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Universality of curvature corrections in statistical QFT in curved space-time and analytic distillation

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In this work, we present a new result concerning the stress-energy tensor of a quantum field theory at global thermodynamic equilibrium in curved space-time. By using known exact results in literature for the massless scalar free field in Minkowski, deSitter, antideSitter and Einstein static Universe, we demonstrate that the stress-energy tensor at equilibrium in curved space-time has the same expression, with the same coefficients, independently of the space-time if one requires the analyticity in the curvature tensors and the derivatives of the Killing vector defining equilibrium, i.e. local acceleration and vorticity. Specific corrections depending on the global properties of the space-time are always non-analytic for zero curvature and thermal vorticity. We conjecture that this feature is a general one which applies to any space-time and to any local observable for a given quantum field. We illustrate in some detail the method of analytic distillation which makes it possible to effectively extract the analytic part of functions expressed by complicated series.

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