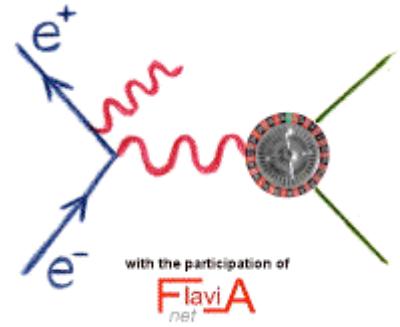

A Look to the Simulation of μμ(γ) with BABAYAGA@NLO (November, 2007)

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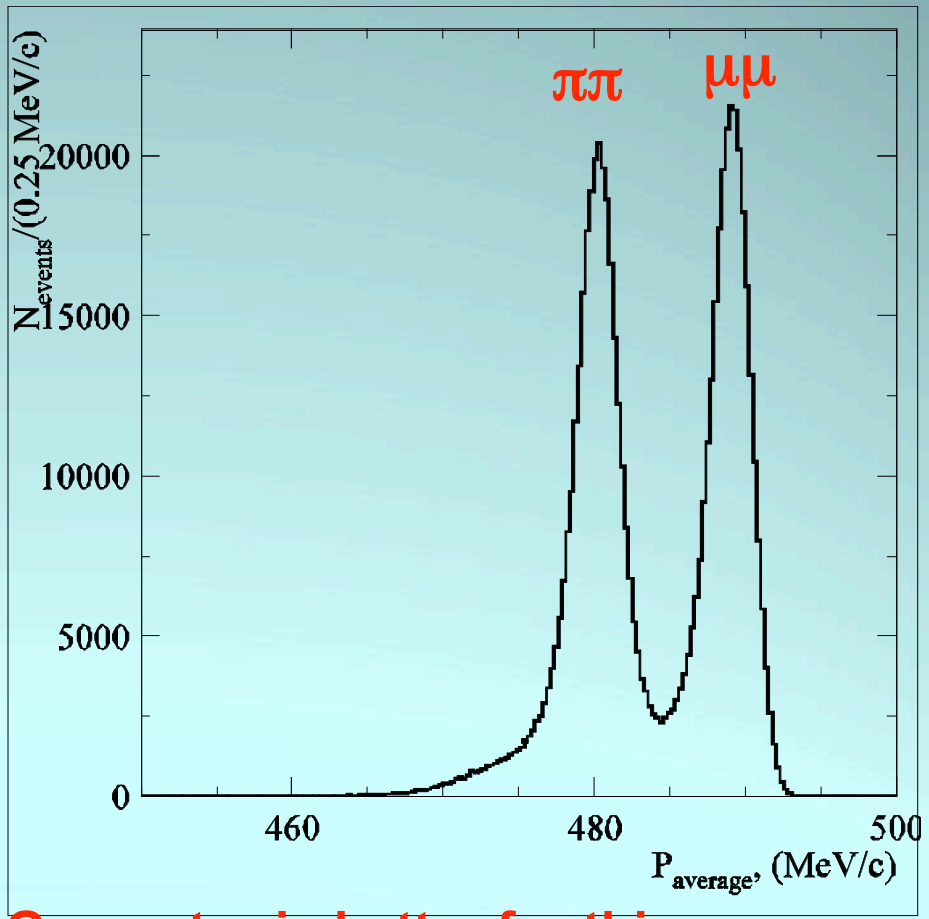
Motivation

Goal: To measure $|F_\pi|^2 \Rightarrow$ determine number $N_{\pi\pi}$

From collinears:

- e+e- events removed by cut on mass of charged track
- $\mu+\mu-$ events were supposed to remove using MC Simulation



Question: which MC Simulation $\mu\mu$ Generator is better for this purpose ?

