Measurement of the branching fraction of $\eta_c \to K_S^0 K\pi$

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Overview

Event Selections

Good Charged tracks selections

- $V_{xy} < 1cm$, $|V_z| < 10cm$ (except for the two tracks from K_S^0)
- $|\cos\theta < 0.93|$

Good phton selections($1 \leq N_\gamma \leq 20$)

- $E_\gamma > 25MeV$ for $|\cos\theta| < 0.8$
- $E_\gamma > 50MeV$ for $0.86 < |\cos\theta| < 0.92$
- $0 \leq TDC \leq 14$(in unit of $50ns$)

Event Selections

To improve the efficiency of selections, we assume the following charged tracks as pions

K_S^0 Reconstruction($N_{K_S^0} \geq 1$)

- $L/\sigma_L > 2$(L: decay length; σ_L: error of decay length)
- $|m_{\pi^+\pi^-}^{invariant} - m_{K_S^0}| \leq 20MeV$

$\gamma\pi^+\pi^-$ list

- $3.45 < m_{\pi^+\pi^-}^{recoil} < 3.65GeV$
- $2.8 < m_{\pi^+\pi^-\gamma}^{recoil} < 3.2GeV$

Another π^+K^- or π^-K^+ pair is required
Combination with the minimum $\chi^2 = \chi^2_{4C} + \sum_{i=1}^{N} \chi^2_{PID}(i)$ is kept

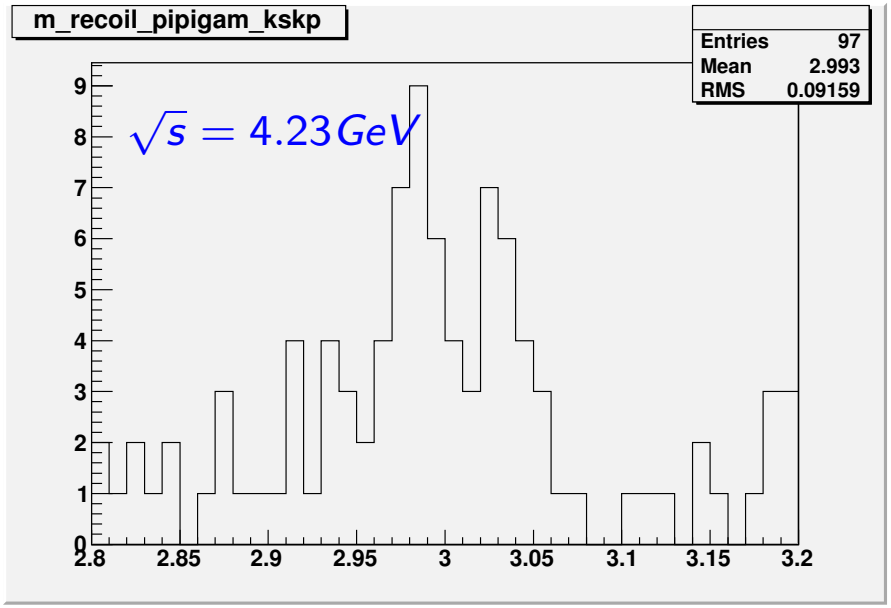
Optimized Selections

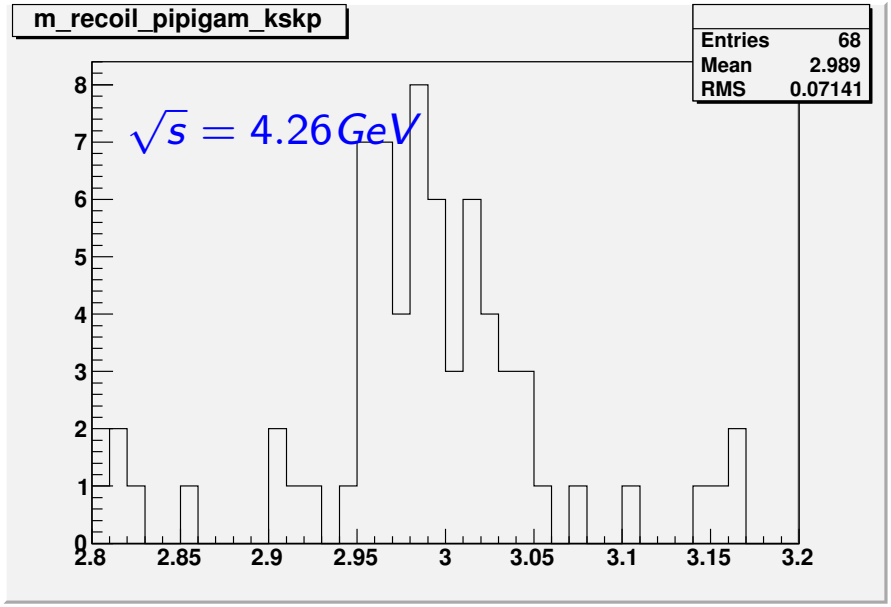
The χ^2_{4C} cut is optimized with the figure of merit(FOM)$\frac{S}{\sqrt{S+B}}$, and the optimized selections are presented below:

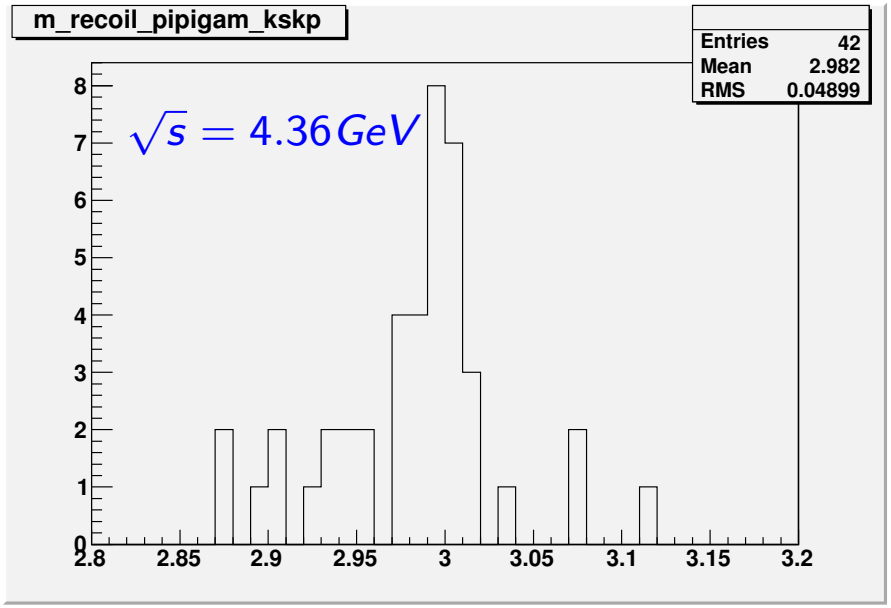
χ^2 Cut ($3.515 < M^{recoil}_{\pi^+\pi^-} < 3.535$)

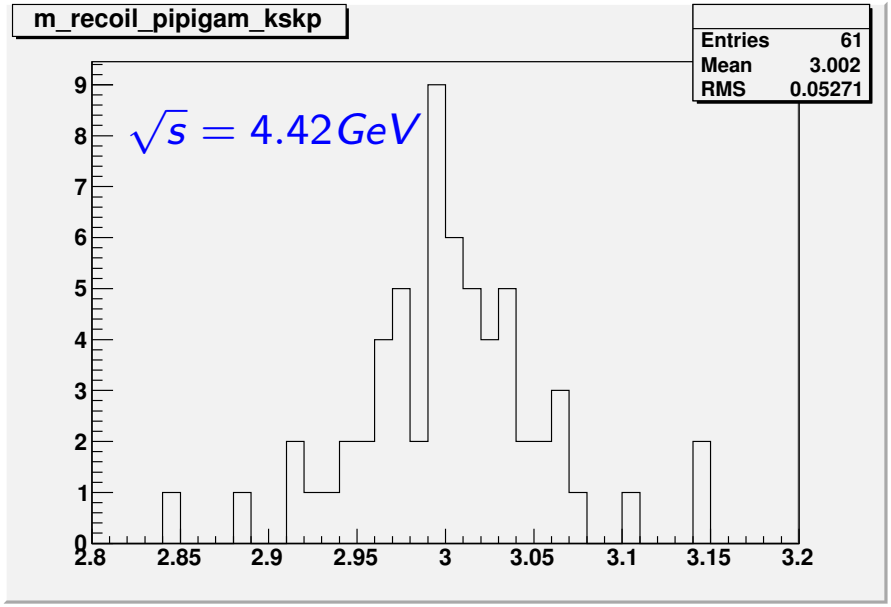
- $\sqrt{s} = 4.23 GeV$: $\chi^2_{4C} < 65$;
- $\sqrt{s} = 4.26 GeV$: $\chi^2_{4C} < 50$;
- $\sqrt{s} = 4.36 GeV$: $\chi^2_{4C} < 25$;
- $\sqrt{s} = 4.42 GeV$: $\chi^2_{4C} < 30$;

