

MAR16-2015-020090

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

From Discrete Breathers to Many Body Localization and Flatbands

SERGEJ FLACH¹, Center for Theoretical Physics of Complex Systems, Institute for Basic Science, Daejeon, South Korea

Discrete breathers (DB) and intrinsic localized modes (ILM) are synonymic dynamical states on nonlinear lattices - periodic in time and localized in space, and widely observed in many applications. I will discuss the connections between DBs and many-body localization (MBL) and the properties of DBs on flatband networks. A dense quantized gas of strongly excited DBs can lead to a MBL phase in a variety of different lattice models. Its classical counterpart corresponds to a 'nonergodic metal' in the MBL language, or to a nonGibbsean selftrapped state in the language of nonlinear dynamics. Flatband networks are lattices with small amplitude waves exhibiting macroscopic degeneracy in their band structure due to local symmetries, destructive interference, compact localized eigenstates and horizontal flat bands. DBs can preserve the compactness of localization in the presence of nonlinearity with properly tuned internal phase relationships, making them promising tools for control of the phase coherence of waves.

¹also at: New Zealand Institute of Advanced Study, Massey University, Auckland, New Zealand