



Breco studies in FastSim: status report

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meeting 17 March 2009



Outline

- * Implementation of Breco reconstruction in FastSim
- * to do list

- * summary of PID studies in fastsimV1
- * BaBar FullSim vs BaBar FastSim
- * Migration from FastSimV1 to FastSimV3



Breco in FastSim

- * Reconstruction of SL and HAD Breco modes implemented in FastSim (V1)

$B \rightarrow D l \nu X$	$(X = \gamma, \pi)$	SL
$D^0 \rightarrow K^- \pi^+$	$D^+ \rightarrow K^- \pi^+ \pi^+$	$D^{*+} \rightarrow D^0 \pi^+$
$D^0 \rightarrow K^- \pi^+ \pi^0 (\gamma\gamma)$		$D^{*+} \rightarrow D^+ \pi^0$
$D^0 \rightarrow K^- \pi^+ \pi^+ \pi^-$		$D^{*0} \rightarrow D^0 \gamma$

$B \rightarrow DX$	$D^+ \rightarrow K^- \pi^+ \pi^-$	$D^{*+} \rightarrow D^0 \pi^+$	$\left(\begin{array}{l} X = n\pi + mK + rK_S^0 + q\pi^0 \\ n + m + r + q < 6 \end{array} \right)$
$D^0 \rightarrow K^- \pi^+$	$D^+ \rightarrow K^- \pi^+ \pi^- \pi^0$	$D^{*0} \rightarrow D^0 \pi^0$	
$D^0 \rightarrow K^- \pi^+ \pi^0 (\gamma\gamma)$	$D^+ \rightarrow K_S^0 \pi^+$	$D^{*0} \rightarrow D^0 \gamma$	
$D^0 \rightarrow K^- \pi^+ \pi^+ \pi^-$	$D^+ \rightarrow K_S^0 \pi^+ \pi^- \pi^+$		
$D^0 \rightarrow K_S^0 \pi^+ \pi^-$	$D^+ \rightarrow K_S^0 \pi^+ \pi^0$		

HAD



To do list

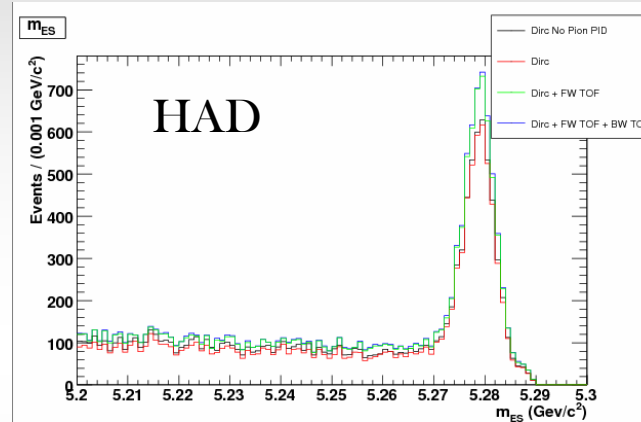
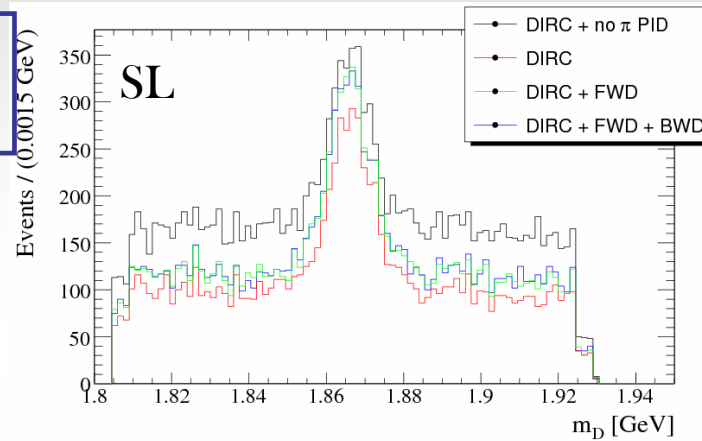
- * effect of **PID devices** on Breco reconstruction in V1
 - * comparison between **BaBar fast simulation (FastSim)**- **BaBar full simulation** (standard BaBar code)
 - Breco and Bsig reconstruction efficiency
 - distribution of kinematical variables
 - * Add **PID selectors** implemented by Nicolas for fastSim V3
 - find the best set of **PID selectors** for **DIRC** and **DIRC+TOF**
 - compare them with the **BaBar fastsim** configuration
- relative improvement of the analysis between **BaBar config** and **SuperB** with **different PID devices**
- * compare **BaBar fastsim** config with different **SuperB EMC geometries**



