

# Status of analysis of leptonic decays from April 2007 $pp \rightarrow pp\eta$ at 1.4 GeV

By Marcin Berłowski

The Andrzej Soltan Institute for Nuclear Studies  
Warsaw

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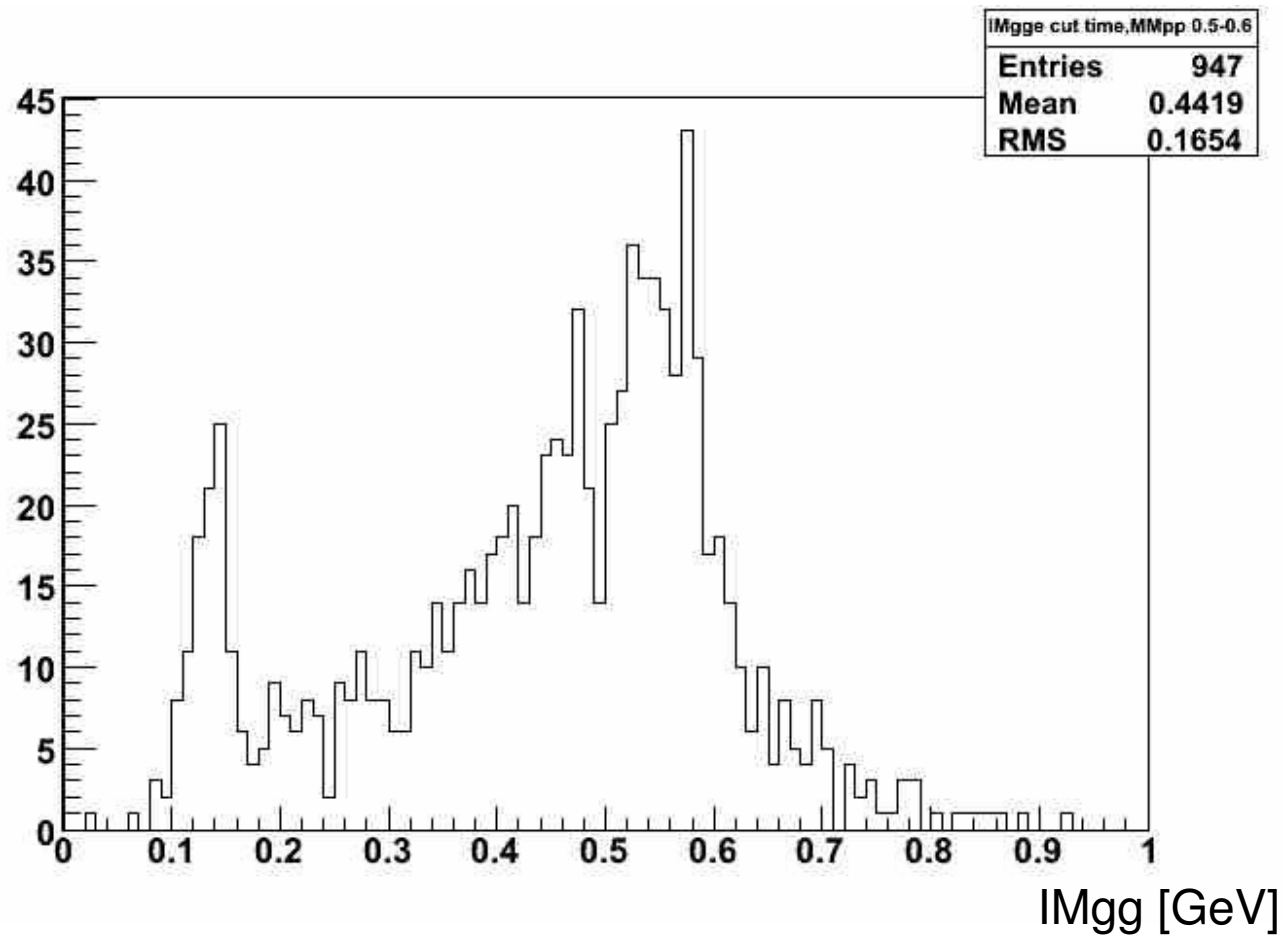
# Data from April 2007 runs

- Reaction:  $pp \rightarrow pp\eta$  at 1.4 GeV
- Three triggers for charged decays (8, **29**, 31)

