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Worldline master formulas for dressed electron propagator in constant external fields

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The standard formalism for calculating the S-matrix in quantum field theory is based on path integrals over field configurations, and can be formulated as a diagrammatic perturbative method. Alternative to this approach is the Worldline formalism, based on first-quantized relativistic point particle path integrals. Recently, a novel representation of the fermion propagator dressed with an arbitrary number of photons was developed based on this formalism.

In this talk, I will present an extension of this work that includes a constant external electromagnetic field. The resulting Bern-Kosower type representation of the fermion propagator, dressed with a constant field in addition to N scattering photons, reduces all spin-related algebra to a minimum. Using this representation I will show, as a simple application, how to recover the relativistic Landau levels.

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