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**Electron Gun – Effects of Magnetic Field**

**Objective**

To observe the effect of a magnetic field on the motion of electrons and to show relationship between the magnetic field strength and deflection of electrons.

**Procedure**

An electron gun is placed between two coils. Then, voltage is introduced in the gun and in the coils. The coils have resistance to it. So according to ohm’s law current is produced in the coils, which create its own magnetic field. Due to this magnetic field the point on the screen of the gun is deflected. Same procedure is repeated using different deflecting voltages.

**Data/ Results:**

∆y: distance electron is deflected (mm)

**X**: voltage ratio

k: tube constant (mm)

∆: accelerating voltage (V)

∆: deflecting voltage (V)

=>**X**= => k=

**Note:** The point in the electron gun disappeared after deflecting 15mm and -15mm. So the readings in the data provided are up to 14mm and -14mm.

**Data # 1: ∆Va= V**

|  |  |  |  |
| --- | --- | --- | --- |
| **∆y(mm)** | **∆Vd(V)** | **X=** | **k=** |
| 14 | .825 | .0491 | 285.132 |
| 10 | .607 | .0361 | 277.008 |
| 8 | .477 | .0284 | 281.700 |
| 4 | .240 | .0143 | 279.720 |
| 2 | .132 | .0079 | 253.164 |
| 0 | 0 | 0 | 0 |
| -2 | -.132 | -.0079 | 253.164 |
| -4 | -.275 | -.0164 | 243.602 |
| -8 | -.519 | -.0309 | 258.900 |
| -10 | -.645 | -.0384 | 260.416 |
| -14 | -.886 | -.0527 | 265.654 |

Total of tube constant k = 2658.46

Tube constant k average=mm

**Data # 2: ∆Va=**

|  |  |  |  |
| --- | --- | --- | --- |
| **∆y(mm)** | **∆Vd(V)** | **X=** | **k=(mm)** |
| 14 | 1.091 | .0531 | 263.653 |
| 10 | .774 | .0377 | 265.252 |
| 8 | .681 | .0331 | 241.692 |
| 4 | .320 | .0156 | 256.410 |
| 2 | .171 | .0083 | 240.964 |
| 0 | 0 | 0 | 0 |
| -2 | -.147 | -.0071 | 281.690 |
| -4 | -.314 | -.0153 | 261.438 |
| -8 | -.675 | -.0329 | 243.161 |
| -10 | -.775 | -.0377 | 265.252 |
| -14 | -1.087 | -.0529 | 264.650 |

Total of tube constant k = 2557.722

Tube constant k average=mm

**Data # 3: ∆Va=**

|  |  |  |  |
| --- | --- | --- | --- |
| **∆y(mm)** | **∆Vd(V)** | **X=** | **k=** |
| 14 | 1.214 | .0510 | 274.510 |
| 10 | .951 | .0400 | 250.000 |
| 8 | .779 | .0328 | 243.902 |
| 4 | .361 | .0152 | 263.158 |
| 2 | .218 | .0092 | 217.391 |
| 0 | 0 | 0 | 0 |
| -2 | -.215 | -.0090 | 222.222 |
| -4 | -.344 | -.0145 | 275.862 |
| -8 | -.717 | -.0302 | 264.900 |
| -10 | -.900 | -.0379 | 263.852 |
| -14 | -1.25 | -.0526 | 266.160 |

Total of tube constant k = 2541.956 mm

Tube constant k average=

**Conclusion:**

It is clear from the data that accelerated voltage is directly proportional to the deflection of electrons. So, as the accelerated voltage increases in the coil the current produced increases which results in increases in magnetic field. As the magnetic field increases the electrons are deflected more. So we can conclude that magnetic field is directly proportional to the deflection of electrons.