Semi-leptonic B→K$^{(*)}$νν analysis: background characterization studies

Alejandro Pérez,

A. Stocchi, N. Arnaud, L. Burmistrov

LAL – Université Paris XI

G. Dolinska

Taras Shevchenko National Univerity of Kyiv

DGWG meeting

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Outline

- **Background studies strategy**

- **Some results for $B^+ \rightarrow K^+ \nu \nu$**

- **Summary and outlook**

Background studies strategy

- **Wants to produce a list of modes which are the dominant contribution to the BB (charge and neutral) background**
- **Samples:**
  - Use BB-generic (charged and neutrals) n-tuples from previous BaBar analyses
    - $B^+ \to K^+ \nu\nu$ and $B^0 \to K^0_S \nu\nu$ (BAD-2132)
    - $B^+ \to K^{*+} \nu\nu$ and $B^0 \to K^{*0} \nu\nu$ (BAD-1845)
- **Two step approach (suggested by Matteo):**
  - Study background composition of tag-side reconstruction
  - Then study background composition of signal-side
- **The method:**
  - Study possible sources of background coming from mis-rec and mis-ID
  - Study multiplicity of the background B-decay modes
- **From those samples will construct a cocktails of B decays**

Reminder: $B^+ \to K^+ \nu\nu$ Analysis

- **Btag candidate:** K^+ (π^+) from D reconstruction is LHKaonTight (is not LHKaonNotAPion)

- **Bsig candidate:** look in ROE for a K^+ in LHKaonTight list with opposite charged as Btag

- **<u>Do a cut and count analysis</u>** with the following selection cuts:

  - Number of Charged tracks in event < 12

  - Number of Neutrals in event < 15

  - R2 < 0.84

  - $-2.5 < \text{Cos}(\theta_{BDl}) < 1.1$

  - $|M_D(\text{rec}) - M_D(\text{PDG})| < 3\sigma$ (mass resolution)

  - $M_{Dl} > 3.0$ GeV/c^2

  - $p^*_D(\text{CM}) > 0.5$ GeV/c

  - $p^*_{lep}(\text{CM}) > 1.35$ GeV/c

  - $M_{miss} > 1.0$ GeV/c^2

  - $p^*_{signalK}(\text{CM}) > 1.25$ GeV/c

  - $|\text{Cos}(\theta[K,Dl])(\text{CM})| < 0.8$

  - $E_{extra} < 250$MeV (**see later slide**)

