

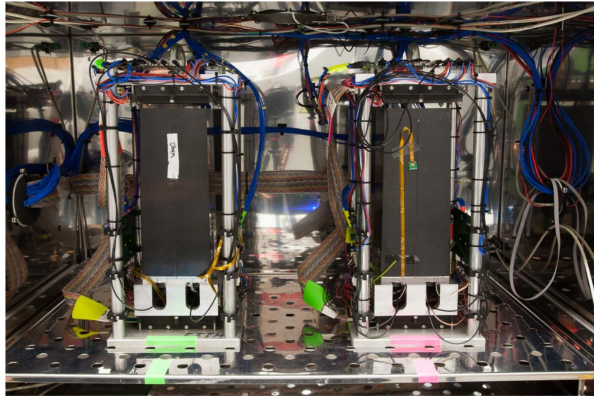
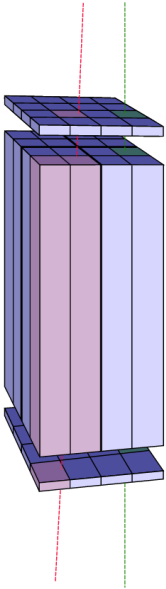
Precalibration results from measurements using the Bonn detector module teststation

Tobias Seifen



10.03.2021

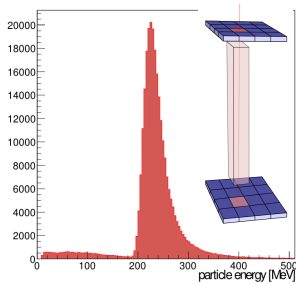
Measurements with cosmic radiation



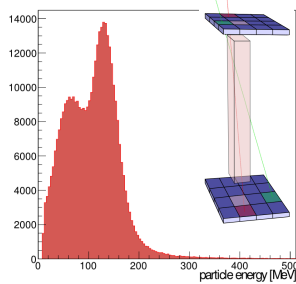
- ≥ 96 h measurement per submodule
- 4 identical Teststations (2 in 2 chambers)
- trigger modules with 16 channels \rightarrow distinguish track types

Examples of track types

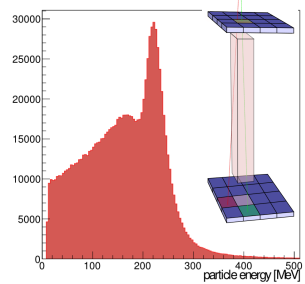
track type 0



track type 4

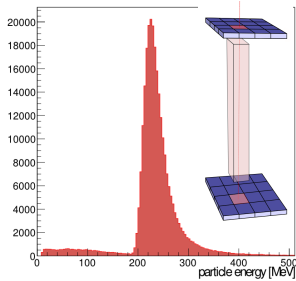


track type 7

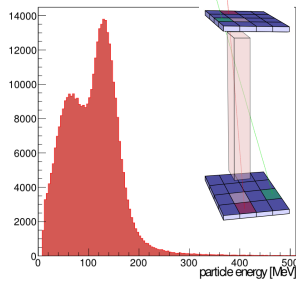


Examples of track types

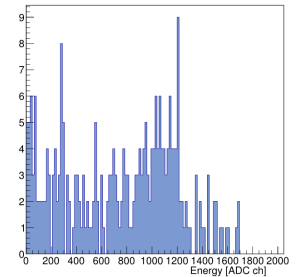
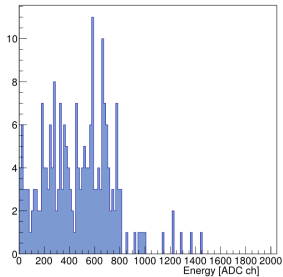
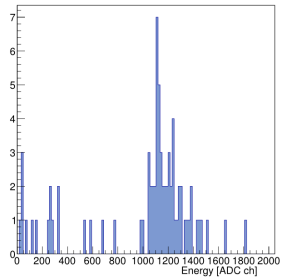
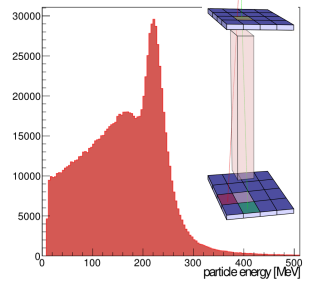
track type 0



