IDEA Dual-Readout Meeting Software - Updates

Lorenzo Pezzotti - 28/02/2020

News

- The TWiki web page has been updated with:
  - detailed instructions on how to compile the simulation without mounting /cvmfs.
  - tentative group assignments for working tasks - please have a look and share what you think

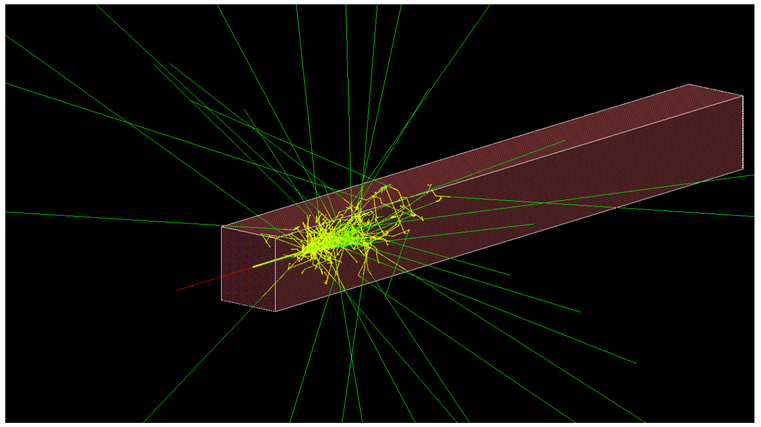
- The last IDEA Physics and Simulation Meeting took place yesterday (27/02).
  https://indico.cern.ch/event/892947/
  - a first draft of the presentation for the next INFN referee meeting was given. Please have a look.

- CALOR 2020 will be held in Brighton, 18-22 May. We would like to submit two abstracts, one related to software and performance activities and one on electronics and hardware activities. Giacomo and Romualdo expressed their interest for the software and hardware respectively.
  We can submit more abstracts: if you are interested, please let us know in order to balance the contents of the talks.

- For practical communication about software we set up a mattermost common chat. You can join us at https://mattermost.web.cern.ch/signup_user_complete/?id=1e9s8fy7q3bczyh183xi3t4q6e using your CERN credentials.

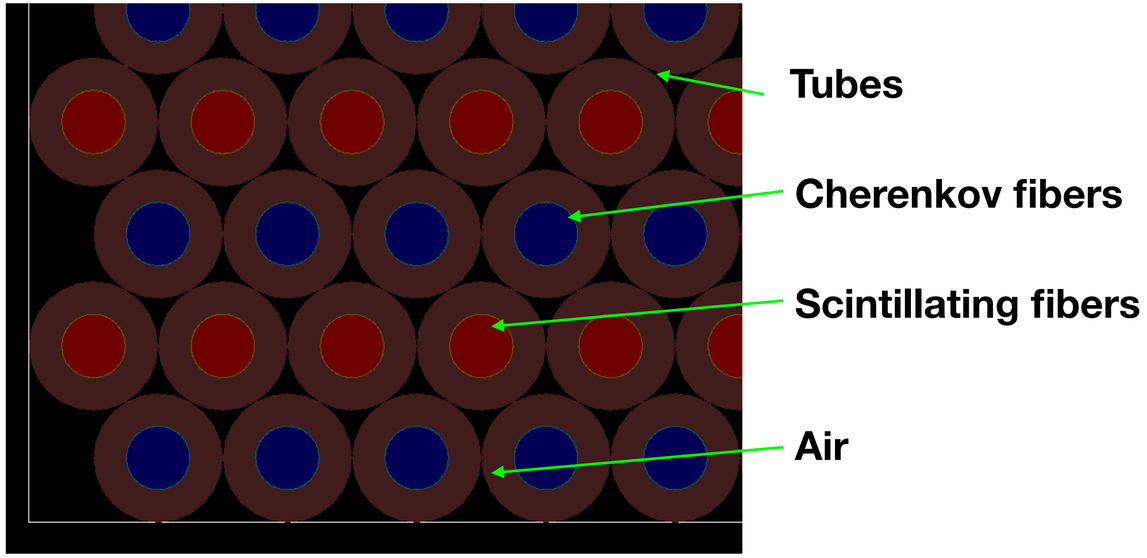
Tubes prototype simulation

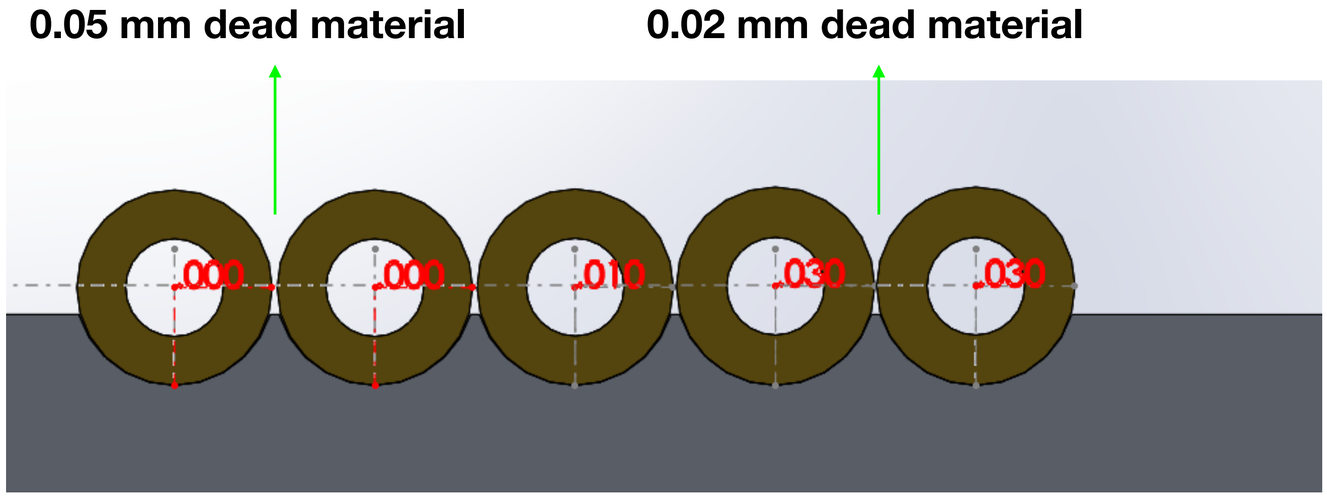
- A first version of the next prototype simulation has been released. Instructions on how to use it will be posted on the TWiki web page. Gabriella and Jinky kindly accepted to share this effort with me.



- The geometry: 2mm-diameter tubes, 1mm-diameter fibers, 60 rows, 48 fibers per row.

