Investigating Practical Deployment of Square Loop Frequency Selective Surfaces in the Indoor Wireless Environment

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Recent years have seen a surge in the popularity of indoor wireless systems, driven by technological progress and the advantages they provide over wired networks. Radio frequency interference is an important issue in indoor wireless systems where the transmitters and receivers are in close physical proximity to each other. Accordingly, techniques which can mitigate against the effect of interference are required. Some research has been done on the use of Frequency Selective Surfaces (FSSs) as a possible cost effective method for mitigating interference in indoor environments (G. Sung et. al*., IEEE Ant. Prop. Mag.*, Vol. 48, 29-37, 2006).

Physical features within the indoor environment can have significant effects on radio wave propagation (E. Lai et. al*., IEEE Int. Symp. Ant. Prop*., 1-4, 2008) (A. Austin et. al., *IEEE Int. Symp. Ant. Prop.*, 1-4, 2009) (J. T. P. Yiin, M. J. Neve, and K. W. Sowerby, "Propagation Modeling for Indoor Wireless Systems Using the Electric Field Integral Equation," in *Proc. IEEE APS/URSI Int. Symp.,* (Toronto, Canada), July 11–17 2010). Frequency selective surfaces are often fabricated as thin sheets to be supported by a substrate—most likely on building walls and partitions. The electromagnetic properties of the substrate, supports, wall structure and the office environment itself can have significant impact on FSS performance. Typical FSS designs consist of periodically repeating conductive elements which are usually assumed to be of infinite extent. This assumption may not be appropriate for real deployments where there are practical limits on the size and configuration of the FSS to be deployed. These limitations must be considered when designing FSS solutions for improving wireless system performances in indoor environments.

This research work is investigating possible practical deployments of the square loop FSS within indoor wireless environments. The influence of underlying wall structures is considered, together with the effects of finite FSS dimensions. The problems are modelled in Microwave Studio using the time-domain transient solver. The results will be presented from an electromagnetic perspective, with emphasis on the field interaction with and energy propagating through the FSS at different frequencies.