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**Electromagnetic cavities as an analog to chaos regularization of quantum tunneling rates** RACHEL OWEN, Western Washington University, JOHN RODGERS, University of Maryland — For double-well potentials separated by a tunneling barrier, it has been shown theoretically that quantum mechanical tunneling rates vary greatly with well geometry. Chaotic wells exhibit statistically smaller fluctuations in energy level splitting than those characterized by nonchaotic dynamics. This phenomenon (chaos regularization) can be analyzed by examining the statistical spreads in symmetric and anti-symmetric wave states produced by tunneling. Exploiting the similarity of transverse electromagnetic waves in large cavities and quantum mechanical wave functions in symmetric double-wells, chaos regularization in electromagnetic structures was studied experimentally and numerically. The resonant frequencies in rectangular (integrable) and bowtie (chaotic) cavities coupled via short sections of cutoff waveguides were simulated using finite element code and measured using a vector network analyzer. The ensemble difference in the measured anti-symmetric and symmetric resonant frequencies squared (analogous to splitting in energy levels) showed remarkably good agreement with theory. In the rectangular cavity we observed quantized resonances spaced across a wide range of frequencies whereas in the bowtie cavity the resonances were grouped randomly close to the theoretical curve.

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