Christmas week progress

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Jan 6, 2020

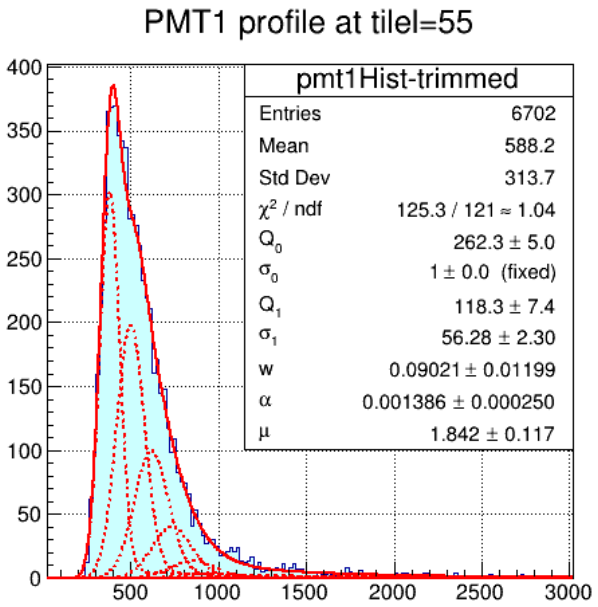
Improving the KaonLT fit results

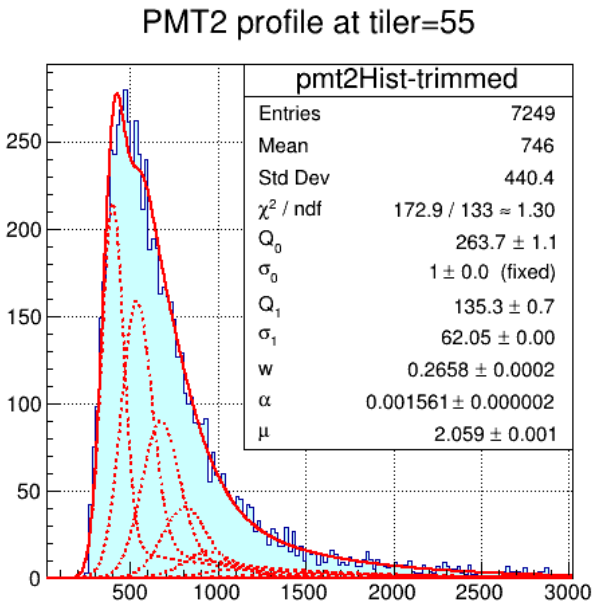
New mechanism for processing of the prototype spectra. ROOT files were merged together into a large single file. This lead generating large file on hard drive. Now spectra are imported in TChain. This saves hard drive space (important for the farm).

Improved fitting results. The rise of the spectrum was excluded from the fitting results (just like we did for the beam spectra). This lead to a better fit of the rest of the spectrum.

