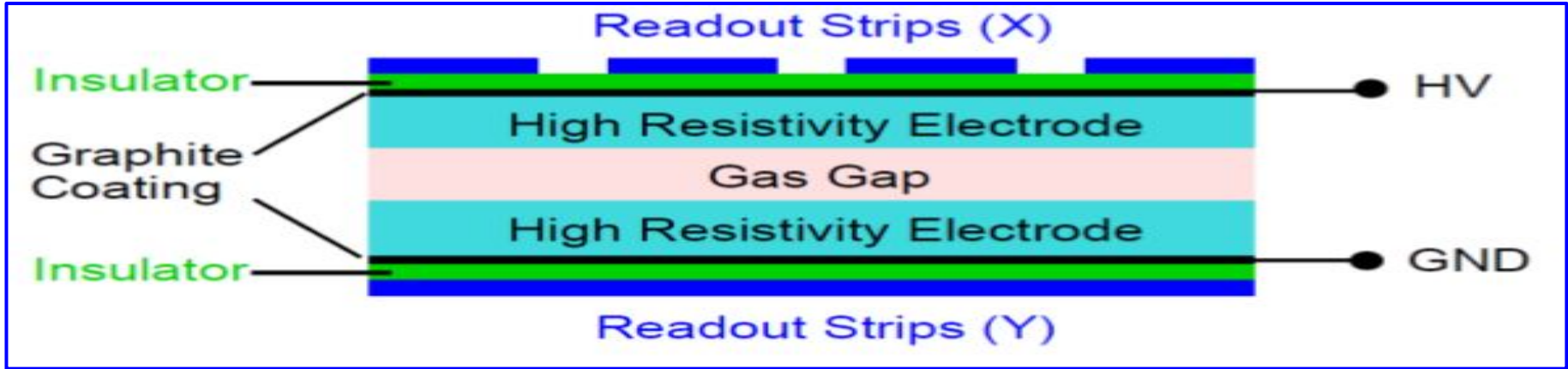


# RPC (Resistive Plate Chamber)

**Presented by : Group I B**

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Geetanjali Chaudhary (PU Chandigarh)  
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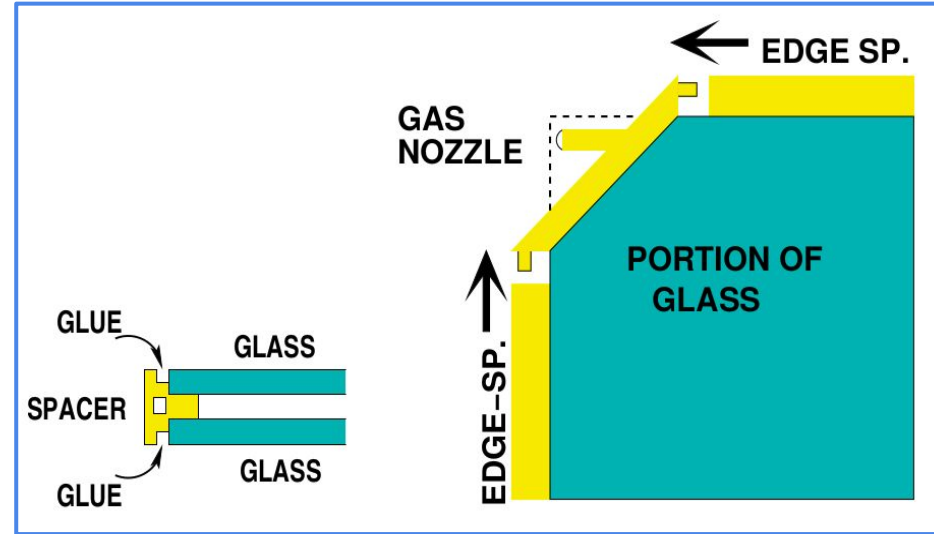
# Construction and Operation



1. Gas constituents are: R134a(95.2%), Isobutane(4.5%) & SF<sub>6</sub>(0.3%).
2. High voltage applied across gas gap at graphite coating.
3. Incoming charge particle ionises the gas and results in free electron . Electron drift towards anode . On its path it further ionises & disturbs the electric field & results in local discharge of the glass electrodes. This induces signal at external pick up strips.
4. Measures location and time of ionization.
5. Discharge time is few nano-seconds & recovery time is few seconds.

