The atomic nucleus consists of positively charged protons and neutrons. Its interior is dominated two types of interaction - repulsive electrostatic interaction between positively charged protons and a strongly attractive strong nuclear force that keeps the nucleus together. Protons and neutrons in atomic nuclei occupy states of strictly defined energies called shells, analogously to electron shells in an atom. Here, analogies do not end, just like valence electrons determine the chemical properties of a given element, nucleons (protons and neutrons) on valence shells in the atomic nucleus and the interaction between them determine the properties of the atomic nucleus, in particular its shape. There is around 3000 known nuclei, only a few percent of them are spherical, rest of them is more or less deformed. We note that nuclear deformation is a unique quantum effect.

Region of neutron-rich nuclei with masses A $\approx$ 100 is a place where nuclear deformation evolves with number of protons and neutrons in nuclei. Studies of those nuclei provides valuable information on the mechanisms of emergence and evolution of nuclear deformation. In our project we would like to focus on a particular type of deformation, called triaxial or gamma deformation. For this purpose we chose Molybdenum isotopic chain, the nuclei with the same number of protons amounting to 42 but different numbers of neutrons. Gamma deformation is well studied for isotopes with the number of protons N > 61, but little information about its formation for lighter isotopes Molybdenum.

This raises the obvious question of how to study atomic nuclei and how one could tell whether a given atomic nucleus is deformed and how strong the deformation is. The atomic nuclei are objects too small to be observed directly. We use nuclear spectroscopy methods for this purpose. Atomic nuclei, just after creation, have an excess of energy, which they loose by the emission of electromagnetic radiation called γ radiation. Energy of emitted gamma rays is a fingerprint of a given atomic nucleus. Of all known atomic nuclei, each is characterized by its own set of emitted gamma rays. Properties of this radiation such as energy, direction of emitted gamma rays or polarization allows us to determine not only with which isotope we are dealing with, but also provide information about the shape of the nucleus.

An excellent tool for studying the properties of gamma rays emitted by excited nucleus is FIPPS (Fission Product Prompt γ-ray Spectrometer) setup located at the Laue Institute Langevin (ILL) in Grenoble, France. The FIPPS setup consist of eight germanium clover detectors. This means that each detector has four germanium crystals that can register gamma rays independently of each other, which gives a total of 32 crystals. To study the atomic nuclei of interest ones need to produce through nuclear reactions. Researches carried out at ILL are based on the use of neutrons produced in the ILL nuclear reactor, which is at present the most intense neutron source in the world, used for scientific studies. In our case, molybdenum nuclei will be produced in the neutron capture reaction. As a result of this reaction new atomic nucleus is created which has o one more neutron more than target nucleus. Another type of reaction which we will use in our project is neutron-induced fission reaction on uranium target. Through this reaction heavy nuclei splits into two lighter fragments. The use of two reactions allows us to get more information about the nuclei of interest.

In addition, we would like to expand the research infrastructure within this project which would allow to measure the neutron capture reaction on gaseous targets. We plan to build cryogenic equipment enabling the production of targets from solidified gases such as krypton or xenon.