# GaAs analysis and Geant4 simulation studies

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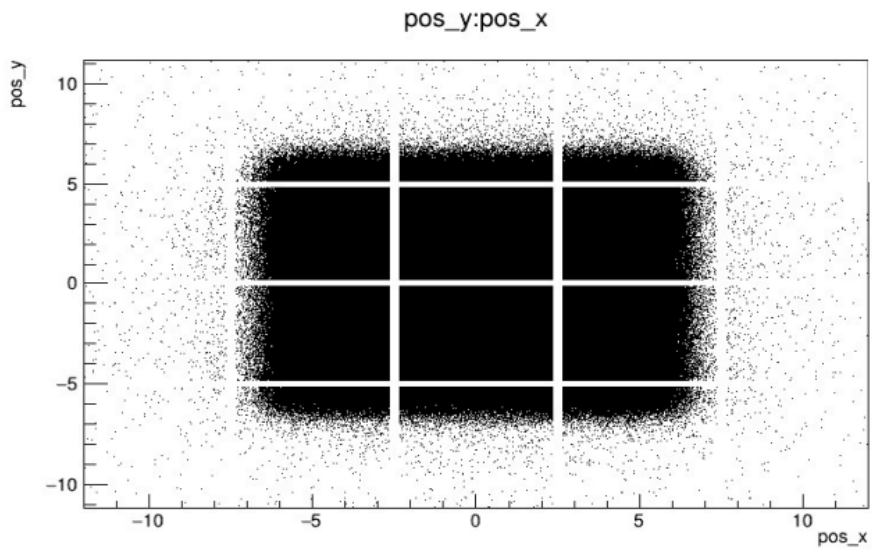
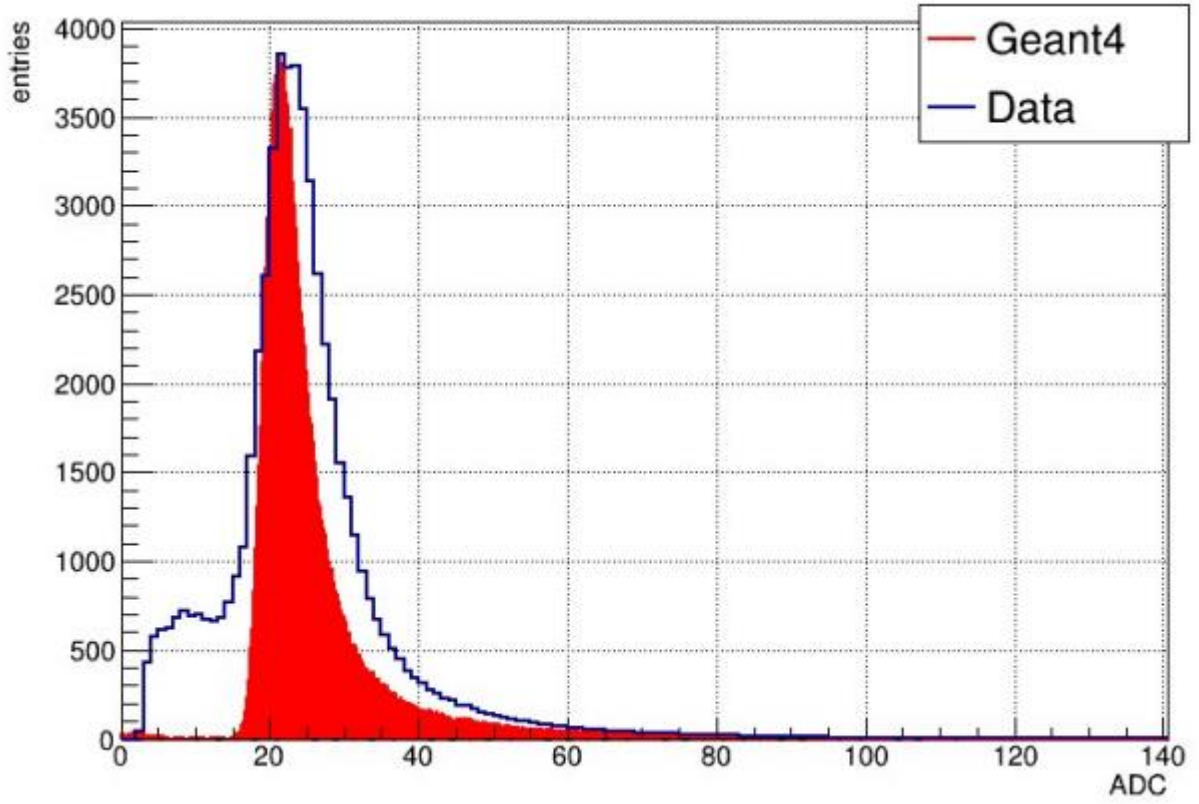
27/11/2024