## **PT29 trigger**

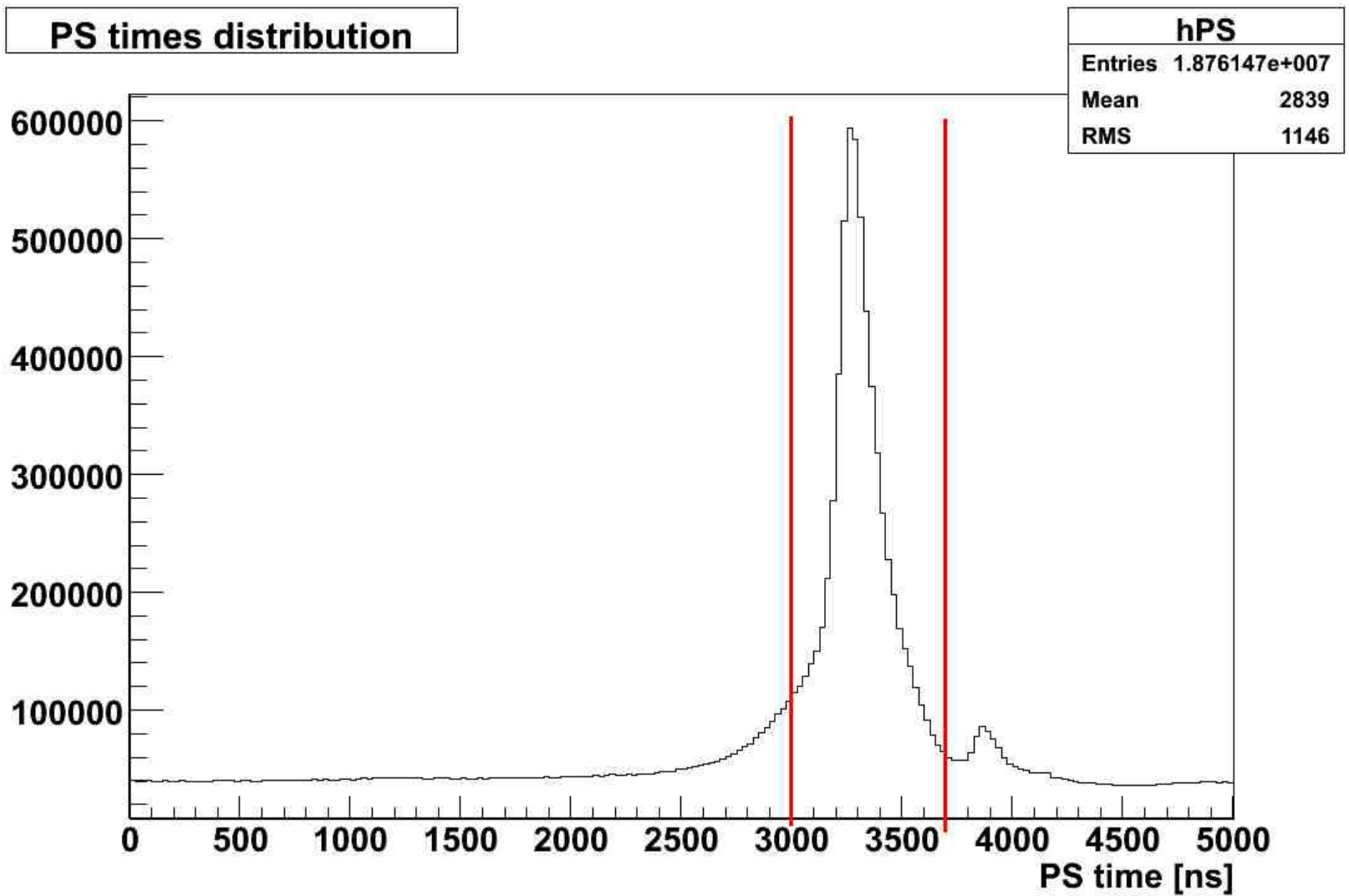
- trigger definition [frha2\*frhb2\*ecrl\*Vfvh]
- Prescaled by factor 5
- High energy deposited in both sides of SEC
- It didn't choose between  $\eta$  decays:
  - $\eta \rightarrow e^+e^-e^+e^-$ ,  $\eta \rightarrow e^+e^-$ ,  $\eta \rightarrow e^+e^-\gamma$ ,  $\eta \rightarrow \gamma\gamma$
- ~300 runs each around 100k of events
- 2 weeks of data taking (with PT29)
  - around 100h of stable conditions

# First step: selection of $\eta \rightarrow \gamma\gamma$



From 4 runs ONLY

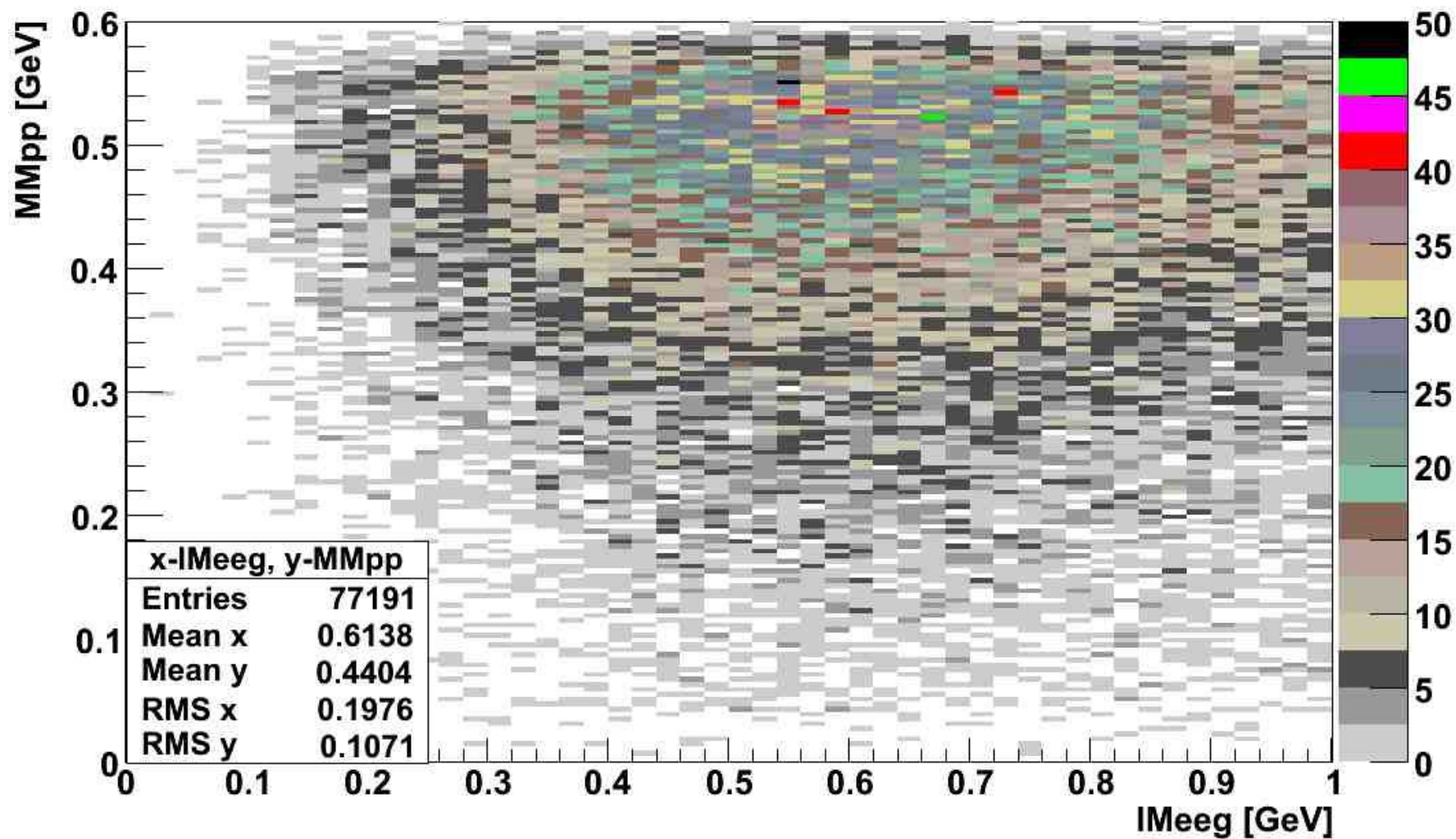
# But ...