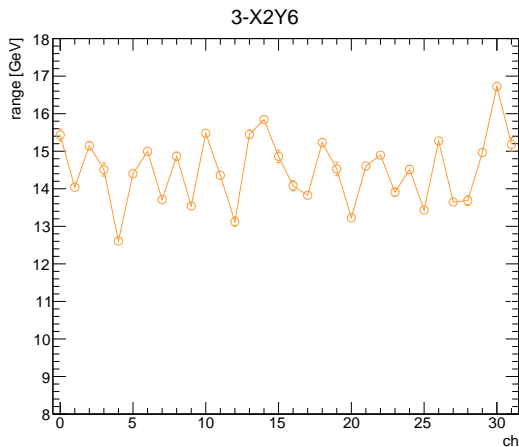
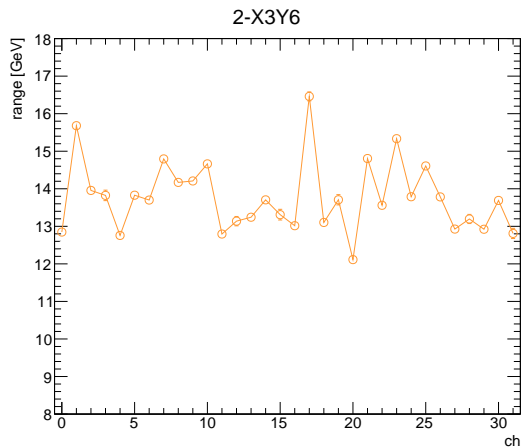
track type 4



