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Finite Lattice Size Corrections the Energy-Momentum Dispersion ZACHARY MCDARGH, None — Lattice Gauge Theory (LGT) describes gauge and matter fields on a discrete Euclidian space-time lattice. Due to the finite spacing between the lattice points, there is a built-in ultra-violet energy cutoff. Additionally, there is an infrared energy cutoff in computer simulations due to the finite size of the lattice. With these approximations, the energy-momentum dispersion becomes modified. In this project, we study the recovery of the continuous energy-momentum dispersion. We perform fits of the correlation function from Markov Chain Monte Carlo (MCMC) simulations for various lattice sizes and spacings for a free-scalar field and for an Abelian $U(1)$ gauge field. For the scalar field, we also vary the mass of the particles; for $U(1)$ LGT, we vary the coupling constant β. These fits return the energy of a particle at definite momentum, from which the mass can be recovered using the energy-momentum dispersion. It is found that the finite-size effect in MCMC calculations decreases as $\exp(-N)$, where N is the space dimension of the lattice. Furthermore, the effect is more significant for larger masses (scalar field) and coupling constant values near the phase transition $\beta_c = 1.01$ ($U(1)$ LGT).

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None

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