Results of $M^{recoil}_{\pi^+\pi^-\gamma}$









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- $0 \leq TDC \leq 14$(in unit of $50ns$)

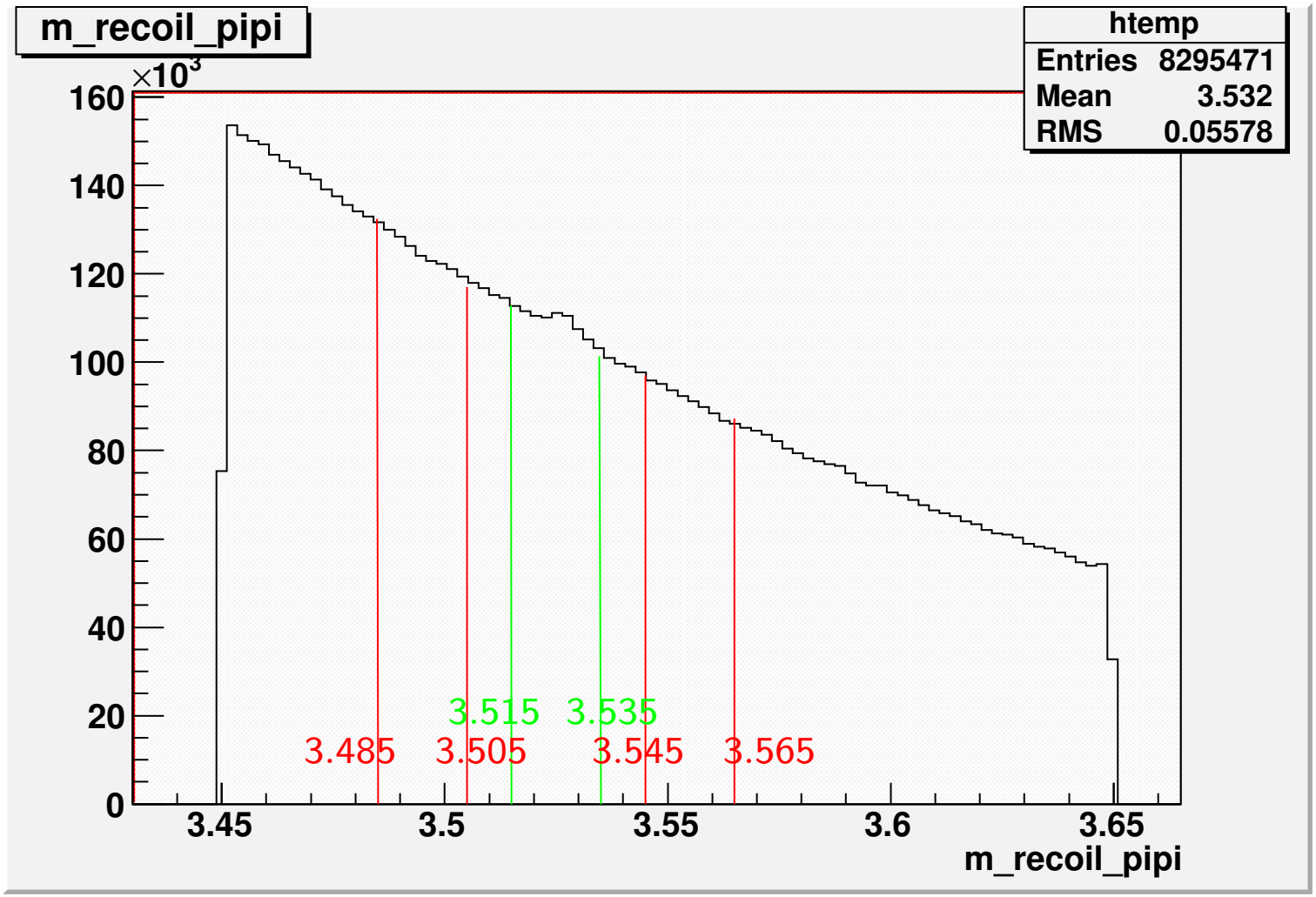
We use the $\gamma\pi^+\pi^-$list to recoil the η_c and h_c signal

