# VTX Simulation

**Pixel distributions**

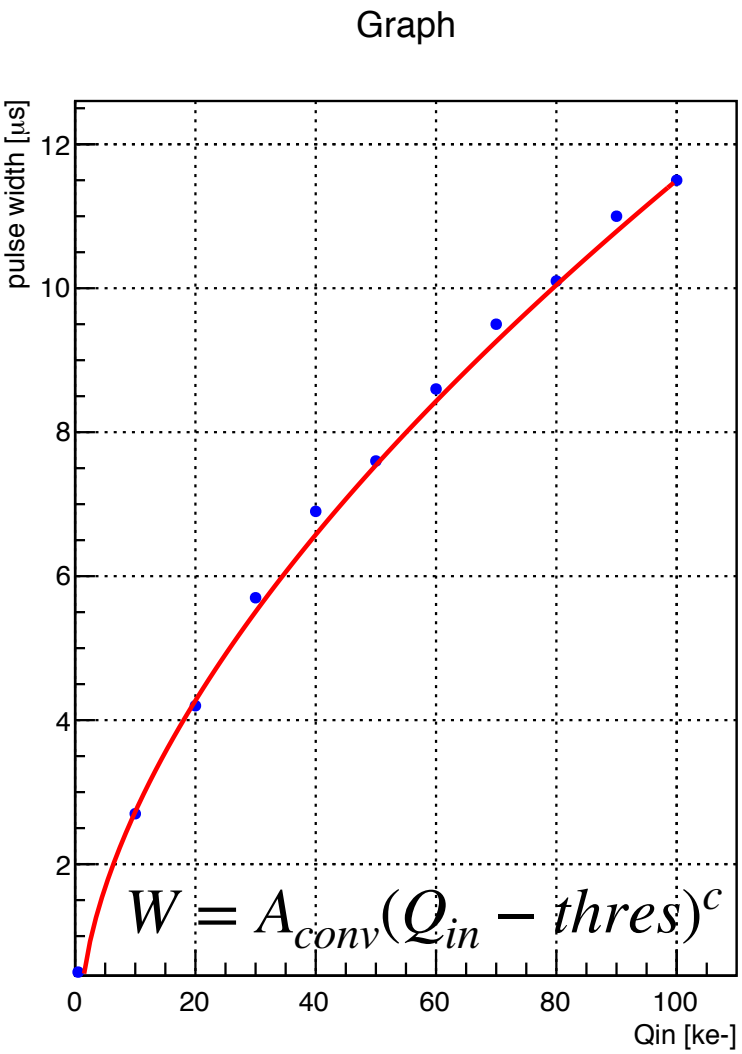
**Charge sharing**

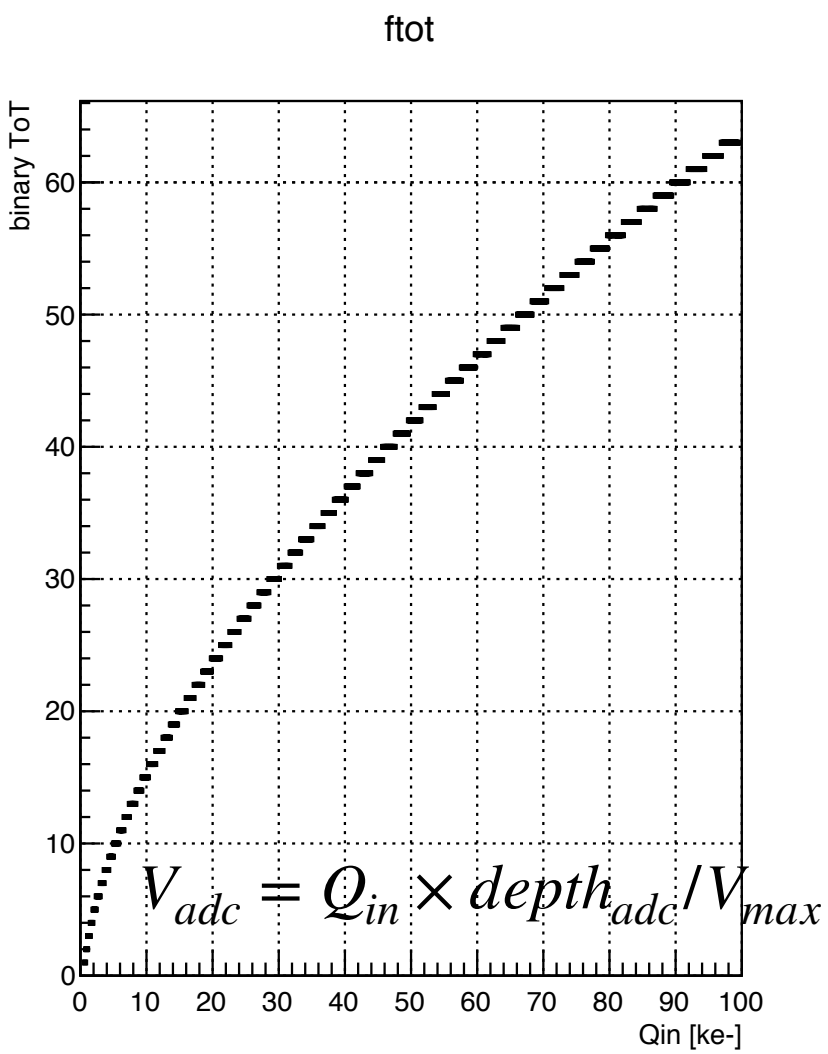
**Simulations**

**Conclusions**

