

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

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Trieste Physics Meeting
November 25, 2022

Recap from last showing

Reweighting from continuum and $B\bar{B}$ fixes the angles in the sideband data fit.

Projections of Moriond 2022 fit using these weights are not good (see [report at btohadron](#)).

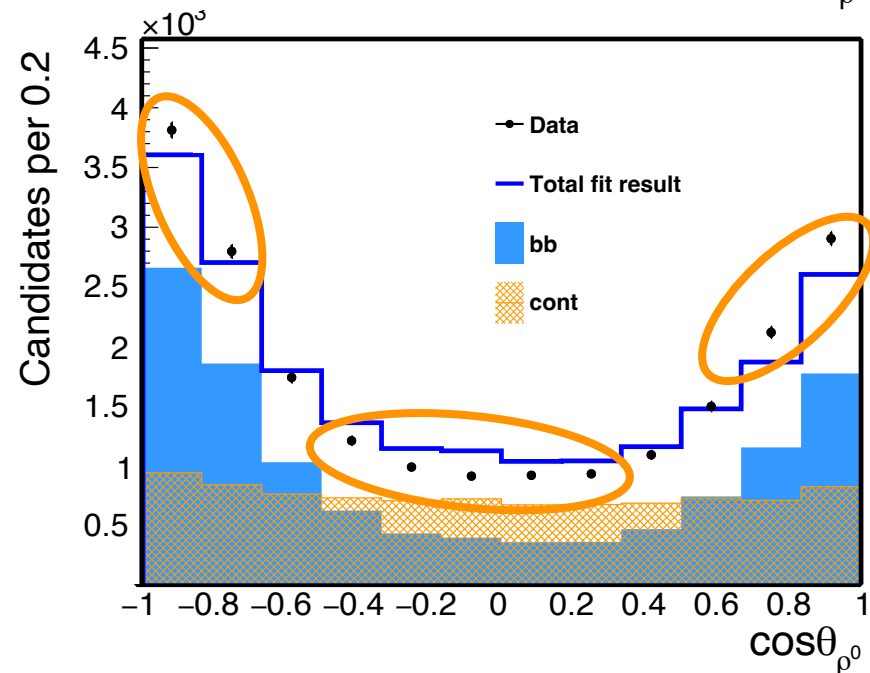
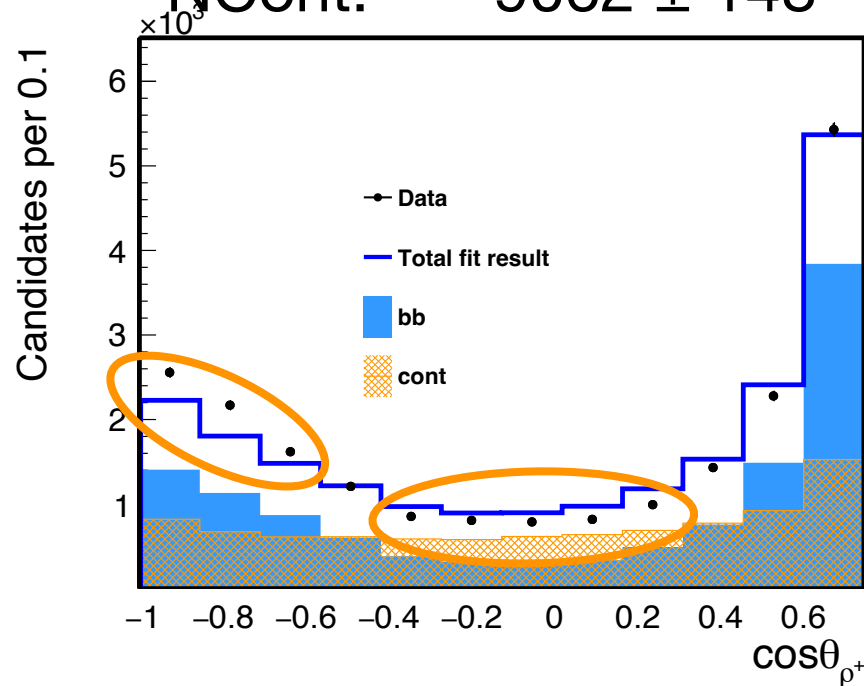
Back to sideband fit, check if this is an effect of bad fit modeling.

Situation: angles

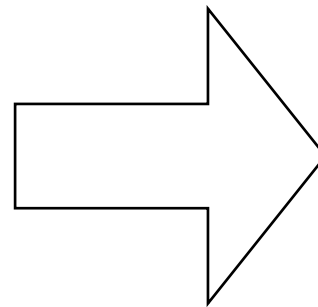
-2LogL: **-385480**

NBBbar: 11905 ± 157

NCont: 9062 ± 148



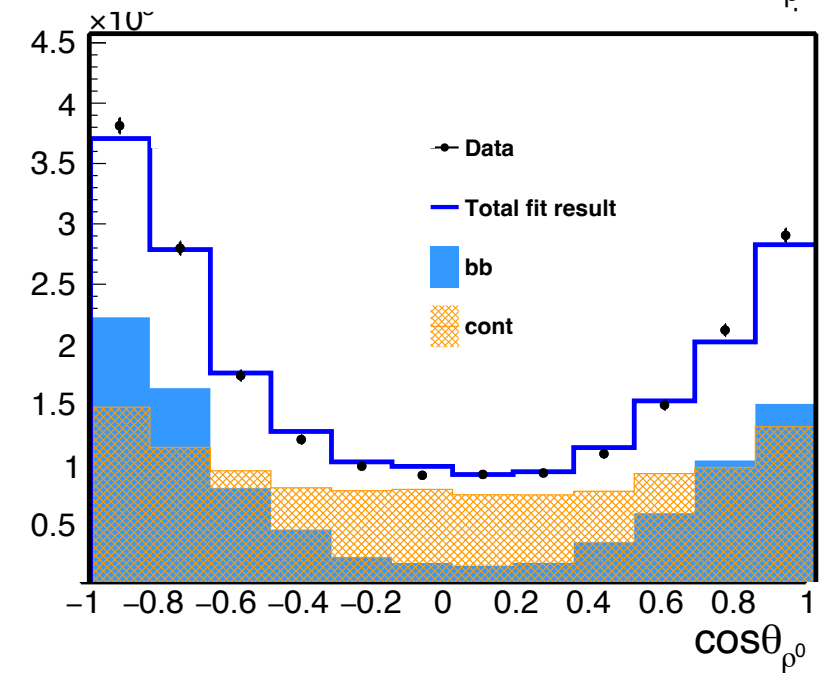
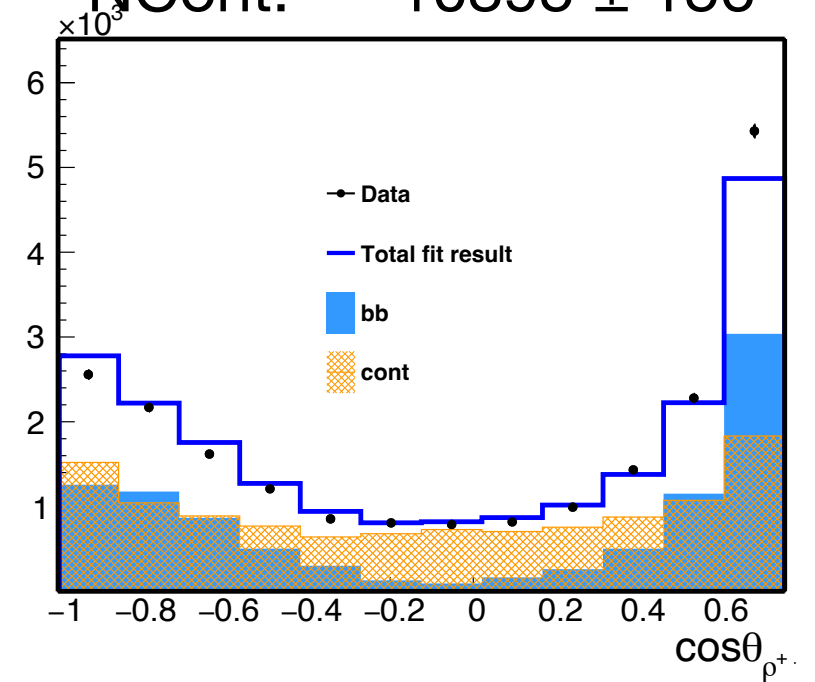
2Dx2D weights
from π momenta.
Different for
continuum and BB.



-2LogL: **-385717**

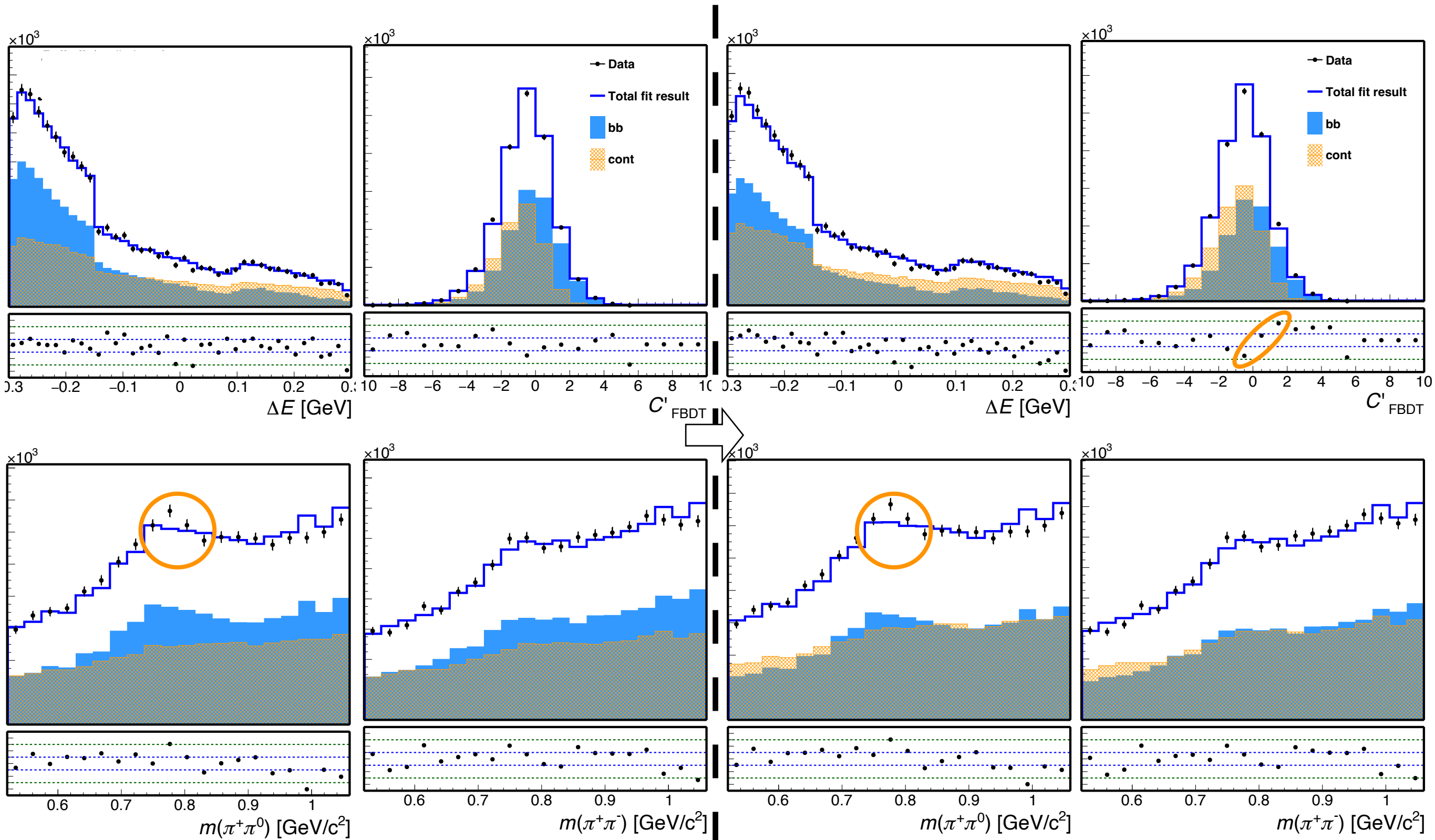
NBBbar: 10562 ± 156

NCont: 10395 ± 156



Angular mismodelling is fixed in the sidebands.

Situation: other observables



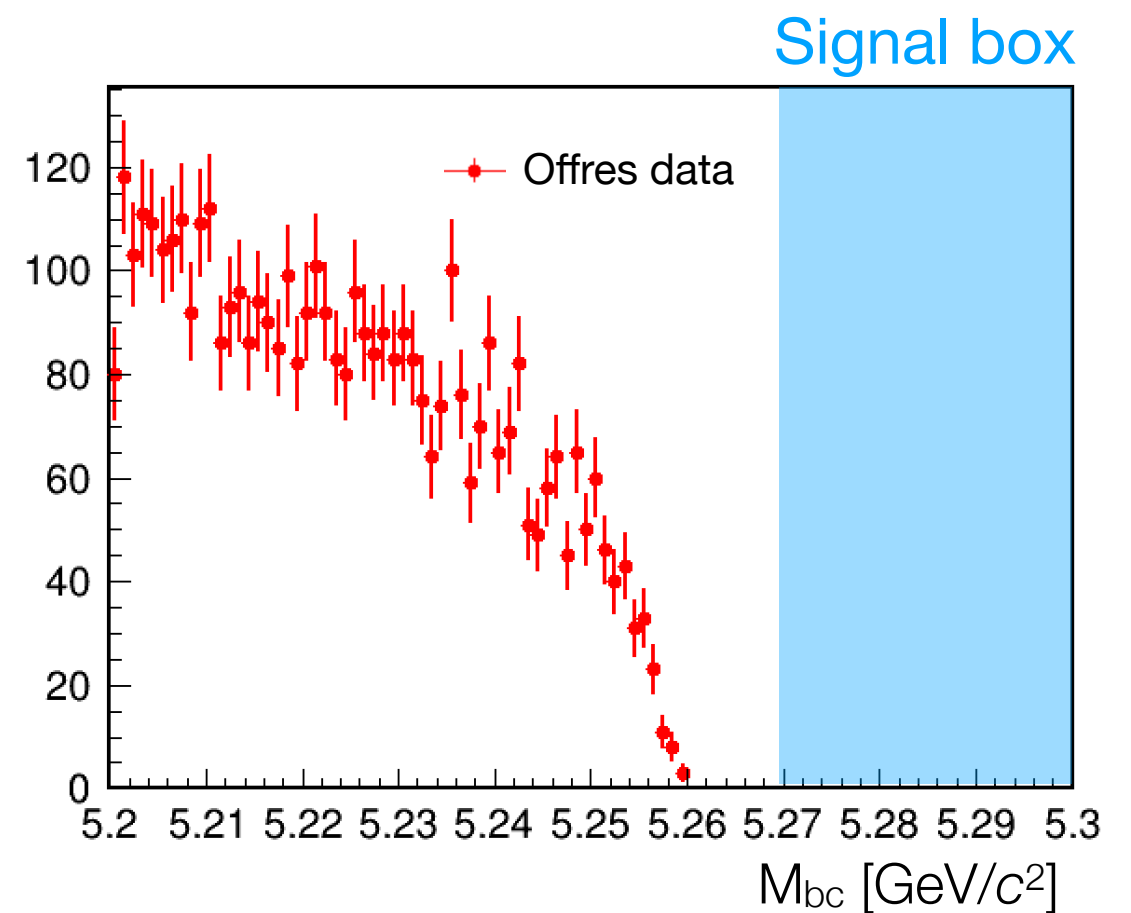
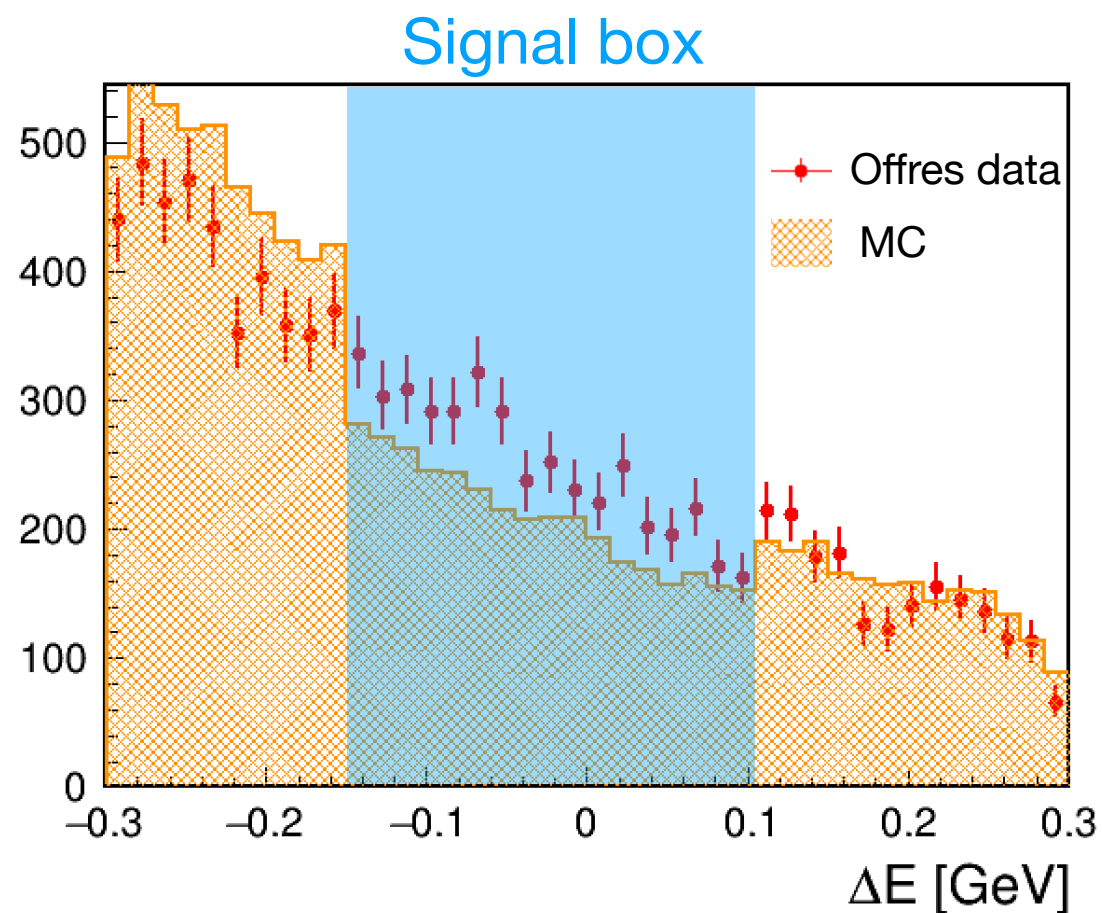
There is mismodeling in other variables.

Improve sidebands fit

Don't fit ΔE

We use off-resonance data, either to reweigh or model.

