

ABSTRACT. Let  $G$  be a countable Abelian group with  $\mathbb{Z}^d$  as a subgroup so that  $G/\mathbb{Z}^d$  is a locally finite group. (An Abelian group is locally finite if every element has finite order.) We can construct a rank one action of  $G$  so that the  $\mathbb{Z}$ -subaction is 2-simple, 2-mixing and only commutes with the other transformations in the action of  $G$ .

Applications of this construction include a transformation with square roots of all orders but no infinite square root chain, a transformation with countably many nonisomorphic square roots, a new proof of an old theorem of Baxter and Akcoglu on roots of transformations, and a simple map with no prime factors. The last example, originally constructed by del Junco, was the inspiration for this work.