$B^+ \to \rho^+\rho^0$ status

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Trieste Physics Meeting
November 11, 2022

Recap from last showing

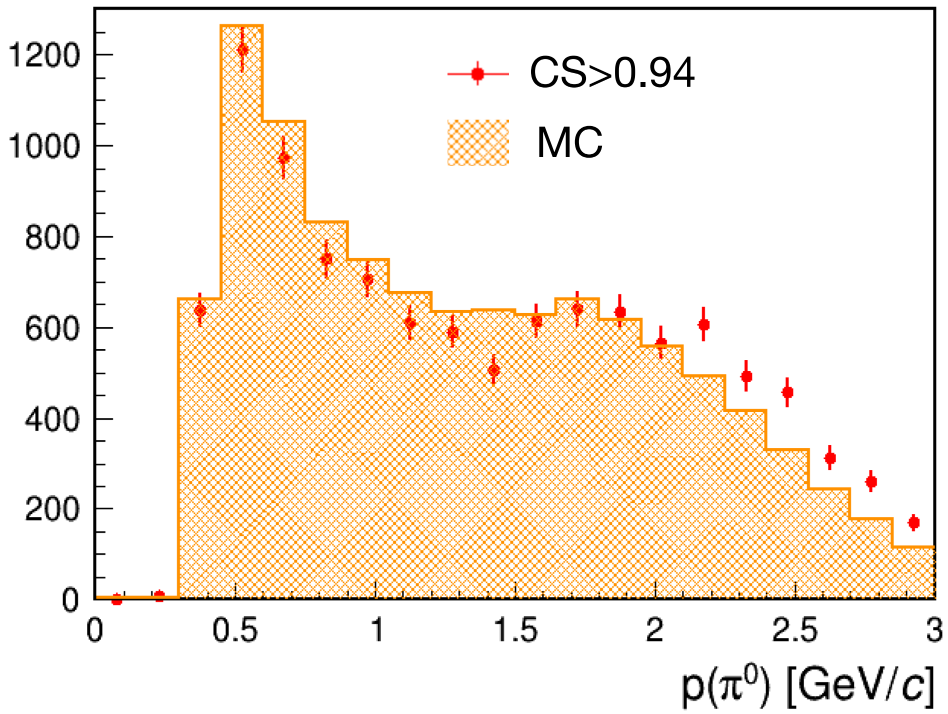
Cure continuum by reweighing the MC using off-resonance data extended in CS range, based on momentum spectra.

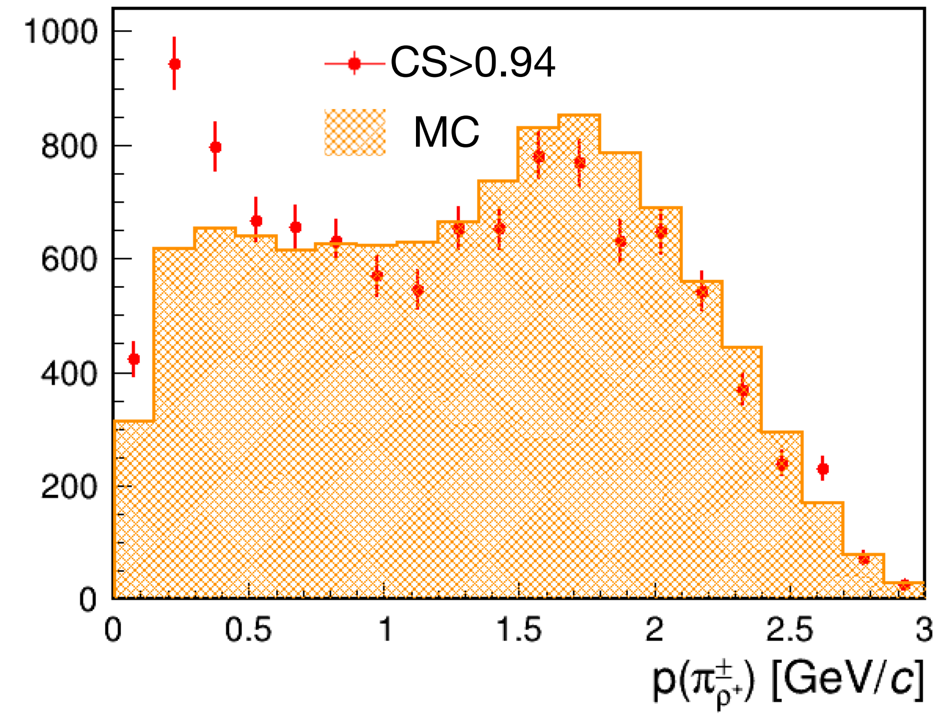
Extract a pure BBbar sample subtracting the off-resonance CS-extended data.

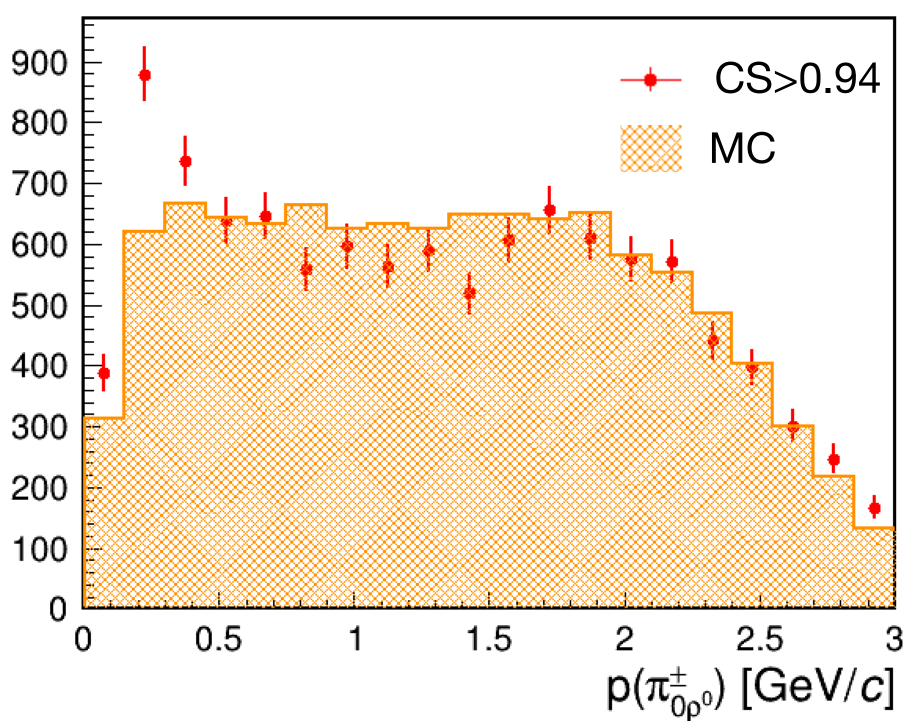
Today (redone with MC15/proc13-buckets26+):
- validation of this reweighing on sidebands
- investigation of Dρ: can we use this?
- test on the Moriond dataset (proc12-buckets16-25)

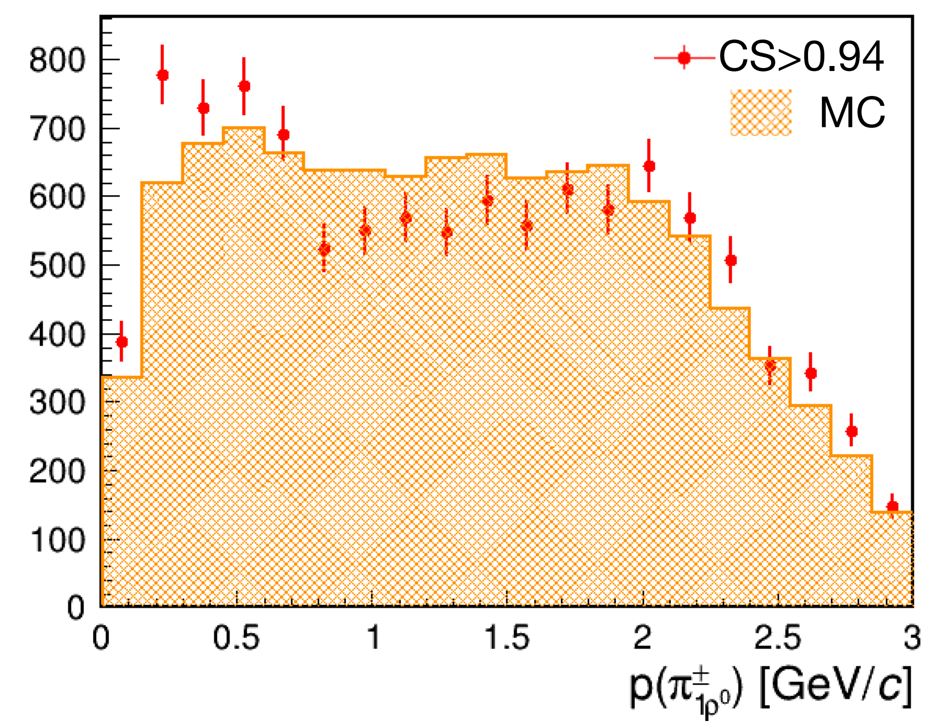
Additional fix: now applying best-candidate selection (BCS) everywhere, was not applying on off resonance data previously.

