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Propagation of Light in an Ensemble of Tripod Level Atoms

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Abstract: We study the propagation of a quantum probe light in an ensemble of tripod level atoms when the atoms are coupled to two other classical control fields. First we calculate the dispersion properties, such as susceptibility and group velocity, of the probe light within such an atomic medium under the case of three-photon resonance via the dynamical algebra method of collective atomic excitations. Then we calculate the dispersion of the probe light in the case that two classical control fields have the different detunings to the relative atomic transitions. Our results show that in both cases the phenomenon of electromagnetically induced transparency can occur. Especially under the second case, we can find two transparency windows for the probe light.

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Key words: group velocity, collective excitation, electromagnetically induced transparency

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