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### **Title**

Multiwavelength Study Of The Distribution Of Neutral Gas In And Around Galaxies And Groups Of Galaxies

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Astronomy

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## Subject Categories

Astrophysics and Astronomy

## Abstract

We study the distribution and nature of neutral hydrogen in various environments. We start by exploring the disk and halos of galaxies in Chapter 1. Our sample consists of 23 sightlines through 15 low-redshift foreground galaxy - background quasar pairs with impact parameters ranging from 1.7 kpc up to 86.7 kpc. We detected one absorber in the GBT survey from the foreground dwarf galaxy, GQ1042+0747, at an impact parameter of 1.7 kpc and another possible absorber in the VLA imaging of the nearby dwarf galaxy, UGC 7408.

In Chapter 2, we present a detailed study of the absorber associated with the galaxy, GQ1042+0747, at an impact parameter of 1.7 kpc. The width of the main absorption line indicates that the gas is cold with kinetic temperature  $< 283$  K, and the HI column is surprisingly low. The lower limit on the size of the absorber is  $27.1 \times 13.9$  pc. In turn, this indicates a low density for a cold cloud,  $n(\text{HI}) = 3.5 \text{ cm}^{-3}$ .

In Chapter 3, we explore the distribution and evolution of tidally stripped HI in a complete distance-limited sample of 22 Hickson Compact Groups (HCGs) with at least four true members. We detected an average HI mass of  $8 \times 10^9 \text{ cm}^{-2} M_{\odot}$ , which is significantly larger than previous single-dish measurements. Spectral comparison of the GBT data with complementary VLA data shows significant HI excess in the GBT spectra. We discuss the origin of the excess gas and explore the possible physical conditions in such systems.

Finally, in the forth chapter we explore the connection of Lyman alpha absorbers to galaxies, groups of galaxies and the large-scale structures. We use data the data and galaxy and galaxy-group catalogs. We find the strength of the Lyman alpha absorbers to be inversely proportional to the impact parameter of the nearest galaxy ( $\rho$ ) or galaxy-group when corrected for the galaxy luminosity ( $L$ ) or group mass ( $M_{\text{halo}}$ ), respectively. We also used the cross-correlation function to explore the connection of Lyman alpha absorbers to galaxies.

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