

EE236 : Electronic Devices Lab

Lab 3 [Tuesday Batch]

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1 Part 1: Measurement of I-V characteristics

1.1 Part 1(a): Measurement of I-V characteristics in the dark

1.1.1 Values for reverse bias

V_{supply} (volt)	V_d (V)	I_d (mA)
0	-0.05	0
0.7	-0.12	0.01
1	-0.26	0.22
1.3	-0.31	0.58
1.5	-0.32	0.64
2	-0.32	0.65
4.3	-0.32	0.66
8	-0.32	0.67

1.1.2 Values for forward bias

$V_d(\text{V})$	$I_d(\text{mA})$
0.25	0.01
0.35	0.02
0.41	0.03
0.82	0.12
0.69	0.08
0.73	0.09
0.93	0.14
0.99	0.16
1.04	0.18
1.12	0.2
1.2	0.22
1.25	0.25
1.36	0.28
1.46	0.32
1.65	0.4
1.8	0.45
1.86	0.5
2.17	0.64
2.18	0.7
2.23	0.75

1.1.3 Plots

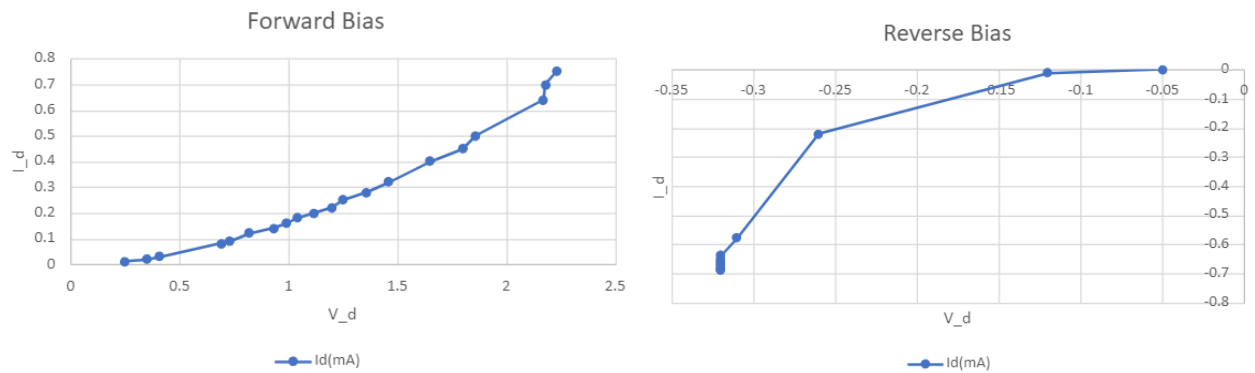


Figure 1: I-V Plots

1.2 Part 1(b): Measurement of I-V characteristics in the light

V_{supply}	$V_d(\text{V})$	$I_d(\text{mA})$
-2.1	1.33	-6.9
-1.9	1.18	-6.83
-1.6	0.91	-6.74
-1.3	0.59	-6.67
-1	0.32	-6.63
-0.8	0.1	-6.61
-0.7	-0.02	-6.6
-0.6	-0.11	-6.56
-0.3	-0.34	-5.69
-0.2	-0.37	-5.13
0	-0.39	-4.65
0.1	-0.43	-2.96
0.2	-0.44	-2.14
0.3	-0.44	-1.31
0.4	-0.44	-0.48
0.5	-0.44	0.37
0.6	-0.47	1.23
0.7	-0.47	2.09
0.8	-0.47	2.96
0.9	-0.47	3.93
1	-0.47	4.7
1.2	-0.49	6.46
1.4	-0.49	8.23
1.6	-0.49	10
1.8	-0.5	11.78
2	-0.51	13.59

