

Whispers from the Dark Universe - Particles & Fields in the Gravitational Wave Era

CLUSTER OF EXCELLENCE
QUANTUM UNIVERSE

DESY THEORY WORKSHOP

WHISPERS FROM THE DARK UNIVERSE – PARTICLES & FIELDS IN THE GRAVITATIONAL WAVE ERA

HELMHOLTZ

24 - 27 September 2024 DESY Hamburg, Germany



Contribution ID: 43

Type: **not specified**

ALP production at finite temperature:

Thursday 26 September 2024 14:48 (16 minutes)

In this talk, we discuss the unphysical behavior that arises when addressing infrared (IR) divergences in particle production rates in cosmology, particularly focusing on axion production coupled to photons. This unphysical behavior manifests as negative production rates for soft axion momentum.

To address this, we calculate the axion production rate at finite temperature. Initially, we use the hard thermal loop (HTL) resummation, which is appropriate for soft momenta. Here, we find that the decay rate remains positive when resumming contributions from both photons. Furthermore, we extend the calculation beyond the HTL approximation, demonstrating that the decay rate remains positive across all momentum scales. This allows us, as well, to identify the deviations between both methods and identify the main contributions to the axion production rate.

Primary authors: PUCHADES IBÁÑEZ, Cristina (Institute of Theoretical High Energy Physics (THEP)-Johannes Gutenberg Universität (JGU), Mainz); COPELLO, Emanuele; MORGANTE, Enrico (U. Trieste & INFN); HARZ, Julia (Technical University of Munich (TUM)); BECKER, Mathias (TU München); SCHWALLER, Pedro (University of Mainz)

Presenter: PUCHADES IBÁÑEZ, Cristina (Institute of Theoretical High Energy Physics (THEP)-Johannes Gutenberg Universität (JGU), Mainz)

Session Classification: Parallel Thursday Cosmo 3

Track Classification: Cosmology & Astroparticle Physics