Status of HMS Wire Chamber

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Jefferson Lab

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Introduction

New HMS Chamber is build to replace the old existing chamber using the same design of SHMS chamber. This chamber will be used to track the scattered particles after beam collides with a fixed target to determine the momentum and scattering angle.

Construction Period

The construction period started around second week of May and completed around first week of November.

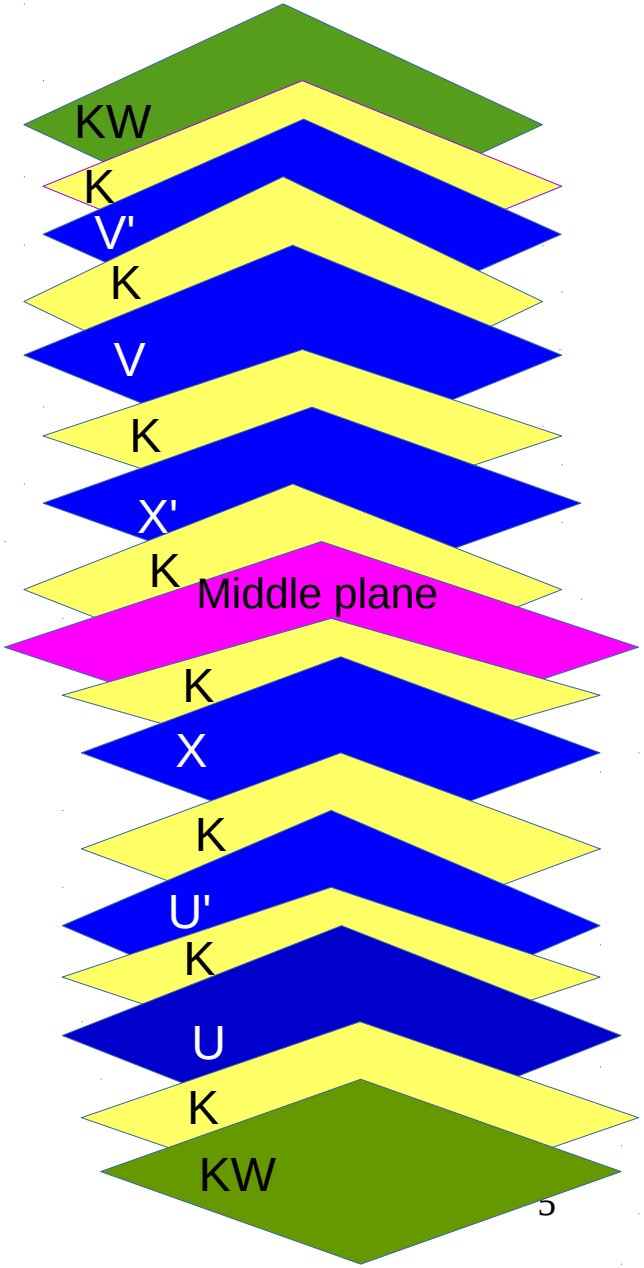
First Chamber
Started: May 10 2016
Completed: August 10 2016
Shipped to Jlab: 08/12/2016

Second Chamber
Started: August 12 2016
completed: November 06 2016
Shipped to Jlab: 11/11/2016

