Hadronic Breco code: status report

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From Sept. to Nov. production: to do list

* Hadronic Breco samples vs $B \to K^* \nu\nu$ produced in September:
  - comparison between DG_1 and DG_4 in terms of efficiency and bkg contamination, mode by mode studies

* To do list for the Nov. production:

- bugs to be fixed:
  - bad assignment of kaon lund for kaon coming from B
  - crash related to Dirc code, due to track with very small momentum (i.e. p=2.26e-212) passed to the DIRC reconstruction

  → ROLF fixed this, THANKS!
- filter to speed up the reconstruction
- clean up the code, to disable unused modules and make it more user-friendly
- add B_{sig} modes
- code for validation
- documentation

Lund assignment bug

* analyzing Breco decay modes, 0 events found where $B \to D^{(*)}K$ + Ks/π(0)
  - BR($B \to DK$)/BR($B \to D\pi$) $\approx$ 0.1

* from efficiency studies: the $B \to D^{(*)}K$ + Ks/π(0) modes should be in the reconstructed sample but the π lund is assigned to K (i.e. $B \to DK$ falls in the $B \to D\pi$ category)

* kaon list used: TableBasedKaonLHTightSelection(_TOF)
  - same list used for kaons in the signal side, lund correctly assigned
  - the wrong lund assignement for K from Breco should happen when merging K and π lists in one of the Breco reconstruction steps

* Investigation ongoin

Filters (I)

* Dave asked to add a filter to speed up had Breco reconstruction

* Some ideas:
  - cuts on invariant masses (as done in PacTwoBodyUser and PacS2bUser): the first masses one can cut on are mD and mES → most of the reconstruction done at this point
  - generator level filter to retain only events in which there is at least one generated B→D → according to BaBar Breco code expert, may induce bais
  - a very loose filter on track and cluster multiplicity (some modes have up to 10 tracks and up to 6 neutrals) → according to BaBar Breco code expert, may induce bais

Filters (II)

* Final choice: limit the number of reconstructed Breco channels according to their purity

  - Breco mode classification: neat : purity > 80%
    clean : 50% < purity < 80%
    dirty : 8%<purity<50%

  - Sept production: neat+clean+dirty modes reconstructed;
    efficiency per mode:

	B+B- generic	B0B0bar generic
neat	3.24×10^{-4}	1.50×10^{-4}
clean	1.12×10^{-2}	6.59×10^{-3}
dirty	6.08×10^{-2}	3.53×10^{-2}

  - in some BaBar analysis (i.e. $B \to \tau\nu$) only the cleanest Breco modes are used; same will be probably done with the high SuperB statistics

→ for the November production, reconstruct only neat+clean modes

adding Bsig channels

* For the Sept. production only Bsig $\rightarrow K^{*}\nu\nu$ reconstruction implemented

* For the Nov. prod., aim to add
  - $K\nu\nu$ (both neutral and charged): code has been implemented without to much changes or additions, debugging is ongoin
  - $\tau\nu$: need to set up the code and analyze rootuples, Chih-hsiang and Caltech people may help

* Other Bsig channels to be included:
  - $K^{(*)}ll$
  - any other idea/needs?

Validation

* Comparison between BaBar full simulation and SuperB FastSim:
  - distribution of selection variables: m_{ES}, ΔE, R_2, $\cos\theta_{B,T}$, m_{K^*}, m_{Ks}, E_{extra}, p^*_{miss}, E^*_{miss}
  - reconstruction and selection efficiency

* Code has been set up

* Some "difficulties" on finding the proper BaBar fullSim sample:
  - my $B \to K^* \nu\nu$ production: neat+clean+dirty modes reconstructed, missing TagB_purity to select only neat+dirty
  - $B \to \tau\nu$ production: only charged Breco available

Documentation

* Some info on the PacHadRecoilUser code available on the README committed inside package

* need to update the description of the code after the last changes

* the goal is to write quite detailed instructions on how to run the code, add Bsig channels, analyze the rootuples in the FastSimi wiki User Manual

* to be done when the code will be frozen and the production will start

Conclusion

* To do list status

  - filter → DONE
  - code clean up → DONE
  - new Bsig modes → ONGOING (debugging $B \to K\nu\nu$, $B \to \tau\nu$ to be added and tested, needed/aimed for Nov. production)
  - K lund bug → ONGOING (can potentially stay with this for the production)
  - validation → ONGOING (code ready, need to find BaBar fullSim sample)
  - documentation → TO BE DONE (lower priority wrt code writing and debugging)

Back-up slides