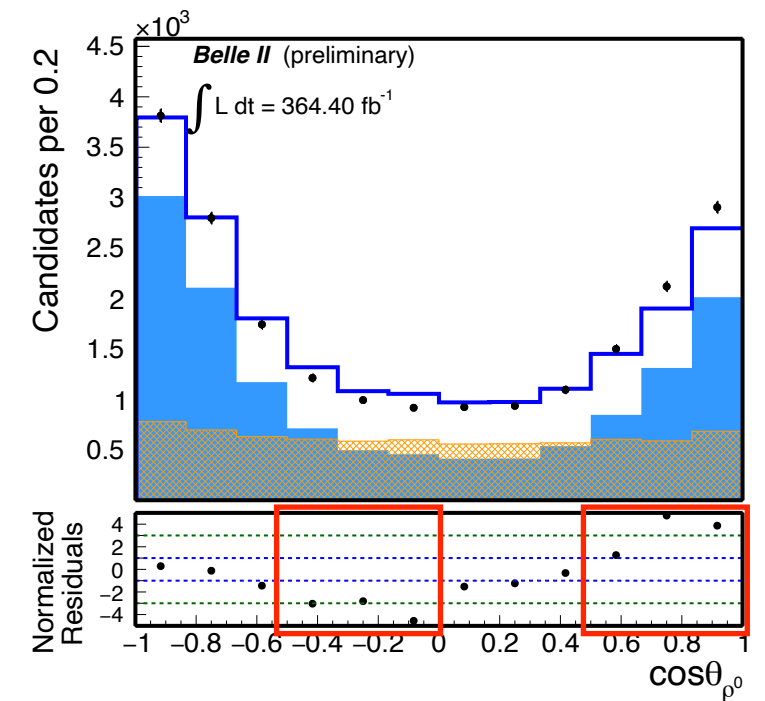
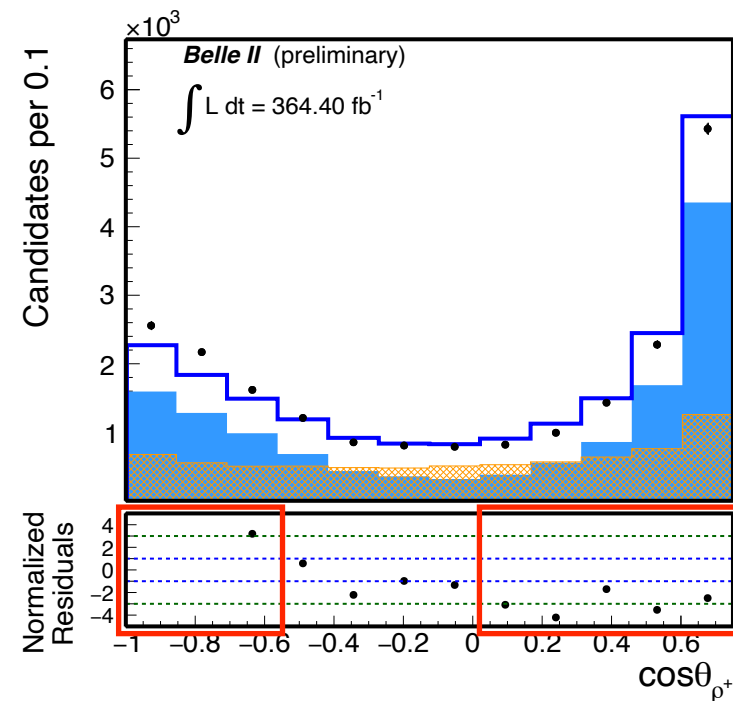
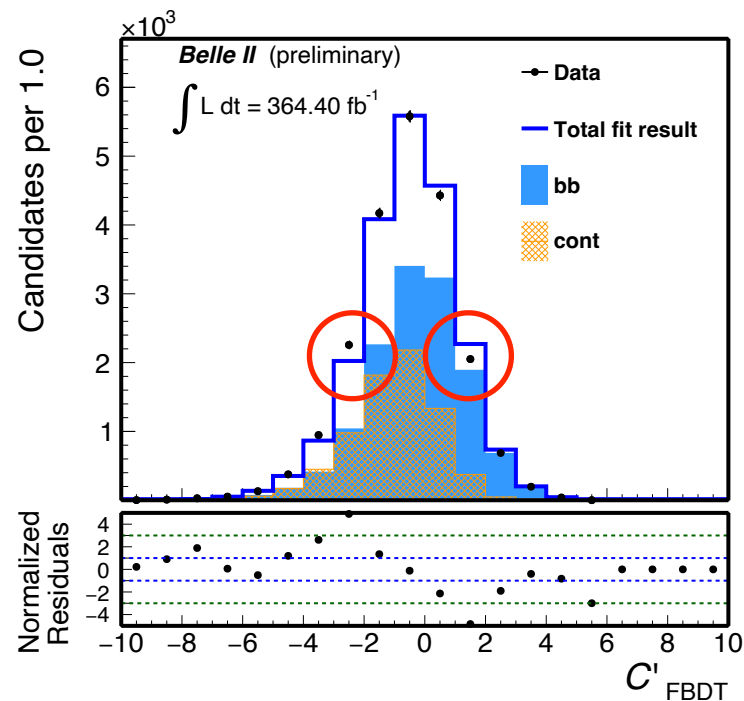
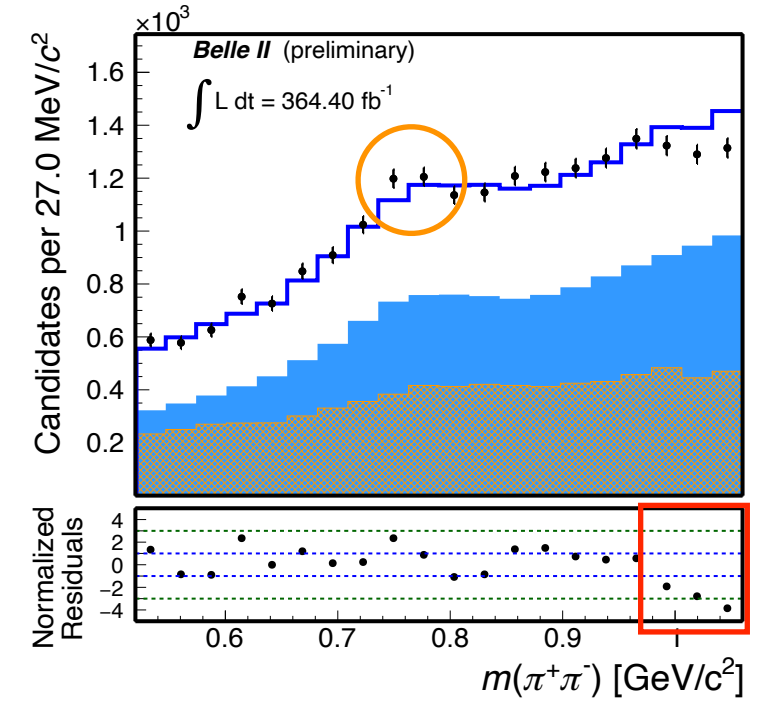
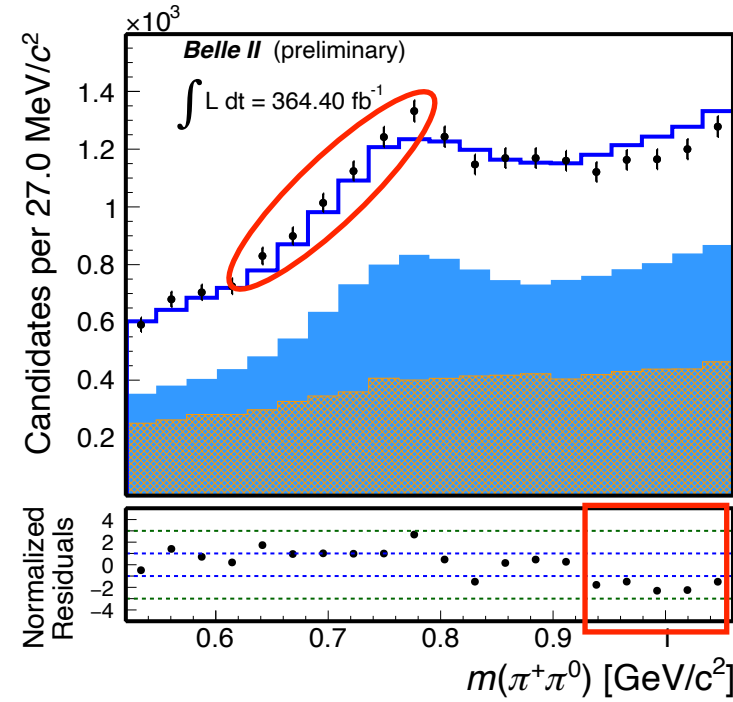
These data have a different ΔE - M_{bc} range and shape $\rightarrow$ fit sidebands without ΔE



Fit sideband using MC

-2LogL: **-353265**
 NBBbar: 13493 ± 184
 NCont: 7464 ± 167

Comp	Model on	Shapes
BBbar	Sideband MC	CS: 3 Gauss
		$m(\rho^+)$: Gauss + pol
		$m(\rho^0)$: Gauss + pol
		$h2D(\cos\theta, \cos\theta)$
Cont	Sideband MC	CS: 3 Gauss
		$h2D(m, \cos\theta)$
		$h2D(m, \cos\theta)$

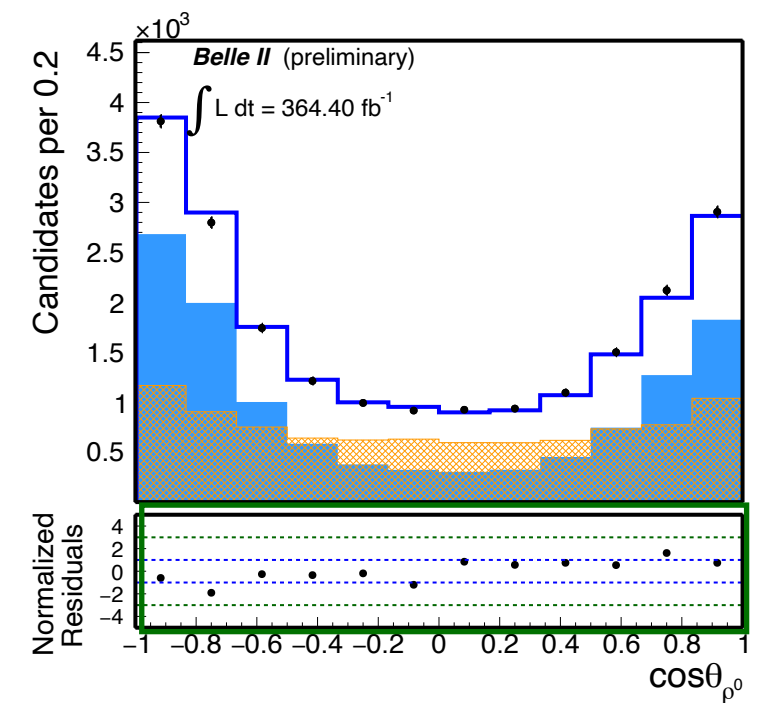
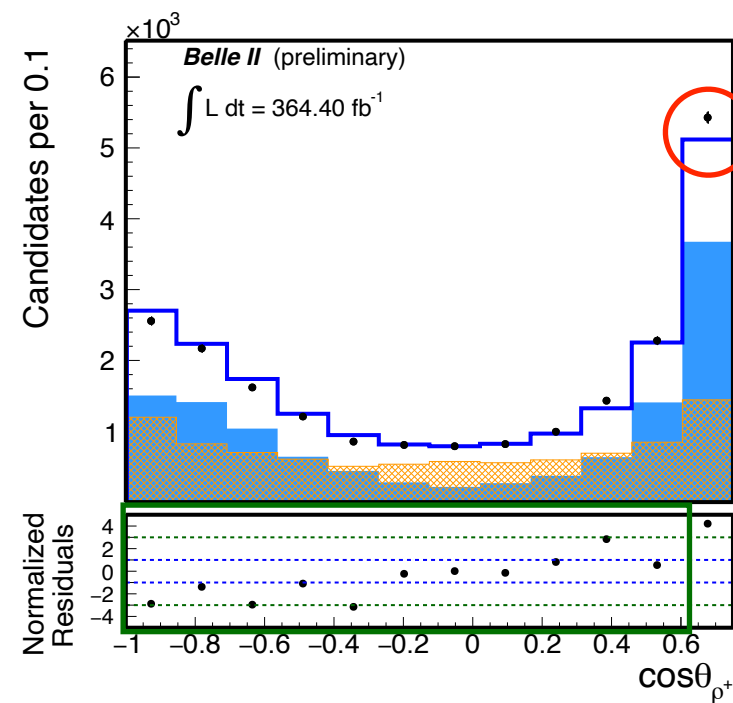
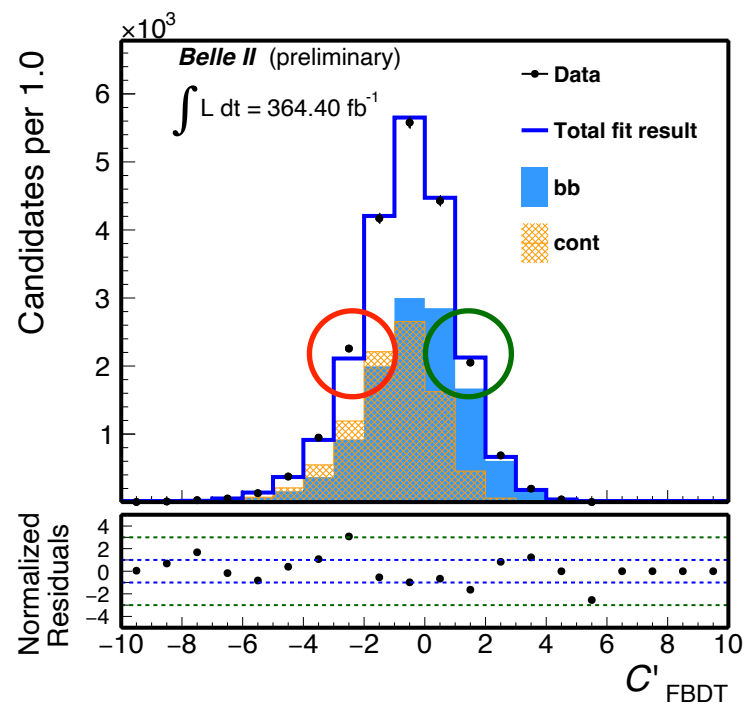
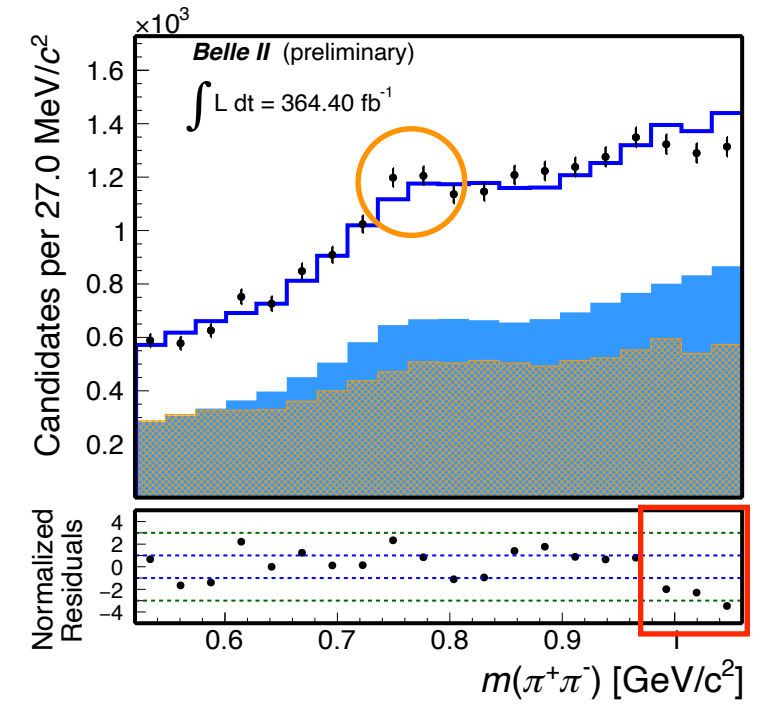
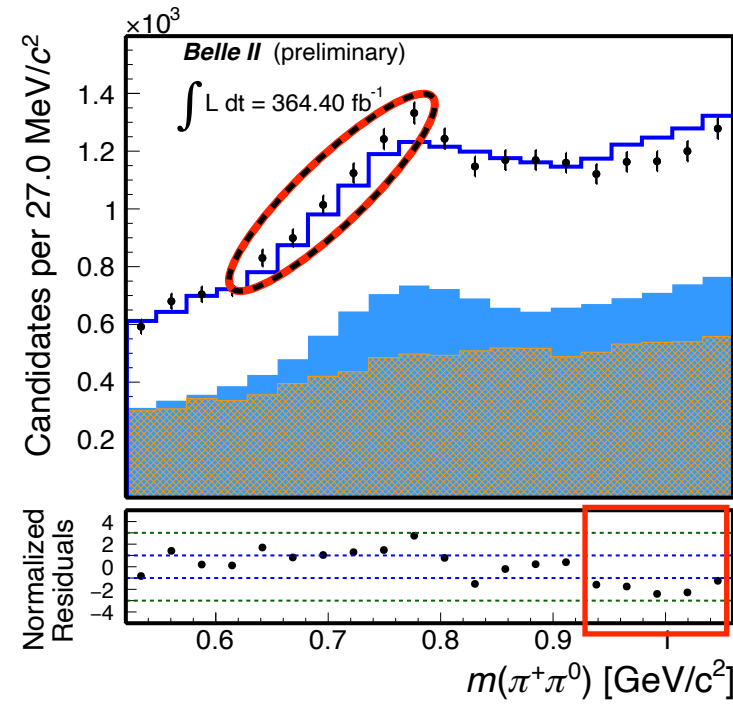


Large difference with 6D fit results.

Correct MC

-2LogL: **-353445**
 NBBbar: 11885 ± 183
 NCont: 9072 ± 175

Comp	Model on	Shapes
BBbar	Sideband MC	CS: 3 Gauss
	Reweigh from data (subtr. cont)	$m(\rho^+)$: Gauss + pol
		$m(\rho^0)$: Gauss + pol
Cont	Sideband MC	h2D(cos θ ,cos θ)
	Reweigh from offres (CS>0.94)	h2D(m,cos θ)
		h2D(m,cos θ)

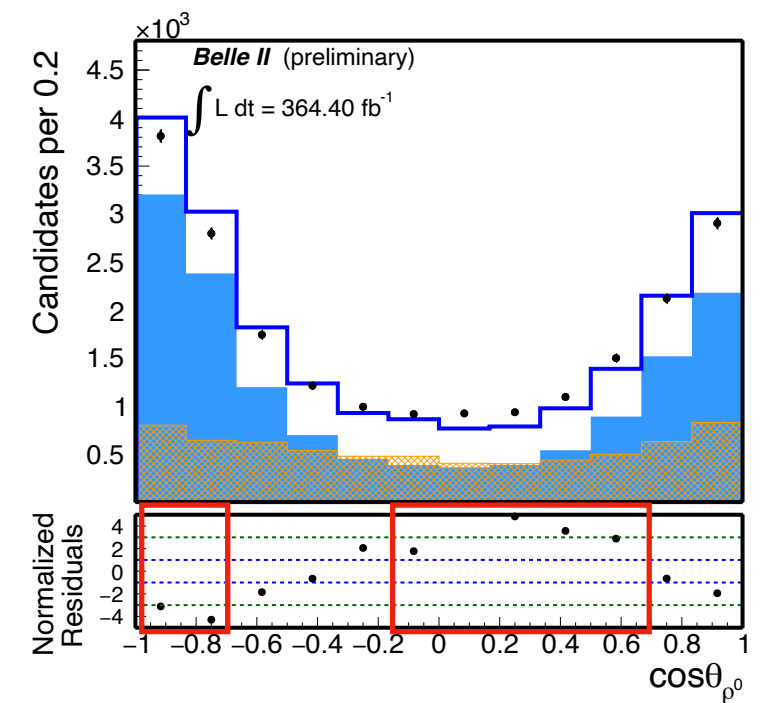
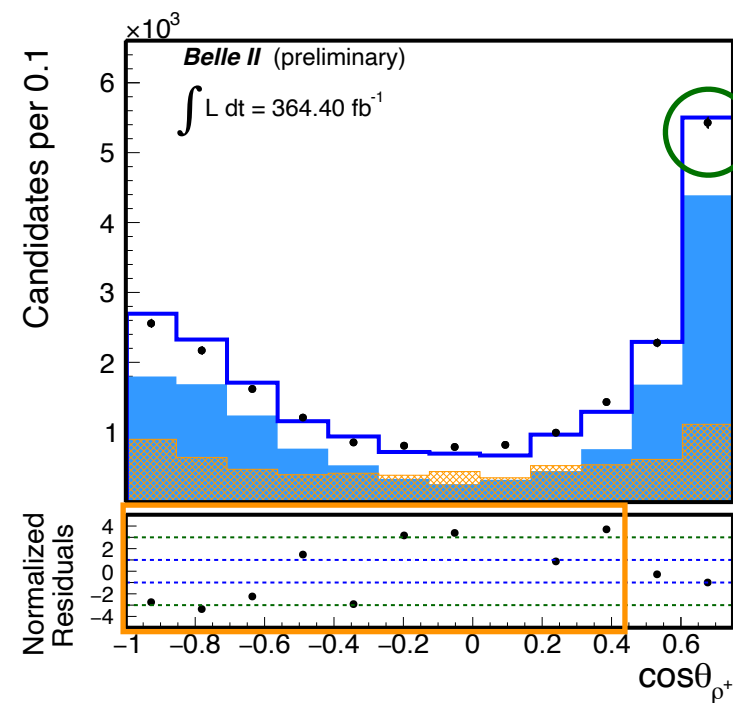
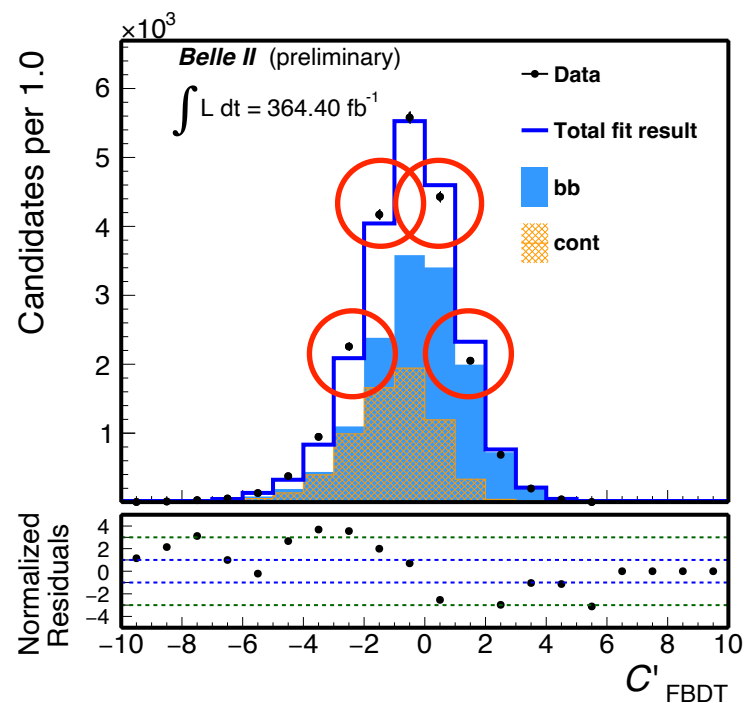
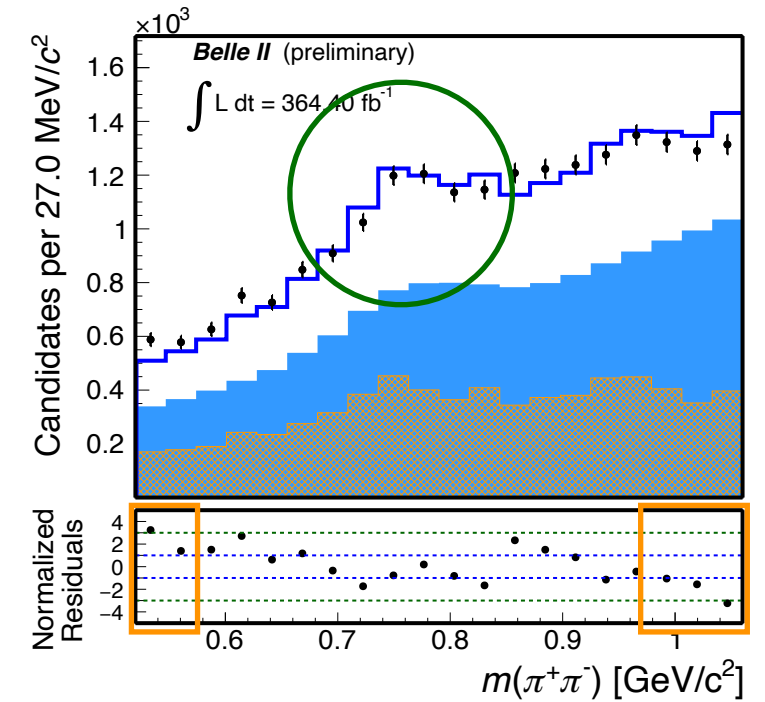
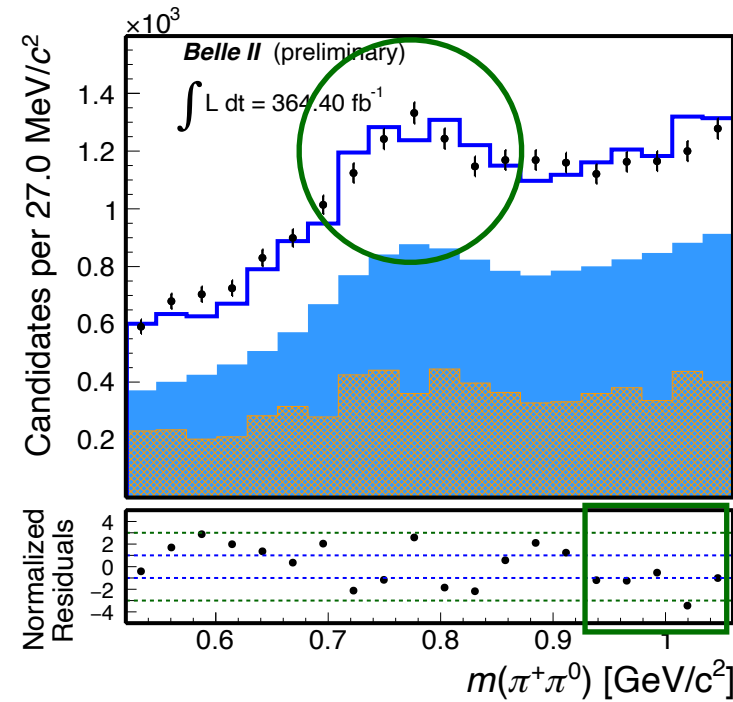


Worse agreement in invariant mass.

