13859 - Unveiling the circumstellar environment of the most extreme hot-Jupiters

Cycle: 22, Proposal Category: GO

(UV Initiative)

(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?*
01	(1) WASP-18	COS/FUV COS/NUV	2	20-Jan-2015 15:57:27.0	yes
02	(2) WASP-13	COS/FUV COS/NUV	4	20-Jan-2015 15:57:29.0	yes

6 Total Orbits Used

ABSTRACT

Ultraviolet HST observations have shown that atmospheric evaporation is a common feature of hot-Jupiters: highly irradiated (short-period) Jupiter-like planets. Models show that hot-Jupiters lose only a small fraction of their mass to evaporation but this may not be the case for extreme hot-Jupiters such as WASP-12b, which orbit very close to their host stars. Our Cycle 17 observations of WASP-12b showed that the planet atmosphere is evaporating and that gas escaping from the heavily irradiated planet may form a stable and thick circumstellar disk, causing an anomalously low

stellar activity index. This anomaly does not allow us to correctly estimate the stellar UV flux, which drives the evaporation, from the available observational material. We request 6 HST orbits to obtain far-UV spectra of WASP-18 and WASP-13. Both stars host extreme hot-Jupiters, show an anomalously low activity index, and are much brighter than WASP-12, allowing one to obtain the necessary high quality far-UV spectra; WASP-12 is too faint at far-UV wavelengths to be measured by the instruments on-board HST. The data will allow us to improve the mass loss rates estimated for the most extreme hot-Jupiters as well as to resolve the ambiguity about the activity of the host stars in these systems. These data are necessary to correctly interpret the Cycle 17 HST observations, as well as observations of WASP-12b which have recently been obtained in Cycle-21.

OBSERVING DESCRIPTION

We will observe WASP-18 for 2 consecutive HST orbits and WASP-13 for 4 consecutive HST orbits to obtain FUV spectra of WASP-18 and WASP-13, respectively.

The WASP-13 observations are timed with the planet transit: the hot-Jupiter WASP-13b passing in front of its parent star. The transit happens every 4.353 days and lasts about 4.08 hours. The WASP-13 observations aim at almost completely covering the planet transit.

For the WASP-13 observations the timing requirements are set as phase constraints on the first acquisition (ACQ) exposure. The given phase is specified so that the first science exposure (1 science exposure is done during each orbit) falls integrally just before the ingress, the second and third science exposures occur during the transit, while the last science exposure occurs integrally just after the planet transit. Having the last exposure integrally after the transit is critical for the success of the program. The phase constraints given for the first orbit authorize a margin of about 4 minutes. Due to the fact that we aim at measuring the planet transit, we have set FP-POS=3, rather than equal to ALL. We submitted a Program Change Request for this (timed observations and use of one single FP-POS) which has been accepted (PCR 78372).

No ACQ/PEAK is set because the coordinates of both targets are extremely precise.

We will take two FUV spectra of WASP-18 and four FUV spectra of WASP-13 with the COS/FUV TIME-TAG mode using the G140L grating and the 1105 setting. WASP-18 is a late F-type main sequence star hosting a massive hot-Jupiter, while WASP-13 is an early G-type main sequence star hosting an extremely bloated and hot Saturn-mass planet. The spectrum will cover the 1118-2251 A spectral region with a spectral resolution R~2000.

To calculate the exposure times of the science exposures we considered the CII lines at lambda~1335 A. We then considered the flux density of this

multiplet as observed on the spectrum of alpha Cen and rescaled it to the distance of WASP-18 (100 pc) and WASP-13 (156 pc).

