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Experimental Study of Quantum Graphs With and Without Time-Reversal Invariance[1] STEVEN MARK ANLAGE, ZIYUAN FU, TRYSTAN KOCH, THOMAS ANTONSEN, EDWARD OTT, University of Maryland, College Park — An experimental setup consisting of a microwave network is used to simulate quantum graphs. The random coupling model (RCM) is applied to describe the universal statistical properties of the system with and without time-reversal invariance. The networks which are large compared to the wavelength, are constructed from coaxial cables connected by T junctions, and by making nodes with circulators time-reversal invariance for microwave propagation in the networks can be broken. The results of experimental study of microwave networks with and without time-reversal invariance are presented both in frequency domain and time domain. With the measured S-parameter data of two-port networks, the impedance statistics and the nearest-neighbor spacing statistics are examined. Moreover, the experiments of time reversal mirrors for networks demonstrate that the reconstruction quality can be used to quantify the degree of the time-reversal invariance for wave propagation. Numerical models of networks are also presented to verify the time domain experiments.

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