

Study on ADC range optimization for lens-based optical detector

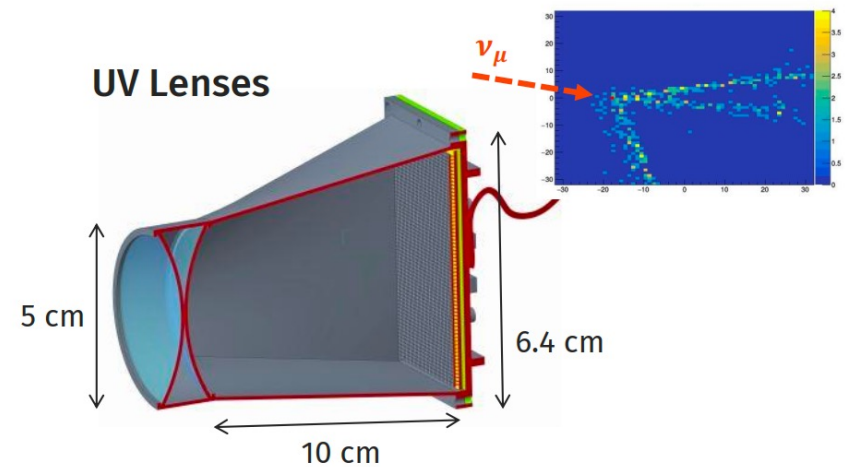
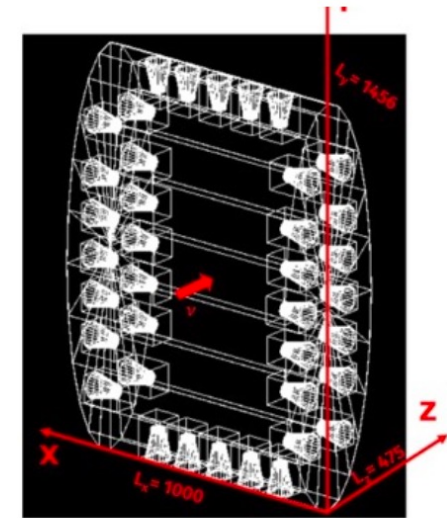
A.Caminata, S. Repetto, L. Di Noto

