UNIVERSITAT POLITÈCNICA DE VALÈNCIA

Nota de prensa

A new prototype two-dimensional acoustic cloak developed to achieve the acoustic undetectability of objects

• The new prototype is the result of the work of the UPV's Wave Phenomena Group (GFO) and the Unit of Optoelectronic Materials and Devices (UMDO), which belongs to the UV's Institute of Materials Science and is associated with CSIC-IMM.

• This research was published in the journal *Applied Physics Letters*, in last August's issue

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Researchers from the Universitat Politècnica de València (UPV), Spain's National Research Council (CSIC), and the Universitat de València (UV) have taken another step towards achieving what is known as "acoustic undetectability". It is a new prototype two-dimensional acoustic cloak that can make sound waves with a specific frequency reaching an object avoid it as if it was not there, thanks to the cooperative effect of the units of which the cloak is made up. This research was published in last August's issue of the journal *Applied Physics Letters*, and it has been included in the American Institute of Physics's (AIP) "News Highlights" section.

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The acoustic cloak developed by these researchers contains 120 aluminium cylinders 15 mm in diameter, surrounding a 22.5 cm cylinder. The position of each cylinder in the cloak has been obtained by using optimization techniques based on genetic algorithms (numerical algorithms which mimic Darwinian evolution).

"This research complements the contributions made by our group to the problem of acoustic undetectability. Its novelty lies in the use of genetic algorithms", says José Sánchez-Dehesa, the director of GFO.

The researchers have shown that sound waves of a specific frequency –3061 Hz, with a 100 Hz bandwidth– maintain their original pattern, both as they go around the object and past it. "This is the first experimental demonstration of acoustic undetectability that we have developed in our laboratory. The new prototype paves the way for future devices with a higher bandwidth, and even for three-dimensional objects", Sánchez-Dehesa adds.

As regards practical applications, Sánchez-Dehesa states that scientists have a long way to go yet: "What we are doing now is basic research; if successful, one day it could be applied, for example, to improve the acoustics of the urban environment or the sound insulation of auditoriums, or to create helmets to better protect our ears from extreme noises".

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