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Maximal arc partitions of designs

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Abstract

It is known that the designs $\mathrm{PG}_{n-1}(n,q)$ in some cases have spreads of maximal α-arcs. Here a α-arc is a non-empty subset of points that meets every hyperplane in 0 or α points. The situation for designs in general is not so well known. This paper establishes an equivalence between the existence of a spread of α-arcs in the complement of a Hadamard design and the existence of an affine design and a symmetric design which is also the complement of a Hadamard design.

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Keywords: Design; Hadamard 2-design; Arc

1. Introduction

An α-arc in a 2-design is a subset of points that meets every block in either 0 or α points. [7,8].

Rahilly [6] established the equivalence of the existence of an affine design of class number 4 and a Hadamard 2-design possessing a spread of lines of maximum size 3. By observing that a line of maximum size 3 in a Hadamard design is a 1-arc in the complementary design, we are able to extend this result and to state it in the language of maximal arcs in designs.

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