

BROADBAND BEAMFORMING AND DIRECTION FINDING  
USING CONCENTRIC RING ARRAY

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ABSTRACT

Sensor arrays have been used widely in applications including radar, sonar, seismology, biomedicine, communications and imaging. A very popular type of sensor array is circular array, which has almost invariant array pattern in azimuthal plane. This dissertation considers beamformer design and direction finding for a broadband source using concentric ring array(CRA) that contains many concentric rings of different radii. The multi-ring structure of a CRA has several advantages including the flexibility in array pattern synthesis and adaptive array design.

We first proposed three CRA array pattern synthesis techniques, which can be used to control the sidelobe and/or mainlobe width of the array pattern of a deterministic broadband beamformer. We then proposed a flexible partially adaptive broadband beamformer design based on element-space approach. Finally, we proposed an efficient direction finding technique for broadband source using CRA. The proposed design techniques are corroborated by experiments from simulated as well as measured data.