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Electromagnetically-induced transparency (EIT) in a four-level atom system CHRIS NELSON, CRISTIAN BAHRIM, Department of Chemistry and Physics, Lamar University - Texas — We prove that the EIT technique can be used for slowing down *simultaneously* two circularly–left and –right polarized laser pulses (probe fields) in the presence of a linearly polarized laser pulse (coupling field) using a four-level atom system prepared with a weak B-field. The simultaneous quantum interference between the coupling field and each of the two probe fields leads to the formation of a new type of EIT system: a **W-system**. By turning off one of the two probe fields, a standard EIT behavior can be recognized in two independent V-systems. Our novel EIT technique is applied to ultra-cold Mg atoms in low-lying states ($^1S_0$– ground state and $^1P_1$ – first excited state). The density matrix formalism is employed for finding coherences between Zeeman levels of the upper $^1P_1$ state in our W-system. Solving the master equation for a population-trapped four-level atom system and assuming a zero population density on the Zeeman levels of the $^1P_1$ state give atomic susceptibilities for the dark states associated to the two probe fields. The analysis of the EIT behavior in our W-system is done by varying (1) the Rabi frequencies for the triplet $^1P_1$state and (2) the detuning of the two probe lasers. The dependence of the EIT features with the B-field is also discussed.

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