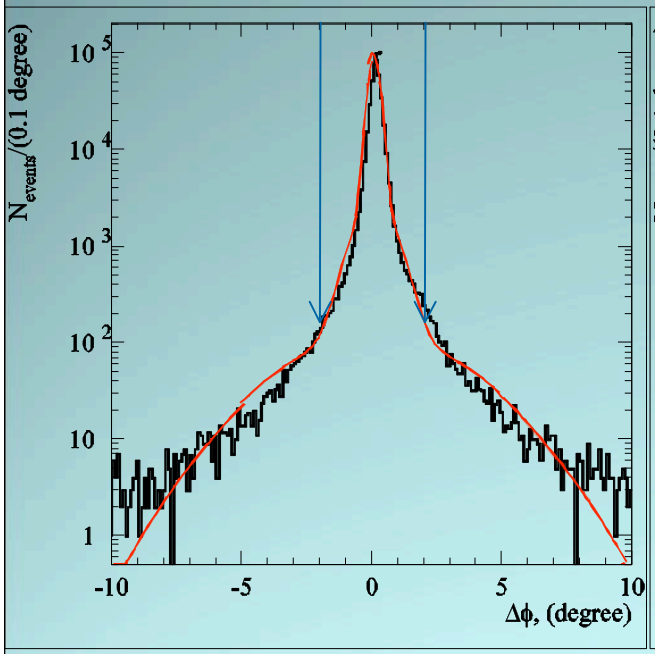
Data and MC Simulation

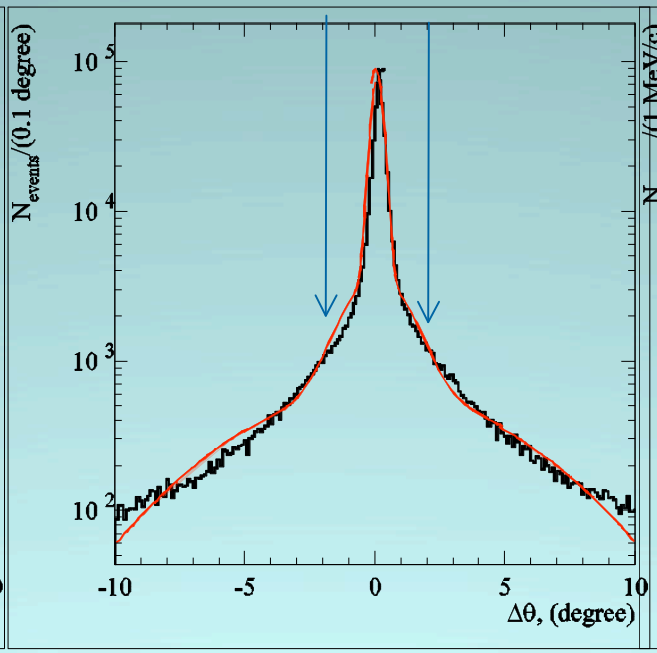
- EXP DATA, collected with KLOE detector @ $\sqrt{s}$ = 1 GeV ($\int Ldt = 8453\ nb^{-1}$)
- SIM DATA of $\mu\mu(\gamma)$ events, generated with BABAYAGA@NLO (100,000 events, σ = 96.53 nb, $\int Ldt = 1036\ nb^{-1}$)
- SIM DATA of $\mu\mu(\gamma)$ events, generated with MCGPJ* (200,000 events, σ = 98.48 nb, $\int Ldt = 2031\ nb^{-1}$)
- SIM DATA of $\pi\pi(\gamma)$ events, generated with MCGPJ* (200,000 events, σ = 99.22 nb, $\int Ldt = 2016\ nb^{-1}$)

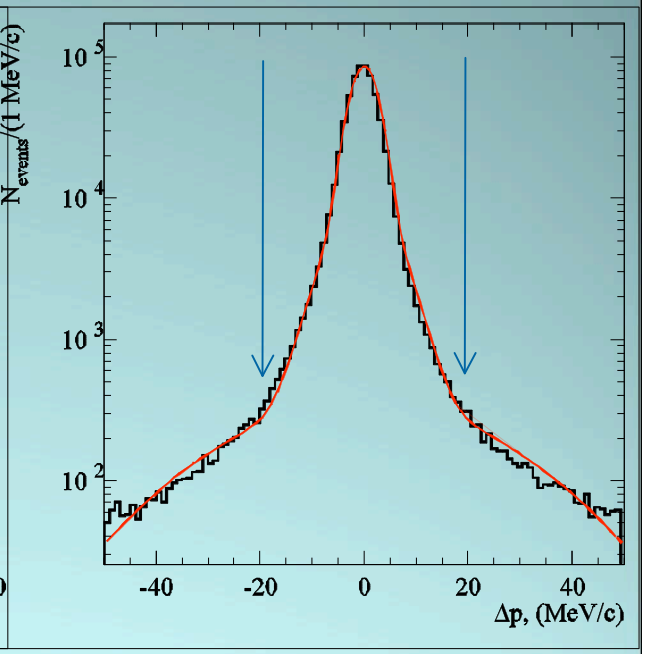
*MCGPJ is described in details in A.Arbuzov *et al., Eur. Phys. J. C46 (2006),689*

