

СЪЮЗ НА МАТЕМАТИЦИТЕ В БЪЛГАРИЯ
ИНСТИТУТ ПО МАТЕМАТИКА И ИНФОРМАТИКА – БАН

НАЦИОНАЛЕН КОЛОКВИУМ ПО МАТЕМАТИКА

Поредната сбирка на Колоквиума ще се състои на 14 ноември 2023 г. (**вторник**) от 16:15 часа в Заседателната зала на Института по математика и информатика.

Доклад на тема:

Arcs of High Divisibility and Their Applications to Coding Theory

ще изнесе

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Arcs of High Divisibility and Their Applications to Coding Theory

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(based on joint papers with Sascha Kurz, Francesco Pavese, Assia Rousseva)

The $(t \bmod q)$ -arcs were introduced as a tool for an unified treatment of the extension problem for linear codes [4]. An arc \mathcal{K} in $\text{PG}(r, q)$ is called a $(t \bmod q)$ -arc if $\mathcal{K}(L) \equiv t \pmod{q}$ for every line L from $\text{PG}(r, q)$. If in addition $\mathcal{K}(P) \leq t$ for every point P then \mathcal{K} is called a strong $(t \bmod q)$ -arc.

There exists a general lifting construction for (strong) $(t \bmod q)$ -arcs which given a $(t \bmod q)$ arc in $\text{PG}(r, q)$ produces such an arc in $\text{PG}(r + 1, q)$. It was conjectured that all strong indecomposable $(t \bmod q)$ -arcs in $\text{PG}(r, q)$ for $r \geq 3$ are lifted. This conjecture turned out to be wrong. Three exceptional $(3 \bmod 5)$ -arcs in $\text{PG}(3, 5)$ of respective sizes 128, 143 and 168 that are not lifted were constructed by computer in [2]. This result was used to fill in the gap in the non-existence proof for the putative $[104, 4, 82]_5$ -code. A geometric (computer-free) description of the three exceptional $(3 \bmod 5)$ -arcs was presented in [3]. One of them uses the Abatangelo-Korchmaros-Larato cap of size 20 in $\text{PG}(3, 5)$ [1], while the other two are based on the elliptic and hyperbolic quadrics.

In this talk, we present a geometric description of the three exceptional $(3 \bmod 5)$ -arcs in $\text{PG}(3, 5)$ and prove that every strong $(3 \bmod 5)$ -arc in $\text{PG}(r, 5)$, $r \geq 4$, is either lifted or a quadratic arc.

References

- [1] V. Abatangelo, G. Korchmaros, B. Larato, Classification of maximal caps in $\text{PG}(3, 5)$ different from elliptic quadrics, *J. of Geometry* **57**(1996), 9–19.
- [2] S. Kurz, I. Landjev, A. Rousseva, Classification of $(3 \bmod 5)$ -arcs in $\text{PG}(3, 5)$, *Adv. in Math. of Comm.*, **17**(1) (2023), 172–206. doi:10.3934/amc.2021066
- [3] S. Kurz, I. Landjev, F. Pavese, A. Rousseva, The Geometry of $t \bmod q$ arcs, *Des. Codes Cryptogr.* 2023, <https://doi.org/10.1007/s10623-023-01290-w>
- [4] I. Landjev, A. Rousseva, Divisible Arcs, Divisible Codes and the Extension Problem for Arcs and Codes, *Probl. of Inf. Trans.*, **55**(3)(2019), 30–45.