Meeting on ASIC design

Genova, May, 9 th 2024

MC data

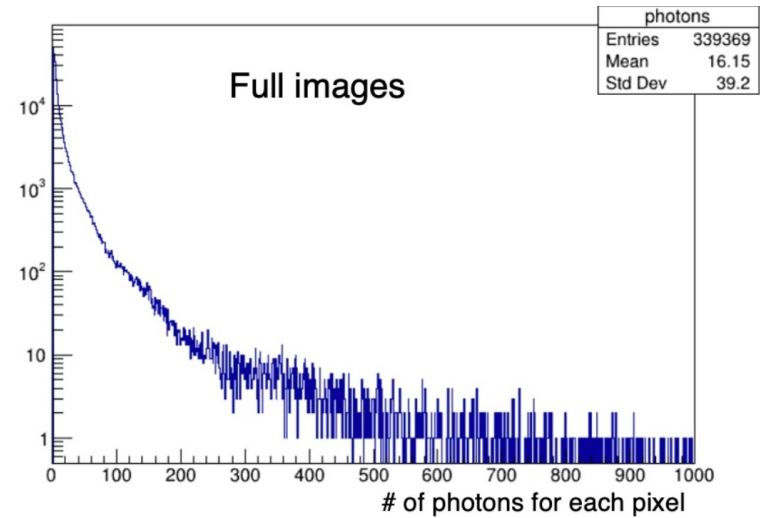
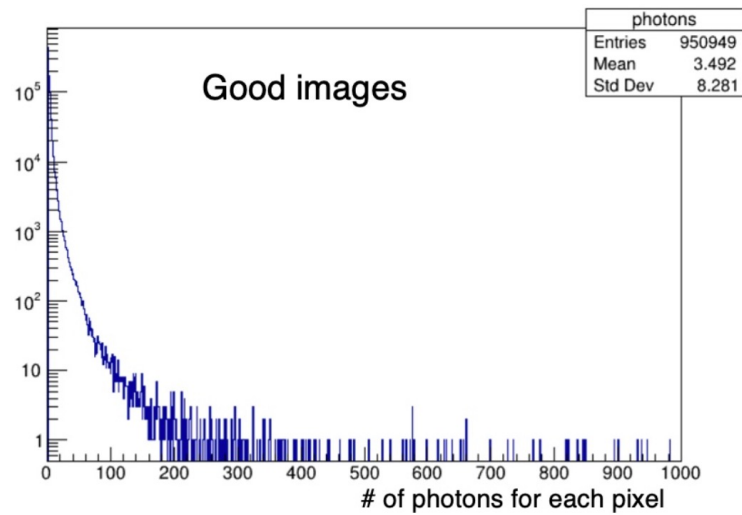
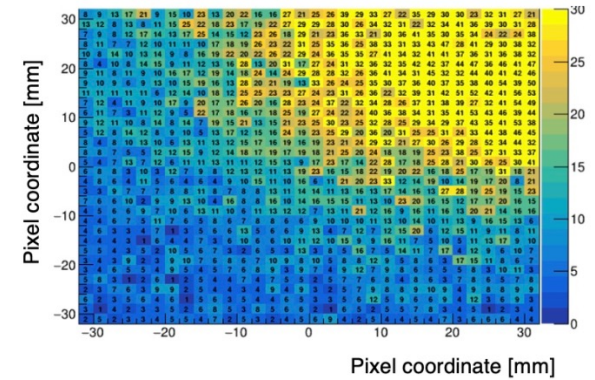
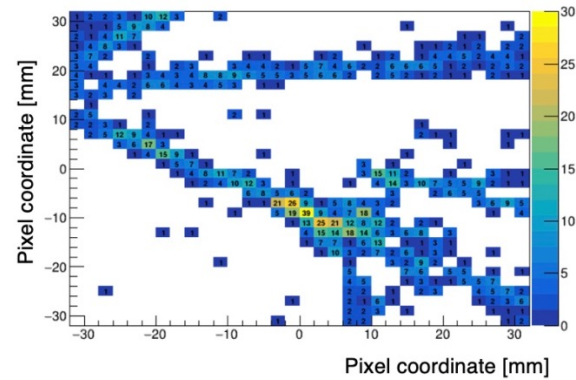
- MC simulation of 100 000 FHC neutrino interactions in GRAIN
 - not spill simulation
 - not the updated geometry (48 cameras)
- Photons have been simulated from the LAr volume to the SiPM sensor plane
- For each SiPM (2 mm x 2 mm) the total number of photons arrived within 500 ns is saved
- For each SiPM a max value is applied (ADC max value)
 - We want to study the effect of this value



