Instrumentation School in Particle, Nuclear and Medical Physics 2023

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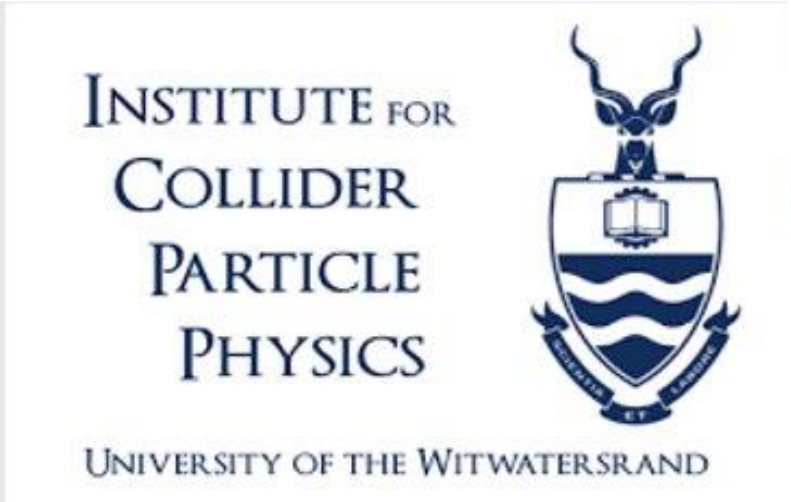


Cloud chamber

Prof. Manfred Jeitler

What is a cloud chamber?

"A cloud chamber is an effective means to visualize the radiation that exists in our surroundings"

The apparatus

Isopropanol, dry ice, cover, magnets, glass tub, black lid and safety gloves

What do we see in a cloud chamber?

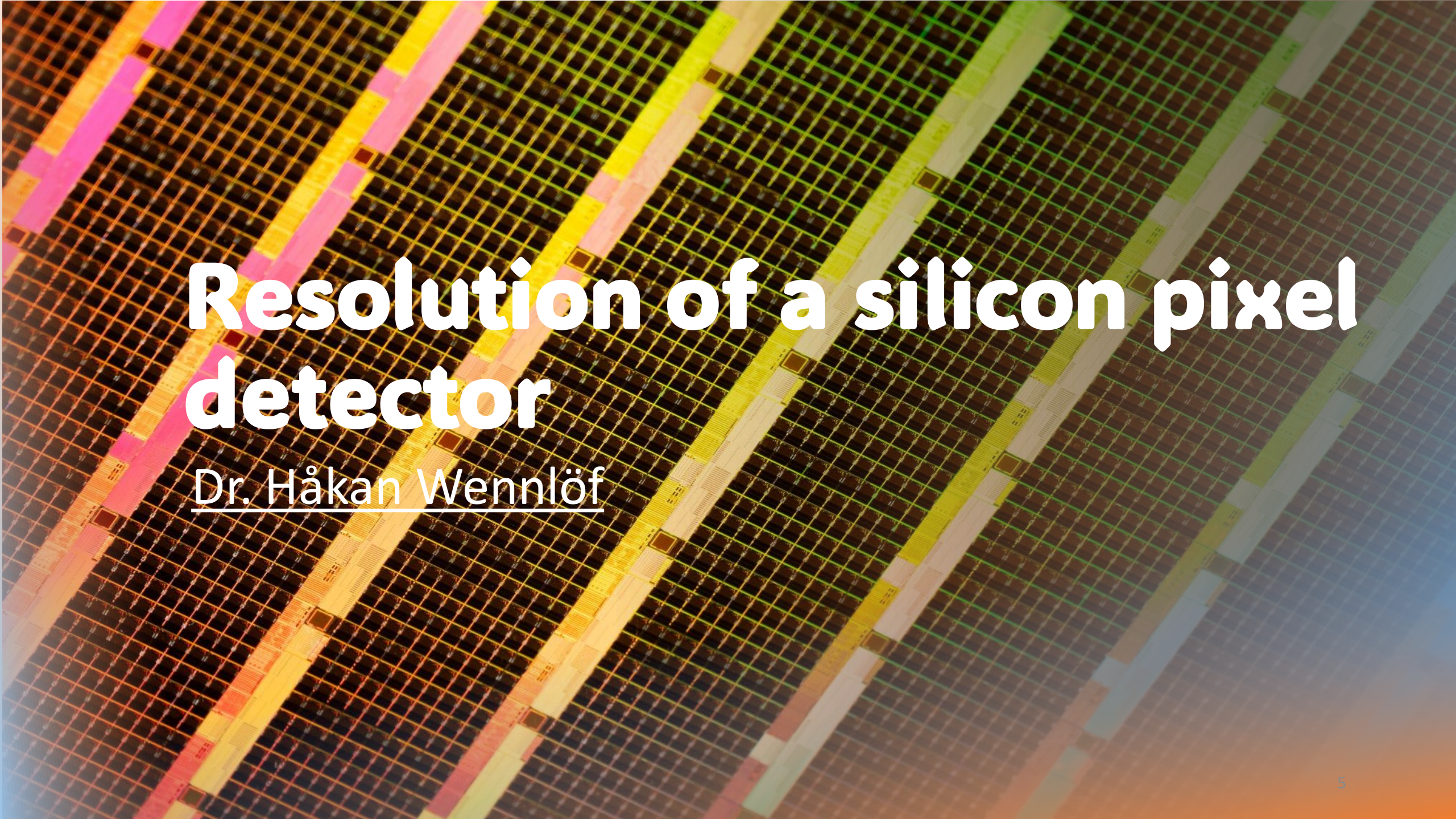
electrons and positrons

alpha particles

muons

particle decays

- You can witness the paths of electrically charged particles as they traverse the chamber
- The chamber is filled with alcohol vapour and, as a particle passes through, tiny droplets of alcohol form, showing up its track



Resolution of a silicon pixel detector

Dr. Håkan Wennlöf

Silicon Detectors

why silicon detectors in the first place??

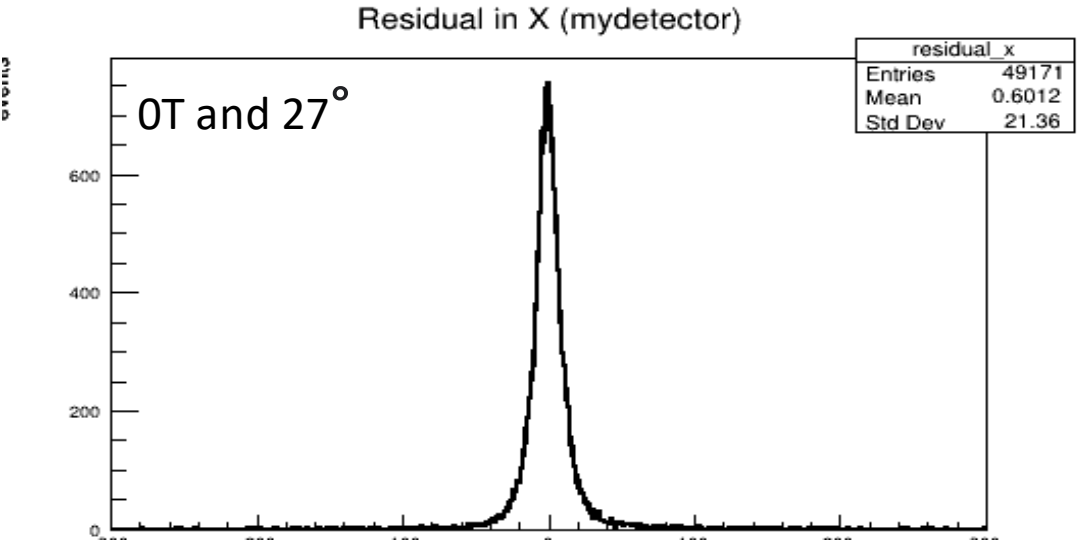
- The goal of this exercise was to optimise the resolution of a single silicon sensor by varying different parameters
- To observe charge carrier transport in a silicon detector
- The used framework is called Allpix squared

