

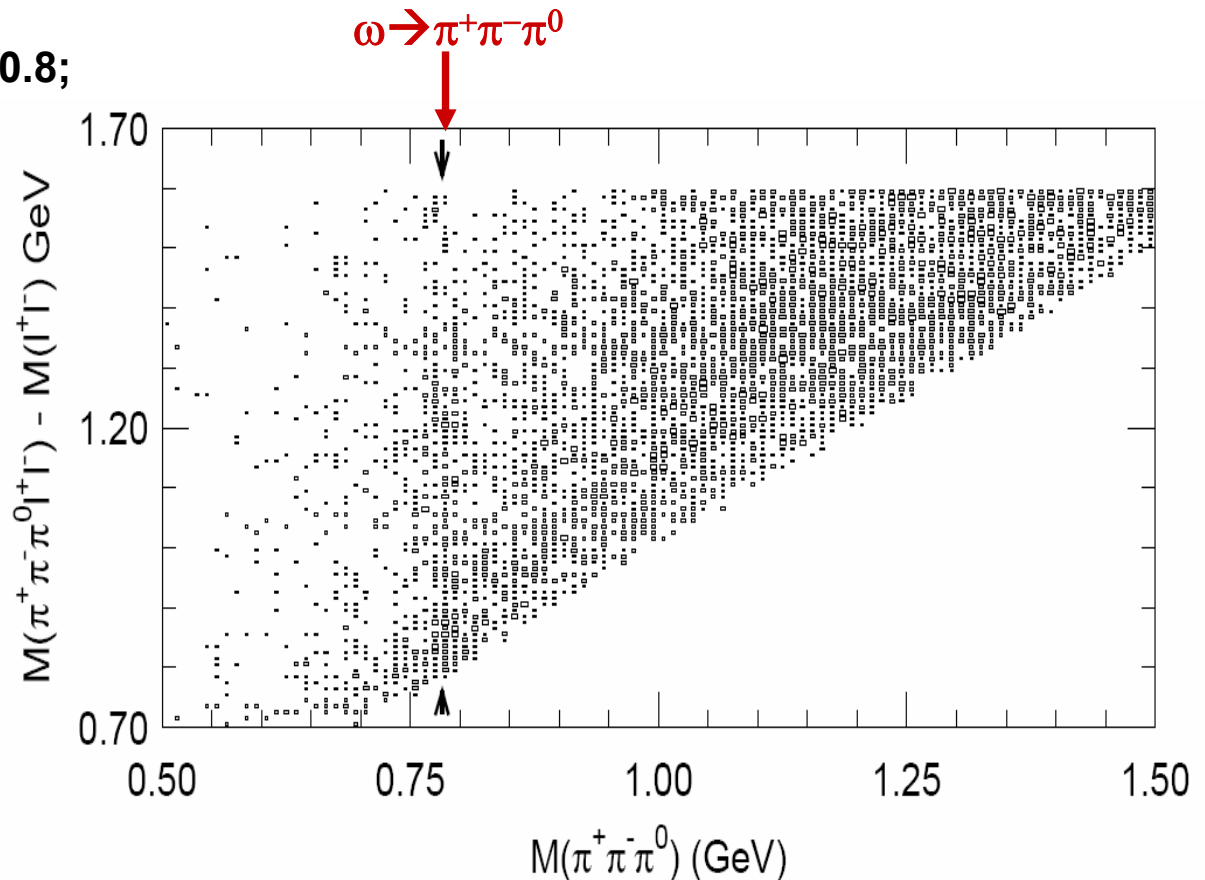
**Observation of a  
near-threshold enhancement  
in the  $\omega J/\psi$  mass spectrum  
from  $B \rightarrow K \omega J/\psi$  decays**

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# Select $B \rightarrow K \pi^+ \pi^- \pi^0 J/\psi$ events

