

Development of a Compact Size 2 K Two-Stage Pulse Tube Cryocooler

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Bluefors Cryocooler Technologies has been continuously developing innovative, low vibration, energy efficient and reliable cryocoolers for different markets and applications. The world's largest 4 K pulse tube cryocooler (Model PT450) was successfully developed and launched in 2023, providing minimum cooling powers of 5.0 W at 4.2 K on the 2nd stage with 65 W at 45 K on the 1st stage simultaneously, operating on either 60 or 50 Hz power. The PT450 answers the market's need for the continuing development of large cryogen-free dilution refrigerators, superconducting magnets, helium liquefiers, and other applications requiring large cooling capacities at 4 K.

In some applications, however, the cryocooler's physical size, lowest temperature and power consumption are more critical. One application requiring these characteristics would be Superconducting Nanowire Single Photon Detectors (SNSPD). A physically compact, highly reliable, 2 K two-stage pulse tube cryocooler (Model PT205) is currently being developed at Bluefors Cryocooler Technologies to provide a minimum of 15 milliwatts of cooling power at 2.50 K, with only 1.2 kW of power consumption when operating on 60 Hz. The cryocooler's no load, minimum temperature is less than 2.30 K. The cooling performance and experimental results of the PT205 cryocooler will be presented in this paper.