Typical images

Good images

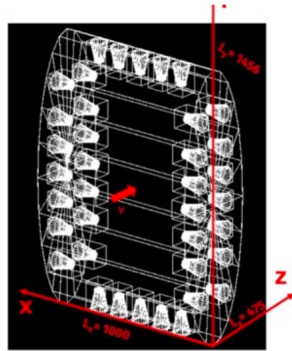
Full images



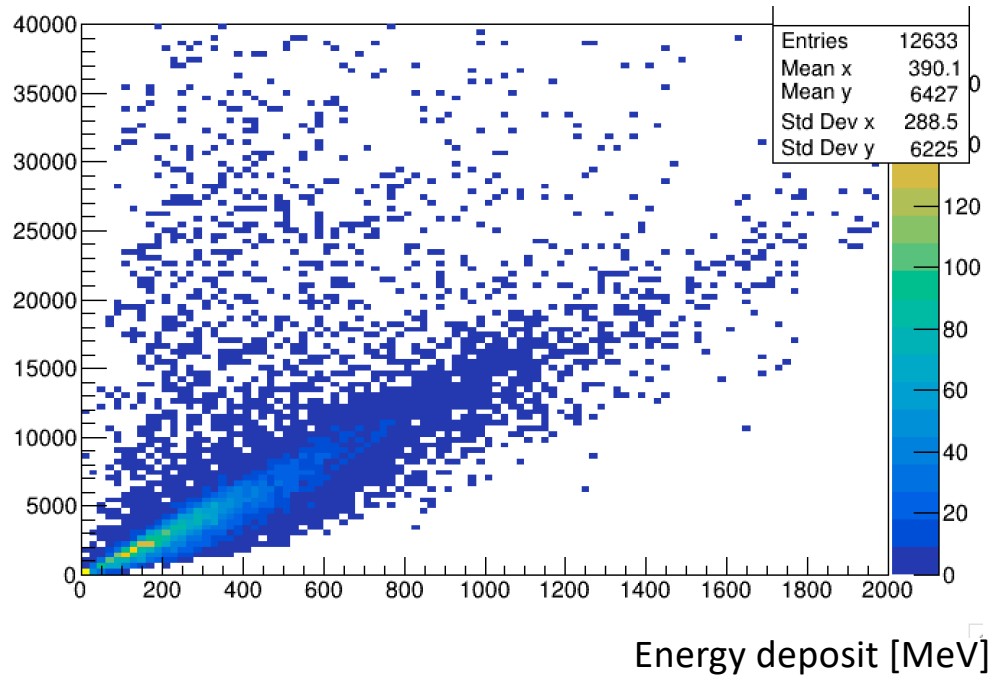
Total number of **detectables** photons in all the cameras

Neutrino interaction vertex in the central GRAIN volume (20 cm from lens surfaces)

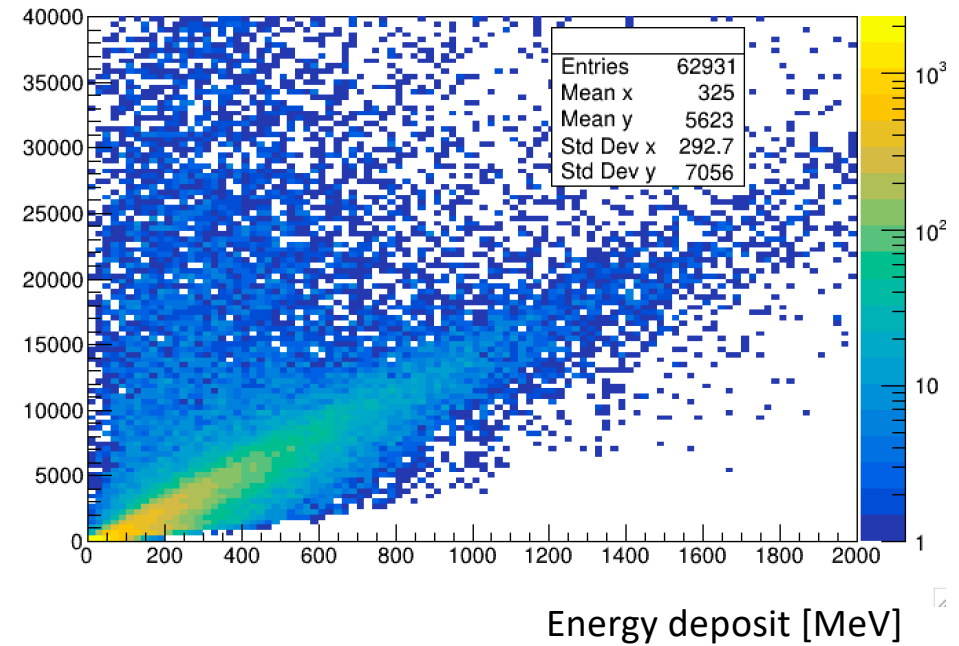
Neutrino interaction vertex in the the biggest fiducial volume (0 cm from lens surfaces)



