Calculate the ratio of the cross sections of $\Sigma_c\bar{\Sigma}_c$ pairs production by CG coefficient

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初态 e^+e^- $|0,0\rangle$ 末态：$\Sigma_c^0\bar{\Sigma}_c^0$ $|1,-1\rangle|1,1\rangle$ $\Sigma_c^+\bar{\Sigma}_c^-$ $|1,0\rangle|1,0\rangle$ $\Sigma_c^{++}\bar{\Sigma}_c^{--}$ $|1,1\rangle|1,-1\rangle$

由CG系数有：

$$|0,0\rangle = \frac{1}{\sqrt{3}}\left(|1,+1\rangle|1,-1\rangle - |1,0\rangle|1,0\rangle + |1,-1\rangle|1,+1\rangle\right)$$

即：
$$|e^+\rangle|e^-\rangle = \frac{1}{\sqrt{3}}\left(|\Sigma_c^{++}\rangle|\bar{\Sigma}_c^{--}\rangle - |\Sigma_c^0\rangle|\bar{\Sigma}_c^0\rangle + |\Sigma_c^+\rangle|\bar{\Sigma}_c^-\rangle\right)$$

$$|\langle\bar{\Sigma}_c^{--}|\langle\Sigma_c^{++}|e^+\rangle|e^-\rangle|^2 = \frac{1}{3} \qquad |\langle\bar{\Sigma}_c^0|\langle\Sigma_c^0|e^+\rangle|e^-\rangle|^2 = \frac{1}{3}$$

$$|\langle\Sigma_c^+|\langle\bar{\Sigma}_c^-|e^+\rangle|e^-\rangle|^2 = \frac{1}{3}$$

$$\therefore \sigma(e^+e^-\to\Sigma_c^{++}\bar{\Sigma}_c^{--}) : \sigma(e^+e^-\to\Sigma_c^0\bar{\Sigma}_c^0) : \sigma(e^+e^-\to\Sigma_c^+\bar{\Sigma}_c^-) = 1:1:1.$$

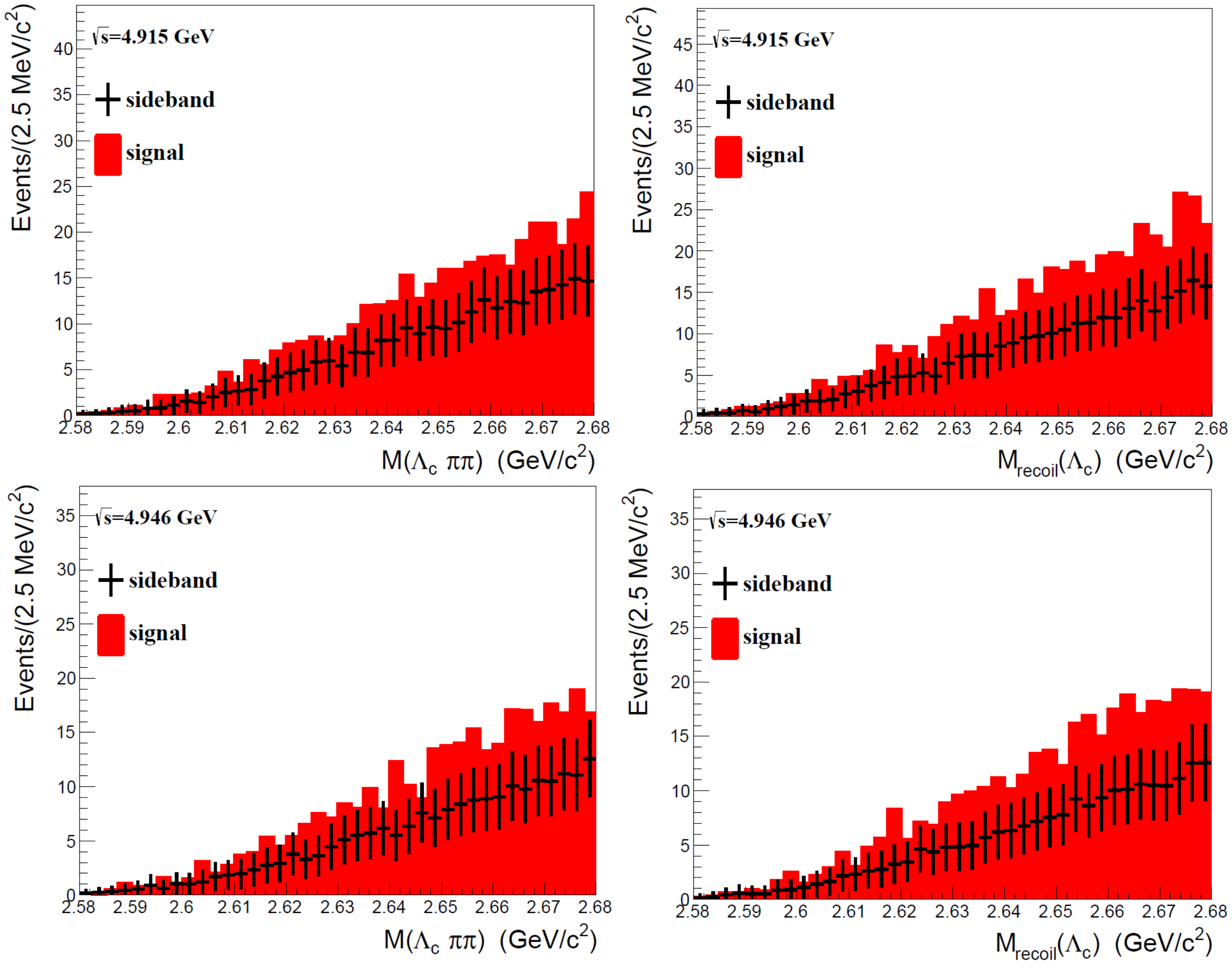
Decay mode of Σ_c

$\Sigma_c(2455)$ Decay Modes

$\Lambda_c^+\pi$ is the only strong decay allowed to a Σ_c having this mass.

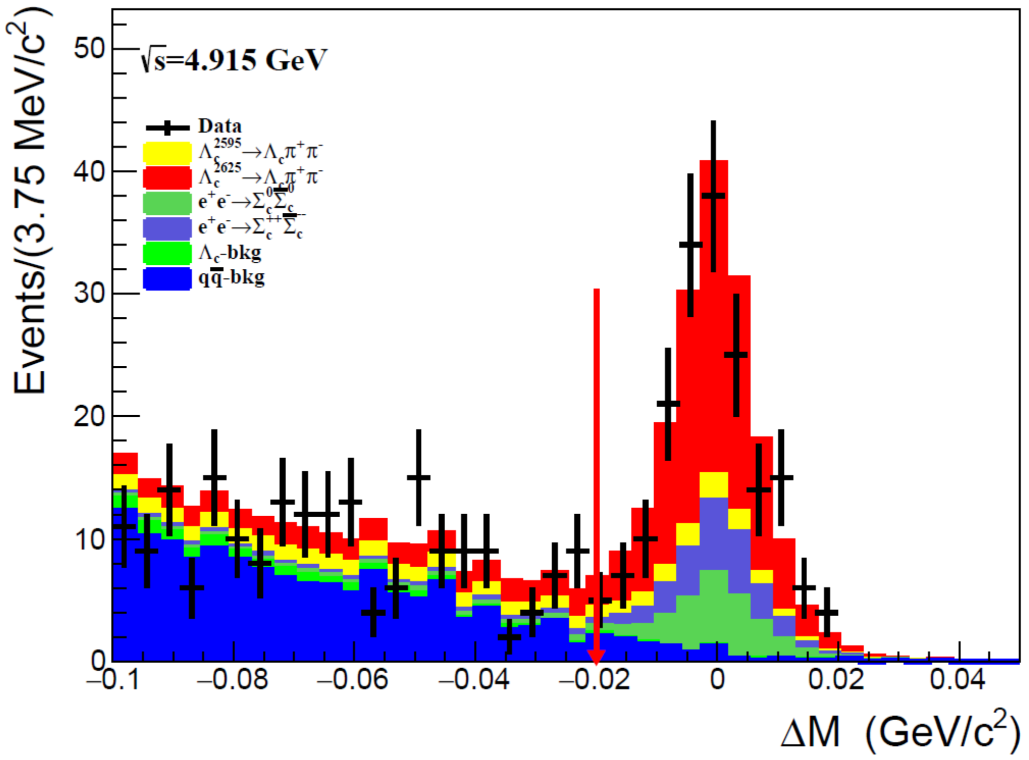
	Mode	Fraction (Γ_i/Γ)	Scale Factor/ Conf. Level	P(MeV/c)
Γ_1	$\Lambda_c^+\pi$	$\approx 100\%$		94

