$B \to D^{*} \tau \nu$ Update

MATEUSZ KALETA

Background components

- $B \to D\ell\nu$
- $B \to D^*\ell\nu$
- $B \to D^{**}\ell\nu$
- $B \to D^{(*)}\pi(\pi)\ell\nu$
- $B \to other$
- $e^+e^- \to c\bar{c}$
- $e^+e^- \to u\bar{u}, c\bar{c}, t\bar{t}$

Decay channels	Background components			
	$B \to D\ell\nu$	$B \to D^*\ell\nu$	$B \to D^{**}\ell\nu$	$B \to D^{(*)}\pi(\pi)\ell\nu$
B^+B^-	$\bar{D}^0 e^+\nu_e$ $\bar{D}^0 \mu^+\nu_\mu$	$\bar{D}^{*0} e^+\nu_e$ $\bar{D}^{*0} \mu^+\nu_\mu$	$\bar{D}_1^0 e^+\nu_e$ $\bar{D}_0^{*0} e^+\nu_e$ $\bar{D}'^0_1 e^+\nu_e$ $\bar{D}_2^{*0} e^+\nu_e$ $\bar{D}_1^0 \mu^+\nu_\mu$ $\bar{D}_0^{*0} \mu^+\nu_\mu$ $\bar{D}'^0_1 \mu^+\nu_\mu$ $\bar{D}_2^{*0} \mu^+\nu_\mu$	$D^{*-}\pi^+e^+\nu_e$ $\bar{D}^{*0}\pi^0e^+\nu_e$ $D^-\pi^+e^+\nu_e$ $\bar{D}^0\pi^0e^+\nu_e$ $\bar{D}^0\pi^+\pi^-e^+\nu_e$ $D^-\pi^+\pi^0e^+\nu_e$ $\bar{D}^0\pi^0\pi^0e^+\nu_e$ $\bar{D}^{*0}\pi^+\pi^-e^+\nu_e$ $D^{*-}\pi^+\pi^0e^+\nu_e$ $\bar{D}^{*0}\pi^0\pi^0e^+\nu_e$ $D^{*-}\pi^+\mu^+\nu_\mu$ $\bar{D}^{*0}\pi^0\mu^+\nu_\mu$ $D^-\pi^+\mu^+\nu_\mu$ $\bar{D}^0\pi^0\mu^+\nu_\mu$ $\bar{D}^0\pi^+\pi^-\mu^+\nu_\mu$ $D^-\pi^+\pi^0\mu^+\nu_\mu$ $\bar{D}^0\pi^0\pi^0\mu^+\nu_\mu$ $\bar{D}^{*0}\pi^+\pi^-\mu^+\nu_\mu$ $D^{*-}\pi^+\pi^0\mu^+\nu_\mu$ $\bar{D}^{*0}\pi^0\pi^0\mu^+\nu_\mu$
$B^0\bar{B}^0$	$D^-e^+\nu_e$ $D^-\mu^+\nu_\mu$	$D^{*-}e^+\nu_e$ $D^{*-}\mu^+\nu_\mu$	$\bar{D}_1^- e^+\nu_e$ $D_0^{*-} e^+\nu_e$ $D'^-_1 e^+\nu_e$ $D_2^{*-} e^+\nu_e$ $\bar{D}_1^- e^+\nu_e$ $D_0^{*-} e^+\nu_e$ $D'^-_1 e^+\nu_e$ $D_2^{*-} e^+\nu_e$	$\bar{D}^{*0}\pi^-e^+\nu_e$ $D^{*-}\pi^0e^+\nu_e$ $\bar{D}^0\pi^-e^+\nu_e$ $D^-\pi^0e^+\nu_e$ $D^-\pi^+\pi^-e^+\nu_e$ $\bar{D}^0\pi^-\pi^0e^+\nu_e$ $D^-\pi^0\pi^0e^+\nu_e$ $D^{*-}\pi^+\pi^-e^+\nu_e$ $\bar{D}^{*0}\pi^-\pi^0e^+\nu_e$ $D^{*-}\pi^0\pi^0e^+\nu_e$ $\bar{D}^{*0}\pi^-\mu^+\nu_\mu$ $D^{*-}\pi^0\mu^+\nu_\mu$ $\bar{D}^0\pi^-\mu^+\nu_\mu$ $D^-\pi^0\mu^+\nu_\mu$ $D^-\pi^+\pi^-\mu^+\nu_\mu$ $\bar{D}^0\pi^-\pi^0\mu^+\nu_\mu$ $D^-\pi^0\pi^0\mu^+\nu_\mu$ $D^{*-}\pi^+\pi^-\mu^+\nu_\mu$ $\bar{D}^{*0}\pi^-\pi^0\mu^+\nu_\mu$ $D^{*-}\pi^0\pi^0\mu^+\nu_\mu$

D** sample composition

$B \to D^{**}\ell\nu$

$j_\ell = 3/2\ doublet$

$D_1(2420)$

Dominant decays via D-wave into:

