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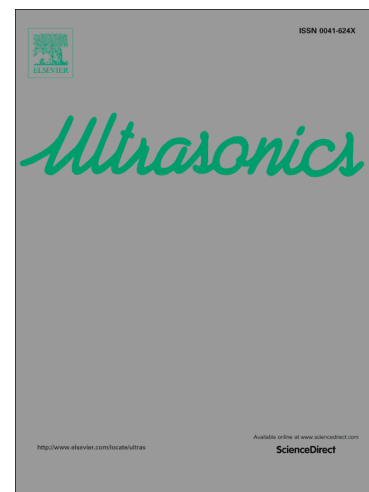
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Focusing phenomenon based on the coupling effect of acoustic waveguide

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Abstract: We investigated the coupling effect in a pair of parallel acoustic cladded waveguides and extended the effect to obtain energy focusing in a specially structured waveguide of nested pipes. For the structure composed of two parallel waveguides, we simulated and verified that when an acoustic input wave propagates in one waveguide, the wave couples with the other and alternates between the two parallel waveguides with periodic amplitude and a well-defined coupling length. This length is related to the frequency of the input wave and the structure of the waveguide. Moreover, we fabricated a specially structured waveguide composed of four concentric circular pipes. In both simulations and experiments, we further demonstrated that the acoustic wave transmitted through designated ports of this fabricated waveguide structure can be focused onto the central waveguide with a well-defined focusing length, and that the focusing length is related to the wave frequency. Similar to its optics counterpart, not only can the coupling effect between the acoustic cladded waveguides be used in energy focusing in the nested waveguide structure, but it can also be used in other acoustic wave controlling devices, such as the frequency-selective device, the power switch for an acoustic wave, and the highly efficient pure-mode transducer.

Keywords: coupling effect; cladded waveguide; wave alternating; energy focusing; waveguide structure.

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