



13727 - Which Stars Go BOOM?

Cycle: 22, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Jason S. Kalirai (PI) (Contact)	Space Telescope Science Institute	jkalirai@stsci.edu
Dr. Brad M. Hansen (CoI)	University of California - Los Angeles	hansen@astro.ucla.edu
Dr. Harvey B. Richer (CoI)	University of British Columbia	richer@astro.ubc.ca
Dr. Pier-Emmanuel Tremblay (CoI)	Space Telescope Science Institute	tremblay@stsci.edu
Dr. Jeffrey Cummings (CoI)	The Johns Hopkins University	jcummi19@pha.jhu.edu
Dr. Benjamin F. Williams (CoI)	University of Washington	ben@astro.washington.edu
Dr. Jeremy Heyl (CoI)	University of British Columbia	hey1@phas.ubc.ca
Dr. Claus Leitherer (CoI)	Space Telescope Science Institute	leitherer@stsci.edu
Dr. Paul Goudfrooij (CoI)	Space Telescope Science Institute	goudfroo@stsci.edu
Dr. Elena Sabbi (CoI)	Space Telescope Science Institute	sabbi@stsci.edu
Prof. Nino Panagia (CoI)	Space Telescope Science Institute	panagia@stsci.edu
Dr. Harry C. Ferguson (CoI)	Space Telescope Science Institute	ferguson@stsci.edu
Dr. Matteo Correnti (CoI)	Space Telescope Science Institute	correnti@stsci.edu
Dr. Molly Peeples (CoI)	Space Telescope Science Institute	molly@stsci.edu

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) NGC-2164	WFC3/UVIS	3	15-Jul-2014 21:06:36.0	yes
02	(2) NGC-1805	WFC3/UVIS	3	15-Jul-2014 21:06:39.0	yes

<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>
03	(3) NGC-330	WFC3/UVIS	3	15-Jul-2014 21:06:42.0	yes
04	(4) NGC-1818	WFC3/UVIS	3	15-Jul-2014 21:06:44.0	yes

12 Total Orbits Used

ABSTRACT

Intermediate mass stars with $M = 6$ to $10 M_{\text{sun}}$ will end their lives by either losing mass quiescently and forming massive white dwarfs or by exploding as core collapse type II supernovae. The critical mass separating these two stellar evolution channels is not only a fundamental threshold of stellar astrophysics, but is a crucial ingredient to generate reliable galaxy evolution simulations. Given the steepness of the stellar IMF, small changes in the critical mass directly affects chemical evolution scenarios, energetics, and feedback relations. Although most astronomers reference the critical mass at $M = 8 M_{\text{sun}}$, there is a lack of robust theoretical or observational confirmation of this number.

We propose to measure the critical mass directly by verifying the end products of stellar evolution in four rich, young, co-eval stellar populations. With ages of 25 to 60 Myr and total stellar masses $>10,000 M_{\text{sun}}$, the Magellanic Cloud globular clusters NGC 1818, NGC 330, NGC 1805, and NGC 2164 have present-day main-sequence turnoff masses of $M = 6.2, 7.2, 8.5,$ and $9.8 M_{\text{sun}}$, respectively. Existing photometry verifies that each cluster has a rich upper main sequence of massive stars, and therefore would have formed dozen(s) of stars above the present day turnoff. If those stars did not explode as core collapse supernovae, they will populate a clear blue white dwarf cooling sequence. Our experiment uses the full power, wavelength coverage, and resolution of HST/WFC3 to detect these cooling sequences in high-precision, UV-sensitive color-magnitude diagrams.