$D^*\pi\ (e.g. D_1(2420)^0 \to D^{*+}\pi^-)$

$D_2^*(2460)$

Dominant decays via D-wave into:

$D\pi\ (e.g.\ D_2^*(2460)^0 \to D^+\pi^-)$

$D^*\pi\ (e.g.\ D_2^*(2460)^0 \to D^{*+}\pi^-)$

$j_\ell = 1/2\ doublet$

$D_0^*(2420)$

Dominant decays via S-wave into:

$D\pi\ (e.g.\ D_0^*(2400)^0 \to D^+\pi^-)$

$D_1(2430)$

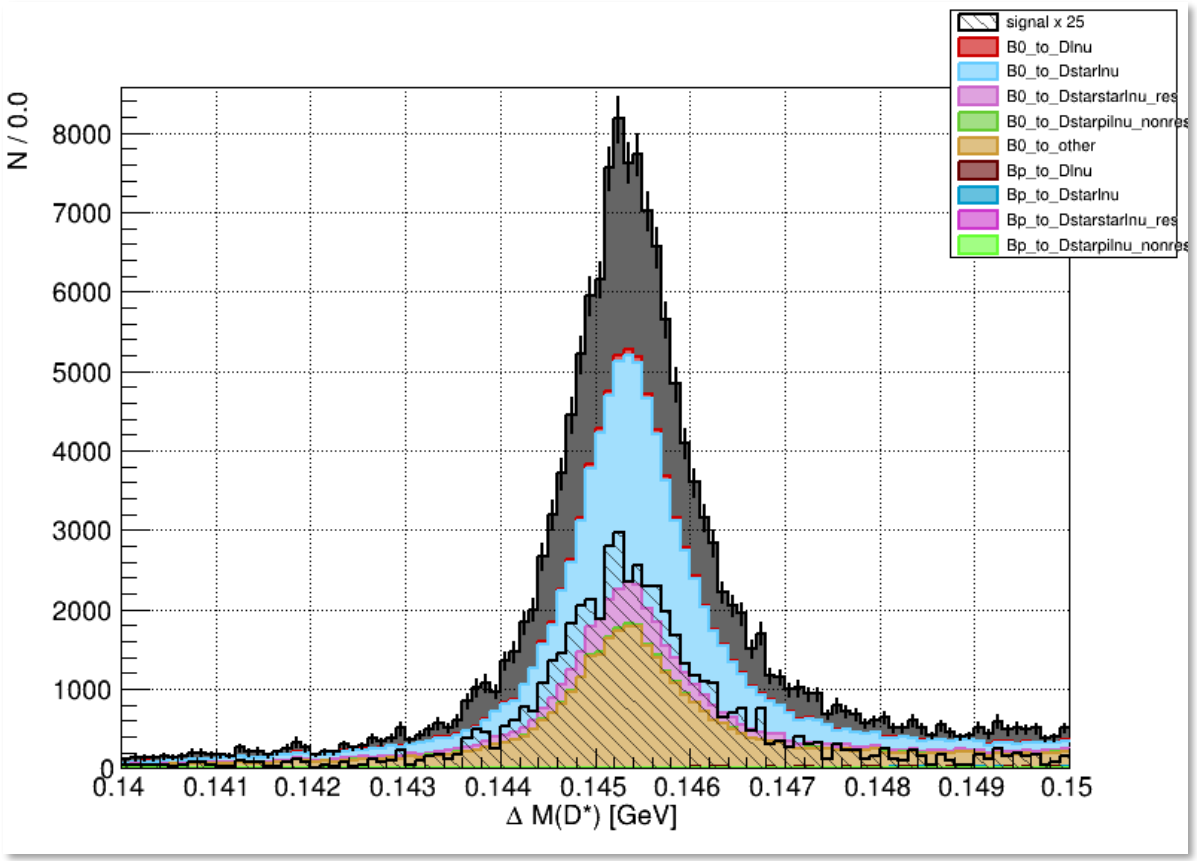
Dominant decays via S-wave into:

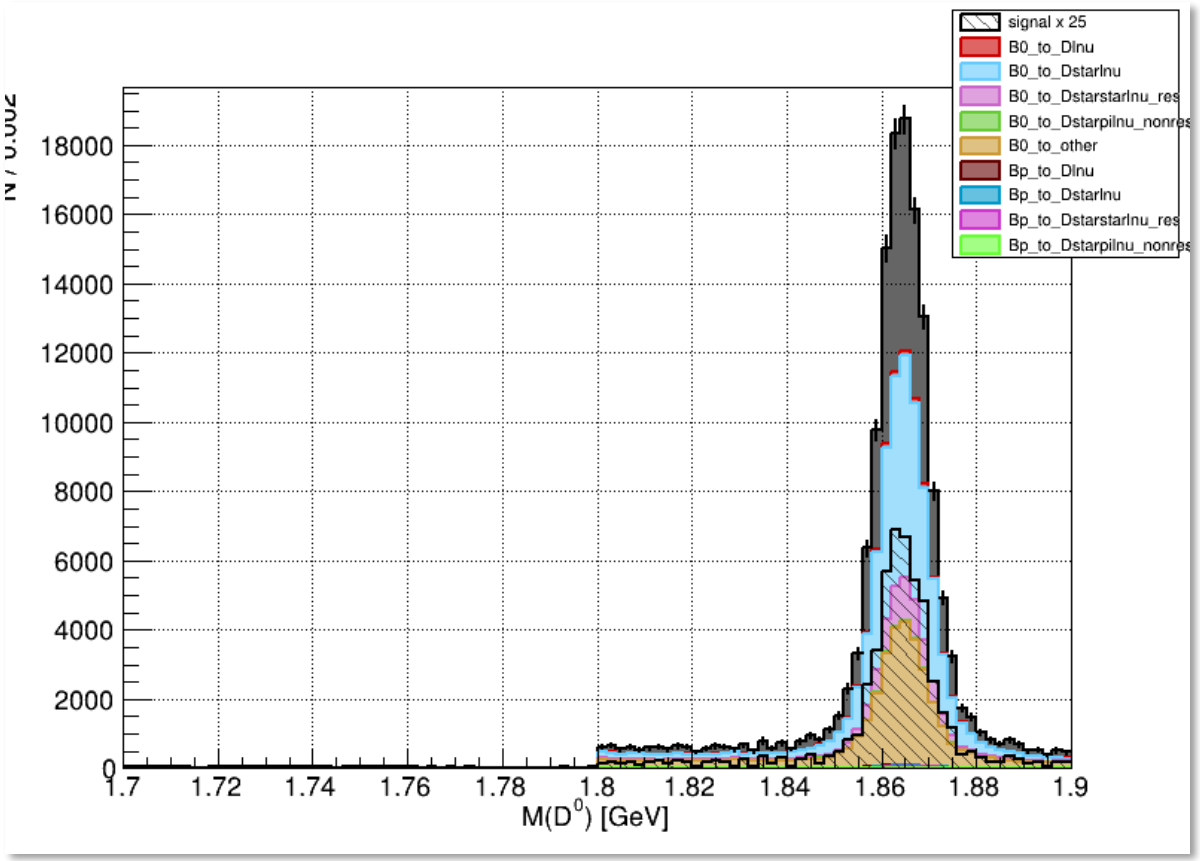
$D^*\pi\ (e.g.\ D_1(2430)^0 \to D^{*+}\pi^-)$

Non-resonant $D^{(*)}\pi$ (π)

$\bar{D}^{*0}\pi^- e^+\nu_e$	$\bar{D}^{*0}\pi^-\mu^+\nu_\mu$
$D^{*-}\pi^0 e^+\nu_e$	$D^{*-}\pi^0\mu^+\nu_\mu$
$\bar{D}^0\pi^- e^+\nu_e$	$\bar{D}^0\pi^-\mu^+\nu_\mu$
$D^-\pi^0 e^+\nu_e$	$D^-\pi^0\mu^+\nu_\mu$
$D^-\pi^+\pi^- e^+\nu_e$	$D^-\pi^+\pi^-\mu^+\nu_\mu$
$\bar{D}^0\pi^-\pi^0 e^+\nu_e$	$\bar{D}^0\pi^-\pi^0\mu^+\nu_\mu$
$D^-\pi^0\pi^0 e^+\nu_e$	$D^-\pi^0\pi^0\mu^+\nu_\mu$
$D^{*-}\pi^+\pi^- e^+\nu_e$	$D^{*-}\pi^+\pi^-\mu^+\nu_\mu$
$\bar{D}^{*0}\pi^-\pi^0 e^+\nu_e$	$\bar{D}^{*0}\pi^-\pi^0\mu^+\nu_\mu$
$D^{*-}\pi^0\pi^0 e^+\nu_e$	$D^{*-}\pi^0\pi^0\mu^+\nu_\mu$

