

# Angular modulation of photon-induced $J/\psi$ and lepton pair production in heavy ion collisions at STAR

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## Abstract

1 Ultra-strong electromagnetic field in relativistic heavy-ion collisions can gener-  
2 ate a large flux of linearly polarized quasi-real photons. Photons emitted by one  
3 nucleus can interact with the other whole nucleus or individual nucleons to pro-  
4 duce vector meson ( $\gamma + A \rightarrow V + A$ ). On the other hand, interactions between  
5 photons emitted by two nuclei can produce lepton pairs ( $\gamma + \gamma \rightarrow l^+ + l^-$ ). Notably,  
6 azimuthal asymmetries between the pair momentum and the daughter momentum  
7 could arise from the linear polarization of incident photons. The photon-induced  
8 vector mesons and lepton pairs carry information about the original electromag-  
9 netic field, which provides a sensitive probe to study the polarization dependent  
10 effects predicted by spin interference and QED vacuum birefringence.

11 In this presentation, we will report the angular modulation measurements of  
12 the photon-induced  $J/\psi$  and  $e^+e^-$  pair production in Ru+Ru, Zr+Zr and Au+Au  
13 peripheral and ultra-peripheral collisions at  $\sqrt{s_{NN}} = 200$  GeV. The angular modu-  
14 lation of  $\mu^+\mu^-$  pairs in Au+Au peripheral collisions will also be presented. Physics  
15 implications of these results will be discussed together with model comparisons.