Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Shot Noise in Coherently Coupled GaAs-AlGaAs Double-Well Resonant-Tunneling Diodes A.K.M. NEWAZ, W. SONG, B. NIELSEN, E.E. MENDEZ, SUNY at Stony Brook, R. HEY, H. KOSTIAL, H.T. GRAHN, Paul Drude Institute, Berlin — We have found experimentally that, regarding shot-noise, there is no difference between coherent and sequential resonant tunneling, in contrast with calculations that predict that the suppression of noise in a coherent-tunneling process should be larger. Our measurements were done at 4.2 K in GaAs-AlGaAs Double-Well Resonant-Tunneling Diodes (DWRTD) grown by molecular beam epitaxy on n^+GaAs substrates. Each AlGaAs barrier at the two ends of each structure was 100 Å, while the central barriers were 60 Å (uncoupled DWRTD), 20 Å and 15 Å (coupled DWRTDs) thick, depending on the sample. In all cases, the two quantum wells between the barriers were 53 Å and 80 Å wide, each well having two confined quantum states. The current-voltage characteristics of the diodes exhibited current peaks associated with voltage-induced alignment of states in adjacent wells. In the coupled DWRTDs each peak split into two, as a result of symmetric and anti- symmetric wavefunctions being extended to both wells. Noise measurements revealed a shot noise power spectrum up to about 50% smaller than that of Poissonian noise $2eI$, regardless of whether the wells were coupled or uncoupled. Our results support those calculations in multiple-barrier structures that predict that the shot-noise reduction should be independent of whether the electronic transport is sequential or coherent.

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Date submitted: 01 Dec 2005 Electronic form version 1.4