Use offres data

-2LogL: **-352443**
 NBBbar: 14814 ± 177
 NCont: 6761 ± 154

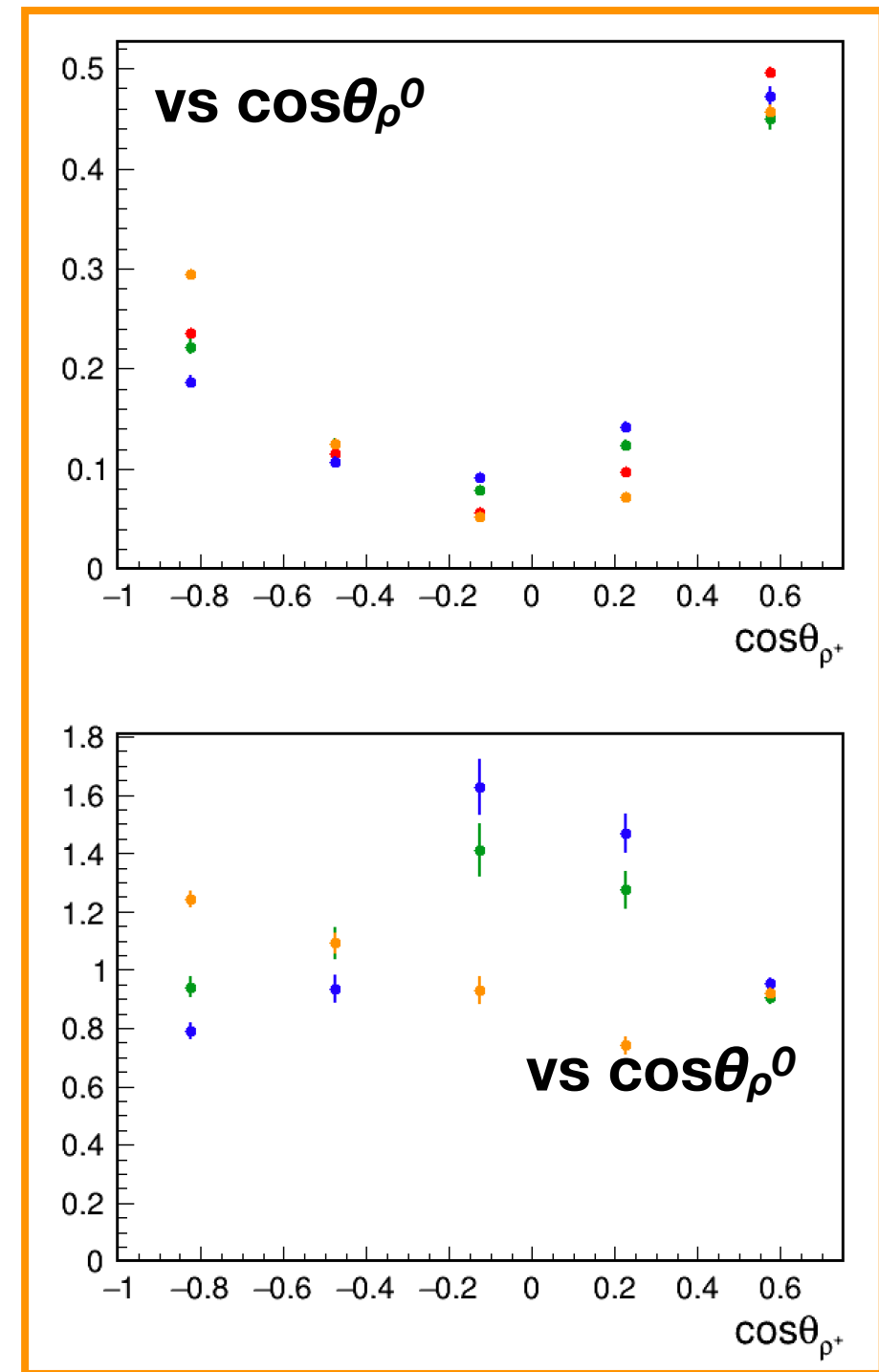
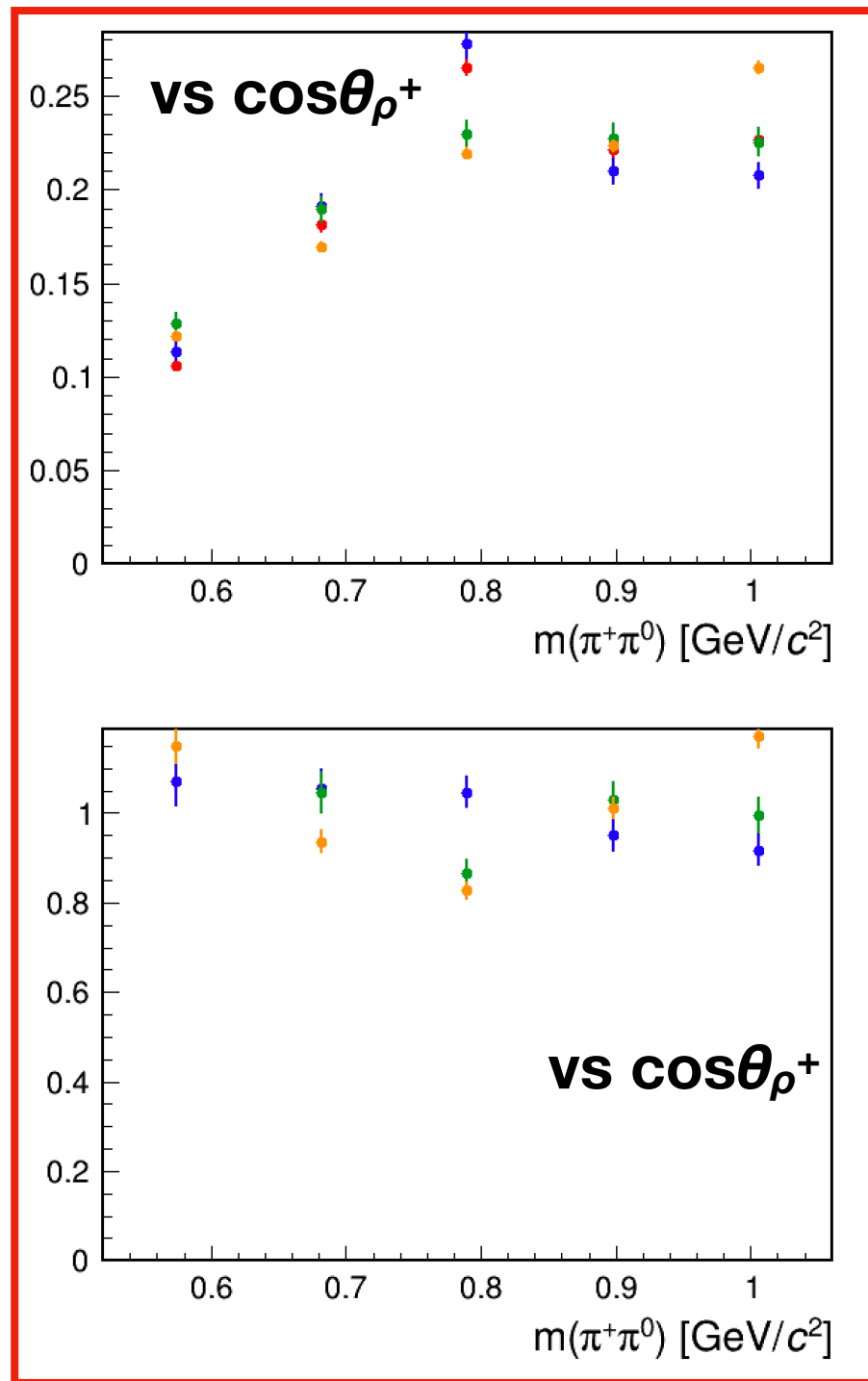
Comp	Model on	Shapes
BBbar	Sideband MC Reweigh from data (subtr. cont)	CS: 3 Gauss
		$m(\rho^+)$: Gauss + pol
		$m(\rho^0)$: Gauss + pol
Cont	offres (CS>0.97)	h2D(cos θ ,cos θ)
		CS: 3 Gauss
		h2D(m,cos θ)



Bad angular agreement.

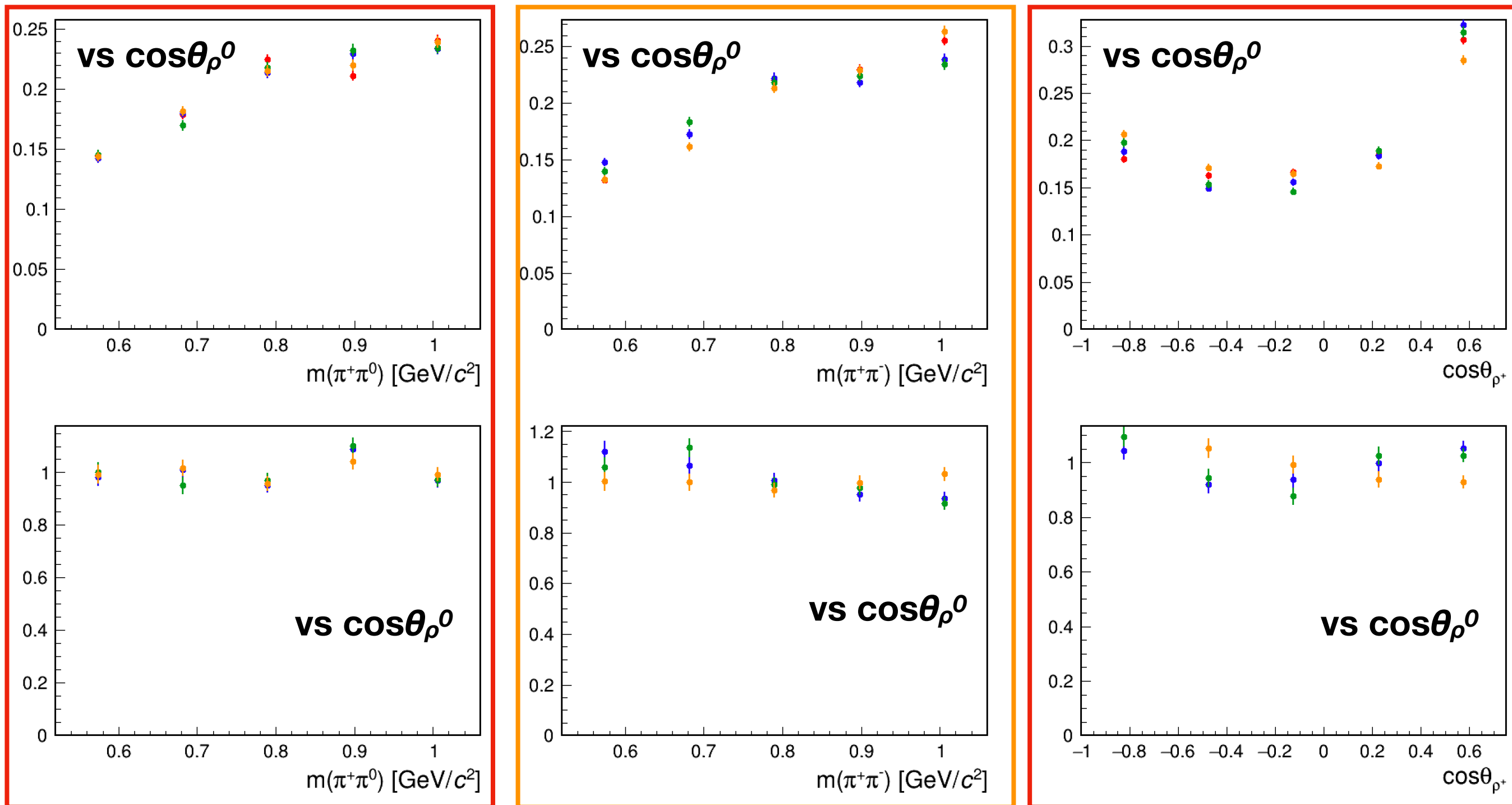
Inspect correlations

BBbar sideband MC



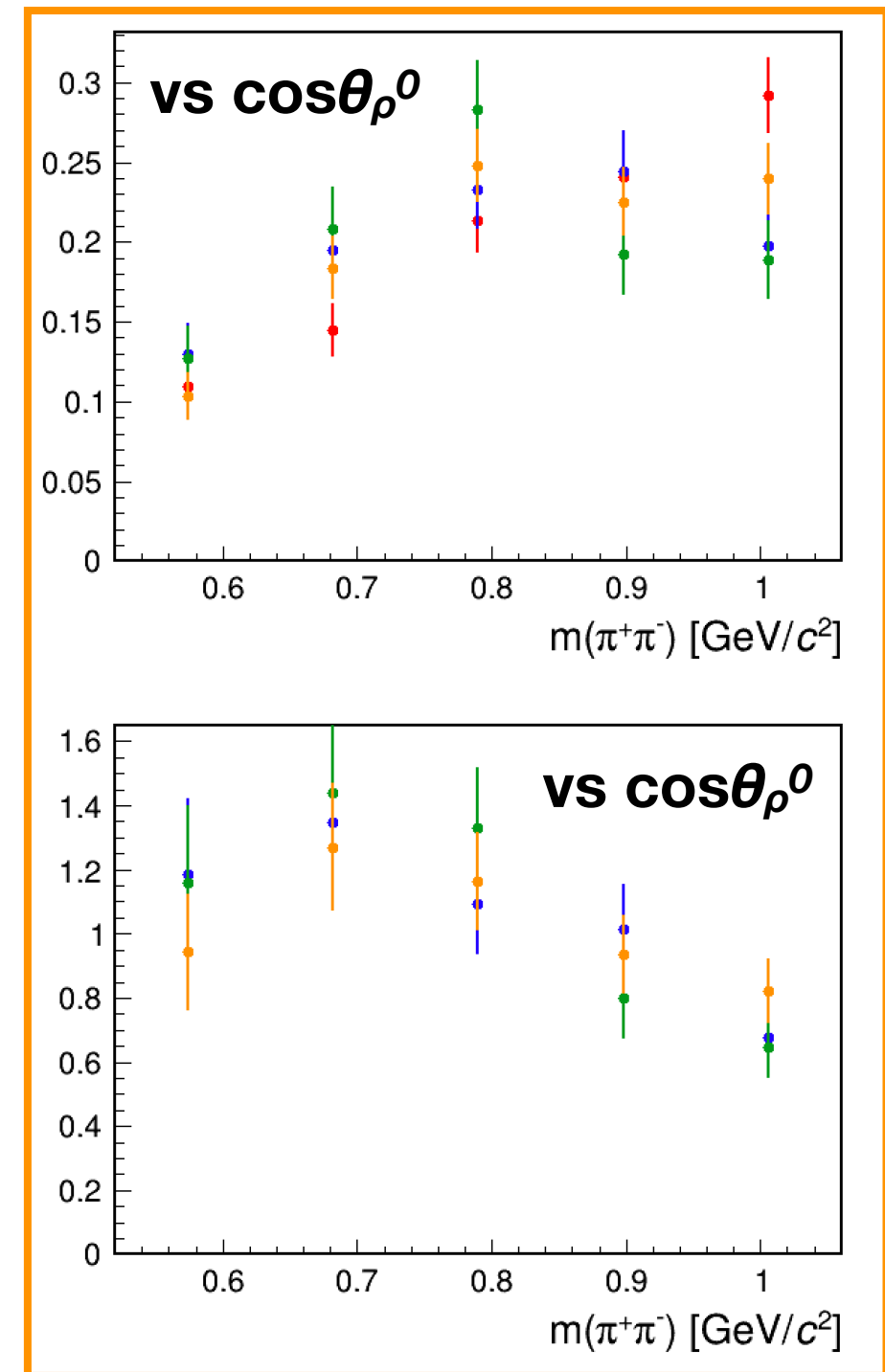
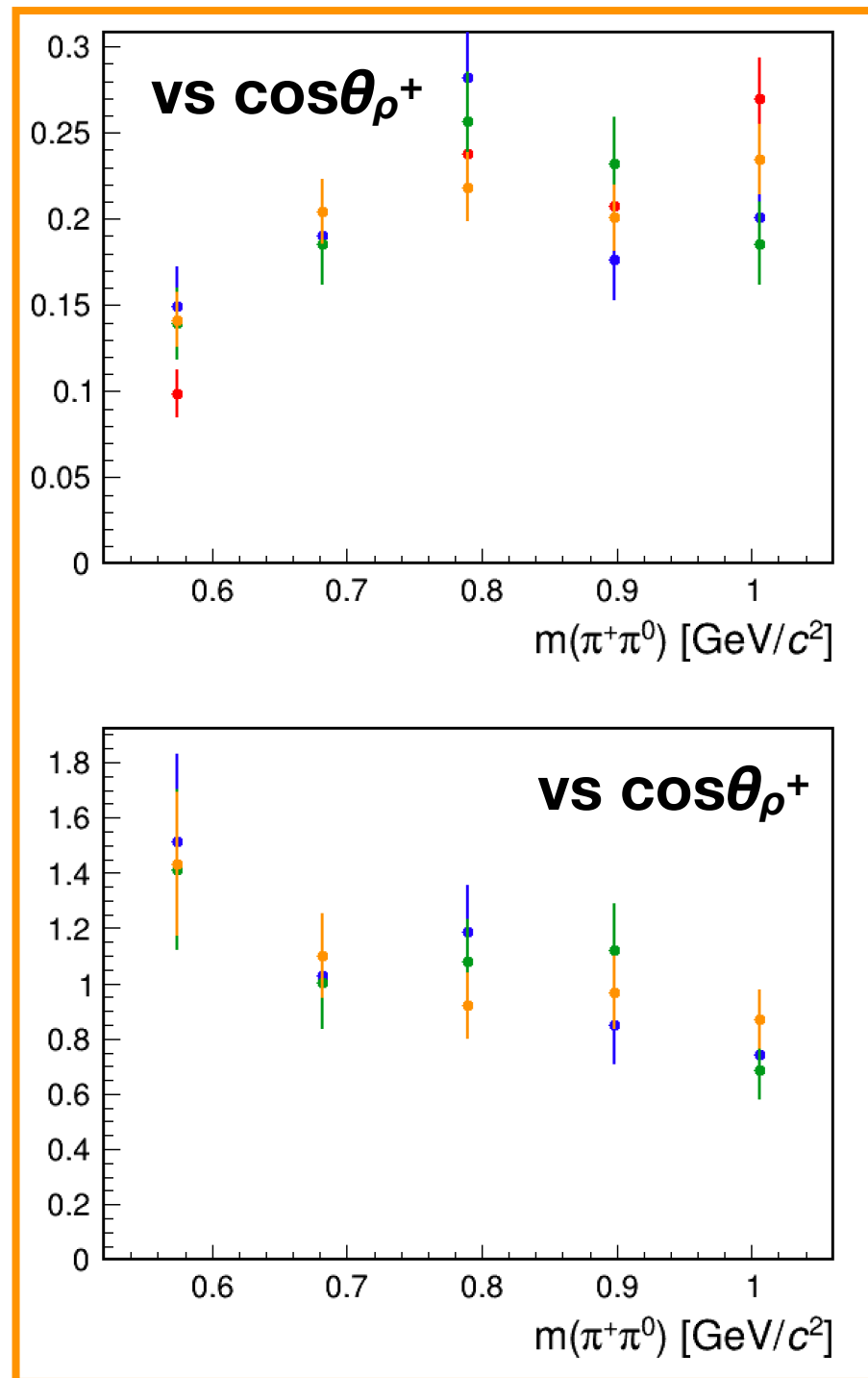
Correlations between angles was accounted for, the one of mass and angle not.

Continuum sideband MC



Strange (and unaccounted) correlations between $\cos\theta_{\rho^0}$ and ρ^+ variables.

Offres data



Masses vs cosHel, taken into account in fit.

Status

Sideband fit is very sensitive to both excluding ΔE and mismodelling in the invariant mass shapes.

Found some unaccounted correlations, especially for $B\bar{B}$.

Will model accordingly and check fit projections.

Side quest: π^0 selection

At the last btohadron meeting Mirco asked if I can uniformiate the π^0 selection in the $\rho^\pm$ with Okubo-san analysis to reduce the work asked to Koga-san for the $\varepsilon(\pi^0)$ systematic.

Uniformizing means to:

- harden the π^0 energy cut $\rightarrow$ no effect on mismodellings, already checked some times ago
- **reproduce the ntuples** with their photonMVA $\rightarrow$ should kill part of the background peaking at the low- $E(\pi^0)$ end of the helicity angle.

