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An investigation of power loss in a thickness-mode piezoelectric transducer

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A fundamental problem that limits the functional capacity of a piezoelectric transducer in high-power applications is its intrinsic operational power loss. The phenomenon may generate a self-heating and temperature increase of the device, which in turn may degrade the piezoelectric material utilized in its implementation and finally the transducer performance. Thus, power loss reduction in piezoelectric transducers is an issue extensively investigated by many researchers. In this context, basically two critical frequencies have been comparatively examined to excite these transducers, namely the resonance and antiresonance ones. But, more recently other operation points have been examined. This work presents a computational investigation of power loss in a thickness mode piezoelectric transducer excited at its fundamental resonance. In the investigation, it is shown the existence of an optimal operation point located between its fundamental resonance-antiresonance frequency interval, where a remarkable power loss reduction may be obtained, regarding excitations at both mentioned critical frequencies.

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