ABSTRACT

This research discusses "Design and Realization of 5G Tranceiver Front End for Femtocell Areas" 5G technology, as an evolution in cellular telecommunications, promises large capacities that support thousands of simultaneous connections and various applications. This technology has a significant impact on the economic and industrial sectors by improving connectivity and data processing. In 5G technology, wide beams with high gain and capacity are needed towards the target. Therefore, it is recommended that 5G technology use a low frequency band, namely 3.5 GHz, for 5G applications. However, the drawback in 5G applications is that the antennas used are large and inflexible.

It is therefore advisable to use several methods such as metamaterials with metasurfaces to miniaturize wideband antennas, and reshape radiation patterns and redirect beams. In this context, Femtocells, a low-power wireless access solution, emerge as an efficient option to improve indoor connectivity. In this project, a 5G femto cell system is designed which consists of an antenna, metasurface, RF amplifier in the form of a Low Noise Amplifier and a High Power Amplifier. In this research, a metasurface was designed which aims to increase the gain value so that it does not require large antenna dimensions.

From the simulation results of the antenna used for this system, a gain value of 3.62 dBi was obtained. Then a metasurface design was carried out which aimed to increase the gain value, the results obtained were a VSWR value of 1,006, a return loss value of -49.61 with a bandwidth of 173 MHz, and a gain value of 4,316 dBi. After carrying out the design in the simulation, measurements were carried out on the metasurface antenna, resulting in a VSWR value of 1.07, a return loss value of -29.37 with a bandwidth of 173 MHz, and a gain value of 4.05 dBi. There is an increase in gain on the antenna when the metasurface component is added to the antenna, namely 3.62 dBi to 4,316 dBi, the percentage increase in gain on the antenna is 19.22%. Based on the simulation results and measurements carried out by antennas with metasurfaces, it can be realized in a system designed for 5G femtocells.

Keywords: 5G, *Femtocell*, Antenna, *Metasurface*.