ESPCI
Laboratoire PMMH
10 rue Vauquelin, 75231 Paris Cedex 05

Séminaire café - PMMH

Bureau d'Études, Batiment L, 2 ème étage

Jeudi 15 septembre 2016, 13h30

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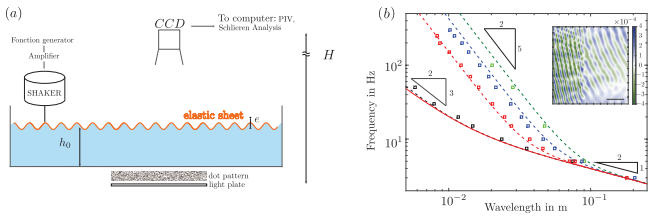
Controlling the propagation of hydroelastic waves

Understanding and mastering wave propagation in complex and/or active media is a key issue in numerous fields. Nevertheless, the scales (frequency domains and wavelengths) at which these waves occur make direct observations and experimentation difficult to achieve. The complete knowledge of the properties of the complex media is extremely difficult to obtain and the design and fabrication of media with given properties is most of the time out of range due to size limitations.



(a) Sketch of the experimental set-up showing the container filled with water and covered with an elastic sheet, the wave generation device and the imaging system. (b) Measured dispersion relation for 4 different film thicknesses e (open squares) and theoretical dispersion relations (dashed lines). Black : $e = 20\mu m$, red : $e = 250\mu m$, blue : $e = 500\mu m$, and green : $e = 750\mu m$, obtained using $250\mu m$ and $500\mu m$ thick films stuck together. The plain red line shows the theoretical gravity-capillary dispersion relation for water waves. (inset) Example of deviation at the interface between two films.

We developed an experimental approach (figure (a)) using hydroelastic surface waves that allows for direct observation with accurate space and time resolution at the laboratory scale. Hydroelastic waves propagate at the surface of water covered by a thin elastic sheet (here we use silicon rubber). By varying the elastic properties of the polymer cover, we can tune the propagation velocity of the waves (figure (b)), which means that we can define an effective refractive index for our waves. This technique allows us to modulate the media properties to the sub-wavelength scale. We can thus achieve broadband focusing, reflecting and deviation of the waves (figure (b) inset).

Prochain séminaire : jeudi 22 septembre 2016 **à 13h30**,
Nicolas Lavielle (post-doctorant PMMH).

Programme des séminaires café : www.pmmh.espci.fr, onglet *Séminaires PMMH>Séminaires café (internes)*
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