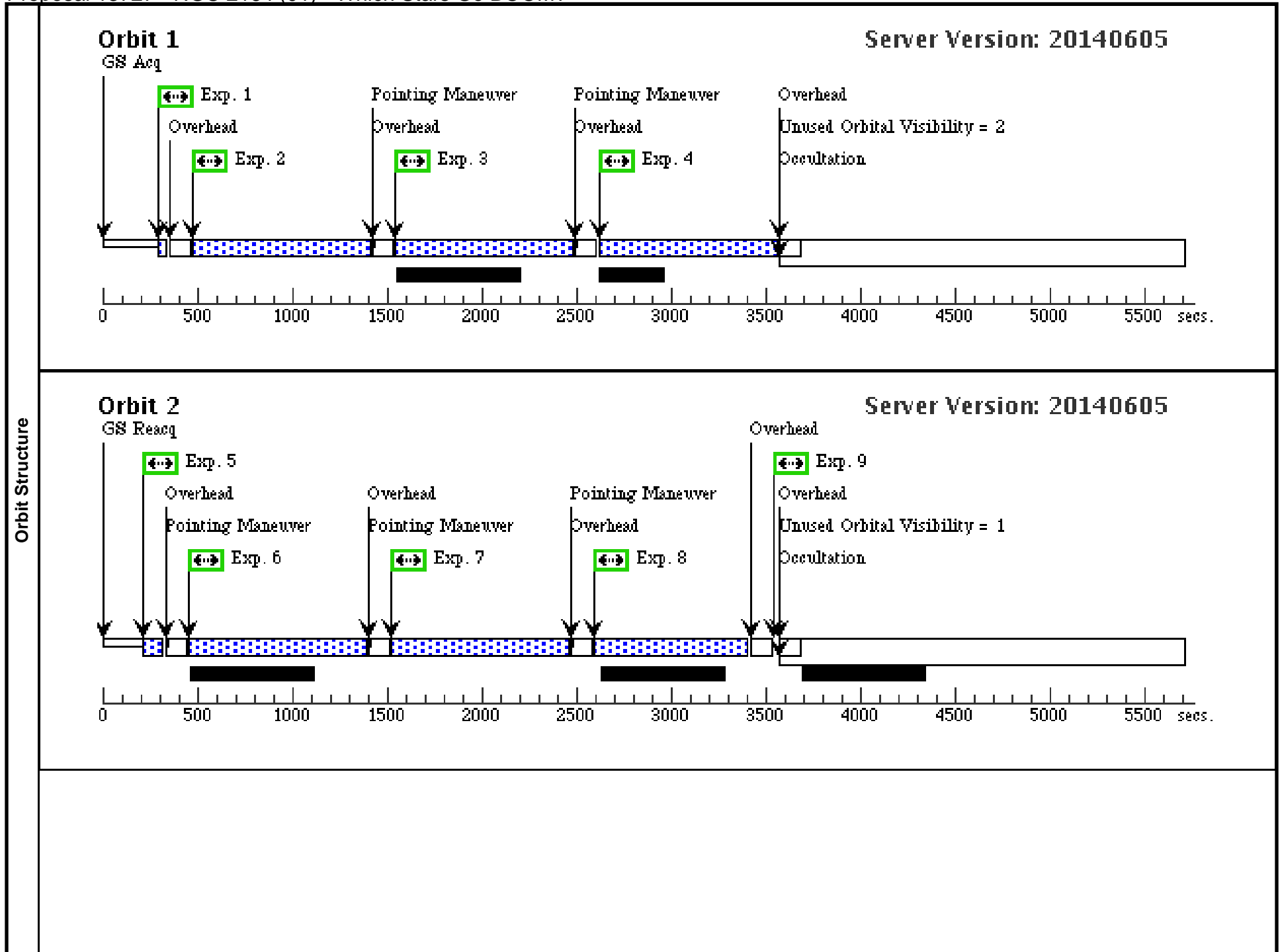
OBSERVING DESCRIPTION

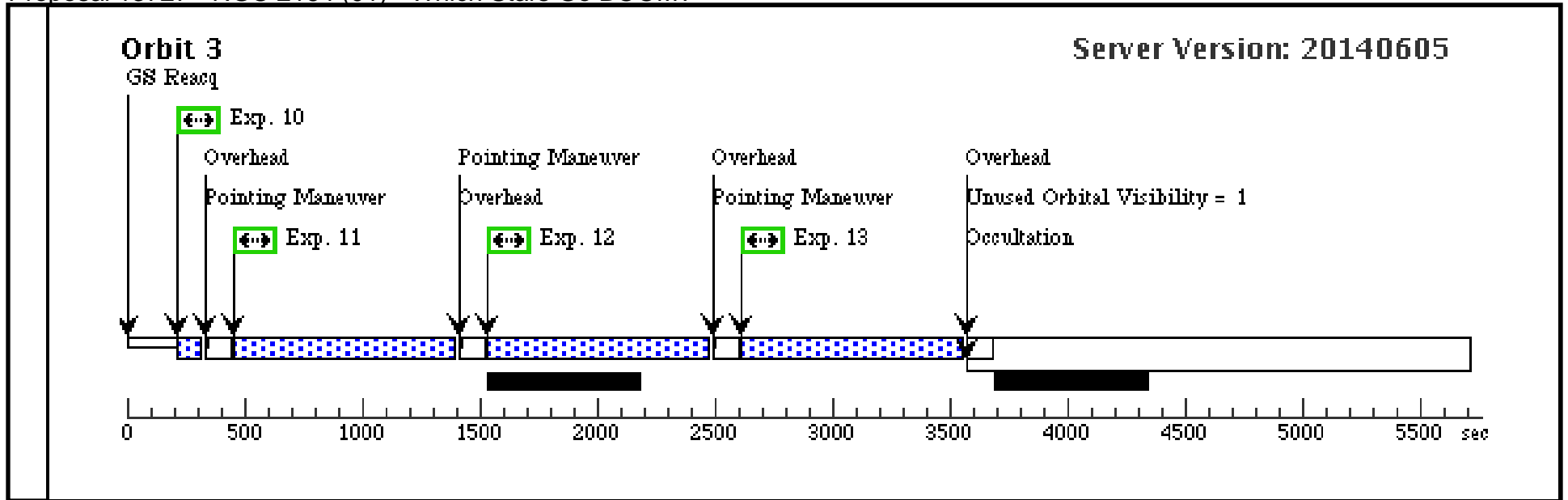
Targeting 3 globular clusters in the LMC and 1 in the SMC in WFC3/UV filters to get deep UV CMDs and find their cooling white dwarfs. Each cluster is contained in one visit with 3 orbits, with a series of F225W and F336W observations. Short exposures are added at the start and end of different orbits to mitigate saturation of bright sources. All exposures (except for shorts) are dithered and offset from the center to avoid the chip gap and to put the bulk of the cluster population on UVIS2 (cleaner flat field pattern). Post flash has been added to ensure 10-12 e- in each exposure to mitigate CTE.

Proposal 13727 - NGC 2164 (01) - Which Stars Go BOOM?

Wed Jul 16 01:06:46 GMT 2014

Visit	Proposal 13727, NGC 2164 (01), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	NGC-2164	RA: 05 58 55.8000 (89.7325000d) Dec: -68 30 59.00 (-68.51639d) Equinox: J2000		V=10.2	Reference Frame: SIMBAD				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=12; CR-SPLIT=NO	POS TARG 0,-15		10 Secs (10 Secs) [==>]	[1]
	2		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0,-15		938 Secs (938 Secs) [==>]	[1]
	3		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0.158,-1 5.070		938 Secs (938 Secs) [==>]	[1]
	4		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0.099,-1 5.165		938 Secs (938 Secs) [==>]	[1]
	5		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=12; CR-SPLIT=NO	POS TARG 0.099,-1 5.165		100 Secs (100 Secs) [==>]	[2]
	6		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG -0.060,- 16.298		938 Secs (938 Secs) [==>]	[2]
	7		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG -0.120,- 16.358		938 Secs (938 Secs) [==>]	[2]
	8		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=5; CR-SPLIT=NO	POS TARG 0,-15		790 Secs (790 Secs) [==>]	[2]
	9		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=10; CR-SPLIT=NO	POS TARG 0,-15		10 Secs (10 Secs) [==>]	[2]
	10		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=10; CR-SPLIT=NO	POS TARG 0,-15		100 Secs (100 Secs) [==>]	[3]
	11		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG 0.158,-1 5.070		947 Secs (947 Secs) [==>]	[3]
	12		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG 0.099,-1 6.368		947 Secs (947 Secs) [==>]	[3]
13		(1) NGC-2164	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG -0.060,- 16.290		947 Secs (947 Secs) [==>]	[3]	

