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A recursive construction of strength-4 covering arrays using an ovoid in $PG(3, q)$

A strength- t covering array $CA(N; t, k, v)$, is an $N \times k$ array over a v -set such that in any t -set of columns, each t -tuple occurs at least once in a row. We employ an ovoid (maximum-sized k -cap with $k = q^2 + 1$) in $PG(3, q)$ and its plane sections, called Möbius planes, to build new strength-4 covering arrays. For odd q , we identify three truncated Möbius planes such that for any choice of circles from each plane, their intersection size is at most three. From this, we construct a strength-4 covering array $CA(3q^4 - 2; 4, \frac{q^2+1}{2}, q)$. By extending one of these truncated Möbius planes to a full one and applying a recursive construction, we further obtain a $CA(3q^4 + (q - 2)(2q^3 - q); 4, q^2 + 1, q)$. For $q \geq 11$, these covering arrays improve the size of the best-known covering arrays with the same parameters.

This is joint work with Lucia Moura and Brett Stevens.