Contribution ID: **68**

Type: **not specified**

Structure of the N=Z nucleus ⁹²Pd: Evidence for an isoscalar spin-aligned neutron-proton coupling scheme

Monday, 27 June 2011 15:10 (20 minutes)

In nuclei with equal neutron and proton numbers (N=Z), the unique nature of the atomic nucleus as an object composed of two distinct types of fermions can be expressed as enhanced correlations arising between neutrons and protons occupying orbitals with the same quantum numbers. Such correlations have since several decades been predicted to favour a new type of nuclear superfluidity; isoscalar neutron-proton pairing, in addition to normal isovector pairing which dominates the structure of most known nuclei. Despite many experimental efforts these predictions have not been confirmed. N=Z nuclei with mass number > 90 can only be produced in the laboratory with very low cross sections. The related problems of identifying and distinguishing such reaction products and their associated gamma rays from the vast array of N>Z nuclei that are present in much greater numbers from the reactions used have prevented observation of their low-lying excited states until recently.
In the present work the experimental difficulties have been overcome through the use of a highly efficient, state-of-the-art detector system and a prolonged experimental running period.
Gamma-ray transitions from excited states in 92Pd were identified at the Grand Accelerateur National d'Ions Lourds (GANIL), France, using a combination of state-of-the-art high-resolution gamma-ray, charged particle, and neutron detector systems: The EXOGAM HPGe detector array coupled to the Neutron Wall liquid scintillator detector array and the DIAMANT CsI(Tl) charged particle detector system. The results have revealed evidence for a transition from normal superfluidity and seniority coupling, to an isoscalar spin-aligned coupling scheme in the ground states and low-lying excited states of the heaviest N=Z nuclei [1]. This new neutron-proton "paired phase"is different from the earlier predictions of a neutron-proton BCS type of pairing condensate and is predicted to have a considerable impact on the level structures and ground state properties of the heaviest N~Z nuclei. The talk will mainly focus on data analysis aspects and the experimental results.
1. B. Cederwall et al., Nature 469, 68 (2011)

Primary author: CEDERWALL, Bo (The Royal Institute of Technology-KTH)

Co-author: GHAZI MORADI, Farnaz (The Royal Institute of Technology-KTH)

Presenter: GHAZI MORADI, Farnaz (The Royal Institute of Technology-KTH)

Session Classification: Exogam