EE236: Electronic Devices Lab
Lab No.8

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1 Hall Effect:-

1.1 Aim:-

- To observe the output voltage of the hall effect sensor with varying distancesfor different magnetic strengths.
- Determine the strength of a given bar magnet.
- Calculate the doping concentration of the hall element within the sensor.

1.2 Design

The hall effect sensor was provided supply voltage as well as ground. Then the bar magnet's distance was varied from the sensor.

1.3 Formulae

The longitudinal Field

$$E_{long} = \frac{V_{in}}{a} \tag{1}$$

The Lateral Electric Field

$$E_{lat} = \frac{|V_{out,0} - V_{out,max}|}{a} \quad (2)$$

B, the magnetic field strength in Tesla

$$B = \frac{E_{lat}}{3.\mu.E_{long}} \tag{3}$$

Hall coefficient, R_H

$$R_H = \frac{V_{out,max}.t}{I_{in}.B} \tag{4}$$

Doping Concentration, N

$$N = \frac{1}{R_H.e} \tag{5}$$

1.3.1 Results

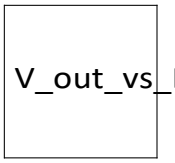

Figure 1: V_{out}(V) vs Distance(cm)

Using the above equations, with the values

Table 1: Given Values

Parameter	Value
a	0.53 mm
V_{in}	8 V
μ	0.8 m^2/Vs
t	0.053 mm
e	1.6×10^{-19}
$V_{out,0}$	1.005 V
$V_{out,max}$	2 V

The final results are as follows

Table 2: Given Parameters

Parameter	Value
E_{long}	15094.33962
E_{lat}	1877.358491
B	0.05182291667
R_H	0.78069738
N	8.00566×10^{18}

1.4 Conclusion

From the observed data, we can infer that

- Regardless of polarity and magnetic strength, the output voltage is 1V at nearly 15cm distance from the sensor.
- For a particular polarity the output voltage is maximum, when closest to the sensor and minimum when the polarity is reversed.
- Higher strength magnetic field follows the curve with higher values for a particular distance.