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Gravitational Modification of Breit Hamiltonian

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Abstract content

Summary

Is presented a deduction of the Breit Hamiltonian for a pair of fermions immersed in a external gravitational field that is described for the General Relativity (GR). The deduction includes the effect of the gravitational field on the quantum nature of the electromagnetic field plus the usually included on the fermions. Working with Fermi Normal Coordinates (FNC) for a free falling observer in a space-time region where $T_{munu} = 0$, under the hypothesis that the gravitational field of the system can be ignored, is deduced the photon Feynman Green function up to first order in the curvature of the external field and then included in a standard Quantum Field Theory (QFT) calculation to obtain corrections to the standard Coulomb and Breit Hamiltonian due to the presence of curvature of the spacetime. The calculations are make treating the fermions separately without inclusion of centre of mass coordinates (relativistic or not) which are only "well posed\'\' in the non-relativistic regime. The final Hamiltonian is approximately relativistic and includes the effect of the curvature up to order c^{-2}.

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