

A Low-Cost Van de Graaff Accelerator

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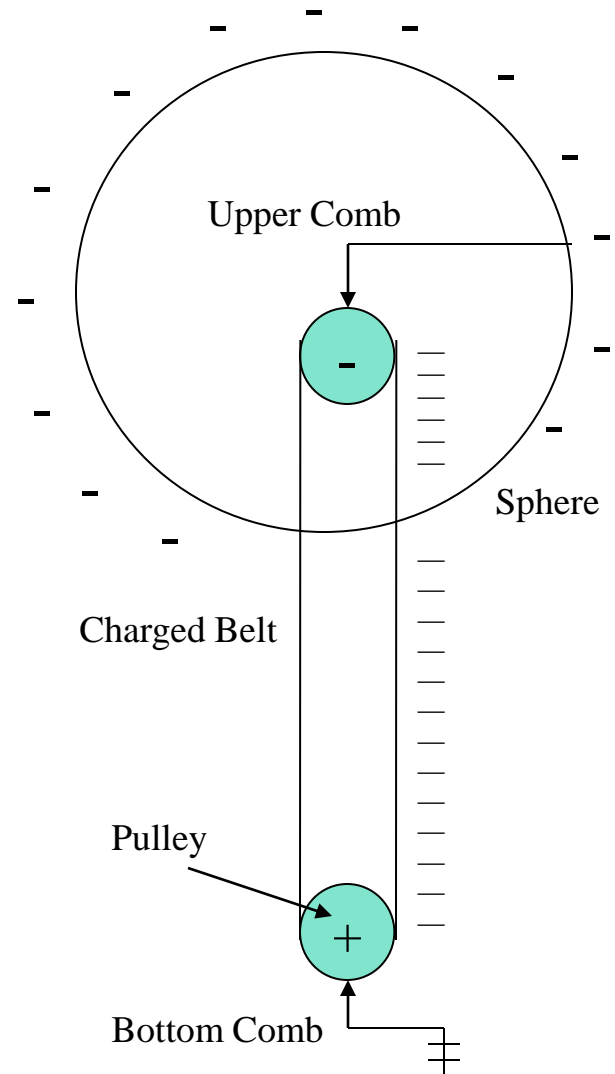
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Outline

- Principles of a Van de Graaff Generator
- Electron Gun and Bias Testing
- Apparatus
- Problems
- X-Ray Angular and Energy Distribution Spectra
- Future Plans

