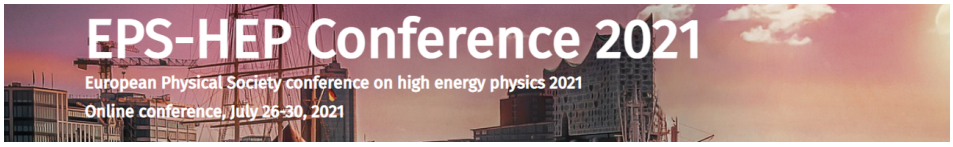

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Gravitational Waves as a Big Bang Thermometer

Monday, 26 July 2021 15:35 (20 minutes)

There is a guaranteed background of stochastic gravitational waves produced in the thermal plasma in the early universe. Its energy density per logarithmic frequency interval scales with the maximum temperature Tmax which the primordial plasma attained at the beginning of the standard hot big bang era. It peaks in the microwave range, at around 80 GHz [106.75/g*s(Tmax)]^(1/3), where g*s(Tmax) is the effective number of entropy degrees of freedom in the primordial plasma at Tmax. We present a state-of-the-art prediction of this Cosmic Gravitational Microwave Background (CGMB) for general models, and carry out calculations for the case of the Standard Model (SM) as well as for several of its extensions. On the side of minimal extensions we consider the Neutrino Minimal SM (νMSM) and the SM-Axion-Seesaw-Higgs portal inflation model (SMASH), which provide a complete and consistent cosmological history including inflation. As an example of a non-minimal extension of the SM we consider the Minimal Supersymmetric Standard Model (MSSM). Furthermore, we discuss the current upper limits and the prospects to detect the CGMB in laboratory experiments and thus measure the maximum temperature and the effective number of degrees of freedom at the beginning of the hot big bang.

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