Continuum weights



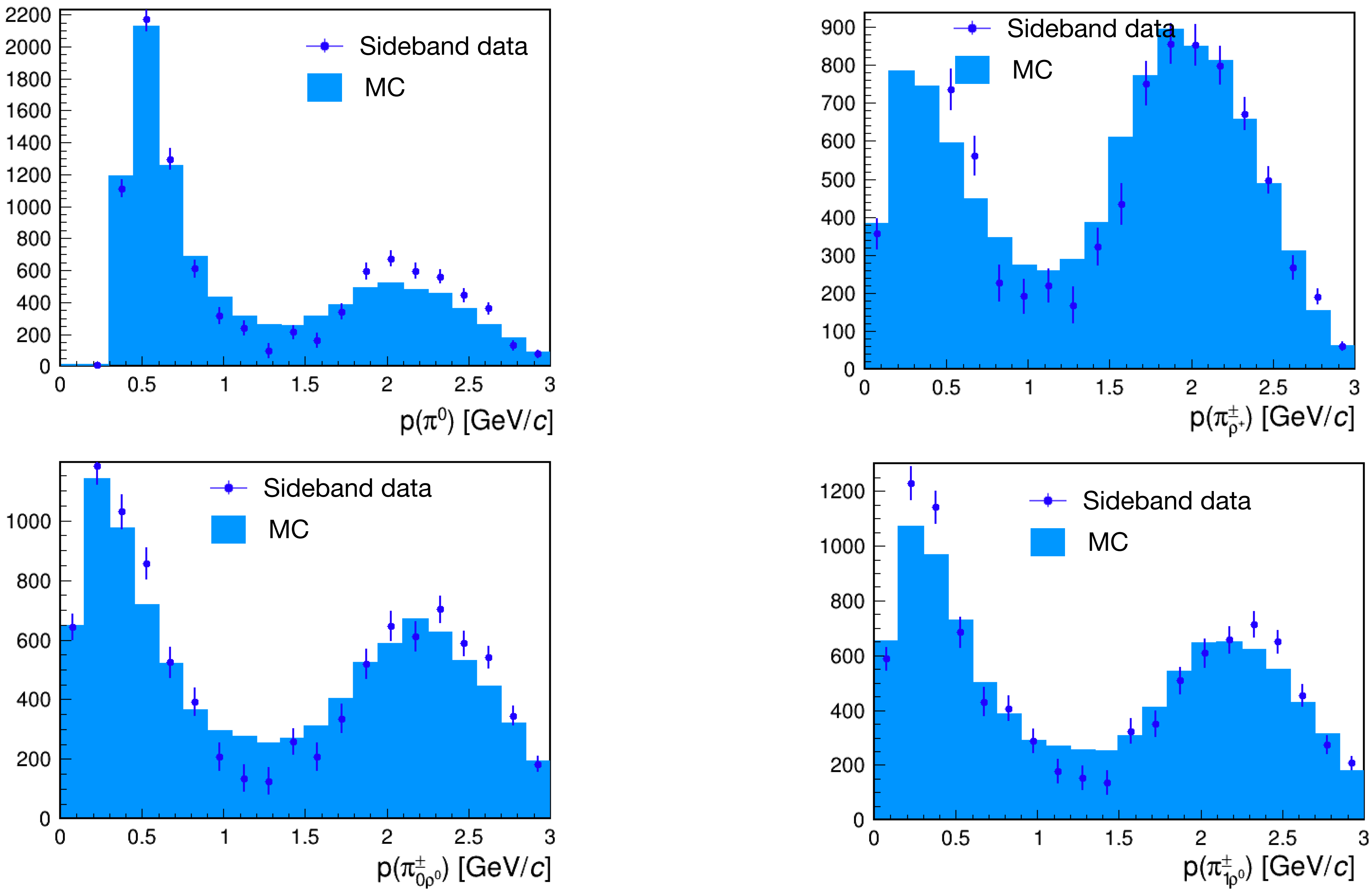






Get 2Dx2D weights from these distributions.

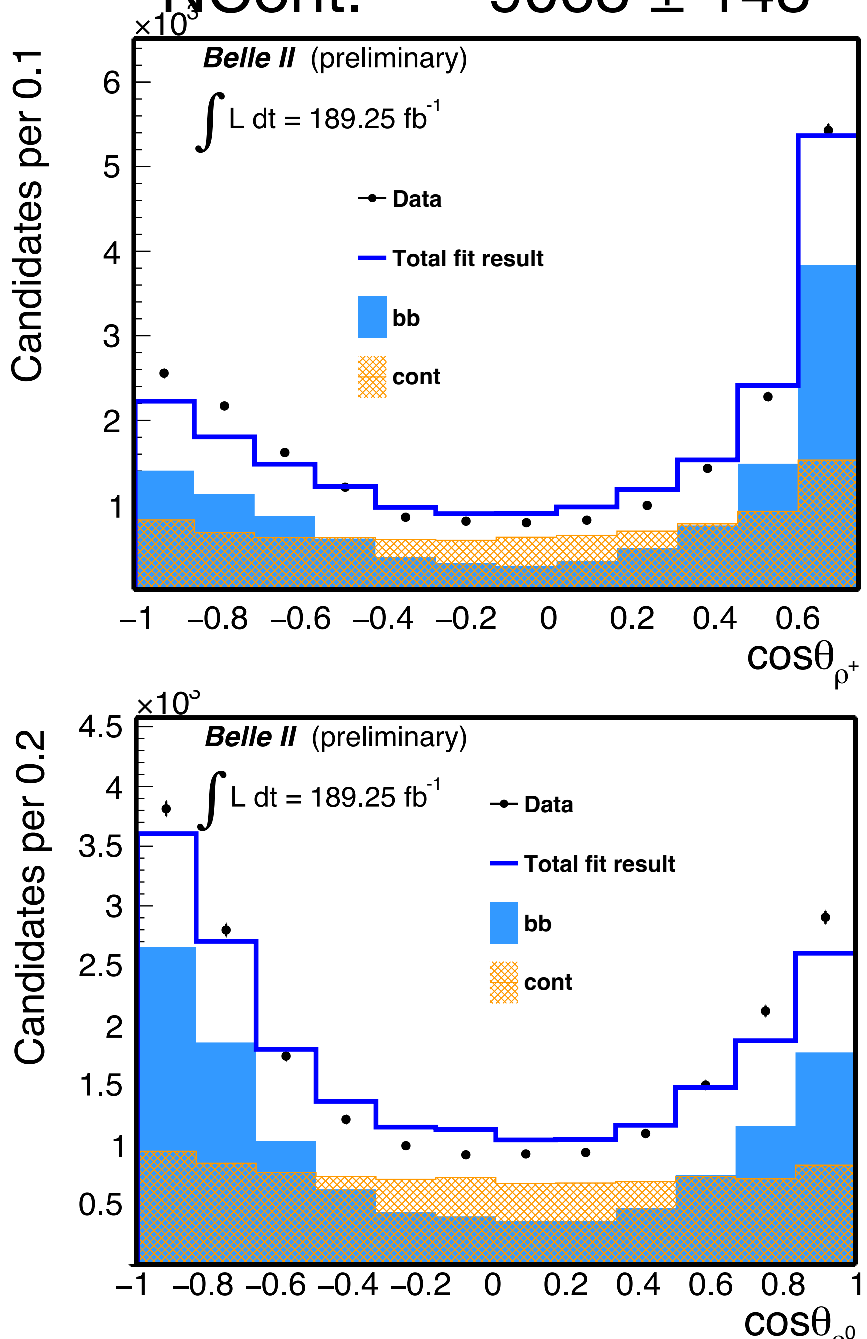
BBbar weights



Get 2Dx2D weights from these distributions.

