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Research Announcement: Recursive Construction for Families of Difference Sets

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Recursive construction for families of difference sets

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A (v, k, λ, n)-difference set is a k-subset D of a group G of order v for which the multiset $\{d_1 d_2^{-1} : d_1, d_2, \in D\}$ contains each nonzero element of G exactly λ times; $n = k - \lambda$. We give a recursive construction for families of difference sets with parameters

$$v_i = u^i v_0 + u^{i+2} n_0 (u^i - 1)/(u - 1)$$
$$k_i = u^i \lambda_0 + u^i n_0 (u^{i+1} - 1)/(u - 1)$$
$$\lambda_i = u^i \lambda_0 + u^i n_0 (u^i - 1)/(u - 1)$$
$$n_i = u^{2i} n_0$$

for each integer $i \geq 0$, where u is integer. This parameter family includes as special cases the Hadamard parameters (satisfying $v = 4n$), the McFarland parameters, and the Spence parameters. We construct examples of difference sets with McFarland parameters in an infinite family of groups in which existence was previously unknown. We also construct new infinite families of difference sets whose parameters do not belong to any previously known family. In particular, we construct $(320, 88, 24, 64)$-difference sets in the groups $Z_2^6 \times Z_5$, $Z_2^4 \times Z_4 \times Z_5$, and $Z_2^2 \times Z_4^2 \times Z_5$. Details of the construction will be given in a forthcoming paper.