Joint Seminar Organized by the Department of Electrical and Electronic Engineering, IEEE Photonics Society (Hong Kong Chapter) and the Department of Mechanical Engineering

Title:

Bright solitons from defocusing nonlinearities

Speaker:

Professor Boris A. Malomed

Department of Physical Electronics, Faculty of Engineering

Tel Aviv University, Israel

Date: February 16, 2015 (Monday)

Time: 3pm - 4pm (15:00 - 16:00)

Venue: Room 7-37, 7/F., Haking Wong Building, Pokfulam Road, HKU

Abstract: Usually solitons (self-trapped localized modes) are associated with self-focusing nonlinearities. Here it is demonstrated that stable solitons can also exist in defocusing cubic media with spatially inhomogeneous nonlinearity increasing toward the periphery. Examples include one-dimensional (1D) fundamental and multi-hump states, 2D vortex solitons with arbitrary topological charges, and vortex tori (soliton gyroscopes, and Hopfions, i.e., twisted tori with two independent topological charges) in 3D. These solitons maintain their coherence in the state of motion, oscillating in the effective nonlinear trapping potential as robust quasiparticles. The 3D vortex tori exhibit stable precession induced by an external torque. Both numerically computed and special analytical soliton families are obtained. A similar mechanism for the self-trapping of bright solitons under the action of spatially growing repulsive nonlinearity works in nonlocal media and discrete systems as well. Furthermore, related numerical and analytical results demonstrate the existence of stable dissipative solitons in media with the uniform linear gain and nonlinear loss. Such 1D and 2D settings can be readily implemented in nonlinear optics and Bose-Einstein condensates (BEC), while the 3D setting is relevant to BEC only.

The Speaker: Boris Malomed is a professor at the Tel Aviv University, where he holds a personal chair on "Optical Solitons". He has published over 500 research papers in the fields of nonlinear dynamics and optics. He serves on the editorial boards of Physical Review Letters, Optics Communications, Chinese Physics Letters, and other leading journals.

ALL INTERESTED ARE WELCOME

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