Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Recursive linear optical networks for realizing quantum algorithms[1] GELO NOEL TABIA, Univ of Tartu — Linear optics has played a leading role in the development of practical quantum technologies. In recent years, advances in integrated quantum photonics have significantly improved the functionality and scalability of linear optical devices [1]. In this talk, I present recursive schemes for implementing quantum Fourier transforms and inversion about the mean in Grover's algorithm with photonic integrated circuits [2]. By recursive, I mean that two copies of a d-dimensional unitary operation is used to build the corresponding unitary operation on $2d$ modes. The linear optical networks operate on path-encoded qudits and realize d-dimensional unitary operations using $O(d^2)$ elements. To demonstrate that the recursive circuits are viable in practice, I conducted simulations of proof-of-principle experiments using a fabrication model of realistic errors in silicon-based photonic integrated devices. The results indicate high-fidelity performance in the circuits for 2-qubit and 3-qubit quantum Fourier transforms, and for quantum search on 4-item and 8-item databases. Ref: [1] G. D. Marshall, et al., Opt. Express 17, 12546 (2009); [2] G. N. M. Tabia, arXiv:1509.04246 (2015).

[1]This work was funded by institutional research grant IUT2-1 from the Estonian Research Council and by the European Union through the European Regional Development Fund.

Gelo Noel Tabia
Univ of Tartu

Date submitted: 06 Nov 2015 Electronic form version 1.4