Photon Energy Scale

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Outline

- γ energy scale, θ, E dependence run I – run IV
- EMC response to π⁰'s and γ's
- Errors
- Summary and Plans
γ Energy Scale - θ Dependence

θ dependence of the γ scale in μμγ MC data

Changes of the θ parametrization with the γ energy scale in different energy bins in case of MC are not significant but sizeable -> systematic error

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EMC Calibration Meeting
\textbf{\(\gamma\) Energy Scale - \(\theta\) Dependence}

- \(\theta\) dependence of the \(\gamma\) scale in \(\mu\mu\gamma\) data

Changes of the \(\theta\) parametrization with the \(\gamma\) energy scale in different energy bins in case of data.

- Apply the \(\theta\) dependent calibration to \(\mu\mu\gamma\) and \(\pi^0\) data and extract the \(E\) dependent part of the calibration.
γ Energy Scale - E Dependence

E dependence of the γ scale in μμγ and π^0 MC in EMC_{barrel}

![Graphs showing γ scale vs. E dependence for different runs](chart)

- MC run 4
- MC run 3
- MC run 2
- MC run 1

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\( \gamma \) Energy Scale - E Dependence

E dependence of the \( \gamma \) scale in \( \mu \mu \gamma \) and \( \pi^0 \) data in EMC_{barrel}.

- \( \pi^0 \) data
- \( \mu \mu \gamma \) data

1% accuracy

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EMC Calibration Meeting
Combined $\gamma$ E scale for $\pi^0$ and $\mu\mu\gamma$ data

Correction functions to the $\gamma$ energy scale

- The corrections arise due to the difference in the calorimeter response in data and MC. For a detailed discussion see EMC session of the September 2005 Collaboration meeting. These corrections are not applied!

- Systematic effects due to the angular part are not considered. They can be quantified looking at the energy dependence in the MC. Changes in the parametrizations of the order of 0.3% can easily happen.
EMC Response in Data and MC

EMC response to high $E_\gamma$ and $\pi^0$

Apply parametrizations to $\pi^0$ and $\mu\mu\gamma$ data and measure data/mc response.

Larger $E$ dependence in $\theta$ at low $E$
**EMC response to high $E_\gamma$ and $\pi^0$**

Apply parametrizations to $\pi^0$ and $\mu\mu\gamma$ data and measure data/mc response.

![Graph showing data/MC ratios for $\mu\mu\gamma$ and $\pi^0$ data in EMC barrel before and after calibration.](image)

- $\mu\mu\gamma$ data EMC$_{\text{barrel}}$
- $\pi^0$ data EMC$_{\text{barrel}}$
- 1% Data/MC
- 1% Data/MC
- $\ln E_\gamma$ / GeV
- $I_0$
- run 3
- run 3
- after calib
- before calib
EMC response to high \( E_\gamma \) and \( \pi^0 \)

Apply parametrizations to \( \pi^0 \) and \( \mu\mu\gamma \) data and measure data/mc response.

\[
\mu\mu\gamma \text{ data } EMC_{\text{barrel}}
\]

\[
\pi^0 \text{ data } EMC_{\text{barrel}}
\]

\[
\text{run 2}
\]

\[
\ln E_\gamma / \text{GeV}
\]

\[
\text{Data/MC}
\]

\[
\text{1 \%}
\]

\[
\text{1 \%}
\]
EMC response to high $E_\gamma$ and $\pi^0$

Apply parametrizations to $\pi^0$ and $\mu\mu\gamma$ data and measure data/mc response.

Data/MC

1% after calib
1% before calib

$\ln E_\gamma / \text{GeV}$

Run 1

1% after calib
1% before calib
Summary and Plans

- There are data/MC deviations in the E region 0.75 GeV – 2.0 GeV. They are probably covered by the systematic errors, but to my taste they are too large.

- Some systematic checks using run 1 are in progress.

- Need to work on run 5.