

# Primordial Black Hole formation from a massless scalar field

*Tuesday, 17 September 2024 10:10 (20 minutes)*

Assuming spherical symmetry we consider primordial black hole formation from the collapse of adiabatic cosmological perturbations of a massless scalar field, sourced by a time independent curvature profile  $\mathcal{R}(r)$  imposed on super horizon scale. We have proved that a massless scalar field is equivalent to a perfect fluid where the pressure is equal to the total energy density (i.e.  $p = \rho$  equation of state). Using the comoving and the constant mean curvature gauge we build up a numerical code based on the BSSN conformal decomposition, developed specifically for this problem, computing the threshold  $\delta_c$  for different initial configurations. This will allow to compute the abundance and mass distribution of PBHs formed when the early Universe is dominated by massless scalar field.

**Primary author:** Dr MUSCO, Ilia (Istituto Nazionale di Fisica Nucleare, Rome)

**Co-authors:** Dr PALLONI, Gabriele (University of Valencia); PANI, Paolo (Sapienza University of Rome & INFN Roma1)

**Presenter:** Dr MUSCO, Ilia (Istituto Nazionale di Fisica Nucleare, Rome)

**Session Classification:** Contributed Talks