**Probing QCD critical fluctuation from light nuclei production**

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Based on the coalescence model for light nuclei production, we have found that the yield ratio $\mathrm{O_{p-d-t}} = \mathrm{N_t N_d^2/N_{\mathit{p}}}$ of $p$, d, and $^3$H (t) in heavy-ion collisions is sensitive to the neutron relative density fluctuation $\Delta n = \langle(\delta n)^2\rangle/\langle n\rangle^2$ at kinetic freeze-out [1]. From recent experimental data in central Pb+Pb collisions at $\sqrt{s_{NN}}$ = 6.3 GeV, 7.6 GeV, 8.8 GeV, 12.3 GeV and 17.3 GeV measured by the NA49 Collaboration at the CERN Super Proton Synchrotron (SPS) [2], we find a possible non-monotonic behavior of $\Delta n$ as a function of the collision energy with a peak at $\sqrt{s_{NN}}$ = 8.8 GeV, as shown in Fig. 1 for various values of the correlation $\alpha$ between the neutron and proton density fluctuations defined by

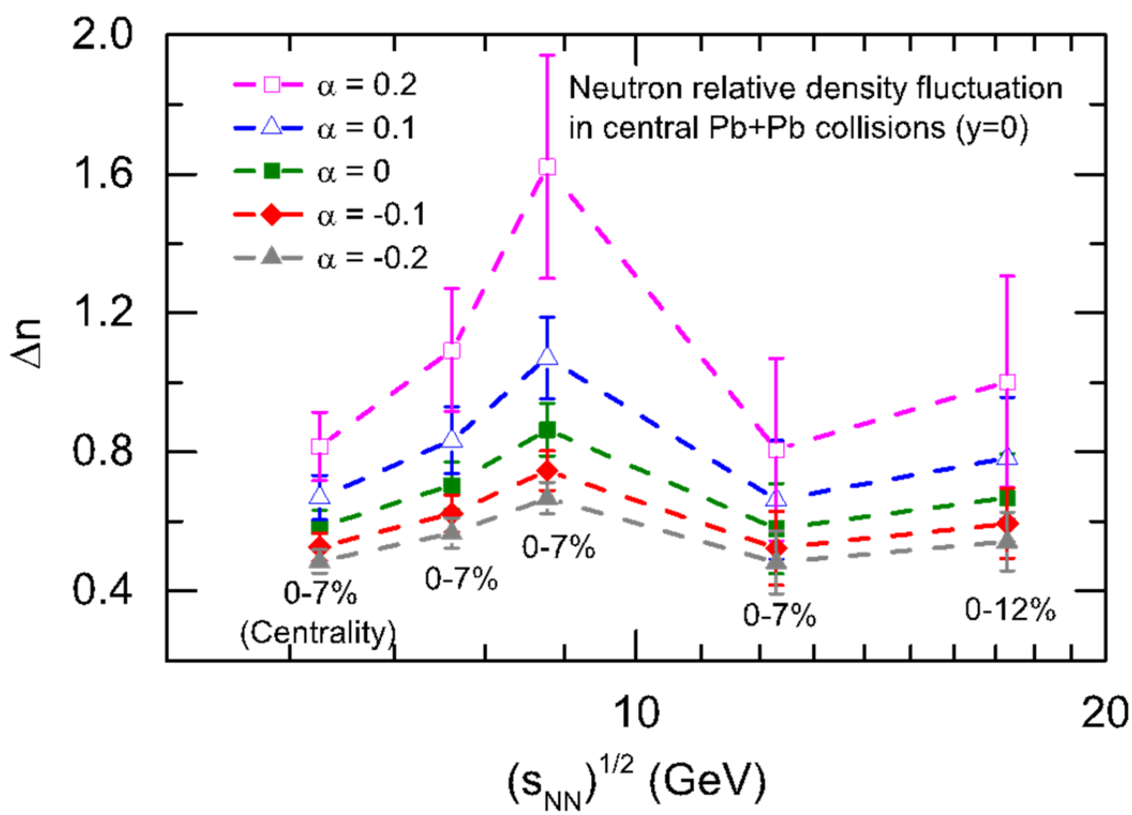


**FIG. 1**. Collision energy dependence of the neutron relative density fluctuation $\boldsymbol{\Delta n}$ in central Pb+Pb collisions at SPS energies based on data from Ref. [2]. Results for $\boldsymbol{\alpha}$ =-0.2, -0.1, 0, 0.1 and 0.2 are shown by various dotted lines.

$\langle \delta n \delta n_p \rangle = \alpha \frac{\langle n_p \rangle}{\langle n \rangle} \langle (\delta n)^2 \rangle$, indicating that the density fluctuations become the largest in collisions at this energy. With the known chemical freeze-out conditions determined from the statistical model fit to experimental data [3], we obtain a chemical freeze-out temperature of about 144 MeV and baryon chemical potential of about 385 MeV at this collision energy, which are close to the critical endpoint in the QCD phase diagram predicted by various theoretical studies. Our results thus suggest the potential usefulness of the yield ratio of light nuclei in relativistic heavy-ion collisions as a direct probe of the large density fluctuations associated with the QCD critical phenomena.

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