

Progress

$J/\psi \rightarrow e^+e^-\pi^0$ decay

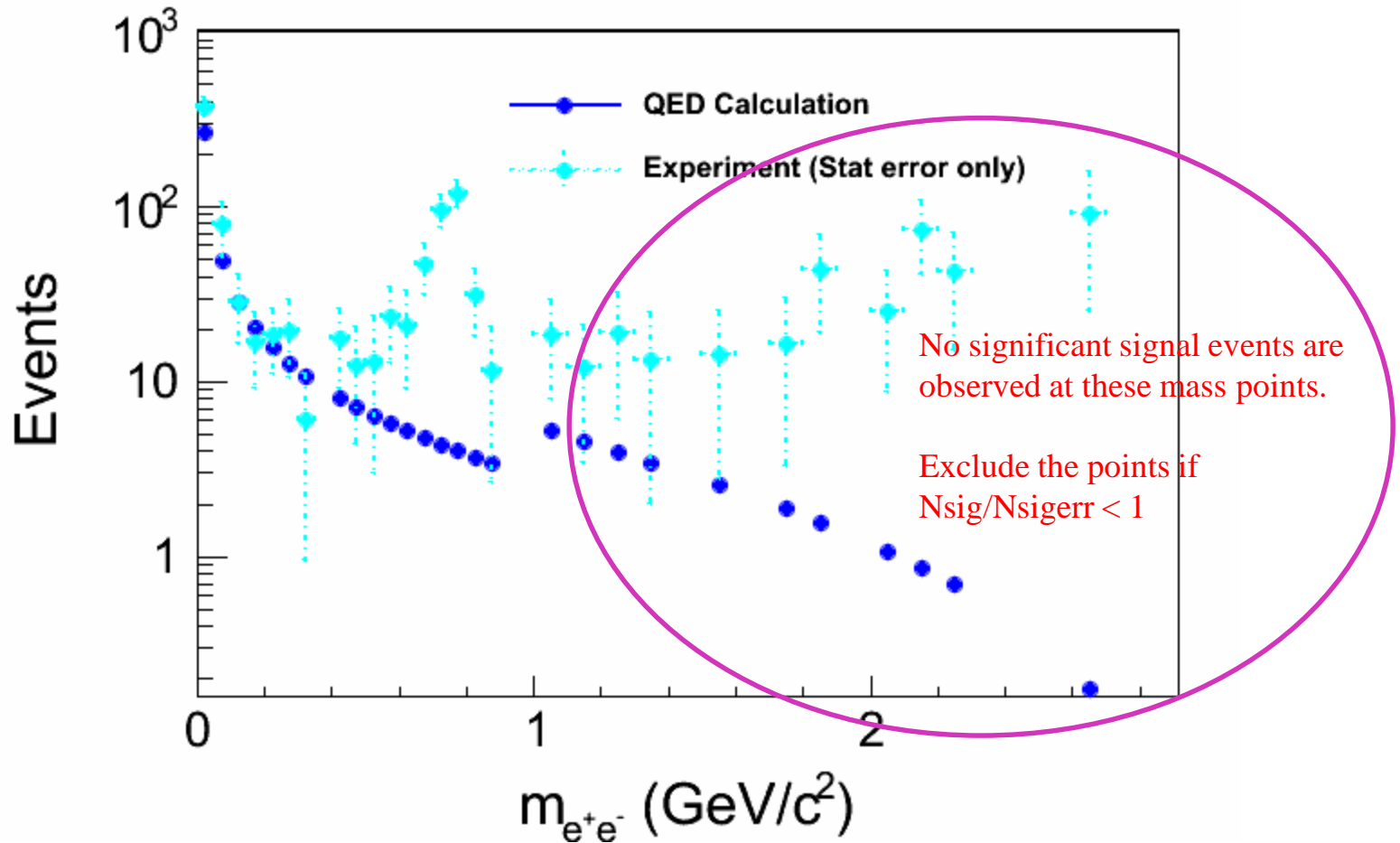
