Starting in the 1920s, experiments conducted by Otto Stern and Walther Gerlach led to further discovery of a previously unknown property of particle called *spin*. Despite simple physical interpretations like ”internal angular momentum” or "property of particle spinning around its own axis", spin indeed is a purely quantum property of the elementary particles. Nowadays, such an essential property in the quantum world has a real significance in broad branches of applied natural science.

Spin plays an important role in particle physics. The transverse polarization of hyperons (baryons containing one or more strange s quarks) that has been observed in unpolarized beams since the 1970s is still under investigation. In particular, studies of the lightest hyperon - Λ particle in hadron collisions are particularly extensive due to its decay mode into proton and pion in which proton tends to be emitted along the spin direction of the Λ hyperon. Changes in hyperon polarization were one of the earliest suggestions for probing the hot and dense nuclear matter in heavy-ion collisions. The observation of changes in transverse polarization in proton-proton, proton-nucleus, and nucleus-nucleus collisions may also help to indicate the beginning of the creation of large clusters of strongly interacting matter – the onset of the so-called fireball.

These effects can be studied thanks to the experimental conditions offered by the NA61/SHINE fixed target experiment at the Super Proton Synchrotron (SPS) located in the laboratory of the European Organization for Nuclear Research (CERN). The NA61/SHINE spectrometer has acceptance coverage of the forward hemisphere and transverse momentum range down to $p_T \approx 0$ GeV/c. The NA61/SHINE experiment recorded about 50 million proton-proton collisions providing the opportunity for precise measurement of Λ transverse polarization.

The method of transverse polarization measurement that will be developed under this project for proton-proton collisions is expected to be further applied in the analysis of nucleus-nucleus collisions. The comprehensive data collected by the NA61/SHINE collaboration during a two-dimensional scan in beam momentum (13A-158A GeV/c) or center-of-mass energy $\sqrt{s_{NN}} \approx 6 \ldots 17$ GeV) and system size (p+p, p+Pb, Be+Be, Ar+Sc, Xe+La, Pb+Pb) allows for systematic studies of system size and energy dependence of the Λ transverse polarization and the verification of theoretical model predictions.

The impact of the project results on the development of science will consist in a better understanding of the production processes and behavior of Λ particles in collisions at energies available at SPS, especially $\sqrt{s_{NN}} = 17.3$ GeV. We expect that such studies possible thanks to the unique experimental capabilities offered by NA61/SHINE will provide valuable new information on hadron production properties and the behavior of nuclear matter at high energies.