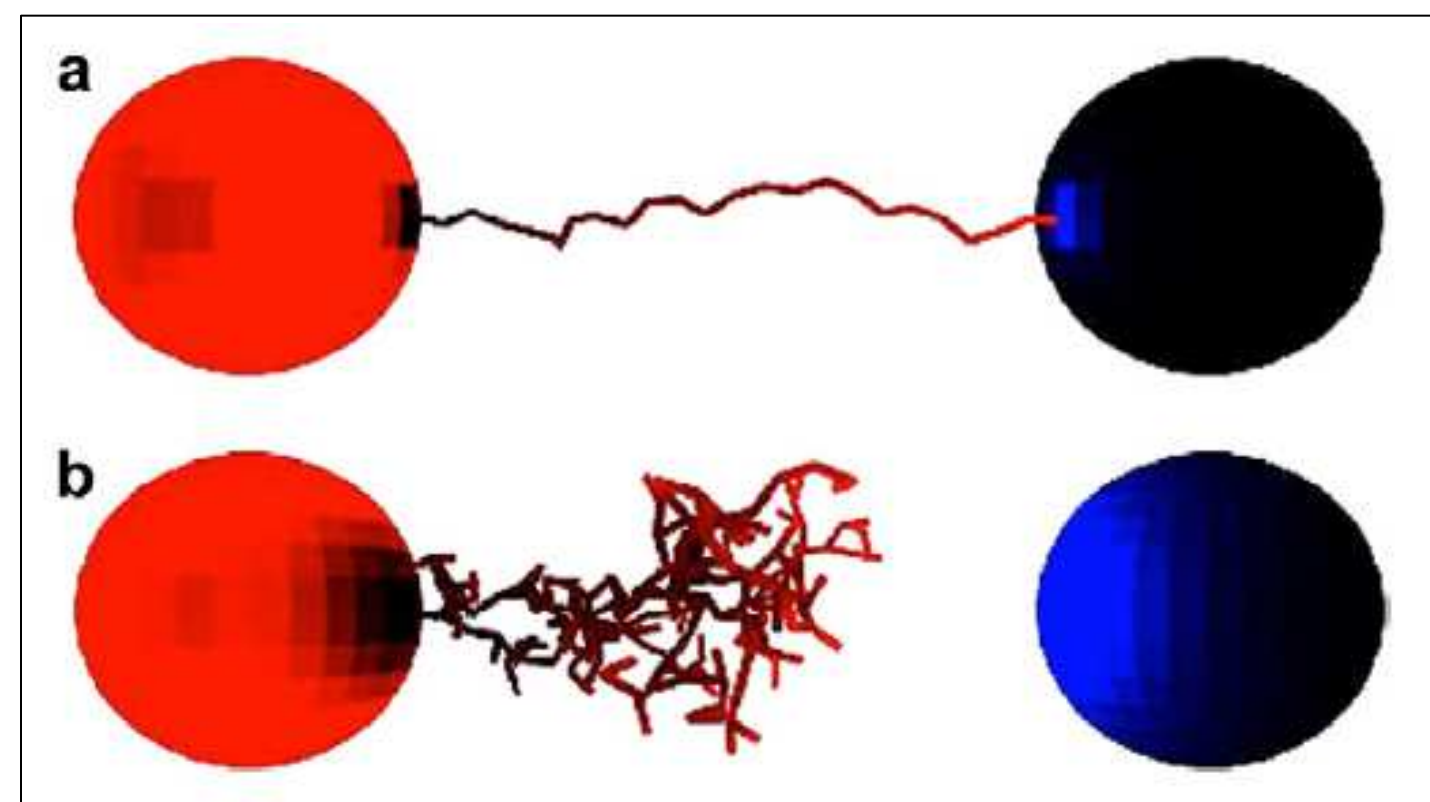


The Power of Electrostatics – Van de Graaff Generator

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Motivation for research:



- Based on [1]:
 - Cold, non-turbulent atmosphere
 - Hot, turbulent atmosphere
- Also, a desire to better understand how the variables of a VDG generator (dome distance, frequency of discharge, belt speed, etc) relate to each other.

