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Experimental Study of Quantum Graphs with Microwave Networks[1] ZIYUAN FU, TRYSTAN KOCH, THOMAS ANTONSEN, EDWARD OTT, STEVEN ANLAGE, University of Maryland, College Park, WAVE CHAOS TEAM — An experimental setup consisting of microwave networks is used to simulate quantum graphs. The networks are constructed from coaxial cables connected by T junctions. The networks are built for operation both at room temperature and superconducting versions that operate at cryogenic temperatures. In the experiments, a phase shifter is connected to one of the network bonds to generate an ensemble of quantum graphs by varying the phase delay. The eigenvalue spectrum is found from S-parameter measurements on one-port graphs. With the experimental data, the nearest-neighbor spacing statistics and the impedance statistics of the graphs are examined. It is also demonstrated that time-reversal invariance for microwave propagation in the graphs can be broken without increasing dissipation significantly by making nodes with circulators. Random matrix theory (RMT) successfully describes universal statistical properties of the system.

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