15106 - The UV attenuation in JWST target VV 191

Cycle: 25, Proposal Category: GO

(UV Initiative, JWST Initative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Benne Willem Holwerda (PI) (Contact)	**University of Louisville Research Foundation, Inc.**	**benne.holwerda@gmail.com**
Dr. William Clifford Keel (CoI)	University of Alabama	wkeel@ua.edu
Dr. Rolf A. Jansen (CoI)	Arizona State University	rolf.jansen@asu.edu
Prof. Rogier A. Windhorst (CoI)	Arizona State University	rogier.windhorst@asu.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) VV191	WFC3/UVIS	1	17-Jul-2017 18:01:28.0	yes
02	(1) VV191	WFC3/UVIS	3	17-Jul-2017 18:01:29.0	yes
03	(1) VV191	WFC3/UVIS	3	17-Jul-2017 18:01:30.0	yes
04	(1) VV191	WFC3/UVIS	3	17-Jul-2017 18:01:31.0	yes

10 Total Orbits Used

ABSTRACT

We aim to map the UV--near--IR attenuation curve along many sightlines within nearby disk galaxies to resolve a large fundamental uncertainty in galaxy evolution studies: the variance in the attenuation curve within an indivual galaxy disk on linear scales <50pc, and the prevalence of the 2175 Angstrom "bump" specifically. We developed a technique to obtain spatially-resolved attenuation measurements using overlapping ("occulting") galaxy pairs. The GalaxyZoo citizen science project and our STARSMOG HST/ACS F606W snapshot survey have only recently identified and

validated overlapping pairs with a geometry that lends itself particularly well for such analysis.

The most promising pair, VV 191, will be observed as JWST/NIRCam GTO targets to cover the near-IR part of the attenuation curves. To complement the JWST NIR observations with UV, we request WFC3/UVIS observations in the F225W and F336W filters. These cover (together with the existing F606W ACS images) the UV--visible portion of the UV--near-IR attenuation curves for each <50pc resolution element in the region of overlap in the non-interacting galaxy pair VV191 (MCG+04-33-005), in which a relatively blue elliptical beautifully backlights the outer disk of a foreground face-on spiral galaxy.

Dither strategy:

We opt for a 2-point dither in the case of the F336W observations (1 orbit) and a 3pt dither strategy for the F225W observations.
The 9 orbits for the F225W observations are broken into three groupings of 3 orbits in the 3 dither pattern. This is to ensure correction of cosmics and detector artifacts.

Our secondary aim is an HST/JWST image with good public outreach potential and our aim is to maximize image quality for this reason as well.

OBSERVING DESCRIPTION

HST/WFC3 Observations

We ask for HST/WFC3 UVIS observations for ten orbits, distributed over the F225W and F336W filters to ensure coverage of the attenuation "bump" observed by Calzetti & Heckman (1999). Exposures are to be dithered to remove cosmics and mitigate detector effects. Roll angle is not particularly constrained as the pair fits comfortably in the WFC3 field-of-view. The STARSMOG program already obtained F606W observations and we ask only for the UV filters. The planned JWST/NIRcam GTO observations cover the near-infrared through K-band.

Filter Choices

Our choice of filters reflects the need to sample the attenuation curve in the ultra-violet (see Fig. 4). The F225W maximizes leverage on the attenuation in the ultraviolet combined with excellent throughput and sensitivity for short exposures. Combined with the F336W filter, it traces the strength of the 2175 Angstrom "bump" in the attenuation curve. We will only use one side of WRC3/UVIS to ensure homogeneity among the observations and include a 10-14e- of post-flash for each exposure. With seven filters, the attenuation curve is sufficiently sampled to distinguish between the different ones observed in local galaxies, e.g., Milky Way (Cardelli et al., 1989), Magellanic Clouds (Gordon & Clayton, 1998; Misselt et al., 1999) or star-forming (Calzetti et al., 1994).