SP-15 with Mesh

BEFORE





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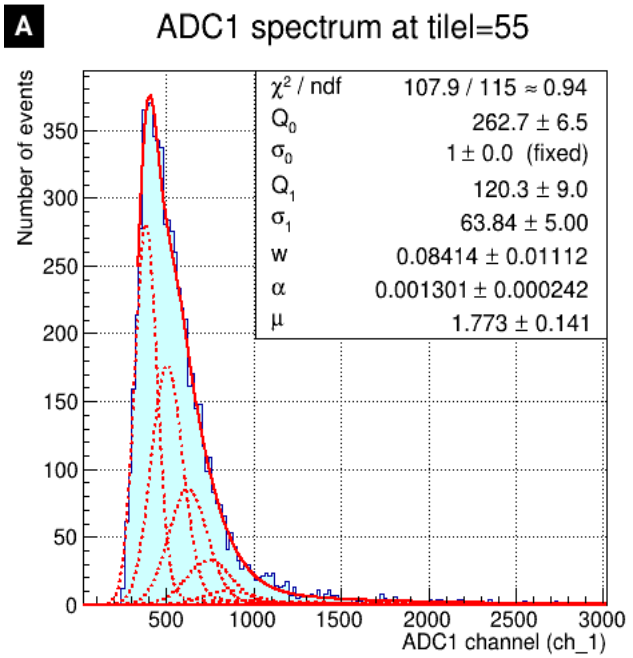
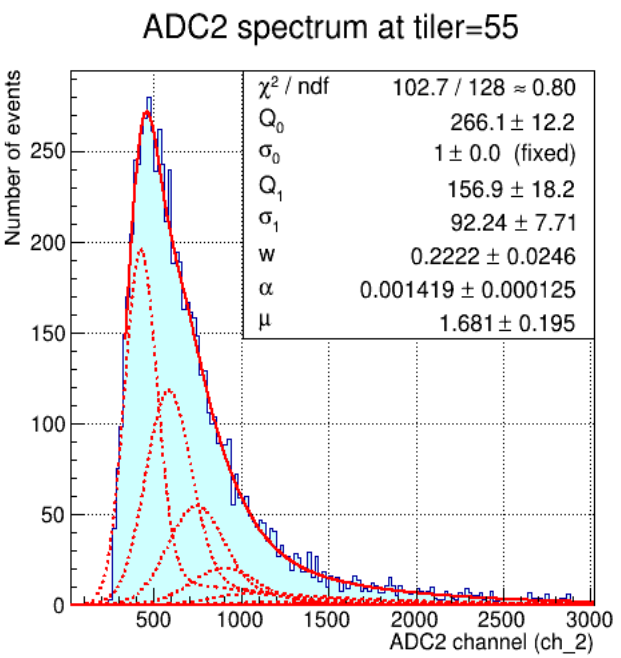
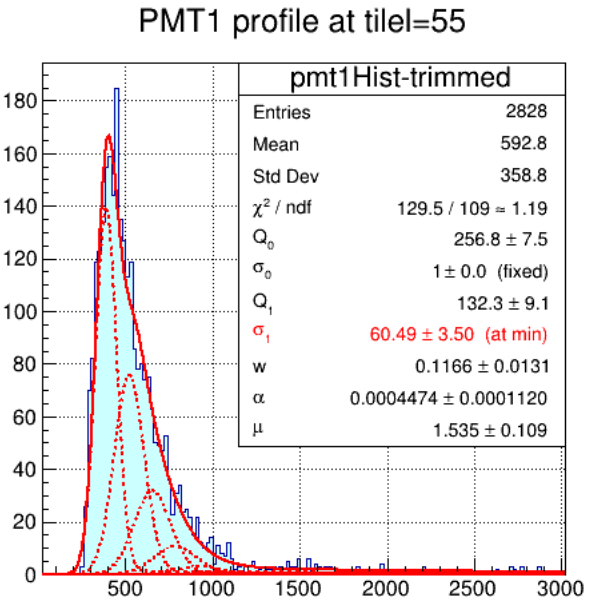
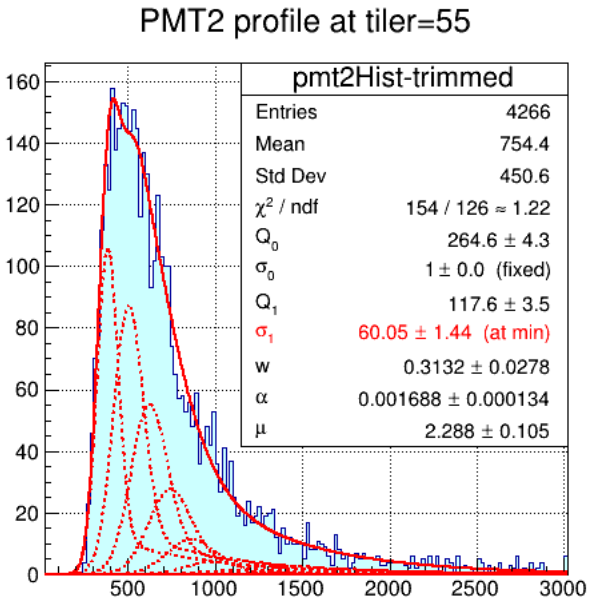




