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Some unitary-related invariants of group C^* -algebras

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We study to what extent Abelian group C^* -algebras $C^*(\Gamma)$ are characterized by their unitary groups. We compare the results obtained with other unitary-related invariants of $C^*(\Gamma)$, such as the K -theoretic $K_1(C^*(\Gamma))$ and find that C^* -algebras of nonisomorphic torsion-free Abelian groups may have isomorphic K_1 -groups, in contrast with the known fact that $C^*(\Gamma)$ (even Γ) is characterized by the topological group structure of its unitary group when Γ is torsion-free and Abelian. For general groups this is no longer true, since $K_1(C^*(\Gamma))$ distinguishes between groups with different finitely generated torsion-free quotients, while $\mathcal{U}(C^*(\Gamma))$ needs not.