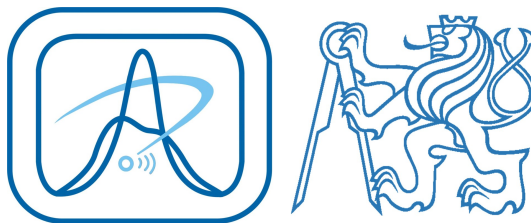


Regular status report

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IEAP CTU in Prague

26.02.2024



- Allpix2 simulation: adding repulsion
- VdG measurements with Timepix2: adaptive gain calibration
- Testing of Timepix2 on Ondra's PCB
- Wirebonding: Timepix2, Timepix3, Timepix4
- AOB: ELI visit, DRD4 collaboration meetings

Adding electrostatic repulsion to Allpix2

- In Allpix2 ClsSize distribution is never correct, especially for thick sensors high-z sensors
- Added ellipsoidal model from M. Benoit, L.A. Hamel, NIM A 606 (2009)
- Started to verify with 1 mm thick CdTe Timepix3 detector

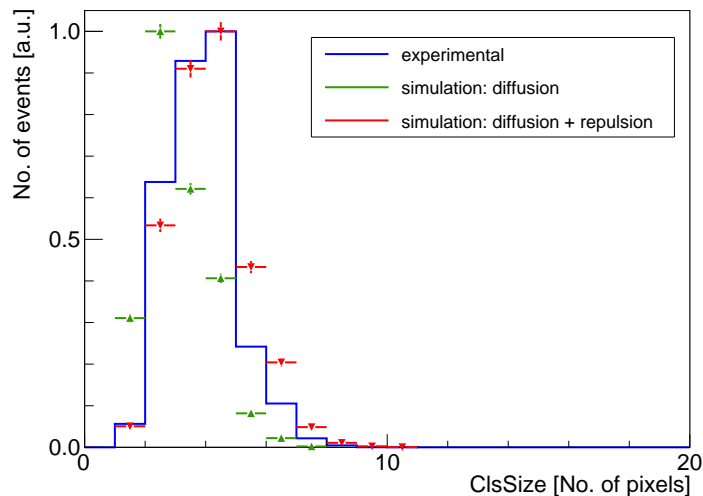


Figure: ClsSize spectrum for photopeak of Am241 source

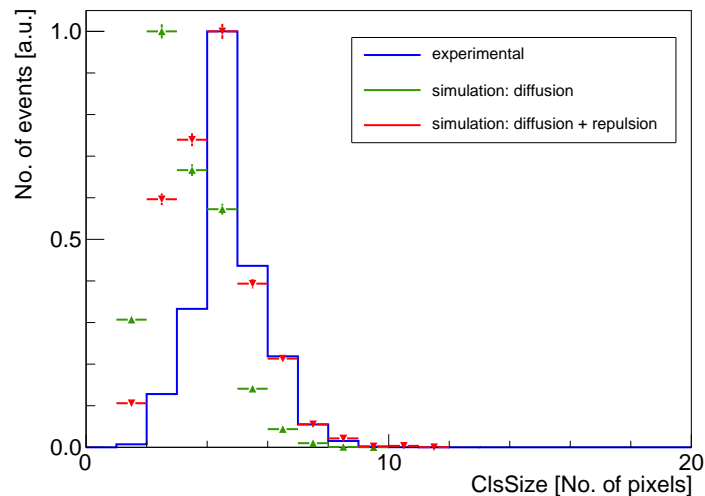


Figure: ClsSize spectrum for photopeak of Co57 source

Energy spectra of Am241, Co57

- Agreement for photopeak is good
- For lower part of spectra the agreement is worse, caused by background radiation in the experiment, different calibrations, effects in the front-end (which are not simulated yet)

