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Response studies of the CME-sensitive sine observable to heavy ion backgrounds YICHENG FENG, JIE ZHAO, FUQIANG WANG, Purdue Univ — A new sine observable, $R(\Delta S)$, has been proposed to measure the Chiral Magnetic Effect (CME) in heavy ion collisions. Studies with A Multi-Phase Transport (AMPT) and Anomalous Viscous Fluid Dynamics (AVFD) models show concave $R(\Delta S)$ distributions for CME signals and convex ones for typical resonance backgrounds. A recent hydrodynamic study, however, indicates concave shapes for backgrounds as well. Preliminary STAR data, on the other hand, reveal concave $R(\Delta S)$ distributions in 200 GeV Au+Au collisions. To better understand these results, we present a systematic study of the v_2 and p_T dependences of resonance backgrounds by toy-model simulations and Central Limit Theorem calculations. The resonance v_2 introduces different numbers of decay $\pi^+\pi^-$ pairs in the in-plane and out-of-plane directions. The resonance p_T affects the opening angle of the decay $\pi^+\pi^-$ pair. For example, low p_T resonances decay into large opening-angle pairs, result in more "back-to-back" pairs out-of-plane, mimicking a CME signal, or a concave $R(\Delta S)$. With these insights, we further investigate the responses of the $R(\Delta S)$ observable to AMPT backgrounds and AVFD CME signals, and the possible implications of the preliminary STAR data.

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