

# Construction and Testing of Multiwire Drift Chamber for SHMS in HALL C

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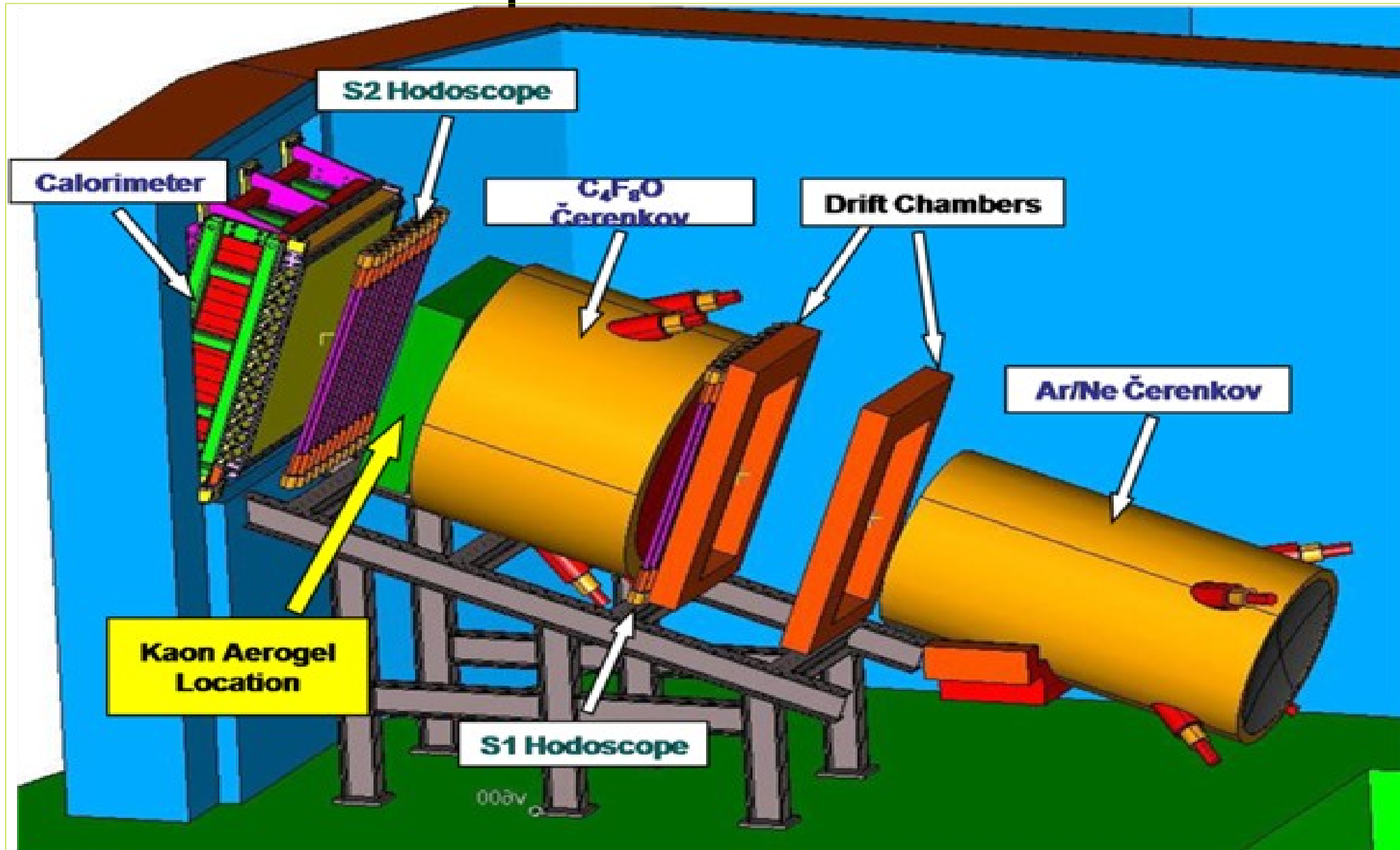
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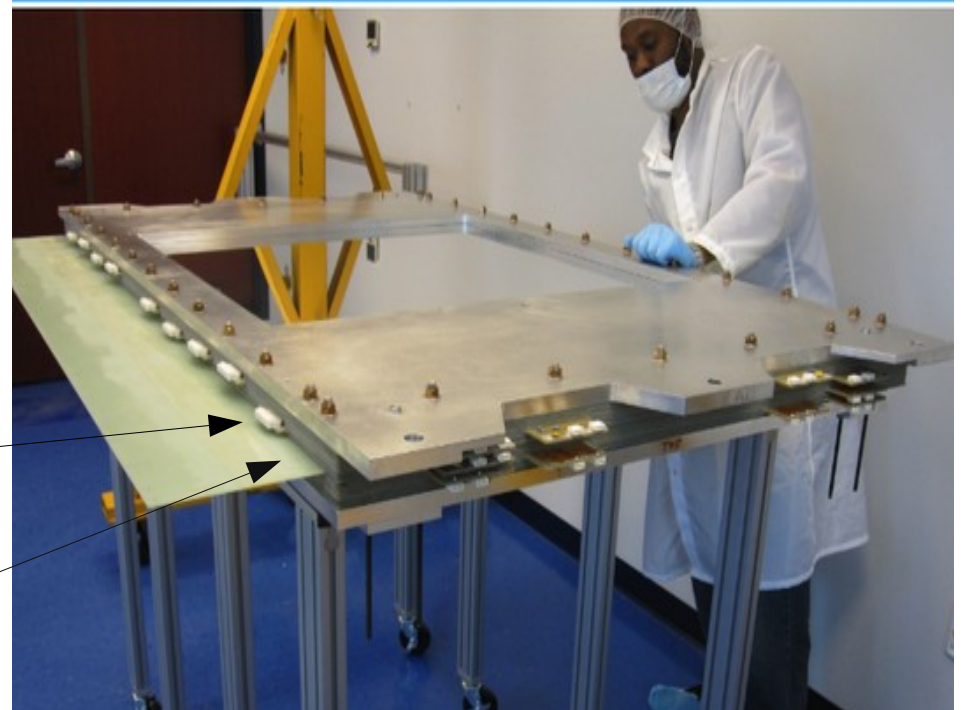
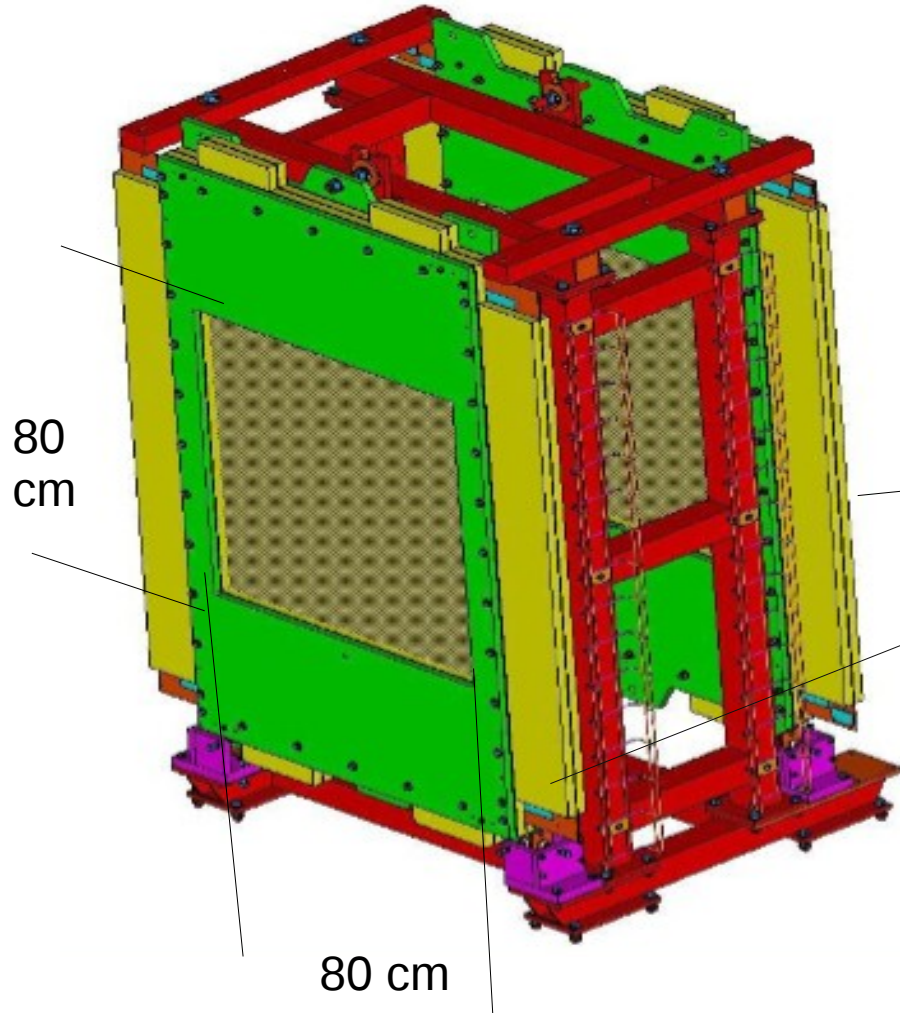
# outline

