Updates on the $B^{\pm} \to K^{\pm}\tau^{\pm}\ell^{\mp}$

Inclusion of $\tau \to \rho\nu_{\tau}$ mode

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Selection criteria

Charged tracks

- Impact parameters: $|dr| < 1$ cm & $|dz| < 4$ cm.
- Track momentum $p > 50$ MeV/c.
- *electrons* : $e_{\mathrm{ID}} > 0.6, \mu_{\mathrm{ID}} < 0.98$, $\mathtt{atcPIDBelle}(K, e) < 0.98$
- *muons* : $\mu_{\mathrm{ID}} > 0.6, e_{\mathrm{ID}} < 0.98$, $\mathtt{atcPIDBelle}(K, \mu) < 0.98$
- *pions* : $\mu_{\mathrm{ID}} < 0.6, e_{\mathrm{ID}} < 0.6$, $\mathtt{atcPIDBelle}(\pi, K) > 0.4$
- *Kaons* : $\mu_{\mathrm{ID}} < 0.98, e_{\mathrm{ID}} < 0.98$, $\mathtt{atcPIDBelle}(K, \pi) > 0.6$

ECL Clusters, π^0, & ρ^+

- `goodBelleGamma`: $E_\gamma^{\mathrm{FE}} > 100$ MeV, $E_\gamma^{\mathrm{BR}} > 50$ MeV, $E_\gamma^{\mathrm{BE}} > 150$ MeV.
- `FakePhoton` > 0.3, `BeamBackground` > 0.3
- π^0: $80 < M_{\gamma\gamma} < 180$ MeV/c^2 & `chiProb`> 0.001
- ρ^+: $570 < M_{\pi^+\pi^0} < 970$ MeV/c^2.

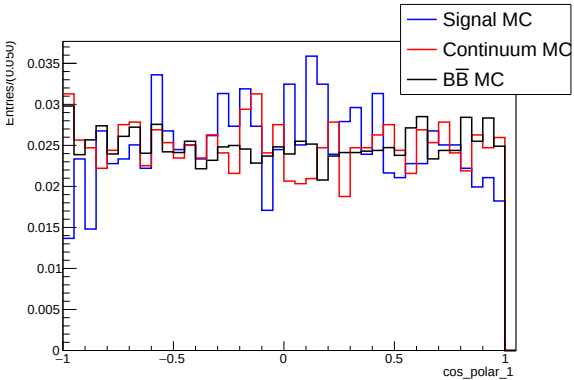
$B^\pm$ signal and ROE side

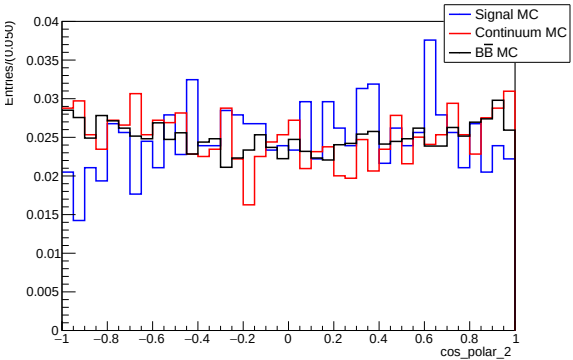
- $m_{D^{0(*)}_{\mathrm{inclussive}}} < 2.15$ GeV/c^2, $|M_{\gamma\gamma} - m_{\pi^0}| < 20$ MeV/c^2, & $|\sin\phi| < 1.0$.

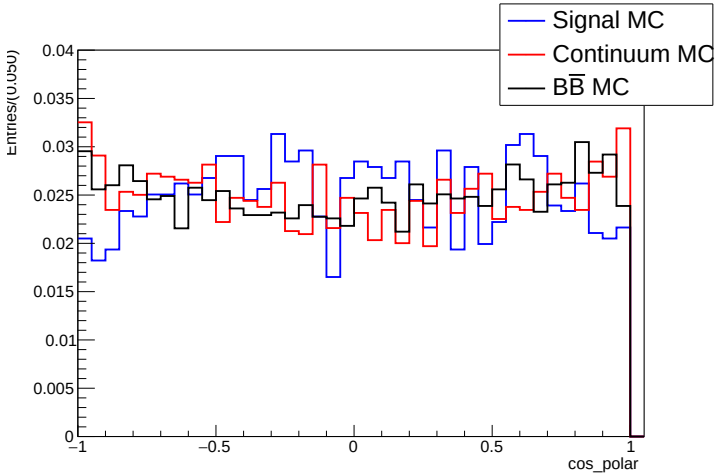
Veto conditions

- $|m_{K^+\pi^-} - m_{D^0}| > 200$ MeV/c^2 for the $B^+ \to K^+\tau^-[\pi^-\pi^0\nu_\tau]\ell^+$ system.
- $m_{K^+\rho^-} > 1.95$ GeV/c^2 for the $B^+ \to K^+\tau^-[\rho^-\nu_\tau]\ell^+$ system.
- $m_{e^\pm_{\mathrm{sig}} e^\mp_{\mathrm{tag}}} > 100$ MeV/c^2.

