

Some new almost difference sets via finite fields

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Abstract

Several investigations on antenna arrays focus on the “thinning” problem wherein one would like to reduce the number of array elements with respect to the original filled layouts. The rationale to do so is to economize costs, weight, consumption of power etc. But this typically would result in the loss of SLL (sidelobe level) control and gain when compared to the filled arrangements. Caorsi, S., Lommi, A., Massa, A. and Pastorino, M. [2004] have successfully used the so-called “difference sets” (DS), a rich class of combinatorial objects in thinned-array design procedures, to synthesize thinned arrays with controlled sidelobes. Oliveri, G., Donelli, M., and Massa, A. [2009] go a step further and exploit the use of a more general class of combinatorial objects known as “almost difference sets” (ADS) since the admissible array configurations embrace a much larger terrain in their generalization. Several construction techniques based on finite fields and cyclotomy are obtained during the last decade providing infinite classes of ADS. We obtain some new examples of such objects using a finite field of order 31, thereby obtaining an almost perfect sequence of length 62 whose existence status was previously open. Further such examples are likely and are being investigated in our REU project supported by NSF.