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Analysis of two simultaneous EITs in a four-level atomic system in a W-scheme using a dressed-state representation CRISTIAN BAHRIM, Department of Physics, Lamar University — A four-level atomic system in a W-scheme is used for slowing down *simultaneously* two circularly polarized optical fields using a linearly polarized coupling field. Our four-level atomic system is composed by the $^1S_0$ ground state and three Zeeman levels of the $^1P_1$ excited state of any alkali-metal atom introduced in a weak magnetic field. When the coupling field is stronger than both probe fields, the electromagnetic induced transparency (EIT) is observed in the coherences associated to the two probes, while the coherence associated to the coupling field shows opacity. We calculate the quantum coherences from the steady-state solutions of the density matrix master equation, in which we neglect the collisional dephasing (we consider ultra-cold atoms), but we include the radiative decays from each Zeeman state to the ground state. The coupling mechanism between the atomic states and the optical fields in our W-system and the evolution of the EIT features with the intensity of the coupling field is done using an intuitive dressed state representation. We also analyze the transit time from the normal dispersive region to the EIT region: when a weak probe field is used, the transit time is the shortest and the width of the Autler-Townes doublet equals the lifetime of the excited atomic state which experiences EIT, but it increases rapidly as the intensity of the probe field increase.

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