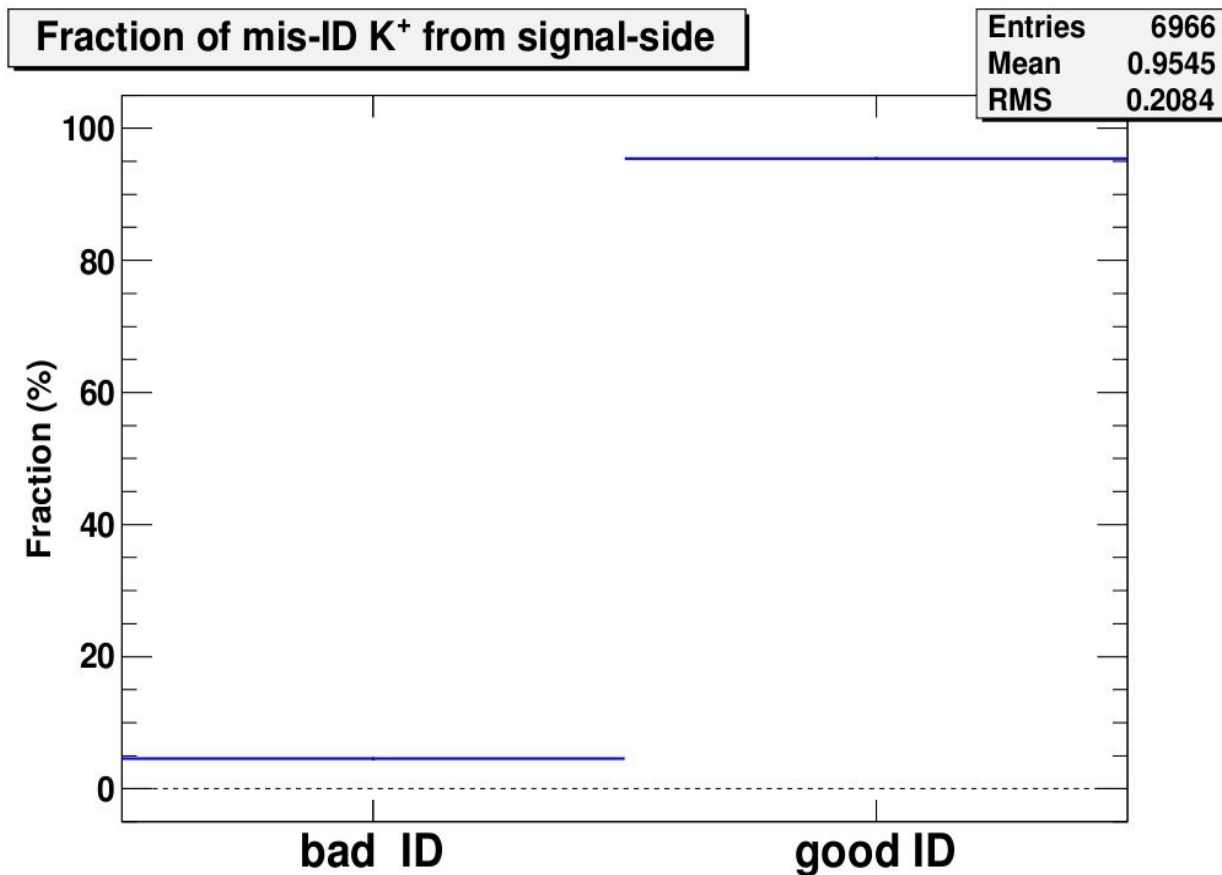# Some results: B$^+$→K$^+$νν Analysis

- **Marginal contribution from mis-ID on the tag-side (BB-generic charged sample)**
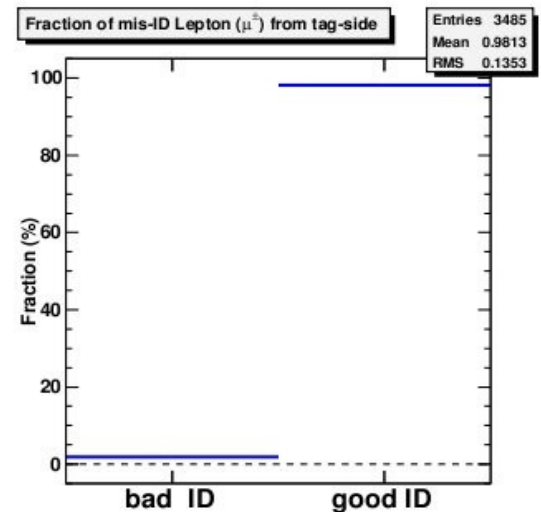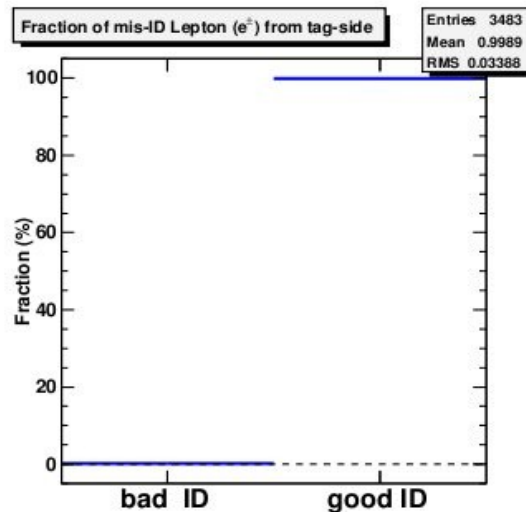