

Neutral Particle Decays and Scatterings in External Fields with Worldline Instantons

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We apply the semiclassical method of Worldline Instantons to the calculation for the rates of neutral particle decays and scatterings to charged ones in an external electromagnetic field which are kinematically forbidden in the absence of the external field. The decay processes include the photon decay to an electron-positron pair in a constant external electric or magnetic field, as well as the neutrino decay to W-boson and electron in constant magnetic field. The scattering process of our consideration is the Breit-Wheeler process (two photon scattering to an electron-positron pair) in a constant electric field below the perturbative threshold. We show that the rate of the latter process is less suppressed than the aforementioned rate of the photon decay which in turn is less suppressed compared to the Schwinger effect. Thus, we argue that the Breit-Wheeler process can be considered as a specific regime of “Doubly assisted Schwinger effect” (requiring three components of the electromagnetic field) which was discussed in the literature in other regimes.