Table 1: Green connection

Vsupply (V)	Vd (V)	Id (mA)
-2.0	1.41	-5.26
-1.8	1.23	-5.18
-1.6	1.03	-5.12
-1.4	0.83	-5.07
-1.2	0.65	-4.99
-1.0	0.45	-4.95
-0.9	0.35	-4.93
-0.8	0.26	-4.85
-0.7	0.15	-4.96
-0.6	0.05	-4.94
-0.5	-0.04	-4.92
-0.4	-0.13	-4.90
-0.3	-0.22	-4.77
-0.2	-0.29	-4.50
-0.1	-0.34	-4.01
0.0	-0.37	-3.36
0.1	-0.39	-2.69
0.2	-0.41	-1.93
0.3	-0.43	-1.14
0.4	-0.44	-0.34
0.5	-0.44	0.48
0.6	-0.45	1.32
0.7	-0.46	2.18
0.8	-0.47	3.03
0.9	-0.47	3.90
1.0	-0.47	4.77
1.2	-0.48	6.52
1.4	-0.49	8.28
1.6	-0.49	10.04
1.8	-0.49	11.81
2.0	-0.49	13.60

Table 2: Blue connection

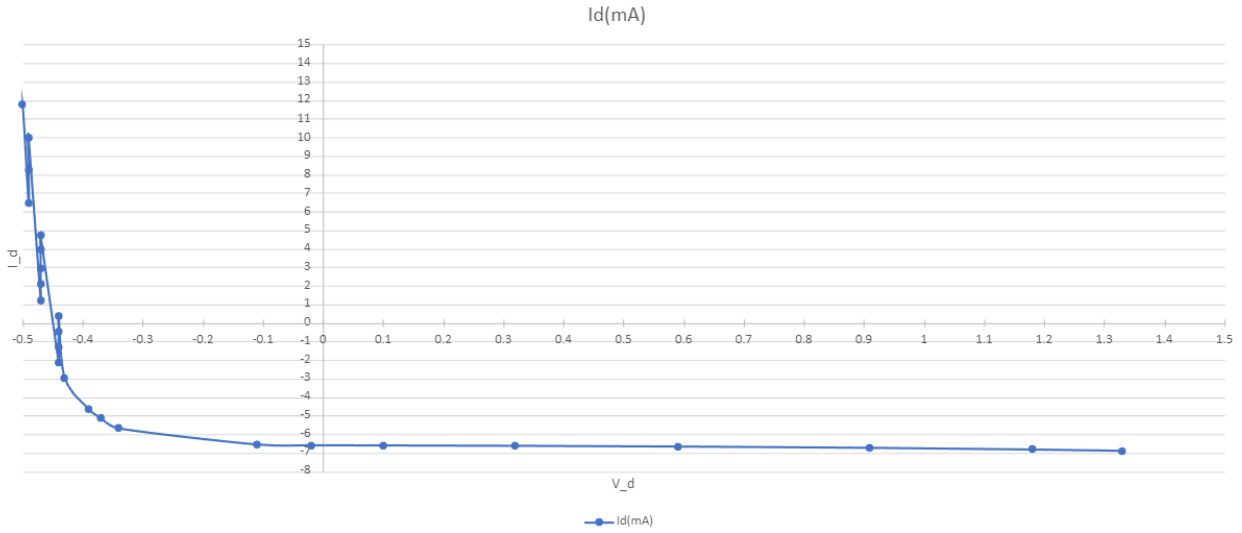


Figure 2: I-V Plots for I1

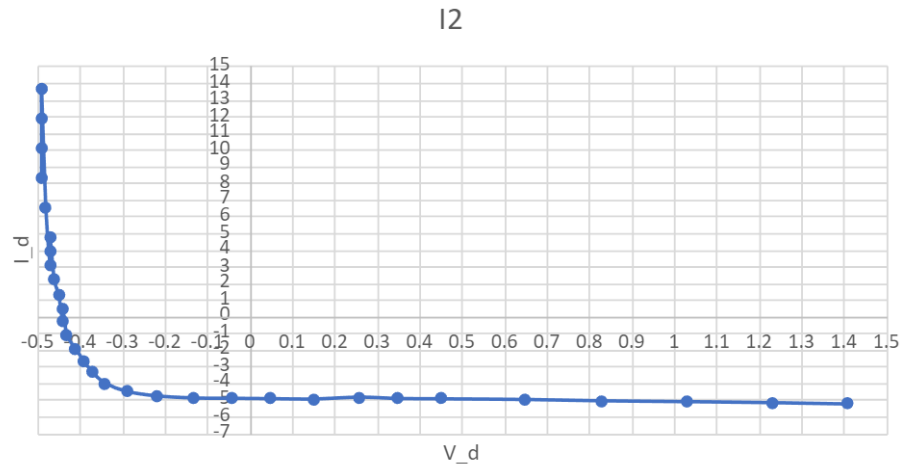


