Radio-Transparent Dielectric Core Metasurface Antenna

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Recent advances in communication systems require increasingly closely packed integrated antenna systems, making the whole antenna system subject to undesired interferences. Although a few attempts have been made to address this ever-growing issue, finding an optimal design for an antenna system equipped with robust and functional cloaking shields remains a challenge.

We present a new approach for antenna blockage reduction that increases cloaking bandwidth and improves angular stability; a significant step forward in designing effective antennas for communication systems. Recently, we proposed the concept of transparent dielectric core metasurface antenna that exploits a low scattering host dielectric rod and appends an immersed metasurface with inductive properties to further reduce the scattering of the host at a high frequency bandwidth. At the same time, the inductive metasurface mimics the performance of a standard dipole radiator at a low frequency bandwidth.

In this work, we significantly improve this design by incorporating a second immersed metasurface with capacitive nature. With the addition of this second degree of freedom, we reduce the restrictions on the inductive (radiating) metasurface and hence optimize our design for better radiation characteristics in the low frequency band. In addition, the second immersed metasurface complements the cloaking performance of the first inductive metasurface improving its cloaking characteristics at the high frequency band. Our design, the Transparent Dielectric Core Double Metasurface Antenna (TDCDMA), also presents enhanced angular stability due to the nature of the immersed metasurfaces. Connected to a source, the conductive immersed metasurface can be driven to perform as a dipole radiator.

The topic of the presentation is to discuss the design procedure, advantages and results of our approach that combines designing an effective radiator at low band frequencies and while effectively minimizing the structure's scattering at the high frequency band.