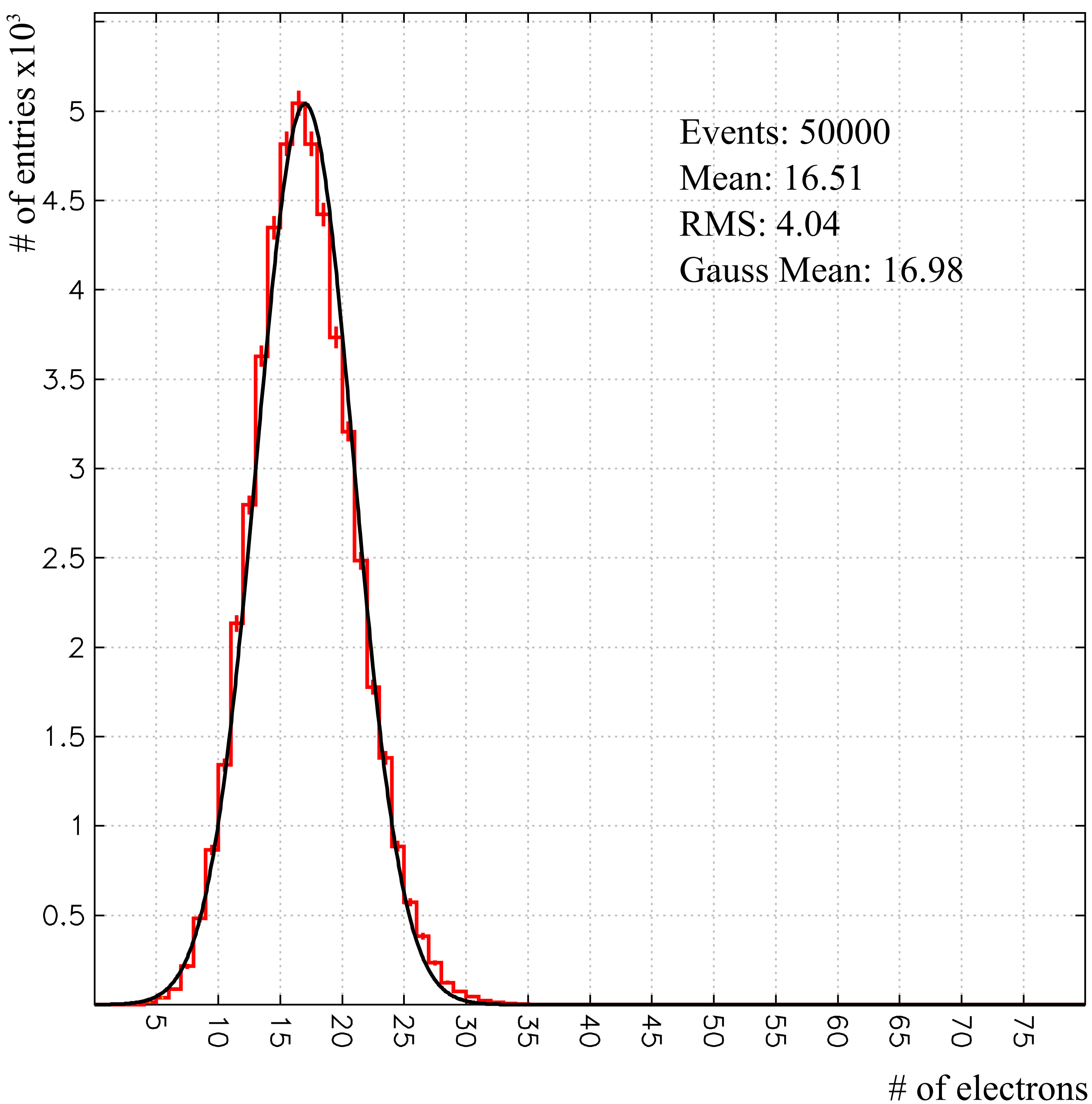
Signal on Micromegas

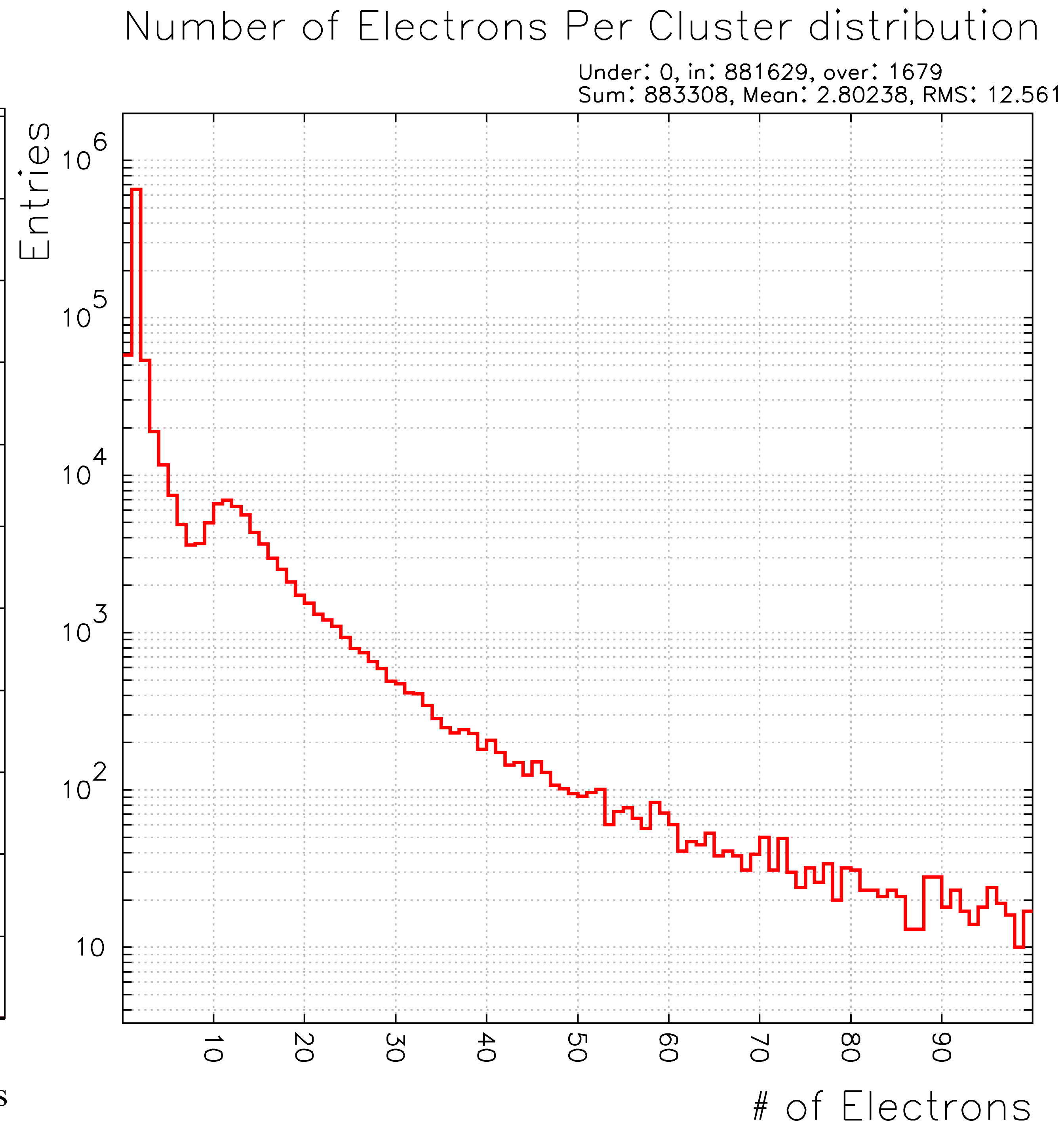
George Iakovidis
Venetios Polychronakos, Theo Alexopoulos

BROOKHAVEN NATIONAL LABORATORY

Micromegas Ionisation (1/2)