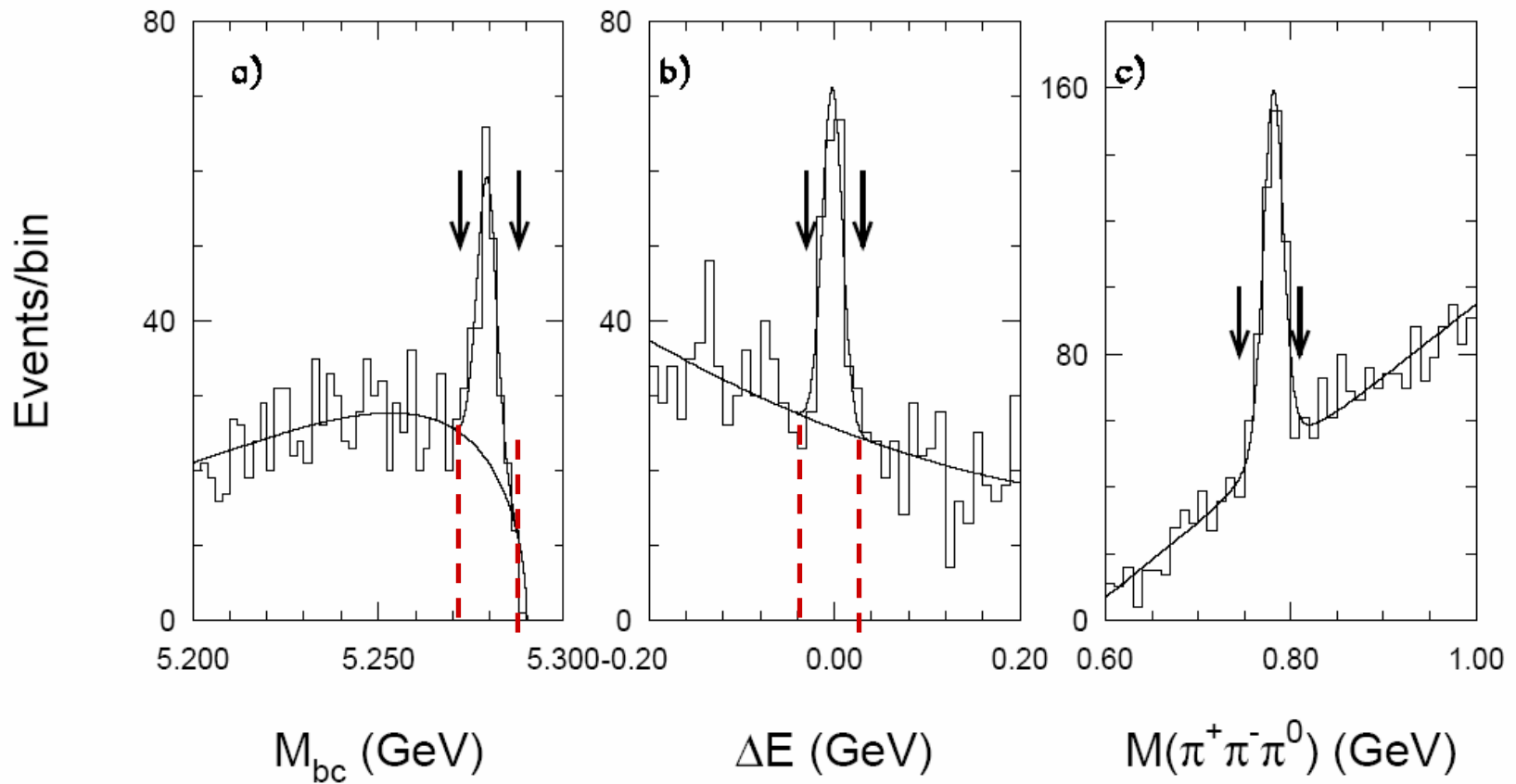
- $J/\psi$ :  $\text{PID}_{\mu^+} > 0.8$   $\text{PID}_{\mu^-} > 0.8$ ;  
 $M_{\mu^+\mu^-} - M_{J/\psi} < 20 \text{ MeV}$
- $K^+$ :  $\text{PID}_{K^+} > 0.5$   
 $K_S$ :  $|M_{\pi^+\pi^-} - M_K| < 12 \text{ MeV}$
- $\chi^2(\pi^0 \rightarrow \gamma\gamma) < 6.0$   
 $p_{\pi^0} > 180 \text{ MeV}$   
 $M_{\pi^+\pi^-} > 300 \text{ MeV}$
- $|M_{bc} - M_B| < 7.5 \text{ MeV}$   
 $|\Delta E| < 30 \text{ MeV}$
- $r_2 < 0.4$ ;  $|\cos\theta_B| < 0.8$
- veto  $\psi' \rightarrow \pi^+\pi^- J/\psi$
- $0.750 < M(\pi^+\pi^-\pi^0) < 0.805 \text{ GeV}$



