Asymptotics of Covering Arrays of Higher Index

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A *covering array of index* λ is an $N \times k$ array (N rows, k columns), where every entry is from the set $\{1, \cdots, v\}$, such that every t columns of the array contain every t-tuple of values at least λ times; t is the *strength*, and λ is the *redundancy*. Covering arrays arise in testing of large-scale complex systems; the *covering array number* is the minimum number of rows for which a covering array exists with k columns, entries from $\{1, \cdots, v\}$, strength t, and redundancy λ. Godbole, Skipper, and Sunley proved an upper bound for the covering array number of $\log k + \lambda \log\log k$ rows when v, t are constant. We improve on their analysis by showing that the covering array number is $\log k + \lambda$, which is asymptotically optimal (again when v, t are constant). This is joint work with Mason Calbert.

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