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Testing the Predictions of Random Matrix Theory in Low Loss Wave Chaotic Scattering Systems[1] JEN-HAO YEH, THOMAS ANTONSEN, EDWARD OTT, STEVEN ANLAGE, University of Maryland — Wave chaos is a field where researchers apply random matrix theory (RMT) to predict the statistics of wave properties in complicated wave scattering systems. The RMT predictions have successfully demonstrated universality of the distributions of these wave properties, which only depend on the loss parameter of the system and the physical symmetry. Examination of these predictions in very low loss systems is interesting because extreme limits for the distribution functions and other predictions are encountered. Therefore, we use a wave-chaotic superconducting cavity to establish a low loss environment and test RMT predictions, including the statistics of the scattering (S) matrix and the impedance (Z) matrix, the universality (or lack thereof) of the Z- and S-variance ratios, and the statistics of the proper delay times of the Wigner-Smith time-delay matrix. We have applied an in-situ microwave calibration method (Thru-Reflection-Line method) to calibrate the cryostat system, and we also applied the random coupling model to remove the system-specific features. Our experimental results of different properties agree with the RMT predictions.

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