Design and analysis of a novel dielectric loaded helical antenna

Helical antennas have been a popular antenna configuration for various applications for its simple structure. This work describes the study on a novel, custom-shaped dielectric loaded helical antenna incorporated on an advanced material, which is Barium Strontium Titanate (BST). This material, which presents the researcher with an advantage in size reduction due to its high relative permittivity, is most suitably used when desiring a miniaturized antenna compared to its conventional design of the same type. In the process of designing, a parametric study was carried out by varying the antenna geometrical parameters and the dielectric loading using the transient solver. The detailed understanding of the sensitive parameters of the proposed antenna will allow for ease of design reuse. Finally, an extended exploration was also carried out in order to determine the design's suitability for operation with two of the WLAN Access Points (APs) already available in the market. Observation from this investigation found out that the three most sensitive parameters in the design are dielectric load's height, radius of ground plane and the helical height, with the dielectric load's height as the main design criteria. On the other hand, examination on the APs' integration found out that several factors influencing the radiation performance of the design are the material used, internal spacing available and overall shape of the APs. While both APs are proven to work with the designed antenna in the desired frequency range, a degradation of up to 1 dB in gain have been observed, when applying the antenna to the less suitable AP.