# FABRICATION

A complete RPC detector is made of mainly these three subcomponents, a glass gap, pickup panel and electronic chain containing amplifier and discriminator in front end and digital backend, which collect analog signal from front-end and send digitized signal to data acquisition system.

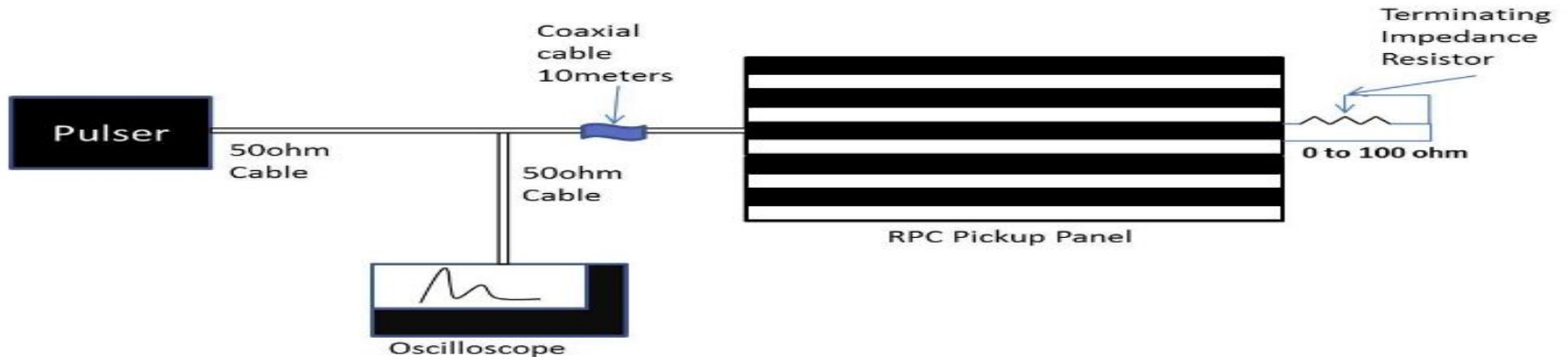
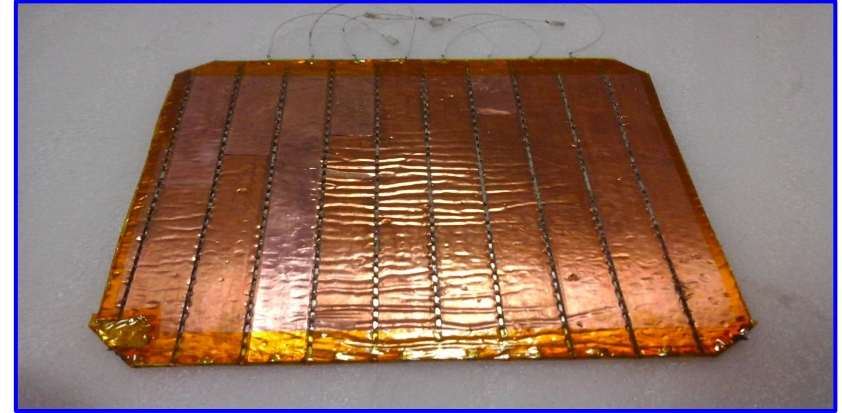


The following steps are followed to fabricate the RPC gas Gap :

