Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Improvement of quantum dot IR photodetector performance due to selective bipolar doping XIANG ZHANG, VLADIMIR MITIN, State University of New York at Buffalo, ANDREI SERGEEV, KIMBERLY SABLON, U.S. Army Research Laboratory, MICHAEL YAKIMOV, SERGE OKTYZBRSKY, SUNY Polytechnic Institute, STATE UNIVERSITY OF NEW YORK AT BUFFALO COLLABORATION, U.S. ARMY RESEARCH LABORATORY COLLABORATION, SUNY POLYTECHNIC INSTITUTE COLLABORATION — Unipolar inter-dot doping creates charge redistribution and nanoscale potential barriers, which exponentially increase the photoelectron lifetime and IR photoresponse. However, the doping also increases the dark current and noise current. For independent optimization of signal and noise characteristics we propose and study quantum dot (QD) structures with selective bipolar doping, i.e. the n-doping of inter-dot space and p-doping of QD layers. The bipolar doping allows us to obtain large potential barriers around QDs at any electron fillings. This provides decoupled control of photocarrier lifetime and the dark current in quantum dot IR photodetectors (QDIP). Here we report experimental results, which demonstrate increase of the photoresponse and suppression of the noise current due to the selective bipolar doping.

Xiang Zhang
State University of New York at Buffalo

Date submitted: 11 Nov 2016 Electronic form version 1.4