of **detectable** photons

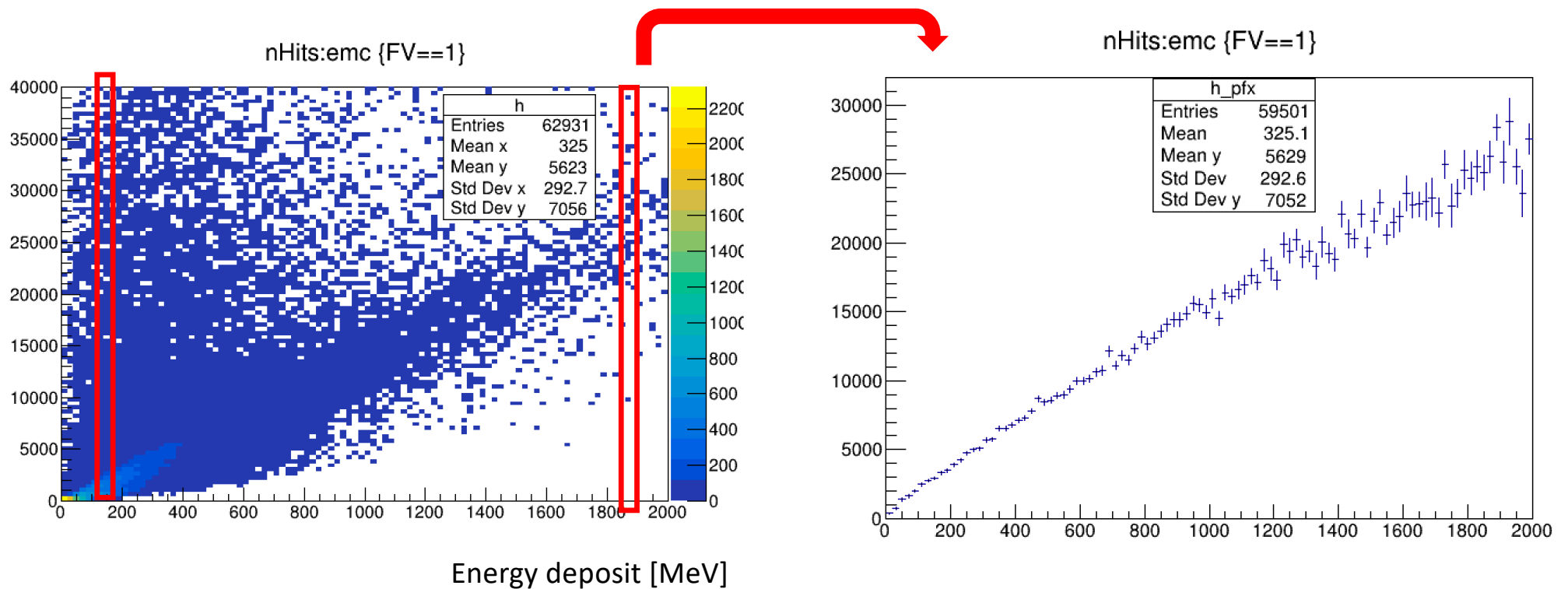


of **detectable** photons



Total number of **detectable** photons in all the cameras

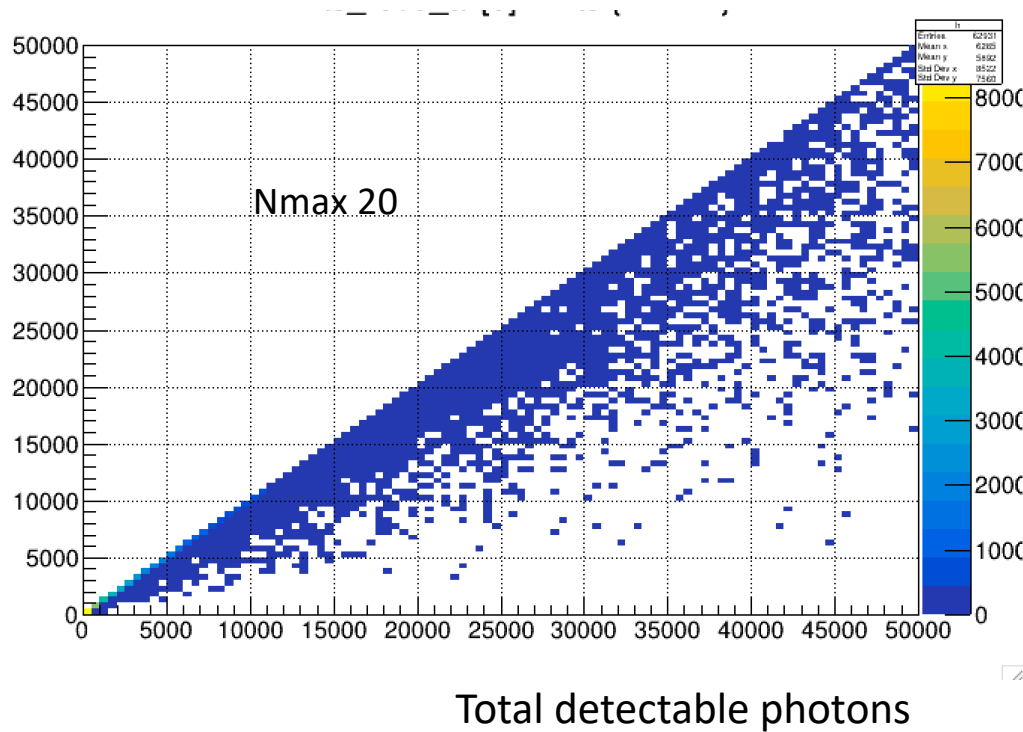