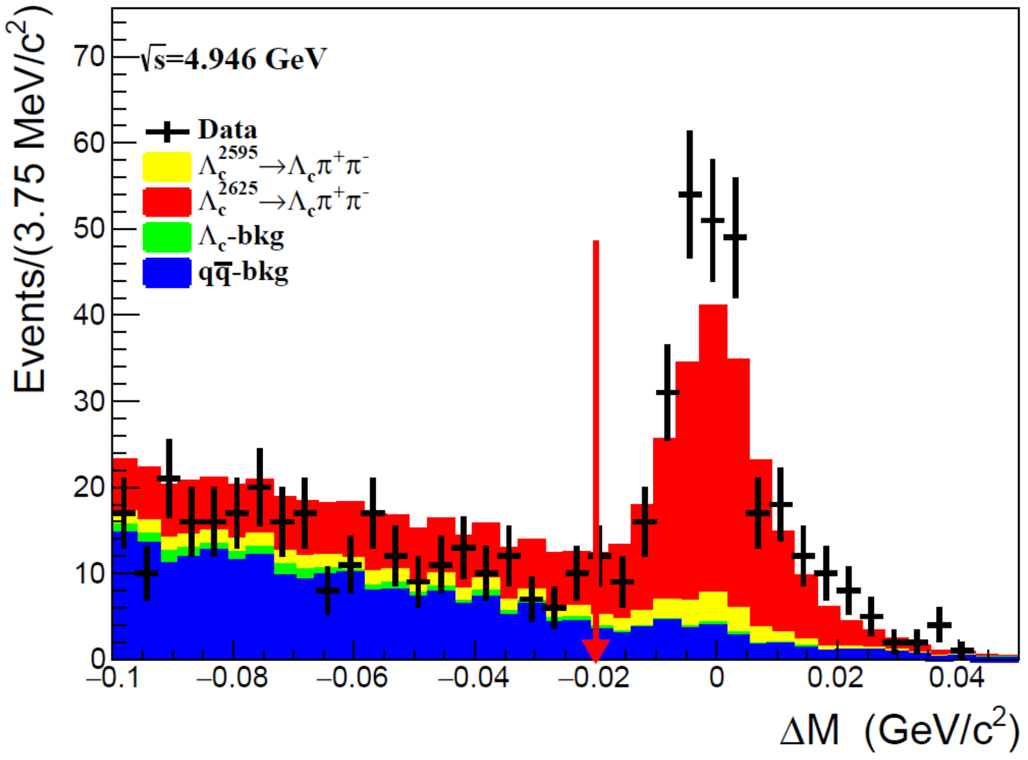
Why the sideband can't describe the signal region?



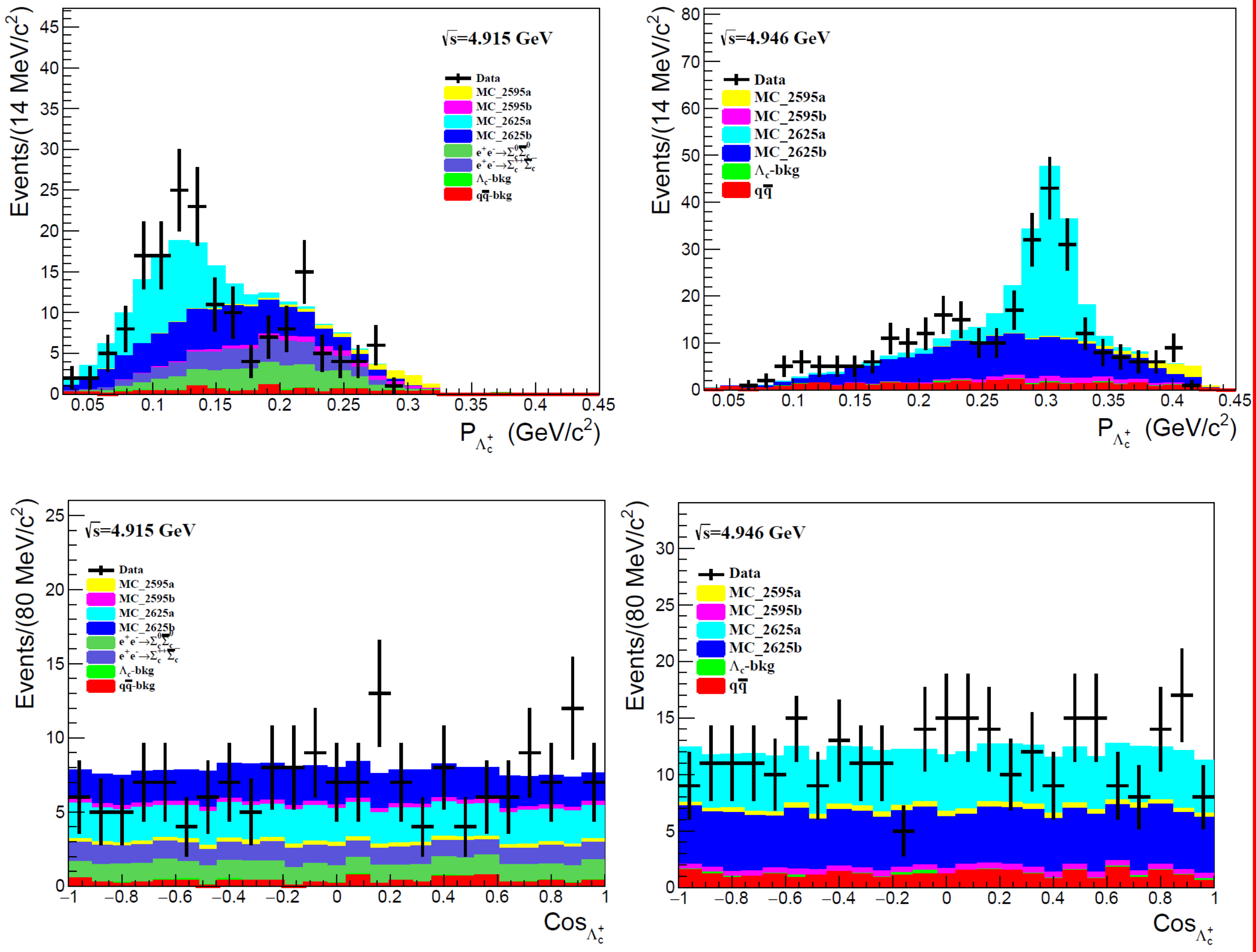
Caused by the requirement $\Delta M > -0.02$

