Impact of Bwd-EMC on Physics using the Sep. 2010 fastsim production

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Elba  **Workshop**

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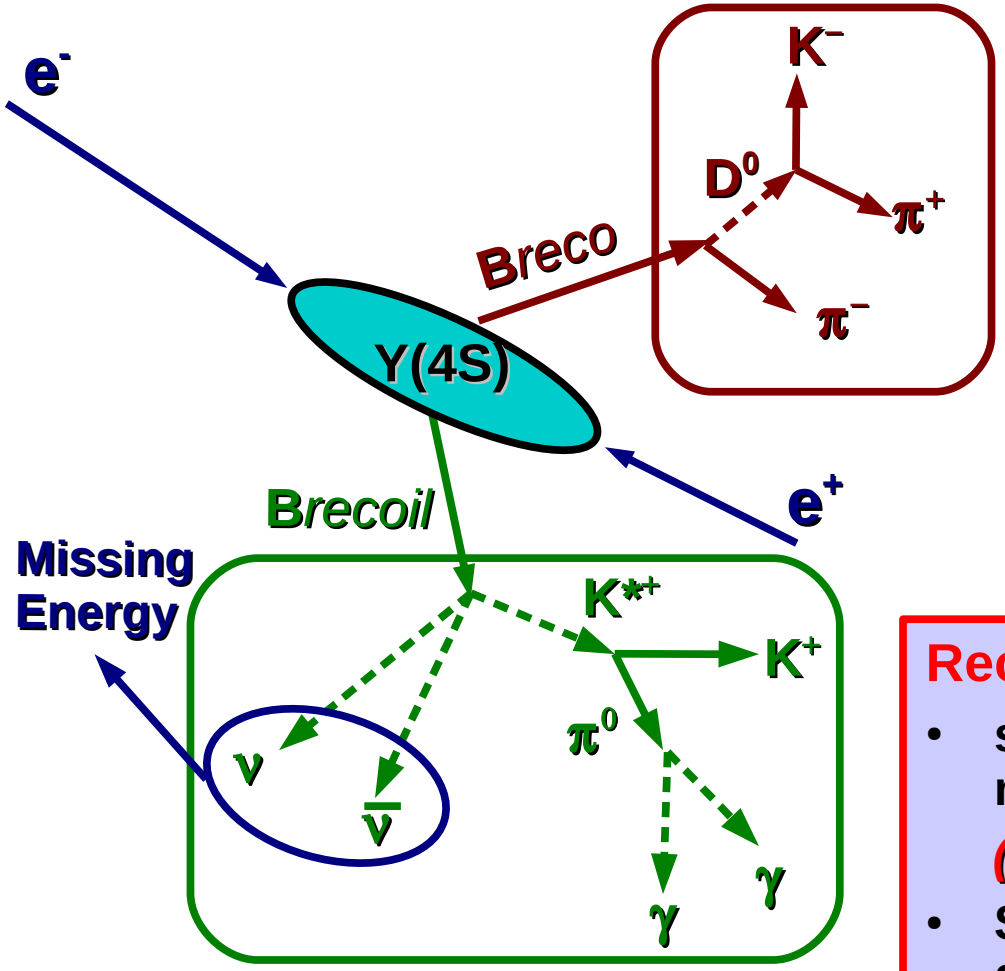
Outline

- **The analysis strategy (a reminder)**
- **The samples**
- **The Bug on the September 2010 samples**
- **A patch to use the September 2010 BB-background samples**
  - The method (the filtering algorithm)
  - Some validations and cross-checks
- **Results on Bwd-EMC Studies**
- **Summary and outlook**

Recoil Analysis Technique

- Most of the searches for rare B decays exploit the **Recoil Technique**:



Breco : full (partial) reconstruction of one B into a hadronic (semi-leptonic) final state

Brecoil : look for the signal signature, e.g. $K^{(*)}$ not accompanied by additional (charged+neutral) particles + **Missing Energy**

Recoil technique at B-Factories:

- search for rare decays (~10^{-5}) with missing energy
  (Not possible at hadronic machines)
- Several benchmark channels at SuperB: $B \to \tau\nu$, $B \to K^{(*)}\nu\nu$, ...

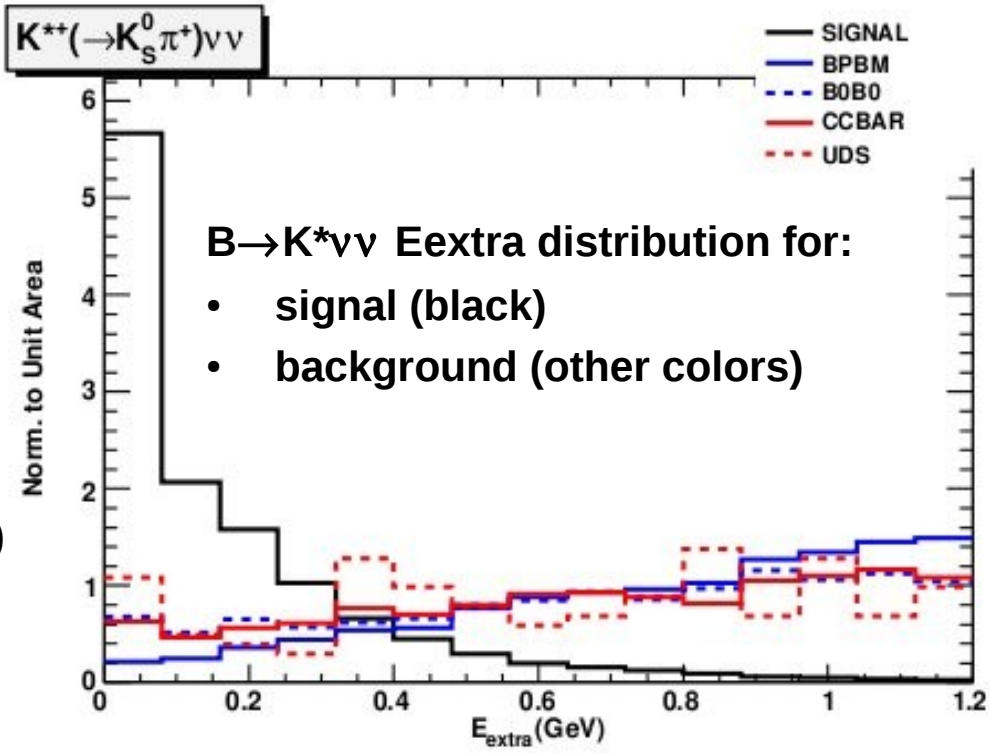
$B \to K^{(*)} \nu\nu$ Analysis strategy

Signal-side selection:

- $B \to K\nu\nu$: look for a single K^+ (K^0_S) in B*recoil*
- $B^* \to K^*\nu\nu$: look for a K^{*+} (K^{*0}) in B*recoil.* Several modes:
  $K^{*+} \to K^0_S(\to\pi^+\pi^-)\pi^+$, $K^0_S(\to\pi^0\pi^0)\pi^+$, $K^+\pi^0$ (charged); $K^{*0} \to K^+\pi^-$ (neutral)
- Opposite (same) charges of B*reco* and B*recoil* for charged (neutral) modes

- No extra tracks in the event
- Kinematic cuts: K^0_S and K* mass
- Kaon (K^+,K^0_S) K* CM momentum
- Missing energy (E_{beams} – energy of charged and neutral objects in event)

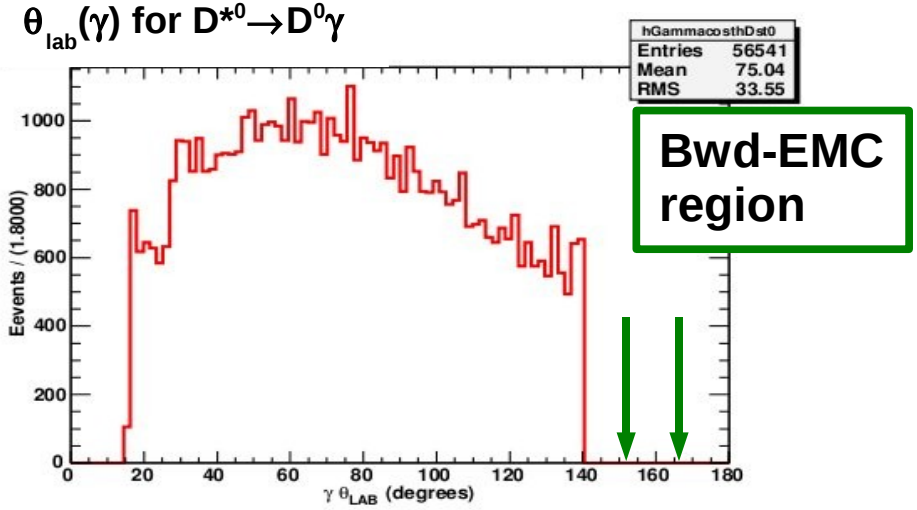
- **Main discriminant variable:**
  Eextra = Σ(extra neutrals in the EMC)



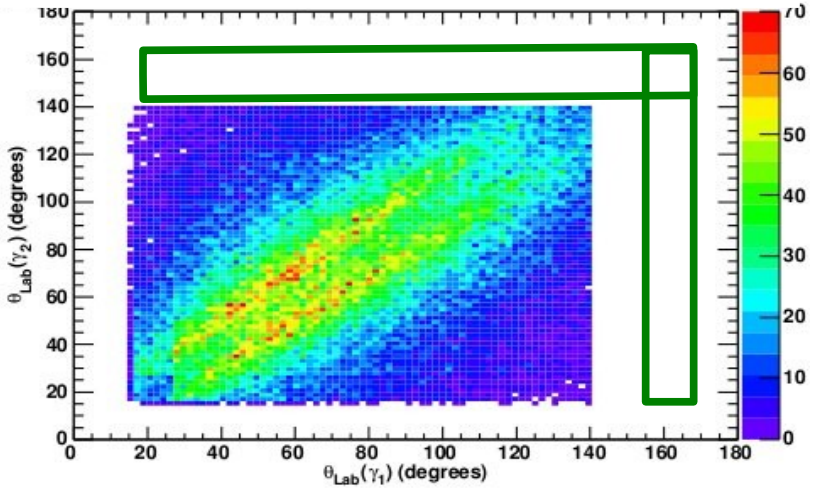
Bwd-EMC Studies Strategy: Veto device

- **B_{tag} and B_{sig} candidates reconstructed without neutrals from Bwd-EMC**

$\theta_{lab}(\gamma)$ for $D^{*0} \rightarrow D^0\gamma$



$\theta_{lab}(\gamma 1)$ vs $\theta_{lab}(\gamma 2)$ for $D^0 \rightarrow K^-\pi^+\pi^0(\rightarrow 2\gamma)$



- **Bwd-EMC information only used at the last step of the selection:**
  - E_{extra}(Bwd) = Σ(extra neutrals on Bwd-EMC)
- **Test different $E(\gamma)_{min}$ cut for Bwd-EMC photons (none, 30, 50, 70 MeV)**
- **Evaluate Bwd-EMC impact with the relative change on significance:**

$$\delta(S/\sqrt{(S+B)}) = \frac{S/\sqrt{(S+B)}|_{bwd} - S/\sqrt{(S+B)}|_{nobwd}}{S/\sqrt{(S+B)}|_{nobwd}} \approx (\varepsilon_S/\sqrt{\varepsilon_B} - 1) \ (B >> S)$$

- **ε_S (ε_B) is the signal (background) relative efficiency after E_{extra}(Bwd) veto**

The Samples

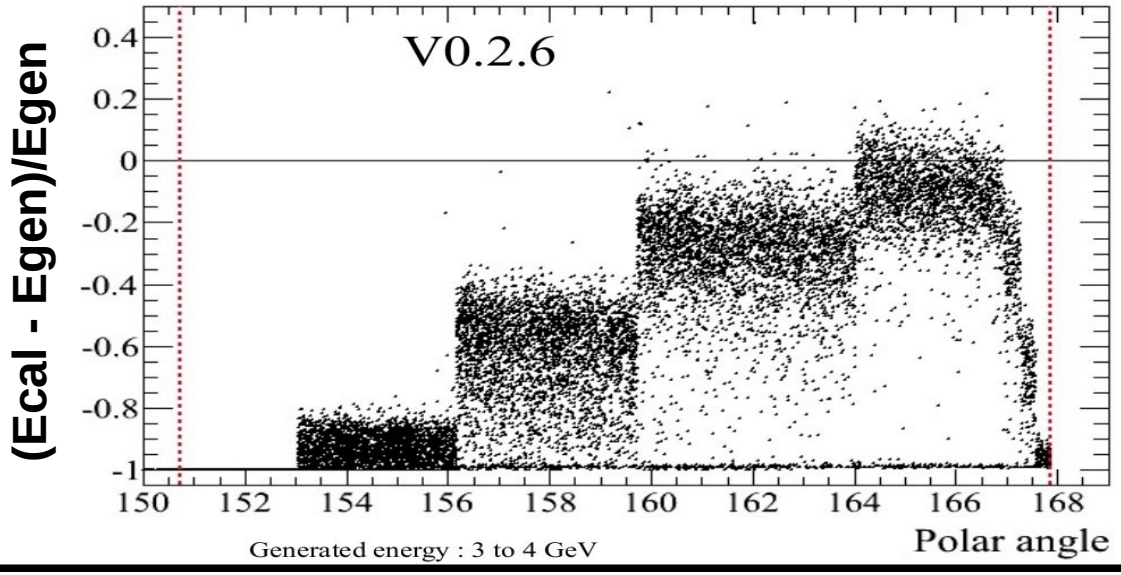
- **Produced new signal samples with FastSim V0.2.7 (No Bwd-EMC bug):**
  - $B^+ \to K^+ \nu\nu$ (DG_4a): 6.00 M
  - $B^0 \to K^0 \nu\nu$ (DG_4/DG_4a): 6.00 M
  - $B^0 \to K^{*0} \nu\nu$ (DG_4/DG_4a): 6.00 M
  - $B^+ \to K^{*+} \nu\nu$ (DG_4/DG_4a): 6.00 M
  - $B^+ \to \tau^+ \nu$ (DG_4/DG_4a): 6.00 M