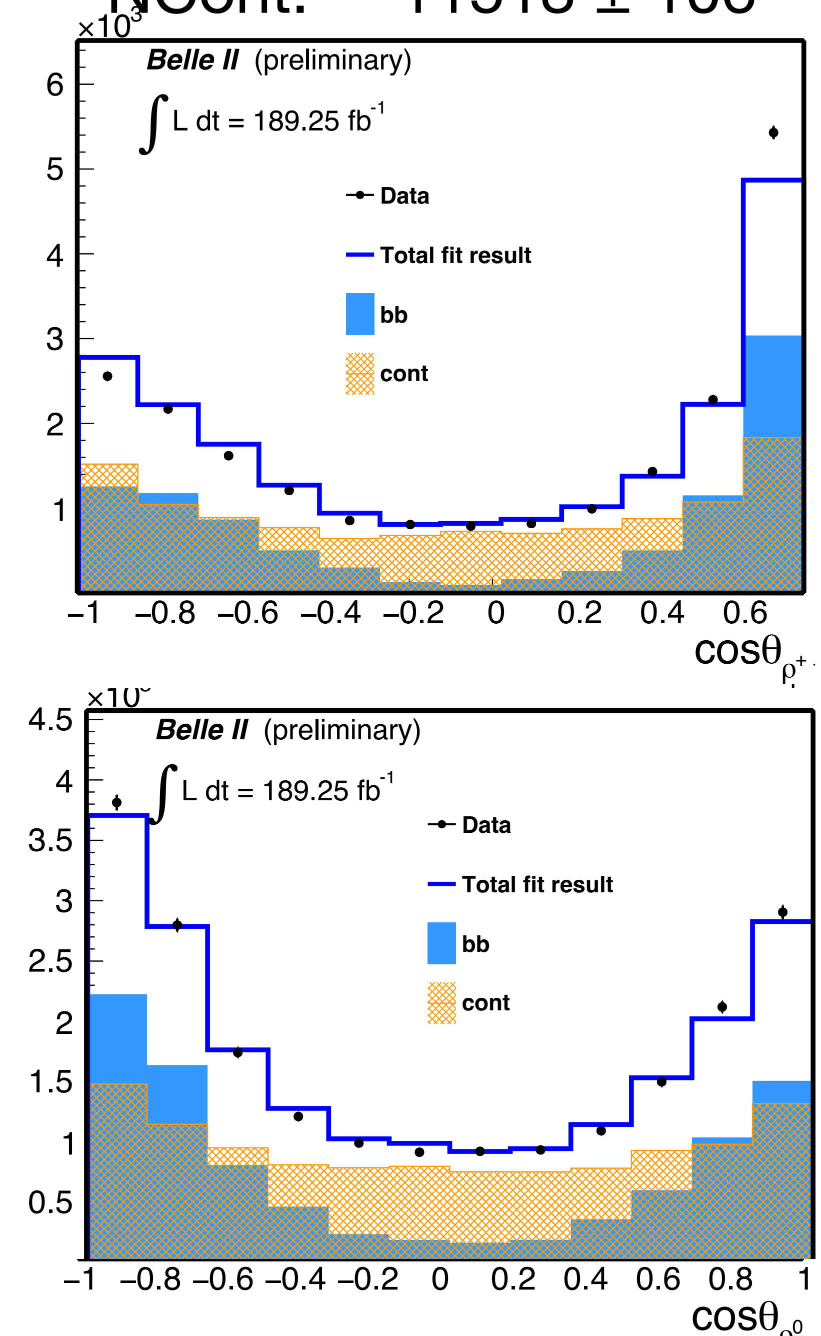
Fit with reweighed continuum

-2LogL: **-385458**
NBBbar: 11889 ± 157
NCont: 9068 ± 148



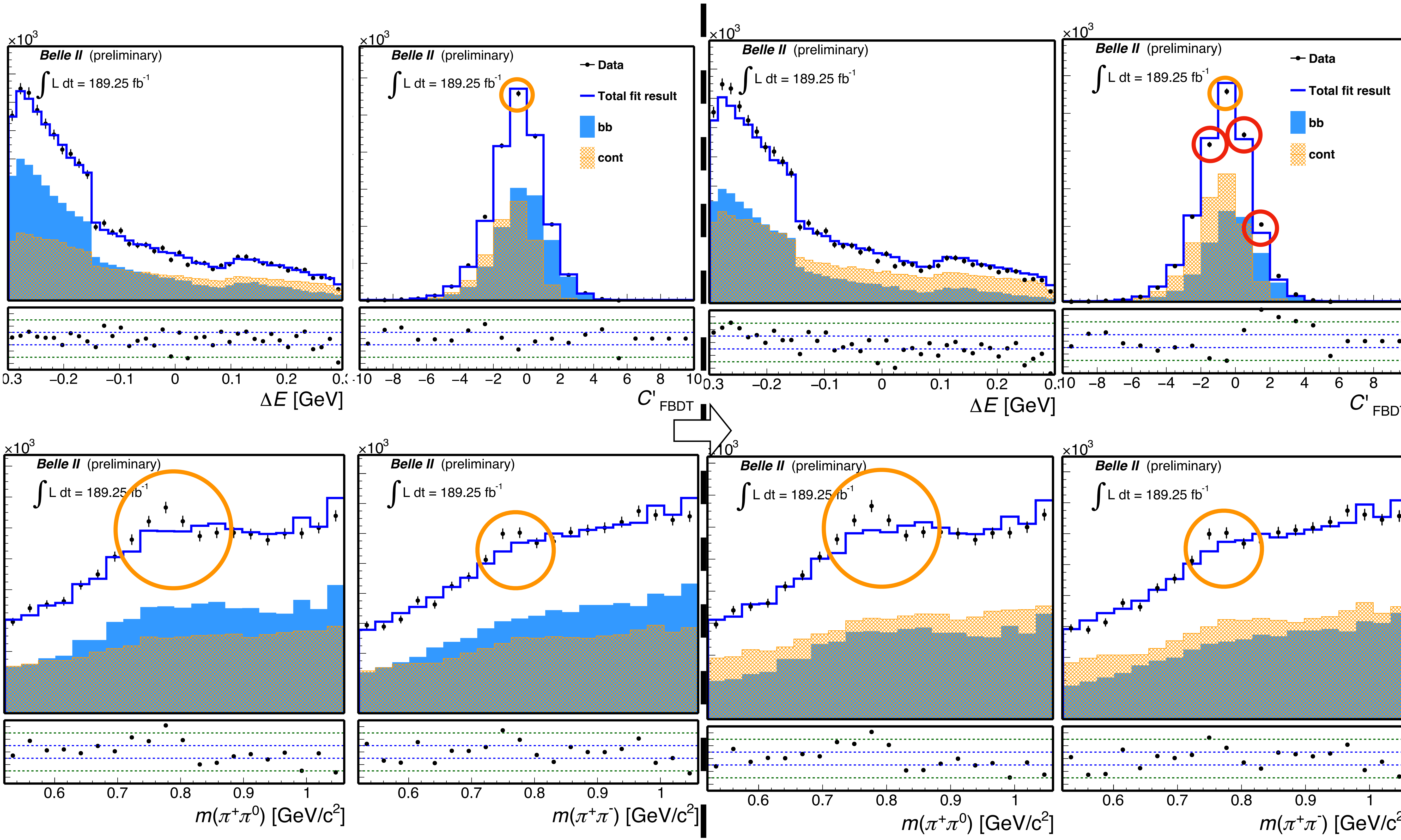
2Dx2D weights
from π momenta

-2LogL: **-385515**
NBBbar: 9444 ± 96
NCont: 11513 ± 106



Angular mismodelling is cured in the sidebands.

Fit with reweighed continuum

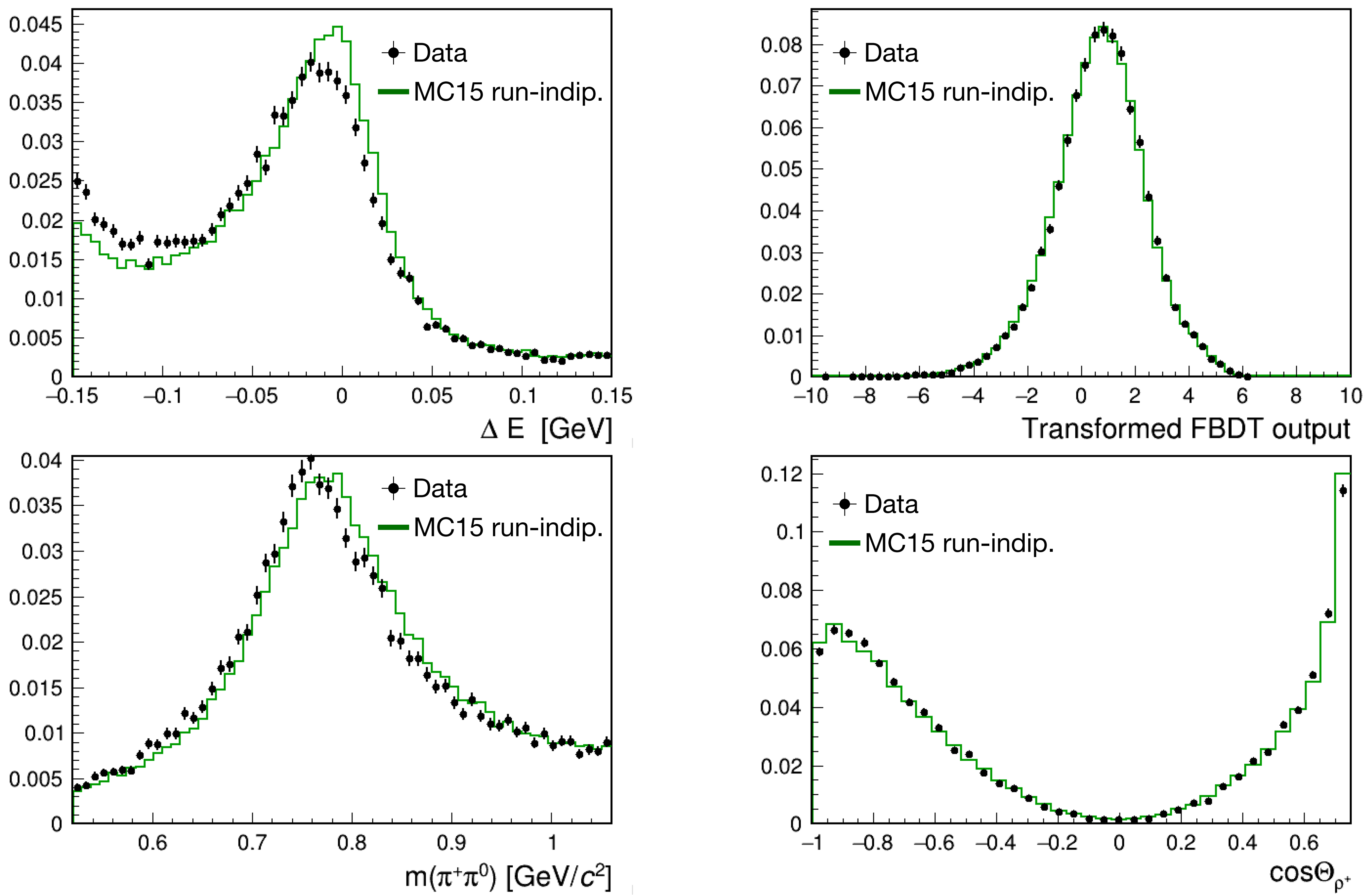


Some other discrepancies still present.

Can we use the $B \to D^0 \rho$?

Another pure BBbar

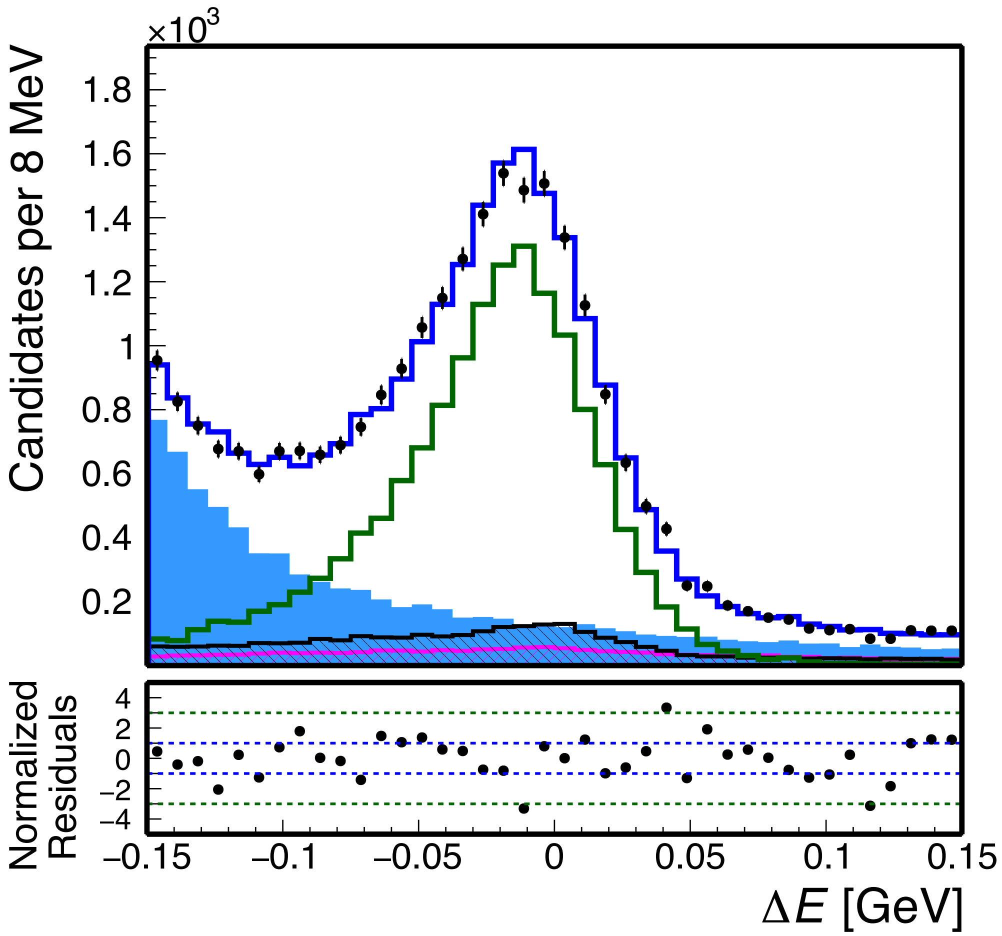
Tight cut on the D0 mass peak: continuum ~1%.

