

CSBDT (after including variables with
 ΔE or M_{bc} correlation)

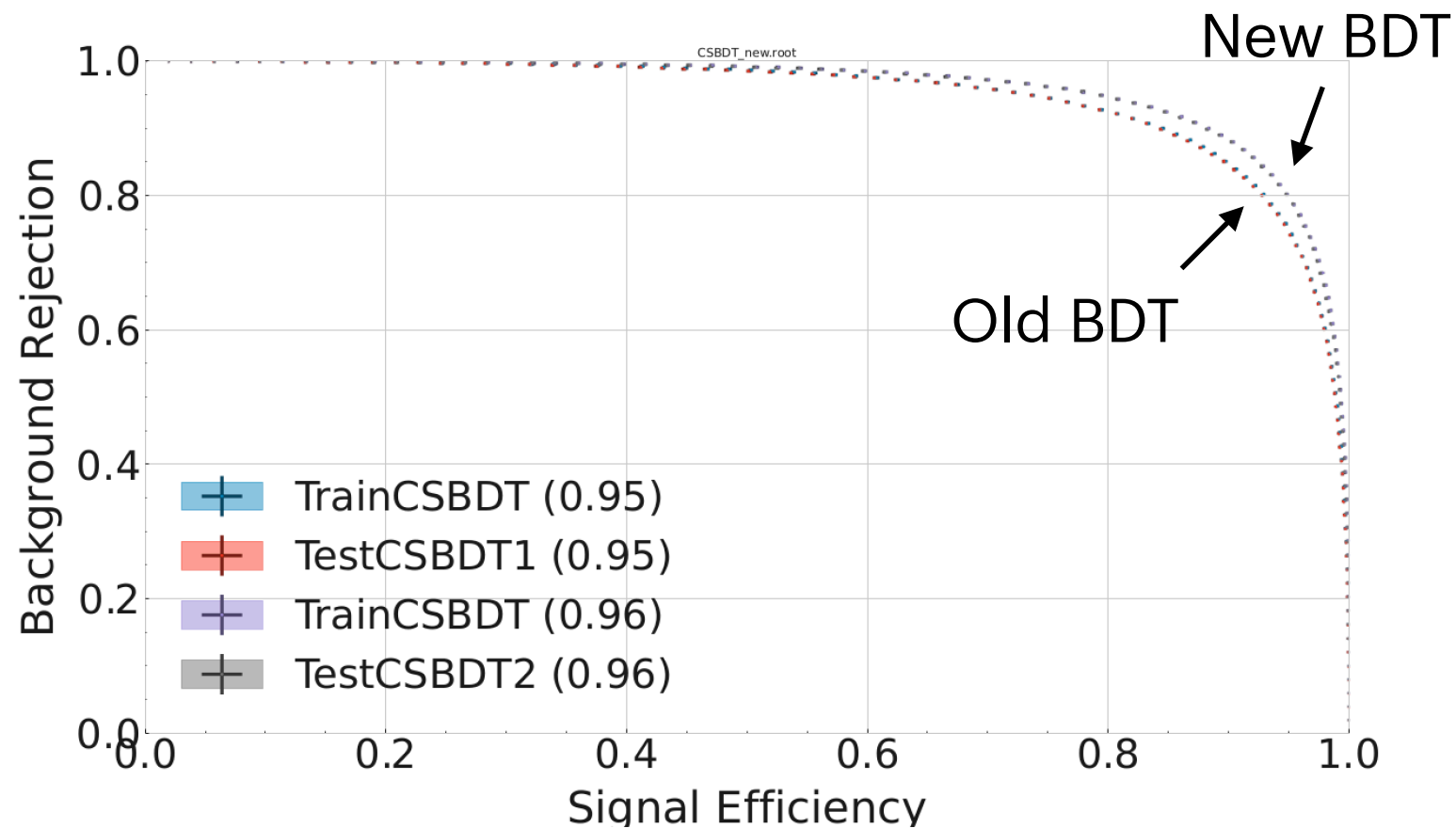
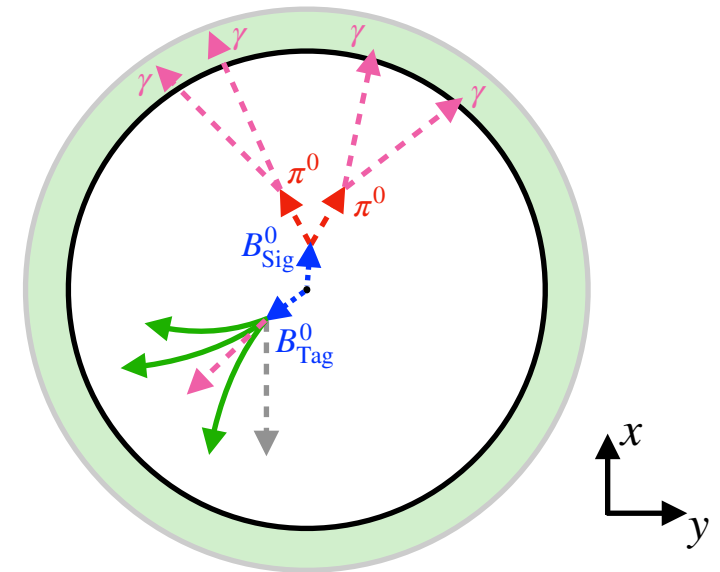
Tentative CSMVA inputs