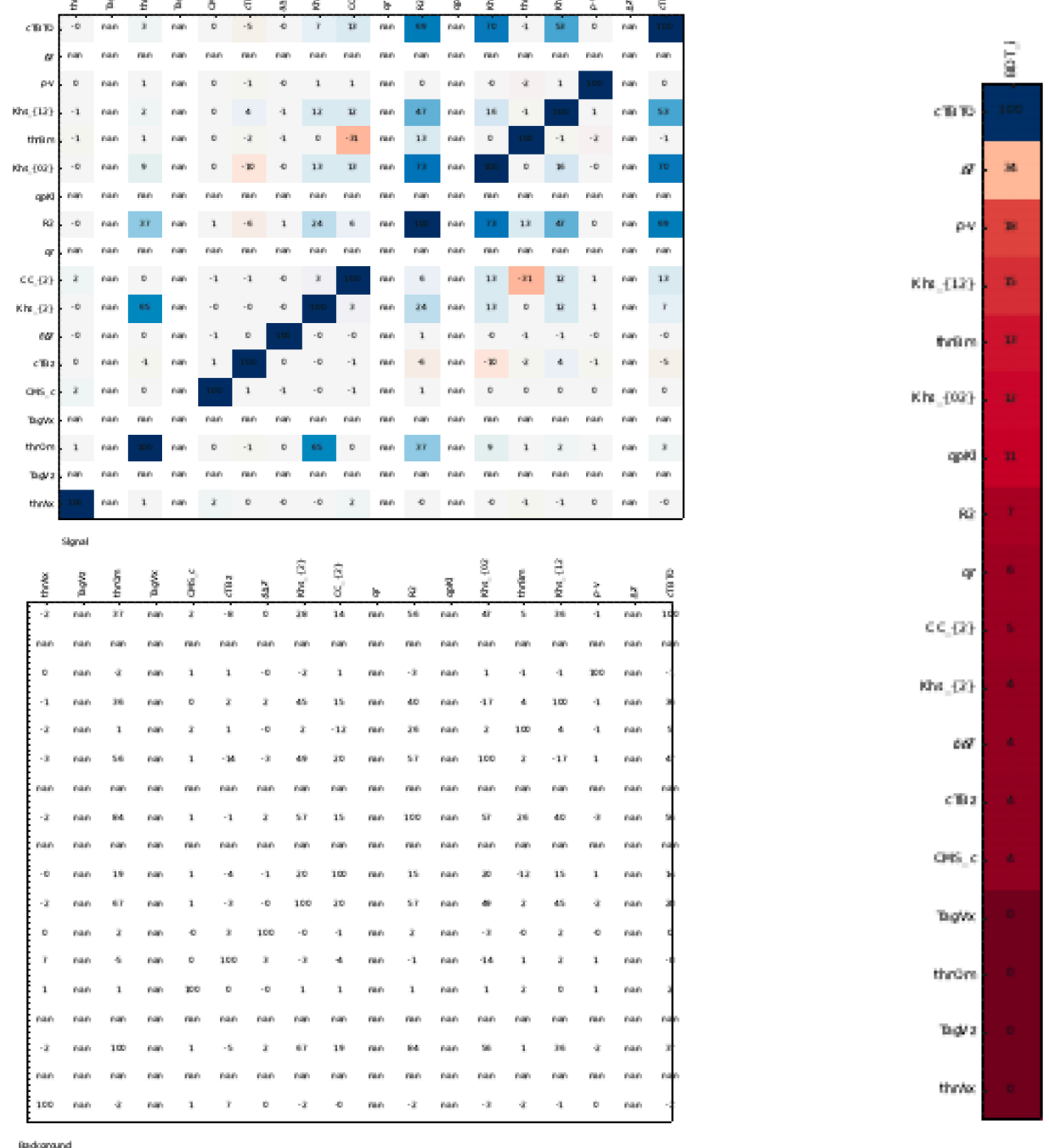
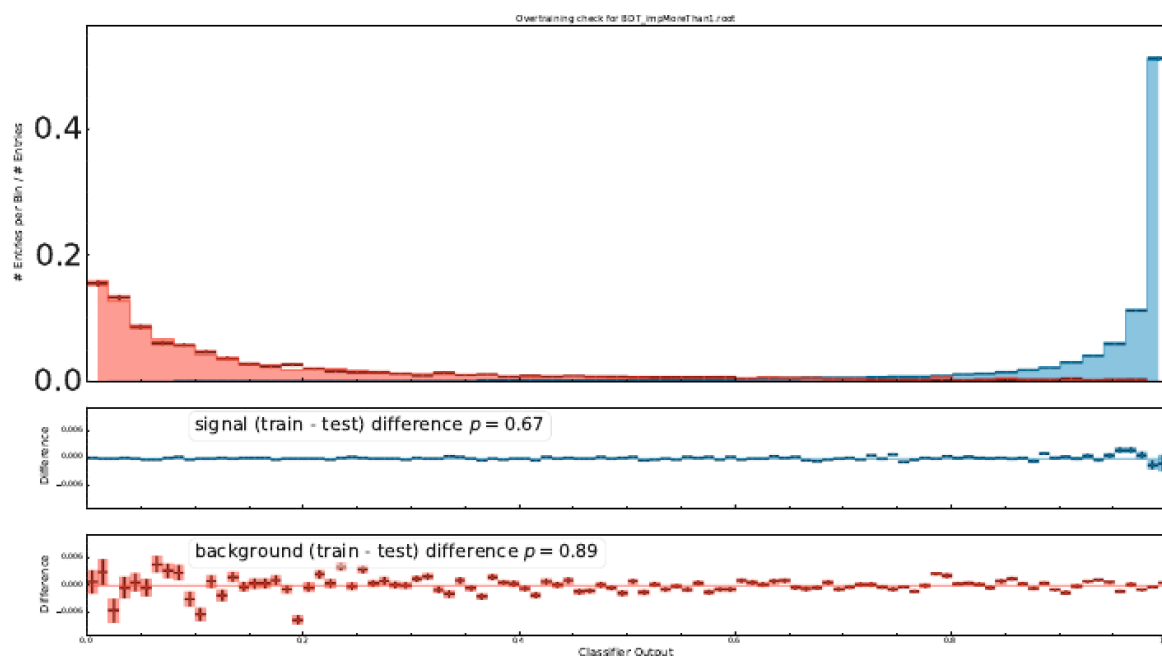
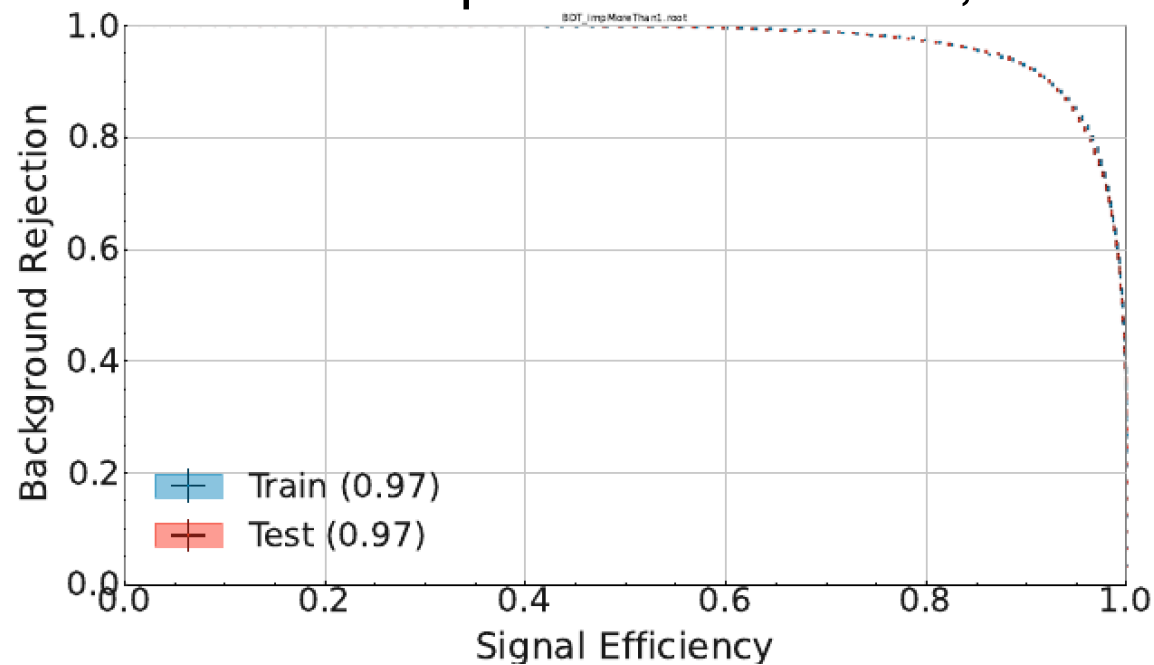
Since I will anyway need to reproduce everything with the new track momentum scalings and $E(\gamma)$ corrections (if/when ready), my plan is to finalize the CS training by the end of the week, then rerun both data and MC as soon as $E(\gamma)$ corrections are ready.

The re-doing of these mismodelling plots and fits with the new π^0 selection shouldn't take long, once I have the ntuples. I don't expect much changes but must be checked.

Optimization of CS and PID cuts takes no longer than ~hours.

Grasp at CS training

Started from same set of variables of older CS, pruned the ineffective ones without loss in performance (based on ROC). Plots are ugly — done with old script from Fernando, I already asked Okubo-san if I can see theirs.

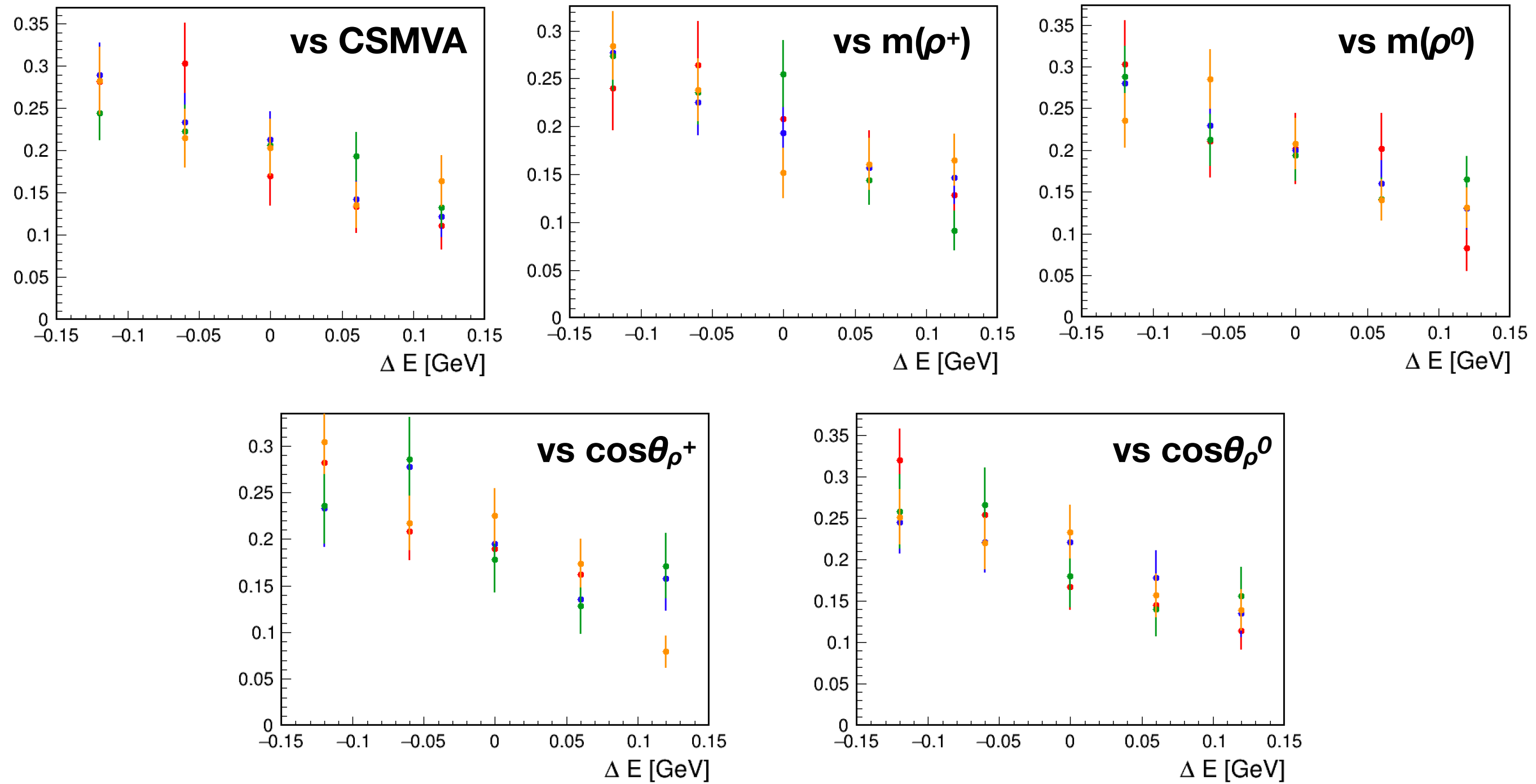


Why so many “nan” in correlation matrix?
Also, for now done with MC15ri.

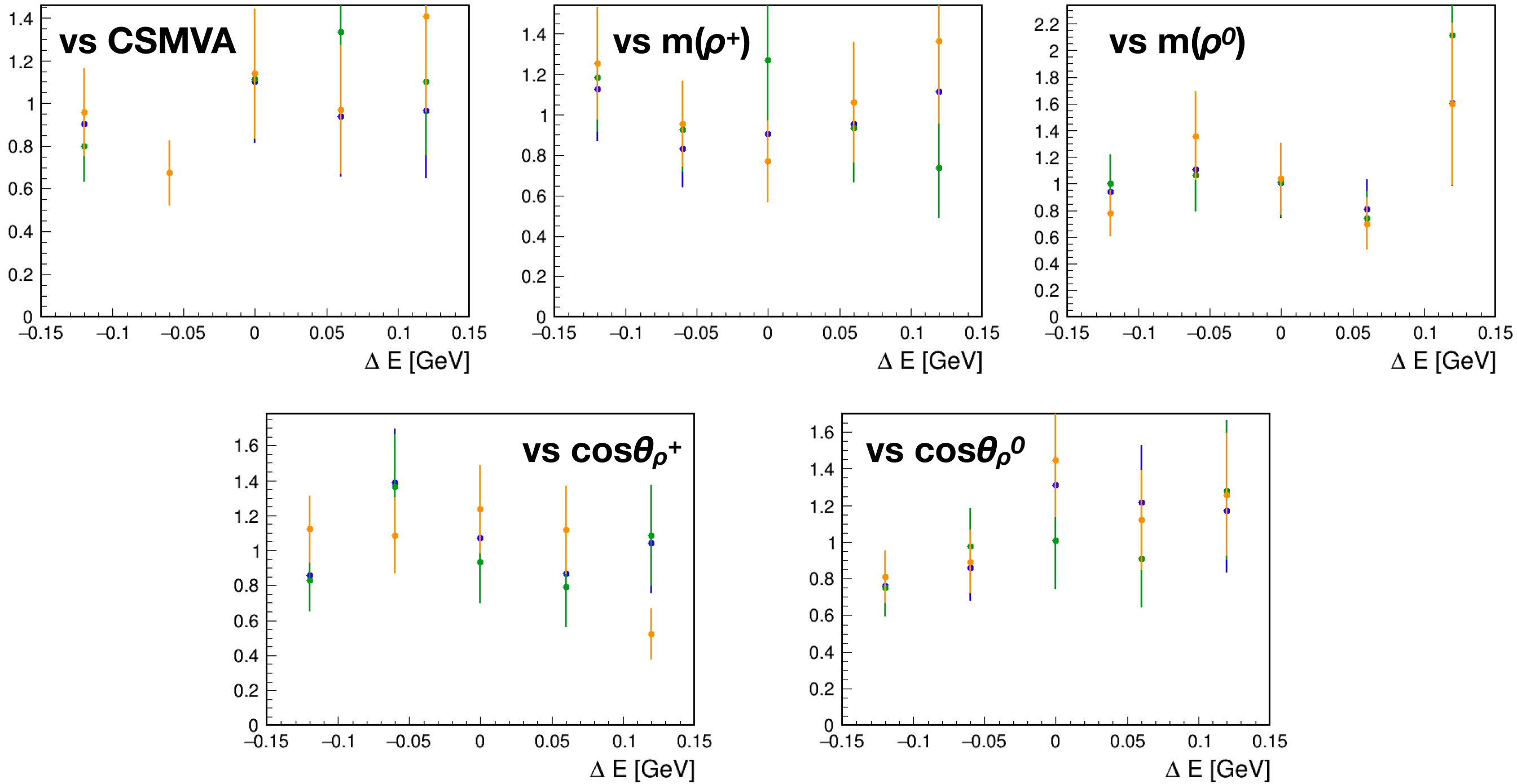
more

Offres

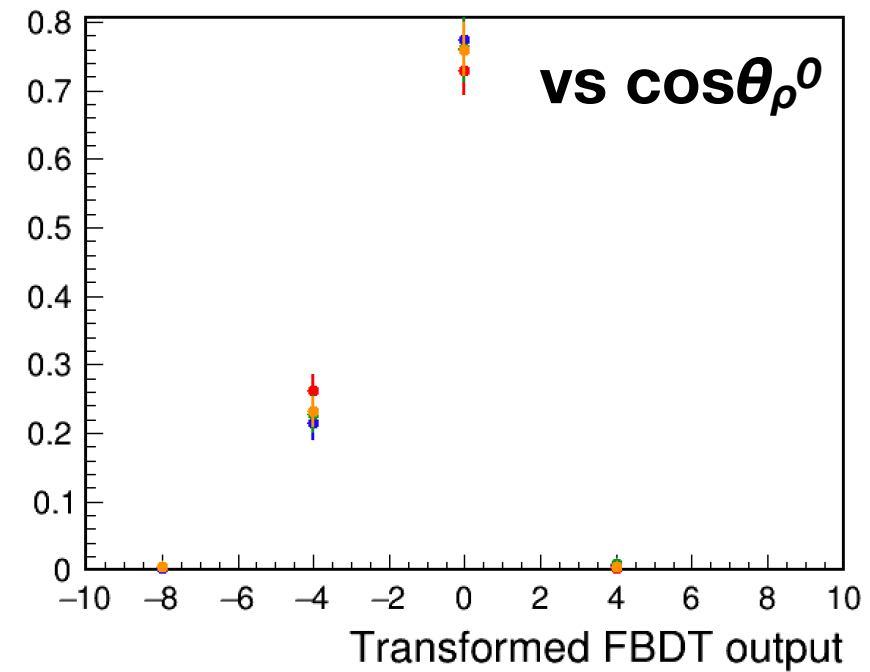
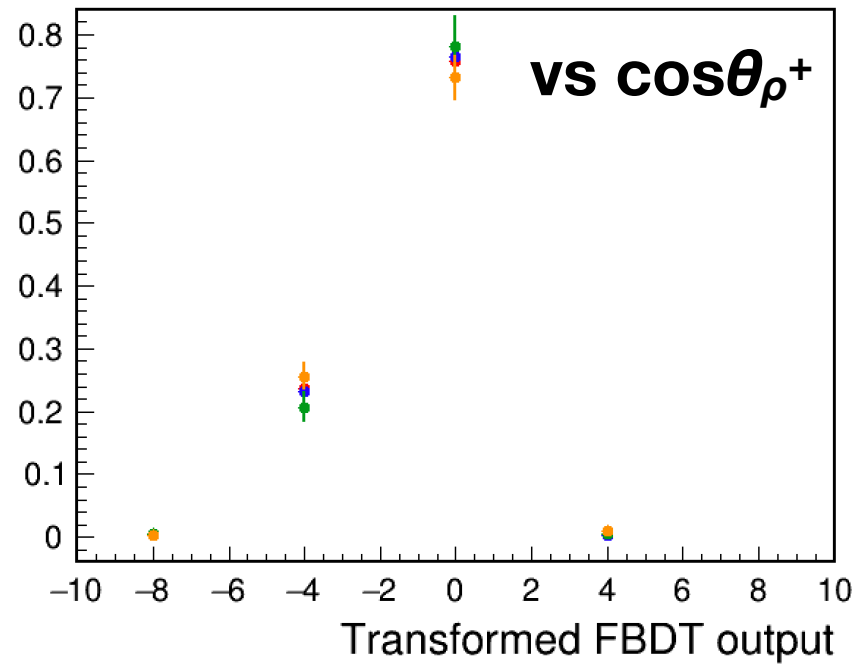
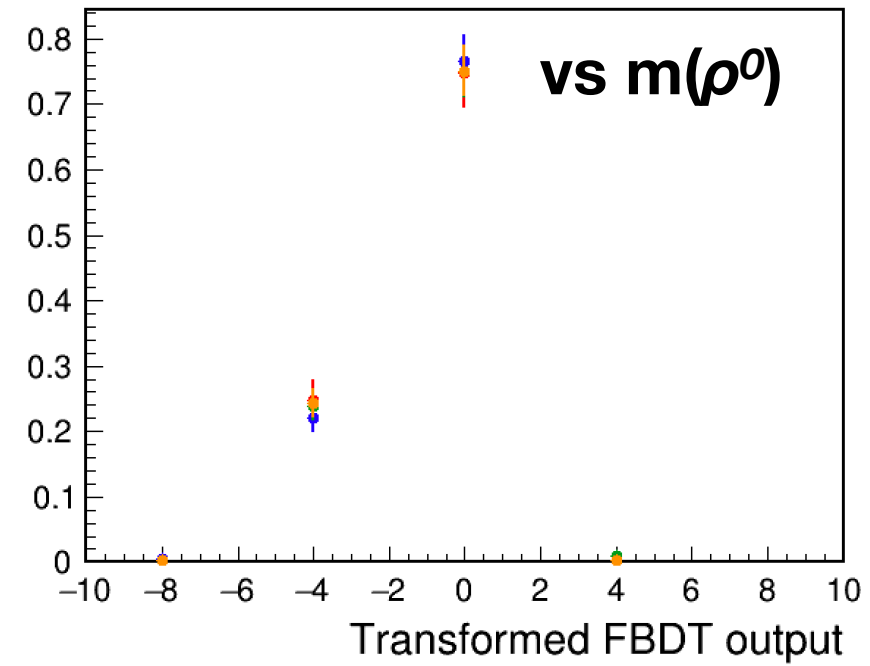
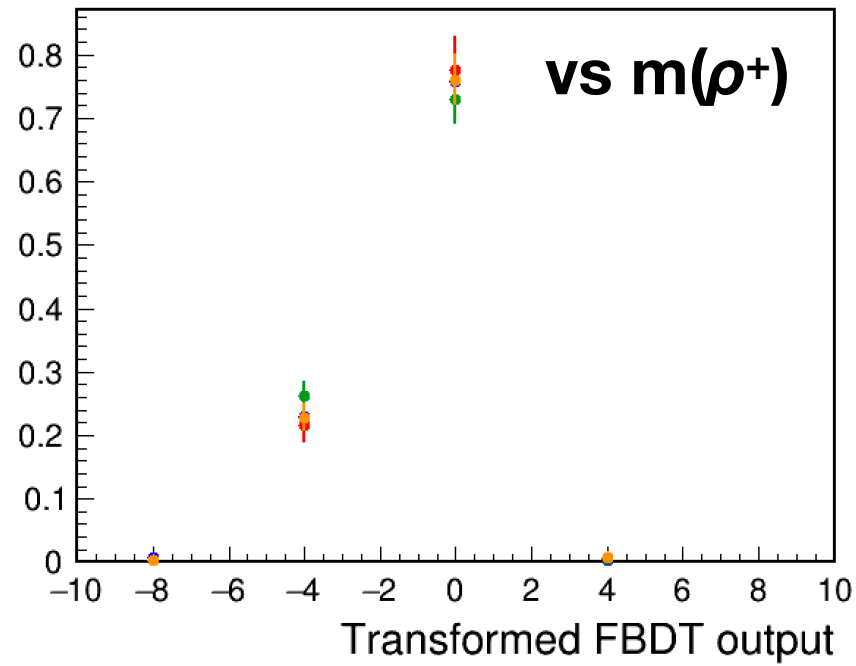
Offres data: ΔE