- **Background Samples are the same of Sep. 2010 (FastSim V0.2.6):**
  - B^+B^- SL-cocktail (DG_4/DG_4a): 340.72/344.32 M
  - B^0B^0 SL-cocktail (DG_4/DG_4a): 284.00/284.56 M

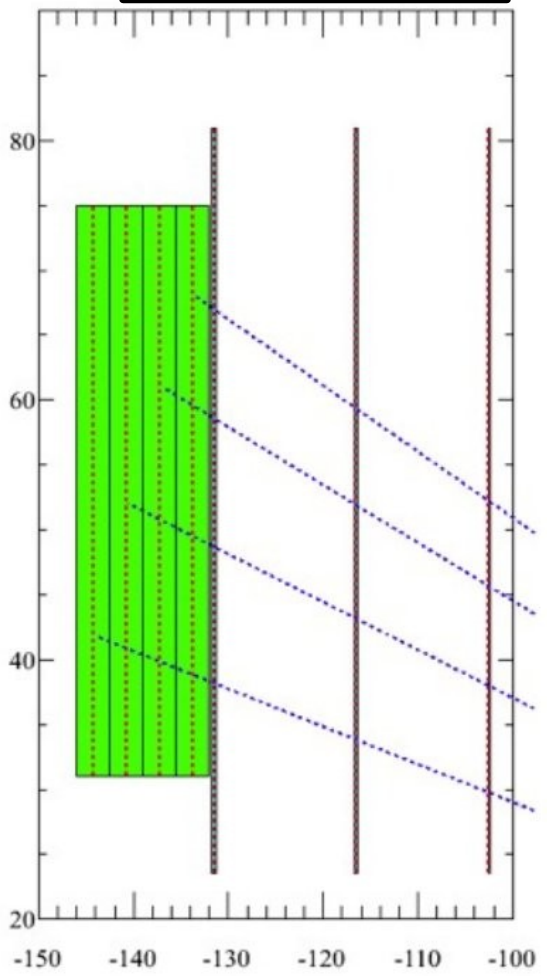
- **All samples generated with bkg mixing NoPairs**

Bwd-EMC: The bug on Sep.2010 samples

A lot of energy is lost in large portion of the Bwd-EMC!!



Slide from Chih-hsiang



Blue dashed lines end at 5 ns

- A pulse timing curve is used to model how much signal should be converted to energy: the curve height at the expected maximum is used.
- The peak is at 5 ns for the time constant 10 ns.
- Particles coming in late result in reduced energy, and zero if later than 5 ns.
- The step structure in the top figure is due to the fastsim modeling (four layer material).

A patch to correct the Bwd-EMC information on the Sep. 2010 samples

The method: filtering algorithm (I)

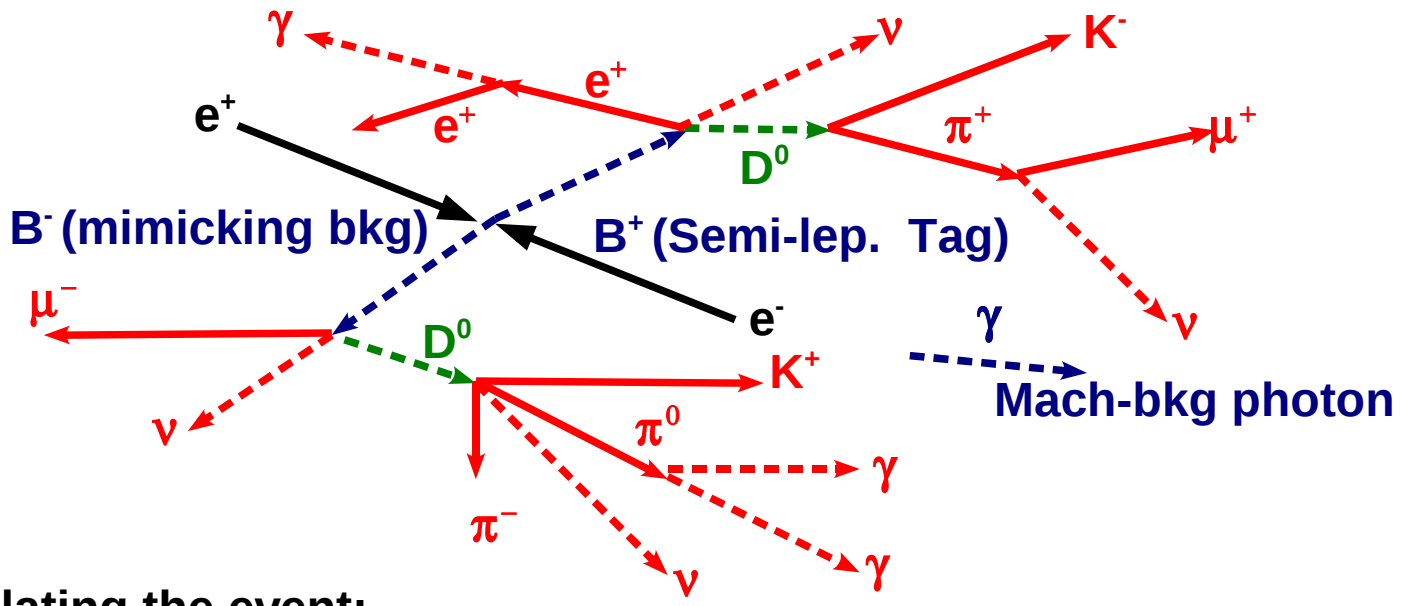
- **Sep. 2010 samples:** bugged Bwd-EMC
  - ⇒ Sub-estimation of Eextra(Bwd-EMC) both for signal and BB-bkg samples
  - ⇒ Sub-estimation of the Bwd-EMC impact on the analysis

- **But Bwd-EMC information is only used at the last stage of the selection (veto device strategy)**

- **The idea:** re-simulate the selected events up to this point with the bug-fixed version of fastsim (V0.2.7) and extract Eextra(Bwd-EMC)
- **To do this need to define a "filtering algorithm" that:**
  - Selects primaries from the mc-truth list (mc-block in the n-tuples)
  - Extract the production vertex and momenta of these primaries (not possible for machine background particles)

The method: filtering algorithm (II)

- **The filtering algorithm:**
  - Select only the stable particles in the event: γ, e^+, μ^+, K^+, π^+, K^0_L, p^+, n0
  - Check that this particles doesn't come from machine background
  - Select as primaries the earliest stable particles in the event full decay chain



- **Re-simulating the event:**
  - Save primaries in a datacard (lundID, Momentum, production vertex)
  - Inject primaries in FastSim V0.2.7 (with the new GfiInputFile generator)
  - Save all the reconstructed neutrals in the event in a n-tuple

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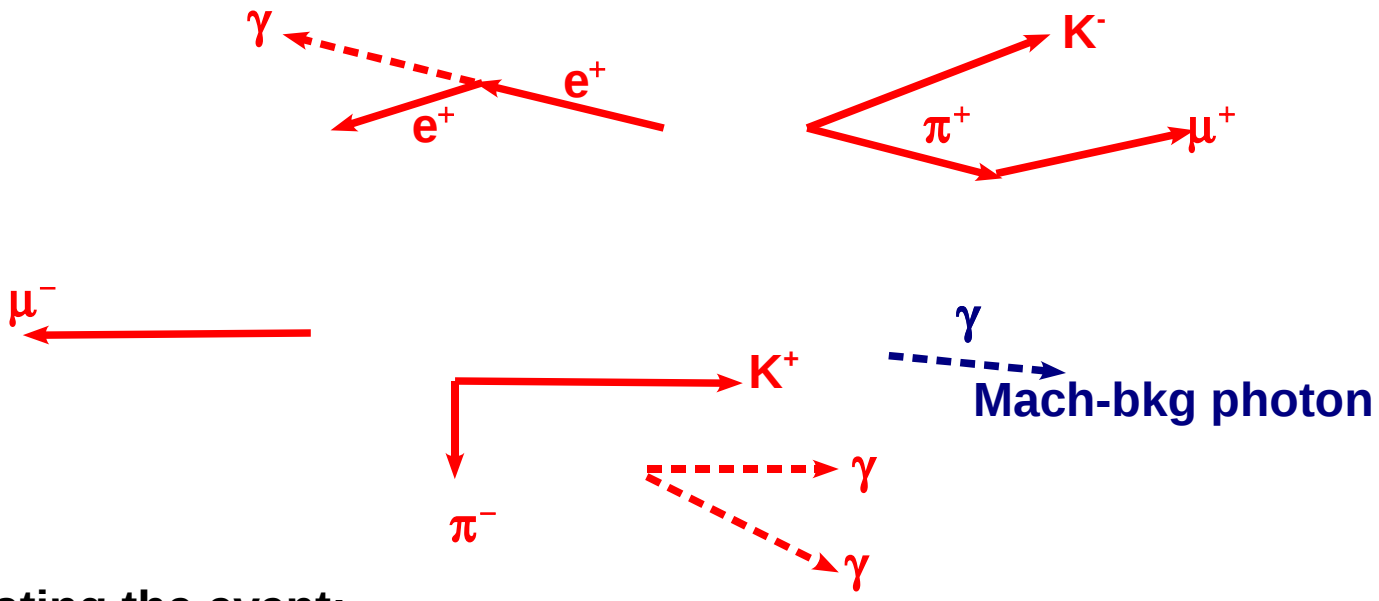

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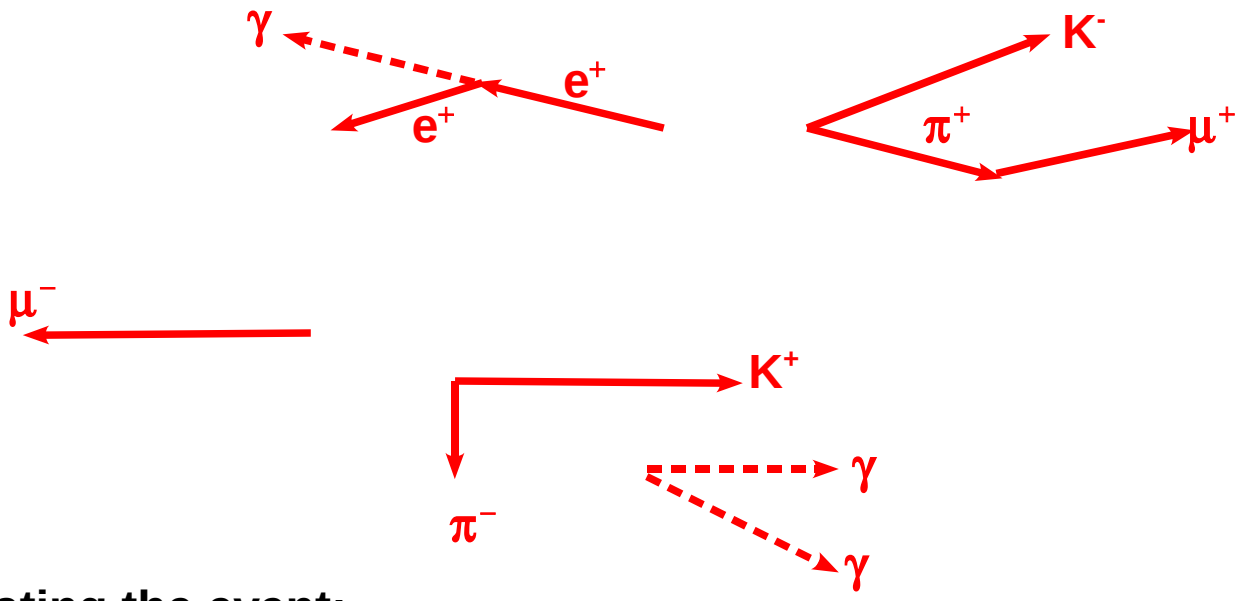