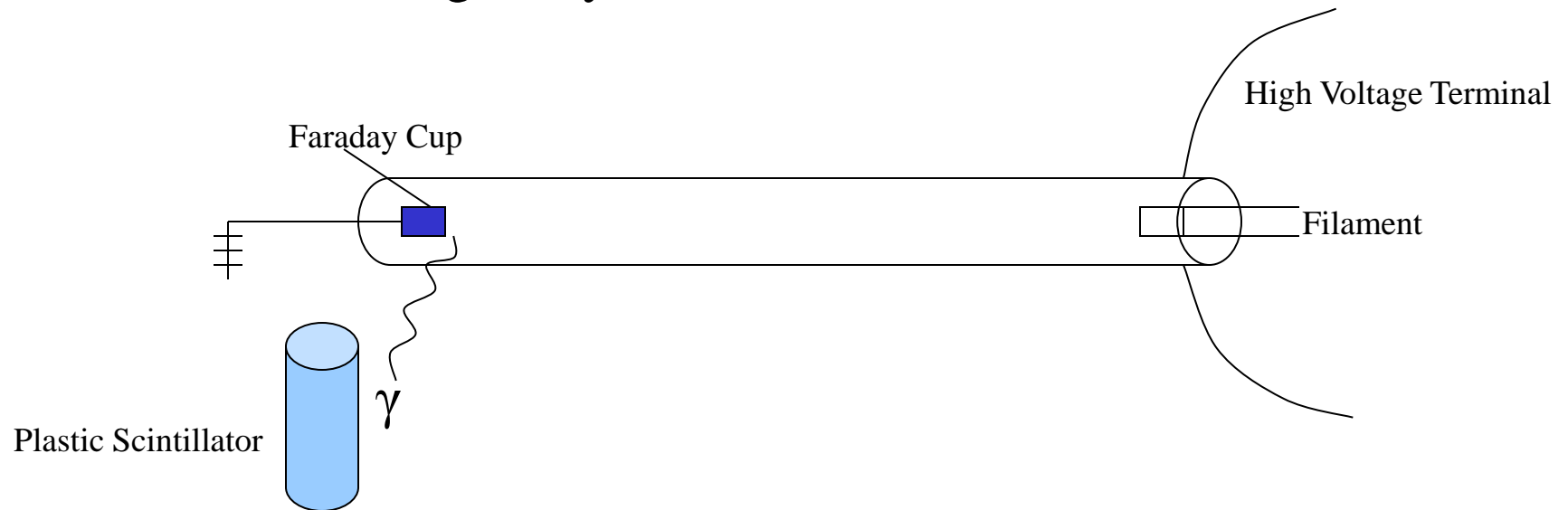
Principles of a Van de Graaff Generator

- The idea of a Van de Graaff Generator
- Voltage and charge maxima
 - $V = I_c R (1 - e^{-t/RC}) \approx 30,000 \text{ V/cm} * r$
 - $C = 4\pi\epsilon_0 r$
 - $Q = CV$
- Our Van de Graaff ($r = 13 \text{ cm}$)
 - $V \approx (30,000) * (13) \text{ V} = 410,000 \text{ V max}$
 - $C = 14.5 \text{ pF}$
 - $Q \approx 5.92 \mu\text{A}$