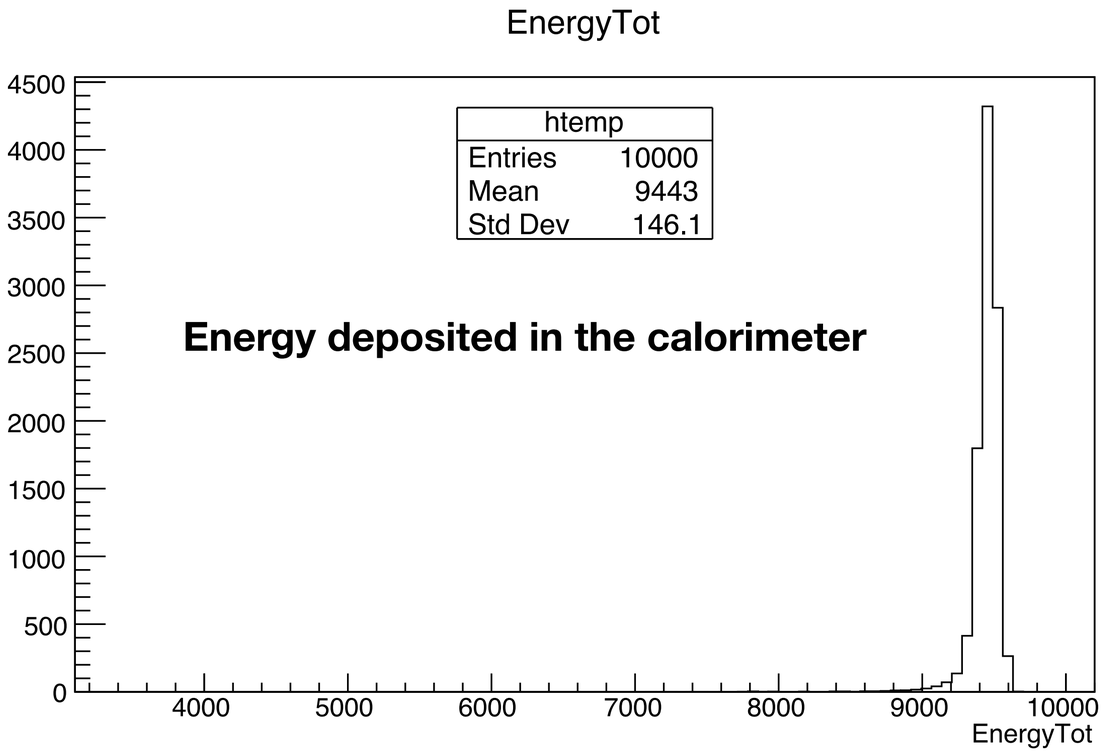
- Include possibility to smear tube outer diameter according to mechanical tolerances.

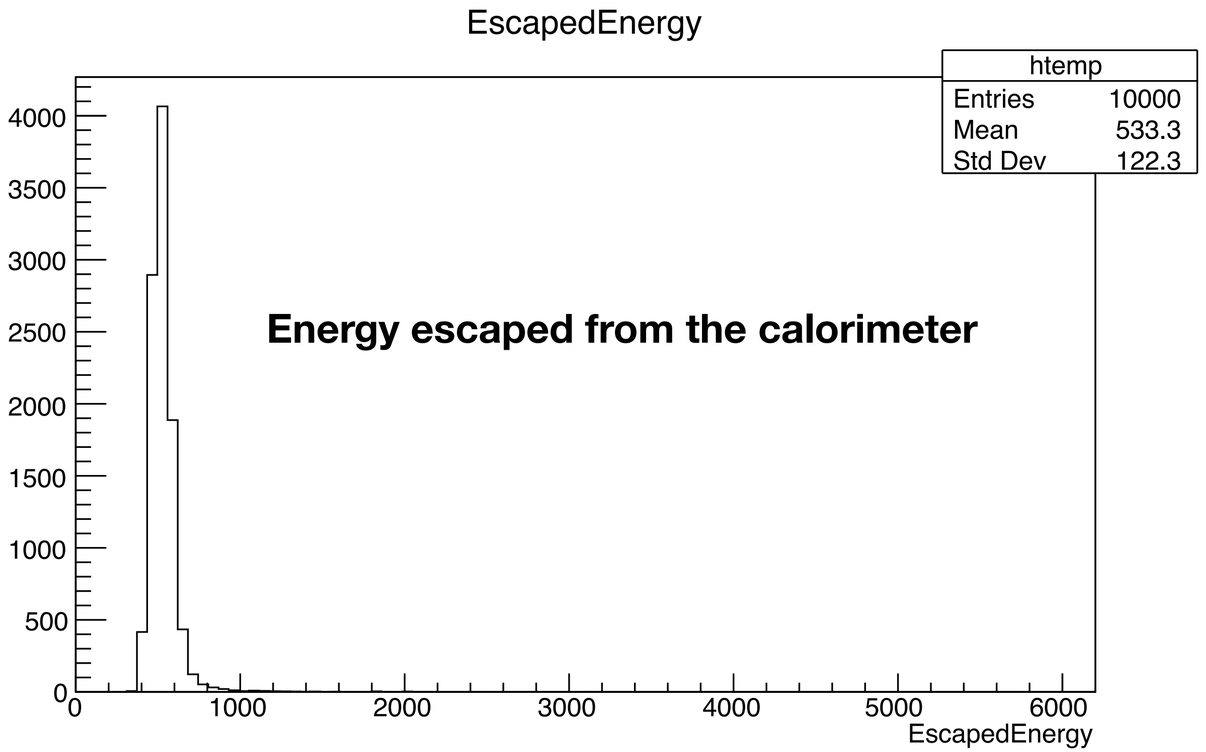




Tubes prototype simulation

- First information about energy containment and sampling fraction. Results with tolerance not included. Energies are in MeV. Results for 10 GeV electrons.

