Contribution ID: **122** Type: **Poster**

RESUMMATION OF INFRARED DIVERGENCES IN THE FREE-ENERGY OF SPIN-TWO FIELDS

The finite temperature behavior of spin-two fields may have some relevant connections with the low energy behavior of more fundamental approaches to gravity, specially in the high temperature limit, when resummation is unavoidable. In this work we derive a closed form expression for the sum of all the infrared divergent contributions to the free-energy of a gas of gravitons. An important ingredient of our calculation is the use of a gauge fixing procedure such that the graviton propagator becomes both traceless and transverse. This has been shown to be possible, in a previous work, using a general gauge fixing procedure, in the context of the lowest order expansion of the Einstein-Hilbert action, describing non-interacting spin two fields. In order to encompass the problems involving thermal loops, such as the resummation of the free-energy, in the present work, we have extended this procedure to the situations when the interactions are taken into account. We will also present some possible consequences which may arise from the imaginary part of the resummed free-energy.

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Track Classification: 12 - Beyond Quantum Field Theory Approaches (including String Theories)