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## The study of giant resonances excited by scattered protons at CCB IFJ PAN in Kraków

The Cyclotron Center Bronowice (CCB) is the proton beam facility at the Institute of Nuclear Physics Polish Academy of Sciences Poland which, except proton cancer therapy, offers the possibility of using proton beams for nuclear physics investigations. Among others, the measurement concerning study of collective excitations was performed.

The experiment aimed at investigation of gamma decay of collective modes in stable nuclei  $^{208}\text{Pb}$ . It concerned mainly the study of giant resonances (giant quadrupole resonance, GQR and giant dipole resonance GDR). In addition the region where the pygmy dipole states (PDR) are present, was explored as well.

During experiment high-energy gamma rays and scattered protons were measured in coincidence mode with the use of HECTOR + KRATTA setup. High efficiency 8 big BaF2 detectors of HECTOR array was used to measure the high-energy gamma rays together with the cluster of PARIS type phoswiches (9 LaBr3-NaI or CeBr3-NaI crystals) and one large volume LaBr3 scintillator. The good timing of BaF2 detectors of the HECTOR array ( $\approx 1$  ns) was exploited to define well the coincidence condition and thus to reduce the accidental coincidences and other sources of background. Scattered protons (their scattering angle and energy) were measured by the KRATTA array consisted of 24 triple telescopes made of silicon detectors and two CsI crystals. The KRATTA detectors were placed at forward angles while HECTOR was mounted at backward direction and PARIS at 90 degrees, both outside the vacuum scattering chamber where target was installed.

The first experiment aiming at study excitation of  $^{208}\text{Pb}$  was preceded by several test measurements done as a preparation of detectors for coincidence measurement. During the talk obtained results and attempt to their theoretical description as well as experimental method will be discussed.

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