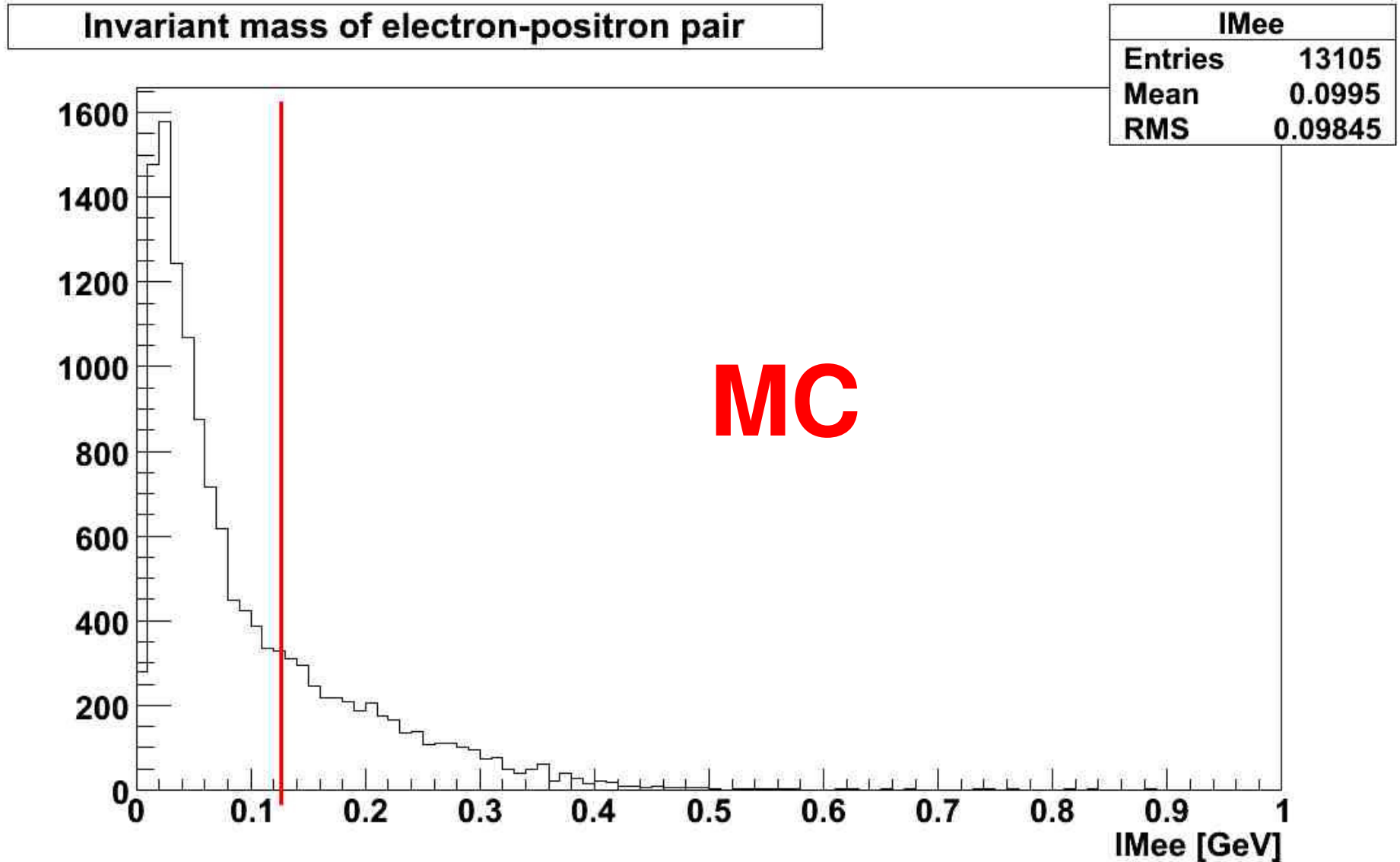
# Selection of $\eta \rightarrow e^+e^-\gamma$