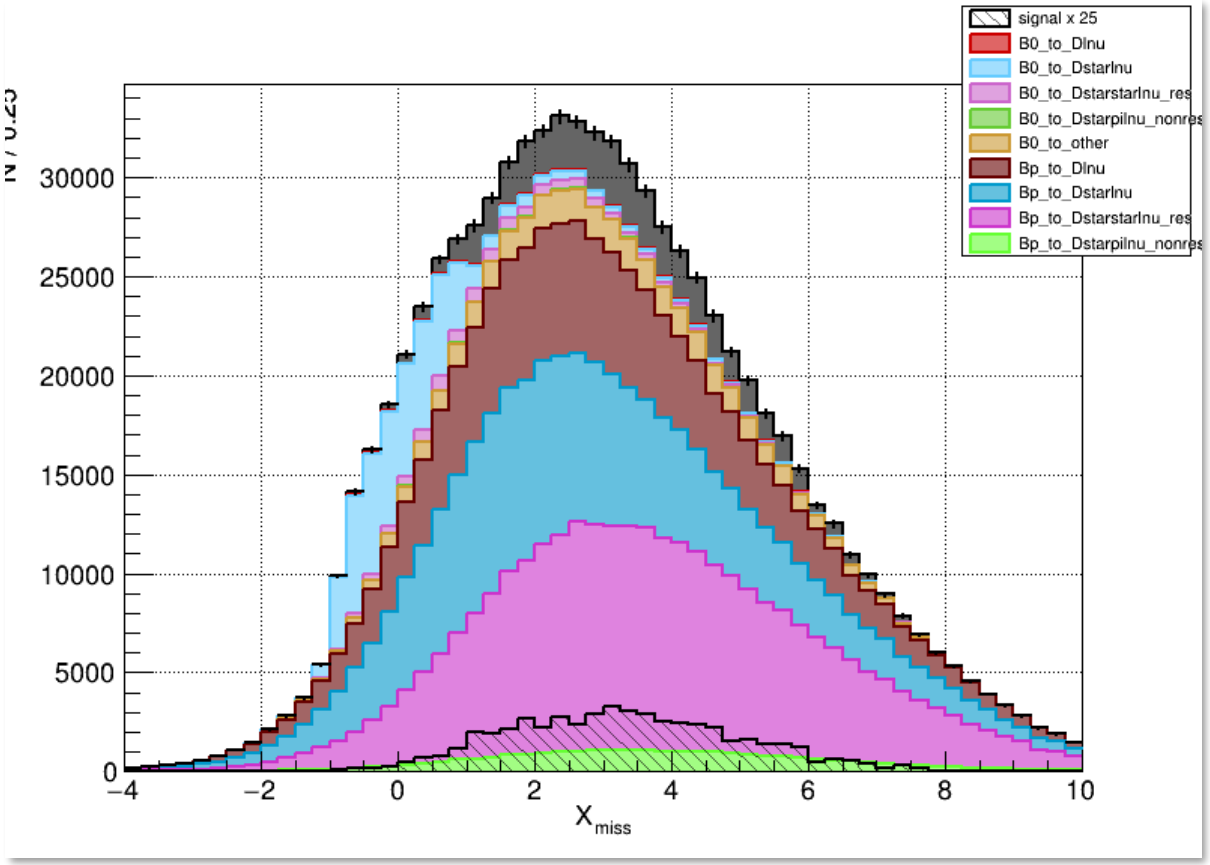
Background calibration: $D^{(*)}$ mass distributions