Visit

Proposal 13859, W18 (01), implementation Tue Jan 20 20:57:30 GMT 2015

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Comments: Two-orbit exposure on WASP-18

Diagnostics

(W18 (01)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

Fixed Targets

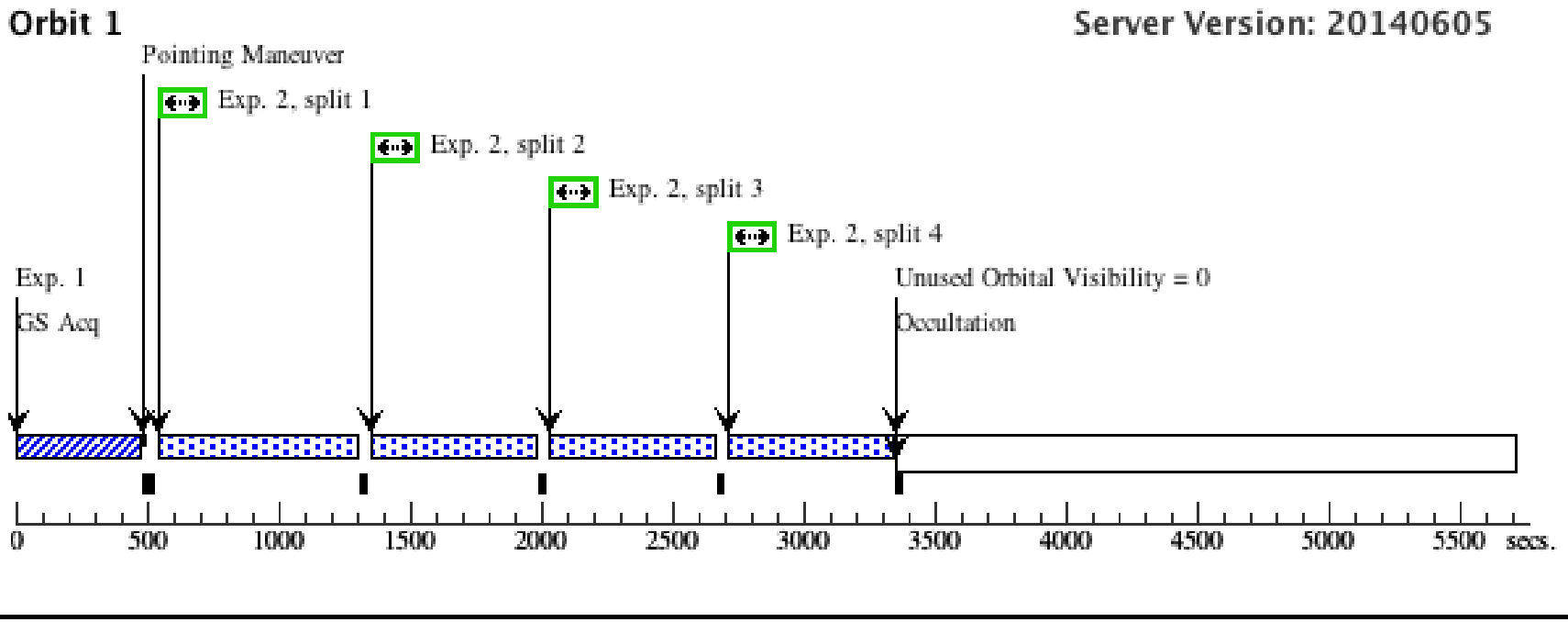
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WASP-18	RA: 01 37 25.0341 (24.3543087d)	Proper Motion RA: 26.52 mas/yr	V=9.3	Reference Frame: ICRS
	Alt Name1: HD10069	Dec: -45 40 40.39 (-45.67789d)	Proper Motion Dec: 18.79 mas/yr	CII emission line at 1334 A: estimated peak flux of 10^-15 erg A^-1 s^-1; GALEX FUV flux: 2.16x10^-15 erg A^-1 s^-1; GALEX NUV flux: saturated	
	Alt Name2: HIP7562	Equinox: J2000	Parallax: 0.01006"		
			Epoch of Position: 2000		

