Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

The Way to Phase Space Crystals[1] LINGZHEN GUO, MARTHALER MICHAEL, GERD SCHÖN, Karlsruhe Institute of Technology (KIT) — A novel way to create a band structure of the quasienergy spectrum for driven systems is proposed based on the discrete symmetry in phase space. The system, e.g., an ion or ultracold atom trapped in a potential, shows no spatial periodicity, but it is driven by a time-dependent field. Under rotating wave approximation, the system can produce a periodic lattice structure in phase space. The band structure in quasienergy arises as a consequence of the n-fold discrete periodicity in phase space induced by this driving field. We propose explicit models to realize such a phase space crystal and analyze its band structure in the frame of a tightbinding approximation. The phase space lattice differs fundamentally from a lattice in real space, because its coordinate system, i.e., phase space, has a noncommutative geometry. The phase space crystal opens new ways to engineer energy band structures, with the added advantage that its properties can be changed in situ by tuning the driving fields parameters.

[1]Carl-Zeiss Stiftung

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Date submitted: 02 Nov 2015 Electronic form version 1.4