# Previous Simulation Results – Anton 1

- $5\mathrm{GeV},\ e^-$
- Square source $12\mathrm{mm} \times 12\mathrm{mm}$
- $1\mathrm{M}$ events
- Traces not yet simulated

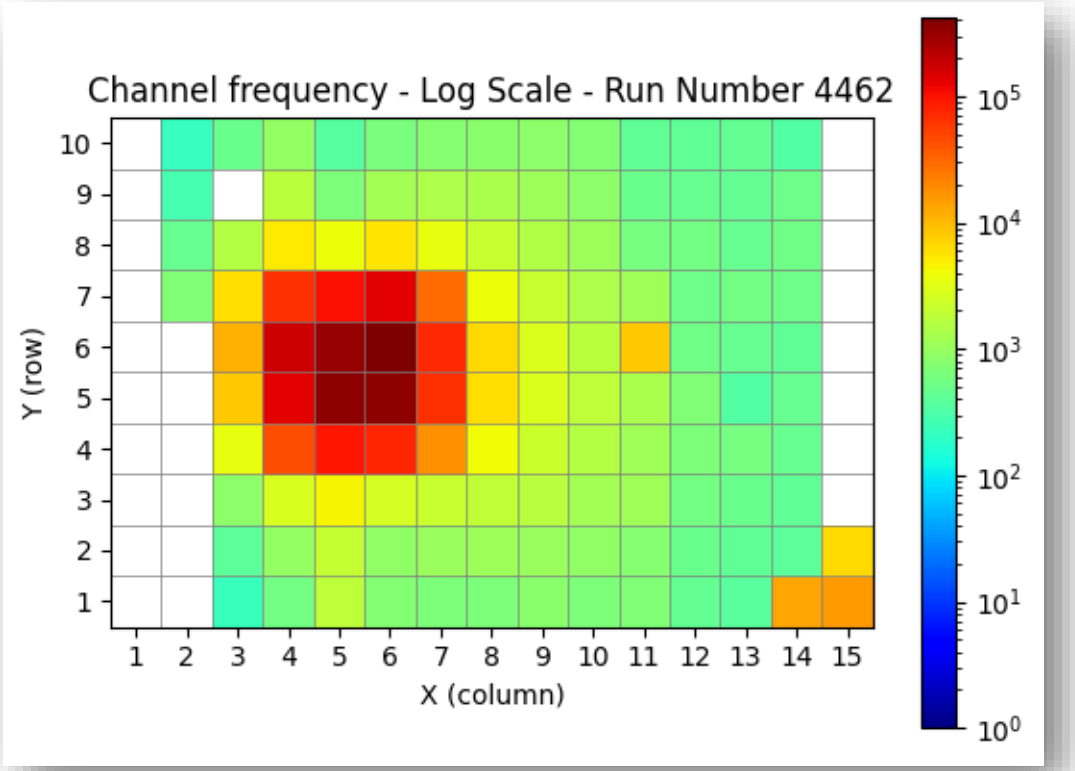


