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Broadband scattering reduction using a hybrid inertial metamaterial design[1] THEODORE MARTIN, GREGORY ORRIS, Naval Research Laboratory — The ability to hide an object from an external wave through scattering reduction is one of the most sought-after goals of the metamaterials community. Using transformational optics, Pendry [1] demonstrated that a wave can be bent around an object using a conformal map that reduces the object's scattering cross section to zero. The transformational method has now been extended to transformational acoustics [2], but the traditional inertial method requires infinite mass at the boundary of the hidden object, which cannot be easily approximated in practice. Scattering reduction can also be obtained over a more limited bandwidth using wrapping layers that cancel some of the modal coupling between the object and the exterior environment [3]. Using multiple scattering theory, we demonstrate that a combination of an "imperfect" conformal map with a scattering cancellation layer can achieve improved scattering reduction over a broad bandwidth in an aqueous acoustic environment. Our "hybrid" design is amenable to a parameter-space constrained to within an order of magnitude of the background fluid in order to obtain a solution with realistic material properties. The introduction of a cancellation layer enables us to optimize performance over targeted frequency bands with only a small impact on the overall size of the design.

[1] J. B. Pendry, D. Schurig, and D. R. Smith, *Science* **312**, 1780 (2006).
[2] S. A. Cummer and D. Schurig, *New J. Phys.* **9**, 45 (2007).
[3] A. Alù and N. Engheta, *Phys. Rev. Lett.* **100**, 113901 (2008).

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