Old inputs:

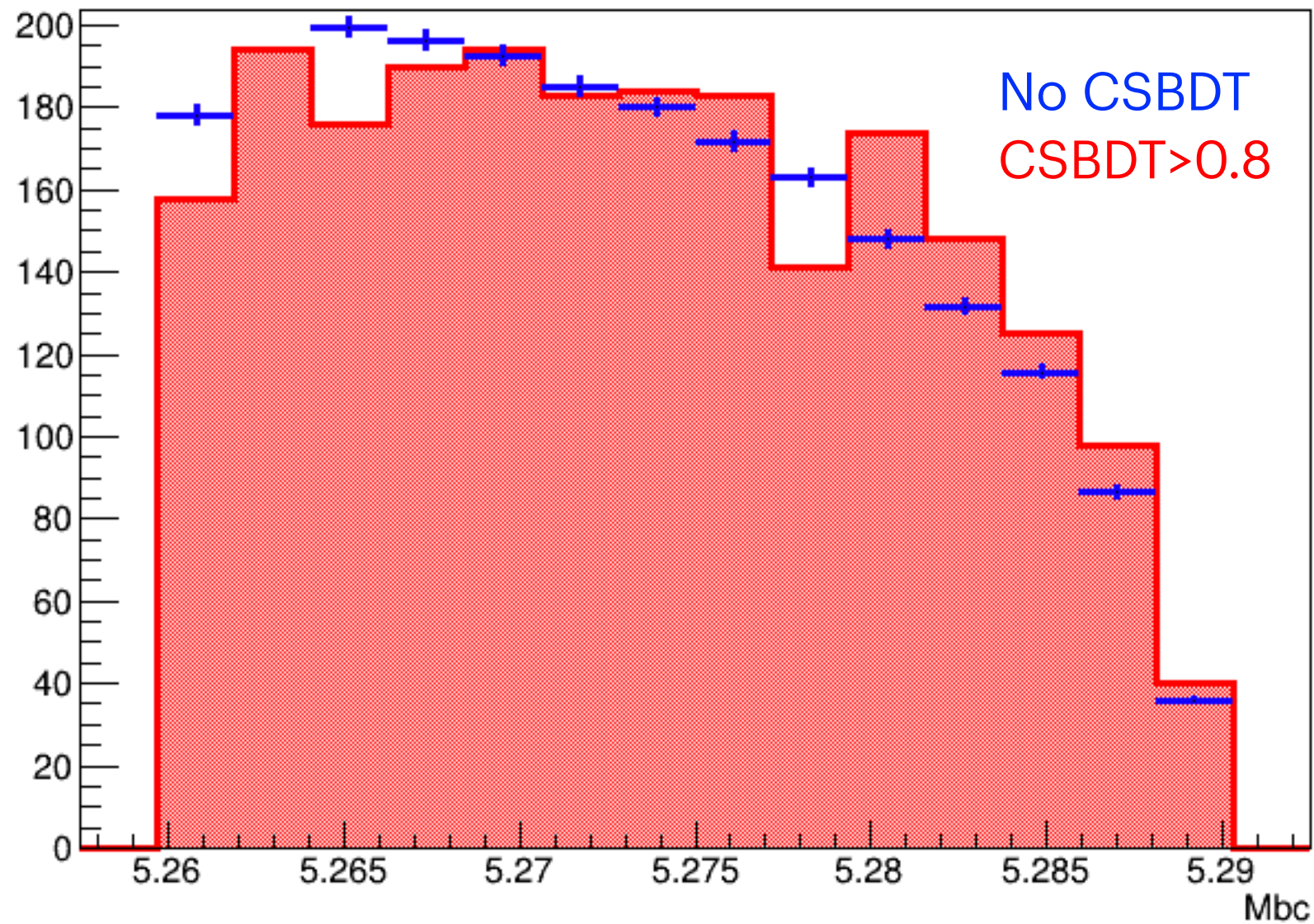
- 13 Kakuno-Super-Fox-Wolfram moments
- cosTBTO
- 7 CleoCones
- cosTheta*
- R2

Additional inputs:

- thrustOm
- ΔZ (BTag)
- Δr (BTag)
- angle between track and π^0
- cone around π^0
- angle between π^0 's
- cosHelicityAngle
- KSFWVariableset
- KSFWVariablesmm2

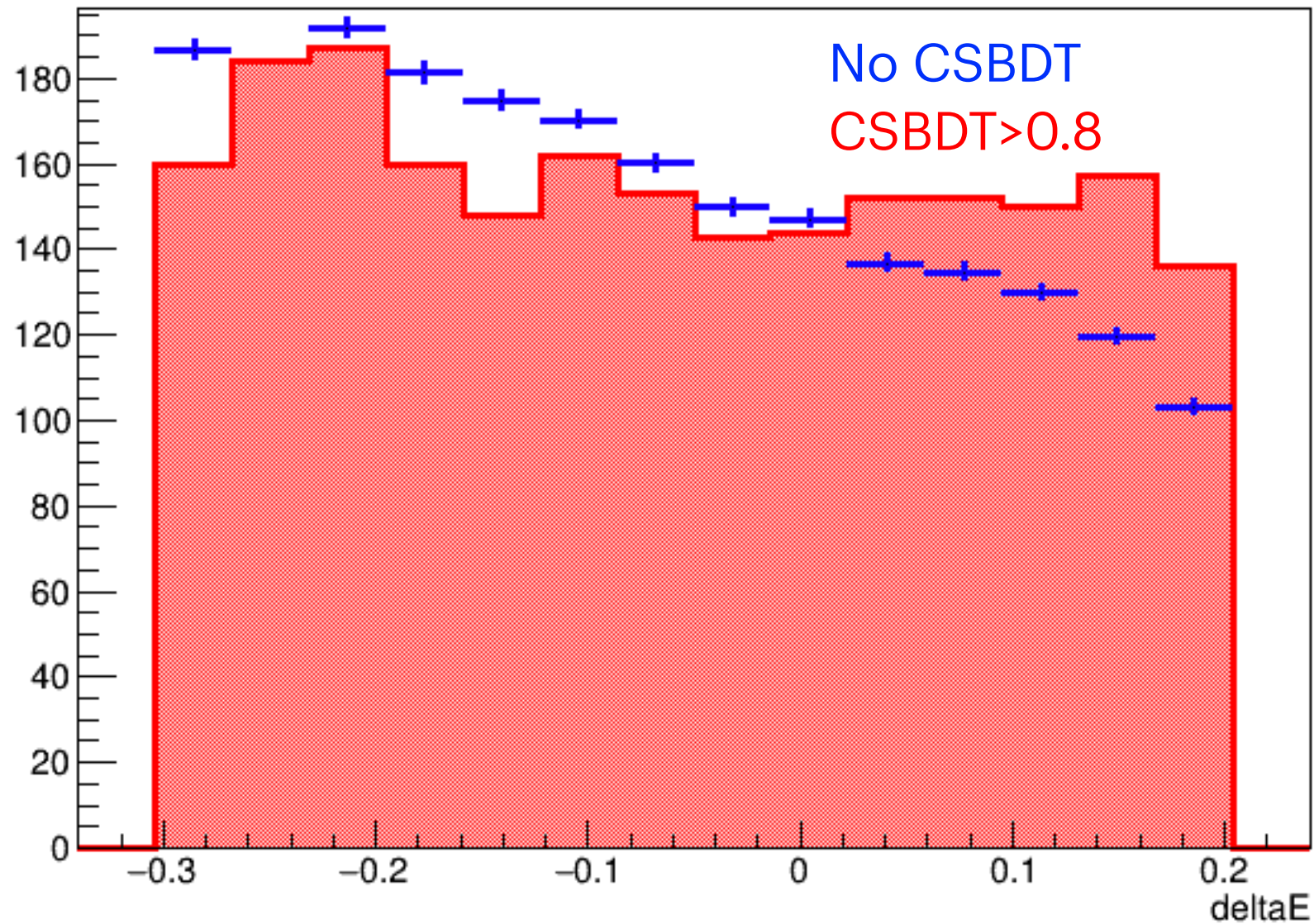


Check the possible sculpting



Different shapes, but **no strange peaks due to sculpting** (also, low statistics).