Cosine of the p_B polar angle

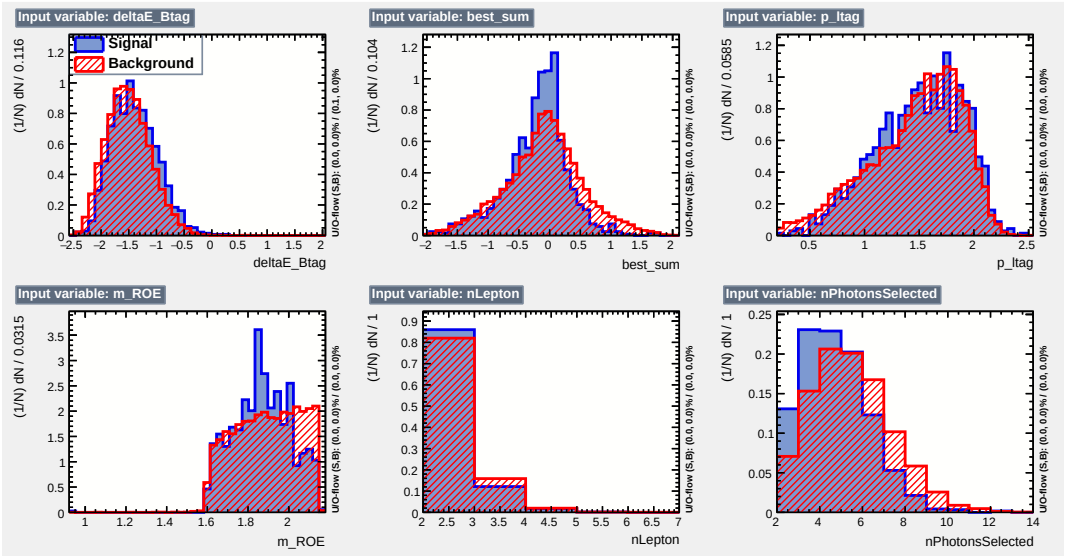




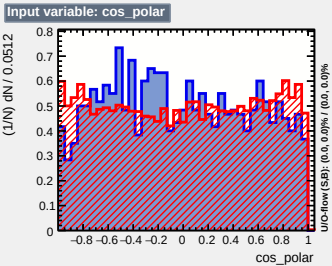


Cosine of the polar angle for which $\Delta \cos\theta = |\cos\theta_{(1,2)} + \cos\theta_{\text{tag}}|$ is minimum.

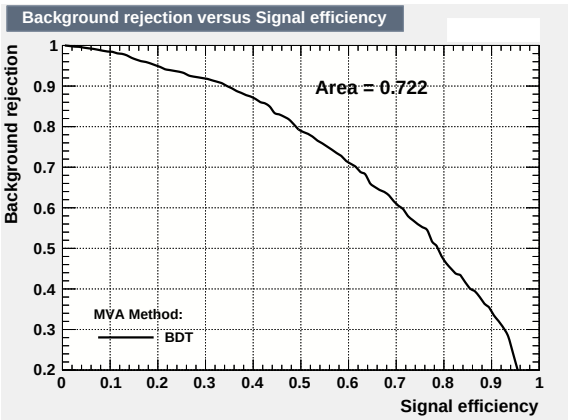
BDT training variables: Signal vs Generic-$B\bar{B}$ MC

