



Contribution ID: 390

Type: Postar

A Study of Chemical Freeze-Out in Ultra-Relativistic Nucleus-Nucleus Collisions Using the van der Waals Type Model Approach

In this study, we examine the chemical freeze-out curve in ultra-relativistic nucleus-nucleus collisions by extracting freeze-out parameters from particle ratios within the van der Waals hadron resonance gas (VD-WHRG) framework. We analyze data from high-energy collision experiments, including the Super-Proton-Synchrotron (SPS), Relativistic Heavy Ion Collider (RHIC), and the Large Hadron Collider (LHC). Employing a best-fit approach, we systematically derive these parameters using established relationships between temperature and chemical potential across varying collision energies. Our analysis contrasts the derived freeze-out line with recent parameters from statistical thermal models of particle ratios. This work advances the understanding of hadron production dynamics and the thermodynamic freeze-out conditions in heavy-ion collisions.

Field of contribution

Phenomenology

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Track Classification: Heavy ion and QCD