Exposure time

A single orbit exposure with F606W results in s/n > 7 in the outer parts of both galaxies, evident by the image in Figure 5, ensuring a wide overlap region for attenuation measurements. In the UV, the observation is more challenging because the background elliptical lower surface brightness in the UV. The central region of the elliptical has the highest surface brightness, enough for UV comparisons. To ensure enough overlap, we require a s=n 1 at the effective radius of the elliptical in both filters. Starting from our F606W image and according to the WFC3 ETC this can be achieved with 9 orbits (23000s, including post-flash) in F225W and 1 orbit (2700s) in F336W, resulting in a total of 10 orbits. The 10 orbits requested can be broken into two visits (0.5+4.5 orbits F336W+F225W).

Flash

Flas options for the F336W and F225W were chosen to be 10. NB: can we check this is enough?

Visit

Proposal 15106, F336W (01) Mon Jul 17 22:01:32 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

Fixed Targets

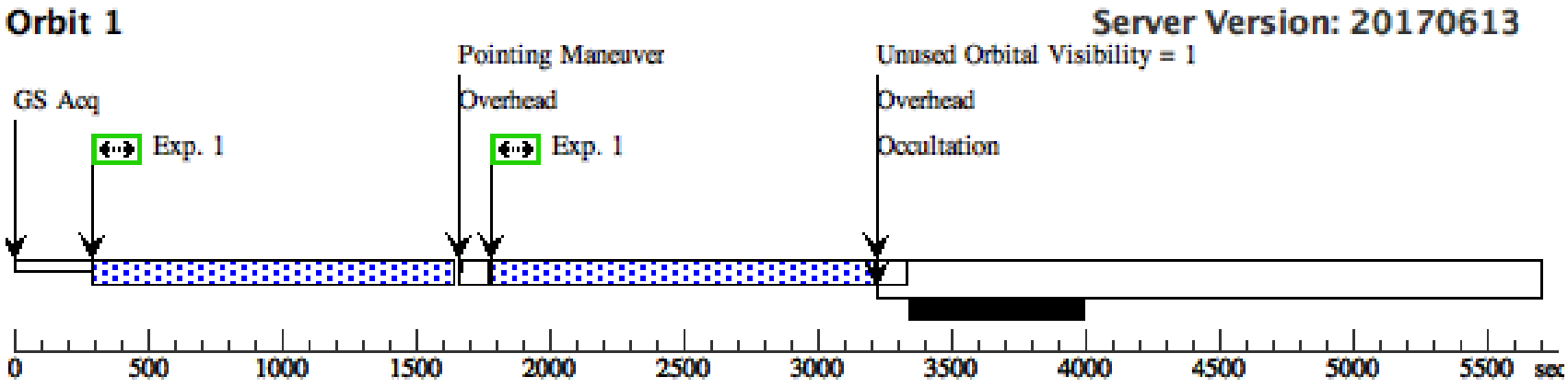
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VV191	RA: 13 48 21.9168 (207.0913200d) Dec: +25 40 38.68 (25.67741d) Equinox: J2000		V=15.5+/-0.4	Reference Frame: SIMBAD

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 (Total)/[Actual Dur.]	Orbit
1		(1) VV191	WFC3/UVIS, ACCUM, UVIS1	F336W	FLASH=10		Pattern 1, Exps 1-1 in F336W (01) (1)	1300 Secs (2749 Secs) *[==>1319.0 Secs (Pattern 1)]* *[==>1430.0 Secs (Pattern 2)]*	*[1]*

Orbit Structure



Visit

Proposal 15106, F225W (02) Mon Jul 17 22:01:32 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