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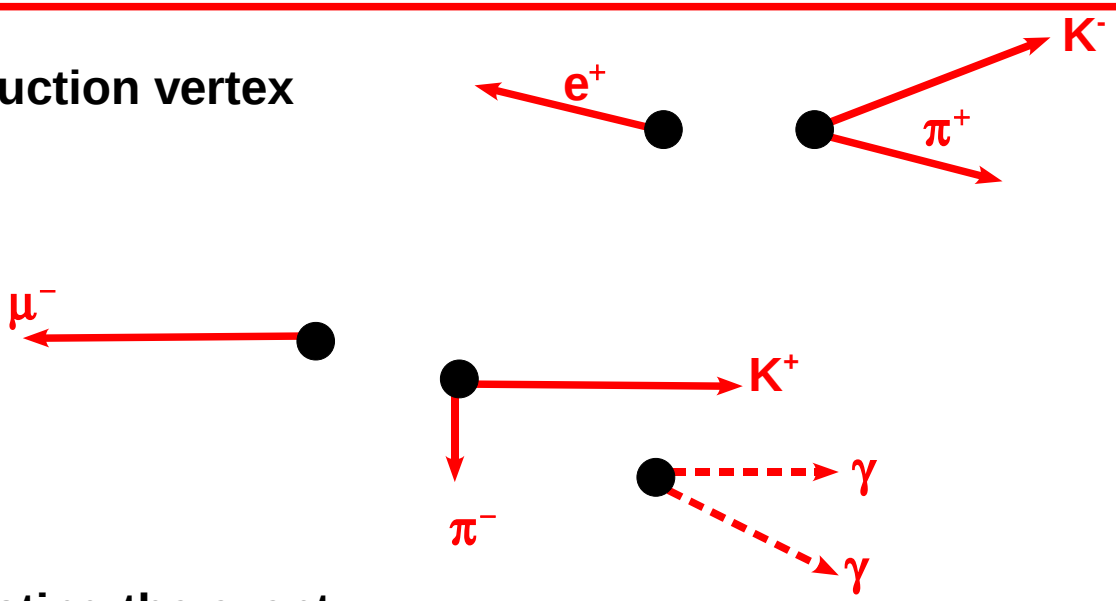
● **= production vertex**



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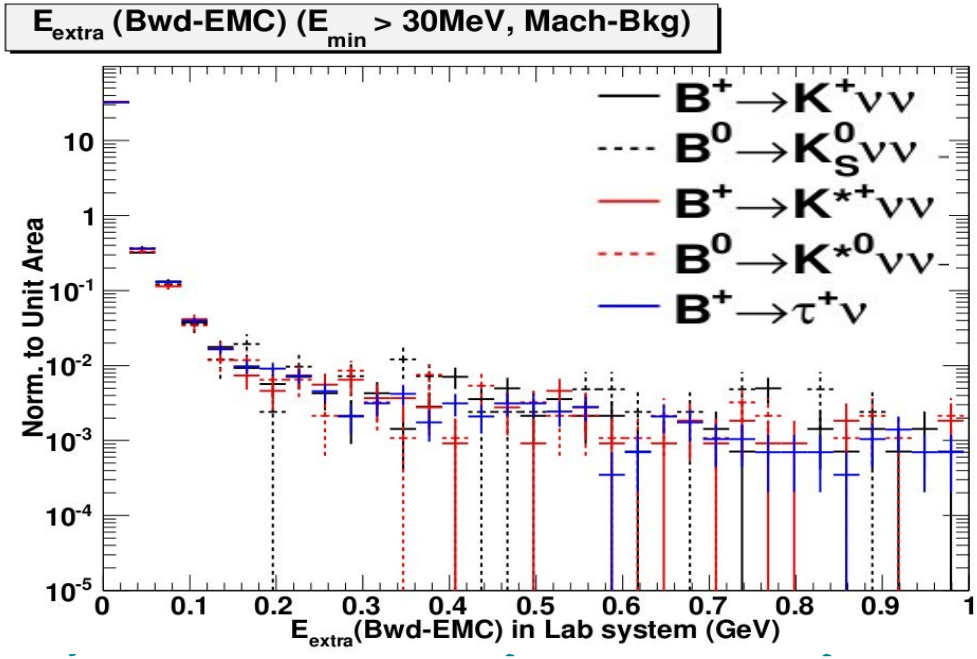
The method: filtering algorithm (III)

- **Re-calculating Eextra(Bwd-EMC) (**no consideration of machine background**):**
  - Select the reconstructed neutrals on the Bwd-EMC
  - Sum up their energies to calculate Eextra(Bwd-EMC)
- **Eextra(Bwd-EMC) = Eextra(Bwd-EMC)$_{phy}$ + Eextra(Bwd-EMC)$_{mach-bkg}$**
  - **Eextra(Bwd-EMC)$_{phy}$**: particles from the physical event (BB-event)
  - **Eextra(Bwd-EMC)$_{mach-bkg}$**: particles from machine background
- **Hypothesis: Eextra(Bwd-EMC)$_{mach-bkg}$** contribution is the same for the signal and BB-generic samples, and it should be mode independent

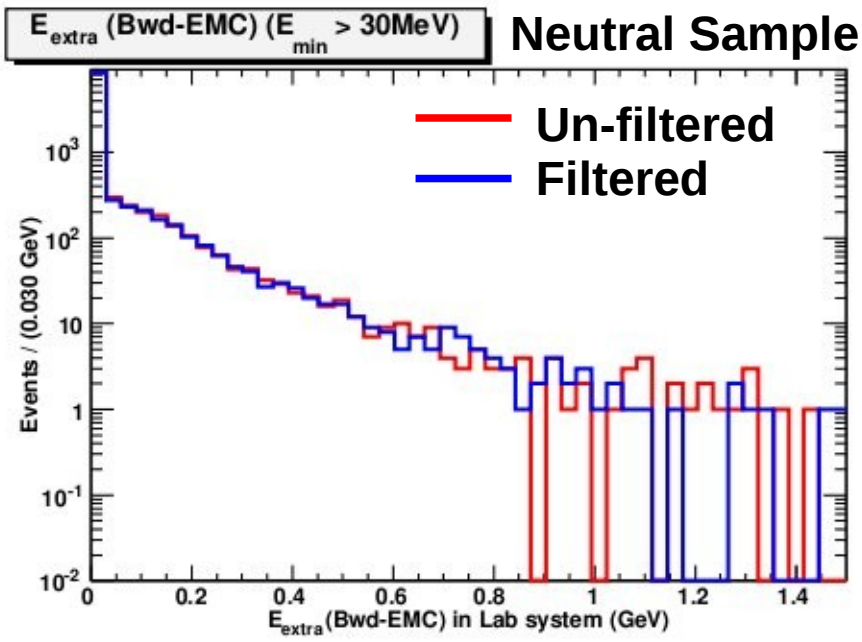


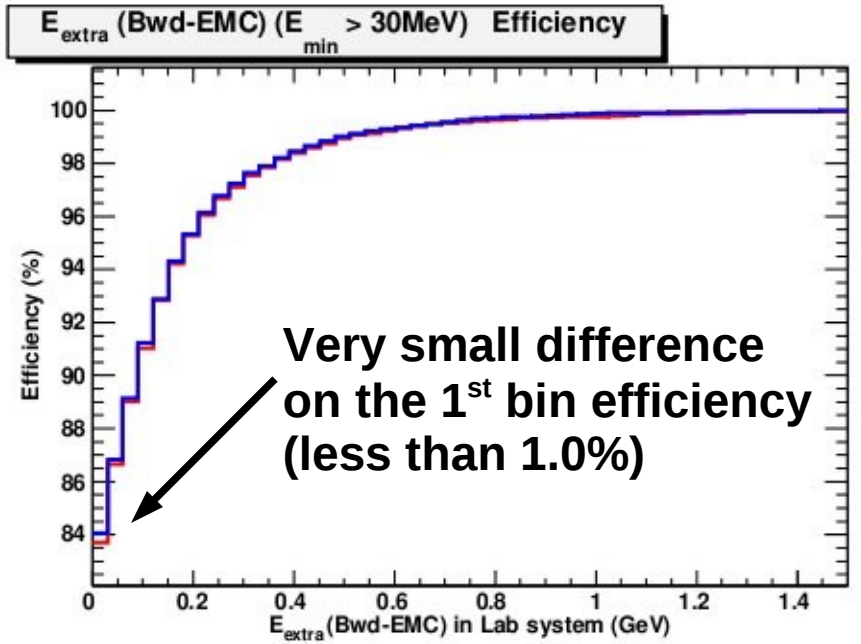
- Extract Eextra(Bwd-EMC)$_{mach-bkg}$ distribution from signal samples (histogram)
- Use histogram as a pdf for generating Eextra(Bwd-EMC)$_{mach-bkg}$ and added to Eextra(Bwd-EMC)$_{phy}$
- Calculate in this way the total Eextra(Bwd-EMC)

The method: Validations (I)

- **Samples:** $B^{+/0} \to \pi^{+}\pi^{-/0}$ and $B^{-/0} \to$ genetic (no machine backgrounds)
  - Save all the events
  - Look for the reconstructed neutrals on bwd-EMC and calculate the total energy deposit (some kind of Eextra(Bwd-EMC))
  - Neutrals on Bwd-EMC mainly due to the generic decay of the B

    $\Rightarrow$ Eextra(Bwd-EMC) expected to be similar to BB-generic background
  - Apply the filtering algorithm and compare the filtered/un-filtered Eextra(Bwd-EMC) distributions





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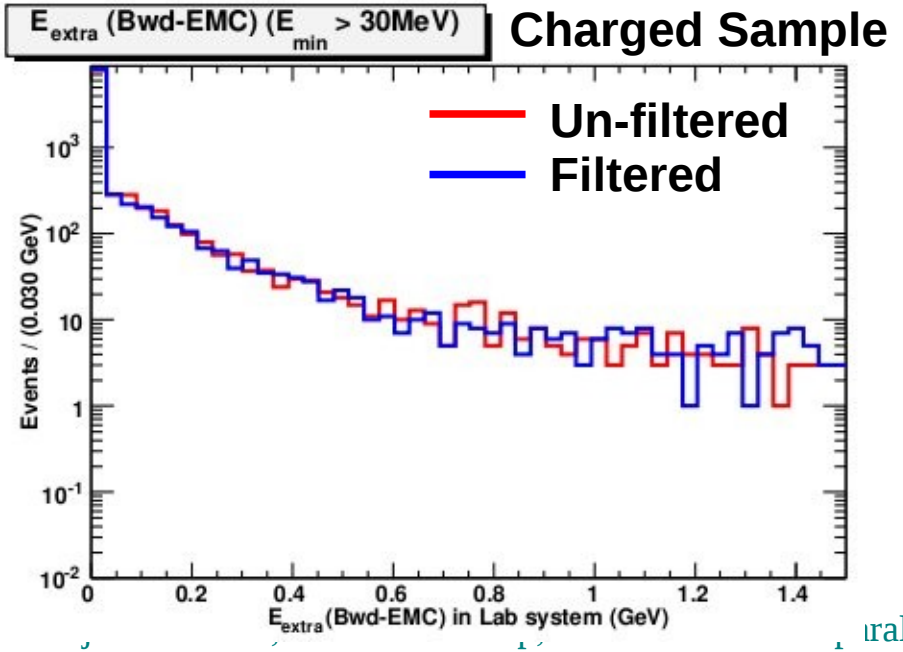
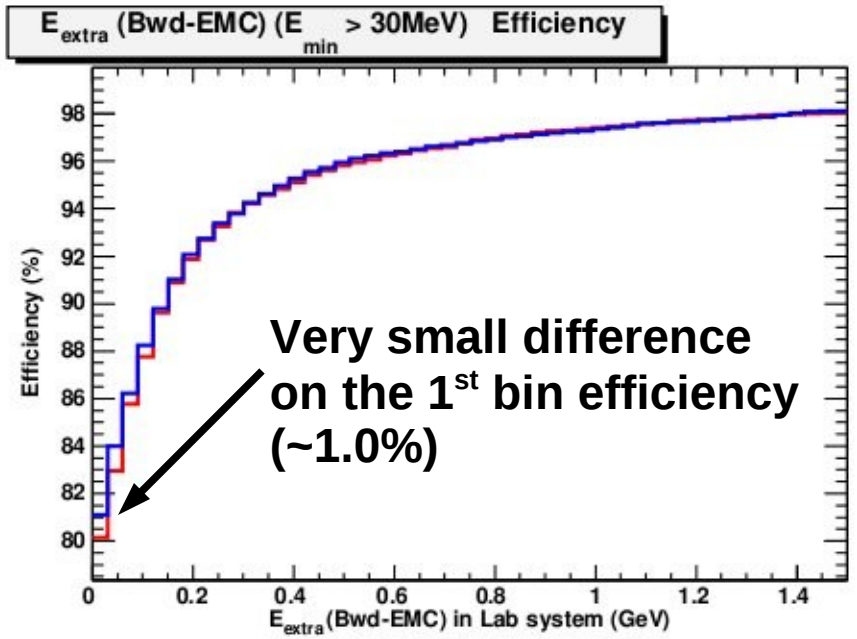
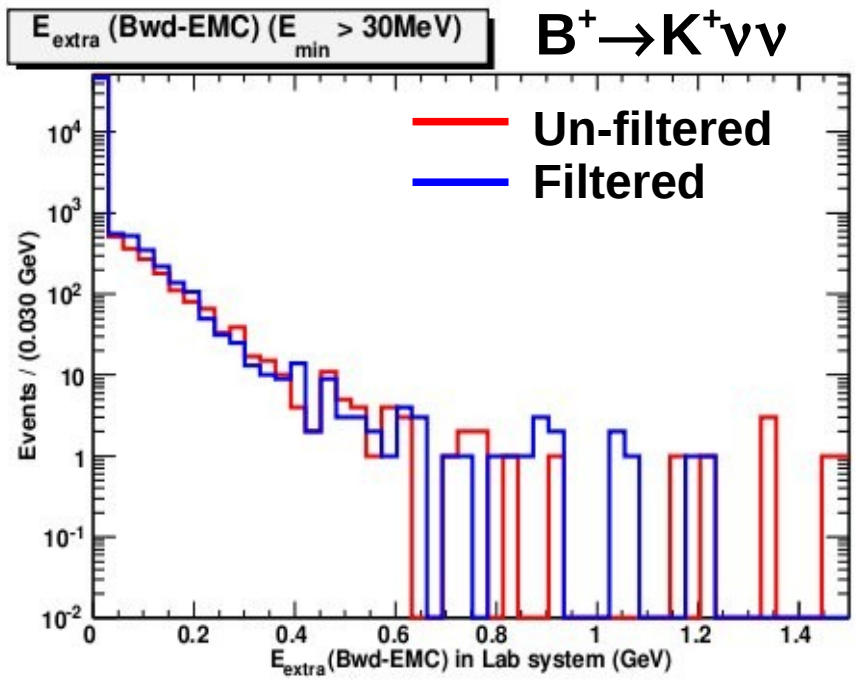
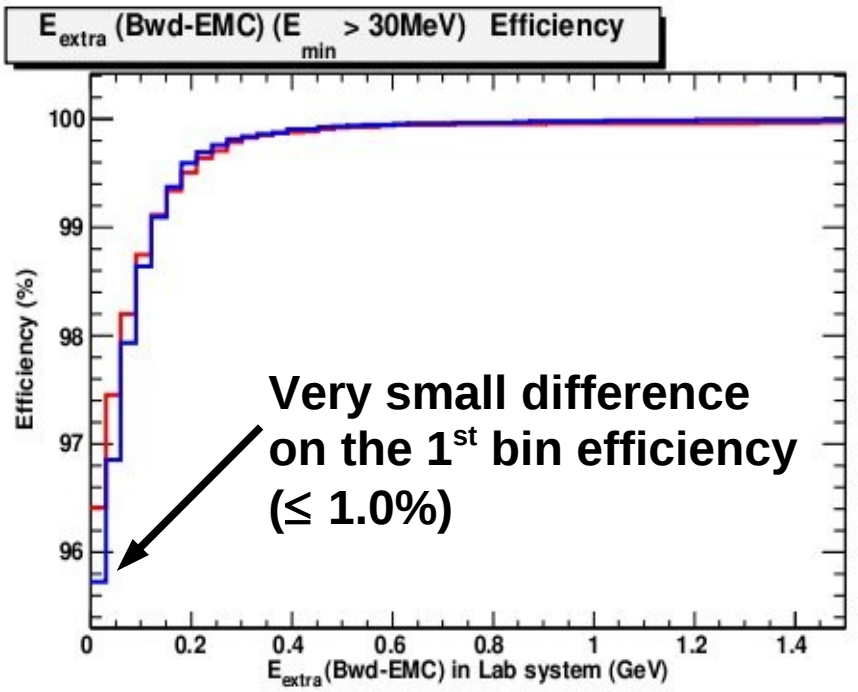




