Status Report on the Analyses of Proton-Number Cumulants in the STAR Fixed-Target Program

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Abstract

Fluctuations of net-proton number distributions in heavy-ion collisions are expected to 2 be sensitive to a QCD critical point. These fluctuations are measured through various-order 3 cumulants, C_n , of net-proton multiplicity distributions. The collision-energy dependence of net-proton cumulant ratio from Beam Energy Scan I shows a hint of deviation from the baseline 5 between $\sqrt{s_{NN}} = 19.6$ GeV to 7.7 GeV, while the recent proton C_4/C_2 value at $\sqrt{s_{NN}} = 3$ GeV 6 from the Fixed-Target program (FXT) at STAR returns to the baseline. These results indicate 7 the importance of filling the gap between $\sqrt{s_{NN}} = 3.0$ GeV and 7.7 GeV. The analyses of 8 the remaining FXT data are ongoing, although analysis of the STAR fixed-target data comes 9 with challenges. A shifting mid-rapidity with beam energy results in acceptance gaps at some 10 energies, and a reliance on time-of-flight particle identification at top FXT energies necessitates 11 a thorough understanding of the effect of precision timing on proton-number cumulants. These 12 and other challenges and techniques used in the analyses of FXT proton cumulants will be 13 presented, and the status of the analyses will be discussed. 14

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