

# $B \rightarrow K_{\tau\tau}$ search in $B \rightarrow K_{\mu\mu}$ decays

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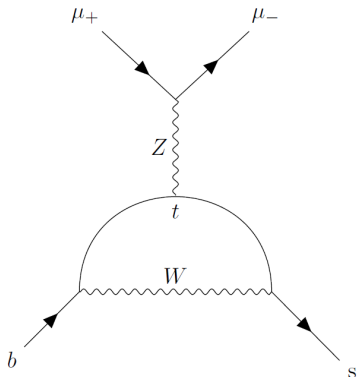
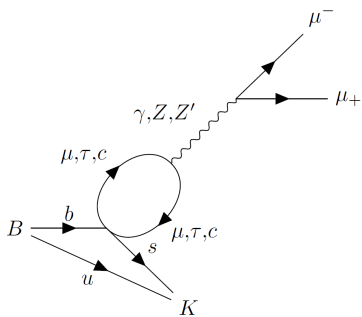
# Overview

1. Decay
2. Search
  - Theory
  - Pdf and its parts
  - Where are we now
3. Outlook

All results and plots are very preliminary

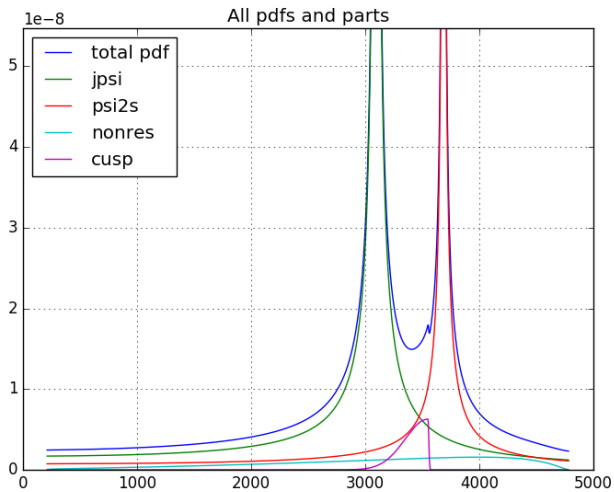
# Decay

- Anomalies gave rise to new search for possible lepton flavor universality violation
  - Different coupling to leptons of different generations
    - ▷ Most to  $\tau$ , least to  $e$
  - ▷ How can we observe different generations at once?



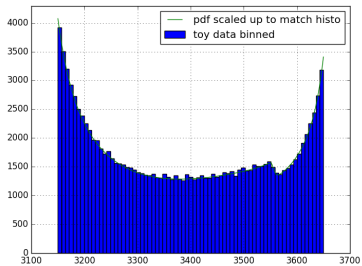
- According to SM the  $\tau$  contribution should not be visible in the dimuon spectrum
    - Dependent on Wilson coefficients ( $C7$ ),  $C9$ ,  $C10$
  - ▷ Some SUSY models predict an amplification of the  $\tau$  contribution:
    - ▷ Amplification due to new channel
    - ▷ Amplification factor: **10 - 1000**
- ⇒  $\tau$  contribution should become visible
- Cusp like shape in between  $J/\psi$  and  $\psi(2S)$  resonances
  - At the moment still a bifurkated gaussian (shape will slightly change as we get the exact shape)

# Search

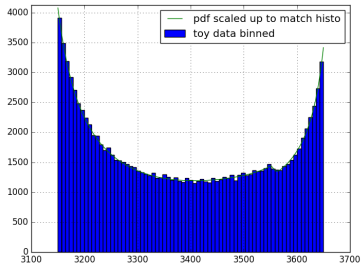


Extremely sensitive to cusp amplitude

Cusp amplitude:  $6 \cdot 10^{-7}$



Cusp amplitude:  $4 \cdot 10^{-7}$



What can we do for now:

- Generate toys (equivalent size of data taken in run I and II)
- Running model of the dimuon spectrum and the relevant contributions for this search
  - Rare nonresonant
  - $J/\psi$
  - $\psi(2S)$
  - *Cusp*
  - Will be added in the future:  $cc$ ,  $B \rightarrow DDK$ ,  $DD^*K$ ,  $D^*D^*K$
- Binned fit pdf to the data and calculate likelihood

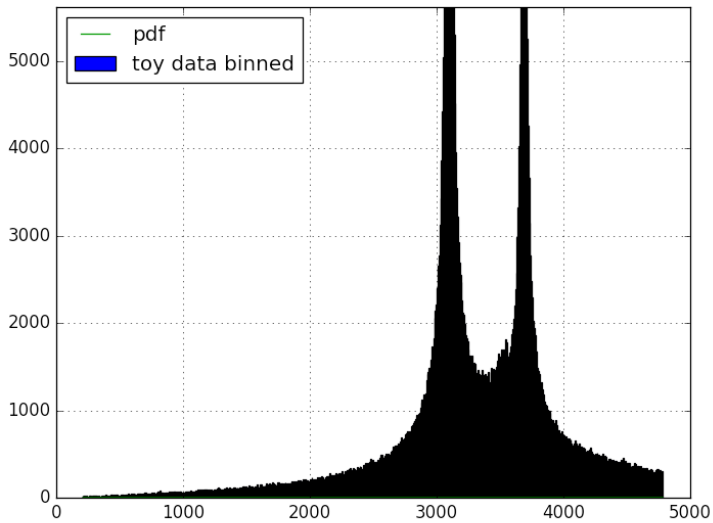
Next steps:

- Integrate true shape of the cusp
- Add  $cc$ ,  $B \rightarrow DDK$ ,  $DD^*K$ ,  $D^*D^*K$ 
  - ▷ Only  $B \rightarrow DD^*K$  nonresonant
- Implement additional crosschecks
- Analyze resolution
- Low energy regime fit:
  - ▷ Improve sensitivity on charm part and tau tail by including a constraint from low  $q^2$





# Backup Slides



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