

A Class of Quasi-exact Solutions of Rabi Hamiltonian

PAN Feng,^{1,2} YAO You-Kun,¹ XIE Ming-Xia,¹ HAN Wen-Juan,¹ and J.P. Draayer²

¹ Department of Physics, Liaoning Normal University, Dalian 116029, China

² Department of Physics and Astronomy, Louisiana State University, Baton Rouge, LA 70803-4001, USA

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Abstract: A class of quasi-exact solutions of the Rabi Hamiltonian, which describes a two-level atom interacting with a single-mode radiation field via a dipole interaction without the rotating-wave approximation, are obtained by using a wavefunction ansatz. Exact solutions for part of the spectrum are obtained when the atom-field coupling strength and the field frequency satisfy certain relations. As an example, the lowest exact energy level and the corresponding atom-field entanglement at the quasi-exactly solvable point are calculated and compared to results from the Jaynes-Cummings and counter-rotating cases of the Rabi Hamiltonian.

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