Metamaterials, from electromagnetic waves to water waves, bending waves and beyond.

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Abstract- We will review our recent work on metamaterials for different types of waves. Transposition of transform optics to water waves and bending waves on plates will be considered with potential applications of cloaking to water waves protection and anti-vibrating systems.

We will show using simple a shallow water model that transposition of invisibility concepts developed in electromagnetism to water waves is straightforward. Experiments on water waves cloaks and carpets will be presented [1,2]. Although we started this work with the aim of popularizing the invisibility concept we will show that it may have some applications for water wave's protection.

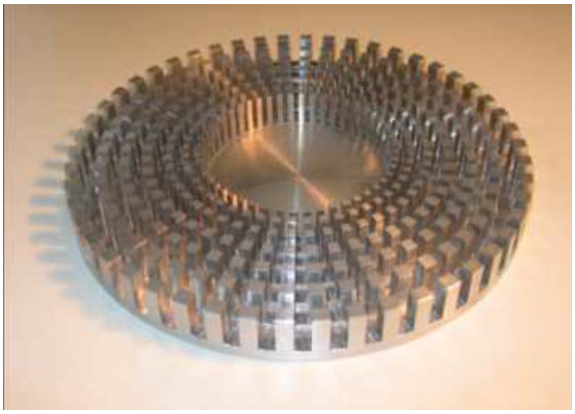

Figure 1 : A waterwave cloak (the diameter of the cloak is equal to 20 cm).

A second type of waves we will review is bending waves. We will consider a thin-plate model and show that cloaking of waves on such plate is possible with potential applications to anti-vibrating systems [3-4]. Other type of control of bending waves will also be presented [5]. It also open the way to earthquake protection that will be presented in a separate talk [6].

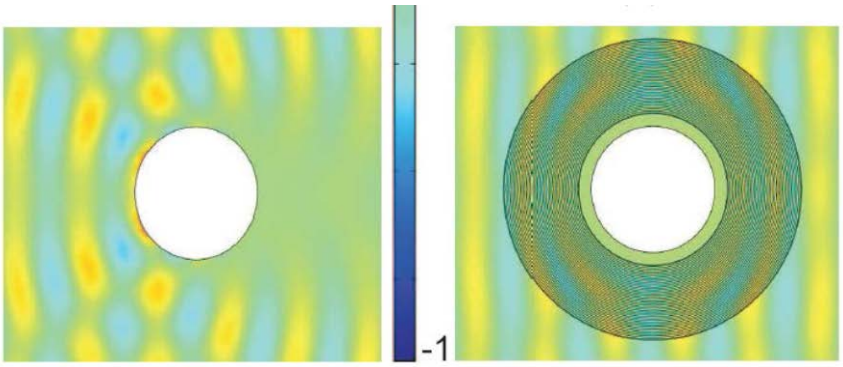

Figure 2: Cloaking of bending waves on thin plates. Left: amplitude of the bending waves when diffracted by a clamped obstacle. Right: same when the obstacle is surrounded by a multilayered cloak.

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