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Experimental Study on a Cascade Pulse Tube Cooler

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With no moving parts at the cold head, a pulse tube cooler can in principle not not achieve the Carnot efficiency since the acoustic power is finally dissipated in phase shifters. Based on our previous study, a cascade pulse tube cooler working at 233 K with 200 W class cooling power is designed, fabricated and tested, in which the secondary stage is driven by the recovered acoustic power from the first stage via a long transmission tube. Experiments are carried out and feasibility is demonstrated with the efficiency significantly increased. Effects of charging pressure, pressure ratio, matrix type and the transmission line size on the cooling performance are investigated. This is a new exploration for high power pulse tube coolers working at lower temperatures.

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