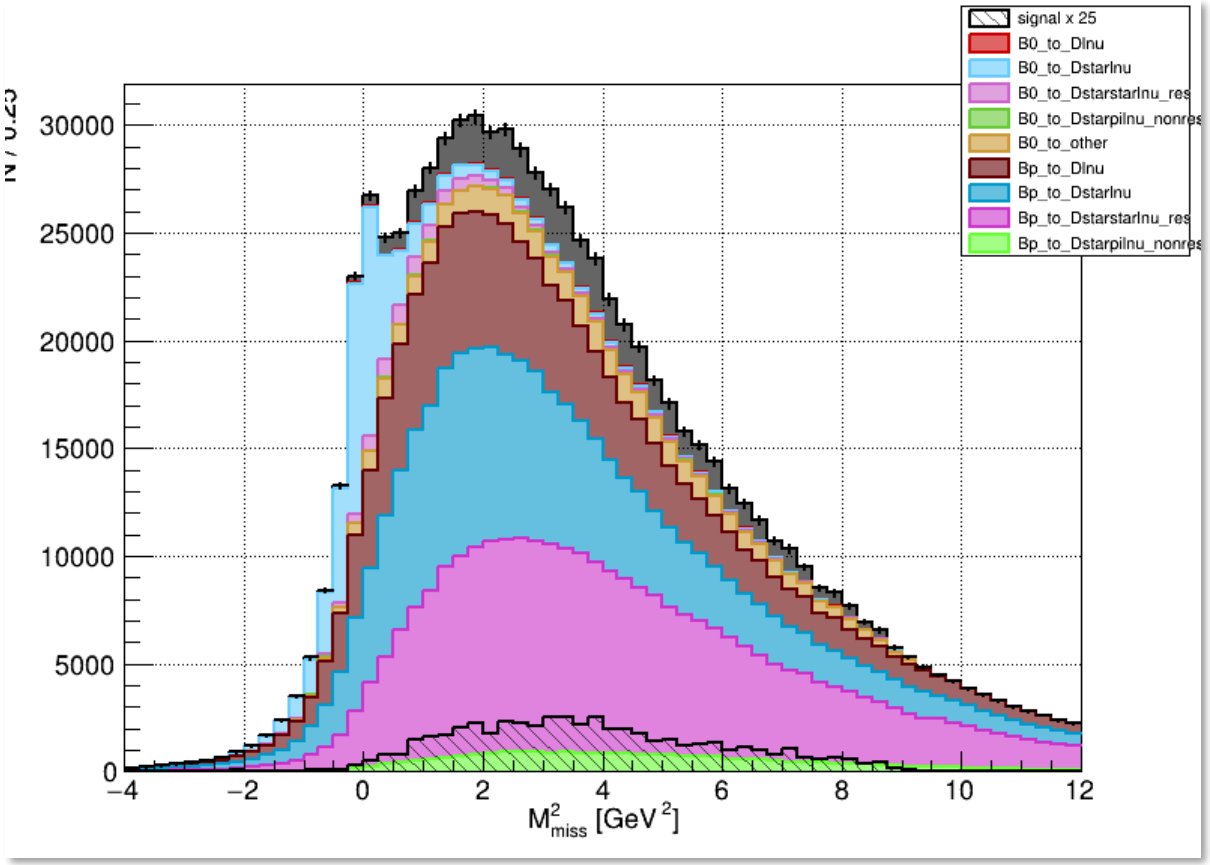




- One stream MC Generic
- Inside D^0 mass region: 1.80 GeV < $M(D^0)$ < 1.95 GeV (loose online selection)
- Inside D^* mass region: 0.14 GeV < $\Delta M(D^*)$ < 0.15 GeV (loose online selection)
- Outside M_{tag} mass region: M_{tag} > 5.20 GeV (loose offline selection)

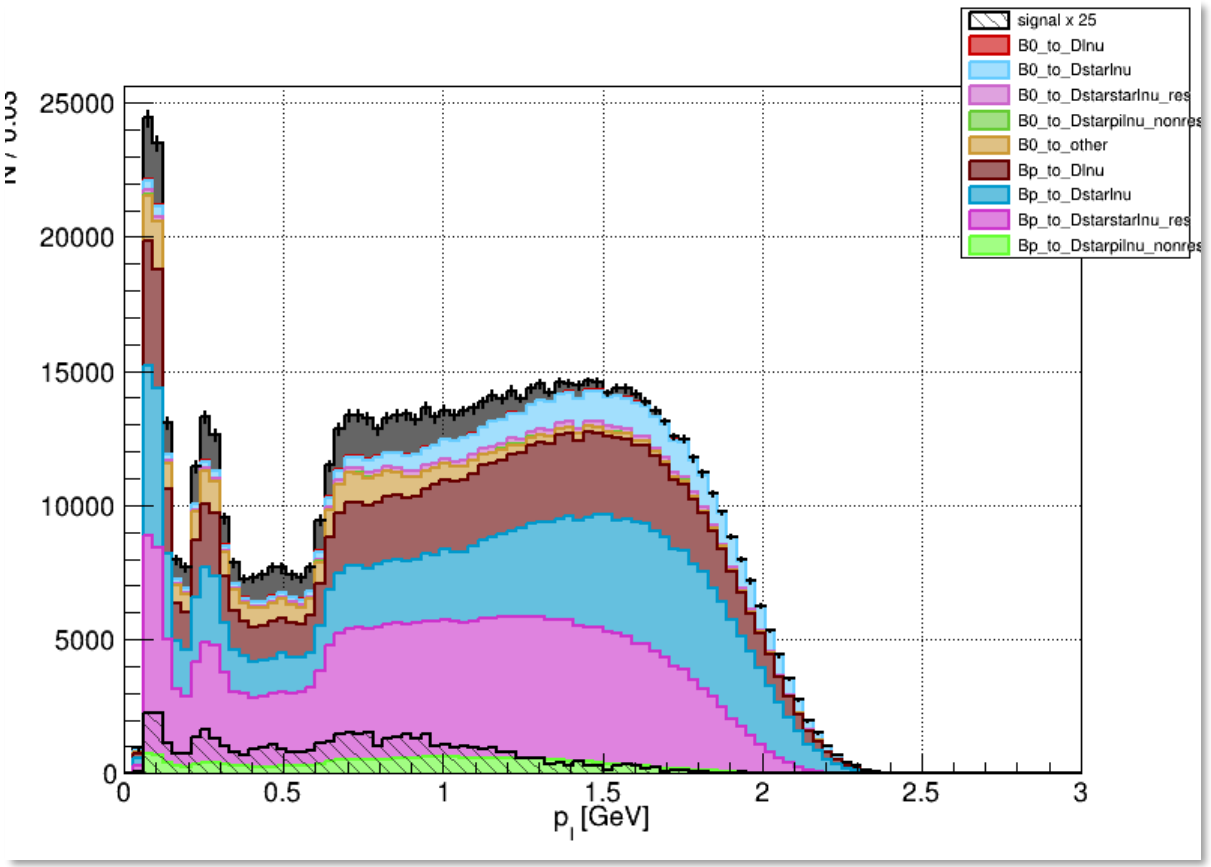
Background calibration: B-sig characteristics