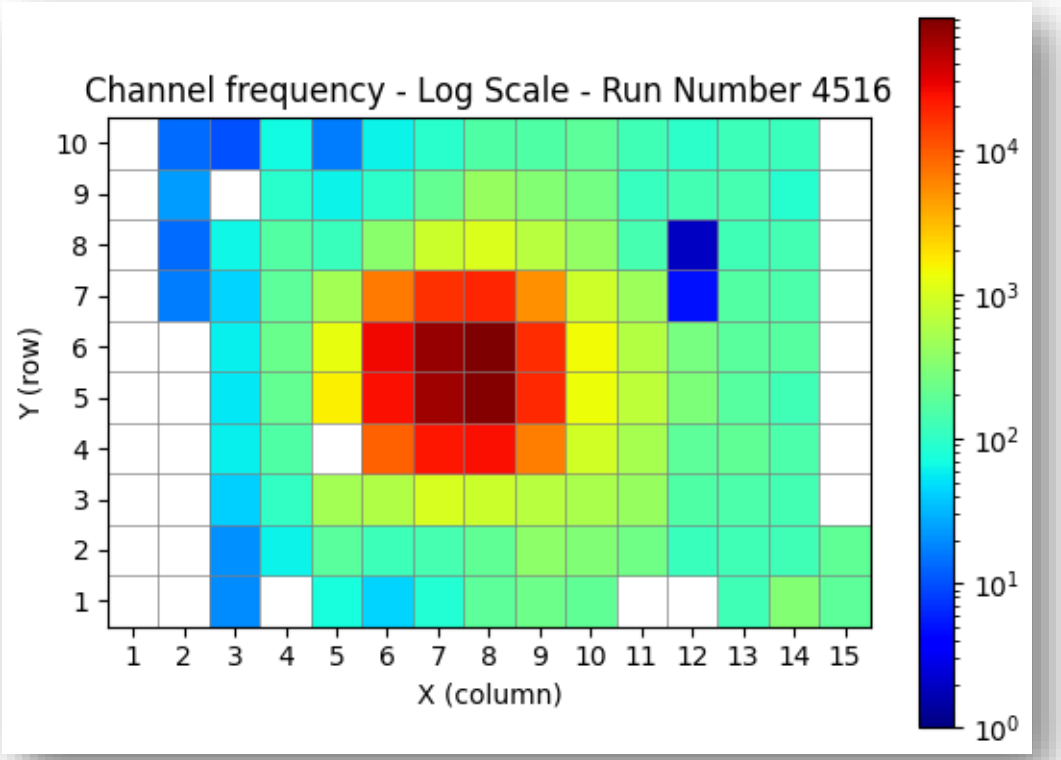
# Experimental Data – Anton 1 vs Yan 1

Yan 1 seems to have more problematic channels

## Anton 1



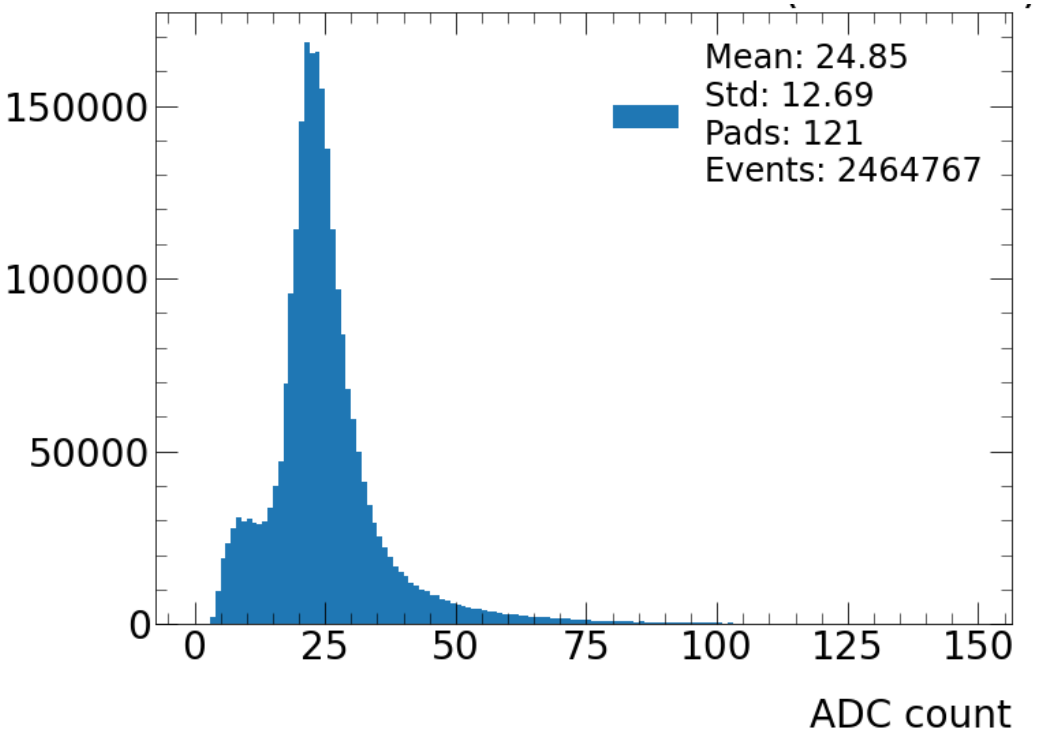

