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# Pseudo-gauge dependence of quantum fluctuations of energy in a hot relativistic fermionic gas

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Explicit expressions for quantum fluctuations of energy in subsystems of a hot relativistic gas of spin-1/21/2 particles are derived. The results depend on the form of the energy-momentum tensor used in the calculations, which is a feature described as pseudo-gauge dependence. However, for sufficiently large subsystems the results obtained in different pseudo-gauges converge and agree with the canonical-ensemble formula known from statistical physics. As different forms of the energy-momentum tensor of a gas are a priori equivalent, our finding suggests that the concept of quantum fluctuations of energy in very small thermodynamic systems is pseudo-gauge dependent. On the practical side, the results of our calculations determine a scale of coarse graining for which the choice of the pseudo-gauge becomes irrelevant.

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