Ultra Thin Printed Monopole Based UWB Antenna with Extended 2.45 GHz ISM Band Operability

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The past decade has witnessed a great deal of research activities in the development and optimization of UWB systems due to their favored properties which include: configuration simplicity, high data rate, and low power consumption. UWB technology can be utilized in a wide spectrum of applications such as: Wireless Body Area Networks (WBANs), multimedia connectivity, medical imaging, etc. For most modern applications, the antenna is required to have an omni-directional and efficient radiation. Hence, printed monopole antennas are favored in UWB system implementation due to its compactness, low cost and simple fabrication process.

A compact Ultra Wide Band (UWB) antenna printed on a 50.8-µm Kapton polyimide Substrate is proposed in this paper. The semi-eliptical based radiating element is fed by a linearly tapered coplanar waveguide (CPW) which provides continuous transitional impedance for improved matching. The proposed design covers the standard UWB range which extends between 3.1 to 10.6 GHz. Furthermore, a T shaped structure is added to give rise to a resonance at 2.45 GHz which encompasses the Industrial, Scientific, Medical (ISM) band.

The radiating element and ground plane are printed on a 33 mm × 41 mm kapton polyimide substrate with a thickness of 50.8 µm and a dielectric constant of 3.4. A slot is confined by the T shaped structure and the semi-elliptical pattern which has a major radius of 12.4 mm and a minor radius of 11.7 mm. A parametric study is conducted to optimize the notch behavior between 2.6 and 3.1 GHz.

Good radiation characteristics, improved impedance matching, extra usability of the essential 2.45 GHz ISM band suggest that the antenna is a reasonable candidate for application that require the integration of ultra low profile antennas.

The figure below depicts the antenna geometry, dimensions (all in mm), and the reflection coefficient.