Recursive constructions for large caps

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Abstract

We introduce several recursive constructions for caps in projective spaces. These generalize the known constructions in an essential way and lead to new large caps in many cases. Among our results we mention the construction of $\{(q+1)(q^2+3)\}-$caps in $PG(5,q)$, of $\{q^4+2q^2\}$-caps in $PG(6,q)$ and of $q^2(q^2+1)^2$-caps in $PG(9,q)$.

1 Introduction

A **cap** in $PG(k-1,q)$ is a set of points no three of which are collinear. If we write the n points as columns of a matrix we obtain a (k,n)-matrix such that every set of three columns is linearly independent, hence the generator matrix of a linear orthogonal array of strength 3. This is a check matrix of a linear code with minimum distance ≥ 4. We arrive at the following:

Theorem 1. *The following are equivalent:*

- *A set of n points in $PG(k-1,q)$, which form a cap.*
- *A q-ary linear orthogonal array of length n, dimension k and strength 3.*
- *A q-ary linear code $[n,n-k,4]_q$.*

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