$\gamma\pi^+\pi^-$ list

- $3.45 < m^{recoil}_{\pi^+\pi^-} < 3.65GeV$
- $2.8 < m^{recoil}_{\pi^+\pi^-\gamma} < 3.2GeV$

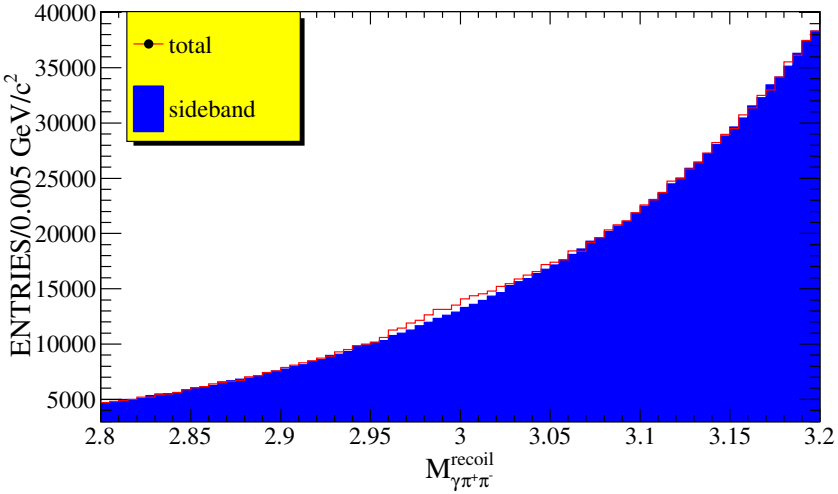
sideband

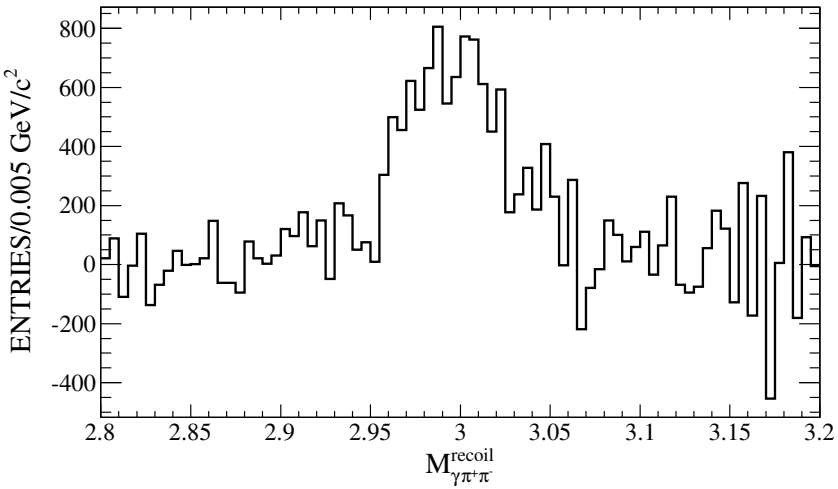
We use the sideband method to analyze the results



