

## New nonexistence results for some spherical designs

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A spherical  $\tau$ -design is a finite set  $C \subset \mathbf{S}^{n-1}$  such that the equality

$$\sum_{x \in W} f(\langle x, y \rangle) = |C|f_0 \quad (1)$$

holds for arbitrary  $y \in \mathbf{S}^{n-1}$ , a real polynomial  $f(t)$  of degree at most  $\tau$ , and where  $f_0$  is the first coefficient in the Gegenbauer expansion  $f(t) = \sum_{i=0}^k f_i P_i^{(n)}(t)$ .

We apply (1) and some geometric arguments for obtaining restrictions on the structure of designs with relatively small cardinalities. New nonexistence results for 3- and 5-designs of odd cardinalities are obtained both in small dimensions and in certain asymptotic process.