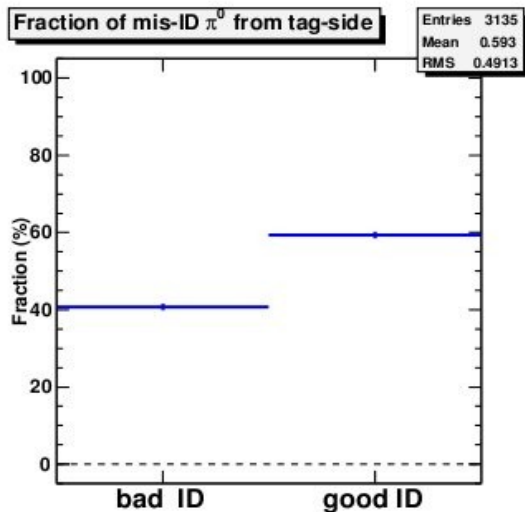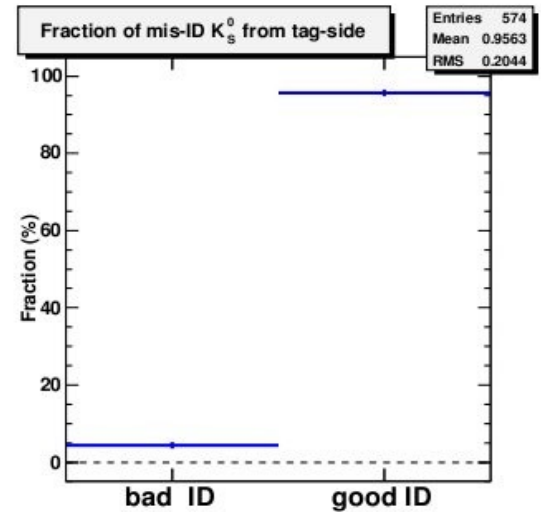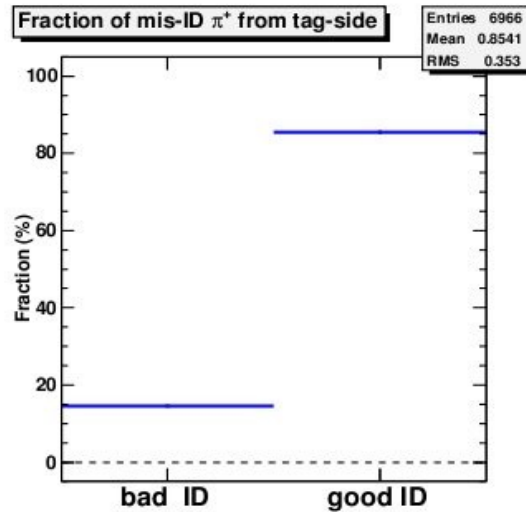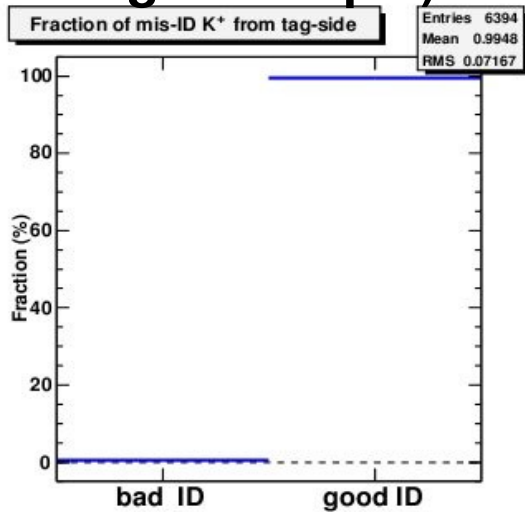
Some results: B⁺→K⁺νν Analysis

- **Marginal contribution from mis-ID on the signal-side (BB-generic charged sample)**

