

COS-GTO: QSO Absorbers, Galaxies and Large-scale Structures in the Local Universe.

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Scientific Category: QUASAR ABSORPTION LINES AND IGM

Scientific Keywords: BAL QUASARS, INTERSTELLAR AND INTERGALACTIC MEDIUM, LYMAN-ALPHA FOREST CLOUDS

Abstract

This is a program to probe the large scale structure of baryons in the universe, including addressing questions of baryon fraction, physical conditions and relationships between absorbers and large-scale structures of galaxies. Besides these specific goals, this proposed GTO program also probes a large enough total path length in Ly alpha and OVI to add significantly to what STIS/FUSE has already observed. Several Galactic High Velocity Cloud Complexes also are probed by these sightlines, particularly the M Complex. The total path length of this proposed program for Ly alpha large-scale structure surveys is $\Delta z \sim 5.5$.

We have selected a variety of targets to address these questions, under the following subcategories:

1. Target 8 bright BL Lac objects to search for low contrast Ly alpha absorbers from the warm-hot interstellar medium (WHIM). Science drivers: What are physical conditions and extent of warm-hot IGM in the current epoch? Can we discover metal-poor WHIM using very broad Ly alpha lines? What is the number density of such lines (dN/dz) and what is their relationship if any with tentative Chandra detections of even hotter gas?
2. Ly alpha cloud sizes: The targets are a bright AGN pair which yield tangential distance separations of 100--500 kpc at $z=0.01--0.05$, where galaxy surveys are excellent. This pair has two filaments and two voids in this distance range. Science drivers: What are the characteristic sizes of Ly alpha absorbers, weak metal-line absorbers and absorbers in voids? Better size determinations will tighten current estimates of the baryon content of the photoionized IGM .
3. Probes of starburst outflows: The targets are bright AGN, ≤ 100 kpc in projection out of the minor axis of nearby starburst galaxies. Science drivers: Outflowing, unbound winds have been implicated as a primary mechanism to enrich the IGM in mass, metals and energy. But do starburst winds from massive galaxies escape the galaxy's gravitational potential? If so, what is the metallicity and what are mass outflow rates of these winds?
4. A large galaxy's gaseous halo: Three probes of the kinematics and metallicity of a single L^* galaxy halo. These observations includes G130M, G160M exposures at $SNR \sim 20$ and G285M at 2850A and $SNR \sim 10$ for

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MgII. The 2L* galaxy, ESO 157-G049 ($cz=1678$ km/s), being probed by these sightlines has an available H I 21cm map from ATCA, H alpha imaging from CTIO and long-slit spectra from MSSSO. Science drivers: What are the extent, metallicity, ionization conditions and kinematics of gaseous halos of normal luminous (L*) galaxies? Is there evidence for outflow, inflow or galactic fountain circulation of gas in massive galaxy halos? What is the source of halo gas (outflowing winds, infalling metal-poor gas from stripping of nearby dwarf galaxies, nuclear outflows, large numbers of bound dark matter halos??) and what is the relationship between this gas and Galactic high-velocity clouds (HVCs)?

5. Dwarf galaxy winds: These targets probe the kinematics and metallicities of outflows from active and inactive (in terms of star formation) dwarfs. Science drivers: Outflowing winds from dwarf galaxies have also been implicated as a primary mechanism to enrich the IGM in mass, metals and energy. What is the evidence that either current starforming dwarfs or "dormant" (and low surface brightness; LSB) dwarfs (presumably in between star forming episodes) create unbound winds of substantial cross section (~ 100 kpc) sufficient to account for all weak metal-line absorbers at high- and low- z ? What are the ionization conditions, mass outflow rates, extents and metallicities of these winds, if they are ubiquitous around dwarf galaxies?

(H_0 is assumed to be 70 km/s/Mpc)

Investigators:

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Number of investigators: 2

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Target Summary:

Target	RA	Dec	Magnitude
MRK421	11 04 27.3000	+38 12 32.00	V = 12.87 +/- 0.02, F(1250) = 6.00E-14
1ES1028+511	10 31 18.5000	+50 53 36.00	V = 16.8 +/- 0.5, F(1250) = 4.00E-15
1ES1553+113	15 55 43.0000	+11 11 24.00	V = 15.0 +/- 0.5, F(1250) = 1.70E-14
PMNJ1103-2329	11 03 37.6000	-23 29 30.00	V = 16.5 +/- 0.1, F(1250) = 2.50E-15
PKS2005-489	20 09 25.4000	-48 49 54.00	V = 15.3 +/- 0.1, F(1250) = 8.00E-14
MRK501	16 53 52.2000	+39 45 37.00	V = 14.15 +/- 0.1, F(1250) = 3.00E-14
1SAXJ1032.3+5051	10 32 16.1000	+50 51 20.00	V = 17.8 +/- 0.2, F(1250) = 3.50E-15
PG0832+251	08 35 35.8000	+24 59 41.00	V = 16.2 +/- 0.5, F(1250) = 1.00E-14
SBS1108+560	11 11 32.2000	+55 47 26.00	V = 16.9 +/- 0.2, F(1250) = 5.00E-15
HE0439-5254	04 40 11.9000	-52 48 18.00	V = 17.0 +/- 0.2, F(1250) = 3.80E-15
HE0435-5304	04 36 50.8000	-52 58 49.00	V = 17.1 +/- 0.2, F(1250) = 3.30E-15
RXJ0439.6-5311	04 39 38.7000	-53 11 31.00	V = 16.2 +/- 0.2, F(1250) = 5.20E-15
VIIZW244	08 44 45.2000	+76 53 9.00	V = 16.3 +/- 0.2, F(1250) = 7.00E-15
SBS1122+594	11 25 53.8000	+59 10 22.00	V = 16.8 +/- 0.3, F(1250) = 3.50E-15
HS1939+700	19 39 30.0000	+70 07 48.00	V = 16.3 +/- 0.1, F(1250) = 4.00E-15
FBQSJ1010+3003	10 10 0.7000	+30 03 22.00	V = 17.0 +/- 0.5, F(1250) = 4.00E-15
HB89-0716+714	07 21 53.4000	+71 20 36.00	V = 15.5 +/- 1.0, F(1180) = 2.5E-14
FBQS-J143917.4+393242	14 39 17.5000	+39 32 43.00	V = 16.9 +/- 1.0, F(1528) = 3.6E-15

Observing Summary:

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Target	Config Mode and Spectral Elements	Flags	Orbits
MRK421	COS/FUV Spectroscopic G130M		2
	COS/FUV Spectroscopic G160M		
1ES1028+511	COS/FUV Spectroscopic G130M		5
1ES1028+511	COS/FUV Spectroscopic G160M		5
1ES1553+113	COS/FUV Spectroscopic G130M		5
	COS/FUV Spectroscopic G160M		
PMNJ1103-2329	COS/FUV Spectroscopic G130M		5
PMNJ1103-2329	COS/FUV Spectroscopic G160M		5
PKS2005-489	COS/FUV Spectroscopic G130M		2
	COS/FUV Spectroscopic G160M		
MRK501	COS/FUV Spectroscopic G130M		3
	COS/FUV Spectroscopic G160M		
1SAXJ1032.3+5051	COS/FUV Spectroscopic G130M		4
1SAXJ1032.3+5051	COS/FUV Spectroscopic G160M		4
PG0832+251	COS/FUV Spectroscopic G130M		5
	COS/FUV Spectroscopic G160M		
SBS1108+560	COS/FUV Spectroscopic G130M	CVZ	4
	COS/FUV Spectroscopic G160M		
HE0439-5254	COS/FUV Spectroscopic G130M	CVZ	4
	COS/FUV Spectroscopic G160M		
HE0439-5254	COS/NUV Spectroscopic G285M	CVZ	2
HE0435-5304	COS/FUV Spectroscopic G130M	CVZ	5
	COS/FUV Spectroscopic G160M		
HE0435-5304	COS/NUV Spectroscopic G285M	CVZ	2
RXJ0439.6-5311	COS/FUV Spectroscopic G130M	CVZ	5
	COS/FUV Spectroscopic G160M		
	COS/NUV Spectroscopic G285M		
VIIIZW244	COS/FUV Spectroscopic G130M		2
VIIIZW244	COS/FUV Spectroscopic G160M		5
SBS1122+594	COS/FUV Spectroscopic G130M	CVZ	5
	COS/FUV Spectroscopic G160M		
	COS/NUV Spectroscopic G285M		
HS1939+700	COS/FUV Spectroscopic G130M		3

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Target	Config Mode and Spectral Elements	Flags	Orbits
HS1939+700	COS/FUV Spectroscopic G160M		5
FBQSJ1010+3003	COS/FUV Spectroscopic G130M		3
FBQSJ1010+3003	COS/FUV Spectroscopic G160M		4
HB89-0716+714	COS/FUV Spectroscopic G130M	CVZ	2
	COS/FUV Spectroscopic G160M		
FBQS-J143917.4+393242	COS/FUV Spectroscopic G130M		2
FBQS-J143917.4+393242	COS/FUV Spectroscopic G160M		2

Total prime orbits: 100

This is a COS GTO project, no scientific justification is needed.