The High Efficiency and Low Cost Massive MIMO Array Antenna for Sub-6GHz 5G Base Station

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Numerous studies for the concept of a 5th generation (5G) network device have been researching by an institutions and industry partners. For the successful changing and commercialization from 4G to 5G, several novel techniques are required at the hardware and software level. Recently, commercialization of base stations in the sub-6 band is underway before proceeding to 5G commercialization supporting mm-Wave frequency.

Massive MIMO antenna is one of the core technologies in the 5G network communication. It utilizes the advantages of large multi-antenna and phased array antenna technology, and adds RF and digital signal processing techniques. In addition, the optimization of various performance specifications is needed to take full advantage of the benefit of these technologies. For example, efficiency, gain, interference, and so on. The Base station antenna based on the N×1 sub-array having dual-fed for polarization diversity. A lot of sub-arrays are deployed for M × N array formation. In addition the complex TL (transmission lines) for managing phase and amplitude of each antenna are attached with antenna structure. In order to assemble the antenna and complex TL, multi-layered printed circuit board (PCB) has been used. However high-end PCB should be required for low loss and it leads to high cost.

In this paper, high efficiency and low cost Massive MIMO array antenna for a base station is proposed. The base station having 32 RF paths. And 16 2×1 sub-arrays are used for 4×4 array. The total ground size is about 270×530 mm.

Reducing of the number of layers of the PCB is a good solution in order to getting low cost. In this paper, the power divider for sub-arrays is designed on very cheap material (Liquid Crystal Polymer). We could reduce the PCB layer and get the high efficiency by using this material and an antenna divider line made of SUS (Stainless Use Steel).

Basically, the base station antenna has to be satisfied a lot of specifications. They are VSWR, Co-pol. isolation, Cross-pol. isolation, gain, horizontal/vertical beamwidth, steering/tilt angle, front-back ratio (FBR), upper side lobe level, and so on. In presentation, author will provide the antenna structure including the PCB. Also the initial design, the simulation results, and the passive/active pattern measurement will be shown. Especially, It will be explained that how to design the low loss power divider and radiator on LCP material in detail.