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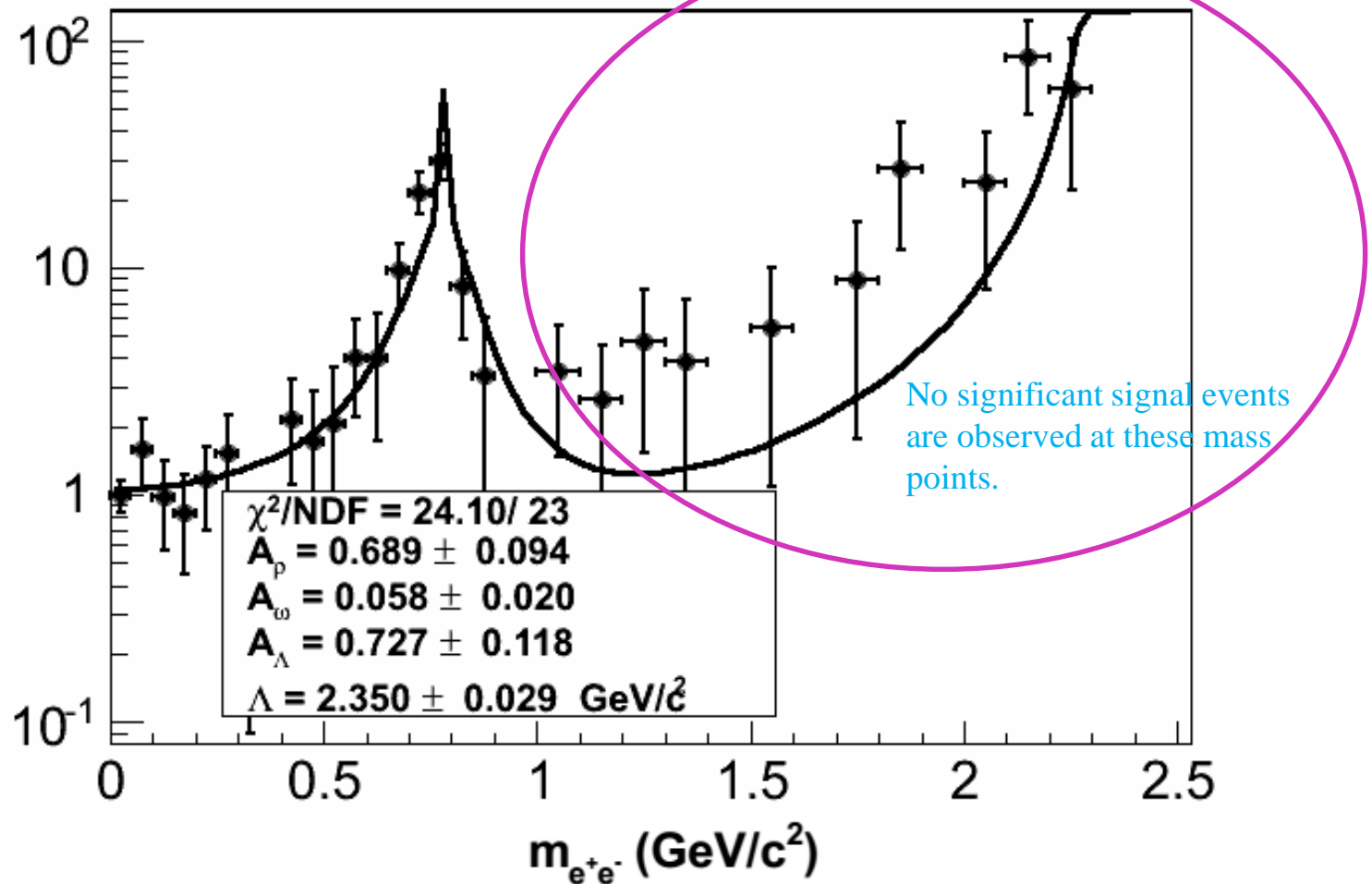