Comparison on the ΔM distribution between data and MC

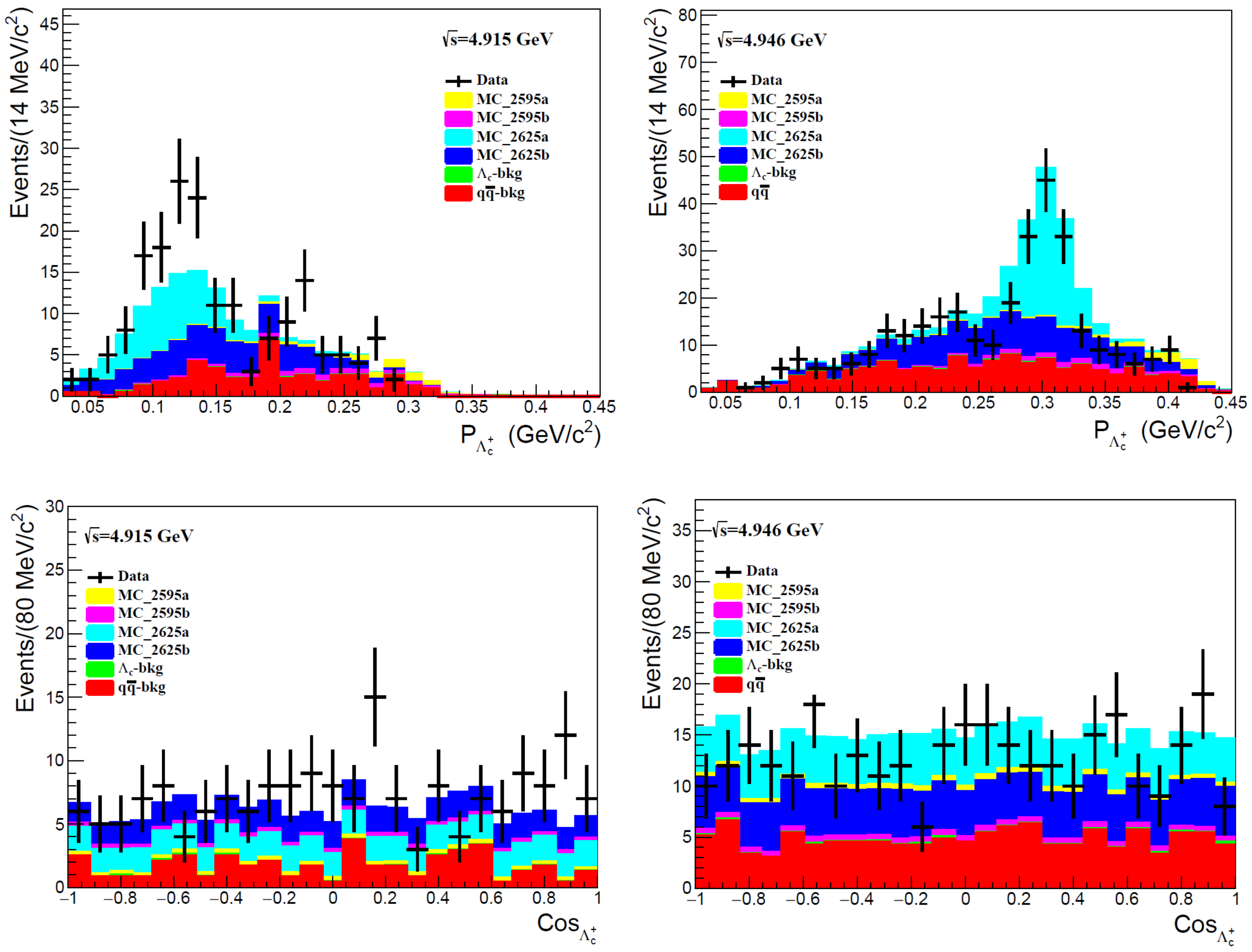




Comparison between data and MC

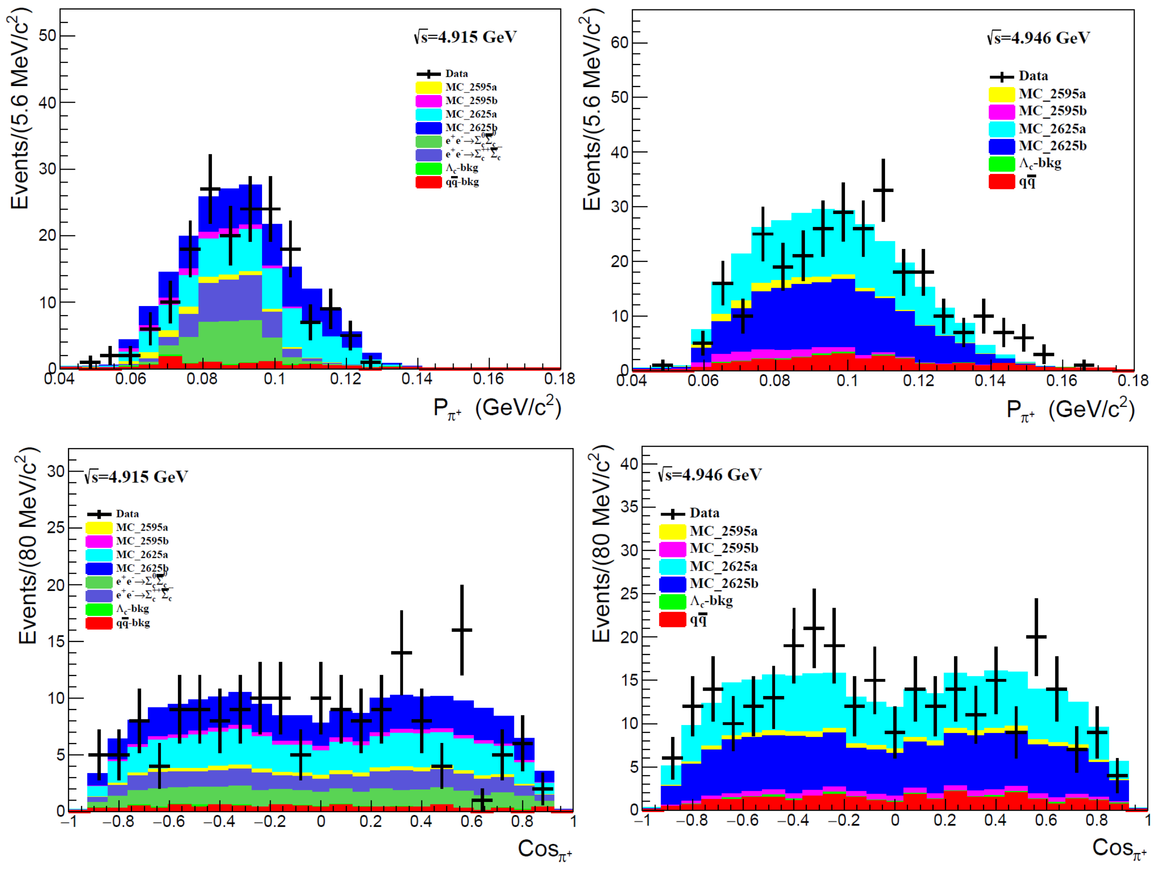


After considering the contribution of $\Sigma_c\bar{\Sigma}_c$ pairs



Before

Comparison between data and MC



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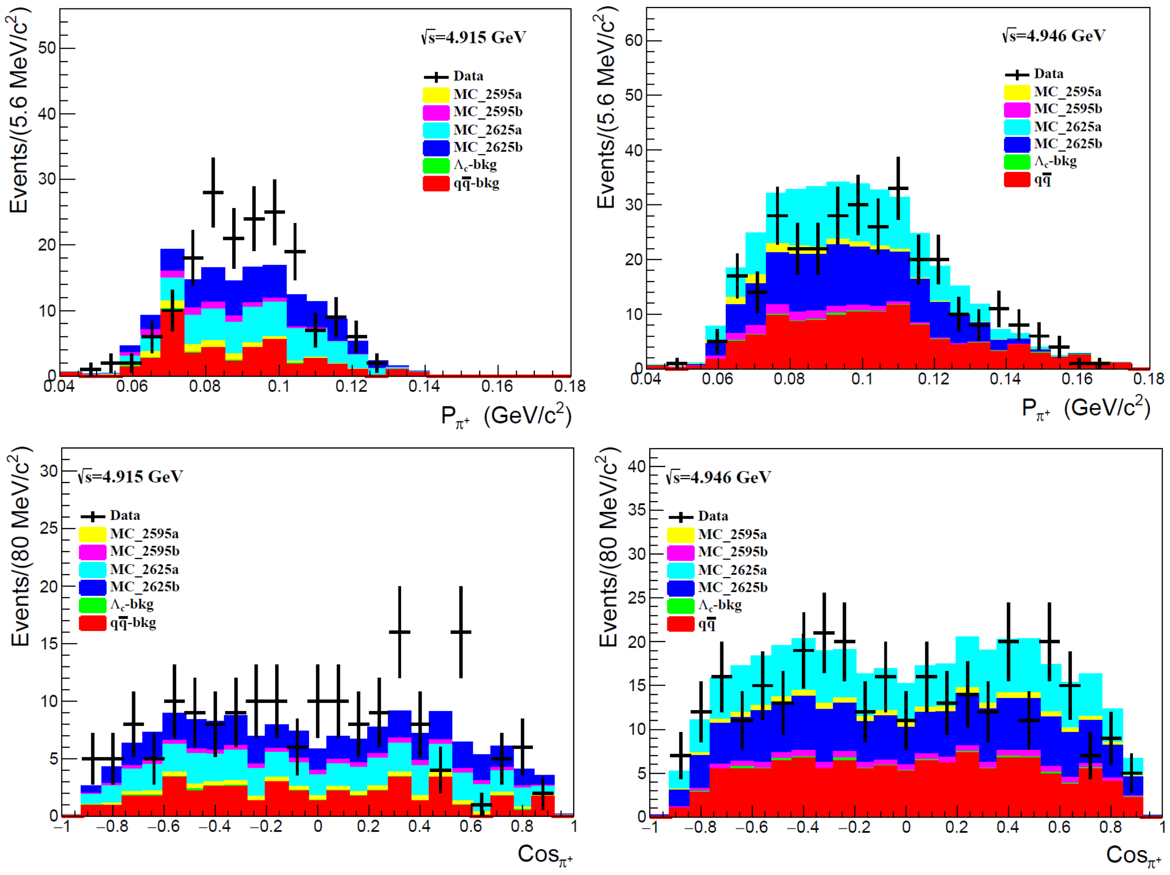

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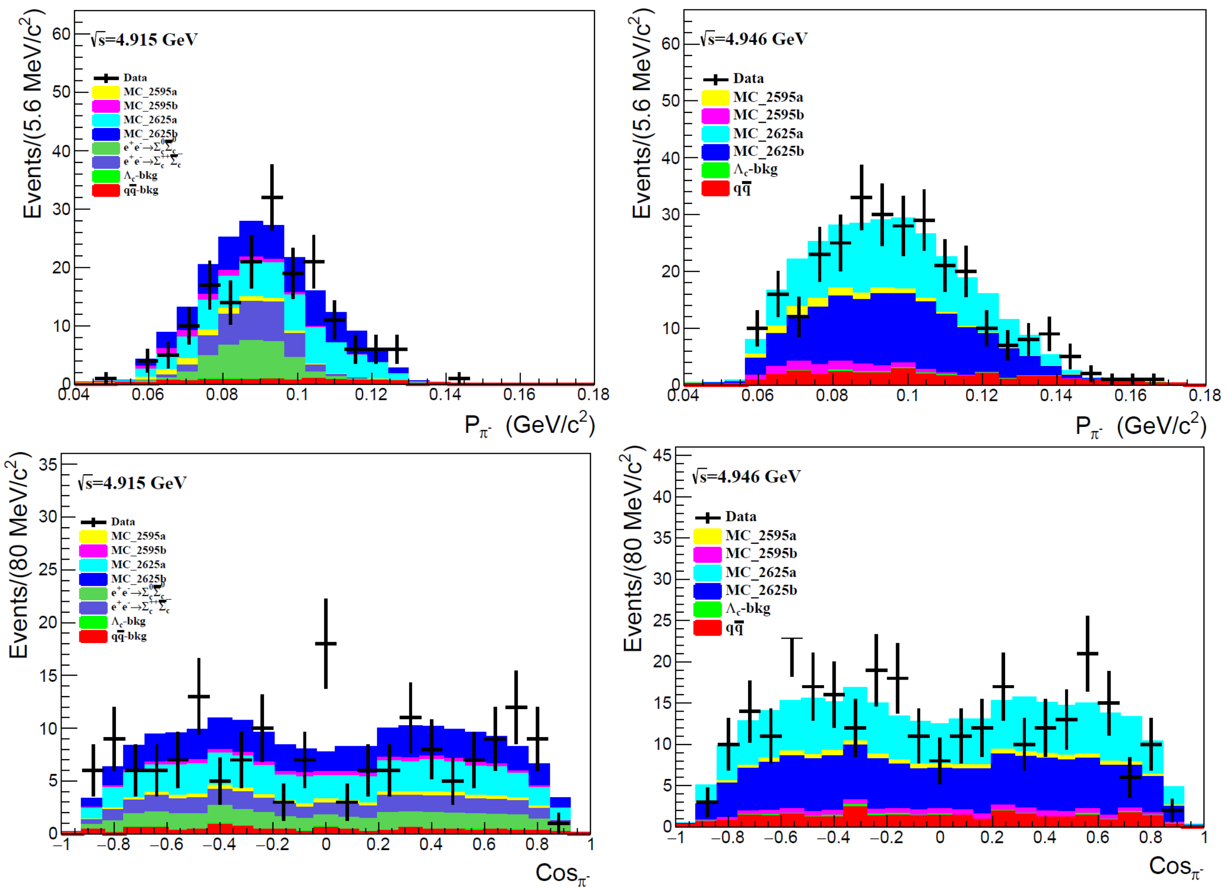

