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Jordan D. Webster* (jdwebster@midmich.edu), 1233 Buckingham Pl., Mount Pleasant, MI.

Reversible and DRAD difference sets via tiling structures.

Difference sets with parameters $(4m^2, 2m^2 - m, m^2 - m)$ are known as Hadamard (or Menon) difference sets. In this talk, we will use rational idempotents in the group ring to develop a theory of tiles. We will show the usefulness of tiles by creating both reversible and DRAD difference sets in groups of the form $(C_{2^r})^3$. We will also use tiling theory to give necessary conditions for both reversible and DRAD difference sets in abelian 2-groups. (Received September 11, 2010)