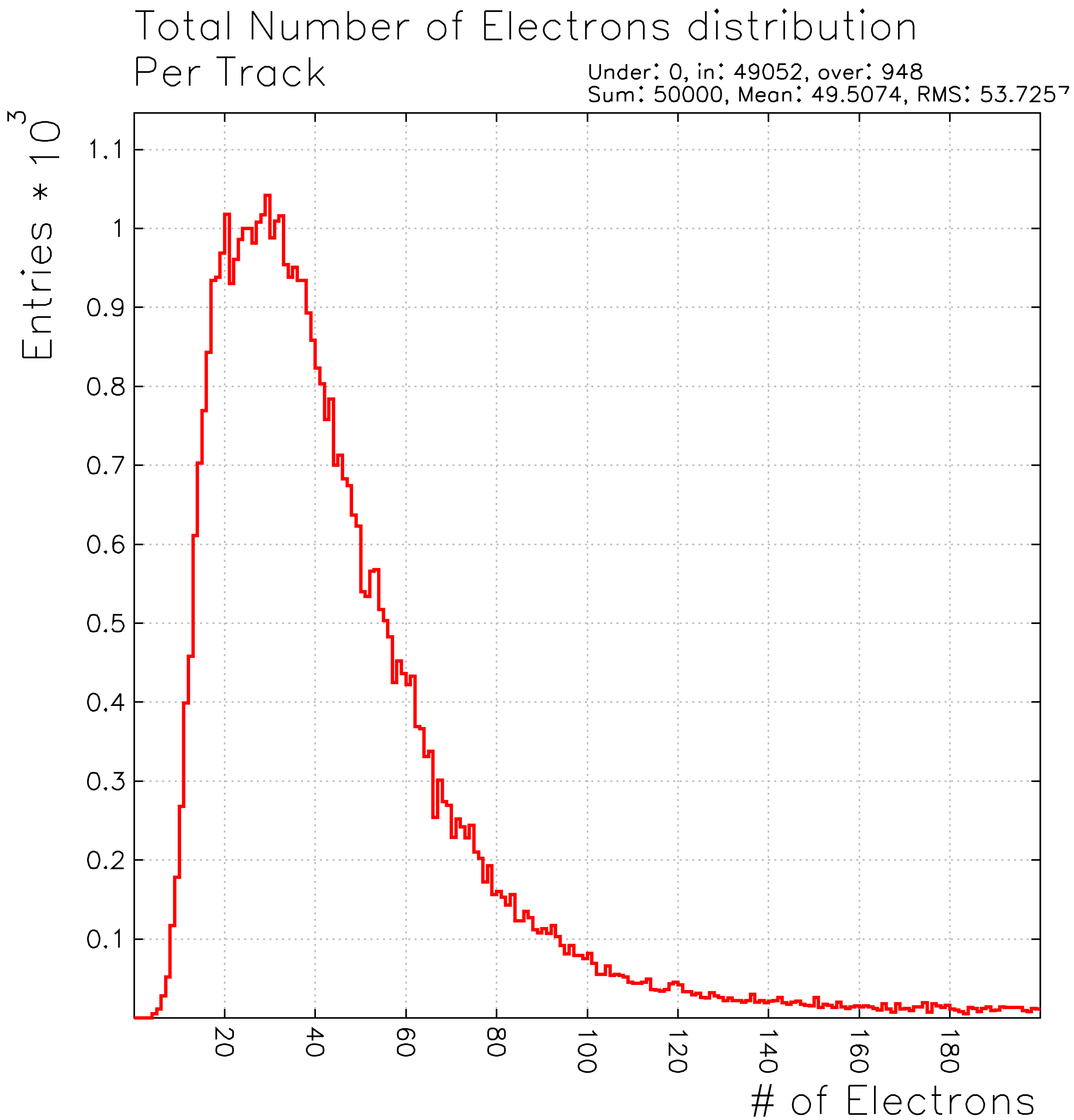
- Mean values sometimes maybe misleading. I run a Monte Carlo (which is in ATHENA digitisation) based on microscopic simulation from Garfield
- left: number of primary ionisation per 5mm track, right: number of electrons per ionisation