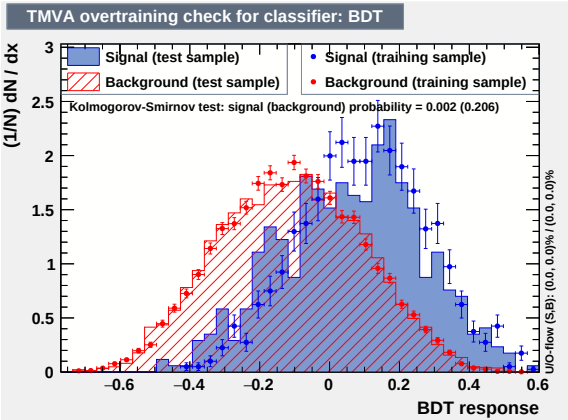


BDT training variables: Signal vs Generic-$B\bar{B}$ MC

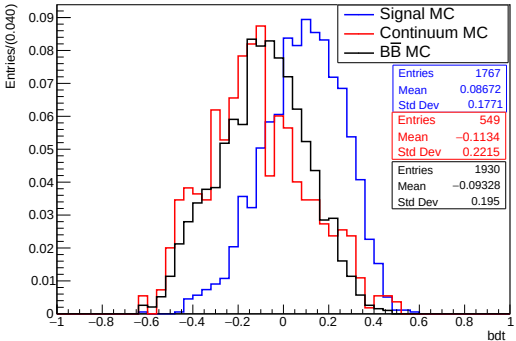


BDT training variables: Signal vs Generic-$B\bar{B}$ MC

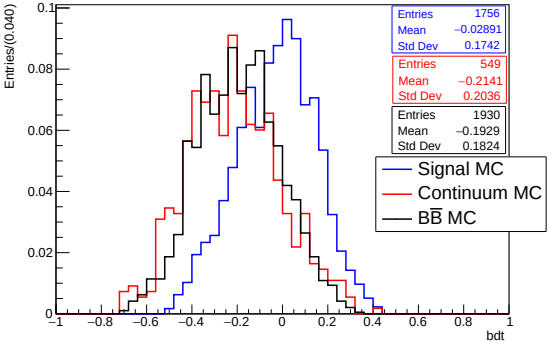




BDT validation



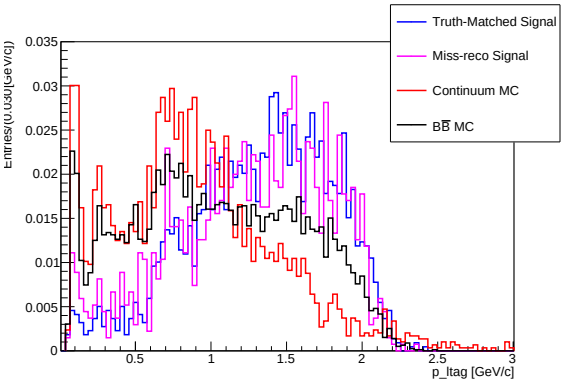
Previous training results

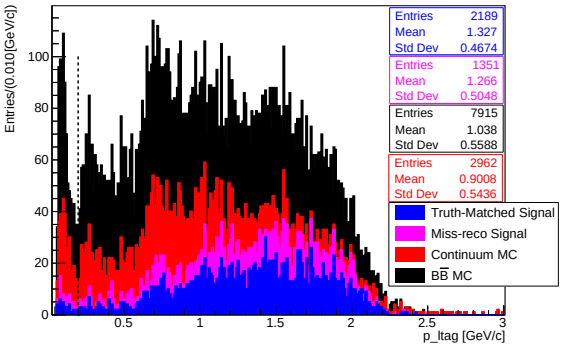


Current training results

Back Up

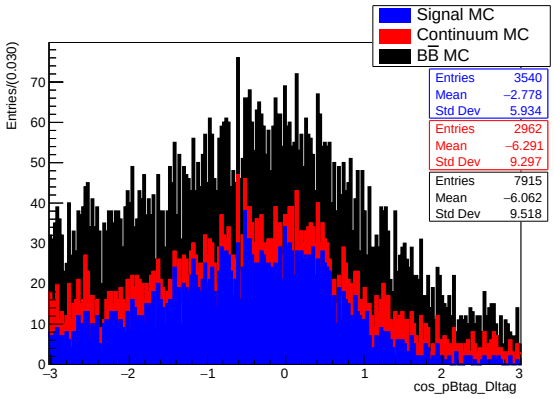
p_ℓ -tag side





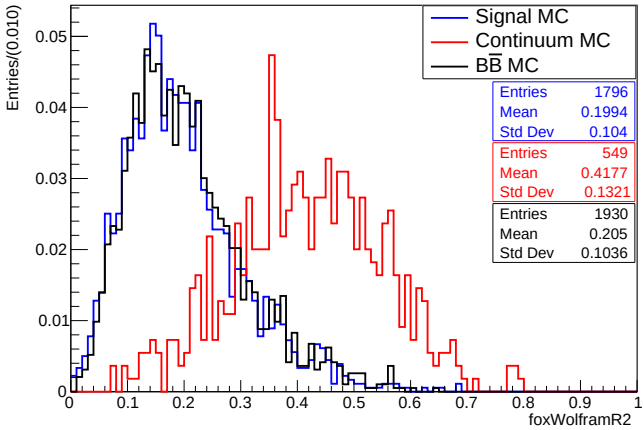
- Loose cut of $p > 200$ MeV/c for the tag side lepton.

Cosine of the angle between B_{tag} and visible momentum on tag side



- Requirement: $|cos\_pBtag\_Dltag| < 1.25$.

Reduced Fox-Wolframe variable R_2



- Requirement: $R_2 < 0.4$.