



## 15462 - The Super-DLA in our Galactic Backyard

Cycle: 25, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

### INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
<b>Prof. J. Michael Shull (PI) (Contact)</b>	<b>University of Colorado at Boulder</b>	<b>mshull@casa.colorado.edu</b>
Dr. Charles Danforth (CoI) (Contact)	University of Colorado at Boulder	danforth@casa.colorado.edu
Prof. John Thomas Stocke (CoI)	University of Colorado at Boulder	stocke@casa.colorado.edu

### 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) Q0025-4047 WAVE	STIS/CCD STIS/NUV-MAMA	1	18-May-2018 18:04:27.0	yes
02	(1) Q0025-4047	COS/FUV COS/NUV	3	18-May-2018 18:04:29.0	yes
03	(1) Q0025-4047	COS/FUV COS/NUV	2	18-May-2018 18:04:30.0	yes

6 Total Orbits Used

### ABSTRACT

During routine AGN observations in Cycle 25, we detected a damped Lyman-alpha absorber (DLA) at redshift  $z = 0$  apparently arising in the Magellanic Stream. This local DLA has an abnormally high neutral hydrogen column density,  $\log N(\text{HI}) = 23.2$ , approximately 500 times higher than the typical maximum values in the Magellanic Stream ( $\log N(\text{HI}) = 20.5$ ) and 100 times that of large HI clouds in the Galactic ISM. However,

there is no clear evidence of dust or molecules despite the unprecedented column density. Given its extreme properties (high neutral column, low metallicity, low dust content, and apparent lack of molecules) we need to observe this DLA in greater detail. We propose to observe the near-UV continuum to constrain dust absorption in the 2175Å feature (STIS/G230L; 1 orbit). In the far-UV we will search for absorption from H<sub>2</sub>, CO, and low-ionization metals (COS/G130M/1222; 5 orbits). We also hope to clarify the location of the DLA (Galactic disk vs Magellanic Stream) through line-profile kinematics and possible changes arising from proper motion.

### **OBSERVING DESCRIPTION**

The good fortune of having a UV-bright QSO behind this low-redshift DLA makes it a unique system. Before we submit a manuscript to Nature, we want to confirm the H I column density and physical characteristics, including the profile recovery shortward of 1130 Å, the molecular content, and the continuum longward of 1900 Å where our COS/G140L spectrum becomes unusably noisy. Two spectral observations (G230L and G130M) totaling 6 orbits will confirm the large DLA column density and detect (or limit) its molecular content in far-UV absorption lines of H<sub>2</sub> and in the shorter-wavelength UV lines of CO. We will also search for the 2175 Å dust feature and derive the metallicity pattern through interstellar absorption lines (C II, Si II, Fe II, N I, Al II, Mg II, C IV, Si IV). The G130M should have sufficient resolution to separate Galactic ISM lines from those in the Stream, using the N I triplet lines at 1134-1135 Å, Si II 1260 Å, and C II 1334-1335 Å. The wavelength coverage of G130M in the 1222 Å setting is 1068-1208 Å (Segment B) and 1223-1364 Å (Segment A).

We propose to observe this intermediate-redshift ( $z = 2.18$ ) QSO with both COS and STIS. We request STIS/G230L (1 orbit) to yield S/N~20 per resel at 2200 Å. With COS/G130M (5 orbits with 1222 setting) straddling our original COS/G140L spectrum we will obtain S/N=5-10 in the wings of the DLA and S/N= 4-6 (1108-1110 Å) where the longest-wavelength H<sub>2</sub> Lyman (0-0) R(0) and R(1) lines are located.

