

Abstract Submitted
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Water wave metamaterials PHILIPPE PETITJEANS, PMMH - ESPCI, CARMEN PALACIOS, PMMH - ESPCI / Imperial College London, AGNÈS MAUREL, Institut Langevin - ESPCI, VINCENT PAGNEUX, Laboratoire d'Acoustique de l'Université du Maine (LAUM) — The phenomenon of water wave deviation in a bended wave-guide has been studied experimentally. We propose a theoretical analogy to electromagnetism, from which we derive the mathematical tools to design a water wave-deviator. To obtain the effect of metamaterial in the case of surface waves, one has to design a water-bed consisting of periodic layers of two different heights inclined with a specific angle with respect to the direction of propagation of waves. We designed and built (using rapid prototyping) deviators with progressively increasing angles of bending, and their homologue wave-guides with a flat bottom. The wave elevation was measured with good accuracy in time and in space by an optical method. Results show a good efficiency of the wave-deviator. The wavefront maintains its original inclination once the wave crosses the bend (in contrary to the wave-guide with a flat bottom), however departs from the predicted behavior as the wavefront advances. The analysis of harmonics shows a reduction of backwards reflection and a strong decrease in higher modes excitation after the bend. The results are optimistic and might open new possibilities; ultimately those regarding the cloaking of floating structures which could, in the future, be used for coastal protection.

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