Abstract Submitted
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Coherent interactions between matter and radiation in neutral hydrogen clouds in the interstellar medium FERESHTEH RAJABI, MARTIN HOUDE[1], Western University — We investigate the possibility of coherent interactions between matter and radiation in neutral hydrogen (HI) clouds in the interstellar medium (ISM), with the goal of determining their impact on the measurement of the abundance of the atomic hydrogen. Currently, astrophysicists assume that the interaction between matter and radiation is fully non-coherent in the ISM, and calculate hydrogen abundance based on this assumption. We reexamine this assumption by adapting Dicke's coherence formalism to different sets of initial conditions in HI clouds in the ISM and by determining the intensity in different ensembles of atoms. We compare this intensity with the one calculated with the non-coherent radiation model, and discuss the importance of potential corrections in abundance measurements. In this study, we have derived the Maxwell-Bloch (MB) equations for an ensemble of N hydrogen atoms interacting with the 21 cm line. The MB equations are solved analytically in the linear regime including homogeneous dephasing mechanisms existing in the ISM. In the non-linear regime, the MB equations are solved numerically for 1) the ideal case where all dephasing mechanisms are neglected, 2) for the case of equal dephasing times. The results suggest possibility of coherent interactions.

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