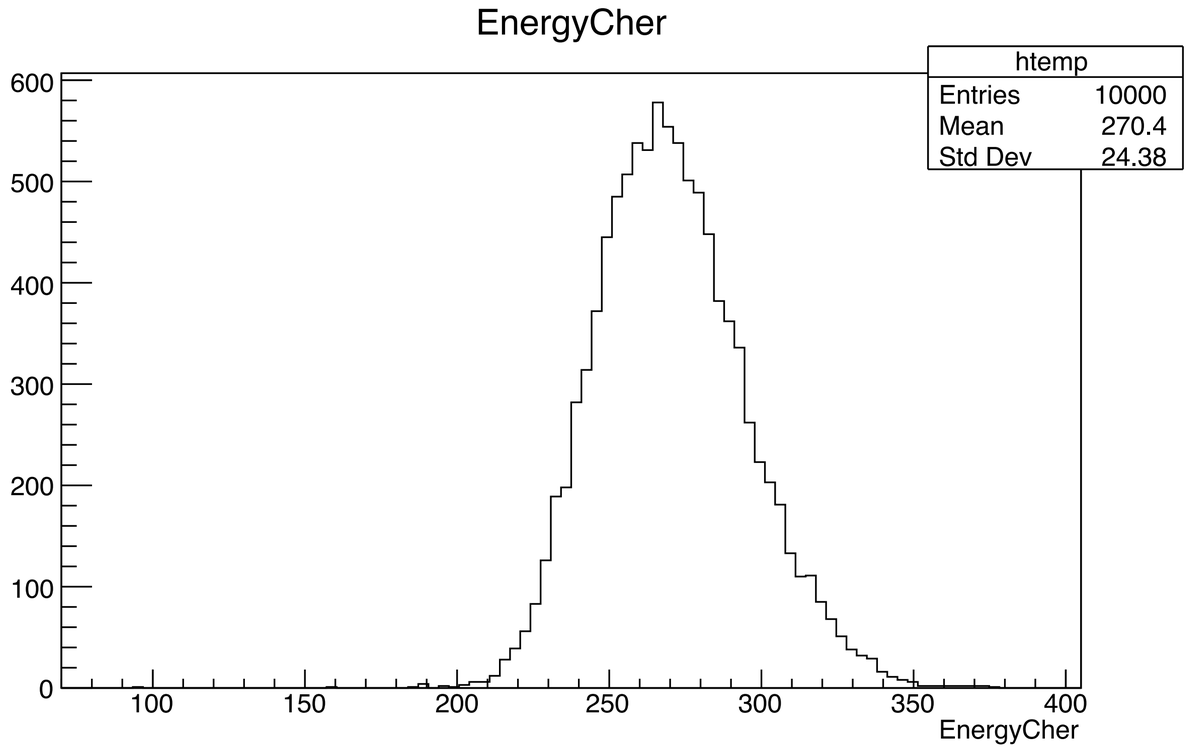




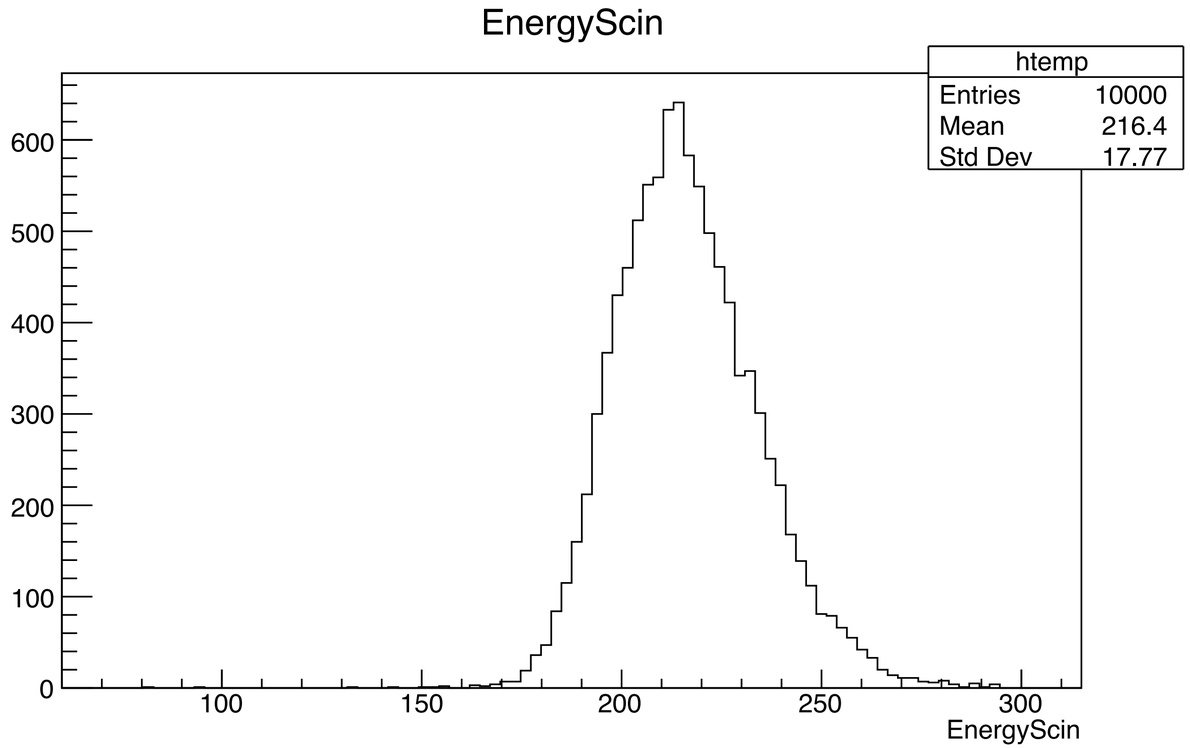
94.4% energy containment for electrons.

Tubes prototype simulation

- First information about energy containment and sampling fraction. Results with tolerance not included. Energies are in MeV. Results for 10 GeV electrons.