Figure 3: I-V plot for I2

2 Part 2: Solar Cell as Power Source

2.1 I1[Green]

$$I_{SC} = 5\text{mA}$$

$$V_{OC} = 0.44\text{V}$$

$V_d(V)$	$I_d(\text{mA})$
-0.44	0
-0.43	0.63
-0.43	0.81
-0.43	0.91
-0.42	1.02
-0.42	1.1
-0.42	1.2
-0.42	1.5
-0.41	1.88
-0.41	2
-0.41	2.2
-0.4	2.4
-0.39	2.7
-0.39	2.98
-0.38	3.2
-0.36	3.5
-0.34	3.95
-0.28	4.47
-0.27	4.57
-0.23	4.74
-0.1	4.8
-0.05	4.9

Table 3: Green connection

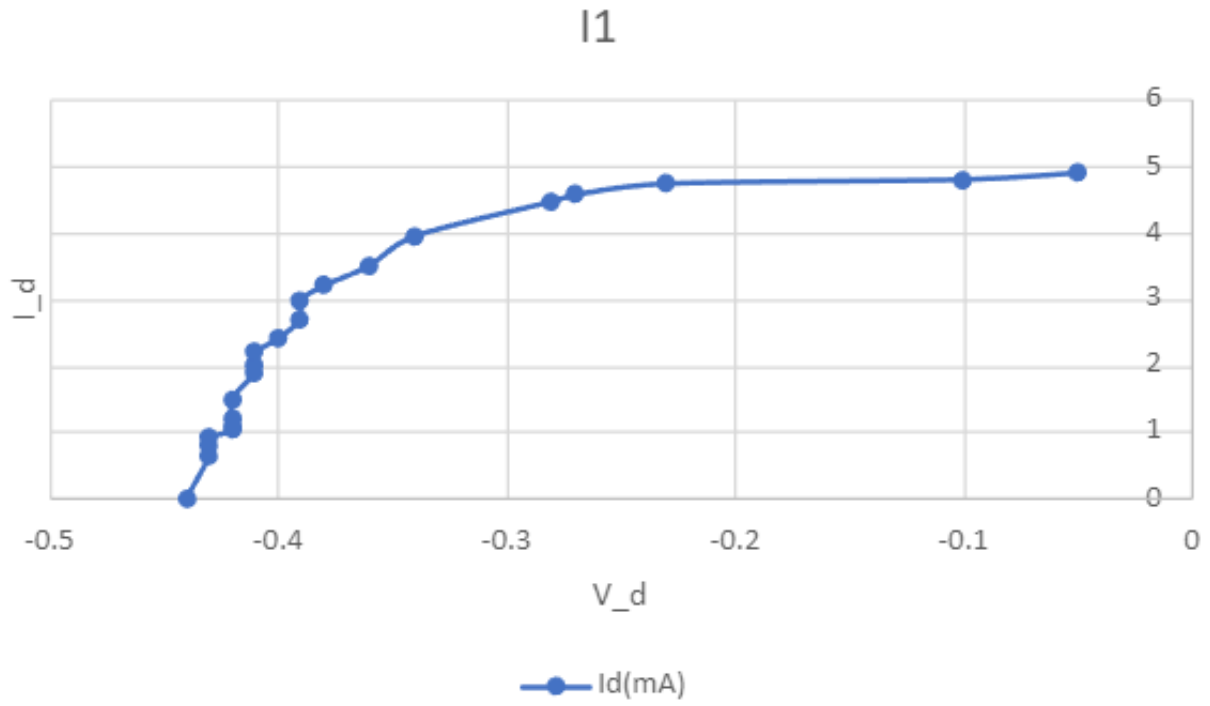


Figure 4: I_1

$$FF = \frac{I_{MP} \times V_{MP}}{I_{SC} \times V_{OC}} \quad (1)$$

$$FF = \frac{4.2 \times 0.32}{5 \times 0.44} \quad (2)$$

$$FF = 0.611 \quad (3)$$

The fill factor of the solar cell is 0.611.

