EPICAL-2 simulation settings
beam energy spread
chip-by-chip threshold
cosmic muons

23.06.2021
mTower meeting

Tim Rogoschinski
Institut für Kernphysik
Goethe University Frankfurt
number of hits and clusters

更强的束流能量发散对分布的影响

- 更强的束流能量发散对较低能级的影响
energy resolution

→ worsening of the energy resolution

dots at energies x.1 GeV
from simulation with beam energy spread

EPICAL-2 preliminary
Allpix\textsuperscript{2} simulation
default settings

solid line
0 GeV spread of beam energy
all chips with threshold 82e ± 20e

crosses
0.158 GeV spread of beam energy
all chips with threshold 82e ± 20e
number of hits and clusters

→ chip-by-chip threshold does not influence the shape of the distribution

→ mean at lower number of hits for higher energies (caused by defect chip in layer 22 ?)

0 GeV spread of beam energy
all chips with threshold $82e \pm 20e$

Crosses
0 GeV spread of beam energy
chips with individual threshold
energy resolution

→ small influence on energy resolution

![Graph showing energy resolution versus electron energy. Dots represent EPICAL-2 preliminary simulation with Allpix$^2$ simulation default settings and EPICAL-2 Allpix$^2$ simulation default settings. The graph includes dots for $\sigma/\mu$ (hits) and $\sigma/\mu$ (clusters).]

solid line
0 GeV spread of beam energy
all chips with threshold $82e \pm 20e$

crosses
0 GeV spread of beam energy
chips with individual threshold

dots at energies
x.1 GeV
from simulation with individual threshold
number of hits and clusters

→ broadening caused by energy spread
→ mean of hits distribution at lower values caused by individual threshold

(defect chip in layer 22)

![Graph showing number of hits and clusters against energy levels.](image)

**Solid line**

0 GeV spread of beam energy
All chips with threshold $82e \pm 20e$

**Crosses**

0.158 GeV spread of beam energy
Chips with individual threshold
energy resolution

ajaran worsening of the energy resolution (dominated by beam energy spread)

dots at energies x.1 GeV from simulation with individual thresholds and energy spread

what do we want to show in the paper?

here we have two scenarios:

→ *ideal* detector and beam

→ *real* detector and beam

calibration for simulation? chip-by-chip threshold like in data would need calibration, right? But how?
longitudinal profile based on hit measurement

0 GeV spread of beam energy
all chips with threshold 82e ± 20e

from EPICAL-2 summary by HIROKI
based on cosmic energy calibration
no lateral profiles involved
longitudinal profile based on cluster measurement

0 GeV spread of beam energy
all chips with threshold $82e \pm 20e$

from EPICAL-2 summary by HIROKI
based on cosmic energy calibration
no lateral profiles involved
EPICAL-2 simulation with cosmic muons

settings for the simulation of cosmic muons?

**source:**
- plane in front of EPICAL2
- set angular distribution such, that it covers extreme cases

**energy:**
- power law
- $E_{\text{min}} = 5 \text{ GeV}$
- $E_{\text{max}} = 100 \text{ GeV}$
additional slides
"The absolute momentum spread is found to be constant at \(158 \pm 6\) MeV/c over the full momentum range for horizontal collimator openings."

<table>
<thead>
<tr>
<th>(B) (T)</th>
<th>(\bar{p}) (GeV/c)</th>
<th>(\sigma) (GeV/c)</th>
<th>(\frac{\sigma}{\bar{p}}) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.12</td>
<td>0.907</td>
<td>0.116</td>
<td>12.7</td>
</tr>
<tr>
<td>0.30</td>
<td>2.162</td>
<td>0.197</td>
<td>9.1</td>
</tr>
<tr>
<td>0.44</td>
<td>3.001</td>
<td>0.111</td>
<td>3.7</td>
</tr>
<tr>
<td>0.59</td>
<td>3.989</td>
<td>0.128</td>
<td>3.2</td>
</tr>
<tr>
<td>0.75</td>
<td>5.078</td>
<td>0.163</td>
<td>3.2</td>
</tr>
<tr>
<td>0.90</td>
<td>6.003</td>
<td>0.093</td>
<td>1.5</td>
</tr>
</tbody>
</table>