12500 - High-resolution UV studies of SAURON galaxies with WFC3: constraining recent star formation and its drivers in local early-type galaxies

Cycle: 19, Proposal Category: GO

(Availability Mode: SUPPORTED)

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?*
11	(1) NGC-524	WFC3/UVIS	1	10-May-2012 22:46:03.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
12	(2) NGC-2685	WFC3/UVIS	1	10-May-2012 22:46:09.0	yes
13	(3) NGC-2768	WFC3/UVIS	1	10-May-2012 22:46:13.0	yes
14	(4) NGC-3032	WFC3/UVIS	2	10-May-2012 22:46:22.0	yes
15	(5) NGC-3156	WFC3/UVIS	2	10-May-2012 22:46:35.0	yes
16	(6) NGC-3489	WFC3/UVIS	2	10-May-2012 22:46:46.0	yes
17	(7) NGC-4459	WFC3/UVIS	2	10-May-2012 22:46:59.0	yes
18	(8) NGC-4477	WFC3/UVIS	2	10-May-2012 22:47:10.0	yes
19	(9) NGC-4526	WFC3/UVIS	1	10-May-2012 22:47:15.0	yes
20	(10) NGC-4550	WFC3/UVIS	1	10-May-2012 22:47:19.0	yes

15 Total Orbits Used

ABSTRACT

A significant recent discovery, using survey data in the rest-frame ultraviolet (UV), is the unambiguous detection of widespread, low-level recent star formation (RSF) in nearby early-type galaxies (ETGs). Its extreme sensitivity to young stars makes the UV the ideal tool to accurately quantify the weak star formation in ETGs, which were traditionally thought to be evolving largely passively. We aim to combine the UV capabilities of WFC3 with the powerful SAURON survey - which offers optical integral-field spectroscopy of local ETGs - to study RSF in ETGs in unprecedented detail. Our targets are a subset of SAURON with fully mapped molecular CO and signatures of star formation. For each target we aim to (1) use a pixel-by-pixel analysis to spatially map the properties of the young stars (ages/mass fractions/metallicities) (2) calculate ages/metallicities of individual globular clusters to probe the galaxy’s mass assembly over time (3) combine UV-derived RSF estimates with CO gas maps to study the star formation law on unprecedentedly small scales (4) compare the age-dated substructure to numerical simulations of minor mergers to constrain characteristics of the last merger event (e.g. mass ratios, satellite gas fractions) in ETGs that are likely to be merger remnants. The research leverages our past work with UV data (e.g. GALEX) and a published WFC3 study of NGC 4150, which we use to explicitly demonstrate the scope and quality of the science results. The unique WFC3 combination of high UV sensitivity and spatial resolution are critical and we demonstrate why this proposal cannot be fulfilled using any other facility. The proposal targets 10 ETGs with 15 orbits.

OBSERVING DESCRIPTION

GALAXY SAMPLE

We propose to observe all early-type galaxies (ETGs) in the SAURON survey that are detected in single-dish CO observations and have interferometric CO maps. The SAURON Hbeta absorption maps and integrated GALEX UV colours of these galaxies unambiguously indicate the presence of star formation, guaranteeing an excellent scientific return from the proposed work. The targets comprise 10 nearby (< 30 Mpc) ETGs, spanning 3 mags in V, with fully mapped M(H_2) between 3 x 10^7 MSun and 3 x 10^8 MSun. Due to the design of SAURON they are drawn equally from clusters and the field. The targets are therefore a representative sample of star-forming ETGs in which recent star formation (RSF) can be probed, with excellent 2D ancilliary data (optical integral-field spectroscopy and molecular CO).

REQUIRED FILTERSET

The filters required to fulfil the aims of this proposal are NUV, g, V and I. For the theoretical modelling, past experience using GALEX/SDSS survey data and WFC3 (Crockett et al. 2011, ApJ, 727, 115, see Sec. 2 in Phase I proposal) clearly indicates that the NUV spectrum around 2250 angstroms is fundamental to the accurate estimation of RSF parameters. The sensitivity to young stars drops off rapidly at longer wavelengths, so that filters centred at 2750 angstroms and 3000 angstroms cannot fulfil the requirements of this proposal. While the NUV will probe the RSF, the g, V and I bands are required to anchor the optical spectrum and probe the shape of the 4000 angstrom break. We propose to use F475W (g) instead of F438W (B) which was used in Crockett et al. (2011), due its 2x better efficiency. The accuracy of the theoretical analysis will remain unchanged. Experience with GALEX/SDSS indicates that the derived RSF parameters do not change if U-band data is added, so we do not need a U-band filter for this proposal. Past work shows that NUV, g, V, I is the minimum filterset required to alleviate parameter degeneracies and extract RSF parameters with good precision.

ORBIT REQUEST AND EXPOSURE TIMES

We will combine WFC3 observations with archival WFPC2/ACS data, to obtain 4 filter photometry for each target in F225W (NUV), F475W (g), F555W (V) and F814W (I). WFC3 observations will have the following allocations: 1.00 orbit for F225W, and roughly 0.33 orbits each for F475W (g), F555W (V), and F814W (I). F225W exposure times are estimated by comparing the central GALEX NUV surface brightness (SB) in each galaxy to the mean central SB of NGC 4150 in F225W. The F225W exposure time gives us S/N ~ 5 per pixel in the central regions of our galaxies. Assuming mu(V) ~ 20.5 mag arcsec^-2 (typical at Re), the g, V, I exposure times achieve at least S/N ~ 5 per pixel in each filter within Re. We do not use the F606W filter, even though it offers a 50% improvement in S/N on F555W, because it suffers from Halpha contamination.

The Phase II mode of APT shows that we can fit six 348 sec UVIS images into one orbit, efficiently hiding overheads. This implies 2 exposures per

g,V,I filter, with a small dither to improve sampling and mitigate bad pixels. A small, tolerable percentage of the field is lost to residual cosmic ray contamination. Overhead constraints force the exposure time to be distributed fairly evenly among g,V,I. The S/N achieved is adequate for our purposes and comparable to the quality of archival WFPC2/ACS data utilised for other galaxies.

5 of our 10 galaxies require only WFC3/F225W (1 orbit), owing to archival data. Note that, while NGC 524 has no F475W data, it does have ACS HRC F330W (U-band) which performs equally well in the theoretical analysis. Likewise, NGC 2685 has WFPC2 F450W data. 2 galaxies have no useful archive data, requiring 2 WFC3 orbits to image in all bands with the orbit allocations stated above. 2 other galaxies have only very shallow WFPC2 F814W images which do not have adequate S/N. We request WFC3 imaging in all bands for these galaxies. It is worth noting that, even though there will be a duplication in F814W, our orbit request would still have to be an integer number (i.e. 2 orbits) if we excluded F814W. The final galaxy (NGC 4459) has ACS/WFC F475W and shallow WFPC2 F814W observations, but no useful F555W data (only a single WFPC2/F555W 160 sec exposure which is heavily contaminated by cosmic rays). We request WFC3 observations of this galaxy in all 4 filters over 2 orbits. As outlined above, a robust theoretical analysis is not possible without a minimum of NUV, g, V and I. The orbit request leverages the existing HST data and, with a minimum WFC3 commitment, allows us to study each target in an identical fashion to that demonstrated in Sec. 2. and Crockett et al. (2011).

