



Institut de recherche sur les lois fondamentales de l'univers

ESNT Seminar

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Bat 703, DPhN salle de séminaires 135, CEA Saclay, Orme des Merisiers

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^{40}Mg and the Kerman problem in the continuum*
Weak-binding effects in nuclear structure

The effect of weak binding on nuclear structure, decay, and reactions is an open question in nuclear physics. On the neutron-rich side of stability, as the neutron separation energy approaches zero, weakly-bound neutrons in the single-particle levels at the Fermi surface approach the edge of the nuclear potential and may move outside the core of well-bound nucleons, and possibly couple to unbound continuum states. The nature of this transition from a “closed” to an “open” quantum system [1], where binding is dominated by correlations rather than the mean field, has only just begun to be explored, and our understanding of weak-binding effects and coupling to the continuum is, in many ways, nascent.

The first spectroscopic study of the near drip-line Nucleus ^{40}Mg [2], revealed two γ -ray transitions that suggest an excitation spectrum with unexpected properties as compared to both the systematics along the lighter Mg isotopes and available state-of-the-art theoretical model predictions. We will discuss a possible explanation for the observed structure in terms of weak-binding effects.

In 1956 Kerman published a seminal paper on rotational perturbations in nuclei [3]. In the second part of the talk, we consider Kerman’s problem when one of the single-particle levels involved is a resonant state. We will present some preliminary results showing the behavior of the moment of inertia and the decoupling parameter as a function of the state width.

[1] J. Dobaczewski, *et al.* Prog. Part. Nucl. Phys. **59**, 432 (2007).

[2] H. L. Crawford, *et al.* Phys. Rev. Lett. **122**, 052501 (2019).

[3] A. K. Kerman, Mat. Fys. Medd. Dan. Vid. Selsk. **30**, no. 15 (1956).

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This seminar is organized within the ESNT workshop (2-6 September) about: Recent advances on proton-neutron pairing (session II). Program is available on: <http://esnt.cea.fr/Phocea/Page/index.php?id=84>



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