Mean and Sigma for each X bin



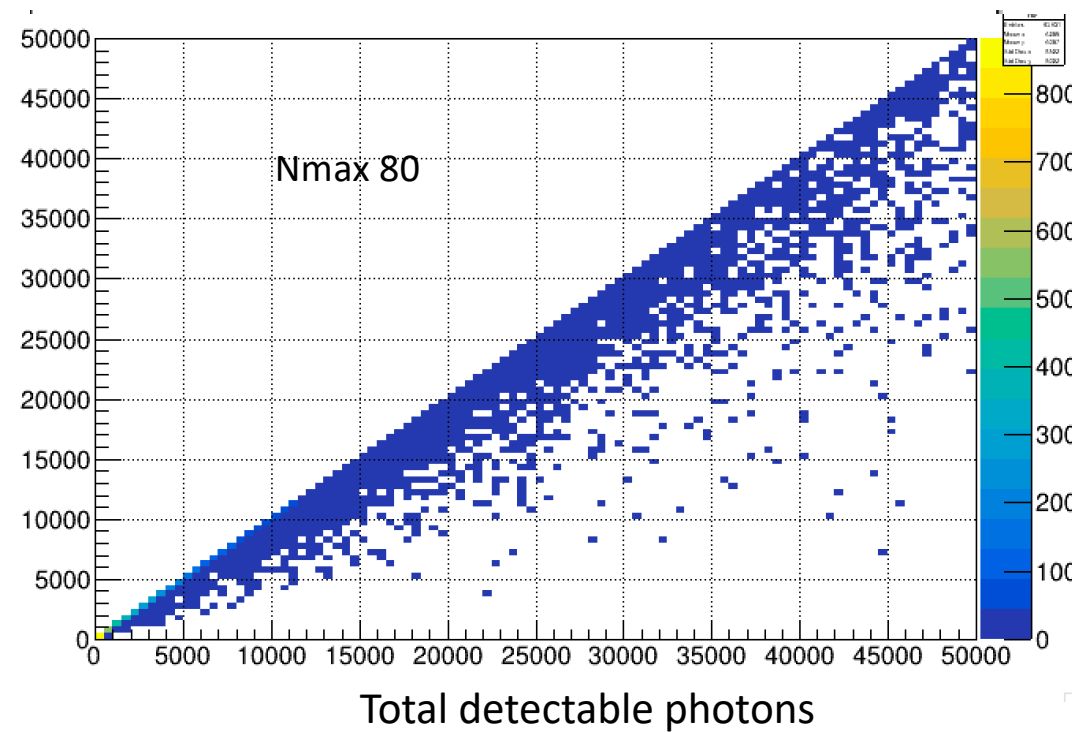
detected photons vs detectable photons

Neutrino interaction vertex in the the biggest fiducial volume (0 cm from lens surfaces)