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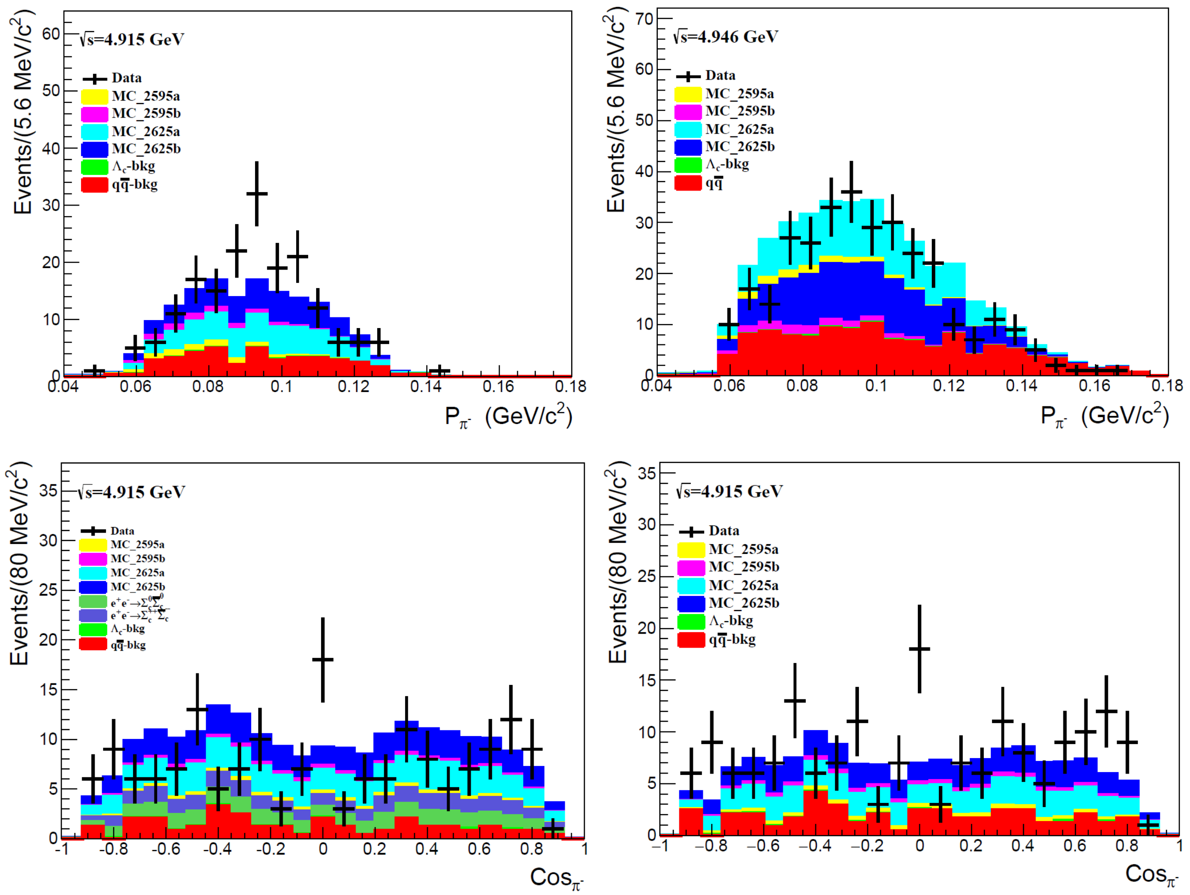

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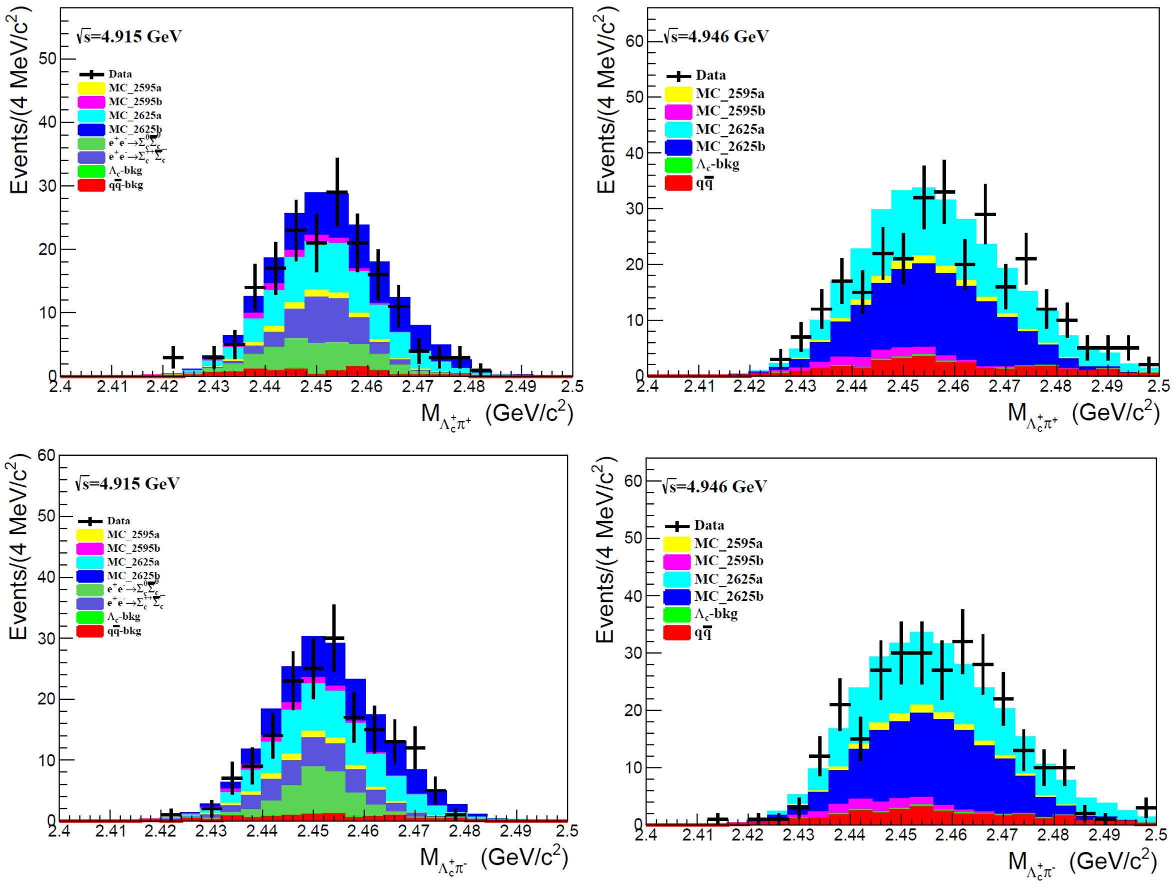

