Gap Waveguide Technology Helps Design Efficient Antennas Arrays for mmWave Applications

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Abstract

Gap waveguide (GWG) technology will be introduced in this talk, which is a highly efficient guiding structure at millimeter-wave bands. It is self-packaged with no radiation losses. Based on this technology, several highly efficient antenna arrays will be presented. In addition, examples of added functions to the arrays will be presented, such as Diplexers separating transmit and receive bands and monopulse array with compact comparable based on the gap waveguide technology, and leaky-wave antenna array for frequency scanning properties.

The fifth-generation (5G) and beyond for the wireless network was the driving force in increasing the demand for millimeter-wave frequency systems to cover the high demand for faster data and reliable service in mobile communication. At these frequencies, the propagation path loss and material losses increase reducing the system efficiency. Therefore, there is a need for efficient millimeter-wave guiding structures that overcome such limitations. Gap waveguide (GWG) technology is found to overcome such limitations at millimeter-wave bands. The advantages of this structure are in its suitability for millimeter-wave applications as it is self-packaged with no radiation losses. Such a guiding structure is based on the bandwidth of the electromagnetic bandgap (EBG) of a periodic structure within which the guiding structure is operating. A minimum of 1:2 bandwidth is achievable with the possibility of increasing it under some conditions. The GWG can be realized using several technologies. Using such highly efficient guiding structures, highly efficient antenna arrays are realized. In this talk, several highly efficient antenna arrays will be presented. In addition, examples of added functions to the arrays will be presented such as Diplexers separating transmit and receive bands and monopulse array with compact comparable based on the gap waveguide technology, and leaky wave antenna array for frequency scanning properties.