Selection Criteria

We select collinear events according following conditions:







$|\Delta\phi| < 2^{o}$

$|\Delta\theta| < 2^{o}$

$|\Delta p| < 20$ MeV/c

Crosscheck № 1: Luminosity

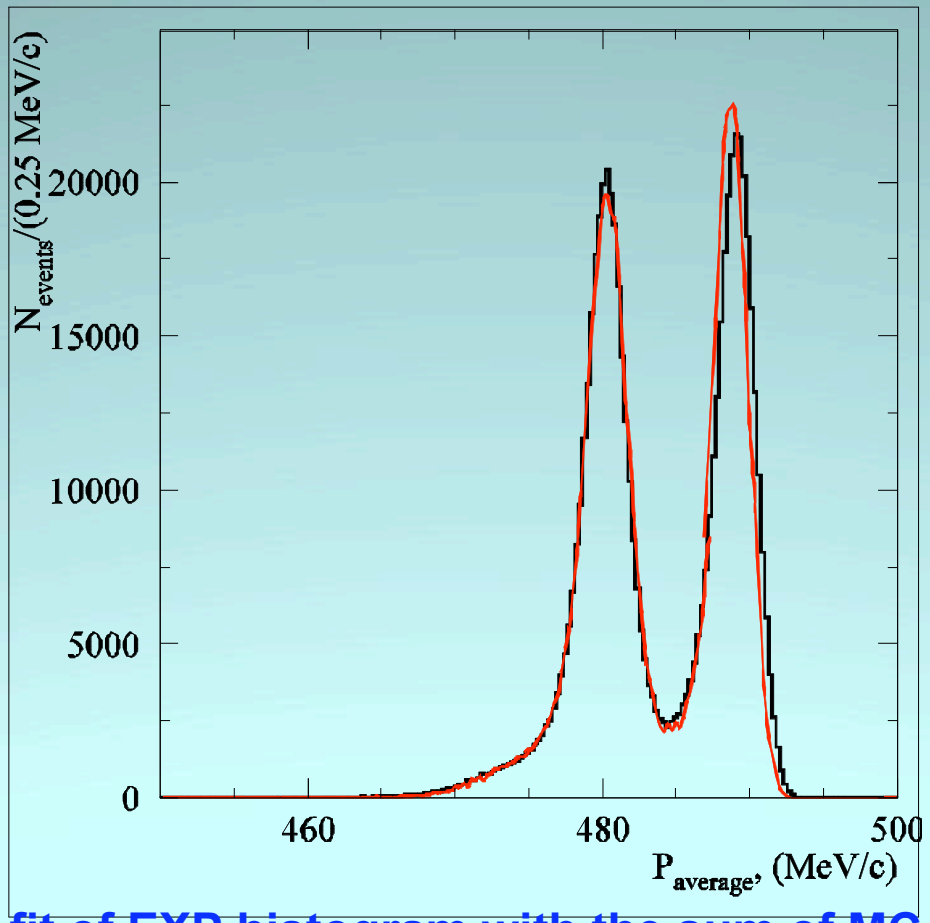
- According to number of MC Simulated events and value of cross section, used in MC Simulation, one could compute the corresponding luminosity integral.