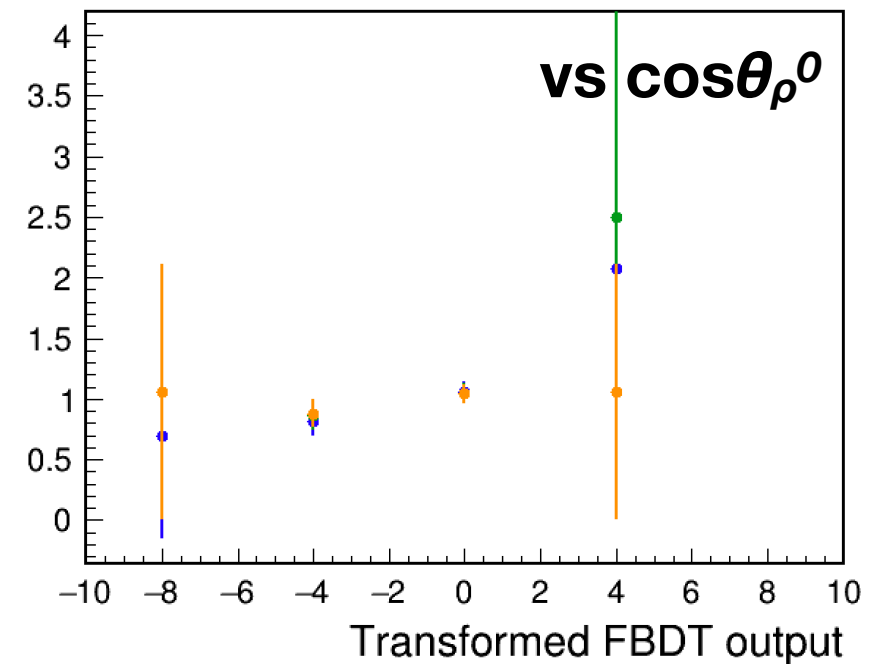
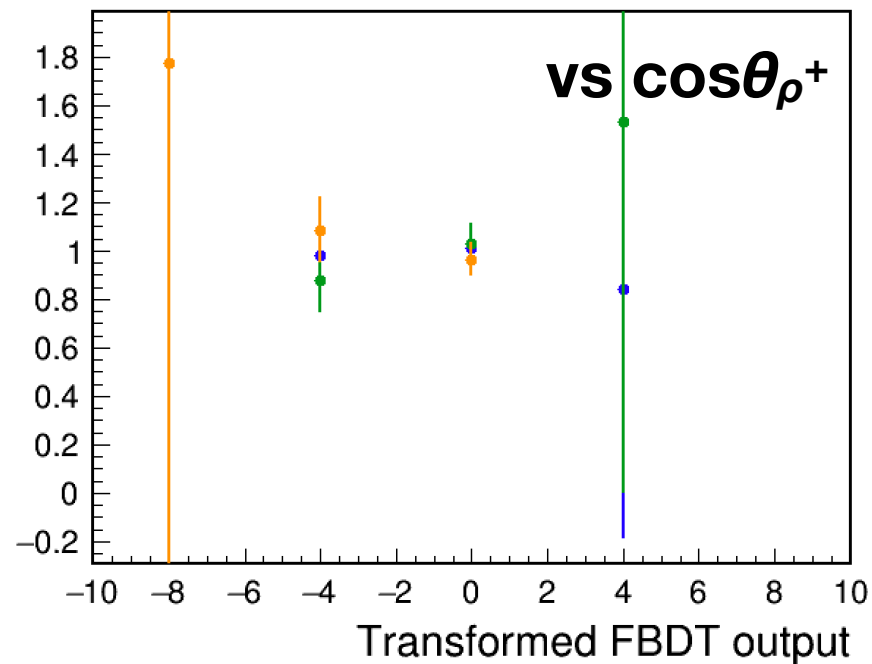
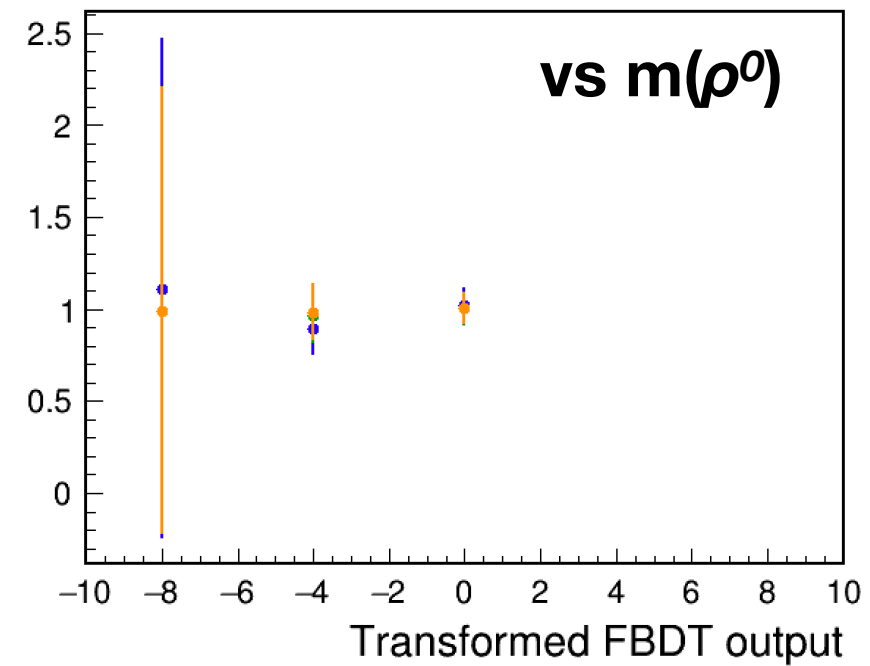
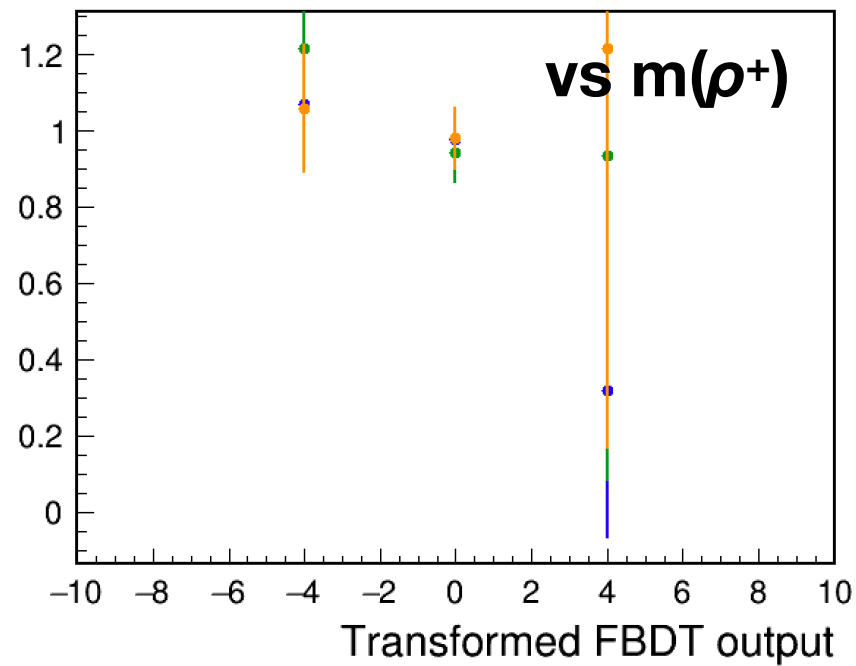
Offres data: ΔE ratios



