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Infinite families of non linear MRD codes

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Let $M_{m,m'}(\mathbb{F}_q)$, with $m \leq m'$, be the rank metric space of all the $m \times m'$ matrices with entries in the finite field $\mathbb{F}_q$. The *distance* between two matrices is the rank of their difference. An $(m, m', q; s)$-*rank distance code* is any subset X of $M_{m,m'}(\mathbb{F}_q)$ such that the minimum distance between two of its distinct elements is $s + 1$. It is *linear* if it is a linear subspace of $M_{m,m'}(\mathbb{F}_q)$.

It is known that $|X| \leq q^{m'(m-s)}$ (*Singleton-like bound*) [3]. When this bound is achieved, X is called $(m, m', q; s)$-*MRD code*.

There are some infinite families of linear MRD codes for all possible values of the parameters m, m', q and s (see e.g. [3]). In finite geometry $(m, m, q; m - 1)$-MRD codes are known as *spreadsets* [1].

To the extent of our knowledge the only non-linear MRD codes, that are not *spreadsets*, are the $(3, 3, q; 1)$-MRD codes provided in [2]. In this talk, we will report on a construction of infinite families of non-linear $(m, m, q; m - 2)$-MRD codes, for $q \geq 3$ and $m \geq 3$ (see [4]) that generalize the MRD codes in [2].

References

[1] P. Dembowski, *Finite Geometries*. Springer 1968.

[2] A. Cossidente, G. Marino, F. Pavese, Non-linear maximum rank distance codes, *Des. Codes Cryptogr.*, DOI 10.1007/s10623-015-0108-0.

[3] Ph. Delsarte, Bilinear forms over a finite field, with applications to coding theory, *J. Combin. Theory Ser. A* **25** (1978), 226–241.

[4] N. Durante, A. Siciliano, Non-linear maximum rank distance codes in the cyclic model for field reduction of finite geometries. Submitted (2016).

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