Modular cooler concepts for HOT and 3rd Gen applications

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ABSTRACT

One of the most important objectives in the development of IR detectors is to achieve improved SWaP,C characteristics. The availability of advanced detector materials allowing the operation at significantly higher operating temperatures - HOT – is the key enabling technology for a new level of SWaP. Lower heat load at much higher operating temperature allowed designing of a more compact, high efficient cryocoolers. Besides HOT detectors there another trend towards larger detector arrays, power hungry high performance ROICs, or large cold shields. Another variation is due to different dewar types being used at different IR detector manufacturers. There is a variation of dewar bore diameters, lengths and interface details. Often, dewars a matched to either linear or rotary type cryocoolers. As a result, several cryocooler solutions are needed to support the entire range of advanced IR detectors.
To allow usage of one dewar type with different detectors at different operating temperatures and heat loads AIM developed a modular concept for linear cryocooler series.
A range of standardized Stirling expanders, fitting to most available dewar types like ¼", 8mm or 9mm is available. This concept does not only allow flexible usage of linear or rotary cooler technology for the same dewar but also allows selection of a range of linear compressors for the same dewar. A ¼" dewar for example can be operated by 5 different linear compressors covering the range from just small heat loads at 150K with a 160g compressor till some hundred Milliwatts at 70K with a 750g compressor.
Technical details and performance data of most relevant combinations between expander and compressor will be presented.

KEYWORD LIST

Cryocooler, Stirling, SWaP, HOT, long life, single piston