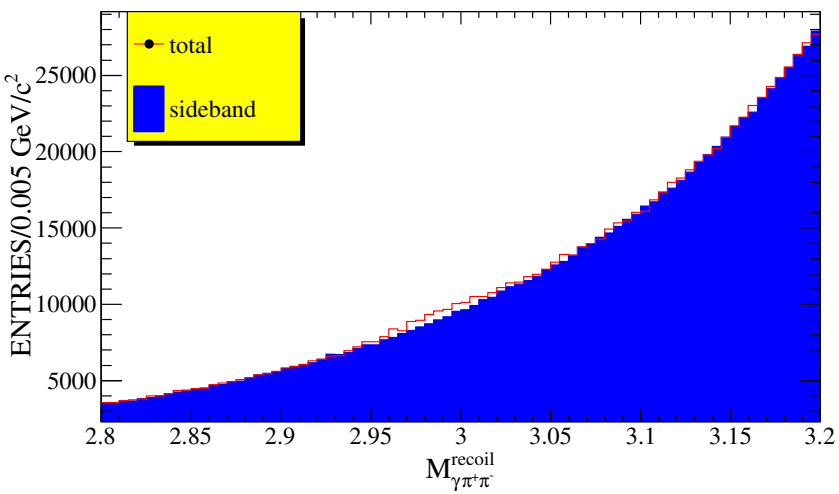
results of sideband $M^{recoil}_{\pi^+\pi^-\gamma}$

