Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Experimental Boson Sampling ANDREW WHITE, MATTHEW BROOME, ALESSANDRO FEDRIZZI, SALEH RAHIMI-KESHARI, TIMOTHY RALPH, University of Queensland, JUSTIN DOVE, SCOTT AARONSON, Massachusetts Institute of Technology — Quantum computers are unnecessary for exponentially-efficient computation or simulation if the Extended Church-Turing thesis—a foundational tenet of computer science—is correct. The thesis would be directly contradicted by a physical device that efficiently performs a task believed to be intractable for classical computers. Such a task is BosonSampling: obtaining a distribution of n bosons scattered by some linear-optical unitary process. Here we test the central premise of BosonSampling, experimentally verifying that the amplitudes of 3-photon scattering processes are given by the permanents of submatrices generated from a unitary describing a 6-mode integrated optical circuit. We find the protocol to be robust, working even with the unavoidable effects of photon loss, non-ideal sources, and imperfect detection. Strong evidence against the Extended-Church-Turing thesis will come from scaling to large numbers of photons, which is a much simpler task than building a universal quantum computer.

Andrew White
University of Queensland

Date submitted: 06 Nov 2012

Electronic form version 1.4