Check the possible sculpting



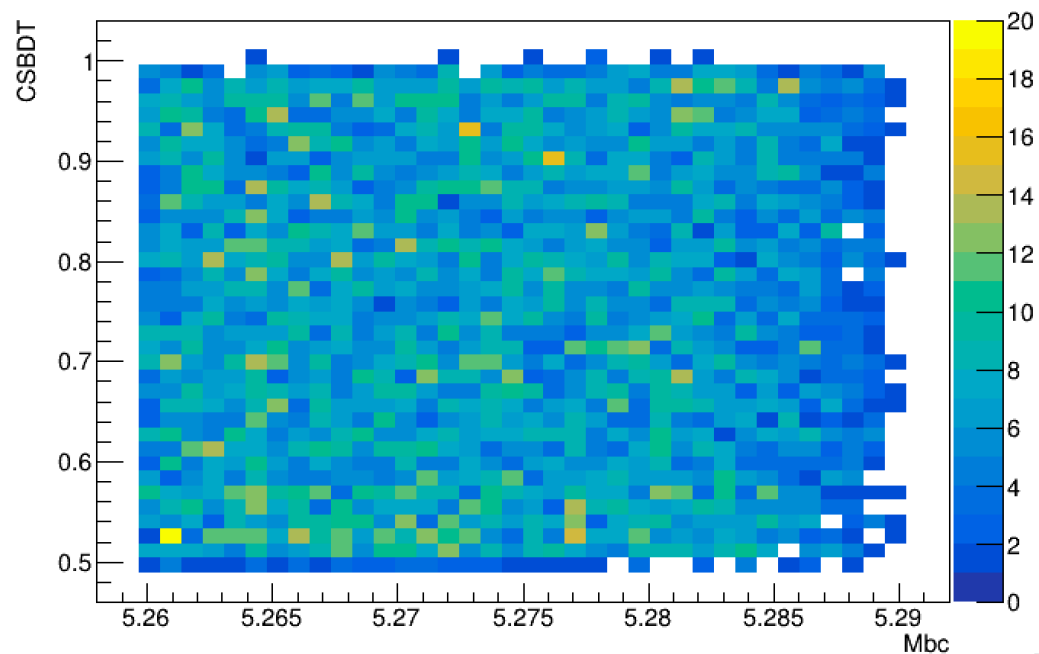
Different slopes, but **no strange peaks due to sculpting** (also, low statistics).

Correlation between CSBDT and $\Delta E/M_{bc}$

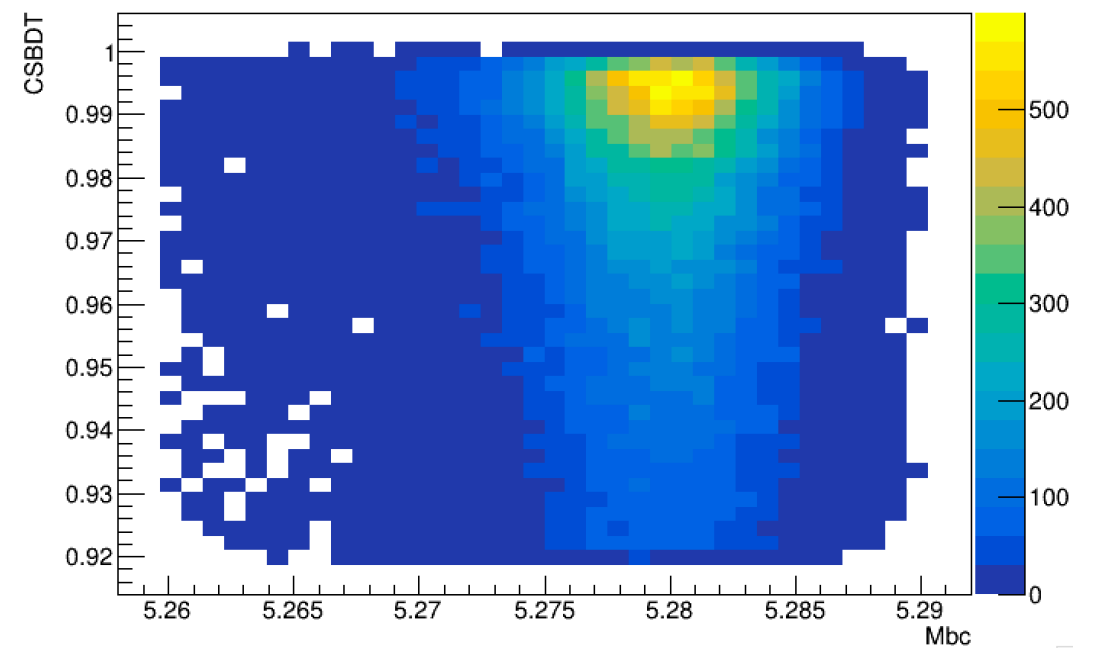
Apply loose selection CSBDT > 0.5.

Correlation with	Signal	Background
ΔE	1.8%	0.6%
M_{bc}	3.9%	1.7%
qr	1.3%	0.9%

Continuum:



Signal:



Small correlation: fine

Correlation between CSDBT and qr

Obtain signal efficiency for CSDBT>0.7 in various qr slices.