- Using EXP and MC luminosity integrals it is possible to determine a scale factor, which should be multiplied by MC number of events to obtain EXP number of events

- One could fit the EXP spectrum of events with MC spectra using scale factors as a fit parameters and should obtain the same values as that from luminosity integrals

Crosscheck № 1(Babayaga@NLO)

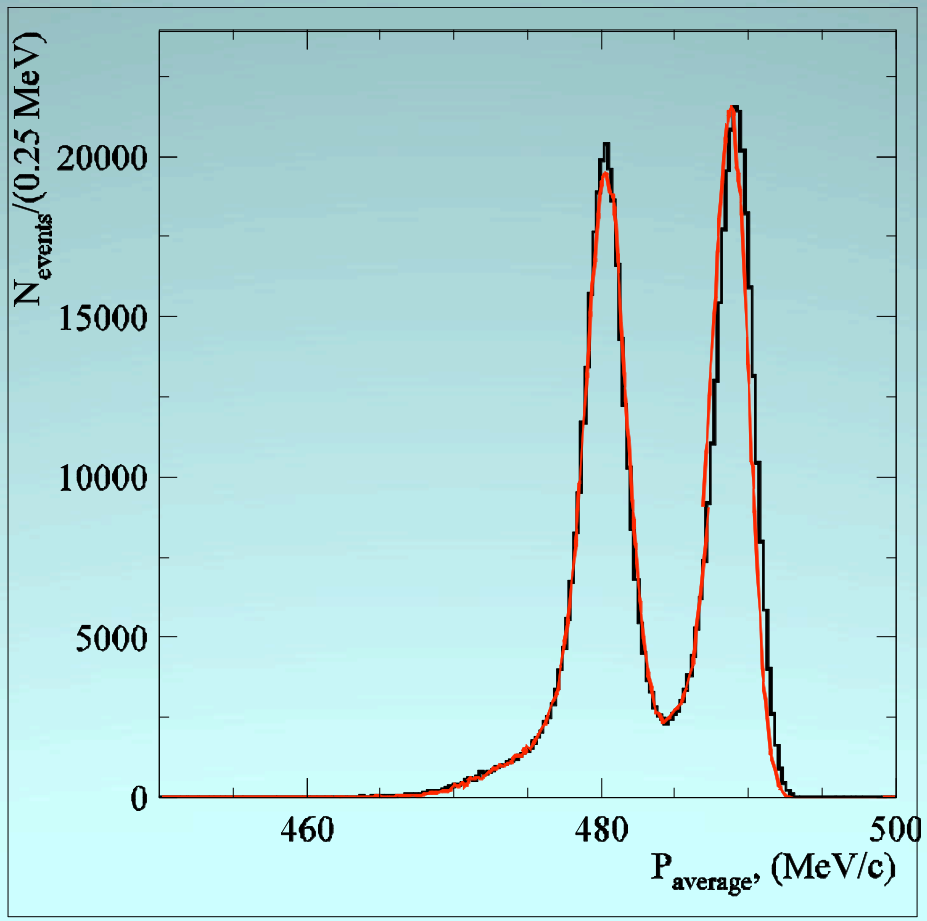
According to total cross section value, used in simulation, the scale factor for $\pi\pi$ should be: K_π =4.193 and for $\mu\mu$ it should be: K_μ = 8.159



From the fit of EXP histogram with the sum of MC Simulation ones:
K_π = 4.215±0.008 (+0.5% difference) K_μ = 7.477±0.014(-8% difference!!!)

Crosscheck № 1(MCGPJ)

