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Static and Dynamic Finite-Size Scaling for Kuramoto Model with Generalized Form of Unimodal Natural Frequency Distribution CHULHO CHOI, HYUNGGYU PARK, Korea Inst for Advanced Study, KIAS TEAM — Synchronization phase transitions of collective phase oscillators have been studied actively for decades. The natural frequency distribution $g(\omega)$ of oscillators plays an important role in determination the phase transition's types, properties and its universality class. Kuramoto model, a basic framework for synchronization, with unimodal and symmetric natural frequency distribution exhibits a second-order phase transition with critical exponent $\beta = 1/2$ whereas uniform distribution or bimodal and symmetric distribution make it a first-order phase transition, i.e., $\beta = 0$. We present a case in which β has other values than 1/2 or 0 even though it still has a unimodal natural frequency distribution and generalize it to obtain any values of β as we want. Therefore, we need to describe the unimodalness more precisely. As a result, the critical exponent $\bar{\nu}$ and dynamic exponent $\bar{z}$ also have different values than the known values. We derive those exponents analytically and confirm them using static and dynamic finite-size scaling in numerical simulation.

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