Some results: B⁺→K⁺νν Analysis

- **Multiplicity of the background components (BB-generic charged sample)**

Some results: B⁺→K⁺νν Analysis

- **In most of the background events (~98%) one of the Bs decays semi-leptonically (BB-generic charged sample)**
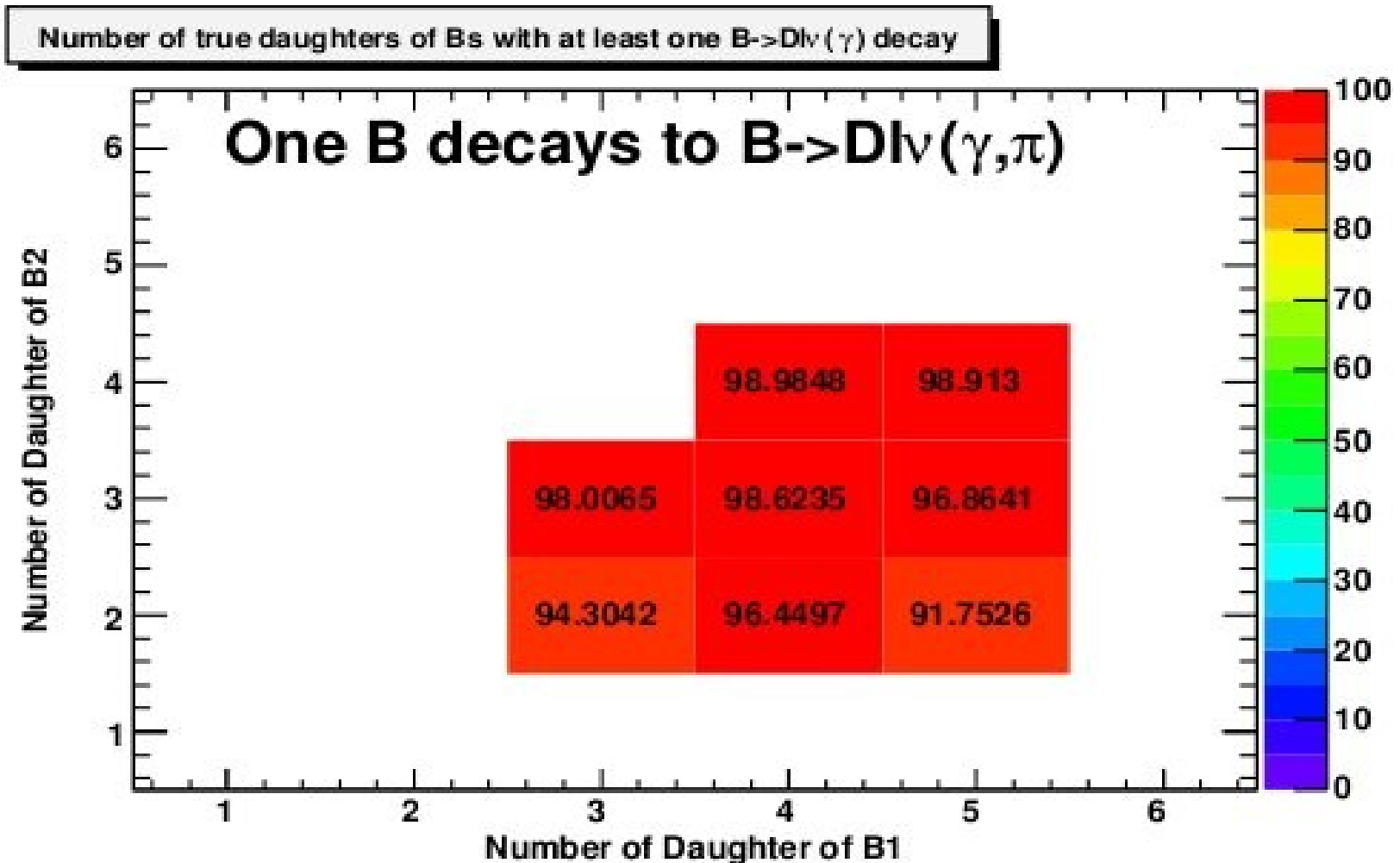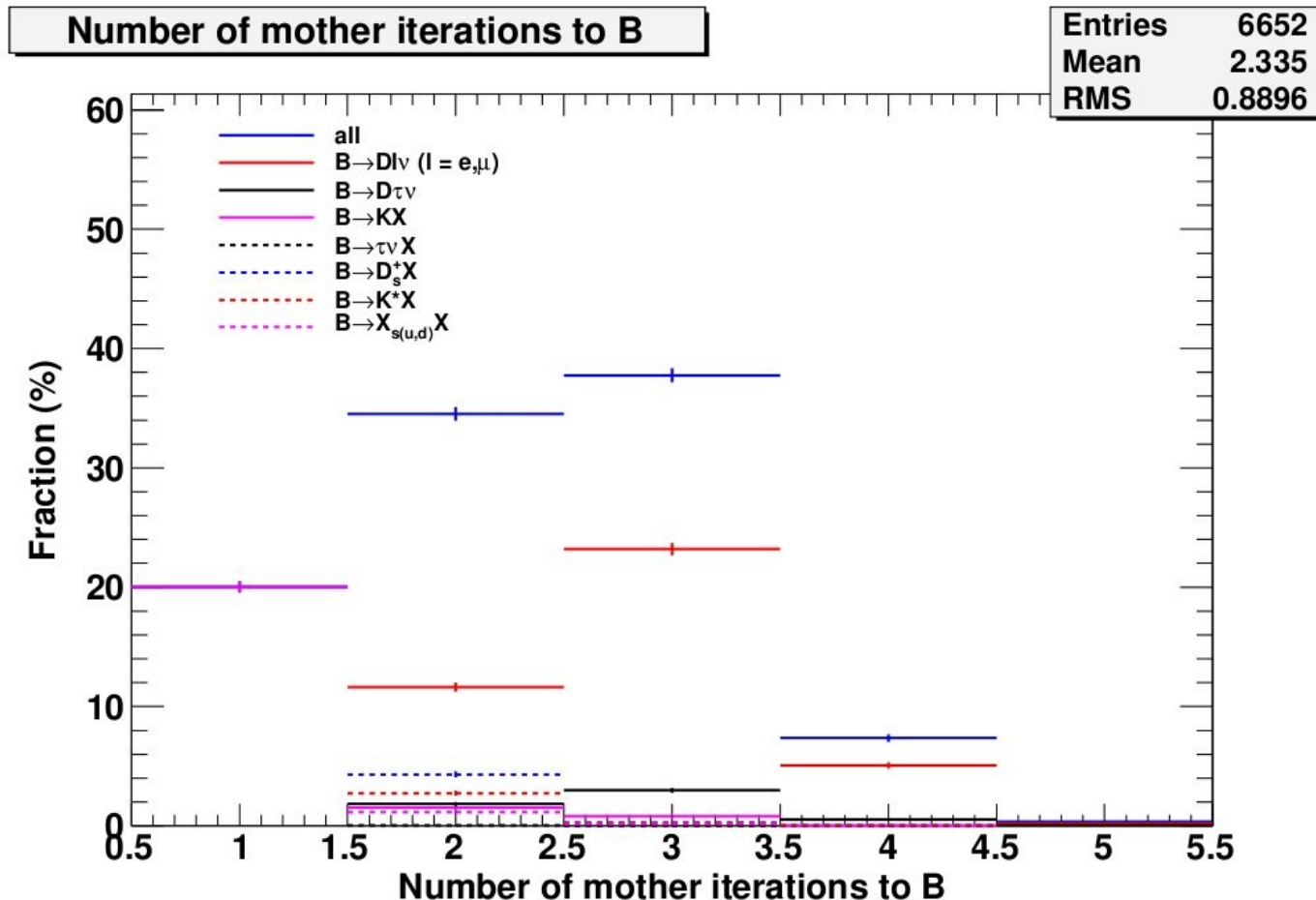
Number of true daughters of Bs with at least one B->Dlν (γ) decay

