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Absence of Quantum Time Crystals in Ground States HARUKI WATANABE, UC Berkeley, MASAKI OSHIKAWA, University of Tokyo — In analogy with crystalline solids around us, Wilczek recently proposed the idea of “time crystals” as phases that spontaneously break the continuous time translation into a discrete subgroup. The proposal stimulated further studies and vigorous debates whether it can be realized in a physical system. However, a precise definition of the time crystal is needed to resolve the issue. Here we first present a definition of time crystals based on the time-dependent correlation functions of the order parameter. We then prove a no-go theorem that rules out the possibility of time crystals defined as such, in the ground state of a general Hamiltonian which consists of only short-range interactions.

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