	Signal efficiency
[0,0.1]	83.5±2.0%
[0.1,0.4]	82.4±1.5%
[0.4,0.6]	82.8±2.0%
[0.6,0.8]	82.4±2.0%
[0.8,1]	80.8±1.9%

All values are compatible

$B^+ \rightarrow K^+ \pi^0$ signal deficit

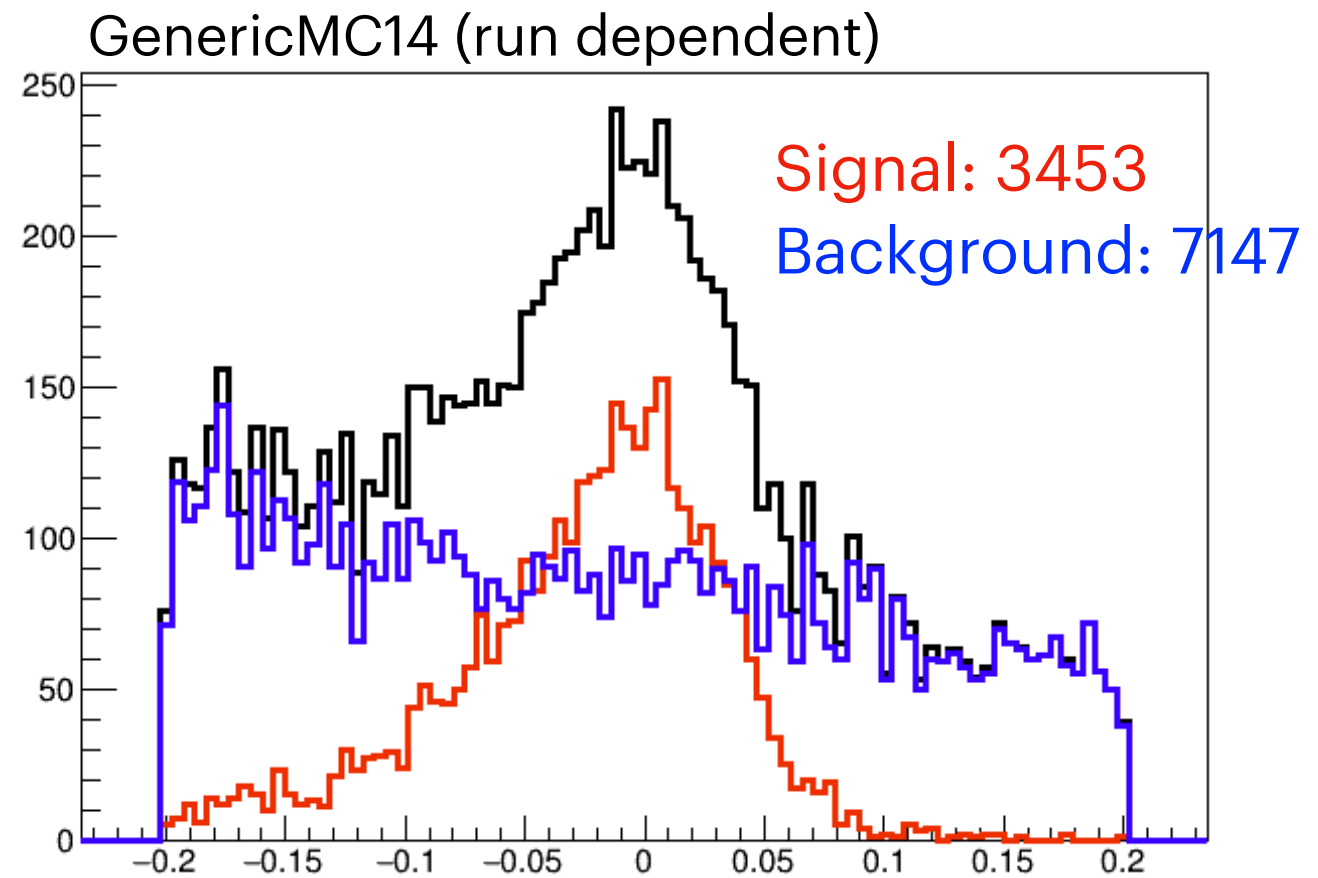
Validation

Use $B^+ \rightarrow K^+ \pi^0$ sample (π^0 has the same energy).

Apply π^0 selections (but photonMVA) used in $B^0 \rightarrow \pi^0 \pi^0 \rightarrow$ number of false π^0 's in MC is 3.6%.

Apply also selection on M_{bc} (>5.27), CS (>0.75) and KaonID (>0.4).

