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Metamaterial Analogue of Continuous Time-Crystal

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Abstract – **Time crystals are an eagerly sought phase of matter in which time-translation symmetry is broken. Quantum time crystals with discretely broken time-translation symmetry have been demonstrated in trapped atomic ions, atoms and spins while continuously broken time-translation symmetry has been observed in an atomic condensate inside an optical cavity. Here we report that a classical metamaterial nanostructure, a two-dimensional array of plasmonic metamolecules supported on flexible nanowires, can be driven to a state possessing all key features of a continuous time crystal: continuous coherent illumination by light resonant with the metamolecules' plasmonic modes triggers a spontaneous phase transition to a state in which transmissivity oscillations result from a many-body interaction among plasmonic metamolecules and which is characterized by long range order in space and time. As the state can be manipulated optically, the phenomenon is of interest to topological and non-Hermitian physics and application in frequency conversion, memory, modulation, nonreciprocity and amplification.**

REFERENCES

[1] Tongjun Liu, Jun-Yu Ou, K. MacDonald, N.I. Zheludev, "Photonic Analogue of Continuous Time-Crystal". arXiv:2209.00324 **(**2022).