# SYIM 2 Intrinsic Modes II

Time: Thursday 17:00–18:30 Room: HSZ 04

## Invited Talk

SYIM 2.1 Thu 17:00 HSZ 04

**Anomalous decay in doped alkali halides: Breather-induced impediments to relaxation** — •Lawrence S. Schulman — Clarkson University, Potsdam, New York 13699-5820, USA

Enhanced and nonexponential decay of luminescence is found in some doped alkali halides following the absorption of a high energy photon by the impurity. This is explained by the formation of a discrete breather that prevents relaxation of the crystal. Impurity atoms in relatively long-lived states are driven by the crystal into shorter lifetime states leading to the enhancement. Because of the scale of these breathers, a quantum treatment is necessary, and we have found by path integral and other methods that aside from quantum tunneling (which is expected to be negligible) the breather is stable.

References:

L. S. Schulman, E. Mihokova, A. Scardicchio, P. Facchi, M. Nikl, K. Polak, B. Gaveau, Slow relaxation, confinement, and solitons, Phys. Rev. Lett. 88, 224101 (2002).

E. Mihokova, L. S. Schulman, K. Polak and W. Williams, The role of breathers in anomalous decay, Phys. Rev. E 70, 016610 (2004).

L. S. Schulman, D. Tolkunov and E. Mihokova, Structure and time-dependence of quantum breathers, Chem. Phys., to appear, 2005.

## Invited Talk

SYIM 2.2 Thu 17:30 HSZ 04

**Intrinsically Localized Modes in Josephson Arrays** — •Ken Segall — Colgate University, Hamilton, NY 13346 USA

Intrinsically Localized Modes (ILMs) are believed to exist in variety of condensed matter systems. One system in which they have been observed experimentally is in arrays of superconducting Josephson junctions. ILMs in Josephson arrays are also known as Discrete Breathers due to the discreteness of the individual junctions. The dynamics of a Josephson junction is similar to that of a damped and driven pendulum, a basic nonlinear element. A Josephson junction's physical parameters are easily controlled by micro-fabrication techniques; thus coupled junctions form an ideal system to study nonlinear phenomena such as nonlinear localization. This talk will review the experimental progress on ILMs in Josephson arrays to date. We will focus on the different types of Discrete Breathers, and how in fact they have been experimentally observed. We will also look at how Discrete Breathers can interact with other excitations such as linear resonances or nonlinear vortices. Finally, we will discuss how a 3-junction circuit similar to a Discrete Breather can be potentially used in an application involving Josephson junctions as single photon detectors.

## Invited Talk

SYIM 2.3 Thu 18:00 HSZ 04

**Localized matter waves** — •Markus Oberthaler — Kirchhoff Institut für Physik, Universität Heidelberg, Im Neuenheimer Feld 227, 69120 Heidelberg, Germany

The realization of weakly interacting degenerate Bose-gases has opened up the way to experimentally investigate the regime, where interaction between matter waves can lead to localization. In this talk we will discuss the special case of localization in presence of repulsive atom-atom interaction.

In the first part of the talk we will concentrate on the propagation of interacting matter waves in periodic potentials. We will discuss in detail the formation of localized i.e. atomic gap solitons, in a weak periodic potential [1]. In the regime of deep periodic potentials i.e. an array of weakly coupled condensates, we have observed for the first time macroscopic quantum self-trapping [2]. In contrast to the gap soliton the localization is due to the modification of the local dynamics between neighbouring sites in the presence of interaction.

In the second part of the talk we will report on the localization due interaction in a double-well potential [3]. We confirm experimentally that the exhibited dynamics is a nonlinear generalization of the familiar Josephson effect which is characterized by oscillating but also self-trapped modes.

[1] B. Eiermann et al., Phys. Rev. Lett. 92, 230401(2004)

[2] Th. Anker et al., Phys.Rev.Lett. 94, 020403 (2005)

[3] M. Albiez et al., Phys.Rev.Lett. 95,010402 (2005)