DRAFT
CMS Paper

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Lepton flavor universality test at CMS with R(D*) measurement in the full leptonic tau final state

The CMS Collaboration

Abstract

Study to perform a measurement of the branching fraction ratio $R(D^*) \equiv B(B_0 \to D^{*-}\tau^+\nu_\tau)/B(B_0 \to D^{*-}\mu^+\nu_\mu)$ with proton-proton CMS data coming from the 2018 B parking stream. The tau lepton is identified in the full leptonic decay mode $\tau^+ \to \mu^+\nu_\tau\nu_\mu$.
The $R(D^*)$ ratio is sensitive to contributions from non-standard-model particles that violates lepton flavour universality. This parameter, measured at B factories and hadron collider, has been observed to have a tension with SM prediction of about 2 sigma.
A multidimensional fit to kinematic distributions of the reconstructed B_0 candidate decays from CMS data can provide a competitive measurement with state of art measurement and impact the experimental world average. This result, can be the first measurement of this quantity at CMS and general purpose hadron collider experiments.

1 Introduction

The Standard Theory (SM) of particle physics predicts the three leptons generation to have the same coupling to gauge bosons. This simmetry, called lepton flavor universality (LFU), is an accidental symmetry and it is broken only by the Yukawa interactions. Differences between the expected branching fraction of semileptonic decays into the three lepton families originate from the different masses of the charged leptons. Further deviations from LFU would be a signature of physics processes beyond the SM. The consitency of the nature with this p[rediction can be tested in heavy mesons semi-leptonic decay.

State briefly what's the nalysis startegy.

2 The CMS detector

Which reco, which calibration gloabal tag and extractor

3 Simulation

3.1 Signal simulation

3.2 Backgorunds simulation

4 Candidate selection

Should mention all the cuts and relative efficiencies

4.1 Final state obserbables

5 Backgrounds estimation

5.1 Simulation driven backgounds

5.2 Data driven backgrounds

6 Signals yeld determination

6.1 Uncertainties breakdown

7 Efficiencies estimation

8 Conclusion

8.1 Future prospects

Acknowledgments

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References