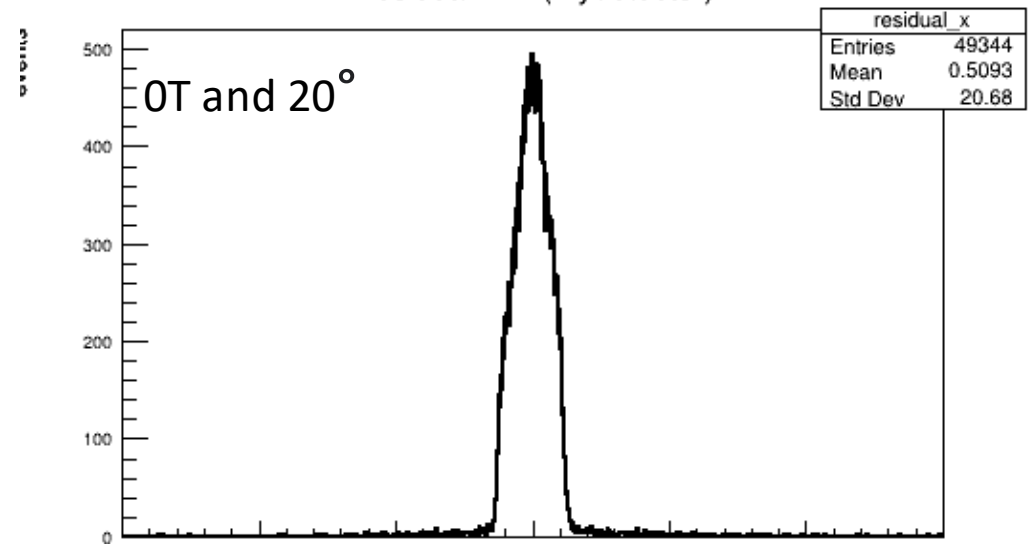
What parameters are we varying

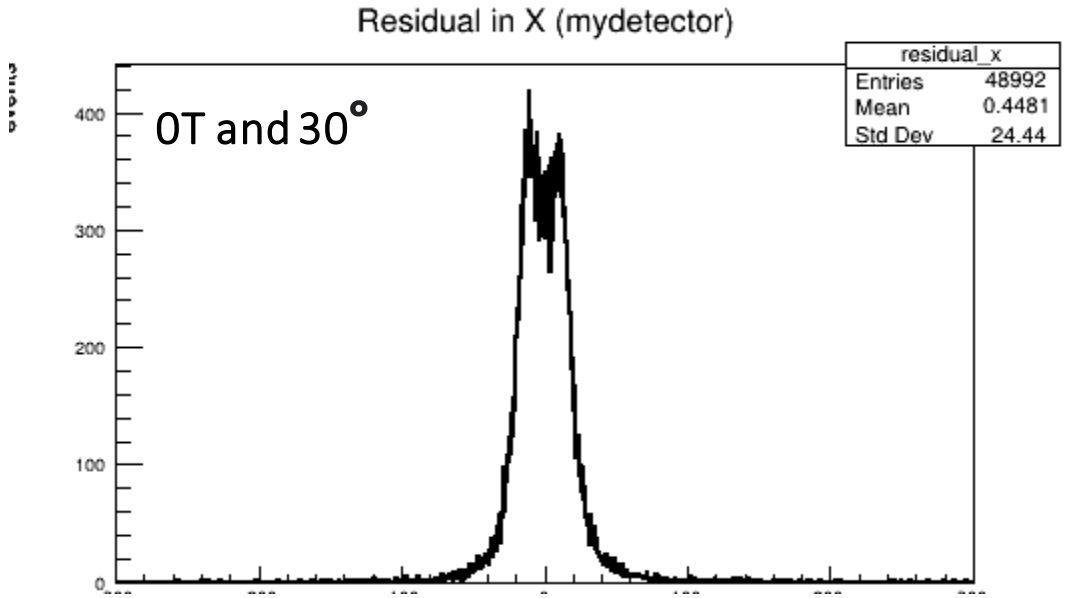
Rotation & Magnetic fields

We tested different magnetic fields at different rotation angles(20°, 27°, 30°)

