Abstract

Cameron-Liebler line classes in AG$(3, q)$

Jonathan Mannaert

Vrije Universiteit Brussel, Belgium.

Cameron-Liebler (CL) line classes were first observed by Cameron and Liebler to classify certain subgroup structures in PG$(3, q)$. A CL line class $\mathcal{L}$ is characterized by the property that for every line spread $\mathcal{S}$ it holds that $|\mathcal{L} \cap \mathcal{S}| = x$. This fixed number $x \in \mathbb{N}$ is called the *parameter* of $\mathcal{L}$. The goal of this talk is to consider CL line classes $\mathcal{L}$ and its properties in AG$(3, q)$, see [2], with a similar definition as in PG$(3, q)$. Because AG$(3, q)$ has significantly more line spreads then PG$(3, q)$, a CL line class in AG$(3, q)$ is actually a special type of CL line class in PG$(3, q)$. This will induce the inherence of many properties for CL line classes in PG$(3, q)$. One of these properties is a non-existence condition based on the modular equality obtained in [4], which allows us to calculate an upper bound on the possible parameters x of a CL line class in AG$(3, q)$. A second important consequence is the existence of a CL line class of parameter $x = \frac{q^2-1}{2}$ in AG$(3, q)$, for $q \equiv 5$ or $9 \mod 12$. This example will be based on the example found in [1] and [3]. These results will imply a classification of the parameters of a Cameron-Liebler line class in AG$(3, q)$, $q \leq 5$.

Joint work with Jozefien D'haeseleer, Leo Storme and Andrea Švob.

References

[1] Jan De Beule, Jeroen Demeyer, Klaus Metsch, and Morgan Rodgers. A new family of tight sets in $\mathcal{Q}^+(5, q)$. *Des. Codes Cryptogr.*, 78(3):655–678, 2016.

[2] Jozefien D'haeseleer, Jonathan Mannaert, Leo Storme, and Andrea Švob. Cameron-Liebler line classes in AG$(3, q)$. *Finite Fields Appl.*, 67:101706, 2020.

[3] Tao Feng, Koji Momihara, and Qing Xiang. Cameron-Liebler line classes with parameter $x = \frac{q^2-1}{2}$. *J. Combin. Theory Ser. A*, 133:307–338, 2015.

[4] Alexander L. Gavrilyuk and Klaus Metsch. A modular equality for Cameron-Liebler line classes. *J. Combin. Theory Ser. A*, 127:224–242, 2014.