Data sample E7  $\rightarrow$  E35  
 +2/3<sup>rd</sup> s of E37;  $\sim 230 \text{ fb}^{-1}$



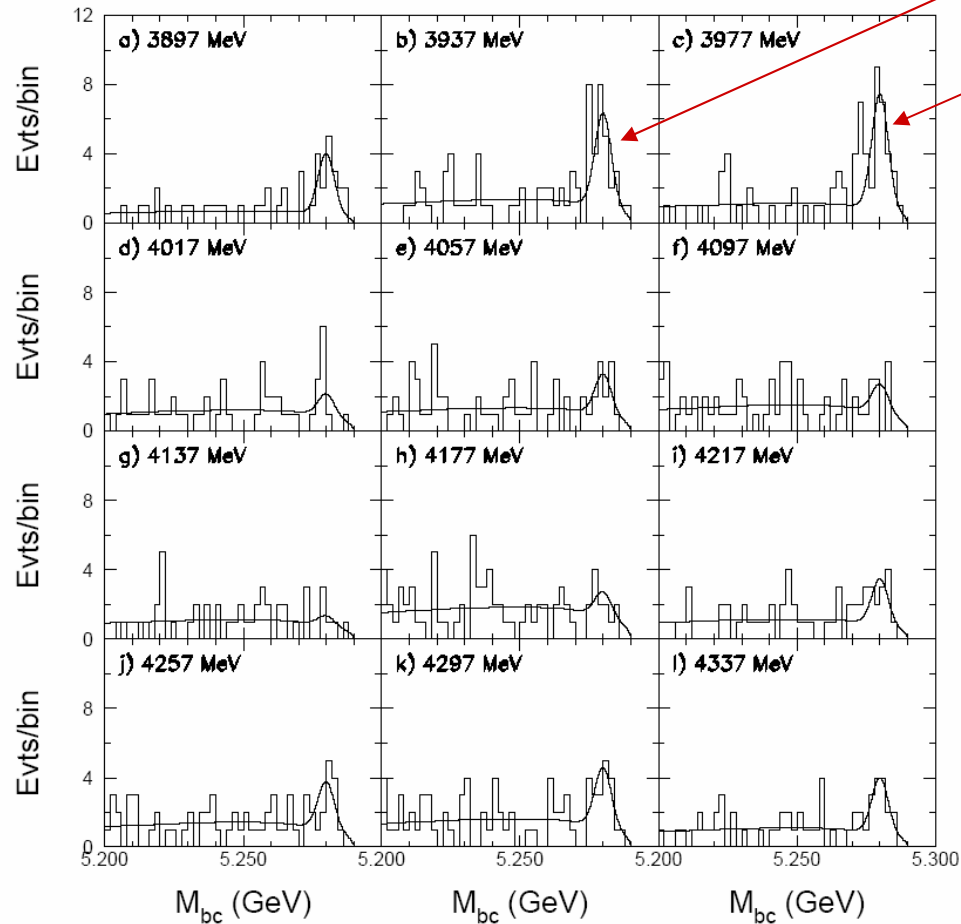
# $M_{bc}$ , $\Delta E$ & $M_{\pi^+\pi^-\pi^0}$ (for $M_{K\omega} > 1.6$ GeV)



