Supported in part by
U.S. DEPARTMENT OF ENERGY | Office of Science

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

Kaifeng Shen (for the STAR Collaboration)

State Key Laboratory of Particle Detection and Electronics,

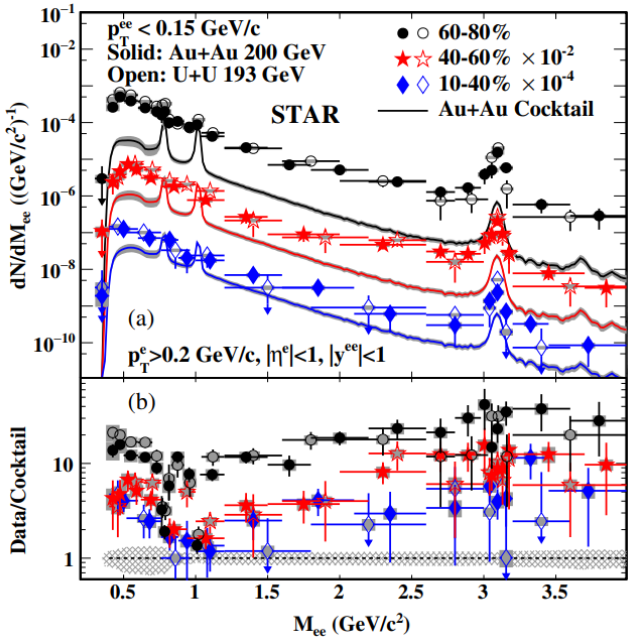
Department of Modern Physics,

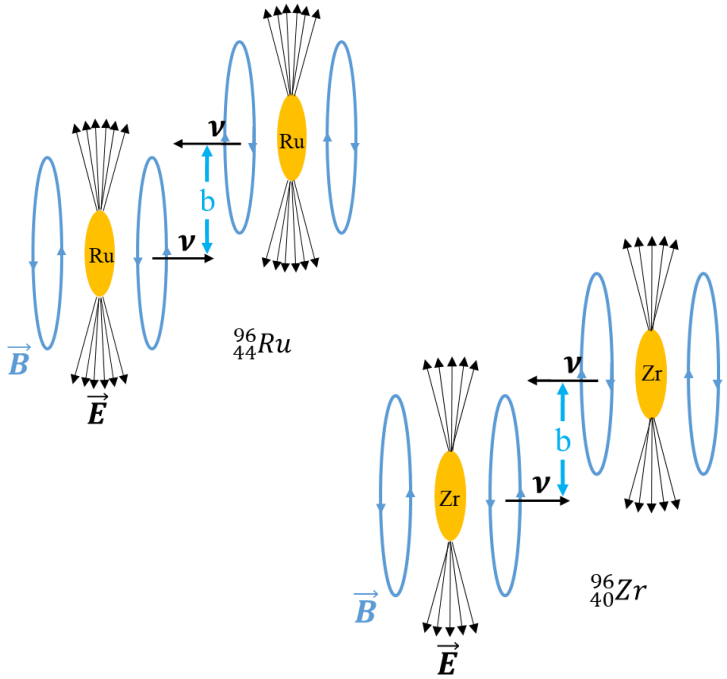
University of Science and Technology of China