Basic Construction

It consists of

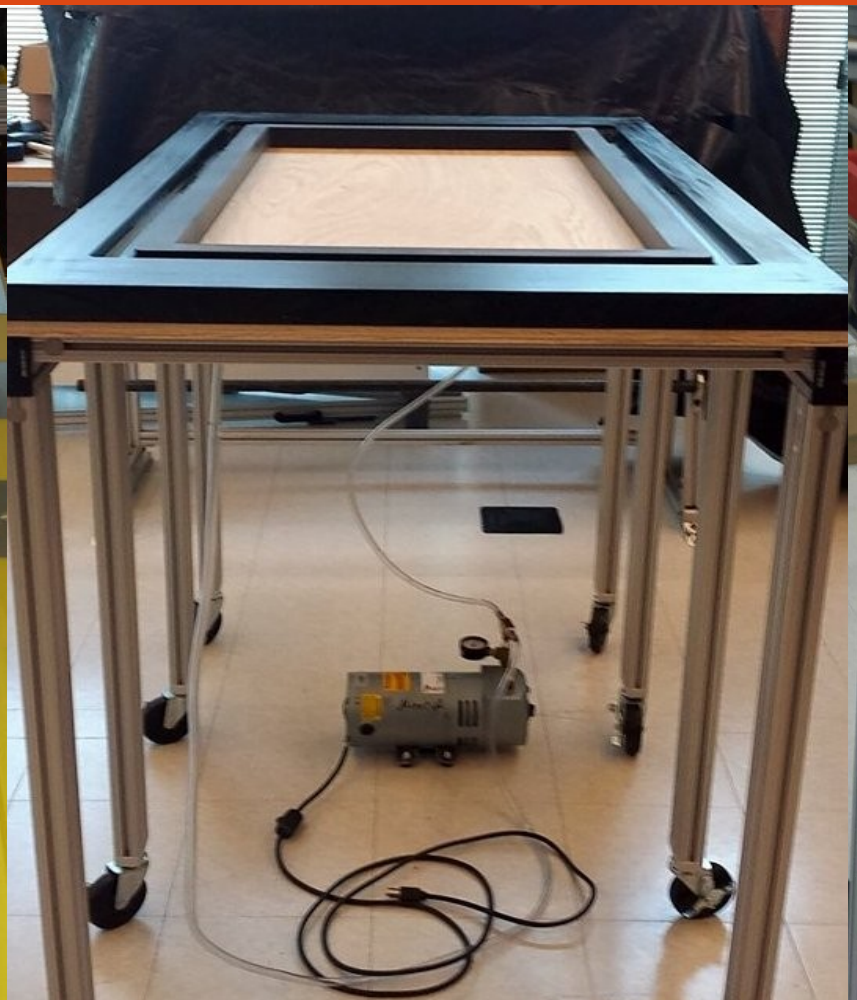
- 2 windows
- 8 cathode planes
- 6 wire planes
- 1 middle plane
- 2 metal frames
- some electronics



Construction of Planes

Cathode plane

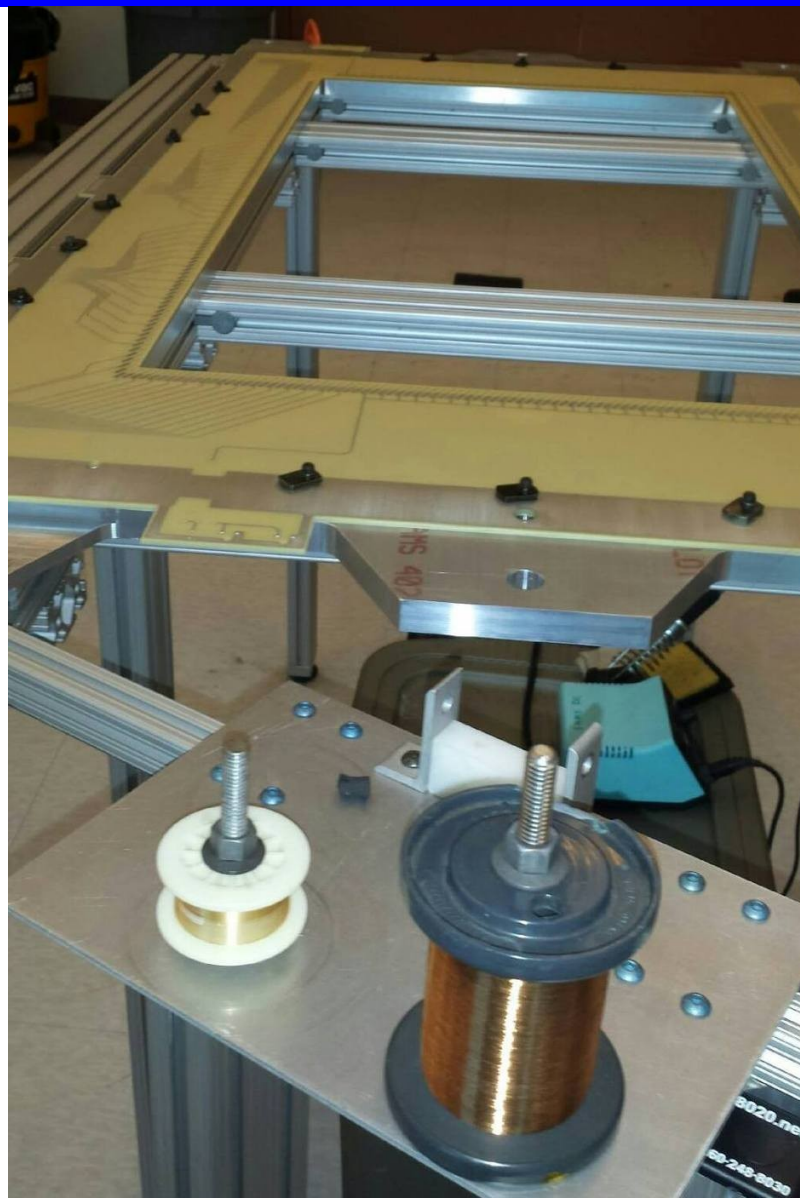
foil is stretched along a table connected with a vacuum pump and a k plane after applying mechanical epoxy is placed over the foil for 24 hours.