# Charge sharing

- Digital values vs number of electrons




- Data and fonction provided by Jérôme, W. Ren et al.

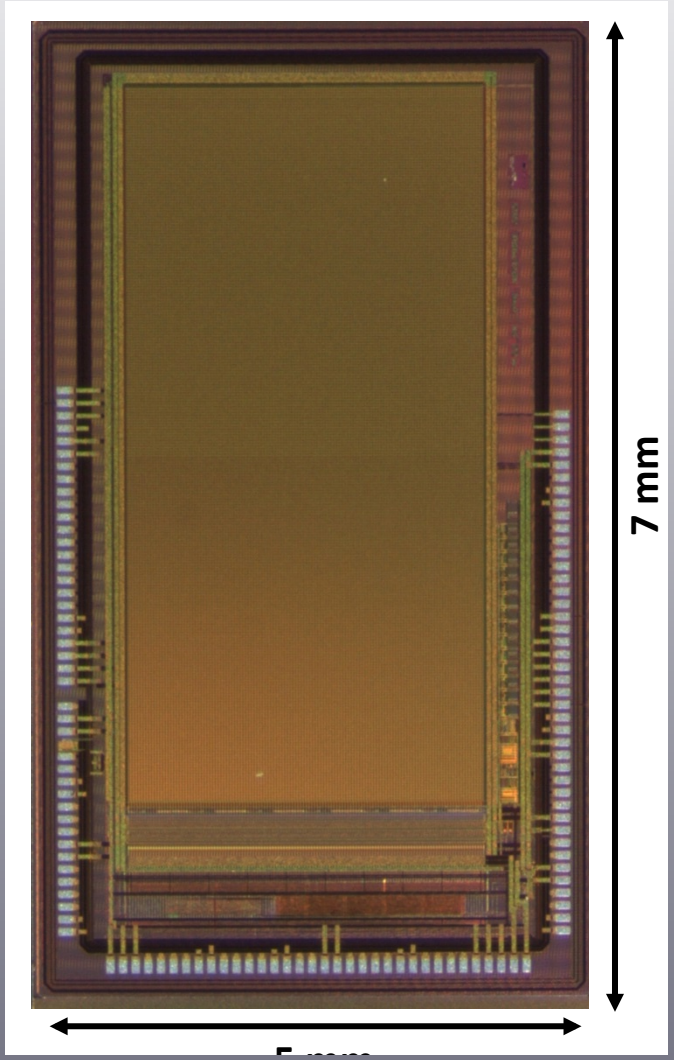
# Simulations (iii)

