Physics > Classical Physics

Circular Sound Wave Scattering Derivation for Acoustic Cloak Detection

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In this Letter we develop analytical formulations to describe sound scattering in lossless medium due to 2D circular wave incident on an acoustic cloak. A perfect acoustic cloak is reflectionless and can completely hide the cloaked object from any sound waves. However, the realization of a perfect acoustic cloak is difficult. Compared to plane wave, our analytic calculations show that circular wave from an annular line source generates distinct scattering patterns from an imperfect cloak design. Large modification in reflection directivities can be observed if the focal point of the incident wavefront is slightly customized. Hence, our work might find applications in acoustic cloak detection, which should have significant impact on cloak design and defense.

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