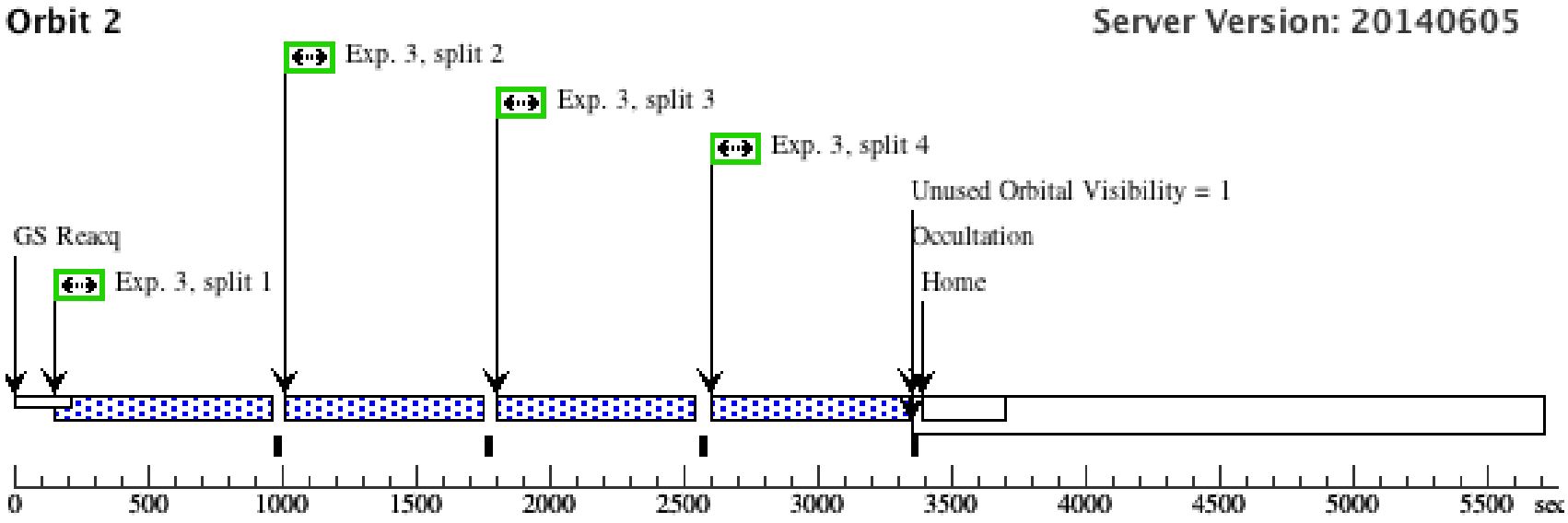
Comments: This object was generated by the target selector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	W18 (COS.ta.620287)	(1) WASP-18	COS/NUV, ACQ/IMAGE, BOA	MIRRORA			Sequence 1-2 Non-Int in W18 (01)	34.7 Secs (34.7 Secs)	
								[==>]	***[1]***
	Comments: Using the PSA aperture I got a total count rate which largely exceeds the bright limit: ETC Run # COS.ta.620288								
2	W18 - Exp 1 (COS.sp.620668)	(1) WASP-18	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FLASH=YES; SEGMENT=A; EXTENDED=NO; FP-POS=ALL; BUFFER-TIME=6830.0		Sequence 1-2 Non-Int in W18 (01)	600 Secs (2304 Secs)	
								[==>576.0 Secs (Split 1)]	***[1]***
								[==>576.0 Secs (Split 2)]	
								[==>576.0 Secs (Split 3)]	
								[==>576.0 Secs (Split 4)]	
3	W18 - Exp 2 (COS.sp.620670)	(1) WASP-18	COS/FUV, TIME-TAG, PSA	G140L 1105 A	EXTENDED=NO; FLASH=YES; FP-POS=ALL; SEGMENT=A; BUFFER-TIME=6830.0			600 Secs (2756 Secs)	
								[==>689.0 Secs (Split 1)]	***[2]***
								[==>689.0 Secs (Split 2)]	
								[==>689.0 Secs (Split 3)]	
								[==>689.0 Secs (Split 4)]	

Orbit Structure





Visit

Proposal 13859, W13 (02), implementation Tue Jan 20 20:57:30 GMT 2015

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: Period 4.353011 D AND ZERO-PHASE HJD2455575.5136

Comments: Four-orbit exposure of WASP-13 timed with the planet transit.