- Inputs:
  - Maximum range (charge nb electrons) given by studied reactions
  - Fluctuations : using Fano factor (0.115)
  - ADC depth: 6-8-9-10 bits
  - Cluster shape (Gaussian) :
    - height given by previous slide
    - **width extrapolate from M22.**
  - Pitch: M28
  - **7 clusters per track required out of 8 sensors**

  - G4 simulation: $^{16}O+^{12}C$ @200 MeV/u, 8mm thickness (~15 kevts fragmented)

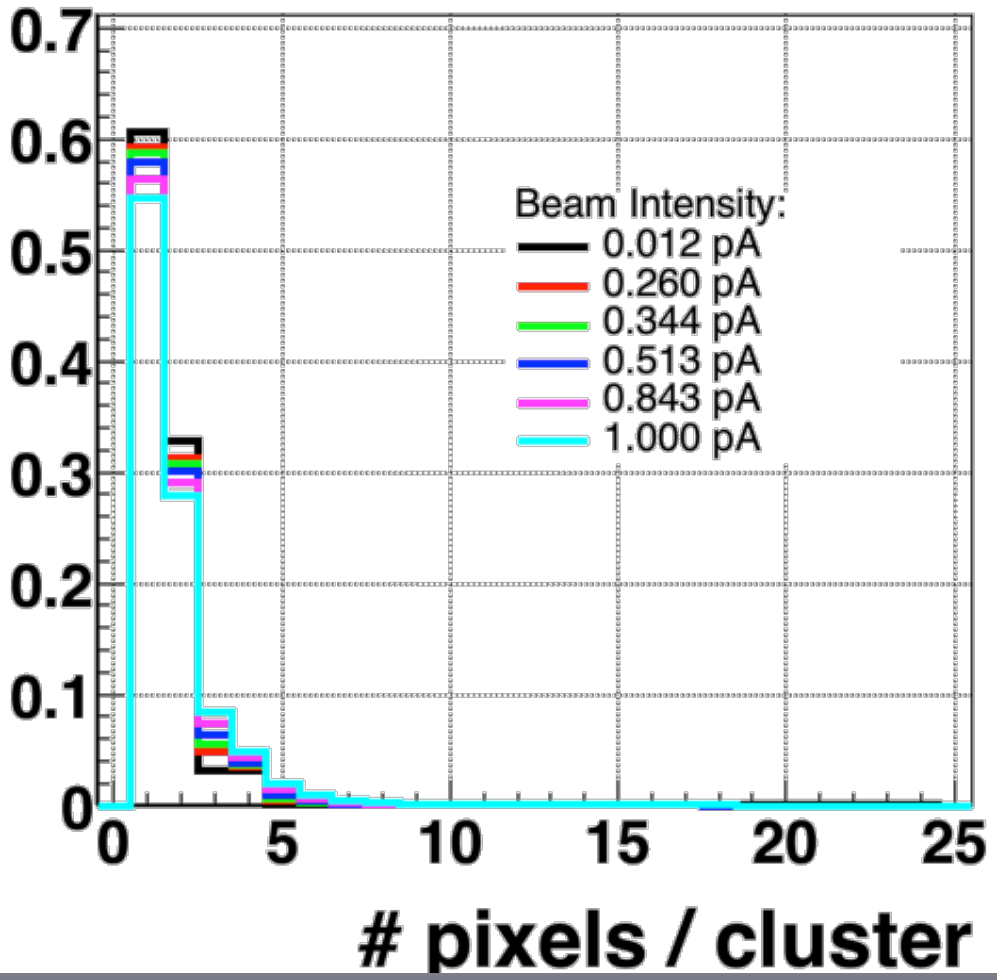
# Mean charge distribution: M22SX (i)

- Design
  - 128 x 256 pixels with 22 µm pixel pitch
  - 18 µm epitaxial layer, resist. > 1 k Ohm.cm



# Mean charge distribution: M22SX (ii)

- Proton @ 25 MeV: (M. Kachel)



