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Lee-Yang zeros and Roberge-Weiss phase transition

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We study the Roberge-Weiss phase transition numerically. The phase transition is associated with the discontinuities in the quark-number density at specific values of imaginary quark chemical potential. We parameterize the quark number density by the polynomial fit function to compute the canonical partition functions. We demonstrate that this approach provides a good framework for analyzing lattice QCD data at finite density and a high temperature. We show numerically that at high temperature, the Lee-Yang zeros lie on the negative real semi-axis provided that the high-quark-number contributions to the grand canonical partition function are taken into account. These Lee-Yang zeros have nonzero linear density, which signals the Roberge-Weiss phase transition. We demonstrate that this density agrees with the quark number density discontinuity at the transition line.

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