Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Nonradiative Auger recombination in coaxial GaAs/AlGaAs nanowire lasers ROMAN VAXENBURG, George Mason Univ, ALEXANDER EFROS, Naval Research Laboratory — Owing to their unique geometry, semiconductor nanowire lasers are rapidly emerging nanoscale coherent light sources.[1] Currently, one of the major goals in the device performance of nanowire lasers is the reduction of their threshold power. In nanoscale systems, the dissipative Auger recombination is an important nonradiative recombination channel which competes with gain development, thereby complicating the search for threshold reduction solutions. Here, we investigate theoretically the Auger recombination in coaxial GaAs/AlGaAs quantum well nanowire structures using the 8-band effective mass model. Specifically, we focus on the dependence of the Auger rate on quantum well radius and thickness. The calculations show that increasing delocalization of the carrier wavefunctions with increasing quantum well thickness reduces the rate of the Auger processes. The efficiencies of two Auger recombination channels, which lead to excitation of either electrons or holes, are compared. The results are compared with available experimental data. A possible strategy to reduce the rate of Auger recombination without changing the quantum well width is proposed. [1] T. Stettner, P. Zimmermann, B. Loitsch, M. Döblinger, A. Regler, B. Mayer, J. Winnerl, S. Matich, H. Riedl, M. Kaniber, G. Abstreiter, G. Koblmüller, and J. J. Finley, Appl. Phys. Lett. 108, 011108 (2016).

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Date submitted: 14 Nov 2016 Electronic form version 1.4