Fixed Targets

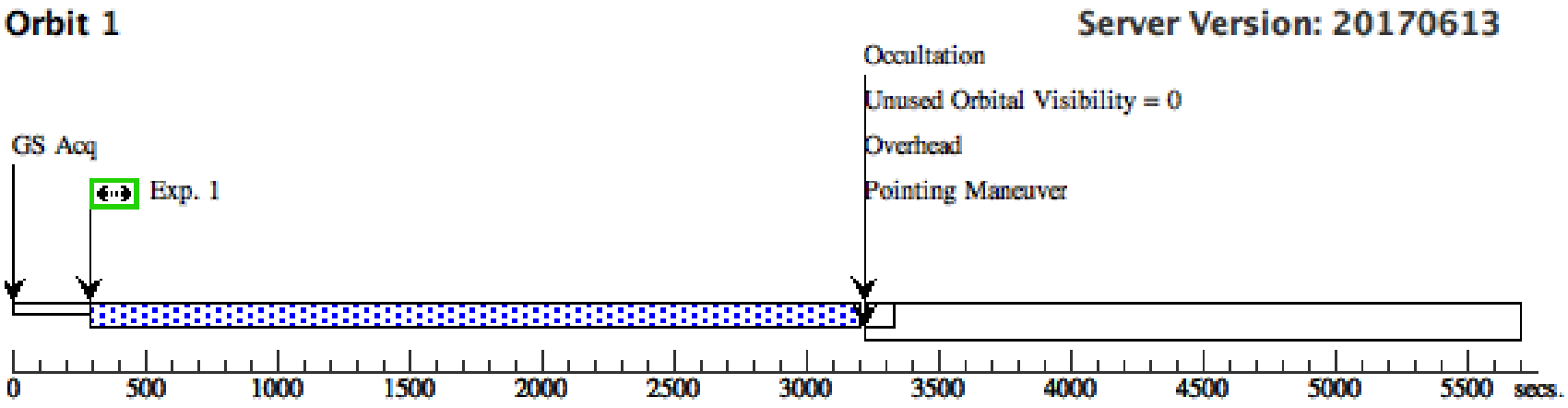
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VV191	RA: 13 48 21.9168 (207.0913200d) Dec: +25 40 38.68 (25.67741d) Equinox: J2000		V=15.5+/-0.4	Reference Frame: SIMBAD

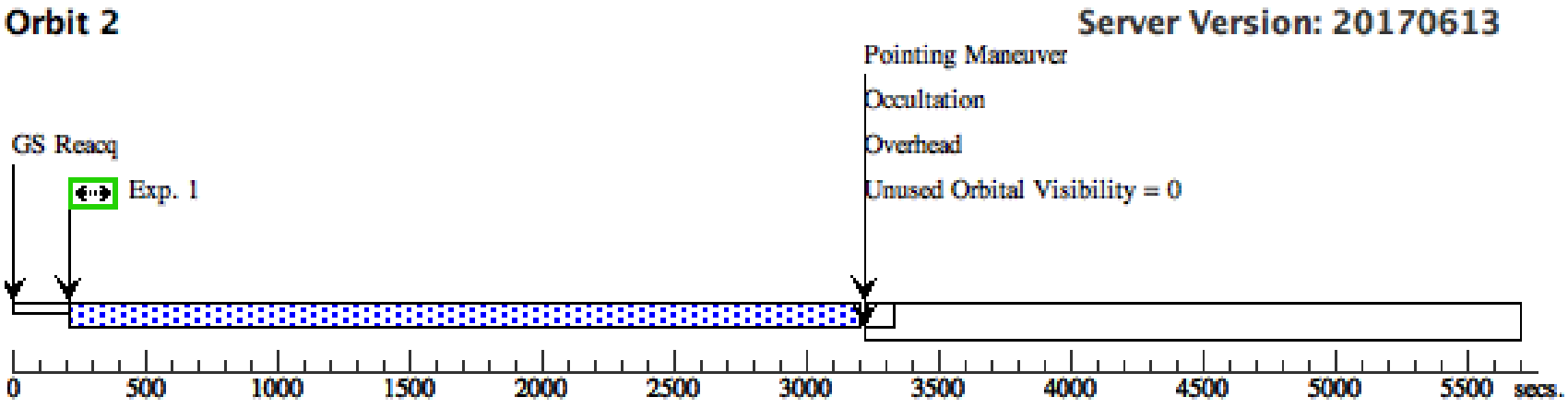
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