ADDITIONAL COMMENTS

We fully understand that obtaining only two exposures for our broadband filters will result in some degree of residual contamination from cosmic rays and detector artifacts. We have carefully assessed the impact of this on our science goals, and feel that this is a tolerable tradeoff -- much better than dropping one of the broadband filters in order to get a third exposure in the other two. Our team has relevant experience with such data quality tradeoffs from the WFC3 ERS program. We will try to keep pointing constraints to a minimum, but where they are included, it is typically to avoid scattering effects from bright foreground stars, and also to manage the location of the overlapping interchip gaps -- we know we will have cosmic rays there, so we will try to avoid placing it over critical target areas (i.e. the galaxy nucleus where the star formation is typically concentrated).

Visit

Proposal 12500, Visit 11, scheduling Fri May 11 02:47:25 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 210D TO 280 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=86.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

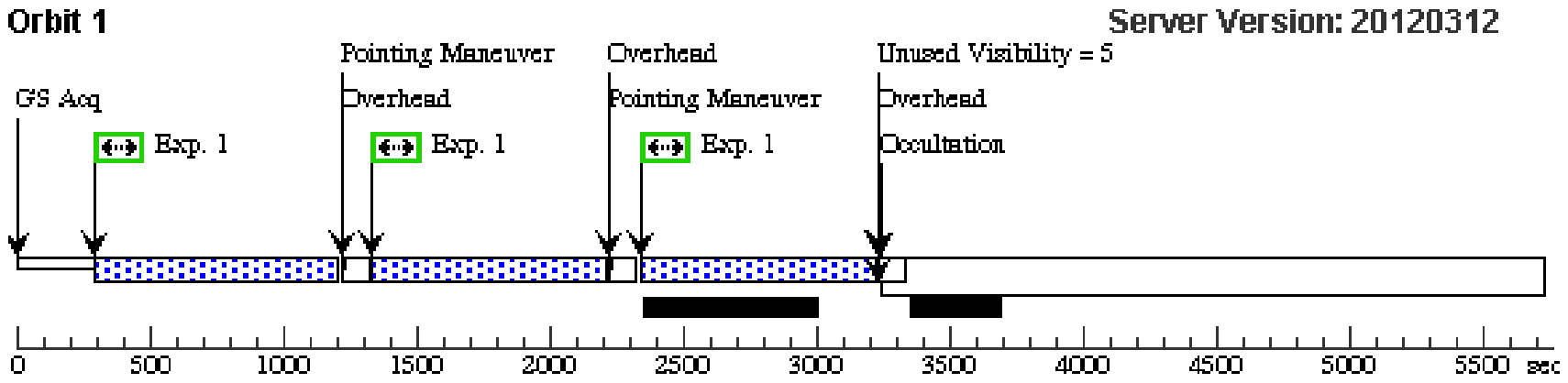
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-524	RA: 01 24 47.7070 (21.1987792d) Dec: +09 32 19.65 (9.53879d) Equinox: J2000		V=10.25+/-0.1	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(1) NGC-524	WFC3/UVIS, ACCUM, UVIS1-FIX	F225W	CR-SPLIT=NO	POS TARG 0,-20; GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in Visit 11 (1)	880 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12500, Visit 12, implementation Fri May 11 02:47:26 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 70D TO 90 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=86.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

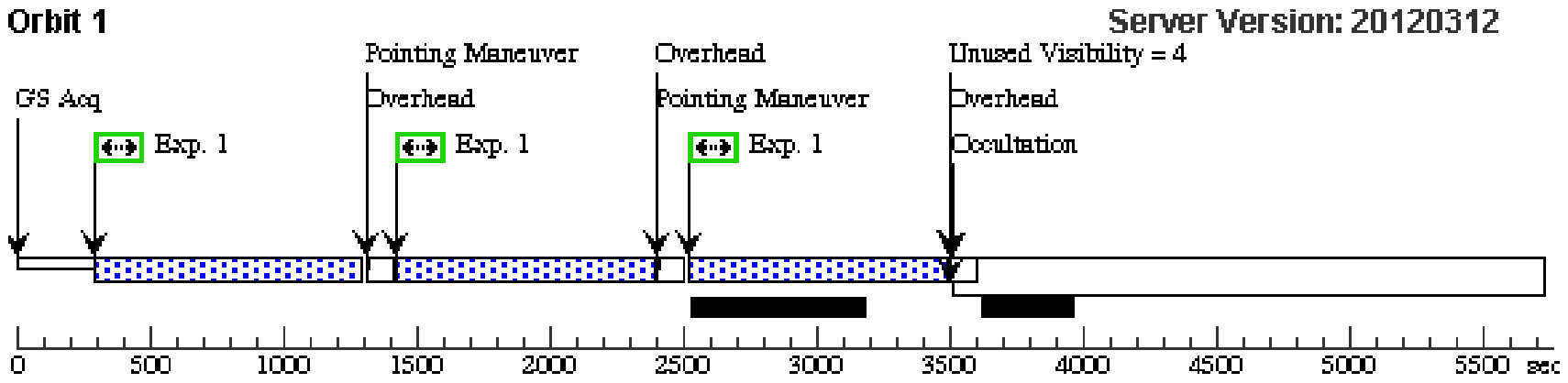
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC-2685	RA: 08 55 34.7500 (133.8947917d) Dec: +58 44 3.87 (58.73441d) Equinox: J2000		V=11.26+/-0.1	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(2) NGC-2685	WFC3/UVIS, ACCUM, UVIS-FIX	F225W	CR-SPLIT=NO	POS TARG 0,5; GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in Visit 12 (1)	970 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12500, Visit 13, completed Fri May 11 02:47:27 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 305D TO 325 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=86.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

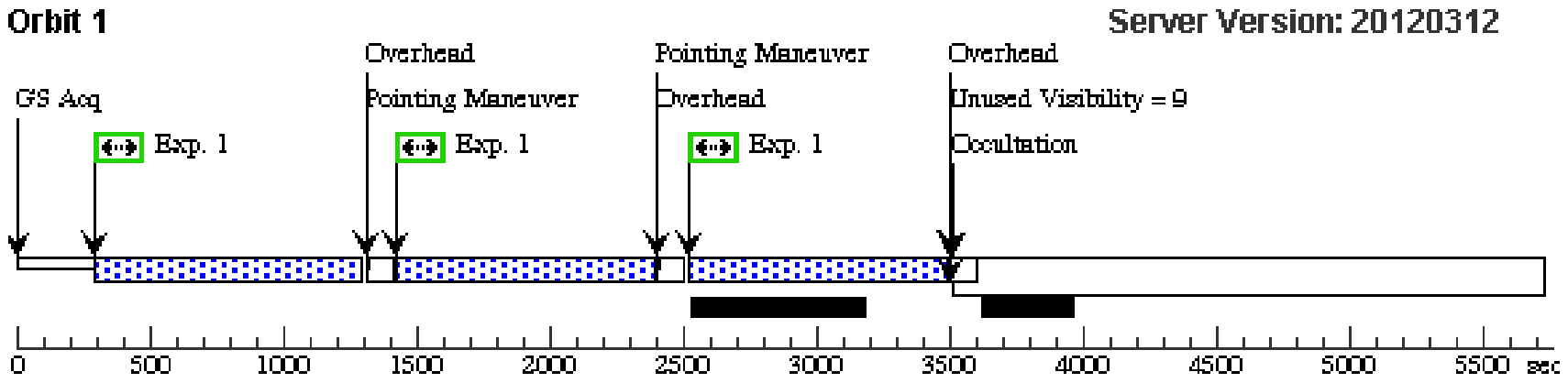
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	NGC-2768	RA: 09 11 37.5040 (137.9062667d) Dec: +60 02 13.95 (60.03721d) Equinox: J2000		V=9.87+/-0.1	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(3) NGC-2768	WFC3/UVIS, ACCUM, UVIS-FIX	F225W	CR-SPLIT=NO	POS TARG 0,10; GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in Visit 13 (1)	970 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12500, Visit 14, scheduling Fri May 11 02:47:27 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 200D TO 240 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=86.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