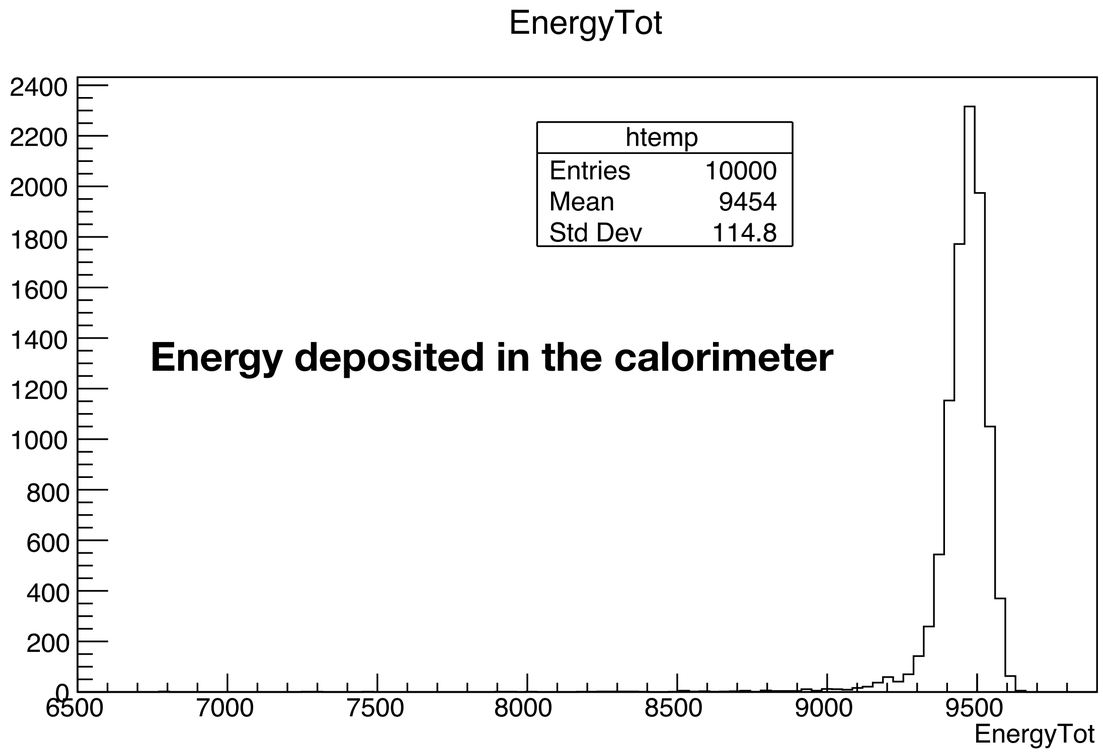
Energy deposited in clear fibers

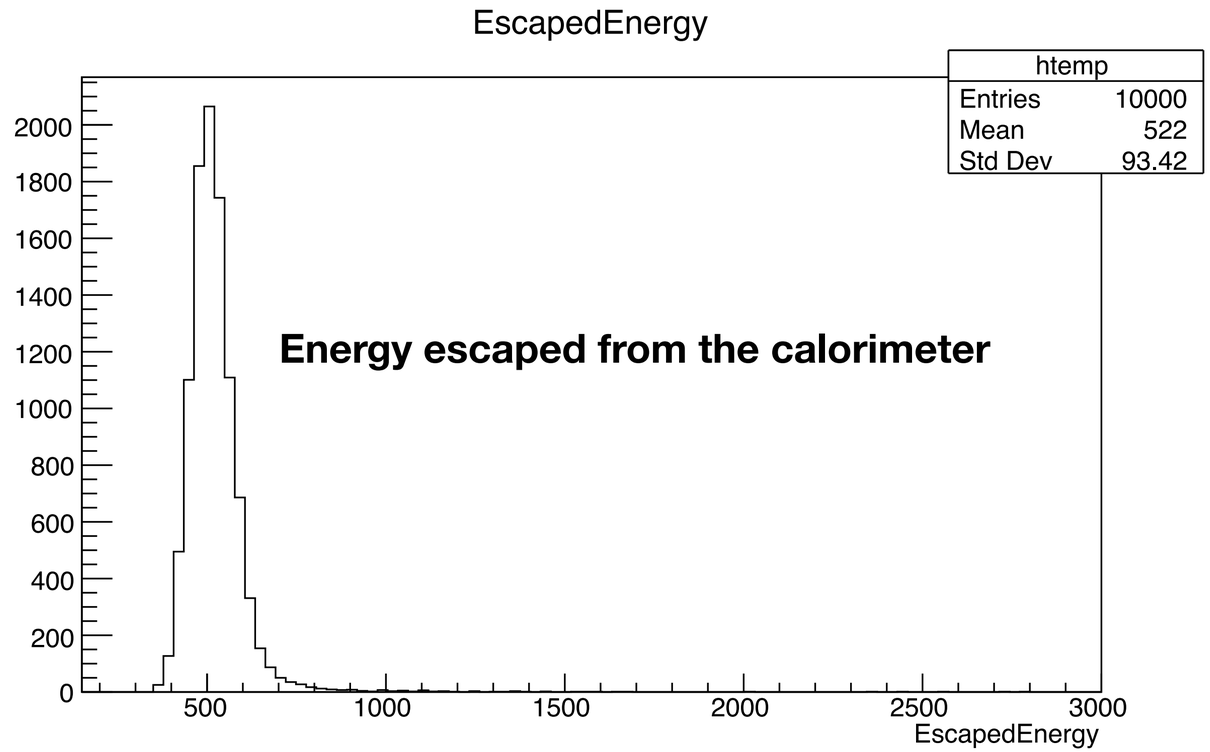


Energy deposited in scintillating fibers

Tubes prototype simulation

- First information about energy containment and sampling fraction. Results with tolerance (50.0 um). Energies are in MeV. Results for 10 GeV electrons.

