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Footprint of Lienard–Wiechert field on a one-dimensional curve in space

On the basis of exact Lienar-Wichert equations a method is developed that determines parametric expressions of the electromagnetic field of a charged particle moving in vacuum on one-dimensional curve in space. Specific parameterization allows to overcome the problem of solving the retardation equation. We call the defined field on a one-dimensional curve the footprint of Lienard-Wiechert field, and the curve itself the footprint line. In this paper the method is applied to a charged particle moving along a helical trajectory. As one-dimensional curves, straight lines located differently with respect to the motion trajectory are chosen. Field domains with maximal amplitudes are identified and their motion with time is considered. It is shown that these domains are marked by the regions of the electric field line concentrations in space. Since the footprint line is given in an absolute manner, the fields of particles moving along different trajectories can be imprinted on it, i.e., the exact solutions of the electromagnetic fields from the particle beam can be determined.

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