Had Breco code: status report

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Outline

* Code issues:
  - multiple Breco candidates
  - bwd EMC related variables
  - B-D vertex variables

* Code status for Februaryproduction

multiple Breco candidates

* events with 'semi-identical' breco candidates, i.e. same m_{ES}, ΔE, decayMode but different E^*_{Breco} (!!)
* only for modes with π^0, i.e. $B \rightarrow D^* \pi\pi^0$, $B \rightarrow Dk\pi^0 ks$
* related warning msg

  UsrWriteBSemiExcl::UsrWriteBRecoBase.hh(63):Cannot put mES = 5.25414 for candidate 0x12d1cff0 in the UsrCandBlock
* fromBaBar-hn: two candidates considered as clones and candBlock.put(cand, mES) fails
* 'semi-identical' candidates are not clones:

  → use different gammas to reconstruct the π^0 (m_{ES} and ΔE should be different between the two); at ntuple level: the i^{th} cand own the UsrVariables (mES, ΔE,...) of the first
* no news from BaBar Breco experts
* not sure this will be fixed for this production run

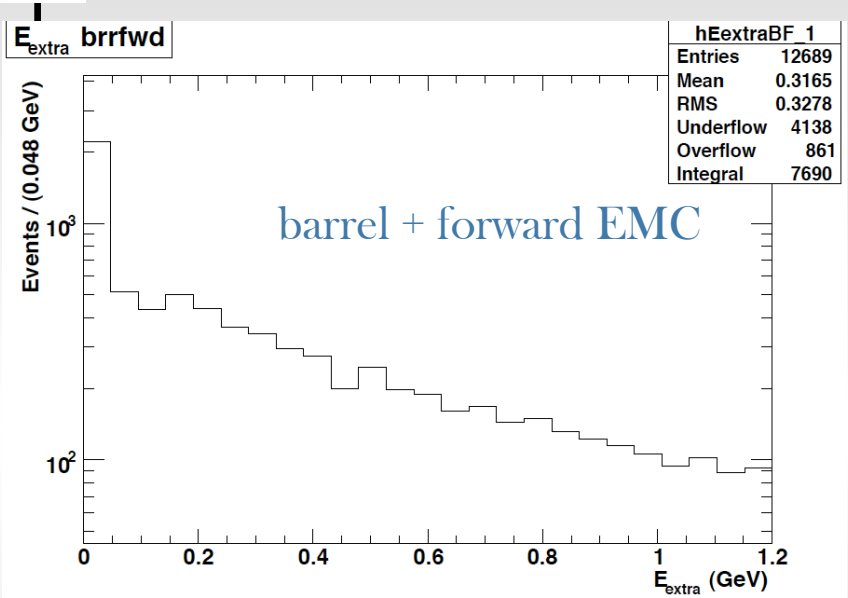
Bwd EMC related variables

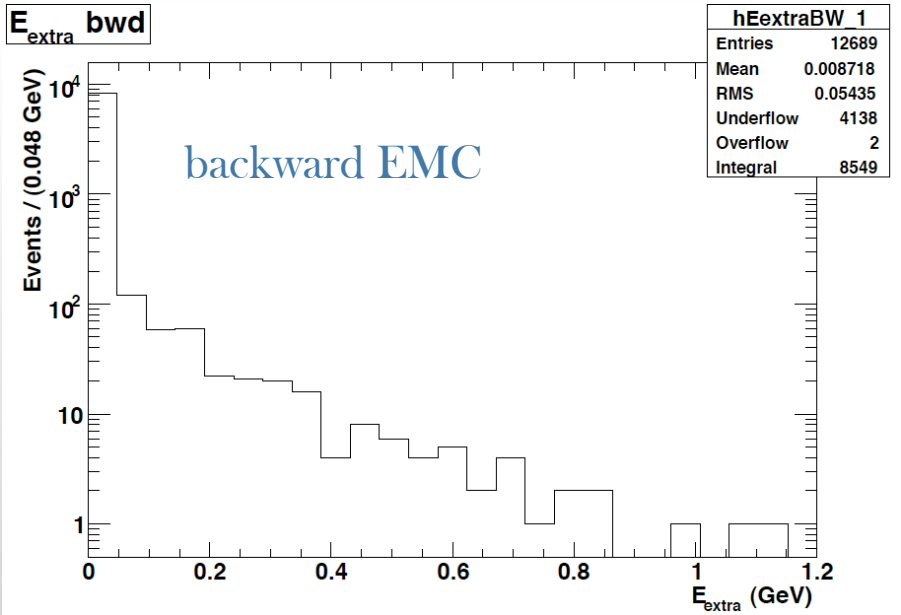
* use Bwd EMC to reconstruct Breco-Bsig candidates
* added Bwd EMC related variable which allow to use the bwd ECM as veto device

* New Vars:
  - EMissBrrFwd, PMissBrrFwd, PhiMissBrrFwd, CosThMissBrrFwd : missing quantities computed using only barrel and fwd emc
  - YSigB_EExtraNeutralBrrFwd, YSigB_EExtraNeutralBwd: split EExtraNeutral
  - in barrel+fwd and bwd
  - YSigB_IsBwdEMC: = 0 no γ from bwd emc to reconstr Breco or Bsig
    = 1 γ from bwd emc to reconstr Breco
    = 2 γ from bwd emc to reconstr Bsig
    = 3 γ from bwd emc to reconstr both Breco and Bsig
  - R2AllCalorNeutrals, R2AllCalorNeutralsBrrFwd

