Identified hadron spectra and baryon stopping in $\gamma + \mathrm{Au}$ collisions at STAR

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Photonuclear collisions are one of the simplest possible processes that can occur in a heavy-ion collision. In these collisions, one nucleus emits a quasi-real photon which interacts with the other colliding nucleus, similar to an $e + A$ collision except that the photon tends to have a much smaller virtuality. Photonuclear collisions can be used to study bulk properties of the medium created in these collisions, such as collectivity due to initial-state effects and hadron chemistry. Results are presented for identified $\pi^{\pm}$, $K^{\pm}$, and $p(\bar{p})$ spectra in photonuclear collisions at STAR for Au+Au collisions at $\sqrt{s_{NN}} = 54.4$ GeV. Significant baryon stopping and rapidity asymmetry are observed at low transverse momentum. These measurements constitute an important step in the search for the existence of a baryon junction within the nucleon, i.e., a non-perturbative Y-shaped configuration of gluons which carries the baryon number and is attached to all three valence quarks [1, 2]. Measuring the same spectra using the 2019 Au+Au dataset at $\sqrt{s_{NN}} = 200$ GeV shows how these effects change as a function of beam energy. Measurements of particle spectra and their rapidity dependence in photonuclear events will give insight into the origin of baryon stopping and the gluon structure of the nucleon. They will also help inform future measurements of identified particles at the Electron Ion Collider.

References

[1] D. Kharzeev, *Can gluons trace baryon number?*, Phys. Lett. B **378**, 238 (1996)

[2] J. Brandenburg, N. Lewis, P. Tribedy, and Z. Xu, *Search for baryon junctions in photonuclear processes and isobar collisions at RHIC*, arXiv 2205.05685