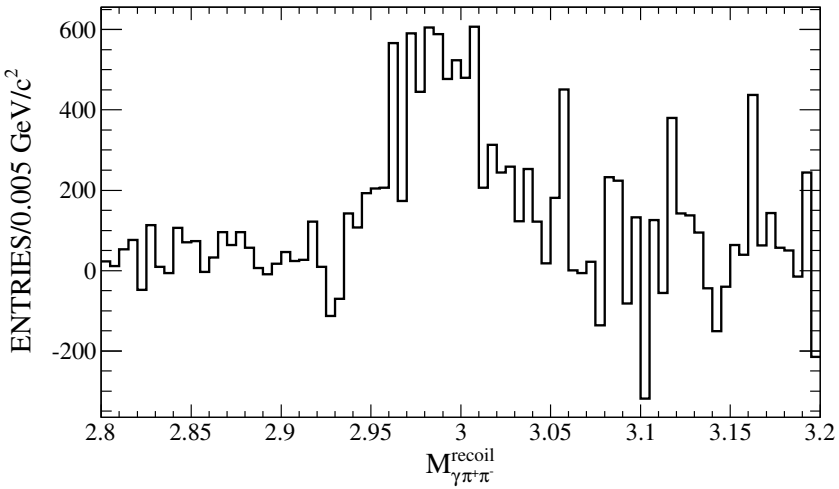
$\sqrt{s} = 4.23 GeV$





$\sqrt{s} = 4.26 GeV$

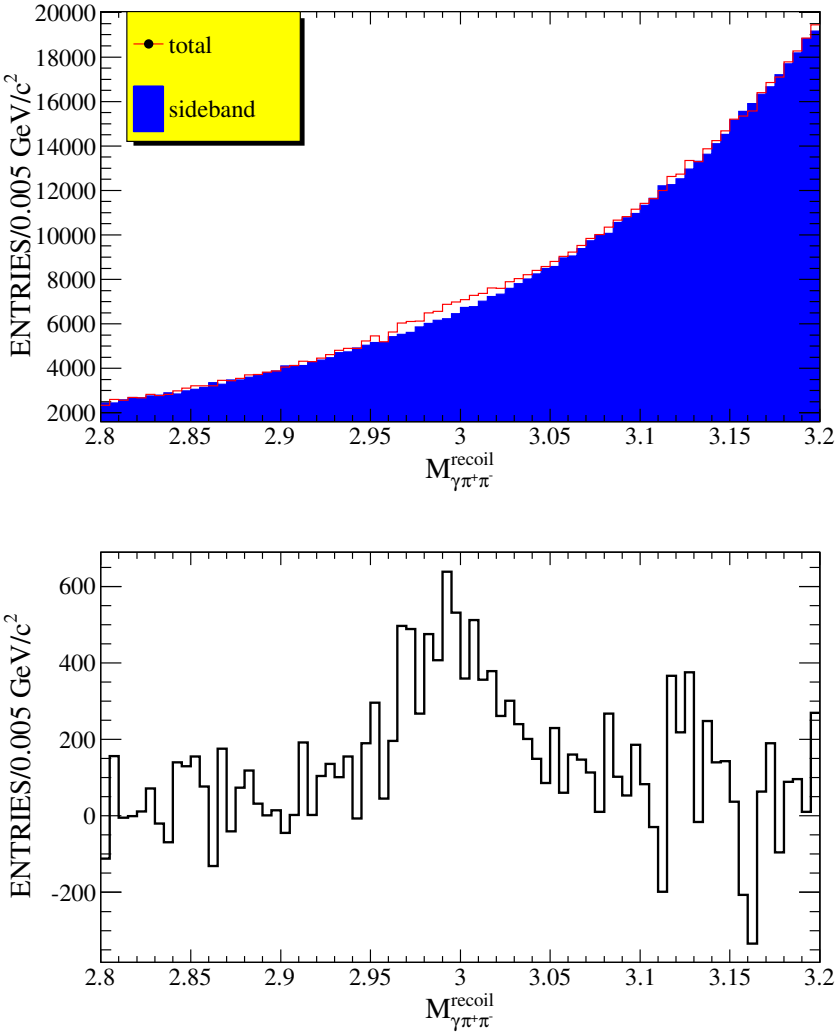




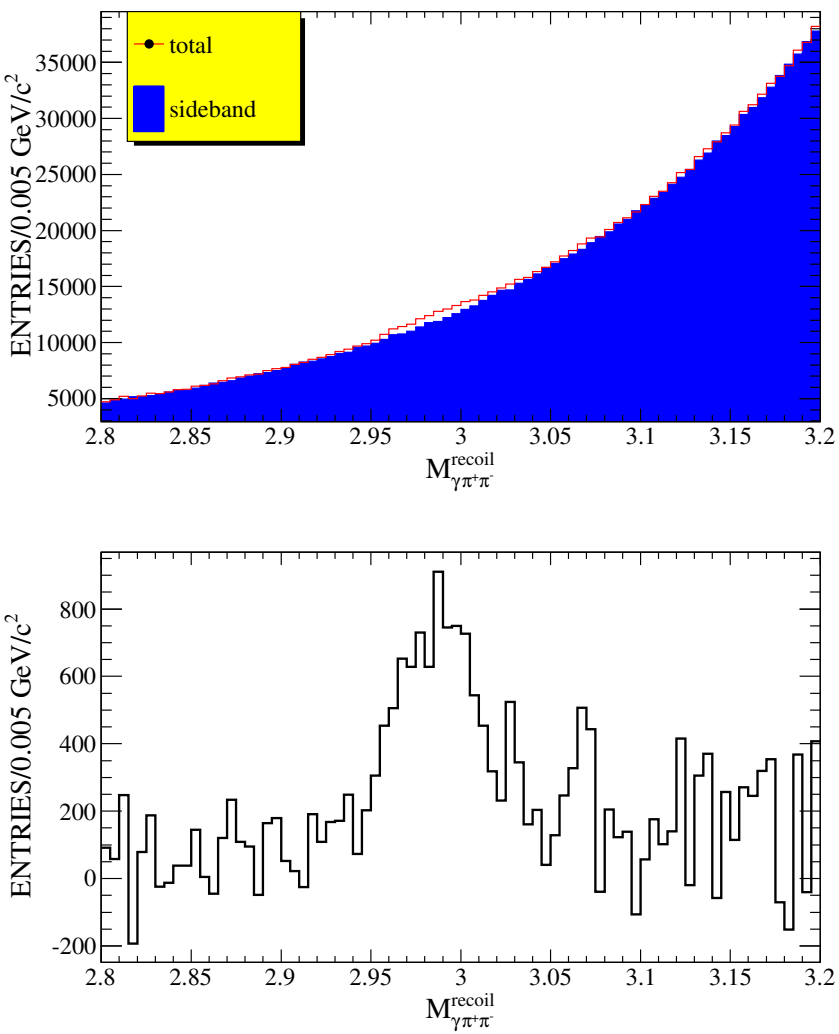
The upper ones draw the sideband and signal regions together, while the lower ones draw net events

results of sideband $M^{recoil}_{\pi^+\pi^-\gamma}$

$\sqrt{s} = 4.36 GeV$



$\sqrt{s} = 4.42 GeV$



The upper ones draw the sideband and signal regions together, while the lower ones draw net events

summary of the exclusive process

- The signal of the exclusive process is clear

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- The signal of the inclusive process is observable, but the background is somehow too thick

We have been working on results fitting yet the results are not ready And we will get the efficiency afterwards