track type 7

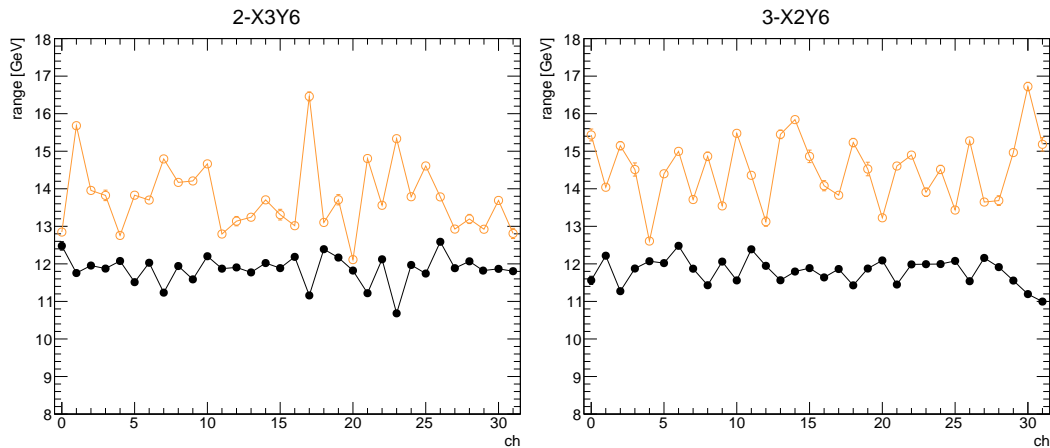


Maximally detectable energy



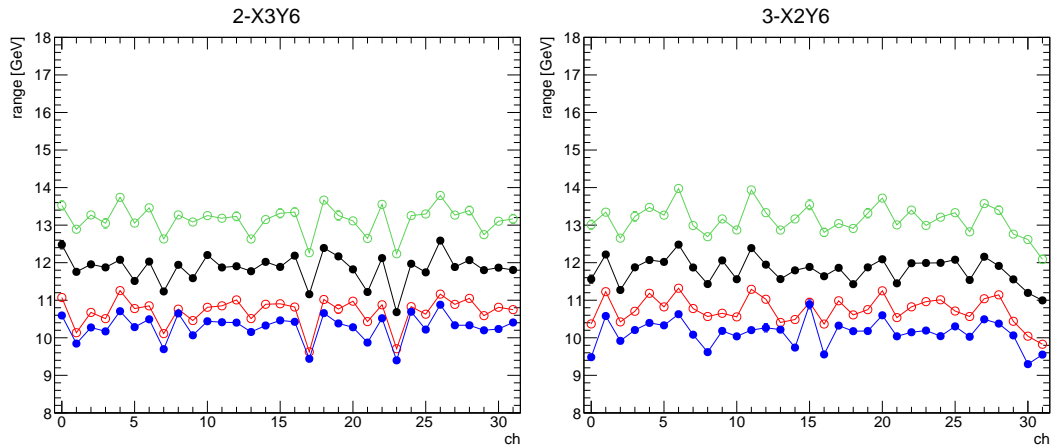
two APDs per crystal, ch0-15: APD A, ch16-31: APD B

Maximally detectable energy



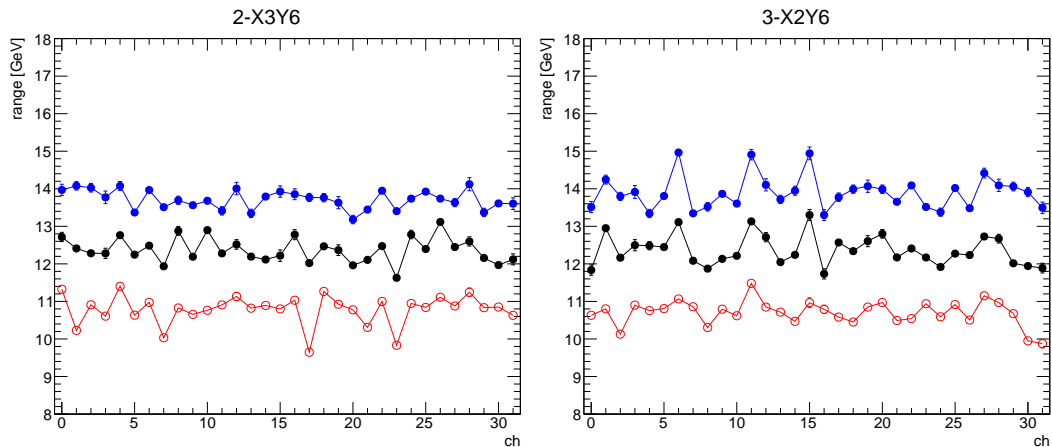
use gain slope to adjust HV to reach 12 GeV

Maximally detectable energy



measurements at different T : -23°C , -24°C , -25°C , -25.5°C

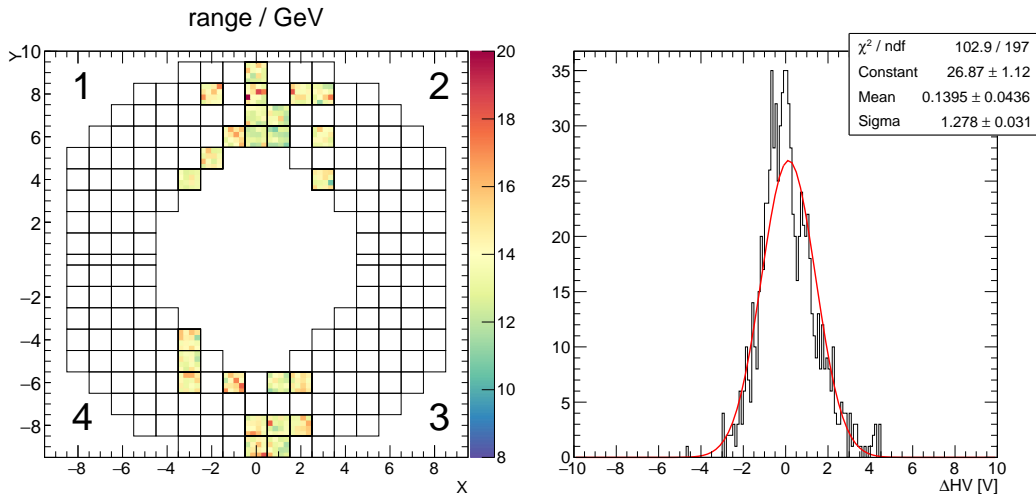
Maximally detectable energy



measurements at different voltages: such that range is at **10.8 GeV**, 12.5 GeV, **14 GeV**