- SHMS of HALL C
- Construction of single wire plane
- Electric field inside the chamber
- Basic working principle of drift chamber
- Left right ambiguity
- Drift Velocity vs drift field
- Drift Chamber Gases
- Response of the chamber with cosmic ray and with external sources
- Method of drift chamber efficiency testing
- acknowledgements

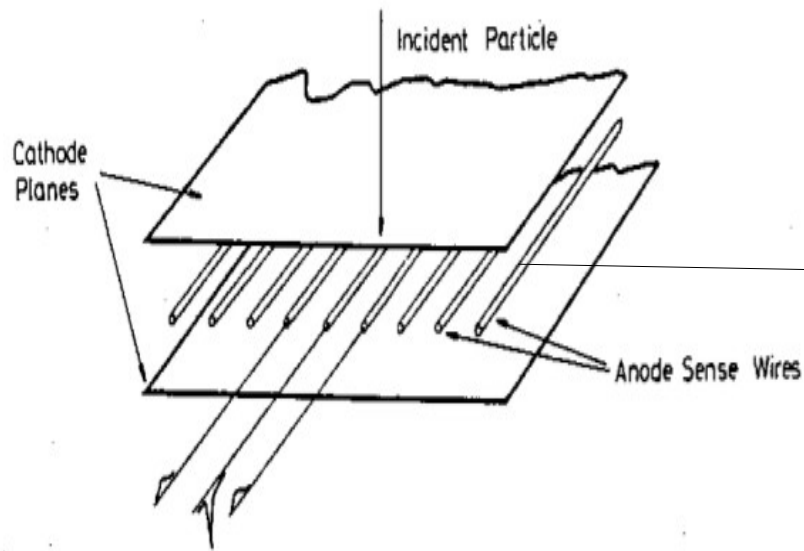
# Super High Momentum Spectrometer



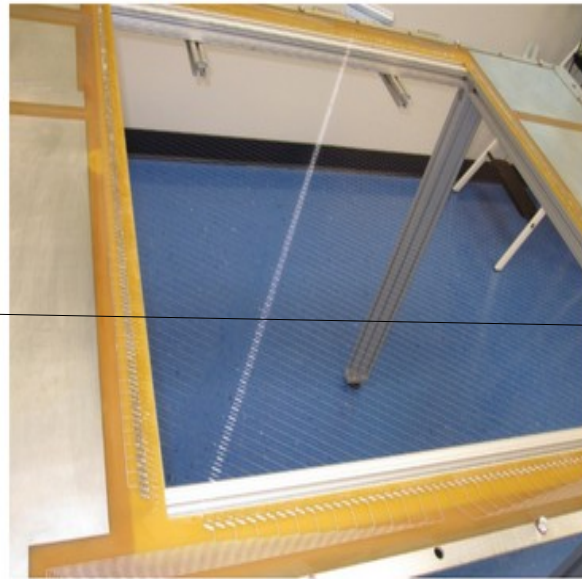
# 3 Dimensional diagram of drift chamber block of SHMS