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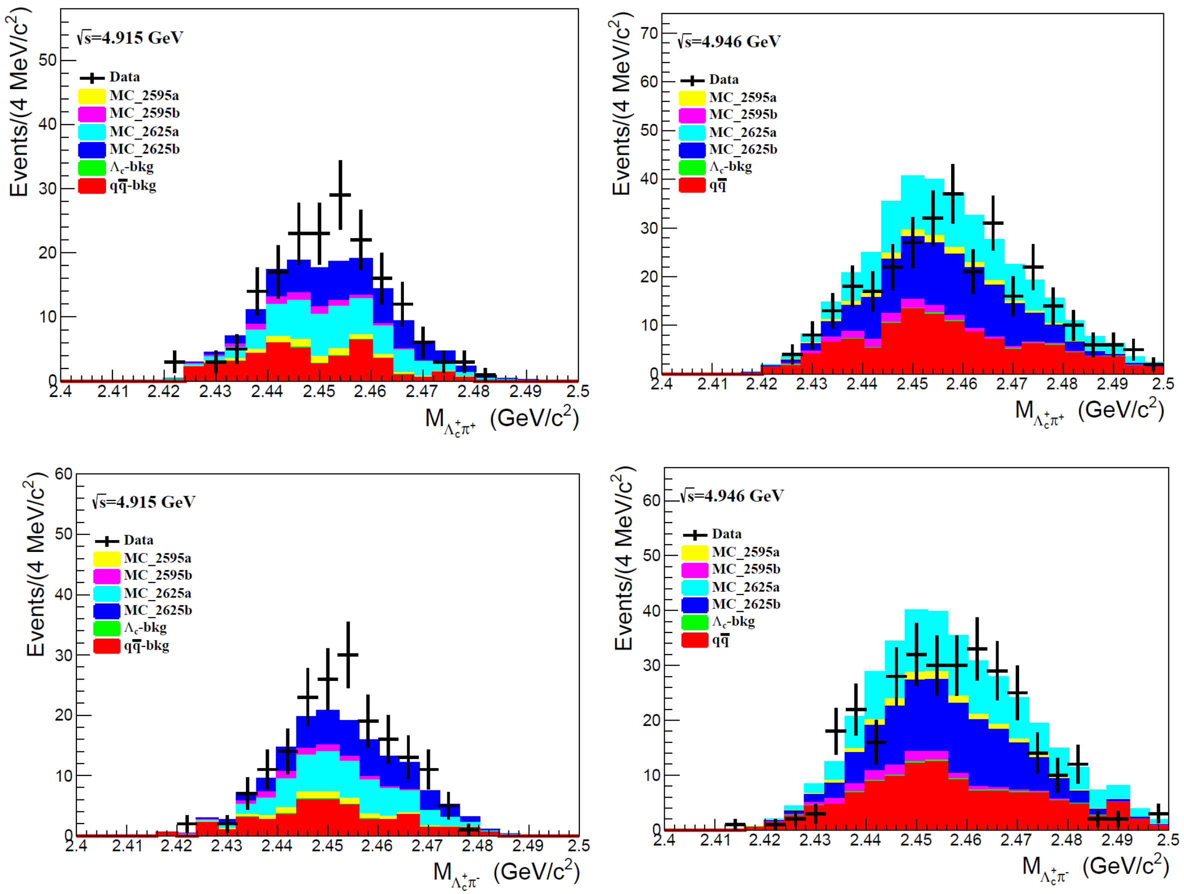

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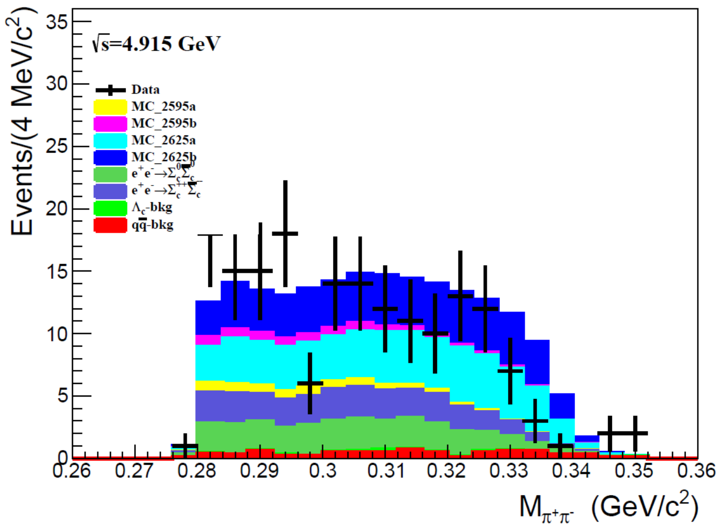