The method: Validations (II)

- **Samples:** signal samples for the semi-leptonic recoil analyses: $B^{+/0} \to K^{+/0} \nu\nu$, $B^{+/0} \to K^{*+/0} \nu\nu$ and $B^{+} \to \tau^{+} \nu$ (machine backgrounds included).
  - Only consider those selected events just before the Eextra(Bwd-EMC) requirement
  - Apply the filtering algorithm on then and calculate Eextra(Bwd-EMC)
  - Use the method described previously to include the $\text{Eextra(Bwd-EMC)}_{\text{mach-bkg}}$
  - Compare the filtered/un-filtered Eextra(Bwd-EMC) distributions





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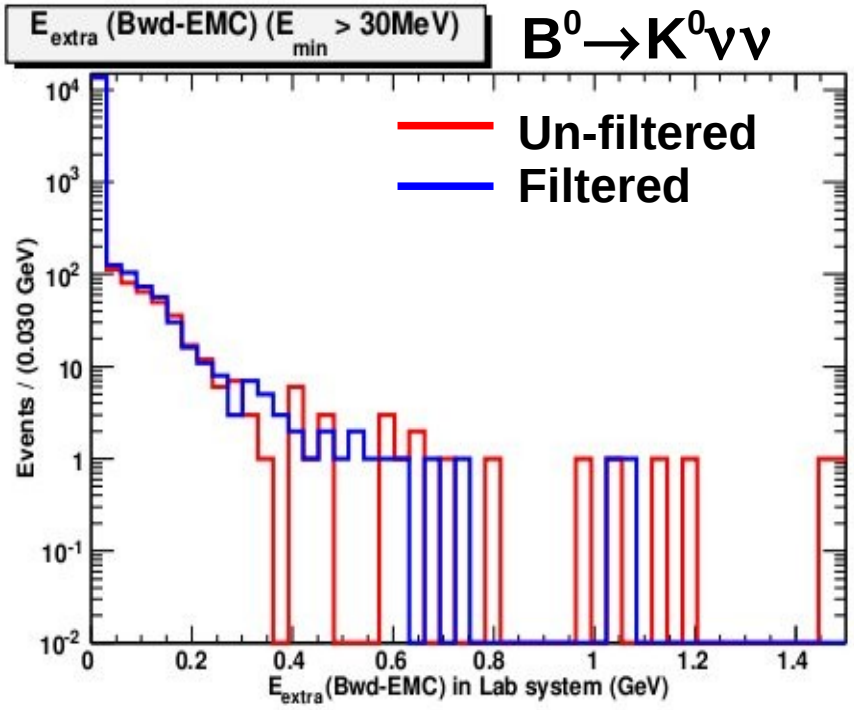

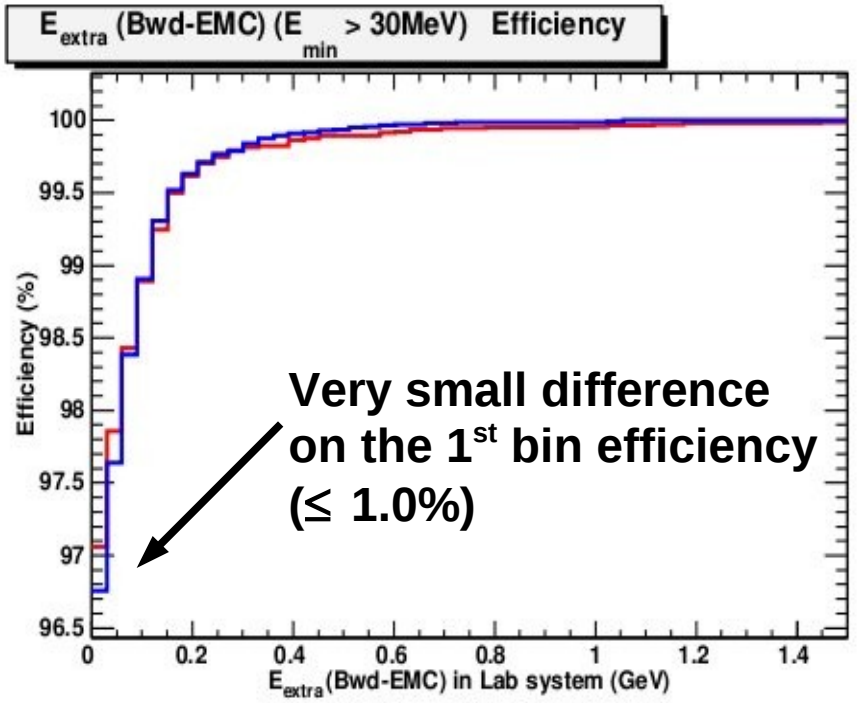

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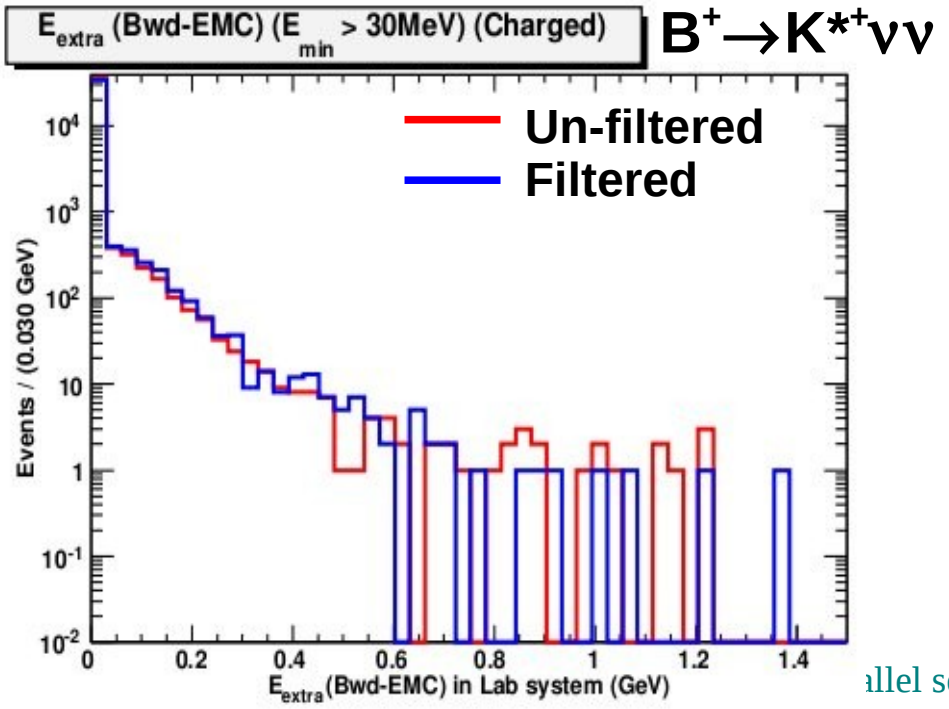

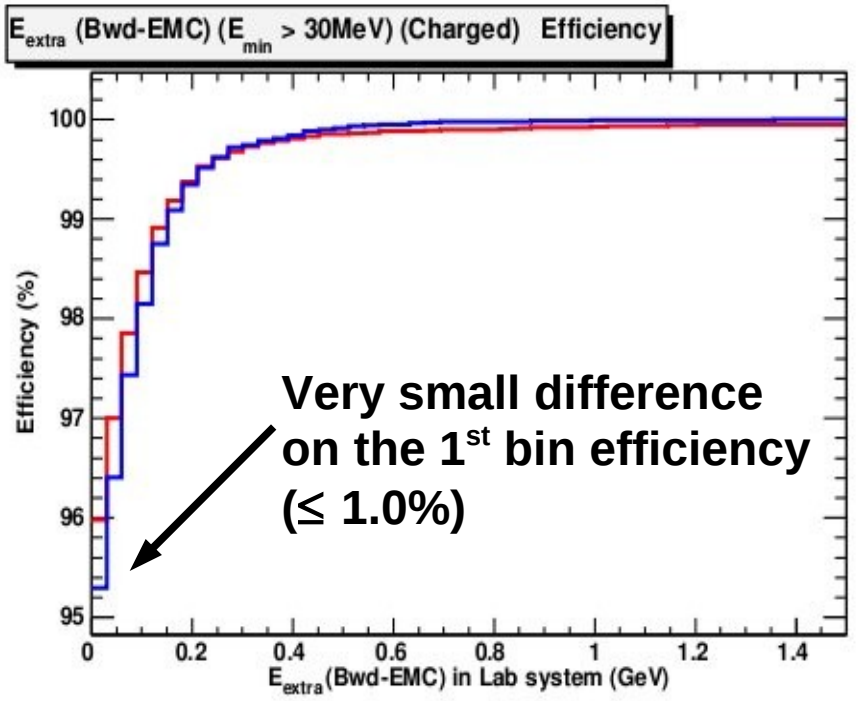

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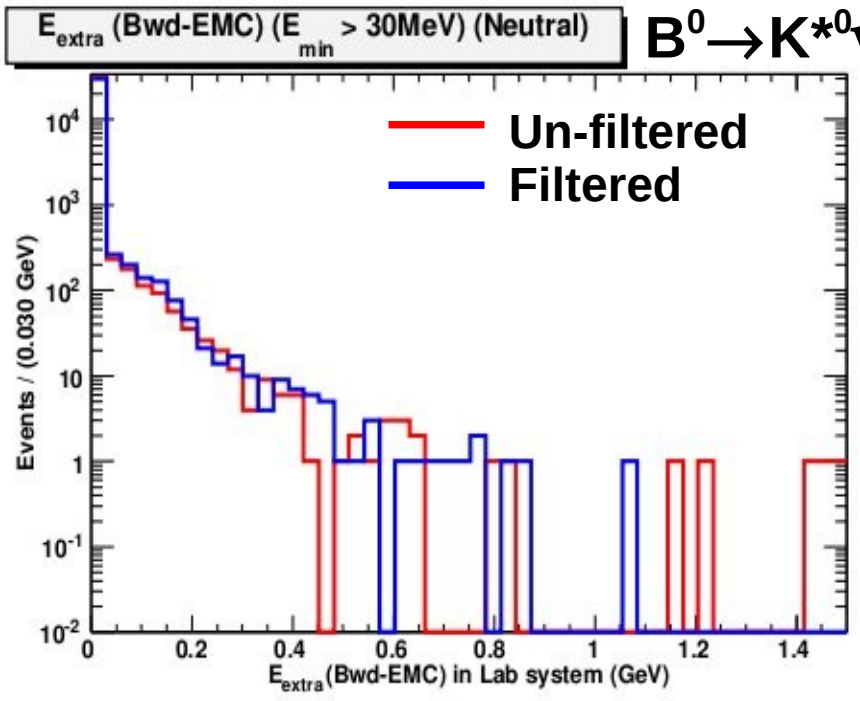