Residuals in the x direction



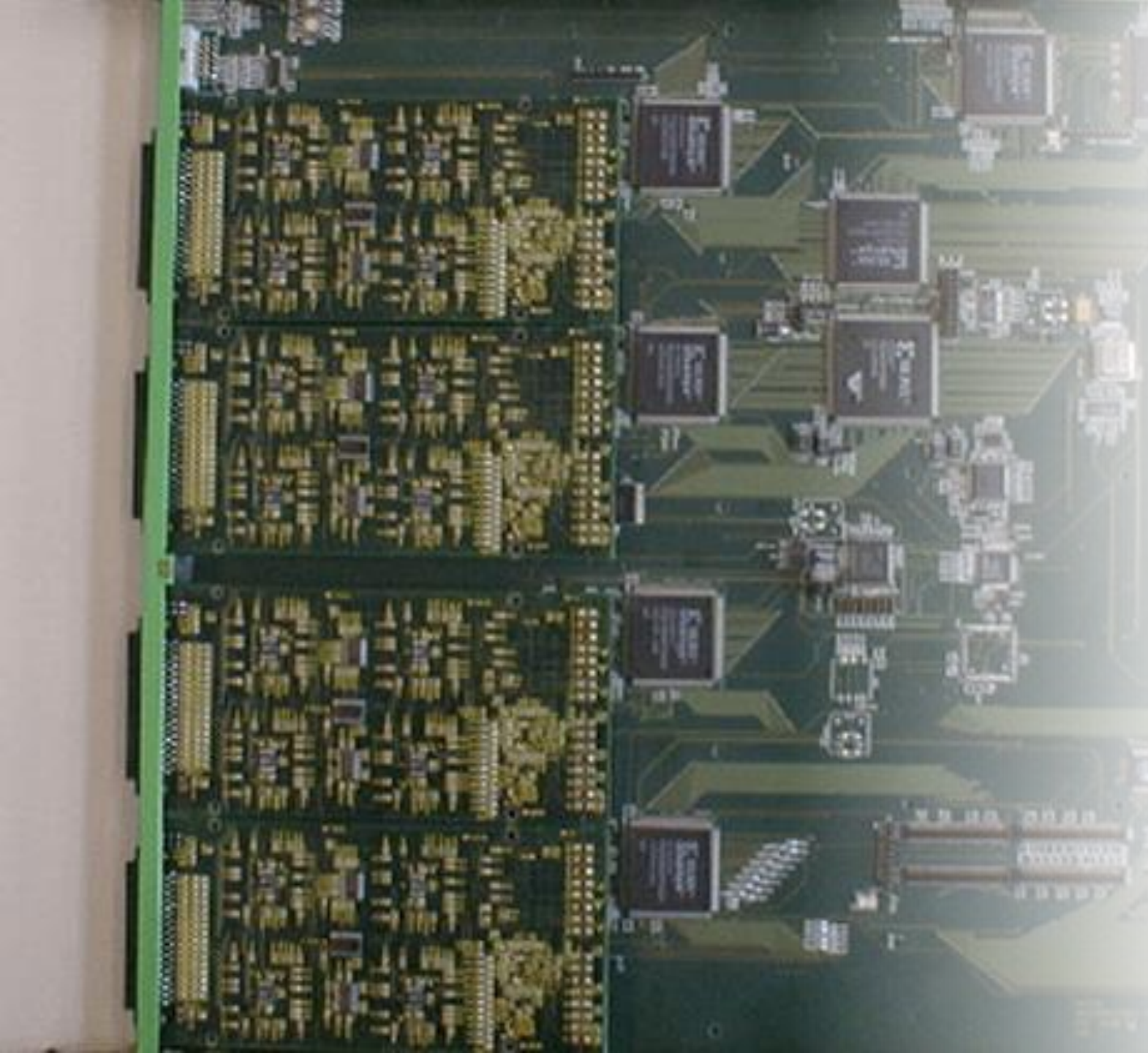




We Observed a better resolution at 0T and 27°

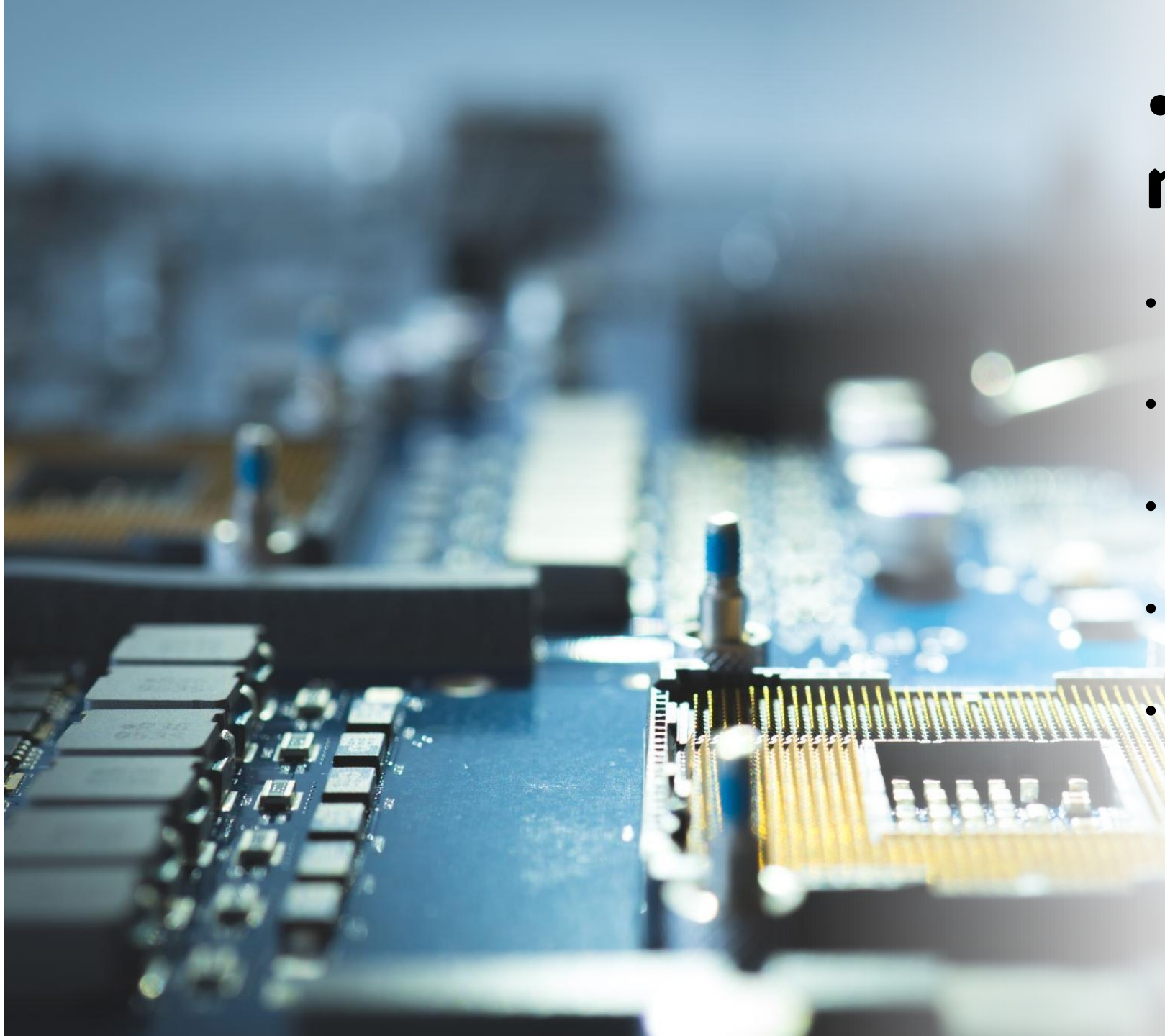
Data Acquisition

Prof. Markus Joos



VMEbus

- A data acquisition system is based on VMEbus and is used to measure the time of flight of the muon
- It uses the C language



