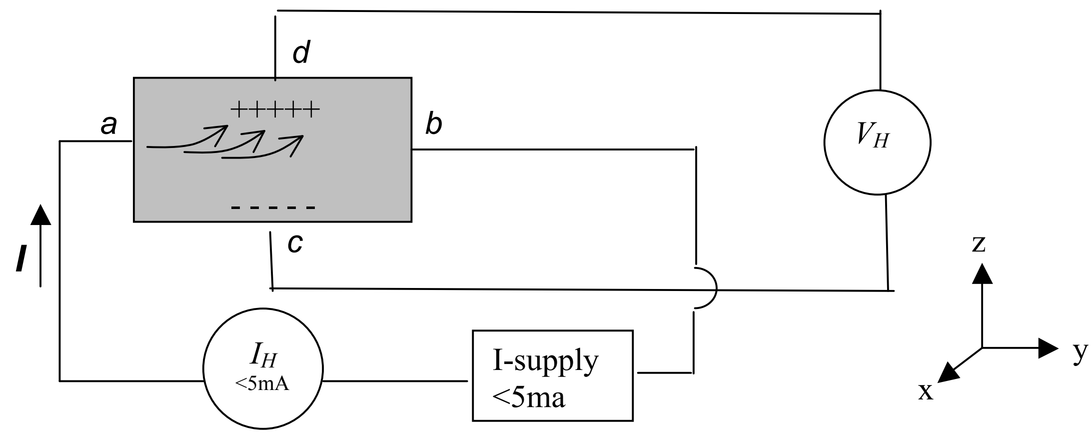
Lab - HALL EFFECT in p-Ge



In this experiment we measure the Hall effect in a p-Ge sample. The sample is placed in a ~250mT magnetic field perpendicular to its surface. A drift current I_H is supplied to the sample *a* to *b*. The resultant Hall voltage V_H is measured from points *c* to *d* as a function of current I_H . The sign of V_H indicates the dominant charge carrier (V_H >0 p-type , V_H <0 n-type) which contributes to the Hall voltage,

$$V_H = \boldsymbol{I} \, (\boldsymbol{B} / n \, q \, t) \tag{1}$$

Equipment

- Drift Current Supply (0-5 mA)
- Magnet Power Supply (0-15V)
- DMM V_H
- DMM I_H
- p-Germanium sample (t = 1mm)

Procedure

1) Measure V_H with magnet and drift current off (I_H=0).

B = 0 T V_H = ___________ I_H = ___________

2) Power the magnet to +13 V , resulting in a gap magnetic field of about B = 250mT = 2500G. Measure this in situ. B = _________ T (250mT)

3) Measure V_H vs I_H (0-5mA)

I (mA)	0.0	1.0	2.0	3.0	4.0	5.0
I_H *(mA)*						
V_H *(mV)*						

4) From Eqn, 1) $V_H = I \times (\boldsymbol{B} / n\,q\,t)$ plot V_H vs I and fit the slope to determine the Hall Coefficient n = #/m^3 at room temperature and the Hall coefficient $R_H=1/nq$.

$\bar{n}$ = ____________ +/- ______________

5) A 2nd method would be to solve for $n = I \times (\boldsymbol{B} / V_H\ q\ t)$ at each measurement with current I and to average the measurements to find $\bar{n}$ and $R_H=1/\bar{n}\,q$.

n = ____________ +/- ______________

6) Do methods 4) and 5) agree? Discuss.

SAMPLE DATA

	Data Set	
	IH (Amps)	VH (Volts)
1	0.00004	0.00000
2	0.00009	0.00003
3	0.00014	0.00007
4	0.00020	0.00011
5	0.00027	0.00018
6	0.00030	0.00020
7	0.00040	0.00028
8	0.00044	0.00032
9	0.00050	0.00035
10	0.00098	0.00069
11	0.00200	0.00133
12	0.00300	0.00198
13	0.00400	0.00258
14	0.00500	0.00320