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Strategies for the Determination of the Running Coupling of $(2 + 1)$ -dimensional QED with Quantum Computing (I): Motivations and Theoretical Foundations

Quantum computations are presently restricted to only a small number of qubits. At the example of 2+1 dimensional QED we will describe how this fact can still be utilized by quantum computing (QC) small distance quantities such as the running coupling in regimes that are difficult to reach for classical Markov Chain Monte Carlo (MCMC) calculations. By matching results for, e.g., the mass gap from QC and MCMC simulations at intermediate coupling values it becomes possible to obtain the physical value of the lattice spacing and hence the physical renormalization scale. This would allow eventually to compute the important Lambda parameter.

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