Abstract

Weighted $\{\delta v_{\mu+1}, \delta v_{\mu}; k-1, q\}$-minihypers, q a square prime power

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(joint work with Leo Storme)

The Griesmer bound in coding theory states that if there exists a linear $[n, k, d; q]$ code for given values of k, d and q, then $n \geq \sum_{i=0}^{k-1} \lceil d/q^i \rceil = g_q(k, d)$, where $\lceil x \rceil$ denotes the smallest integer greater than or equal to x.

An $\{f, m; k-1, q\}$-*minihyper* is a pair (F, w), where F is a subset of the point set of $\mathrm{PG}(k-1, q)$ and where w is a weight function $w : \mathrm{PG}(k-1, q) \to \mathbb{N} : x \mapsto w(x)$, satisfying:

(1) $w(x) > 0 \Leftrightarrow x \in F$,

(2) $\sum_{x \in F} w(x) = f$, and

(3) $\min_{H \in \mathcal{H}} \left(\sum_{x \in H} w(x) \right) = m$, where $\mathcal{H}$ denotes the set of hyperplanes of $\mathrm{PG}(k-1, q)$.

Minihypers in projective spaces were introduced to study linear codes meeting the Griesmer bound. Namely, the existence of particular weighted minihypers is equivalent to the existence of linear codes meeting the Griesmer bound.

But minihypers are also interesting for solving geometrical problems. In particular, the class of weighted $\{\delta v_{\mu+1}, \delta v_{\mu}; k-1, q\}$-minihypers, with $v_s = (q^s - 1)/(q-1)$, is interesting for the study of many geometrical problems.

In this talk, we report on new classification results for these minihypers when q is a square: for small values of δ, these minihypers are sums of subspaces $\mathrm{PG}(\mu, q)$ and of (projected) subgeometries $\mathrm{PG}(2\mu+1, \sqrt{q})$.

Results for q a cube prime power will be presented in the talk of Leo Storme.