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Towards absorption enhancement and design optimization of Split-off band infrared photodetectors[1] MANMOHAN SHISHODIA, A. G. UNIL PERERA, Department of Physics and Astronomy, Georgia State University, Atlanta, GA-30303, USA — Room temperature photodetectors operating in infrared (IR) region are important for astronomy, biomedical, defence and security related applications. Recently developed short wavelength infrared (2-5μm) detectors utilizing light absorption through split-off band transitions in mature GaAs/AlGaAs material system may offer an efficient alternative to the intrinsically slow present day microbolometer detectors. The total quantum efficiency of these detectors, defined as the product of absorption efficiency, internal quantum efficiency, and collection efficiency, usually limited by low absorption, can be improved through IR antenna induced surface plasmon enhanced absorption. The antenna induced absorption besides free carrier and split-off absorption should improve the total quantum efficiency (η) and hence the responsivity (R), two being related by R=q$\eta\lambda$/hc, of these detectors. The optimized detector designs capable of reinforcing absorption due to free carriers and the antenna in the split-off region, and the theoretical results on absorption enhancement and performance improvement will be presented.

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