Total detected photons

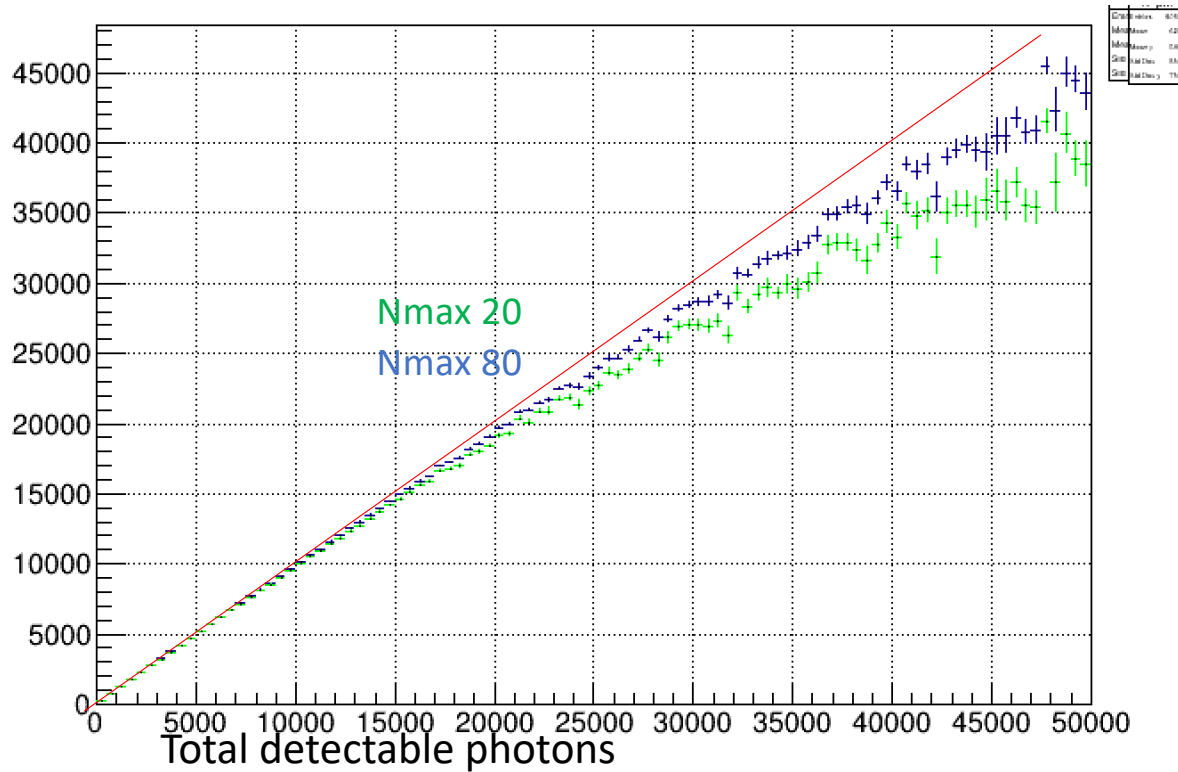


Total detected photons

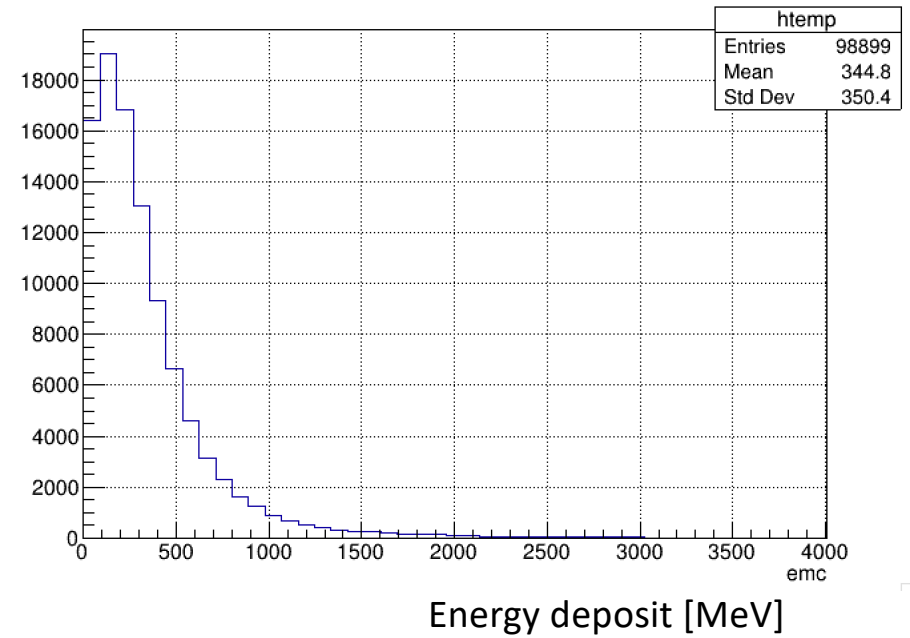
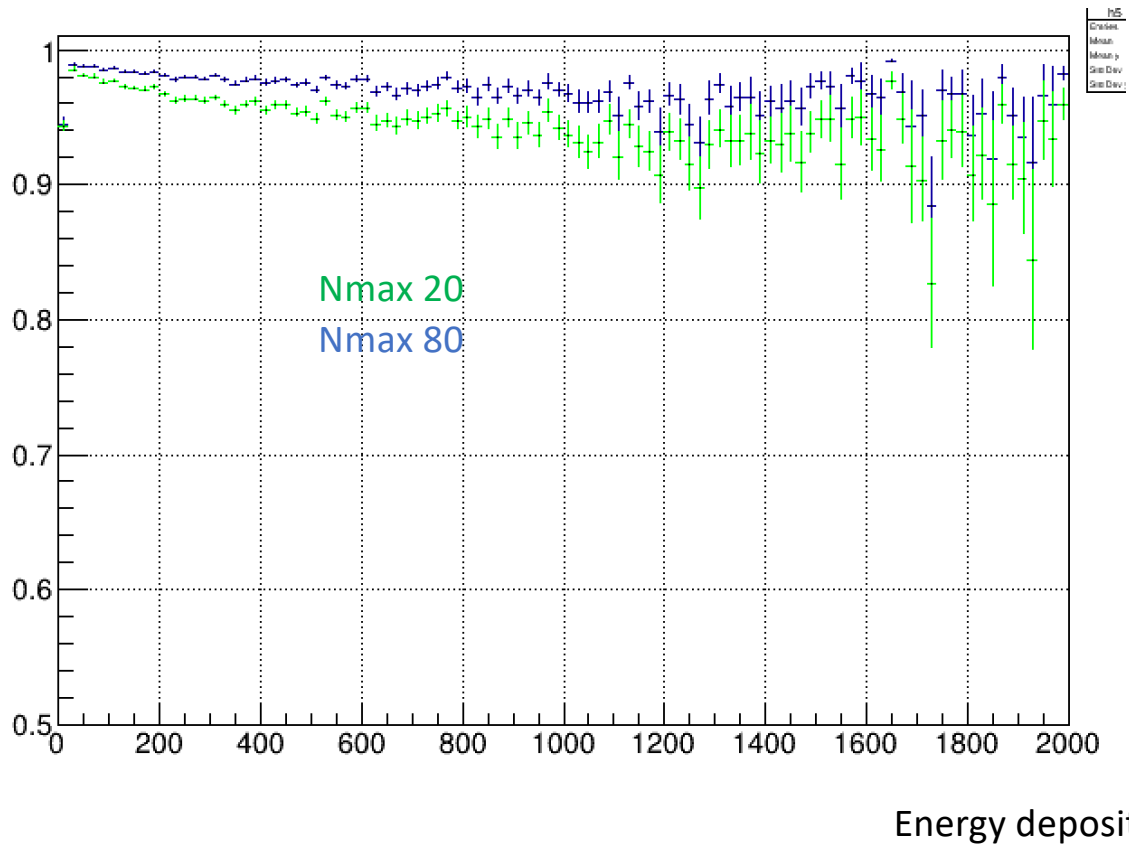


detected photons vs detectable photons

Total detected photons



#detected/#detectable vs Edep



Conclusions

- This work is preliminary
- With this approach, we want to evaluate the impact of the electronics on the calorimetry with minimal assumptions on the position reconstruction
- This approach points to the necessity of a dynamic range of about 80
- For the future, we need to include electronic resolution in the code
- The final number has to be optimized including track reconstruction and spill event reconstruction