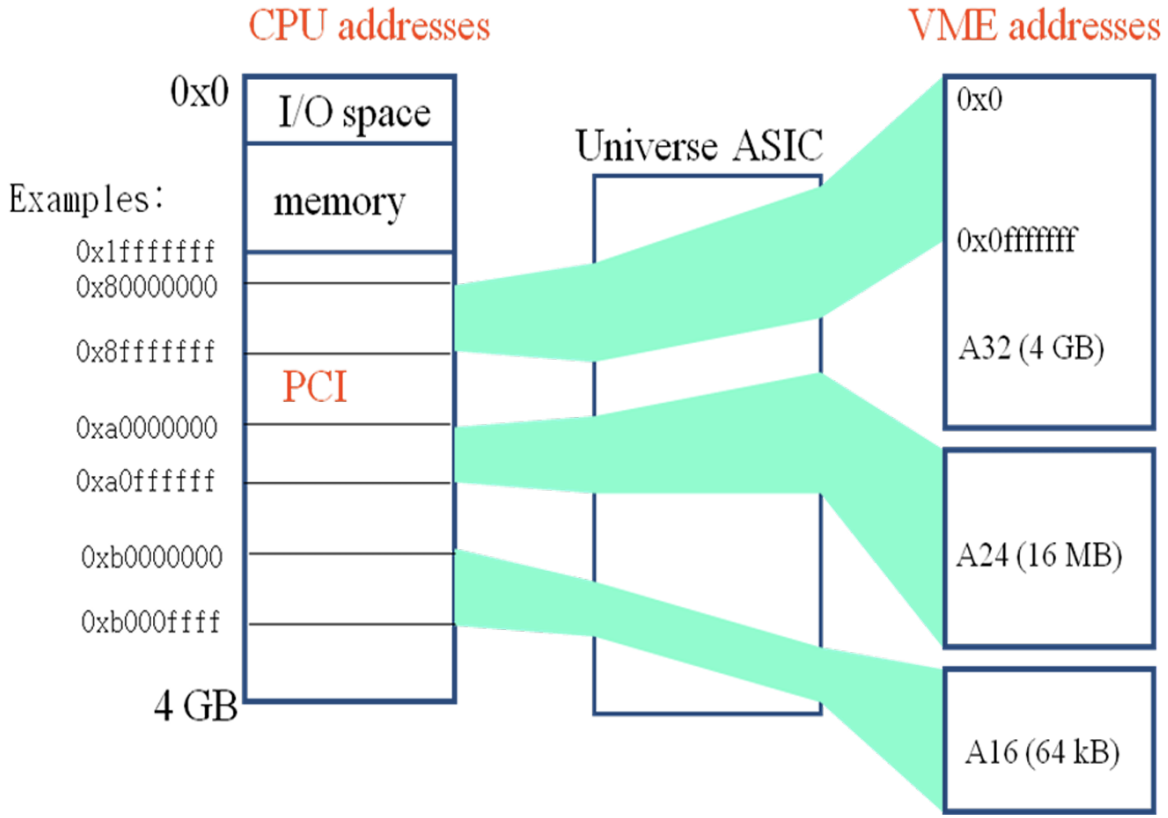
•Classes of modules

- Master :A module that can initiate data transfers
- Slave :A module that responds to a master
- Interrupter : A module that can send an interrupt
- Interrupt handler : A module that can receive and interrupts
- Arbiter :A piece of electronics that monitors the status of the bus. It should always be installed in slot 1 of the VMEbus crate if interrupts are used

VMEbus Programming

An important aspect is that the VMEbus memory has to be mapped into the (virtual) address space of a user process

Once this is completed, one can initiate data transfers which will be done in single cycle mode, meaning that the CPU controls the data transfer



Calorimetry Silicon Tungsten

Dr. Roman Poeschl

THE AIM?

