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Abstracts

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PREFACE

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On the structure of a class of spherical designs

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A spherical τ-design is a finite subset of the unit sphere S^{n-1} such that for every polynomial $f(x_1, x_2, \ldots, x_n)$ of degree at most τ, the average of f over the sphere equals the average of f over the design. We investigate the structure of $(2k)$-designs of cardinality of magnitude n^{k-1} in the asymptotic process when the strength $\tau = 2k$ is fixed and the dimension n tends to infinity.

Using a polynomial approach and connections between $(2k)$-designs and antipodal $(2k+1)$-designs we obtain restrictions on the structure of such designs. It follows that, for certain constant γ, all designs of cardinality at most γn^{k-1} have structure which resembles the structure of the designs of minimal possible cardinality.

On the weight enumerators of $[218, 6, 144]_3$ codes

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Let $GF(q)$ denote the Galois field of q elements, and let $V(n,q)$ denote the vector space of all ordered n-tuples over $GF(q)$. The *Hamming weight* of a vector x is the number of nonzero entries in x. A linear code C of length n and dimension k over $GF(q)$ is a k-dimensional subspace of $V(n,q)$. Such a code is called an $[n,k,d]_q$ code if its minimum Hamming distance is d. For a linear code, the minimum distance is equal to the smallest of the weights of the nonzero codewords.

A central problem in coding theory is that of optimizing one of the parameters n, k and d for given values of the other two and q-fixed. One of the three possible versions is:

Problem: Find $n_q(k,d)$, the smallest value of n for which there exists an $[n,k,d]_q$ code.

A code which achieves this value is called *n-optimal.*

It is known that $218 \leq n_3(6,144) \leq 220$. In this paper we investigate hypothetical $[218,6,144]_3$ codes. The obtained results are:

Theorem 1 *If there exist a $[218,6,144]_3$ code C, then:*

1) The possible nonzero weights are 144, 153, 162, 171 and 180.

2) There exist 32 possibilities for the weight enumerator of C with $A_{180} > 0$.