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Quantum Time Crystal By Decoherence in Incommensurate Charge Density Wave Ring KEIJI NAKATSUGAWA, Dept. of Appl. Phys., Hokkaido Univ., TOSHIYUKI FUJII, Dept. of Physics, Asahikawa Medical Univ., SATOSHI TANDA, Dept. of Appl. Phys., Hokkaido Univ., DEPT. OF PHYSICS, ASAHIKAWA MEDICAL UNIV. COLLABORATION — A quantum time crystal (QTC)[1,2] is a novel quantum mechanical ground state which breaks time-translation symmetry $\mathcal{T}$. $\mathcal{T}$ of a system with thermodynamic (infinite-volume) limit is expected to become discrete by spontaneous $\mathcal{T}$ breaking[1], but the possibility to realize such system is still under debate [3,4]. Meanwhile, Volovik[5] proposes the possibility of an effective QTC, that is, a QTC with a finite size in time. In this presentation we show that $\mathcal{T}$ of a finite-size system becomes discrete by a "decoherence measurement", which is best described using an incommensurate charge density wave (ICDW). We use a ring-shaped ICDW threaded by a fluctuating magnetic flux to model an effective QTC with a finite size in space and time: $\mathcal{T}$ becomes discrete by measuring the ground state of an ICDW ring and the lifetime of the QTC is extended using decoherence[6].

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