

Sound insulation using meta-atoms with Willis Coupling

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Abstract

Willis coupling is a phenomenon, which can increase the effectivity of acoustic metamaterials. We present a concept for sound insulation based on meta-atoms with strong Willis coupling. The meta-atom geometry is simple and easy to realize in industrial applications. Furthermore, available analytical formulation of its polarizability allows tuning the operating frequency and the Willis coupling magnitude to desired values. One of the outcomes is a metacapsule, which can be beneficial for example in stage machinery applications, where common noise control solutions were not successful. We investigated the transmission properties of an exemplary metacapsule during experiments and using simulation techniques.

Keywords: Sound, Insulation, Metamaterials, Willis Coupling