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Statistical thermal models for particle reproduction in heavy ion collisions

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The quantity of various particles reported in relativistic heavy-ion collision research is consistent with the notion that they attain thermal equilibrium at temperatures substantially higher than those at which they kinetically freeze-out, which is a remarkable conclusion. This study attempts to explain this phenomenon by using statistical thermal models based on statistical mechanics theories to simulate the behavior, properties, and distribution of matter at extreme temperatures of microscopic matter. Additionally, the focus of the study is to apply statistical thermal models to determine how particle ratios and densities are influenced by temperature for particles produced in heavy-ion collisions. Statistical thermodynamics models are applied in the last stage of heavy ion collision which is hypothesized to be in thermal equilibrium. The reason for this is that, as the temperature rises beyond 200 MeV, the quark-gluon plasma begins to form, and after the quark-gluon plasma forms, hadronization occurs, resulting in the production of elementary particles. The ratios of these elementary particles, kaons, pions, anti-protons, and protons, were calculated and found to be in good agreement with the experimental results obtained from other studies. In conclusion, the study obtained the $\bar{p}/p$, K/π ratio, and u-quark and gluon densities plots as a function of temperature.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

Primary authors: MAPHOTO, Refiloe Innocencia (University of Limpopo); Ms SEKORI, Boineelo (Sol Plaatje University); Mr SITHOLE, Kudzai (University of the Western Cape); Mr MASILELA, Vincent (University of Johannesburg); Ms KHUMALO, Thuthukile (Wits/iThemba LABS)

Presenter: Mr SITHOLE, Kudzai (University of the Western Cape)

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