

Beam-reconfigurable crescent array antenna with AMC plane

ABSTRACT

A beam-reconfigurable crescent array antenna with AMC plane is presented for application at 9.41 GHz. The unit cell of the AMC plane is modeled based on a square patch integrated with rectangular ring slot with mirrored C-shaped structures, placed between two layers of Taconic TLY-5 substrate and located near to the main radiating element. The presented AMC design is achieved an operating bandwidth of 2.82 GHz (30%) with a center frequency of 9.41 GHz. It is found that the AMC plane can reduce the thickness of the structure in comparison to the use of a conventional ground plane, which leads to the overall compactness size of the proposed antenna of $1.1\lambda \times 2.57\lambda$. Moreover, through the implementation of 12×4 AMC unit cell, the proposed antenna improved its performance with a maximum gain and total efficiency of 10.5 dB and 97%, respectively. Meanwhile, the antenna reconfigurability is realized by integrating RF MEMS switches on its right and left arm symmetrically. The presence of a T-shaped Yagi-Uda-like parasitic further widened the beam steering angle to $\pm 63^\circ$ via mutual coupling. The obtained results demonstrate a good agreement between the simulation and measurement and have a huge potential for development of X-band radar.