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*Computation of banded hafnians and applications in optical quantum computing.*

We prove that a classical computer can efficiently simulate a shallow Gaussian quantum-optical circuit with local interactions. The key to our proof is a novel algorithm for calculating hafnians of banded matrices. Computing hafnians is closely related to counting perfect matchings, and hence is  $\#P$ -hard in the worst case. Nonetheless, the problem becomes tractable under suitable sparsity constraints on the matrix. Our results pose a challenge to the feasibility of demonstrating quantum supremacy on photonic platforms with local interactions. (Received January 09, 2021)