2.2 I2[Blue]

$V_d(V)$	$I_d(\text{mA})$
-0.45	0.7
-0.45	0.9
-0.44	1.54
-0.44	2
-0.43	2.5
-0.42	3
-0.41	3.5
-0.4	4
-0.39	4.5
-0.36	5
-0.35	5.5
-0.3	6
-0.2	6.3
-0.13	6.5
-0.07	6.55

Table 4: Blue connection

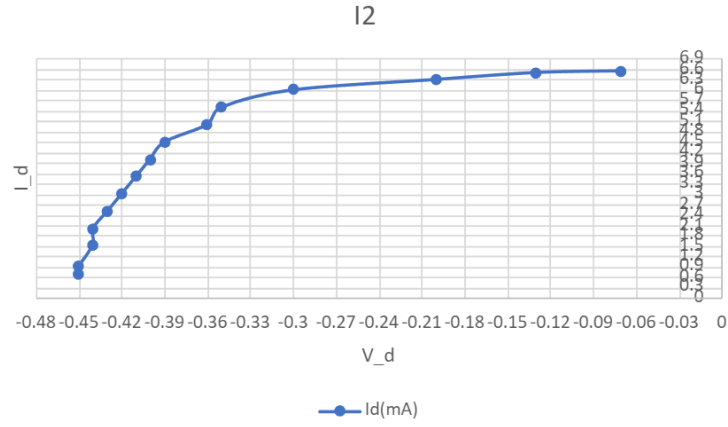


Figure 5: I2

$$I_{SC} = 6.6 \text{ mA}$$

$$V_{OC} = 0.45 \text{ V}$$

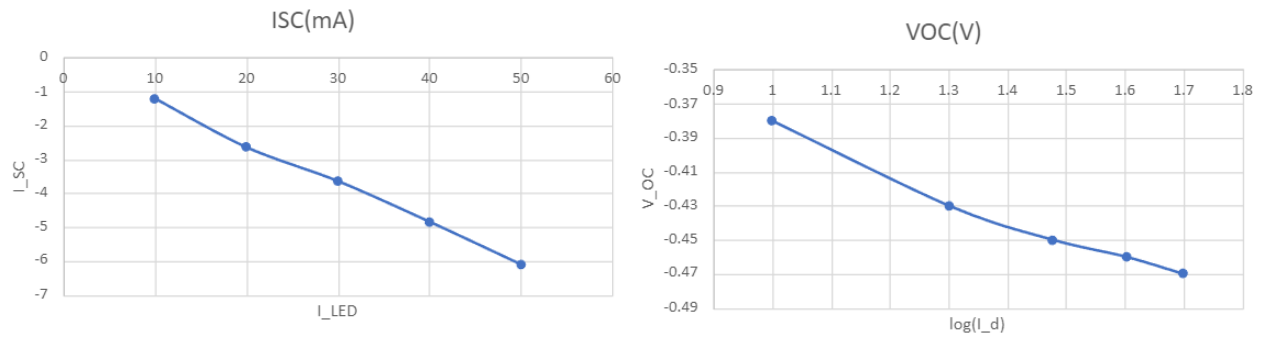
$$FF = \frac{I_{MP} \times V_{MP}}{I_{SC} \times V_{OC}} = \frac{5.7 \times 0.33}{6.6 \times 0.45} \quad (4)$$

$$= 0.6333333$$

The fill factor of the solar cell is **0.6333**.

3 Part 3: Measurement of V_{OC} and I_{SC} at different levels

$I_{LED}(\text{mA})$	$I_{SC}(\text{mA})$	$V_{OC}(\text{V})$
10	-1.2	-0.38
20	-2.64	-0.43
30	-3.64	-0.45
40	-4.84	-0.46
50	-6.1	-0.47



Clearly Visible that the curves (1) I_{SC} vs I_{LED} and (2) V_{OC} vs I_{LED} are both linear as in the plot

4 Experiment Completion Status

Successfully completed all the experiments on time and successfully completed the report.