SP-15 Japan with mesh

BEFORE





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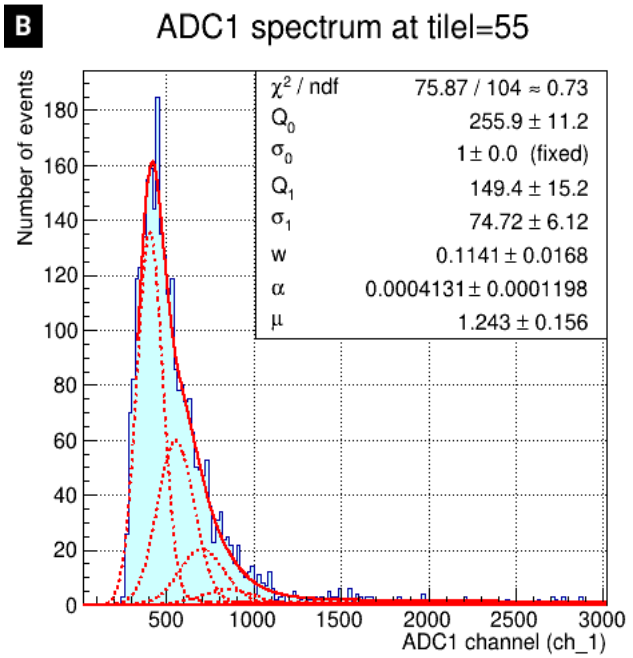
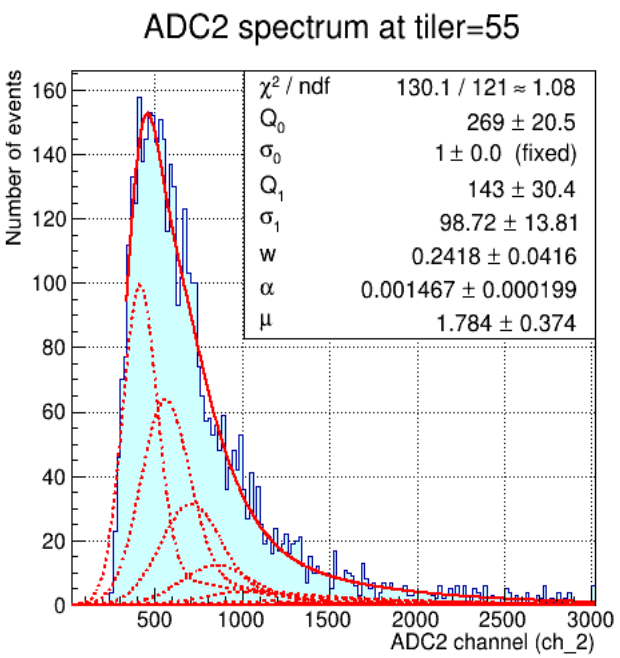
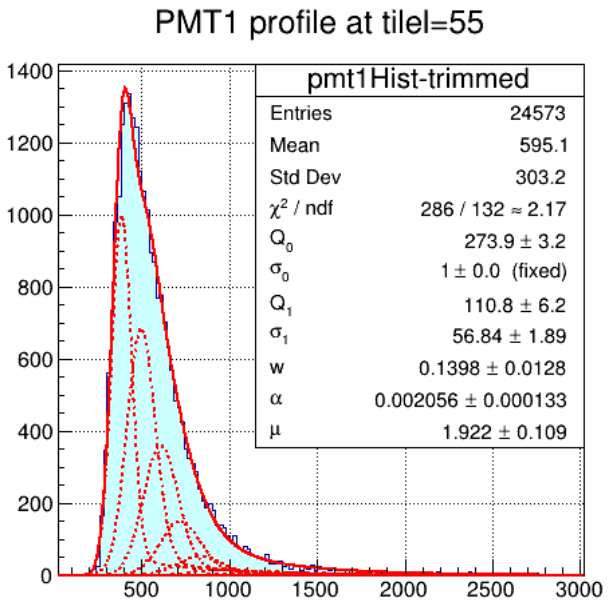
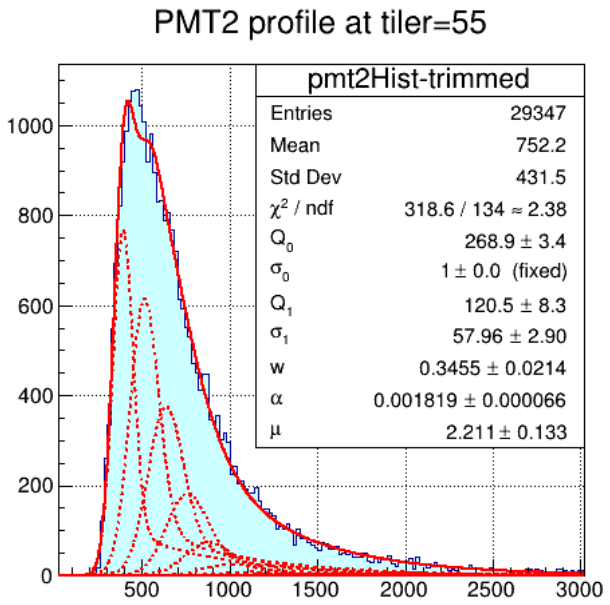




