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Improved high performance MCT MWIR and LWIR modules

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In recent years enormous development progress on key subcomponents of IR-modules was achieved: the operating temperature of MWIR FPAs has successfully been increased to high operating temperature (HOT) while preserving a 5µm cutoff-wavelength and small pixel pitch and miniature cryocoolers with low power consumption were introduced at AIM. This leads to new ultra-compact IR-solutions and improvements of existing IR-modules best suited to respond to the wide range of system needs in military and civilian applications.
Key enabler for the realization of a low SWaP MWIR engine in a XGA, 10µm pitch format is AIM's HOT MCT p-on-n detector technology, able to provide high electro-optical (e/o) performance at 160K. This technology has now been optimized and transferred to various detector formats and pitch sizes in the range from 10µm to 30µm. At moderate operating temperatures around 100K it can be used to provide highest e/o performance including a very low defective pixel level.
To improve thermal resolution of 640x512, 15µm pitch LWIR modules the charge handling capacity (CHC) of the associated ROIC has now been increased to nearly 20Me$^-$. Typical integration times remain below 1ms ensuring high frame rates of 120Hz. In addition, an interlaced mode allows for an even higher CHC value of ~40Me$^-$, a 2x2 binning mode for 450Hz operation in a smaller format.
Furthermore, an optimized ROIC design in a 1024x768 format, offering a high CHC of ~7.5Me$^-$ in a small pixel pitch of 10µm, has been completed to improve existing MWIR modules and to provide a good basis for a XGA 10µm pitch LWIR version currently under development at AIM.
In this paper latest performance results of improved MCT MWIR and LWIR detector arrays will be presented, together with optimization of associated cooled IR-modules.

Keywords: MCT, IR-module, high operating temperature, SWaP, MWIR, LWIR, high charge handling capacity, small pixel pitch