Title: Laser Induced Graphene (LIG) based Stretchable Antenna

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Abstract

Wearable and flexible wireless devices are becoming more common in healthcare, sports, and the Internet of Things (IoT). However, most traditional antennas are made on rigid substrates, which makes them unsuitable for body-conformal and stretchable applications. This creates the need for new materials and fabrication methods that allow antennas to be both flexible and reliable. Laser-induced graphene (LIG) is a promising solution because it combines good electrical conductivity, mechanical flexibility, and easy fabrication through direct laser writing.

The aim of this work is to design and study a stretchable patch antenna made from LIG. The antenna is fabricated by laser writing on a polyimide substrate, which directly converts the surface into conductive graphene without using extra metals or inks. EDA simulation tools like HFSS are used to optimize the antenna structure, resonance frequency, and impedance matching. Prototypes are then tested to evaluate their performance and response to mechanical stretching and bending. Moreover, LIG-based patch antenna maintains stable radiation and frequency response in the intended band, even under repeated stretching. The porous graphene structure also provides good durability and mechanical strength.

In conclusion, LIG-based antennas offer a simple, low-cost, and sustainable approach for next-generation wearable and flexible communication systems. Their ease of fabrication and reliable performance make them highly suitable for future applications in body-conformal and IoT devices.