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Decoherence-induced geometric phase in an open multilevel atomic system SHUBHRANGSHU DASGUPTA, University of Toronto, DANIEL A. LIDAR, University of Southern California — We consider the process of stimulated Raman adiabatic passage (STIRAP) in a three-level atom. Viewed as a closed system, no geometric phase is acquired. But in the presence of spontaneous emission and/or collisional relaxation we show numerically that a non-vanishing, purely real, geometric phase is acquired during STIRAP, whose magnitude grows with the decay rates. Rather than viewing this decoherence-induced geometric phase as a nuisance, it can be considered an example of beneficial decoherence : the environment provides a mechanism for the generation of geometric phases which would otherwise require an extra experimental control knob.

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