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Electro-Optical characterization of W-structured type-II superlattice photodetectors J.G. TISCHLER, E.H. AIFER, I. VURGAFTMAN, J.R. MEYER, Naval Research Laboratory, C.L. CANEDY, E.M. JACKSON, SFA Inc. — Antimonide based superlattices (SLs) have shown promise as the next generation material system for very long wave infrared focal plane arrays. In particular, we investigated n-i-p diodes with "W-structured" type-II SLs, consisting of repetitions of AlGaInSb/InAs/InGaSb/InAs/AlGaInSb layers such that the bulk conduction band-edges of each period forms a "W" pattern. The performance of such photodiodes (PDs) depends on a combination of optical and transport properties, such as the absorption coefficient and minority carrier diffusion length. In order to optimize such devices, it is necessary to measure these properties independently. Using a combination of techniques such as transmission and photoluminescence (PL) spectroscopies, and black-body responsivity measurements, we have systematically studied and optimized our PDs. We have found that the most sensitive parameter that limits the PD performance is the carrier lifetime, making PL measurements the most sensitive characterization technique. We report PDs with up to 100% charge collection efficiency and up to 35% external quantum efficiency.

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