Dipole- and Loop-Mode Switchable Origami Paper Antenna

Dongju Lee* and Sungjoon Lim
School of Electrical and Electronics Engineering, Chung-Ang University,
Seoul, Republic of Korea

In these days, demands of pattern reconfigurable antennas for adaptive wireless communication systems have been rapidly increasing. When the signal is received to the null position of the antenna, quality of service is dramatically reduced due to weak signal reception. This problem can be solved by pattern reconfigurable antennas. For instance, a dipole antenna and a loop antenna can be compensated because of their duality. At the null direction of the dipole antenna, the loop antenna can radiate with the maximum radiation intensity. Therefore, it is possible to remove shadow region by employing both dipole and loop antennas.

In this paper, we propose a pattern switchable origami antenna which provide both dipole and loop antennas by folding and unfolding paper. The proposed origami antenna is inkjet-printed on paper.

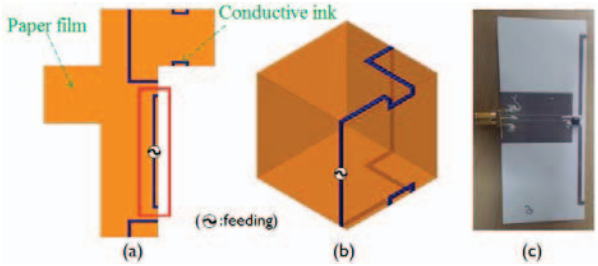

Fig. 1(a) λ/2 dipole antenna (b) 1λ loop antenna (c) fabricated dipole antenna

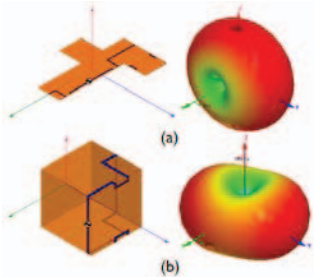

Fig.2 3-D Radiation pattern (a) dipole (b) loop antenna

Figure 1 shows the geometries of the proposed origami antenna. When the paper is unfolded, it is operating as a dipole antenna as illustrated in Fig. 1(a). When it is folded to a cube as shown in Fig. 1(b), it is changed to a loop antenna. Figure 1(c) shows the fabricated origami antenna. At each mode, the resonant frequency is kept to be 1.85 GHz. Figure 2 shows the simulated 3-D radiation patterns. It is observed that the radiation pattern is successfully switched and the null becomes compensated.

Acknowledgment
This research was supported by the MSIP(Ministry of Science, ICT&Future Planning), Korea, under the ITRC(Information Technology Research Center) support program (NIPA-2014-H0301-14-1015) supervised by the NIPA(National ICT Industry Promotion Agency).