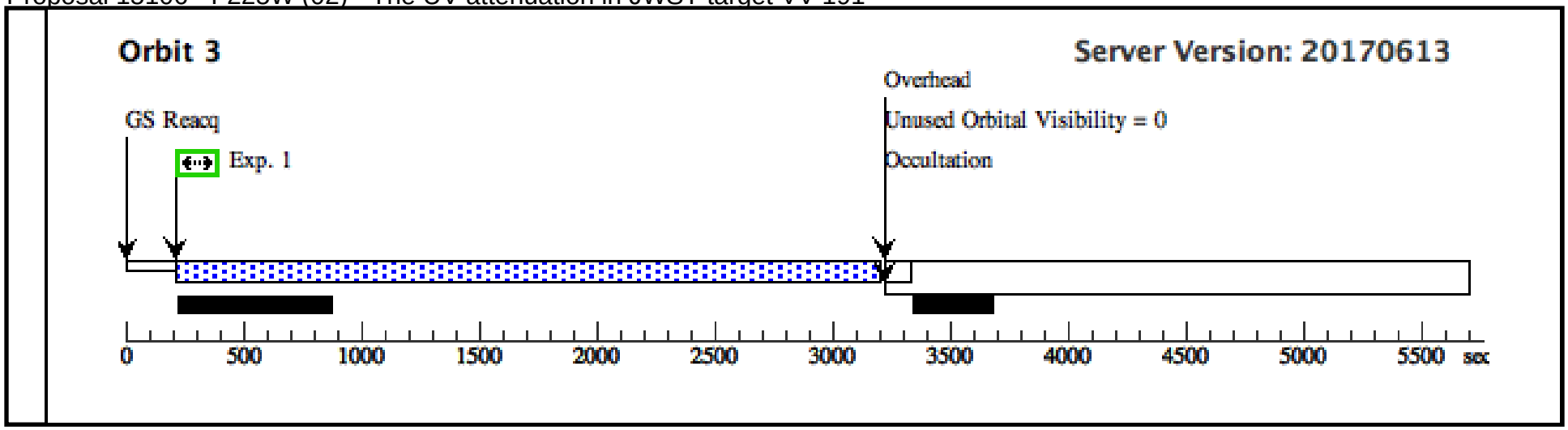
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) VV191	WFC3/UVIS, ACCUM, UVIS1	F225W	FLASH=5		Pattern 2, Exps 1-1 in F225W (02) (2)	1300 Secs (8874 Secs)	
								[==>2884.0 Secs (Pattern 1)]	***[1]***
								[==>2995.0 Secs (Pattern 2)]	***[2]***
								[==>2995.0 Secs (Pattern 3)]	***[3]***

Orbit Structure






Orbit 3
Server Version: 20170613
Overhead
GS Reacq
Unused Orbital Visibility = 0
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15106, F225W (03) Mon Jul 17 22:01:32 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

Fixed Targets

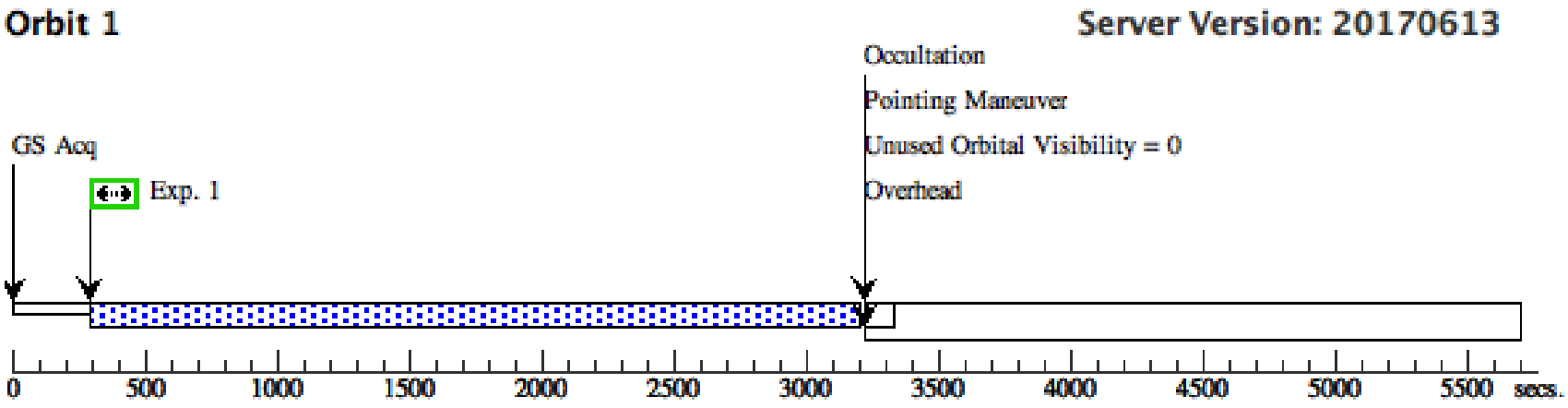
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VV191	RA: 13 48 21.9168 (207.0913200d) Dec: +25 40 38.68 (25.67741d) Equinox: J2000		V=15.5+/-0.4	Reference Frame: SIMBAD

