Maximal Arcs in $PG(2,2^m)$
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This thesis is concerned with the study of Mathon maximal arcs in $PG(2,2^m)$. These maximal arcs are constructed using $\{p,q\}$-maps over some subgroup $A \leq F_{2^m}$. We study the problem of determining the largest degree of a Mathon maximal arc which is not a Denniston maximal arc. When $m \geq 5$ and $m \neq 9$, we prove that Mathon maximal arcs generated by $\{p,1\}$-maps have degree at most $2^{m/2} + 1$ if they are not Denniston maximal arcs. We also prove the existence of such non-Denniston maximal arcs of degree $2^{m/2} + 1$. For general $\{p,q\}$-maps, our bound is one dimension larger than the dimension of the degree of the known constructions. That is, when $m \geq 7$ and $m \neq 9$, the largest degree of a non-Denniston maximal arc generated by a $\{p,q\}$-map is either $2^{m/2} + 1$ or $2^{m/2} + 2$. This result is joint work with Ka Hin Leung and Qing Xiang.

We also investigate maximal arcs that are the union of mutually disjoint conics, sharing a nucleus. We prove that such maximal arcs of degree 4 are Denniston maximal arcs. In general, we conjecture that such arcs are exactly the Mathon maximal arcs, and we provide some evidence for this conjecture.

Key words

Arc, linearized polynomial, maximal arc, quadratic form