

## **Design and development of Ni<sub>0.75</sub>Zn<sub>0.25</sub>Fe<sub>2</sub>O<sub>4</sub>/MWCNT microstrip patch antenna (MPA) for ISM band spectrum applications**

### **ABSTRACT**

This research paper represents the design and development of a microstrip patch antenna (MPA) for the ISM (Industrial, Scientific and Medical) band spectrum applications. The main objective of this paper is to analyze the performance of the MPA design using new engineering materials (Ni<sub>0.75</sub>Zn<sub>0.25</sub>Fe<sub>2</sub>O<sub>4</sub>/MWCNT) synthesized through chemical vapour deposition (CVD) method by utilizing the use of waste cooking oil (WCO) as a carbon source which acts as a printed radiating patch in order to replace a copper or gold (conventional) radiating patch in previous literature. The proposed antenna is fabricated on kapton substrate with dielectric constant,  $\epsilon_r = 3.4$  and loss tangent,  $\tan \delta = 0.004$ . The conducting patch is Ni<sub>0.75</sub>Zn<sub>0.25</sub>Fe<sub>2</sub>O<sub>4</sub>/MWCNT and ground antenna material is copper. The results demonstrate that the antenna is capable to comprehend return loss (RL) of  $-24.03$  dB at frequency of 2.43 GHz with bandwidth of 1.00 GHz and voltage standing wave ratio (VSWR) of 1.14. The antenna has overall dimensions of  $33.60 \times 41.74 \times 0.025$  mm<sup>3</sup>.

**Keyword:** Multi-walled carbon nanotube (MWCNT); Chemical vapour deposition (CVD); Electronic materials; Microstrip patch antenna (MPA); Return loss (RL); Voltage standing wave ratio (VSWR)