Wire plane

wire is stringing along the wire plane over the printed circuit board. Tension is fixed by hanging an iron bar on the wire. The position of the wire is fixed by soldering.

Picture shows SHMS wire plane



Types of wire used

- 20 μm gold tungsten sense wire
- 100 μm copper plated beryllium field

Test at Hampton

- Tested tension on the wires
- Tested all electrical connections

Operational Testing at ESB

Gas mixture used

$Ar : CO_2$ 75:25 by volume

Ar Ionizing gas

CO_2 quenching gas

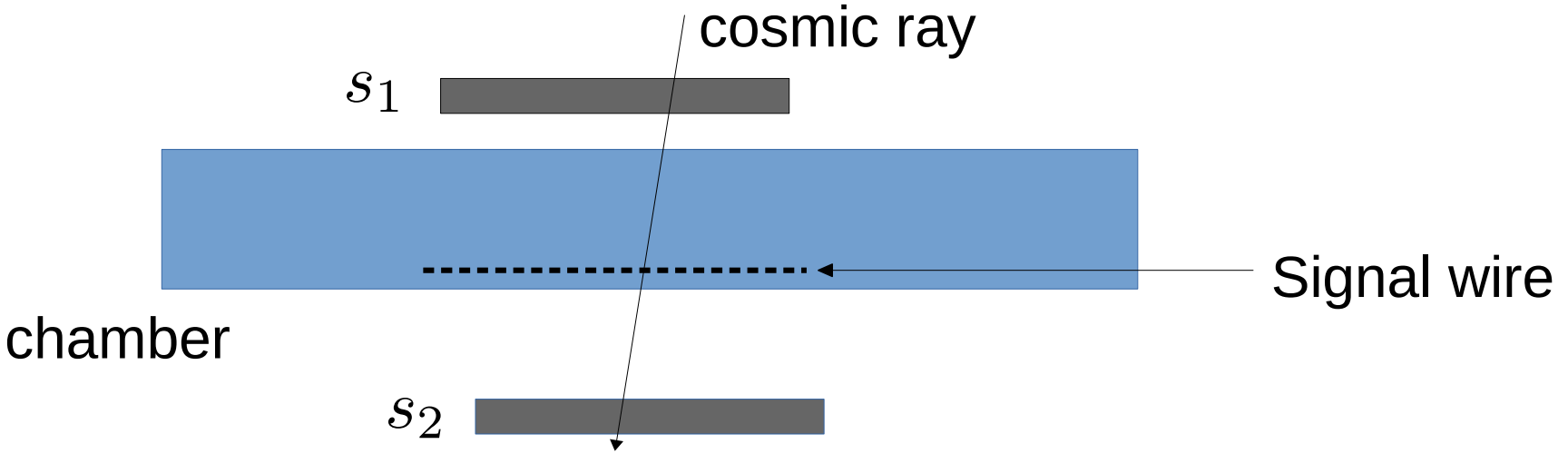
The mixture is non flammable

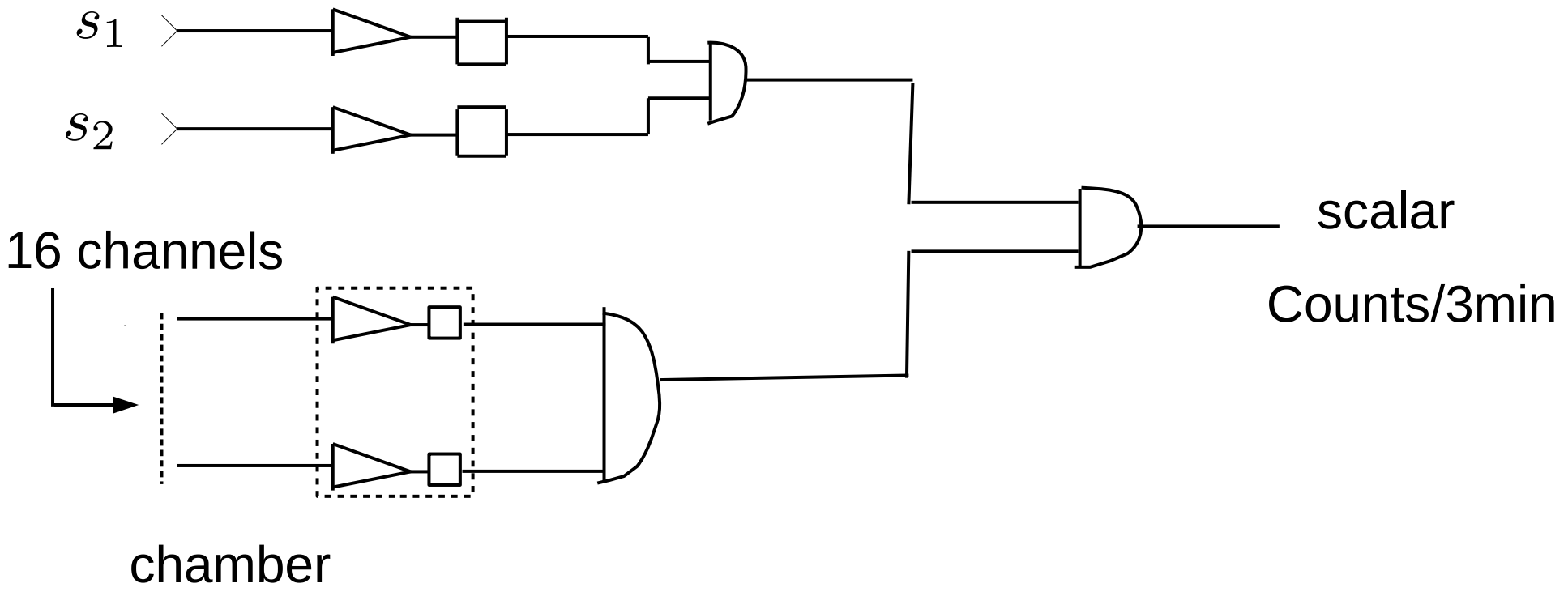
Conditioning

High voltage conditioning started before mid November and completed after new year holiday.

- chamber is connected to gas
- raised voltage up to 1860V
- At 1800V current per plane is less than 100nA