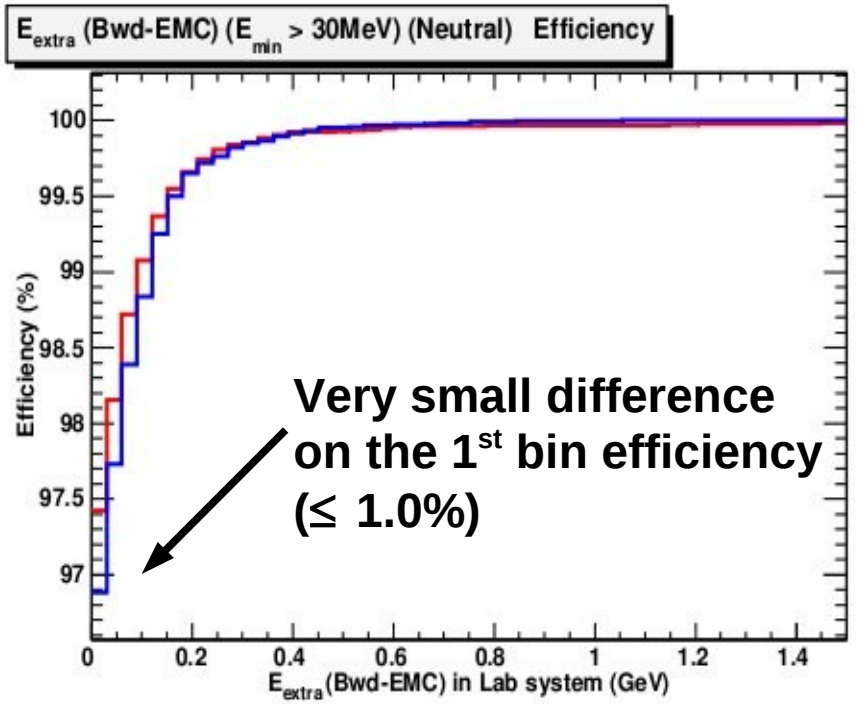

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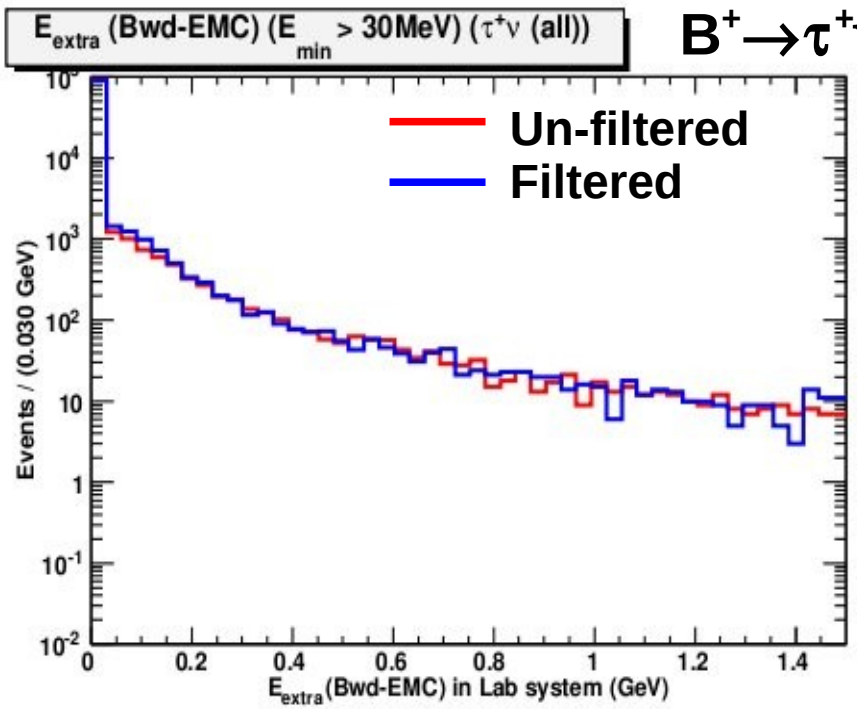

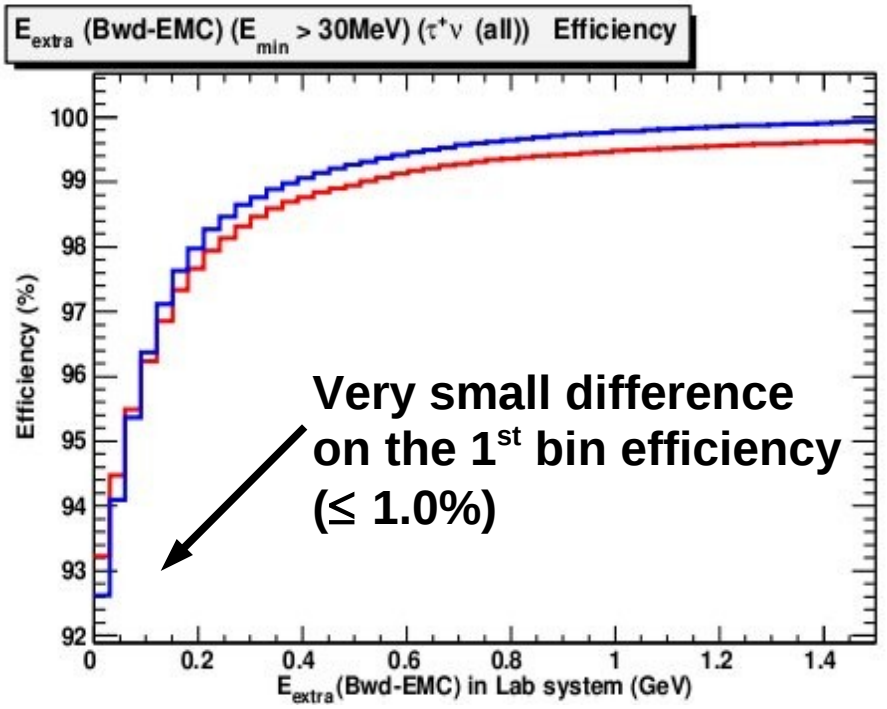

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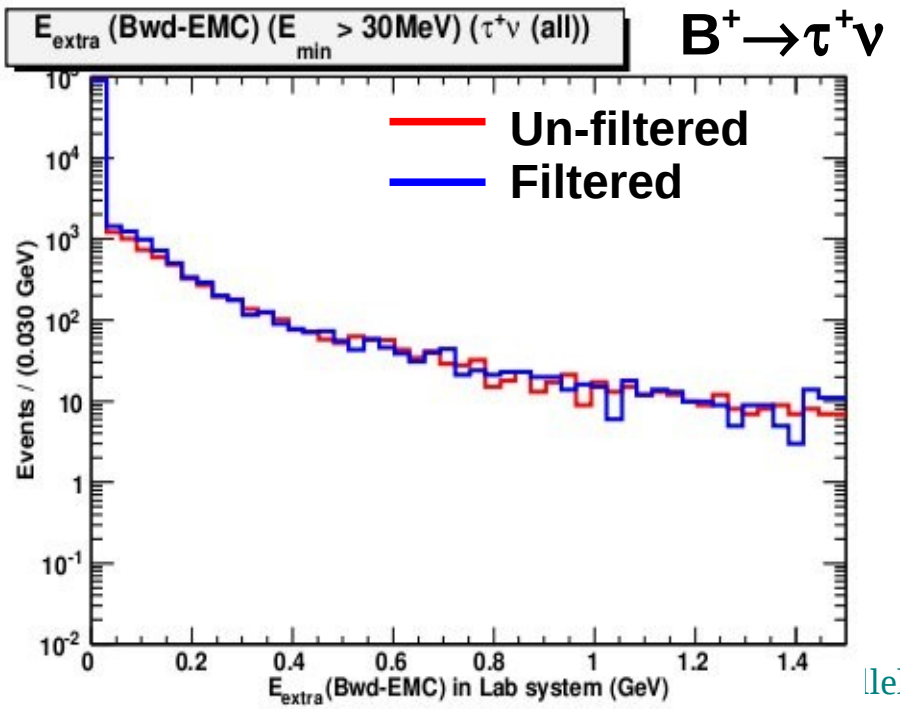
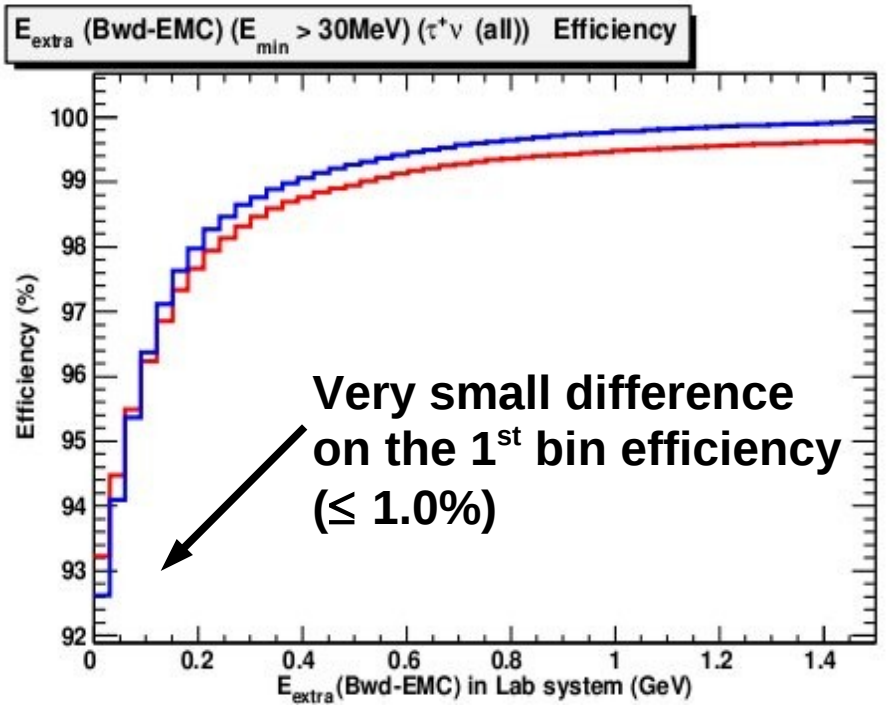
- **Filtering algorithm always gives a somewhat lower efficiency**
- **Quote a systematic of ~+1.0% on the estimation of BB-generic background efficiency**

