

8-9 and 14-15 μm Two-color 640x486 GaAs/AlGaAs Quantum Well Infrared Photodetector (QWIP) Focal Plane Array Camera

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ABSTRACT

An optimized long-wavelength two-color Quantum Well Infrared Photodetector (QWIP) device structure has been designed. This device structure was grown on a three-inch semi-insulating GaAs substrate by molecular beam epitaxy (MBE). This wafer was processed into several 640x486 format monolithically integrated 8-9 and 14-15 μm two-color (or dual wavelength) QWIP focal plane arrays (FPAs). These FPAs were then hybridized to 640x486 silicon CMOS readout multiplexers. A thinned (i.e., substrate removed) FPA hybrid was integrated into a liquid helium cooled dewar to perform electrical and optical characterization and to demonstrate simultaneous two-color imagery. The 8-9 μm detectors in the FPA have shown background limited performance (BLIP) at 70 K operating temperature, at 300 K background with f/2 cold stop. The 14-15 μm detectors of the FPA have reached BLIP at 40 K operating temperature at the same background conditions. In this presentation we discuss the performance of this long-wavelength dualband QWIP FPA in quantum efficiency, detectivity, noise equivalent temperature difference (NE Δ T), uniformity, and operability.