**~130 signal events  
& 150 bkgnd events**

# Fit $M_{bc}$ & $\Delta E$ for 40-MeV $M(\omega J/\psi)$ bins

**Strong  
 $B \rightarrow K \omega J/\psi$   
signals**



# Plot & fit the results

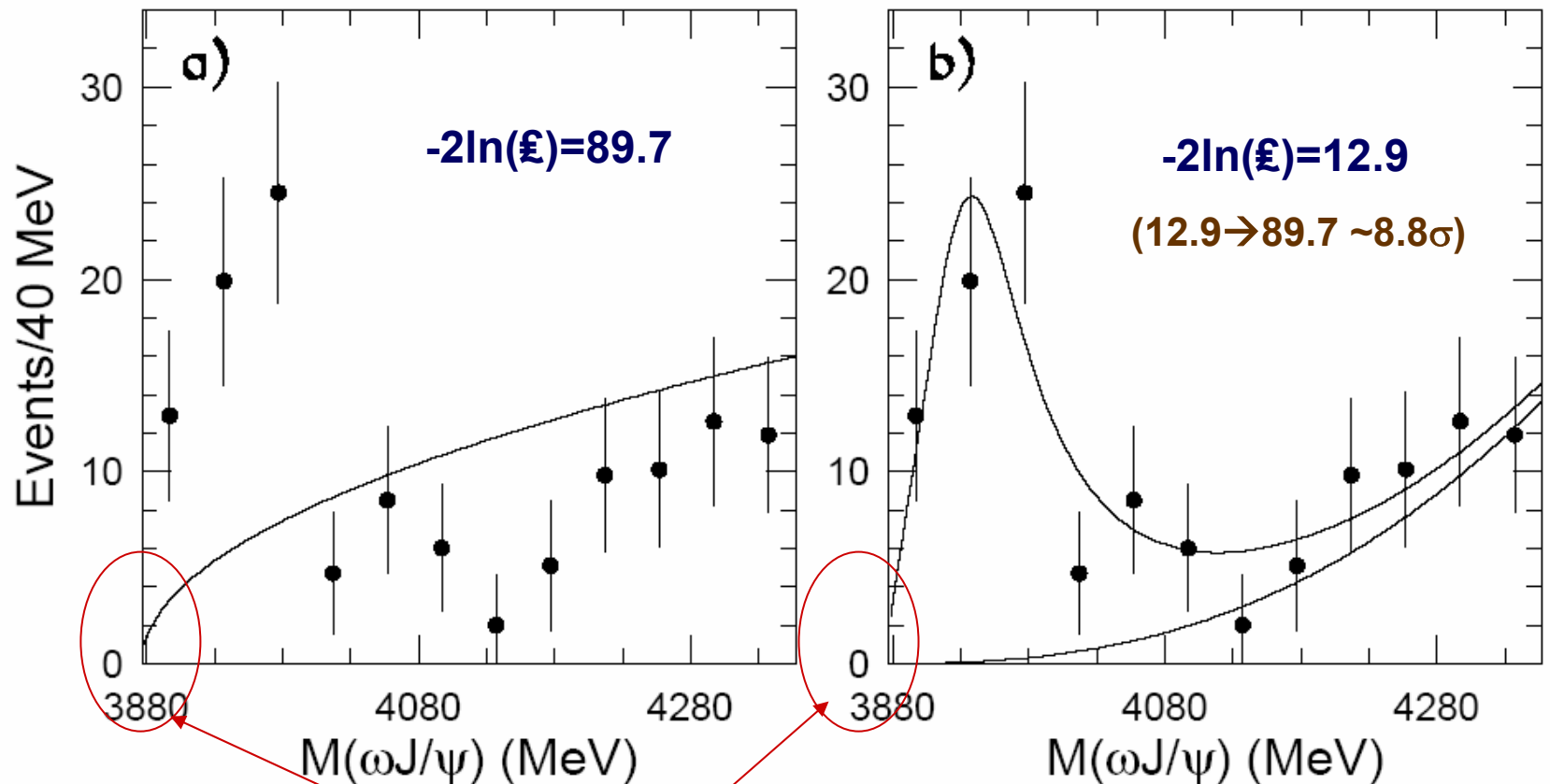
Fit with a monotonic  
threshold function

$$f = A \Delta M^{1/2}$$

Add a BW “signal”

