One of the greatest puzzles in modern science is the observed unbalance between matter and antimatter in the universe. The puzzle is closely linked to the violation of so-called charge-parity (CP) symmetry. In particular, this symmetry assures that particles known as baryons behave exactly like their antimatter counterparts. Baryons are a family of particles whose best-known members are the protons and neutrons that makeup all the matter in the universe. The crucial property of baryons which makes them the matter building blocks is their fractional spin, a quantum property which allows baryons to have two possible states. Any violation of CP symmetry would imply that the laws of physics are not the same for matter and antimatter. The Standard Model (SM) of particle physics predicts that a tiny amount of CP violation exists but is not sufficient to explain the overwhelming excess of matter in the universe. Therefore, other CP violation sources must contribute.

Here, a team of scientists from Poland and Sweden plans to use a novel method to study CP symmetry for baryons containing strange or charm quarks. The proposed method uses the spin property of the baryons. We will use two facilities: BESIII at IHEP Institute in Beijing and LHCb at CERN, where the baryon spins are polarized. The proposed analysis method will allow us to obtain new and precise information about CP symmetry and its violations.