SUMMARY on BESII NEUTRAL CORRECTION

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— MC CORRECTION

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METHOD

- I use $J/\psi \rightarrow e^+e^-\gamma$ sample to determine DATA neutral correction,because:
  - The sample is very easy to be selected
  - Purity of the sample is very near to 100%
  - Size of the sample is quite huge to satisfy statistical requirement
  - Gamma energy distibution is wide enough,so it could be used to do neutral correction for whole energy range
  - Gammas' momentum could be determined by electron pair momenta precisely and wouldn't introduce any bias,since MDC resolution is much better than BSC
- DATA $J/\psi \rightarrow e^+e^-\gamma$ sample selection
  - NCHRG=2, NCHPU=0, 0<NNEU<6

  - $|cos\theta|$<0.8, R_{xy}<0.015m, $|Z|$<0.15m, MFIT=2, E/P>0
  - Higher momentum track satisfies:1.45GeV/c< P_{higher} <1.75GeV/c,no MUHIT,0.7<E/P<2.0
  - Run13500–16844: 1176620 events

- Obtain clear electron and gamma BSC sample
  - $P_\gamma < -0.96667 P_e + 1.61 GeV/c$,to reject bad MDC momentum resolution events
  - $10^\circ < \theta_{gc} < 75^\circ$,$\phi_{gc} > 6^\circ$. θ_{gc} is the angle between the gamma momentum direction and low momentum electron shower development direction at BSC,the gamma momentum is calculated by electron pair momenta,while ϕ_{gc} is ϕ plane project of θ_{gc}
  - $\delta_\theta < 1^\circ$,δ_θ is the angle between the gamma momentum direction and its BSC hitting direction
  - Run13500–16844: 84247 events

DATA CORRECTION

- Gamma energy correction
  - further require:low momentum electron E/P<2.0, and the gamma E/P<2.0
  - Using MDC total momentum as gamma's real energy.
  - Half width of momentum bin is 0.025GeV/c
  - Using Gauss fit to get BSC energy and its resolution for a certain momentum,momentum step is 0.05GeV/c
  - In order to get correction under P_γ=1.54845GeV/c, to select $e^+e^- \to \gamma\gamma$ events(selection is bellow)
  - Fit Gamma BSC energy and resolution under different momentun to get the correction

- Gamma σ_ϕ correction
  - Using the gamma E/P is between 0.5 to 1.5 instead of δ_θ<1°.δ_ϕ=ϕ_{BSC} -$\phi_{calculated}$
  - In order to get correction under P_γ=1.54845GeV/c, to select $e^+e^- \to \gamma\gamma$ events,its selection:NCHRG=0. number of tracks hitting BSC is between 2 to 4.$|cos\theta|$<0.7. BSC E_γ>0.8GeV. $|\delta_\phi|=||\phi_1-\phi_2|-180^\circ|<2^\circ$, ϕ_1 and ϕ_2 are the first and second large energy γs. σ_ϕ=$\sigma(\delta_\phi)/\sqrt{2}$
  - Using Gauss distribution to fit δ_ϕ to get BSC ϕ resolution for a certain momentum
- Gamma σ_Z correction,similar to the gamma σ_ϕ correction.
  - δ_Z=Z_{BSC}-$Z_{calculated}$,$Z_{cal.}$= $1.331\times ctg\theta_{calculated}$
  - For the $\gamma\gamma$ sample with P_γ = $1.54845GeV/c$, σ_Z=$\delta_Z/\sqrt{2}$=$\delta(Z_1+Z_2)/\sqrt{2}$
  - $e^+e^- \to \gamma\gamma$ mixed with three gamma decay

MC CORRECTION

- Using HOWL generates $e^+e^- \to \gamma\gamma$ events with no radiation
  - MC Real-dead simulation version is 022
  - Gamma momentum step is 0.05GeV
  - σ_ϕ=$|\delta_\phi|/\sqrt{2}$
  - σ_Z=$\delta(Z_1 + Z_2)/\sqrt{2}$
  - After E,σ_E,σ_ϕ,σ_Z correction,gamma PULL1-3 are about 0.92,0.9,0.9 when Ecm=3.1GeV, so σ_E,σ_ϕ,σ_Z second correction parameters are 0.92,0.9,0.9

