Antenna with Parasitic Radiators for Front-to-Back Ratio Enhancement.

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With the rapid development of wireless communication systems, there is a growing demand for enhanced service. For the successful changing and commercialization from 4G to 5G which has relatively short transmit distance, service providers need to install the more base station antennas in the service area. One of the biggest challenges will be faced in the upcoming next-generation 5G era is a phenomenon known as cell interference between the co-located base station antennas. Especially in highly concentrated communication environment such as a cell consisting of multiple antennas (i.e. sector antenna), the interference by the back lobe is very important. Therefore, suppression of back lobe radiation is required for efficient cell planning and improve the capacity. For this reasons, the front-to-back ratio (FBR) is defined as the ratio of power gain between the beam peak and the lowest ratio of total power in the rear ±30º angular region as a base station antenna standard, and the service providers are asking hardware manufacturers more than 25 dB of FBR.

In the past, a lot of techniques have reported improving the (FBR) or the antenna such as placing a reflector or an absorber in the antenna downside, adding metal sidewalls and using an electromagnetic band-gap. However, the main disadvantages of these methods are increasing the SLL and the size of the antenna as well as expensive manufacturing cost.

In this paper, a method to reduce the back lobe radiation of the antenna is proposed, designed with folded dipole-shaped parasitic radiators. The parasitic radiators are placed periodically near the ends of the antenna ground plane to reduce the radiating energy that causes the back lobe radiation using phase cancellation phenomenon. Through the full-wave simulation, optimal positions and sizes of the parasitic radiator are investigated to provide a design guideline and the parametric analysis is carried out to analyze the effects of the proposed. The proposed method is also suitable for array applications not only the single antenna or small array, a large array formed with the proposed antenna is also designed, fabricated, and measured. The results reveal that the proposed method has great suppression effects on the back lobe radiation without any changing the other antenna parameters such as gain, half power beamwidth, and cross polarization ratio (CPR). Because the proposed method does not need further antenna design or modification, it is very easy to design and manufacture. In addition, the biggest advantage is that there are no problems such as volume increase, expensive cost of SLL, and deformation of the main lobe, which is a problem of previous FBR reduction methods.