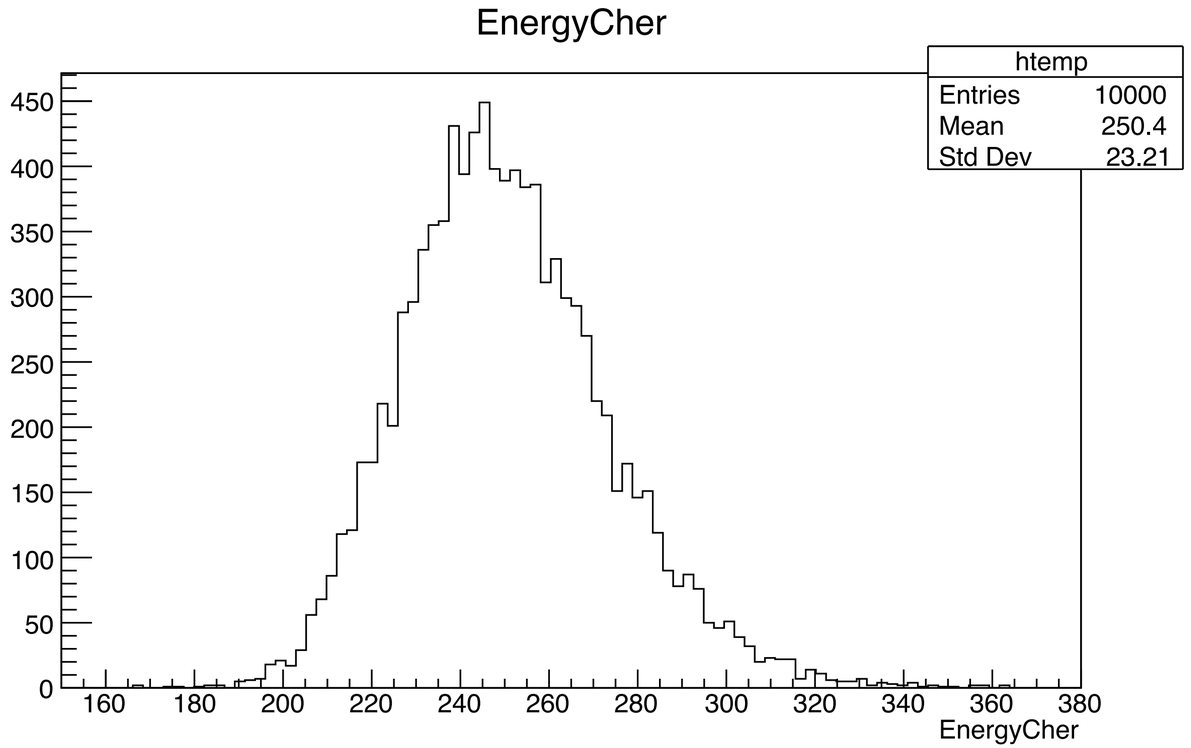




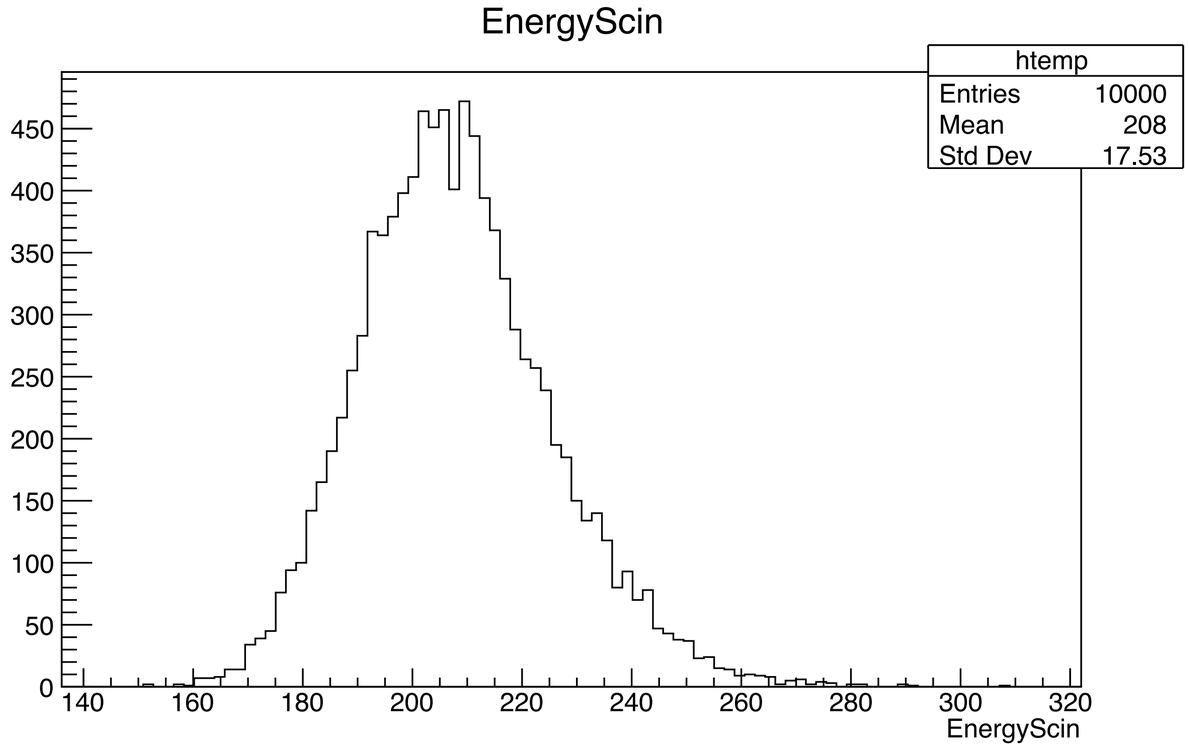
94.5% energy containment for electrons.

Tubes prototype simulation

- First information about energy containment and sampling fraction. Results with tolerance (50.0 um). Energies are in MeV. Results for 10 GeV electrons.



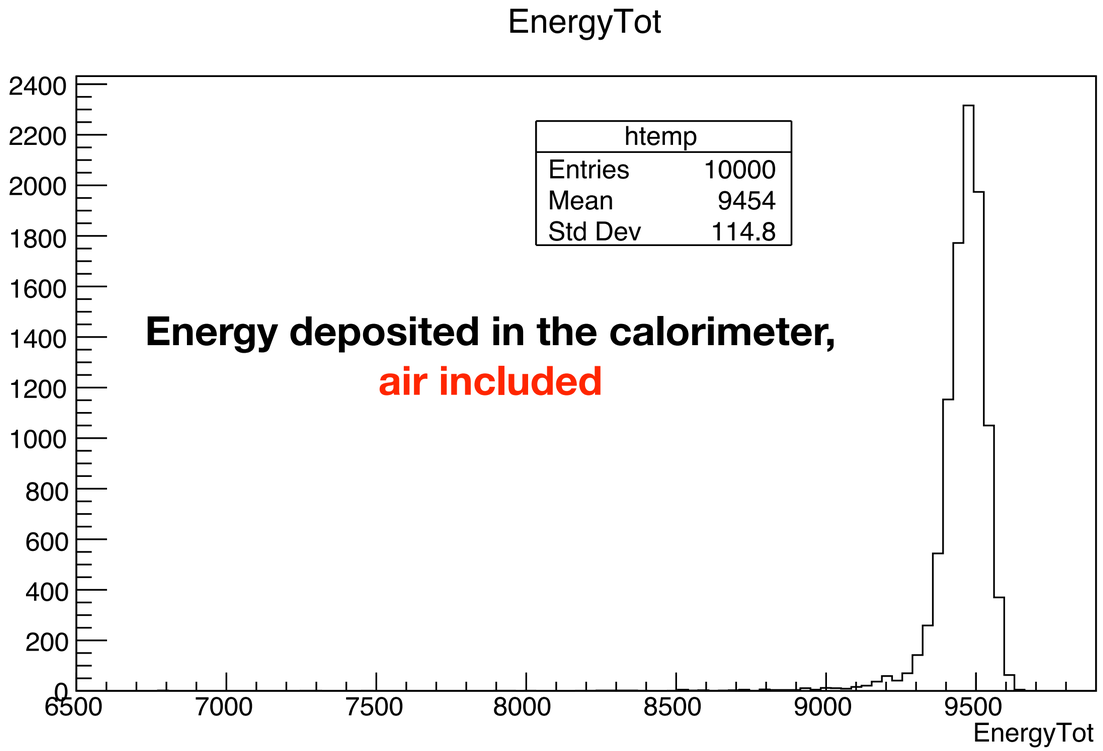
Energy deposited in clear fibers

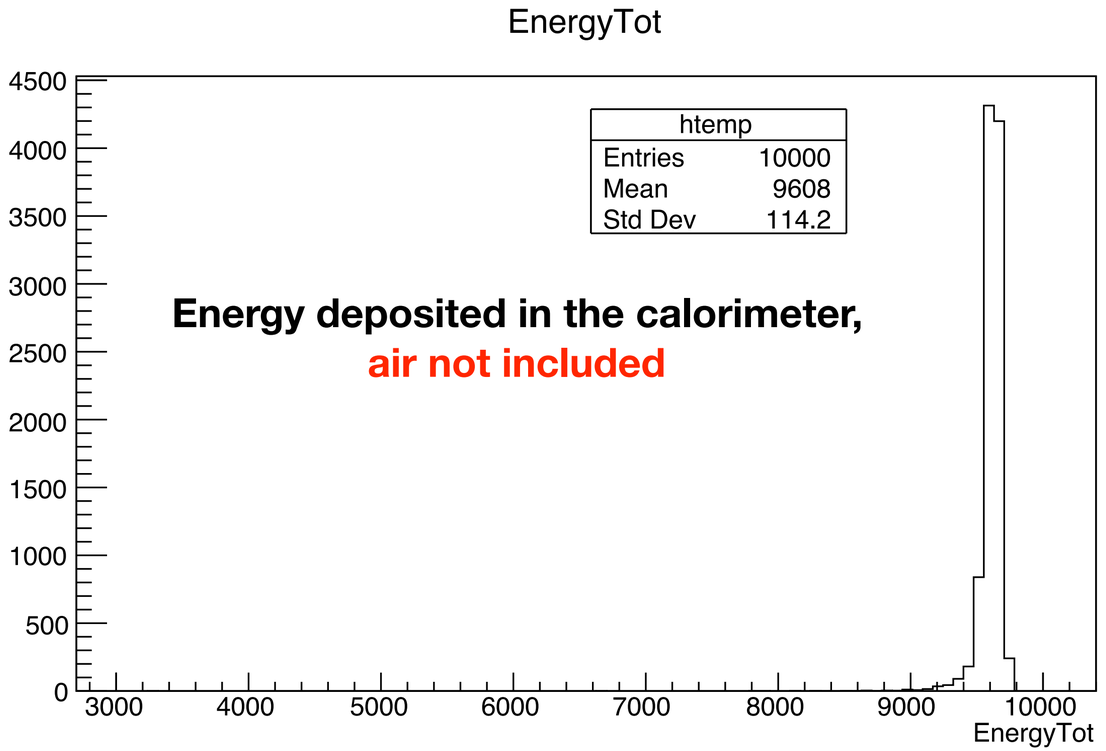


Energy deposited in scintillating fibers

Tubes prototype simulation

- Impact of air between fibers has been evaluated by changing air with copper so that no air is included.





94.5% -> 96.1% when no air is considered.

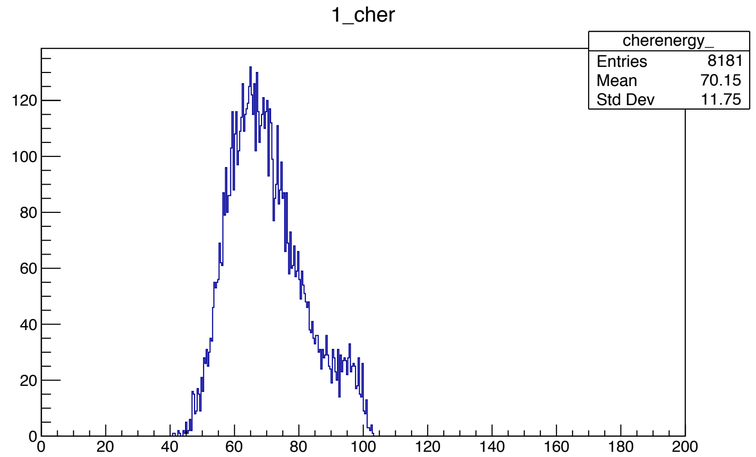
BACKUP

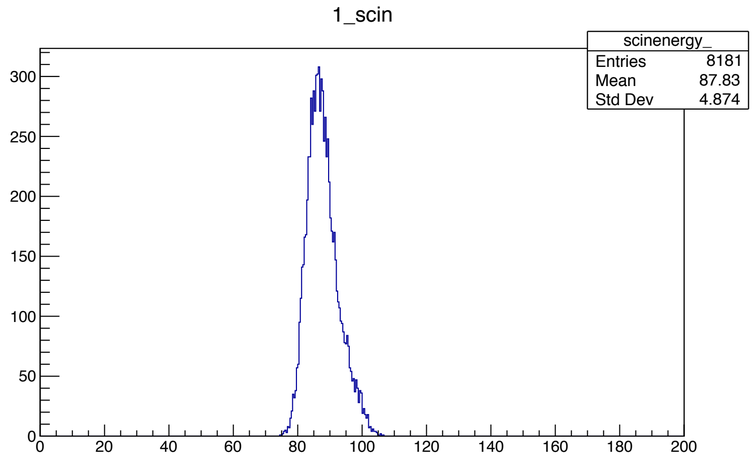
Hadronic performances

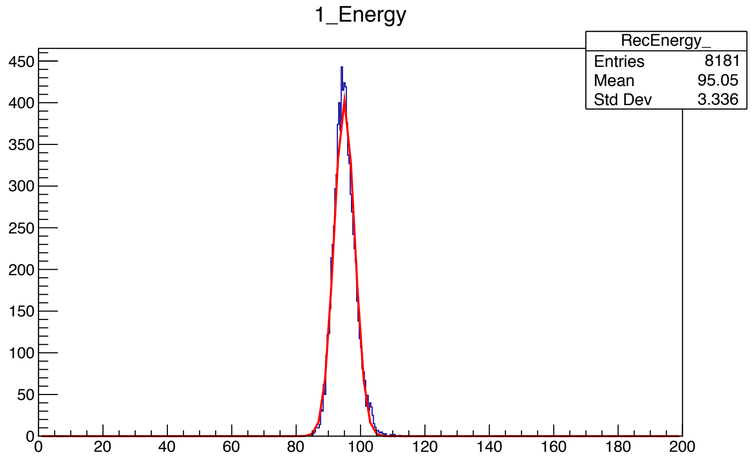
- During last meeting we saw some differences between Korean and Italian sides on signals from single charged pions. We suggested to study in detail these distributions adopting several physics lists.

- Results from the IDEA Calorimeter (Tower 0) indicate an energy containment for 100 GeV single pions of 98.6% - 98.8% depending on the physics list. Results in the following obtained using Chi=0.29.

FTFP-BERT Physics List - Energy (GeV)