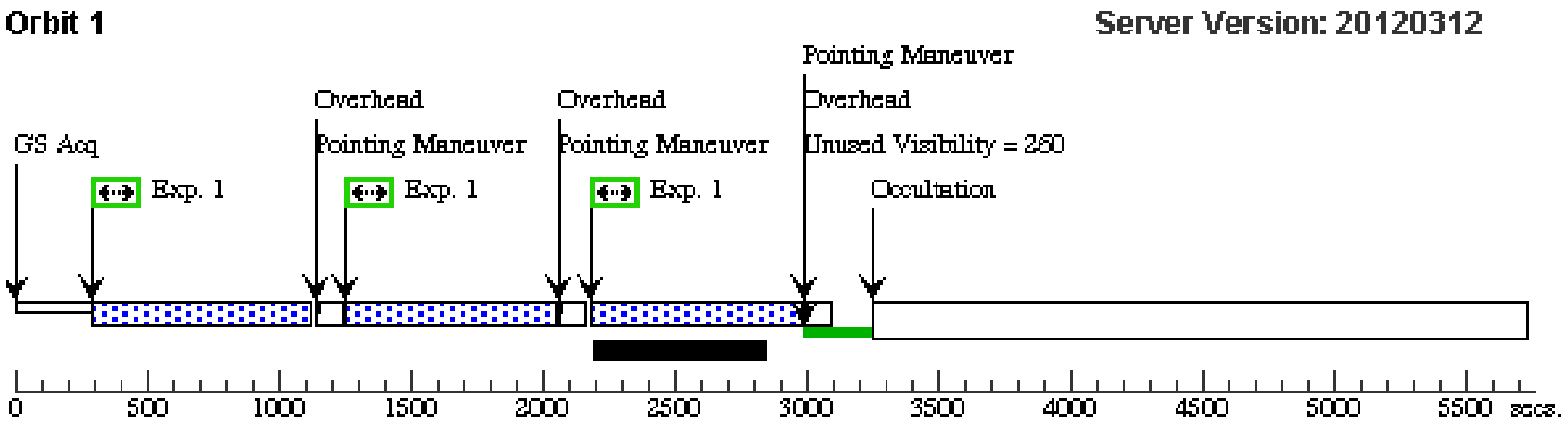
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	NGC-3032	RA: 09 52 8.1890 (148.0341208d) Dec: +29 14 10.60 (29.23628d) Equinox: J2000		V=12.51+/-0.14	Reference Frame: ICRS

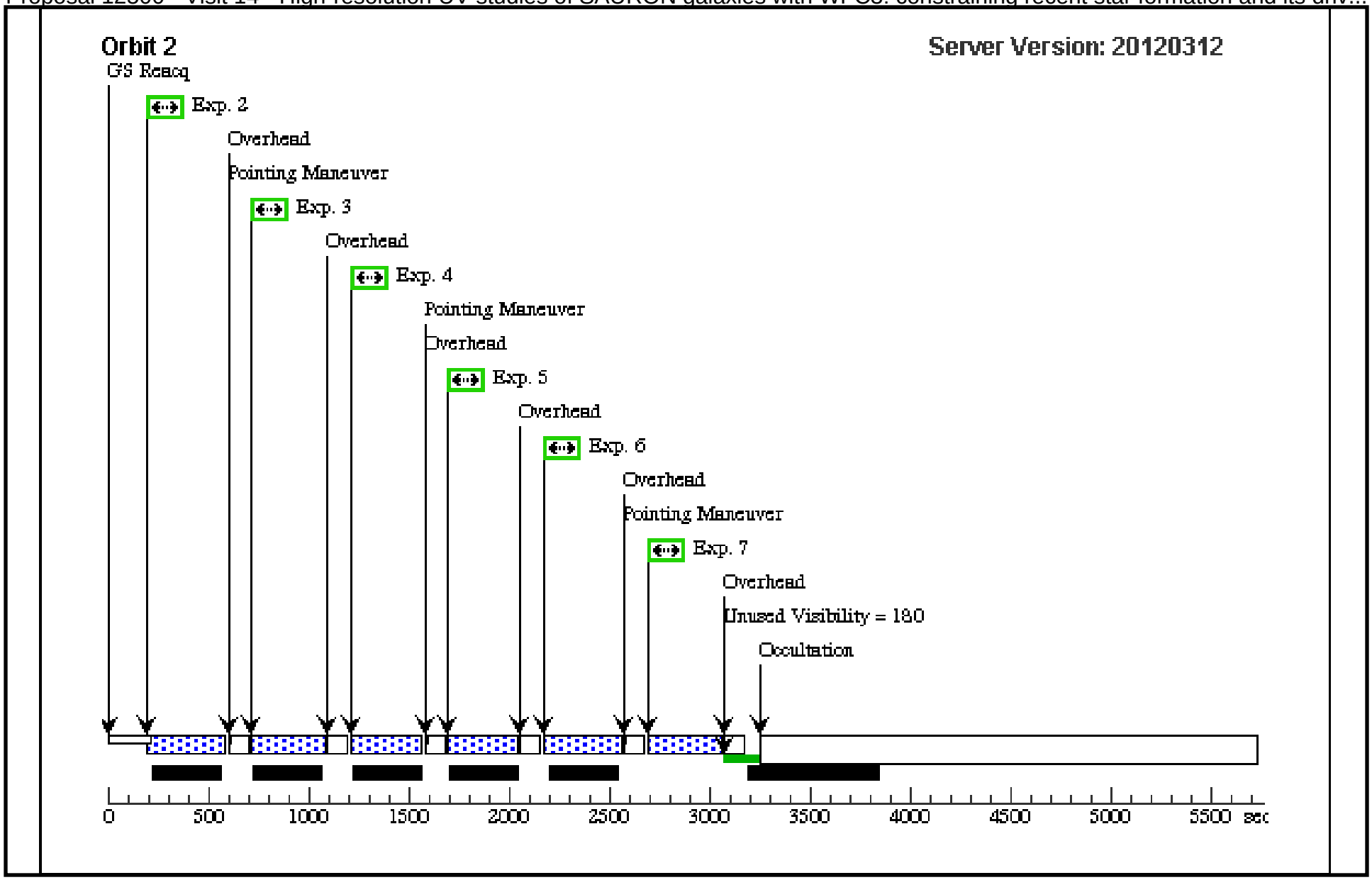
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(4) NGC-3032	WFC3/UVIS, ACCUM, UVIS	F225W	CR-SPLIT=NO		Pattern 1, Exps 1-1 in Visit 14 (1)	800 Secs	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
2	814	(4) NGC-3032	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO			370 Secs	
								[==>]	***[2]***
3	814	(4) NGC-3032	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO	POS TARG 0.4,1.8		370 Secs	
								[==>]	***[2]***
4	555	(4) NGC-3032	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0.4,1.8		348 Secs	
								[==>]	***[2]***
5	555	(4) NGC-3032	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0,0		348 Secs	
								[==>]	***[2]***
6	475	(4) NGC-3032	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0,0		370 Secs	
								[==>]	***[2]***
7	475	(4) NGC-3032	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0.4,1.8		370 Secs	
								[==>]	***[2]***