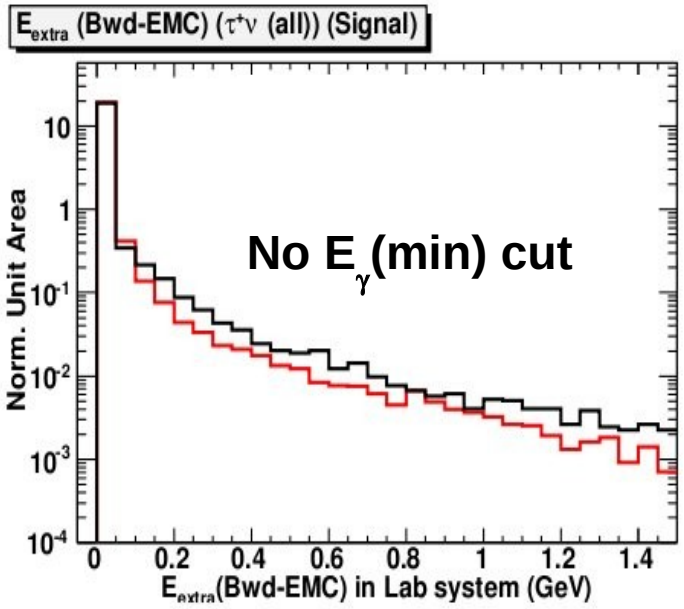
ach-bkg

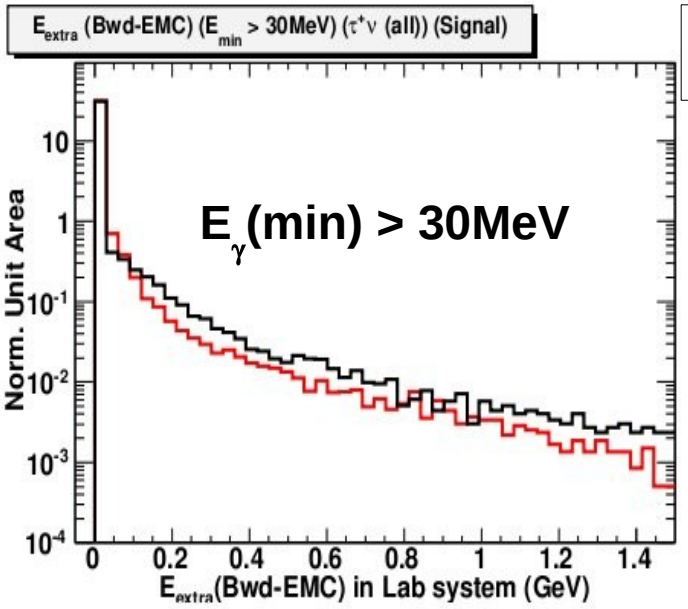


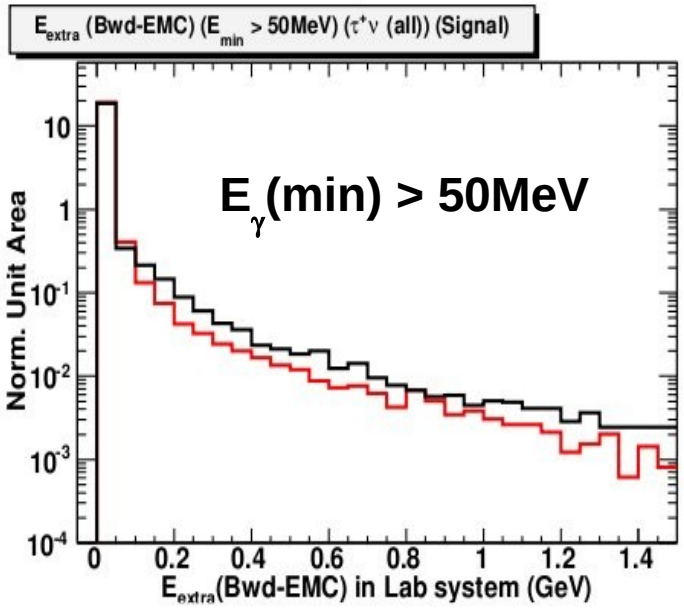


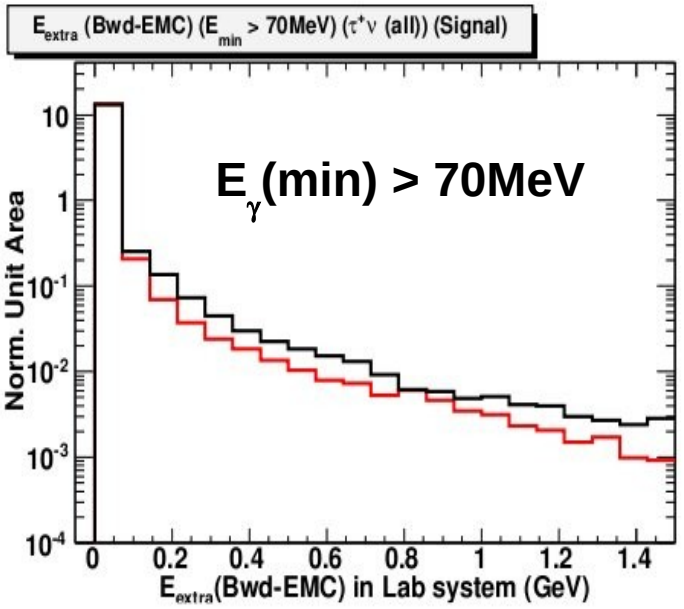
Physics Results on Bwd-EMC Studies

Signal V0.2.7/V0.2.6: $B^+ \to \tau^+ \nu$







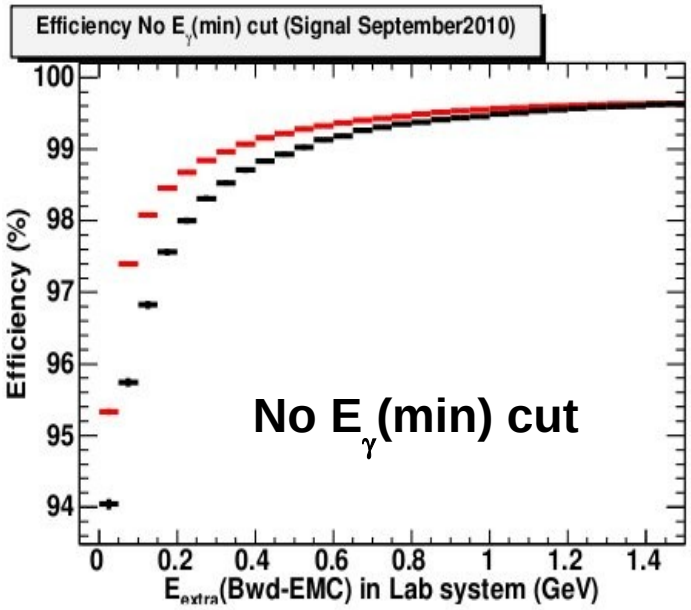


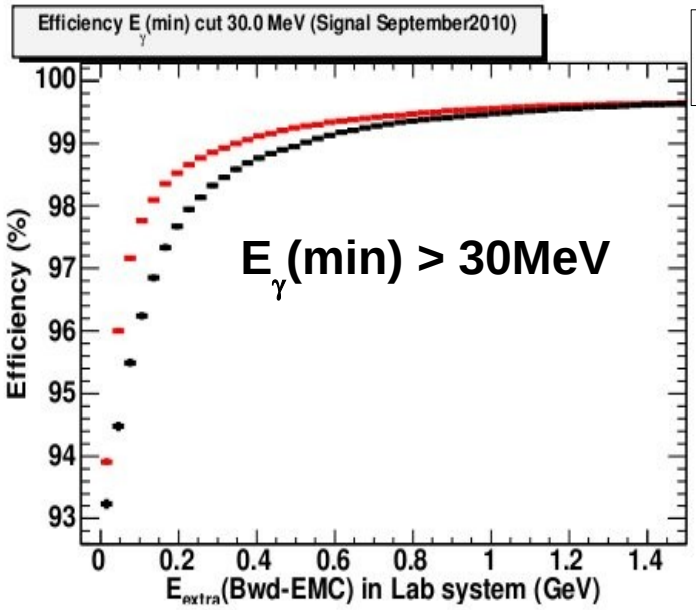
FastSim V0.2.7
FastSim V0.2.6

Warning:
log-scale in the vertical scale

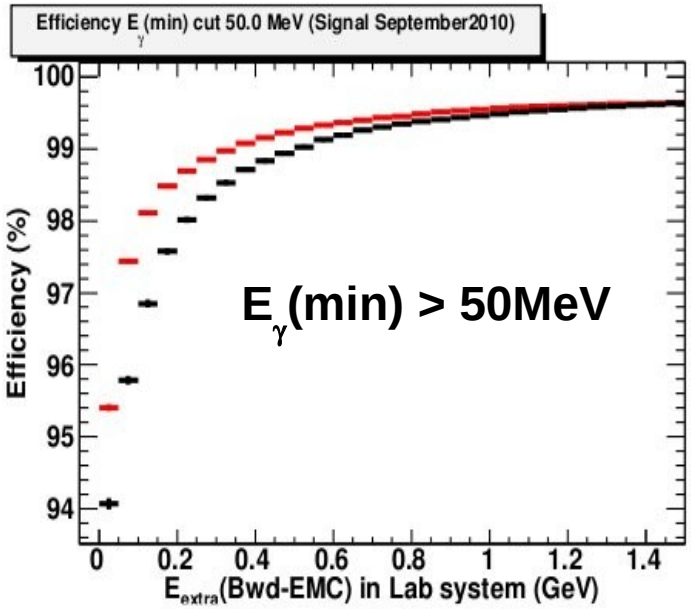
The Eextra distribution calculated with V0.2.7 has larger tails as expected

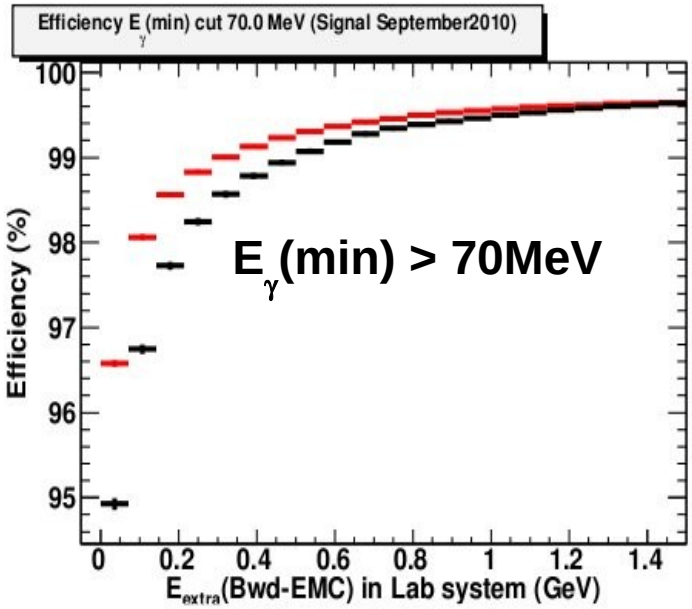
Signal V0.2.7/V0.2.6: $B^+ \to \tau^+ \nu$





FastSim V0.2.7
FastSim V0.2.6

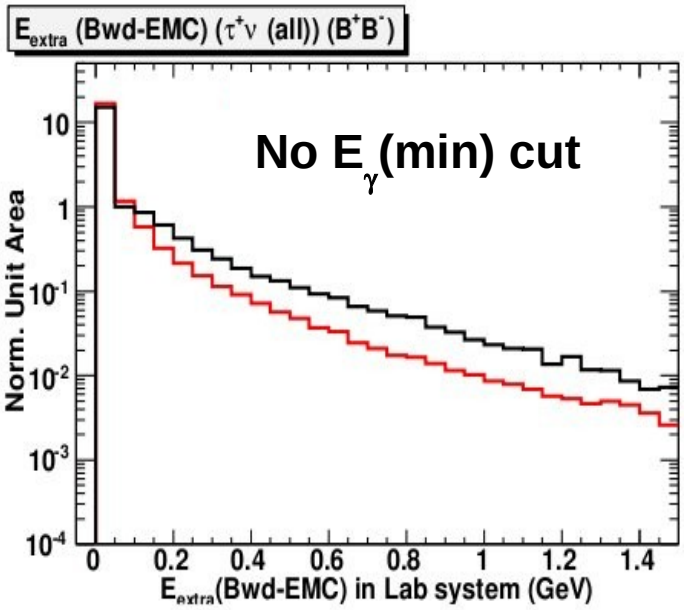


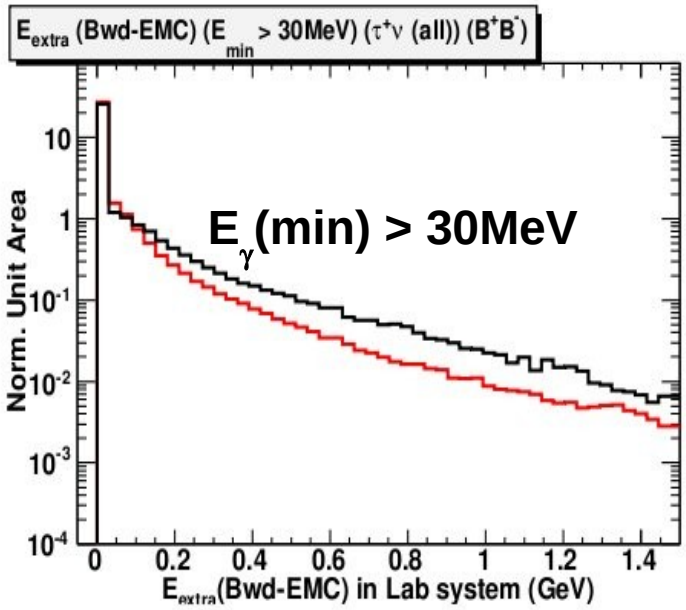


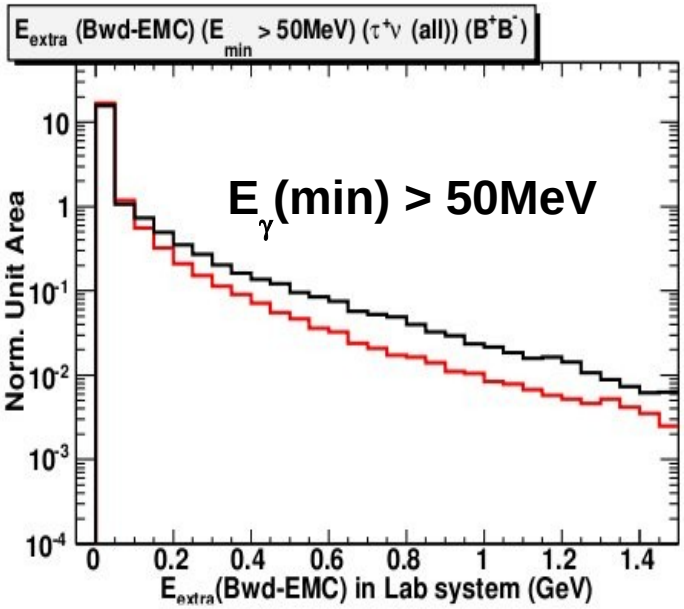
Warning: vertical scale not from zero

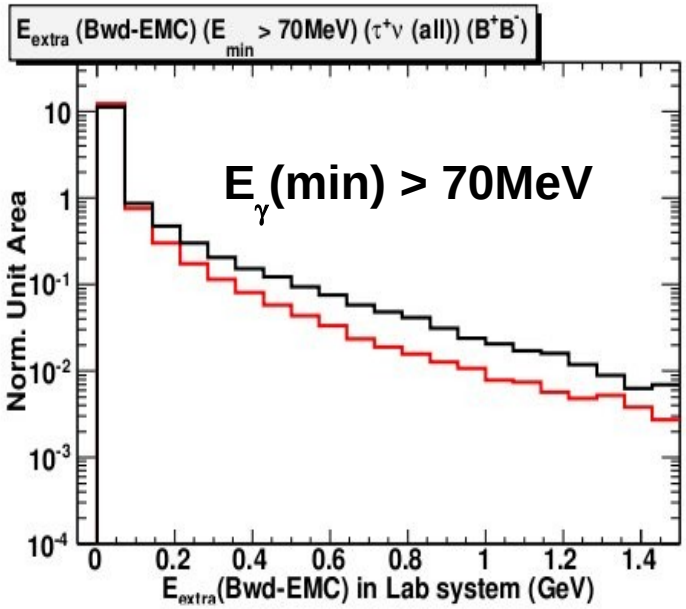
Relatively smalle difference in signal efficiency between V02.6 and V0.2.7 (~1%)

