UNDERSTANDING QCD MATTER THROUGH HEAVY-ION COLLISIONS AT STAR

Gavin Wilks (for the STAR Collaboration)
University of Illinois at Chicago
1200 West Harrison St., Chicago, Illinois 60607
gwilks@uic.edu

The Solenoidal Tracker At RHIC (STAR) is a highly versatile detector with many sub-systems designed to explore QCD matter across the QCD phase diagram through measurements in heavy-ion collisions. The experimental program is focused on studying properties of the deconfined state, Quark Gluon Plasma, the onset of deconfinement, the critical point, the nature of phase transition, and matter at high baryon chemical potential (μ_B). Au+Au collisions from the first and second RHIC Beam Energy Scan programs (BES-I and BES-II), in conjunction with the Fixed Target (FXT) program at STAR, provide data for various regions of the QCD phase diagram as shown in Figure 1. Using these data, STAR aims to measure many observables with high precision, such as cumulant ratios of conserved quantities, anisotropic collective flow, global spin alignment, and hyperon polarization, among many others. Additionally, STAR has collected data for smaller collision system sizes, including isobar Ru+Ru and Zr+Zr, with which we can study system size dependence of various observables. STAR has recently received a forward upgrade, which has been in data collection since 2022. The forward upgrade detectors will allow measurements of hot and cold QCD observables at large pseudo-rapidities. In this talk, we will discuss several new measurements from the STAR collaboration from heavy-ion collisions at RHIC.

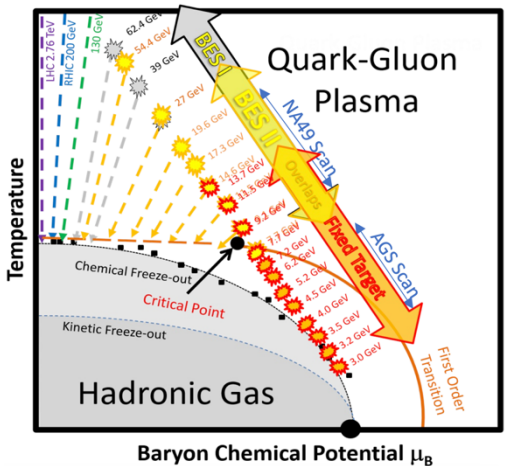

Figure 1 - Conjectured QCD phase diagram with STAR Au+Au experimental coverage. Collider and Fixed Target programs overlap at 7.7, 9.2, and 11.5 GeV.