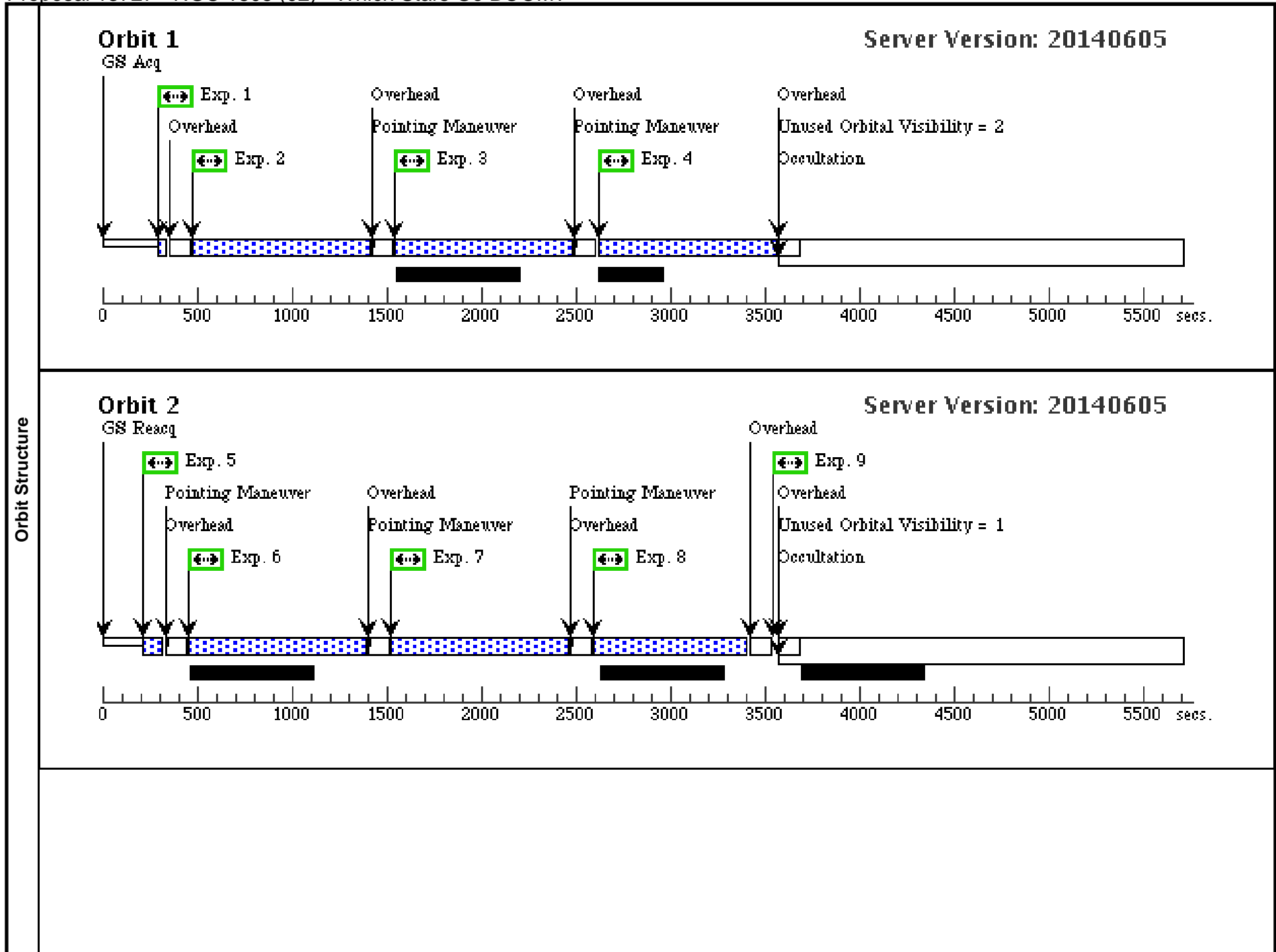


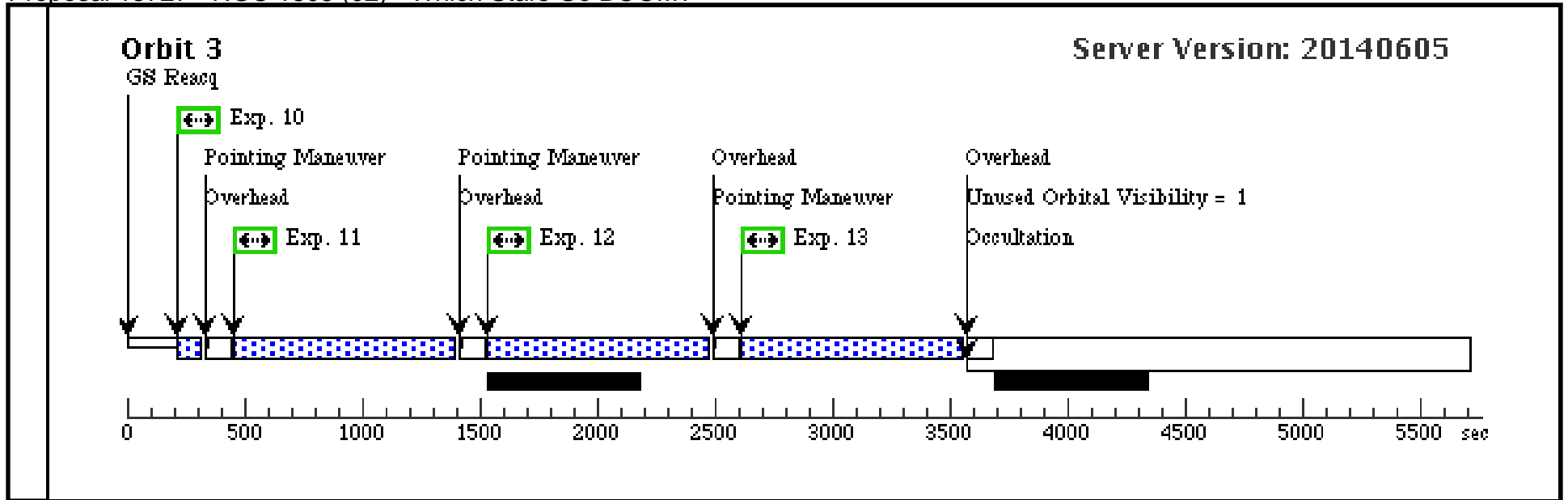


Proposal 13727 - NGC 1805 (02) - Which Stars Go BOOM?

Wed Jul 16 01:06:46 GMT 2014

Visit	Proposal 13727, NGC 1805 (02) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(2)	NGC-1805	RA: 05 02 21.4600 (75.5894167d) Dec: -66 06 44.00 (-66.11222d) Equinox: J2000		V=10.2	Reference Frame: SIMBAD				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=12; CR-SPLIT=NO	POS TARG 0,-15		10 Secs (10 Secs) [==>]	[1]
	2		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0,-15		938 Secs (938 Secs) [==>]	[1]
	3		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0.158,-1 5.070		938 Secs (938 Secs) [==>]	[1]
	4		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0.099,-1 5.165		938 Secs (938 Secs) [==>]	[1]
	5		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=12; CR-SPLIT=NO	POS TARG 0.099,-1 5.165		100 Secs (100 Secs) [==>]	[2]
	6		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG -0.060,- 16.298		938 Secs (938 Secs) [==>]	[2]
	7		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG -0.120,- 16.358		938 Secs (938 Secs) [==>]	[2]
	8		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=5; CR-SPLIT=NO	POS TARG 0,-15		790 Secs (790 Secs) [==>]	[2]
	9		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=10; CR-SPLIT=NO	POS TARG 0,-15		10 Secs (10 Secs) [==>]	[2]
	10		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=10; CR-SPLIT=NO	POS TARG 0,-15		100 Secs (100 Secs) [==>]	[3]
	11		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG 0.158,-1 5.070		947 Secs (947 Secs) [==>]	[3]
	12		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG 0.099,-1 6.368		947 Secs (947 Secs) [==>]	[3]
13		(2) NGC-1805	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG -0.060,- 16.290		947 Secs (947 Secs) [==>]	[3]	