Orbit Structure




Orbit 2
Server Version: 20120312
GS Reacq
Exp. 2
Overhead
Pointing Maneuver
Exp. 3
Overhead
Exp. 4
Pointing Maneuver
Overhead
Exp. 5
Overhead
Exp. 6
Overhead
Pointing Maneuver
Exp. 7
Overhead
Unused Visibility = 180
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12500, Visit 15, completed Fri May 11 02:47:28 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 349D TO 359 D; VISIBILITY INTERVAL 52 M

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=86.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

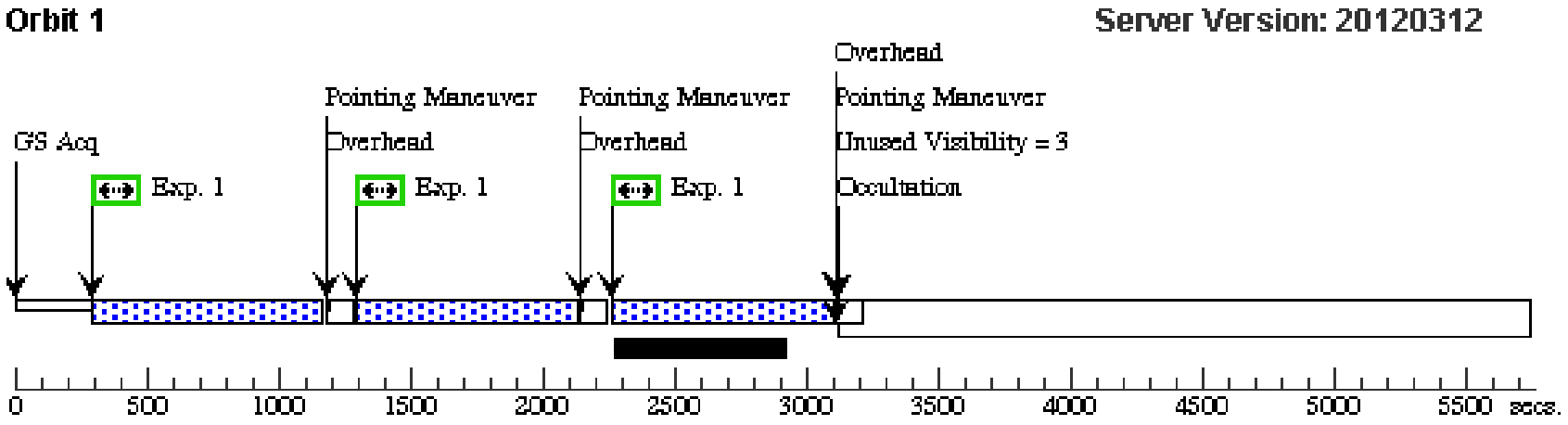
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	NGC-3156	RA: 10 12 41.2060 (153.1716917d) Dec: +03 07 45.55 (3.12932d) Equinox: J2000		V=12.3+/-0.13	Reference Frame: ICRS

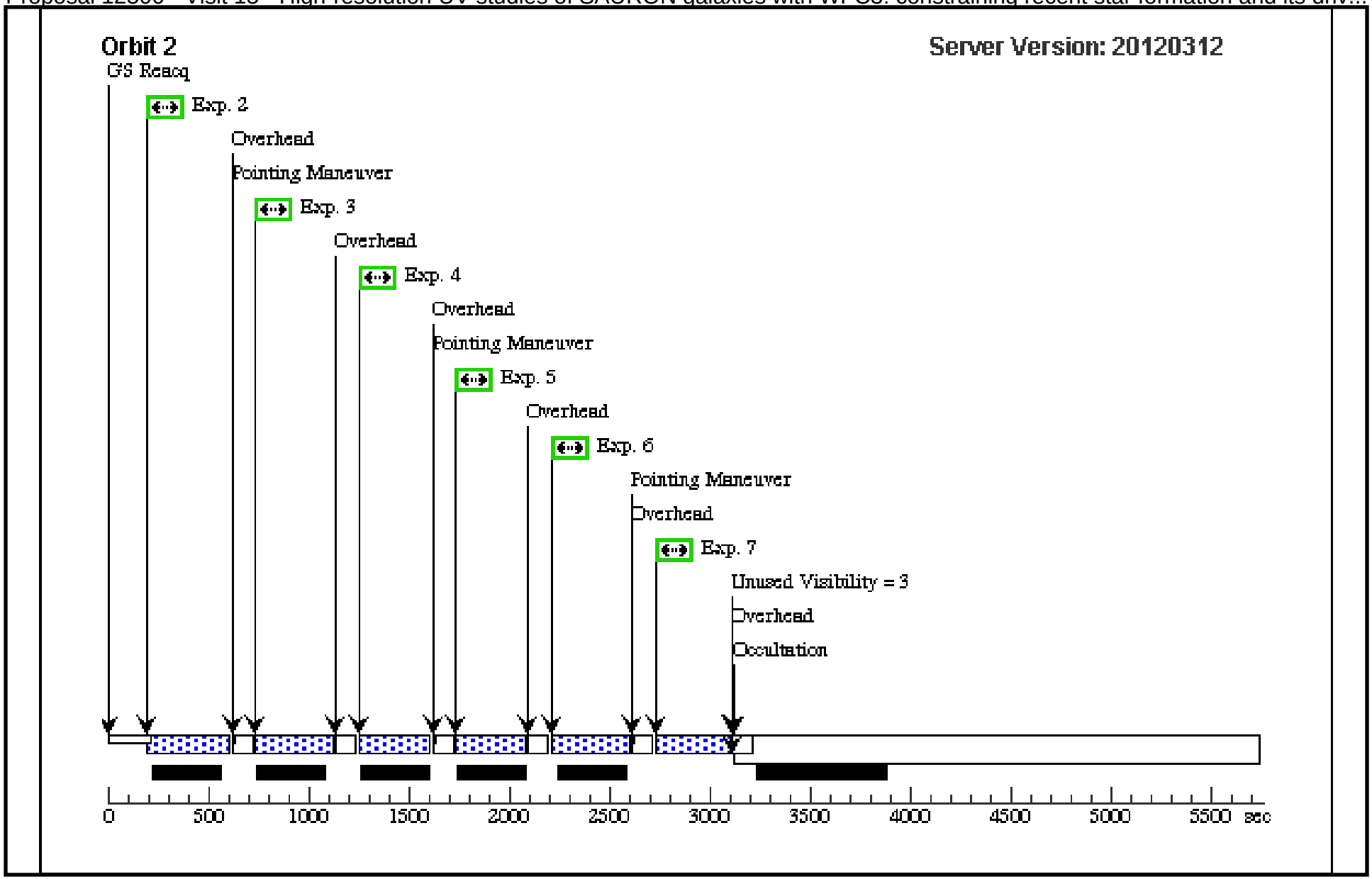
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(5) NGC-3156	WFC3/UVIS, ACCUM, UVIS-FIX	F225W	CR-SPLIT=NO	POS TARG 0,10; GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in Visit 15 (1)	840 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
2	814	(5) NGC-3156	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO	POS TARG 0,10		390 Secs *[==>]*	 ***[2]***
3	814	(5) NGC-3156	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO	POS TARG 0.4,11.8		390 Secs *[==>]*	 ***[2]***
4	555	(5) NGC-3156	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0.4,11.8		348 Secs *[==>]*	 ***[2]***
5	555	(5) NGC-3156	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0,10		348 Secs *[==>]*	 ***[2]***
6	475	(5) NGC-3156	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0,10		370 Secs *[==>]*	 ***[2]***
7	475	(5) NGC-3156	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0.4,11.8		370 Secs *[==>]*	 ***[2]***