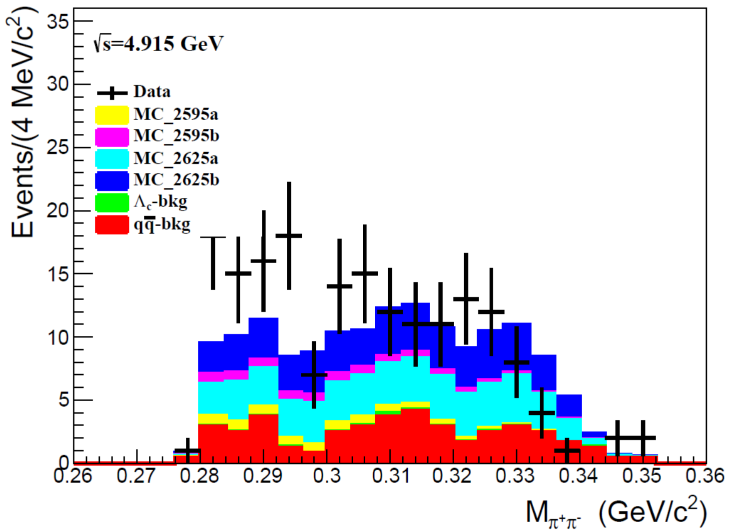

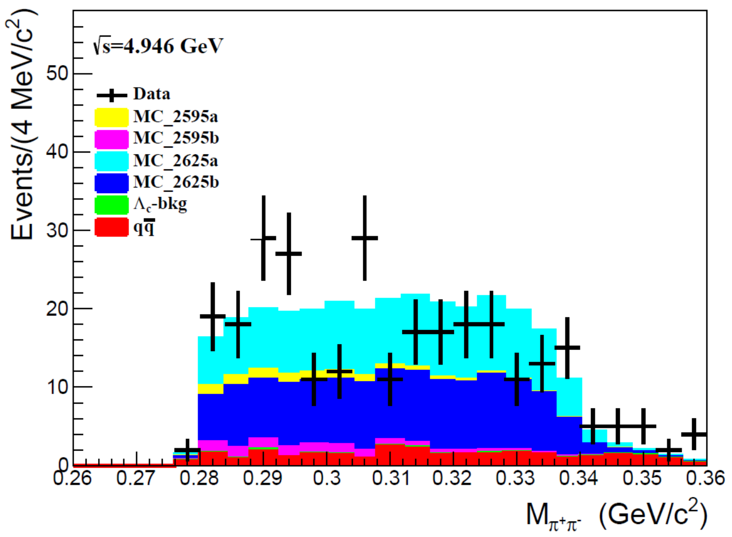

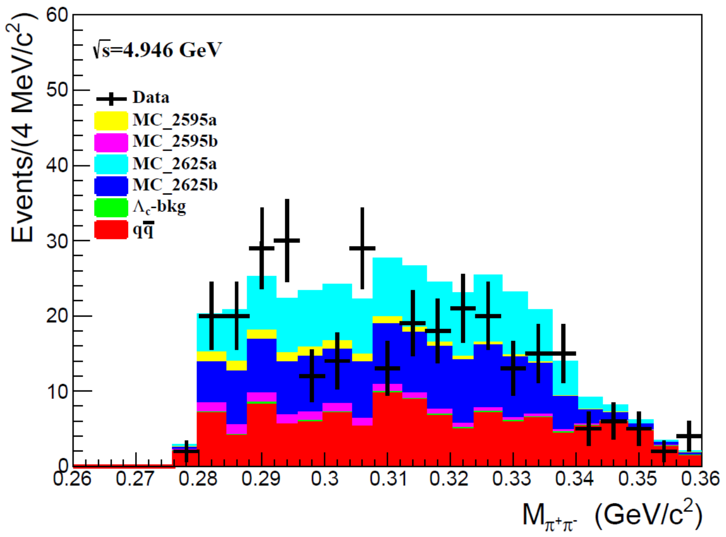

