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Pairing in 6He, Giant Pairing Vibrations in Carbon and pair-transfer in reactions

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Pairing phenomena emerge in nuclear structure and in reactions involving a transfer of correlated pairs. We will give an account of the studies on this topic that have been carried on at our institute in collaboration with several other groups. The low-lying bound ground state and continuum states of 6He are constructed starting from neutron single-particle unbound p-resonances of the 5He system plus pairing interaction. We compare our findings with available databases (TUNL, NNDC) and with more recent experimental works [1]. This model is realistic and can give detailed information on how to disentangle the sometimes contrasting experimental results. We discuss also recent experiments performed by the group in Catania LNS [2] that show strong signatures of the presence of the Giant Pairing Vibration, a collective mode built out of particle-particle and hole-hole excitations, in transfer reactions involving Carbon isotopes, where the energy spectrum is measured up to the region where this resonance is expected. As a third example of the importance of pairing in nuclei, we discuss several calculations for two-neutron transfer reactions on various targets of certain relevance for present-day experiments, such as 32Mg and 68Ni [3]. These calculations show how to determine the wavefunction “content” in terms of ratio of cross-sections.

[1] X. Mougeot et al., Phys. Lett. B 718, 441 (2012).
[2] F. Cappuzzello et al., accepted in Nat. Comm. (2015).
[3] J.A. Lay, L. Fortunato, and A. Vitturi, Phys. Rev. C 89, 034618 (2014).

Primary author: FORTUNATO, Lorenzo (Dept. of Physics & Astronomy - Univeristy of Padova)

Presenter: FORTUNATO, Lorenzo (Dept. of Physics & Astronomy - Univeristy of Padova)

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