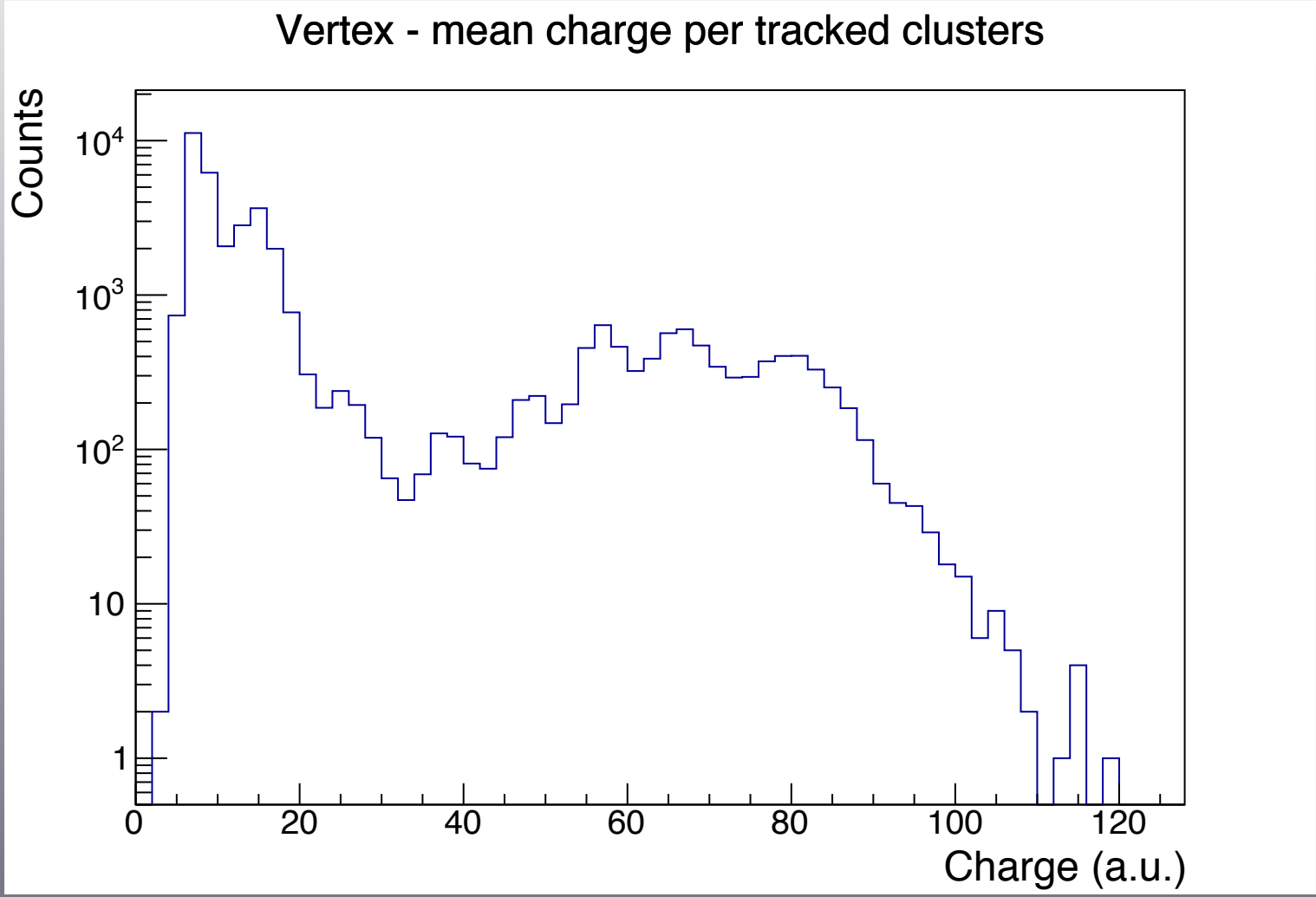

The cluster size has only a small dependence on the intensity

At 1 pA, the average is 1.8 pixels / cluster

- Extrapolate value for $^{16}O$ @ 200 MeV

# Mean charge distribution: 8 sensors (i)

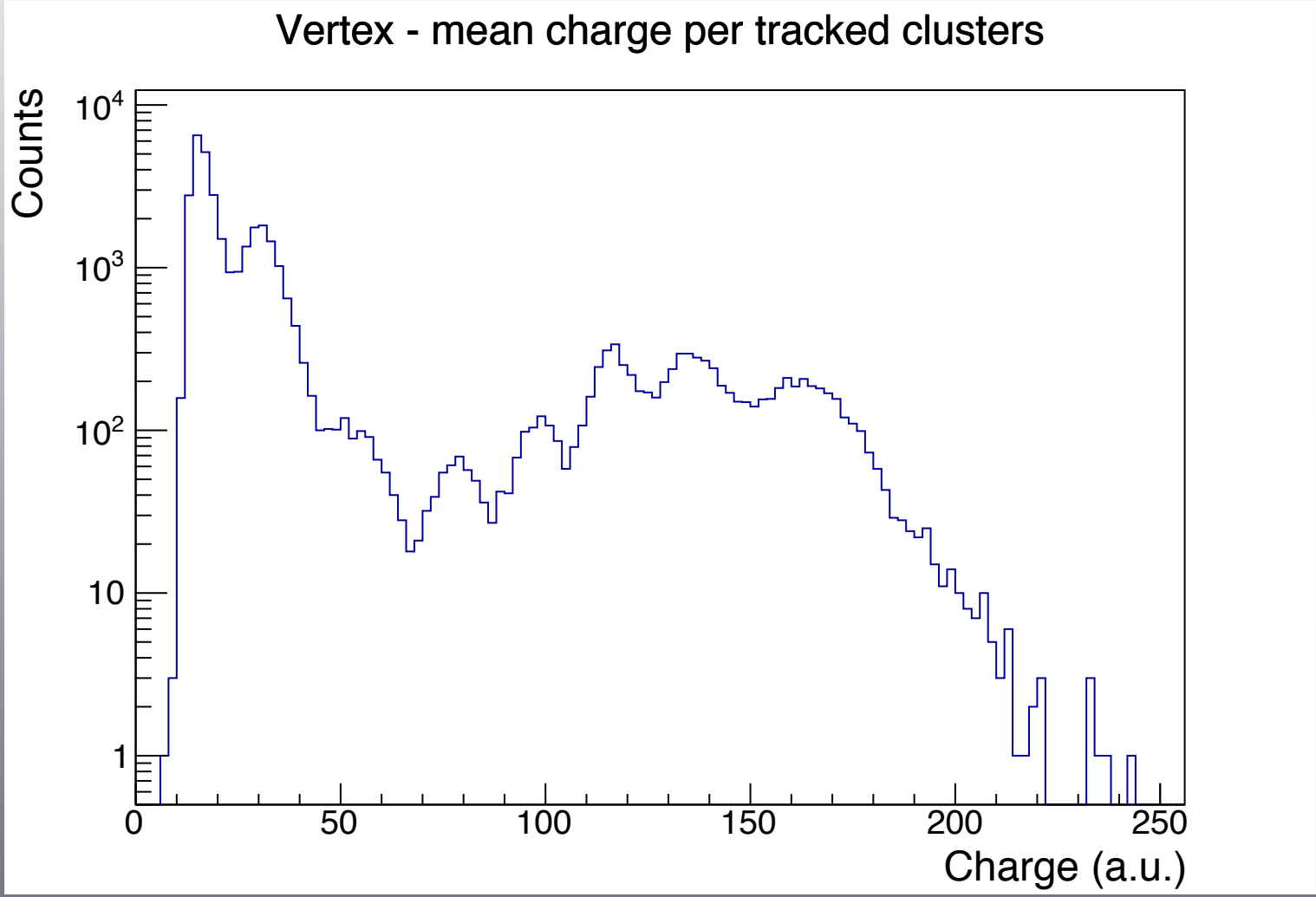
