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### **Miniaturation of thermoacoustic refrigerators**

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The possibility to miniaturize thermoacoustic refrigerators is theoretically investigated. Both standing-wave and traveling-wave systems are considered. In the consideration of standing-wave refrigerators, a system consisting of a resonator tube (50 cm) with a closed end and a PVC stack (length 5 cm) is taken as a reference. Helium is used at a mean pressure of 10 bars and an amplitude of 1 bar. The operating frequency is 1 kHz. The variation of the performance of the refrigerator when scaled down in size is computed under the prerequisites that the temperature difference over the stack or the energy flux or energy flux density are fixed. The analytical results show, as expected, that there is a limitation for scaling-down of a standing-wave thermoacoustic refrigerator due to heat conduction. Similar scaling trends are also shown in traveling-wave refrigerators. The traveling-wave reference system consists of a feedback inertance tube of 0.567 m long, inside diameter 78 mm, a compliance volume of 2830 cm<sup>3</sup> and a 24 cm thermal buffer tube. The regenerator is sandwiched between two heat exchangers. The system is operated at 125 Hz and filled with 30 bar helium gas. Again, the thermal conductance forms a practical limitation in down-scaling.