



13108 - The X-ray and UV spectra of the quiescent neutron star X-ray binary EXO 0748-676

Cycle: 20, 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) V-UY-VOL	COS/FUV COS/NUV	5	31-Jan-2013 02:37:31.0	yes
02	(1) V-UY-VOL	COS/FUV COS/NUV	4	31-Jan-2013 02:37:48.0	yes

9 Total Orbits Used

ABSTRACT

We propose a 45-ks Chandra observation to continue our monitoring of the quiescent neutron star X-ray binary EXO 0748-676. A 25-year long accretion outburst severely heated the neutron star crust, which has been gradually cooling since the source returned to quiescence in 2008. Monitoring this thermal evolution provides the unique opportunity to study the heating processes and thermal transport properties of the neutron star crust. In addition we propose for 9 orbits of HST time to investigate the UV spectrum of EXO 0748-676 to disentangle its quiescent accretion stream. This is of vital importance for a correct interpretation of the quiescent thermal X-ray emission and hence of the observed crust cooling.

OBSERVING DESCRIPTION

The cold quiescent accretion disk in LMXBs is expected to peak in the UV band, with most ionized emission lines occurring in the FUV between ~1200-1700 Angstrom. Investigation of the quiescent accretion stream in EXO 0748-676 thus benefits most from spectroscopic observations with the HST/COS.

Given the expected faintness of our target we propose to use the COS with the low-resolution G140L grating to obtain the best possible S/N. The resolving power of the low-resolution grating is sufficient to resolve the expected ionized emission lines (which have typical widths of ~10 Angstrom), and to determine whether these lines are single or double peaked. We propose to use the 1105 A setting that provides continuous coverage between 1118-2251A in segment A, while segment B is switched off.

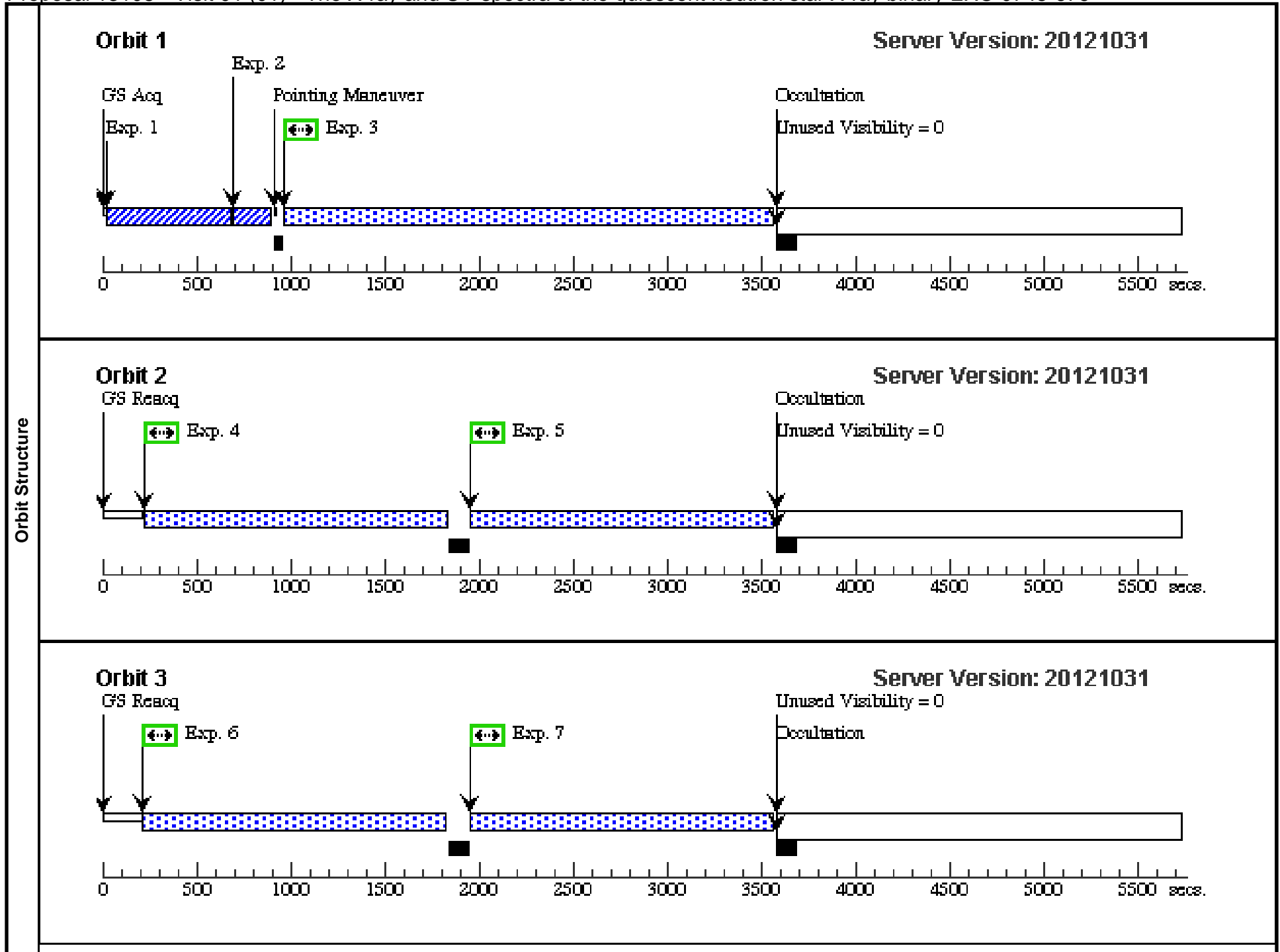
To determine the time required for the science exposures, we used the online HST-COS exposure time calculators (v. 20.1.1). We model our point source as a blackbody with a temperature of ~10,000 K (as has been found from modeling a number of quiescent X-ray binaries; Hynes & Robinson 2012), where we normalized the continuum flux to the value inferred from XMM-Newton/OM data of our target (~5E-16 erg/cm²/s at 2910 Angstrom; Diaz-Trigo et al. 2011). The reddening towards our target is $E(B-V)=0.12$.

