The aim of this project is study of properties of matter that interact strongly. Example of particles that interact through strong interactions are quarks and gluons. The specific character of this fundamental interaction allows exotic state of matter to be created – the quark-gluon plasma (QGP).

What is QGP anyway? By definition it is a state of matter, where quarks and gluons act as if they were free particles. It is contrary to ordinary matter, where this particles are bound within e.g. neutrons or protons. When and how QGP is created? For this question we still do not have an answer. According to standard model, Universe existed in form of QGP shortly after the Big Bang. Nowadays such “little Big Bangs” can be created during collisions of heavy ions accelerated to near-light speed.

One of the tools used to describe systems created during such collisions is angular correlation function. It is probability of finding pair of particles, compared to probability of finding such particles separately. By analysis of $\Delta\eta$-$\Delta\varphi$ (difference of pseudorapidity of particles and their relative azimuthal angle) correlation function, the ridge structure was observed. The ridge is a flat shape of correlation function, that spreads to large values of $\Delta\eta$ for particles with small $\Delta\varphi$. At first, creation of the ridge was explained by existence of so called elliptic flow - v_2. This explanation connects ridge with collectivity of medium, which implies existence of QGP. However recent results from LHC show, that ridge is observed in high-multiplicity p+p and p+Pb collisions! In such small systems QGP cannot be formed, hence no v_2 should be observed. That leaves ridge creation mechanism unexplained. By solving this riddle we could shed more light on strongly interacting matter properties.

Additionally, conducted researches were mostly done for unidentified particles. In fact, 80-90% of unidentified particles are pions. It means that such analysis are done *de facto* for pion-pion pairs with a bit of kaon and proton contamination. Recent results show that proton-proton pairs interact differently than pairs of mesons. In this project analysis of identified particles is proposed. This will lead to disentanglement of different particle contribution to global angular correlation function. It will allow for more precise study of strong interactions.

In this project data taken by STAR experiment from Beam Energy Scan program will be used. During this program Au+Au collisions were conducted over a broad energy range, with single detector setup. Collisions at energies: 7.7, 11.5, 14.5, 19.6, 27, 39 and 62.4 GeV will be analyzed. This particular range is extremely interesting, as several results indicate, that phase transition between ordinary matter and QGP may lay between 11.5 and 19.6 GeV. This fact encourages to exploit all possible observables in search for phase transition. Not only this project will contribute to mentioned search, bu also it will allow do discriminate which theoretical models properly describe creation of elliptic flow and the ridge. This will broaden our knowledge about strongly interacting matter properties.