

# Design and Development of Compact MIMO Antenna for Ultra-Wideband Applications

Chethan K<sup>1</sup>, Pavani G<sup>2</sup>, Pruthvi G A<sup>3</sup>, Sunil M<sup>4</sup>,

Mr. Hanumanthappa Magalada<sup>5</sup>, Dr. Chandrappa D N<sup>6</sup>

<sup>1,2,3,4</sup>UG Students ECE Department, PES Institute of Technology and Management Shivamogga

<sup>5</sup>Assistant Professor ECE Department, PES Institute of Technology and Management, Shivamogga

<sup>6</sup>Associate Professor, East Point College of Engineering and Technology, Bangalore.

<sup>1,2,3,4,5,6</sup> Visvesvaraya Technological University Belagavi

**Abstract:** This paper introduces a compact 2-element MIMO antenna optimized for Ultra-Wideband (UWB) applications, addressing the critical need for miniaturization and high isolation in modern wireless systems. The design integrates staircase-shaped radiating elements and a comb-line Electromagnetic Band-Gap (EBG) structure to achieve an operational bandwidth of 3.28–12.77 GHz (122.5% fractional bandwidth), inter-port isolation exceeding 20 dB, and a return loss below  $-10$  dB. Fabricated on a  $26 \times 31$  mm Rogers RO4003 substrate ( $\epsilon_{\text{sub}} = 3.55$ ,  $\tan\delta = 0.0027$ ), the antenna exhibits omnidirectional radiation patterns with a peak gain of 1.14 dB and mutual coupling as low as  $-36.9$  dB. ANSYS HFSS simulations validate its performance, demonstrating an envelope correlation coefficient (ECC)  $< 0.01$  and total efficiency  $> 85\%$ . The antenna's compact form factor, wide bandwidth, and robust isolation make it suitable for 6G backhaul, IoT wearables, autonomous vehicles, and military communications.

**Keywords:** MIMO antenna