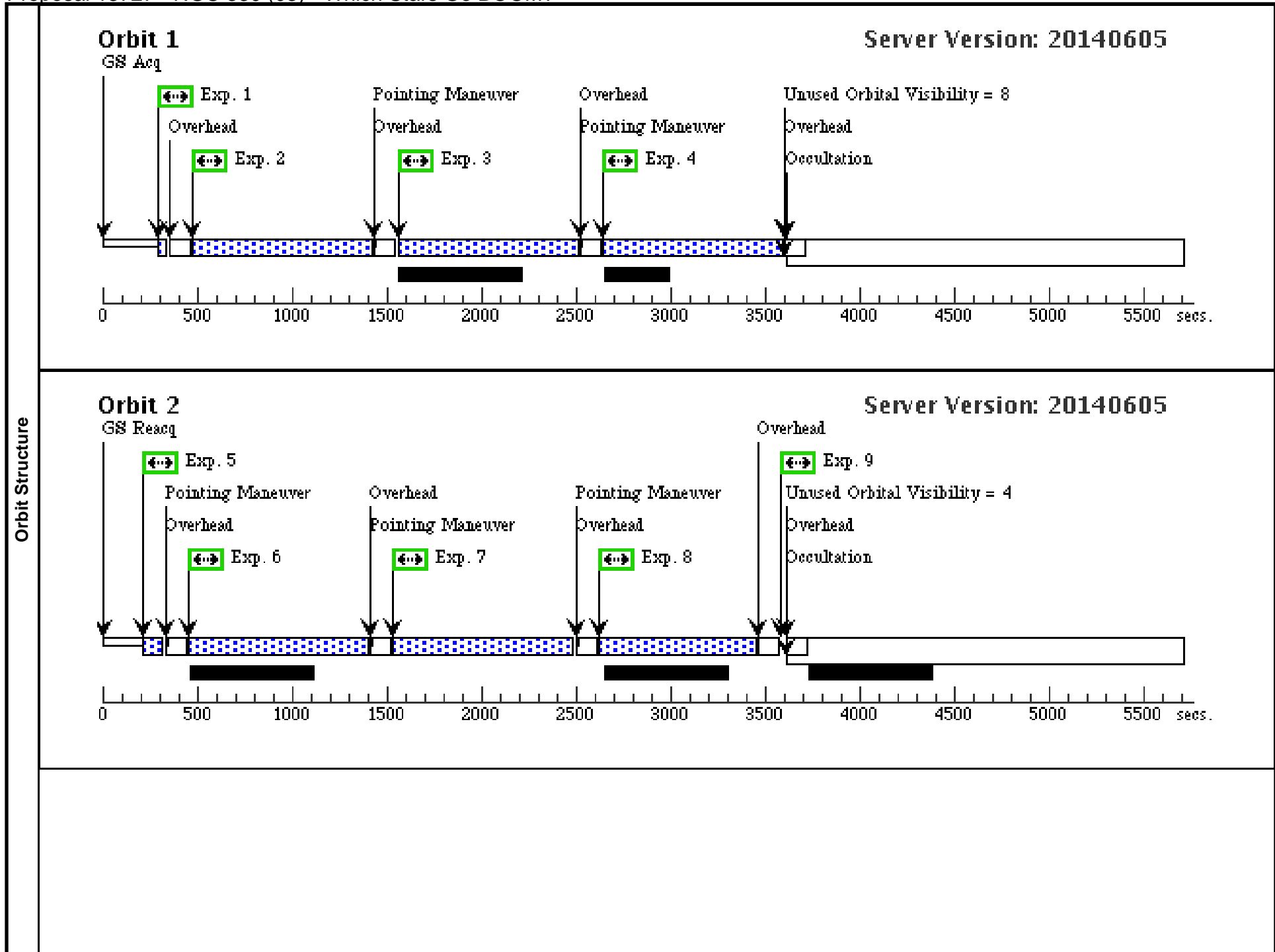


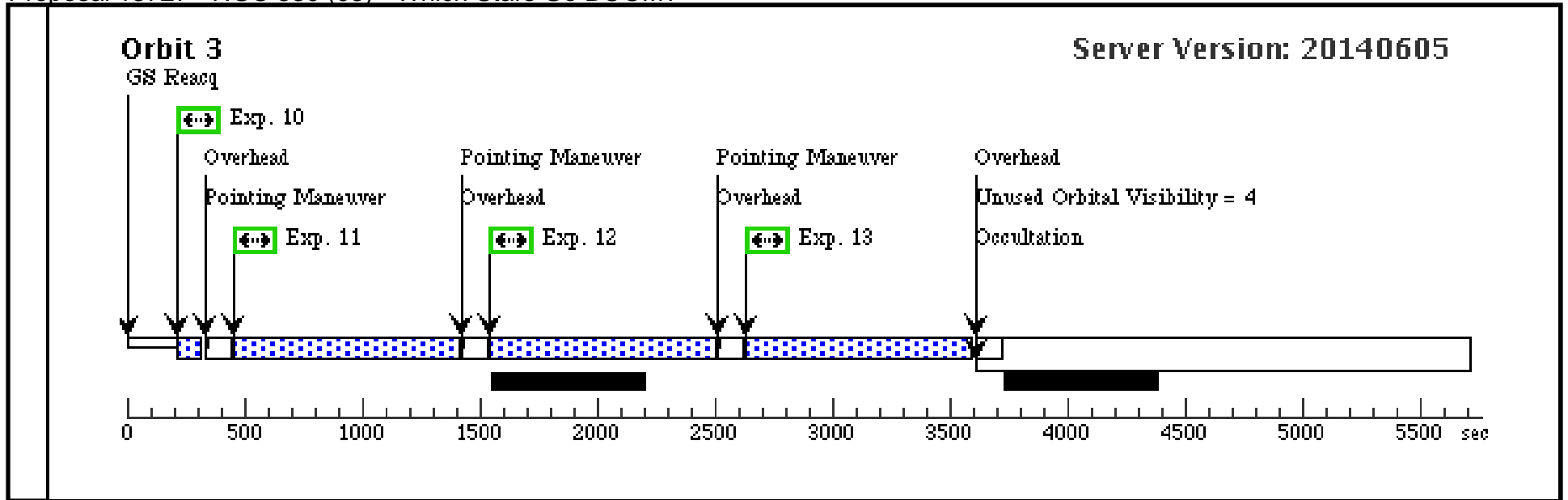


Proposal 13727 - NGC 330 (03) - Which Stars Go BOOM?

Wed Jul 16 01:06:46 GMT 2014

Visit	Proposal 13727, NGC 330 (03) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(3)	NGC-330	RA: 00 56 18.5400 (14.0772500d) Dec: -72 27 52.20 (-72.46450d) Equinox: J2000		V=9.1	Reference Frame: SIMBAD				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=12; CR-SPLIT=NO	POS TARG 0,-15		10 Secs (10 Secs) [==>]	[1]
	2		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0,-15		950 Secs (950 Secs) [==>]	[1]
	3		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0.158,-1 5.070		950 Secs (950 Secs) [==>]	[1]
	4		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0.099,-1 5.165		950 Secs (950 Secs) [==>]	[1]
	5		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=12; CR-SPLIT=NO	POS TARG 0.099,-1 5.165		100 Secs (100 Secs) [==>]	[2]
	6		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG -0.060,- 16.298		950 Secs (950 Secs) [==>]	[2]
	7		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG -0.120,- 16.358		950 Secs (950 Secs) [==>]	[2]
	8		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=5; CR-SPLIT=NO	POS TARG 0,-15		805 Secs (805 Secs) [==>]	[2]
	9		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=10; CR-SPLIT=NO	POS TARG 0,-15		10 Secs (10 Secs) [==>]	[2]
	10		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=10; CR-SPLIT=NO	POS TARG 0,-15		100 Secs (100 Secs) [==>]	[3]
	11		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG 0.158,-1 5.070		960 Secs (960 Secs) [==>]	[3]
	12		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG 0.099,-1 6.368		960 Secs (960 Secs) [==>]	[3]
	13		(3) NGC-330	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG -0.060,- 16.290		960 Secs (960 Secs) [==>]	[3]