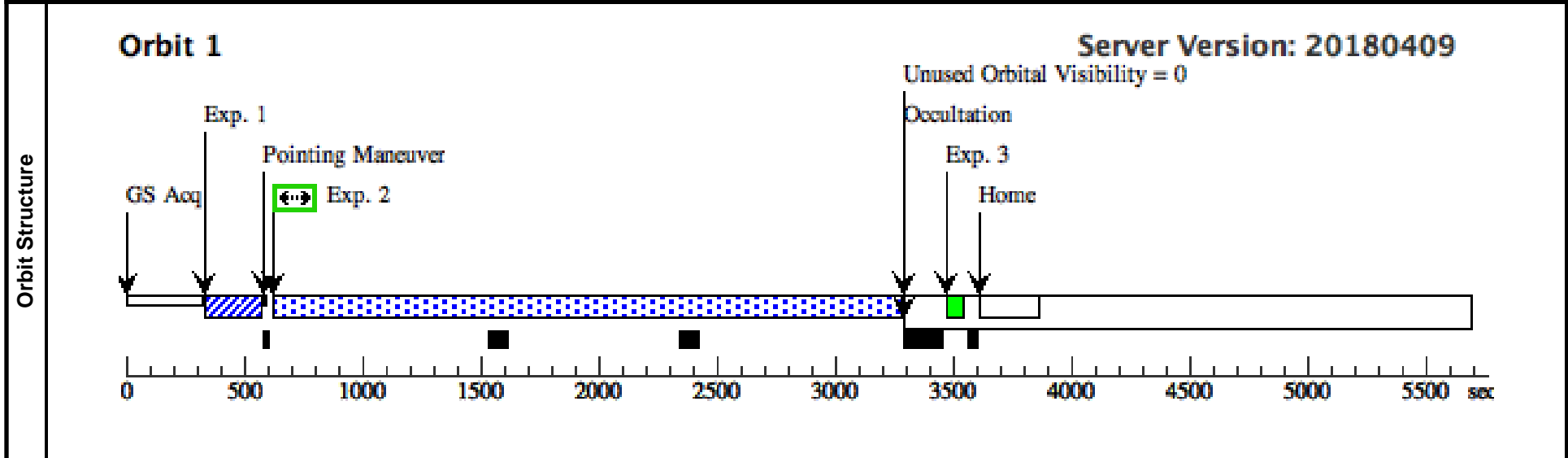
Proposal 15462 - V1 - STIS (01) - The Super-DLA in our Galactic Backyard

Fri May 18 22:04:31 GMT 2018

<b>Visit</b>	<b>Proposal 15462, V1 - STIS (01)</b>				
	<b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: STIS/NUV-MAMA, STIS/CCD Special Requirements: (none) <i>Comments: Single orbit of STIS/G230L observation. Target ACO for STIS should be straight-forward and not require a PEAK-ACO(?).</i>				

<b>Fixed Targets</b>	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	Q0025-4047	RA: 00 27 42.8300 (6.9284583d)	Redshift: 2.18	V=17.14	Reference Frame: ICRS
		Alt Name1: HE0025-4047	Dec: -40 31 0.60 (-40.51683d) Equinox: J2000		F(1500)=1.8-15 erg/cm2/s/Ang	
	<i>Comments:</i> Category=GALAXY Description=[LYMAN ALPHA CLOUD, QSO, TIDAL TAIL] Extended=NO					

