Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Controlling Quantum Transport with a Programmable Nanophotonic Processor NICHOLAS HARRIS, GREGORY STEINBRECHER, JACOB MOWER, YOAV LIHINI, MIHIKA PRABHU, Massachusetts Institute of Technology, TOM BAEHR-JONES, MICHAEL HOCHBERG, Coriant Advanced Technology, SETH LLOYD, DIRK ENGLUND, Massachusetts Institute of Technology —
Recent experimental and theoretical work has revealed emergent, counter-intuitive quantum transport effects in a range of physical medial including solid-state and biological systems. Photonic integrated circuits are promising platforms for studying such effects. A central goal in for photonic quantum transport simulators has been the ability to rapidly control all parameters of the transport problem. Here, we present a large-scale programmable nanophotonic processor composed of 56 Mach-Zehnder interferometers that enables control over modal couplings and differential phases between modes—enabling observations of Anderson localization, environment-assisted quantum transport, ballistic transport, and a number of intermediate quantum transport regimes. Rapid programmability enables tens of thousands of realizations of disordered and noisy systems. In addition, low loss makes this nanophotonic processor a promising platform for many-boson quantum simulation experiments.

Nicholas Harris
Massachusetts Institute of Technology

Date submitted: 06 Nov 2015

Electronic form version 1.4