Triple Band Circularly Polarized Microstrip Antenna

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1 Introduction
In this paper, a triple band circularly polarized square MSA with two pair of crank slits is proposed and the antenna for GPS is designed. Moreover, the operational principle for triple band circular polarization is explained using the simulated electric current distributions.

2 Antenna Design
Figure 1 shows a proposed triple band circularly polarized square MSA. The geometry of the patch conductor is a square with two pair of crank slits at each edge. The antenna is excited by an L-probe feed [2] to enhance the bandwidth at the three frequency bands. A triple band MSA for GPS is designed according to the parametric studies.

3 Result and Discussion
For the simulations in this paper, the simulation software package FEKO [3], which is based on fast multipole moment method, is used.

Figure 2 shows the simulated results of the axial ratio and VSWR. The bandwidths of 3-dB axial ratio with 2-VSWR are 9.0 MHz in L5 band, 9.2 MHz in L2 band, 13 MHz in L1 band. The simulated bandwidths satisfy the specifications (4MHz) of the GPS [4].

Figures 3(a)-(c) show the time-averaged electric current distributions at triple band. In the L5 band, the electric current flows strongly on the T-shaped elements at the center of edges. In the L2 band, the electric current flows on the T-shaped elements and the elements between two crank slits. In the L1 band, although the electric currents flow on the elements between two crank slits, those on the T-shaped elements are very small. Therefore, the T-shaped elements, the inner crank slits and the outer crank slits operate as the radiation elements in the L1, L2 and L5 bands, respectively.

4 Conclusion
A triple band circularly polarized square MSA with two pairs of crank slits has been proposed. The operational principles of circular polarization at triple band have been clarified using simulated electric currents. Moreover, the proposed antenna is designed for GPS (L1, L2, and L5 bands).

References