Abstract

Characterization results on minihypers

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Let $\mathrm{PG}(n, q)$ denote the n-dimensional projective space over GF(q), the finite field of order q, $q = p^h$, p prime. Denote by θ_n the size of the point set of $\mathrm{PG}(n, q)$.

Definition(Hamada and Tamari [1]) An $\{f, m; N, q\}$-minihyper is a pair $(F; w)$, where F is a subset of the point set of $\mathrm{PG}(n, q)$ and w is a weight function $w : \mathrm{PG}(n, q) \to \mathbb{N} : P \mapsto w(P)$, satisfying

1. $w(P) > 0$, $P \in F$,
2. $\sum_{P \in F} w(P) = f$, and
3. min$\{\sum_{P \in H} w(P) : H$ is a hyperplane$\} = m$.

The weight function w determines the set F completely. When this function has only the values 0 and 1, then $(F; w)$ is determined completely by the set F and the minihyper is denoted by F. We present the following new result.

Theorem An $\{\epsilon_1(q+1) + \epsilon_0, \epsilon_1; n, q\}$-minihyper, q square, $\epsilon_1 + \epsilon_0 < \frac{q^{7/12}}{\sqrt{2}}$ and with at most $\frac{q^{1=6}}{\sqrt{2}}$ multiple points in the case $n = 3$, is a sum of

1. lines
2. $\mathrm{PG}(2, \sqrt{q})$
3. $\mathrm{PG}(3, \sqrt{q})$

References

[1] N. Hamada and T. Helleseth. Codes and minihypers. Proceedings of the Third European Workshop on Optimal Codes and Related Topics, OC'2001, June 10-16, 2001, Sunny Beach, Bulgaria, pages 7984, 2001.