Hadronic Breco code for November production

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Sept Production

* September production:
  - 2 analysis run in parallel (Had Breco + sin2β)
  - produced generic BBbar MC events (+ private production for signal MC studies)
  - compare DG_1 (superb baseline + fwd and bwd DCH) and DG_4 (superb baseline + fwd PID + bwd EMC) in terms of efficiency and bkg contamination, mode by mode studies

* Preliminary results: i.e. B^+B^- generic MC sample
  - DG_4 and DG_1 give similar performances (efficiency, bkg contamination)

	DG_1		DG_4	
	neutral B_{reco}	charged B_{reco}	neutral B_{reco}	charged B_{reco}
reconstructed	1.34×10^{-2}	5.65×10^{-2}	1.36×10^{-2}	5.93×10^{-2}
ΔE cut	1.10×10^{-2}	4.76×10^{-2}	1.12×10^{-2}	5.02×10^{-2}
m_{ES} cut	1.41×10^{-3}	1.02×10^{-2}	1.45×10^{-3}	1.06×10^{-2}
$\cos\theta_{Breco,Thrust}$ cut	1.39×10^{-3}	1.01×10^{-2}	1.43×10^{-3}	1.05×10^{-2}
$\varepsilon_{charged}/\varepsilon_{neutral}$	7.26		7.34	

From Sept. to Nov. production: to do list

* 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

* couldn't fix it before the Nov. production, investigation ongoing

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

Bsig channels in Nov. production (I)

* For the Sept. production only Bsig $\to K^* \nu\nu$ reconstruction implemented
* For the Nov. prod., added
  - $K\nu\nu$, $K_s(\pi\pi)\nu\nu$
  - $\tau\nu$, with $\tau \to e\nu\nu$, $\mu\nu\nu$, $\pi\nu$, $\rho(\pi\pi^0)\nu$, $a_1(\rho\pi)\nu$

* Output of the production will be one ntuple containing the info on all the Bsig modes reconstructed in the recoil of a Had Breco

* More than one Upsilon per event:
  - $\Upsilon 1 \to$ Breco1 Bsig1
  - $\Upsilon 2 \to$ Breco1 Bsig2
  - $\Upsilon 3 \to$ Breco2 Bsig1
  - $\Upsilon 4 \to$ Breco3 Bsig1
  - $\Upsilon 5 \to$ Breco3 Bsig2

* select best Breco according to smallest ΔE

* if to this Breco, corresponds more than one Bsig select the one corresponding to searched Bsig channel

Bsig channels in Nov. production (I)

* Bkg production

November 2009 production request table

Detector Geometry	Generator	N events	Analysis	Requestor	Status
DG_1	B0B0bar_generic	50x10^6	All	Dave	Running
DG_1	B+B-_generic	50x10^6	All	Dave	Mostly Complete
DG_1	ccbar	50x10^6	DstD0ToKspipi, HadRecoil	Rolf, Elisa	Pending
DG_1	uds	100x10^6	HadRecoil	Elisa	Pending
DG_1	B+B-_tau_DX	1x10^6	BtoTauNu	Chih-hsiang	Pending
DG_4	B0B0bar_generic	50x10^6	All	Dave	Running
DG_4	B+B-_generic	50x10^6	All	Dave	Mostly Complete
DG_4	ccbar	50x10^6	HadRecoil	Elisa	Pending
DG_4	uds	100x10^6	HadRecoil	Elisa	Pending
DG_4	B+B-_tau_DX	1x10^6	BtoTauNu	Chih-hsiang	Pending
DG_BaBar	B0B0bar_generic	50x10^6	HadRecoil	Elisa	Complete
DG_BaBar	B+B-_generic	50x10^6	HadRecoil	Elisa	Complete
DG_BaBar	ccbar	50x10^6	DstD0ToKspipi, HadRecoil	Rolf, Elisa	Pending
DG_BaBar	B+B-_tau_DX	1x10^6	BtoTauNu	Chih-hsiang	Pending

* Signal MC production run “privately”
  - DG_BaBar, DG_1, DG_4 ; 10^6 events for each signal mode
* Other Bsig channels to be included:
  - $K^{(*)}ll$
  - any other idea/needs?

Validation and Documentation

* 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
  - need to find proper BaBar fullSim sample:

  charged and neutral sample, ntuples with putiry info to select only neat+clean modes

* 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

Conclusion

* To do list status
  - filter → DONE
  - code clean up → DONE
  - new Bsig modes → DONE
  - K lund bug → ONGOING
  - validation → TO BE DONE
  - documentation → TO BE DONE

Back-up slides