

# Understanding the $K\pi$ spectrum of $B^0 \rightarrow K^{*0} \mu^+ \mu^-$ at LHCb

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# Chapter 1

## Introduction

Processes which contain a  $b \rightarrow s$  transition are popular FCNC decays for tests of contributions from new physics [1]

## Chapter 2

# The standard model of particle physics

# Chapter 3

## The LHCb detector

### 3.1 Intro

### 3.2 subdetectors

### 3.3 Trigger

# Chapter 4

## Theoretical formulism of $B^0 \rightarrow K^{*0} \mu^+ \mu^-$

4.1 Angular distribution

4.2 Matrix elements

4.3 Angular observables

4.4 higher  $K_J^{*0}$  states

# Chapter 5

## The acceptance correction for $B^0 \rightarrow K^{*0} \mu^+ \mu^-$ at LHCb

### 5.1 acceptance correction intro

### 5.2 Monte CARlo simulations

#### 5.2.1 Data-Simulation corrections

### 5.3 A full 4D acceptance correction

#### 5.3.1 algorithm

#### 5.3.2 validation

#### 5.3.3 results

### 5.4 A factorised acceptance correction

#### 5.4.1 algorithm

#### 5.4.2 validation

#### 5.4.3 results



# Chapter 6

## The S-wave in $B^0 \rightarrow K^+ \pi^- \mu^+ \mu^-$

### 6.1 The effect of an S-wave on the nagular analysis of $B^0 \rightarrow K^{*0} \mu^+ \mu^-$

#### 6.1.1 theory

#### 6.1.2 effect from toy simulations

#### 6.1.3 effect on data

### 6.2 Measuring the S-wave in $B^0 \rightarrow K^+ \pi^- \mu^+ \mu^-$

#### 6.2.1 theory

#### 6.2.2 measurement expected from toy simulations

#### 6.2.3 measurement on data

# Chapter 7

## Measuring the D-wave in $B^0 \rightarrow K^{*0} \mu^+ \mu^-$

- 7.1 angular distribution
- 7.2 angular observables
- 7.3 acceptance correction
- 7.4 Angular fits
  - 7.4.1 no  $m_{K\pi}$
  - 7.4.2 with  $m_{K\pi}$
- 7.5 Results
- 7.6 conclusion

# Bibliography

- [1] D. Melikhov, N. Nikitin, and S. Simula, *Probing right-handed currents in  $B^0 \rightarrow K^* \ell^+ \ell^-$  transitions*, Phys.Lett. **B442** (1998) 381, [arXiv:hep-ph/9807464](#).