

Tilings by $(0.5, n)$ -Crosses and Perfect Codes

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The existence question for tiling of the n -dimensional Euclidian space by crosses is well known. A few existence and nonexistence results are known in the literature. Of special interest are tilings of the Euclidian space by crosses with arms of length one, known also as Lee spheres with radius one. Such a tiling forms a perfect code. In this paper crosses with arms of length half are considered. These crosses are scaled by two to form a discrete shape. We prove that an integer tiling for such a shape exists if and only if $n=2^t-1$ or $n=3^t-1$, $t>0$. A strong connection of these tilings to binary and ternary perfect codes in the Hamming scheme is shown.

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