$\pi\pi\gamma$ Large Angle analyses report

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from Olga
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Large Angle **2002**

Update on

1. f_0

2. Background fit procedure

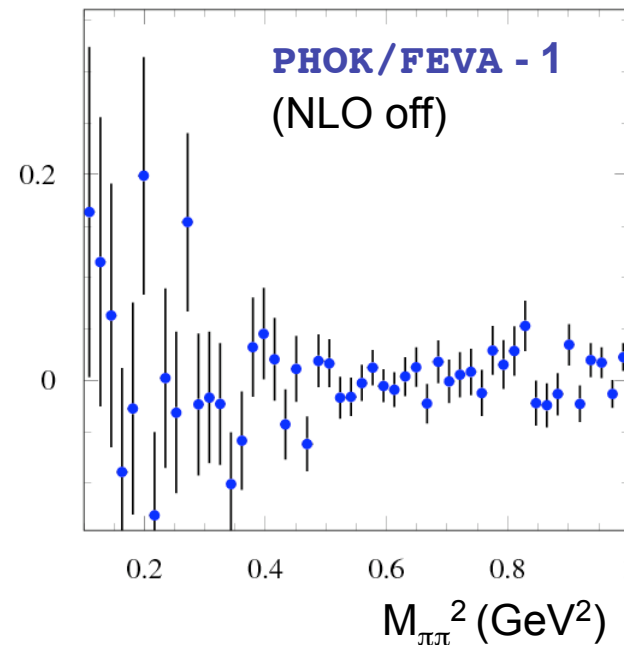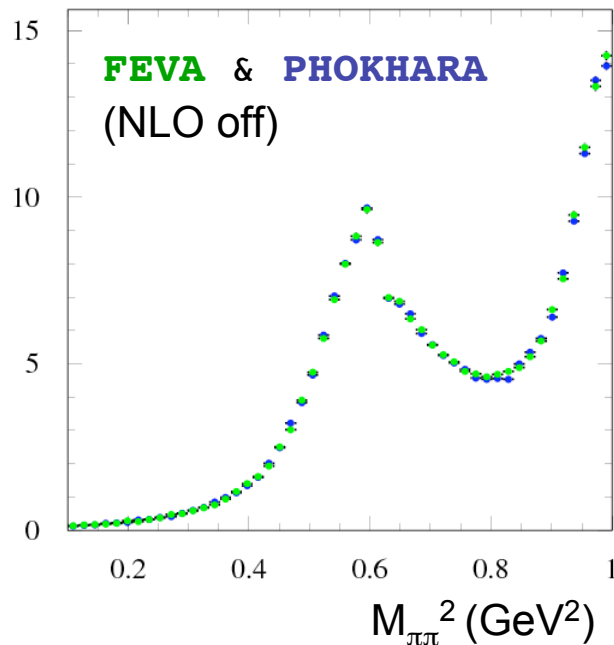# f_0 - Achasov models insertion

✖ **EVA**

 - **best** Achasov model

 - **but** ISR-FSR-LO only

✖ **PHOKHARA**

 - **best** NLO correction

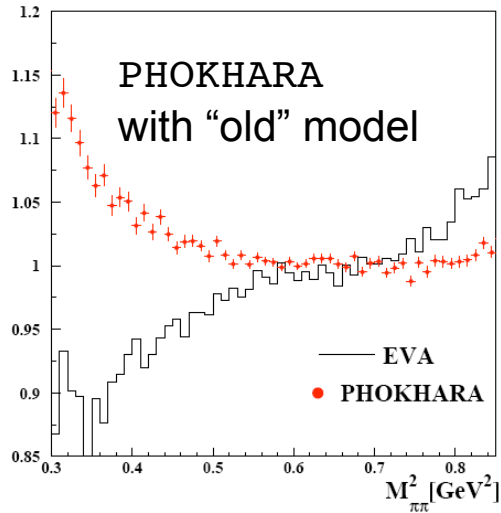 - **but** semplification of an old Achasov model (and no $\rho \to \pi\gamma$)

➔ **latest Achasov model inserted in PHOKHARA**

(by Olga Shekhovtsova)

f_0 - f_0 and $\rho\pi$ contribution

(ISR+sQED+f_0+$\rho\pi$)/(ISR+sQED) - 1

(ISR+sQED+f_0+$\rho\pi$)/(ISR+sQED) - 1

PHOKHARA
with "old" model

EVA
● PHOKHARA

PHOKHARA
with new model

NLO approximation

$M_{\pi\pi}^2$ (GeV^2)

"New" PHOKHARA behavior:
not only because of f_0
but also
for $\rho\pi$ contribution

PHOKHARA (with new model)
predicted contribution at high mass
compared with
Cesare's fit of f_0 mass spectrum
➜ they look in agreement (see hep-ex/0511031)