SP-15 Japan

BEFORE





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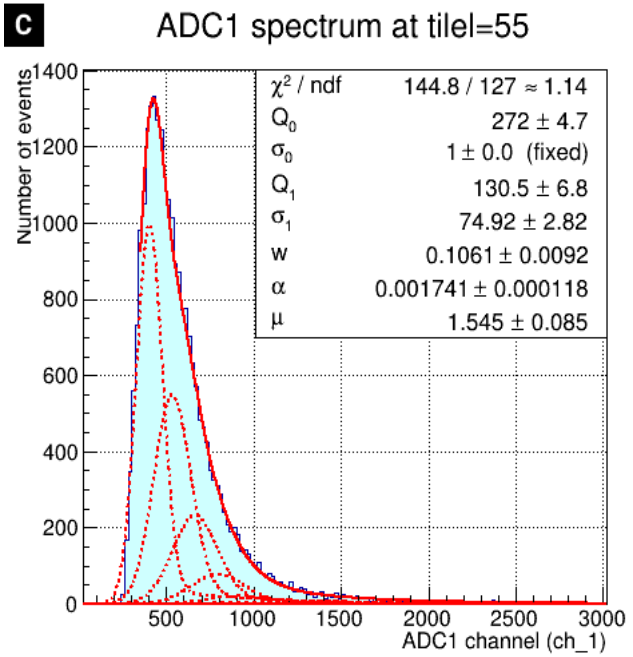
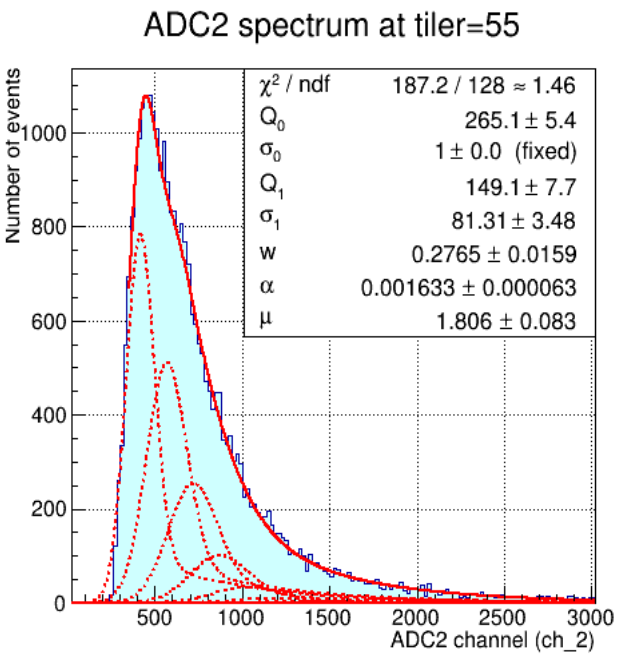
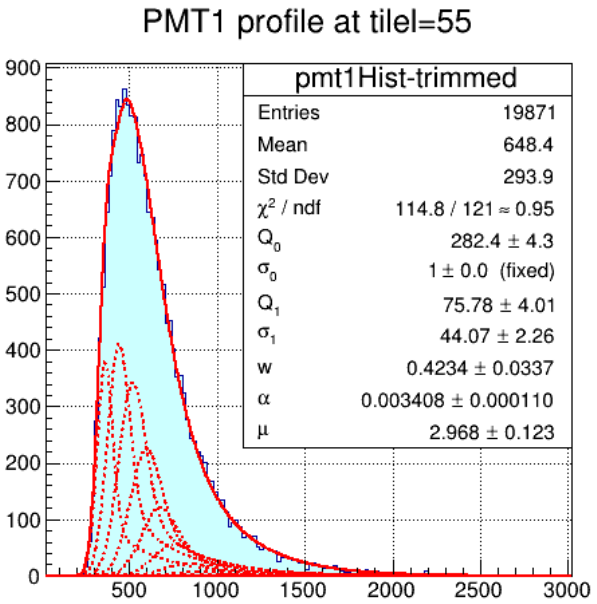