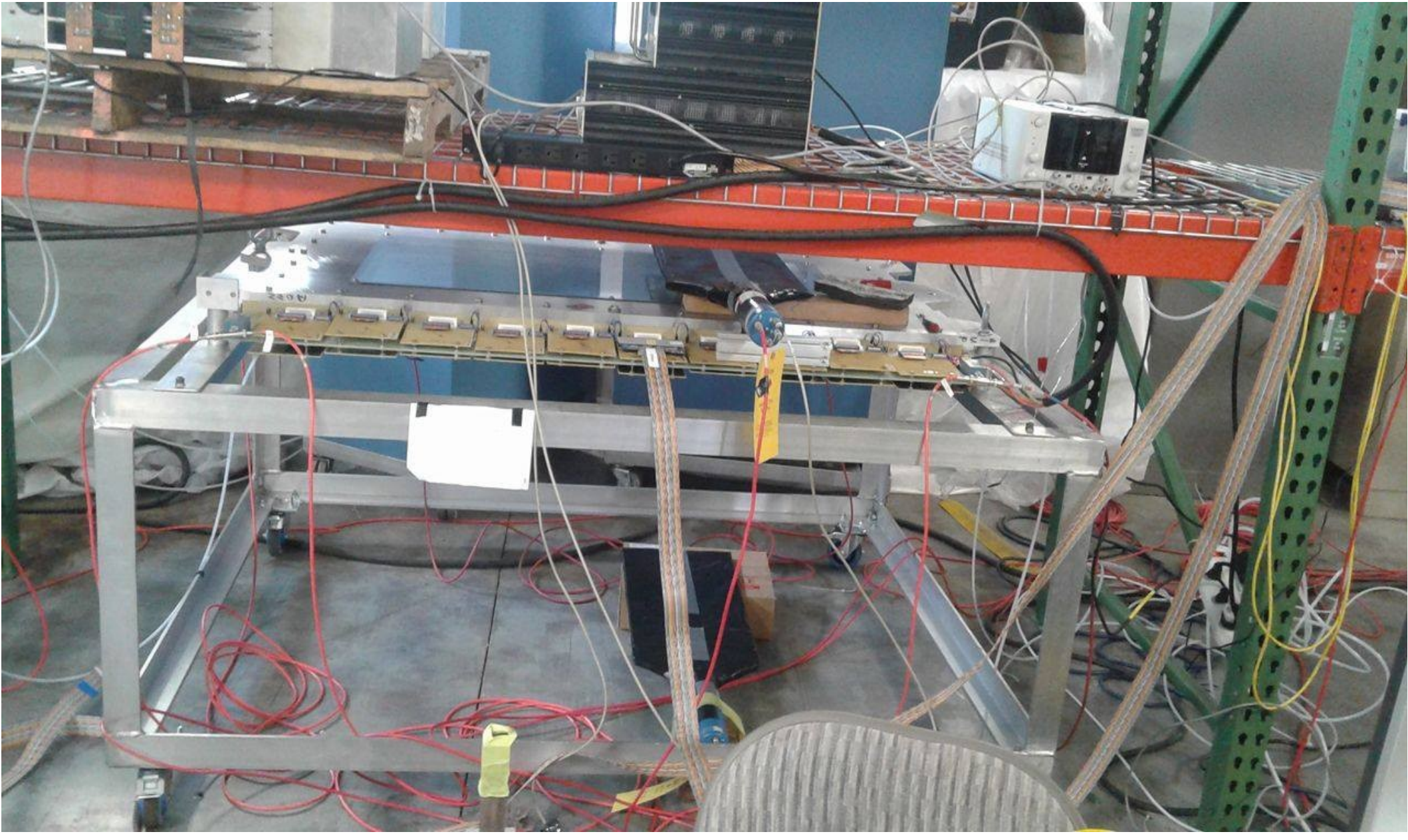
Test of Chamber