## Yan 1



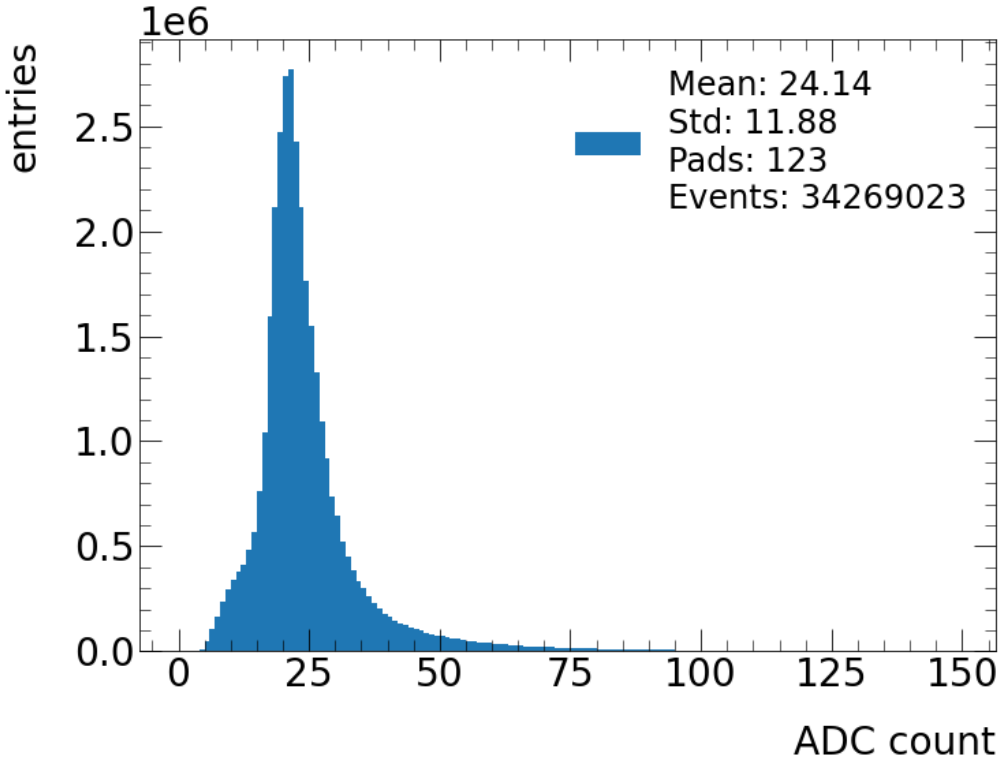
# Experimental Data – Anton 1 vs Yan 1

Anton 1 has a larger “bump” in lower depositions

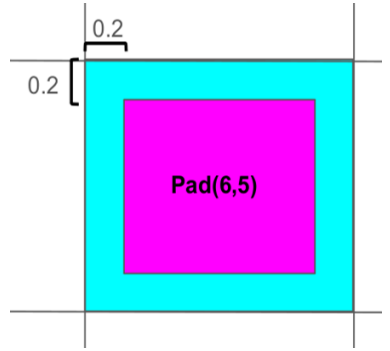
