Highly Retarded GT decay to the quasi-deuteron 1^+ state in odd-odd 62Ga: absence of proton-neutron T=0 condensate in the N=Z A=62 Nucleus

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It is well known that in the atomic nucleus, alike nucleons (neutrons or protons) in time reverse orbits, couple in pairs giving rise to nuclear superfluidity, with very significant impact in the structure as well as in the collective properties of the nucleus. In addition, nuclei consist of a combination of two fermionic fluids (neutrons and protons) and as a consequence of the isospin (T) degree of freedom, four types of pairs, the triplet with T=1, J=0 and the singlet T=0 J>0, are expected. It has been shown that T=0 pairs will be only relevant in the vicinity of N=Z nuclei [1,2]

In medium mass N=Z nuclei, the existence of T=0 pairing has been studied searching for the absence of Coriolis Anti-Pairing effects at high angular momentum in rotational bands[1,2,3]. Nevertheless no clear-cut signature has been found. It has been suggested that enhanced Gamow-Teller (GT) β-decay rates between the ground state of an even-even N+2=Z nucleus and the lowest I=1 state of its odd-odd N=Z daughter nucleus can be the fingerprint of T=0 pairing. The role played in β-decay by proton-neutron coherent pairs (bosons) have been extensively discussed by F.Iachello [4,5] in the framework of the proton-neutron boson scheme (IBM-4).

While in light nuclei strong GT transitions to low lying states result from the presence of approximate SU(4) symmetry, the existence of strong spin-orbit splitting, in heavier nuclei, suppresses the symmetry. The GT strength can then be fragmented over many final states resulting in a reduced B(GT) for the low lying ones [6,7,8].

The Gamow teller β-decay of the ^{62}Ge T=1 0+ g.s. into excited states of the odd-odd N=Z ^{62}Ga have been studied for the first time at the GSI laboratory with the Fragment Separator (FRS) and the RISING Ge-array coupled to an active implantation setup.

The aim of the present was to seek for an enhancement of the B(GT) as fingerprint of the proton-neutron T=0 condensate in the odd-odd N=Z nuclei. Contrary to expected, a diminish B(GT)=0.07±17 $g_A^2/4\pi$ has been observed for the transition to the first 1^+ state lying at 571 keV excitation energy. A lifetime of τ=119.6 ±20 ms has been measured for the ^{62}Ge ground state.

[1] W. Satula and R. Wyss Phys Lett. B 393 (1997) 1
[2] S. Frauendorf , J. Sheikh Nucl. Phys. A 645 (1999) 509
[3] G.de Angelis et al., Phys. Lett. B 415 (1997) 217
[4] F.Iachello, Proceeding Int. Conf. on Perspectives for the IBM, Padova Italy, (1994) p.1.
[5]F.Iachello, Yale University preprint YCTP-N13-88 (1988).
[6]P.Van Isaker, Rep. Prog. Phys. 62 (1999) 1661.
[7]A.F. Lisetskiy, et al., Eur. Phys. J. A 26 (2005) 51.
[8]I. Petermann, et al., Eur. Phys. J. A 34 (2007) 319.