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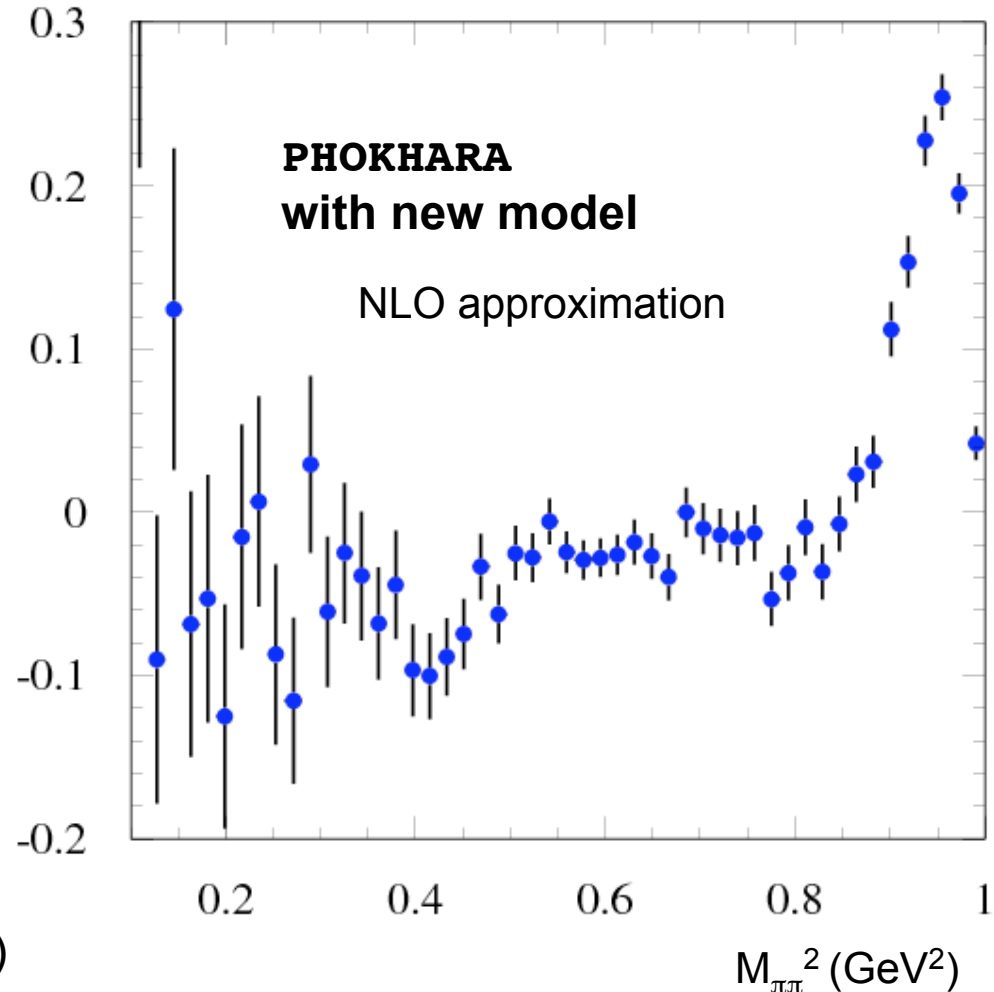
f_0 - Conclusion

✔ New Achasov model inserted in PHOKHARA

✔ f_0 and $\rho\pi$ contribution subtracted according to PHOKHARA with new model

✔ Systematic evaluation:

       - repeat the parameter optimization procedure using the F-B asymmetry
       with PHOKHARA

       - for the time being: take the full correction (~10% at the threshold)
       predicted by PHOKHARA

Bkg fit - reminder and "goodness"

MC smearing and tuning (see Capri's 2007)

1. Bini-Valeriani's:

   take DATA as they are, correct MC to fit with DATA based on MC-DATA 2001, applied also for 2002
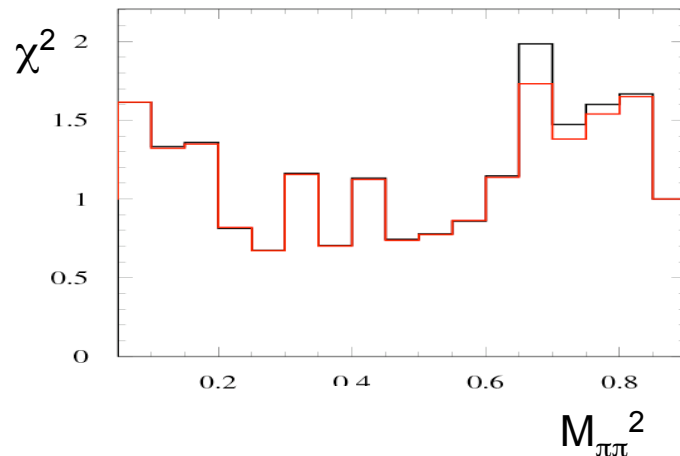
2. 007:

   small calibration applied to DATA, correct MC to fit $DATA_{clb}$, studied for 2002 and 2006 (DATA & MC)
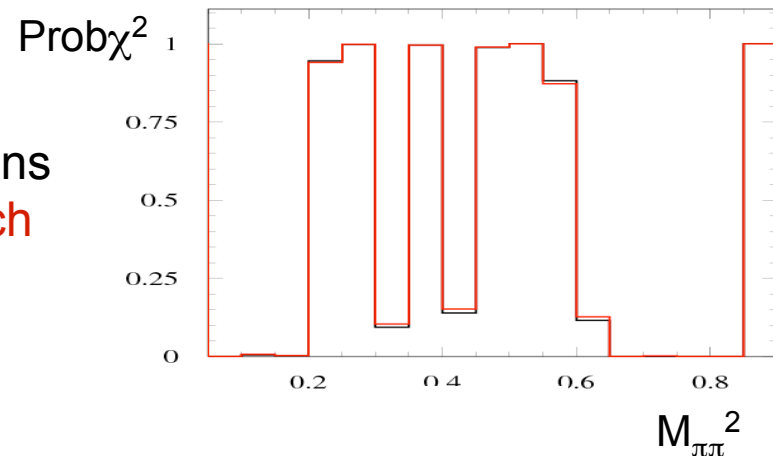
Background fitting procedure

