

Proposal Abstract:

Tiny Scale Atomic Structures (TSAS) in the interstellar medium, with spatial scales ranging from a few to thousands of AU, have been studied through HI absorption observations for over four decades. These structures, characterized by their overdense and overpressured nature, challenge the traditional multi-phase ISM theory. Despite extensive research, there is a lack of robust magnetic field strength measurement for TSAS, which is critical for understanding their physical properties and role in the ISM. This proposal aims to fill this gap by obtaining the first robust Zeeman splitting measurements in HI absorption toward pulsars, allowing precise magnetic field strength determination in TSAS. High-resolution observations, with spatial scales close to several milliarcseconds (mas), will mitigate issues of spectral line blending and beam dilution. By detecting HI absorption variations, measuring Zeeman splitting in HI absorption, and measuring magnetic field strengths in TSAS, we aim to examine the magnetic field and explore the decoupling scale of ions and neutrals in the cold neutral medium (CNM). Our study will provide crucial insights into the origins and roles of TSAS in the ISM, provide insights into ion-neutral interactions in the CNM, and contribute to a refined model of the interstellar environment.