CHECK

- DATA $J/\psi \to \rho\pi$ events selection
  - NCHRG=2, NCHPU=0,NNEU=2
  - $|cos\theta|$<0.8, R_{xy}<0.015m, $|Z|$<0.15m, MFIT=2
  - Good gamma number equal two:E_γ>50MeV,ILAYT >1, $\theta_{gc}>8^\circ$
  - charged tracks are identified as pions by TOF
  - Passing 4c-fit
  - After 4c-fit,invariant mass of two gammas is between 0.05 to 0.25 GeV
- Checked by $J/\psi \to \rho\pi$ events
  - After neutral correction,PULL1-3 of charged and neutral tracks are all close to (0,1) distribution
  - After DATA neutral correction,TELESIS efficiency raises about 10% relative to the

result without the correction by requirement CL>1%.The higher CL cut is,the larger efficiency difference between using and no using the correction

- Check by MC $e^+e^- \to \gamma\gamma$ events
  - After neutral correction,PULL1-3 of neutral tracks are all (0,1) distribution
  - 4c-Fit confidence level distribution is quite flat under energy Ecm= 0.8,1.0,1.5,2.0,2.5GeV
- Check by HONG Tao by channels of $J/\psi \to \omega\pi^0$,$\omega\eta$
  - Before the correction,branching fractions of above channels are $(4.20\pm0.06^{+0.40}_{-0.28}) \times 10^{-4}$ and $(1.38\pm0.04^{+0.11}_{-0.09}) \times 10^{-3}$
  - After the correction,branching fractions of above channels are $(4.40\pm0.05^{+0.28}_{-0.26}) \times 10^{-4}$ and $(1.46\pm0.04^{+0.09}_{-0.11}) \times 10^{-3}$, which are quite consistant with PDG: $(4.2\pm0.6) \times 10^{-4}$ and $(1.58\pm0.16) \times 10^{-3}$

