

# Some self orthogonal designs, self orthogonal codes and strongly regular graphs from the linear group $L_4(3)$

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**SAMS Subject Classification: Algebra**

We construct self-orthogonal codes obtained from the row span over  $\mathbb{F}_2$  or  $\mathbb{F}_3$  of the incidence (resp. adjacency) matrices of some self-orthogonal designs (resp. strongly regular graphs) defined by the action of the simple linear group  $L_4(3)$  on the conjugacy classes of some of its maximal subgroups. We establish some properties of these codes and the nature of some classes of codewords, especially those of minimum and maximum weight. Further, we describe the structure of the stabilizers of minimum and maximum weight codewords and show that in many instances these are maximal subgroups of the automorphism groups of the corresponding codes or of  $L_3(4)$ . Some of the codes are optimal or near optimal for the given length and dimension. The dual codes of the graphs admit majority logic decoding.