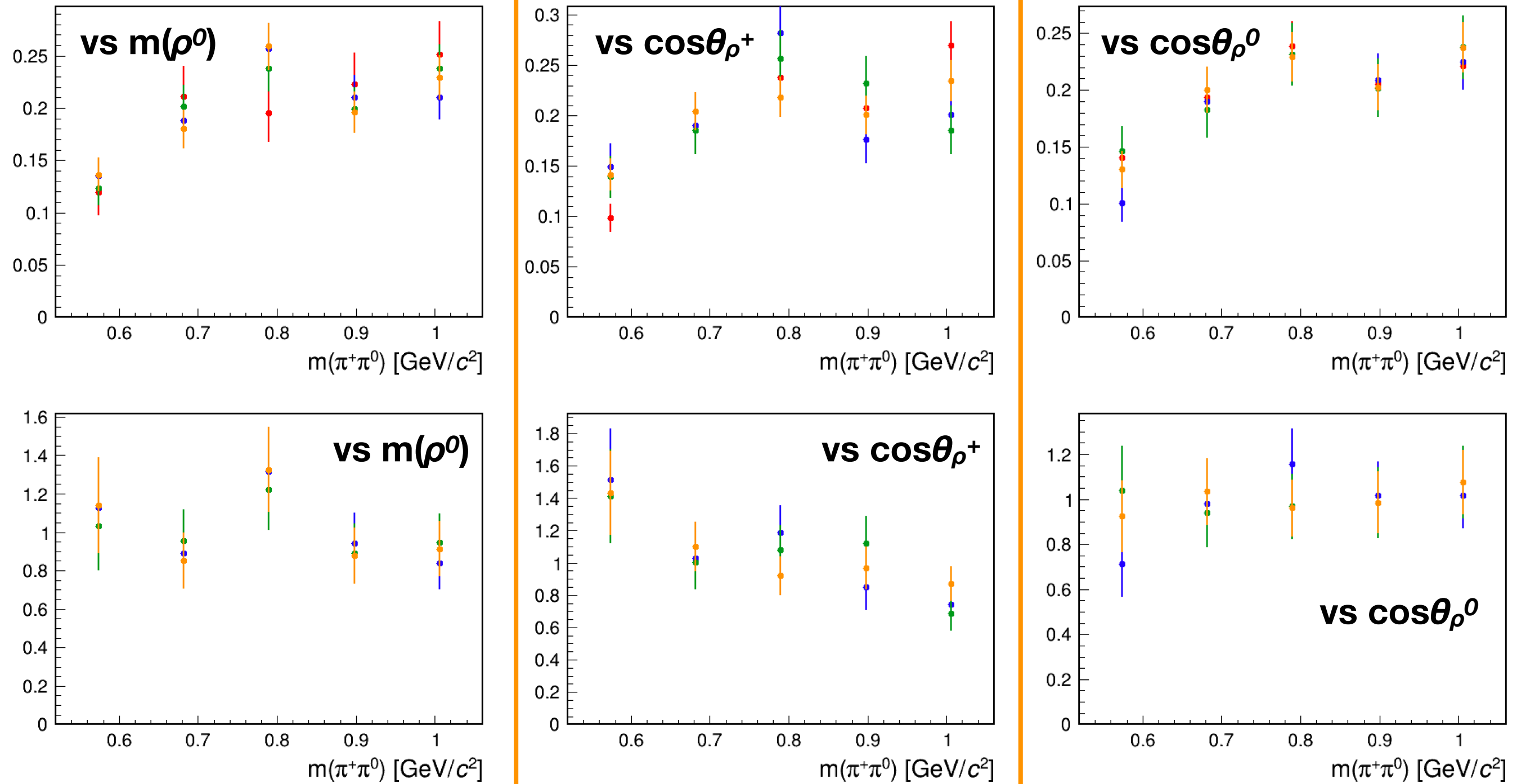
Offres data: CS



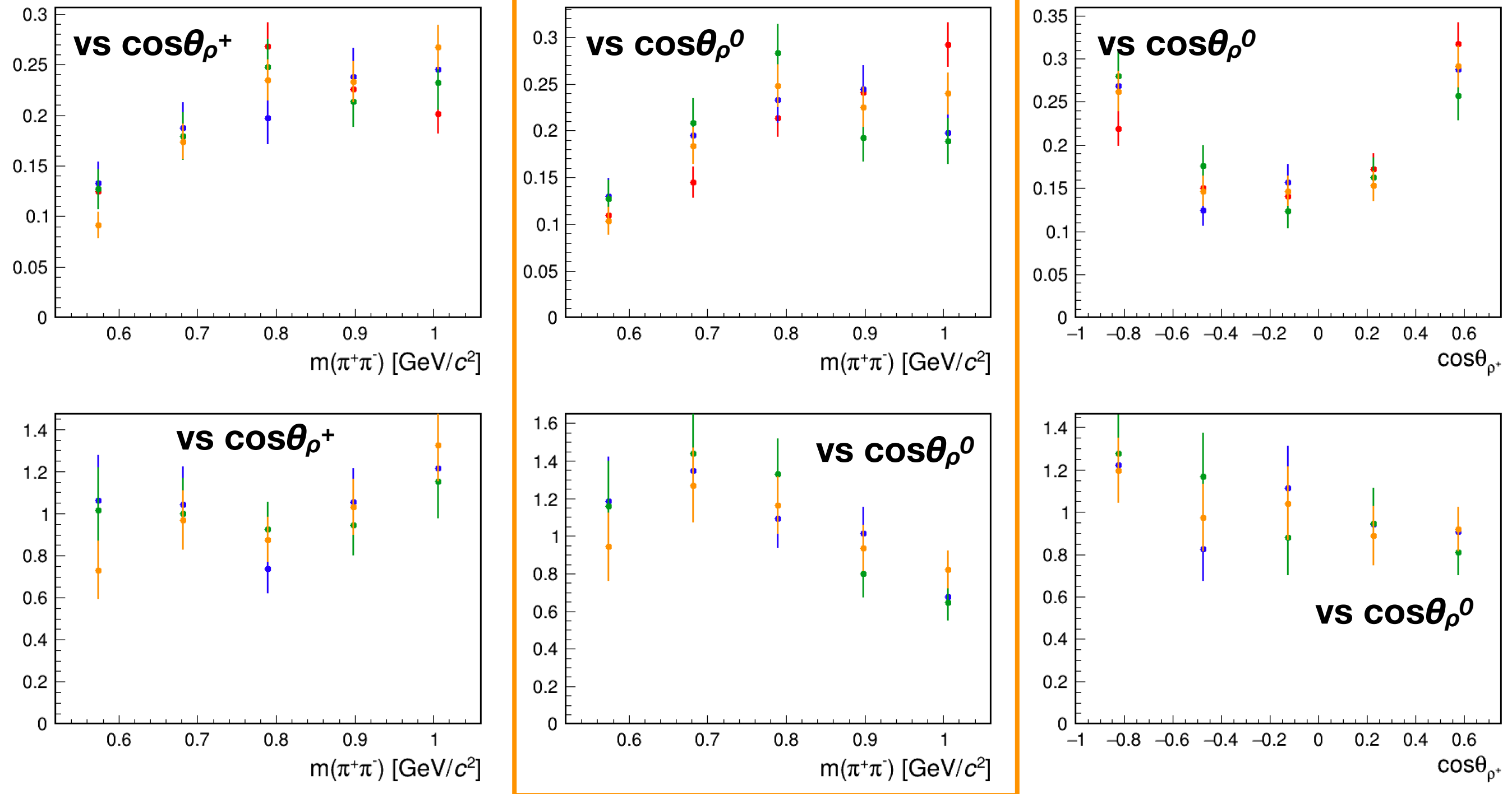
Offres data: CS ratios



Offres data: $m(\rho^+)$ +ratios

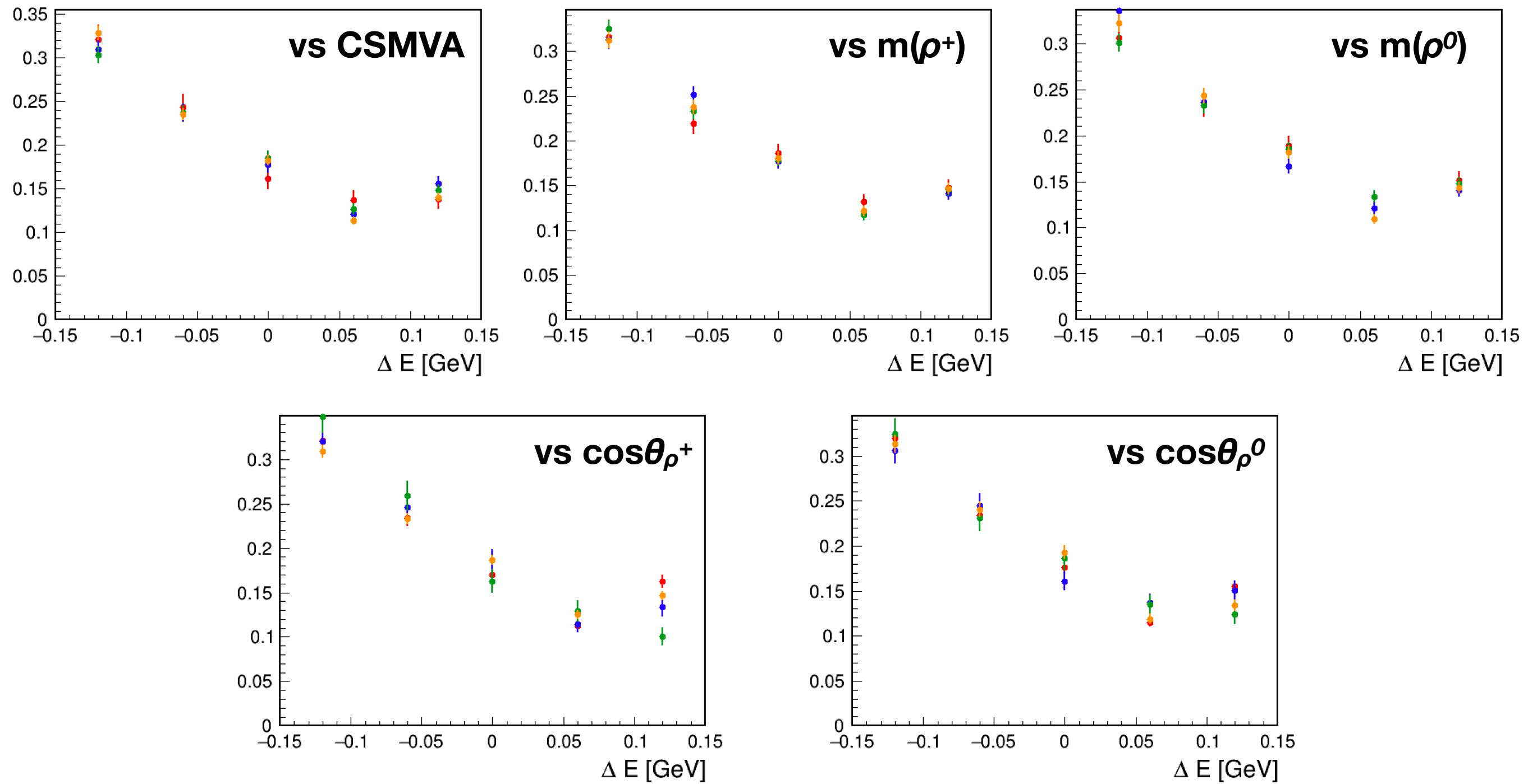


Offres data: $m(\rho^0)$ & angles +ratios

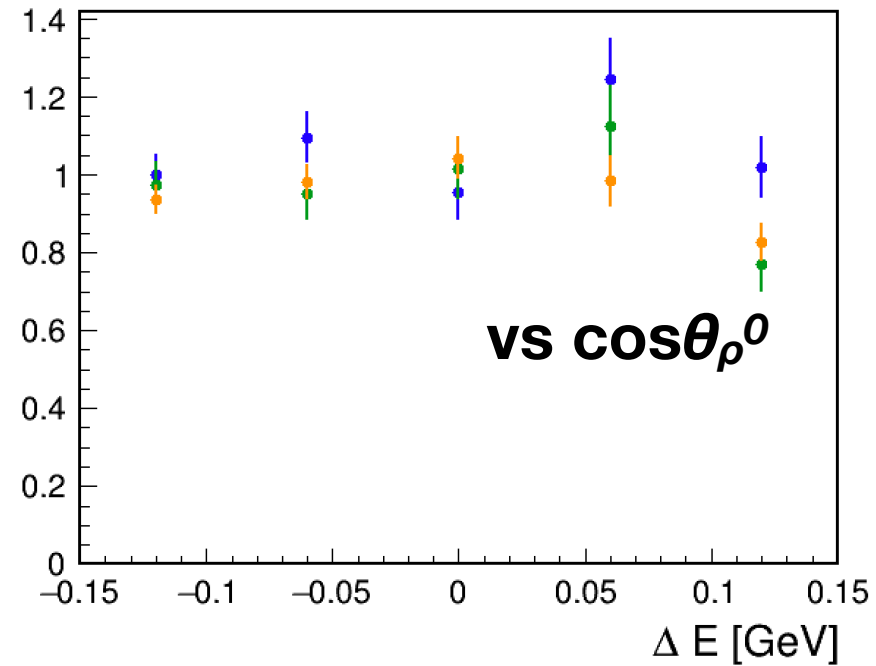
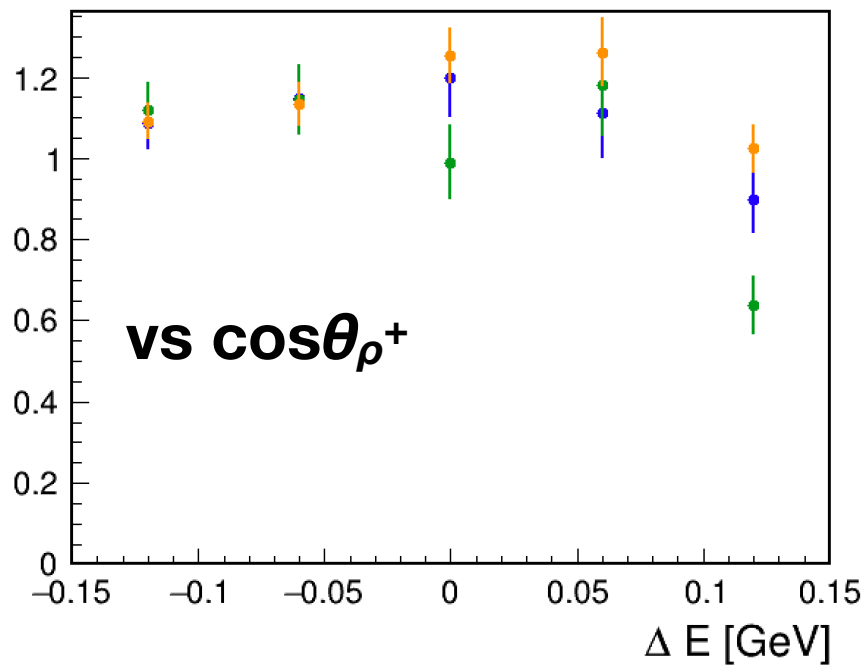
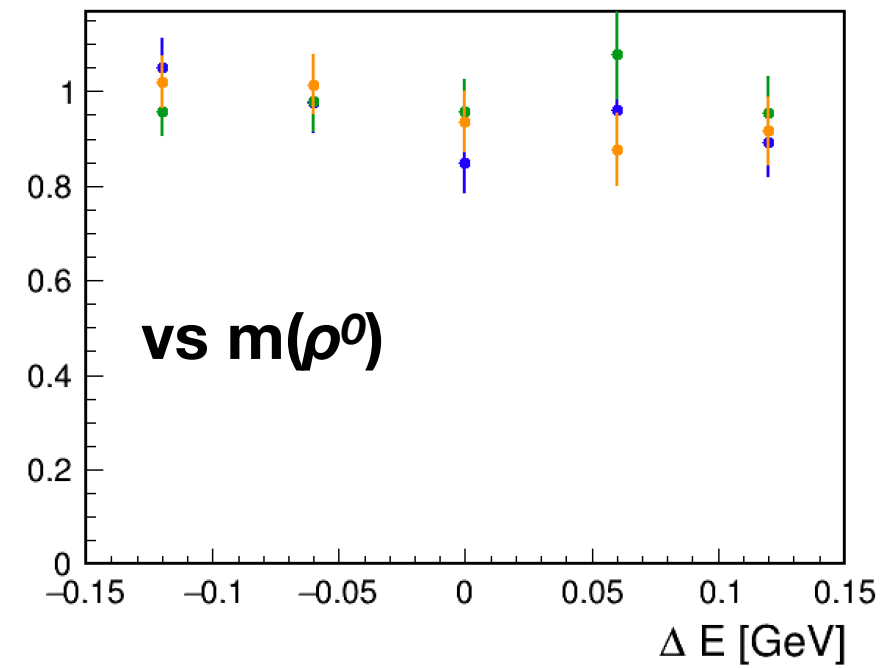
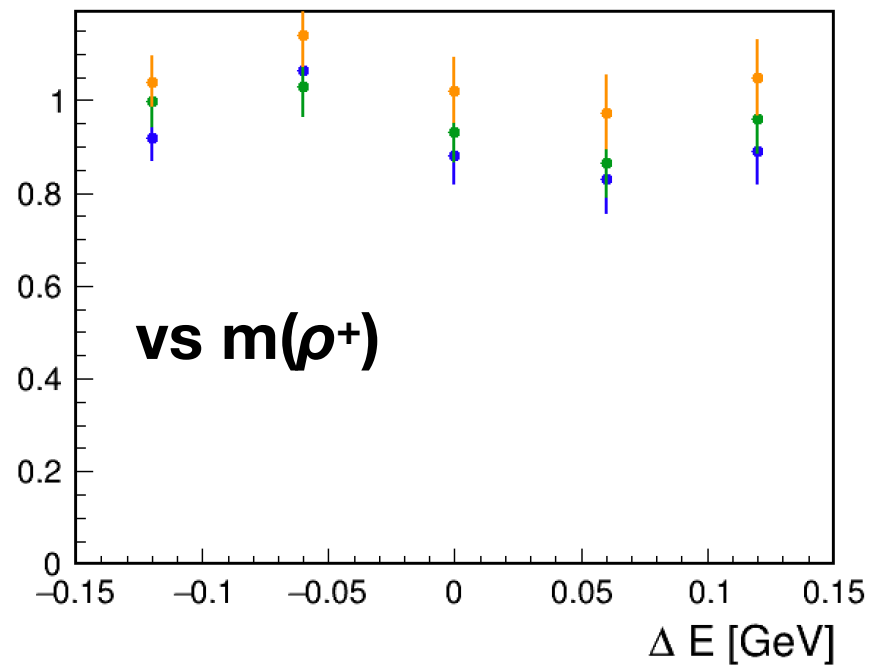
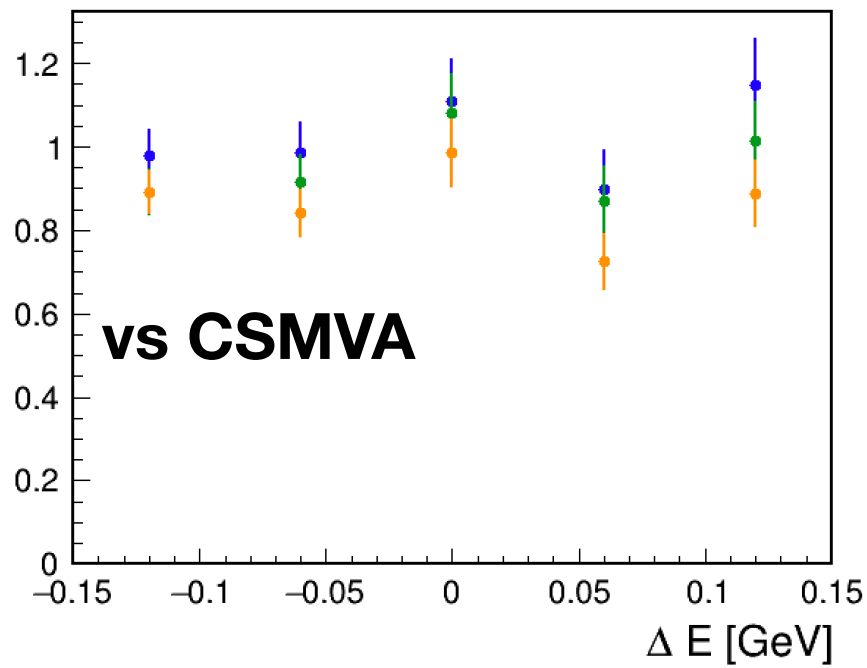


BBbar sideband

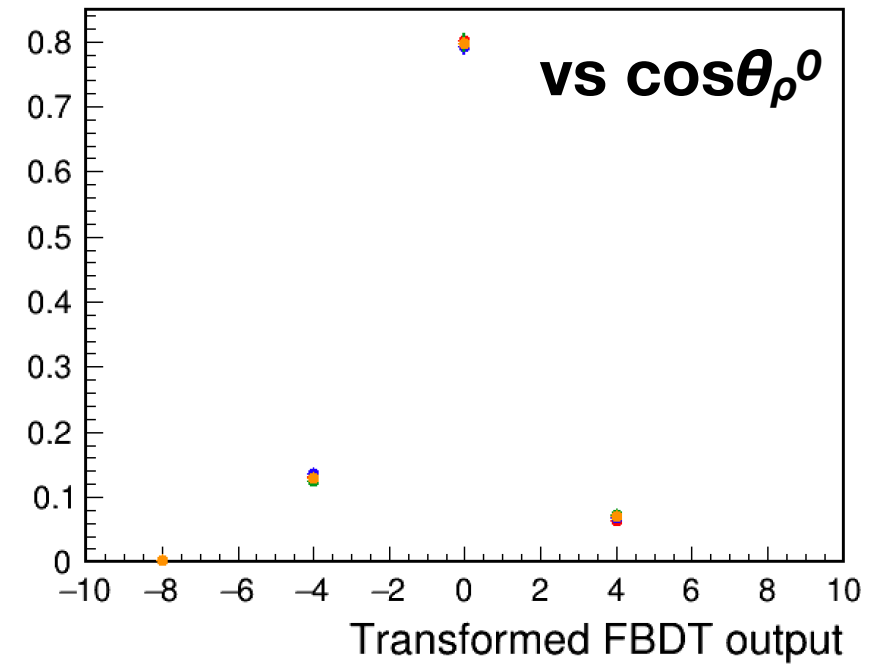
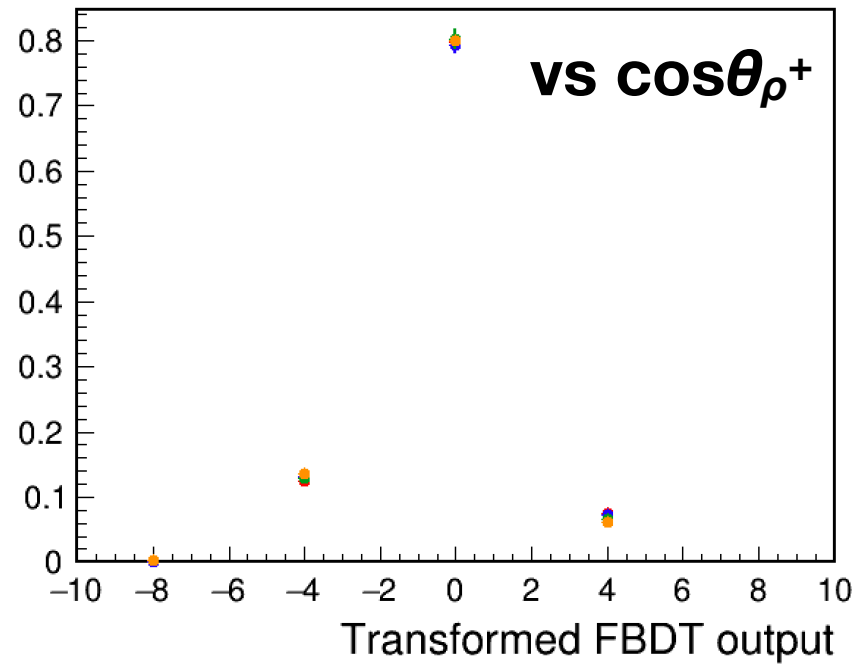
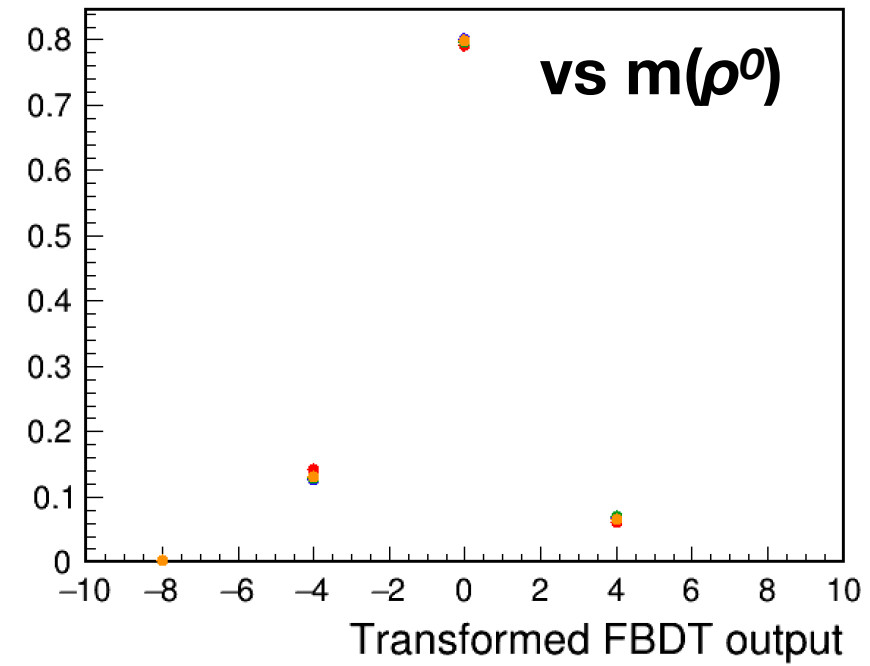
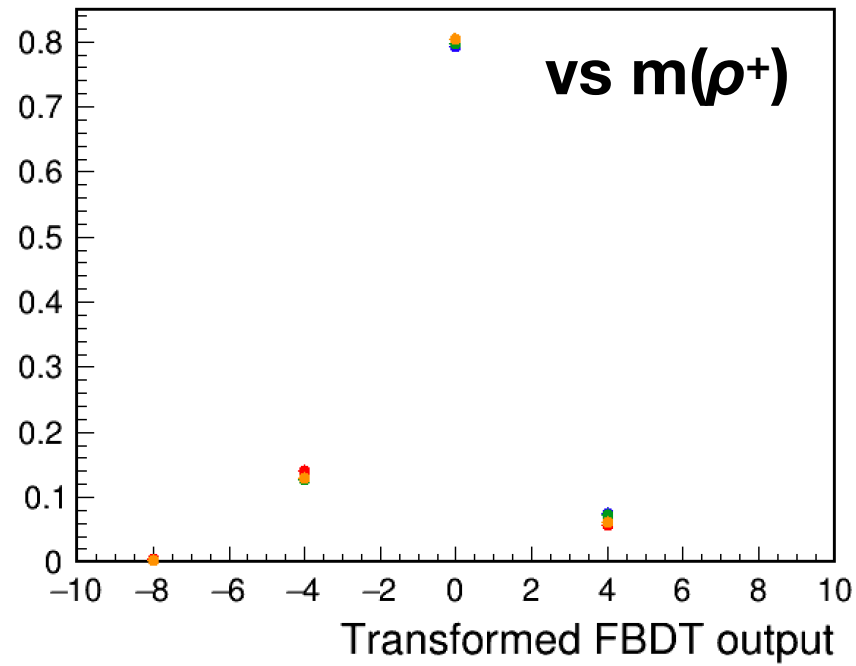
BB sideband: ΔE



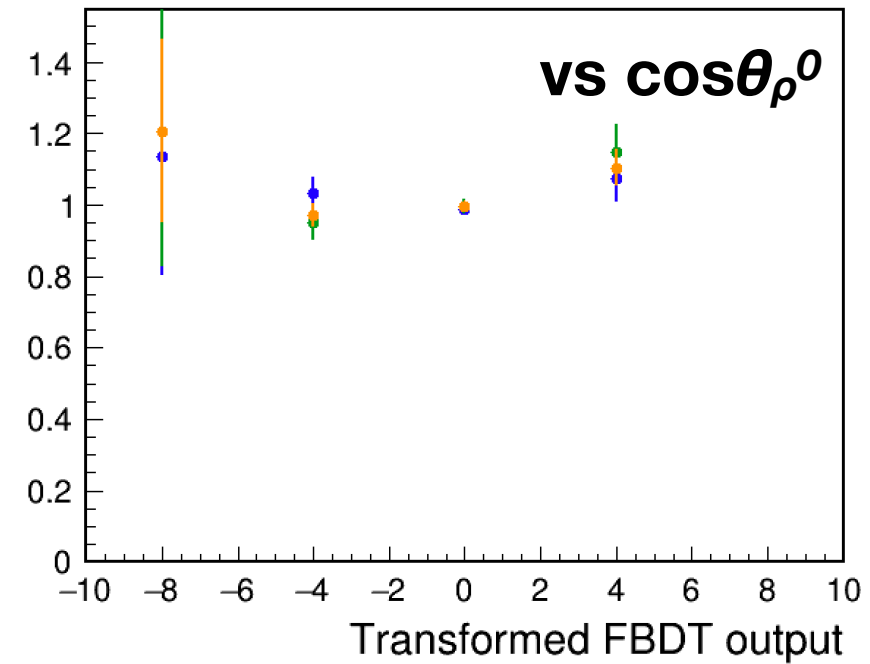
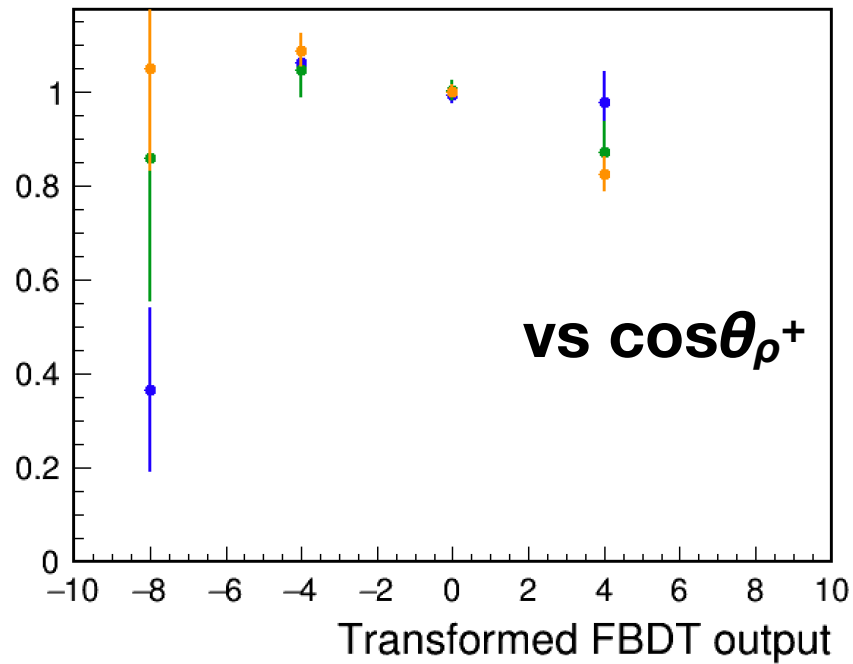
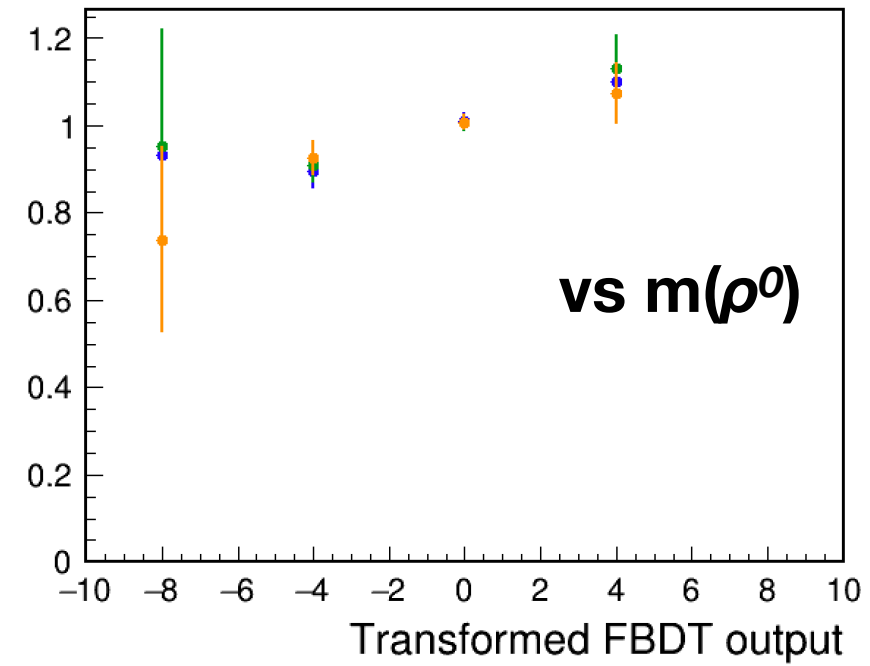
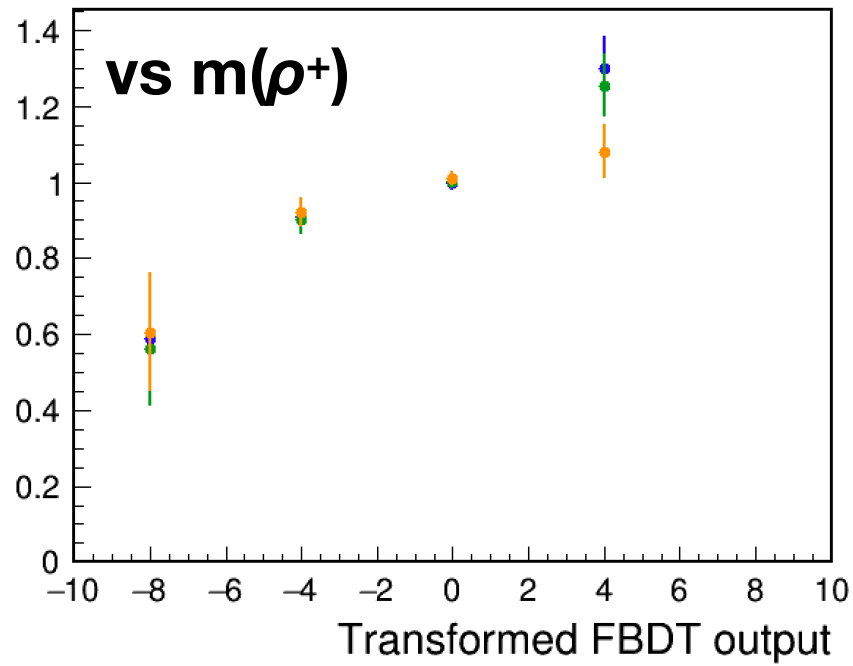
BB sideband: ΔE ratios



