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Gradient Index Metalens for WLAN Applications

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Abstract : The control of electromagnetic waves is a key aim of several researches over the past decade. In this regard, Metamaterials have shown a strong ability to manipulate the electromagnetic waves on a subwavelength scales thanks to its unconventional properties that are not available in natural materials such as negative refraction index, super imaging and invisibility cloaking. Metalenses were used to avoid some drawbacks presented by conventional lenses since focusing with conventional lenses suffered from the limited resolution because they were only able to focus the propagating wave component. Nevertheless, Metalenses were able to go beyond the diffraction limit and enhance the resolution not only by collecting the propagating waves but also by restoring the amplitude of evanescent waves that decay rapidly when going far from the source and that contains the finest details of the image. Metasurfaces have many mechanical advantages over three-dimensional metamaterial structures especially the ease of fabrication and a smaller required volume. Those structures have been widely used for antenna performance improvement and to build flat metalenses. In this work, we showed that a well-designed metasurface lens operating at the frequency of 5.9GHz, has efficiently enhanced the radiation characteristics of a patch antenna and can be used for WLAN applications (IEEE 802.11 a). The proposed metasurface lens is built with a geometrically modified unit cells which lead to a change in the response of the lens at different position and allow the control of the wavefront beam of the incident wave thanks to the gradient refractive index.

Keywords : focusing, gradient index, metasurface, metalens, WLAN Applications
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