Effects of weak vacuum on triboelectric charging and x-ray emissions of colliding particles.

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Background

• The triboelectric effect: charging due to collisions
• Believed to be the reason for lightning in thunder and sand storms
• Yet poorly understood
• Release x-rays when occur in a vacuum.
Apparatus

(Far Left): The previous incarnation made of acrylic with thin aluminum plates
(Left) the newer model with a glass cylinder and thick aluminum plates.

(Right): The whole system.
- Oscilloscope
- Shaker
- Cell
- Vacuum tubing
- Filter (hidden)
- Pump
Results

Shaking the cell in atmospheric pressure vs in 20 milli-torr vacuum

- Loss of gaseous particles might have caused the lower voltage
- Pressure has more of an effect on voltage than humidity does
- Fluctuations in voltage for vacuum system are not understood
X-Rays and Future Studies

• Calibrated for Cadmium-109, 88keV X-rays
• Found no significant difference in background rate and rate when shaking

• Future Work
  – Test for lower energy x-rays
  – Determine if there is a difference in charging when going from atmospheric pressure to vacuum and the opposite
  – Determine what the relation is between level of vacuum and voltage
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