ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

INVITATION TO A GUEST LECTURE

BENT PARTITIONS AND ASSOCIATION SCHEMES

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N.2.35

ABSTRACT

A partition Ω of an n-dimensional vector space $\mathbb{V}_n$ over $\mathbb{F}_p$ into an $n/2$-dimensional subspace U, and subsets $A_1, \ldots, A_K$, is called a bent partition if every function $\mathbb{V}_n \to \mathbb{F}_p$ with the following property is a bent function.

(I) Every $c \in \mathbb{F}_p$ has precisely K/p of the sets A_i in its pre-image set $f^{-1}(c) = \{x \in \mathbb{V}_n^{(p)} : f(x) = c\}$, and

(II) f is constant on U.

We have recently constructed bent partitions of $\mathbb{V}_n = \mathbb{F}_{p^m} \times \mathbb{F}_{p^m}$ (i.e., $n = 2m$) from semifields, whose duals satisfy a linearity property over a subfield of $\mathbb{F}_{p^m}$. These partitions can be seen as a generalization of the classical semifield spread. We show that the sets of such a partition, and any union of these, are partial difference sets. Equivalently, such a partition of $\mathbb{F}_{p^m} \times \mathbb{F}_{p^m}$, induces a decomposition of the complete graph with vertex set $\mathbb{F}_{p^m} \times \mathbb{F}_{p^m}$ into strongly regular graphs. This enables the construction of amorphic association schemes from semifields, whose duals satisfy a linearity property over a subfield of $\mathbb{F}_{p^m}$.

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We hope to see you there!

