

High Frequency Steel Flexure Acoustic to Electric Transducer for Cryocoolers

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A steel flexure acoustic to electric transducer developed for a thermoacoustic engine is proposed for use as a driver for cryocoolers. This transducer operates at around 500 Hz and will thus allow for the construction of simpler, more reliable, more compact and higher power density cryocoolers. The transducer is characterised by high efficiency (90%), high power (1 kW), lack of any sliding parts and was designed for very long maintenance free life. The transducer uses a moving iron only flux switching alternator to allow for efficient small motion actuation. Furthermore, the alternator is external to the pressure vessel and thus there is no possibility of contamination of the working gas by outgassing. A 77K cryocooler using such a transducer was simulated using thermoacoustic code vetted on an engine and the results are very competitive with a Stirling cryocooler.