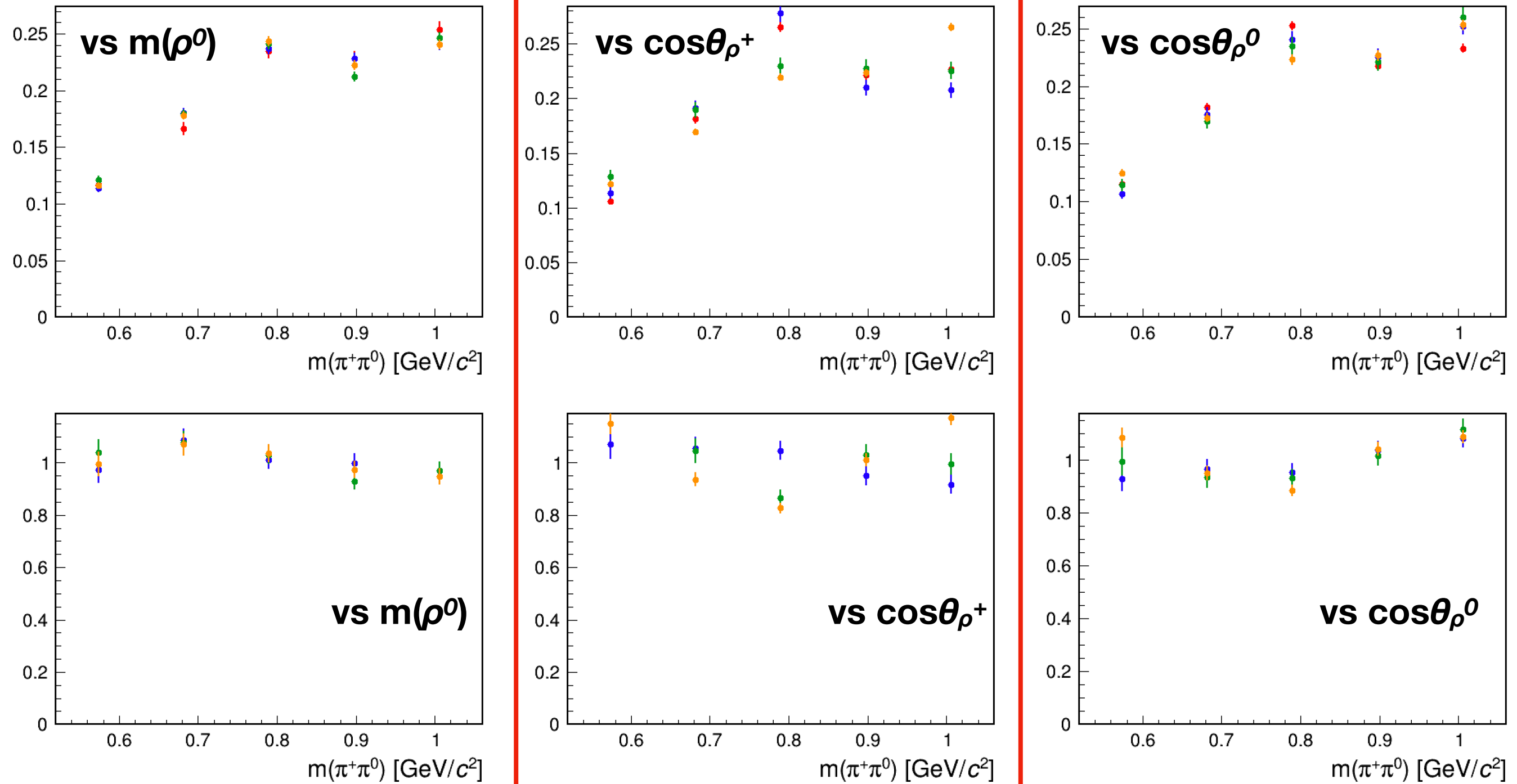
BB sideband: CS



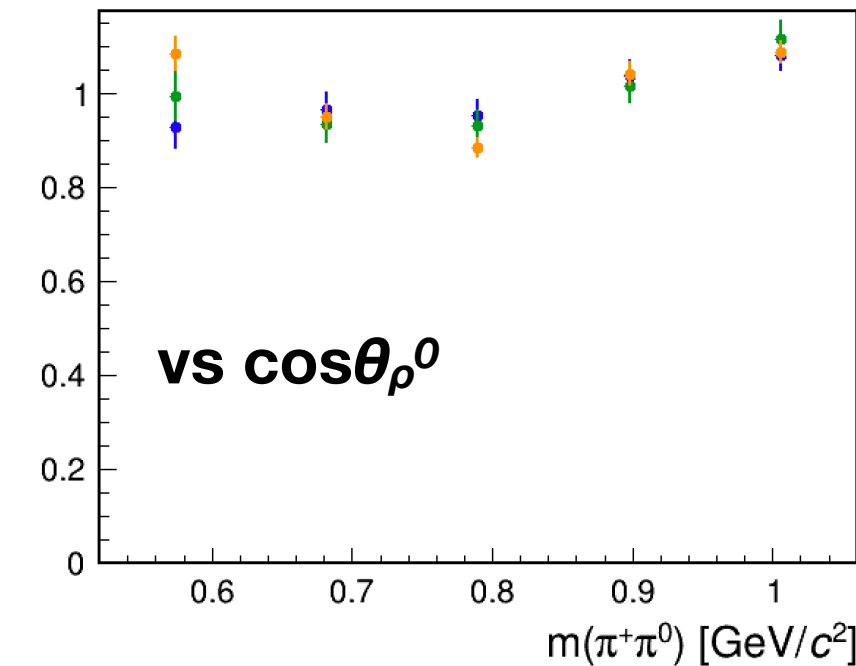
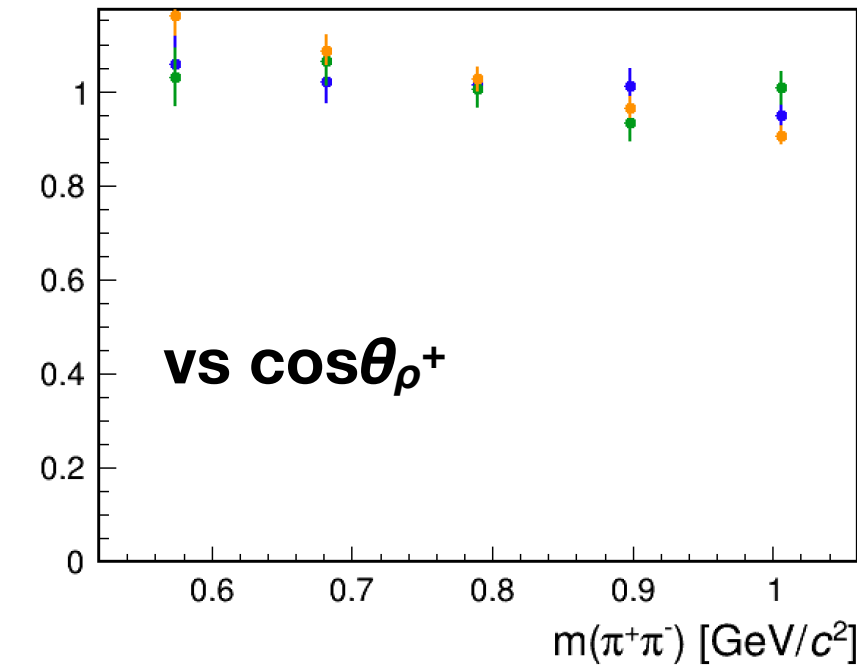
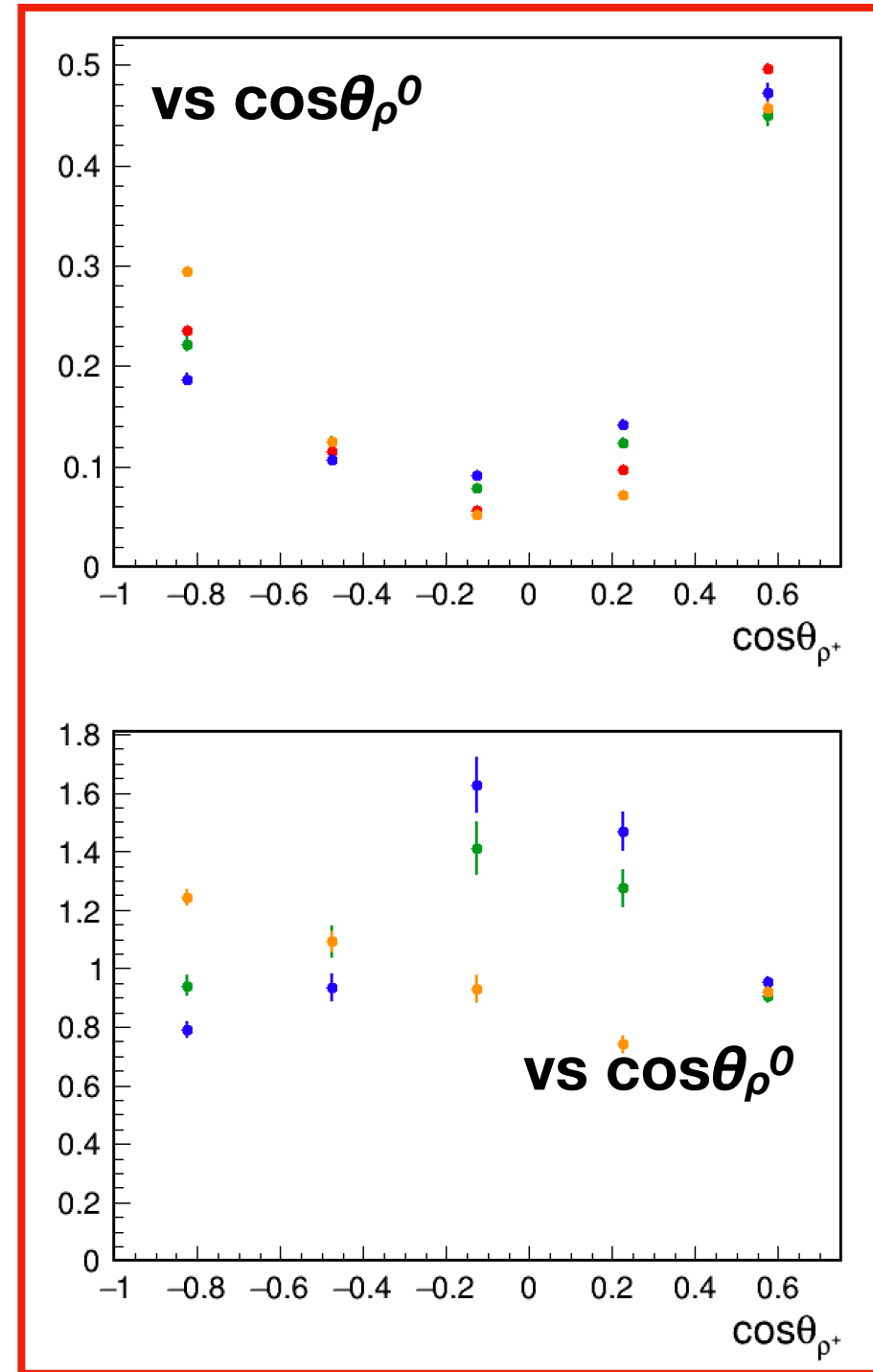
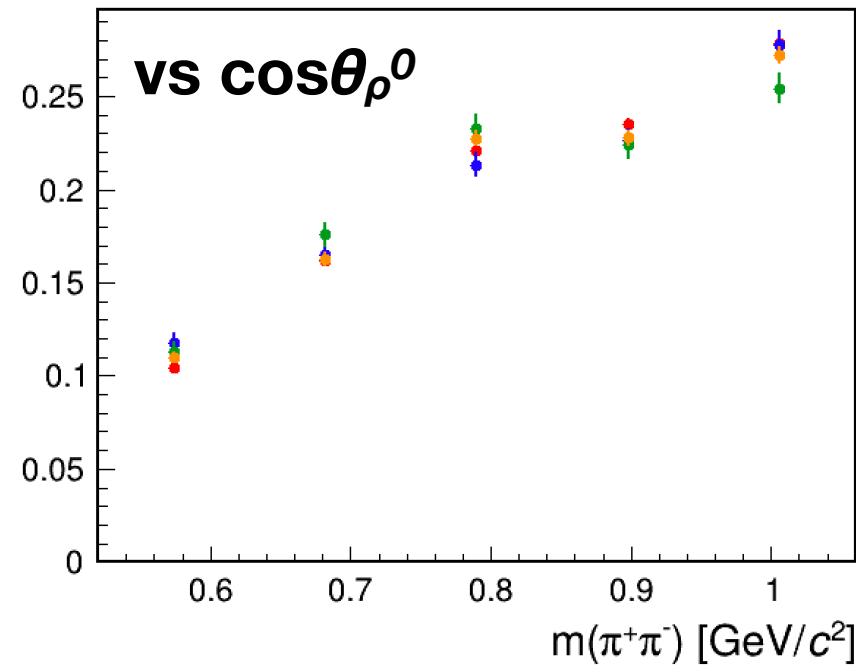
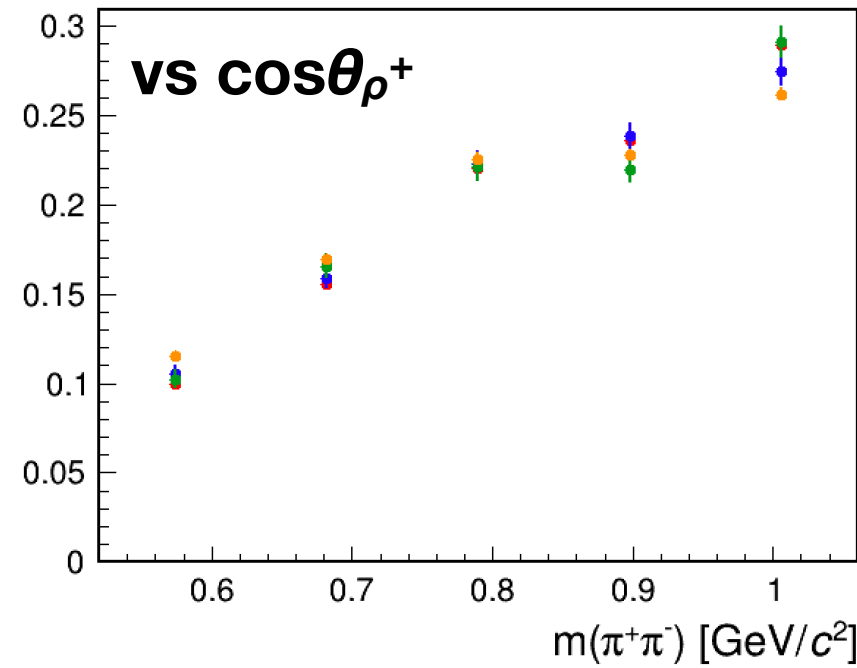
BB sideband: CS ratios



BB sideband: $m(\rho^+)$ + ratios

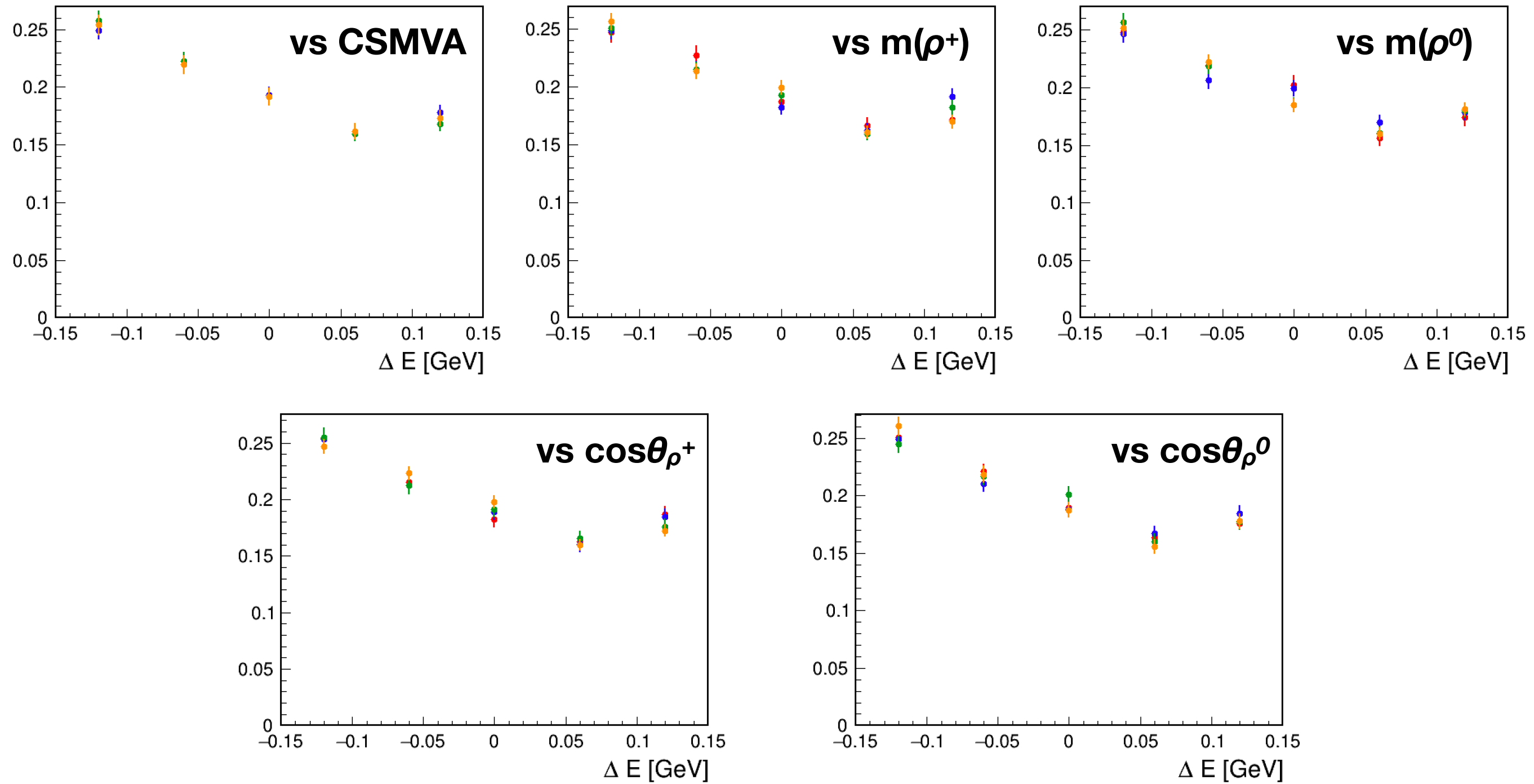


BB sideband: $m(\rho^0)$ & angles +ratios

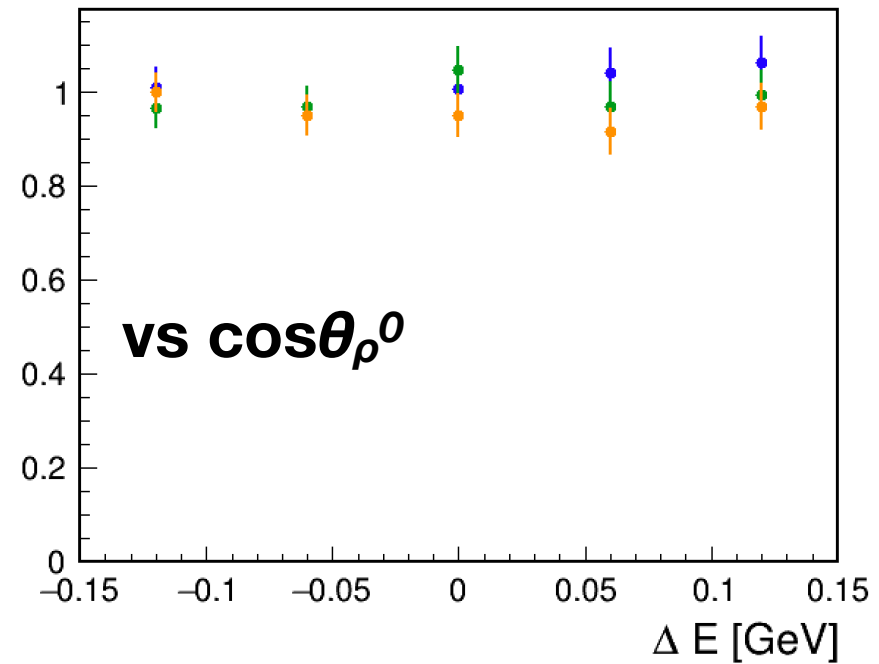
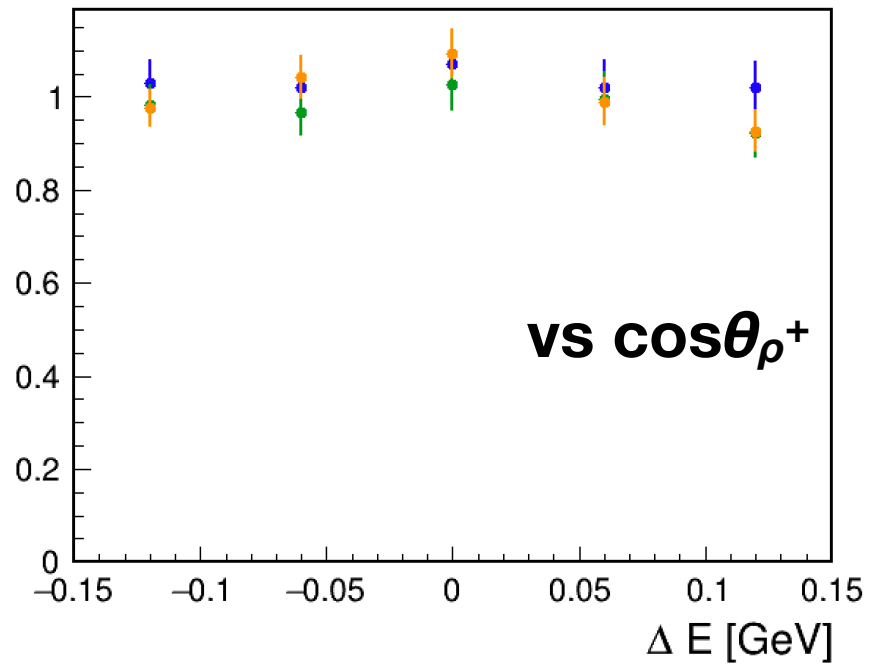
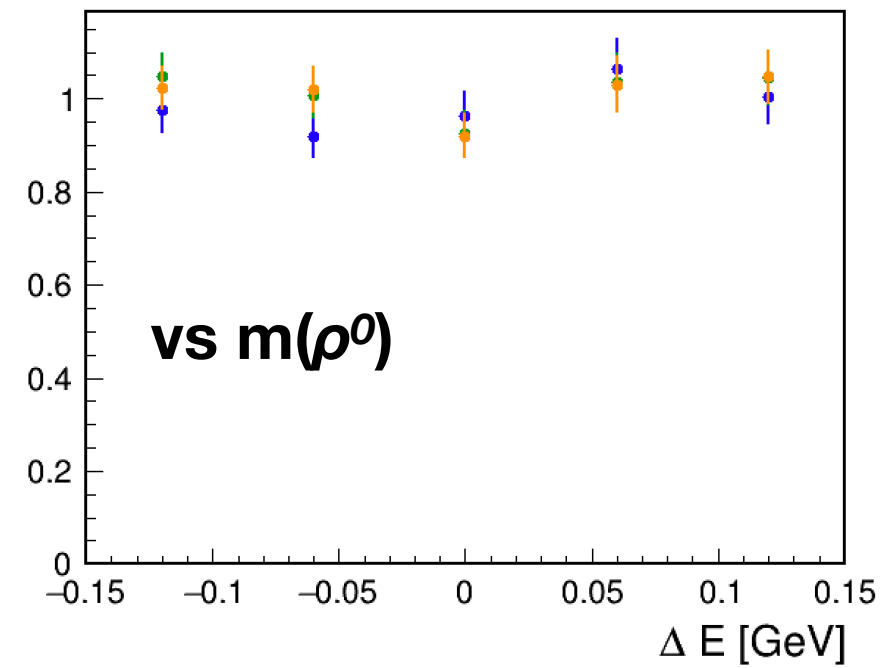
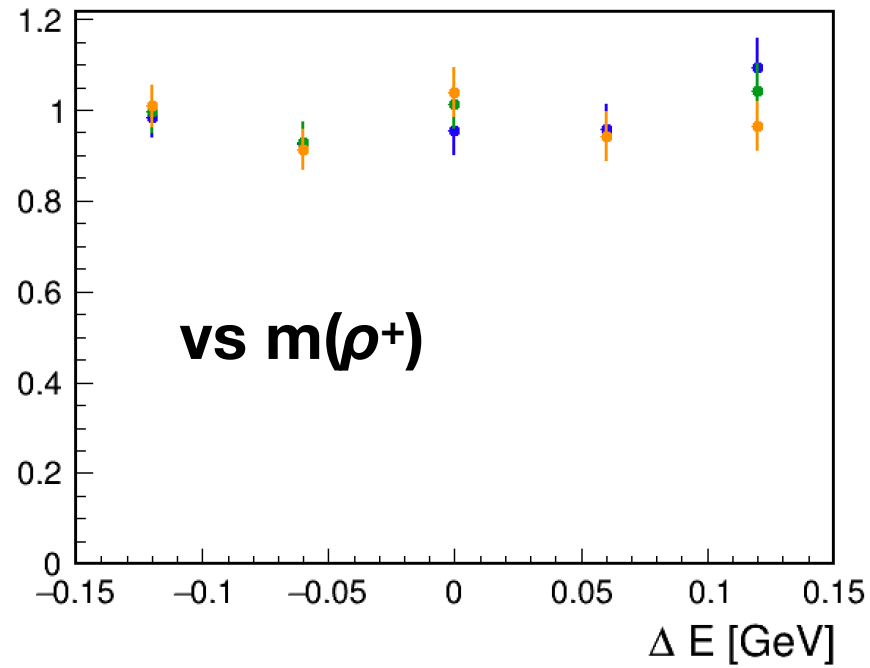
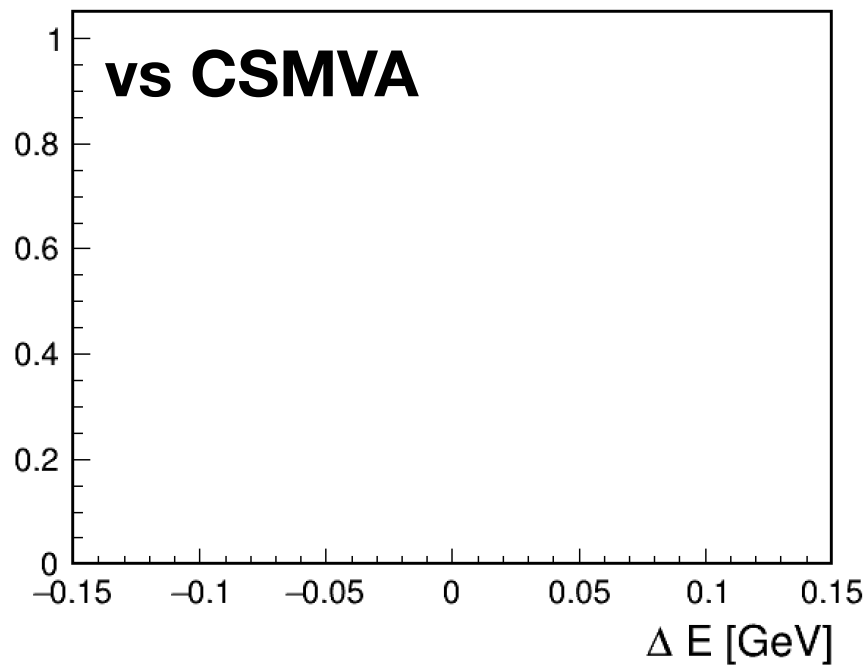