- ADC depth: 7 bits




- Disentangle clearly Z =1, 2  and guess Z = 3-8

# Mean charge distribution: 8 sensors (i)

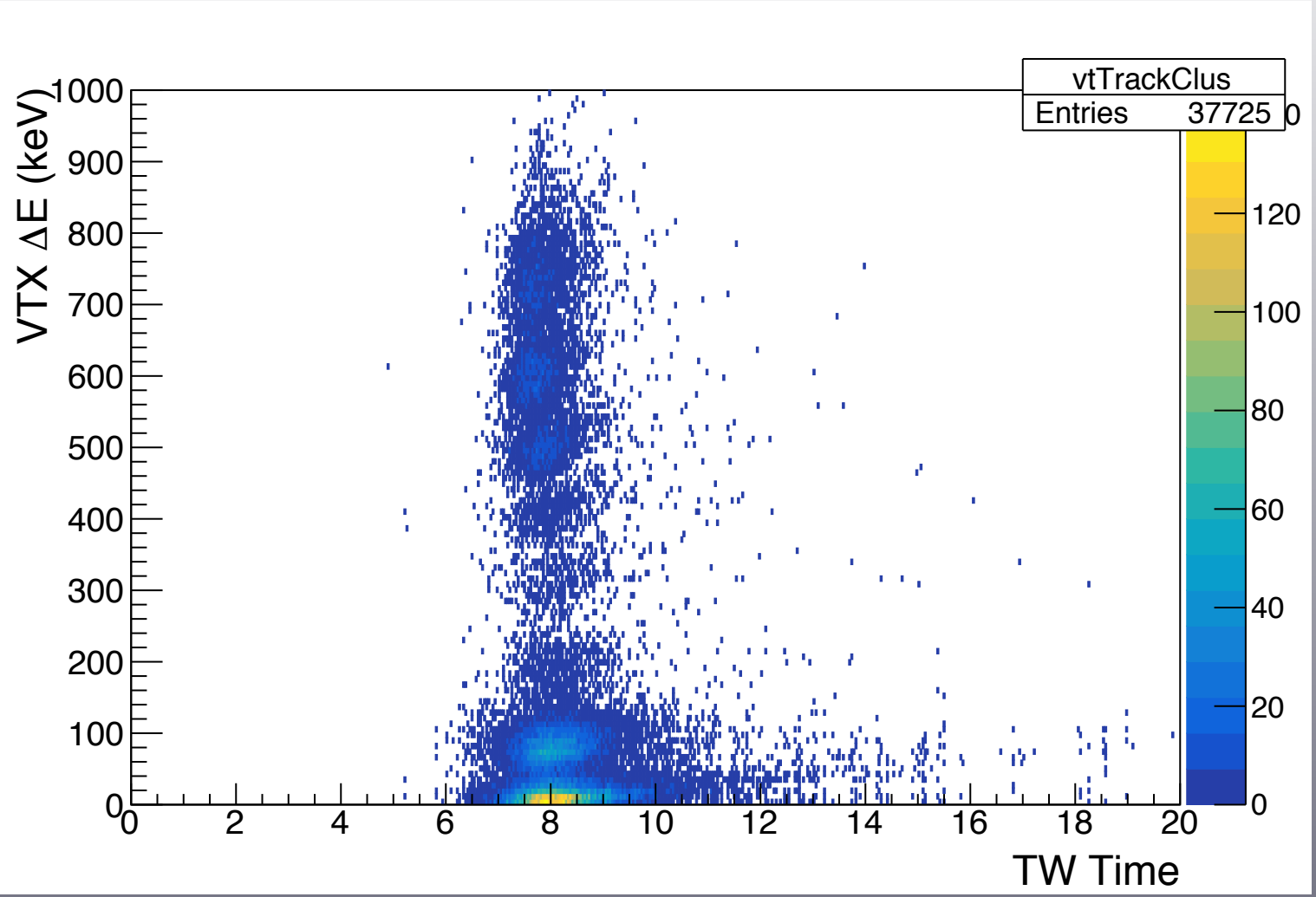
- ADC depth: 8 bits




- Disentangle clearly Z =1, 2  and guess Z = 3-8