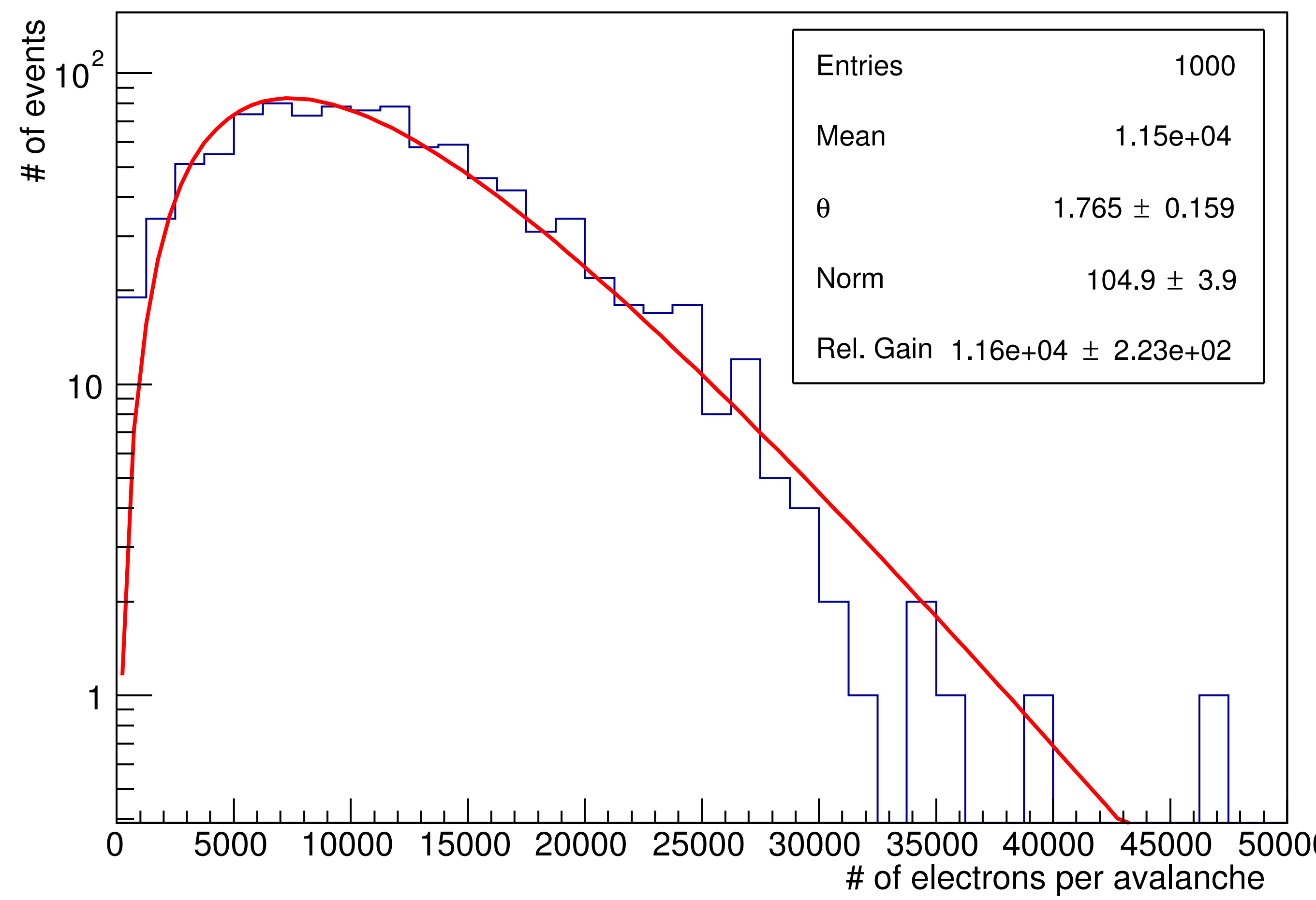




Micromegas Ionisation (2/2)

