

Status of the Analyses for the Proton Higher-Order Fluctuations in the STAR Fixed-Target Program from $\sqrt{s_{NN}} = 3.2$ to 7.7 GeV

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Abstract

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Higher-order fluctuations of the net-proton number distributions in heavy-ion collisions are expected to be sensitive to a QCD critical point. These fluctuations can be obtained by measuring various order of cumulants, C_n , of the net-proton multiplicity distributions. The collision energy dependence of net-proton C_4/C_2 from Beam Energy Scan I hints at a possible enhancement from $\sqrt{s_{NN}} = 19.6$ GeV to 7.7 GeV across the baseline, while the proton C_4/C_2 value at 3 GeV from the Fixed-Target program (FXT) returns to the baseline. These results indicate the importance of filling the gap between 3.0 GeV and 7.7 GeV. The analyses of the remaining FXT data sets are ongoing to fill the gap and to see whether any critical behaviour is observed in the region between 3.2 and 7.7 GeV, although limited acceptance at the top FXT energies complicates these analyses. A status report on the challenges, methods, and statistical significance of these analyses will be presented.