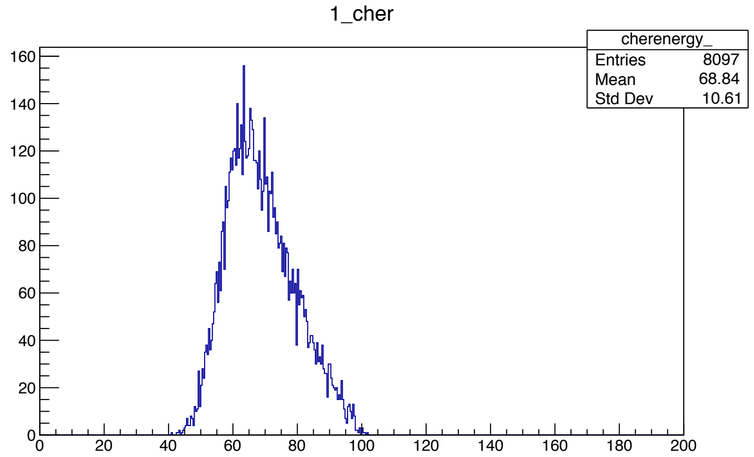


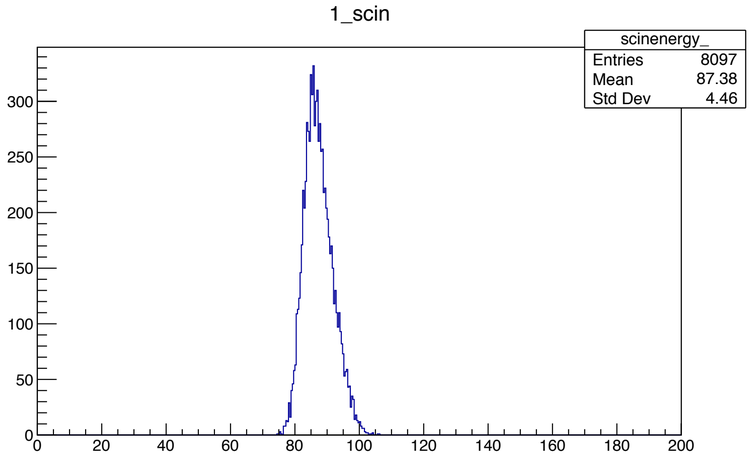


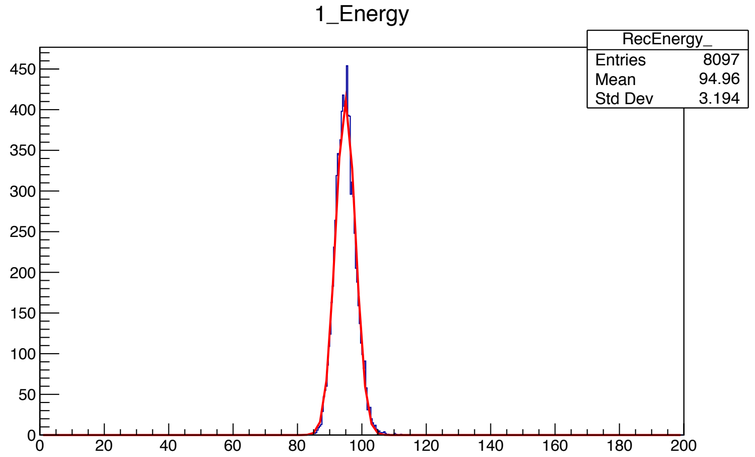


Hadronic performances

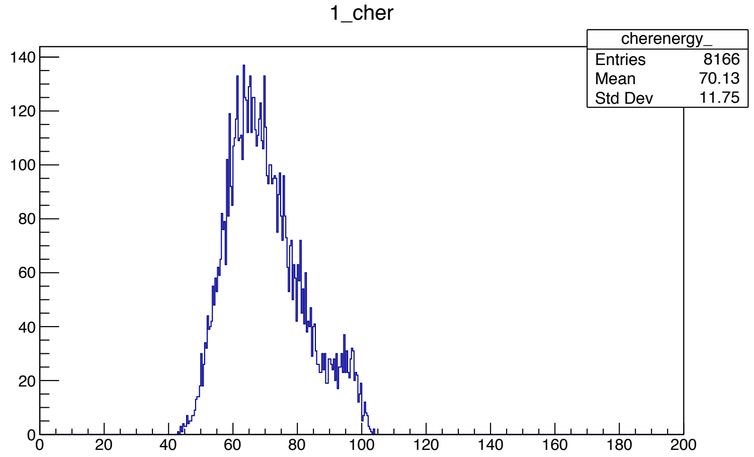
QGSP-BERT Physics List - Energy (GeV)

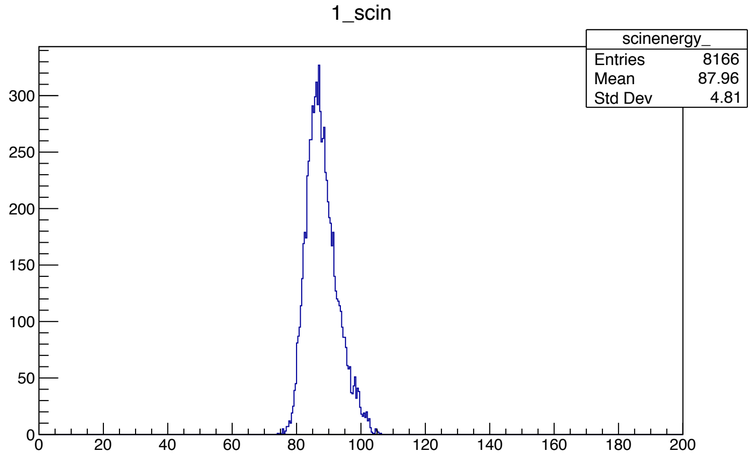


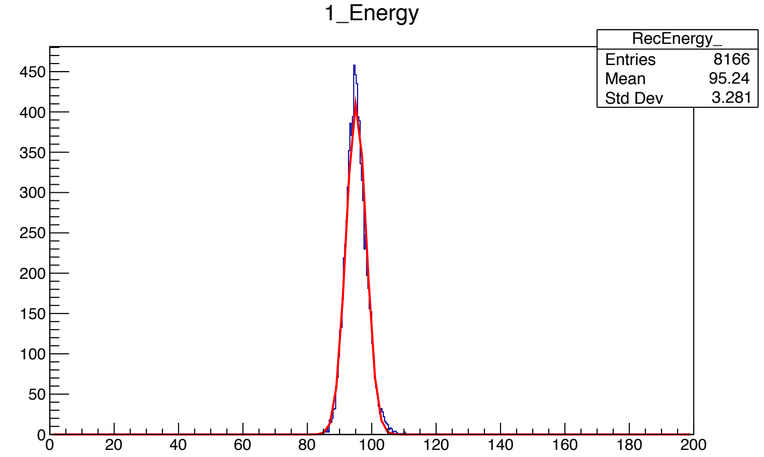




FTFP-BERT-HP Physics List - Energy (GeV)