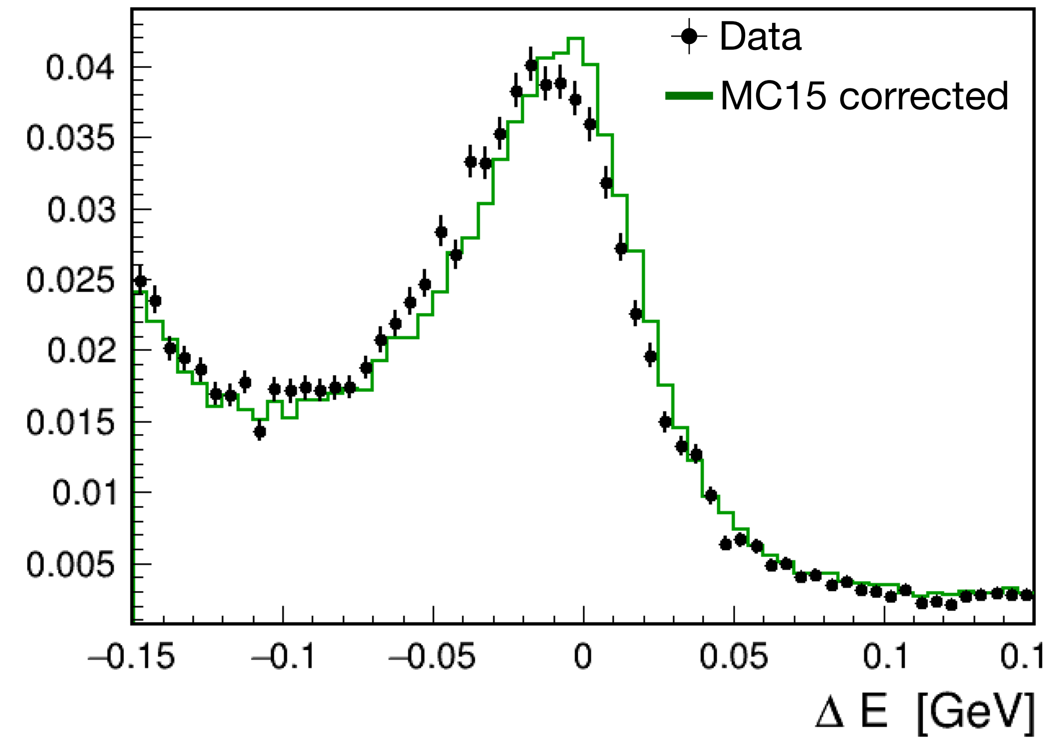


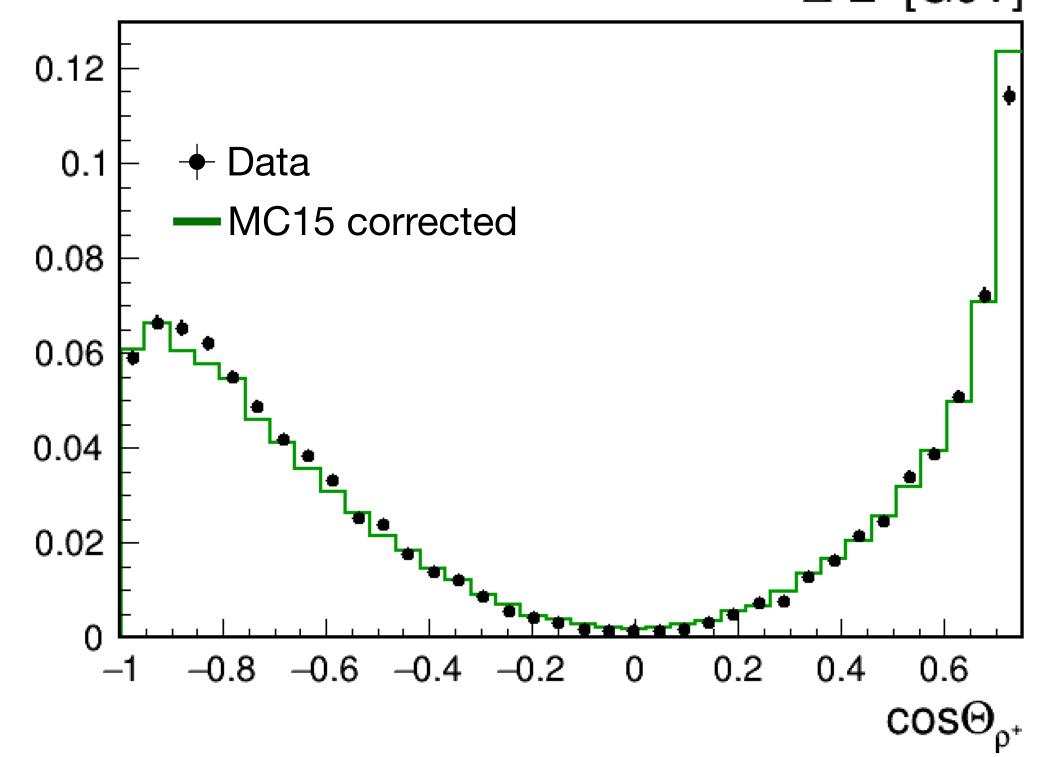
Discrepancies due also to the wrong signal/background ratio in MC.

Adjust signal proportions

Fit ΔE in data to extract real signal/background proportions.







Fit results:

signal : [redacted]

SxF real ɣ's: [redacted]

SxF — else: [redacted]

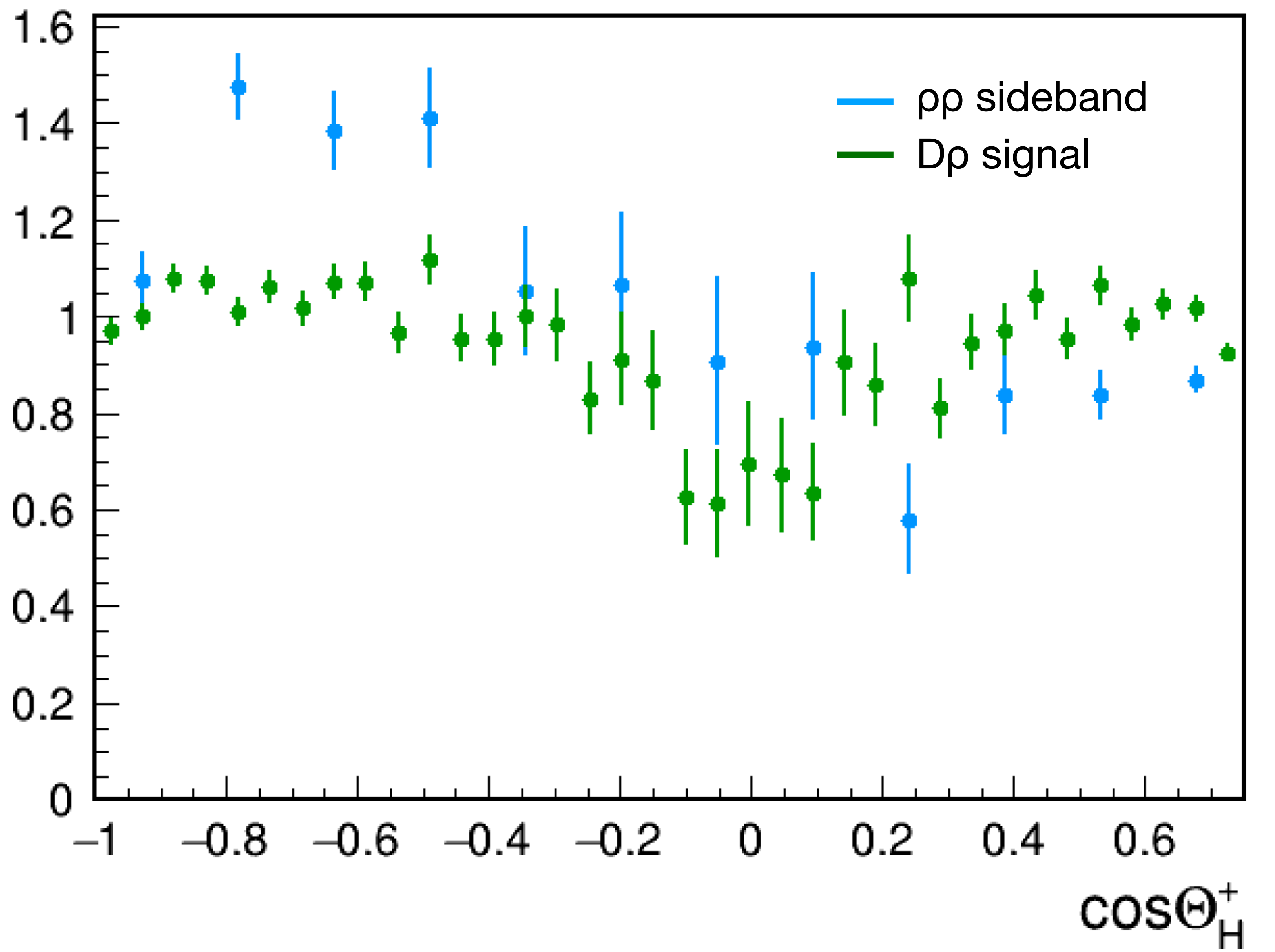
BB comb. : [redacted]

ΔE shift : -4.6 ± 0.4 MeV

There is some angular mismodelling.