Orbit Structure




Orbit 2
Server Version: 20120312
GS Reacq
Exp. 2
Overhead
Pointing Maneuver
Exp. 3
Overhead
Exp. 4
Overhead
Pointing Maneuver
Exp. 5
Overhead
Exp. 6
Pointing Maneuver
Overhead
Exp. 7
Unused Visibility = 3
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12500, Visit 16, scheduling Fri May 11 02:47:29 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 285D TO 290 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
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	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

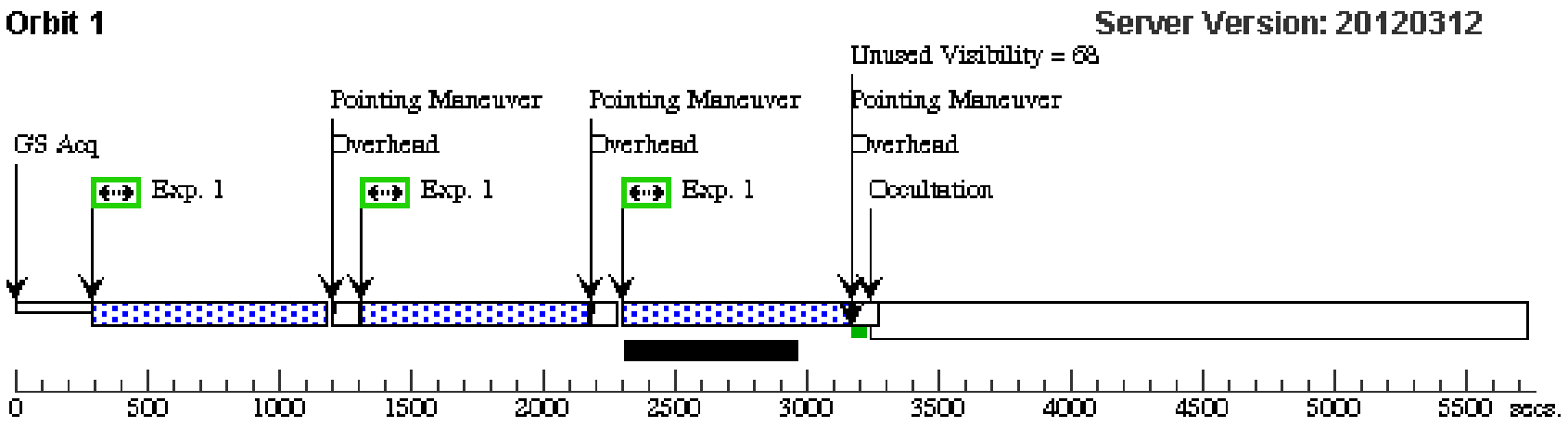
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	NGC-3489	RA: 11 00 18.5890 (165.0774542d) Dec: +13 54 4.53 (13.90126d) Equinox: J2000		V=10.29+/-0.13	Reference Frame: ICRS

