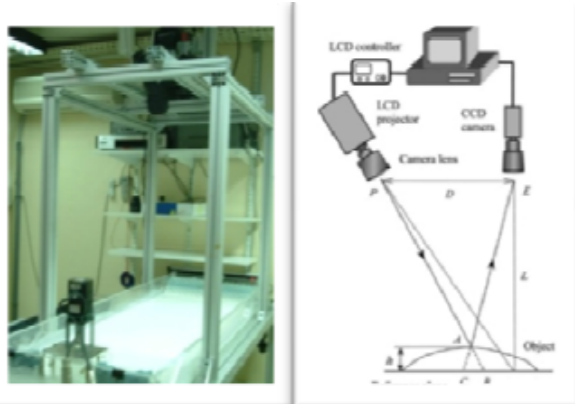


Post Doctoral Proposal: Experimental study of metamaterials for water waves



Water waves have been studied for almost two centuries and they are one of the most popular manifestations of the physics of waves. They have all the fundamental complexity of the physics of waves and also have many practical applications, as in naval and coastal engineering. Ocean waves offer great potential because their energy could be an alternative to fossil energies but in addition, they represent a danger because they can produce catastrophic damage.

Very recently, different groups of researchers have demonstrated that a set of scatterers is able to produce phenomena similar to those observed in physics of solids. For instance, it has been shown that a periodic set of cylindrical scatterers (a crystal of cylinders) is able to focus water waves. Thus, it appears to be possible to design metamaterials for water waves, i.e. synthetic configurations of obstacles that can control the propagation of surface waves.

The subject of the post doc project is the experimental and theoretical study of the effective propagation of water waves through a set of immersed scatterers (either periodic system as for the acoustic lens or layered structure for cloaking system). Our group has developed an optical technique that measures the surface elevation instantaneously in laboratory experiments of water waves. This technique characterises very accurately the spatio temporal behaviour of the surface waves.

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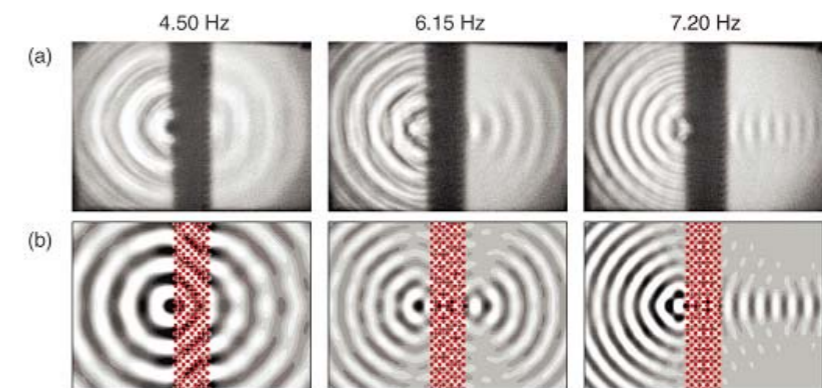
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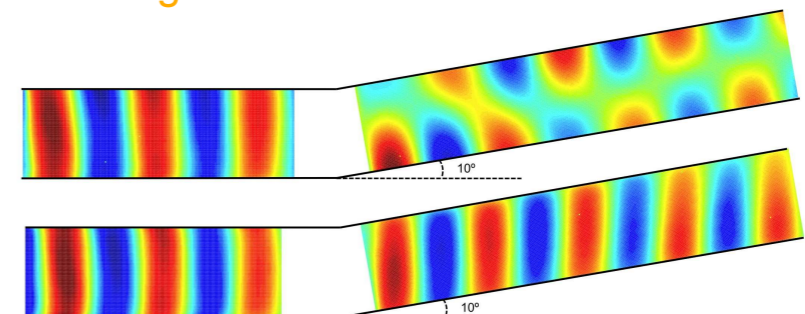
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Acoustic lens



X. H. Hu, Y. Shen, Z. Liu, R. Fu, and J. Zi, Phys. Rev. E **69**, 030201(R) (2004).

Cloaking



C. Palacios, A. Maurel, V. Pagneux & P. Petitjeans, submitted to PRL (2013)

see also the websites of the ANR project :
<https://blog.espci.fr/procomedia/accueil/>