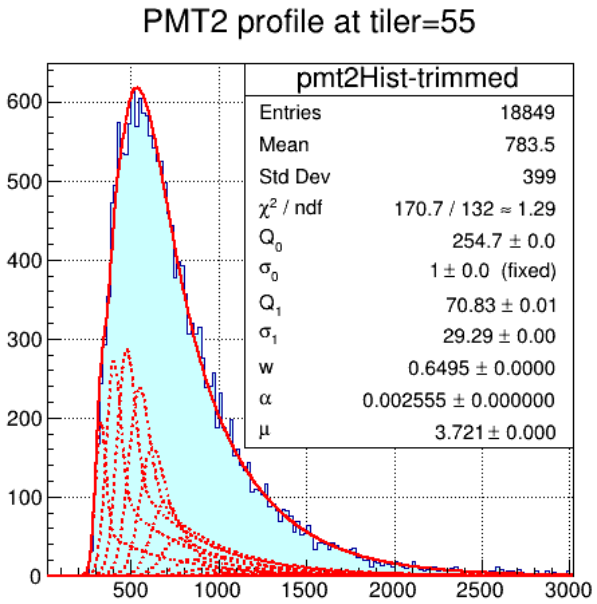




SP-15 with Mesh

BEFORE





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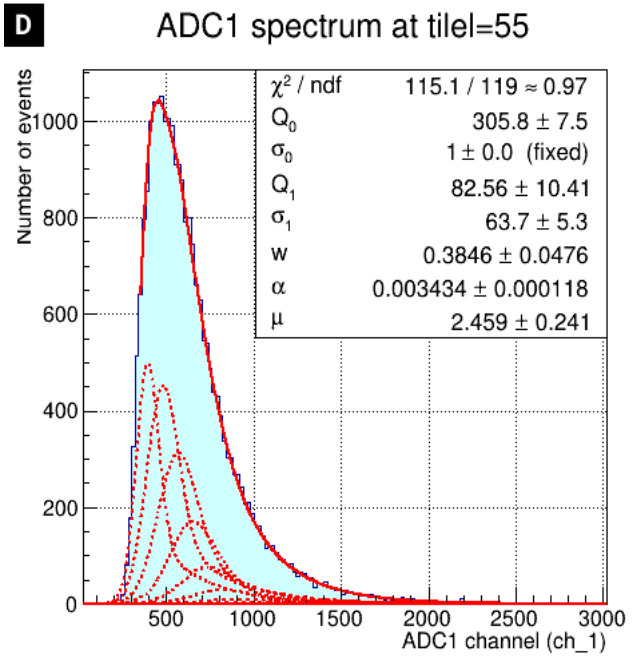

