According to the so-called standard model of particle physics there are four known fundamental forces in nature:

- gravitational (example: an apple falling down from tree),
- electromagnetic (example: radio and telephones),
- weak force (example: radioactivity),
- strong force holding the constituent quarks of a hadron together.

The strong force gets its name by being the strongest attractive force and it acts only at extremely small distances holding the quarks together. The residual force holds hadrons together with each other, such as the proton and neutrons in a nucleus. It is responsible for binding together the fundamental particles of matter to form larger particles and finally the world which we know. The strong force is 137 times more powerful than the electromagnetic one, 100 000 times more powerful than the weak force and $6*10^9$ times more powerful than gravity.

In our studies we focus on a “nucleons level” trying to understand the interaction in a few-nucleon systems. First, in 1934, a Japanese scientist Yukawa, developed the theory of nuclear forces. Since then, there have been tremendous research to explore the nuclear forces in detail. Today we understand exactly how the nuclear force works between two nucleons and we are able to formulate theoretical models to explain it. However, when we add at least one more nucleon, this theories failed to explain the force acting in such system. This problem was solved in recent decades when new theories were developed with addition of so-called three-nucleon force (3NF). The 3NF appears when there are 3 or more nucleons. Adding 3NF models into calculations helps to better understand the interaction, however, some puzzles still remain unexplained …. Therefore, to better understand the nature of the nuclear interaction a new experiment was planned aiming at investigation of the 3NF effects in heavier systems, composed of 4 nucleons.

For the collision process deuterons are accelerated by a cyclotron to given speeds and once the collision with a liquid deuteron target occurs, the one or both deuterons breaks into protons and neutrons. To detect the charged reaction products, apparatus called BINA (Big Instrument for Nuclear polarization Analysis) at KVI laboratory, the Netherlands were used. The ultimate goal of the project is to obtain cross-section observables (which correspond to the reaction probability) for deuteron disintegration or for the nucleon transfer reaction in which ^{3}He lub triton are produced. Finally the data are compared to the theoretical calculations which are currently developed.

The research aims at exploring fundamental sciences. If we do not know how the gravity works we wouldn't be able to send a spaceship to Mars or send a man to the Moon and bring him back safely or put a satellite in the space rotating around Earth in a very precise orbit. If we do not know exactly how the electromagnetic force works, we wouldn't be able to use any radio telecommunication that we do today and any electronic device. And the most fundamental discovery of radioactivity which was done more than 100 years before by Maria Sklodowska Curie. Who was able to foreseen the multitude of new applications not only in medicines but many other fields ? In the same way, knowing the exact nature of nuclear forces will for sure lead to new era of progress not only in science, but also in our everyday lives .