Fitting procedure to get precise agreement between DATA and MCs in Trackmass spectrum in slices of $M_{\pi\pi}^2$ (of 0.5 GeV^2)
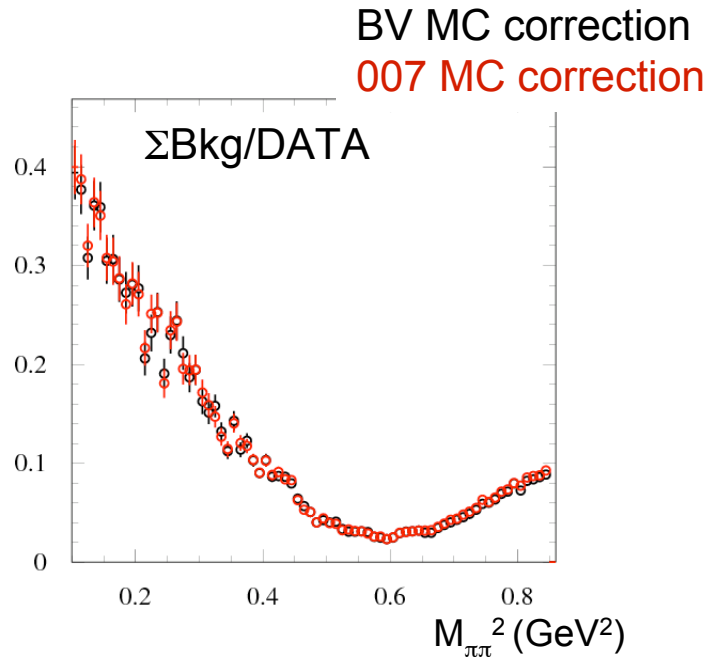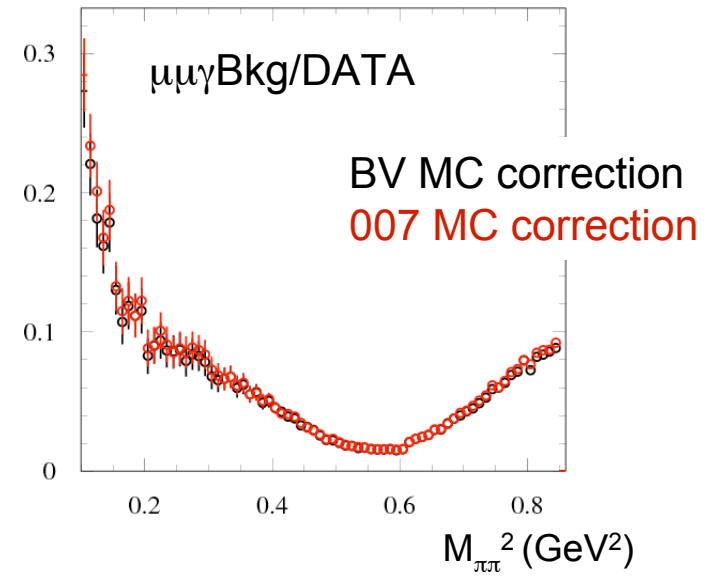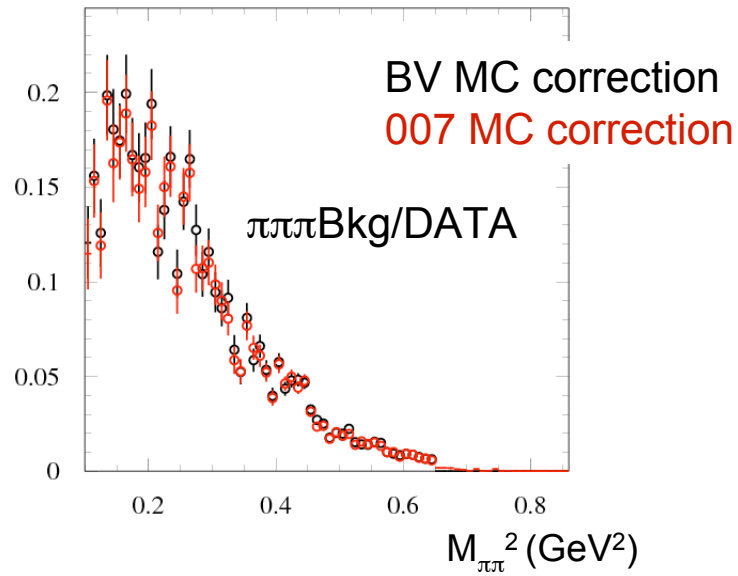
➜ **weights** for $\mu\mu\gamma$, $\pi\pi\pi$, $ee\gamma$ MCs

BV corrections
007 approach

# Bkg fit - Results

BV MC correction
007 MC correction
$\pi\pi\pi$Bkg/DATA
$M_{\pi\pi}^2$ (GeV^2)

$\mu\mu\gamma$Bkg/DATA
BV MC correction
007 MC correction
$M_{\pi\pi}^2$ (GeV^2)

BV MC correction
007 MC correction
ΣBkg/DATA
$M_{\pi\pi}^2$ (GeV^2)

