Influence of FSR Element Shape on FSR Backed Dipole Antenna Applied to Mobile Base Station Antenna

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Reflector backed dipole antenna (RBD) is a typical configuration used for mobile base station antennas because the antenna has broadband characteristics and it is easy to form dual-polarized sector radiation pattern. Recent mobile communication systems are working in multiple frequency bands from 700 MHz to 2 GHz bands, thus multi-band operation is required for the base station antenna. Several types of multi-band antennas have been developed and installed in commercial systems so far. Recently, 3.5 GHz band has much attention as a new mobile communication frequency band.

The spacing between reflector and dipole element is an important design parameter for the RBD. Thus, when the reflector is commonly used in the multi-band RBD, dipole elements for high frequency bands should be placed closer to the reflector. In that case, radiation pattern in the high frequency band may be distorted by the current induced on the low frequency dipole elements which are placed in front of the high frequency dipole element.

We try to overcome the problem by using frequency selective surface as a reflector of the RBD for high frequency bands. We call the surface 'frequency selective reflector (FSR)'. By using this technique, the reflector can be separately placed from that of the low frequency band RBD, then the undistorted radiation pattern can be obtained both in the low and high frequency bands. In this presentation, we especially focus on the influence of the shape of FSR element on the radiation characteristics of the RBD for the application of mobile communication base station antenna.

We consider a dual-band antenna operating 800 MHz and 3.5 GHz bands, and FSR is applied to 3.5 GHz band antenna here. The effectiveness of using dipole array configuration in the H-plane will be also presented to stable the radiation pattern.