**Anton 1**




**Yan 1**

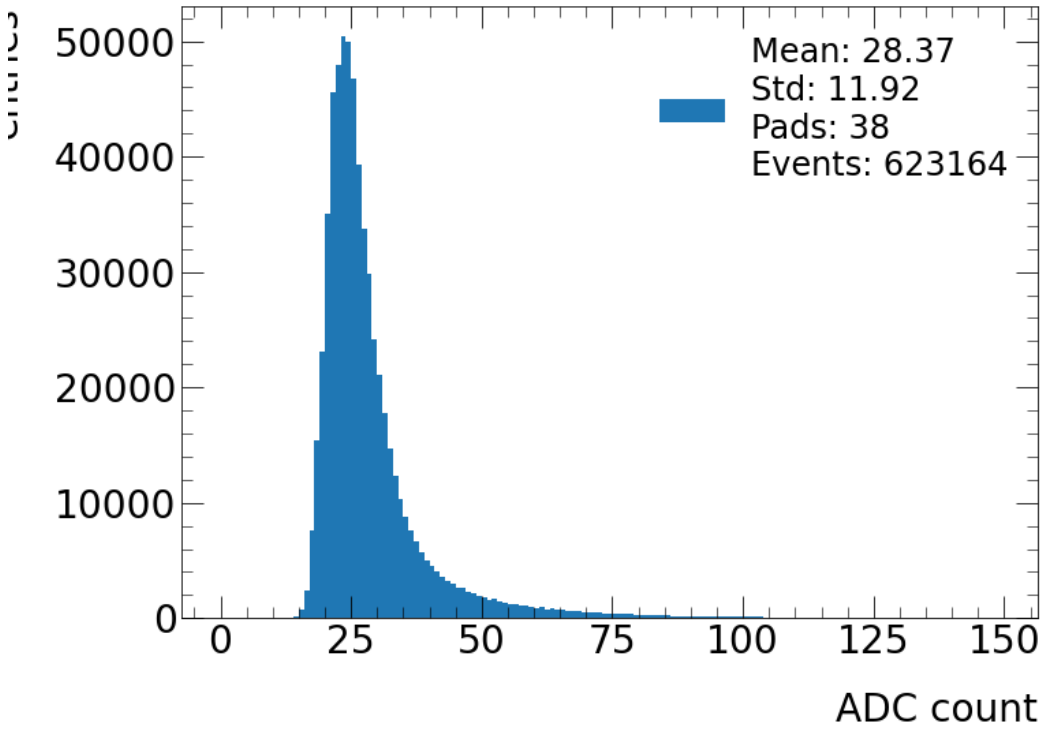


# Experimental Data – Anton 1 vs Yan 1

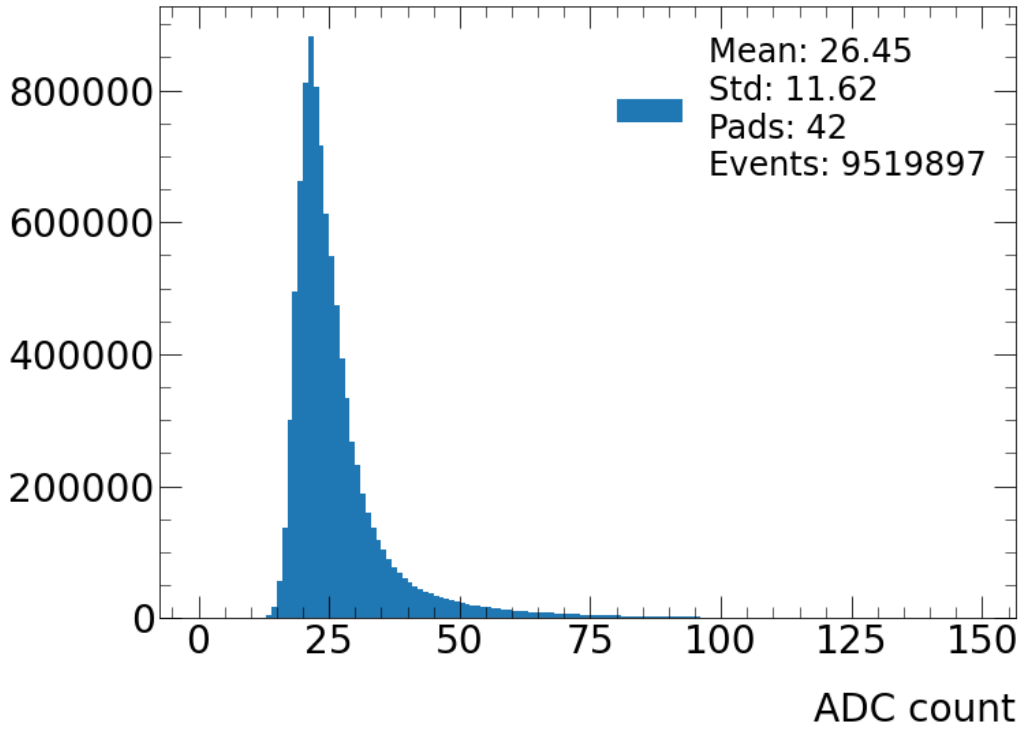



Taking only center of pad hits (20% margin) removes “bump”

