Heat transport by phonon tunneling across layered structures used in heat assisted magnetic recording (HAMR)

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Abstract
In this paper we analyze heat transport by acoustic waves in arbitrary layered structures that may include several vacuum layers. The analysis is based on our prior description of the spectrum of thermally excited waves in systems with a heat flux, and on the new approach to the coupling between acoustic fields in separated bodies and the description of the interference of thermally excited waves. The developed method predicts correct results for all known special cases for both large and closing gaps, agrees with available experiments, explains the phenomena of interface thermal resistance and of thermal rectification (asymmetry of thermal transport). Numerical examples demonstrate the applicability of the approach to the calculation of the heat transport coefficient across nanoscale gaps due to acoustic waves.