On small complete arcs in projective planes

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Let $PG(2, q)$ be the projective plane over the field $GF(q)$. A $k$-arc in $PG(2, q)$ is a set of $k$ points, no three of which are collinear. A $k$-arc in $PG(2, q)$ is called complete if it is not contained in a $(k + 1)$-arc in $PG(2, q)$. A $k$-arc corresponds to a $[k, 3, k - 2]$ maximum distance separable code (MDS code); a complete arc corresponds to a code that cannot be extended. Then, coding theory motivates us to the study of the spectrum of values of $k$ for which a complete $k$-arc exists in $PG(2, q)$. In particular, we are interested in the value of $t_2(2, q)$, the smallest size of a complete arc in $PG(2, q)$. We will prove the following new upper bounds on $t_2(q)$: $t_2(97) \leq 28$; $t_2(q) \leq 30$, for $q = 109, 121, 125$; and $t_2(q) \leq 36$, for $q = 137, 139, 151$.

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