Contribution ID: **37** Type: **not specified**

ALPs production from Light Primordial Black Holes: the role of Superradiance

Wednesday 21 May 2025 12:00 (20 minutes)

Light Primordial Black Holes (LPBHs) with masses in the range $10\ \mathrm{g} \leq M_{\mathrm{BH}} \leq 10^9\ \mathrm{g}$, although they evaporate before Big Bang Nucleosynthesis, can play a significant role in the production of both Dark Matter and Dark Radiation. In particular, LPBHs can evaporate into light axions or axion-like particles (ALPs) with masses m_a
$lesssim$ MeV, contributing to the effective number of neutrino species, ΔN_{eff}. Additionally, heavy scalar particles known as *moduli*, predicted by String Theory, can be produced both via Hawking evaporation and through amplification by a mechanism called *Superradiance Instability* in the case of spinning PBHs. These moduli can subsequently decay into ALPs, further amplifying their abundance.
In this work, we calculate the number density of ALPs in the presence of moduli enhanced by Superradiance for Kerr PBHs. Using current limits on ΔN_{eff} from Planck satellite observations, we derive updated constraints on this scenario.

Author: MANNO, Marco (University of Salento)

Co-author: Prof. MONTANINO, Daniele (University of Salento)

Presenter: MANNO, Marco (University of Salento)

Session Classification: PBHs, structure formation, cosmological evolution & particle DM