

A novel compact tree-design antenna (NCTA) with high gain enhancement for UWB application

Abstract

In this paper, a novel compact tree-design antenna (NCTA) for ultra-wideband (UWB) application with high gain and impedance matching improvement is analyzed and presented. The novel antenna is composed of a single centered circle connected to seven outer circles via three bridges with partial ground plane execution. Instead of functioning as filters, these seven circles play a major role in producing UWB's frequency resonant of 3.3 to 10.8 GHz with a minimum reflection coefficient of -10 dB ($|S_{11}| < -10$ dB). Furthermore, this compact antenna structure (38 mm × 38 mm) which is fed by the microstrip line generates a high gain of up to 5.5 dBi. Moreover, the proposed tree-design antenna possesses a linear polarization with a proficient omnidirectional radiation pattern at 3.5 and 5 GHz and a divisive radiation pattern at 7.5 and 10 GHz. The parametric study performed for the purpose of antenna compaction is emphasized in the details of this research. The numerical and measurement results exhibit the success of the antenna's performance. The attainable NCTA is sufficiently competent to be an initial structure consideration for the future Multi-Input Multi-Output (MIMO) development.