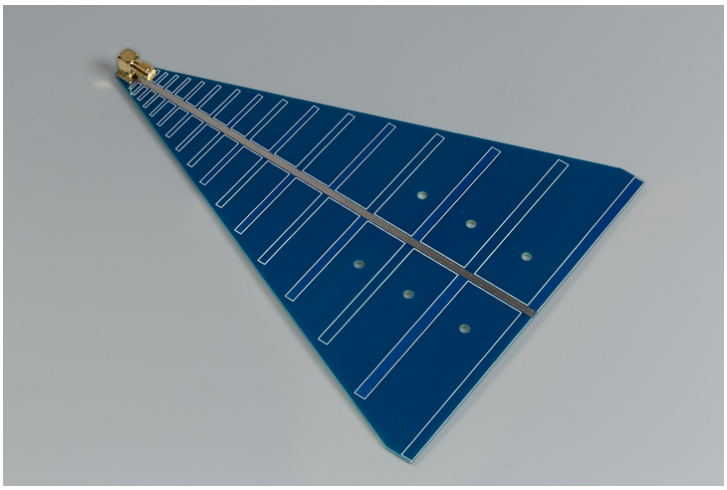
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Transparent and Flexible Conductors by Additive Processes and Applications Thereof

TECHNOLOGY NUMBER: 6915



OVERVIEW

Transparent, flexible, and tunable antennas using metallic micromesh structures

- Allows mechanical deformation without using liquid metal or rigid textiles
- Wearable technology, medical implants, transparent and flexible devices

BACKGROUND

The evolution of wearable electronics has resulted in the need for compact, lightweight, and flexible antennas. Traditionally, antennas used in such applications are fabricated on inflexible substrates, leading to various issues of rigidity and mechanical instability. Liquid metal antennas have been explored as alternatives due to their stretchability, but they present integration challenges and the risk of leakage. Textile-based antennas have also been considered, yet their lack of stretchability limits functionality in frequency-tunable applications. Furthermore, previous materials like graphene and indium tin oxide (ITO) used for transparency introduce conductivity challenges, as they require thicker layers. The market demand for advancements in wearable technology shows the need for antennas that are not only flexible and stretchable but also allow seamless integration with other electronic systems. Addressing these shortcomings is crucial to improving the interactivity, durability, and invisibility of wearable electronics, thus leading to a better user experience.

Technology ID

6915

Category

Manufacturing Process
Engineering & Physical Sciences

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INNOVATION

Researchers at the University of Michigan have developed a semitransparent, flexible, and frequency-tunable antenna that uses a tortuous metallic micromesh structure. The innovation lies in replacing traditional metal patches with a stretchable micromesh encapsulated in elastomeric polymers, providing mechanical reconfigurability without the risks of liquid metals or inflexibility of textiles. Its zeroth-order resonant property enables the antenna to maintain high performance even with reduced size and mechanical deformation. The micromesh design permits stretching, folding, or twisting without breakage, and the resonant frequency can adjust linearly within 2.46 to 2.94 GHz through stretching. Potential real-world applications include wearable electronics, where semitransparency and integration without obtrusion are critical, such as in smart clothing, health monitoring implants, and flexible smart devices. This technological advancement thus opens new opportunities in creating interactive and unobtrusive electronic devices that cater to the growing trend for smaller, more versatile wearable tech.

ADDITIONAL INFORMATION

REFERENCES

T. Jang, C. Zhang, H. Youn, J. Zhou and L. J. Guo, "Semitransparent and Flexible Mechanically Reconfigurable Electrically Small Antennas Based on Tortuous Metallic Micromesh," in IEEE Transactions on Antennas and Propagation, vol. 65, no. 1, pp. 150-158, Jan. 2017, doi: 10.1109/TAP.2016.2623479

INTELLECTUAL PROPERTY

US11217358 "Transparent and flexible conductors made by additive processes"