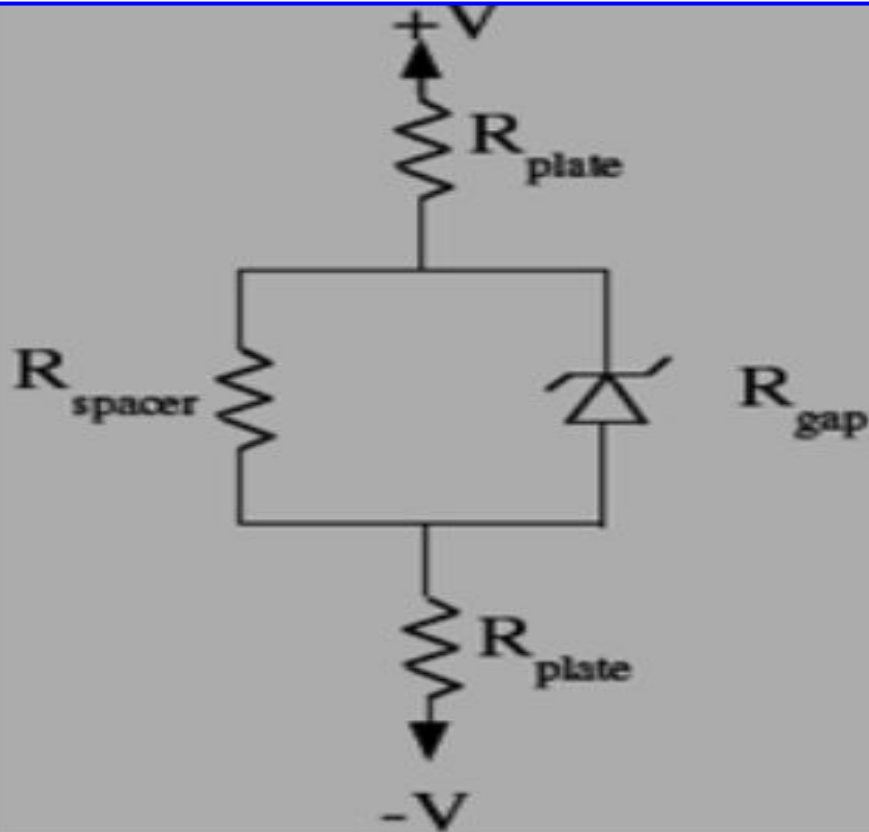
- Cutting and Cleaning of glass
- Conductive coating
- Gluing the glass with the spacers
- Gas leak test and estimate the leak rate

# PICKUP STRIPS & CHARACTERISTIC IMPEDANCE

1. **PICK UP PANEL :** 8 parallel Cu strips ; width 2.8 cm ; Gap 0.2 cm
2. **CHARACTERISTIC IMPEDANCE :** Resistance added to eliminate the reflected signal (~35 ohm)