Is $D^0\rho^+$ a good $\rho^+\rho^0$ proxy?

Data/MC ratio in *Dρ* signal region and *ρρ* sideband continuum-subtracted.

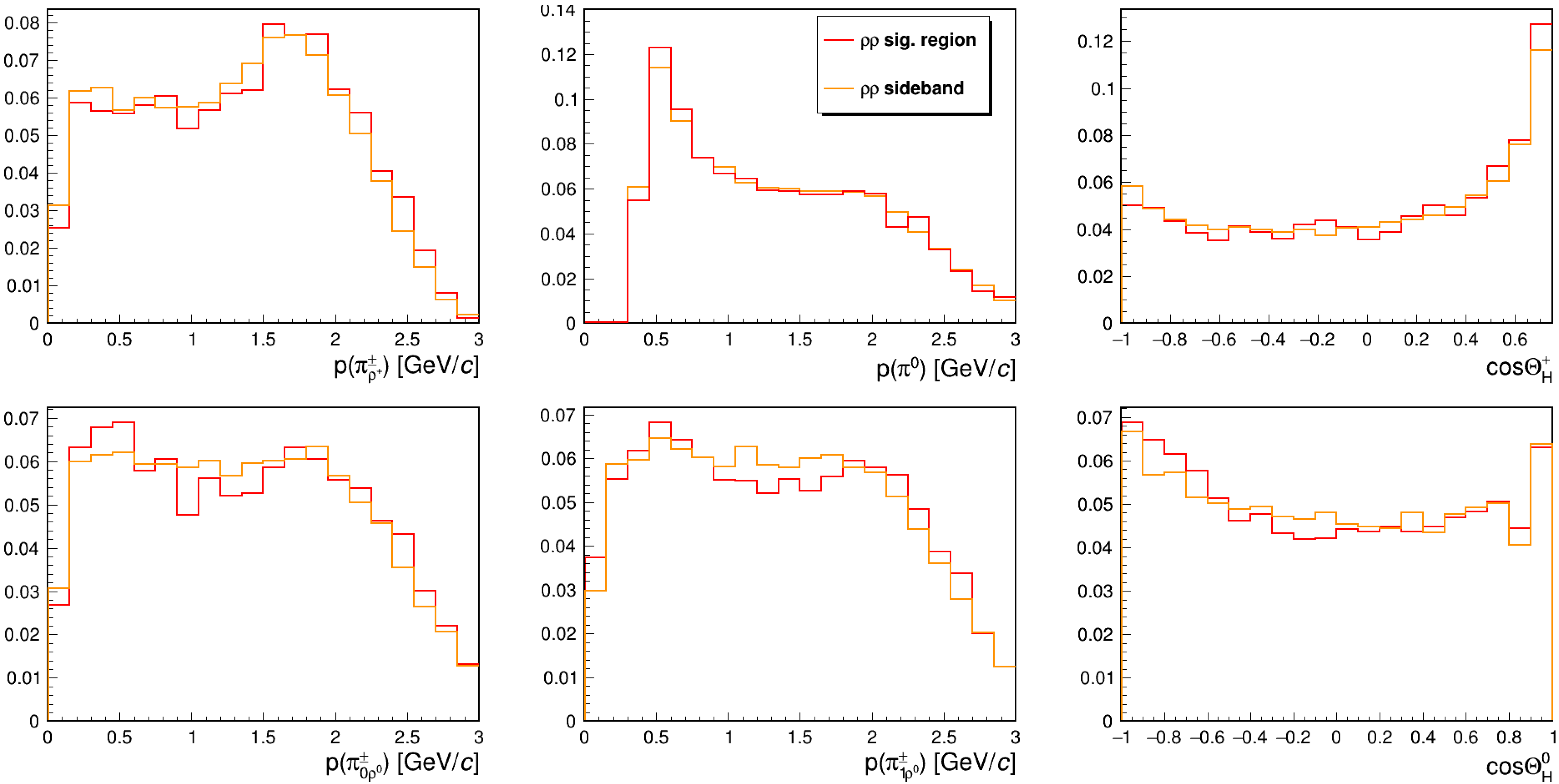


No, the mismodellings are different. Stick to BBbar from sidebands.

Fit of Moriond22 data

Validate continuum

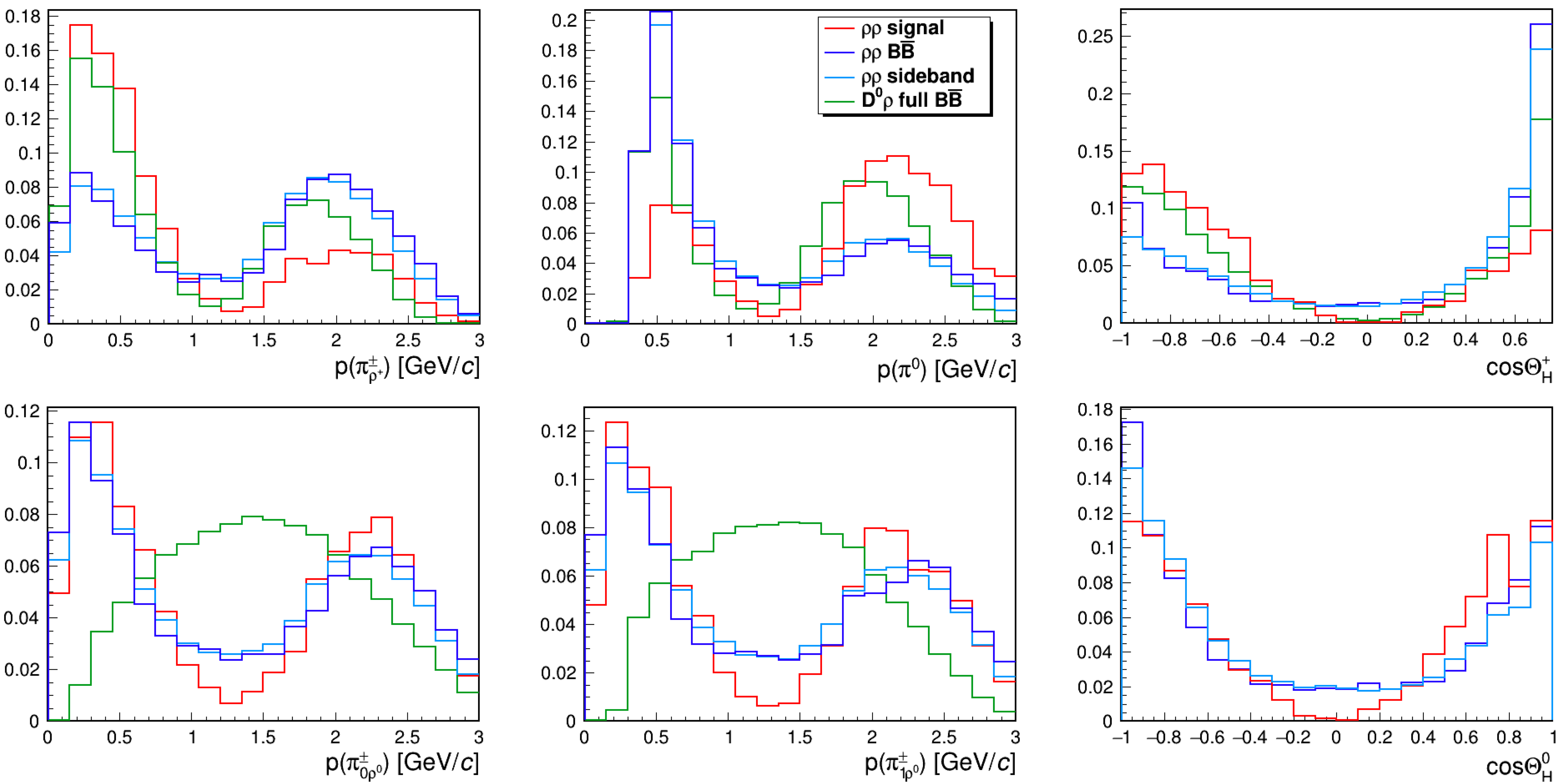
Comparison of MC distributions in signal region and sidebands.



Continuum in sideband is a good proxy for continuum in signal region.

Angles and π's momenta — BBbar

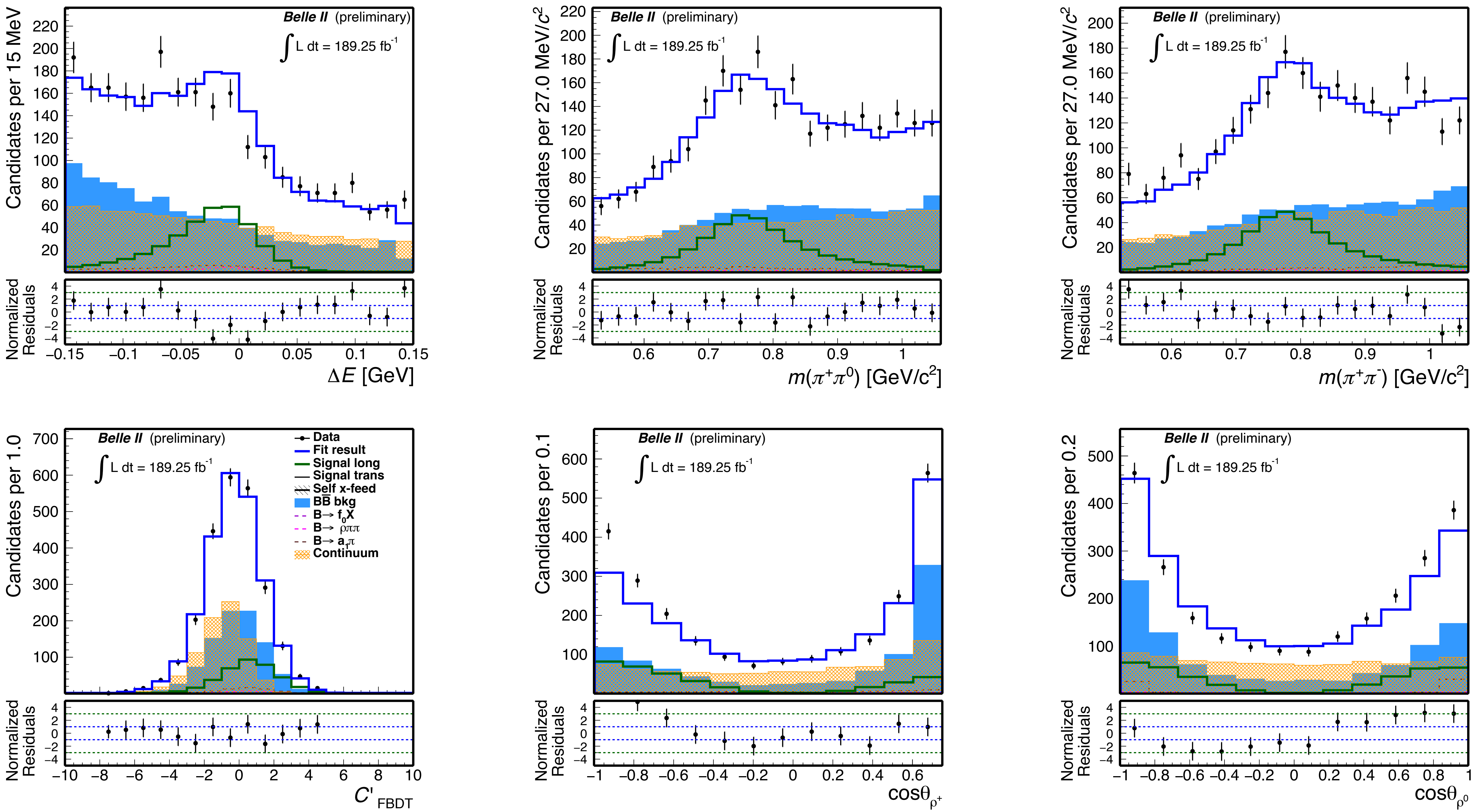
Comparison of MC distributions in ρρ and Dρ signal region, and ρρ sidebands.



