Quantum Metrology with DTC Leveraging the LMG Model

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Quantum phase transitions have been shown to be highly beneficial for quantum sensing, owing to diverging quantum Fisher information close to criticality. In this work we consider a periodically modulated Lipkin-Meshkov-Glick model to show that discrete time crystal (DTC) phase transition in this setup can be beneficial for high-accuracy sensing of field strength. We employ a detailed finite-size scaling analysis to determine the critical properties of this second-order phase transition. Finally, by establishing the relationship between the critical exponents, we provide a comprehensive understanding of how quantum criticality in DTCs involving long-range interactions can be harnessed for advanced quantum sensing applications.