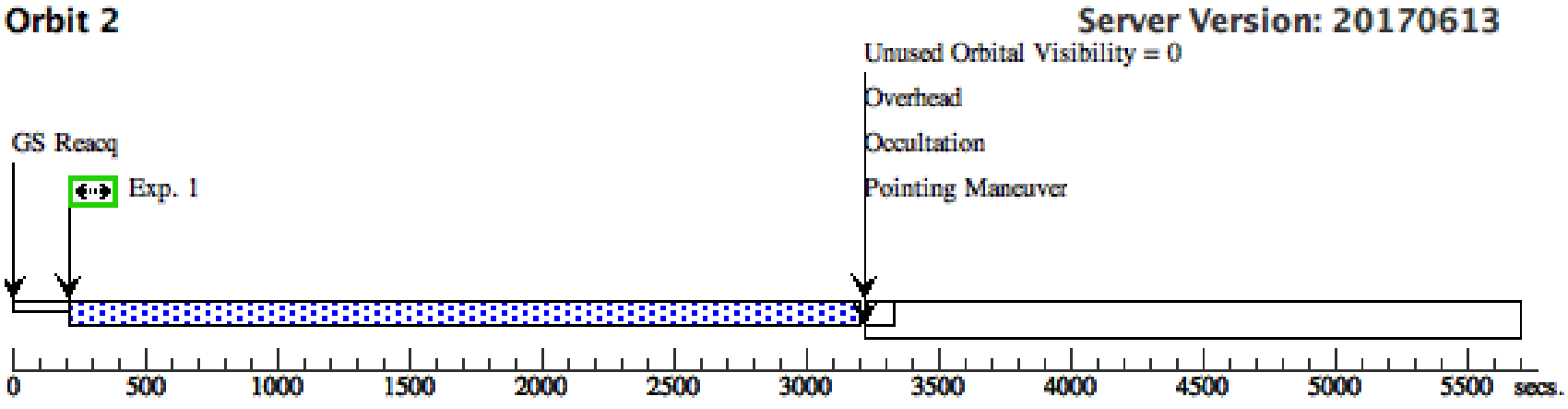
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

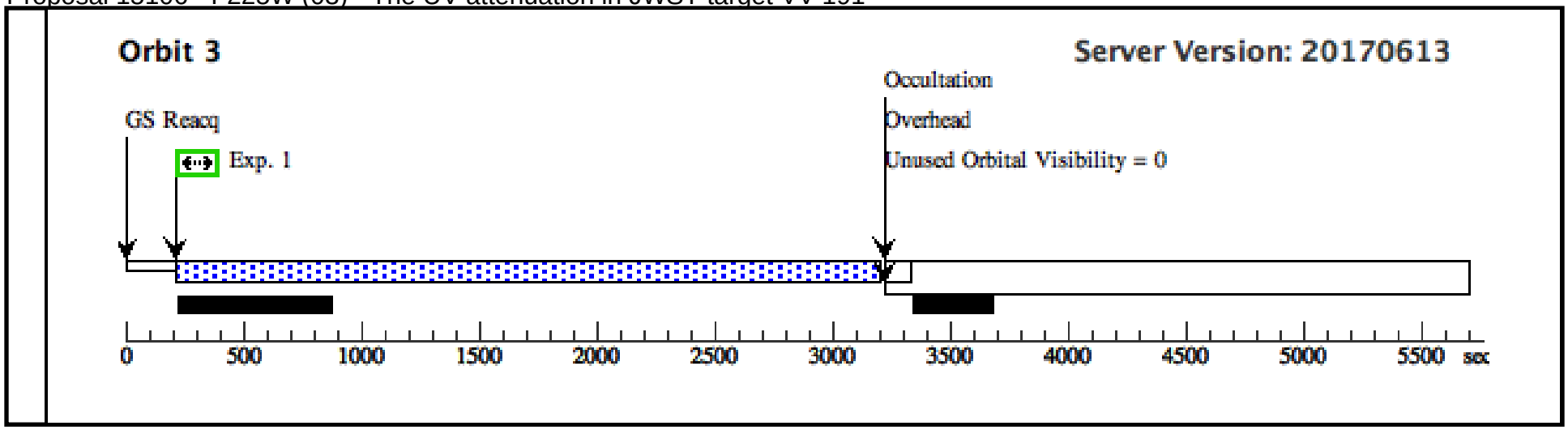
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) VV191	WFC3/UVIS, ACCUM, UVIS1	F225W	FLASH=5		Pattern 2, Exps 1-1 in F225W (03) (2)	2700 Secs (8874 Secs)	
								[==>2884.0 Secs (Pattern 1)]	***[1]***
								[==>2995.0 Secs (Pattern 2)]	***[2]***
								[==>2995.0 Secs (Pattern 3)]	***[3]***