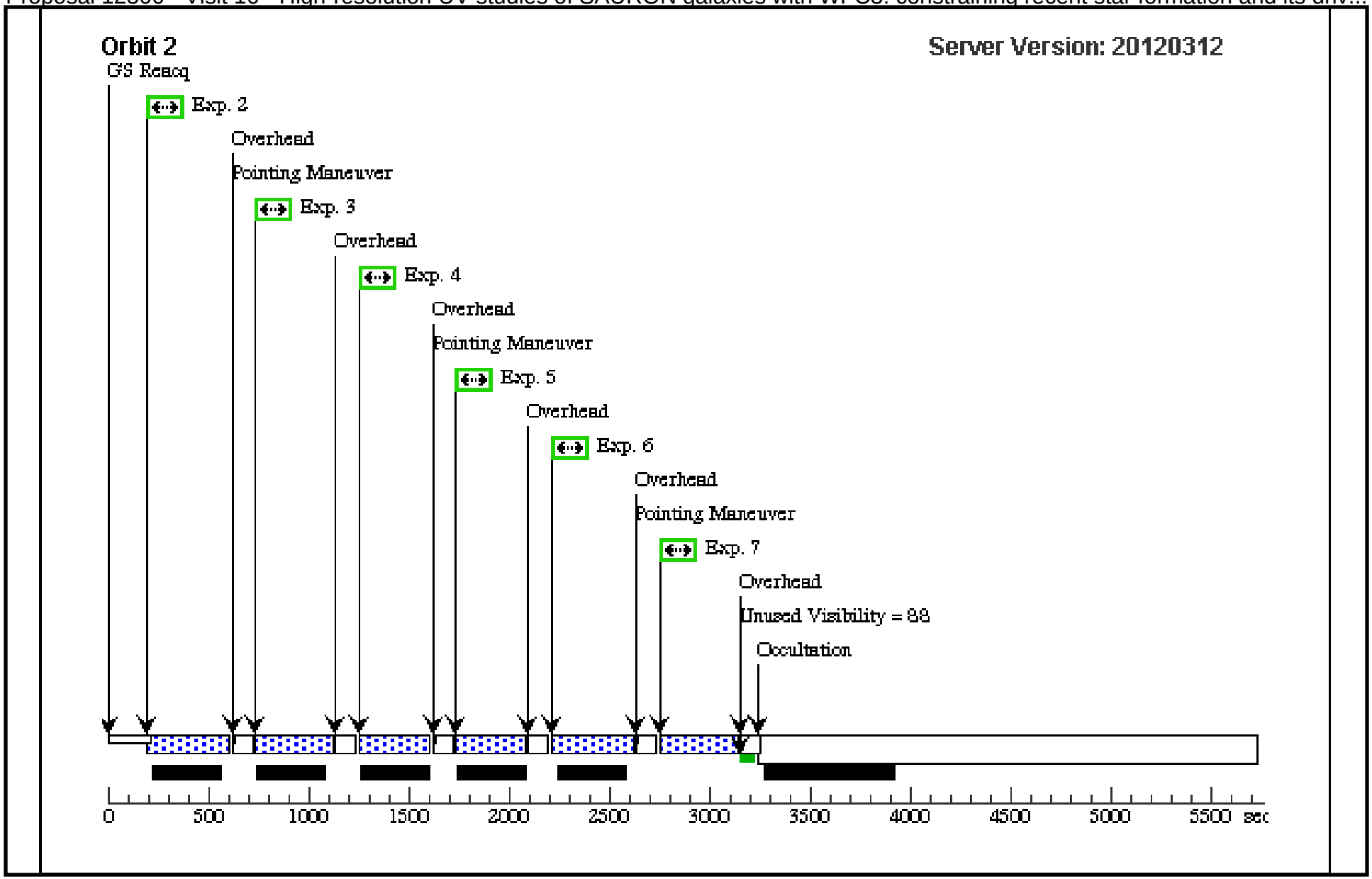
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(6) NGC-3489	WFC3/UVIS, ACCUM, UVIS-FIX	F225W	CR-SPLIT=NO	POS TARG 0.4,1.8	Pattern 1, Exps 1-1 in Visit 16 (1)	860 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2	814	(6) NGC-3489	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO	POS TARG 0,0		390 Secs *[==>]*	***[2]***
3	814	(6) NGC-3489	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO	POS TARG 0.4,1.8		390 Secs *[==>]*	***[2]***
4	555	(6) NGC-3489	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0.4,1.8		348 Secs *[==>]*	***[2]***
5	555	(6) NGC-3489	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0,0		348 Secs *[==>]*	***[2]***
6	475	(6) NGC-3489	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0,0		390 Secs *[==>]*	***[2]***
7	475	(6) NGC-3489	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0.4,1.8		390 Secs *[==>]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20120312
GS Reacq
Exp. 2
Overhead
Pointing Maneuver
Exp. 3
Overhead
Exp. 4
Overhead
Pointing Maneuver
Exp. 5
Overhead
Exp. 6
Overhead
Pointing Maneuver
Exp. 7
Overhead
Unused Visibility = 88
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12500, Visit 17, completed Fri May 11 02:47:30 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 155D TO 115 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=86.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

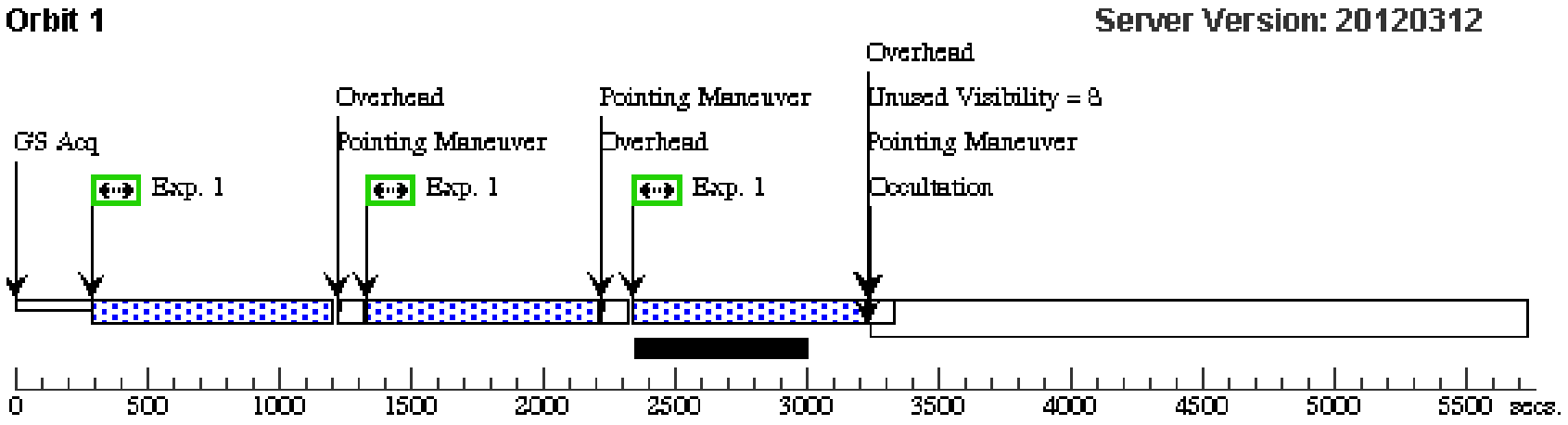
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(7)	NGC-4459	RA: 12 29 0.0260 (187.2501083d) Dec: +13 58 42.89 (13.97858d) Equinox: J2000		V=10.37+/-0.04	Reference Frame: ICRS

