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# Impact of magnetic field fluctuations on the CME in small systems

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Many great efforts have been made to investigate the Chiral Magnetic Effect (CME), which relies on the existence of extremely large electromagnetic fields in relativistic heavy-ion collisions. However, the recent CMS measurements in small systems challenge the traditional CME interpretation, indicating that the dominant contribution to the CME observable of charge azimuthal correlation ( $\gamma = \langle \cos(\phi_\alpha + \phi_\beta - 2\Psi_{RP}) \rangle$ ) may not be related to the CME in p+Pb and Pb+Pb collisions.

In this work, we investigate the properties of the electromagnetic fields in small systems by using a multiphase transport (AMPT) model [1]. We find that compared to A+A collisions, the magnitudes of absolute electric and magnetic fields in small systems are comparable. We show that **the correlation of  $\langle \cos 2(\Psi_B - \Psi_2) \rangle$  between the magnetic field direction and the participant plane angle is strongly suppressed in high-multiplicity events, but strongly correlated in parallel in low-multiplicity events.** It indicates that the traditional CME observable  $\gamma$  is not valid to study the CME in high-multiplicity events. However, the strong correlation in low-multiplicity events can reduce or even change sign of the traditional CME observable, which is qualitatively consistent with the recent event-shape engineering measurement from the CMS [2]. Therefore, we suggest searching for a possible CME signal in small systems with low multiplicities.

[1] X. L. Zhao, Y. G. Ma and G. L. Ma, [arXiv:1709.05962 [hep-ph]].

[2] A. M. Sirunyan et al. [CMS Collaboration], [arXiv:1708.01602 [nucl-ex]].

## Content type

Theory

## Collaboration

## Centralised submission by Collaboration

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