

What are the time-scales of particle formation in the Schwinger effect?

Friday, 18 November 2022 12:00 (20 minutes)

Lasers providing ultra-strong fields might allow for the first time a verification of electron-positron pair production via the Schwinger effect. Recent theoretical investigations have elucidated many aspects of this essentially non-perturbative effect. However, there is, at least, one fundamental question which has remained elusive: What is the formation time of the electron (or, equivalently, of the positron) in this process? We will discuss whether and how this question can be formulated as a well-posed problem and point out the advantages of the adiabatic particle number as a pseudo-observable in this process. Furthermore, we will analyze the numerical results obtained in Dirac-Heisenberg-Wigner formalism for time-dependent and inhomogeneous electric fields in 1+1- dimensional QED to extract at least three different time-scales which are relevant for particle formation. Hereby, the time evolution of late-time-observable quantities such as the charge density and the particle number density are studied with respect to the influence of spatial and temporal field variations. An outlook for a corresponding investigation in 3+1-dimensional QED will be given.

Affiliation

University of Graz

Financial Support

I apply for financial support (student application)

Primary author: Mr DIEZ, Matthias (University of Graz)

Co-authors: Dr KOHLFÜRST, Christian (Helmholtz-Zentrum Dresden Rossendorf); Prof. ALKOFER, Reinhard (University of Graz)

Presenter: Mr DIEZ, Matthias (University of Graz)

Session Classification: Morning session