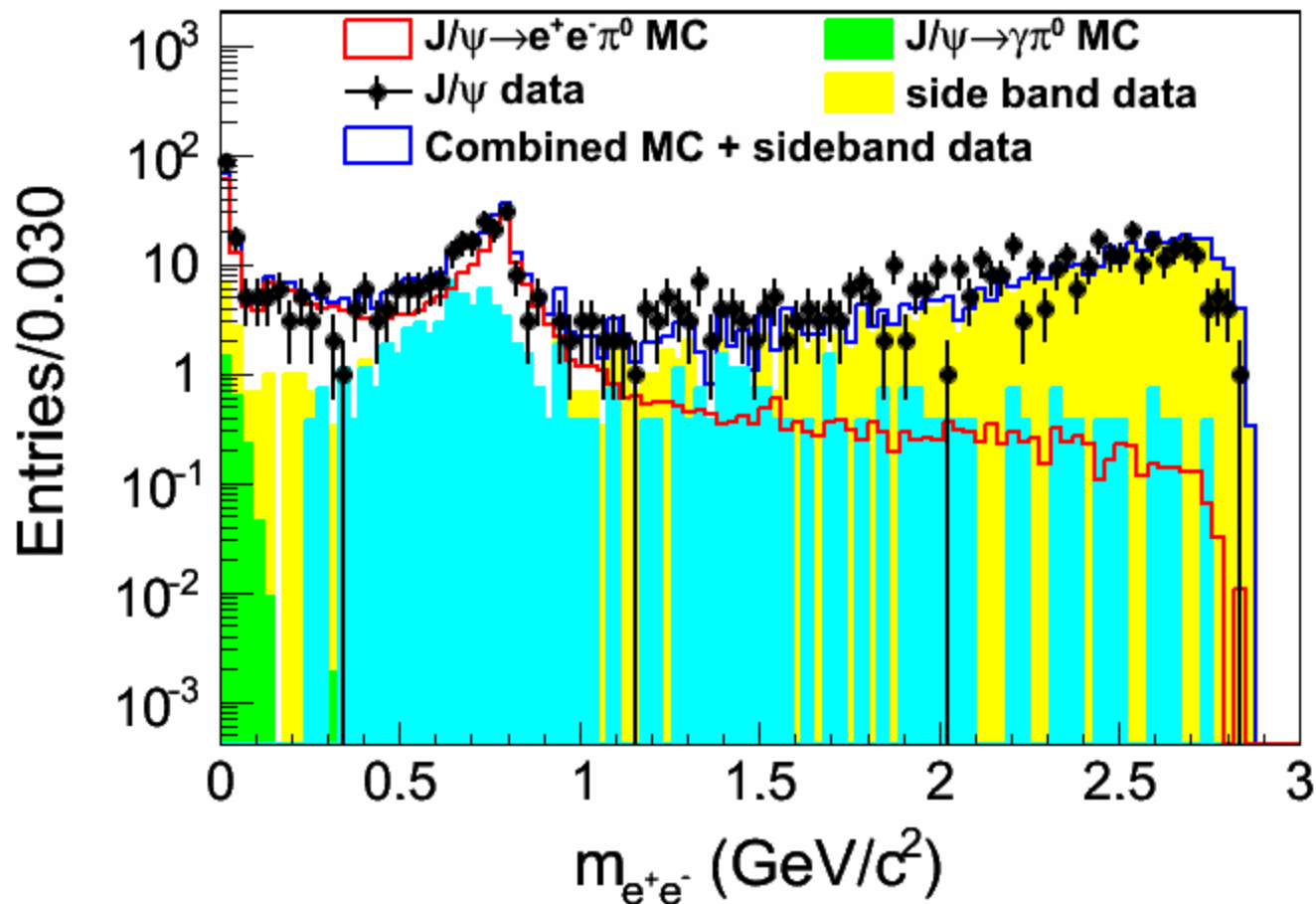
Efficiency corrected signal yield



TFF vs. $m_{e^+e^-}$ curve

$$F_{VP}(m_{l^+l^-}^2) = N \sum_{V'} A_{V'} \frac{m_{V'}^2}{m_{V'}^2 - m_{l^+l^-}^2 - i\Gamma_{V'} m_{V'}}$$