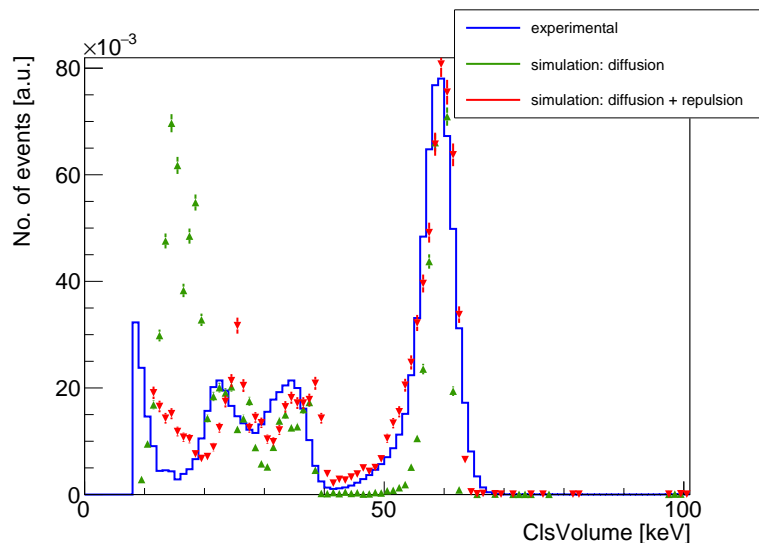


Figure: ClsVolume spectrum of Am241 source

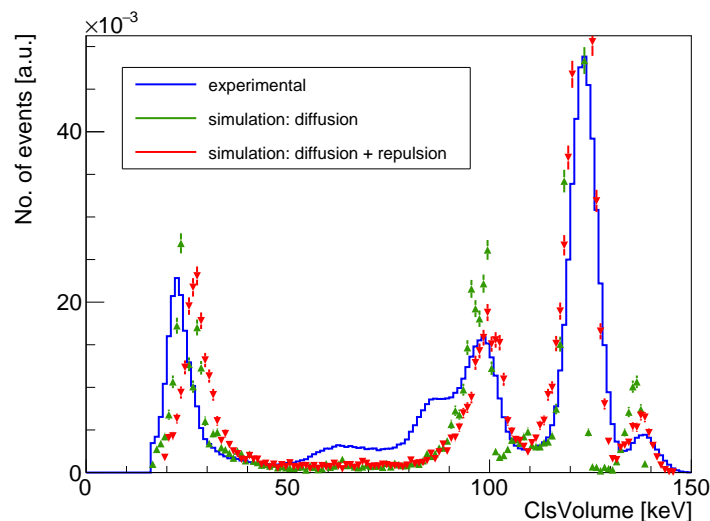
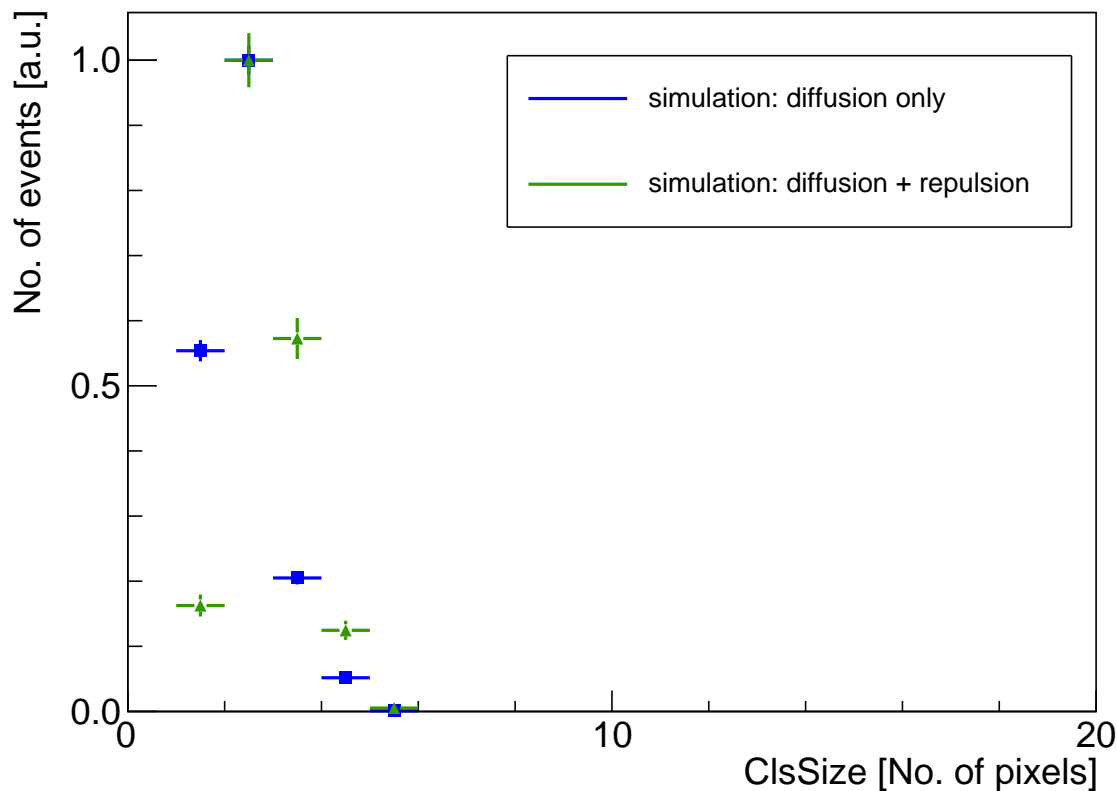


