

Temporal and spatial structures in the Sauter-Schwinger effect

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Pair creation in ultra-strong background fields, particularly the Sauter-Schwinger effect, has been a long-standing theoretical prediction. Despite extensive studies, one aspect, the formation times of particles, has remained elusive. In this poster, I present our recent work on time scales in Sauter-Schwinger pair production. To this end, we study the time evolution of observables in spatially and temporally structured electric fields within a (1+1)-dimensional Dirac-Heisenberg-Wigner approach. In order to interpret these extracted observables at intermediate times we use a hypothetical shutoff procedure [1]. The switching off of the field at intermediate times allows us to study pair and charge densities at non-asymptotic times. From this, we are able to identify different time scales in both, the spatial and momentum domains. We perform a detailed analysis of multiple parameters to obtain power laws for the parameter dependence of the time scales for pair production in the case of a single Sauter pulse [2,3]. This work therefore allows us interesting insights into non-equilibrium quantum systems.

References

[1] A. Ilderton, Phys. Rev. D 105, 016021 (2022)

[2] M.Diez, R.Alkofer, C.Kohlfürst, Phys. Lett. B 844, 138063 (2023)

[3] M.Diez, R.Alkofer, C.Kohlfürst, „Temporal and Spatial Scales in Particle production from Ultra-Strong Fields”, in preparation

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