

# Abstract

LHCb is one of the four major experiments of the LHC at CERN, built to perform precision measurements of CP violation and rare decays. In order to protect the sensitive elements of the experiment from adverse beam conditions the Beam Condition Monitor has been created. Such conditions increase the particle flux arriving from the LHC, known as Machine Induced Background. These particles interfere with the experiment, for example through the physics trigger.

In this thesis software development and simulations for the design and validation of the Beam Condition Monitor is shown, ranging from LHCb-specific algorithm implementation to beam dump threshold determination. Furthermore, software development in order to attain a complete simulation chain of machine induced background is shown. The results of these simulations are compared to early data collected at LHCb. Lastly, the development and implementation of the Inclusive  $\phi$  trigger line for the High Level Trigger is presented. This line aims to reconstruct and select the two prong decay  $\phi \rightarrow K^+K^-$ , where  $\phi$  is a daughter of a B-meson decay. This chain is characteristic of several key channels of the LHCb physics programme.