

Seminar EDPs

Speaker: Olivier Sarbach (Universidad Michoacana de San Nicolás de Hidalgo, México).

Title: Boson stars and their linear stability.

Abstract: Boson stars composed of massive scalar fields are among the most promising exotic objects that may populate the universe. Even though they remain hypothetical they are frequently considered as candidates for black hole mimickers, massive compact objects, or even the core of the galactic halos in the context of dark matter.

In this talk I will focus on static, spherically symmetric boson stars and first explain how they arise as solutions of a nonlinear eigenvalue problem which is obtained from the Einstein-Klein-Gordon system. This eigenvalue problem is solved by means of a shooting method, giving rise to a two-parameter family of solutions, in which one parameter is continuous and describes the amplitude of the scalar field at the origin, whereas the second parameter is discrete and describes the number of nodes of the field. After discussing the standard boson star solutions I will present new solutions, dubbed l-boson stars, which considers instead of a single scalar field a finite number of such fields, each of them having a nontrivial dependency in the angle variables, yet the configuration as a whole is still static and spherically symmetric. In the second part of my talk I will discuss the stability of these l-boson stars with respect to linearized, time-dependent, radial perturbations. The pulsation equations, governing the dynamics of such perturbations give rise to a two-channel Schrödinger operator. Using known tools from the spectral theory of self-adjoint operators, I will show (using a combination of analytic and numerical methods) that there exists a family of l-boson stars which are linearly stable with respect to radial fluctuations.

Based on recent work with Miguel Alcubierre, Juan Barranco, Argelia Bernal, Juan Carlos Degollado, Alberto Diez-Tejedor, Miguel Megevand and Darío Núñez (arXiv:2103.15012, arXiv:1805.11488).

Thursday (5/06) at 4:15 pm (Chilean time).

La dirección zoom:

<https://uchile.zoom.us/j/82613481862?pwd=dWpodEw1ckVuY1gyenJiSTJlVZmI4UT09>

Meeting ID: 826 1348 1862

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