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Shot Noise Charateristics of InGaAs-InAlAs Triple Barrier Resonant Tunneling Diodes A.K.M. NEWAZ, W. SONG, E.E. MENDEZ, SUNY at Stony Brook, Y. LIN, National Tsing Hua U., J. NITTA, NTT Basic Research Laboratories and CREST-JST — We have found that the shot noise of Triple-Barrier Resonant- Tunneling Diodes (TBRTD) shows distinct differences with that of Double-Barrier Resonant-Tunneling (DBRTD) diodes. Our measurements were done at 4.2 K in $In_{0.53}Ga_{0.47}As$-$In_{0.52}Al_{0.48}As$ heterostructures grown by MOCVD on InP substrates. Each InAlAs barrier at the two ends of a structure was 100 Å thick, while the central barrier was either 52 or 100 Å thick, depending on the sample; the InGaAs wells were 82 and 52 Å wide. We observed that, as in DBRTDs, in the quasi-linear region of the current-voltage characteristics of our TBRTDs the noise was smaller than the corresponding Poissonian value of $2eI$, while in their negative-conductance region the noise was enhanced significantly relative to $2eI$. There were important differences, though, between this behavior and that found in DBRTDs. First, in TBRTDs the noise reduction was more pronounced than predicted by a sequential-tunneling theory. And second, the enhancement found for one of the two bias polarities did not follow the accepted rule that the larger (in absolute value) the negative-differential conductance, the larger the noise enhancement. Our results suggest that the current understanding of shot noise in multibarrier systems is incomplete.

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