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Bkg fit - Conclusion

✔ Refined background fit procedure more robust

✔ Better agreement between BV's correction and 007 approach

✔ Systematic error: errors on the amount of background source

                    (error due to statistic and fitting procedure taken into account)

$\mu\mu\gamma$ Bkg

$M_{\pi\pi}^2$ (GeV^2)

$\pi\pi\pi$ Bkg

$M_{\pi\pi}^2$ (GeV^2)
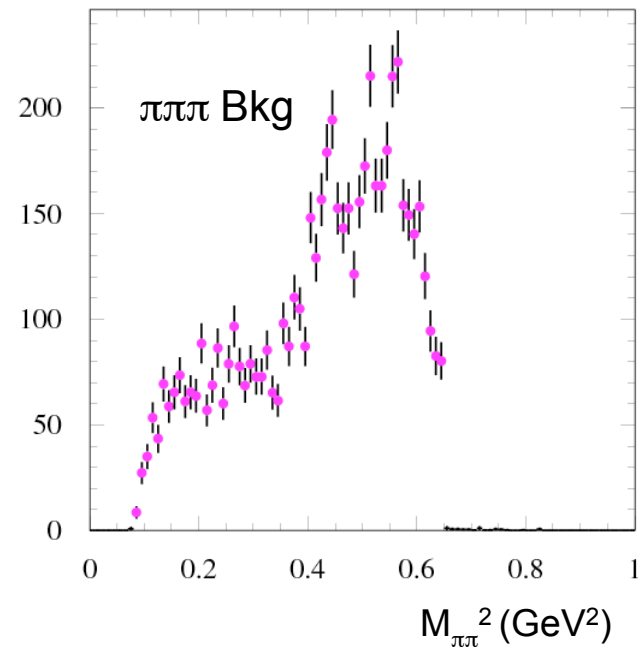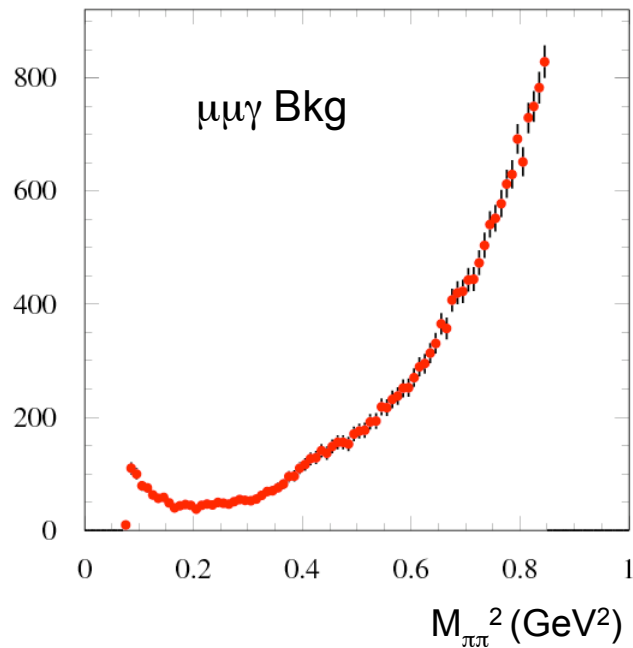
Large Angle 2006

Preliminary Tracking Efficiency

Filtering criteria

Directly $\pi\pi\gamma$ (or $\pi\pi$) events to evaluate the efficiency

~ 16 pb^{-1} of DATA filtered and ntuplized ($\times 6$ for MC)

$\pi\pi\gamma$ events

✖ *Tagging Track*:
  - → PCA: $|z_{pca}| < 7$ cm and $|\rho_{pca}| < 15$ cm
  - → Track to cluster association
  - → $35º < \theta < 145º$
  - → Lieklihood: $0.3 < LogL < 35$

✖ *Neutral prompt cluster*:
  - → Cluster not associated with the tagging track
  - → $E_\gamma > 50$ MeV
  - → $\left(\dfrac{R_{clu}}{c} - T_{clu} \right) < \sqrt{ \left(\sigma_{T(Br;EnC)} \sqrt{ \dfrac{1}{E_{clu}(GeV)} } \right)^2 + \Delta T^2 } < 5\text{ns}$
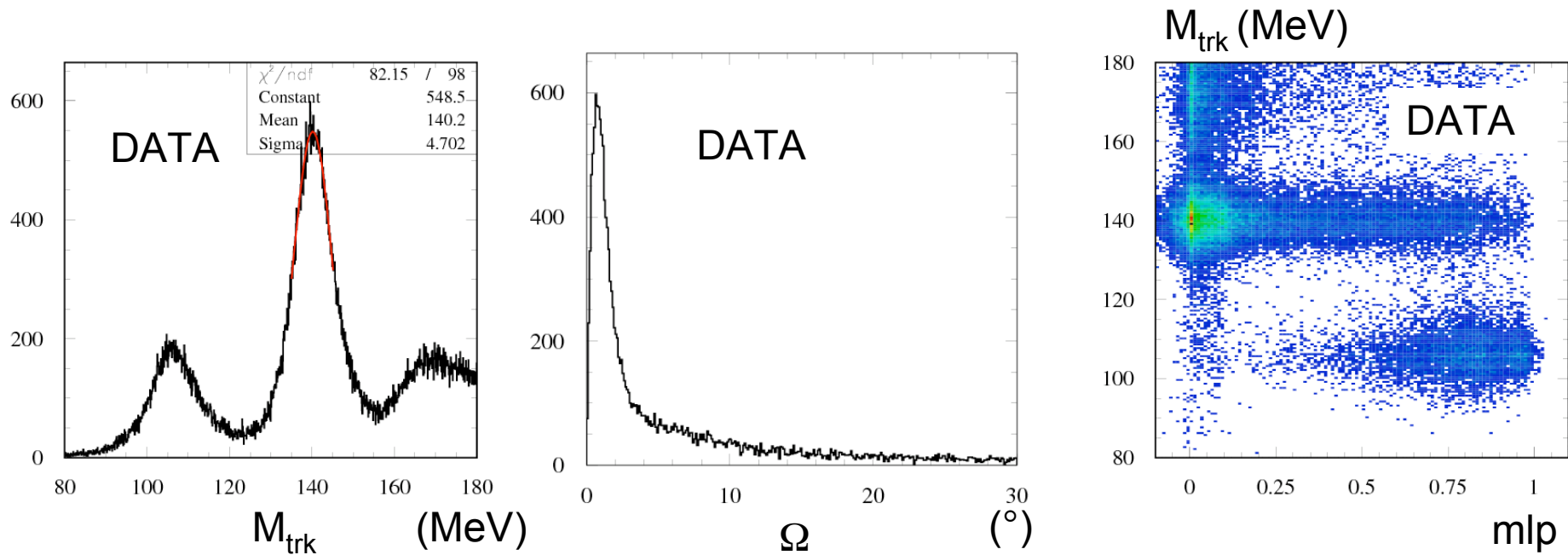
$\pi\pi$ collinear events

✖ *Tagging Track*
✖ *Collinear track(s)*:
  - → $460 < |p| < 500$ MeV
  - → No neutral cluster

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Check on the selection of ππγ events

Two tracks which fulfill the
tagging criteria and requiring
also the vertex

Trackmass, Ω and Trackmass vs mlp suggest
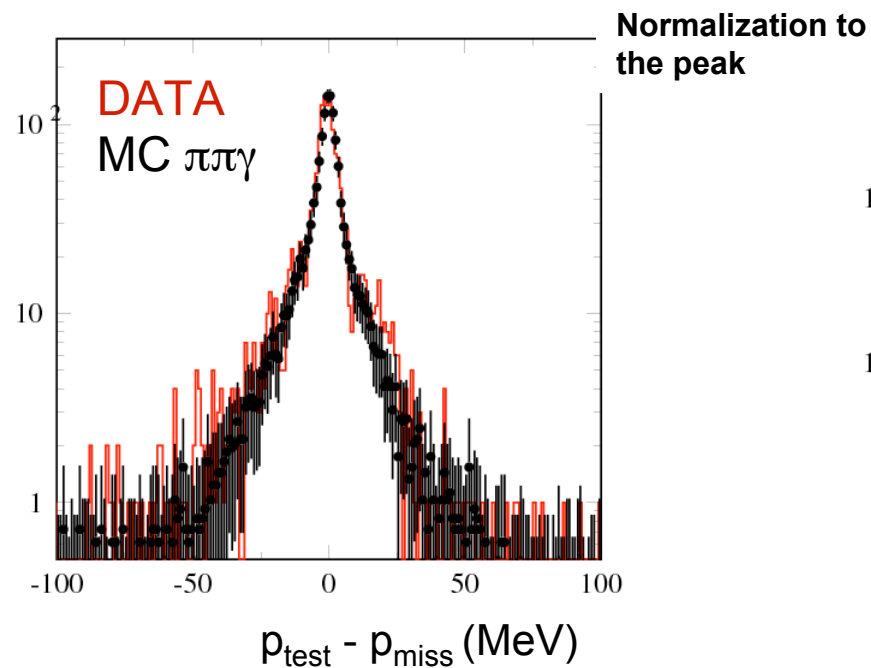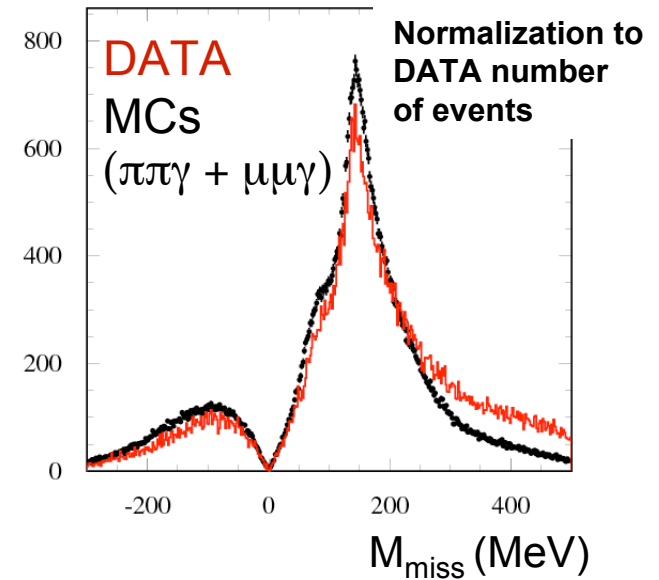good selection of ππγ events

Cuts

Tagging Tracks: $50° < \theta < 130°$

Photon : $50° < \theta < 130°$

Missing momentum: $50° < \theta < 130°$

$|M_{miss} (\pi$ hypothesis$) - m_\pi| < 20$ MeV

$-0.2 < mlp_{tag} < 0.2$

Self trigger from the tagging track

➔ $\mu\mu\gamma/\pi\pi\gamma \sim 2\%$

DATA
MCs
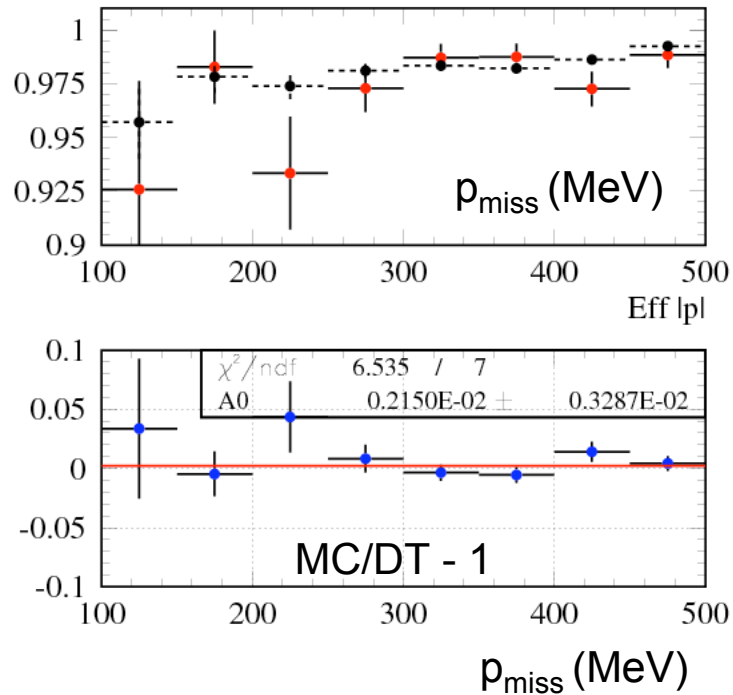$(\pi\pi\gamma + \mu\mu\gamma)$

Normalization to DATA number of events

M_{miss} (MeV)

DATA
MC $\pi\pi\gamma$

Normalization to the peak

$p_{test} - p_{miss}$ (MeV)

DATA
MC $\pi\pi\gamma$

$\theta_{test} - \theta_{miss}$ (°)

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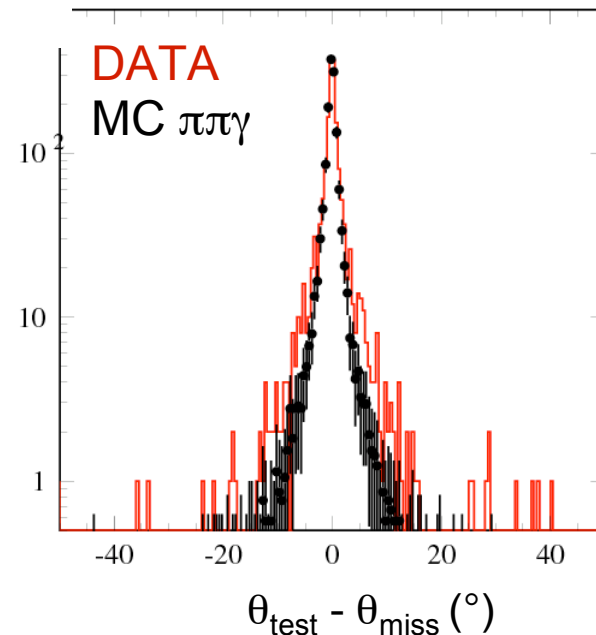
EFFICIENCY:
another track (other the tagging one)
- **opposite charge**
- ρ_{FH} **< 50 cm**
- ρ_{PCA} **< 8 cm and** $|z_{PCA}|$ **< 12 cm**

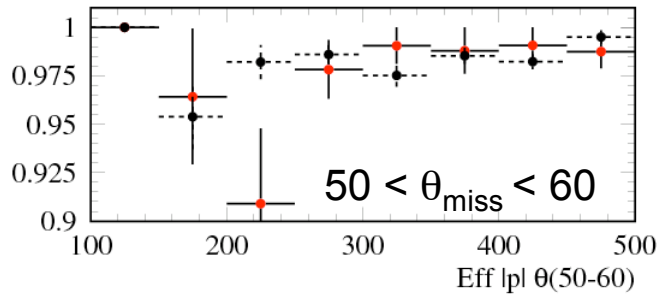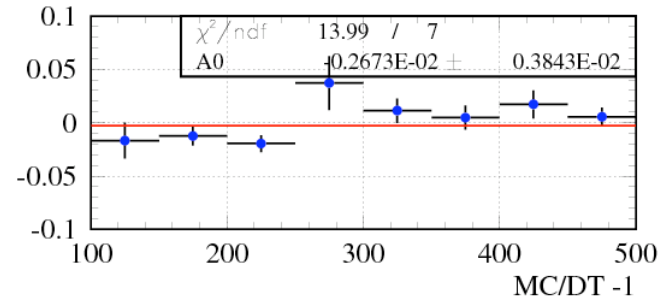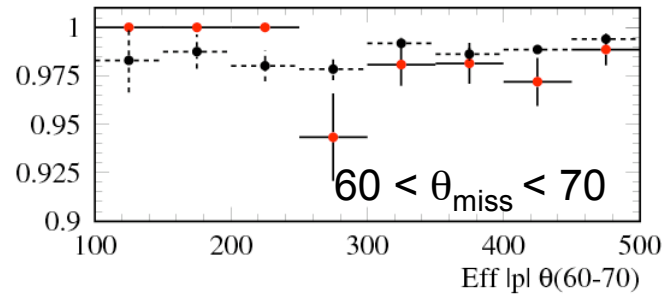Inclusive in θ_{miss}
Self triggering

