Galois Geometries and Applications II
(Chair/Président: **Petr Lisonek** (Simon Fraser University)
Org: **Jan De Beule** (Ghent University) and/et **Petr Lisonek** (Simon Fraser University))

MICHAEL BRAUN, University of Applied Sciences, Darmstadt, Germany
q-Analog of Packing Designs

A $P_q(t, k, n)$ q-packing design is a selection of k-subspaces of $\mathbb{F}_q^n$ such that each t-subspace is contained in at most one element of the collection. A successful approach adopted from the Kramer-Mesner-method of prescribing a group of automorphisms was applied by Kohnert and Kurz to construct some constant dimension codes with moderate parameters which arise by q-packing designs. In this talk we recall this approach and give a version of the Kramer-Mesner-method breaking the condition that the whole q-packing design must admit the prescribed group of automorphisms. Finally, we give some improvements on the size of $P_2(2, 3, n)$ q-packing designs.

JAN DE BEULE, Ghent University
Constructing Cameron-Liebler line classes with large parameter

We report on joint work with Jeroen Demeyer, Klaus Metsch and Morgan Rodgers to construct Cameron-Liebler line classes with parameter $x \in \mathcal{O}(q^2)$. The geometrical understanding of the orbits of the points of $\mathrm{PG}(3, q)$ under a group of order $q^2 + q + 1$ preserving the desired Cameron-Liebler line class, together with the representation of $\mathrm{AG}(3, q)$ as $\mathbb{F}_{q^3}$ plays a central role. We overview the state of the art of the currently known examples, [1, 2].

References

[1] M. Rodgers. Private communication.

[2] M. Rodgers. Some new examples of cameron-liebler line classes in $\mathrm{PG}(3, q)$. *Des. Codes Cryptogr.*, to appear, DOI: 10.1007/s10623-011-9581-2

MAARTEN DE BOECK, UGent
The Erdős-Ko-Rado problem for geometries

An Erdős-Ko-Rado set of a finite geometry is a set of k-dimensional subspaces such that any two subspaces have a non-empty intersection. It is maximal if it is non-extendable regarding this condition. The general Erdős-Ko-Rado problem asks for the size and the classification of the (large) maximal Erdős-Ko-Rado sets. In this talk we will focus on finite projective spaces (finite vector spaces), finite polar spaces and designs. I will present recent results on Erdős-Ko-Rado sets of generators of a polar space, on Erdős-Ko-Rado sets of planes in projective and polar spaces and on Erdős-Ko-Rado sets of blocks in a unital.

SARA ROTTEY, Vrije Universiteit Brussel
The automorphism group of linear representations

We discuss the automorphism group of linear representations of projective point sets. A linear representation $T_n^*(K)$ of a point set K is a point-line geometry embedded in $PG(n + 1, q)$. The common misconception was that for $T_n^*(K)$ every automorphism is induced by a collineation of its ambient space. This is not true in general. We prove that every automorphism is induced by an automorphism of $T_n^*(S)$, where S is the smallest subgeometry containing K. By use of field reduction, we uncover the full automorphism group of $T_n^*(S)$. This is joint work with Stefaan De Winter and Geertrui Van de Voorde.

ALFRED WASSERMANN, Department of Mathematics
Construction of q-analogs of Steiner systems

The notion of t-designs and Steiner systems has been extended to vector spaces by Cameron and Delsarte in the 1970s. In projective geometry, q-analogs of Steiner systems are called (s, r)-spreads. Metsch (1999) conjectured that q-analogs of Steiner systems do not exist for $t \geq 2$. Here, we show how we constructed the first examples of $S_2[2, 3, 13]$ q-analogs of Steiner systems. For the search we prescribed the normalizer of a Singer cycle as automorphism group and solved the resulting system of Diophantine linear equations. This is joint work with M. Braun, T. Etzion, P. Östergård, and A. Vardy.