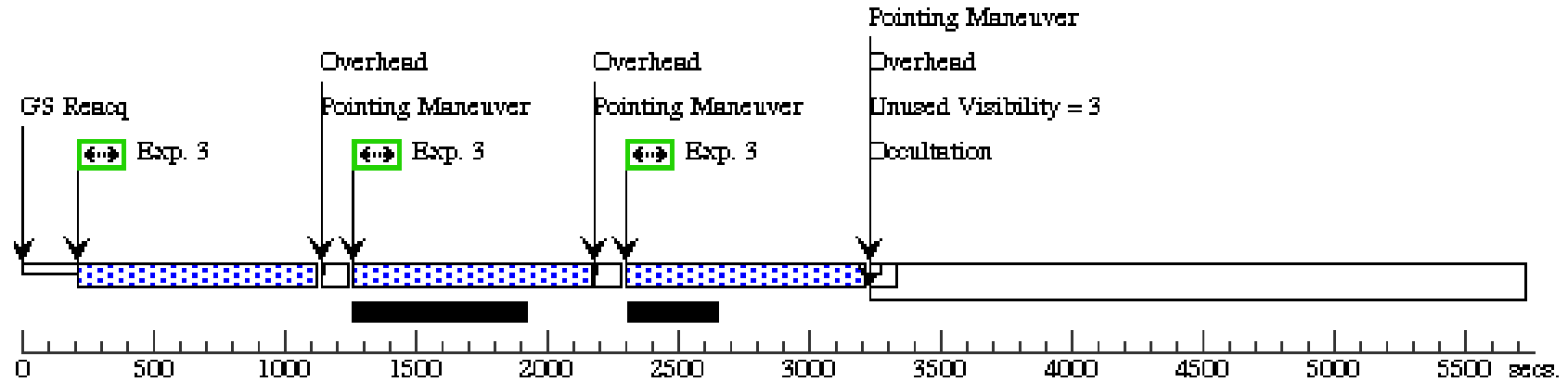
Proposal 12552 - Visit 04 - Shock Energy in Merging Systems: The Elephant in the Room.

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	F673N	(2) NGC6240	WFC3/UVIS, ACCUM, UVIS	F673N			Pattern 1, Exps 1-1 in Visit 04 (1)	195 Secs	
									[==>(Pattern 1)]	[1]
									[==>(Pattern 2)]	
	2	FQ508N-Par t1	(2) NGC6240	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ508N			Pattern 1, Exps 2-2 in Visit 04 (1)	1045 Secs	
									[==>(Pattern 1)]	[1]
								[==>(Pattern 2)]		
3	FQ508N-Par t2	(2) NGC6240	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ508N			Pattern 2, Exps 3-3 in Visit 04 (2)	915 Secs		
								[==>(Pattern 1,1)]	[2]	
								[==>(Pattern 1,2)]		
								[==>(Pattern 1,3)]		
								[==>(Pattern 2,1)]	[3]	
								[==>(Pattern 2,2)]		
								[==>(Pattern 2,3)]		
4	F680N	(2) NGC6240	WFC3/UVIS, ACCUM, UVIS	F680N			Pattern 1, Exps 4-4 in Visit 04 (1)	525 Secs		
								[==>(Pattern 1)]	[4]	
								[==>(Pattern 2)]		
5	F467M	(2) NGC6240	WFC3/UVIS, ACCUM, UVIS	F467M			Pattern 1, Exps 5-5 in Visit 04 (1)	770 Secs		
								[==>(Pattern 1)]	[4]	
								[==>(Pattern 2)]		



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