## NLO EW radiative corrections to the decay of the polarized W boson


### Abstract

In order to verify the successful Standard Model of elementary physics, described by the interplay of strong and electroweak interactions, and in order to find out whether or not extensions of this model are necessary, high precision measurements of particle creation and decay processes performed at facilities like the Large Hadron Collider at CERN have to be compared with theory predictions that are of the same precision. The precision and significance of theory predictions can be improved in two ways, namely by taking into account exchanges of virtual particles in the framework of higher order perturbative corrections to a given process, known as radiative corrections, or by looking at observables that characterise the process in a more precise way. One for instance can take into account the masses of the particles that participate in the process, or look at effects of polarisation in the process.

In the work we present here, we do both. We present next-to-leading order (NLO) electroweak (EW) radiative corrections to the decay $W^+(\uparrow) \to c+\bar{b}$ of the polarised $W$ boson into a pair of heavy quarks by looking at the angular distribution of the decay. Incorporating the nonvanishing masses of the final state quarks and comparing with the limit of vanishing quark masses, known as the collinear limit, we demonstrate the importance of mass effects on the result, in particular as there are deviations in the comparison that can most probably be explained by the effect of finite masses. For experts, we give details concerning the removement of ultraviolet singularities via the renormalisation procedure, the cancellation of the infrared singularities between loop and tree contributions, and the treatment of the collinear limit.