# Basic construction of single wire plane

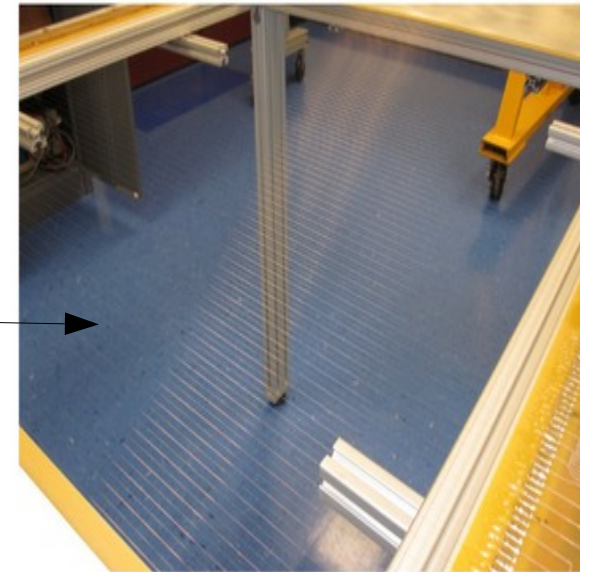


U-Plane:



- ~220 wires
- Angled

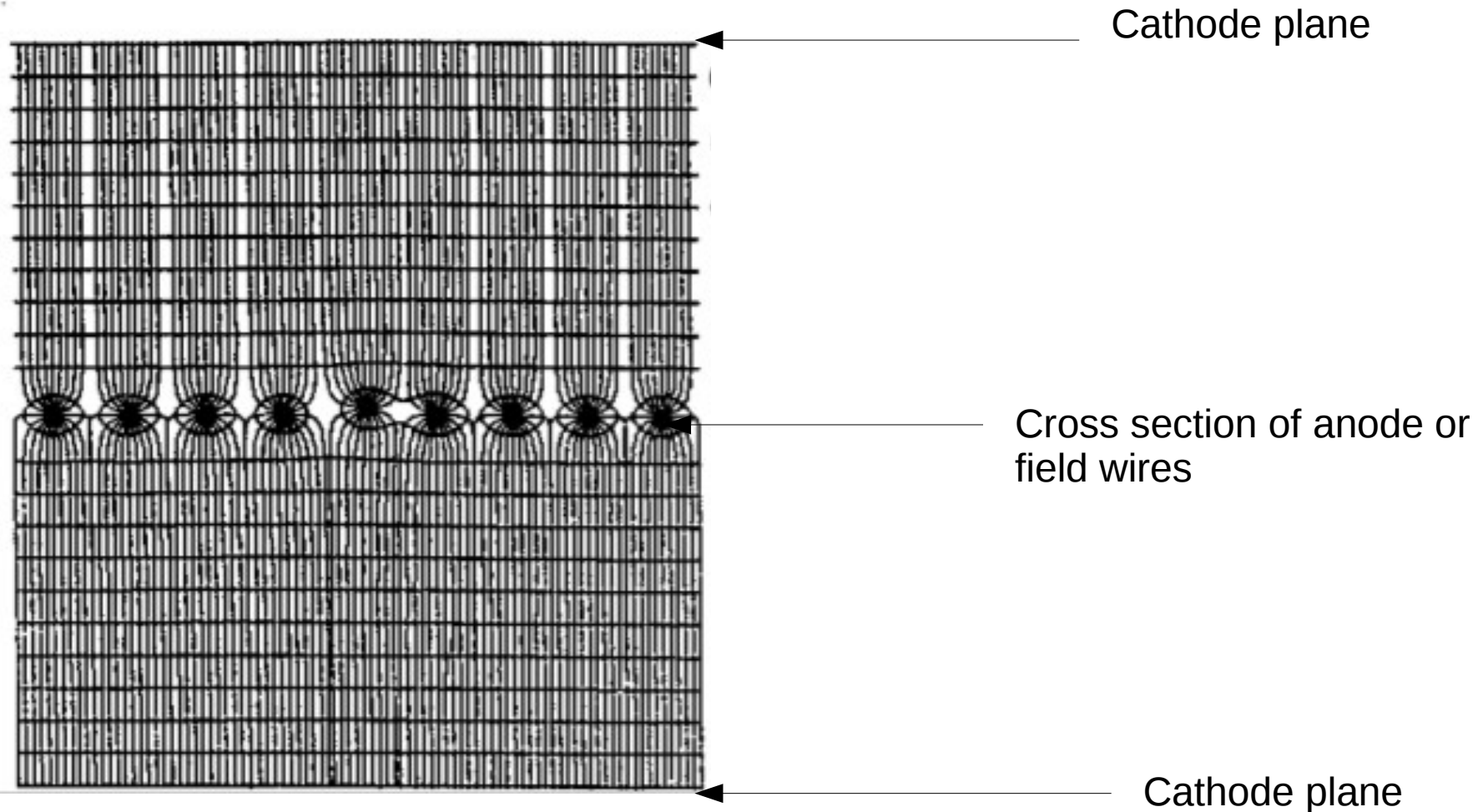
X-Plane:



- ~160 wires
- Horizontal

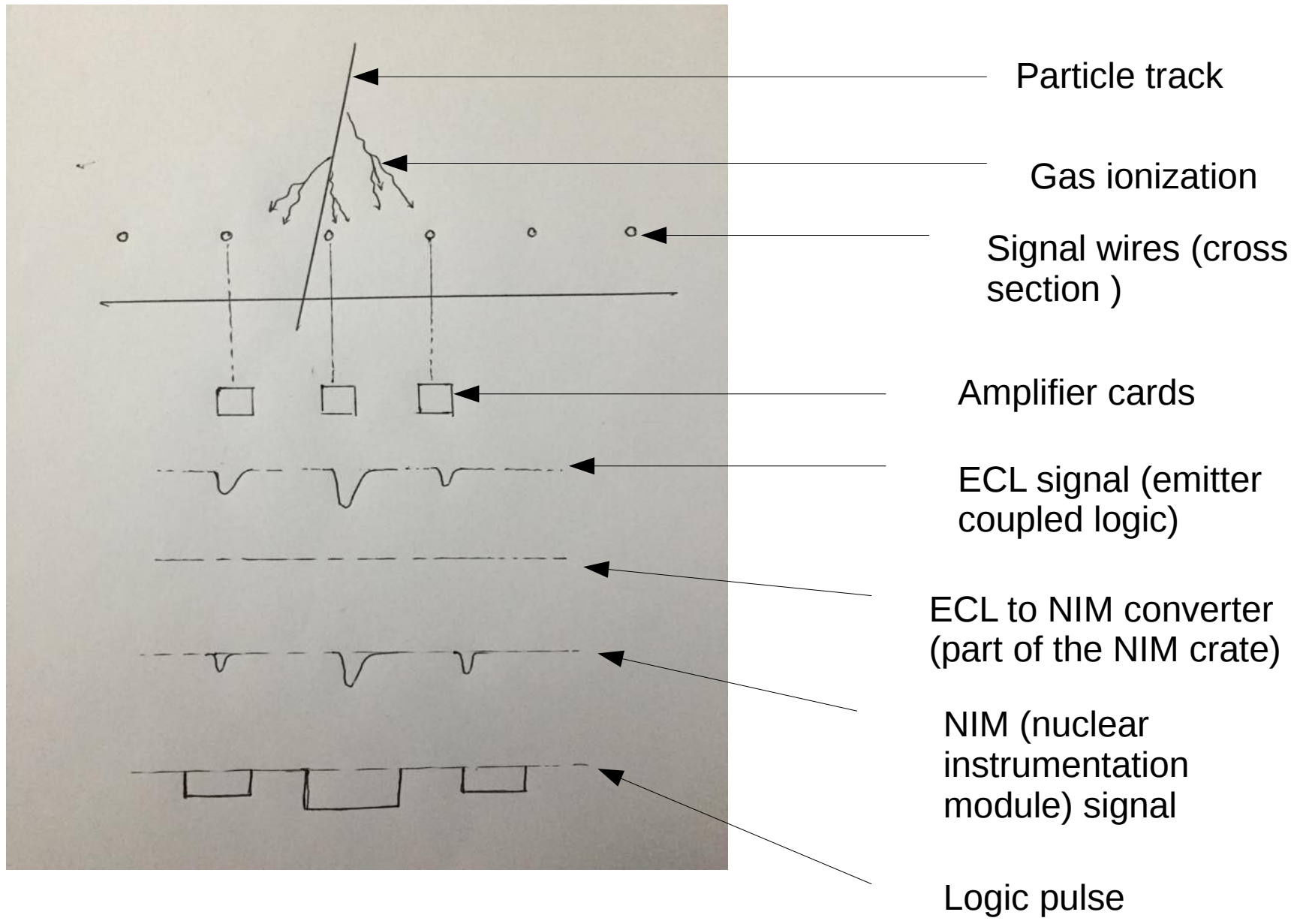
- \* signal wire : diameter : 20 micrometer ; material : gold plated tungstane
- \* field wire : diameter : 100 micrometer ; material : copper plater berillium
- \* distance between two consecutive signal wires (or between two consecutive field wires) is 1 cm

# Electric field inside the chamber

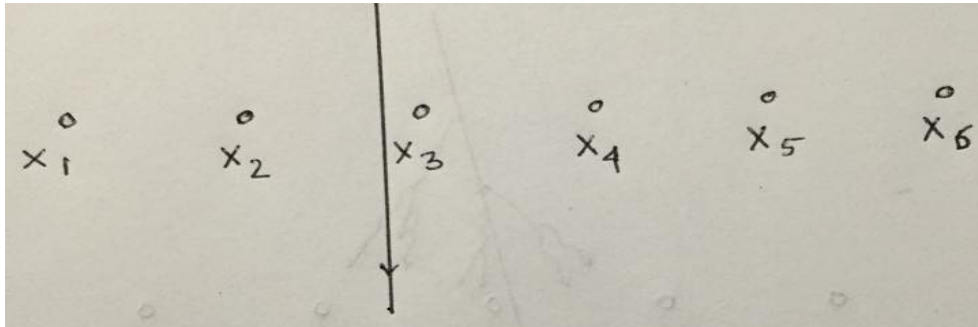


Field wires are used in between two signal wires to make the electric field more uniform inside