Maximally detectable energy

25 APD-equipped submodules measured



adjust HV to set maximally detectable energy to 12.5 GeV

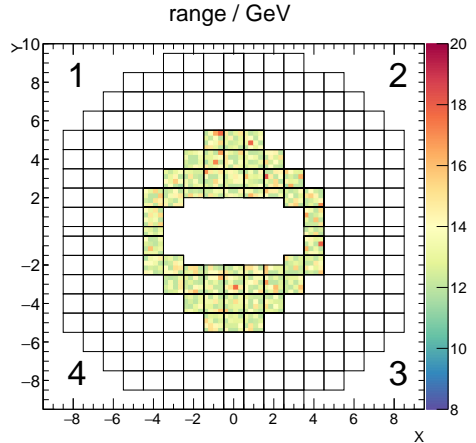
Status of VPTT-equipped submodules

42 submodules + 12 half-sized submodules: all precalibration measurements finished

geometry measurements

Ch. Hammann

- 24 measured and glued
- 9 need repairs
(mostly damaged cables)
- 7 showed inconsistencies in geometry measurements
- 2 showed deviations larger than acceptable



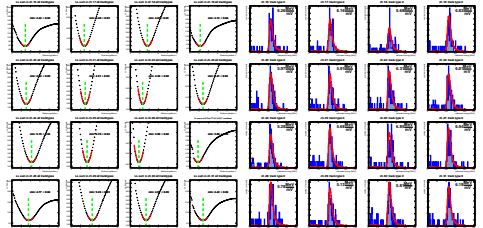
Summary

Results of the precalibration measurements

- all VPTT-equipped submodules measured
- results about to be incorporated into RUB database
- 25 APD-equipped submodules measured
- temperature and voltage dependence investigated
- range of 12.5 GeV can be achieved with adjusted HV

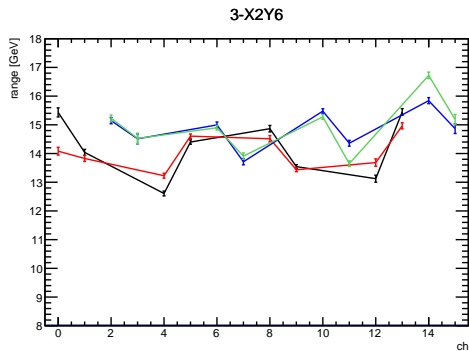
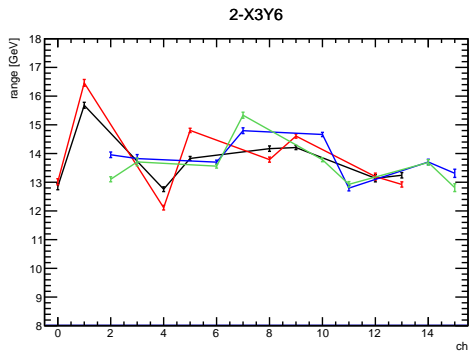
2021-03-09 12:22:42

Alveole: 2-X3Y8			Station: RIGHT_A			Run number: 200567			Date: 26-02-2021		Duration: 118.67h	
position	scat in MeV/cv	range in GeV	U in V	position	scat in MeV/cv	range in GeV	U in V	2-K319-08	2-K319-11	2-K319-12	2-K319-13	
2-K319-10	6.26+-0.03	13.27	368.22	2-K319-09	5.41+-0.03	11.30	368.21					
2-K319-11	6.26+-0.04	13.81	368.28	2-K319-10	5.78+-0.03	11.71	368.27	2-K319-14	2-K319-15	2-K319-16	2-K319-17	
2-K319-12	5.78+-0.03	12.67	368.03	2-K319-11	7.28+-0.03	15.89	368.03					
2-K319-13	6.48+-0.03	14.46	368.65	2-K319-12	5.60+-0.03	13.00	368.88					
2-K319-14	6.13+-0.04	13.48	368.22	2-K319-13	5.78+-0.03	13.71	368.28	2-K319-18	2-K319-19	2-K319-1A	2-K319-1B	
2-K319-15	6.17+-0.03	13.88	368.22	2-K319-14	6.23+-0.03	11.48	368.28					
2-K319-16	6.48+-0.03	14.25	358.98	2-K319-15	6.97+-0.04	13.73	358.98	2-K319-1C	2-K319-1D	2-K319-1E	2-K319-1F	
2-K319-17	6.25+-0.04	13.74	358.98	2-K319-16	6.19+-0.04	13.01	368.88					



