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QCD matter in strong electric fields

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Currently, the effect of strong magnetic fields on the QCD phase diagram in the ($T \times eB$) plane is well-established, thanks to extensive research using effective QCD models and lattice simulations. However, the situation is different when it comes to incorporating electric fields. Electric fields make the QCD action complex, making standard lattice simulations impractical. To tackle this issue, alternative methods have been proposed, such as using imaginary electric fields and Taylor expansions. There is a noted discrepancy between the predictions of effective models of QCD and lattice simulations regarding the behavior of the deconfinement phase transition. While models predict a decrease in the pseudocritical temperature as the electric field grows, lattice simulations suggest an increase. In this presentation, we will outline the problem and share our recent findings on the impact of a strong electric field on the deconfinement and chiral transitions, using different effective models of QCD.

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