Frequency Experiment:

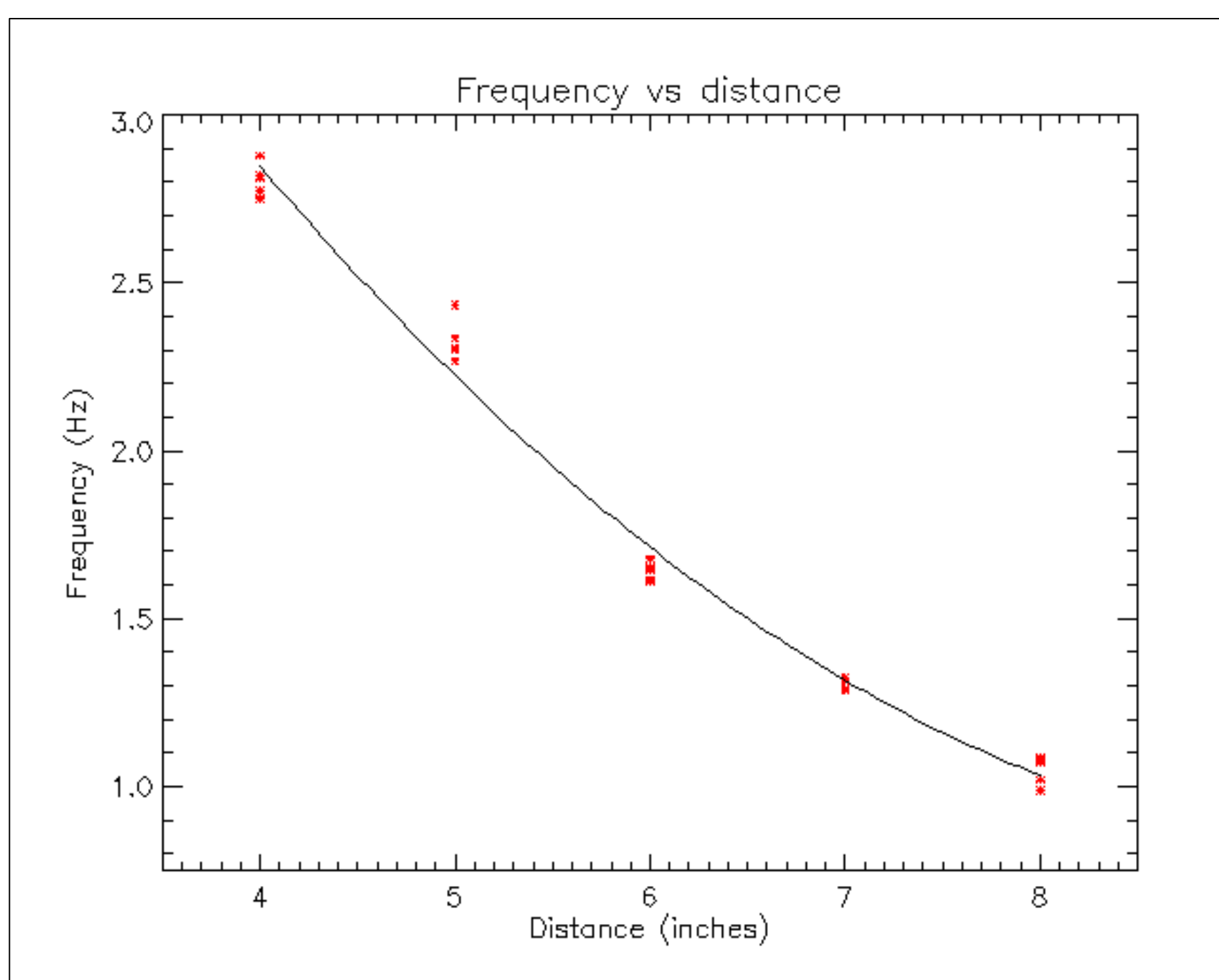


Figure 1: Frequency vs distance plot for the frequency experiment.

- Results:**
 - Line of best fit: $0.052x^2 - 1.1x + 6.5$
 - Unreduced chi-squared value: 0.02 (weighted sum of squared errors)
- Also performed frequency vs belt speed and current vs belt speed experiments.

References:

- Berkopec, Ales, and Slivnik, Tomaz. "Estimation of W_0/W_T ratio for cloud-to-ground lightnings." *Journal of Electrostatics* 68 (2010) 337-344. Web.

