SPIE Defense + Security, Baltimore 2015
Conference 9451
Infrared Technology and Applications XLI

Improved MCT LWIR modules for demanding imaging applications

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ABSTRACT

Thermal imagers based on cooled LWIR Modules are the choice for many Army applications in battlefield conditions like e.g. Gunner and Commander Sights in armored vehicles or Pilotage and Targeting Sights for helicopters.

AIM has developed and produces LWIR FPAs based on liquid phase epitaxy (LPE) grown MCT on CZT substrates with different formats up to detector arrays with 1280x1024 elements in a 15µm pitch. LWIR detector arrays with different spectral cut-off wavelengths in the range of 9µm up to >12µm have been produced and characterized.
For cost reduction a fabrication of molecular beam epitaxy (MBE) grown MCT on GaAs substrates is developed.

Critical performance parameters of the detector arrays are temporal noise at low frequencies and the residual fixed pattern noise after non-uniformity correction. A performance limiting factor of a LWIR FPA is also the available full well capacity (FWC) of the readout integrated circuit (ROIC) for signal integration. AIM has done a redesign of the standard 640x512, 15µm pitch ROIC using now 0.18µm Si-CMOS technology. The available FWC for signal integration could be significantly increased resulting in better NETD performance.

Further developments are done for pitch reduction to realize LWIR modules also with 12µm and 10µm pixel pitch.

The FPAs are integrated in compact dewar cooler configurations using different kinds of cooler types, like AIM's split linear coolers SX095 or SX040 or rotary integral types depending whatever fits best to the application.

The paper will present the development status and performance results of AIM's latest improved MCT LWIR Modules.

Keywords: MCT, LWIR, FPA, LPE grown MCT, MBE grown MCT, NETD, RFPN, NUC