Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Quantum Fourier transform performance scaling; defective rotation gates YUNSEONG NAM, REINHOLD BLUMEL, Wesleyan Univ — We investigate analytically and numerically the quantum Fourier transform (QFT) with defective controlled rotation (CROT) gates. We find that the QFT can tolerate systematic and random defects up to 30% and still perform its function. Analytical scaling laws of QFT performance are derived with respect to the number of qubits n, the size δ of systematic defects, and size ϵ of random defects. Our analytical results are in excellent agreement with numerical simulations. In addition, we present an unexpected result: The performance of the defective QFT does not deteriorate with increasing n, but approaches a constant that scales in ϵ. We derive an analytical formula that accurately reproduces the ϵ scaling of the performance plateaus. The extraordinary robustness of the QFT with respect to static gate defects displayed in our numerical and analytical calculations should be a welcome boon for laboratory and industrial realizations of quantum circuitry.

Yunseong Nam
Wesleyan Univ

Date submitted: 14 Nov 2014 Electronic form version 1.4