Contribution ID: **189** Type: **not specified**

ALP Production from Abelian Gauge Bosons: Beyond Hard Thermal Loops

Wednesday 28 May 2025 15:40 (20 minutes)

Previous studies on the production of feebly interacting particles have encountered challenges due to negative interaction rates at soft momenta. We resolve this issue by investigating the thermal production of Axion-Like Particles (ALPs) from the freeze-in mechanism via feeble interactions with U(1) gauge fields, employing the full 1PI-resummed gauge boson propagator. This approach ensures a consistent treatment across all momentum scales, avoiding the need for matching or subtraction techniques.

Our analysis confirms that the ALP production rate remains positive throughout and identifies new production channels at soft momentum ($p \leq g^2 T$). These results refine the predicted thermal ALP abundance and momentum distribution, providing important input for structure formation constraints on keV-mass ALP dark matter. More broadly, our approach offers a systematic and physically consistent framework for addressing infrared effects in feebly interacting particle production.

(Based on arXiv:2502.01729v1)

Primary authors: PUCHADES IBÁÑEZ, Cristina (JGU); MORGANTE, Enrico (U. Trieste &INFN); Prof. HARZ, Julia; Dr BECKER, Mathias; Prof. SCHWALLER, Pedro

Presenter: PUCHADES IBÁÑEZ, Cristina (JGU)

Session Classification: Light and dark particles