Orbit Structure






Orbit 3
Server Version: 20170613
Occultation
GS Reacq
Overhead
Exp. 1
Unused Orbital Visibility = 0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15106, F225W (04) Mon Jul 17 22:01:32 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

Fixed Targets

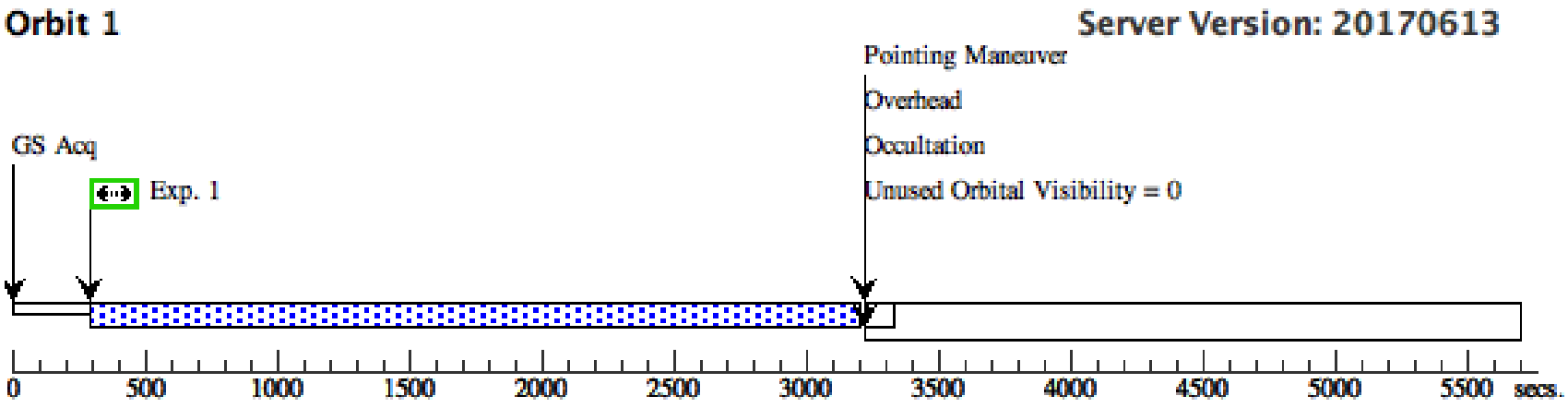
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VV191	RA: 13 48 21.9168 (207.0913200d) Dec: +25 40 38.68 (25.67741d) Equinox: J2000		V=15.5+/-0.4	Reference Frame: SIMBAD

