Connection between t-packings and QMDS codes

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We studied additive codes, defined as $\mathbb{F}_q$-linear subspaces $C \subseteq \mathbb{F}_{q^h}^n$ of length n and dimension r over $\mathbb{F}_q$. Such a code is said to be of type $[n, r/h, d]_q^h$, where d denotes the minimum Hamming distance and the normalized dimension r/h may be fractional. A central object of interest is the class of quasi-MDS (QMDS) codes, those additive codes achieving the generalized Singleton bound:

$$d = n - \left\lceil \frac{r}{h} \right\rceil + 1.$$

In this work, we construct explicit families of additive QMDS codes whose lengths exceed those of the best-known $\mathbb{F}_{q^h}$-linear MDS codes, such as Reed–Solomon codes. By leveraging $\mathbb{F}_q$-linearity and geometric tools like partial spreads and dimensional dual arcs, we show that additive structures allow longer codes without sacrificing optimality in distance. We also examine dual codes and give conditions under which the QMDS property is preserved under duality.