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Manipulate acoustic waves by impedance matched acoustic metasurfaces¹ YING WU, King Abdullah Univ of Sci Tech (KAUST), JUN MEI, South China University of Technology, RASHA ALJAHDALI, King Abdullah Univ of Sci Tech (KAUST) — We design a type of acoustic metasurface, which is composed of carefully designed slits in a rigid thin plate. The effective refractive indices of different slits are different but the impedances are kept the same as that of the host medium. Numerical simulations show that such a metasurface can redirect or reflect a normally incident wave at different frequencies, even though it is impedance matched to the host medium. We show that the underlying mechanisms can be understood by using the generalized Snell's law, and a unified analytic model based on mode-coupling theory. We demonstrate some simple realization of such acoustic metasurface with real materials. The principle is also extended to the design of planar acoustic lens which can focus acoustic waves.

¹Manipulate acoustic waves by impedance matched acoustic metasurfaces

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