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Protected gates for topological quantum field theories

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We give restrictions on the locality-preserving unitary automorphisms U, which are protected gates, for topologically ordered systems. For arbitrary anyon models, we show that such unitaries only generate a finite group, and hence do not provide universality. For abelian anyon models, we find that the logical action of U is contained in a proper subgroup of the generalized Clifford group. In the case D(?2), which describes Kitaev's toric code, this represents a tightening of statement previously obtained within the stabilizer framework (PRL 110:170503). For non-abelian models, we find that such automorphisms are very limited: for example, there is no non-trivial gate for Fibonacci anyons. For Ising anyons, protected gates are elements of the Pauli group. These results are derived by relating such automorphisms to symmetries of the underlying anyon model: protected gates realize automorphisms of the Verlinde algebra. We additionally use the compatibility with basis changes to characterize the logical action. This is joint work with M. Beverland, F. Pastawski, J. Preskill and S. Sijher.