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Net-proton fluctuations influenced by baryon stopping and quark deconfinement

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Preliminary data from the Beam-Energy Scan II measurements by the STAR Collaboration at the Relativistic Heavy Ion Collider suggest a dip in the fourth-to-second-order cumulant ratio when plotted vs. beam energy. At the same energy range where the structure appears, a transition from hadrons to quarks is expected, the deconfinement transition. In this paper, the role of quark deconfinement in establishing fluctuaitions in the early stages of the collision is considered. Two models are compared: one with stopping occurring on a baryon-by-baryon basis, and a second where stopping proceeds through quark degrees of freedom. In the latter model, the fluctuation of baryon number is significantly reduced and this signal is found to survive recombination into hadrons and the subsequent diffusion. The transformation from baryon to quark stopping thus produces a dip in the fourth-to-second-order cumulant ratio when plotted vs. beam energy, consistent with observations.

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