BB in sideband is a good proxy for BB in signal region.
Neither BB in sideband nor *D⁰ρ* is a good proxy for signal.

Default MC Moriond 2022

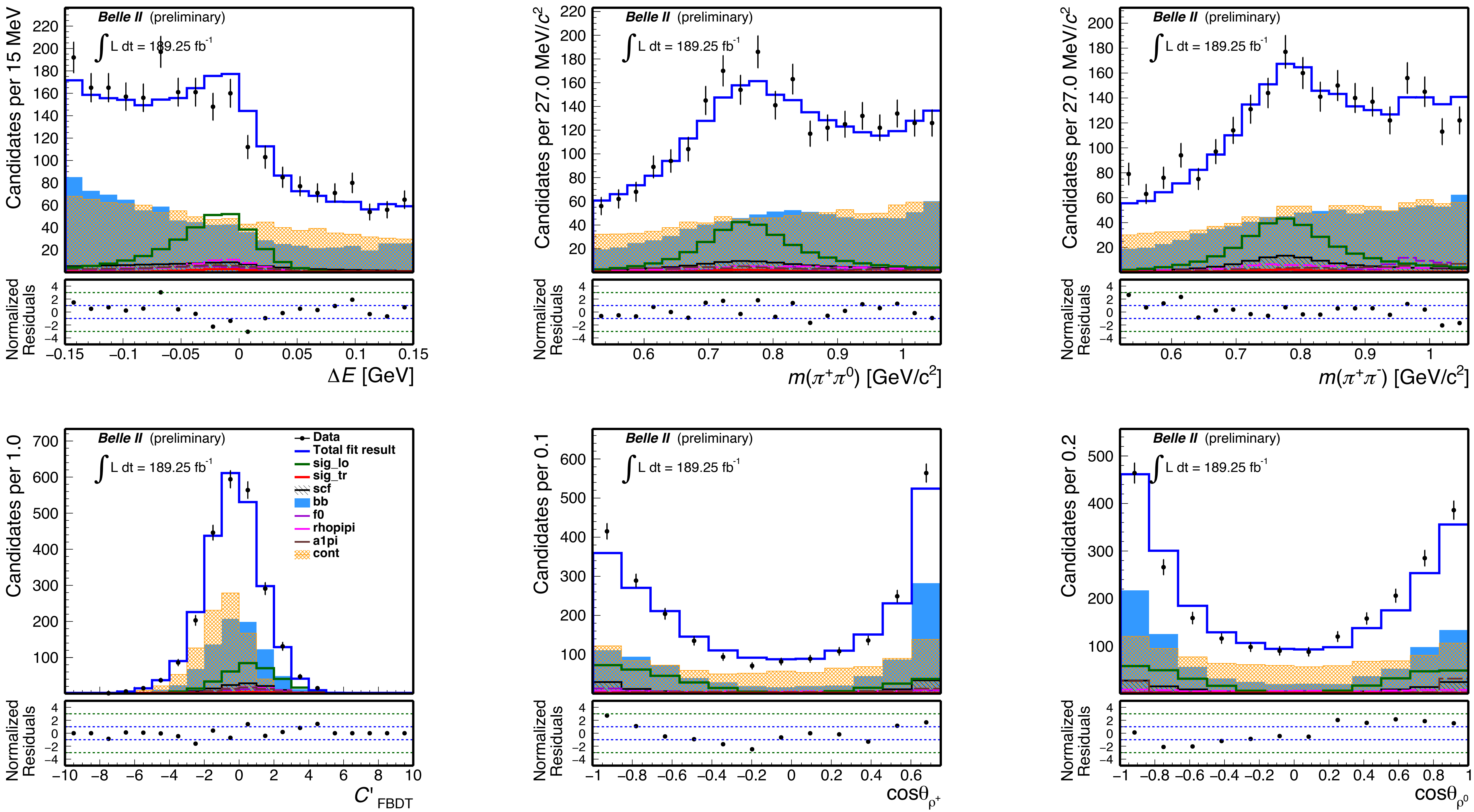
Fit of Moriond22 data using MC14 shapes. ΔE and m(ρ) shifts taken from Dρ. Nothing is reweighed.



Angles are bad

Reweight from sidebands

Fit of Moriond22 data using MC14 shapes. ΔE and m(ρ) shifts taken from Dρ.
Continuum and BBbar are reweighed separately as just shown.



Improvement especially in $\cos\theta_{\rho+}$, but some mismodelling is still there.

Status

Mismodellings are still visible in angular distributions when fitting Moriond 2022 data.

Continuum is fine.

BBbar is also fine, at most not optimal.
Fit in the sidebands validates this.

Can't use neither sidebands nor Dρ to cure signal.

Next steps

Continuum and BBbar mismodelling can be due to discrepancies in composition, decay modelling or acceptance/efficiencies.
Signal mismodelling to wrong decay model or acceptance/efficiency.

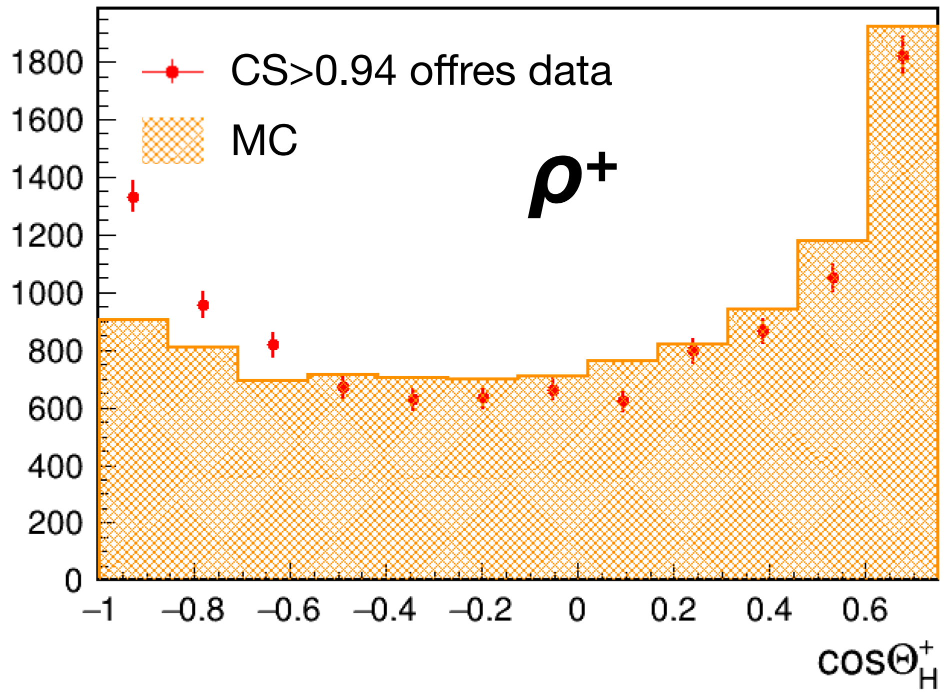
The fit to the Moriond22 data is discrepant in the angles: either from signal mismodellings, or for fit effects due to either shape.

