Probing the isobaric Ru and Zr nuclear structure with the diffractive photoproduction of ρ mesons

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Abstract

The electron scattering process has been used to determine the nuclear charge radius. Similarly, the photon scattering process can be used to determine the nuclear strong-interaction radius, primarily through the diffractive photoproduction of vector mesons. Such an approach has been proven effective at RHIC. The isobar collisions of Ru+Ru and Zr+Zr at RHIC provided an excellent opportunity for studying their nuclear structure. Since Ru and Zr have the same mass number but different atomic numbers, measurement of the Ru and Zr nuclear radii would be sensitive to the nuclear structure parameters, such as the neutron skin and possible deformity. In this presentation, we will report the diffractive photoproduction of ρ mesons in UPCs of Ru+Ru and Zr+Zr at 200 GeV. The ratio of differential cross section $\mathrm{d}\sigma/\mathrm{d}t$ between the two isobar species will be compared with model calculations. Implications of these results on the Ru and Zr nuclear structure will also be discussed.