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Signed or oriented Cayley graphs with nice spectrum

Let G be a finite abelian group. We consider signed or oriented Cayley graphs on G , whose adjacency matrices are symmetric or skew symmetric $(0,1,-1)$ matrices, respectively. We give a characterization of when all the eigenvalues of such a graph are integer multiples of $\sqrt{\Delta}$ for some fixed square-free integer Δ . This generalizes a result of Bridges and Mena on when a Cayley graph on G has only integer eigenvalues. Our result also characterizes signed or oriented Cayley graphs on which continuous quantum walks are periodic. This is joint work with Chris Godsil.