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Inhomogeneous chiral condensates and nonanalyticity under external magnetic field

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We investigate inhomogeneous chiral condensates such as the dual chiral density wave in QCD under an external magnetic field at finite real and imaginary chemical potentials. In a model-independent manner, we find a non-analyticity at zero chemical potential induced by the inhomogeneous chiral condensates and then the analytic continuation is no longer possible at the singular point. We discuss consequences from the existence of the nonanalyticity to the Taylor expansion, reweighting, canonical and analytic continuation methods which are widely used in the lattice QCD simulation.

We also discuss an exceptional case which does not have the nonanalyticity at zero chemical potential.

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