B meson reconstruction

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SLAC NATIONAL ACCELERATOR LABORATORY

Status

- A draft has been available on the PBF hypernews for a while now

  ⇒**http://hypernews.slac.stanford.edu/HyperNews/BFLB/get/AUX/2010/09/30/15.05-2772-pbf-brecon.pdf**

  - Current Table of Contents:
    1. Introduction
    2. Methodology and Motivation
    3. Techniques
       - Hadronic tag B reconstruction
       - Semileptonic tag B reconstruction
       - Double-tagging

Introduction

- Currently includes a short description of the detectors
  - Is that relevant to retain?
  - Potentially useful, but could be trimmed down a little
- Include some brief description of how the sections will be set out?

Methodology and Motivation section

- Recoils method are crucial for studying decay modes where decay kinematics can not be fully constrained
- B_{tag} reconstructed semileptonically or hadronically
- A variety of “Double-tagging” methods are used for systematic studies, control samples and cross-checks
- Overview of this chapter is included
- Some mention of the relevance of these techniques for the Super Flavour Factories – should this be dropped or softened?

Techniques: Hadronic tag B reconstruction

- Description of BABAR's semi-exclusive approach to $B \to D^{(*)} Y$ reconstruction (two versions available at BABAR, only one described)
- Descriptions of Belle's approaches (two versions available at Belle)
  - cut based selection of exclusive modes: $B \to D^{(*)}(\pi, \rho, a_1, D^{(*)})$
  - neural-net based selection of semi-exclusive modes: $B \to D^{(*)}(K, \pi, 2\pi, 3\pi, 4\pi, D^{(*)})$ and $B \to J/\psi(K, K\pi, K\pi\pi)$
  - Probably we'll need description of both Belle's versions, since not all results from Belle will be based on the updated version.
  - Sections with results will refer to this section, but which version?
- Typical performance (efficiency) is given for all three cases
  - Plots are missing?
- ΔE, $m_{\rm ES}$ (M_{bc}) variables and Argus function are defined
  - Do we need to define them here? Can we refer to definitions given in previous sections?
- General overview of signal side reconstruction is given

Techniques: Semileptonic tag B reco

- Description of $B \to D^{(*)}\ell\nu_\ell$ reconstruction is given
- $cos\theta_{B,D\ell}$ variable is defined
  - Plots missing?
- Performance is given
- Comparison wrt. hadronic tag B reconstruction is briefly discussed (e.g. impact of loss of ability to determine signal B kinematics)
  $\hookrightarrow$ Plan is to expand the comparison of the semileptonic to hadronic methods.

Techniques: double-tagging

- Motivation for performing double tagged analysis is given
  - test of tag B reconstruction efficiency and the description of extra energy in calorimeter
    - Definition of the extra energy is missing.
- 3 classes: semileptonic double-tags, hybrid double-tags and hadronic double tags.
  - description of two approaches testing semileptonic tag B reconstruction efficiency made by BABAR
  - description of test of extra energy distribution with double-tags made by Belle

Is this section in any conflict with sections presenting the results (with tag B related systematics)?

Summary

- Made some progress on B-reconstruction section
- Uploaded to SVN!
- Contacted (sub)editors for assistance in writing some aspects

- What's missing?? Quite a bit!
  - Relevant distributions (some discussion with physics section likely beneficial)
  - Description of Belle techniques, currently very poorly covered
  - Some way to characterize the techniques as they evolved – for easier reference by other sections
  - Explanation of use cases and evolution of different techniques employed (linked to physics again)
  - References

extras