Abstract

The recent increase in the use of high-definition multimedia applications and contents by consumers created a growing need for high data rate availability. Therefore, Extra High Frequency (EHF) band is used to meet consumer's needs. Current technologies are unable to supply data rates comparable to wired standards such as Gigabit Ethernet (GbE) and High Definition Multimedia Interface (HDMI).

The 60 GHz frequency band has been selected as a suitable frequency for short-range communication systems. However, this frequency is attenuated by obstacles such as glass, wood, concrete, and human body, which adds more restriction on using it. This study addresses the limitation of the 60 GHz band by modifying building using ring Frequency Selective Surface (FSS) wallpaper to increase the utilization of 60 GHz band.

The ring FSS wallpaper response at 60 GHz band has been analyzed using both MATLAB and Computer Simulation Technology (CST) Microwave Studio (MWS) software. Wireless InSite is also used to demonstrate wave propagation in a modified building with ring FSS wallpaper to prove the enhancement of capacity. The demonstration is applied to Single Input Single Output (SISO) and Multiple Input Multiple Output (MIMO) systems to verify the effect of ring FSS wallpaper on such systems capacity, as well the effect of the suggested modification over delay spread has been studied in the MIMO scenario, while the effect of human body over capacity has been studied in the same scenario.

Numerical and simulation results are presented in this study, where the results prove that modifying building using ring FSS wallpaper is an attractive scheme for indoor 60 GHz wireless communications band while the capacity of the system has been significantly improved compared to the normal case.