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A singularity-free model for a point charge potential in the presence of a momentum cutoff in a D-dimensional Euclidean space ($D \geq 3$)

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Abstract

In Maxwell electrostatics the electrostatic potential of a point charge is singular at the position of the point charge. In this paper, a nonsingular model for a point charge potential is presented in the presence of a momentum cutoff p_{max} based on a one-parameter deformation of the Heisenberg algebra in a 2D-dimensional phase space. For $p_{max} \to \infty$, the results of this paper reduce to the results of ordinary Maxwell electrostatics for a point charge.

Keywords: phase space, deformed Heisenberg algebra, Maxwell electrostatics, momentum cutoff, point charge potential

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