T-04

Demonstration of 320 x 256 Quantum Dots-in-a-Well Infrared Focal Plane Array

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Infrared photodetectors based on intersubband transitions in nanoscale self assembled quantum dots continue to show potential due to their inherent sensitivity to normally incident light, broad spectral response range, potential for low dark current and long carrier lifetimes due to reduced electron-phonon scattering. As a result of these promising attributes, coupled with the potential for high yield manufacturing processes based on a mature GaAs technology, QD based detectors continue to attract the interest of the infrared detection research community. In the Quantum dots-in-a well (DWELL) heterostructure, InAs quantum dots are placed in a thin InGaAs quantum well that is in turn placed in a GaAs matrix, and the growth issues and the structural and optical characterization techniques were discussed. Two-color DWELL detectors, operating at 78K, with spectral response in the MWIR (λ_{p1} ~ 5 ㎛) and LWIR (λ_{p2} ~ 10 ㎛) regime have been fabricated in our study. The DWELL QDIP also were fabricated into 320 x 256 focal plane array (FPA) with Indium bumps using standard lithography at UNM. The FPA was hybridized to an Indigo 9705 read-out integrated circuit (ROIC) in collaboration with QmagiQ and tested with a CamIRa^{TM} system manufactured by SE-IR Corp. We have demonstrated that we can operate the device at an intermediate bias (V_b = -1.25 V) and obtain the infrared image of a 300K objecte from the same QD based FPA at 60K.

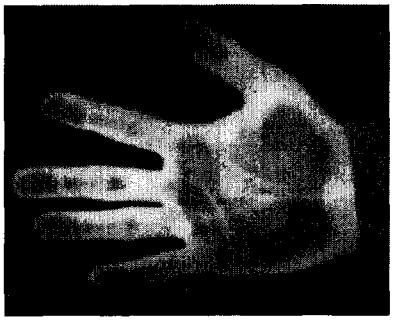

Fig. 1. The infrared image of a 300K object (human's hand) captured with the DWELL QDIP at 60 K.