EextraNeutrals: BrrFwd vs Bwd

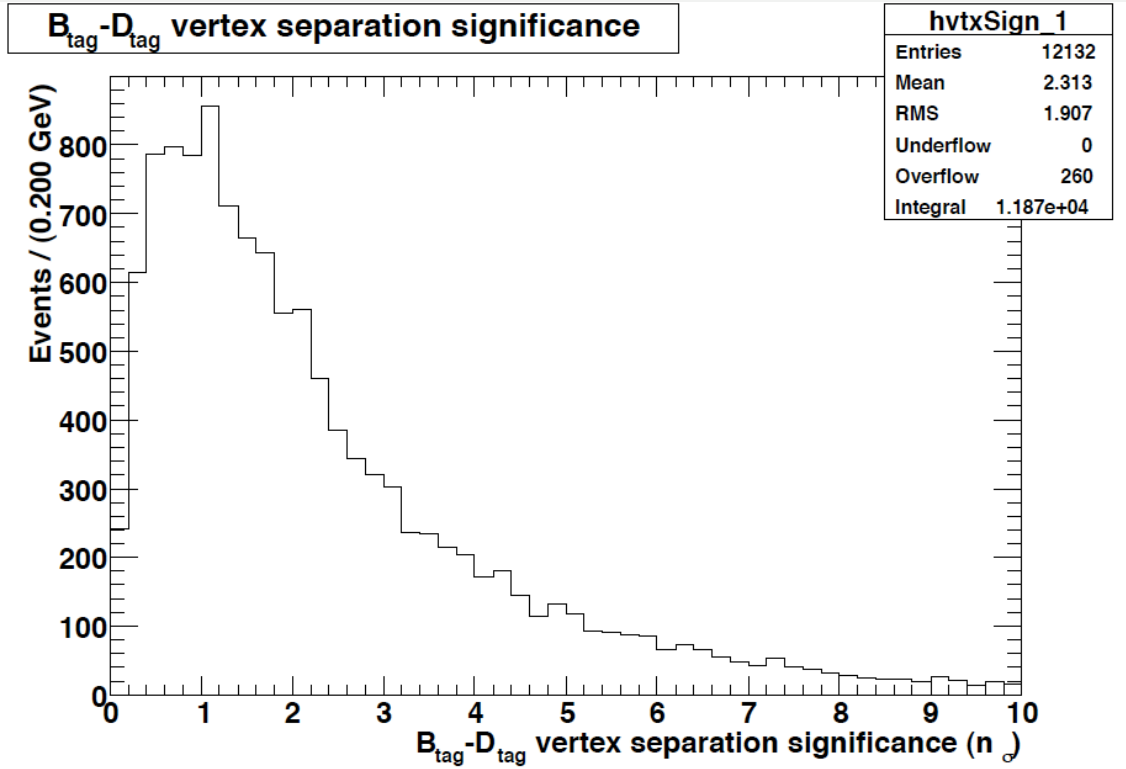
* EExtraNeutrals for $B^+ \to K^{+*} \nu\nu$ signal MC





B-D vertex separation

* added UsrVariables to study Breco-D vertex separation
  - useful to test SVT L0 performances
* B and D vertex coordinates and fit vertex infos
* B-D vertex separation significance



Code Status

* fixed most of the issues on the to-do-list from Frascati meeting
* added new variables to use Bwd EMC as Veto device
* added infos on B-D vertex separation useful for SVTers

* multiple Breco bug still to be fixed (probably not feasible before the production)

* other pending issues:
  - write Wiki documentation
  - validation code on PacUserQA

* minor refinements may be done, but code is ready to be committed

Back-up slides

Hadronic Breco reconstruction in FastSim (I)

* SemiExclusive reconstruction implemented in FastSim: PacHadRecoilUserPackage
* Package based on BaBar BTauSemiExclUser code

* It contains:
  - main analysis tcl on which run the executable
  - tcl for skim emulation (based on FilterTools/BSemiExclPath.tcl)
  - tcl for PID selection (TableBasedXXXSelection selectors based on BaBar run6-r24c PID tables)
  - tcl and .cc / .hh for signal and tag side reconstruction and selection:

    $B_{sig} \to K\nu\nu$, $K^*\nu\nu$, $\tau\nu$ available
  - tcl for BtaTupleMaker settings
  - README

Hadronic Breco reconstruction in FastSim (II)

* Breco side: limit the number of reconstructed modes channels according to their purity
  - Breco mode classification: neat : purity > 80% , $\varepsilon_{neat} \approx O(10^{-4})$
    clean : 50% < purity < 80% , $\varepsilon_{clean} \approx O(10^{-3}\text{-}10^{-2})$
    dirty : 8%<purity<50% , $\varepsilon_{dirty} \approx O(10^{-2})$
  - 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

→ reconstruct only neat+clean modes

* Bsig side:
  - $K^+\nu\nu$
  - $K_s(\pi^+\pi^-)\nu\nu$
  - $K^{*+}(K_s\pi^+, K^+\pi^0)\nu\nu$
  - $K^{*0}(K^+\pi^-)\ \nu\nu$
  - $\tau^+\nu$, with $\tau^+ \to e^+\nu\nu$, $\mu^+\nu\nu$, $\pi^+\nu$, $\rho^+(\pi^+\pi^0)\nu$, $a_1{}^+(\rho^0\pi^+)\nu$

Bsig channels in Nov. production

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

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

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

  * select best Breco according to smallest ΔE

  * if more than one Bsig is associated to the best Breco, select the one corresponding to the searched Bsig channel