Flat Lens with Phased Array Antenna for 5G Fixed Wireless Access

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5th generation (5G) communication are disclosed by institutions and industry partners. Also, the Federal Communication Committee (FCC) announced new rules that would facilitate the adoption of the development of 5G wireless networks. Although a lot of standards for 5G are not determined yet, the visible developments are proceeding in order to secure a wide band to accept a required huge traffic. For greater network speed and capacity, fixed wireless network (FWA) has been developed as one of the 5G application technology. However, 28 GHz frequency for 5G causes many challengeable issues technically. Especially, undesirable losses from a concrete wall, foliage and window become critical obstacles. To overcome the problems, flat lens using phased array antenna systems that can support a beam steering and a high directivity simultaneously has been proposed.

In this paper, practical flat lens antenna design for FWA is suggested and implemented. The design of the lens is performed by using a common electromagnetic (EM) simulation and a computer based calculation. An MATLAB based design method is adopted to convert an array antenna beam pattern to required beam pattern. The phase profile of array antenna can be extracted from full EM simulation. Using MATLAB based calculation, the beam shape by effect of lens is easily estimated before a full wave EM simulation or a measurement. The three layered unit-cells are designed to have 360° phase compensation range. Two layered unit-cells are also studied for low cost implementation. The N x N unit-cells are deployed in order to obtain the required phase profile. The allocation of unit-cells are executed by python based design. The design procedures, the simulation results, and the measured results will be discussed in the presentation.