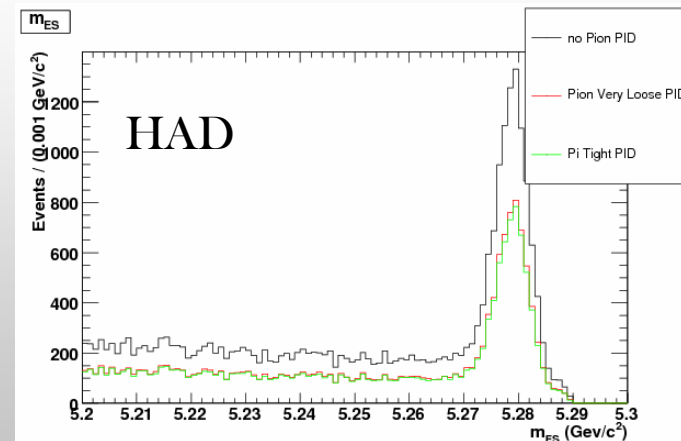
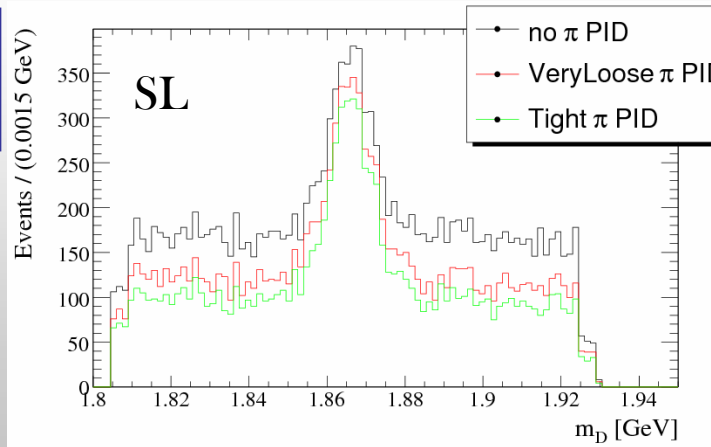
Summary of PID studies in fastsim V1

* Study effects of the PID by using MC-truth information and reproducing BaBar PID selector performances

PID DEVICES



pion PID





BaBar config: FastSim vs FullSim (I)