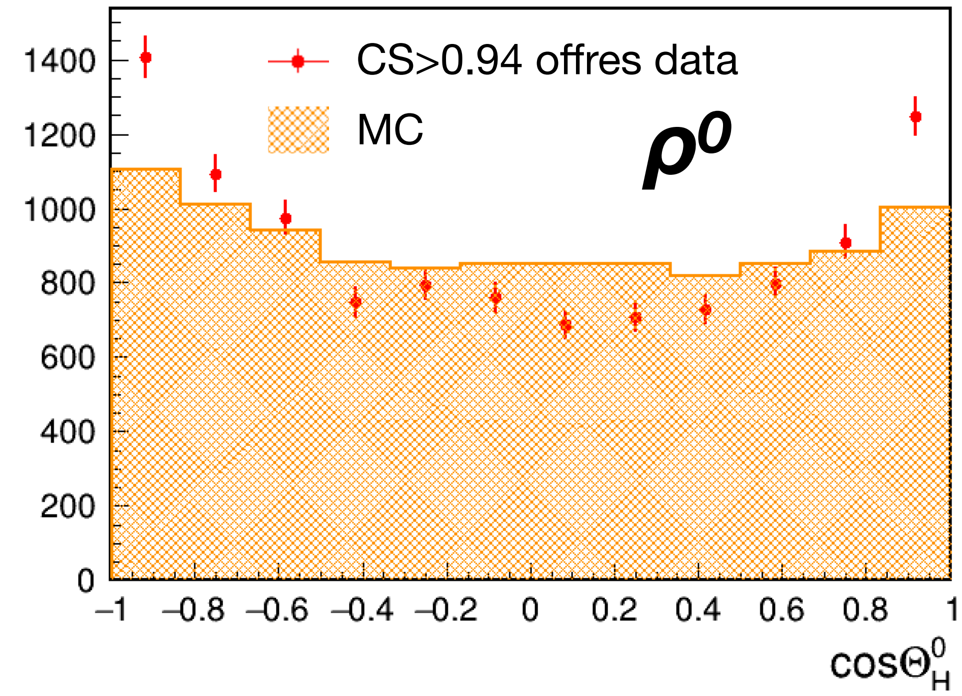
Next steps:

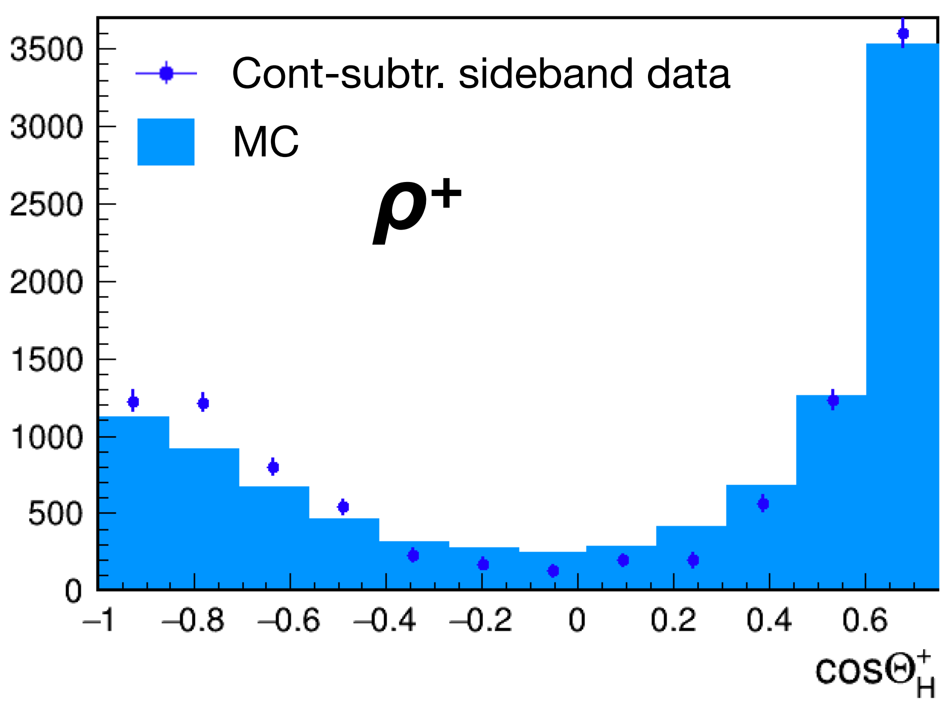
1. estimate a systematic (using Moriond22 data) associated to this configuration;
2. Explore cutting at higher π^0 energies;
3. Try to extracts correction for signal using other channels ($D^0\rho^+$, $D^0\rho^0$, $J/\psi\rho^0$, …);
4. Still thinking…