B^+B^- bkg (V0.2.6) filtered/unfiltered: $B^+ \to \tau^+\nu$







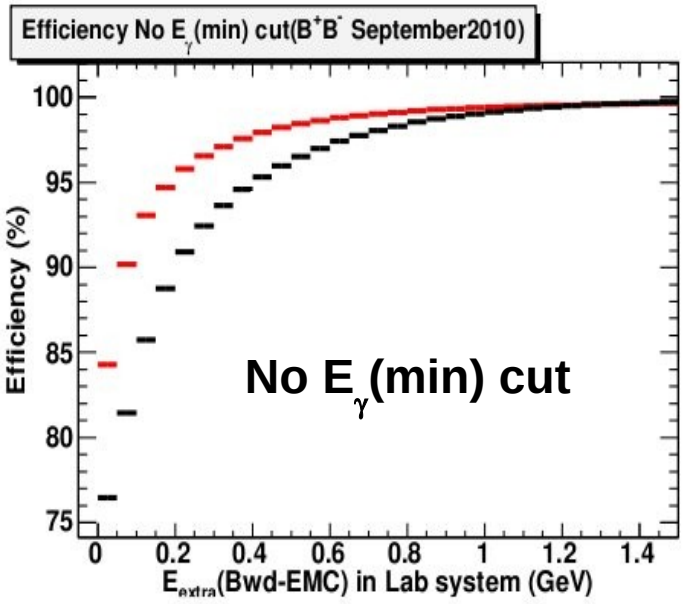


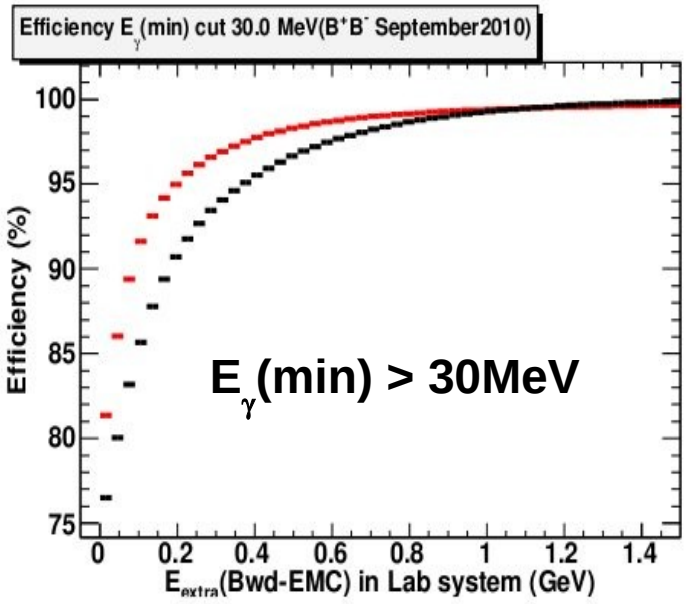
V0.2.6 filtered
V0.2.6 unfiltered

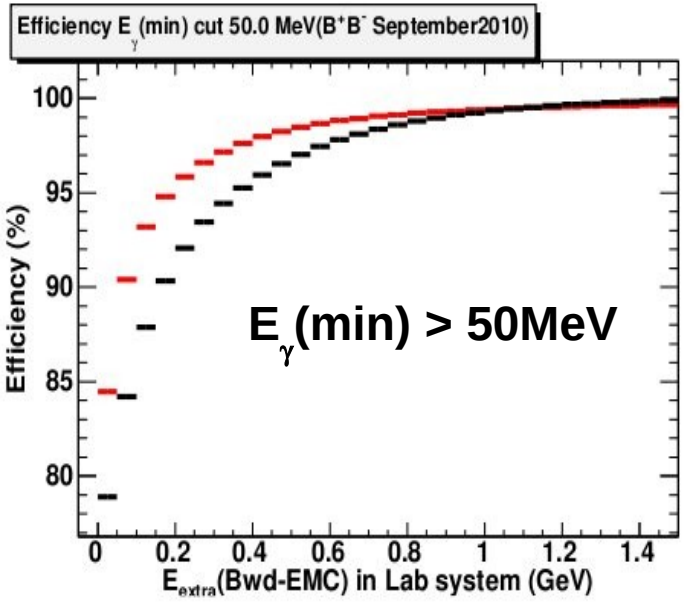
Warning:
log-scale in the vertical scale

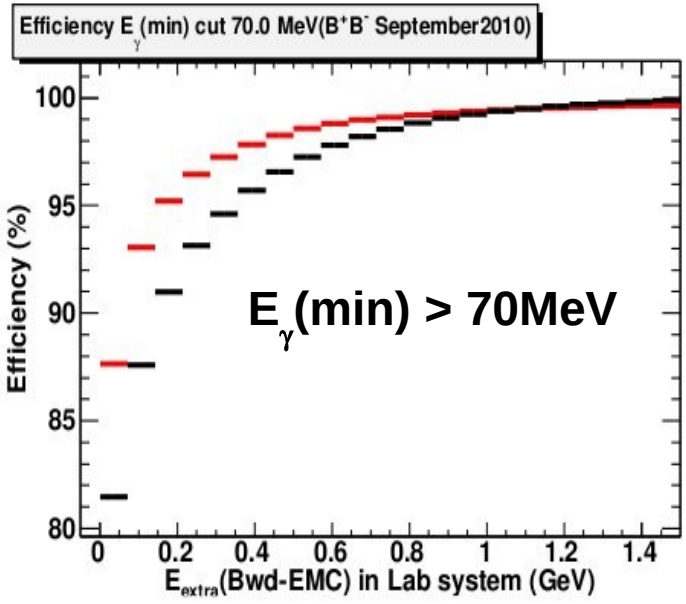
Filtering algorithm gives larger tails as expected

B^+B^- bkg (V0.2.6) filtered/unfiltered: $B^+ \to \tau^+ \nu$







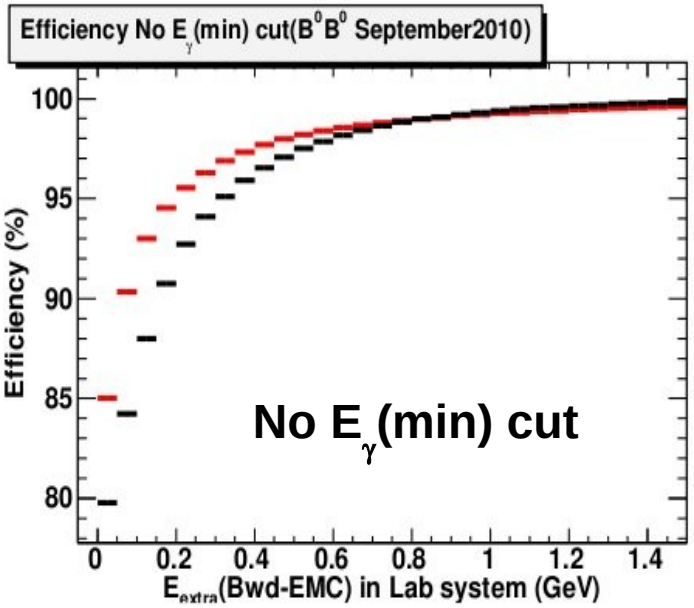


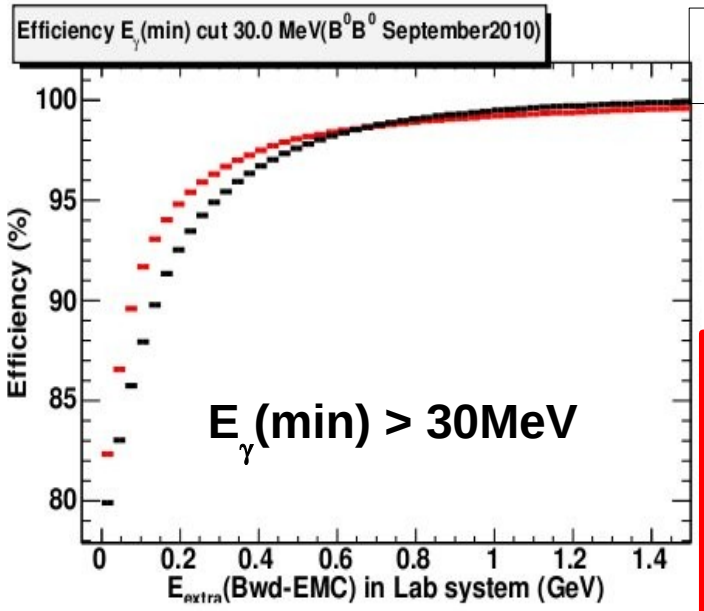
V0.2.6 filtered
V0.2.6 unfiltered

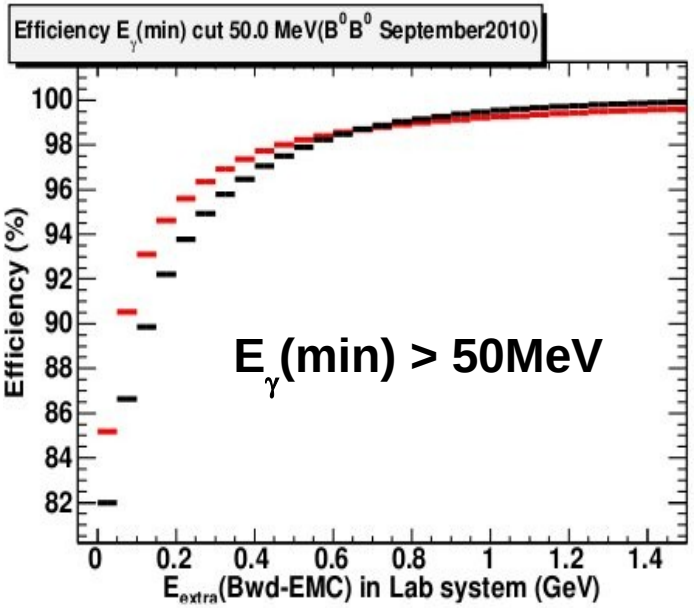
Warning: vertical scale not from zero

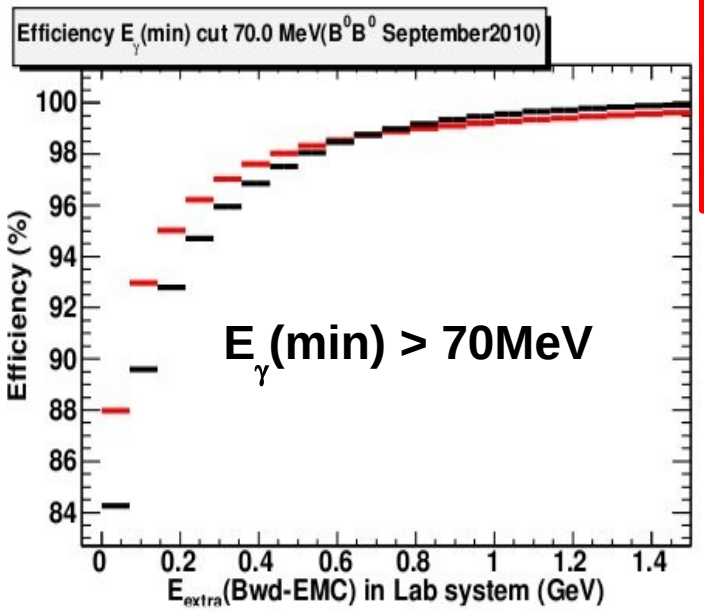
Filtered Eextra distribution has significant lower efficiency

B^0B^0 bkg (V0.2.6) filtered/unfiltered: $B^+ \to \tau^+\nu$









V0.2.6 filtered
V0.2.6 unfiltered

Warning: vertical scale not from zero

Filtered Eextra distribution has significant lower efficiency

$B^+ \to \tau^+ \nu$ results

No E_{gamma}(min) cut

Sep. 2010 samples:

Effic(S) = (95.332 ± 0.047) %

Effic(B^+B^-) = (84.292 ± 0.037) %

Effic(B^0B^0) = (85.006 ± 0.071) %

ΔSign/Sign = (3.744 ± 0.068) %

New signal and patched Bkg:

Effic(S) = (94.040 ± 0.076) %

Effic(B^+B^-) = (76.440 ± 0.043 + 1.0) %

Effic(B^0B^0) = (79.770 ± 0.080 + 1.0) %

ΔSign/Sign = (7.05 ± 0.10 - 0.69(sys.)) %

E_γ(min) cut 30.0 MeV (E_{extra} cut at 30.12 MeV)

Sep. 2010 samples:

Effic(S) = (93.909 ± 0.054) %

Effic(B^+B^-) = (81.371 ± 0.039) %

Effic(B^0B^0) = (82.335 ± 0.076) %

ΔSign/Sign = (3.977 ± 0.077) %

New signal and patched Bkg:

Effic(S) = (93.230 ± 0.080) %

Effic(B^+B^-) = (76.487 ± 0.043 + 1.0) %

Effic(B^0B^0) = (79.879 ± 0.080 + 1.0) %

ΔSign/Sign = (6.08 ± 0.11 - 0.69(sys.)) %

E_γ(min) cut 50.0 MeV (E_{extra} cut at 50.00 MeV)

Sep. 2010 samples:

Effic(S) = (95.405 ± 0.047) %

Effic(B^+B^-) = (84.466 ± 0.036) %

Effic(B^0B^0) = (85.165 ± 0.071) %

ΔSign/Sign = (3.718 ± 0.067) %

New signal and patched Bkg:

Effic(S) = (94.066 ± 0.075) %

Effic(B^+B^-) = (78.894 ± 0.041 + 1.0) %

Effic(B^0B^0) = (81.984 ± 0.077 + 1.0) %

ΔSign/Sign = (5.45 ± 0.10 - 0.66(sys.)) %

E_γ(min) cut 70.0 MeV (E_{extra} cut at 71.43 MeV)

Sep. 2010 samples:

Effic(S) = (96.577 ± 0.041) %

Effic(B^+B^-) = (87.661 ± 0.033) %

Effic(B^0B^0) = (87.966 ± 0.065) %

ΔSign/Sign = (3.113 ± 0.058) %

New signal and patched Bkg:

Effic(S) = (94.928 ± 0.070) %

Effic(B^+B^-) = (81.462 ± 0.039 + 1.0) %

Effic(B^0B^0) = (84.257 ± 0.073 + 1.0) %

ΔSign/Sign = (4.78 ± 0.09 - 0.64(sys.)) %

$B^+ \to K^+ \nu\nu$ results

No E_{gamma}(min) cut

Sep. 2010 samples:

Effic(S) = (97.665 ± 0.064) %

Effic(B^+B^-) = (85.360 ± 0.757) %

Effic(B^0B^0) = (87.805 ± 1.475) %

ΔSign/Sign = (5.394 ± 0.908) %

New signal and patched Bkg:

Effic(S) = (97.104 ± 0.076) %

Effic(B^+B^-) = (82.048 ± 0.822 + 1.0) %

Effic(B^0B^0) = (86.585 ± 1.536 + 1.0) %

ΔSign/Sign = (6.55 ± 0.99 - 0.64(sys.)) %

E_γ(min) cut 30.0 MeV (E_{extra} cut at 30.12 MeV)

Sep. 2010 samples:

Effic(S) = (96.390 ± 0.079) %

Effic(B^+B^-) = (83.066 ± 0.803) %

Effic(B^0B^0) = (85.772 ± 1.575) %

ΔSign/Sign = (5.406 ± 0.996) %

New signal and patched Bkg:

Effic(S) = (96.414 ± 0.084) %

Effic(B^+B^-) = (82.056 ± 0.822 + 1.0) %

Effic(B^0B^0) = (86.789 ± 1.527 + 1.0) %

ΔSign/Sign = (5.75 ± 0.98 - 0.64(sys.)) %

E_γ(min) cut 50.0 MeV (E_{extra} cut at 50.00 MeV)

Sep. 2010 samples:

Effic(S) = (97.730 ± 0.063) %

Effic(B^+B^-) = (85.452 ± 0.755) %

Effic(B^0B^0) = (87.805 ± 1.475) %

ΔSign/Sign = (5.422 ± 0.907) %

New signal and patched Bkg:

Effic(S) = (97.120 ± 0.076) %

Effic(B^+B^-) = (83.662 ± 0.792 + 1.0) %

Effic(B^0B^0) = (88.415 ± 1.443 + 1.0) %

ΔSign/Sign = (5.49 ± 0.90 - 0.62(sys.)) %

E_γ(min) cut 70.0 MeV (E_{extra} cut at 71.43 MeV)

Sep. 2010 samples:

Effic(S) = (98.729 ± 0.048) %

Effic(B^+B^-) = (87.838 ± 0.700) %

Effic(B^0B^0) = (89.228 ± 1.398) %

ΔSign/Sign = (5.176 ± 0.836) %

New signal and patched Bkg:

Effic(S) = (97.809 ± 0.066) %

Effic(B^+B^-) = (85.223 ± 0.760 + 1.0) %

Effic(B^0B^0) = (90.041 ± 1.350 + 1.0) %

ΔSign/Sign = (5.24 ± 0.83 - 0.61(sys.)) %

$B^0 \to K^0 \nu\nu$ results

No E_{gamma}(min) cut

Sep. 2010 samples:

Effic(S) = (98.254 ± 0.119) %

Effic(B^+B^-) = (87.129 ± 0.506) %

Effic(B^0B^0) = (91.388 ± 0.270) %

ΔSign/Sign = (3.313 ± 0.315) %

New signal and patched Bkg:

Effic(S) = (97.597 ± 0.129) %

Effic(B^+B^-) = (78.744 ± 0.618 + 1.0) %

Effic(B^0B^0) = (85.430 ± 0.339 + 1.0) %

ΔSign/Sign = (6.56 ± 0.42 - 0.64(sys.)) %

E_γ(min) cut 30.0 MeV (E_{extra} cut at 30.12 MeV)

Sep. 2010 samples:

Effic(S) = (97.521 ± 0.141) %

Effic(B^+B^-) = (84.231 ± 0.551) %

Effic(B^0B^0) = (89.649 ± 0.293) %

ΔSign/Sign = (3.690 ± 0.356) %

New signal and patched Bkg:

Effic(S) = (97.060 ± 0.142) %

Effic(B^+B^-) = (78.822 ± 0.617 + 1.0) %

Effic(B^0B^0) = (85.358 ± 0.340 + 1.0) %

ΔSign/Sign = (6.00 ± 0.42 - 0.63(sys.)) %

E_γ(min) cut 50.0 MeV (E_{extra} cut at 50.00 MeV)

Sep. 2010 samples:

Effic(S) = (98.311 ± 0.117) %

Effic(B^+B^-) = (87.243 ± 0.504) %

Effic(B^0B^0) = (91.499 ± 0.268) %

ΔSign/Sign = (3.308 ± 0.313) %

New signal and patched Bkg:

Effic(S) = (97.611 ± 0.128) %

Effic(B^+B^-) = (81.105 ± 0.591 + 1.0) %

Effic(B^0B^0) = (87.004 ± 0.323 + 1.0) %

ΔSign/Sign = (5.47 ± 0.39 - 0.62(sys.)) %

E_γ(min) cut 70.0 MeV (E_{extra} cut at 71.43 MeV)

Sep. 2010 samples:

Effic(S) = (99.003 ± 0.090) %

Effic(B^+B^-) = (90.256 ± 0.448) %

Effic(B^0B^0) = (93.442 ± 0.238) %

ΔSign/Sign = (2.805 ± 0.265) %

New signal and patched Bkg:

Effic(S) = (98.113 ± 0.114) %

Effic(B^+B^-) = (83.797 ± 0.557 + 1.0) %

Effic(B^0B^0) = (88.632 ± 0.305 + 1.0) %

ΔSign/Sign = (4.88 ± 0.36 - 0.60(sys.)) %

$B^+ \to K^{*+} \nu\nu$ results

No E_{gamma}(min) cut

Sep. 2010 samples:

Effic(S) = (97.493 ± 0.081) %

Effic(B^+B^-) = (86.957 ± 0.106) %

Effic(B^0B^0) = (88.804 ± 0.151) %

ΔSign/Sign = (4.183 ± 0.124) %

New signal and patched Bkg:

Effic(S) = (96.666 ± 0.093) %

Effic(B^+B^-) = (79.773 ± 0.118 + 1.0) %

Effic(B^0B^0) = (81.793 ± 0.167 + 1.0) %

ΔSign/Sign = (7.77 ± 0.15 - 0.67(sys.)) %

E_γ(min) cut 30.0 MeV (E_{extra} cut at 30.12 MeV)

Sep. 2010 samples:

Effic(S) = (96.282 ± 0.098) %

Effic(B^+B^-) = (84.164 ± 0.115) %

Effic(B^0B^0) = (86.519 ± 0.163) %

ΔSign/Sign = (4.467 ± 0.146) %

New signal and patched Bkg:

Effic(S) = (95.978 ± 0.102) %

Effic(B^+B^-) = (79.872 ± 0.118 + 1.0) %

Effic(B^0B^0) = (81.873 ± 0.167 + 1.0) %

ΔSign/Sign = (6.95 ± 0.16 - 0.66(sys.)) %

E_γ(min) cut 50.0 MeV (E_{extra} cut at 50.00 MeV)

Sep. 2010 samples:

Effic(S) = (97.549 ± 0.080) %

Effic(B^+B^-) = (87.110 ± 0.106) %

Effic(B^0B^0) = (88.893 ± 0.150) %

ΔSign/Sign = (4.166 ± 0.123) %

New signal and patched Bkg:

Effic(S) = (96.682 ± 0.093) %

Effic(B^+B^-) = (82.312 ± 0.112 + 1.0) %

Effic(B^0B^0) = (83.940 ± 0.159 + 1.0) %

ΔSign/Sign = (6.22 ± 0.14 - 0.64(sys.)) %

E_γ(min) cut 70.0 MeV (E_{extra} cut at 71.43 MeV)

Sep. 2010 samples:

Effic(S) = (98.469 ± 0.063) %

Effic(B^+B^-) = (90.187 ± 0.094) %

Effic(B^0B^0) = (91.347 ± 0.134) %

ΔSign/Sign = (3.470 ± 0.102) %

New signal and patched Bkg:

Effic(S) = (97.348 ± 0.083) %

Effic(B^+B^-) = (84.785 ± 0.106 + 1.0) %

Effic(B^0B^0) = (86.060 ± 0.150 + 1.0) %

ΔSign/Sign = (5.46 ± 0.13 - 0.62(sys.)) %

$B^0 \to K^{*0} \nu\nu$ results

No E_{gamma}(min) cut

Sep. 2010 samples:

Effic(S) = (98.672 ± 0.093) %

Effic(B^+B^-) = (84.555 ± 0.549) %

Effic(B^0B^0) = (85.302 ± 0.514) %

ΔSign/Sign = (7.055 ± 0.360) %

New signal and patched Bkg:

Effic(S) = (97.880 ± 0.081) %

Effic(B^+B^-) = (77.633 ± 0.590 + 1.0) %

Effic(B^0B^0) = (81.096 ± 0.515 + 1.0) %

ΔSign/Sign = (9.71 ± 0.42 - 0.69(sys.)) %

E_γ(min) cut 30.0 MeV (E_{extra} cut at 30.12 MeV)

Sep. 2010 samples:

Effic(S) = (98.055 ± 0.113) %

Effic(B^+B^-) = (81.743 ± 0.587) %

Effic(B^0B^0) = (83.133 ± 0.543) %

ΔSign/Sign = (7.961 ± 0.403) %

New signal and patched Bkg:

Effic(S) = (97.422 ± 0.089) %

Effic(B^+B^-) = (77.802 ± 0.588 + 1.0) %

Effic(B^0B^0) = (81.292 ± 0.513 + 1.0) %

ΔSign/Sign = (9.07 ± 0.41 - 0.68(sys.)) %

E_γ(min) cut 50.0 MeV (E_{extra} cut at 50.00 MeV)

Sep. 2010 samples:

Effic(S) = (98.745 ± 0.091) %

Effic(B^+B^-) = (84.809 ± 0.545) %

Effic(B^0B^0) = (85.407 ± 0.512) %

ΔSign/Sign = (7.025 ± 0.356) %

New signal and patched Bkg:

Effic(S) = (97.912 ± 0.080) %

Effic(B^+B^-) = (80.128 ± 0.565 + 1.0) %

Effic(B^0B^0) = (83.089 ± 0.493 + 1.0) %

ΔSign/Sign = (8.25 ± 0.38 - 0.66(sys.)) %

E_γ(min) cut 70.0 MeV (E_{extra} cut at 71.43 MeV)

Sep. 2010 samples:

Effic(S) = (99.250 ± 0.070) %

Effic(B^+B^-) = (88.174 ± 0.490) %

Effic(B^0B^0) = (88.040 ± 0.471) %

ΔSign/Sign = (5.738 ± 0.304) %

New signal and patched Bkg:

Effic(S) = (98.380 ± 0.071) %

Effic(B^+B^-) = (82.314 ± 0.540 + 1.0) %

Effic(B^0B^0) = (85.265 ± 0.466 + 1.0) %

ΔSign/Sign = (7.34 ± 0.35 - 0.64(sys.)) %

Summary and outlook

Bwd-EMC studies:

- Bugged version of Bwd-EMC for Sep. 2010 production
- Implemented Off-line patch to try to estimated Eextra(Bwd-EMC) using mc-truth
- Small effect of patch correction on signal and significant effect on BB-background samples
- All analysis give similar results:
  - Negligible reduction on signal efficiency ~(2-7)%
  - ~(15-20)% reduction on main backgrounds (B^+B^-, B^0B^0)

- Summary on $\delta(S/\sqrt{(S+B)})$ gain due to Bwd-EMC ($E\gamma(min) > 30MeV$):
  - $B^+ \to \tau^+\nu$: **(3.98 ± 0.08)% (previous) → (6.08 ± 0.11 - 0.69(sys))% (current)**
  - $B^+ \to K^+\nu\nu$: **(5.41 ± 0.10)% (previous) → (5.75 ± 0.98 - 0.64(sys))% (current)**
  - $B^0 \to K^0\nu\nu$: **(3.69 ± 0.36)% (previous) → (6.00 ± 0.42 - 0.63(sys))% (current)**
  - $B^+ \to K^{*+}\nu\nu$: **(4.47 ± 0.15)% (previous) → (6.95 ± 0.16 - 0.66(sys))% (current)**
  - $B^0 \to K^{*0}\nu\nu$: **(7.96 ± 0.40)% (previous) → (9.07 ± 0.41 - 0.68(sys))% (current)**

Backup