



12864 - UV Spectroscopy of the H 2356-309 Sightline: Confirming the X-ray WHIM Absorber and Testing the Structure Formation Theory

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) QSO-B2356-309	COS/FUV COS/NUV	4	12-Apr-2013 21:04:46.0	yes
02	(1) QSO-B2356-309	COS/FUV COS/NUV	3	12-Apr-2013 21:04:57.0	yes

7 Total Orbits Used

ABSTRACT

Most of the Warm-Hot Intergalactic Medium (WHIM) has yet to be found, posing a fundamental challenge to the current theory of cosmological structure formation. A key prediction is that the WHIM resides in the "cosmic web" structures that are traced by galaxy superstructures and served as "signposts" of baryons. Our detection of an OVII K-alpha absorption line located in the Sculptor Wall superstructure of galaxies ($z \sim 0.03$) in the X-ray spectrum of the blazar H 2356-309 is arguably to date the most promising X-ray detection of gas that could represent the typical WHIM. However, despite the solid statistical significance of our detection (4-sigma) and the consistency of the measurements with both good-quality Chandra and XMM data, further verification is warranted because of the scientific importance of the result and the history of controversial claimed detections in this field. We therefore propose a HST/COS observation of the blazar H 2356-309 sightline. The detection of an HI broad Ly alpha absorber (BLA) will offer an independent confirmation of the Sculptor Wall WHIM absorber at even higher significance than achieved with X-ray data. This sightline also passes through two other galaxy superstructures, therefore offering the best opportunity to perform a comprehensive, joint UV/X-ray study of the WHIM residing in the three galaxy superstructures, the signposts of the cosmic web.

OBSERVING DESCRIPTION

We propose a COS observation of the blazar H 2356-309. The main science goal is to detect UV absorption lines produced by ion species in the foreground superstructures, as well as any other locations along the sight line, and perform a joint analysis with high quality X-ray observations.

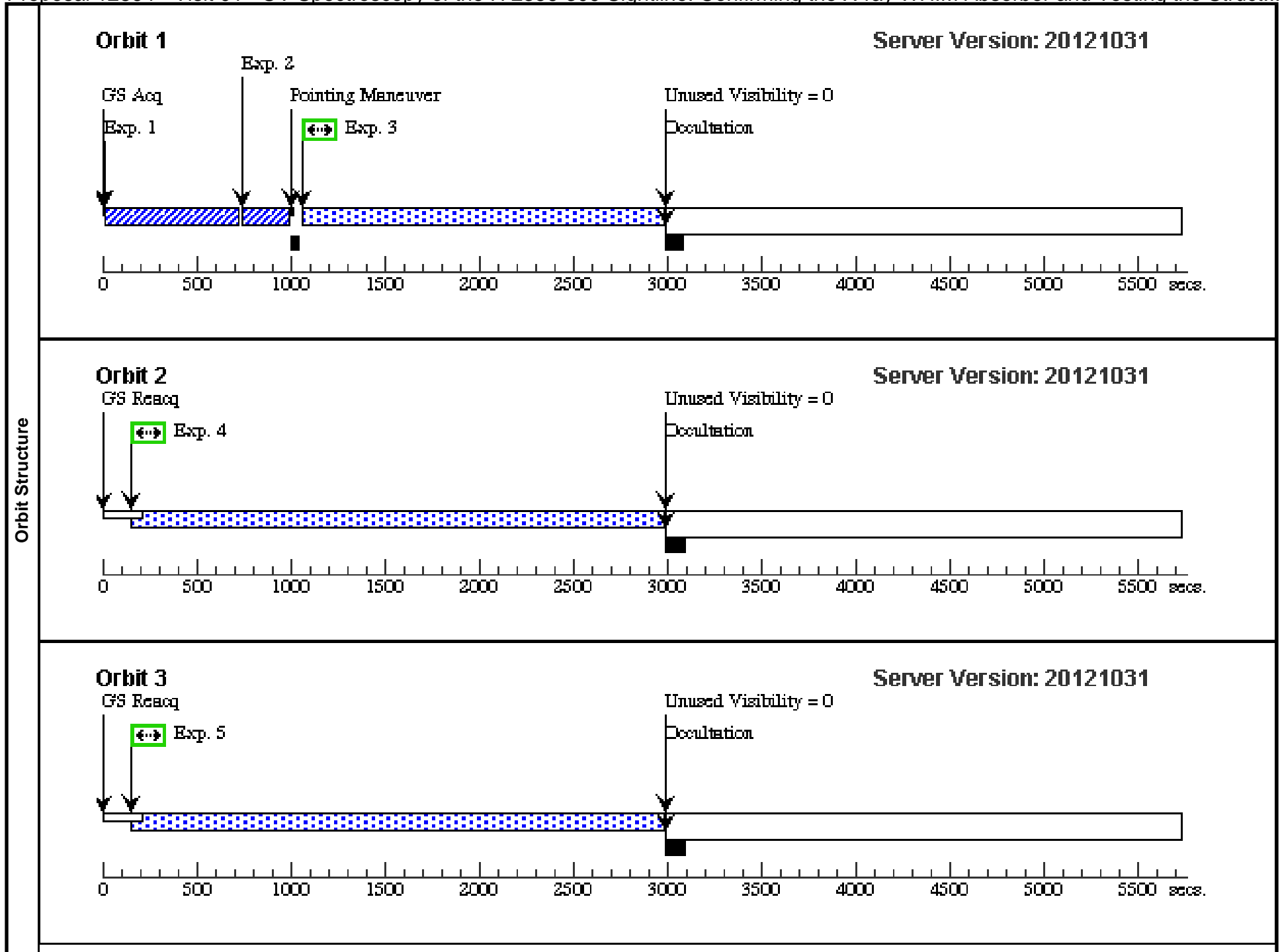
Choice of Gratings; The major ion species we plan to study are listed in the phase I proposal Table 1. We will select COS over the Space Telescope Imaging Spectrograph (STIS) mainly because COS is more sensitive in the far ultraviolet (FUV) band. We will also select the G130M grating of the COS FUV. The resolution of G140L is too low for resolving narrow UV absorption lines. We will use multiple grating central wavelength and FP positions to ensure continuous spectral coverage between 1150 and 1450 Å and to dither instrumental features across the spectrum. Our team members have extensive experience in this area.

