

Time Crystals

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Time crystals are quantum many-body systems which, due to interactions between particles, are able to self-organize spontaneously their motion in a periodic way in time by analogy with the formation of crystalline structures in space in condensed matter physics [1]. In solid state physics properties of space crystals are often investigated with the help of external potentials that are spatially periodic and reflect various crystalline structures. A similar approach can be applied for time crystals, as periodically driven systems constitute counterparts of spatially periodic systems, but in the time domain [1].

The basic idea of the so-called discrete time crystals [2][3][4], that have been already realized in the experiments [5][6], will be presented. Moreover, it will be shown that condensed matter problems ranging from Anderson localization in time or single particles in potentials of quasi-crystal structure in time to many-body systems with exotic long-range interactions in the time domain can be realized with an appropriate periodic driving [1][7][8][9]. Moreover, it is possible to create molecules where atoms are bound together due to destructive interference if the atomic scattering length is modulated in time [9].

References

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