# Mean charge distribution vs ToF (i)

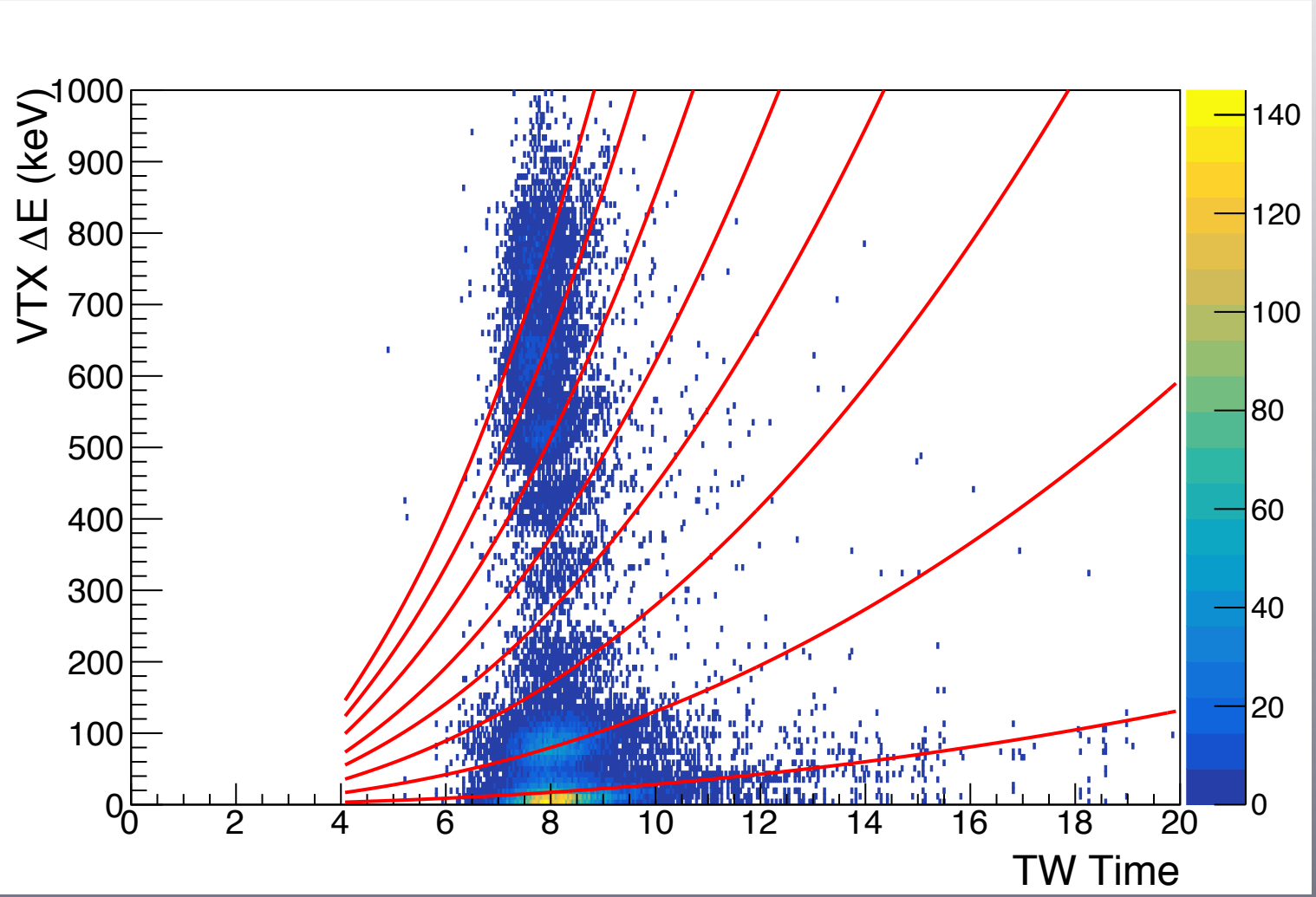
- ADC depth: 7 bits vs ToF (external)




- Could help ?

# Mean charge distribution vs ToF (ii)

- ADC depth: 7 bits vs ToF (external)




- Try to fit with the Bethe-Bloch formula (under progress)

# Conclusions

- Digitizer update: new parametrization of the Gaussian height
  - not depleted need 7bits ADC depth
  - when fully depleted need 8bits ADC depth or 7bits with help of a ToF

➡ Find compromise between ADC depth and depletion.