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Collective modes excited by proton inelastic scattering studied at CCB IFJ PAN

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An experimental campaign of measurements of the γ decay from states excited in nuclei using proton inelastic scattering reaction have been performed at CCB facility of IFJ PAN. The main goal of the experiments was to study the decay to the ground state of isoscalar giant quadrupole resonance (ISGQR) via γ-ray emission. Previously such phenomenon was observed only once, in 1980s [1].

The experiment was performed at Cyclotron Centre Bronowice (CCB) of IFJ PAN Kraków, Poland, a facility dedicated mainly to the proton radiotherapy. The experimental setup consisted of eight large-volume BaF2 γ -ray detectors of the HECTOR (High Energy deteCTOR) array [2] and 16 triple telescopes of the KRATTA (KRAków Triple Telescope Array) array [3] together with fast plastic scintillators for light charged particle identification and energy measurement. In the experiment the inelastic scattering of 85 MeV proton beam on 208Pb target has been employed and the scattered protons were measured in coincidence with γ transitions.

As a result the measurement of the ISGQR γ-decay has been confirmed and the branching ratio between ISGQR gamma decay to ground state and neutron emission was obtained [4]. During the talk I will present the experimental method, the used equipment as well as the obtained results. In addition, the outlook for the continuation of such studies will be discussed.

[1] J.R. Beene, et al., Phys. Rev. C 39, 1307 (1989);
[2] A. Maj et al., Nucl. Phys. A 571, 185 (1994);
[3] J. Łukasik et al., Nucl. Instrum. Methods Phys. Res., Sect. A709, 120 (2013);
[4] B. Wasilewska et al., Phys. Rev. C 105, 014310 (2022).

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