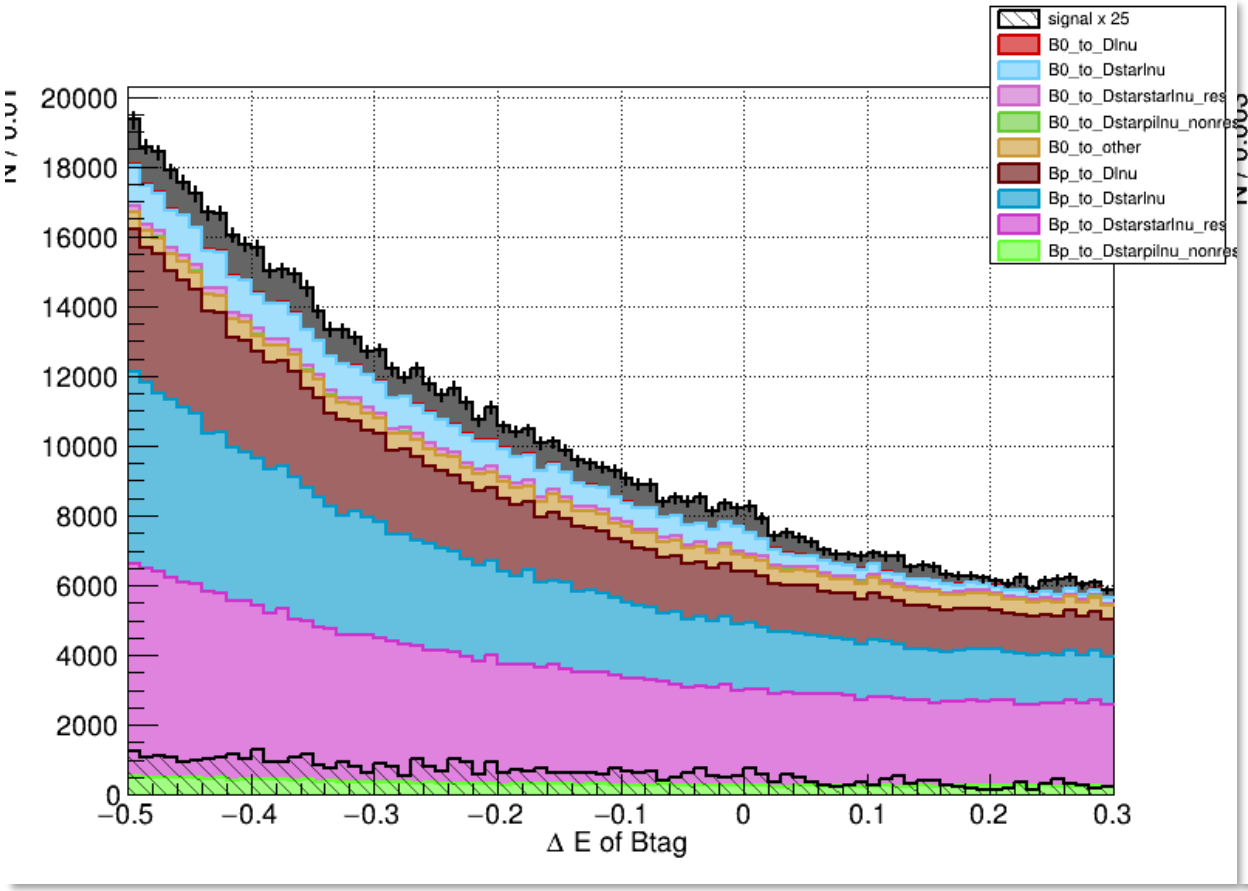
- One stream MC Generic
- Inside D^0 mass region: 1.80 GeV < M(D^0) < 1.95 GeV (loose online selection)
- Inside D^* mass region: 0.14 GeV < ΔM(D^*) < 0.15 GeV (loose online selection)
- Outside M_{tag} mass region: M_{tag} > 5.20 GeV (loose offline selection)