Quark Matter 4-10.4.2022, KRAKOW, POLAND

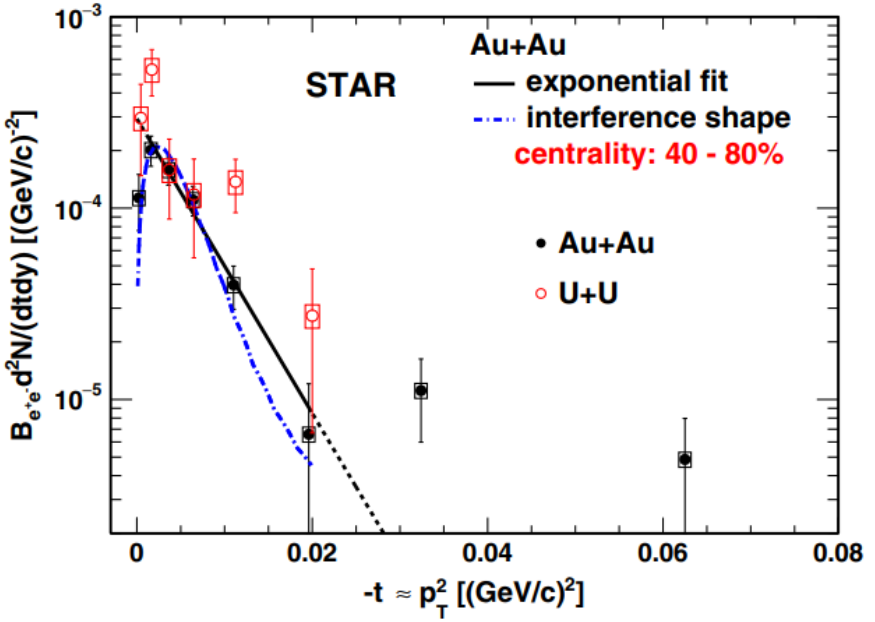
Motivation

J.Adam et al. (STAR) 2018 Phys. Rev. Lett. 121 132301



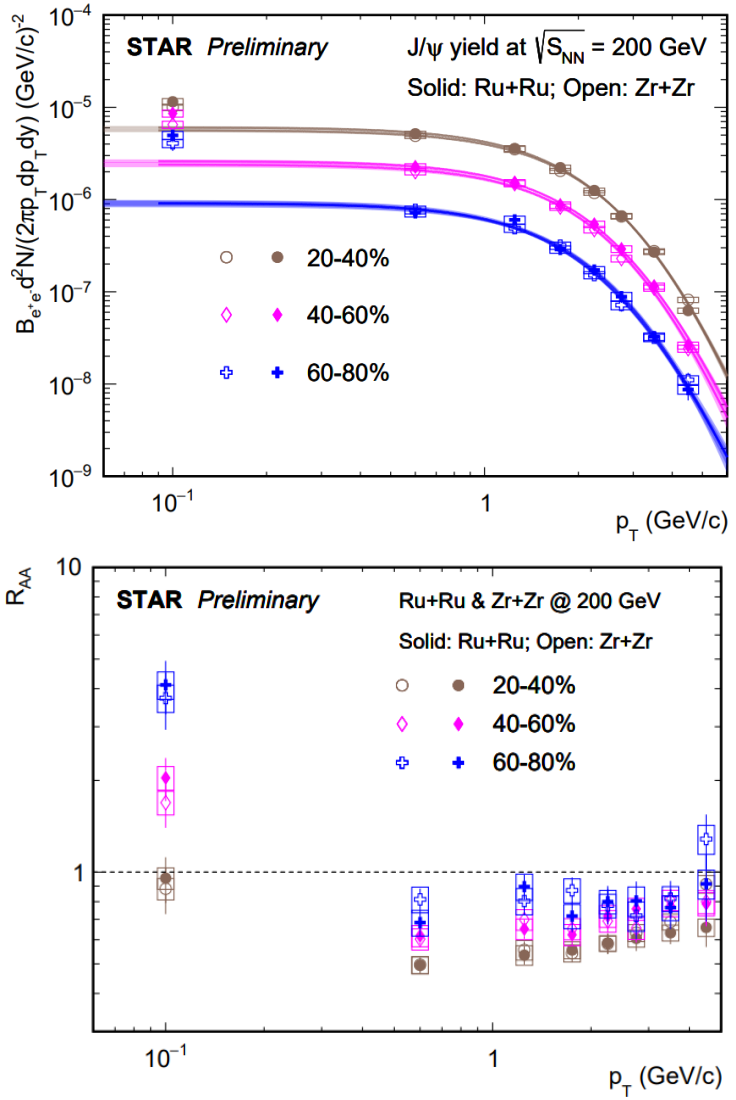


J.Adam et al. (STAR) 2019 Phys. Rev. Lett. 123 132302.

