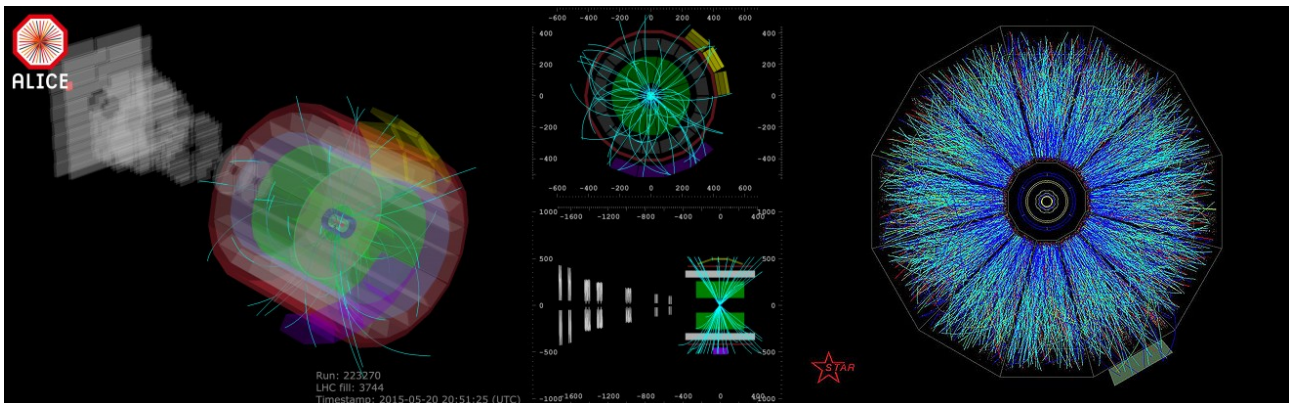


## “Probing baryon and antibaryon interactions in relativistic ion collisions in STAR at RHIC and ALICE at LHC”

In the Large Hadron Collider (LHC) lead nuclei are accelerated and being brought to collide head-on at the energy of 2.76 TeV per nucleon pair. The study of such collisions is the task of ALICE (A Large Heavy Ion Collider Experiment). Similarly Relativistic Heavy Ion Collider (RHIC) accelerates Au ions and collides them at 200 GeV per nucleon pair. The collisions are analyzed by the Solenoidal Tracker At RHIC (STAR) experiment. Example collisions from those experiments are shown in the figure below. The team from the Faculty of Physics, WUT is a member of ALICE and STAR since more than 10 years. One of the objectives of the heavy-ion program is to produce and study the new state of strongly interacting matter – the Quark Gluon Plasma (QGP). It exhibits collective behavior, consistent with a hydrodynamic description. By studying it one expects to find its equation of state. Large energy densities are produced in Pb-Pb and Au+Au collisions. When the system hadronizes, several thousand particles are created, including a significant number of K mesons and baryons. In addition similar number of particles and antiparticles is produced. The created system is unique, consisting of a large number of both baryons and antibaryons, which interact. The particles propagate to the detectors where they are registered and identified and their interaction can be studied. The aim of this project is to carry out a femtoscopic analysis of two-particle correlations for pairs where at least one particle is an (anti-)baryon. This technique will be used in an innovative way to determine parameters of the strong interaction potentials between exotic baryons, including the hyperon as well as baryon-antibaryon potentials.



The plan is to analyze heavy-ion and proton collisions registered in ALICE and STAR. Two-particle correlations as a function of pair relative momentum will be analyzed. It will allow to probe the strong interaction between baryons, their antiparticles and other exotic particles. This knowledge can then be used to understand the behavior of exotic astrophysical objects: neutron stars. The project will allow us to broaden our knowledge of matter and antimatter. The annihilation of baryons will be of special interest. So far our knowledge is limited to the interaction of “ordinary” protons and antiprotons. Thanks to the research proposed in this project we will learn if the “exotic” particles annihilate in the same way and if the existing theoretical models are able to successfully predict their behavior in the more complicated cases. This knowledge cannot be obtained in any other currently ongoing or planned experiment.