Do we fully understand basic constituents of the Universe and interactions between them? Is the way we describe within the Standard Model elementary particles and forces correct and complete? Are there any particles beyond the Standard Model? Answering these fundamental questions has been a goal of high energy physics over last few decades.

Precision measurements performed in flavour physics allow testing a structure of the Standard Model and searching for any deviations arising from New Physics. These are indirect searches, carried through studying reactions into which new particles might contribute. As history shows, indirect discoveries of new particles often preceded their direct observations (e.g. charm quark, third quark generation). Studies in a beauty-quark family have already revealed a few intriguing results which are difficult to explain within the Standard Model. A charm sector starts reaching a precision allowing for sensitive tests of the Standard Model. Importantly, charm tests are complementary to those performed in beauty and strange sectors. Charm decays with a photon in their final state proceed with a significant contribution from a loop amplitude, known as a 'penguin'. Exotic particles exchanged in such a quantum loop could significantly affect Standard Model predictions, in particular charge-parity CP asymmetry or photon polarization.

CP violation points to matter and anti-matter differences, thus is of fundamental importance for explaining an absence of antimatter in our Universe. Photon polarization points to crucial properties of the electroweak interactions. Despite many searches, CP asymmetry in charm has not yet been observed. The Standard Model predicts large, up to 10%, CP asymmetries in radiative charm decays. This project may therefore lead to awaited discovery of CP violation in charm sector. Photon polarization results in different rates for decays with left-handed photon and their 'mirror' image involving right-handed photon. Therefore its measurement corresponds to a probing of spatial P parity, which is maximally violated in the electroweak interactions. As a result, charm-meson decays involving left-handed photon (and charm-antimeson decays with right-handed photon) are expected to dominate. No photon polarization measurement has been yet performed for charm.

Radiative charm decays, being attractive on a theoretical side, are however experimentally challenging. They are rare, with rates at the 10^{-5} level, and particularly difficult for reconstruction at LHCb, owing to high backgrounds typical for a hadron collider environment. These difficulties are being compensated by the unprecedented LHCb data size. Studies of radiative charm decays are possible at LHCb, and their immediate future depends on LHCb. This project will also allow to participate in preparations for the LHCb upgrade phase, facilitating future measurements along with the Belle2 experiment. A significance of having results from the two independent experiments hardly can be overestimated.