Jornada de Física no Lineal 2011

Jueves 13 de Octubre de 2011. Ciclo de Conferencias

Seminario del Departamento de Física Aplicada I. G0.81

ETSI Informática. Av. Reina Mercedes s/n. 41012 Sevilla

Programa

16:00 **Dimitris Frantzeskakis**. Universidad de Atenas (Grecia): *Dark-bright solitons in multi-component Bose-Einstein condensates*

Based on the Gross-Pitaevskii mean-field theory, we present results for dark-bright solitons in multi-component BECs. Employing symmetries of the underlying system, we show that dark-bright solitons can be used for the construction of other vector solitons, such as the regular and beating dark-dark solitons. The dynamics of dark-bright soliitons in the trap, as well as the interactions between dark-bright solitons, are studied analytically by means of Hamiltonian perturbation theory. The same technique is also used to describe soliton dissipation due to finite temperature effects. Finally, in the framework of the small-amplitude approximation, we show that dark-bright solitons in binary and spinor (F=1) BECs can be effectively described by completely integrable systems, such as the Mel'nikov, Yajima-Oikawa, and Davey-Stewartson systems.

17:00 **Nikos Karachalios**. Universidad del Egeo (Grecia): *Dynamics of Nonlinear lattices: Analysis from their linear limit*

We highlight by discussing particular examples, the role of the linear limit of nonlinear lattices in the analysis of their dynamics. The first example concerns bifurcation of nonlinear states from their linear analogues in an array of repulsive Bose-Einstein condensate droplets confined in the wells of an optical lattice. The second example concerns the analysis of the dynamics of escape from the domain of attraction of a metastable state for single particles of coupled oscillators. The third example concerns the derivation of energy thresholds approximating the contribution of the linear part to the energy. The model here is a DNLS lattice with nonlinear hopping terms.

18:00 **Ricardo Carretero González**. San Diego state University (EE.UU.): *Matter wave vortices: the quantum Spirograph*

Motivated by recent experiments studying the dynamics of configurations bearing a small number of vortices in atomic Bose-Einstein condensates (BECs), we illustrate that such systems can be accurately described by ordinary differential equations (ODEs) incorporating (a) vortex precession induced by the harmonic trap confining the BEC and (b) vortex-vortex interactions. The dynamics is studied in detail at the ODE level, both for the equal and opposite charge vortex pairs. Co rotating steady states are identified about which perturbations lead to spirographic (epicyclical) motion with excellent agreement with experimental observations. A detailed analysis of the ensuing ODEs reveals the possibility of stable asymmetric states bifurcating from symmetric ones. Cases with more than two vortices are also discussed.