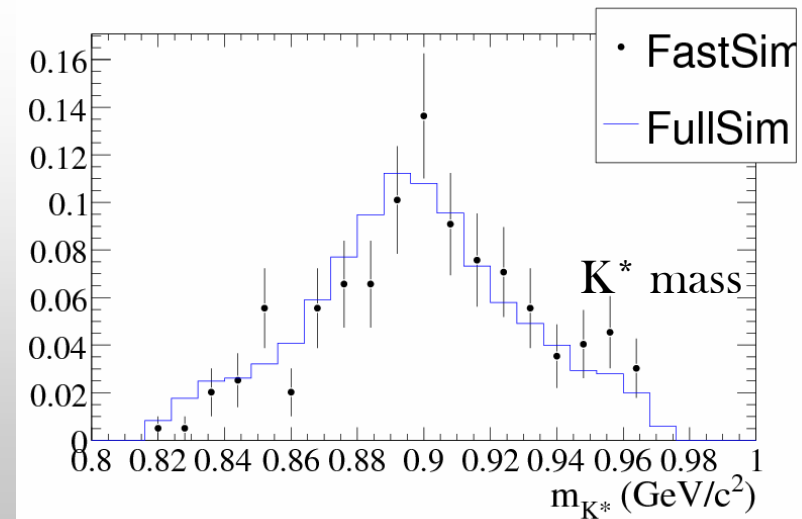
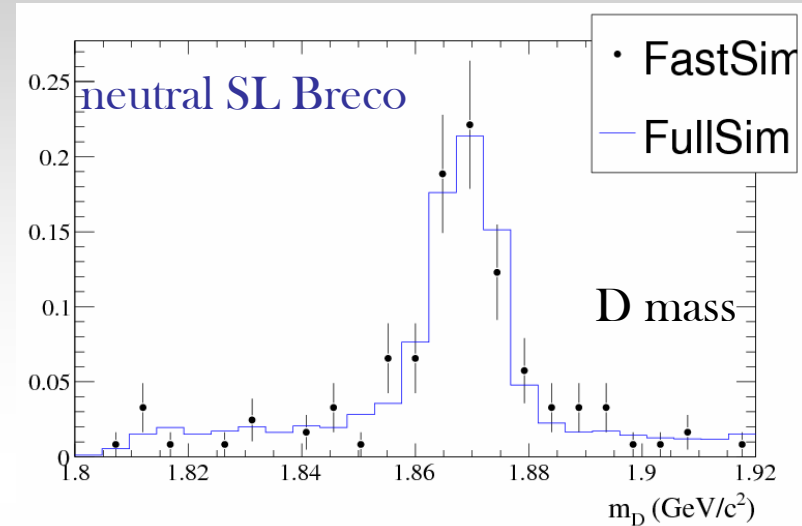
Strategy:

- * generate **SL Breco vs $B \rightarrow K^* \nu \nu$**
- * reconstruct events in FastSim using **BaBar** configuration
- * compute **Breco** and **Breco+Bsig** reconstruction **efficiencies**
- * compare with those obtained from the standard **BaBar fullSim**
- * use some kinematics variable **distributions** to compare fast and full **BaBar** simulation



BaBar config: FastSim vs FullSim (II)

	$B^0 \rightarrow K^{*0} \nu \bar{\nu}$	
	Breco eff	Breco+Bsig eff
BaBar fastSim	1.68%	0.19%
BaBar fullSim	1.36%	0.14%
	$B^+ \rightarrow K^{*+} \nu \bar{\nu}$	
BaBar fastSim	1.28%	0.15%
BaBar fullSim	1.93%	0.22%





Migration to FastSimV3

- * running BaBar code to reconstruct SL and HAD Breco
- * package used:
 - ~ BTauNuSemiLepUser (SL)
 - ~ BTauNuSemiExclUser (HAD)
 - ~ BRecoilTools (HAD)
- * code **WORKING** in FastSimV1
- * **CRASHES** when running in **FastSimV3** with errors:

BtaRecoCandId.cc(161):AbsRecoCalo has no Emc or Ifr >> component >>
BtaRecoCandId.cc(47):Candidate has no recognized >> reco object! >>

- * differences in the creation of the BtaCandidate in the two versions?



Man power

- * LAL, Roma and Perugia

- * BReco side
 - ~ SL: Francesco (Roma)
 - ~ HAD: Elisa (Perugia)

- * Bsig channels
 - ~ $B \rightarrow K\nu\nu$ vs SL BRECO: Alejandro (LAL)
 - ~ $B \rightarrow K\nu\nu$ vs HAD BRECO: Leonid (LAL)
 - ~ $B \rightarrow K^*\nu\nu$ vs SL BRECO: Francesco (Roma)
 - ~ $B \rightarrow K^*\nu\nu$ vs HAD BRECO: Alessandro and Elisa (Perugia)
 - ~ other Bsig channels (i.e. $B \rightarrow \tau\nu$) to be added



