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Coordinate-space representation of a charged scalar particle propagator in a constant magnetic field expanded as a sum over the Landau levels

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There exist different representations of charged particle propagators in a constant magnetic field. Among the most useful are the Fock-Schwinger proper-time representation, both in the coordinate and momentum spaces, and the momentum-space representation with the expansion over the Landau levels. In this study we derive the missing coordinate-space representation for the propagator of a charged scalar particle as a series over Landau levels, where each expansion term explicitly decomposes into two factors. The first factor, the modified Bessel function of a second kind, depends only on time and z coordinate, with the z-axis chosen to be a direction of the magnetic field. The second factor, a product of a Laguerre polynomial and a damping exponential, depends on x and y coordinates, which form a plane perpendicular to the direction of magnetic field.

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