# EQUIVALENT CIRCUIT OF RPC



- Low voltage

$$R_{\text{gap}} \approx \infty$$

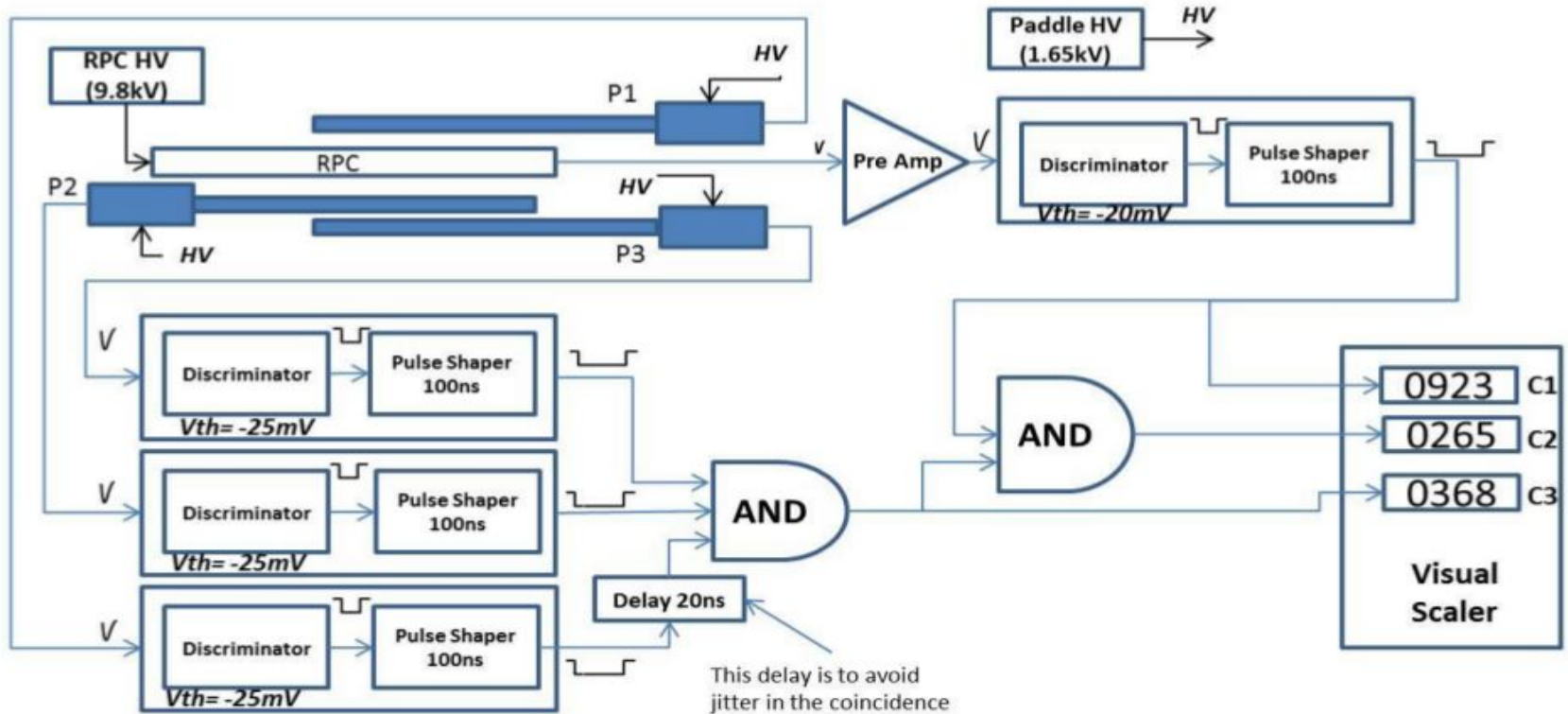
$$\frac{dV}{dI} = R_{\text{spacer}}$$

- High voltage

$$R_{\text{gap}} \approx 0$$

$$\frac{dV}{dI} = R_{\text{plate}}$$

# ELECTRONIC CHAIN DIAGRAM

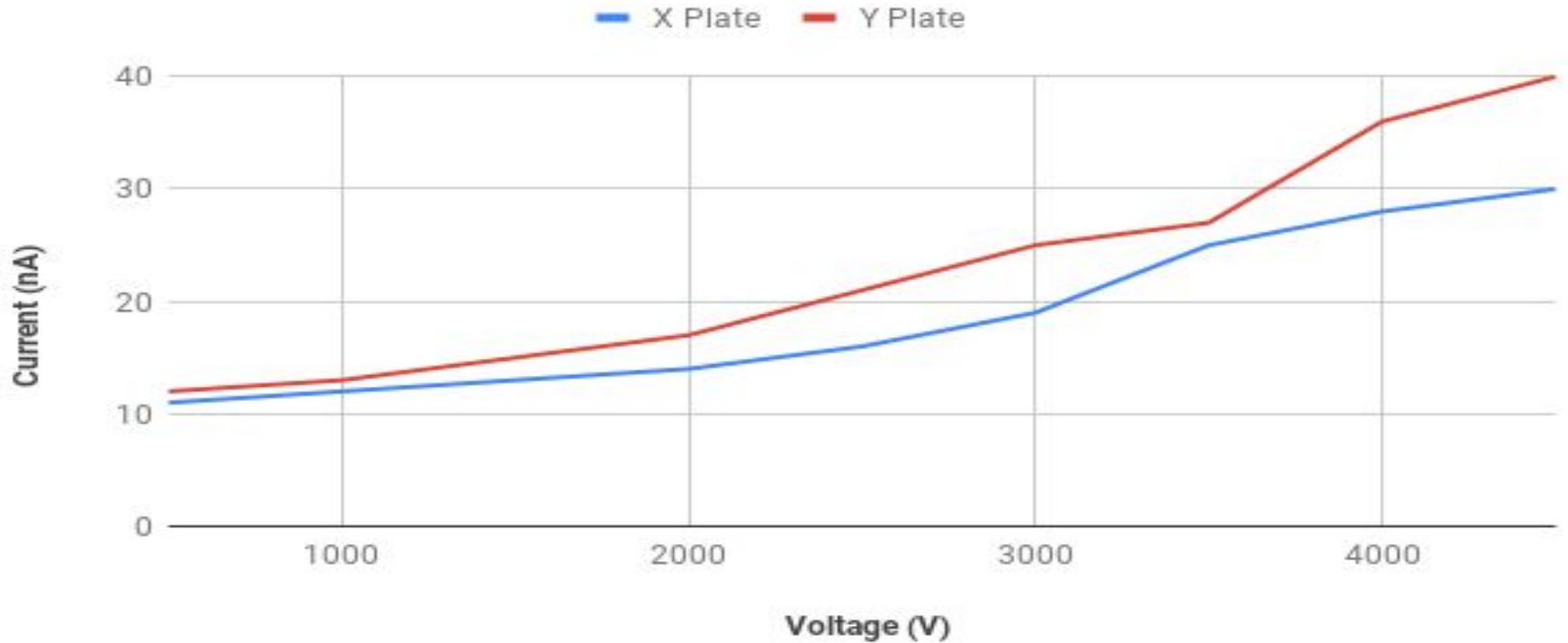


# RPC Surface Resistance Measurement (Mohms)

<b>Top glass</b>			
<b>H</b>	<b>1.8</b>	<b>0.948</b>	<b>1.1</b>
<b>I</b>	<b>1.2</b>	<b>0.912</b>	<b>1.1</b>
<b>H</b>	<b>0.964</b>	<b>0.85</b>	<b>0.97</b>
<b>I</b>	<b>0.95</b>	<b>0.83</b>	<b>0.915</b>
<b>H</b>	<b>0.955</b>	<b>1.08</b>	<b>1.06</b>
<b>I</b>	<b>0.988</b>	<b>1</b>	<b>1.05</b>
<b>Bottom glass</b>			
<b>H</b>	<b>0.68</b>	<b>0.77</b>	<b>0.736</b>
<b>I</b>	<b>0.53</b>	<b>0.794</b>	<b>0.77</b>
<b>H</b>	<b>0.66</b>	<b>0.606</b>	<b>0.762</b>
<b>I</b>	<b>0.772</b>	<b>0.957</b>	<b>0.68</b>
<b>H</b>	<b>0.67</b>	<b>0.653</b>	<b>0.875</b>
<b>I</b>	<b>0.61</b>	<b>0.682</b>	<b>0.8</b>

