Performance Analysis of Linearly arranged Concentric Circular Antenna Array with Low Sidelobe Level and Beamwidth Using Robust Tapering Technique.

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Abstract

In this research, a novel antenna array named Linearly arranged Concentric Circular Antenna Array (LCCAA) is proposed concerning lower beamwidth, lower sidelobe level, sharp ability to detect the false signal, and impressive SINR performance. The performance of the proposed LCCAA beamformer is compared with geometrically identical existing beamformers using the conventional technique where the LCCAA beamformer shows the lowest beamwidth and sidelobe level (SLL) of 12.50° and -15.17 dB in equal element accordingly. However, the performance gets degraded due to looking direction error, and robust techniques—fixed diagonal loading (FDL), optimal diagonal loading (ODL), and variable diagonal loading (VDL) are applied to all the potential arrays to minimize this problem. Furthermore, the LCCAA beamformer is further simulated to reduce the sidelobe applying tapering techniques where the hamming window shows the best performance having 17.097 dB less sidelobe level compared to the uniform window. The proposed structure is also analyzed under a robust tapered (VDL-hamming) method which reduces around 69.92 dB and 48.39 dB more sidelobe level compared to conventional and robust techniques. Analyzing all the performances, it is clear that the proposed LCCAA beamformer is superior and provides the best performance with the proposed robust tapered (VDL-hamming) technique.

Full Text

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Figures
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Block diagram of the concentric circular antenna array-based communication system.
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Figure 3

Antenna arrays.

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(c) UCCAA antenna array (33 elements).

(d) CECCAA antenna array (34 elements).

(e) UCECCAA antenna array (34 elements).

(f) ULCCAA antenna array (102 elements).
Figure 4

LCCAA antenna array (102 elements).

Figure 5

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