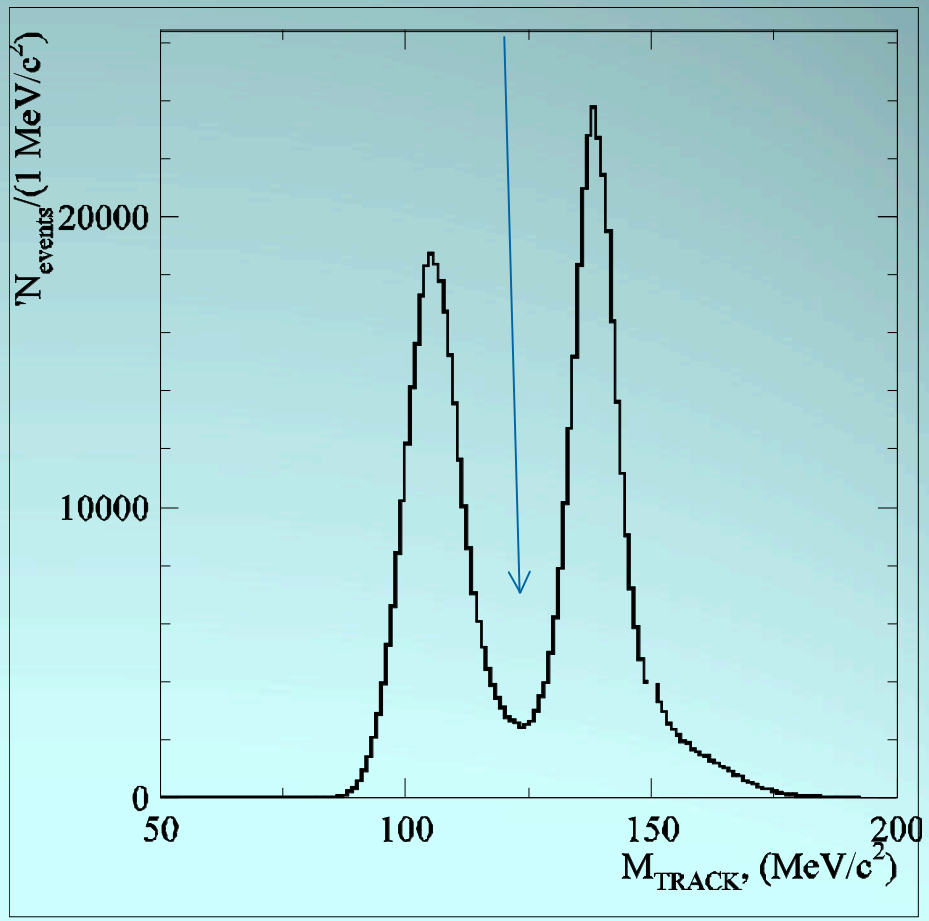
According to total cross section value, used in simulation, the scale factor for $\pi\pi$ should be: K_π =4.193 and for $\mu\mu$ it should be: K_μ = 4.162



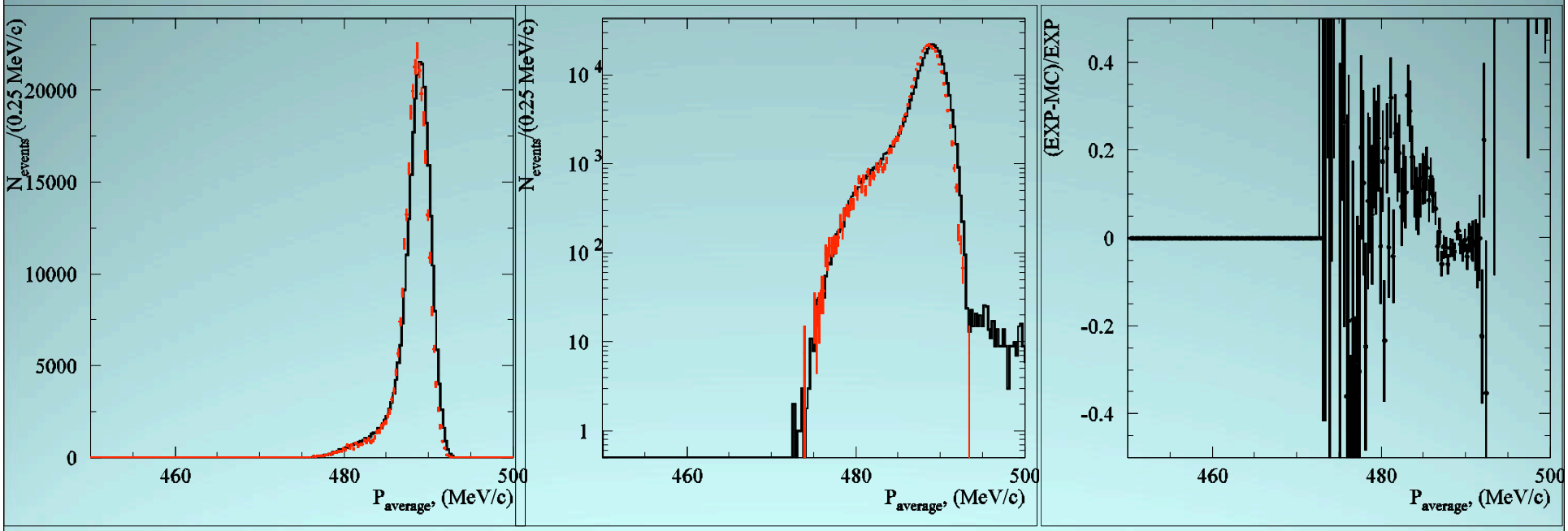
From the fit of EXP histogram with the sum of MC Simulation ones:
K_π = 4.186±0.008 (-0.2% difference) K_μ = 4.135±0.008(-0.7% difference)