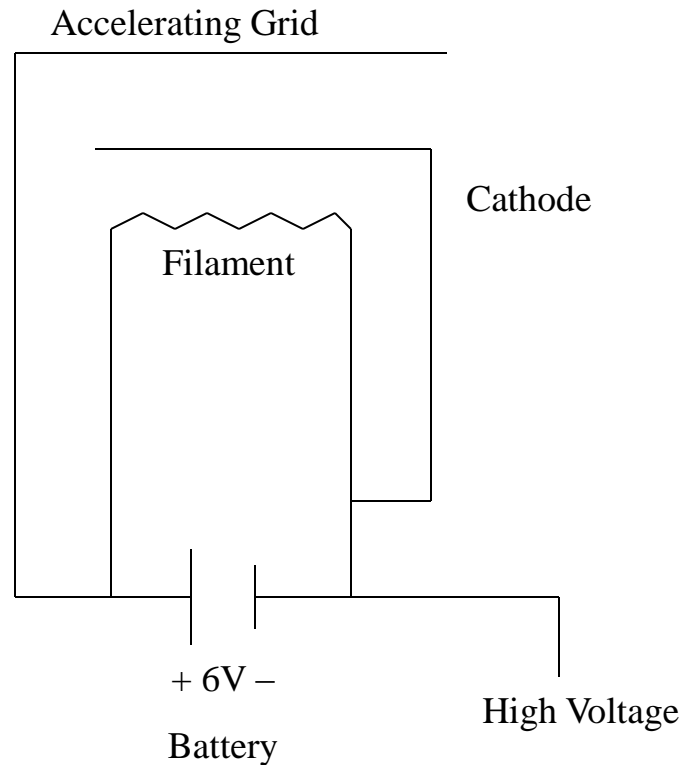
Principles of a Van de Graaff Generator

- Equipotential Rings
- Faraday Cup
