Single-Layer Multiband FSS for Wi-Fi Applications

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Wireless local area networks (WLAN) or Wi-Fi, operating in the 2.4 and 5 GHz bands, are currently saturating many indoor environments, such as hospitals, buildings, or offices. In a hospital's intensive care unit, unwanted electromagnetic interference (EMI) noises may cause life-support instruments to malfunction, hence endangering many patients' lives. To reduce or eliminate the co-channel interference with neighboring Wi-Fi systems, it is required to block the unwanted EMI noises and to contain the Wi-Fi signals within specific physical boundaries.

In the past, a two-layer frequency selective surface (FSS) printed with miniature fractal elements was shown to provide more than 38 dB attenuation for the Wi-Fi signals in the 2.4 GHz band (T.K. Wu, IEEE Int. APS/URSI Meetings, Sec. 506.8, 2014). However, the 5 GHz band was not considered and the design and fabrication of a two-layer FSS are more complicated and expensive. In addition, a single layer (FSS) has been designed with a combination of ring loop elements to block the Wi-Fi signals in 2.4 and 5 GHz bands (D. Ferreira, et. al., 9th EuCAP, 2015). But their FSS transmission results are shown for only one polarization. Moreover, the 2nd resonance frequency in the 5GHz band shifts drastically as the incident angle is greater than 30°. It is still desirable to find better element FSS for Wi-Fi applications.

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In this paper, single layer FSS with various conducting elements (double square loop, gridded fractal, or convoluted elements) etched on various dielectric substrates (Kapton, Duroid 6006, or TMM-6), will be designed and compared for Wi-Fi applications. Transmission results will be presented for various incident angles and for both TE and TM polarizations.