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*(0,1)-matrices arising from Generalized Hadamard matrices*

Let $G$ be a group of order $n$. A $(n, k; \lambda)$-*difference matrix* over $G$ is a $k \times n\lambda$ matrix $D = (d_{ij})$ with entries from $G$, so that for each $1 \leq i < j \leq k$, the multiset

$$\{d_{i\ell} d_{j\ell}^{-1} : 1 \leq \ell \leq n\lambda\}$$

contains every element of the group $\lambda$ times. The multiplication table in any finite field $\mathbb{F}_n$ forms an $(n, n; 1)$-difference matrix. An $(n, n\lambda; \lambda)$-difference matrix over the group $G$ is said to be a *generalized Hadamard matrix*, over the group $G$. Concentrating on generalized Hadamard matrices arising from finite fields, some very interesting applications which lead to symmetric designs and commutative association schemes will be discussed. This is a joint work with Sara Sasani and Sho Suda.