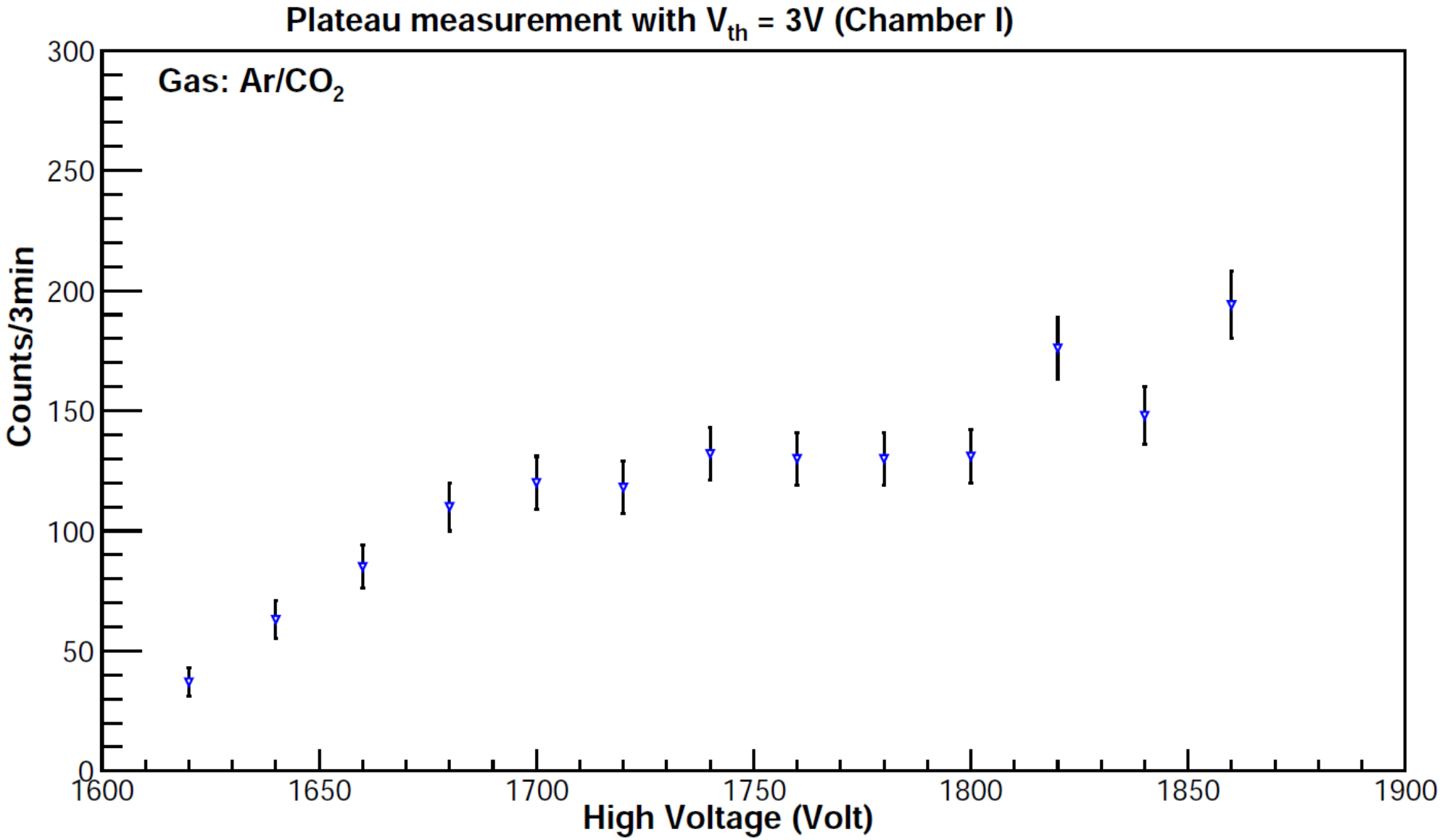
Cosmic Ray Signal Test Set up

