

Vertical Strip Transmission Line Primary Radiator Etched on FR-4 Substrate at 60 GHz

Futoshi Kuroki and Tomonori Morita

Department of Electrical Engineering, Kure National College of Technology
2-2-11 Aga-Minami Kure , Hiroshima,737-8506, Japan

We devised a primary radiator made by the vertical strip transmission line whose center conductor was bent as an L-shape to transform the guided mode to radiated waves. This primary radiator was etched on the Glass Fiber PTFE substrate, and was placed in the parallel metal plates. And a reactive stub was installed on the vertical strip transmission line to suppress the reflection from the primary radiator.

In this paper, the Glass Fiber PTFE substrate was replaced by the FR-4 substrate from the viewpoint of cost reduction. Generally the dielectric loss tangent of the FR-4 substrate is larger than that of the Glass Fiber PTFE. For this reason the FR-4 substrate is hard to use in the millimeter wavebands. Recently, it was however suggested that the dielectric loss tangent of the FR-4 might decreased in the higher frequency region from the measurement reported in our laboratory.

Having this fact in mind, we used the FR-4 substrate having optimized etching pattern of the vertical strip line for the primary radiator in this paper. At first, we calculated the reflection coefficient versus the length of the vertical strip transmission line by using the electromagnetic simulator (Ansoft HFSS). And the end of the L-shaped portion was bended at 90 degrees and extended so as to decrease the reflection coefficient instead of the reactive stub. After optimization of the primary radiator, we calculated the reflection characteristics considering the housing for the actual measurement. And finally, we fabricated this primary radiator and evaluated the reflection and radiation characteristics. From the results, it was confirmed that the fabricated primary radiator would be suitable for use in the millimeter-wave planar antennas.