Conclusion

- * reconstruction of SL and HAD Breco modes implemented in FastSim V1
- * preliminary studies on PID devices and selectors
 - ~ SL can benefit from tight PID selectors, loose PID in the HAD reco avoid loss of efficiency
 - ~ improvement (above all in the HAD reconstruction) by adding FW TOF
- more detailed studies repeated with PID selectors in V3
- * (preliminary) comparison between BaBar FastSim and FullSim
 - ~ discrepancies probably due to PID and Vertexing
- * problems when migrating to fastSimV3
 - ~ **ANY HELP WOULD BE REALLY APPRECIATED!**
- * Plan to estimate the relative improvement between SuperB and BaBar in $B \rightarrow K^{(*)} \nu \nu$ using FastSim
- * More detailed studies on PID devices and EMC geometries



Back-up slides



Implementation of a “raw” PID

- * Implementation of **PID selector** in FastSim : *ongoing*
- * Study effects of the **kaon** and pion **PID** by using **MC-truth information**
 - ~ choose a **K** and a π selector assuming the **BaBar** performances

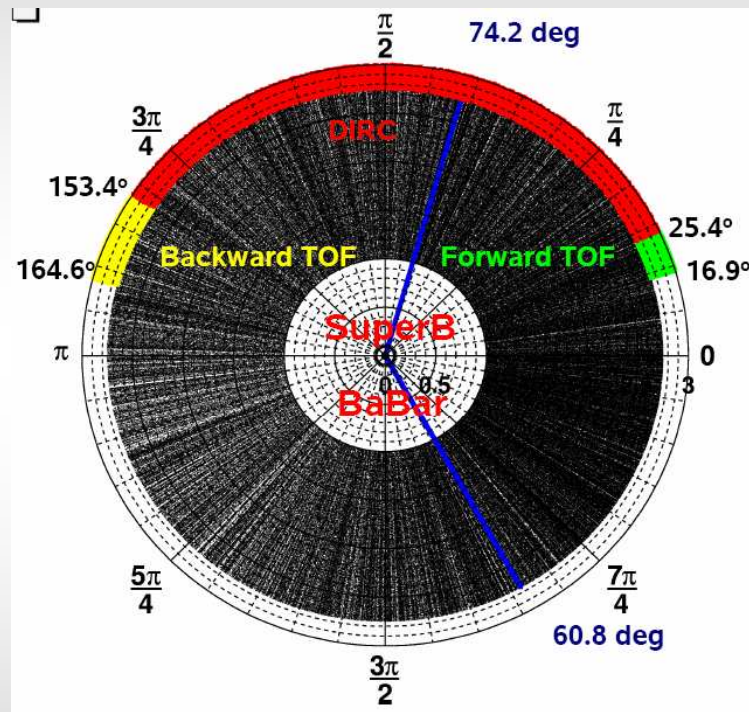
selector	efficiency	misID
Kaon: KLHTight	85%	1% (with pion)
Pion: piLHVeryLoose	99%	20% (with kaon)

- ~ for each reconstructed Breco check the a **K** has been correctly reconstructed using MC truth info: if yes accept the **K** with a probability = **K eff.** of a given selector
If the **K** has been misidentified as a π , accept the hadron with a probability = **K- π misID** of a given selector
- ~ iterate for each **K** associated to the Breco and do the same for all π
- ~ select the **B** candidate if all the daughters have been accepted



PID devices geometry (I)

* different PID device coverage (by Leonid)



* Study the impact of the three devices by selecting Breco candidates with all tracks crossing:

- ~ DIRC
- ~ DIRC + FW TOF
- ~ DIRC + FW TOF + BW TOF

implemented by cutting in θ_{Lab}

* “geometric” gain wrt DIRC-only by adding:

- FW TOF : 6.1%
- BW TOF : 0.6%