Optimization of a Hand-Fan Shaped Microstrip Patch Antenna by Means of Orthogonal Design Method of Design of Experiments for L-Band and S-Band Applications

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Abstract : A hand-fan shaped microstrip patch antenna (MPA) for L-band and S-band applications is designed, and its characteristics have been reconnoitered. The proposed microstrip patch antenna with double U-slot defected ground structure (DGS) is fabricated on an FR4 substrate which is a very readily available and inexpensive material. The suggested antenna is optimized using Orthogonal Design Method (ODM) of Design of Experiments (DOE) to cover the frequency range from 0.91-2.82 GHz for L-band and S-band applications. The L-band covers the frequency range of 1-2 GHz, which is allocated to telemetry, aeronautical, and military systems for passive satellite sensors, weather radars, radio astronomy, and mobile communication. The S-band covers the frequency range of 2-3 GHz, which is used by weather radars, surface ship radars and communication satellites and is also reserved for various wireless applications such as Worldwide Interoperability for Microwave Access (Wi-MAX), super high frequency radio frequency identification (SHF RFID), industrial, scientific and medical bands (ISM), Bluetooth, wireless broadband (Wi-Bro) and wireless local area network (WLAN). The proposed method of optimization is very time efficient and accurate as compared to the conventional evolutionary algorithms due to its statistical strategy. Moreover, the antenna is tested, followed by the comparison of simulated and measured results.

Keywords : design of experiments, hand fan shaped MPA, L-Band, orthogonal design method, S-Band

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