Abstract Submitted
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Stochastic current switching in semiconductor superlattices: observation of non-exponential kinetics[1] YU. BOMZE, Duke University, H.T. GRAHN, R. HEY, Paul-Drude-Institute, Berlin, Germany, S.W. TEITSWORTH, Duke University — We report the experimental measurement of first-passage-time distributions associated with noise-induced current switching in doped, weakly-coupled GaAs/AlAs superlattices, in a regime of nonlinear electronic transport where the static current-voltage ($I - V$) curves exhibit multiple branches and bistability. For applied voltages near the end of each branch, internal shot noise induces switching of measured current to the next branch with a stochastically varying switching time. Switching time distributions are constructed by carrying out up to 10^5 measurements under identical initial conditions. We have implemented a novel, high bandwidth technique that permits measurement of switching times over very large dynamic range of approximately 10^9, with measured times ranging from 4 ns to 10 s. For relatively small times ($< 10\mu$s), the switching time distributions show exponential tails, as expected for activated escape from an initial metastable state. However, at larger times (> 10 μs), the distributions exhibit approximate power law tails that extend over several decades of time, with additional fine structure. A rate equation model indicates the possible role of multiple, nearly degenerate metastable states in producing the long tail behavior.

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