Diagnostics

(W13 (02)) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

Fixed Targets

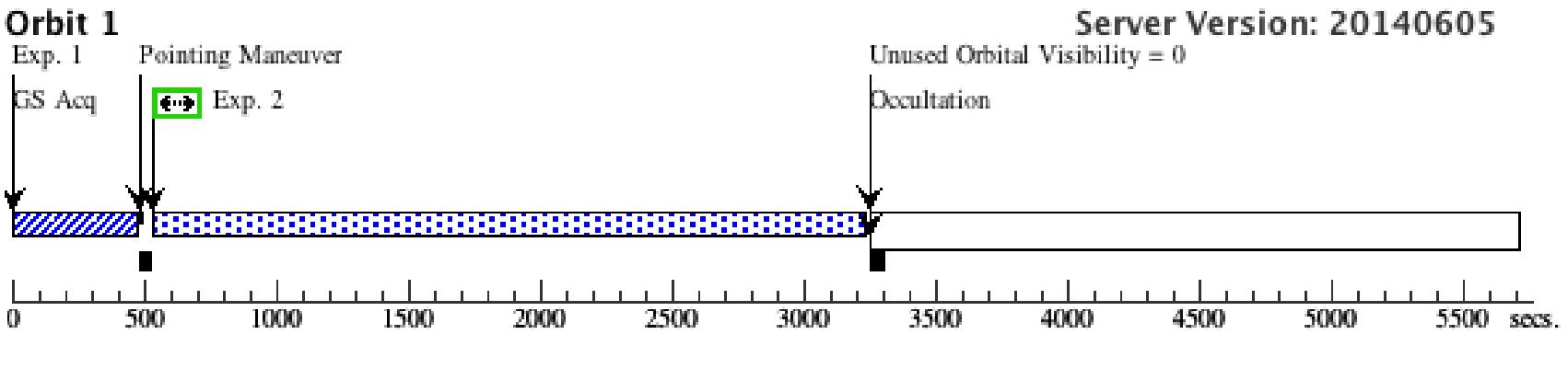
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	WASP-13 Alt Name1: TYC2496-1114-1 Alt Name2: 2MASSJ09202471+3352567	RA: 09 20 24.7020 (140.1029250d) Dec: +33 52 56.69 (33.88241d) Equinox: J2000	Proper Motion RA: -8.3 mas/yr Proper Motion Dec: -22.0 mas/yr Epoch of Position: 2000	V=10.42+/-0.06 CII emission line at 1334 A: estimated peak flux of 4.3*10^-16 erg A^-1 s^-1; GALEX FUV flux: 1.9x10^-16 erg A^-1 s^-1; GALEX NUV flux: 5.0x10^-14 erg A^-1 s^-1	Reference Frame: ICRS