**Anton 1**

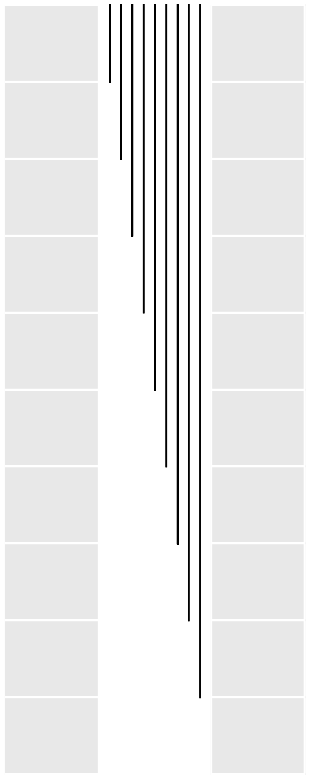



**Yan 1**

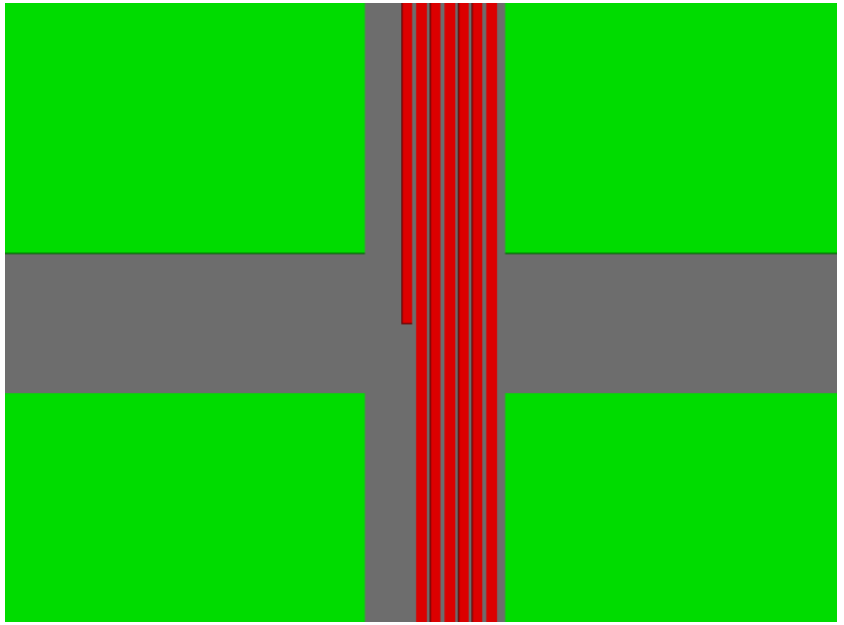


# Current Simulation Results [WIP]

- $5\mathrm{GeV},\ e^-$
- Square source $12\mathrm{mm} \times 12\mathrm{mm}$
- $1\mathrm{M}$ events
- Traces implemented:
  - Implemented as narrow Al sensitive pads
  - 9 straight traces of varying lengths between each 2 columns (total of $9\mathrm{x}14$)
  - Top area not simulated (above upper most row), as well as diagonal connection to corner of pad
  - Each trace begins in the middle of the vertical gap

