

Switched symplectic graphs and their 2-ranks

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We apply Godsil-McKay switching to the symplectic graphs over \mathbb{F}_2 with at least 63 vertices and prove that the 2-rank of (the adjacency matrix of) the graph increases after switching. This shows that the switched graph is a new strongly regular graph with parameters $(2^{2\nu} - 1, 2^{2\nu-1}, 2^{2\nu-2}, 2^{2\nu-2})$ and 2-rank $2\nu + 2$ when $\nu \geq 3$. For the symplectic graph on 63 vertices we investigate repeated switching by computer and find many new strongly regular graphs with the above parameters for $\nu = 3$ with various 2-ranks. Using these results and a recursive construction method for the symplectic graph from Hadamard matrices, we obtain several graphs with the above parameters, but different 2-ranks for every $\nu \geq 3$.

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