# Microwave Scattering Studies on Superconductive Devices

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Recently, superconductive devices coupled to one-dimensional continuum of photon modes have been proposed and demonstrated allowing applications in quantum optics. In this talk, I plan to present experimental results on photon scattering by one-dimensional(1D) arrays of Josephson junctions at microwave frequencies. For better coupled to the microwave photons, the 1D arrays were placed in a co-planar waveguide as a point defect. The waveguide presented a standing wave nature of a period in frequency of 240 MHz, similar to a Fabry-Perot interferometer with a low coefficient of finesse. Because the 1D array was oriented in parallel to the polarization of rf/microwave, a larger coupling between rf/microwave photons and the 1D array was obtained. The microwave transmission revealed the magnetic-field tuned superconductor-insulator transition of the 1D array: The 1D array gave rise to stronger rf/microwave absorption when the array is in superconduting state, resulted in an oscillatory modulation of rf/microwave transmission amplitude in magnetic field dipped at zero magnetic field. For the phase shift, the oscillation evolved from in-phase to out-of phase when the rf/microwave frequency was swept from one transmission maximum to the adjacent one.