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ENHANCED ANTENNA PERFORMANCE AT 3.5 GHZ WITH A COMPACT AND INTELLIGENT REFLECTING SURFACE
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Abstract
Intelligent Reflecting Surface (IRS) is an upbound 5G technology capable of intelligently controlling and altering an electromagnetic (EM) wave. IRS is a planar 2D metamaterial or metasurface made up of many passive element reflecting elements connected to a smart controller, which is capable of introducing an independent phase shift and/or amplitude attenuation (collectively termed as “reflection coefficient”) to the incident signal at each reflecting element. Hence, in this research, an IRS was designed to operate at 3.5 GHz structured by a compact unit cell size of 21.4 mm x 21.4 mm with Circular Patch and Ring. The metasurface consists of FR-4 substrate with a dielectric constant of 4.3 and copper backplane as the ground plane. Generally, the IRS uses a PIN diode or varactor to achieve the configurability by the ON and OFF state. However in this research, the concept is proven by connecting and disconnecting metal strips to indicate the ON and OFF state. The reflection magnitude and phase are the main parameters that were analyzed in this research. In OFF and ON states, the magnitude of the reflection coefficient is -0.32 dB and -0.38 dB respectively with dynamic reflection range of 3250. A prototype for the OFF state has been fabricated and demonstrated as a reflecting surface for a horn antenna. The measured outcome, employing the reflecting surface positioned approximately 10 cm away from the horn antenna, indicates a decrease in return loss of approximately 72.2%. The results show that the proposed reflecting surface can be used as a good reflector in IRS at 3.5 GHz.

Author Keywords
5G; Circular Patch and Ring (CPR); measurement; metasurface; reconfigurable intelligent surface; unit cell

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