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Quantum reference frames for general symmetry groups

Treating reference frames as physical systems, subject to the laws of quantum mechanics, they become quantum reference frames. Located at the interplay of quantum and gravitational physics, their treatment marks an essential step towards the construction of a relational quantum theory. In this work, we introduce a relational formalism which identifies coordinate systems with elements of a symmetry group G. We define a general operator for reversibly changing between quantum reference frames associated to a group G. This generalises the known operator for translations and boosts to arbitrary finite and locally compact groups, including non-Abelian groups.

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