

# INVITATION TO A GUEST LECTURE

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**“BENT PARTITIONS AND ASSOCIATION SCHEMES”**

📍 N.2.35

📅 Thursday, 22 September 2022

🕒 10:00 a.m.

## Abstract

A partition  $\Omega$  of an  $n$ -dimensional vector space  $\mathbb{V}_n$  over  $\mathbb{F}_p$  into an  $n/2$ -dimensional subspace  $U$ , and subsets  $A_1, \dots, A_K$ , is called a bent partition if every function  $\mathbb{V}_n \rightarrow \mathbb{F}_p$  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  $\mathbb{F}_{p^m}$ .

This is a joint work with Tekgöl Kalaycı and Wilfried Meidl. This work is supported by TÜBİTAK Project under Grant 120F309.

Wilfried Meidl and the Department of Mathematics look forward to seeing you at the talk!

