Discovering the Difference: Bispectral MCT-based Detectors by AIM

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Bispectral infrared-sensors that provide detection in two different spectral regions, e.g. short-wavelength infrared and mid-wavelength infrared (SWIR/MWIR) or MWIR/MWIR, offer compared to single-color sensors improved performance in a wide variety of space and ground-based applications. Possible applications are target identification, signature recognition and clutter rejection. In particular the combination of the SWIR/MWIR or MWIR/MWIR spectral regions promote an enhanced target discrimination and identification by increasing the identification range, by enabling the target acquisition in front of strongly structured backgrounds or of targets with low thermal signature. We have extended our MBE growth technology, primarily developed for the cost-effective production of standard IR-detectors in the MWIR spectral range, to the growth of mercury-cadmium-telluride (MCT) multi-layers with different cutoff-wavelengths. The design of the bispectral pixel with two indium bumps per cell allows for temporal and spatial coincidence. To demonstrate the capabilities of the bispectral infrared-sensors, FPAs with a format of e.g. 320x256 pixels and a 30 µm pitch have been fabricated. In this paper we present the key performance parameters of recently optimized SWIR/MWIR and MWIR/MWIR bispectral MCT detectors along with images taken with the bispectral detectors by using SWIR or MWIR optics. The detectors demonstrate improved quantum efficiency, very low color cross-talk, and an excellent NETD in conjunction with low defect densities. Processing of the bispectral images with algorithms for combining the information from both spectral ranges provide striking evidence for the potential of these bispectral detectors in various applications.

Keywords: FPA, MCT, MBE, bispectral, SWIR/MWIR, MWIR/MWIR, dual-color, dual-band

Text Summary (100 Words)

Combination of the SWIR/MWIR or MWIR/MWIR spectral regions in bispectral detectors promotes an enhanced target discrimination and identification. To demonstrate the capabilities of the bispectral infrared-sensors FPAs with a format of 320x256 pixels and a 30 µm pitch have been fabricated. The optimized detectors demonstrate very low color cross-talk, an excellent NETD in conjunction with low defect densities and improved quantum efficiency. Processing of the bispectral images with algorithms for combining the information from both spectral ranges provide striking evidence for the potential of these bispectral detectors in various applications.