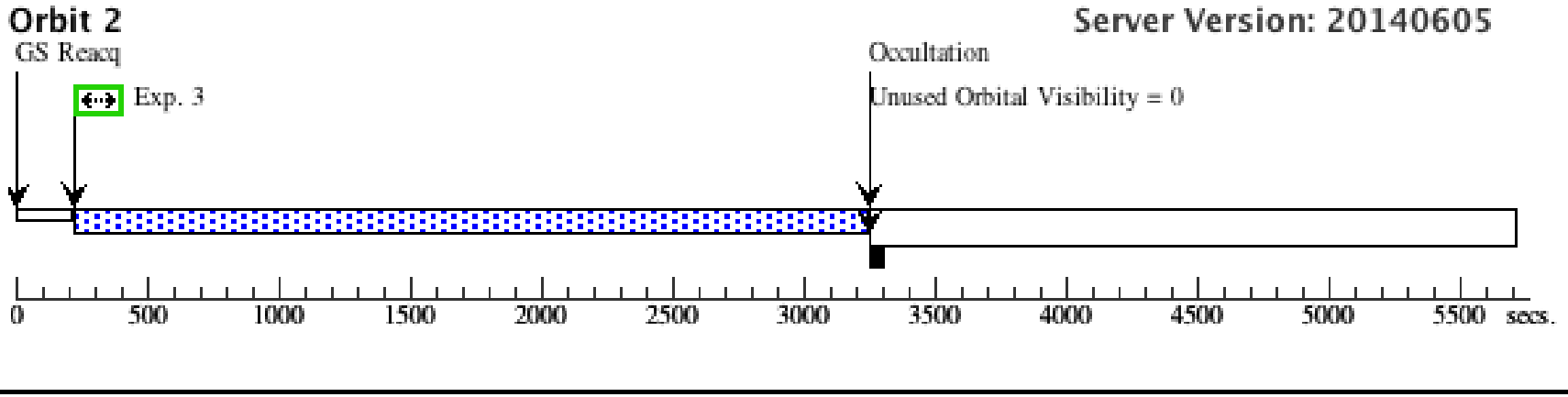
Comments: This object was generated by the target selector and retrieved from the SIMBAD database.