- Results for 86 runs
- Particle selection:
  - Two charged from FD closest in time, within  $3^\circ$ - $18^\circ$ ,  $e_{dep} > 0.1$  GeV
  - Two charged giving lowest  $IM_{ee}$  (must have opposite charges)
  - Photon of energy  $> 0.2$  GeV, giving greatest angle to  $e^+e^-$  pair on a XY plane
- Time cuts:
  - Coincidence between FDC, CDC, CDN (every combination of them in  $[-25, +35]$  ns bounds)
  - At least one PS hit in the proper time interval
  - For each of FDC, CDC: ( $max\_time - min\_time$ ) in 20 and 50 ns respectively

x-IMeeg, y-MMpp, all candidates

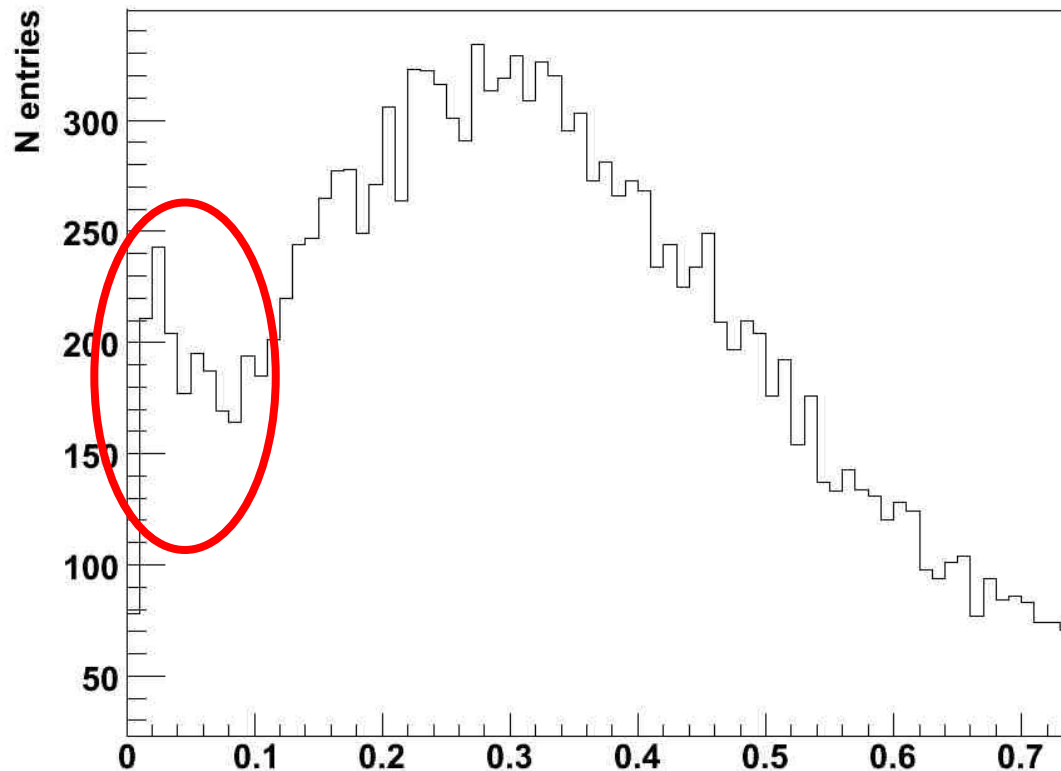


# Indication of $e^+e^-$ pair(s)

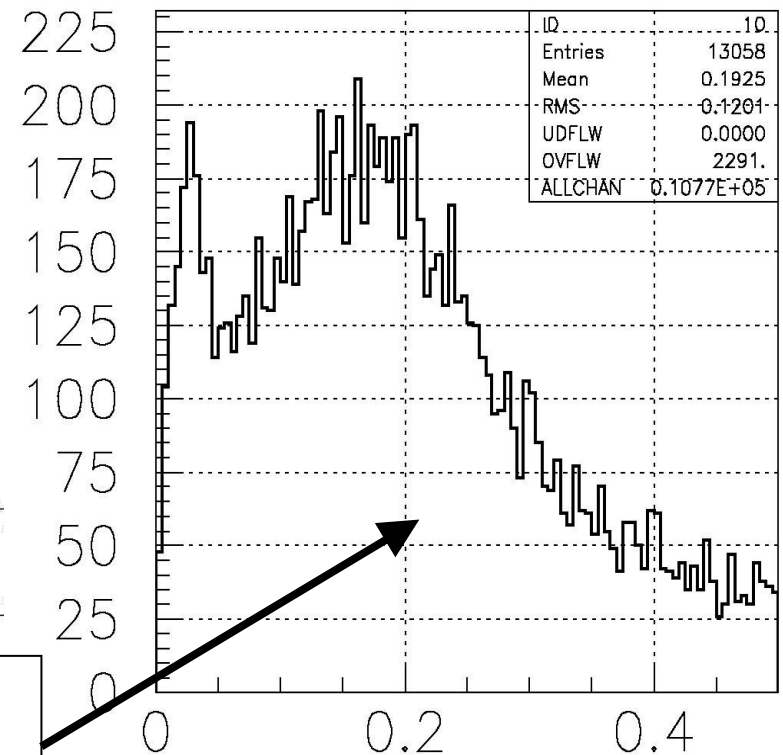


# Electron-positron pairs in data

Invariant mass of two electrons with missing mass of two protons cut



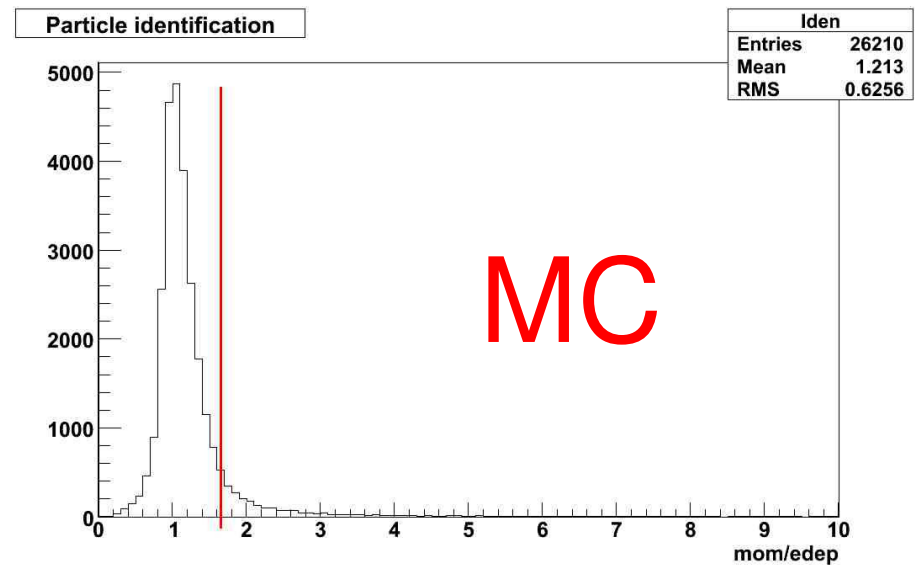
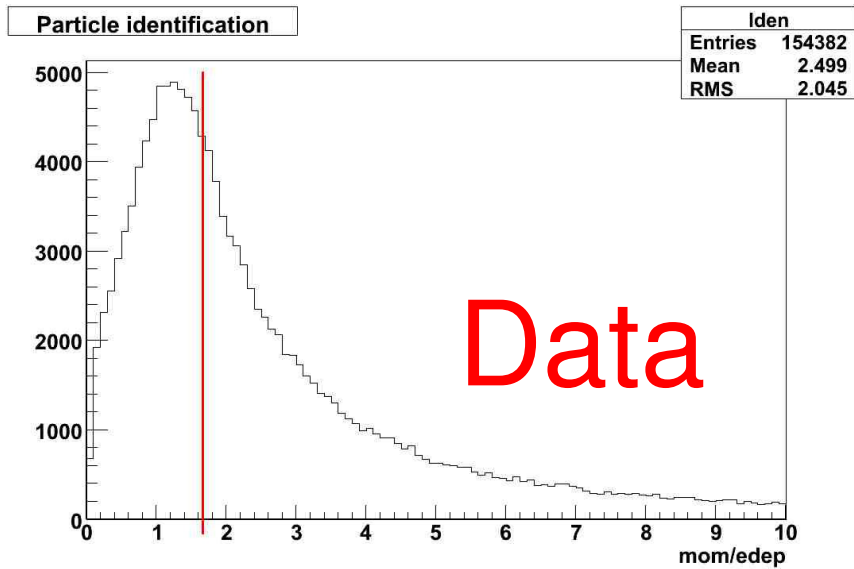
IMee cut MMpp	
Entries	19451
Mean	0.3681
RMS	0.2282



Data from CELSIUS/WASA  $pd \rightarrow {}^3\text{He}n\eta$  experiment:  
Phys.Rev.D77:032004,2008

