Operating Parameter Optimization of Single color and Four-Color Spatially Separated QWIP Focal Plane Array

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Four-Color spatially separated QWIP Focal Plane Array (FPA) presents very unique challenges to characterize and optimize. In ideal single color QWIP FPA, bias and integration time are independently controllable parameters. Hence, a single color FPA is easily characterize and optimized. Unfortunately, the read out integrated circuit (ROIC) that is used for a four-color demonstration is not designed to simultaneously operate with four different color detectors that exhibit different responsivity and dark currents. Even though all detectors are specifically designed to operate at the same bias, the four-color QWIP FPA still exhibits different offsets. Therefore, in a background limited operation of the four-color FPA, the longest wavelength detector dictates the highest operating temperature while the most responsive detector with large dark current dictates the longest integration time without saturating the ROIC well capacity. Since the bias and integration time are the same for all four detectors, the most responsive detector with large dark current limits the upper bound of the dynamic range, and the least responsive detector with smaller dark current limits lower bound, e.g., 300 K background. Hence, bias and integration times are adjusted to optimize the operation of spatially separated four-color QWIP FPA at a given background condition. This paper will report on the characterization of spatially separated four-color QWIP FPA and LWIR QWIP camera. Optimization of operating parameters for each color and the best optimized operating parameters for all four-color operating simultaneously will be discussed.