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Theory and numerical analysis of thermoviscous effects in ultrasound-induced acoustic streaming in microchannels PETER BARKHOLT MULLER, HENRIK BRUUS, Technical University of Denmark, DTU Physics — We present a numerical study of the thermoviscous effects on the acoustic streaming flow generated by an ultrasound standing wave resonance in a long straight microfluidic channel. These effects enter through the temperature and density dependence of the fluid viscosity. The resulting magnitude of the streaming flow is calculated and characterized numerically, and remarkably, we find that even for thin acoustic boundary layers, the channel height affects the magnitude of the streaming flow. For the special case of a sufficiently large channel height we have successfully validated our numerics with analytical results from 2011 by Rednikov and Sadhal for a planar wall. Furthermore, the time-averaged energy transport in the system is analyzed, and the time-averaged second-order temperature perturbation of the fluid is calculated.

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