- Bremsstrahlung x-rays

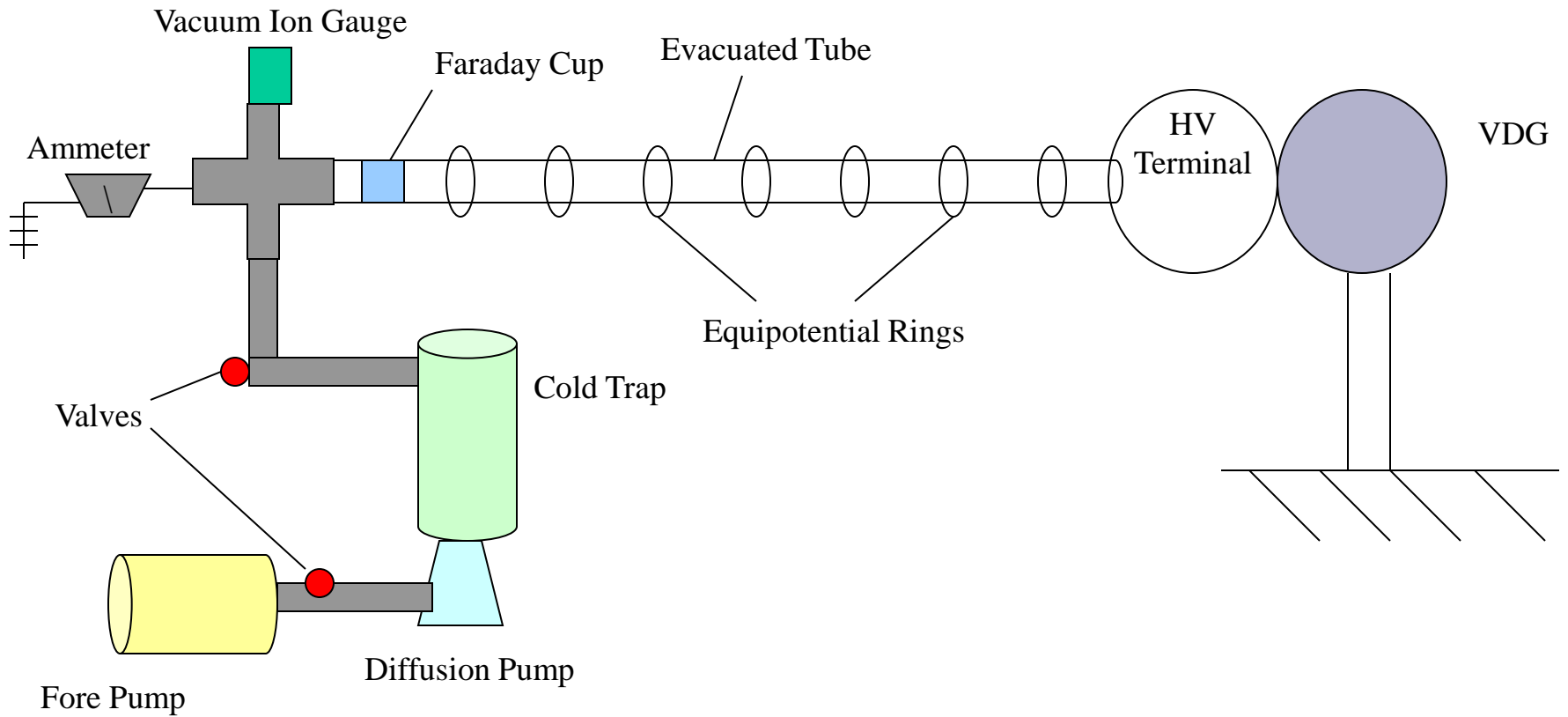


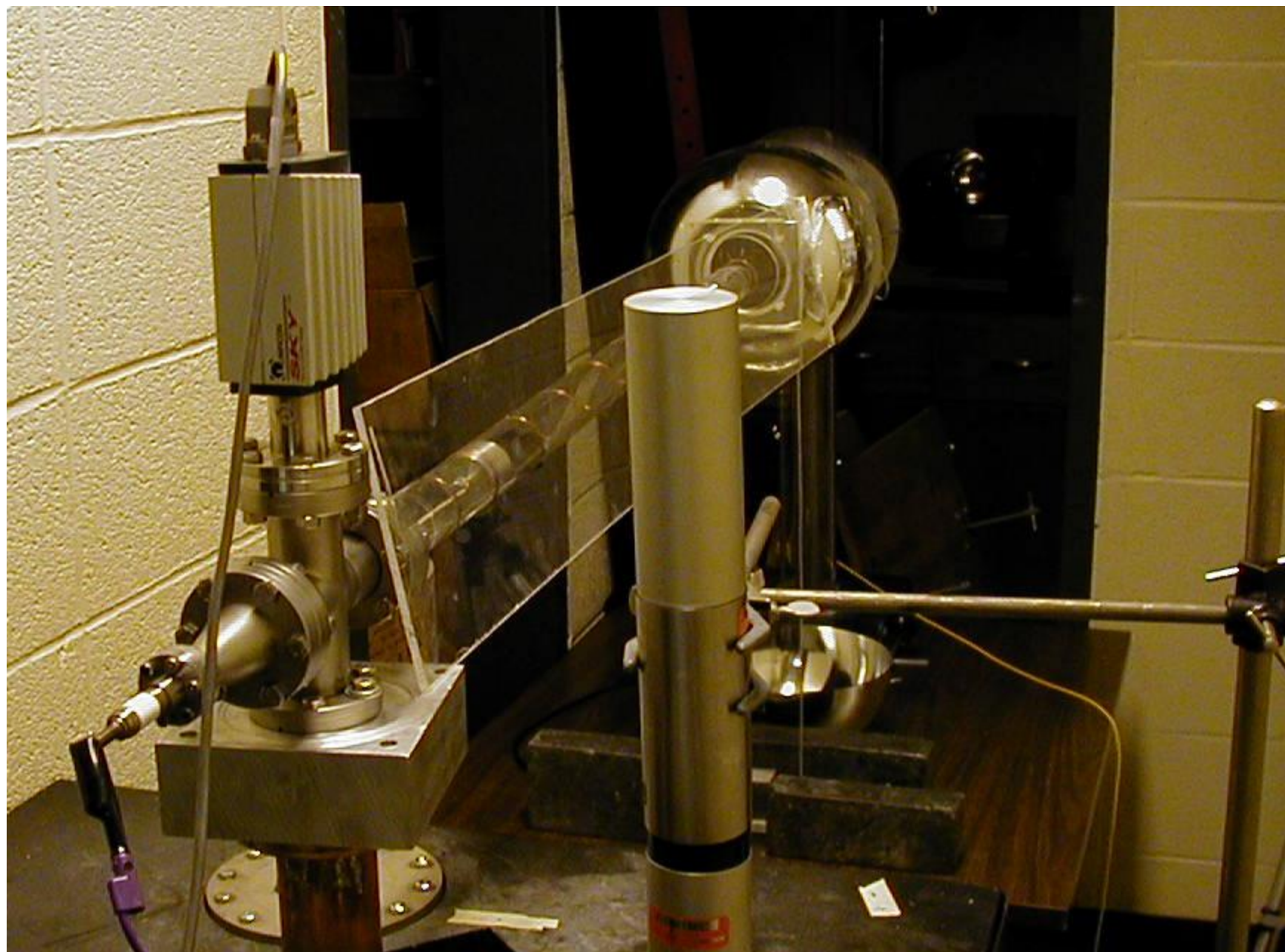
Electron Gun and Biasing