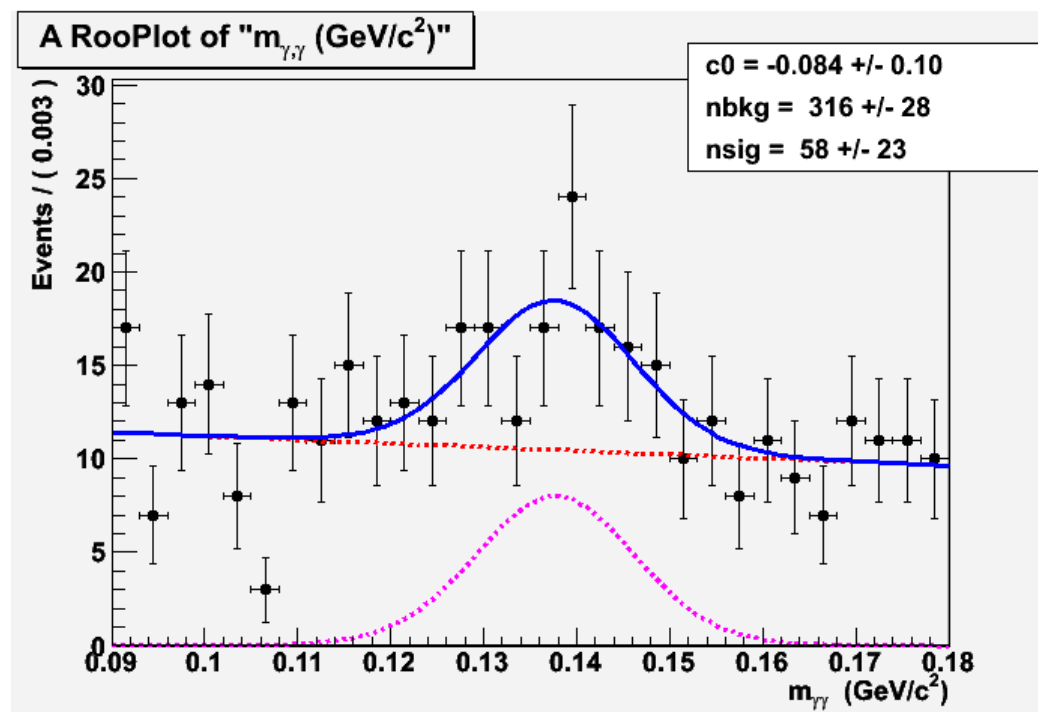




Generate the signal MC with the function of the measured TFF curve, but the pole mass (Λ) is kept to 3.097 GeV.

Difference between the efficiency values to be calculated with $\Lambda = 2.35$ GeV and $\Lambda = 3.097$ GeV as a systematic uncertainty.