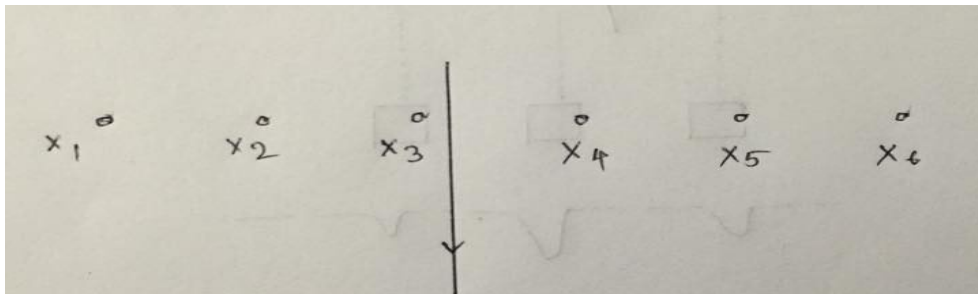
# Basic working principle of drift chamber



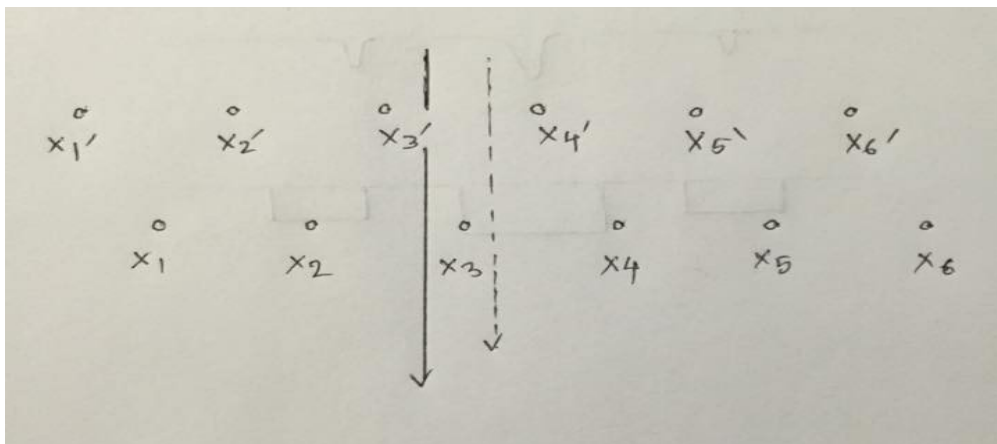
# Left right ambiguity



Particle track at the left of the X3 signal wire



Particle track on the right of the signal wire

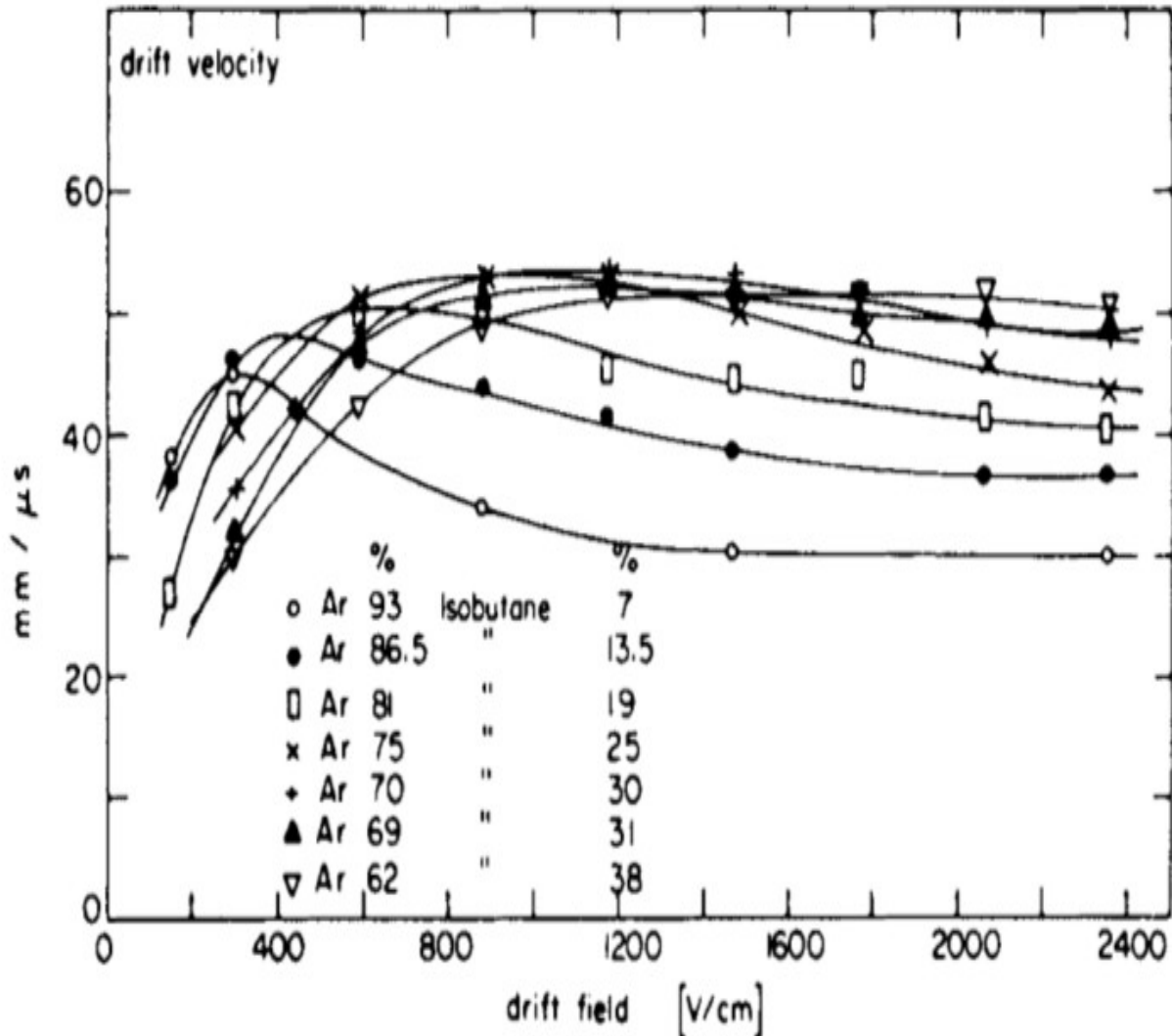


X3' and X3 give signal when the particle track at the left of the X3 Signal wire

X4' and X3 give signal when the particle track at the right of the X3 signal wire