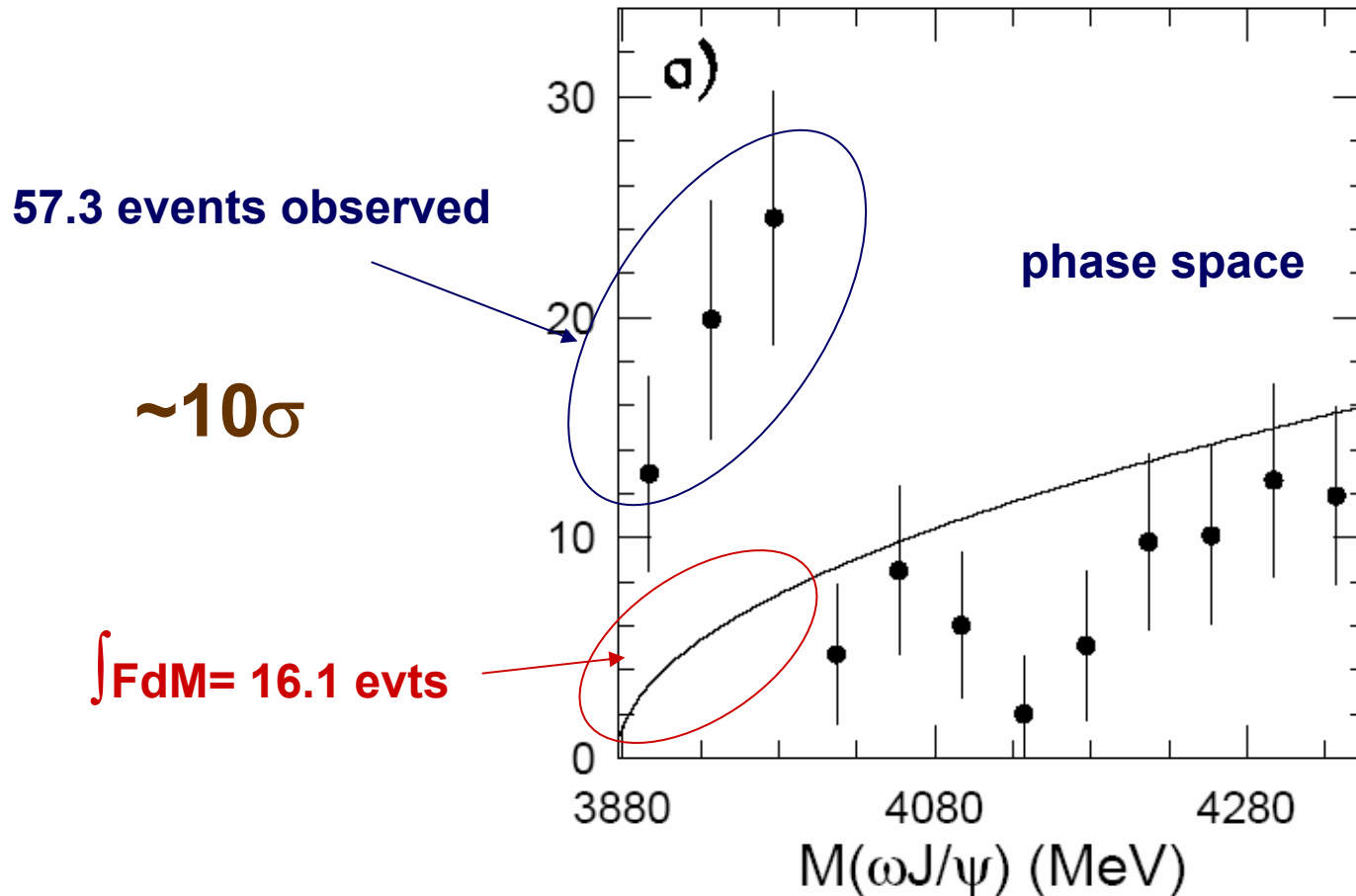
$$M = 3949 \pm 9 \text{ MeV}$$

$$\Gamma = 111 \pm 25 \text{ MeV}$$



forced to 0 at threshold

# Significance of the enhancement

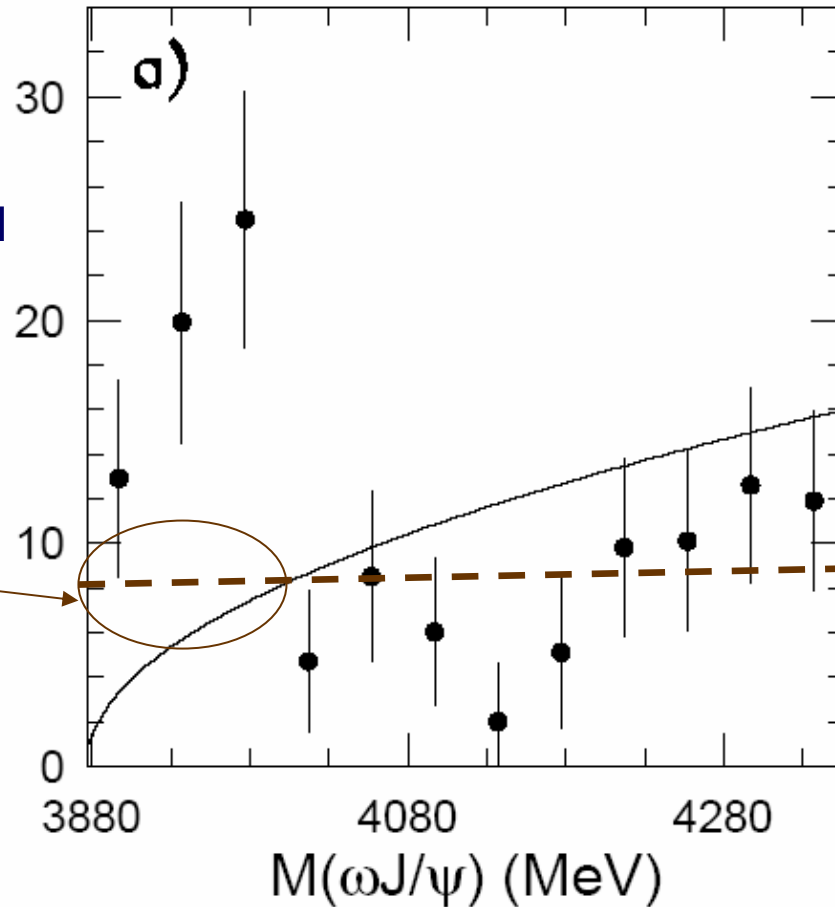


# Significance (cont'd) (underestimate?)

57.3 events observed