Fig.1 DATA Neutral Correction

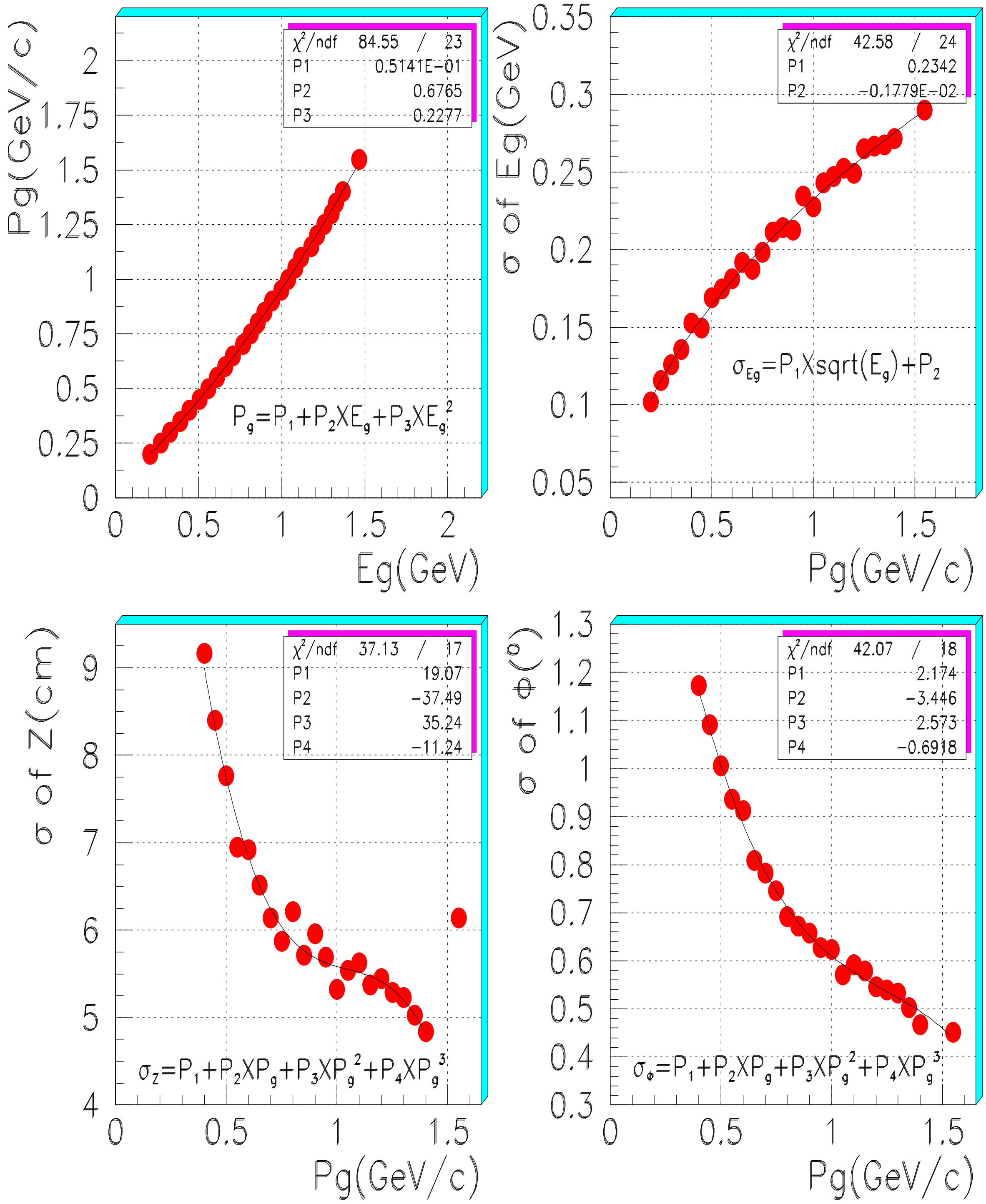

Fig.2 MC Neutral Correction by HOWL e^+e^- to $\gamma\gamma$

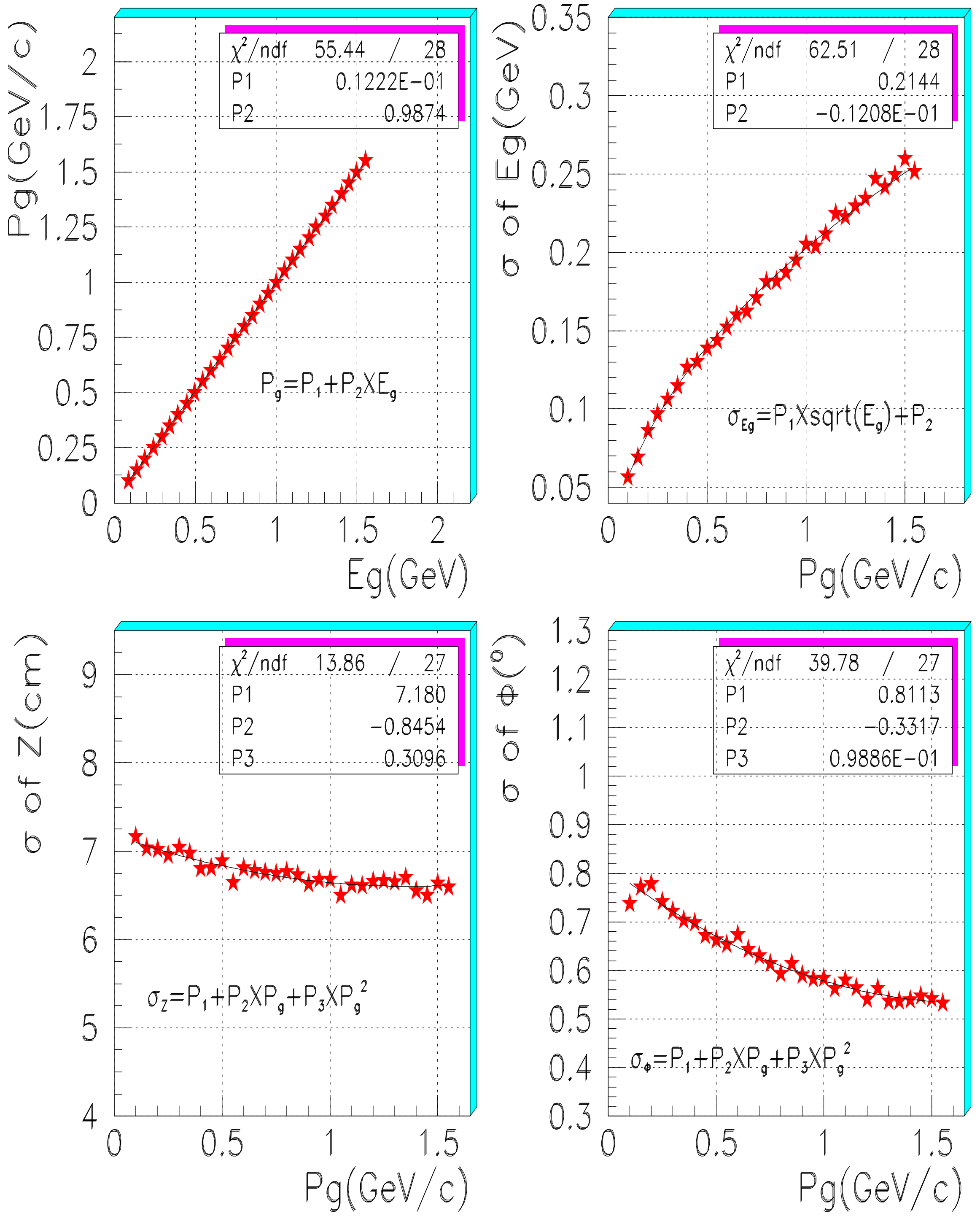

