Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Analog simulations of quantum impurity physics with a high-impedance Josephson transmission line ROMAN KUZMIN, NICHOLAS GRABON, YEN-HSIANG LIN, LONG NGUYEN, NITISH MEHTA, VLADIMIR MANUCHARYAN, Univ of Maryland-College Park — Interacting 1D electrons are usually understood within the Luttinger liquid picture as non-interacting, acoustic excitations, analogous to TEM photons in a "telegraph"-type transmission line. This system is known to exhibit non-perturbative, many-body dynamics upon introducing a single, back-scattering impurity. The rich phenomenology of such system is usually referred to as quantum impurity physics. Interestingly, a back-scattering impurity is mathematically equivalent to a Josephson junction embedded into a transmission line. The strong interaction regime (Luttinger parameter of order unity) occurs when the impedance of the transmission line is of the order of the resistance quantum. One can use this to probe quantum impurity physics in a simple, microwave scattering experiment. We present our implementation of a quantum impurity by introducing a small, "impurity" Josephson junction into a high-impedance transmission line made of moderate size junctions.

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Date submitted: 11 Nov 2016 Electronic form version 1.4