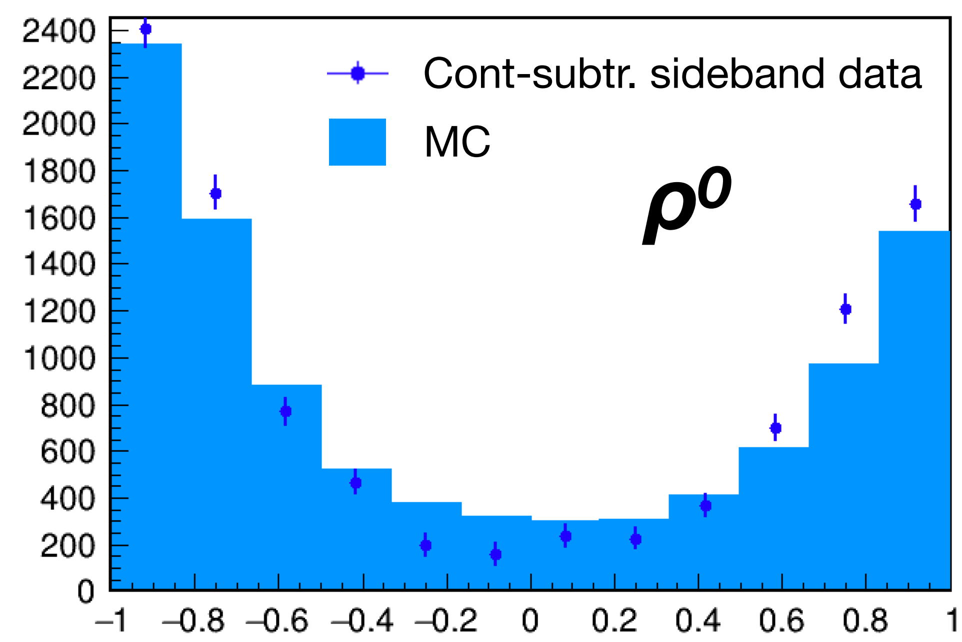
more

Discrepancies in angles

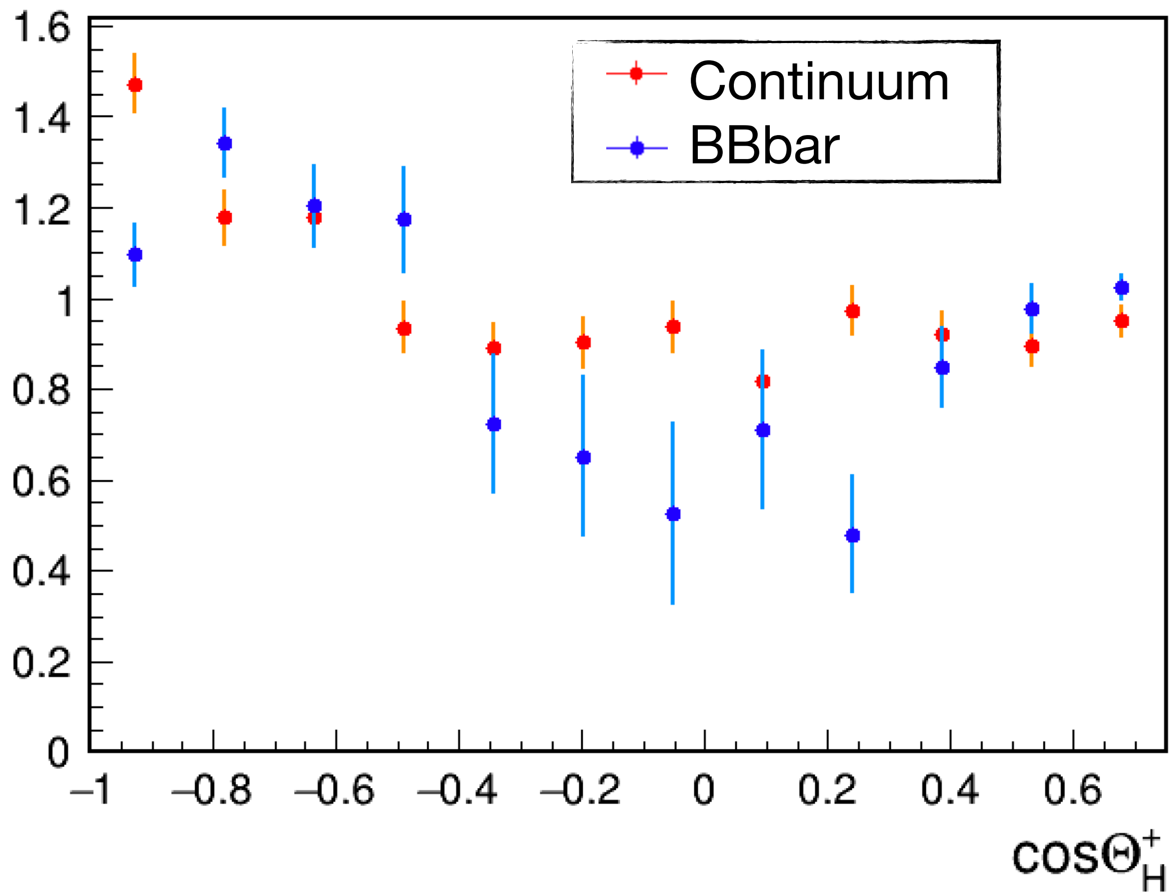


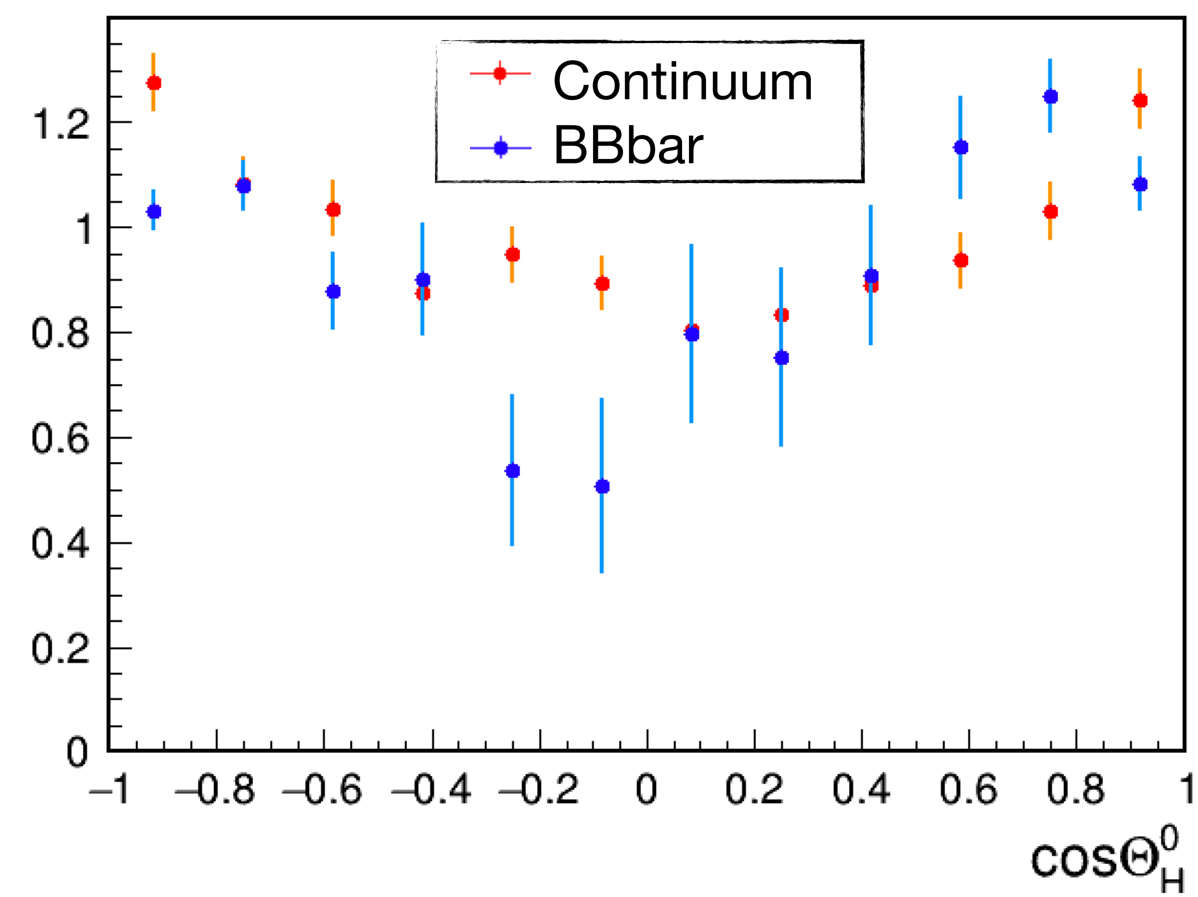






Data/MC ratios

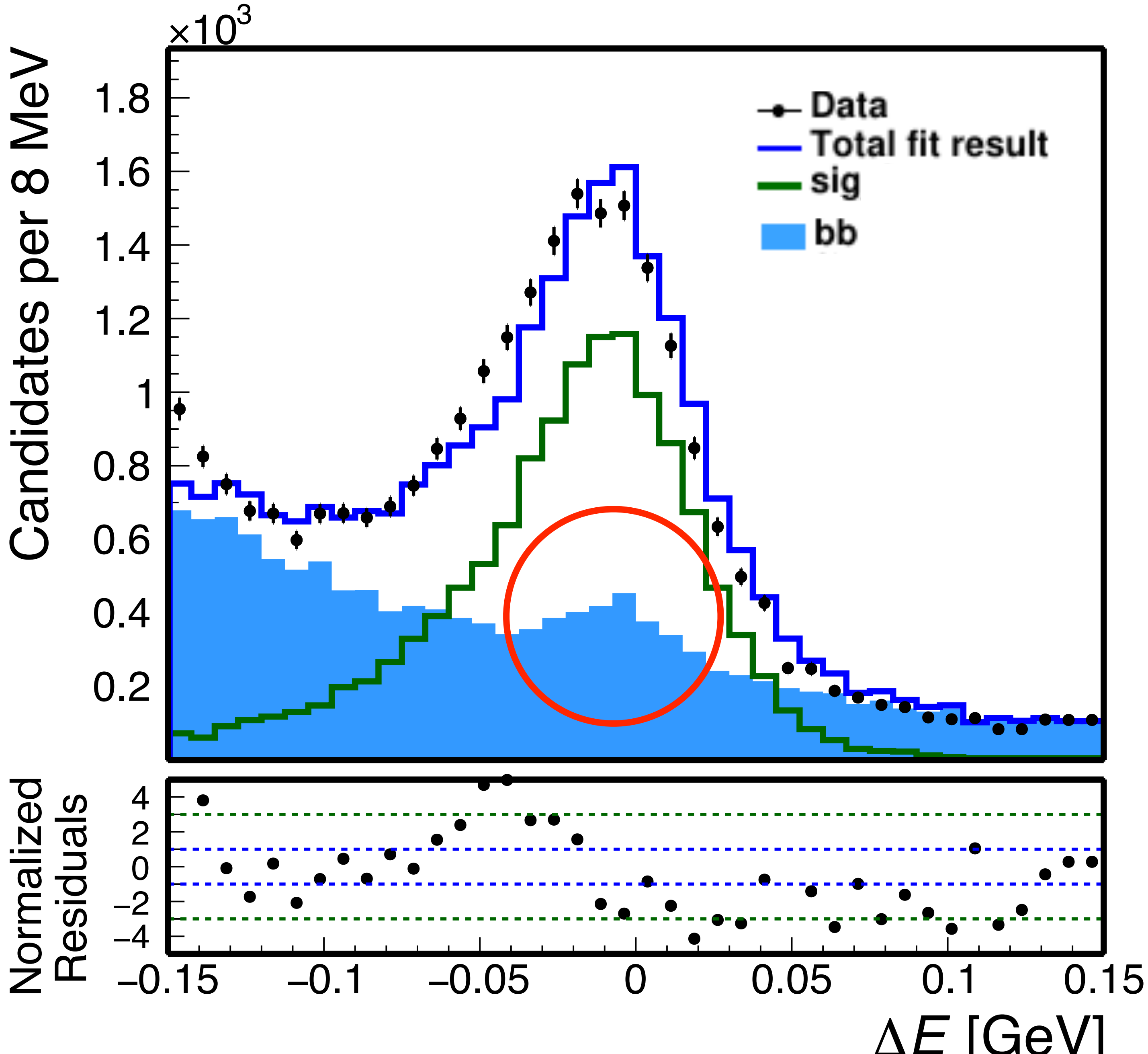




Mismodelling is different, can’t be only acceptance effects.

$B^- \to D^0(\to K^-\pi^+)\rho^-(\to \pi^-\pi^0)$

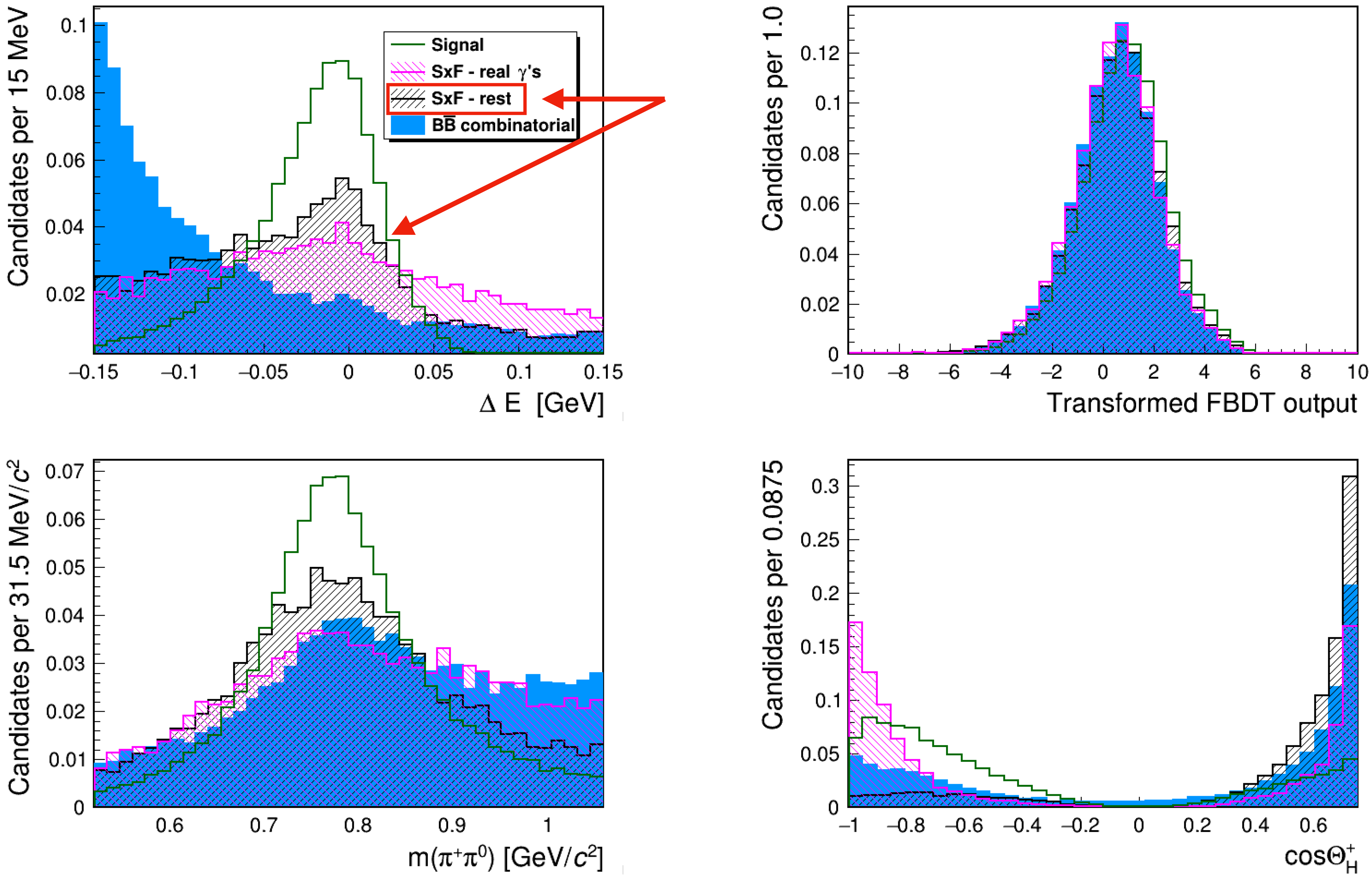
Fit of data using shapes from MC



What is that peak?

$B^- \to D^0(\to K^-\pi^+)\rho^-(\to \pi^-\pi^0)$

Compare different shapes in MC (normalized to same area)



Patched for Moriond 2022

Fit of Moriond22 data using MC14 shapes. ΔE and m(ρ) shifts taken from Dρ.
Everything is reweighed with inclusive weights from angles in sidebands.