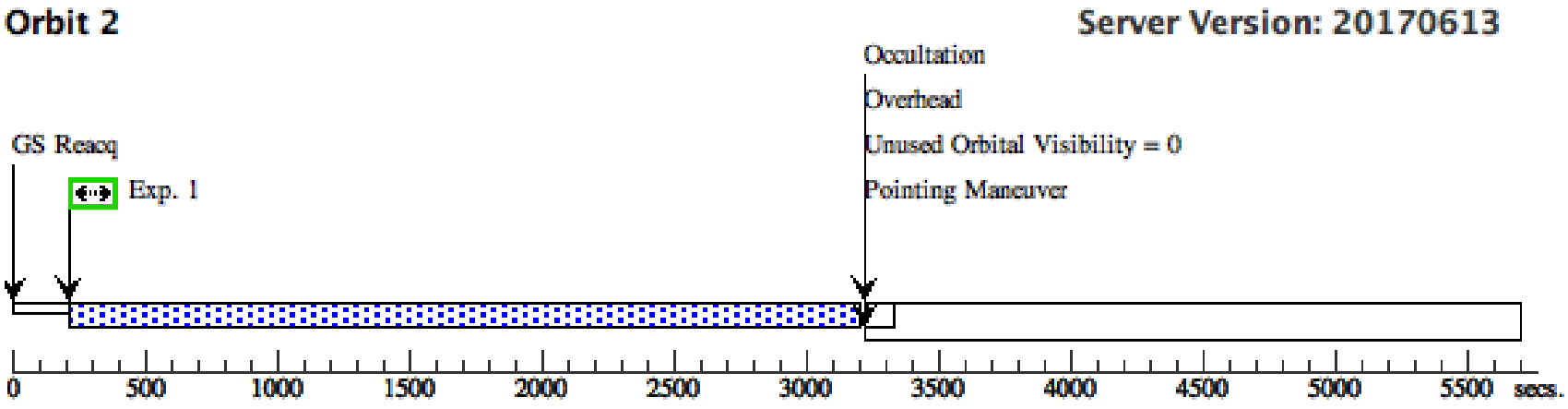
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

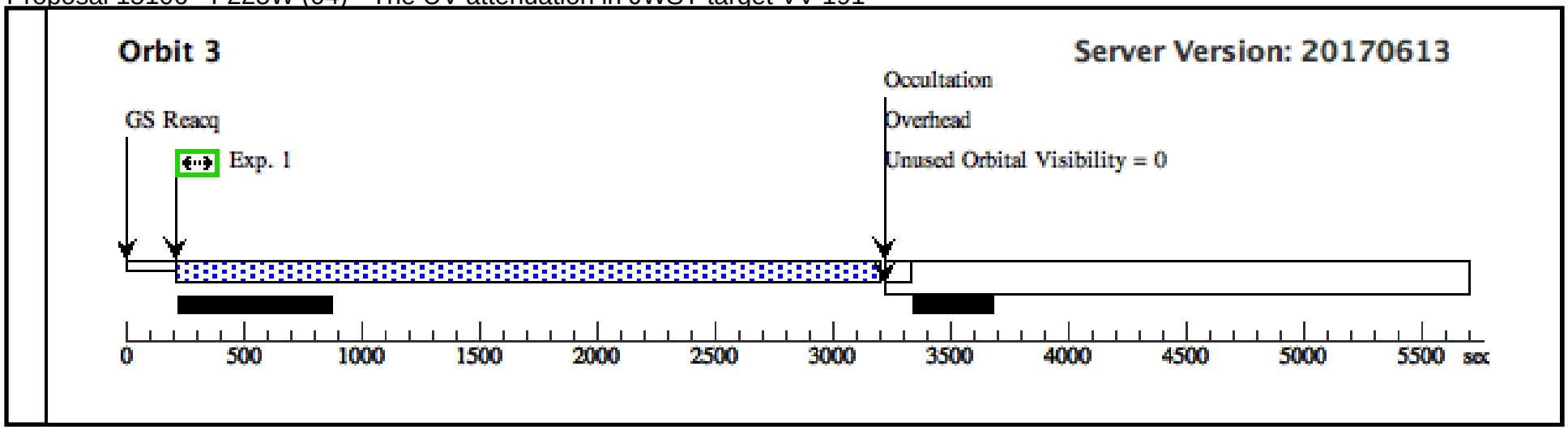
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) VV191	WFC3/UVIS, ACCUM, UVIS1	F225W	FLASH=5		Pattern 2, Exps 1-1 in F225W (04) (2)	2700 Secs (8874 Secs)	
								[==>2884.0 Secs (Pattern 1)]	***[1]***
								[==>2995.0 Secs (Pattern 2)]	***[2]***
								[==>2995.0 Secs (Pattern 3)]	***[3]***

Orbit Structure






Orbit 3
Server Version: 20170613
Occultation
GS Reacq
Overhead
Exp. 1
Unused Orbital Visibility = 0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec