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Comparison of Unit - Cell and All - Cells Active Element Patterns of Small Antenna Array

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Abstract

In this paper, an array of microstrip patch array antenna has been designed and simulated for 5G applications at 28 GHz. Beamforming which requires pattern analysis remain significant especially for 5G communication as it is able to mitigate high path loss at high frequency. Thus, an accurate pattern analysis is essential in order to obtain accurate beamforming capability. Active element pattern is one of the techniques, considering better accuracy as it includes mutual coupling effect between elements in antenna array . In many cases, unit - cell AEP was preferable because full element -by- element analysis was time consuming and complex especially for infinite or large antenna arrays. However, this analysis is less accurate for small antenna arrays due to different neighboring elements between centre-fed and edge-fed elements which makes all - cells AEP is more accurate rather than unit - cell AEP. This paper compares between unit - cell (UC) and all - cells (AC) of active element patterns (AEPs) in 1 by 4 patch antenna array . The geometrical design of the microstrip patch array antenna is simulated and executed using CST Microwave Studio (CST MWS). Both (AEPs) are obtained from simulation for pattern synthesis in beamforming. The results show that AC-AEP performs better for pattern synthesis compared to UC-AEP. Thus, AC-AEP is recommended for pattern synthesis of small antenna arrays rather than UC-AEP. © 2020 IEEE.

Author keywords

5G pattern synthesis; array antenna ; beamforming; Linear Array ; microstrip antenna

Engineering controlled terms
Antenna feeders; Beam forming networks; Beamforming; Cells ; Cytology; Directional patterns (antenna); Microstrip antennas; Microwave antennas; Slot antennas; Sound recording

Engineering uncontrolled terms
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