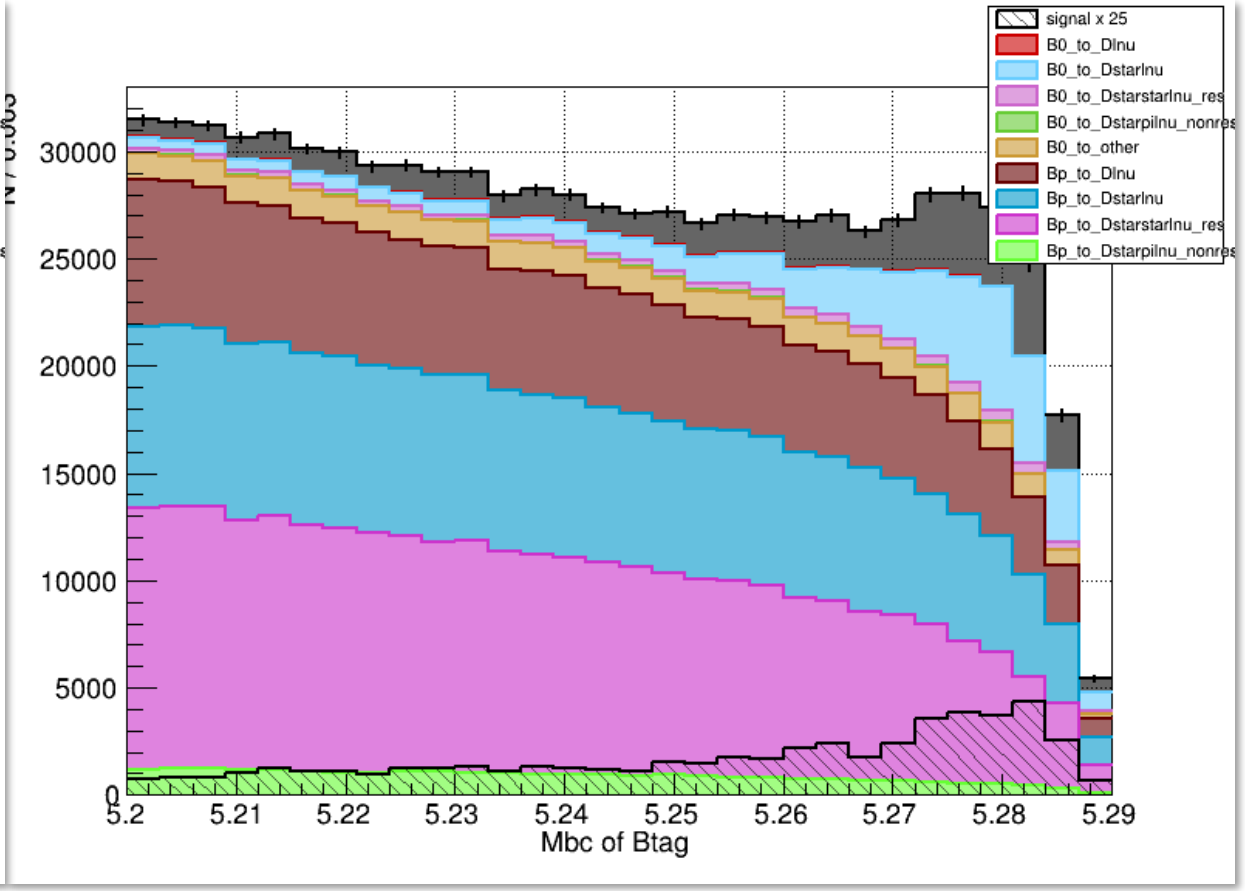
Background calibration: B-sig characteristics



- One stream MC Generic
- Inside D^0 mass region: 1.80 GeV < M(D^0) < 1.95 GeV (loose online selection)
- Inside D^* mass region: 0.14 GeV < $\Delta M(D^*)$ < 0.15 GeV (loose online selection)
- Outside M_{tag} mass region: M_{tag} > 5.20 GeV (loose offline selection)

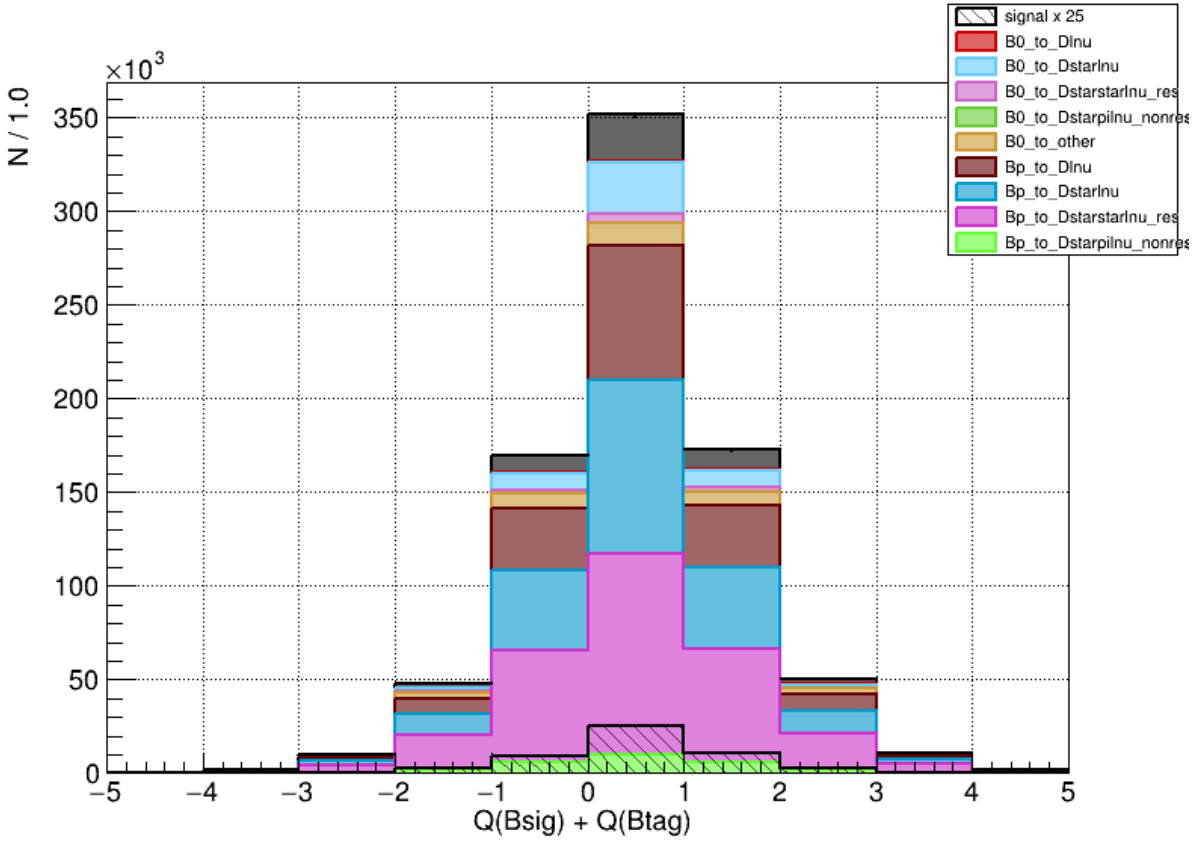
Background calibration: B-tag characteristics

