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THE SANDPILE GROUP OF CAYLEY GRAPHS

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[Mentor: Victor Reiner]

**Abstract of Report Talk:** The **Abelian Sandpile Model** and its recurrent configurations, known as the **Sandpile group**, are abundant in modern mathematics and have combinatoric, algebraic, and geometric descriptions. Past work has focused on the sandpile group of the  $n$ -dimensional hypercube. In this project, we perform a more general analysis on the Cayley graph of the group  $\mathbb{F}_2^r$  and any of its generating sets. While the  $p$ -syLOW component of the sandpile group has been classified for  $p \neq 2$ , significantly less is known about the 2-syLOW component. In this paper, we use representation theory and ring theory to prove a sharp upper bound for the largest 2-syLOW subgroup in the sandpile group of an arbitrary Cayley graph. We also partially classify the number of 2-syLOW subgroups in the sandpile group and make further reductions into determining its structure. Using these reductions, we provide a full classification of the sandpile group for the  $r = 2$  case and other enlightening results for small  $r$  cases.

[Joint work with Vaughan McDonald, Jiyang Gao, Amal Mattoo]

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