We propose to use different FP-POS positions to reduce fixed-pattern noise and to minimize long-term gain sag. The total observing time of 9 orbits is spread over two visits.

Proposal 13108 - Visit 01 (01) - The X-ray and UV spectra of the quiescent neutron star X-ray binary EXO 0748-676

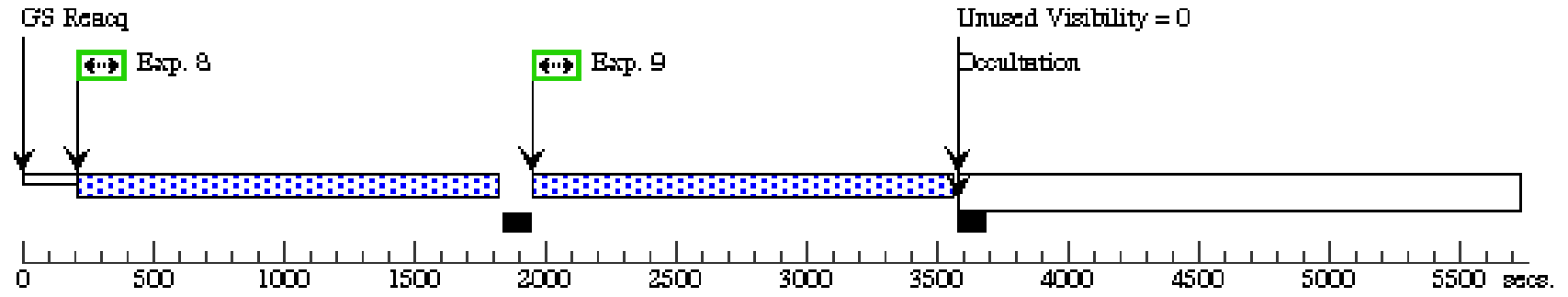
Thu Jan 31 02:37:57 GMT 2013

Visit	Proposal 13108, Visit 01 (01), implementation Diagnostic Status: No Diagnostics Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	V-UY-VOL Alt Name1: EXO0748-676	RA: 07 48 33.7300 (117.1405417d) Dec: -67 45 7.90 (-67.75219d) Equinox: J2000		V=16.9 Expected continuum flux in the FUV: ~(0.5-5)E-16 erg/cm2/s	Reference Frame: ICRS				
	<i>Comments: The target only became bright in 1985 so it is not in the GSC1 catalog.</i>									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	TA1-search (433261)	(1) V-UY-VOL	COS/NUV, ACQ/SEARCH, PSA	MIRRORA	CENTER=FLUX-W T; SCAN-SIZE=2; STEP-SIZE=1.767			51 Secs [==>]	[1]
	2	TA2-image (433261)	(1) V-UY-VOL	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				51 Secs [==>]	[1]
	3	Science0 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=1; BUFFER-TIME=24 23			2423 Secs [==>]	[1]
	4	Science1 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=1; BUFFER-TIME=15 57			1557 Secs [==>]	[2]
	5	Science2 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=1; BUFFER-TIME=15 61			1561 Secs [==>]	[2]
	6	Science3 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=2; BUFFER-TIME=15 58			1558 Secs [==>]	[3]
	7	Science4 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=2; BUFFER-TIME=15 60			1560 Secs [==>]	[3]
	8	Science5 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=3; BUFFER-TIME=15 58			1558 Secs [==>]	[4]
	9	Science6 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=3; BUFFER-TIME=15 60			1560 Secs [==>]	[4]
	10	Science7 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=4; BUFFER-TIME=15 58			1558 Secs [==>]	[5]
11	Science8 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=4; BUFFER-TIME=15 60			1560 Secs [==>]	[5]	



