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Electromagnetic moments of elementary particles from a second order formalism

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Abstract content

We calculate the static electromagnetic moments of an elementary particle with spin, in particular the spin 3/2 case, and relate the result to Compton scattering in the forward direction. We start from a second order Lagrangian based on the properties of a particle viewed as a state transforming under some representation of the Poincaré group. Coupled to an electromagnetic field, this Lagrangian leads to an EM interaction current written in terms of undeterminded parameters. This parameters are related to the electromagnetic moments of the particle, we fix them by requiring a well behaved forward Compton scattering cross section. As a result we find that all the moments are related by means of the giromagnetic factor. In the cases of spin 1 and spin 3/2, the value consistent with a well behaved forward Compton scattering cross section is found to be g=2. We reproduce the known results for an electron, for vector particles our results match the natural moments of the W boson, in the spin 3/2 case we obtain diferent results from those of the Rarita-Schwinger formalism.

Summary

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