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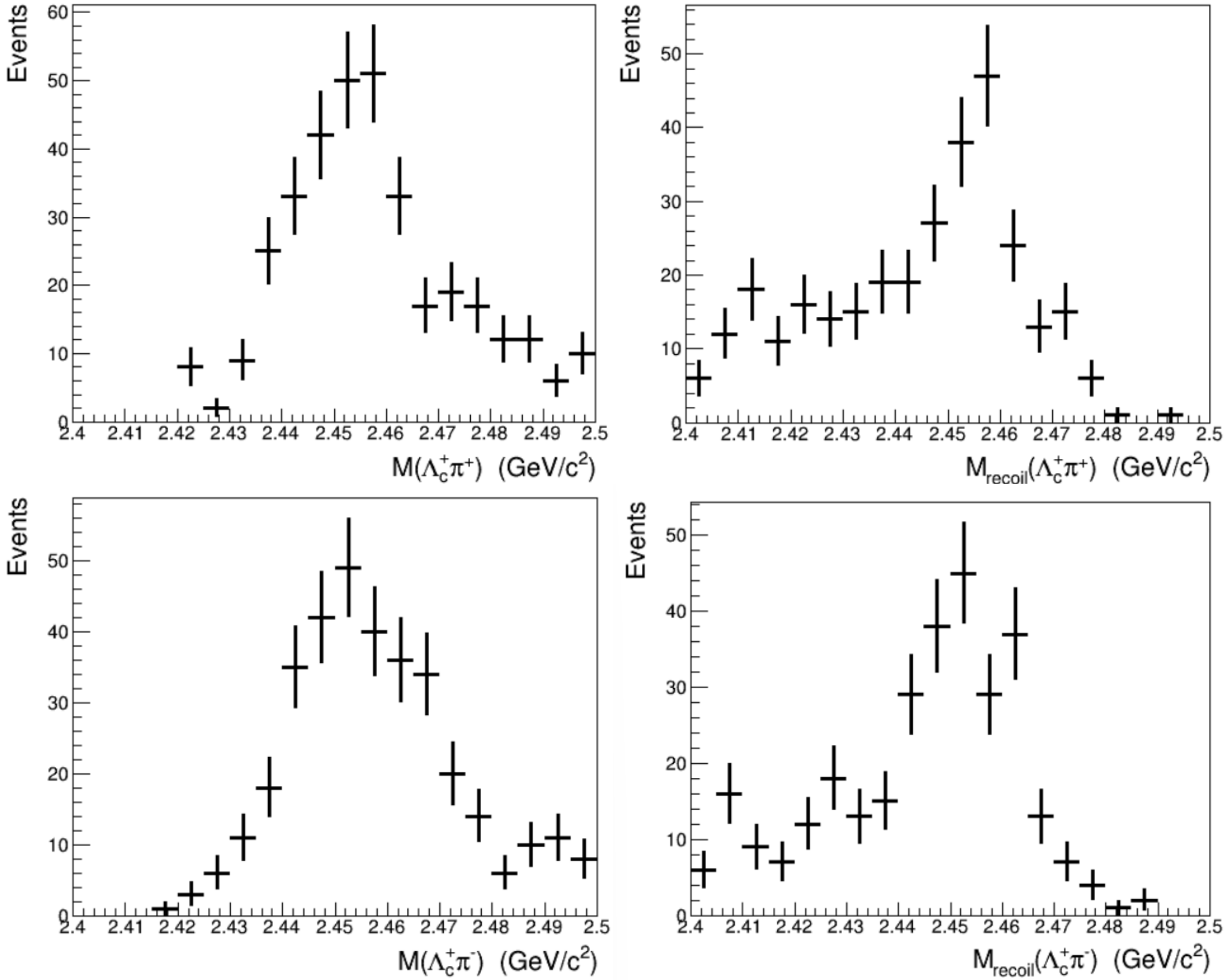
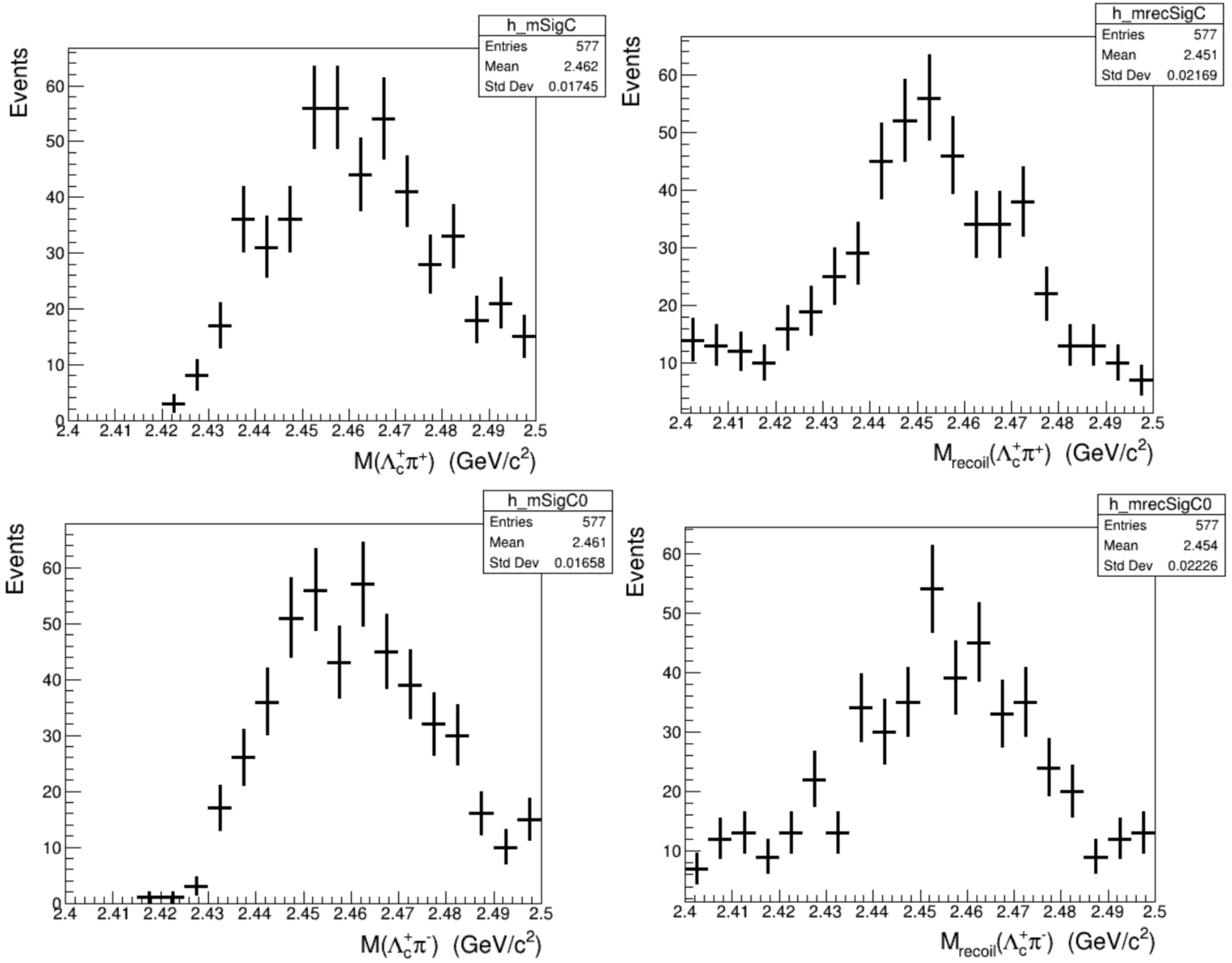
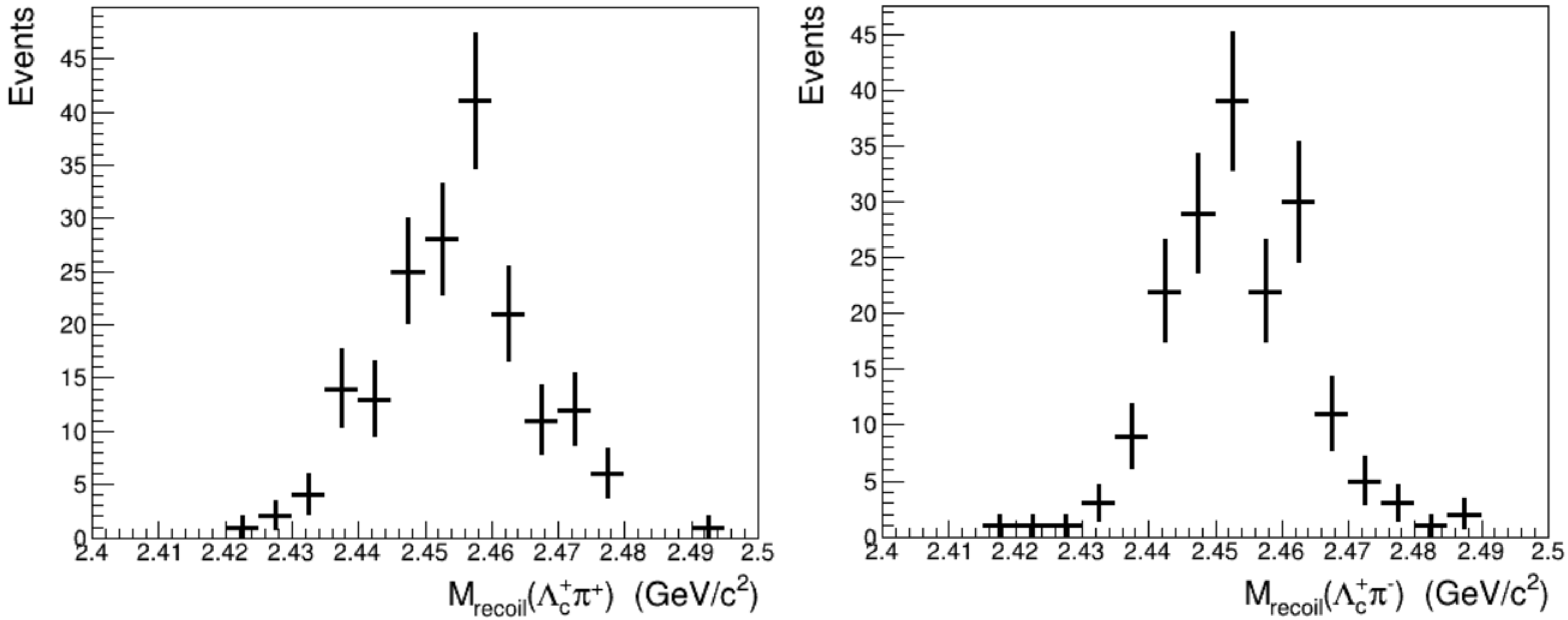


