Light Weight and Large Beamwidth Antenna Array for 2.4/5.8 GHz WLAN Applications

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Light weight vehicular antennas are increasingly being used for communications and intelligence applications. To further increase communication range and link performance over traditional antennas, new antennas are highly desirable with optimized performance such as low weight, and improved aerodynamics & electromagnetic performance.

Traditional omnidirectional antennas such as monopoles antennas are widely applied and installed on vehicles. This sets a limit in the broadcasting area that the vehicle can cover. And for larger area of coverage, the antenna with larger beamwidth should be used. To improve the antenna beamwidth/coverage, it is necessary to improve antenna radiation pattern and gain at the same time. To achieve this goal, it is meaningful to explore new designs such as 2-D switchable multi beam array or single antenna element with large beamwidth. In the past, a single band large beamwidth planar antenna using sequential feeding network has been proposed (C. Deng, Y. Li, Z. Zhang and Z. Feng, IEEE Trans. on Ant. and Propag., vol. 62, no. 3, 1461-1464). To the best of our knowledge, there has been no fully-printed large beamwidth dual-band antenna demonstrated so far. To fill this gap, in this work we design a new dual-band antenna with large beamwidth for 2.4/5.8 GHz WLAN bands.

To demonstrate the design concept, Fig. 1(a) shows the simulated 3D radiation pattern of a single-port monopole antenna. By using sequential feeding network printed on thin-flexible substrate, an array antenna consisting of four monopole elements is formed and its radiation pattern is shown in Fig. 1(b). It is observed that the single antenna element has an omni-directional dipole-like radiation pattern. While by employing the proposed antenna array, a quasi-isotropic radiation pattern with broad beamwidth is achieved. By further arranging the proposed antenna elements in a rotationally symmetrical structure, complete full spatial coverage could be achieved with dual-band operation.

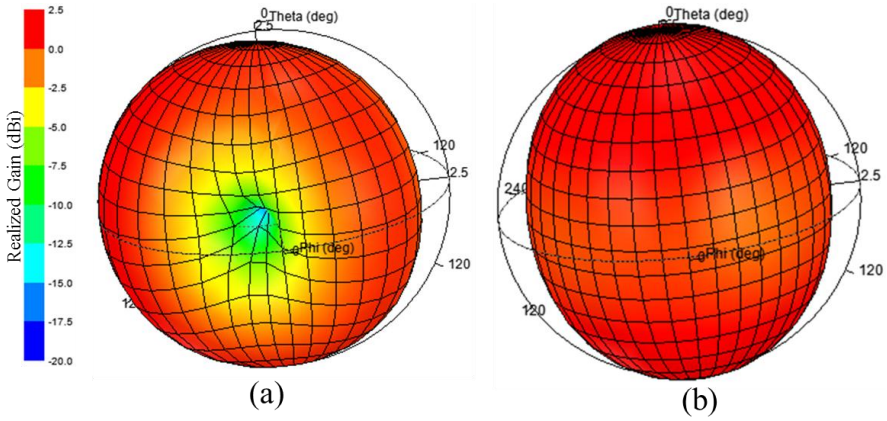

Figure 1. Simulated radiation pattern of: (a) a single antenna element; (b) an antenna array consisting of four antennas elements.