Figure: ClsVolume spectrum of Co57 source

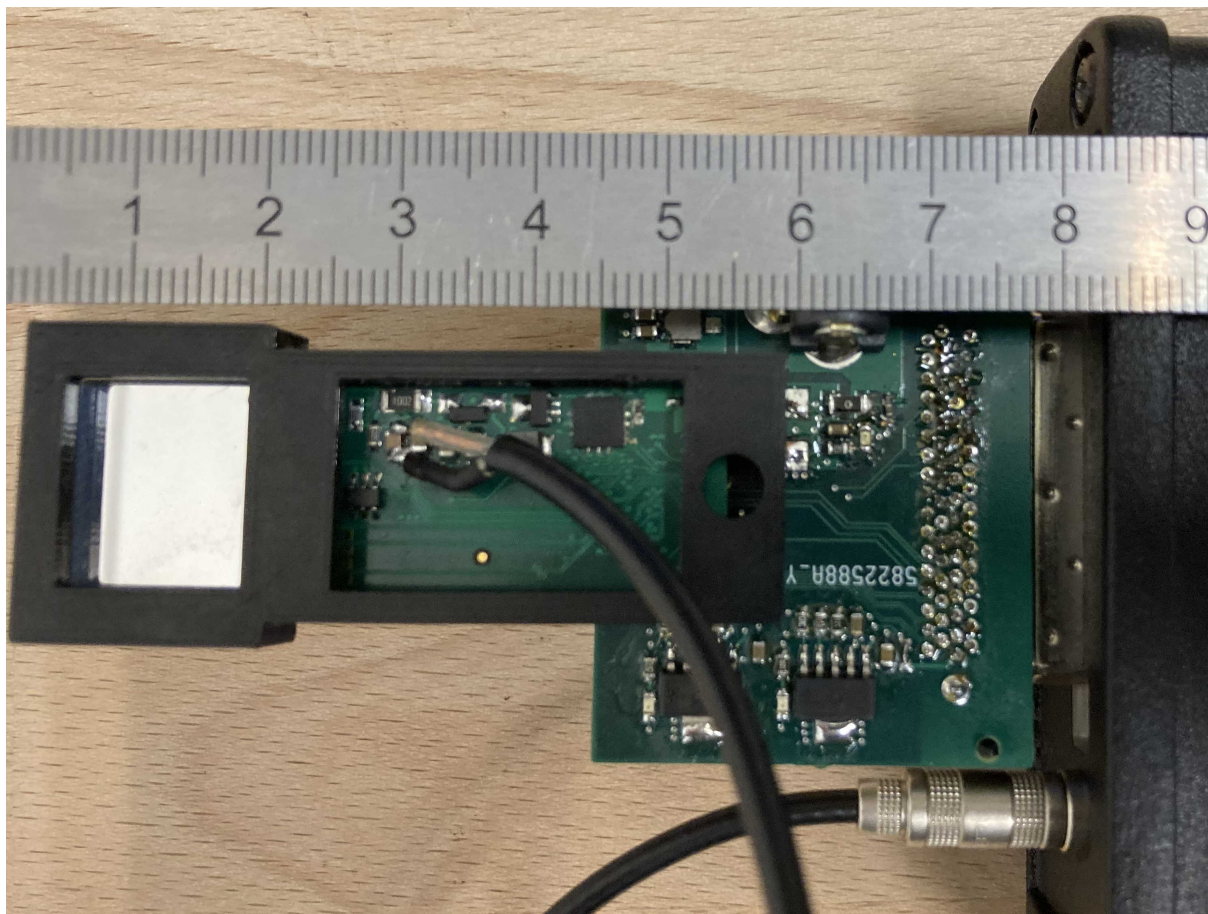
ClsSize spectrum for 30 keV photons [simulation only]

