Phononic hyperbolic metamaterials with a twist

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Résumé

For the last decades, metamaterials and metasurfaces have been extensively studied to induce extreme anisotropic behaviors. As a landmark example, hyperbolic media are characterized by strongly directional, ray-like propagation stemming from extreme asymmetry in the material response, which comes along with negative refraction and enhanced wave-matter interaction. At the same time, moiré super-lattices and the rapidly expanding domain of twistronics in solid-state physics have demonstrated the relevance of using the rotation degree-of-freedom for controlling the symmetries of a medium, and thus its wave-related behavior. Inspired by these ideas, we've investigated how the interplay between the twist and the hyperbolicity of macroscopic phononic metasurfaces allows us to achieve advanced wave manipulation. In this talk, we present some recent results about hyperbolic metasurfaces and their twisted multilayer counterparts, providing an overview of the physical mechanisms at play and their potential practical implications.

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