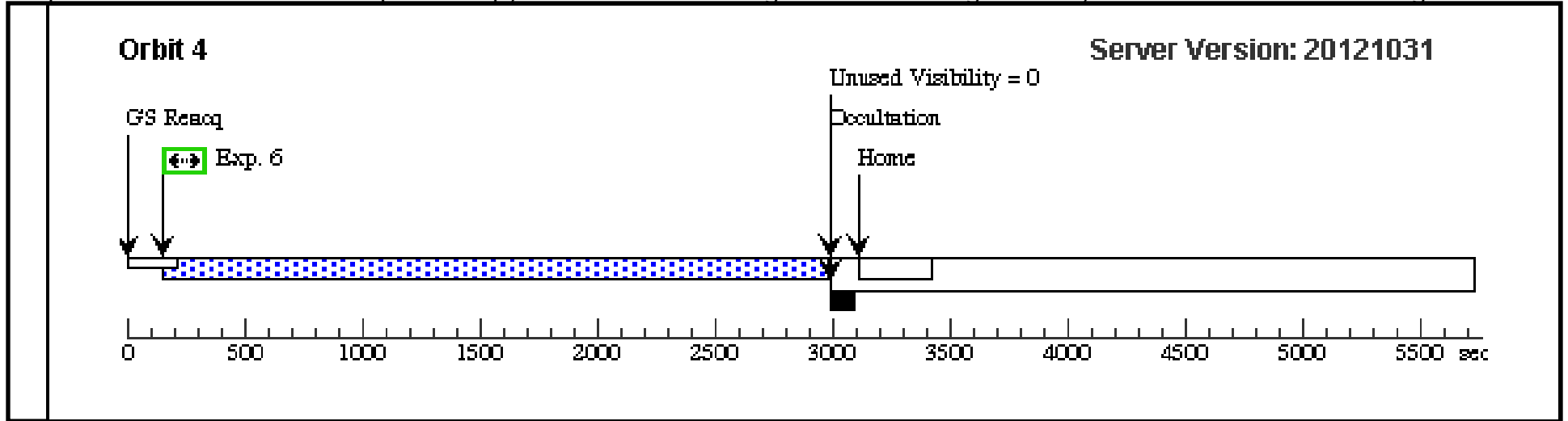
Exposure Time: Recent observations with the HST/COS suggested the spectrum must have a S/N of around 20 per 6 pixel resolution element to detect the BLA. Using the COS Exposure Time Calculator, we estimate an exposure time of 16 ksec., or about 7 orbits after taking into account all the instrumental overheads. With this exposure time, we should be able to detect the BLA down to 30 mÅ, or H I column density of $5 \times 10^{12} \text{ cm}^{-2}$, at 10-sigma significance.

Proposal 12864 - Visit 01 - UV Spectroscopy of the H 2356-309 Sightline: Confirming the X-ray WHIM Absorber and Testing the Struct...

Sat Apr 13 01:05:05 GMT 2013

Visit	Proposal 12864, Visit 01, scheduling Diagnostic Status: Warning Scientific Instruments: COS/NUV, COS/FUV Special Requirements: SCHED 100%																																																																															
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Proposal 12864 - Visit 02 - UV Spectroscopy of the H 2356-309 Sightline: Confirming the X-ray WHIM Absorber and Testing the Struct...

Sat Apr 13 01:05:09 GMT 2013

Visit	<p>Proposal 12864, Visit 02, scheduling</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: COS/NUV, COS/FUV</p> <p>Special Requirements: SCHED 100%</p>									
	<p>(Visit 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.</p>									
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