

Over 100 years ago the existence of the nucleus was observed for the first time. From that moment intense research has been conducted, however not all mysteries concerning it has been fully understood. One of the methods to learn more about the atomic nucleus is its excitation (i.e. giving it additional energy) and later on the measurement of the way the nuclei dispose the excessive energy. The energy usually is discarded from the nuclei in the form of their basic ingredients: protons and neutrons, sometimes forming light particles (e.g. alpha particle which consist of two protons and two neutrons), or via emission of high energy photons, which are called gamma-rays. Sophisticated equipment (called detectors) which surrounds the excited nuclei is able to observe them, recognise the type and give the information about the energy they had. With those data, comparing the results with a theory, the physicists are able to deduce the properties of the atomic nuclei under investigation.

The increase of our knowledge is highly dependent on technological development. On the one hand it is possible now to study nuclei which production just 10 years ago wasn't possible. On the other hand, the information given by detection setups is getting more and more precise. One of the new generation detector arrays that are under construction now is, described in this project, PARIS, which is dedicated to measure gamma-rays. It consists of novel crystals of highly desired parameters by the experimentalists, namely high efficiency and precise information on energy and time. Those properties were obtained on the cost of complicated read-out of the data. Because of that the very first step in this project will be refinement of existing algorithms and preparation of new ones, which will make obtaining the useful information from the measurement easier.

Those algorithms will be then used to analyse the data from experiments held in the leading nuclear physic laboratories in Poland: Heavy Ion Laboratory in Warsaw and Cyclotron Centre Bronowice in Krakow. In those experiments the topic of study will be the deformation of the nucleus, or in other words the deviation of its shape from the spherical one. The experiment in Warsaw was focused on measurement of this phenomenon in relatively low excitation energy, while the ones held in Krakow will study high excitations. The project, as a whole, is based on extremely difficult measurements, which are at the frontiers of experimental possibilities. However, they will significantly broaden our knowledge about atomic nuclei.