

XVth Quark Confinement and the Hadron Spectrum



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A quantum computing study of the static potential in (2+1)D QED

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Current noisy quantum computers can be already used to investigate properties of quantum systems. Here we focus on lattice QED in (2+1)D including fermionic matter. This complex quantum field theory with dynamical gauge and matter fields has similarities with QCD, in particular asymptotic freedom and confinement. We define a suitable setup to measure the static potential between two static charges as a function of their distance and use a quantum computation to explore the Coulomb, the confinement and the string breaking regimes. A symmetry-preserving variational quantum circuit is employed for the creation of the ground state of the theory at various coupling constant values corresponding to different physical distances. We confirm that classical simulations for the static potential agree with quantum simulations of the system and also with results from quantum experiments on a trapped-ion device. Moreover, we visualize the relevant flux configurations that contribute to the quantum ground state in the different distance regimes of the potential giving thus insight into the mechanisms of confinement and string breaking.

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