

Large Pulse Tube Cooler with a Heat Interceptor

***M.B.C. Branco, C. Buti, L. Desjonqueres, T. Tirolien, M. Linder,
European Space Research & Technology Center, The Netherlands***

Following on the hegemony over many years of the Oxford/Bae Stirling Coolers on Space missions, the Large Pulse Tube Cooler (or LPTC), by Air Liquide, has established itself as Europe's de facto workhorse cryocooler, having been chosen for the Meteosat Third Generation, IASI-NG on Metop-SG and being currently considered for plenty other Earth Observation missions as well as Space Science Observatories. Following on the work carried with heat interceptors by I Charles [1] on the Mini Pulse Tube Cooler, and earlier by D.L. Johnson and R.G Ross [2] on the Bae Stirling Cooler, an LPTC Engineering Model was tested at the Cryocooler Performance Characterisation Facility at the European Space Research and Technology Center (ESTEC), for its cooling capabilities employing a heat interceptor, at different positions on the cold finger, at temperatures ranging from 150 K to 200 K. Such an application might render the LPTC a suitable alternative for the 30 K - 40 K range, namely on missions already employing passive cooling, compatible with the interceptor, e.g. ATHENA or ARIEL. A significant increase in performance was measured, compared to the same cryocooler's measured performances without the interceptor, especially at a higher intercept position and for a lower intercept temperature. The heat load at the interceptor was also measured, in order to reflect on the passive cooling requirements. Considerations on the physical behaviour of the pulse tube cooler with the interceptor are also described in this paper, as well as the test setup and the experimental protocol. [1] I. Charles et al, "A New Mini Pulse Tube with a Heat Interceptor," CEC, Vol. 53, 2008; [2] D.L. Johnson and R.G. Ross, Jr. "Cryocooler Coldfinger Heat Interceptor," Cryocoolers 8, 1994.