Search for the rare decays $B^0_s \rightarrow \mu^+\mu^-$ and $B^0 \rightarrow \mu^+\mu^-$ with the LHCb Experiment

Abstract

Decays of the $B^0$ and $B^0_s$ mesons into two muons are extremely rare in the Standard Model as they occur only via helicity suppressed loop diagrams. Their amplitudes can be significantly different in many New Physics models, especially with an extended Higgs sector. Therefore, the search for these decays provides a sensitive probe of physics beyond the Standard Model.

A search for the decays $B^0_s \rightarrow \mu^+\mu^-$ and $B^0 \rightarrow \mu^+\mu^-$ is performed with about 37 pb$^{-1}$ of $pp$ collisions at $\sqrt{s} = 7$ TeV collected by the LHCb experiment at the Large Hadron Collider at CERN. The analysis relies mostly on control samples with minimal use of the simulation. The observed numbers of events are consistent with the background expectations. The resulting upper limits on the branching ratios are $B(B^0_s \rightarrow \mu^+\mu^-) < 56 \times 10^{-9}$ and $B(B^0 \rightarrow \mu^+\mu^-) < 15 \times 10^{-9}$ at 95% confidence level. The analysis is presented and prospects are also given for the coming run.