- Cathode
- Biasing

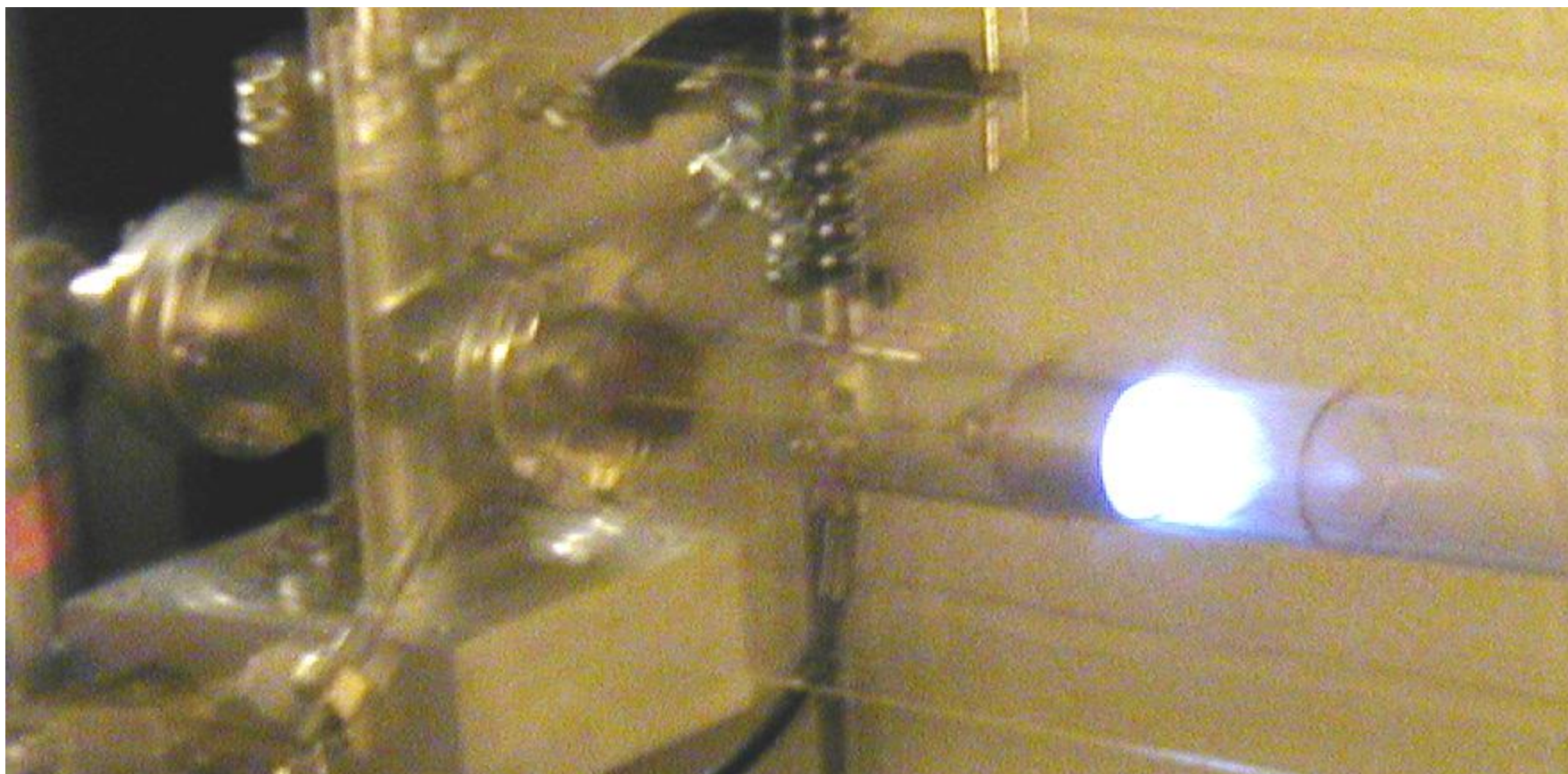


Apparatus

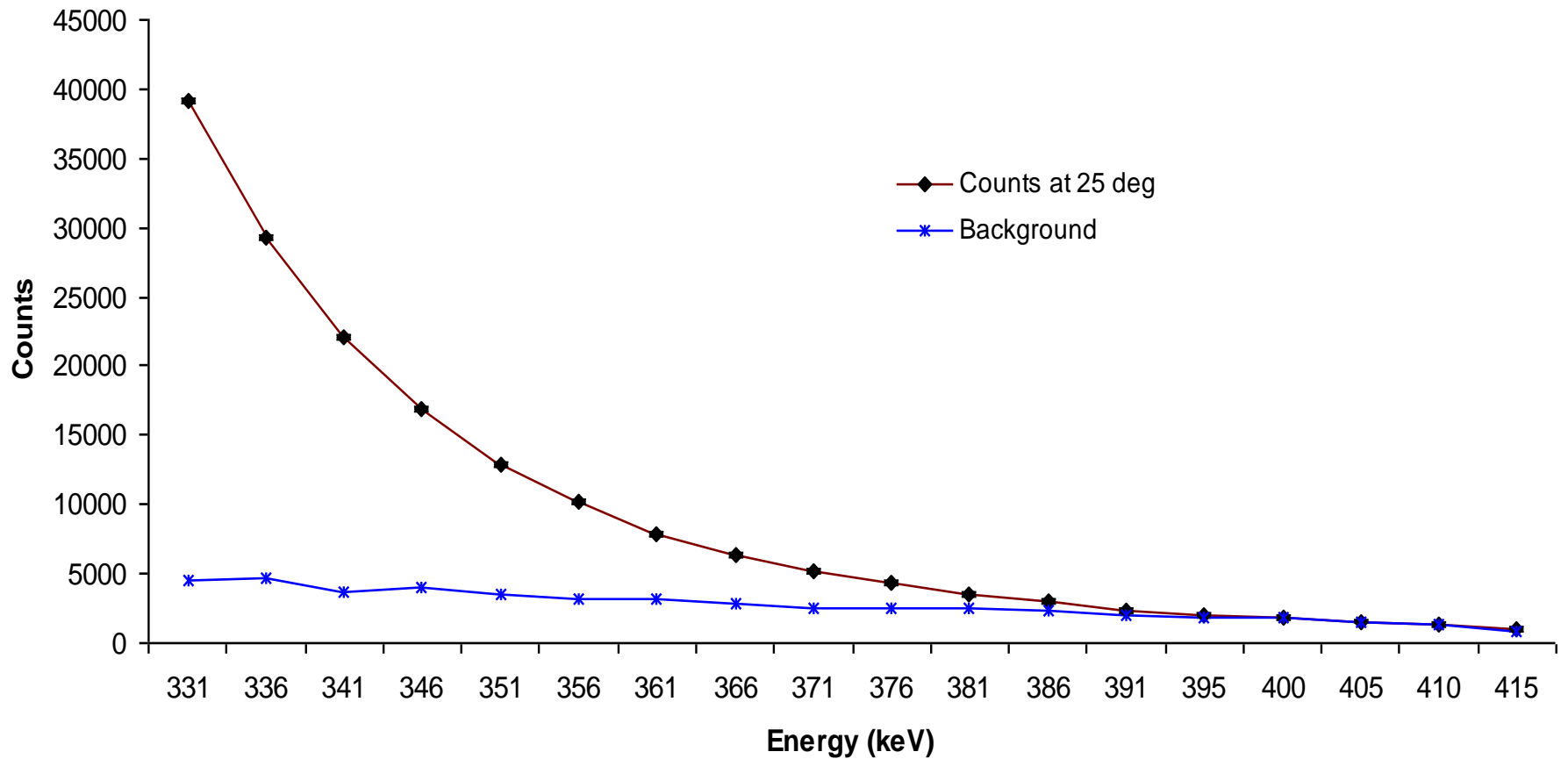