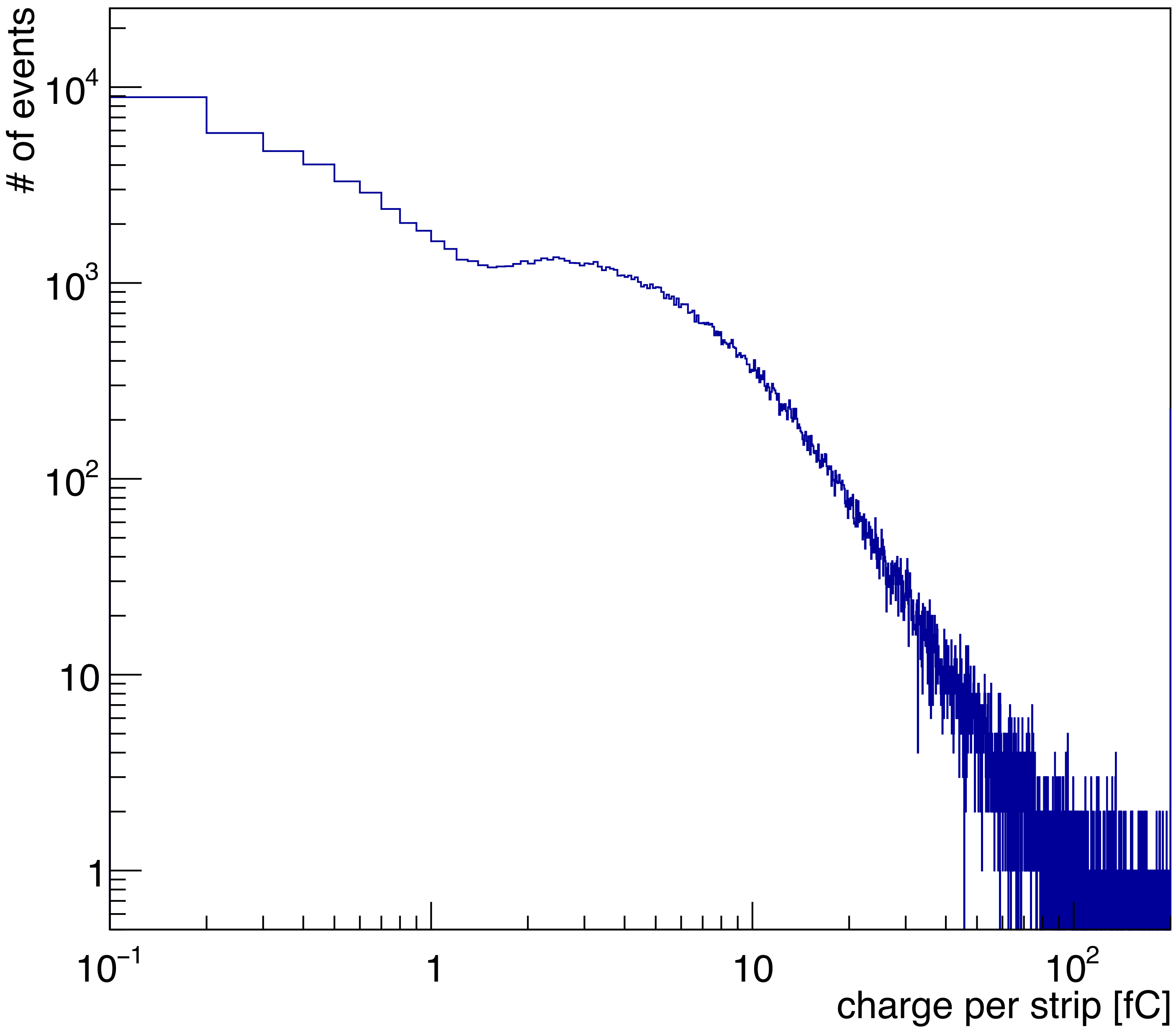
- This creates a total of electrons arriving to the strips (at this moment the transparency is put at 98%).
- There are though gain fluctuations that is described with a Polya distribution. The gain was found at the level of $1.15\mathrm{x}10^4$





Strip Charge

- Now if you assume a worst case for NSW of tracks under 30^{o} on which the charge spreads over a number of strips (mean value at ~6 strips) then I can study the charge profile of a strip for several cases.
- Below is a charge profile for a strip independent of its position in a cluster for 150 thousand events



- In case of noise of 3000 e^- then for an integration time of 50ns it's around to 1fC on the distribution. The hits lost are 32.65%
- In case of 6000 e^- noise which is around 2fC then the lost hits are 40.8%
- In case the noise is what it should be (max of 4k e^-) then the loss is of the order of 25%.
- A good point is to run the detectors with higher gain like 2x10^4.
- Small chambers with an ENC of 300e^- then the loss <5%
- Then if you take into account the combinatorics with a mean value of 6 strips per event.