Fig.3 DATA J/ψ to $\rho\pi$ 1.Before 2.After Neutral Correction

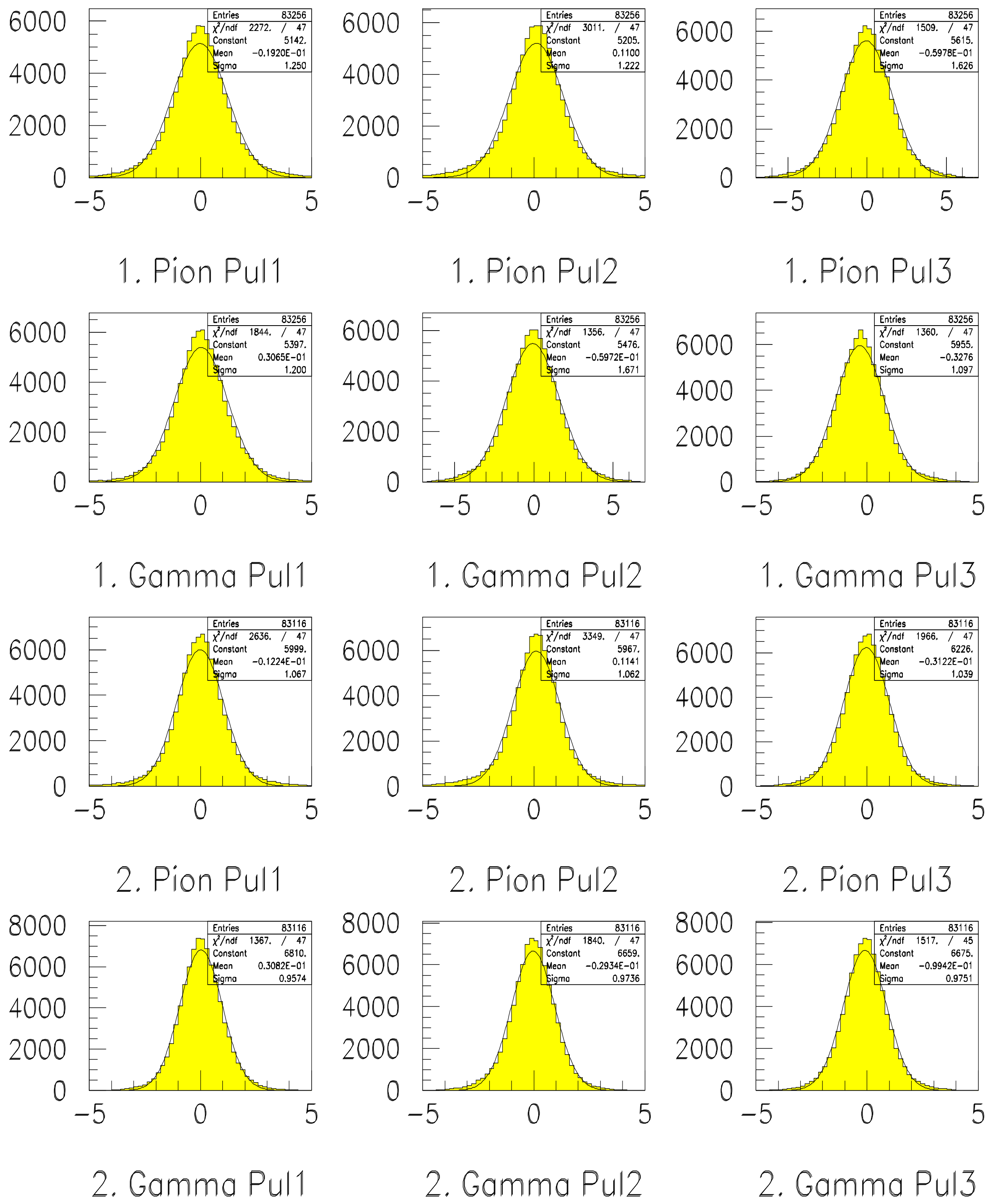

Fig.4 HOWL Ecm=2.0GeV $e^+e^- \to \gamma\gamma$ 1.Before 2.After Correction

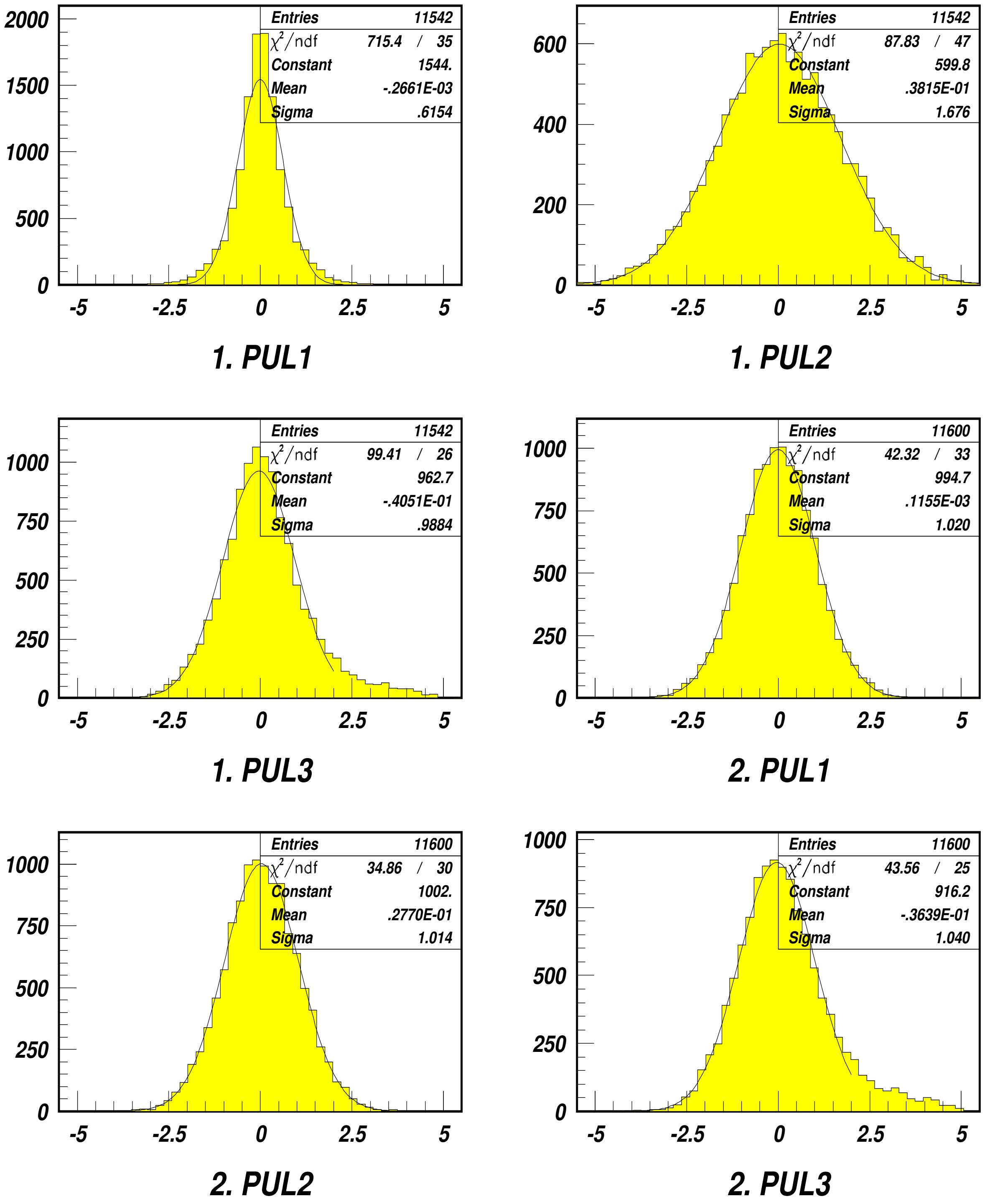

Fig.5 a. MC HOWL Ecm=2.0GeV $e^+e^- \to \gamma\gamma$ b. DATA $J/\Psi \to \rho\pi$