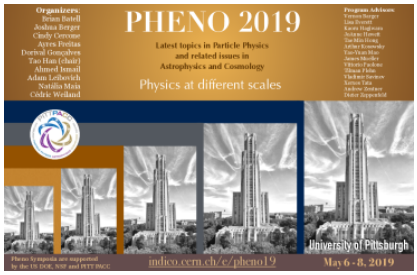

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Particle Decay in the Expanding Spacetime of Post-Inflationary Cosmology

Tuesday 7 May 2019 17:45 (15 minutes)

The calculation of particle decay rates typically proceeds by an S-matrix approach in Minkowski spacetime. While such an approach is often highly effective, it fails, in general, when performing calculations in dynamic spacetimes since the S-matrix necessitates global energy conservation which is not present in an expanding universe, like ours. I will describe how the decay law of scalar particles decaying during the radiation dominated epoch of a standard cosmological model can be obtained by introducing an adiabatic approximation valid for degrees of freedom with typical wavelengths much smaller than the particle horizon at a given time. Furthermore, this decay law is calculated, treating the cosmological expansion consistently, through the non-perturbative Wigner-Weisskopf method adapted for cosmology. I will discuss both scalar to scalar and scalar to fermion (with Yukawa couplings) decays within this framework highlighting how the effects of cosmic expansion, such as cosmic redshift and the confluence of time-dependent particle frequencies with a renormalizable theory, lead to salient differences from the usual Minkowski spacetime results.

Summary

Author: HERRING, Nathan (University of Pittsburgh)

Presenter: HERRING, Nathan (University of Pittsburgh)

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