

# Performance and Reliability Enhancement of Linear Coolers

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## **Abstract**

Highest efficiency seems to be the most important requirement for tactical IR cryocoolers today. For enhancement of thermodynamic efficiency of our linear cooler family a thorough investigation has been performed. All relevant loss mechanisms and associated components within the cooler has been considered. To achieve highest accuracy in predicted performance improvements state-of-the-art simulation tools for magnet circuit of the compressor, Stirling process and the fluid dynamics inside the cooler has been employed. As a result, an improved design for AIM linear coolers has been derived. This Paper gives an overview on the performance enhancement activity and the major results.

A second important requirement for cryocoolers is reliability. AIM has introduced flexure bearing coolers with full Flexure Bearing suspension on both ends of the driving mechanism and Moving Magnet driving mechanism. In conjunction with a Pulse-Tube coldfinger this coolers meeting MTTF's in excess of 50.000h hours. This cooler design also meets the stringent reliability requirements of space applications. In a reliability enhancement program AIM is working on the introduction of technical solution of space coolers into tactical coolers. This Paper will show the status of this reliability program.

## **KEYWORD LIST**

Cryocooler, Simulation, Stirling, Infrared, IR detector, High performance