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Search for Local Strong Parity Violation Using Reaction Plane Determined by Spectator Neutrons in STAR GANG WANG, UCLA, STAR COLLABORATION — Parity-odd domains [1] are predicted to lead to charge separation of quarks along the orbital momentum of the system created in non-central relativistic heavy ion collisions [2]. A signal consistent with several of the theoretical expectations has been detected by STAR [3], with a three particle azimuthal correlator, a P-even observable, but sensitive to the charge separation effect. In this correlator, the first two particles reveal the physics of interest, and the third particle serves as a reference for the reaction plane. To minimize the non-parity correlation between the three particles, we utilize the spectator neutrons detected by STAR ZDC-SMDs to define the event plane. The 1st- order event plane thus obtained can also be used to study the global strong parity violation effects. In this work, we report measurements of both P-even and P-odd observables using the STAR ZDC-SMDs in Au+Au at 200 GeV. The results are presented as a function of collision centrality, particle separation in rapidity, and particle transverse momentum. Good consistency has been observed between current and previous results [3]. Systematic checks on the impact from the directed flow will also be presented. [1] T. D. Lee, Phys. Rev. D 8, 1226 (1973). [2] D. Kharzeev, Phys. Lett. B 633, 260 (2006). [3] B. I. Abelev et al., accepted by Phys. Rev. Lett. [arXiv:0909.1739].

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