- For lower energies repulsion contribution is also not negligible



Timepix2 on Ondra's chipboard testing

- Two Timepix2 chips were assembled on Ondra's chipboards



Timepix2 calibration comparisons

- $\text{THL} = 5 \text{ keV}$
- Normal gain mode
- Standard ToT calibration with Cu, Zr, Sn foils and Am241 source
- No significant difference was observed

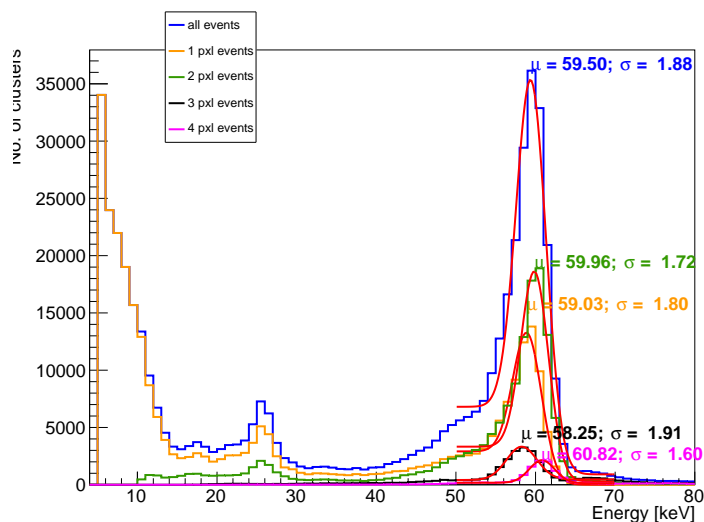


Figure: Reference Timepix2 on UWB chipboard

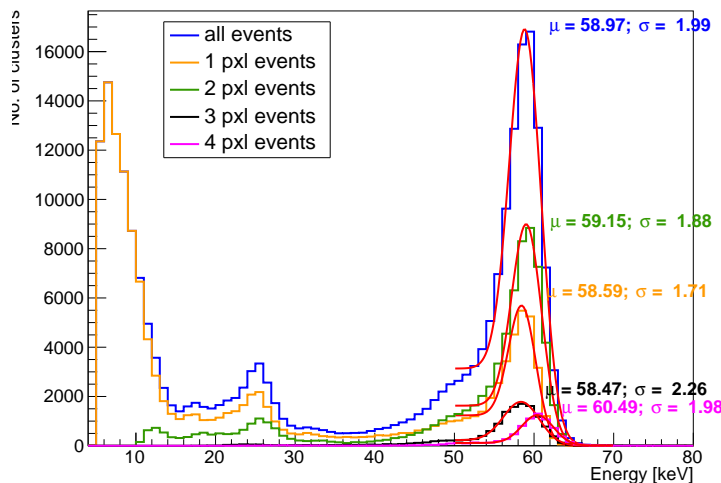


Figure: Timepix2 on Ondra's chipboard

- Protons 500 keV, 1000 keV, 1500 keV, 1750 keV, 1900 keV
- Alphas 5.5 MeV from Am241 source
- Change of bias voltage from 100 to 230 keV
- Adaptive/normal gain modes
- Main goal is high energy calibration in adaptive gain mode (methodology was published by Benedikt 2 year ago)

Timepix2 high energy calibration results

- In previously published results the saturation is around 2.25 MeV (measured) = 3.2 MeV (nominal)
- To go to higher energies per pixel (to see the saturation) we need to try higher bias voltage