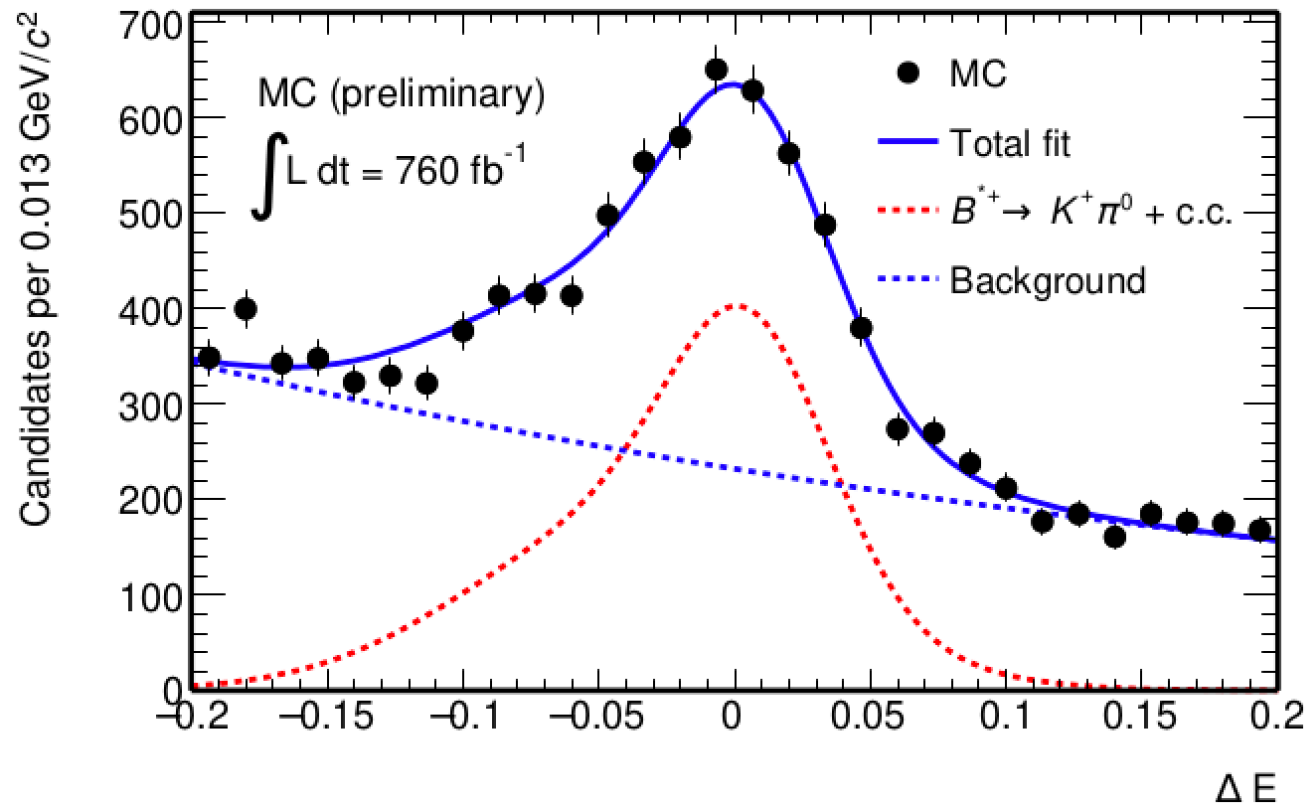
Fraction of false π^0 's goes to 2%.



