

Observation of the Breit-Wheeler Process in Heavy-Ion Collisions

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Only a handful of fundamental interactions between light and matter are allowed by QED, almost all of which have been observed in the 80 or so years since their prediction. Only the linear Breit-Wheeler process, the simplest mechanism for converting 'light quanta' into matter and antimatter, has eluded observation for decades.

In this talk we will present measurements of e^+e^- pair production in ultra-peripheral and peripheral Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV (Lorentz boost $\gamma = 107$). A comprehensive study of the e^+e^- pair kinematics is presented to distinguish the $\gamma\gamma \rightarrow e^+e^-$ process from other possible production mechanisms and to definitively identify the Breit-Wheeler process. Furthermore, the measured distribution of electron-positron pairs reveals a striking fourth-order angular modulation which demonstrates the linear polarization of the colliding photons.