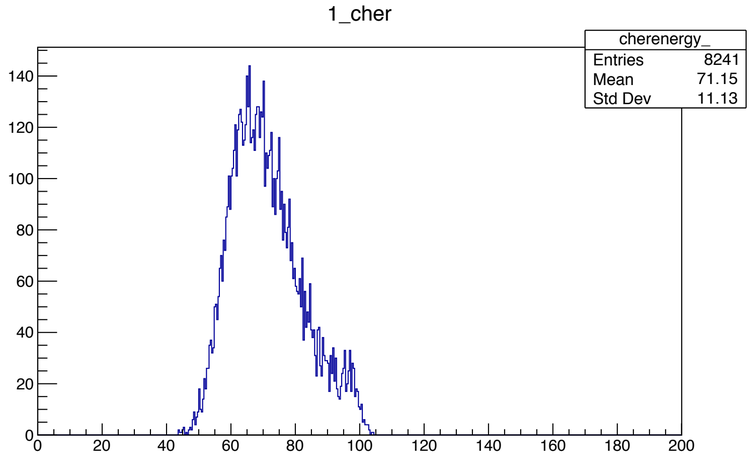


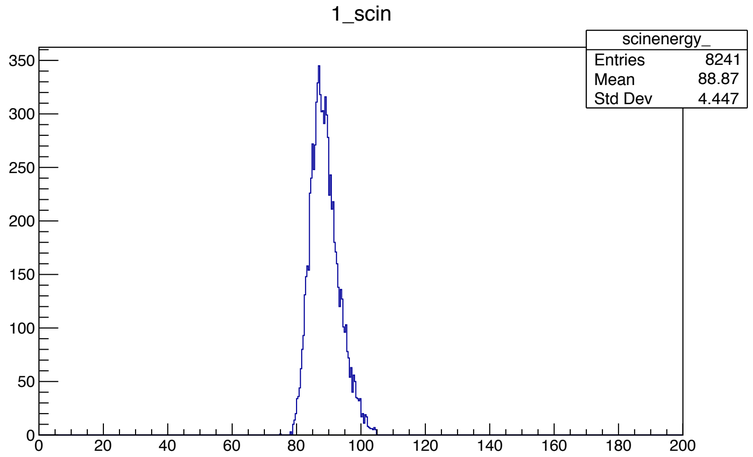


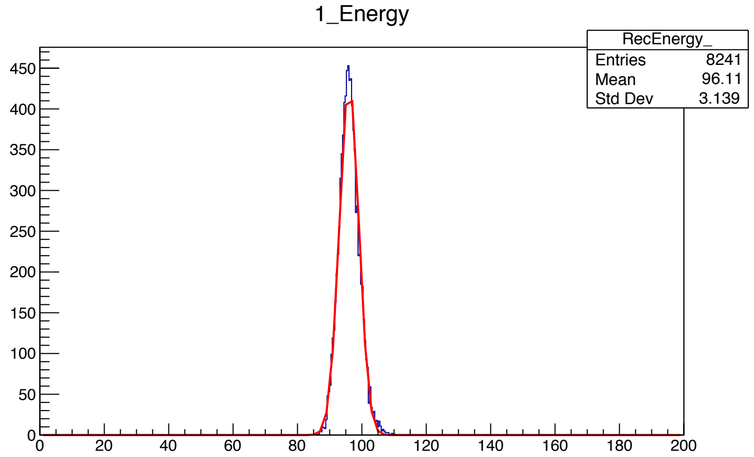


Hadronic performances

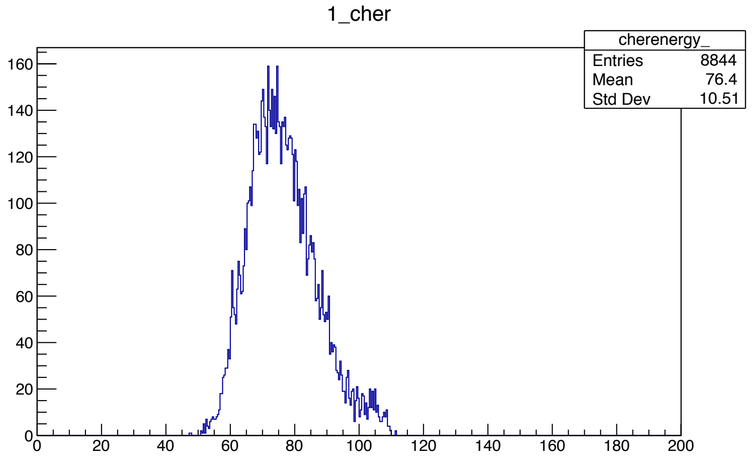
QBBC Physics List - Energy (GeV)

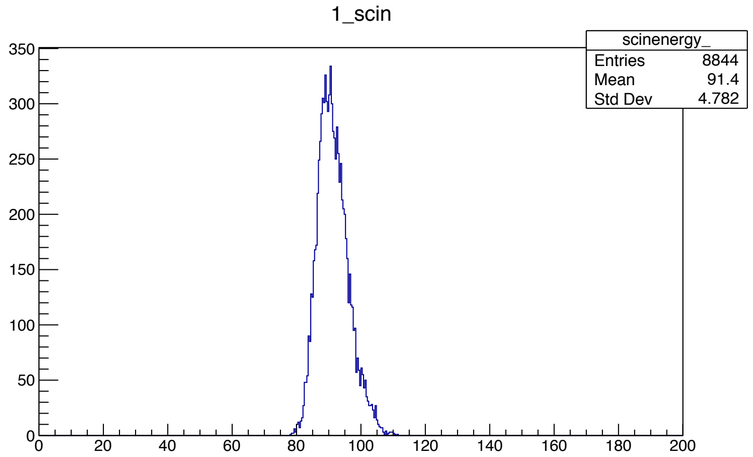


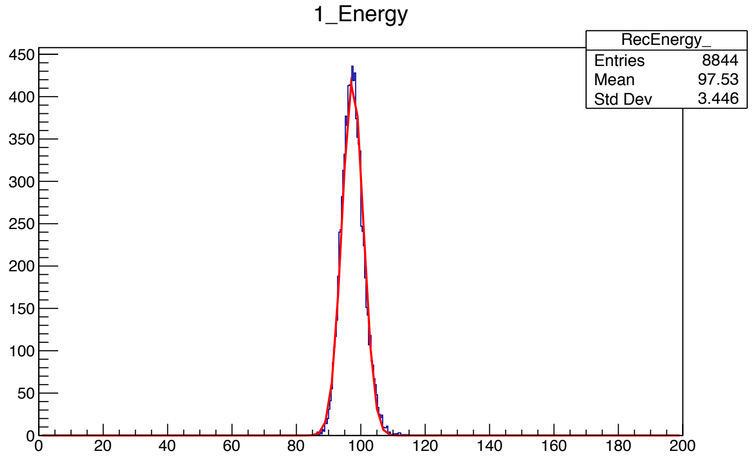




FTFPBERTTRV Physics List - Energy (GeV)







Summary of recent hadronic studies

- As the energy containment is 98.6% - 98.8% we should reconstruct 98.6 - 98.8 GeV for 100 GeV pions in the hypothesis of a correct description of nuclear interactions, i.e. assuming Chi=0.29 well reproduced. We see that standard physics lists (FTFP-BERT and QGSP-BERT) are about 4% off in the mean reconstructed energy. The High-Precision (FTFP-BERT-HP) package for neutron treatment does not lead to a significant improvement. However, more recent physics lists (QBBC and FTFP-BERT-TRV) do show a better agreement with data and are about 3% and 1% off in the mean reconstructed energy.

- With any physics list the energy resolution improves when combining the two signals. Using a Gaussian fit a resolution of about 3% at 100 GeV is reached with any physics list. As today I use mostly the FTFP-BERT-TRV physics list.

- Deliberately increasing the Chi factor increases the reconstructed energy as it boosts the S-C difference. However, S-C fluctuations are boosted as well and the overall resolution gets worse. It is also true the opposite: a smaller chi factor (within some limits) improves the overall energy resolution. I suggest to be careful in quoting resolution for hadrons as long as the Chi factor is not well understood.