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Designing Molecular Eigenstates in a Four-level Lambda System TEODORA KIROVA¹, FRANK SPANO², A. MARJATTA LYYRA³, Temple University — The interaction of single c.w. laser (coupling) field with a four-level lambda system containing two closely spaced upper levels (a and b) is studied as a means to attain quantum control. By adjusting the coupling field Rabi frequency and detuning, it is possible to create a target state of a prescribed admixture of a and b within the dressed state representation. We prove that the design of such a state requires a certain relation between the Rabi frequency and the detuning of the coupling laser, expressed by a specific "control" equation. We further show how the creation of the target eigenstate is revealed through the optical absorption spectrum. Electromagnetically induced transparency of an additional probe beam is also studied. The four-level lambda system gives rise to generally two dark resonances for a given coupling field detuning.

¹Department of Physics ²Department of Chemistry ³Department of Physics

> Teodora Kirova Temple University

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