Acknowledgements

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Spark Geometry Experiment:

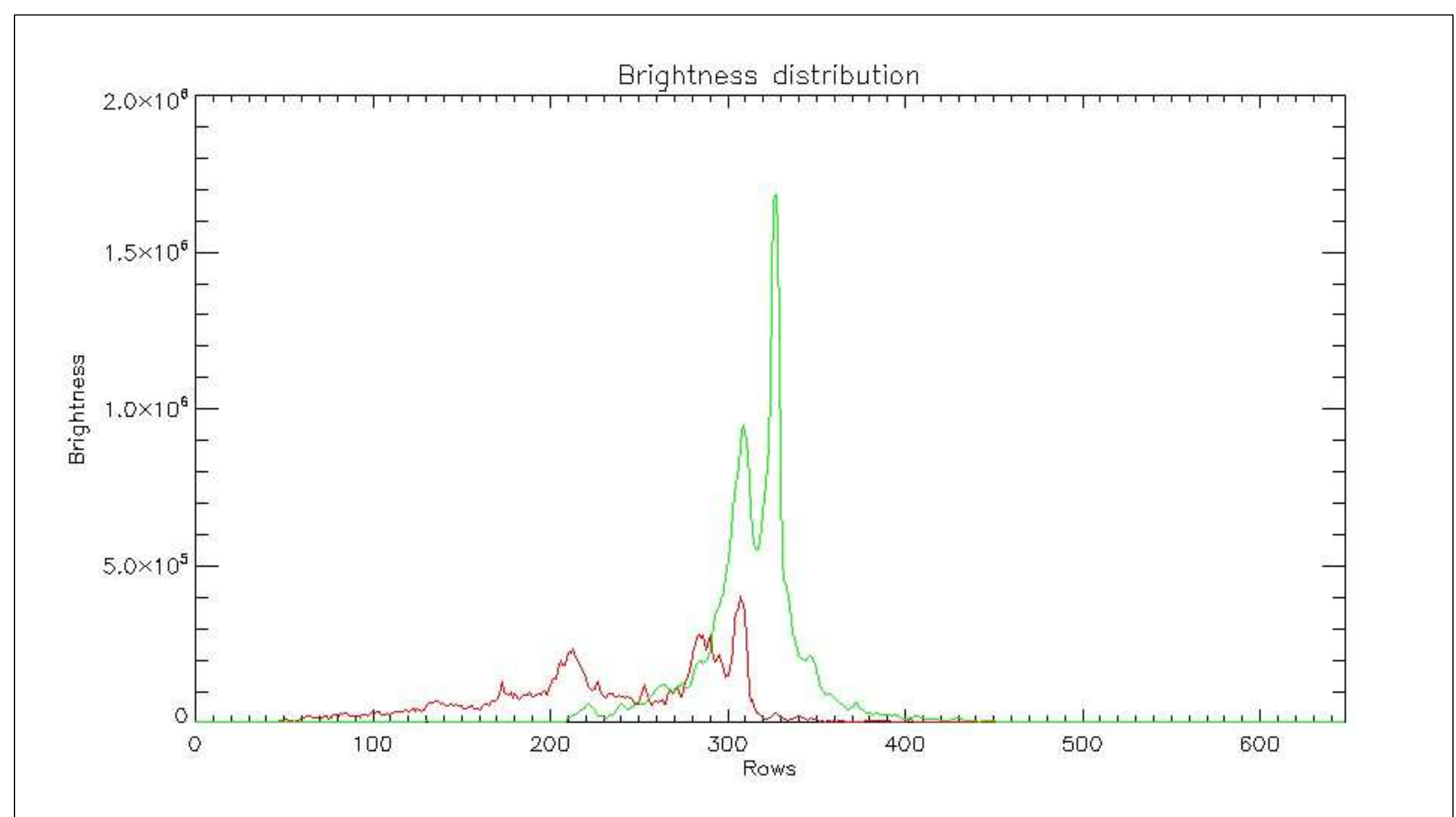


Figure 2: Brightness distribution for the spark experiment.

- Results:**
 - "Fan on" data (red):

Percentile	25	50	75
Row	193	240	292
 - "Fan off" data (green):

Percentile	25	50	75
Row	303	318	329
- The total brightness is about 80% higher in the "fan off" trial due to a loss of focus in the camera.

Future Testing/Analysis:

- Frequency experiment:**
 - Repeat with a different size VDG.
 - Compare results with theoretical equations.
- Spark geometry experiment:**
 - Repeat trials several times with different size VDGs.
 - Repeat the experiment for different distances between the domes.
 - Test for other atmospheric conditions: temperature, pressure.
- Other experiments:**
 - Orientation experiment.
 - Water-drop experiment.

