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Transport of a lattice gas under continuous measurement[1] HIL F. H. CHEUNG, YOGESH SHARAD PATIL, IVAYLO S. MADJAROV, HUIYAO Y. CHEN, MUKUND VENGALATTORE, Cornell University — The act of measurement has a profound consequence on a quantum system. While this backaction has hitherto been discussed as a limitation to the precision of measurements, it is increasingly being appreciated that measurement backaction is a powerful means of quantum control. We have previously demonstrated that backaction from position measurement can modify the coherent tunneling rate of a lattice gas through the Quantum Zeno effect [1]. By suitably designing measurement landscapes we can control the transport properties of the lattice gas. We describe a quantitative study of lattice gas dynamics under continuous quantum measurement in the context of a quantum to classical transition where the atom dynamics goes from a quantum walk at low measurement strengths to classical diffusion at high measurement strengths. We further discuss the prospect of using disorder measurement landscapes to realize a new form of Anderson localization.

[1] Y. S. Patil, S. Chakram and M. Vengalattore, Phys. Rev. Lett. 115, 140402 (2015)

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Yogesh Sharad Patil
Cornell University

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