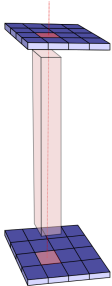
every submodule equipped with summary of the measurements

Maximally detectable energy

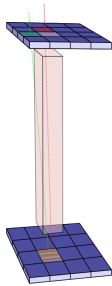


Definition of all Track Types

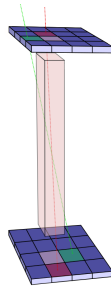
Track Type 0



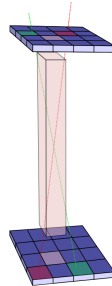
Track Type 1



Track Type 2



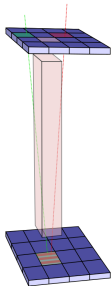
Track Type 3



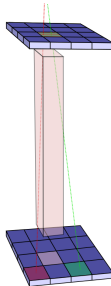
Track Type 4



Track Type 5



Track Type 6

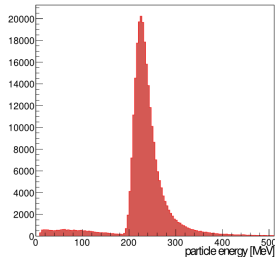


Track Type 7

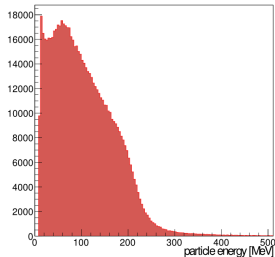


Simulated Spectra of all Track Types

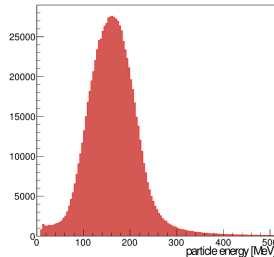
Track Type 0



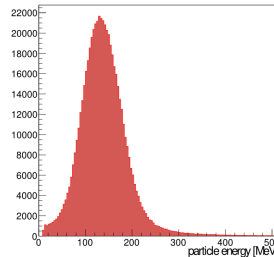
Track Type 1



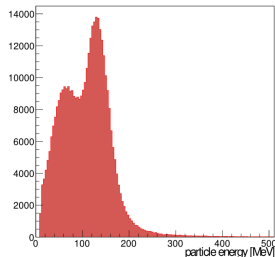