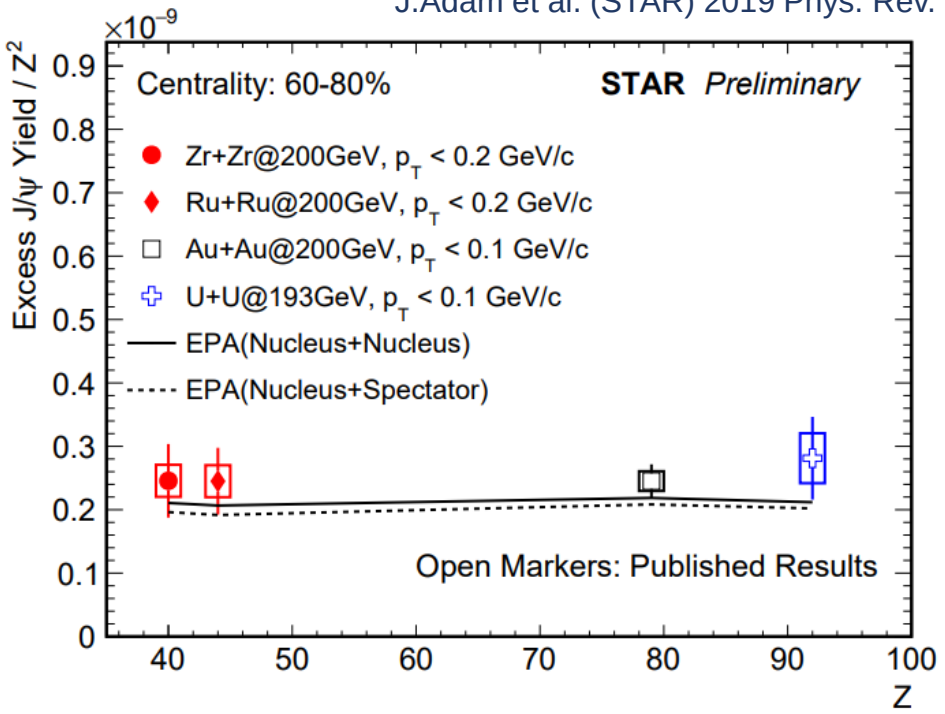


- Photon-induced interactions could explain the observed enhancements of J/ψ and e^+e^- production at very low p_T
  - ➢photonuclear process ($\propto Z^2$)
  - ➢photon-photon process ($\propto Z^4$)
- The isobaric collisions provide a unique opportunity to test the electromagnetic field dependence

Z^2 dependence of J/ψ yield



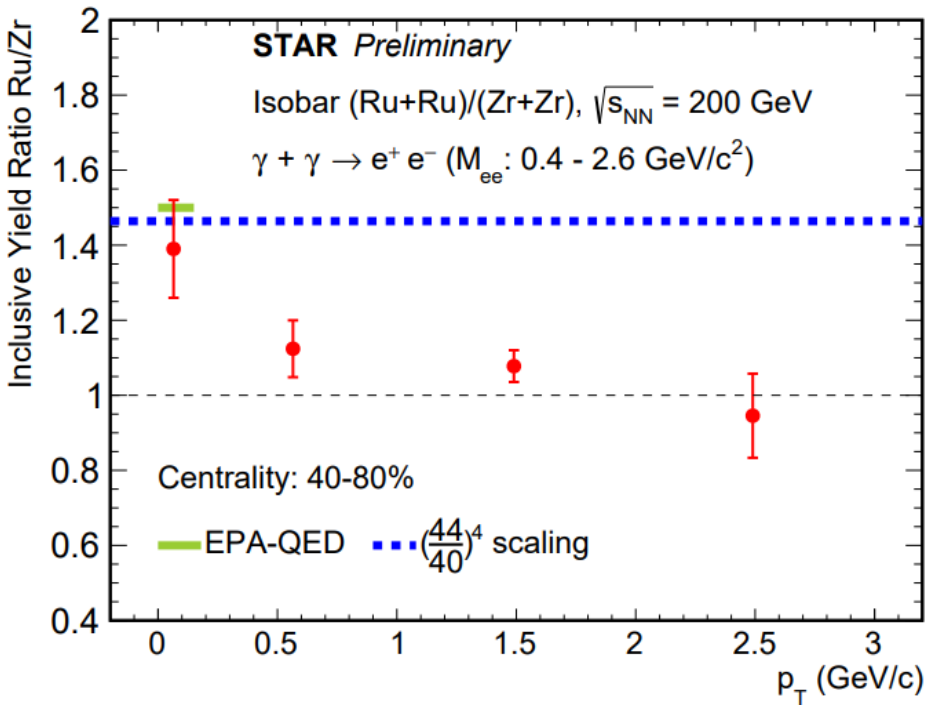
J.Adam et al. (STAR) 2019 Phys. Rev. Lett. 123 132302.