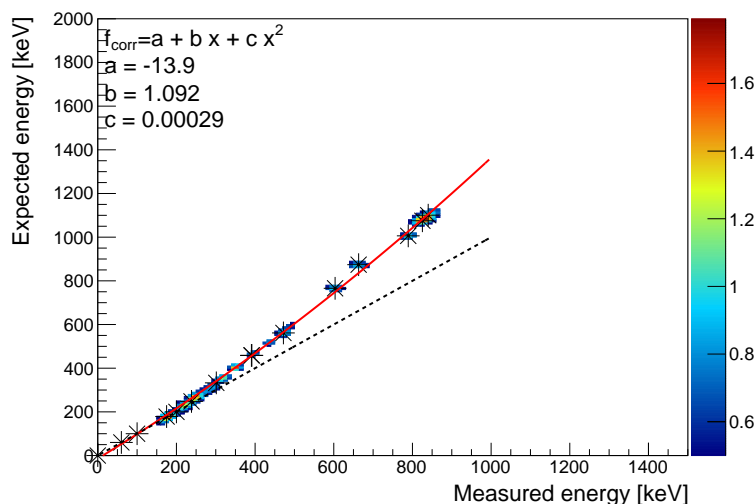


Figure: Calibration curve

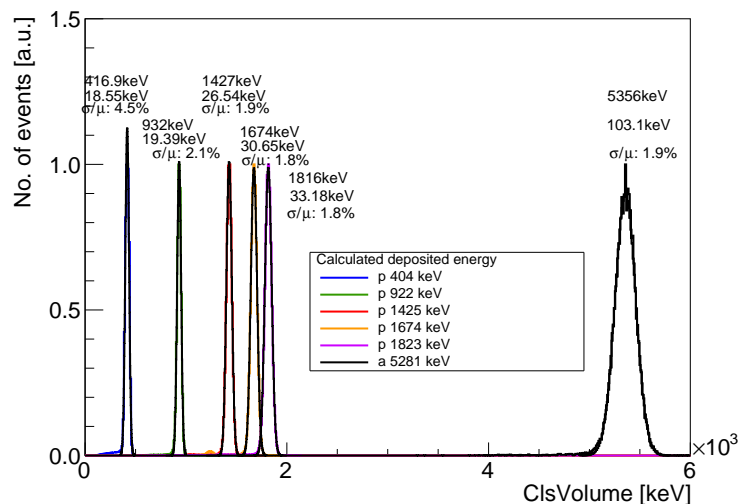


Figure: Corrected energy spectra

Timepix2 ions spectra

- 330 GeV/c Pb beam hitting beryllium target – mixed ions beam.
- Timepix2 with a 500 μm thick sensor in adaptive gain mode.
- For 50 deg 11 (12) ions species can be recognized

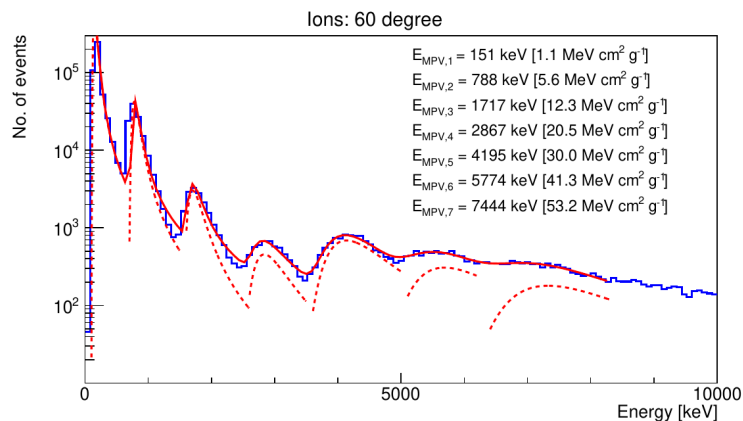


Figure: Timepix3 published spectrum (60 deg)

