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C1Po1B-07: Investigation on a thermal-coupled two-stage pulse tube cryocooler with multi-bypass working at 8 K

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The Stirling type pulse tube cryocooler (SPTC) eliminates moving parts at the cold end and is driven by a linear compressor at the hot end, thus offering the advantages of low vibration at both ends, high reliability, and long service life, which makes it attractive for various special fields, such as the space field.In practice, there is an increasing interest in providing cooling power at different temperature levels.This paper presents an experimental investigation of a thermal-coupled two-stage pulse tube cryocooler with multi-bypass structures.The experiments firstly investigated the effect of pre-cooling stage temperature on the temperature of the second-stage cold finger and multi-way bypass, and then focused on the effect of the second-stage operating frequency and charging pressure on the second-stage cold finger, multi-bypass as well as the pre-cooling stage, and experimental testing of cooling performance.The experimental results show that through the thermal coupling pre-cooling and the design of multi-bypass structure, the second-stage cold finger can realize the lowest temperature of 5.4K, and can simultaneously provide 40mw cooling capacity at 8K in the second-stage cold head and 60mw cooling capacity at 34K in the multi-bypass, respectively.

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