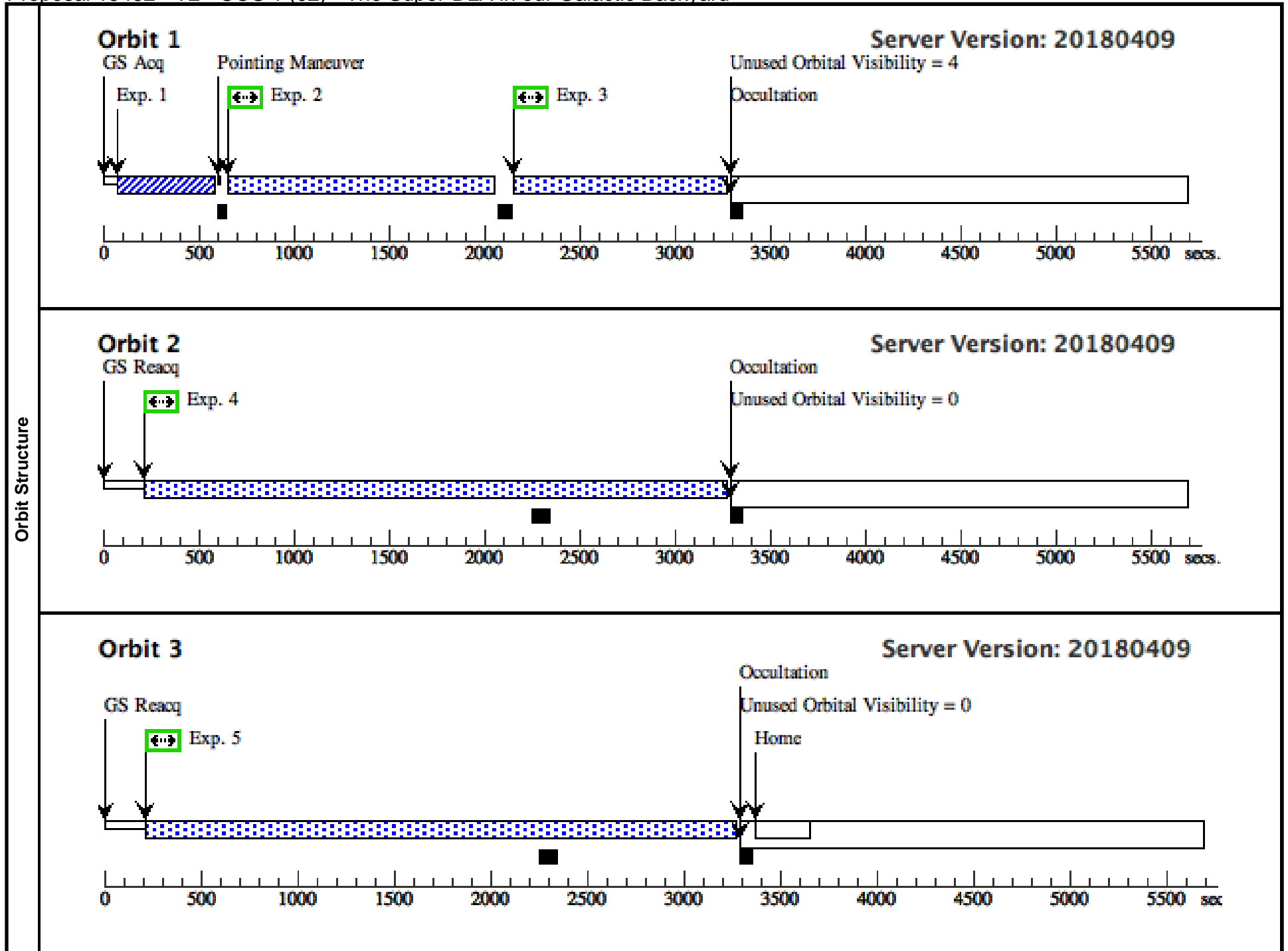
<b>Exposures</b>	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	V1 STIS AC Q (STIS.ta.116 3844)	(1) Q0025-4047	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			3 Secs (3 Secs) [==>]	[1]
	<i>Comments: ETC gives exposure time of 1.5 seconds. Doubling it here to guard against (unlikely) flux changes.</i>									
	2	V1 STIS G2 30L (STIS.sp.11 63846)	(1) Q0025-4047	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=80 0; WAVECAL=NO			2000 Secs (2530 Secs) [==>2530.0 Secs]	[1]
	3	V1 STIS Wa vecal	WAVE	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				[==>]	[1]



Proposal 15462 - V2 - COS 1 (02) - The Super-DLA in our Galactic Backyard

Fri May 18 22:04:31 GMT 2018

Visit	<b>Proposal 15462, V2 - COS 1 (02)</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none) <i>Comments: Three orbits of COS/G140M/1222 observations. Minimizing number of exposures to maximize S/N (a la Keeney et al. 2012) while still using all four FP positions. Target ACQ procedure cloned from successful 15084 V1 procedure (COS/G140L obs of same object).</i>																																																																																																																																																																										
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Proposal 15462 - V3 - COS 2 (03) - The Super-DLA in our Galactic Backyard

Fri May 18 22:04:32 GMT 2018

Visit	<b>Proposal 15462, V3 - COS 2 (03)</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none) <i>Comments: Two orbits of COS/G140M/1222 observations. Minimizing number of exposures to maximize S/N (a la Keeney et al. 2012) while still using all four FP positions. Target ACQ procedure cloned from successful 15084 V1 procedure (COS/G140L obs of same object).</i>																																																																																																																																																																				
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