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Progress on MCT SWIR modules for passive and active imaging applications

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ABSTRACT

For SWIR imaging applications, based on AIM's state-of-the-art MCT IR technology specific detector designs for either low light level imaging or laser illuminated active imaging are under development.

For imaging under low-light conditions a low-noise 640x512 15 μ m pitch ROIC with CTIA input stages and correlated double sampling was designed. The ROIC provides rolling shutter and snapshot integration. To reduce size, weight, power and cost (SWaP-C) a 640x512 format detector in a 10 μ m pitch is been realized. While LPE grown MCT FPAs with extended 2.5 μ m cut-off have been fabricated and integrated also MBE grown MCT on GaAs is considered for future production. The module makes use of the extended SWIR (eSWIR) spectral cut-off up to 2.5 μ m to allow combination of emissive and reflective imaging by already detecting thermal radiation in the eSWIR band. A demonstrator imager was built to allow field testing of this concept. A resulting product will be a small, compact clip-on weapon sight.

For active imaging a detector module was designed providing gating capability. SWIR MCT avalanche photodiodes have been implemented and characterized on FPA level in a 640x512 15 μ m pitch format. The specific ROIC provides also the necessary functions for range gate control and triggering by the laser illumination. The FPAs are integrated in a compact dewar cooler configuration using AIM's split linear cooler. A command and control electronics (CCE) provides supply voltages, biasing, clocks, control and video digitization for easy system interfacing. First lab and field tests of a gated viewing demonstrator have been carried out and the module has been further improved.

The paper will present the development status and performance results including field trials of AIM's MCT based SWIR modules and sights for imaging applications.

Keywords: SWIR, MCT, FPA, LPE grown MCT, MBE grown MCT, Weapon Sight, Laser Gated Viewing