Proposal 13727 - NGC 1818 (04) - Which Stars Go BOOM?

Wed Jul 16 01:06:47 GMT 2014

Visit	Proposal 13727, NGC 1818 (04) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(4)	NGC-1818	RA: 05 04 13.8000 (76.0575000d) Dec: -66 26 2.00 (-66.43389d) Equinox: J2000 <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>		V=8.7	Reference Frame: SIMBAD				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=12; CR-SPLIT=NO	POS TARG 0,-15		10 Secs (10 Secs) [==>]	[1]
	2		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0,-15		938 Secs (938 Secs) [==>]	[1]
	3		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0.158,-1 5.070		938 Secs (938 Secs) [==>]	[1]
	4		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG 0.099,-1 5.165		938 Secs (938 Secs) [==>]	[1]
	5		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=12; CR-SPLIT=NO	POS TARG 0.099,-1 5.165		100 Secs (100 Secs) [==>]	[2]
	6		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG -0.060,- 16.298		938 Secs (938 Secs) [==>]	[2]
	7		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=8; CR-SPLIT=NO	POS TARG -0.120,- 16.358		938 Secs (938 Secs) [==>]	[2]
	8		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=5; CR-SPLIT=NO	POS TARG 0,-15		790 Secs (790 Secs) [==>]	[2]
	9		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=10; CR-SPLIT=NO	POS TARG 0,-15		10 Secs (10 Secs) [==>]	[2]
	10		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=10; CR-SPLIT=NO	POS TARG 0,-15		100 Secs (100 Secs) [==>]	[3]
	11		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG 0.158,-1 5.070		947 Secs (947 Secs) [==>]	[3]
	12		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG 0.099,-1 6.368		947 Secs (947 Secs) [==>]	[3]
13		(4) NGC-1818	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4; CR-SPLIT=NO	POS TARG -0.060,- 16.290		947 Secs (947 Secs) [==>]	[3]	

