$\mathbb{Z}_2\mathbb{Z}_4$-additive codes: duality and invariants

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A code $\mathcal{C}$ is $\mathbb{Z}_2\mathbb{Z}_4$-additive if the set of coordinates can be partitioned into two subsets X and Y such that the punctured code of $\mathcal{C}$ by deleting the coordinates outside X (respectively, Y) is a binary linear code (respectively, a quaternary linear code). Their corresponding binary images, via the Gray map, are called $\mathbb{Z}_2\mathbb{Z}_4$-linear codes. As for binary and quaternary linear codes, for these codes the fundamental parameters are found and standard forms for generator and parity-check matrices are given. Moreover, two invariants for these $\mathbb{Z}_2\mathbb{Z}_4$-linear codes, the rank and dimension of the kernel, have been studied. Specifically, given the parameters of the code, the possible values of these two invariants, giving lower and upper bounds, are established. For each possible rank r and dimension of the kernel k between these bounds, there exists a $\mathbb{Z}_2\mathbb{Z}_4$-linear code having these values. These invariants have been used in the classification of some families of $\mathbb{Z}_2\mathbb{Z}_4$-linear codes.

References

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