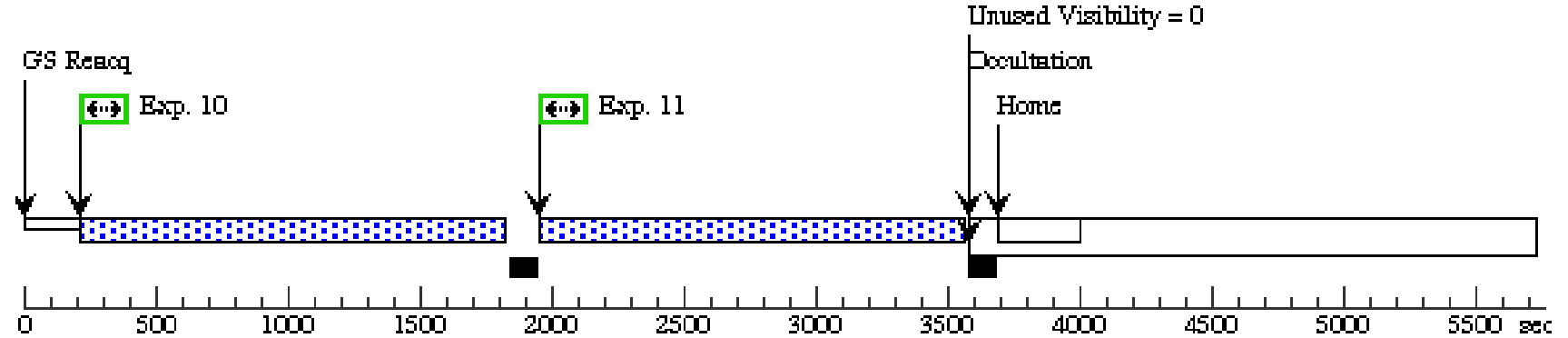
Orbit 4

Server Version: 20121031



Orbit 5

Server Version: 20121031



Proposal 13108 - Visit 2 (02) - The X-ray and UV spectra of the quiescent neutron star X-ray binary EXO 0748-676

Thu Jan 31 02:38:04 GMT 2013

Visit	Proposal 13108, Visit 2 (02), implementation Diagnostic Status: No Diagnostics Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	V-UY-VOL Alt Name1: EXO0748-676	RA: 07 48 33.7300 (117.1405417d) Dec: -67 45 7.90 (-67.75219d) Equinox: J2000		V=16.9 Expected continuum flux in the FUV: ~(0.5-5)E-16 erg/cm2/s	Reference Frame: ICRS				
	<i>Comments: The target only became bright in 1985 so it is not in the GSC1 catalog.</i>									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	TA1-search (433261)	(1) V-UY-VOL	COS/NUV, ACQ/SEARCH, PSA	MIRRORA	CENTER=FLUX-W T; SCAN-SIZE=2; STEP-SIZE=1.767			51 Secs [==>]	[1]
	2	TA2-image (433261)	(1) V-UY-VOL	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				51 Secs [==>]	[1]
	3	Science0 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=1; BUFFER-TIME=24 23			2423 Secs [==>]	[1]
	4	Science1 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=1; BUFFER-TIME=15 57			1557 Secs [==>]	[2]
	5	Science2 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=1; BUFFER-TIME=15 61			1561 Secs [==>]	[2]
	6	Science3 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=2; BUFFER-TIME=15 58			1558 Secs [==>]	[3]
	7	Science4 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=2; BUFFER-TIME=15 60			1560 Secs [==>]	[3]
	8	Science5 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=3; BUFFER-TIME=15 58			1558 Secs [==>]	[4]
	9	Science6 (433242)	(1) V-UY-VOL	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=4; BUFFER-TIME=15 57			1557 Secs [==>]	[4]

