

# Nuclear Structure Investigations in Light Nuclei

Tonev D.

*Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences,  
Blvd. Tzarigradsko Chaussee 72, 1784 Sofia, Bulgaria*

The investigation of light nuclei along the  $N=Z$  line is of considerable interest since it addresses directly the charge symmetry of the nuclear forces and the role of the Coulomb effects on nuclear structure.

Excited states in the mirror nuclei  $^{31}\text{P}$  and  $^{31}\text{S}$  were populated in the  $1p$  and  $1n$  exit channels of the reaction  $^{20}\text{Ne} + ^{12}\text{C}$ , at a beam energy of 33 MeV. The  $^{20}\text{Ne}$  beam was delivered for the first time by the Piave-Alpi accelerator of the Laboratori Nazionali di Legnaro. Angular correlations of coincident  $\gamma$ -rays and Doppler-shift attenuation lifetime measurements were performed using the multi-detector array GASP in conjunction with the EUCLIDES charged particle detector. In the observed  $B(E1)$  strengths, the isoscalar component, amounting to 24% of the isovector one, provides strong evidence for breaking of the isospin symmetry in the  $A = 31$  mass region. The comparison of the  $B(E1)$  strengths in the two mirror transitions indicates a violation of the isospin symmetry manifested by the presence of a large induced isoscalar component. Self-consistent calculations using the NNLOsat and the Equation of Motion Phonon Method reproduce well the experimental findings, confirming the breaking of the isospin symmetry originating from the violation of the charge symmetry of the two- and three-body parts of the potential. The result provides evidence for a coherent contribution to isospin mixing, probably involving the isovector giant monopole resonance [1].

Second experiment represents DSAM lifetime measurements which were carried out with the multidetector array EUROBALL [2]. The results of the analysis, partly achieved with a precise procedure [3], provide valuable information on the transition strengths in the yrast cascades of the mirror nuclei  $^{47}\text{Cr}$  and  $^{47}\text{V}$ . The behavior of the transition strengths with spin is well described by full  $p f$  shell model calculations. In this way, a test of the isospin symmetry in mirror nuclei is performed on the basis of the determined  $B(E2)$  values.

New experimental results for the  $N=Z$  nucleus of  $^{30}\text{P}$  will be presented for the first time.

Some experimental findings in both mirror couples with  $A=31$  and  $A=47$  will be compared and discussed in the presentation.

**Acknowledgment:** This research has been supported by Bulgarian Science Fund under Contract № KP-06-N77/1, 28.11.2023 and by the National Roadmap for Research Infrastructure 2020–2027, Bulgaria for the National Cyclotron Centre funded by the Bulgarian Ministry of Education and Science.

## References:

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