# I-V CHARACTERISTICS

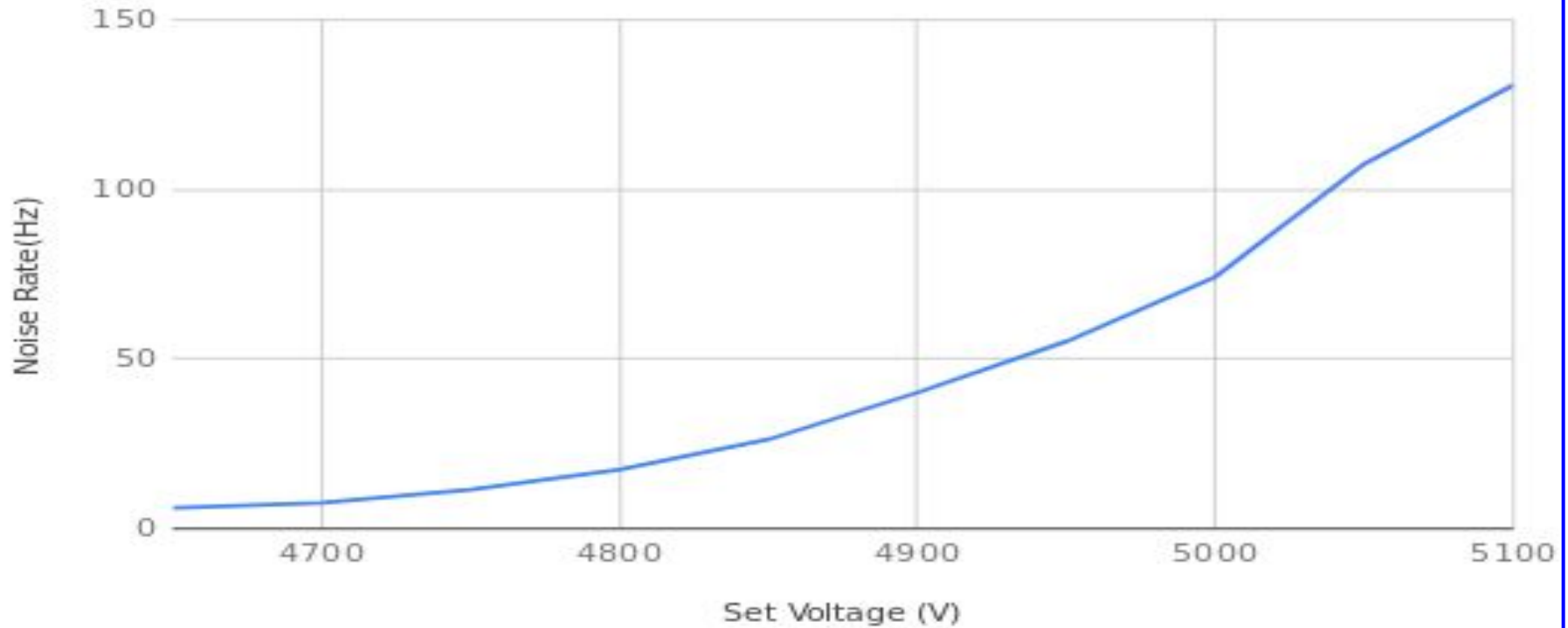
I-V characteristics





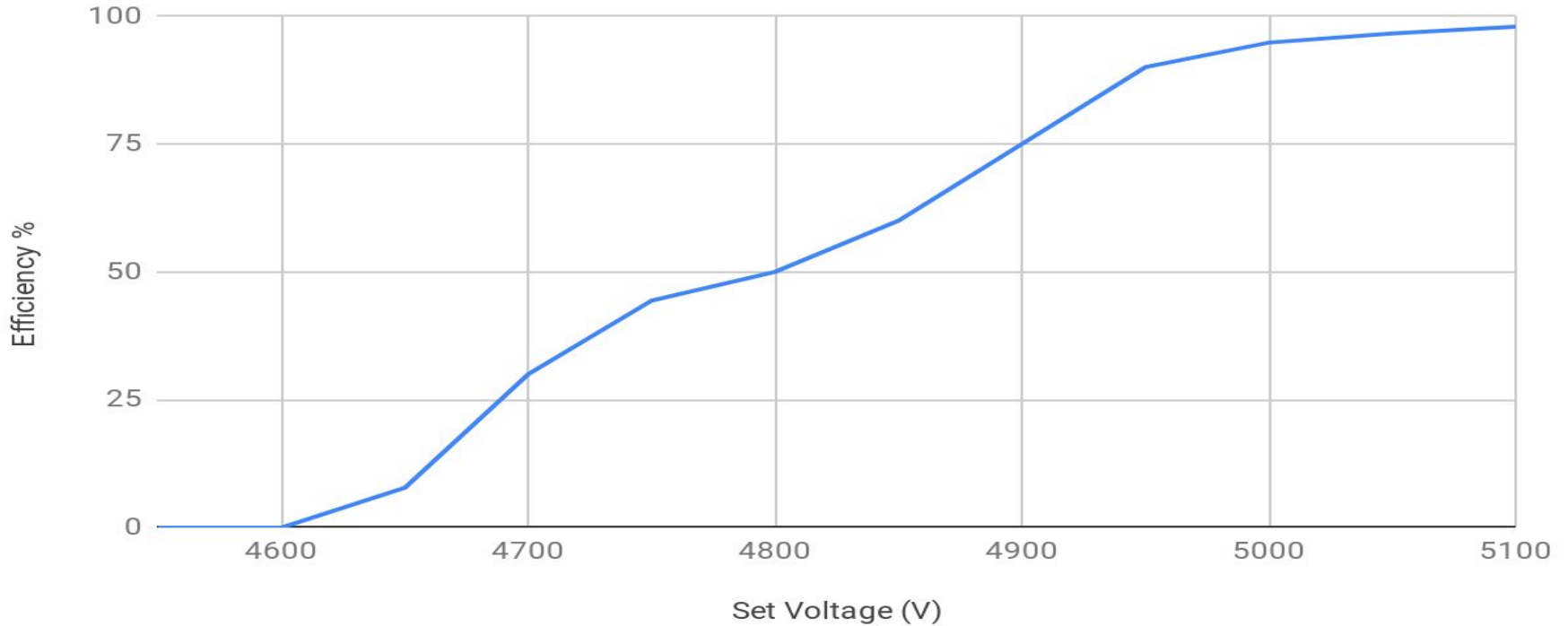
# NOISE RATE PLOT

Noise Rate(Hz) vs. Set Voltage (V)



# EFFICIENCY PLOT

Efficiency % vs. Set Voltage (V)



# ADVANTAGES

- 1) RPC's can be made to have a large area but at a minimal material cost.
- 2) These are easy to assemble and they possess simple read-out electronics.
- 3) They exhibit better time resolutions like scintillators and long term stability.
- 4) Moderate position resolution and give good detection efficiency.

**THANK YOU**