Cut –  $0.5 \text{ GeV} < MM_{pp} < 0.6 \text{ GeV}$

# Particle identification

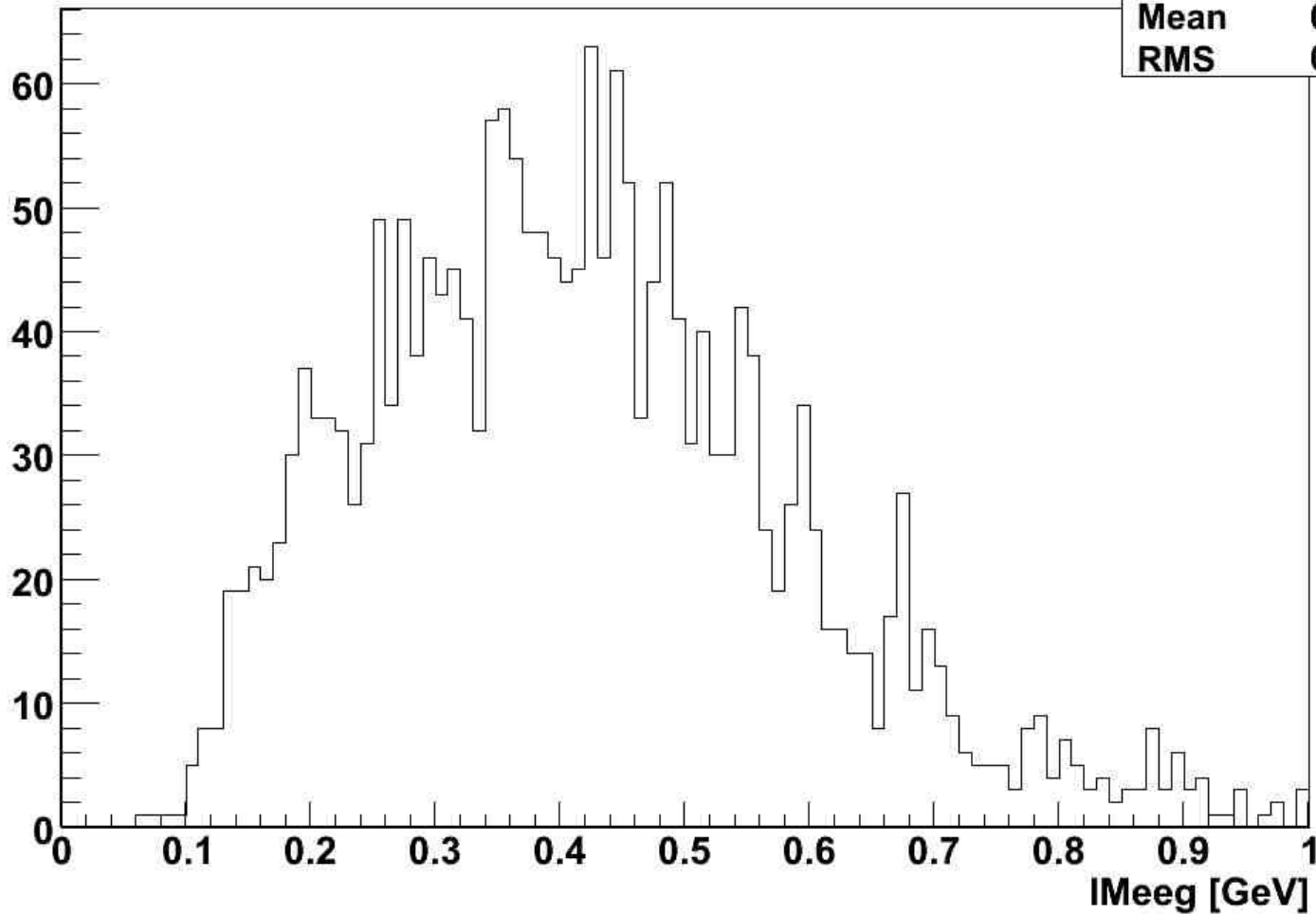


- $P/edep < 1.65$  ratio

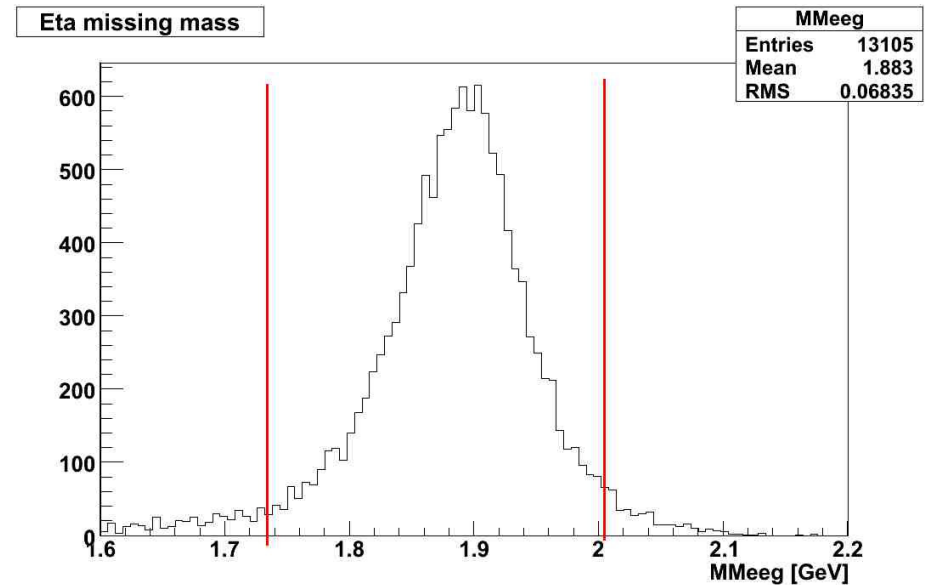
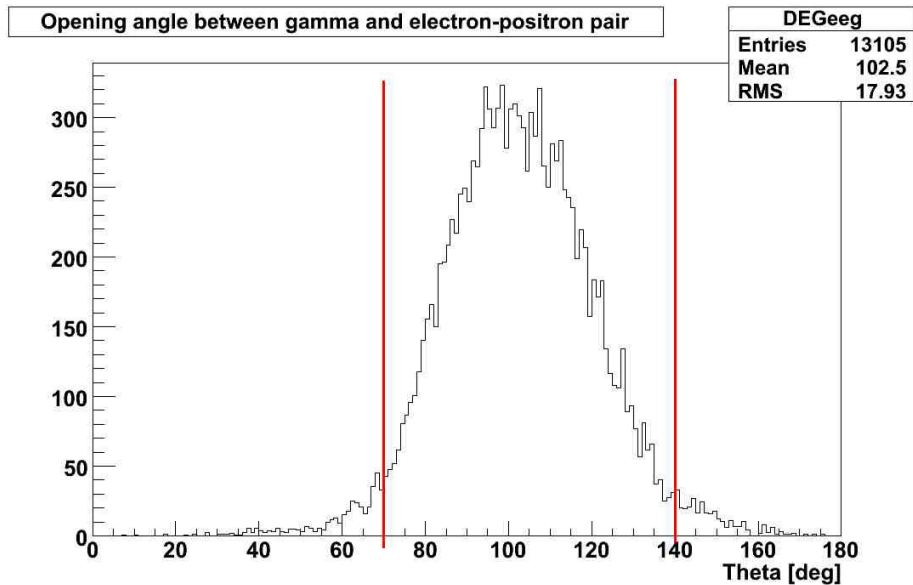
# Cuts - $MM_{pp}$ , Iden, $IM_{ee} < 0.125$ GeV

