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**Drastic Reduction of Shot Noise in Semiconductor Superlattices**

W. SONG, A.K.M. NEWAZ, SUNY at Stony Brook, J.K. SON, Samsung Advanced Institute of Technology, Korea, E.E. MEDEZ, SUNY at Stony Brook — We have found experimentally that when the states in adjacent wells of GaAs-GaAlAs superlattices are coupled, the shot noise of the current  $I$  flowing through a superlattice photodiode (a  $p-i-n$  photodiode with an embedded superlattice in the insulating region) is reduced in comparison with the Poissonian noise value  $2eI$ . For very strongly coupled wells the shot noise is about  $1/3$  of the Poissonian value, while for wells with weaker coupling the reduction is less pronounced. On the other hand, when the coupling is destroyed by a strong electric field along the superlattice direction the current noise becomes Poissonian. Although our results are qualitatively consistent with existing theories, these theories cannot account for either the dependence of noise reduction on superlattice coupling or the abrupt field-induced transition from sub-Poissonian to Poissonian noise that we have observed.

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