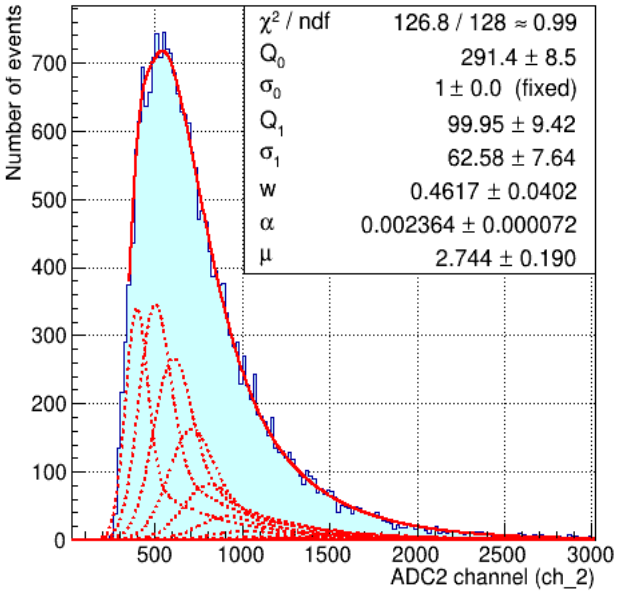

KaonLT Overleaf Conclusions

Spectra ID	Details	μ_1	μ_2	$\mu_1 + \mu_2$	Total N_{PE}
A	SP-15 Aspen with mesh	1.8 ± 0.1	1.7 ± 0.2	3.5 ± 0.2	10.6 ± 0.7
B	SP-15 Japan with mesh	1.2 ± 0.2	1.8 ± 0.4	3.0 ± 0.4	9.3 ± 1.2
C	SP-15 Japan	1.5 ± 0.1	1.8 ± 0.1	3.4 ± 0.1	10.3 ± 0.4
D	SP-30	2.5 ± 0.2	2.7 ± 0.2	5.2 ± 0.3	16.0 ± 0.9

TABLE 4.6.2. Values of the μ parameters and absolute numbers of photo-electrons for studied samples.

- Aerogel samples manufactured in Aspen average at 1.3 PE higher light efficiency. Factoring in the error values this correspond to about 1–30% improved light efficiency compared to the Japan samples.
- Presence of the support mesh between the crystals decreases the light efficiency by 1 PE (about 24%.
- Aerogel sample SP-30 demonstrates considerable increase in 6 PE (about 60%) in light efficiency compared to the SP-15 samples.

Higher statistics for the experimental spectra will benefit to obtain smaller absolute values for the error values of the number of the emitted PE for the series of the studies samples. Having smaller error values will allow us to carry out more specific conclusions.

Outline

Improved the mechanism of importing the Aerogel spectra in the KaonLT fitting program. This saves space on the hard drive in 2 times (important for the farm).

A **better approach of fitting the KaonLT spectra is found**. Rise of the spectrum is excluded from the fit. We exclude the region because of the noise in the lower region of ADC.

Aerogel prototype **technical note in Overleaf is completed**. Some parts marked yellow need attention.

TODO

Yellow report submit.
Radiation refresh training (by the end of January).
Check who should sign the Form International student office or actual advisor? STEM OPT extension (F1 visa).
Polishing equipment – reply Andrew from Kemet.
Complete the SciGlass technical note (January 15th).
Implement **Crystal Ball fitting** function for energy resolution spectra.
https://www.jlab.org/primex/weekly_meetings/slides_2009_07_17/dmitry/crystalball.html

Check how change of physics list affects the energy deposition profiles.
Compare the results of 6x6 20x20x400 to 3x3 40x40x400 (same size).

Obtain energy resolutiuon graphs for following crystals:

5x5 20x20x400 BaGdSiO,

3x3 20x20x200 BaGdSiO and PWO4,

1x1 40x40x400 BaGdSiO

Energy range: 4.5 GeV, -> 10GeV (0.5 GeV step)

Number of events: 10000