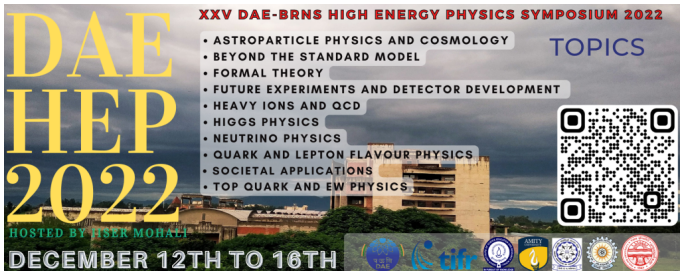

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Formation of primordial black holes in the subhorizon k-space of inflation

Wednesday 14 December 2022 16:15 (15 minutes)

We investigate a high momentum regime of inflation where the cosmological perturbation breaks down due to large inflationary quantum fluctuations to form the primordial black holes(PBHs). In our study, we have found that, in this region, the values of the Bardeen potential is large negative causing a gravitational instability conducive to the formation of the PBHs. We have used three self-consistent differential equations to study the dynamical evolution in the k-space, in the spatially flat gauge i.e. $\delta\phi \neq 0$, which shows the role of the inflaton perturbation as well as that of the background metric in the formation of PBHs. We have found that the α-attractor potentials which are favored by the PLANCK-18 data help to create the gravitational instability i.e. the large value of Bardeen potential in the region k~10^{13} Mpc^{-1} and the density contrast exceeds the value of 0.41 which indicates the formation of the PBHs. Further we have calculated the values of the σ(M), β(M) and f_{PBH}(M) and masses of these PBHs in a new method and get the values which are consistent with LISA, WD, NS, DECIGO/AI, FL, SIGWs forecasts. The calculated masses of the PBHs are in the range of 1.35×10^{-13} – $2.60\times10^{-16} M_{\odot}$ and f_{PBH} are 0.3% – 36% which indicates the fraction of PBH present in dark matter.

Session

Astroparticle Physics and Cosmology

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