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C1Po1B-04: A high frequency lightweight coaxial pulse tube cryocooler operating at 70 K

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An infrared detector represents a crucial instrument for human exploration of the universe. The pulse tube cryocooler is a widely utilized technology for the cooling of various types of infrared detectors. At present, the development of pulse tube cryocoolers, which can operate at lower temperatures and have higher cooling capacity, has become an important development direction in this field. In order to achieve this objective, a pulse tube cryocooler with a substantial cooling capacity in the lower temperature zone has been developed, in this study, a high-frequency pulse tube cryocooler operating at 70 K with a total weight of 4.7 kg, a cold finger diameter of 25.6 mm, and a length of 51 mm. The regenerator is filled with #600 and #500 stainless steel screens. Under the conditions of input power 200 W, hot end temperature 300 K, operating frequency 106 Hz, and charge pressure 6MPa, the minimum temperature is 32.4 K, and the cooling capacity of 10 W can be obtained at 70.75 K, the relative Carnot efficiency is 16.35%.

Keywords: pulse tube cryocooler·10 W@70.75 K·106 Hz·lightweight

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