Background study: Two photon process of $e^+e^- \rightarrow e^+e^-\pi^0$ @ J/ψ



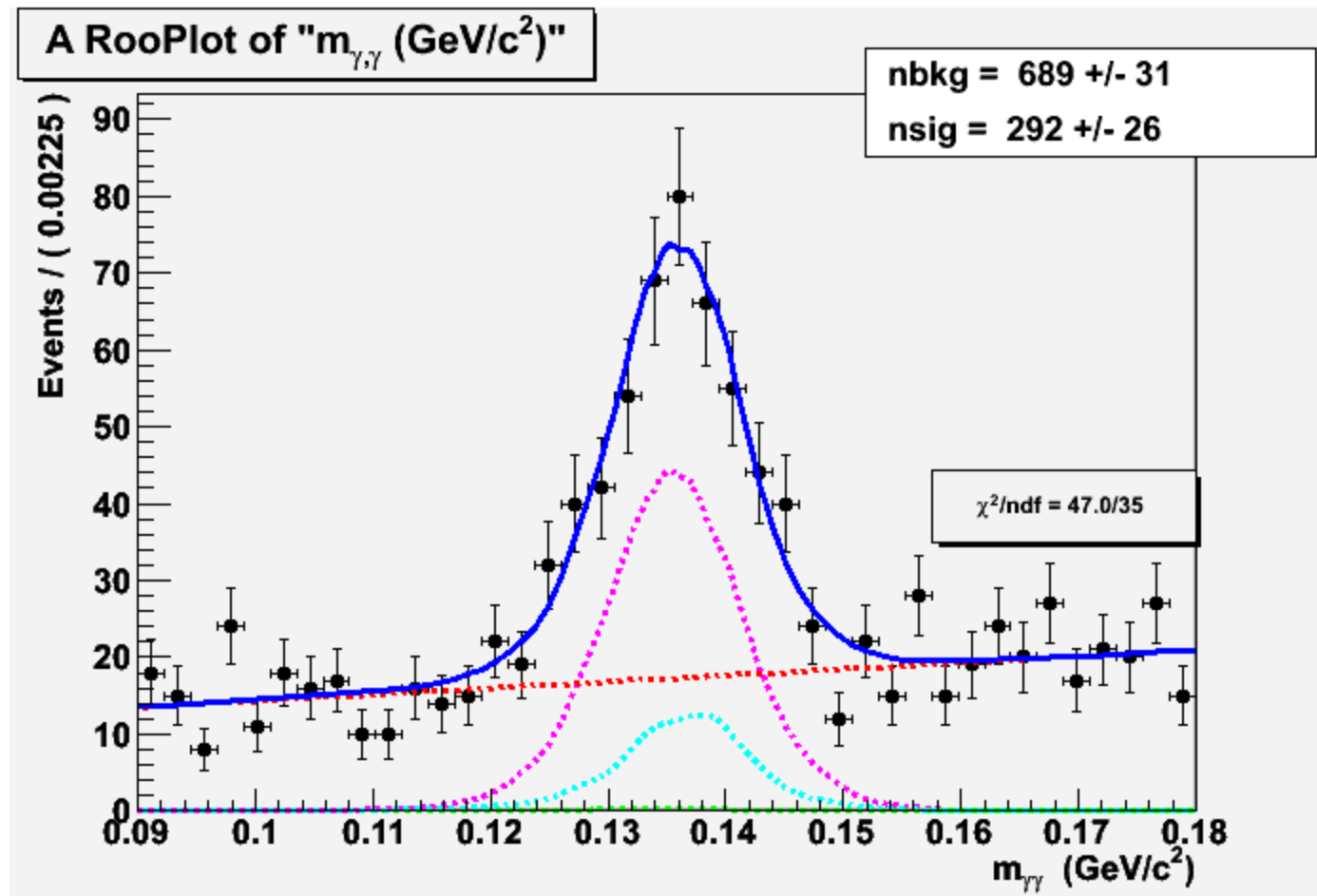
$$\frac{d\sigma^{(0)}}{dsd\Gamma} = 2 \left(\frac{\alpha}{\pi} \right)^2 \frac{1}{s} \ln^2 \frac{E}{m_e} f\left(\frac{\sqrt{s}}{2E}\right) \frac{d\sigma_{\gamma\gamma \rightarrow X(s)}}{d\Gamma},$$

$$f(\gamma) = -(2 + \gamma^2)^2 \ln \gamma - (1 - \gamma^2)(3 + \gamma^2),$$

$$f = \frac{N_{J/\psi}}{N_{\psi(3770)}} = \frac{L_{J/\psi}}{L_{\psi(3770)}} \cdot \frac{\sigma_{(e^+e^- \rightarrow e^+e^-\pi^0)}^{J/\psi}}{\sigma_{(e^+e^- \rightarrow e^+e^-\pi^0)}^{\psi(3770)}} \approx 0.14$$

- The normalized two photon $e^+e^- \rightarrow e^+e^-\pi^0$ peaking background contribution in J/ψ data is:
 $(58 \pm 23) \times 0.14 = 8.11 \pm 3.22$ events

Projection plot



N_{sig} (after subtracting the background from the two photon process) = **283.89 ± 26.20** events

Projection plot

$$\mathcal{B}(J/\psi \rightarrow e^+e^-\pi^0) = \frac{N_{sig}}{eff \cdot \mathcal{B}(\pi^0 \rightarrow \gamma\gamma) \cdot N_{J/\psi}}$$

$$eff = 27.43\%$$

$$\mathbf{B(J/\psi \rightarrow e^+e^-\pi^0) = (7.99 \pm 0.738) \times 10^{-7}}$$