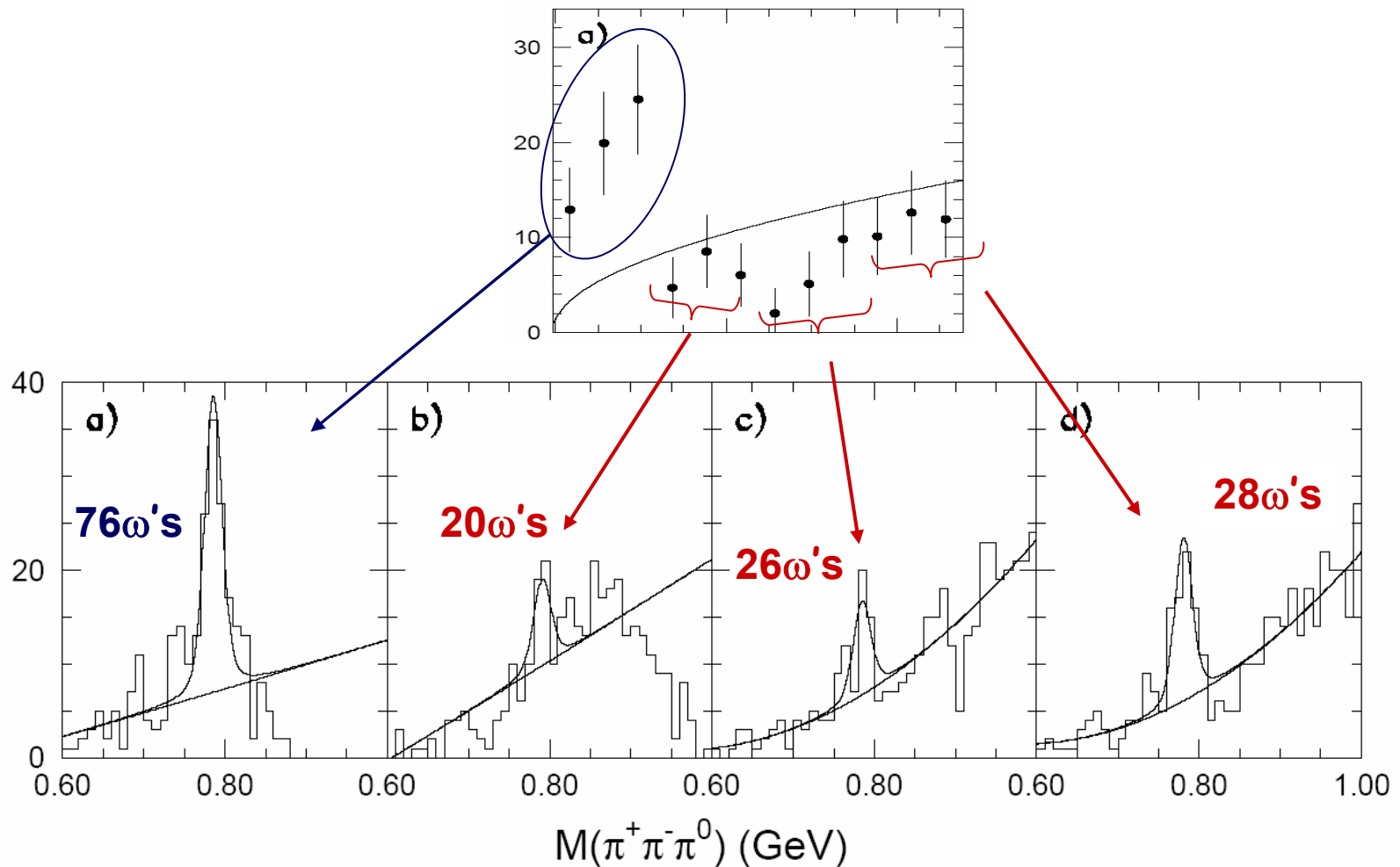
$\sim 6\sigma$

Nevts (+1 $\sigma$ ) = 26.4

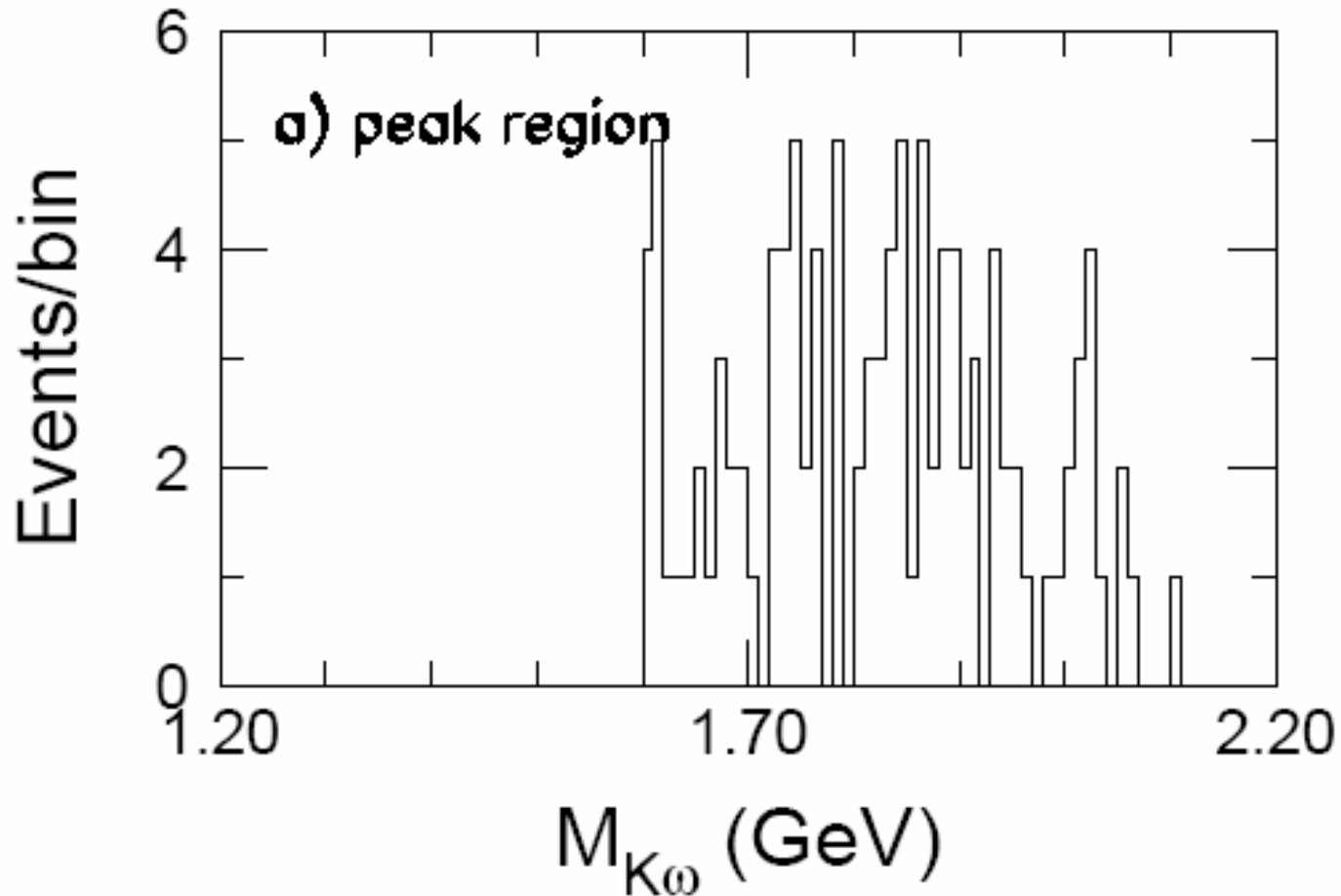


Fit nine higher bins  
to a flat line

# $\omega \rightarrow \pi^+ \pi^- \pi^0$ "lookback" plots



# $M(K\omega)$ for the signal region



# What is it?

- **A broad  $\omega$ - $J/\psi$  resonance?**
  - Above DD & DD\* threshold!
- **More than one overlapping narrow states?**
  - Our resolution is OK, but we need more data
- **Some kind of  $\omega$ - $J/\psi$  threshold interaction?**
  - Does the  $J/\psi$  act like an ordinary hadron?
- **None of the above?**

# Things to do

- Full data set
  - still missing  $\sim 1/3^{\text{rd}}$  of E37
- Calculate efficiency & Branching fractions
- Systematic errors
- Study bkgnds from broad, high mass  $K^* \rightarrow K\omega$

**Ready by the BGM**