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Hiding a Realistic Object Using a Broadband Terahertz Invisibility Cloak

Source

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Abstract

The invisibility cloak has been a long-standing dream for many researchers over the decades. Using transformation optics, a three-dimensional (3D) object is perceived as having a reduced number of dimensions, making it "undetectable" judging from the scattered field(1-5). Despite successful experimental demonstration at microwave and optical frequencies(6-12), the spectroscopically important Terahertz (THz) domain(13-16) remains unexplored due to difficulties in fabricating cloaking devices that are optically large in all three dimensions. Here, we report the first experimental demonstration of a 3D THz cloaking device fabricated using a scalable Projection Microstereolithography process. The cloak operates at a broad frequency range between 0.3 and 0.6 THz, and is placed over an a-lactose monohydrate absorber with rectangular shape. Characterized using angular-resolved reflection THz time-domain spectroscopy (THz-TDS), the results indicate that the THz invisibility cloak has successfully concealed both the geometrical and spectroscopic signatures of the absorber, making it undetectable to the observer.