Track Type 2



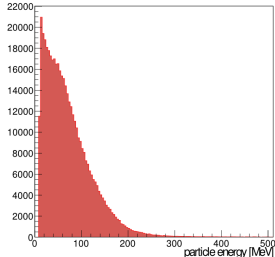
Track Type 3



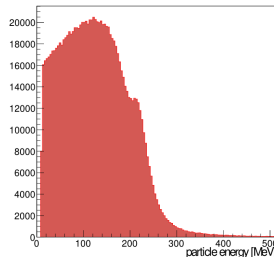
Track Type 4



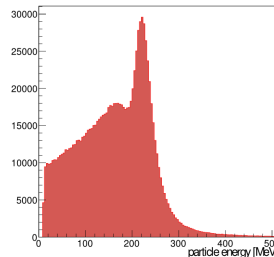
Track Type 5



Track Type 6



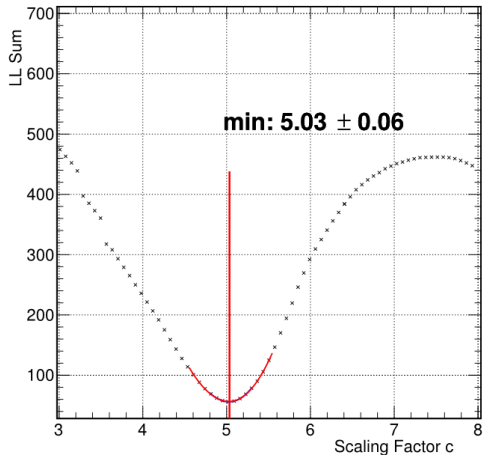
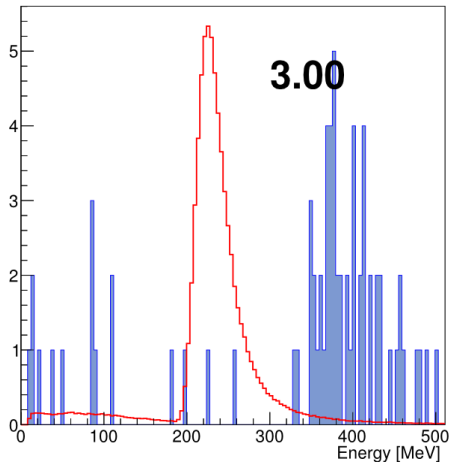
Track Type 7



Combining Measurement and Simulation

Example Track Type 0

LL sum in ch 5 for TT 0

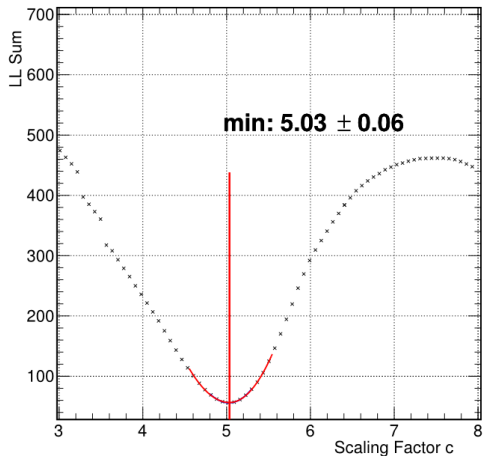
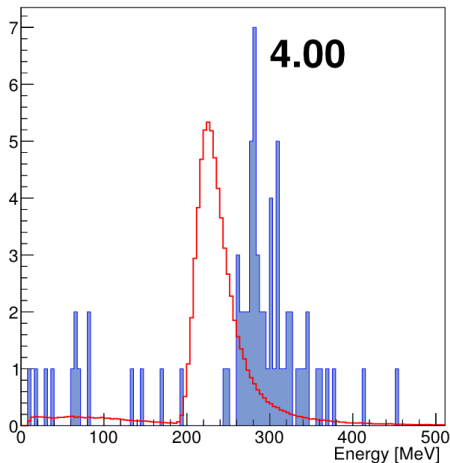


Rescaling measured spectrum \Rightarrow calculating $\sum_{\text{TT}} \ln \mathcal{L} \Rightarrow$ finding minimum in $\ln \mathcal{L}$

Combining Measurement and Simulation

Example Track Type 0

LL sum in ch 5 for TT 0

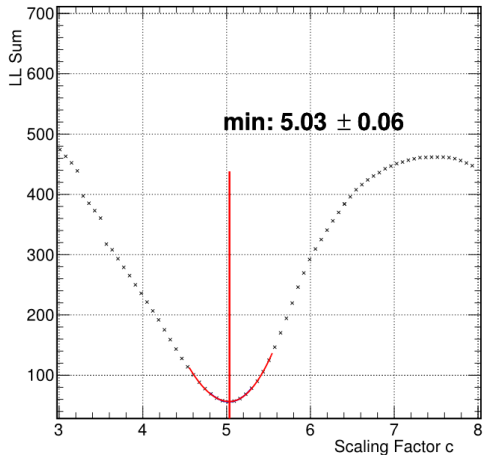
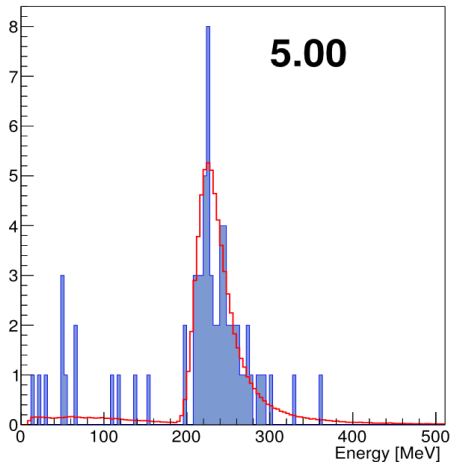