Crosscheck № 2: subtract muons from pions

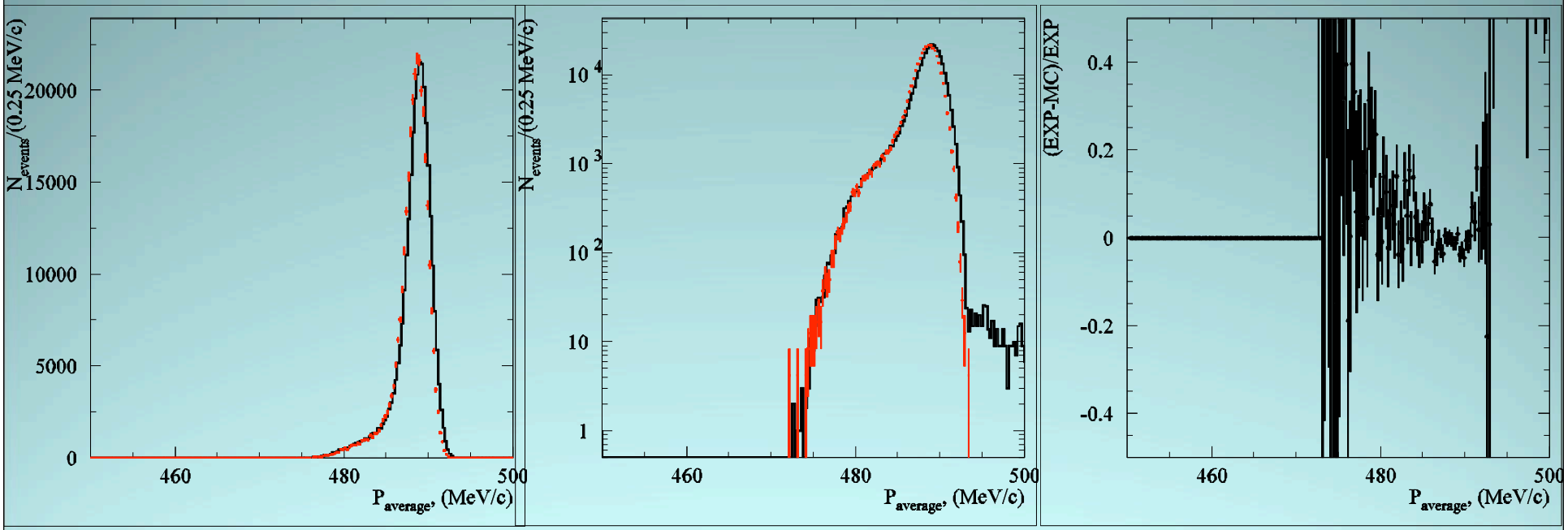
- To remove ππ events, we apply cut on Mtrack: Mtrack < 120 MeV to both EXP and MC data
- ππ tail under μμ peak subtract using MC Simulation, normalized by k_π



Crosscheck № 2 (Babayaga@NLO)



Crosscheck № 2 (MCGPJ)



Results

- MC Generator MCGPJ better describes $\mu\mu(\gamma)$ experimental spectra, than Babayaga @NLO

- 2% difference in the value of total cross section of $\mu\mu(\gamma)$ has been observed between MCGPJ and Babayaga @ NLO

- Probably the problem is in simulation of soft radiative photons in Babayaga@NLO