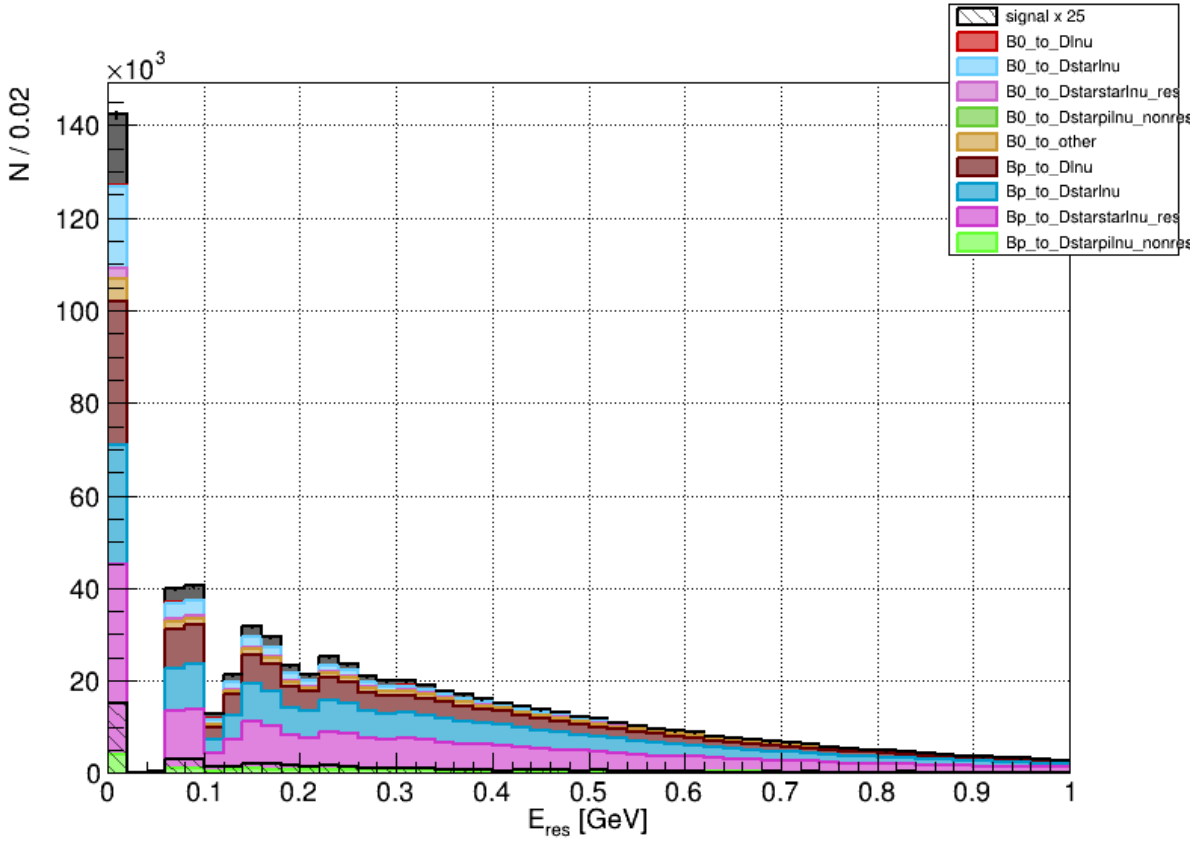




- One stream MC Generic
- Inside D^0 mass region: 1.80 GeV < $M(D^0)$ < 1.95 GeV (loose online selection)
- Inside D^* mass region: 0.14 GeV < $\Delta M(D^*)$ < 0.15 GeV (loose online selection)
- Outside M_{tag} mass region: M_{tag} > 5.20 GeV (loose offline selection)

Background calibration: whole event





- One stream MC Generic
- Inside D^0 mass region: 1.80 GeV < M(D^0) < 1.95 GeV (loose online selection)
- Inside D^* mass region: 0.14 GeV < ΔM(D^*) < 0.15 GeV (loose online selection)
- Outside M_{tag} mass region: M_{tag} > 5.20 GeV (loose offline selection)

BACKUP