

FAST Proposal Coverpage

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Project Name:

FAST Zeeman Observations of HI Narrow Self-Absorption in Molecular Clouds

Project Summary:

Interstellar magnetic field is one of the most important physical quantities regulating star formation in molecular clouds. Zeeman effect is the only feasible method to directly measure magnetic field strength in molecular clouds. We propose FAST Zeeman observations of HI narrow self-absorption (HINSA) lines in molecular clouds to study the role of magnetic fields in star formation. HINSA is potentially one of the best Zeeman tracers in that (1) the Zeeman splitting factor of HINSA is larger than most of molecules; (2) the intensity of HINSA is usually stronger than other molecular lines; (3) HINSA is not affected by depletion and hence can trace magnetic fields in dense, chemically evolved gas; (4) the density ranges probed by HINSA are the ranges where magnetic fields are expected to be dynamically important. The proposed observations will be helpful to determine the critical density for magnetic fields and address the evolution of magnetic fields in molecular clouds. Based on our experience of the FAST polarization commissioning, we expect to obtain the first Zeeman detection through HINSA, which could be a major discovery.