# Drift velocity vs drift field for Ar and isobuten mixture

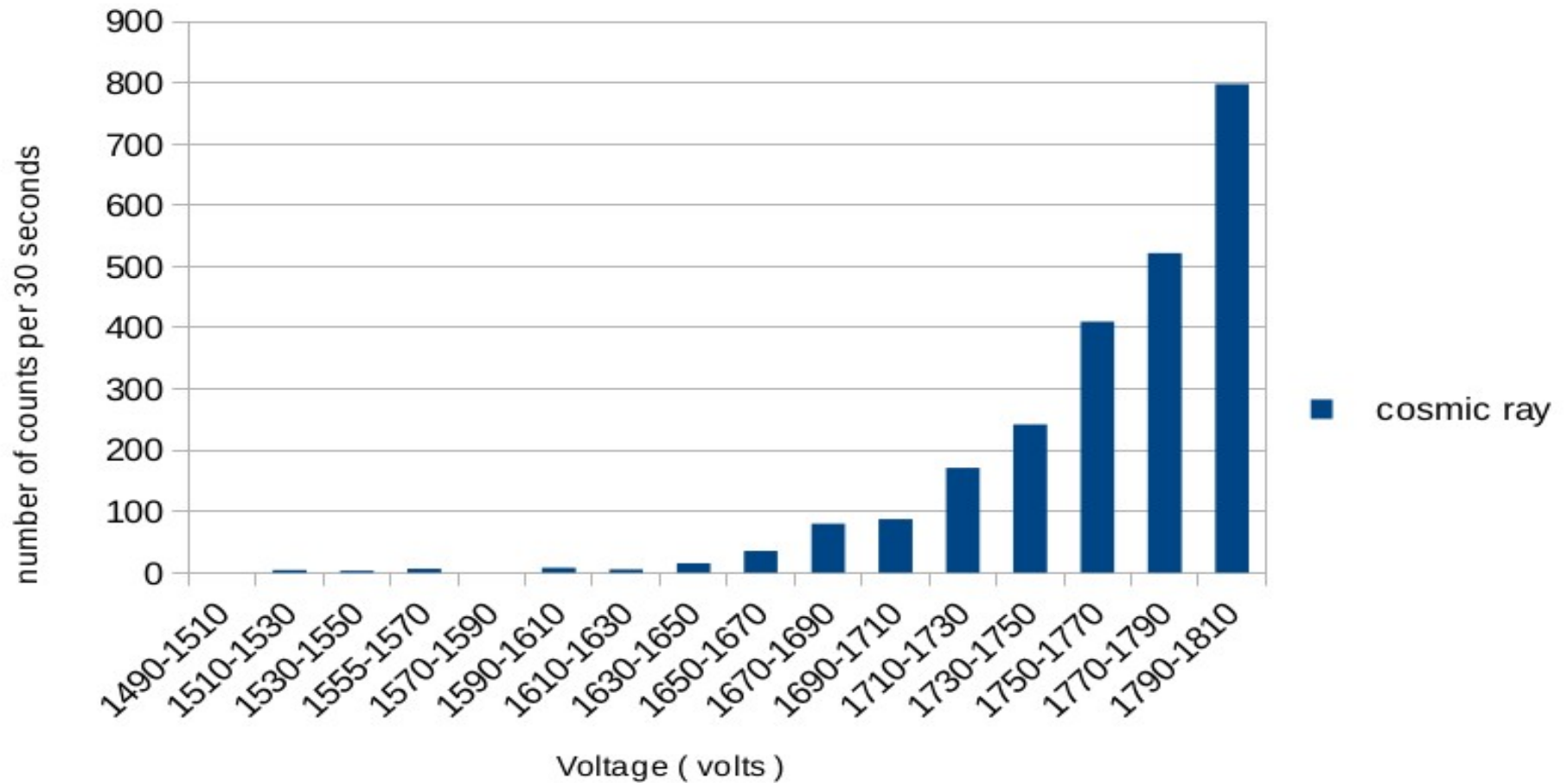


- With high enough drift field the drift velocity is fairly constant. Which ensures the less dependence of the drift velocity on local gradient of the electric field
- The gas mixture should also be chosen like that this graph holds true

