Contribution ID: **50** Type: **Oral talk (15 min + 5 min questions)**

Analysis of M1 excitations in ^{28}Si using inelastic proton scattering

Tuesday, 12 July 2022 15:00 (20 minutes)

Isovector and isoscalar spin-flip excitations in even-even sd-shell nuclei excited by inelastic proton scattering were considered in [1]. Recently $M1$ excitations in sd-shell were also analyzed in [2]. In [2] only strongest excitations of ^{28}Si were discussed. Shell model predicts for ^{28}Si a few of 1^+ states with excitation energy lower than 20 MeV. Nearly all of these states can be identified with experimentally observed levels excited in (p,p') and (e,e') reactions. Here we analyze the spectrum of 1^+ states in ^{28}Si excited in (p,p') reaction in comparison with theoretical spectroscopic predictions. The calculations were carried out in the sd model space with the USDA Hamiltonian [3] using the code NuShellX [4].
The M1 excitations in light nuclei are mainly determined by the spin transition density. Current transition density play only minor importance in the observed B($M1$) value. The B($M1$) value can be extracted from the (e,e') scattering experiments. On the other hand only spin transition density determine the forward cross section of (p,p') reaction with the excitation of $M1$ states. We analyze forward cross sections of (p,p') reaction with excitation of 1^+ levels in ^{28}Si and determine the possible impact of current density in the B($M1$) value.
In the excitation of $M1$ states with protons both T=1 and T=0 states are excited and only T=1 states can be excited in (e,e'). The theoretically predicted states can be identified with the observed 1^+ levels according to their excitation energy but the strength of the excitations can considerably differ from the theoretical prediction. The possible explanation of this difference may be the isospin mixture.

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2. H. Matsubara, A. Tamii, H. Nakada et al, Phys. Rev. Let. 115, 102501 (2015).
3. B. A. Brown and W.A. Richter, Phys. Rev. C 74, 034315 (2006).
4. B. A. Brown and W. D. M. Rae, The Shell-Model Code NuShellX. Nuclear Data Sheets 120, 115 (2014).

The speaker is a student or young scientist

No

Section

1. Nuclear structure: theory and experiment

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