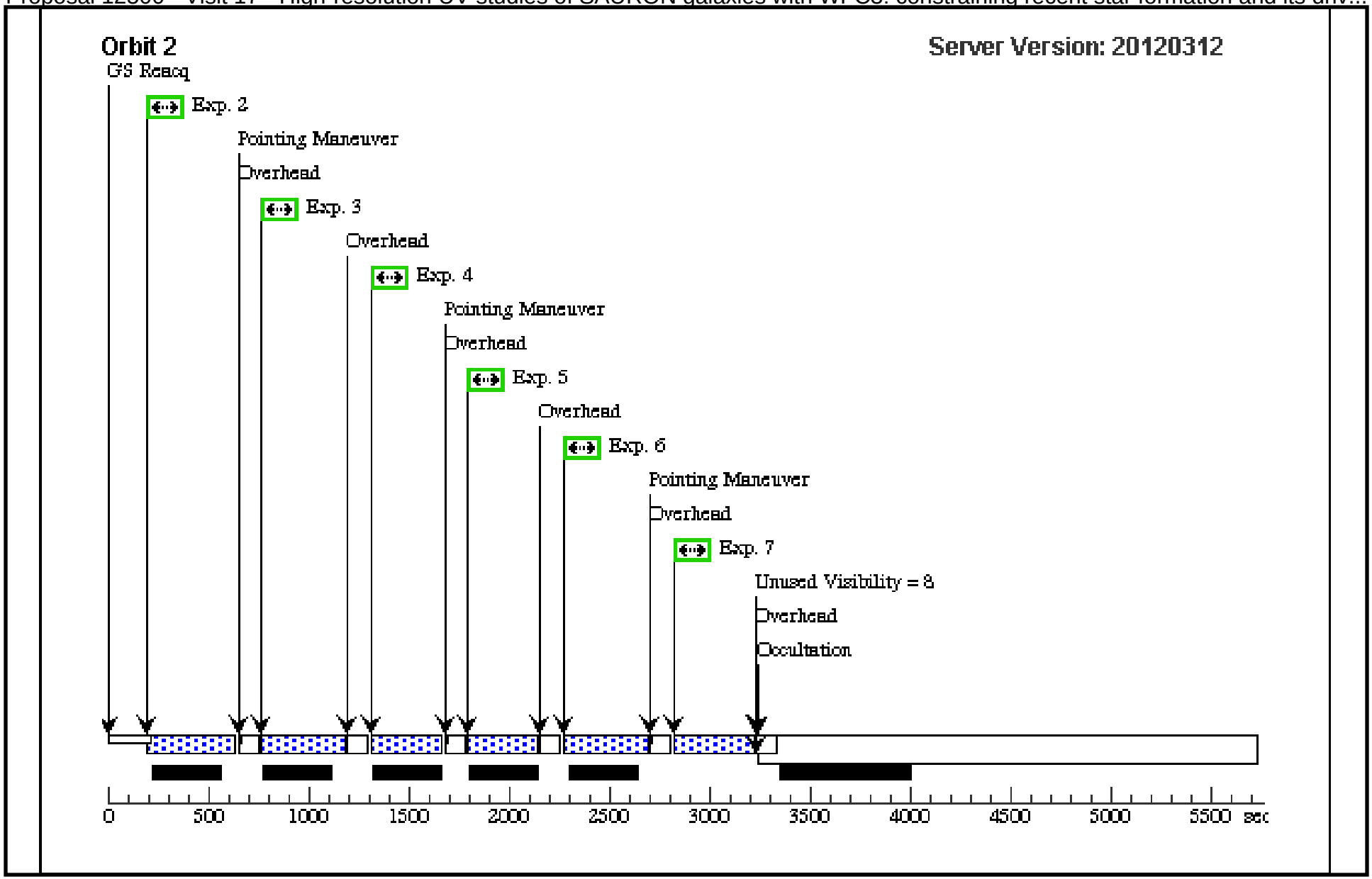
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(7) NGC-4459	WFC3/UVIS, ACCUM, UVIS-FIX	F225W	CR-SPLIT=NO	POS TARG 0.4,1.8	Pattern 1, Exps 1-1 in Visit 17 (1)	880 Secs	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
2	814	(7) NGC-4459	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO	POS TARG 0,0		420 Secs	
								[==>]	***[2]***
3	814	(7) NGC-4459	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO	POS TARG 0.4,1.8		420 Secs	
								[==>]	***[2]***
4	555	(7) NGC-4459	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0.4,1.8		348 Secs	
								[==>]	***[2]***
5	555	(7) NGC-4459	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0,0		348 Secs	
								[==>]	***[2]***
6	475	(7) NGC-4459	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0,0		400 Secs	
								[==>]	***[2]***
7	475	(7) NGC-4459	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0.4,1.8		400 Secs	
								[==>]	***[2]***

Orbit Structure




Orbit 2
Server Version: 20120312
GS Reacq
Exp. 2
Pointing Maneuver
Overhead
Exp. 3
Overhead
Exp. 4
Pointing Maneuver
Overhead
Exp. 5
Overhead
Exp. 6
Pointing Maneuver
Overhead
Exp. 7
Unused Visibility = 8
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12500, Visit 18, completed Fri May 11 02:47:31 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 220D TO 250 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=86.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

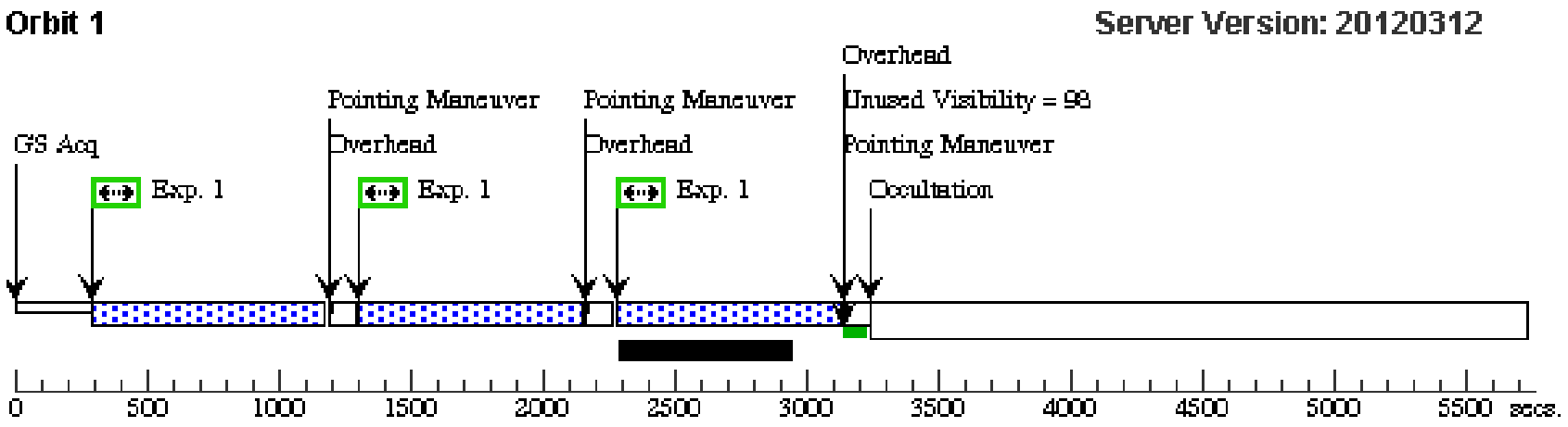
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(8)	NGC-4477	RA: 12 30 2.1720 (187.5090500d) Dec: +13 38 11.19 (13.63644d) Equinox: J2000		V=10.42+/-0.05	Reference Frame: ICRS