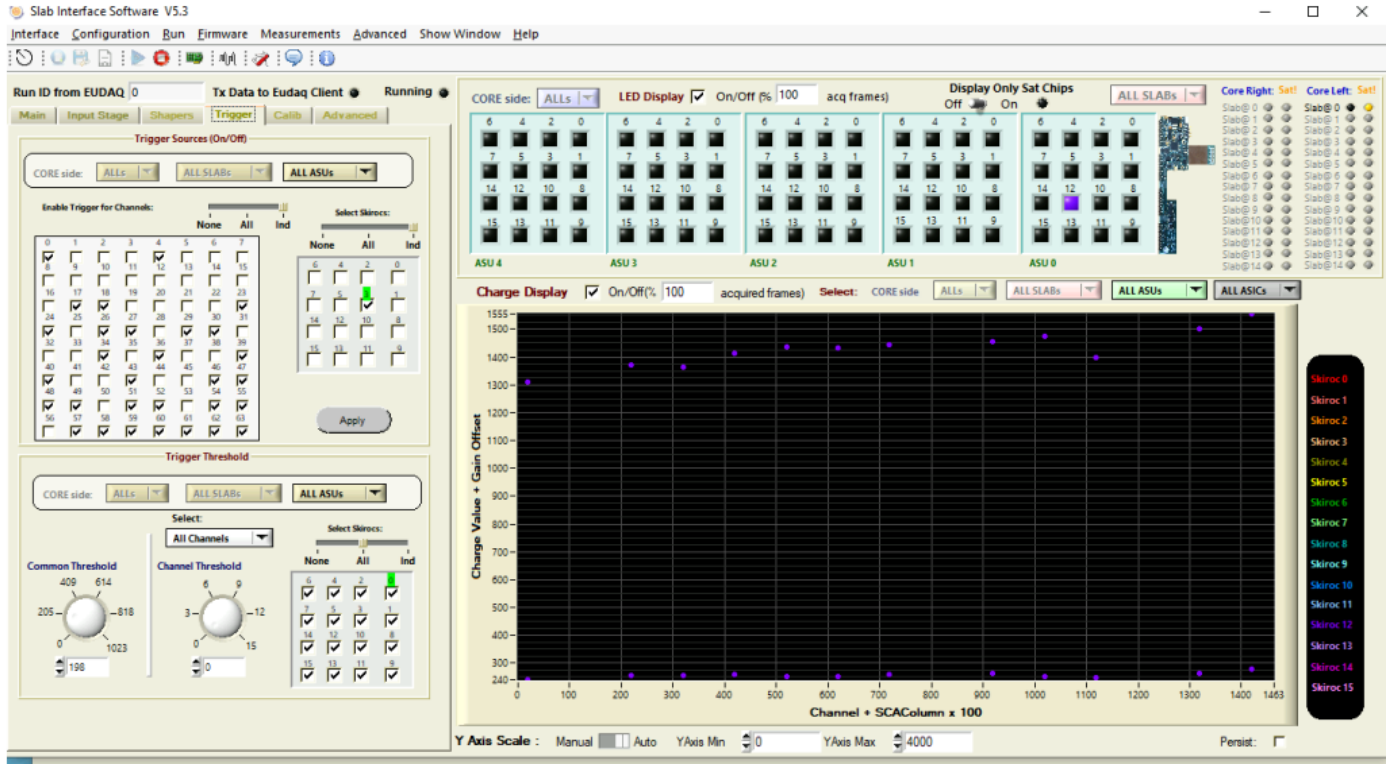
TO DISABLE NOISY CELLS

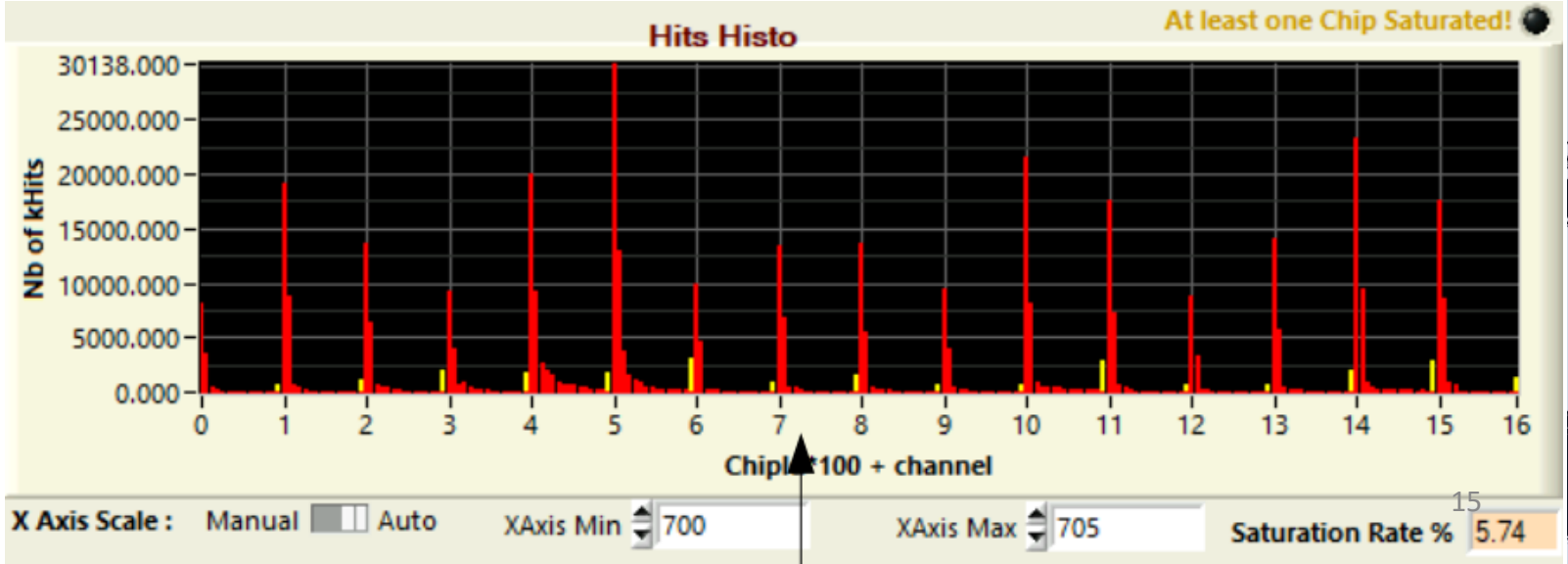
- **The apparatus**
- DAQ laptop
- LVPS
- HVPS
- Detector layer
- Cover
- Radiation source (Ra-226)

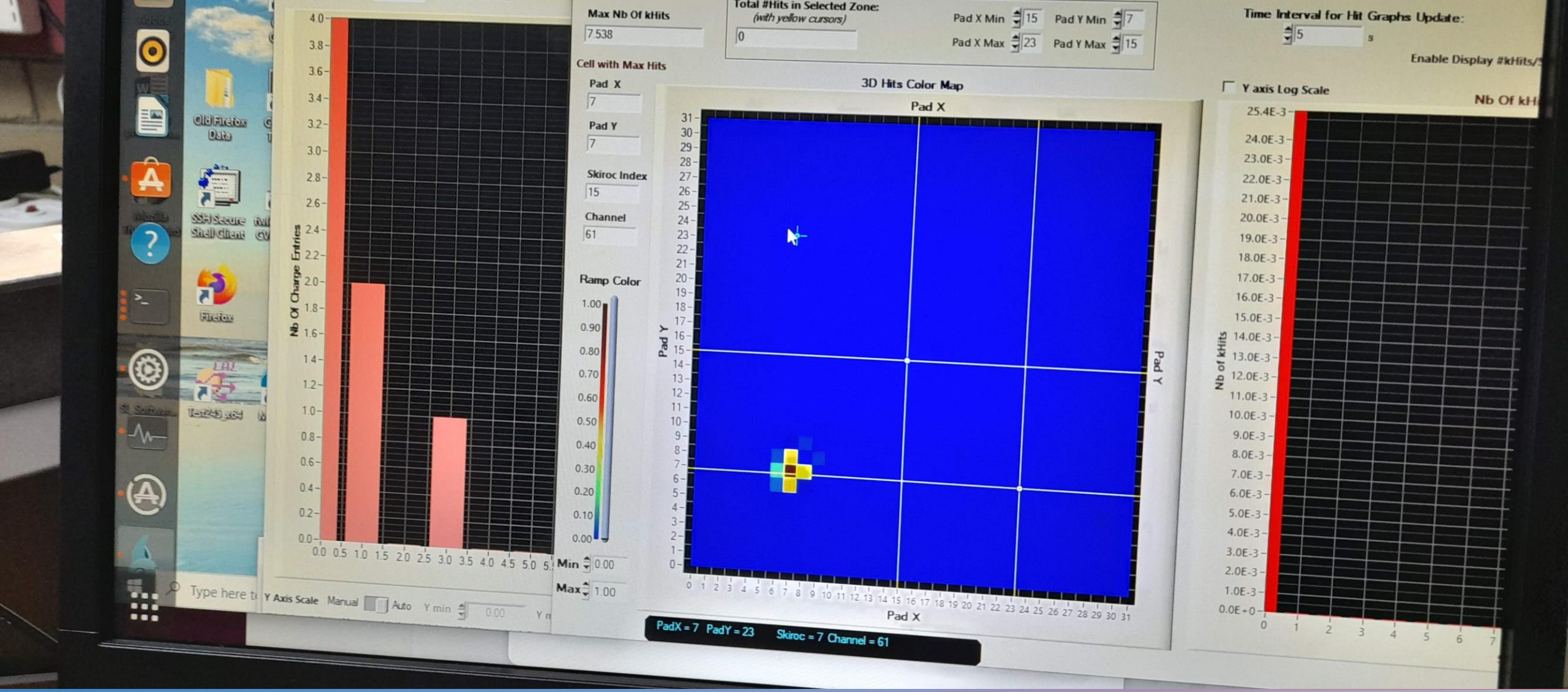
How do we disable noisy cells?

