

Abstract Submitted
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Direct measurement of the intrinsic linewidth of a resonant state¹

ZACHARY KOBOS, Department of Electrical Engineering, Yale University, MARK REED, Departments of Electrical Engineering and Applied Physics, Yale University — We have applied inelastic electron tunneling spectroscopy (IETS) techniques to a resonantly-coupled system to determine quantitative differences in resonant versus non-resonant IETS. We use as a model system a set of GaAs-AlGaAs resonant tunneling diodes (RTDs)(footnote: with different barrier widths to tune resonant state linewidths and transmission coefficients. Modulation-broadening studies confirm theoretical predictions;² however, the thermal dependence is markedly different than expected from classical IETS theory.³ An analysis of resonance shut-off reveals that the thermal dependence reflects the thermal broadening of the injector and resonant state density of states. Using this analysis, we show that one can extract both the transmission coefficient and the intrinsic linewidth of the resonant state. This is compared for RTDs of different tunneling barrier widths, and we observe the expected increase in resonance width for thinner barriers.

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²Klein, et al., **Phys. Rev. B** 7(6), 1973

³J. Lambe & R.C. Jaklevic, **Phys. Rev.** 165(3), 1968

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