

The Performance of a Moving Magnet Pressure Wave Generator at Various Ambient Temperatures

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At the University of Twente, we are developing a medium capacity (100 W at 80 K) high efficiency cryocooler for the healthcare domain. To satisfy the requirement of fluctuating ambient temperature especially during the summer months we are investigating the performance of the cooler at various warm ambient temperatures. In this paper, we report the experimental data of a linear moving magnet pressure wave generator operating in the temperature range of 30 to 65 deg C for several electrical powers. The oscillating displacement of the piston and the pressure are measured. The acoustic power is determined from the pressure and displacement data. We observed a fairly linear decrease in the efficiency of the linear motor performance, the ratio of the acoustic to the electric power. For a set sink temperature, the performance reduces with increasing electrical power. A parametric model is developed to correlate the data with the electromagnetic parameters of the linear motor.