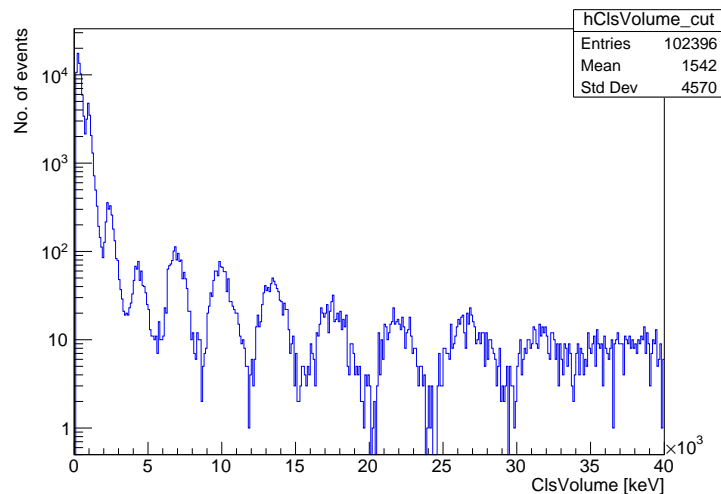


Figure: Timepix2 in adaptive gain mode (50 deg)

Timepix2 ions spectra

- For 70 deg 13 (14) ions species can be recognized

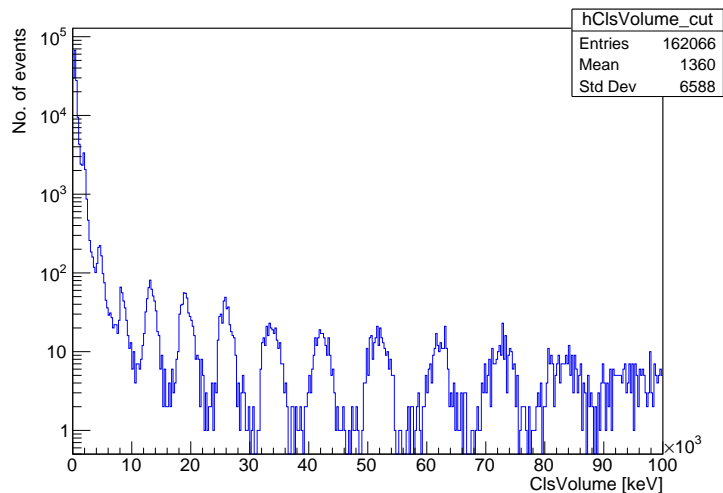


Figure: Timepix2 in adaptive gain mode (70 deg)

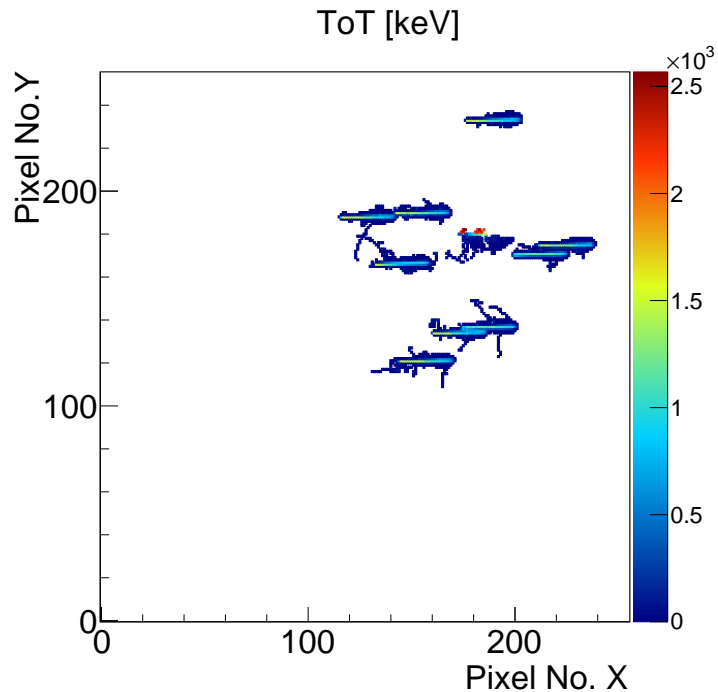


Figure: Ions which deposit 40-45 MeV