

# Initial electromagnetic field dependence of photon-induced production in isobaric collisions at STAR

Kaifeng Shen and Zebo Tang (for the STAR Collaboration)  
University of Science and Technology of China

## Abstract

1 Strong electromagnetic field arising from the Lorentz-contraction and a large  
2 number of charges ( $Z$ ) in the colliding nuclei at ultrarelativistic speeds can generate  
3 a large flux of quasi-real photons. Consequent photon-induced interactions could  
4 reasonably explain the observed enhancements of  $J/\psi$  and  $e^+e^-$  pair productions  
5 at very low transverse momenta ( $p_T$ ) in peripheral high-energy heavy-ion collisions,  
6 via photonuclear ( $\propto Z^2$ ) and photon-photon ( $\propto Z^4$ ) processes. STAR has collected  
7 a large sample of  ${}^{96}_{44}\text{Ru}+{}^{96}_{44}\text{Ru}$  and  ${}^{96}_{40}\text{Zr}+{}^{96}_{40}\text{Zr}$  collisions at  $\sqrt{s_{\text{NN}}} = 200$  GeV in 2018,  
8 around two billion good events for each collision system. The isobaric collisions,  
9 with different number of charges and same number of nucleons in the colliding  
10 nuclei, provide a unique opportunity to test the electromagnetic field dependence  
11 of photon-induced production.

12 In this presentation, we will present the first measurement of the electromagnetic  
13 field dependence of  $J/\psi$  and  $e^+e^-$  pair production at very low  $p_T$ , via comparisons  
14 between the new measurements in isobaric collisions as well as to the published  
15 results in Au+Au collisions at  $\sqrt{s_{\text{NN}}} = 200$  GeV. Physical implications of these  
16 results will be discussed.