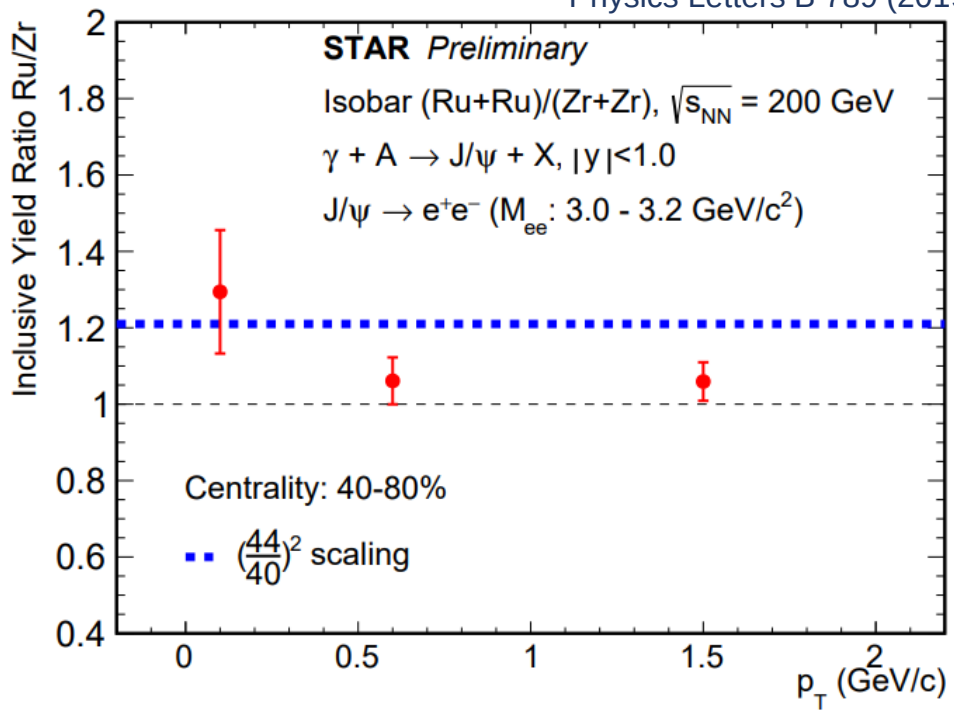


- The R_{AA} of J/ψ production at p_T lower than 0.2 GeV/c is significantly higher than one
- The Z^2 dependence of photonuclear production has been observed at very low p_T

Dielectron and J/ψ yield ratio

Physics Letters B 789 (2019) 238-242





- The collision system dependence ($^{96}_{44}Ru$+$^{96}_{44}Ru$ and $^{96}_{40}Zr$+$^{96}_{40}Zr$) of yield are shown as function of p_T
  - The e^+e^- inclusive production follows Z^4 scaling and J/ψ inclusive production follows Z^2 scaling at very low p_T
  - ~3σ deviation from unity in e^+e^- inclusive production at p_T < 0.15 GeV/c, the initial EM seems to be different
  - ~1.7σ deviation from unity in J/ψ inclusive production at p_T < 0.2 GeV/c

Summary

- There is an excess of J/ψ production at very low p_T in peripheral collisions in isobaric collisions
- The charge dependence of photonuclear process has been observed
- The initial electromagnetic field seems to be different (~3σ) between $^{96}_{44}Ru$+$^{96}_{44}Ru$ and $^{96}_{40}Zr$+$^{96}_{40}Zr$ collisions