- trigger panel with 16 cells/skiroc (labelled 0 – 15)

- Each cell have 64 channels (labelled 0 – 63)



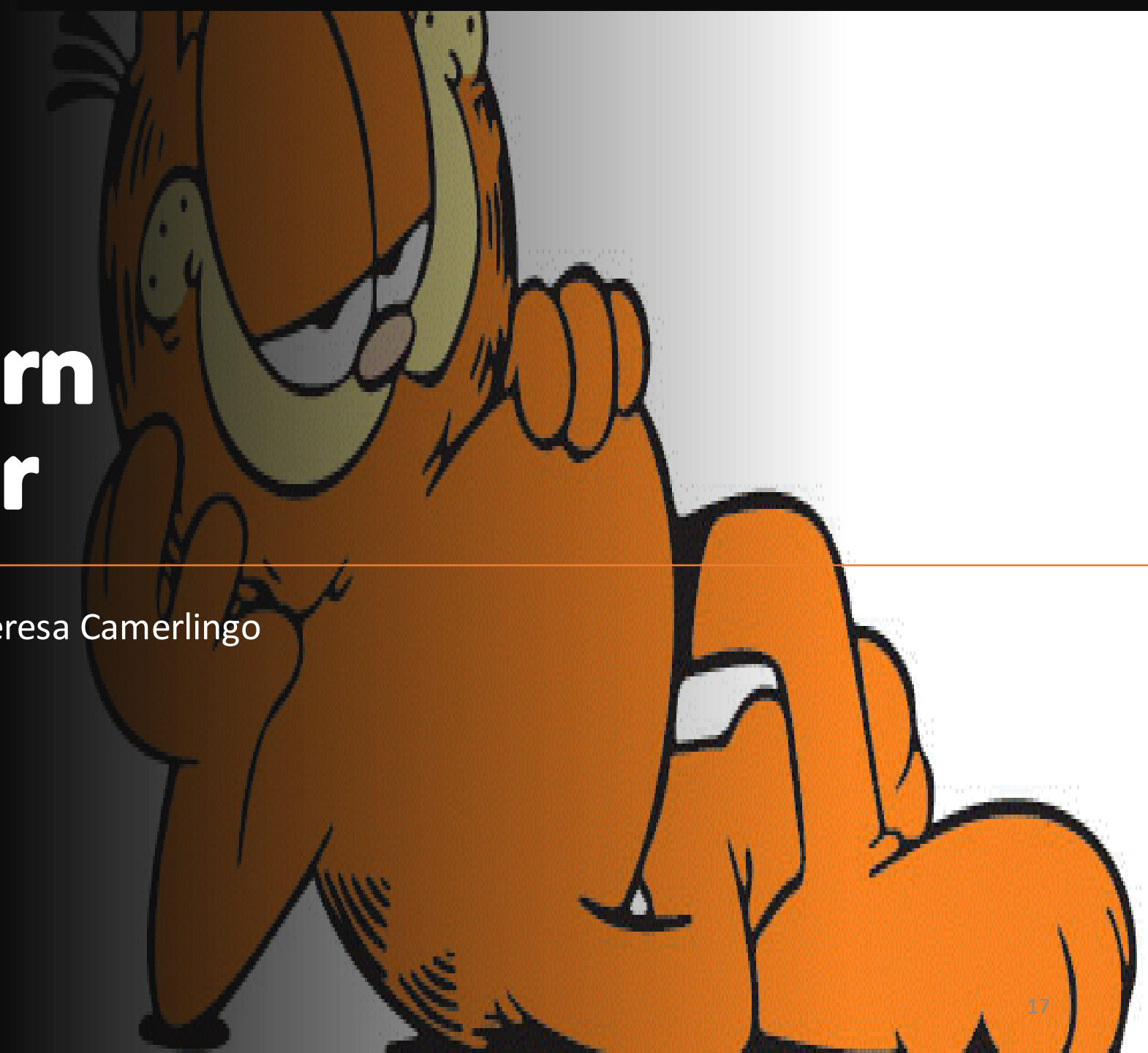




Effect of the Ra-226 radioactive source

Micro pattern gas detector

Dr. Djunes Janssens & Dr. Maria Teresa Camerlingo



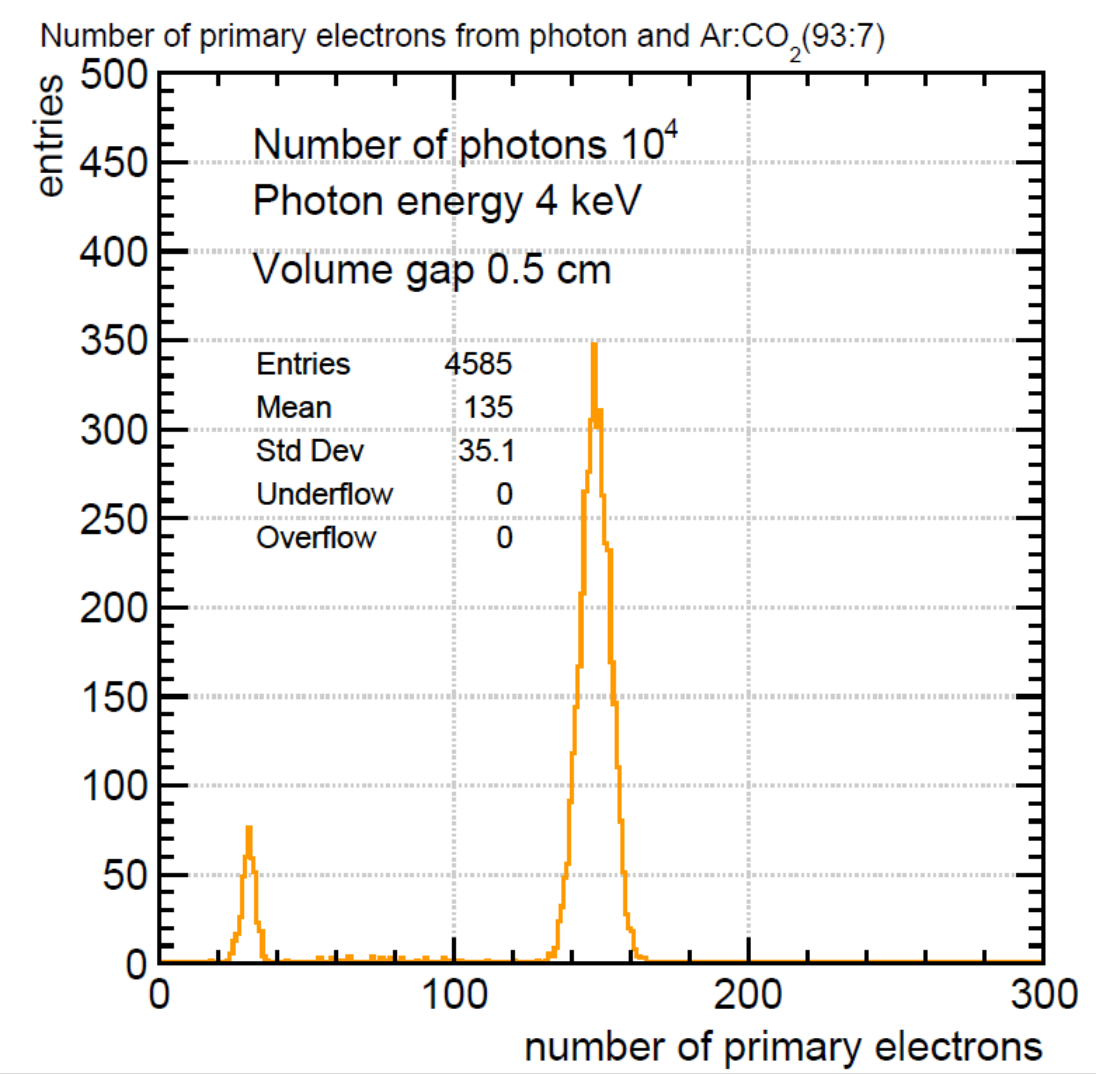
Aim

