**Gravitational Waves, Black Holes and Fundamental Physics** 

Contribution ID: 68

Type: Poster

## Kicking Q-balls and boson stars: stimulated emission of radiation by confined structures

Scalar fields can give rise to confined structures, such as Q-balls or boson

tars, which can serve as interesting models for cold dark-matter. The existence and stability of objects in a given theory is relevant for a wide range of topics, from planetary science to a description of fundamental particles. Taking as starting point a theory describing a time-dependent scalar field, in this talk, I study two different theories, yielding localized objects with a static energy-density profile, but where the scalar is time-periodic. The first theory describes a nonlinearly-interacting scalar in flat space, yielding solutions known as Q-balls, non-topological solitons which arise in a large family of field theories admitting a conserved charge Q, associated with some continuous internal

symmetry. The second theory add the gravitational interaction to the picture, the resulting objects are known as boson stars. As a starting point, I build thin- and thick-wall Q-balls and Newtonian boson stars, and compute their proper oscillation modes. Moreover, I would like to show the dynamical behaviour and the emission of radiation from these objects when excited by external matter in their vicinities. Particularly, I compute energy fluxes, total radiated energy and linear momentum during this process.

The study of the dynamics of such objects is interesting for a number of reasons. As dark matter candidates, it is important to understand the stability of such configurations, and the way they interact with surrounding bodies (stars, black holes etc). For example, when a star crosses one of these objects, it may change the local properties to the extent that the configuration simply collapses or disperses. It is also important to quantify the gravitational drag that bodies are subjected to when immersed in scalar structures.

Primary author: ANNULLI, Lorenzo (Instituto Superior Tècnico)

**Co-authors:** Prof. CARDOSO, Vitor (CENTRA - Instituto Superior Técnico and CERN); VICENTE, Rodrigo (CENTRA - Instituto Superior Técnico)

**Presenter:** ANNULLI, Lorenzo (Instituto Superior Tècnico)

Session Classification: Coffee+Posters session