Invariant mass eeg, cuts IMee, iden, MMpp 500-600

IMeeg cut MMpp,IMee,iden1p	
Entries	2156
Mean	0.4187
RMS	0.1698



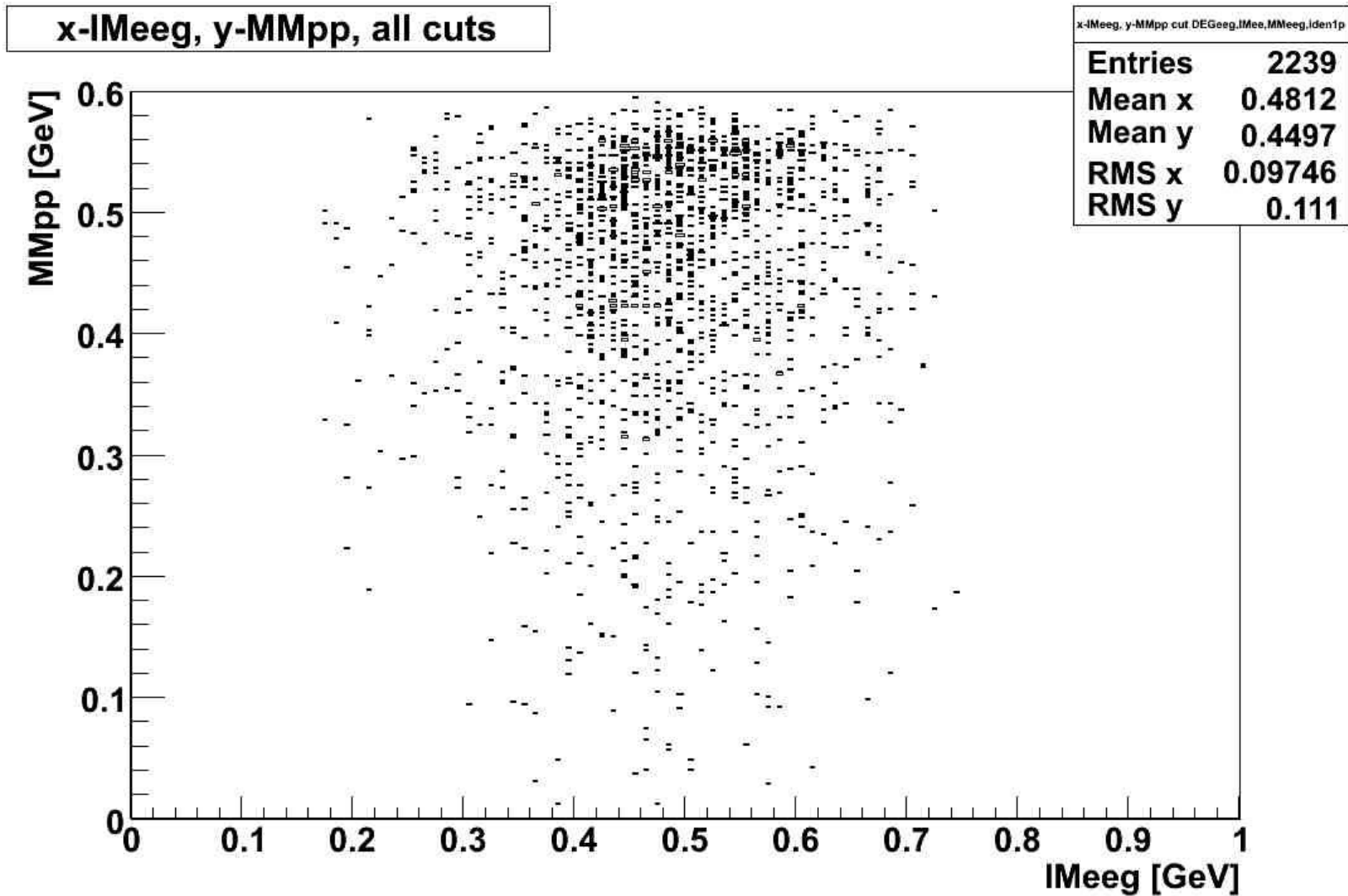
# More Monte Carlo simulations



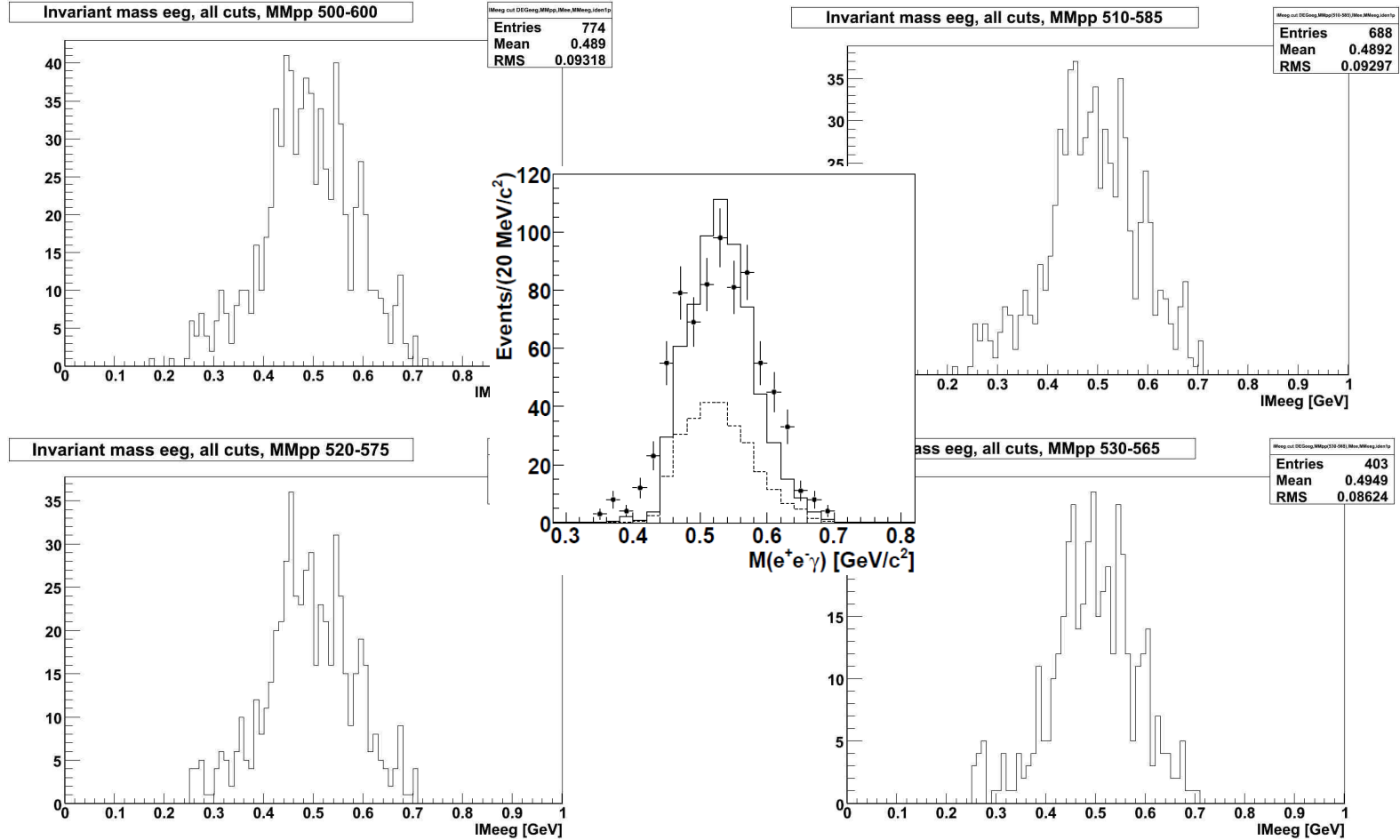
Cuts:

$$1.736 \text{ GeV} < M_{\text{M}eeg} < 2.207 \text{ GeV}$$
$$70^\circ < \theta_{eeg} < 140^\circ$$

# After applying all of above conditions

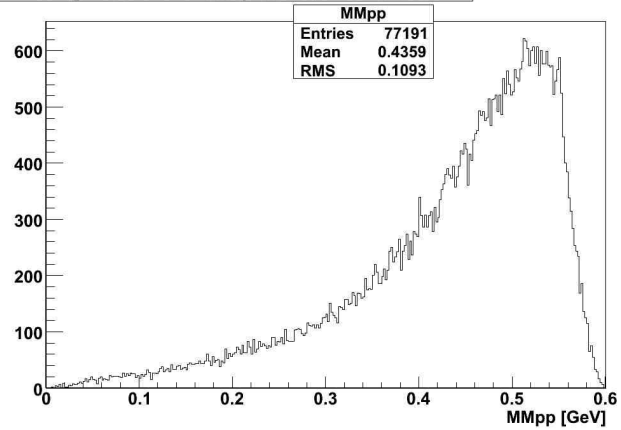


# Final results

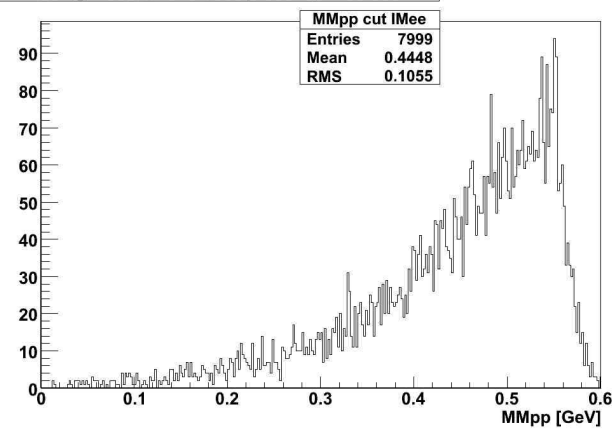


# Influence in $MM_{pp}$ spectrum

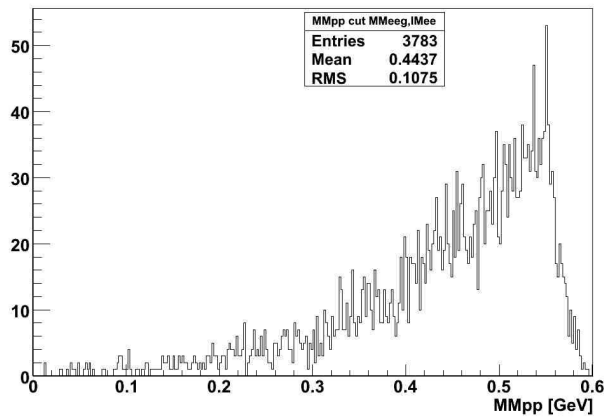
Missing mass of two best protons, all candidates



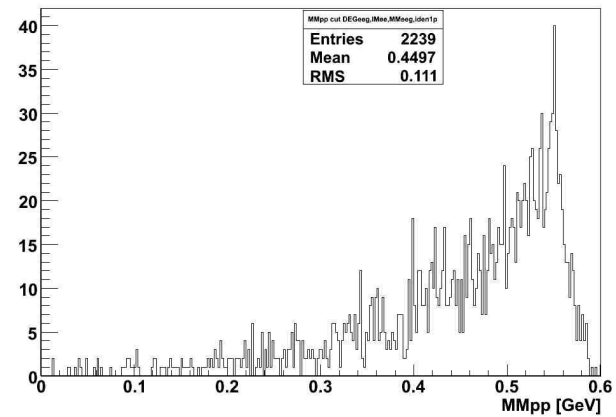
Missing mass of two best protons, IMee cut



Missing mass of two best protons, IMee, MMeeg cut



Missing mass of two best protons, all cuts



# Conclusions and „to do” list

- Only 40% of all data collected with trigger PT29 was analyzed
- Calibration for PS needed
- Background analysis for  $\eta \rightarrow e^+e^-\gamma$  in progress
- Background studies for  $\eta \rightarrow e^+e^-$  must be done and upper limit similar to that obtained in  $pd \rightarrow {}^3\text{He}\eta$  from CELSIUS/WASA collaboration is expected.