The LHCal MC simulation

Updated results

Vladyslav Lukianchuk[1]

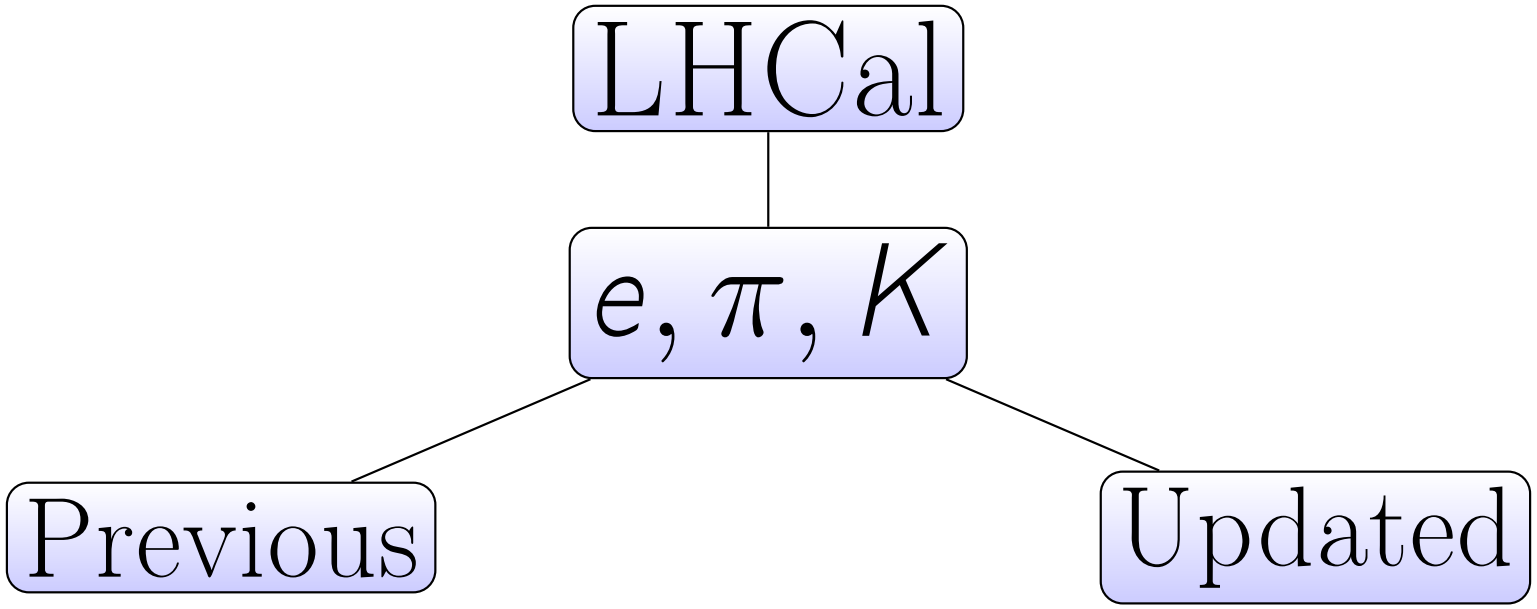
TARAS SHEVCHENKO NATIONAL UNIVERSITY OF KYIV
DEPARTMENT OF NUCLEAR PHYSICS

4-May-2016

[1] vladyslav.lukianchuk@desy.de

Outline

Introduction: Current status

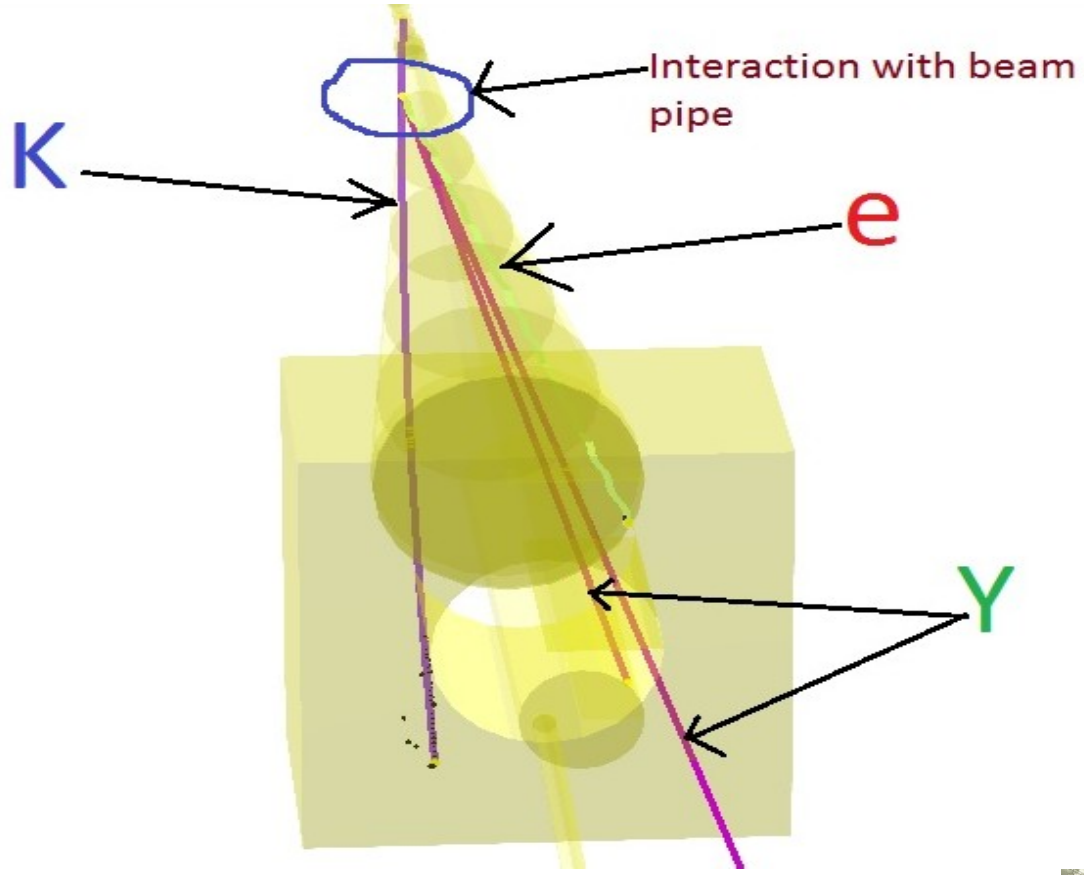


- Energy deposition — **W, Fe** within **1 GeV — 20 GeV**
- Detector response vs initial particle energy (linearity observed)
- Energy deposition vs Z axis (energy leakage observed)
- Energy resolution — studied (for **Fe** better compare to **W**)

- Energy deposition — **W, Fe** for **50 GeV, 100 GeV**
- Check linearity of detector response within **1 GeV — 100 GeV**
- Energy resolution studied within **1 GeV — 100 GeV**

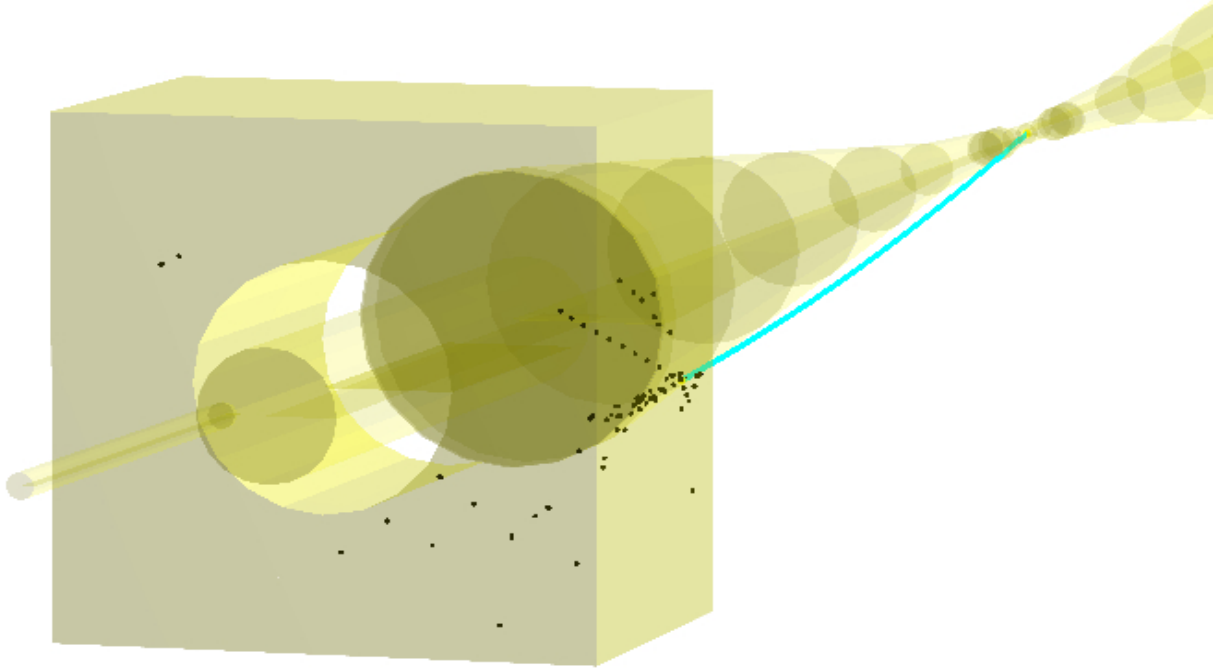
Introduction: Updated features

- An initial particle - K, 5 GeV
- The interaction with beam pipe causes a formation of e, γ



Introduction: Updated features

- Only events "initial particle — the LHCal" were chosen



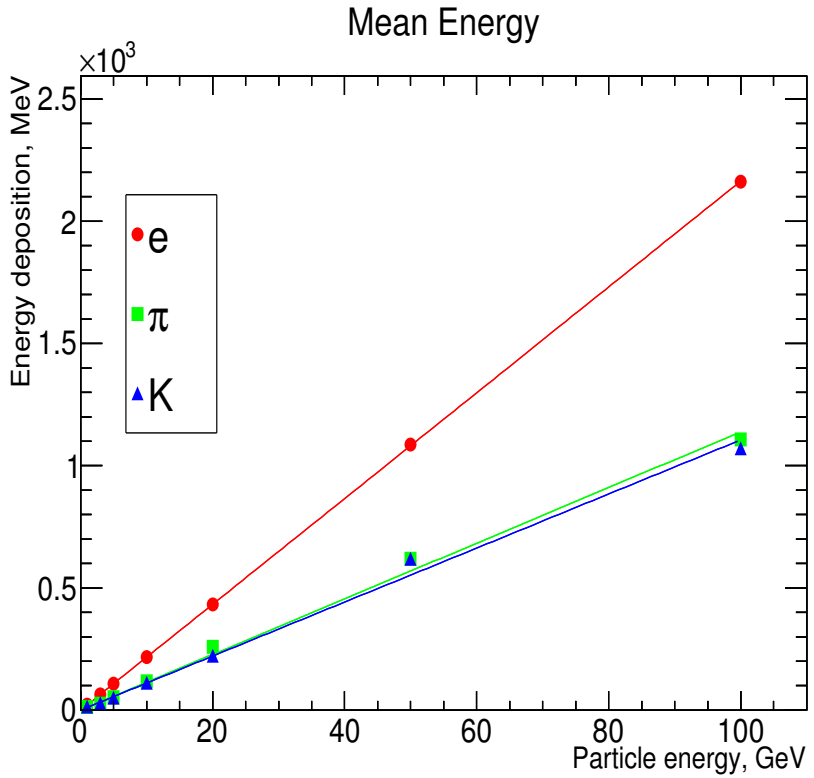
Detector response vs initial energy:

Data fitted by $E_{deposition} = A \cdot E_{init}$

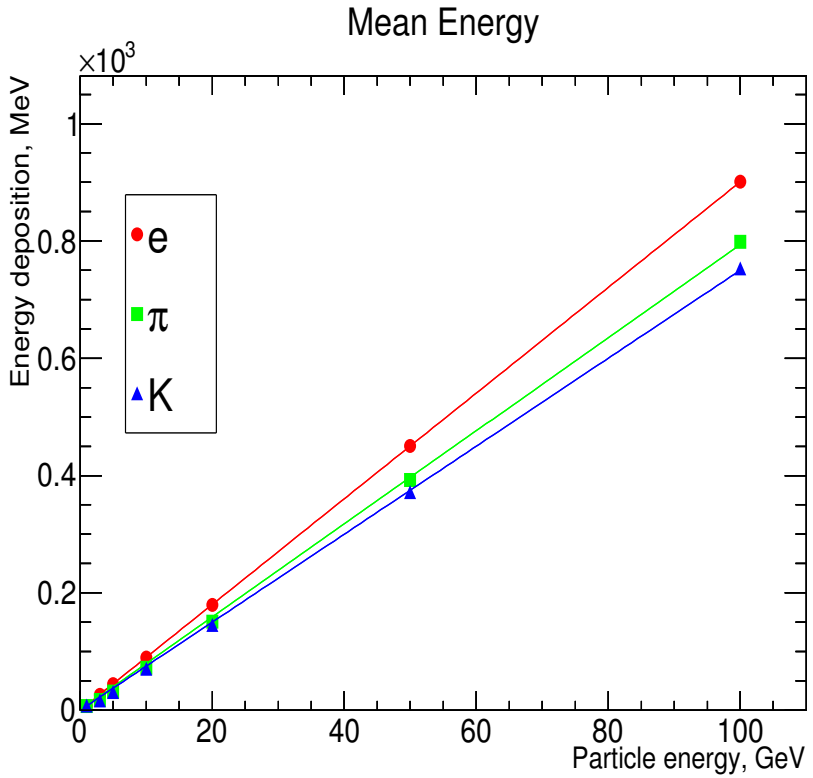
Particle	χ^2/ndf	A
e	$22,76/6$	$21,64 \pm 0,02$
π	$4533/6$	$11,38 \pm 0,24$
K	$5572/6$	$11,05 \pm 0,27$

Particle	χ^2/ndf	A
e	$4,377/6$	$9,01 \pm 0,01$
π	$267,4/6$	$7,94 \pm 0,06$
K	$132,7/6$	$7,50 \pm 0,04$

Fe



W



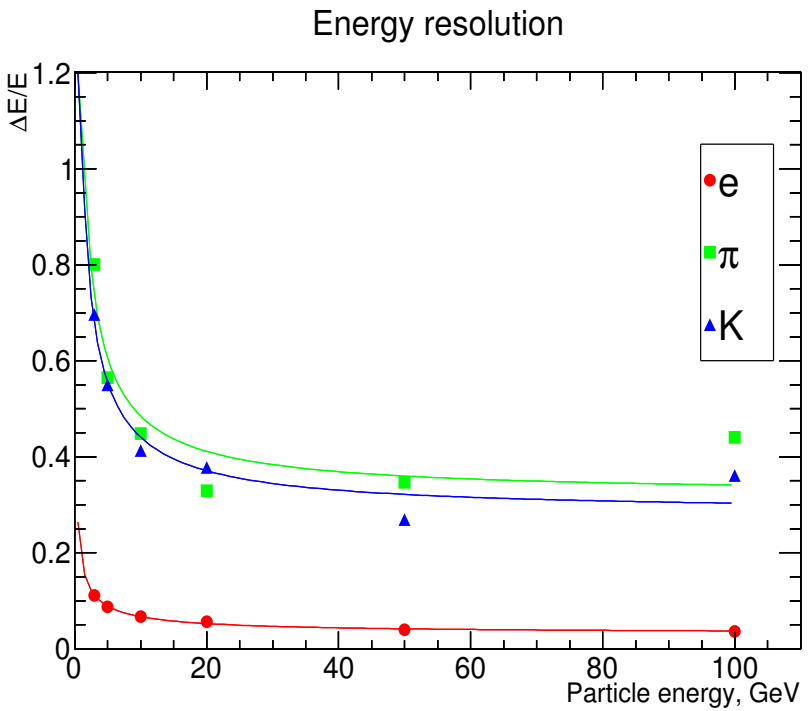
Energy resolution:

Data fitted by $\frac{\Delta E}{E} = \frac{A}{\sqrt{E}} \oplus B$

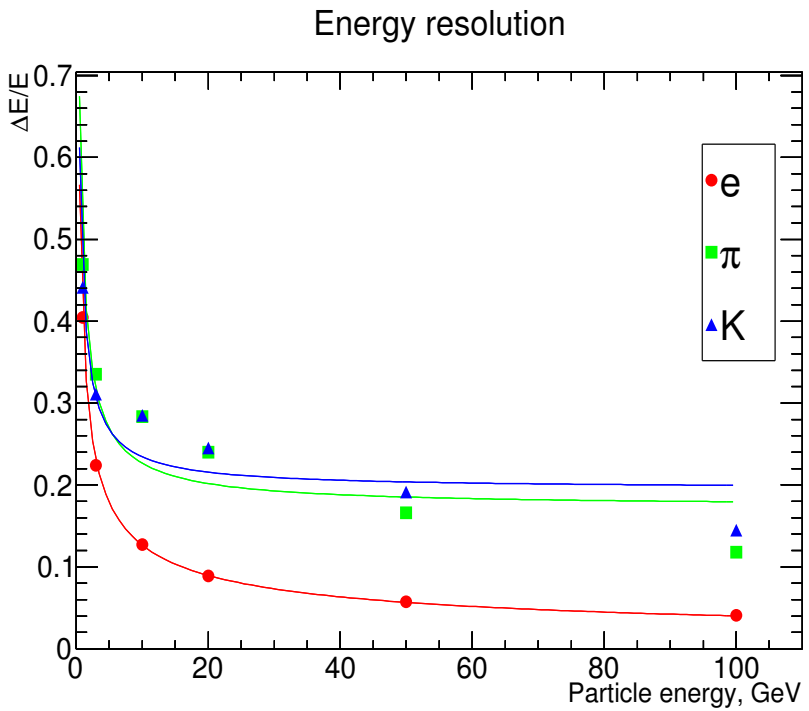
Particle	A	B
e	$0,185 \pm 0,003$	$0,032 \pm 0,002$
π	$1,15 \pm 0,14$	$0,32 \pm 0,05$
K	$1,07 \pm 0,07$	$0,28 \pm 0,03$

Particle	A	B
e	$0,401 \pm 0,004$	$0,001 \pm 0,05$
π	$0,46 \pm 0,05$	$0,17 \pm 0,03$
K	$0,41 \pm 0,05$	$0,20 \pm 0,02$

Fe



W



Conclusions

- The simulation for e, π, K within 1-100 GeV done for Fe, W
- The linear response of the LHCal is observed
- The energy resolution of the LHCal studied for Fe, W

The next steps:

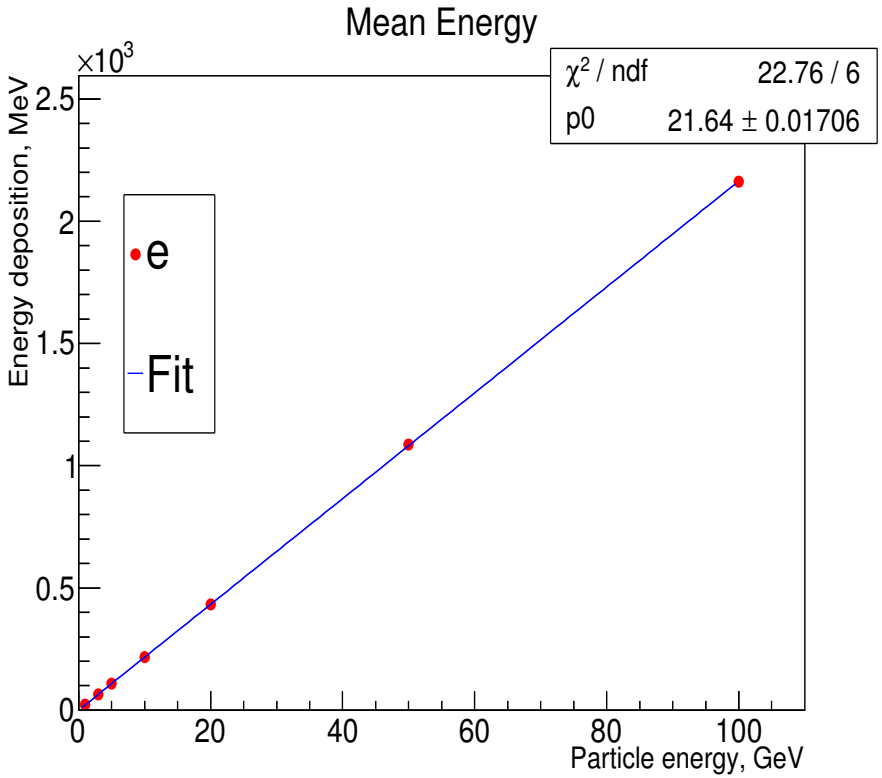
- Summarize obtained results regarding the LHCal study
- Writing the master thesis

Backup slides

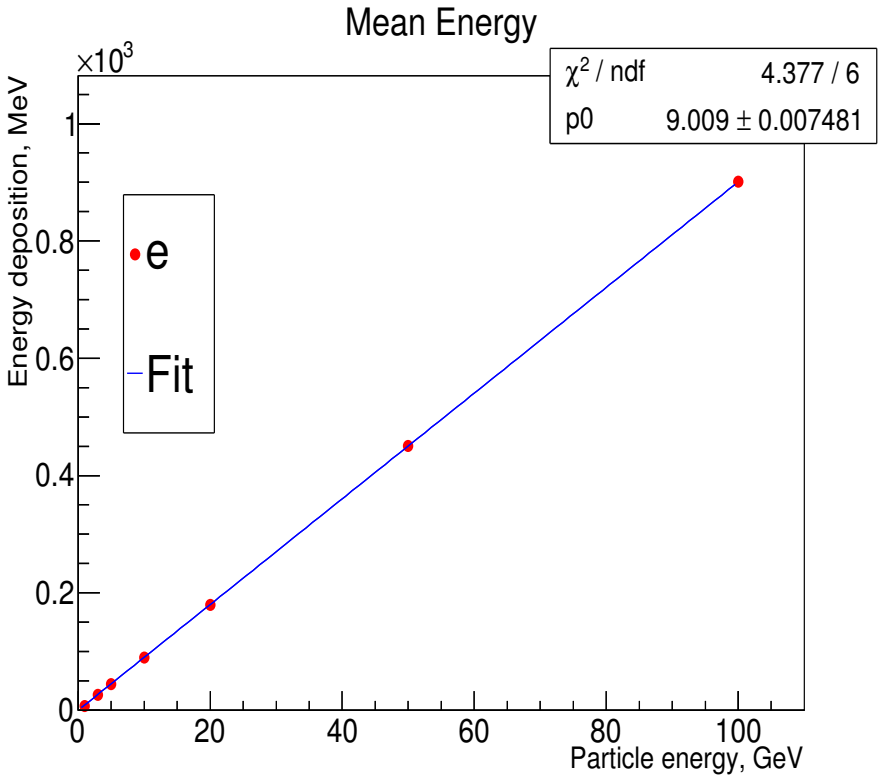
Detector response vs initial energy:

Data fitted by $E_{deposition} = A \cdot E_{init}$

Fe



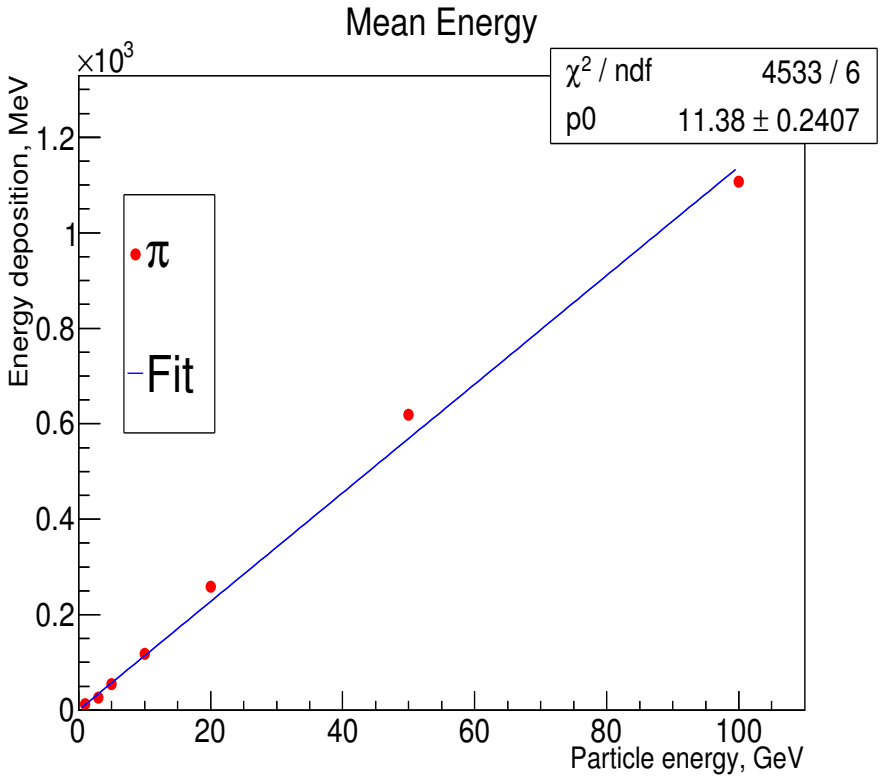
W



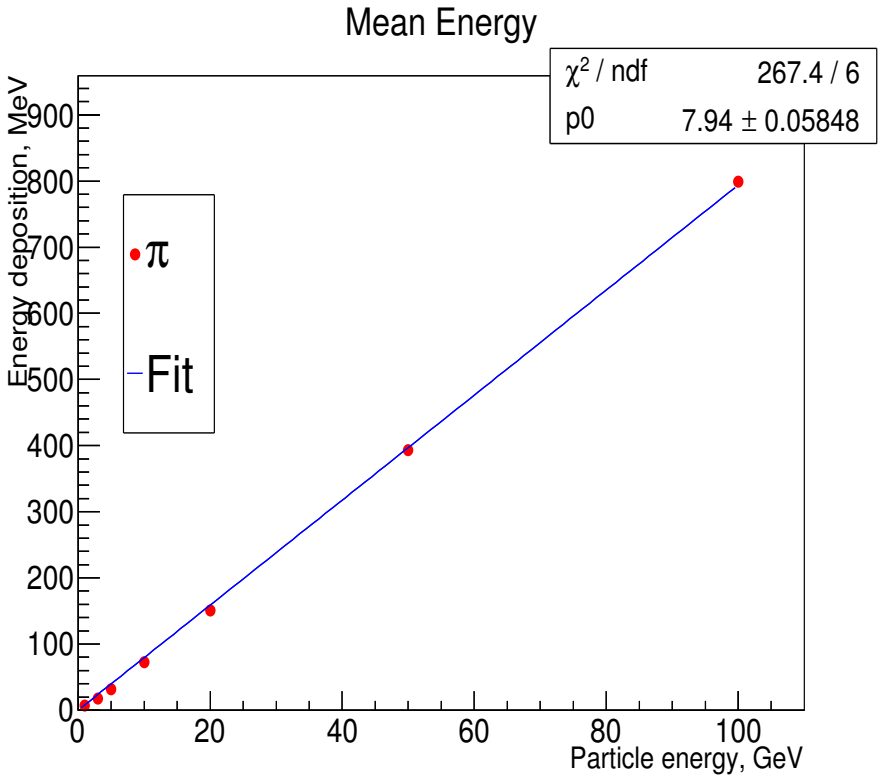
Detector response vs initial energy:

Data fitted by $E_{deposition} = A \cdot E_{init}$

Fe



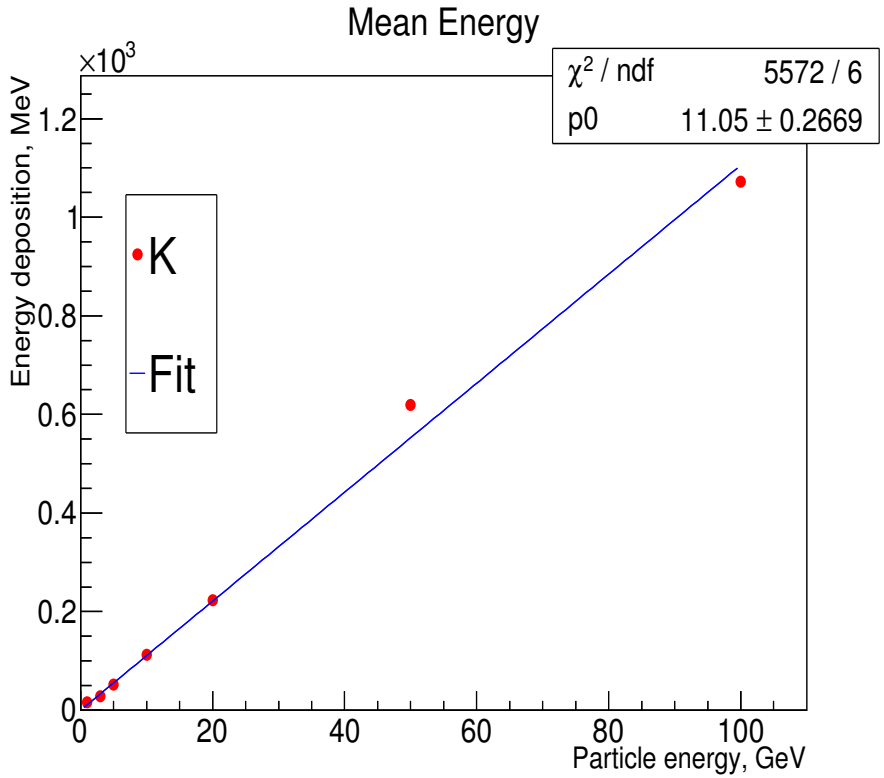
W



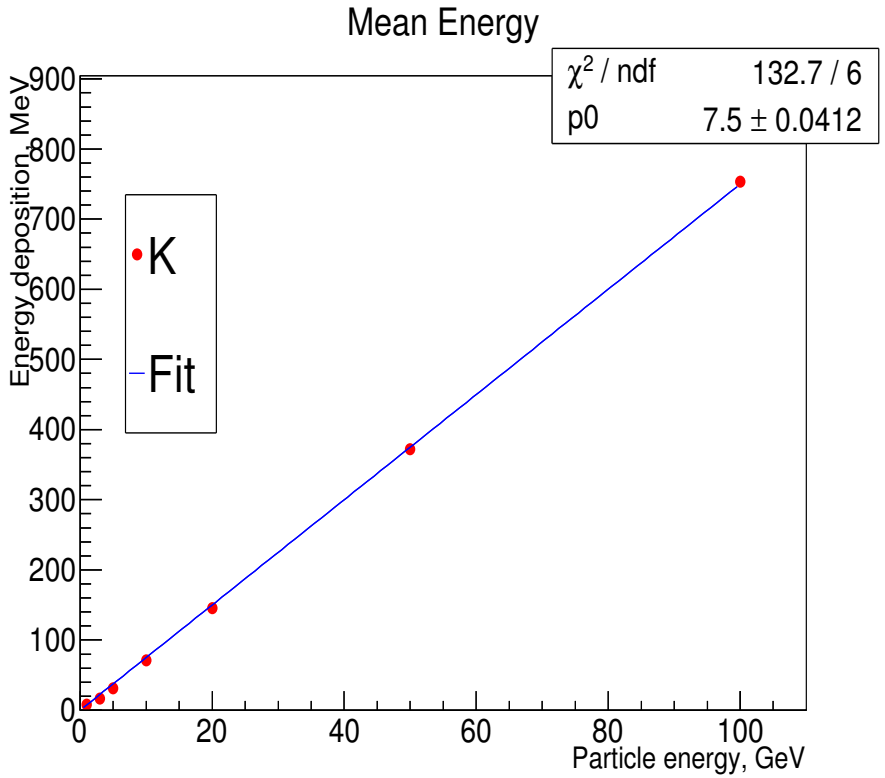
Detector response vs initial energy:

Data fitted by $E_{deposition} = A \cdot E_{init}$

Fe



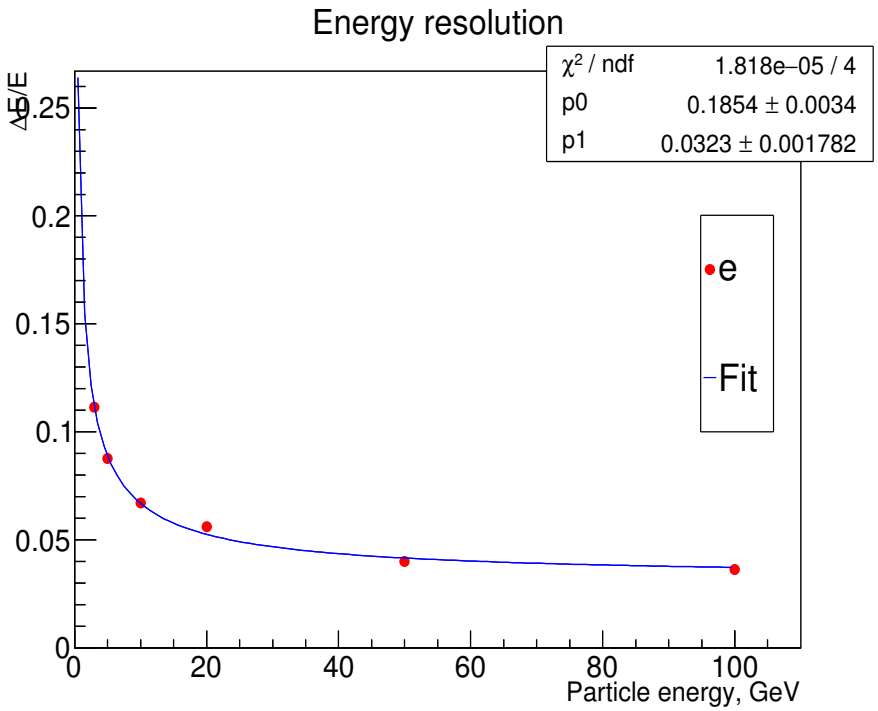
W



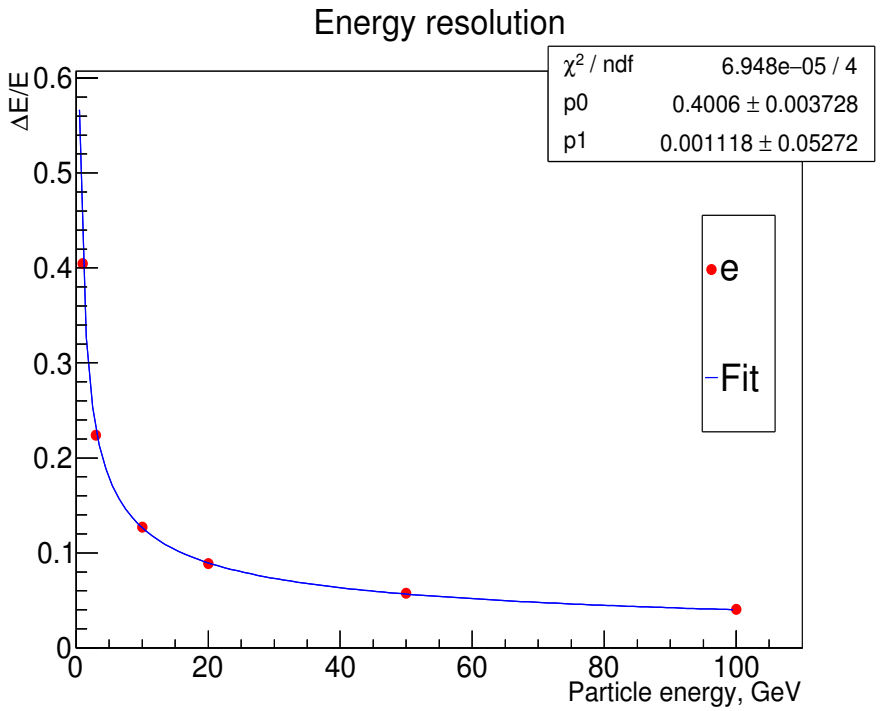
Energy resolution:

Data fitted by $\frac{\Delta E}{E} = \frac{A}{\sqrt{E}} \oplus B$

Fe



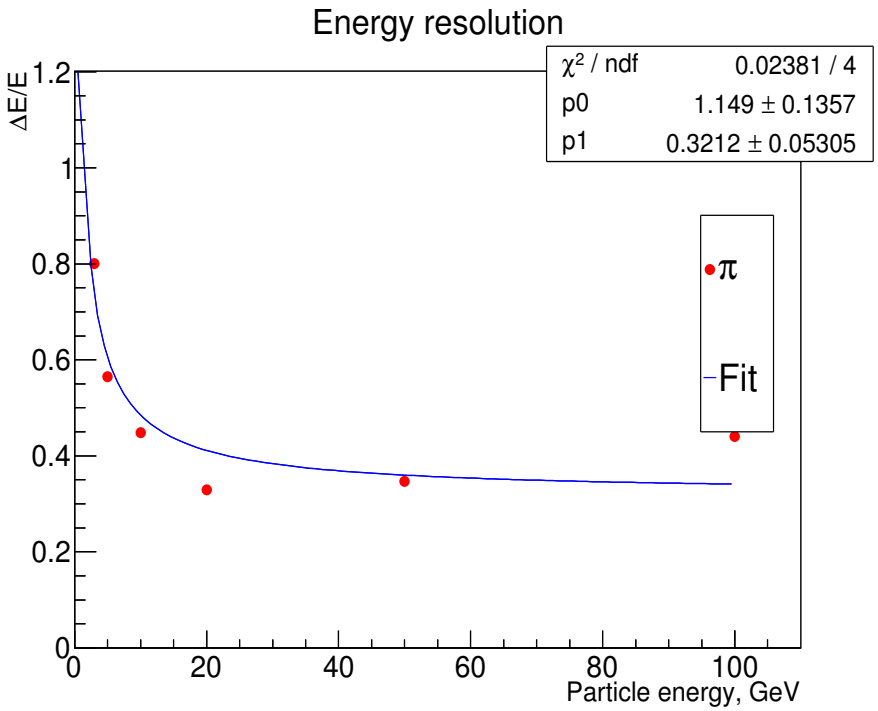
W



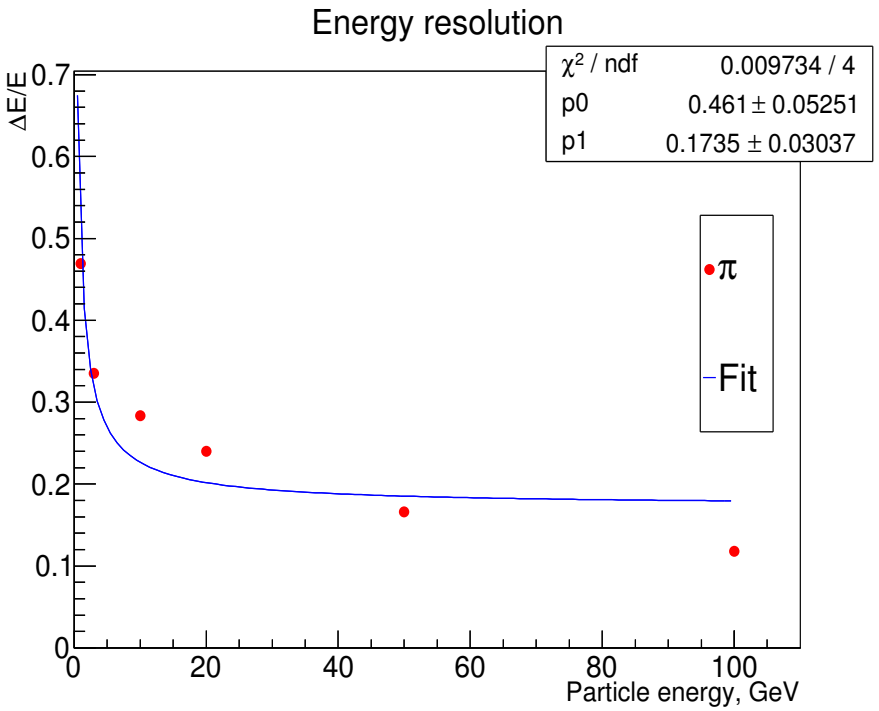
Energy resolution:

Data fitted by $\frac{\Delta E}{E} = \frac{A}{\sqrt{E}} \oplus B$

Fe



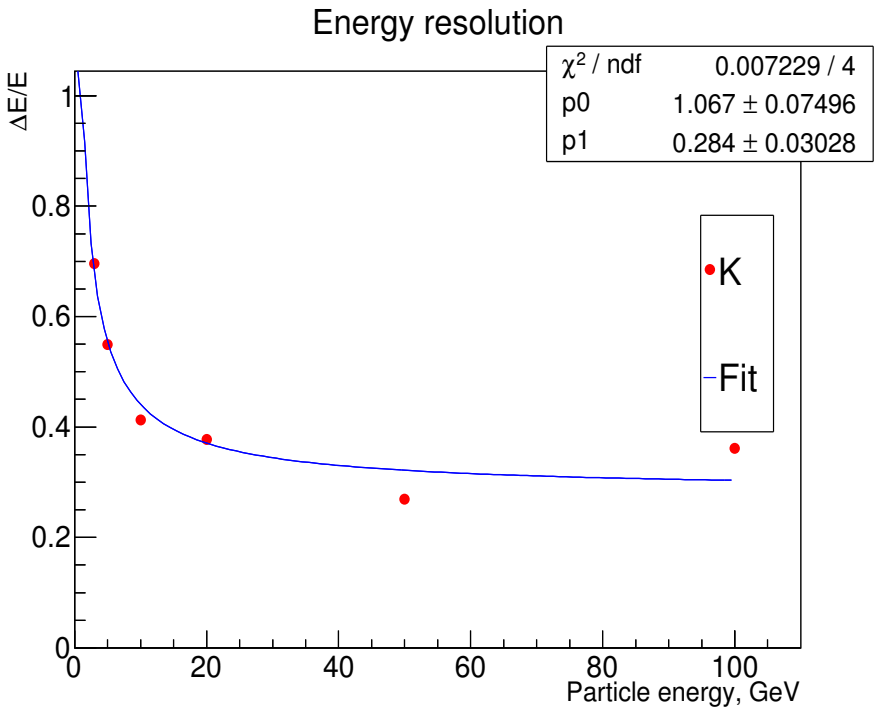
W



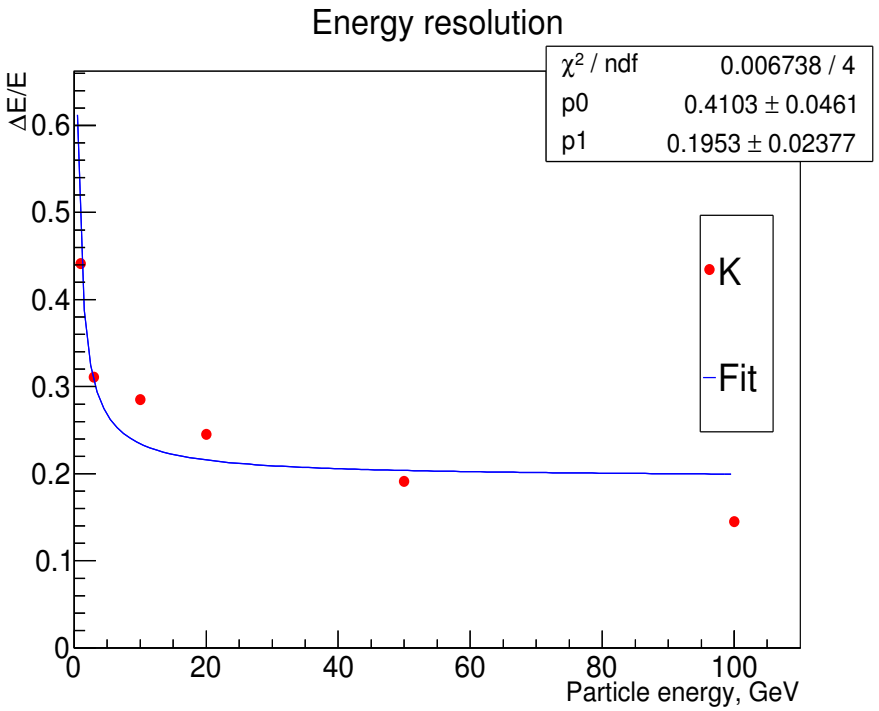
Energy resolution:

Data fitted by $\frac{\Delta E}{E} = \frac{A}{\sqrt{E}} \oplus B$

Fe

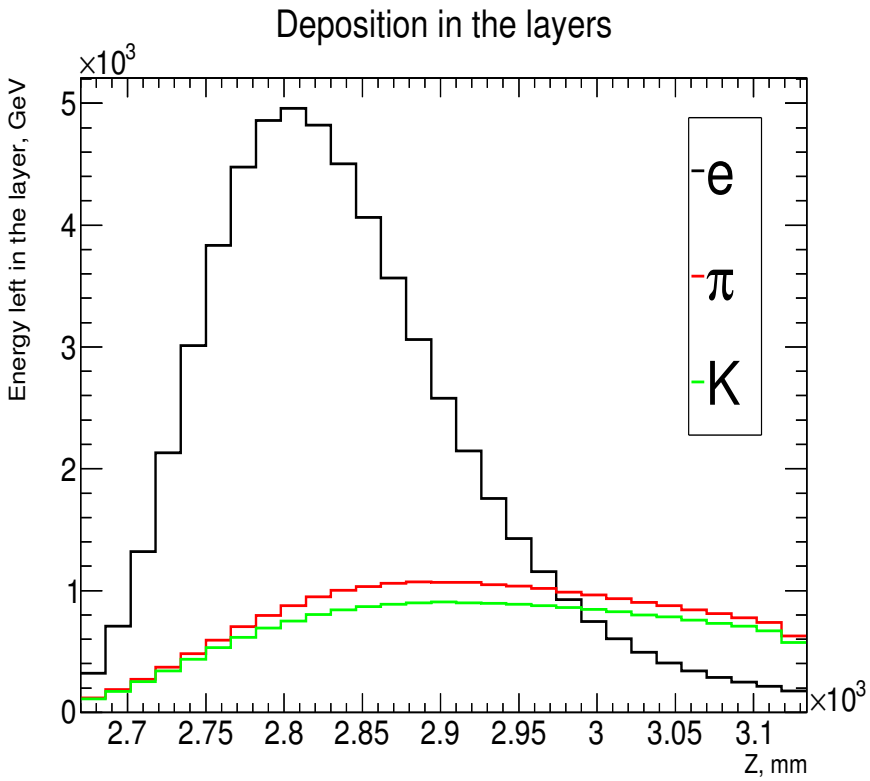


W

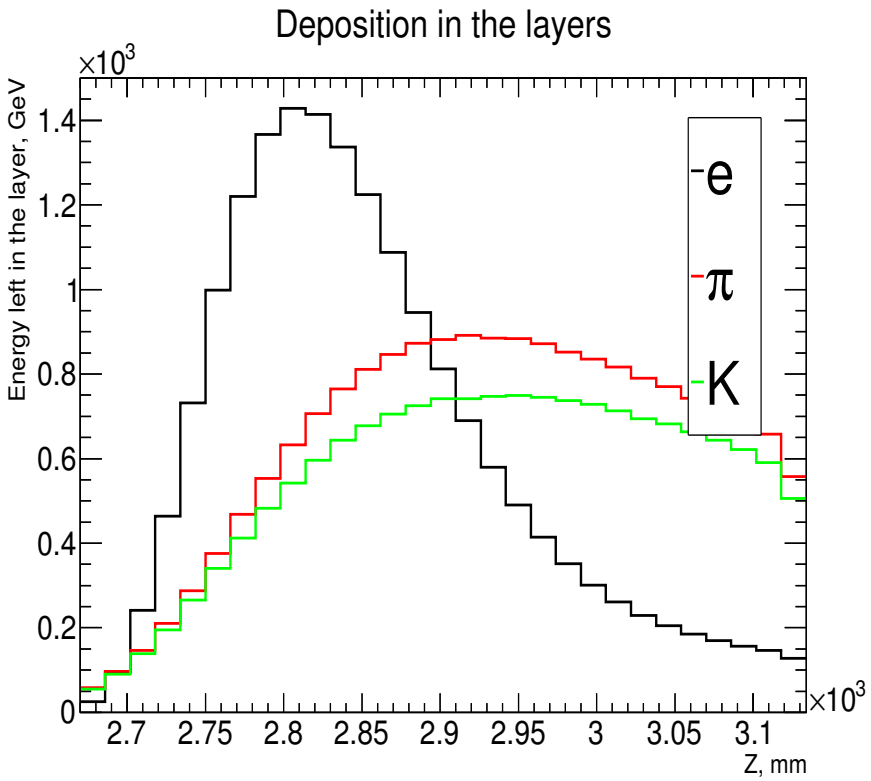


Energy deposition in the LHCal vs Z: Initial energy — 100 GeV

Fe, all particles



Fe, single particle



Energy deposition in the LHCal vs Z: Initial energy — 100 GeV