DATA
MC $\pi\pi\gamma$

Inclusive in θ_{miss}
No self triggering request

p_{miss} (MeV)

Eff |p|

χ^2/ndf   6.535 / 7
A0   0.2150E-02 $\pm$ 0.3287E-02

MC/DT - 1

p_{miss} (MeV)

p_{miss} (MeV)

Eff |p|

χ^2/ndf   2.903 / 7
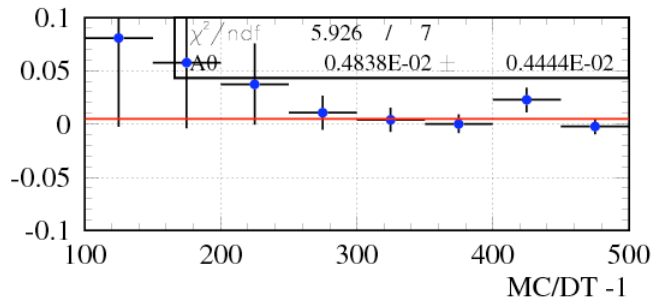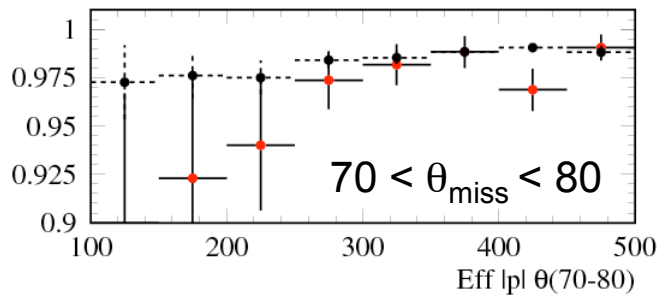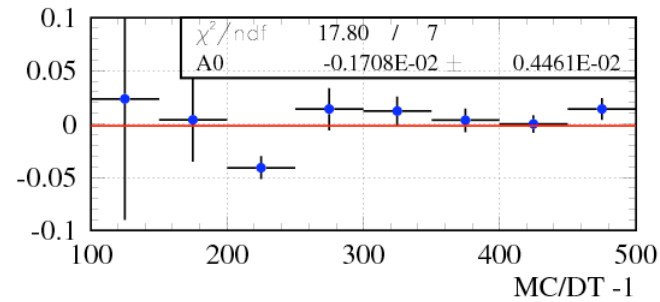A0   0.6677E-02 $\pm$ 0.2522E-02

MC/DT - 1

p_{miss} (MeV)
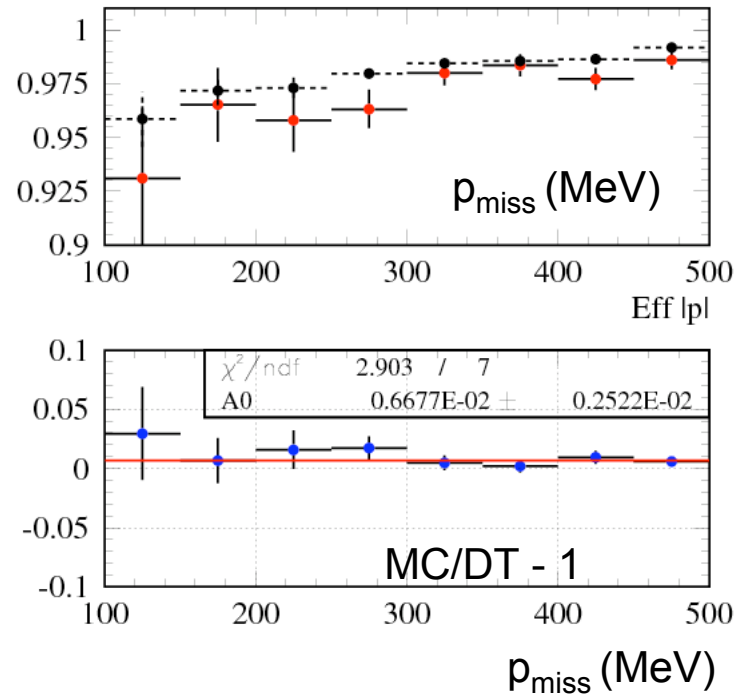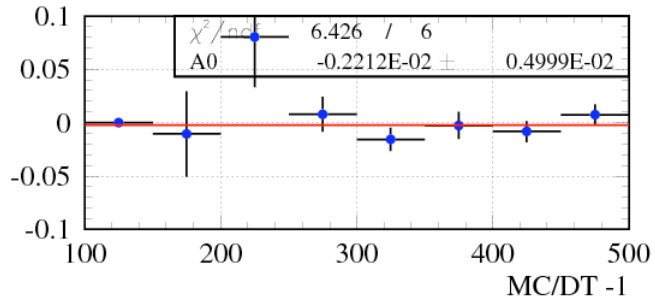
DATA
MC $\pi\pi\gamma$

In all the plots
no self triggering
request

50 < θ_{miss} < 60

Eff |p| θ(50-60)

