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Importance of imaginary chemical potential for determination of QCD phase diagram KOUJI KASHIWA, Department of Physics, Kyushu University, Japan, HIROAKI KOUNO, Department of Physics, Saga University, Japan, YUJI SAKAI, MASANOBU YAHIRO, Department of Physics, Kyushu University, Japan — Lattice QCD (LQCD) calculations have the well-known sign problem at finite real chemical potential. One approach to circumvent the problem is the analytic continuation of LQCD data to real chemical potential from imaginary one. This approach, however, has some problems in moderate real chemical potential region. Therefore, we propose the new approach, *Imaginary chemical potential matching approach*, to quantitatively determine the QCD phase diagram by using a phenomenological model that reproduce LQCD data at imaginary chemical potential. In this approach, we fit the model parameter by LQCD data at imaginary chemical potential. At the imaginary chemical potential, the QCD partition function has the special periodicity called Roberge-Weiss (RW) periodicity. Therefore, an adopted model must have the RW periodicity. We reveal the Polyakov-loop extended Nambu-Jona-Lasinio (PNJL) model has the RW periodicity. Moreover, we investigate the meson mass behavior and show that meson mass is useful for fitting the model parameters at imaginary chemical potential.

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