Dielectric Constant

Group 12

Chirag Deshpande And Samyak Jain

Aim:

1. The relation between charge Q and voltage U is to be measured using a plate capacitor.

2. The electric constant e0 is to be determined from the relation measured under point 1.

3. The charge of a plate capacitor is to be measured as a function of the inverse of the distance between the plates, under constant voltage.

4. The relation between charge Q and voltage U is to be measured by means of a plate capacitor, between the plates of which different solid dielectric media are introduced. The corresponding dielectric constants are determined by comparison with measurements performed with air between the capacitor plates.

Apparatus:

Plate capacitor, Plastic plate, Glass plates f. current conductors, High-value resistor (10 MOhm) High voltage supply unit, Capacitor, Voltmeter, Connecting cord, Screened cable

Procedure:

1. The circuit was connected properly. The highly insulated capacitor plate was connected to the upper connector of the high voltage power supply over the 10 MΩ protective resistor.
2. The capacitor plates were set at particular distance and the capacitor was charged to 2.5 volts.
3. The corresponding voltage was measured after disconnecting the main supply.
4. The same procedure was repeated for different values of distance (d) between the capacitor plates.
5. In the second part the supply voltage(or the charge on the capacitor plates) was changed keeping the d fixed and the corresponding voltage was measured after disconnecting the main supply.
6. The same procedure was repeated for different values of supply voltage.
7. A dielectric made of plastic was then kept between the plates and steps 5 and 6 were repeated.
8. A glass dielectric was kept between the plates and steps 5 and 6 were repeated.

Observations:

Part 1 (when nothing was placed between capacitor plates and changing the distance in between)

|  |  |
| --- | --- |
| Distance(d)(cm) | voltage (observed)(V) |
| 0.4 | 1.4 |
| 0.5 | 0.12 |
| 0.6 | 0.09 |
| 0.7 | 0.08 |
| 0.8 | 0.06 |
| 0.9 | 0.05 |
| 1 | 0.04 |
| 1.1 | 0.03 |
| 1.2 | 0.02 |

Part 2 (when nothing was placed between capacitor plates and without changing the distance in between)

|  |  |  |
| --- | --- | --- |
| voltage(power supply)(kV) | voltage (observed)(V) | D=0.5cm |
| 0 | 0 |  |
| 0.2 | 0.03 |  |
| 0.4 | 0.05 |  |
| 0.6 | 0.08 |  |
| 0.8 | 0.11 |  |
| 1 | 0.15 |  |
| 1.2 | 0.19 |  |

Part 3 (when plastic plate is kept in between the capacitor plates)

|  |  |  |  |
| --- | --- | --- | --- |
| voltage(power supply)(kV) | voltage (observed)(V) | D=1cm | for plastic |
| 0 | 0 |  |  |
| 0.2 | 0.04 |  |  |
| 0.4 | 0.07 |  |  |
| 0.6 | 0.1 |  |  |
| 0.8 | 0.12 |  |  |
| 1 | 0.16 |  |  |
| 1.2 | 0.21 |  |  |

Part 4 (when glass plate is kept in between the capacitor plates)

|  |  |  |
| --- | --- | --- |
| voltage(power supply)(kV) | voltage (observed)(V) | D=0.4cm |
| 0 | 0 |  |
| 1 | 0.96 |  |

Graphs:

Part 1

Part 2 and 3

Blue line for part 2

Red line for part 3

Precautions:

1. Correct measurement of the initial voltage is to be assured by the corresponding adjustment of the toggle switch on the unit.
2. Be sure not to be near the capacitor during measurements, as otherwise the electric field of the capacitor might be distorted.