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Black holes and gravitational waves from phase transitions in realistic models

Among all the possible candidates for Dark Matter, one appealing example is a population of Primordial Black Holes, which could have been borne by various processes in the early stages of the Universe. In this talk, I will investigate the formation of such objects as the result of the collapse of energy density fluctuations originating from supercooled first-order phase transitions. I will stress the importance of including the second-order corrections in the expansion of the bubble nucleation rate and show its implications for the production of Primordial Black Holes as well as the emission of Gravitational Wave signals. Finally, I will illustrate the application of this formalism to a realistic particle model, showing that in certain regions of parameter space both abundant production of Primordial Black Holes and emission of strong Gravitational Wave signals is realized.

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