χ^2/ndf   6.426 / 6
A0   -0.2212E-02 $\pm$ 0.4999E-02

MC/DT -1

60 < θ_{miss} < 70

Eff |p| θ(60-70)

χ^2/ndf   13.99 / 7
A0   -0.2673E-02 $\pm$ 0.3843E-02

MC/DT -1

DATA
MC $\pi\pi\gamma$

70 < θ_{miss} < 80

Eff |p| θ(70-80)

χ^2/ndf   5.926 / 7
A0   0.4838E-02 $\pm$ 0.4444E-02

MC/DT -1

80 < θ_{miss} < 90

Eff |p| θ(80-90)

χ^2/ndf   17.80 / 7
A0   -0.1708E-02 $\pm$ 0.4461E-02

MC/DT -1

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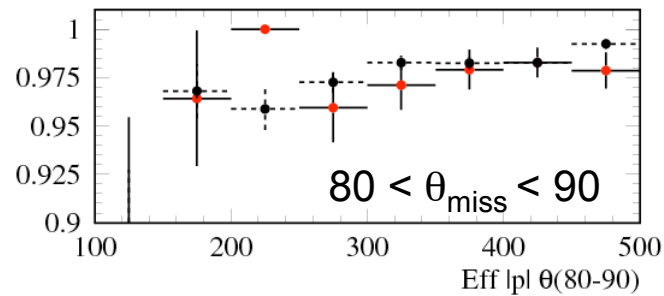
Conclusion

✔ First steps on the way:

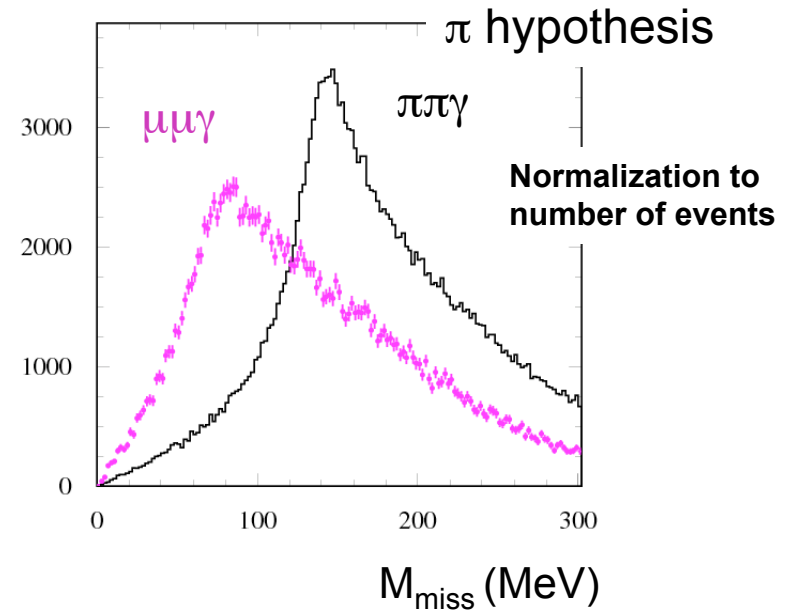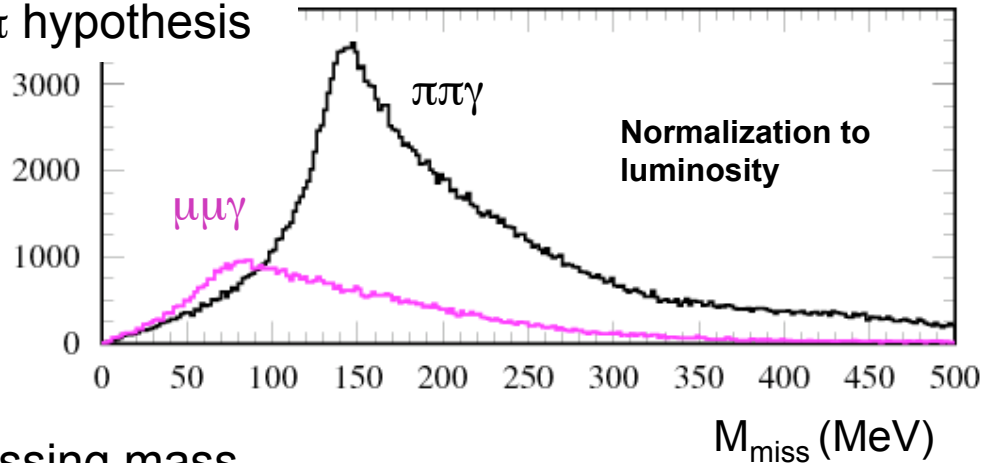   - DATA - MC comparison looks reasonable

✔ More statistic is strictly needed

✔ Next steps: precise evaluation and systematics

✔ Collinear events

Backup

Missing mass (one track and one neutral prompt cluster)

Missing mass in π hypothesis

$\pi\pi\gamma$

$\mu\mu\gamma$

Normalization to luminosity

M_{miss} (MeV)

Missing mass in μ hypothesis

$\pi\pi\gamma$

$\mu\mu\gamma$

Normalization to luminosity

M_{miss} (MeV)

π hypothesis

$\mu\mu\gamma$

$\pi\pi\gamma$

Normalization to number of events

M_{miss} (MeV)

μ hypothesis

$\mu\mu\gamma$

$\pi\pi\gamma$

Normalization to number of events

M_{miss} (MeV)