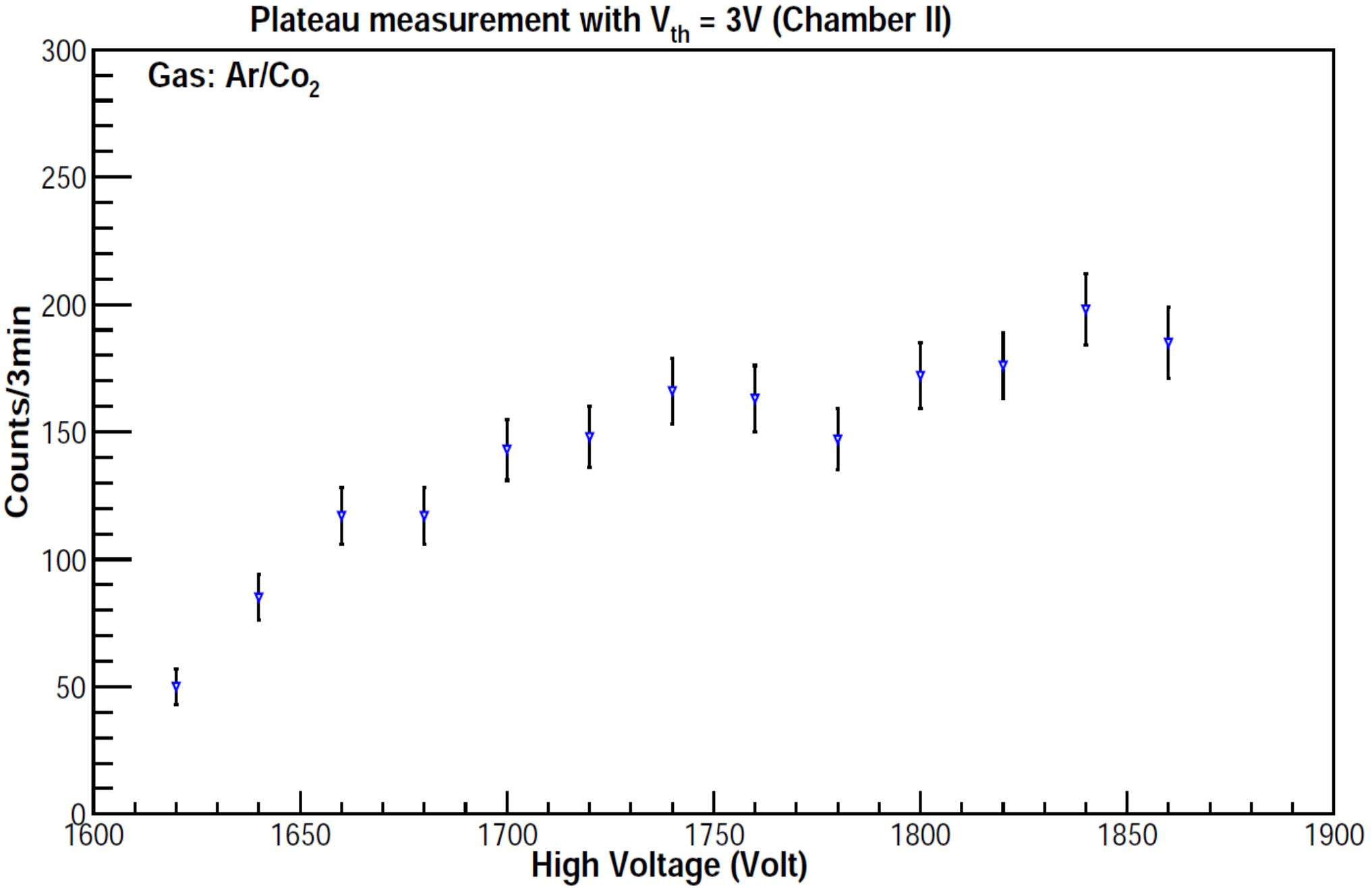
Started signal test after new year holiday.



