HK 3 Kernphysik/Spektroskopie

Zeit: Freitag 14:00–16:00

Gruppenbericht

HK 3.1 Fr 14:00 TU MA004

Observation of soft and giant dipole modes in 138Sn and neighboring stable nuclei — A. DAMAD KLINKEWICZ for the LAND-FRS collaboration — GSI, Darmstadt, Germany

Secondary beams of unstable neutron-rich 129–132Sn, 132–135Sn and 136,137Te isotopes (~500 MeV/u) were produced by in-flight fission of a primary 238U beam at GSI, Darmstadt. Dipole strength distributions ranging from the neutron threshold up to 30 MeV excitation energy were derived from the measured electromagnetic excitation cross sections in a Pb target using the LAND setup at the fragment separator FRS.

The data reveal the giant dipole resonance structure. In addition, in some of the isotopes, clear evidence for a resonant-like, relatively narrow structure at lower excitation energy is obtained. In 132Sn this low-lying resonance is centered at 10 MeV and comprises 4(2)% of the TRK sum rule. The systematics of the parameters of low-lying and giant dipole resonances will be presented. The low-lying resonance will be discussed with regard to soft dipole modes expected to arise from a neutron skin vibration against the nucleus core, see also our photoabsorption measurements on stable N=82 nuclei [1]. The data are compared to (QR)PA calculations [2,3] and the impact on r-process nucleosynthesis calculations is briefly addressed [4].

Work supported by BMBF and GSI.


HK 3.2 Fr 14:30 TU MA004

Test of the critical point symmetry (5) in the A=180 mass region — O. MÖLLER1, A. DEWAAL1, B. MELON1, P. PETKOV2, A. PITZLER2, K. JESSEN1, J. JOLLE1, C. UE1, M. AXIOTIS3, and C. RHODES1

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The investigation of nuclear phase transition phenomena is one of the new and very challenging topics in nuclear structure physics. Recently N=90 nuclei became of special interest as testing ground for new and very challenging topics in nuclear structure physics.

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HK 3.3 Fr 15:15 TU MA004

Structure of the 2+_1 state in radioactive 66Ge from g factor and lifetime measurements — J. LESKE1, K.-H. SPREDEL1, S. SCHIELE2, O. KENN1, J. GERBER2, P. MAIER-KOMON3, S.J. ROBINSON1, Y.Y. SHARON2, and L. ZAMICK3

1Helmholtz-Institut für Strahlen- und Kernphysik, Universität Bonn, Germany — 2Institut de Recherches Subatomiques, Strasbourg, France — 3Physics Dept., TU München, Garching, Germany — 4Univ. of Southern Indiana, Evansville, Indiana, USA — 5Rutgers Univ., Piscataway, NJ, USA

The g factor of the 2+_1 state of radioactive 66Ge (T1/2 = 270 d) has been measured for the first time. The technique used is based on a transfer from a 12C target to 180 MeV 44Zn projectiles that incorporates the favourable conditions of inverse kinematics as in projectile Coulomb excitation. It also includes the good features of the transient field technique applied to the nuclear spin precessions. In addition we have determined the lifetimes of several excited states using the Doppler-Shift-Attenuation method. All measurements were carried out at the Munich tandem accelerator. The g factor value obtained, g(2+_1) = +0.55(14), is in good agreement with the collective model, g = Z/A = -0.47, and is also consistent with the precise data of the stable even-Ge isotopes. The deduced B(E2) values and the g factor have been interpreted in the framework of the spherical shell model assuming a closed 56Ni core and neutron and proton orbitals in the fp shell model space. Among the various effective interactions used the FPD6 interaction without A-scaling yielded surprisingly the best overall agreement with the experimental data.

[1] supported by the BMBF
First measurements of $g$ factors of the $2^+_1$ states in $^{36,38}$Ar have been performed via $\alpha$ transfer reactions in inverse kinematics combined with the technique of transient magnetic fields. In addition, $B(E2)$ values were deduced from newly measured lifetimes using the Doppler-Shift-Attenuation method. These investigations were mainly motivated by the specific features, that for $^{36}$Ar with $N=Z=18$, isospin symmetry effects as well as neutron-proton pairing correlations, and for $^{38}$Ar with 20 neutrons, the $N=20$ shell closure should dominate the nuclear structure. Hence, for these nuclei with the inclusion of similar data for $^{40}$Ar, appropriate shell model calculations ought to explain subtle alterations of the structure with neutron number. In the measurements, $^{32}$S and $^{34}$S beams of the Cologne and Munich tandem accelerators were used as projectiles bombarding a multilayered target with natural carbon for the nuclear reaction. Excellent agreement was achieved between experiment and theory for all Ar isotopes.

[+\textsuperscript{1}]\textsuperscript{1} supported by the DFG

Dominant neutron component in the $^{68}$Zn($4^+_1$) wave function from $g$ factor measurements\textsuperscript{2} — J. Leske\textsuperscript{1}, K.-H. Speidel\textsuperscript{1}, S. Schielke\textsuperscript{1}, J. Gerber\textsuperscript{2}, and P. Maier-Komor\textsuperscript{3} — \textsuperscript{1}Helmholtz-Institut für Strahlen- und Kernphysik, Univ. Bonn, Germany — \textsuperscript{2}Institut de Recherches Subatomiques, Strasbourg, France — \textsuperscript{3}Physik-Dept. TU München, Garching, Germany

The $g$ factor of the $4^+_1$ state in $^{68}$Zn has been measured for the first time employing projectile Coulomb excitation in inverse kinematics. A multilayered target consisting of thin layers of C/Gd/Ta/Cu was bombarded with a $^{68}$Zn beam of 180 MeV provided by the Munich tandem accelerator. The $\gamma$ rays emitted from the excited states were measured in coincidence with forward scattered carbon ions. Spin precessions occurred in the transient field of the magnetized Gd layer. A Si detector was used for detection of the carbon ions whereas the $\gamma$ rays were detected by pairs of NaI(Tl) scintillators and Ge detectors. The superior energy resolution of the Ge detectors was essential for separating the $(4^+_1 \rightarrow 2^+_1)$ $\gamma$ line from neighbouring and Doppler-shifted $(2^+_3 \rightarrow 2^+_1)$ 1261 keV line in the forward hemisphere. The negative $g$ factor deduced is a surprise as its sign contradicts large-scale shell model predictions. It can only be understood if $9/2$ neutrons are a strong component in the nuclear wave function. This result will be discussed in the context of similar measurements in $^{64}$Zn for which the $g$ factor of the $4^+_1$ state was found to be positive in agreement with the collective as well as shell model predictions.

[+\textsuperscript{2}] supported by the DFG