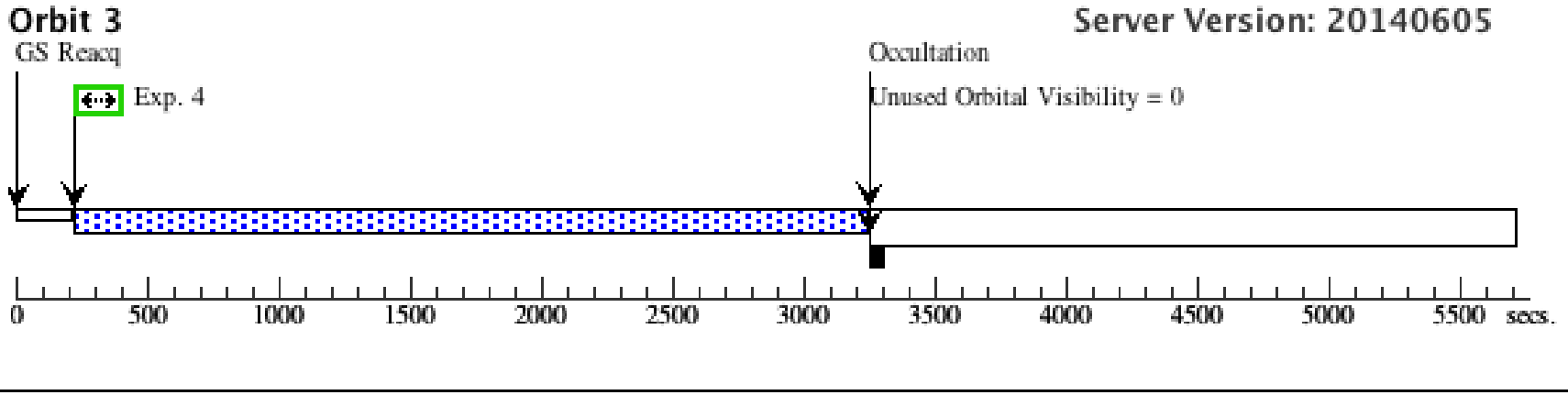
Exposures

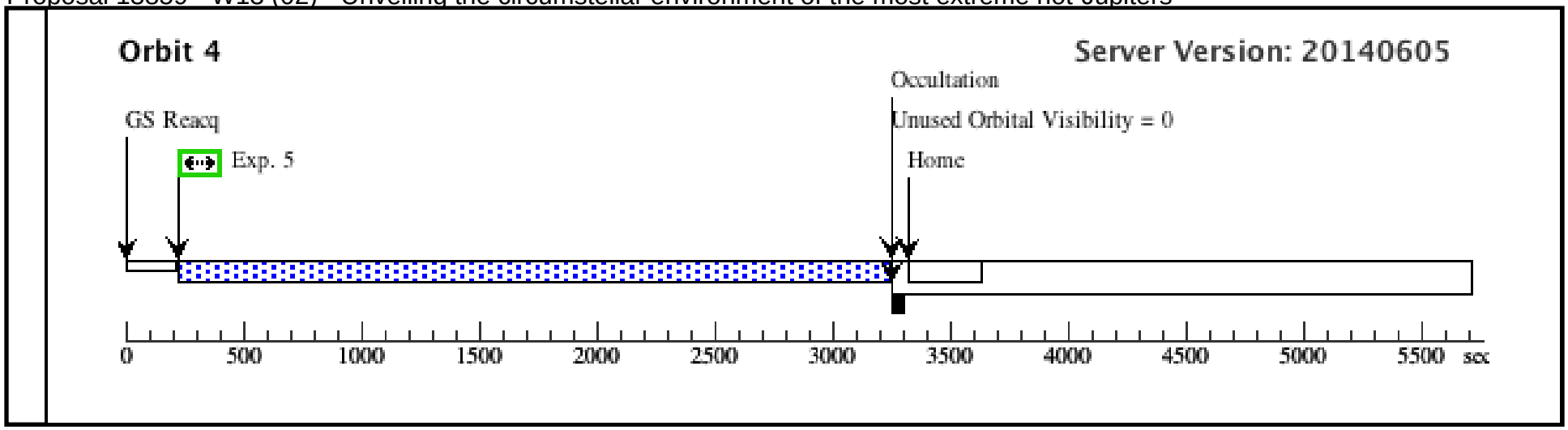
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	W13 - ACQ (COS.ta.635940)	(2) WASP-13	COS/NUV, ACQ/IMAGE, PSA	MIRRORB		PHASE 0.97014 TO 0.97473	Sequence 1-2 Non-Int in W13 (02)	21.8 Secs (21.8 Secs) *[==>]*	***[1]***
Comments: The exposure time is based on the GALEX magnitude of NUV_mag=15.57									
2	W13 - Exp 1 - Orb 1 (COS.sp.620328)	(2) WASP-13	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FLASH=YES; EXTENDED=NO; SEGMENT=A; FP-POS=3; BUFFER-TIME=7277.0		Sequence 1-2 Non-Int in W13 (02)	2000 Secs (2522 Secs) *[==>2522.0 Secs]*	***[1]***
Comments: HST Orbit 1									
3	W13 - Exp 2 - Orb 2 (COS.sp.620329)	(2) WASP-13	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FLASH=YES; EXTENDED=NO; SEGMENT=A; FP-POS=3; BUFFER-TIME=7277.0			2500 Secs (2971 Secs) *[==>2971.0 Secs]*	***[2]***
Comments: HST Orbit 2									
4	W13 - Exp 3 - Orb 3 (COS.sp.620329)	(2) WASP-13	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FLASH=YES; EXTENDED=NO; SEGMENT=A; FP-POS=3; BUFFER-TIME=7277.0			2500 Secs (2971 Secs) *[==>2971.0 Secs]*	***[3]***
Comments: HST Orbit 3									
5	W13 - Exp 4 - Orb 4 (COS.sp.620329)	(2) WASP-13	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FLASH=YES; EXTENDED=NO; SEGMENT=A; FP-POS=3; BUFFER-TIME=7277.0			2500 Secs (2971 Secs) *[==>2971.0 Secs]*	***[4]***
Comments: HST Orbit 4									

Orbit Structure





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