A high efficiency single-stage Stirling-type coaxial pulse tube cryocooler (SPTC) operating at around 40 K has been designed, built and tested. The double-inlet and the inerter tubes together with the gas reservoir were adopted as the phase shifters. Under the conditions of 2.5 MPa charging pressure and 30 Hz operating frequency, the prototype has achieved a no-load temperature of 23.68 K with 330 W electric input power rejecting at 279 K. It can provide 5 W cooling capacity at 40 K when electric input power increases to 395 W, and 7.56% of relative Carnot efficiency has been realized. It takes 10 minutes for the SPTC to lower its no-load temperature at the cold head from 295 K to 40 K.

Conclusions
- A high efficiency single-stage Stirling-type coaxial pulse tube cryocooler driven by a linear dual-opposed compressor has been designed, manufactured and tested.
- It takes 10 minutes for the SPTC to lower its no-load temperature at the cold head from 295 K to 40 K.
- It can provide a cooling capacity of 3.02 W/35 K or 4.3 W/40 K with a charging pressure of 2.5 MPa and an input power of 330 W.
- A cooling capacity of 5 W/40 K can be achieved when the input power increases to 395 W, and 7.56% of relative Carnot efficiency has been realized.

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