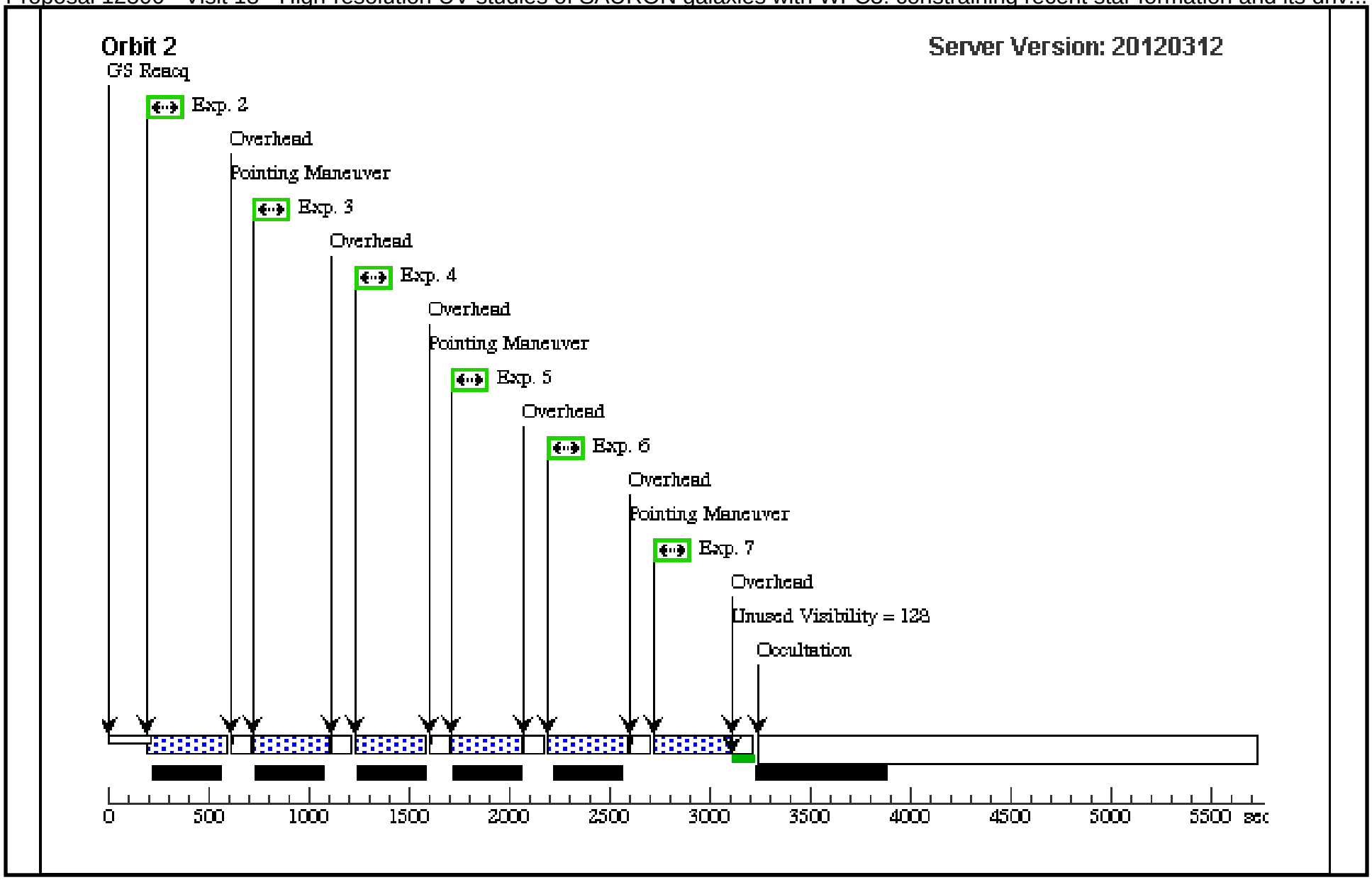
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(8) NGC-4477	WFC3/UVIS, ACCUM, UVIS-FIX	F225W	CR-SPLIT=NO	POS TARG 0.4,1.8	Pattern 1, Exps 1-1 in Visit 18 (1)	850 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2	814	(8) NGC-4477	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO	POS TARG 0,0		380 Secs *[==>]*	***[2]***
3	814	(8) NGC-4477	WFC3/UVIS, ACCUM, UVIS-FIX	F814W	CR-SPLIT=NO	POS TARG 0.4,1.8		380 Secs *[==>]*	***[2]***
4	555	(8) NGC-4477	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0.4,1.8		348 Secs *[==>]*	***[2]***
5	555	(8) NGC-4477	WFC3/UVIS, ACCUM, UVIS-FIX	F555W	CR-SPLIT=NO	POS TARG 0,0		348 Secs *[==>]*	***[2]***
6	475	(8) NGC-4477	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0,0		380 Secs *[==>]*	***[2]***
7	475	(8) NGC-4477	WFC3/UVIS, ACCUM, UVIS-FIX	F475W	CR-SPLIT=NO	POS TARG 0.4,1.8		380 Secs *[==>]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20120312
GS Reacq
Exp. 2
Overhead
Pointing Maneuver
Exp. 3
Overhead
Exp. 4
Overhead
Pointing Maneuver
Exp. 5
Overhead
Exp. 6
Overhead
Pointing Maneuver
Exp. 7
Overhead
Unused Visibility = 128
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12500, Visit 19, completed Fri May 11 02:47:32 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 140D TO 170 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=86.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

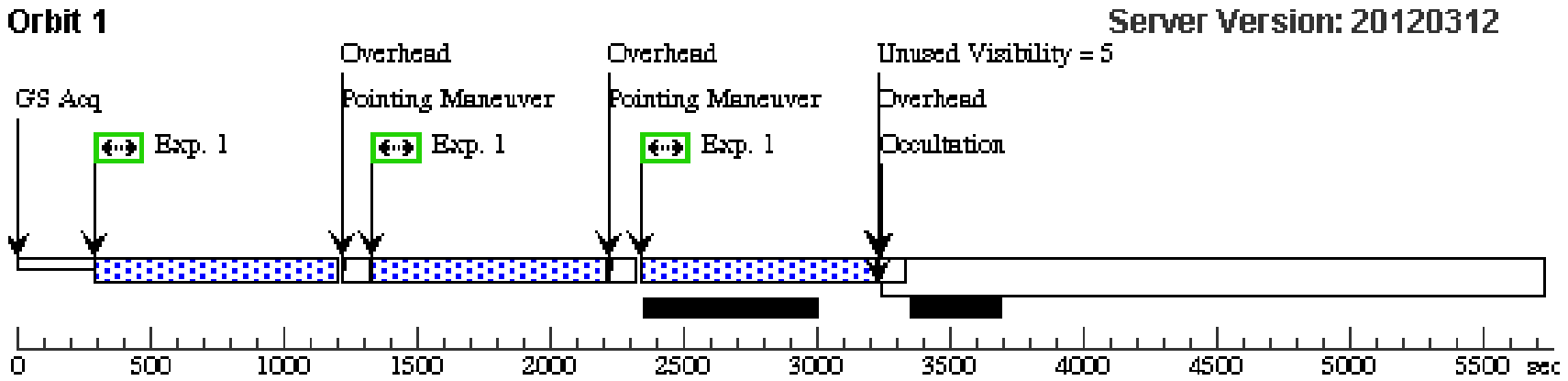
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(9)	NGC-4526	RA: 12 34 3.0290 (188.5126208d) Dec: +07 41 56.90 (7.69914d) Equinox: J2000		V=9.7+/-0.06	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(9) NGC-4526	WFC3/UVIS, ACCUM, UVIS-FIX	F225W	CR-SPLIT=NO	POS TARG 0,15	Pattern 1, Exps 1-1 in Visit 19 (1)	880 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12500, Visit 20, scheduling Fri May 11 02:47:33 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 200D TO 240 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=86.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=1.8	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(10)	NGC-4550	RA: 12 35 30.6120 (188.8775500d) Dec: +12 13 15.44 (12.22096d) Equinox: J2000		V=11.68+/-0.05	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	225	(10) NGC-4550	WFC3/UVIS, ACCUM, UVIS-FIX	F225W	CR-SPLIT=NO	POS TARG 0,10; GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in Visit 20 (1)	830 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***

Orbit Structure