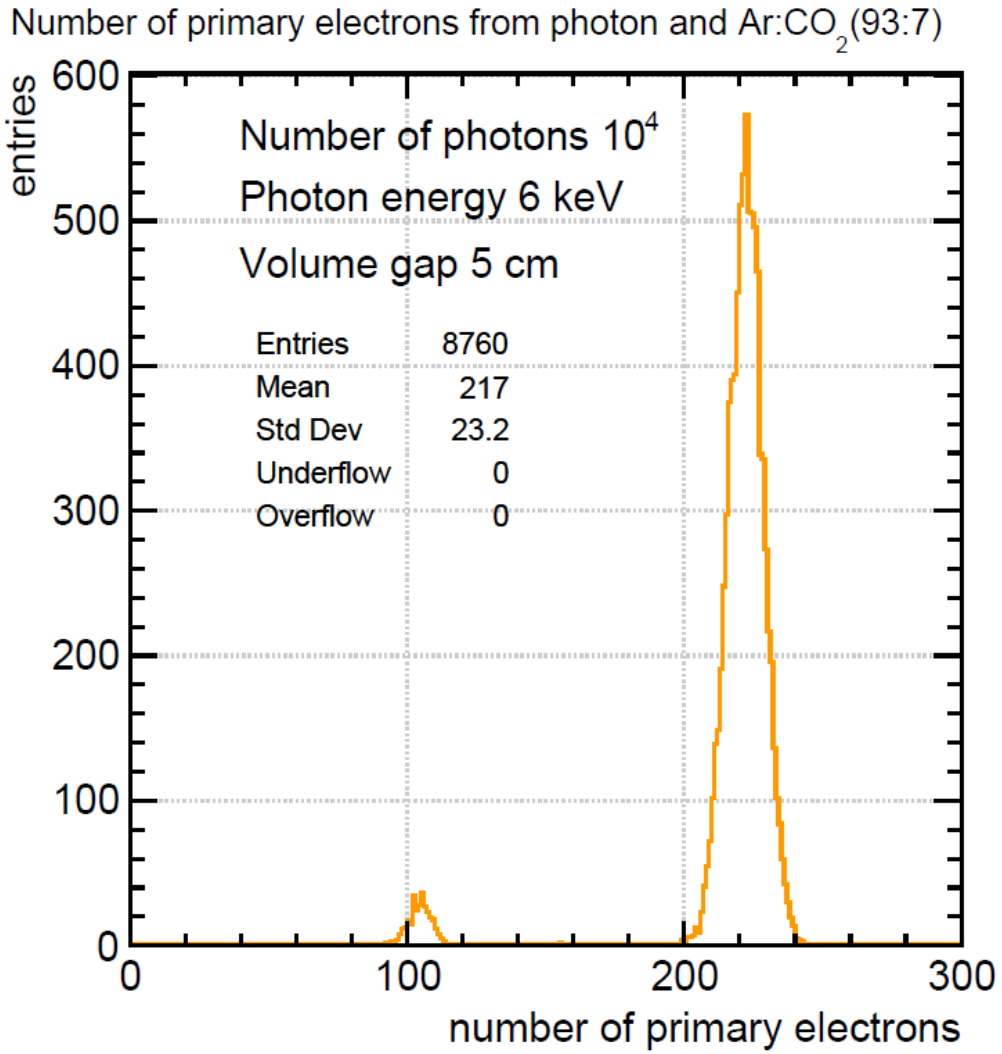
We use Garfield ++ with C++ language

Simulating the primaries in $ArCO_2$ with 93% Ar and 7% CO_2

Electron diffusion and drift velocity with applied electric field

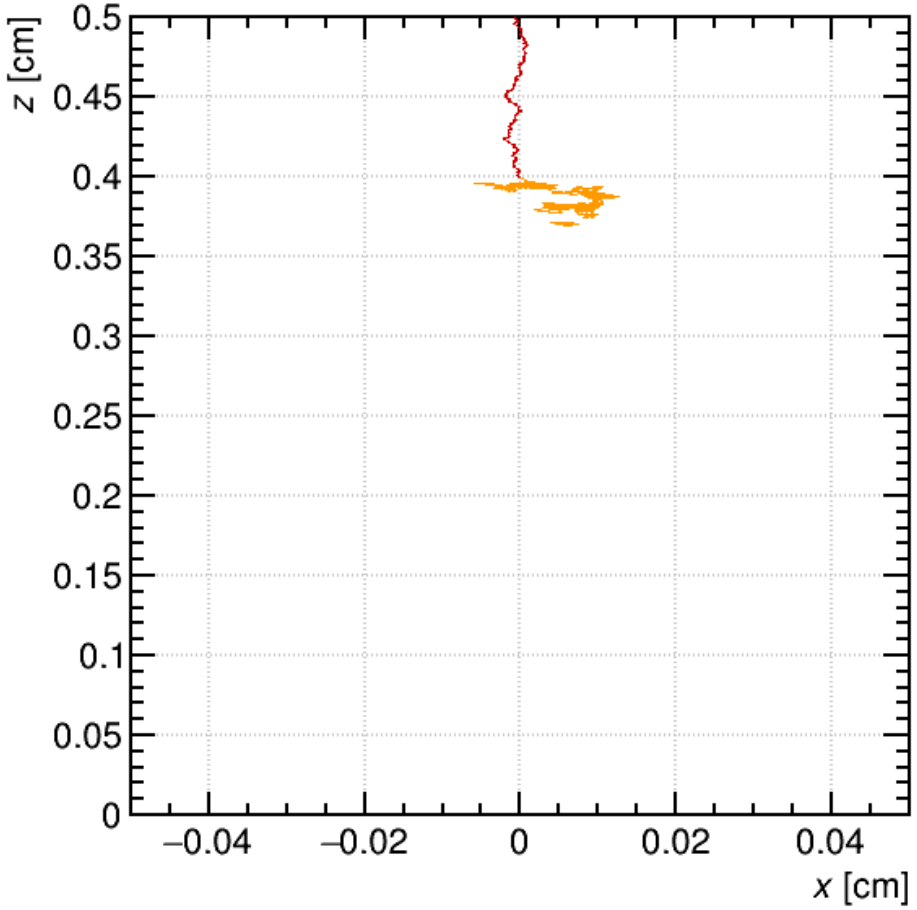
Reconstructing the track position of a charged particle in a Micromegas detector