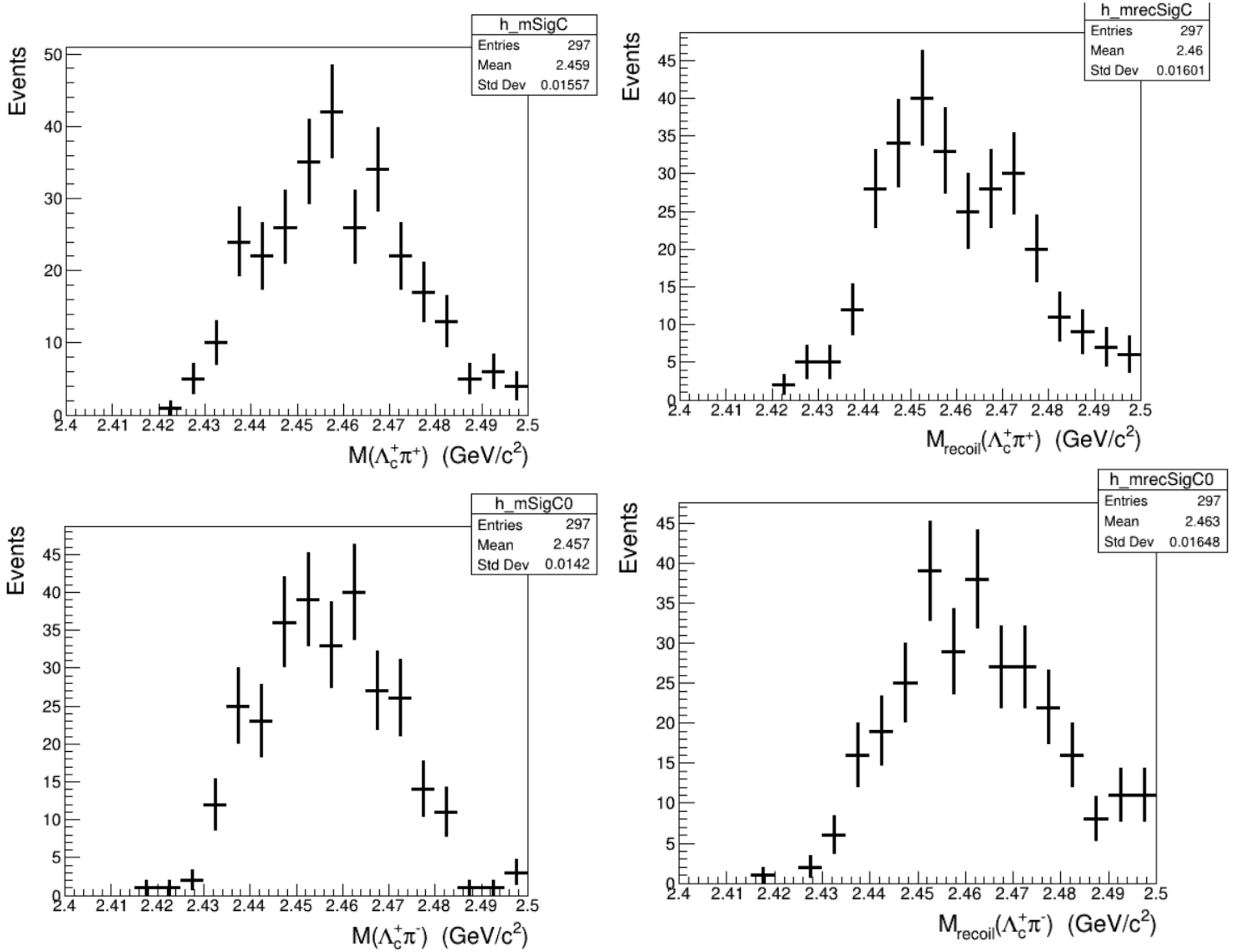
$$\Delta M > -0.1, \sqrt{s} = 4.915\ \mathrm{GeV}$$



$$\Delta M > -0.1, \sqrt{s} = 4.946\ \mathrm{GeV}$$



$$\Delta M > -0.02, \sqrt{s} = 4.915\ \text{GeV}$$



$$\Delta M > -0.02, \sqrt{s} = 4.946\ \mathrm{GeV}$$