Validation

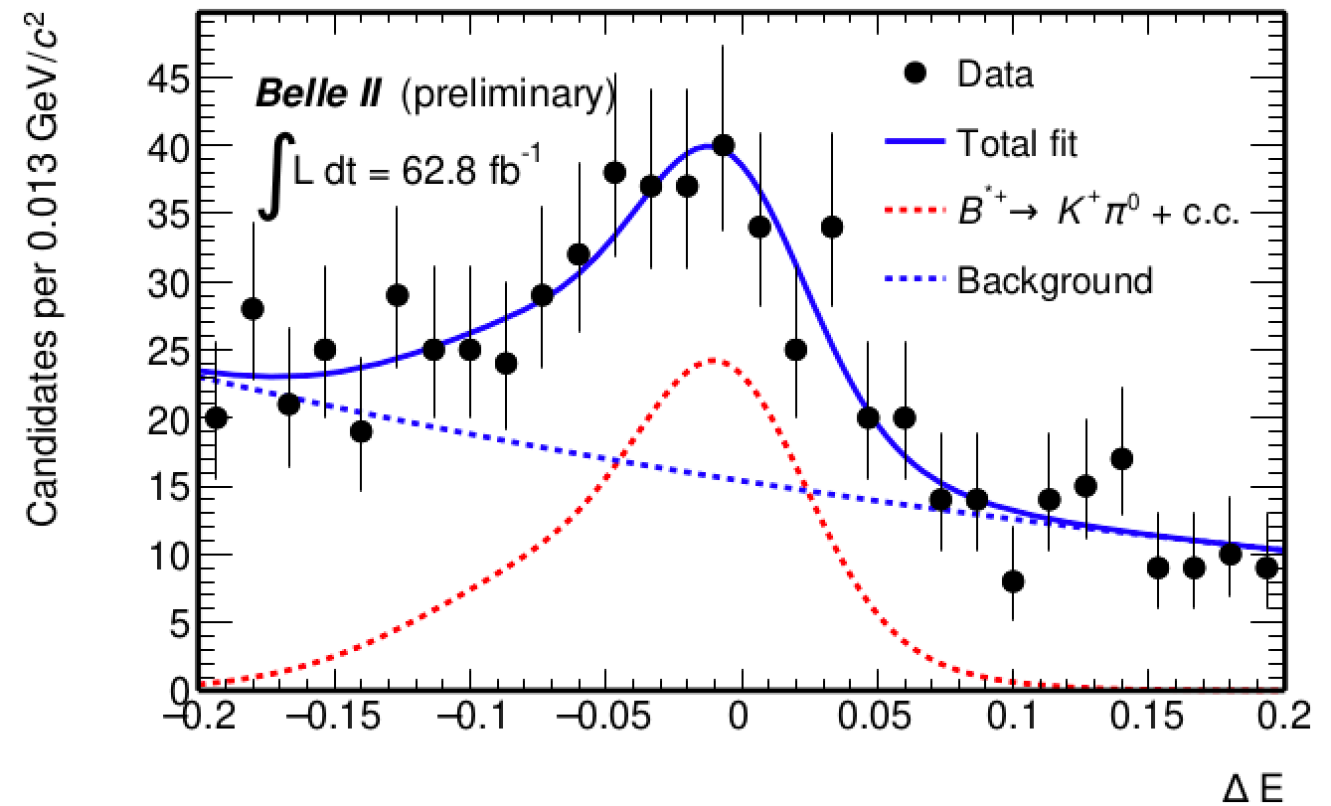
Problem solved

MC



Fitted signal yield: 3448.8 ± 84.1
(Consistent with MC value)

Data



Fitted signal yield: 206.9 ± 21.3
Expected signal yield from MC: 290

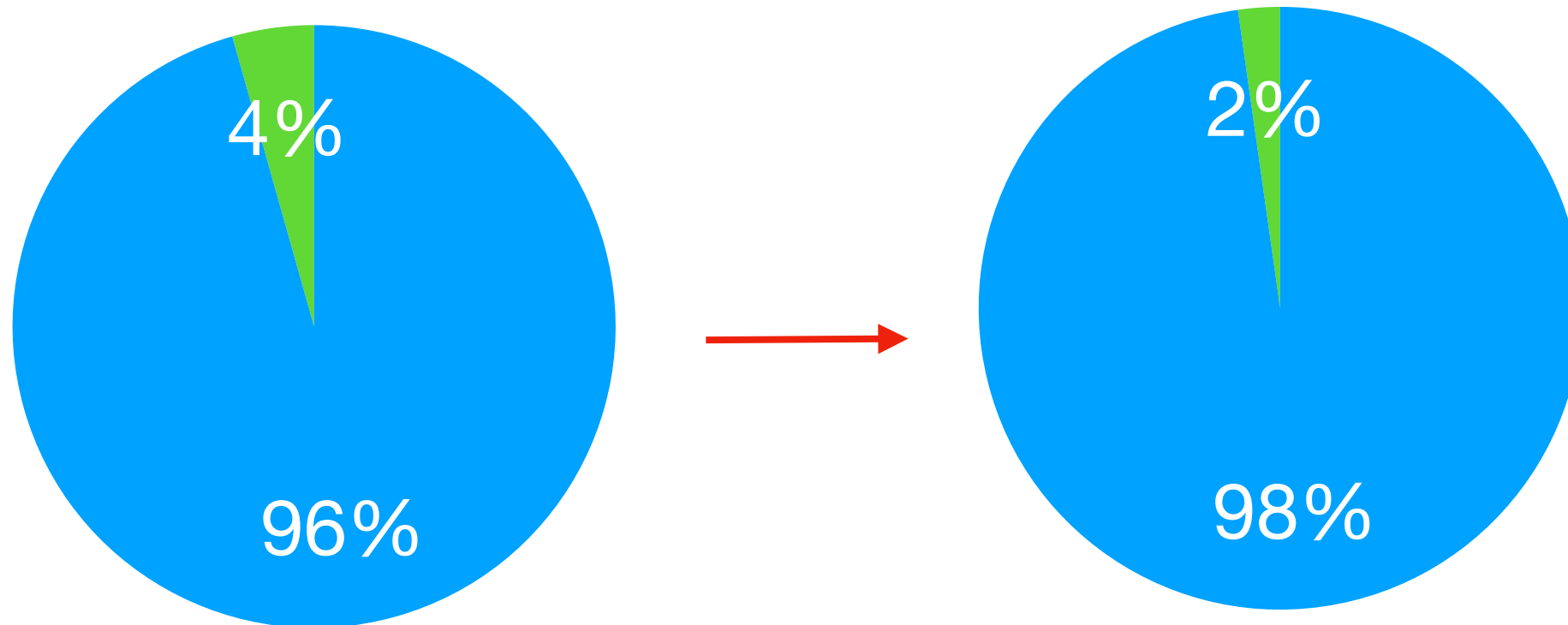
Observed signal by Ching-Hua: 211 ± 18 (with roughly similar signal efficiency
- not exactly same cuts applied)

