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Bose-Einstein condensation phenomenology in systems with repulsive interactions

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The role of repulsive interactions in statistical systems of Bose particles is investigated. Three different phenomenological frameworks are considered: a mean field model, an excluded volume model, and a model with a medium dependent effective mass. All three models are tuned to yield similar equations of state, with only minor deviations from the ideal Bose gas at small chemical potentials. Our analysis indicates, however, that these models lead to qualitatively different results for the Bose-Einstein condensation phenomenon. We discuss the different aspects of this phenomenon, namely, an onset of the Bose-Einstein condensation, particle number fluctuations, and a behavior of the Bose condensate. The obtained results can be helpful for interpreting the lattice QCD data at small temperature and large isospin chemical potential and the data on multiple pion production in high energy nuclear collisions.

Primary authors: Mr SAVCHUK, Oleh (Frankfurt Institute For Advanced Studies); Mr STASHKO, Oleksandr (Taras Shevchenko National University of Kyiv)

Presenter: Mr SAVCHUK, Oleh (Frankfurt Institute For Advanced Studies)

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