Build Your Own Electric Field Demonstrator

May 14, 2011

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Abstract

I have reviewed some of the methods surrounding the “Grass Seeds in Mineral Oil” Electric Field Demonstration and am advocating for a simpler, user-friendly, inexpensive method that enables a more interactive and engaging demonstration.

I have also focused on utilizing freely available materials so that this apparatus can be produced with likely zero additional cost to the teacher.
Some Grass E-Field Images (these ones are in vegetable oil).
Introduction & Motivation

Despite having taught physics for several years previous, I had neither performed nor witnessed live the Electric Field Visualization Demonstration.

I have long known from textbook images and catalogues that such a demonstration existed, but resisted in attempting it because I had thought that the demo involved some fancy equipment or techniques.

continued…
Introduction & Motivation

Upon purchasing one of the E-Field Demonstrators, I found that the demo enriched my instruction and improved my students’ visualization of the Electric Field.

I also realized that this exciting demo could have been easily constructed with materials I already had lying around the classroom.

Therefore, with a little advice, I will show that one can easily replicate the same results as the catalogue ordered design.

Also I have some TIPS for how to get the best results.
Past Methods vs. Updated Methods

Past Methods

• Grass Seeds (grey dots)

• Mineral Oil (clear)

• HV Source or Wimshurst or HV Gun

• Overhead Projector
Past Methods vs. Updated Methods

Past Methods

- Grass Seeds (grey dots)
- Mineral Oil (clear)
- HV Source or Wimshurst or HV Gun
- Overhead Projector

RESULT: A stagnant, clear image
Past Methods vs. Updated Methods

Updated Method

• Lettuce Seeds (black, pointy)

• Vegetable Oil (yellow, like amber)

• Van de Graaff

• Microscope Cam & LCD Projector
Past Methods vs. Updated Methods

Updated Method

- Lettuce Seeds (black, pointy)
- Vegetable Oil (yellow, like amber)
- Van De Graff
- Microscope Cam & LCD Projector

RESULT: A moving, interactive image
Experimental Set up
Experimental Setup - Detail
Experimental Set up – Camera View
Examples: Capacitor
Examples: Capacitor
Examples: Monopole
Examples: Pole & Capacitor Plate
Examples: Dipole
Examples: No E-Field in a Conductor
Making the Home Made Version

Materials

• Van de Graaff and clips
• Small Grounding Sphere
• Brass (looking) Hanger
• Styrofoam cups
• Petri Dish
• White Paper
• Lettuce Seeds
Constructing Simple Electrodes:

Point Charge
Constructing Simple Electrodes:

Capacitor
Constructing Simple Electrodes: Round
Experimental set up: Home-Made DIY
Experimental set up: Home-made DIY

Demonstration?
Tips for Successful Demonstrations

1. *How to bend & break a hanger – do it again & again

2. Place white paper underneath the dish – for camera

3. Hold a fluorescent light tube to drain off the charge

4. *An Arc should occur between the electrodes -not wires

5. Don’t put too many seeds, they clump & image poorly.

6. Bend the hanger with pliers, students are happy to help.
thank you

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