Signal yield in data is fine

PhotonMVA

False π^0 's fraction before and after all selections (but photonMVA)

- True π^0 's
- False π^0 's (at least one false photon)



Apply photonMVA>0.2: pass from
3.6% of false π^0 's to 2.5%

But, check B^0 candidates:
signal efficiency=84%
background rejection=20%

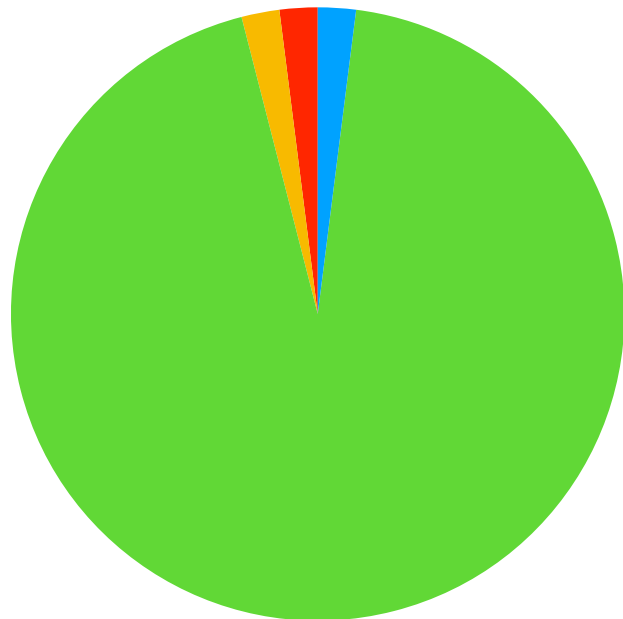
A (simple) photonMVA is probably worth it!

Most urgent problem

Final composition of the sample

Check sample composition after applying $CS > 0.74$ (Francis cut). Note: we have a signal efficiency a bit higher than Francis' ($\epsilon \sim 35\%$, obtained using signalMC).

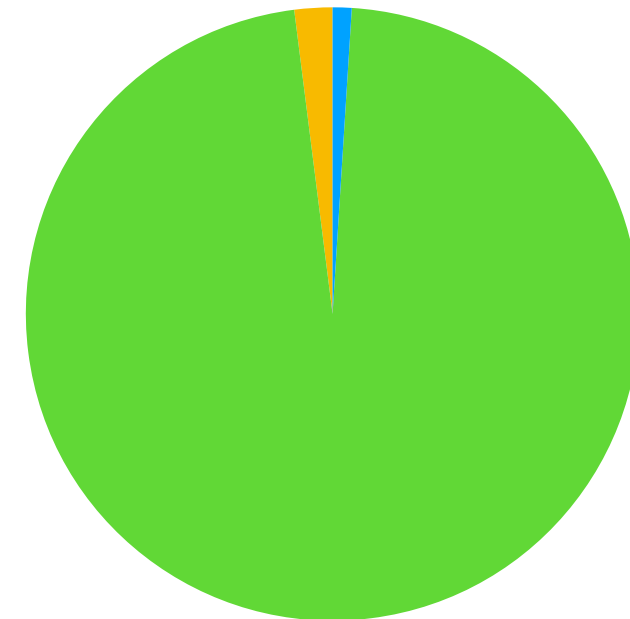
Francis



● Signal ● Continuum
● BBbar ● Taupairs

Signal in 200fb^{-1} : 120

Me



● Signal
● Continuum + Taupairs
● BBbar

Signal in 200fb^{-1} : 40

I'm losing a lot of signal events (already at reconstruction).
Still trying to understand why

Expected signal using PDG BF and my signal efficiency (obtained using my signalMC) is 120 events. After reconstruction in genericMC (no cuts applied) I observe only < 80 events. Problem of the genericMC? But BF in decfile is correct.

Final composition of the sample

Check sample composition after applying $CS > 0.74$ (Francis cut). Note: we have a signal efficiency a bit higher than Francis' ($\epsilon \sim 35\%$, obtained using signalMC).

	Expected signal	Expected background
Francis	120	4930
Me	40	3587

In the run-dependent MC:

Expected signal events: 582

Reconstructed signal events: 307