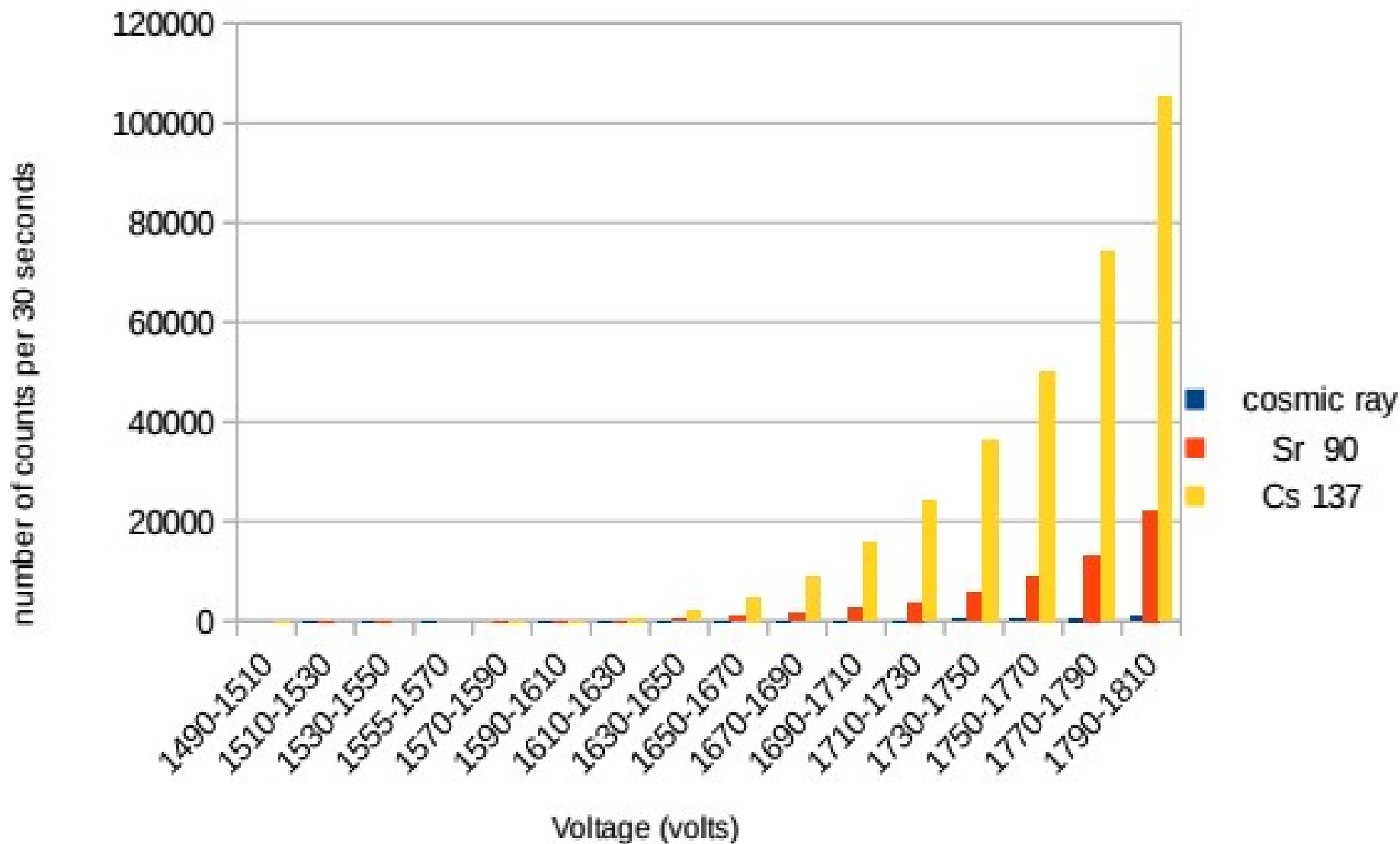
# Drift Chamber Gases

- Gases which are used in drift chambers must have these qualities
  - \* low working voltage
  - \* High Gain
  - \* Good Proportionality
  - \* High Rate capacity
- Argon and Ethen Mixture is used in Hall C drift chambers
- For primary testing we are using Argon and Carbon dioxide mixture as ethen in flammable
- Incoming charged particles ionize the Argon Gas
- Carbon dioxide and ethen are used as quenching gases

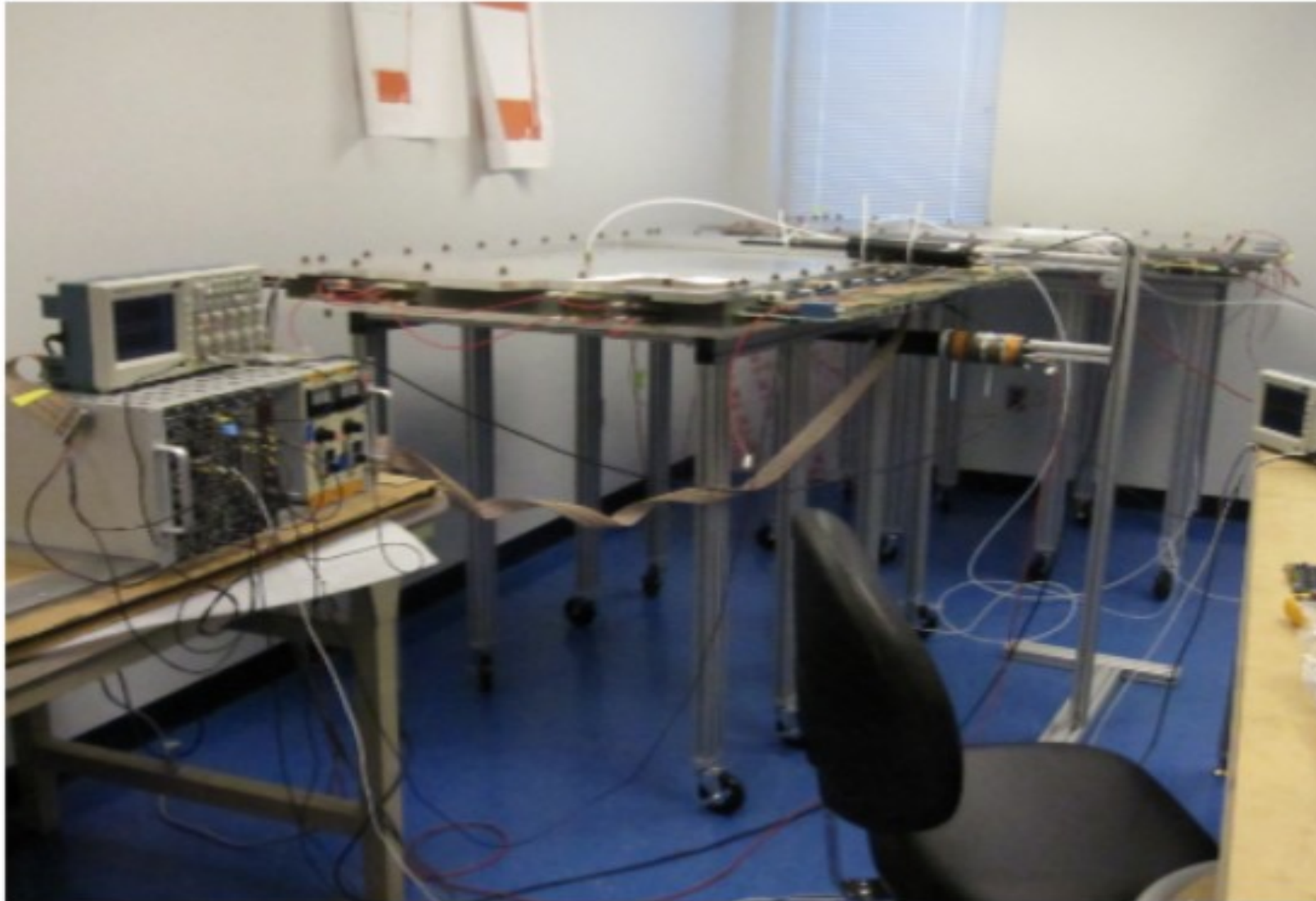
# Response of a block (16 wires) of one X plane with cosmic rays with different HV