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Combining Measurement and Simulation

Example Track Type 0

LL sum in ch 5 for TT 0

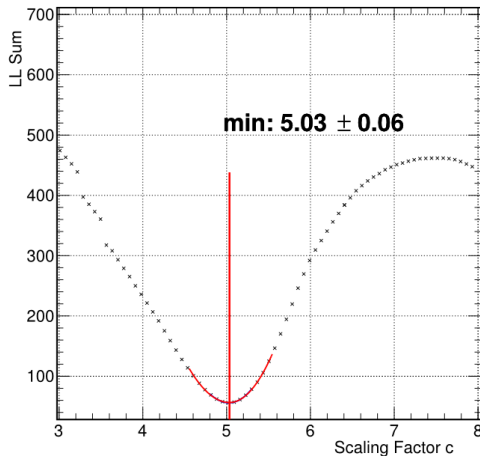
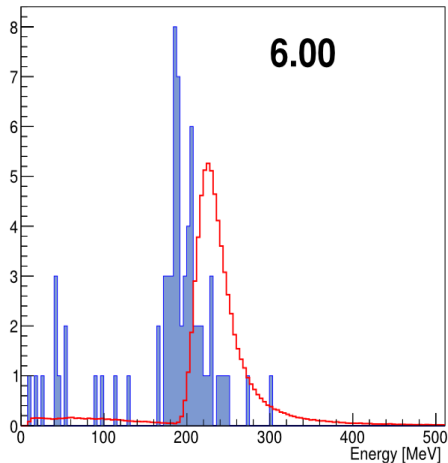


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Combining Measurement and Simulation

Example Track Type 0

LL sum in ch 5 for TT 0

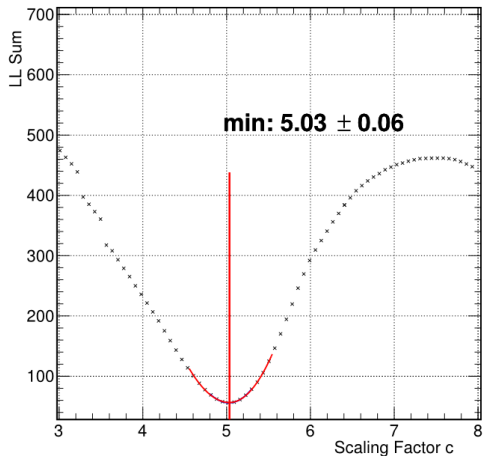
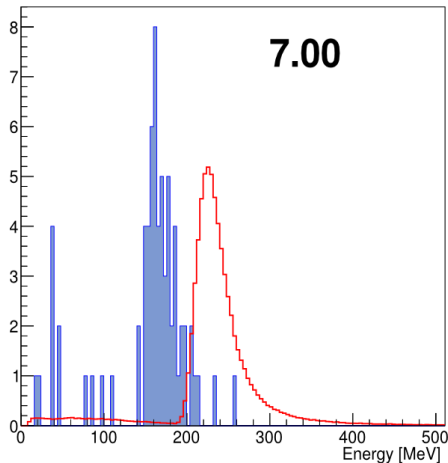


Rescaling measured spectrum \Rightarrow calculating $\sum_{\text{TT}} \ln \mathcal{L} \Rightarrow$ finding minimum in $\ln \mathcal{L}$

Combining Measurement and Simulation

Example Track Type 0

LL sum in ch 5 for TT 0



Rescaling measured spectrum \Rightarrow calculating $\sum_{\text{TT}} \ln \mathcal{L} \Rightarrow$ finding minimum in $\ln \mathcal{L}$