Using FRIST to probe the magnetic field with low-mass molecular ions.

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Abstract

Observations of the effects the magnetic field has on its environment are usually achieved using techniques which rely on its interaction with the spin of the particles under study. Because of the relative weakness of this effect, extraction of the field characteristics proves to be a most challenging task. We have recently presented a totally different approach to the problem and showed how and why a manifestation of the presence of the magnetic field can be directly detected in the spectra of ionic molecular lines. Our model makes predictions concerning the expected differences between the line profiles of coexistent ion and neutral molecular species and between ions of different mass. We have already published observational evidence in support of these predictions with spectra of neutral (HCN, $H^{13}CN$) and ion (HCO^+, N_2H^+, $H^{13}CO^+$, HCS^+) species of relatively high mass obtained in a sizable sample of molecular clouds. Because of its frequency range, FIRST would allow us to study low-mass molecular species (CH^+, H_3O^+, ...) that are otherwise difficult or even impossible to observe with ground-based telescopes. We could then verify the applicability of our model to such molecular species and test the mass dependency that it predicts.