

1 Measurements of proton-antiproton pairs from
2 QED vacuum excitation in Au+Au
3 ultra-peripheral collisions at $\sqrt{s_{\text{NN}}} = 200$ GeV
4 from STAR

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6 January 26, 2025

7 Relativistic heavy-ion collisions generate extremely strong electromagnetic
8 (EM) fields, providing an ideal environment to study the EM excitation of the
9 vacuum. The Breit-Wheeler process, which involves the electron-positron pair
10 production via photon-photon interactions, represents the lowest-order decay
11 mode of the QED vacuum excitation. This process was first observed by the
12 STAR experiment in 2021, and has stimulated further exploration into higher-
13 order decay modes, including hadron-antihadron pair production.

14 In this presentation, we will report the first measurement of proton-antiproton
15 pairs resulting from QED vacuum excitation in Au+Au ultra-peripheral colli-
16 sions at $\sqrt{s_{\text{NN}}} = 200$ GeV by the STAR experiment. The pairs' invariant mass
17 distributions (from $M_{p\bar{p}} = 2.1$ to 2.4 GeV/ c^2), transverse momentum p_{T} spec-
18 tra, and the azimuthal angular modulation caused by the polarized EM field
19 will be presented. The measured results will be compared with theoretical cal-
20 culations. These measurements will shed new light on the understanding of the
21 QED vacuum.