How fast is a quantum jump?

Luis de la Peña, Ana María Cetto, and Andrea Valdés-Hernández

Instituto de Física, UNAM, Apartado postal 20-364, Ciudad Universitaria, 01000 Mexico, DF, Mexico

The physics of the transitions between quantum states is a matter that has received little attention in the past, despite the crucial importance of these transitions for atomic and molecular physics. Recently however the picture has started to change, thanks to calculational and experimental work using attosecond spectroscopy. In this work we focus on the basic underlying physics by carrying out a theoretical analysis informed by stochastic electrodynamics, which does not rely on specific experimental settings, with the ultimate purpose of estimating the duration of a transition. The proposal rests on the consideration that a resonance of the atomic electron with modes of the zero-point radiation field of Compton's frequency is at the core of the phenomenon. The theoretical result obtained for the jumping time lies within the range of the recently experimentally estimated values of the order of attoseconds (10^{-18}s).