Title: Nuclear Tomography with Polarized Photon-Gluon collisions

STAR's recent observation of the Breit-Wheeler process and vacuum birefringence have demonstrated that ultra-peripheral heavy-ion collisions provide an abundant source of linearly polarized photons. We utilize such polarized photons in diffractive photo-nuclear vector meson production ($\rho^0 \to \pi^+\pi^-$) to observe a novel quantum interference effect between non-dentical particles (i.e. the π^+ and π^- decay daughters). The interference effect is further employed to isolate the pomeron momentum contribution, thereby providing a pristine measurement of the gluon distribution within large nuclei.

We present STAR measurements from diffractive photo-nuclear interactions in ultra-peripheral Au+Au and p+Au data at $\sqrt{s_{NN}} = 200$ GeV and from U+U collisions at $\sqrt{s_{NN}} = 193$ GeV. These measurements are used to measure the strong interaction radius of gold and uranium nuclei at high energy. We will report the first measurement of the neutron skin of uranium measured at high energy. Finally, we will discuss the implications for experiments at the future Electron Ion Collider, where similar diffractive photo-nuclear interactions are an essential component in the planned physics program.