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Generalized local frame transformation theory for Rydberg atoms in external fields[1] PANAGIOTIS GIANNAKEAS, FRANCIS ROBICHEAUX, CHRIS H. GREENE, Department of Physics and Astronomy, Purdue University, West Lafayette, Indiana 47907, USA — In this work a rigorous theoretical framework is developed generalizing the local frame transformation theory (GLFT) and it is applied to the photoionization spectra of Rydberg atoms in an external electric field. The resulting development is compared with previous theoretical treatments, including the first version of local frame transformation theory, developed initially by Fano and Harmin. Our revised version of the theory yields non-trivial corrections because we now take into account the full Hilbert space on the energy shell without adopting truncations utilized by the original Fano-Harmin theory. The semi-analytical calculations from GLFT approach are compared with ab initio numerical simulations yielding errors of few tens of MHz whereas the errors in the original Fano-Harmin theory are one or two orders of magnitude larger. Our analysis provides a systematic pathway to precisely describe the corresponding photoabsorption spectra that should be accurate enough to meet modern experimental standards.

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