Continuum sideband

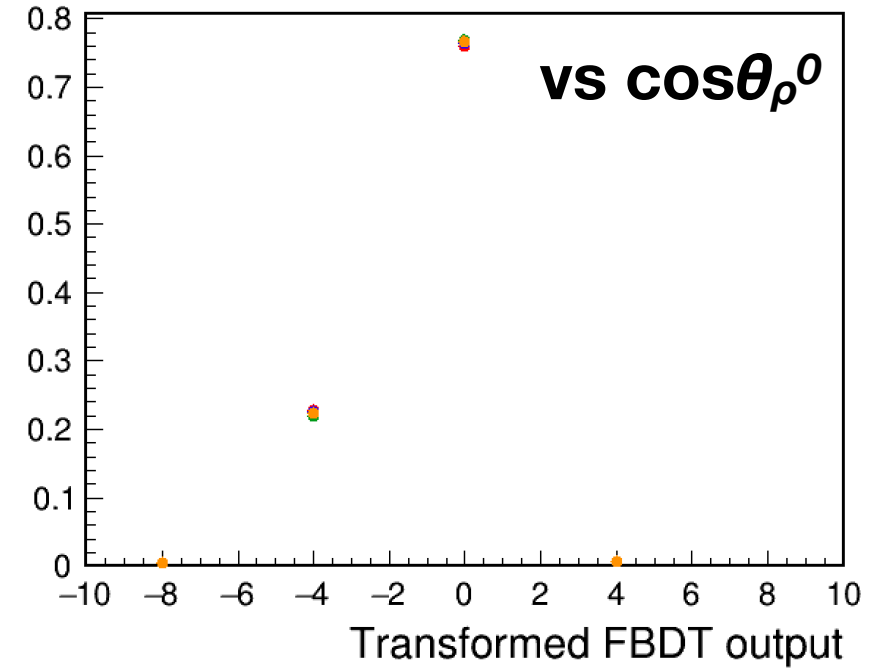
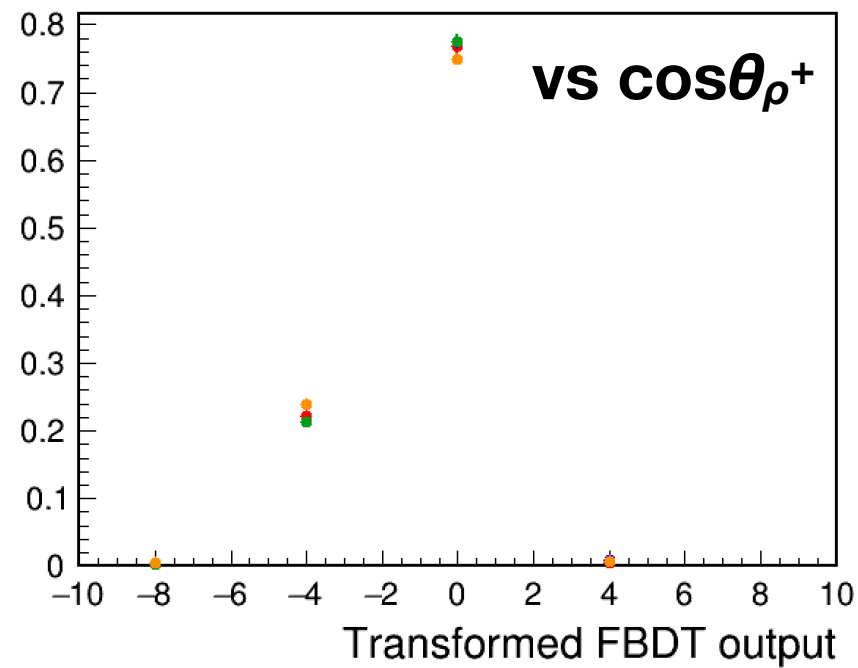
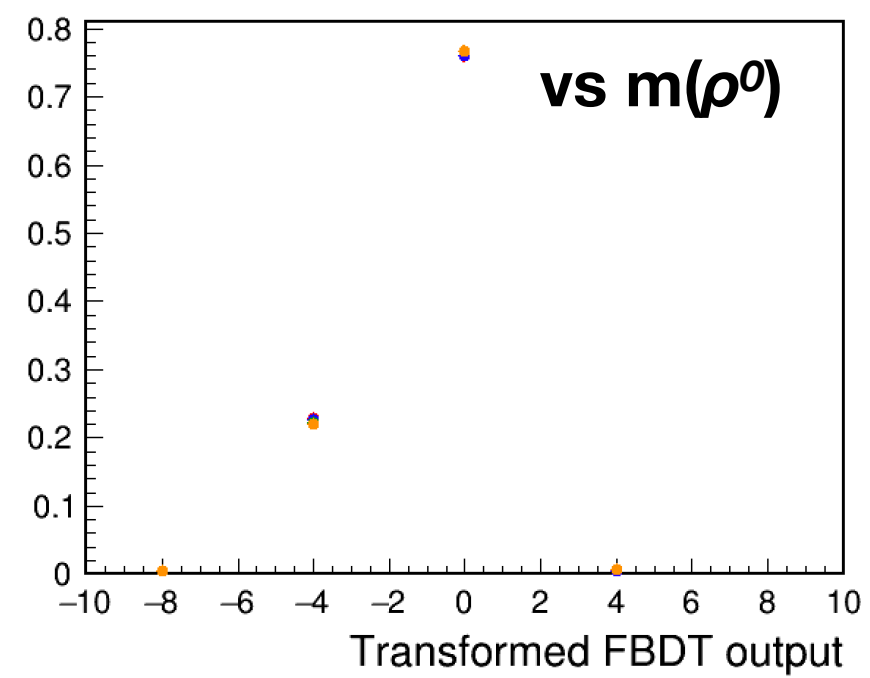
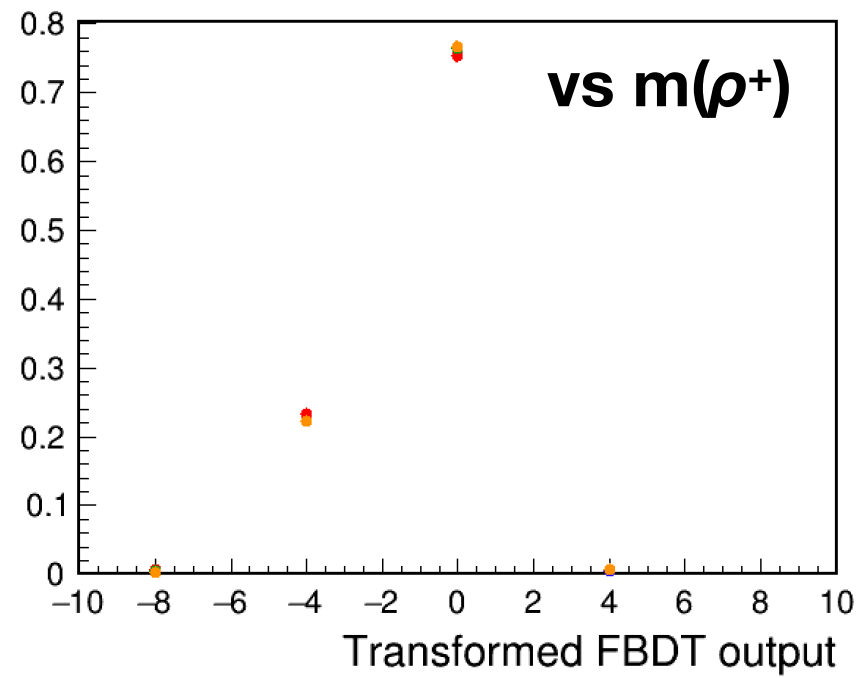
Continuum sideband: ΔE



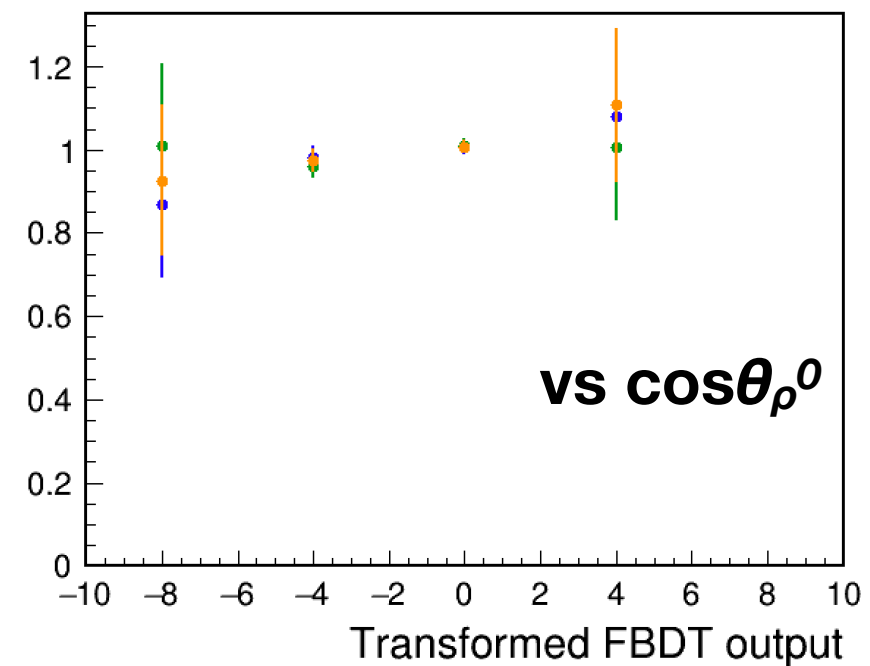
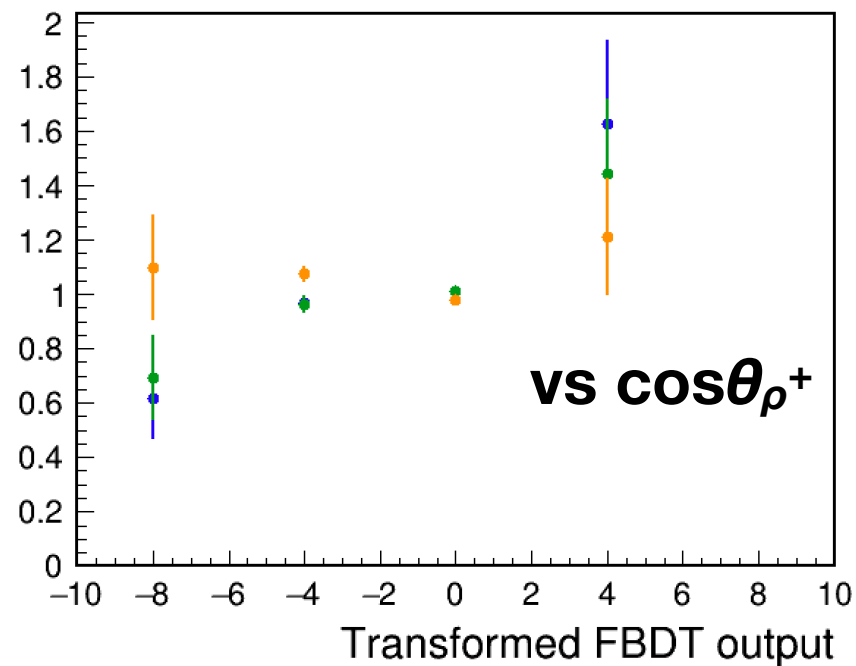
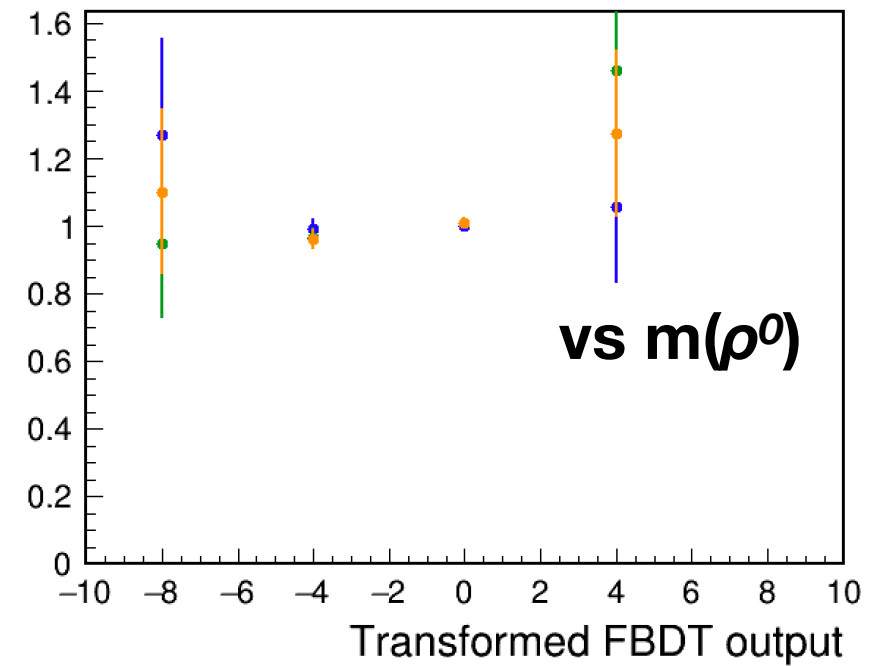
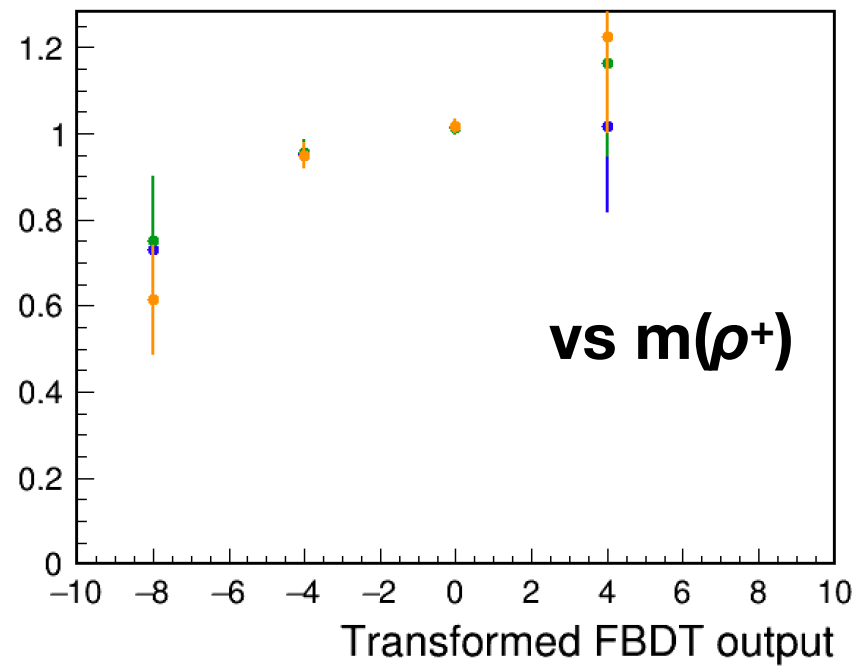
Continuum sideband: ΔE ratios



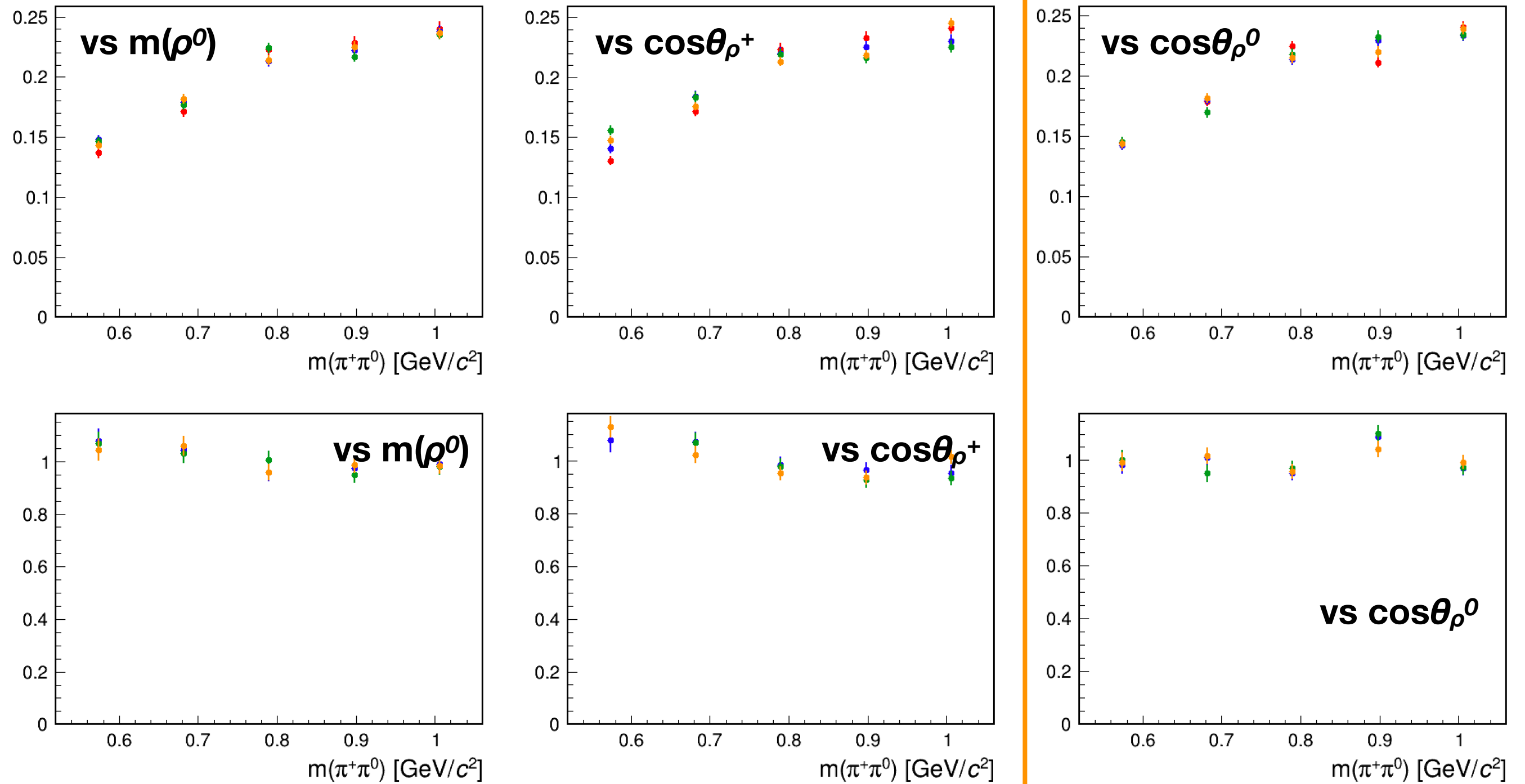
Continuum sideband: CS



Continuum sideband: CS ratios



Continuum sideband: $m(\rho^+)$ +ratios



Continuum sideband: $m(\rho^0)$ & angles +ratios

