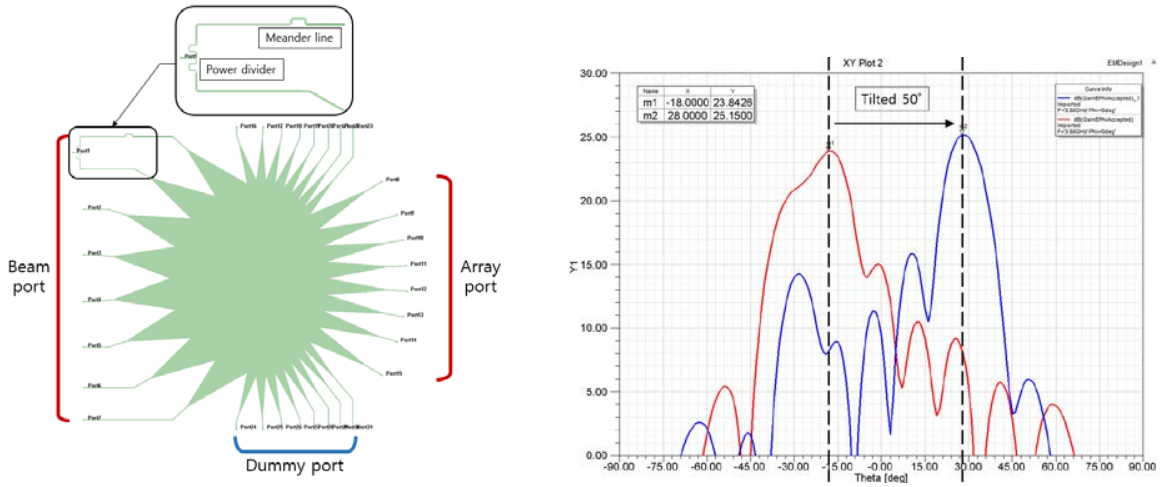
Asymmetric Beamwidth Beamforming Antenna Using Rotman Lens

In-Ryeol Kim(1), Dong-Woo Kim(1), Jae-Beom Jin(1), Soon-Soo Oh* (1)
(1) Chosun University, Gwanju, Republic of Korea
*ssoh@chosun.ac.kr

This paper design and fabricate an asymmetric beamwidth beamforming antenna operating at 3.55GHz. The asymmetric beamwidth was implemented by simultaneously applying the wave to the beam port of the Rotman lens. Designed antenna and Rotman lens were fabricated and the results were demonstrated by measurement.

All the substrates used in this research were TLY-5 substrates of Taconic Co., the dielectric constant(ε_r) of the substrate was 2.2, and the thickness of the substrate was 20 mil (0.508 mm). Figure 1 (a) shows the Rotman lens that outputs the designed asymmetric phase. The designed Rotman lenses have output array port magnitude values of about -10dB to -15dB for all input ports. The transmission coefficient and output phase difference of Rotman lens for all ports. Simulation results following, each array port output phase difference is -103 °, -65 °, -45 °, -16 °, +15 °, +45 °, 65 °, 107 °. The designed Rotman lens have symmetrical properties. For asymmetric beamwidth beamforming, simulated in seven directions for seven beam ports by connecting two beam ports of the Rotman lens to a power splitter.

Figure 1 (b) shows the simulation result of the radiation pattern of the antenna tilted asymmetrically when the outermost beam port of the Rotman lens is input. As a result, the maximum point of the radiation pattern is formed at -20 ° and the maximum tilting angle is 50 degrees.



(a) (b)

Figure 1. Simulate using ANSYS Designer (a) asymmetric Rotman lens (b) asymmetric beamforming.