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# A Graphene-Based Rectangular-Notched UWB Antenna with Reconfigurable Notch

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## Abstract

– This article examines the design of a small Ultra-Wideband (UWB) antenna with an adjustable bandwidth, center frequency, and rectangular notch within a Wireless Local Area Network (WLAN) band for relocation to the worldwide interoperability for microwave access (WiMAX) band. The antenna's UWB properties are obtained by truncating the lower ends of a square microstrip patch, while the notch characteristic is achieved through an Electromagnetic Bandgap (EBG) structure. The mushroom-like EBG structure comprises five square metallic conductor patches loaded onto the back of the substrate and linked to the ground plane through shorting vias. When strips of graphene material are embedded in the EBG structure, the rectangular notch's bandwidth and center frequency can be adjusted to suit applications with on-demand rejection bands electronically. The surface impedance of graphene is

modified by adding a direct current voltage bias, which allows the material's surface impedance to be set to one of two extreme values corresponding to the ON and OFF states of typical switches. The simulation results indicate that the suggested antenna operates from 2.4 to 15.5 GHz for input reflection coefficient less than  $-10$  dB. Based on its graphene characteristic, a reconfigurable rectangular notch moving between the two bands 5.1 to 5.8 GHz and 3.2 to 3.7 GHz is achieved, effectively denying WLAN and WiMAX band transmissions, respectively. Furthermore, the same graphene characteristics can be used to control the ON/OFF notch inside the WLAN band. Finally, the antenna has additional advantages: compact size ( $32\times48\times0.8$  mm<sup>3</sup>), stable gain, and consistent radiating pattern. Copyright © 2025 Praise Worthy Prize S.r.l.-All rights reserved. © 2025 Praise Worthy Prize S.r.l.-All rights reserved.

### Author keywords

EBG; Graphene; Reconfigurable; Rectangular-Notched; UWB Antenna

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