Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Subharmonic Shapiro steps in sliding colloidal monolayers[1] ANDREA VANOSSI, CNR-IOM Democritos SISSA, Trieste, Italy, STELLA PARONUZZI, SISSA, Trieste, Italy, GABRIELE FORNASIER, NICOLA MANINI, Dipartimento di Fisica, Universita' di Milano, Italy, GIUSEPPE E. SANTORO, SISSA, Trieste, Italy, ERIO TOSATTI, SISSA ICTP, Trieste, Italy — We examine the possibility to observe dynamical mode locking, in the form of Shapiro steps, when a time-periodic potential modulation is applied to two mutually sliding incommensurate 2D lattices. Specifically we present realistic MD simulations of a monolayer of charged colloids that are dragged by an external force over an optically generated periodic potential, where the colloid sliding is enacted through the motion of soliton or antisoliton lines between locally commensurate domains. Clear integer Shapiro steps, with the synchronous rigid advancement of the whole monolayer, known from previous studies [1], are found. The jump between one step and the next during each AC cycle corresponding to particles jumping from one patch to the next, across the soliton boundary. We find additional smaller "subharmonic" steps. Here, the overall colloid advancement takes several AC cycles. At each cycle, different subsets of particles negotiate the soliton line between commensurate domains [2]. The wide parameter tunability of colloid monolayers makes these predictions potentially easy to access in an experimentally rich 2D geometry. [1] A. Libal et al., Phys. Rev. Lett. 96, 188301 (2006). [2] S. Paronuzzi et al., J. Phys. Cond. Matt., in press (2015)

[1]Supported by ERC Advanced Grant N. 320796 MODPHYSFRICT

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Date submitted: 05 Nov 2015 Electronic form version 1.4