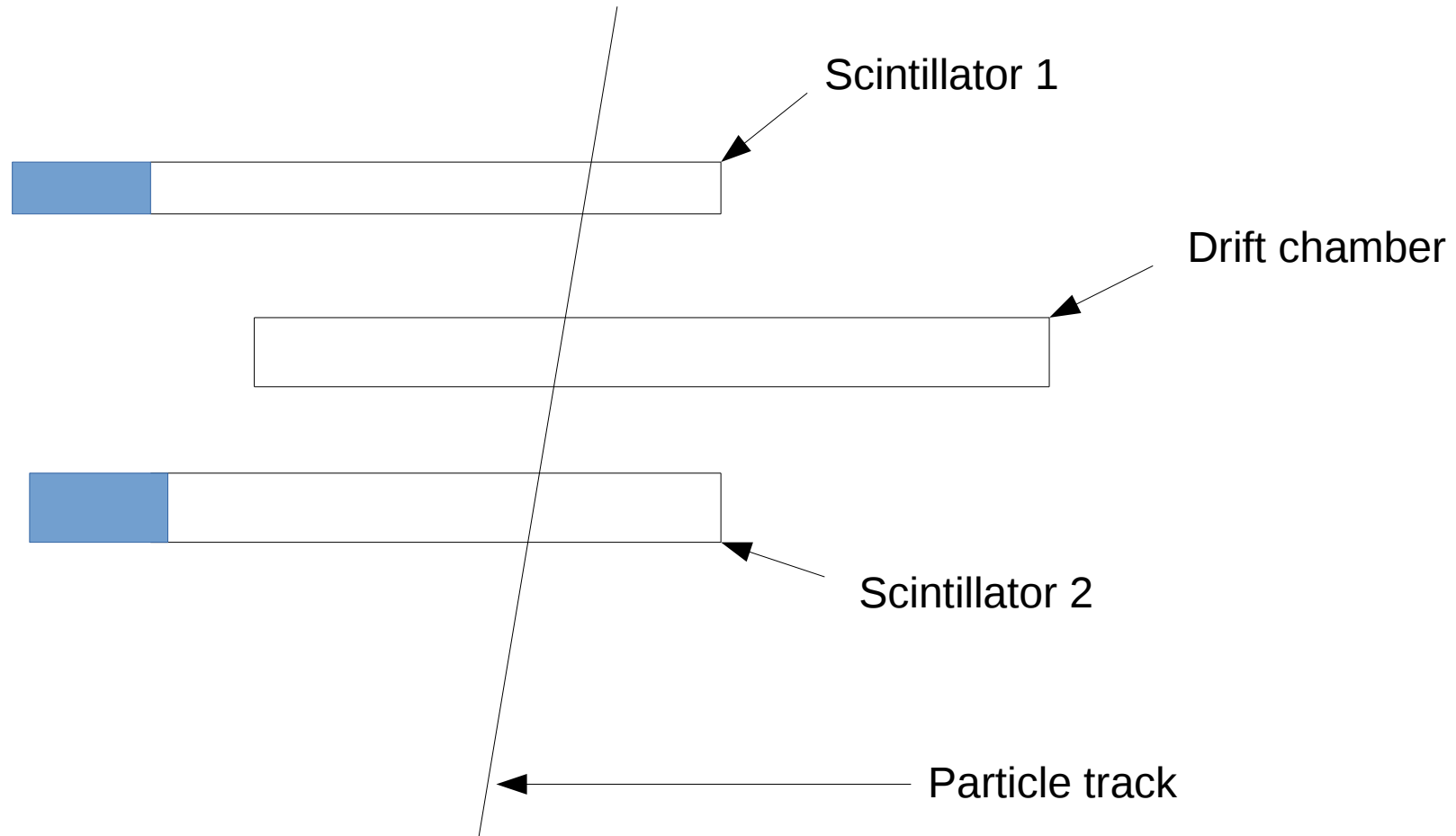
# Response of a block (16 wires) of one X plane with Cs and Sr sources (cosmic ray as background) with different HV



# Testing of chambers for the efficiency measurement



# Testing of chambers for the efficiency measurement



Triple coincidence

Efficiency =  $\frac{\text{Triple coincidence}}{\text{Double coincidence}}$

Double coincidence

# Acknowledgements

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**Thank You !**