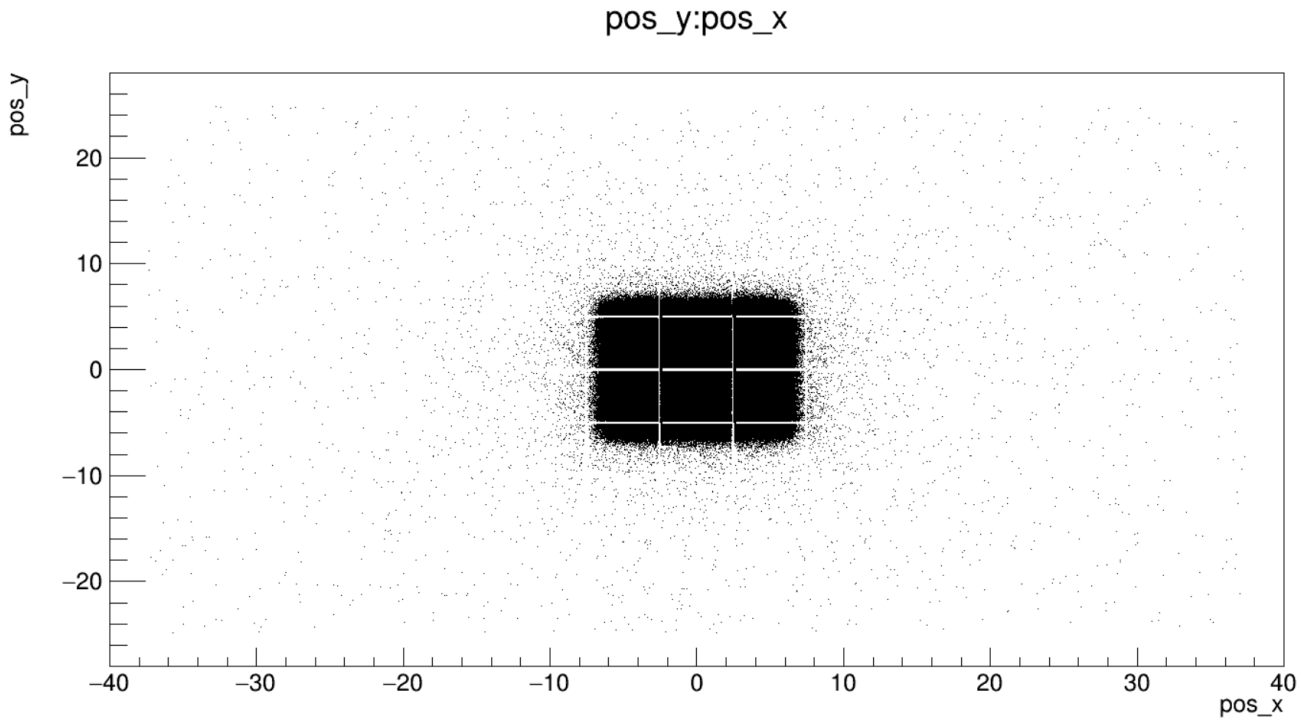


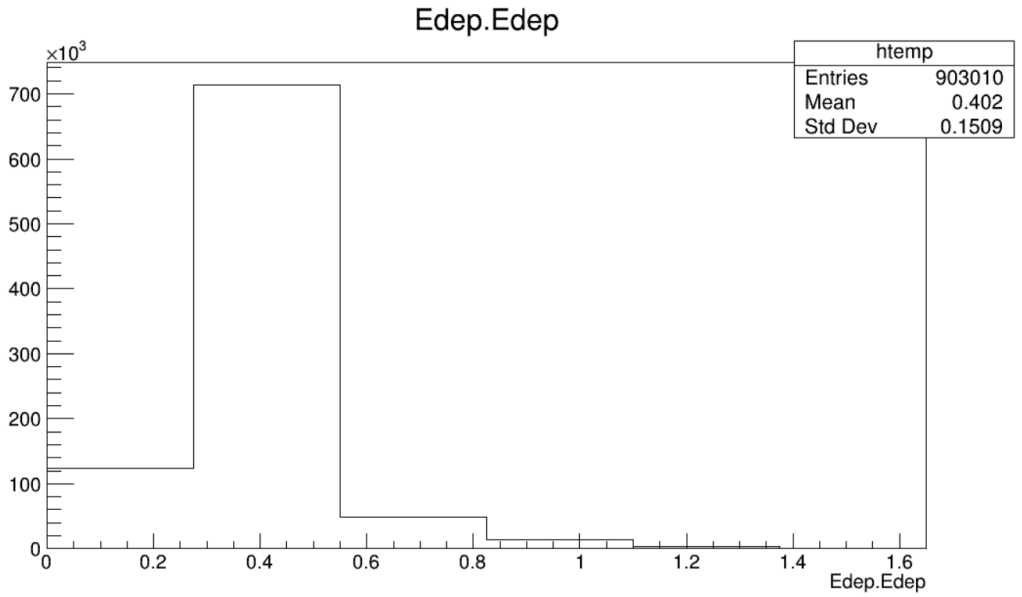
Traces implementation sketch (not to scale)



Traces implementation
Geant4 Visualization
Green: pads
Red: traces

# Current Simulation Results [WIP]




Prelim TBrowser hist
Very bad binning but shows first hints of events with lower depositions

# Ongoing tasks and conclusion

- Compare **center-of-pad** results between simulation and experimental data
- Compare between simulation **with traces** and **full data** (centered beam)
- Possible approach – **simulate digitization** in Geant4

Questions:

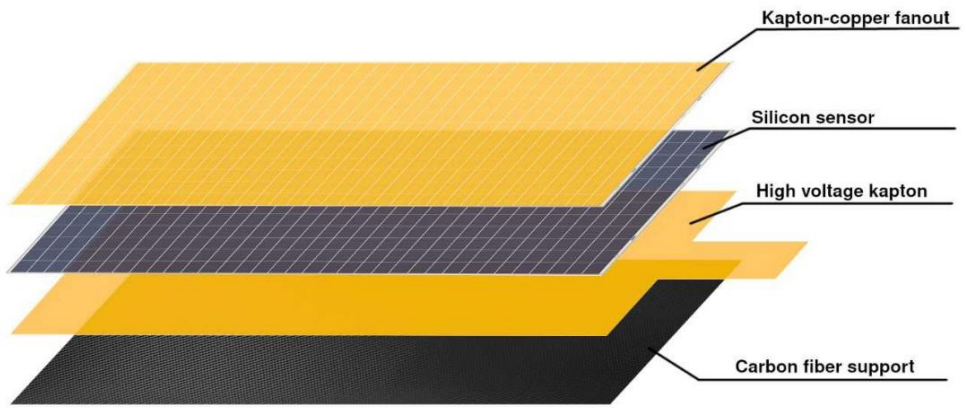
- Verify – GaAs layer is a wafer.
- Work done on Yan 1? (differences between Anton 1 and Yan 1)
- TB22 – GaAs backside facing beam

# Backup

# Sensors under investigation @ TB

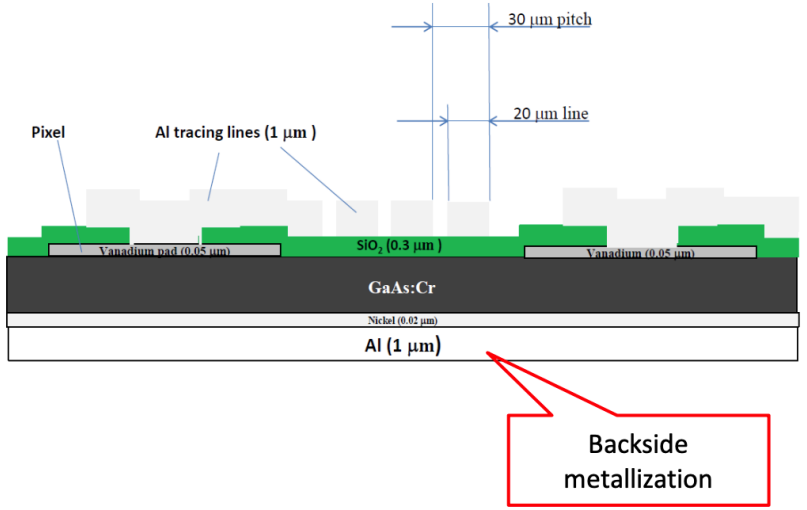
## Silicon

- Produced by Hamamatsu (**CALICE** design)
- 500 µm thickness
- $5.5 \times 5.5\ \mathrm{mm}^2$ pads, 10 µm gap
- External **Kapton fan-outs** with copper traces connected to the sensor pads with **conductive glue** (EPO-TEK E4110)




## Gallium Arsenide

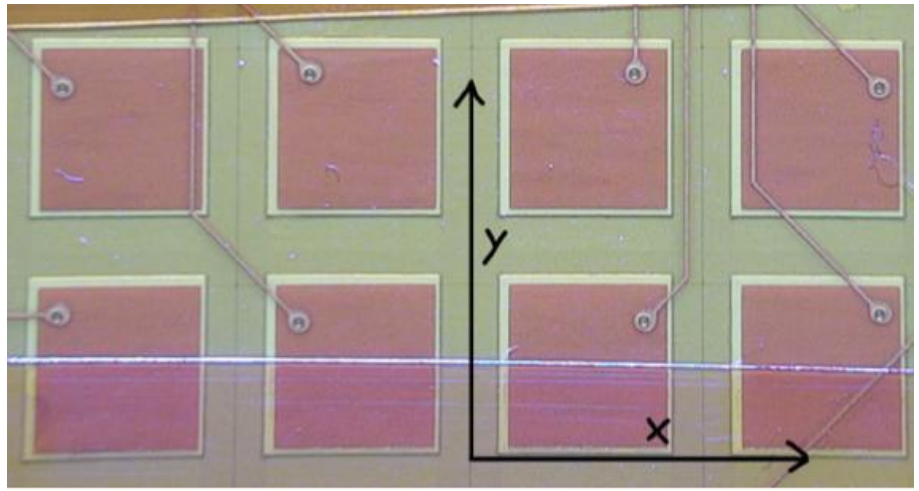
- Produced by National Research **Tomsk** State University
- 500 µm thickness
- $4.7 \times 4.7\ \mathrm{mm}^2$ pads, 300 µm gap
- 10 µm Aluminum traces in the gaps, 20 µm apart from each other



# Sensors under investigation @ TB

## Silicon

- 16 × 8 pads




## Gallium Arsenide

- 15 × 10 pads