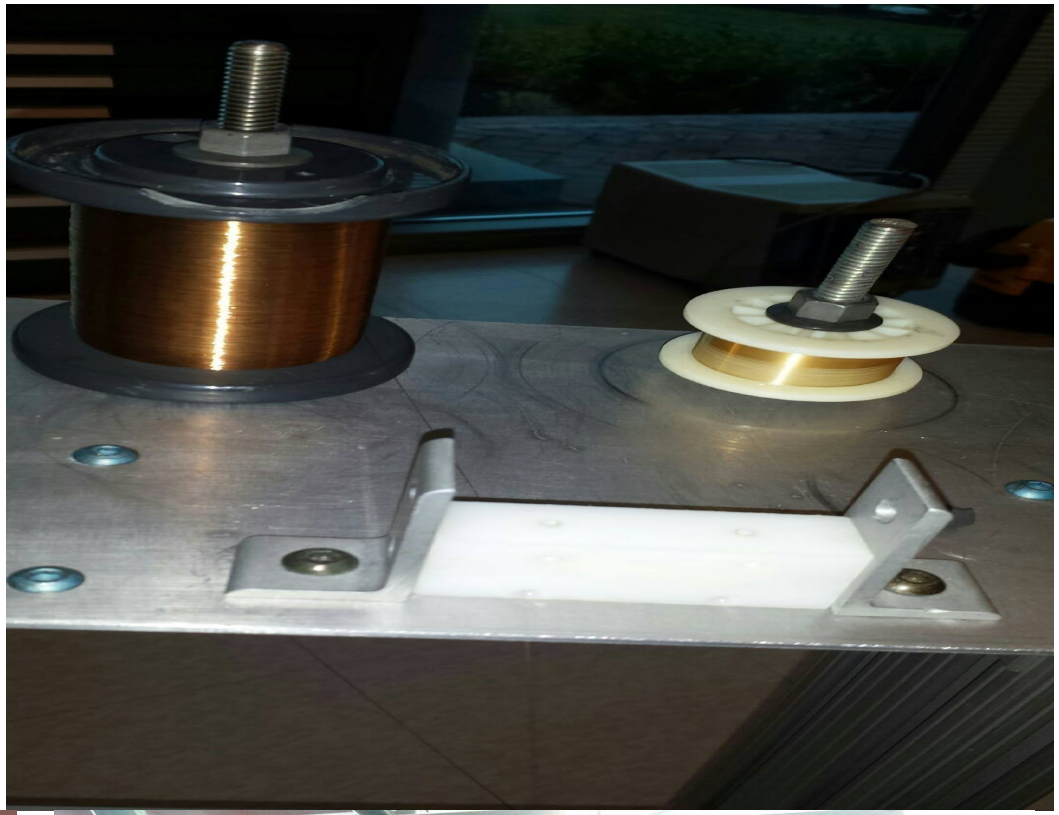
Plateau Curve

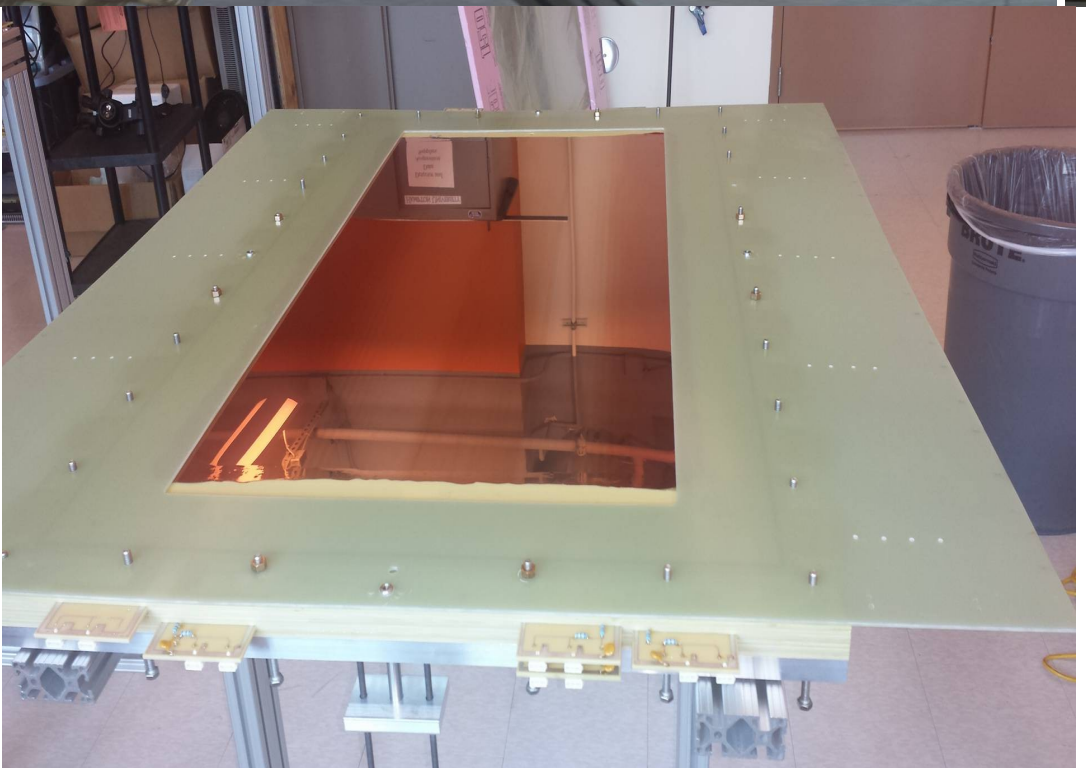
Plateau measurement started around second week of January.




Plateau measurement with V_{th} = 3V (Chamber II)
Gas: Ar/Co_2
Counts/3min
High Voltage (Volt)
0
50
100
150
200
250
300
1600
1650
1700
1750
1800
1850
1900

Some Snapshots





Summary and Future plans

- Two HMS wire chamber were built at Hampton University from May to November 2016.
- After the primary test at Hampton, the chambers were shipped to Jlab(ESB building).
- Chambers are currently under high voltage connection for testing signals.
- The signal from each wire and the efficiency of each chamber will be tested very soon.

Acknowledgements

I would like to acknowledge my advisor Dr. Liguang Tang for his continuous support and encouragement.

Thank You