The effect of photon energy & volume gap

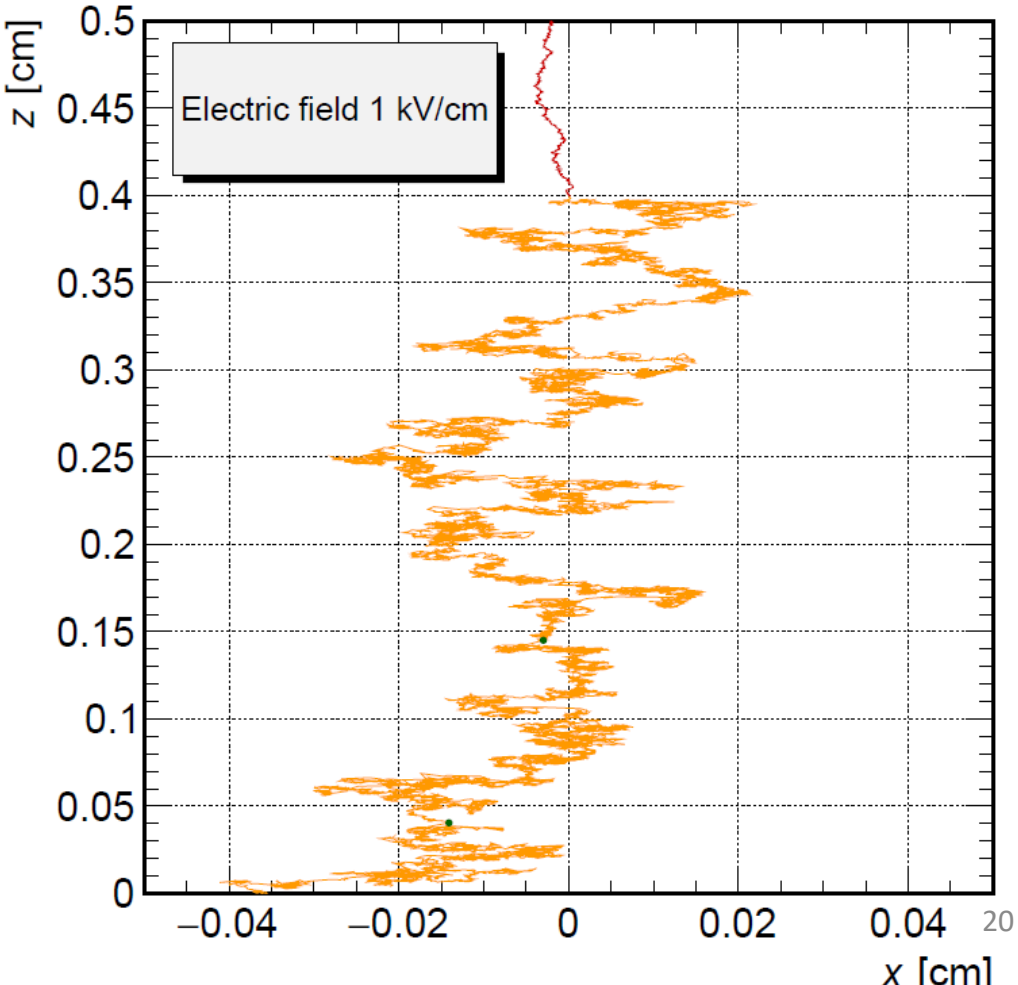
Motion of the electrons in an electric field



Observing any deviation?

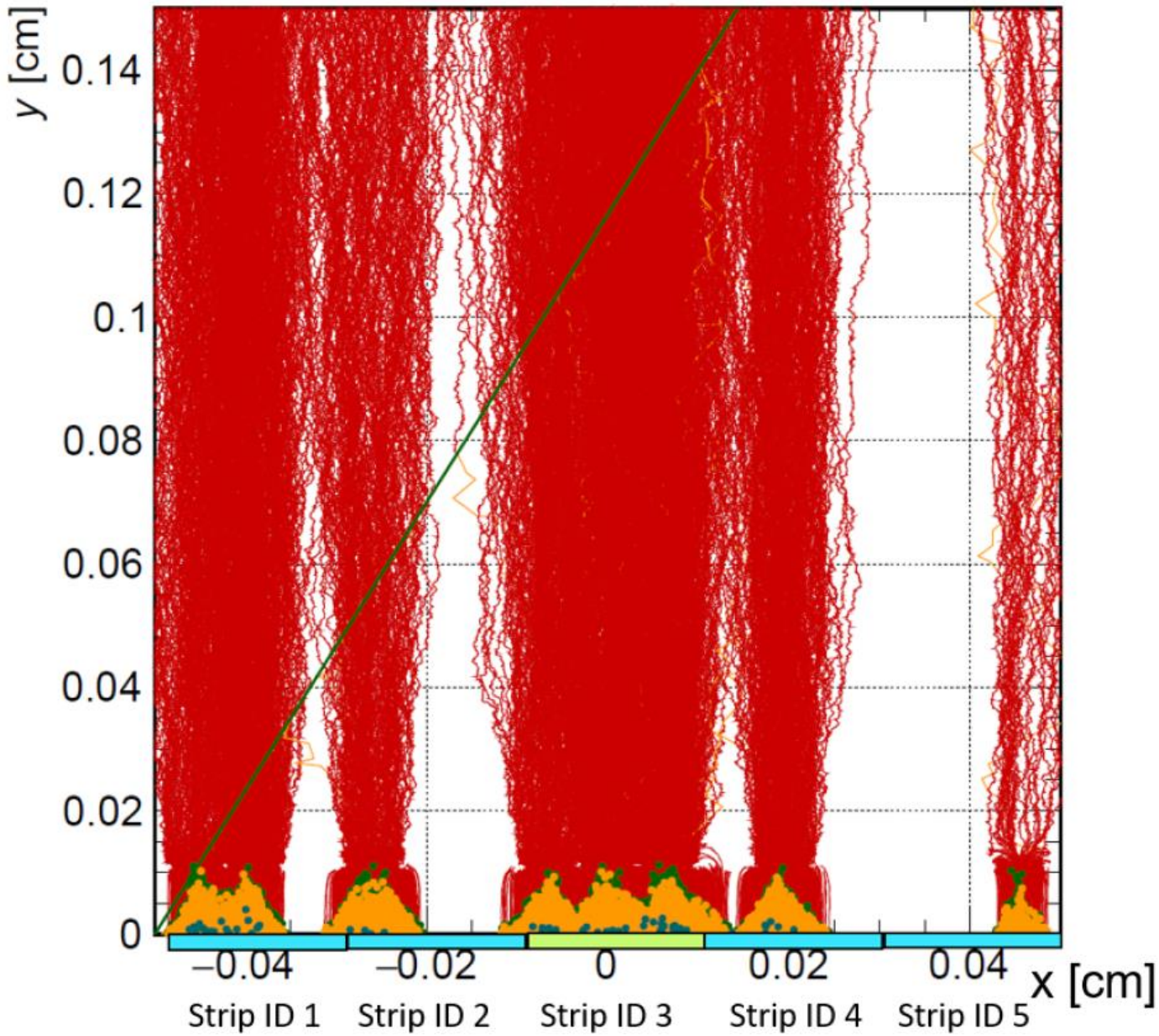
We have collisions !

Electron and Ion motion in Pure Ar



Micromegas detector

- We have a passing muon
- Strips on the left and right
- We observe an avalanche of electrons



We learnt a lot!

- Different detectors

- **Importance of Radiation and safety**
- **Simulation software and different computational languages**
- **And we had fun!**

Thank you

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