Some results: B⁺→K⁺νν Analysis

- Around ~65% of the background events are double semi-leptonic decays (BB-generic charged sample)

- Around 20% are real charged kaons coming from a B (BB-generic charged sample)

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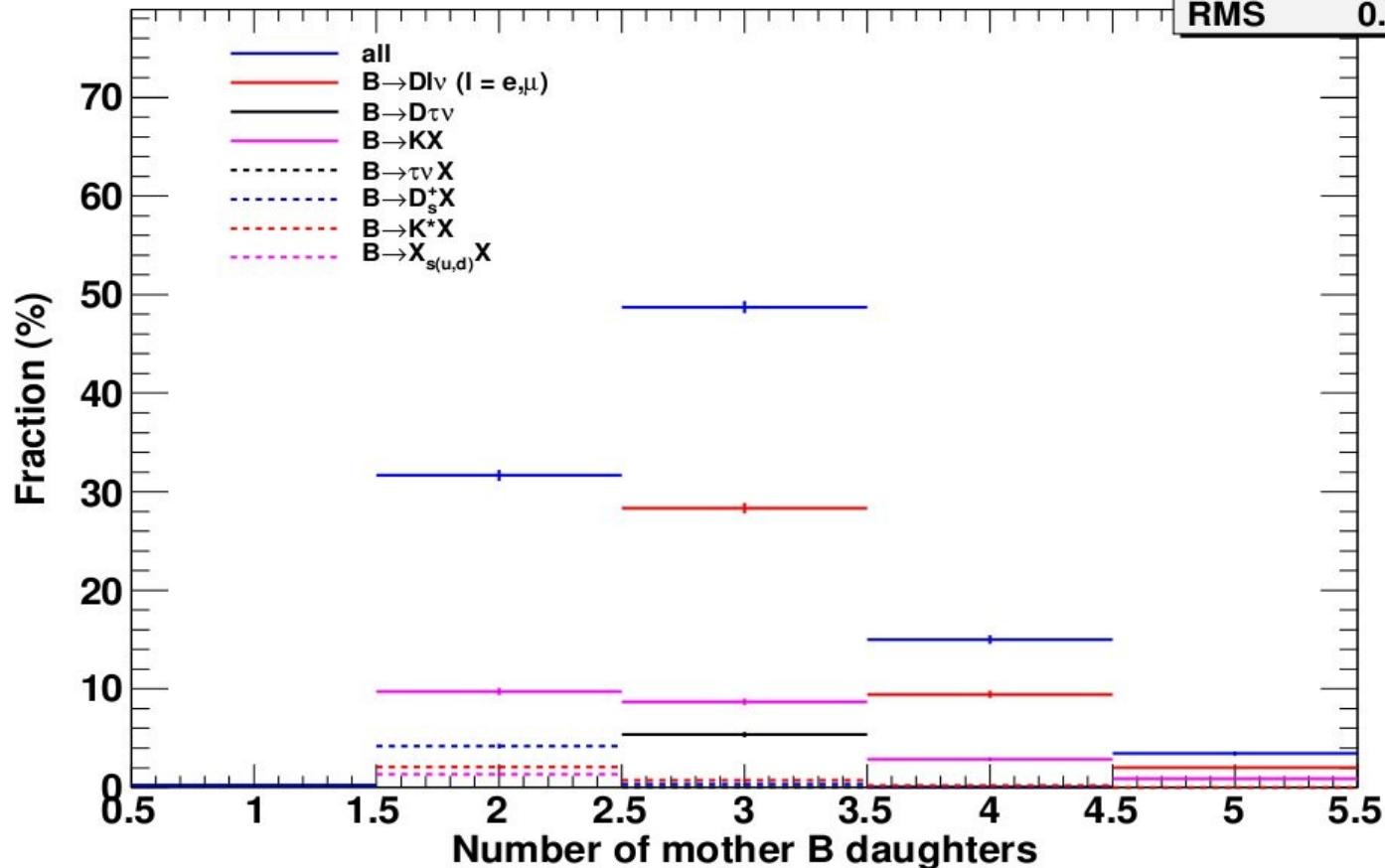- Around 20% are real charged kaons coming from a B (BB-generic charged sample)

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Summary and outlook

- **Already some results for $B^+ \to K^+ \nu\nu$:**
  - Almost all the tag-side candidates (~98%) are real semi-leptonic (SL) decays
  - The other B decays semi-leptonically most of the times (~65%)
  - Around 20% of the background comes from B->KX decays
  - Obtain similar results for the BB-generic (neutral) samples

- **Can use a cocktail of double SL decays to study BB-backgrounds**

- **Next steps:**
  - Need to finish background characterization for the $B^+ \to K^+ \nu\nu$ mode
  - Extend the studies for the other decay modes ($B^0 \to K^0 \nu\nu$ and $B \to K^* \nu\nu$)

Backup