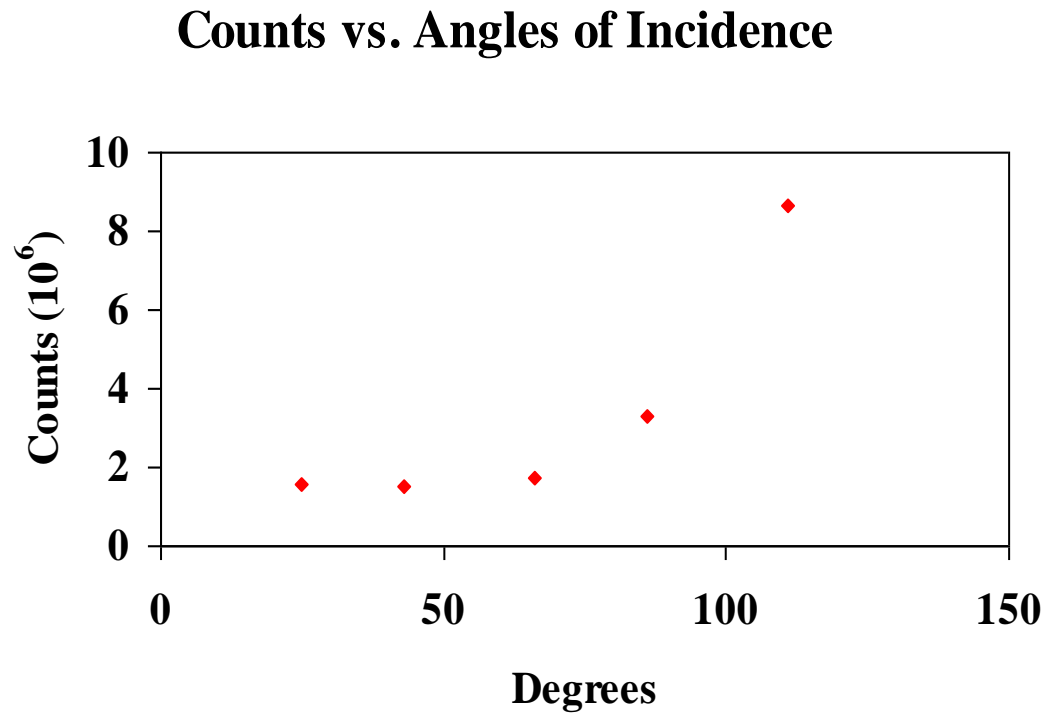
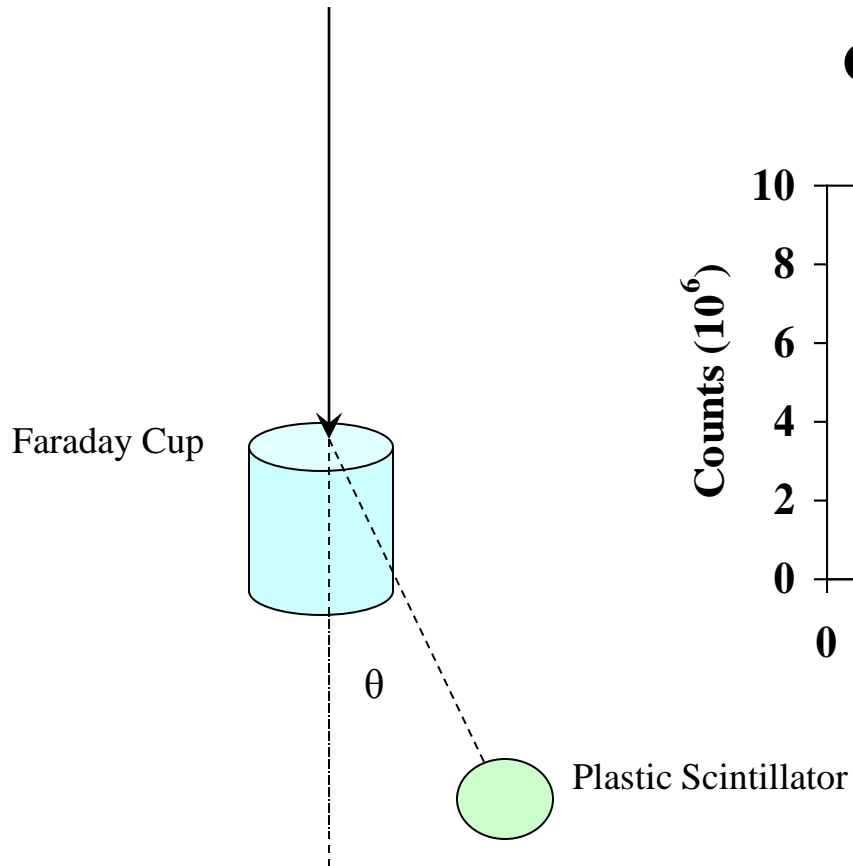
Higher Voltage Operation



Preliminary Results



Preliminary Results



Future and Conclusion

- High Voltage Discharging Near Cathode
- Equipotential Rings
- Neutron and Ion Source