

EE236: Experiment No.1

I-V characteristics of different diodes and finding the Ideality factor

Jahn timer Devangula,20D070025

August 20, 2022

1 Overview of the experiment

1.1 Aim of the experiment

To plot the I-V characteristics of a normal diode, zener diode and few colour LEDs and to observe their patterns and then to obtain the Ideality factor using the slope of the \ln curve.

1.2 Methods

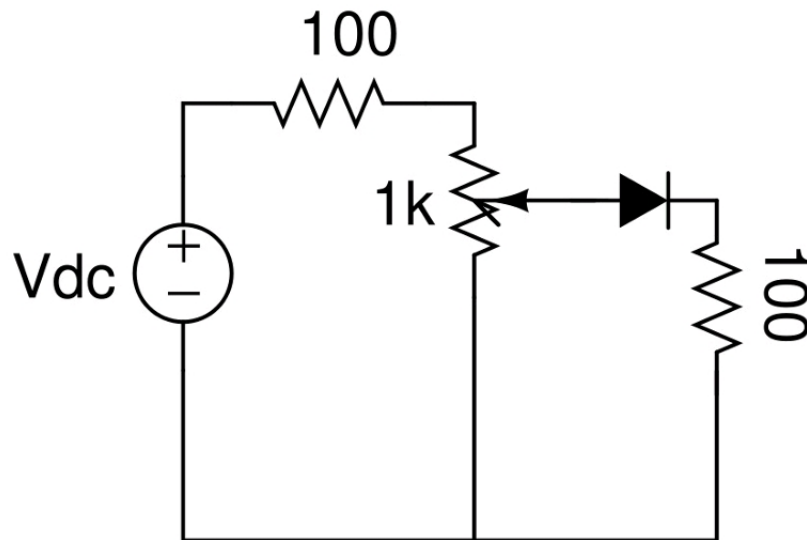
The voltage across the diode is varied using a potentiometer. Then the current and the voltage across the diodes is measured for different values of V . The voltages and corresponding currents through the diode are then plotted in a $\ln(I_D)$ vs V_D curve. Slope can be calculated from the graph. Ideality factor can be found using the formulae below.

$$\ln(I_D/I_0) + E_g/KT = qV_d/nKT$$

(1)

2 Design

- 1) A voltage of +5v is connected to a 100ohm and 1Kohm in series.
- 2) Now our diode under observation and a 100ohm resistor in series are to be connected across the potentiometer.
- 3) Varying the potentiometer with small values of voltage across the diode, the voltage and current values through the diode are measured



3 Simulation results

3.1 Code snippet

```
Diode Charecterstics
.include red5mm.txt
.includewhite5mm.txt
.includeblue5mm.txt
.includeDiode1N914.txt
.includegreen5mm.txt
```

```

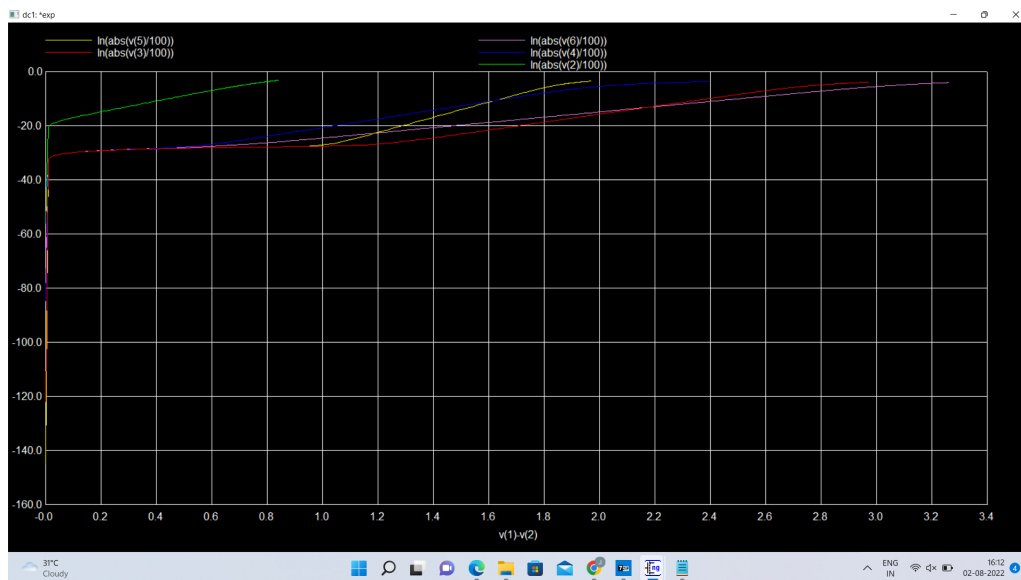
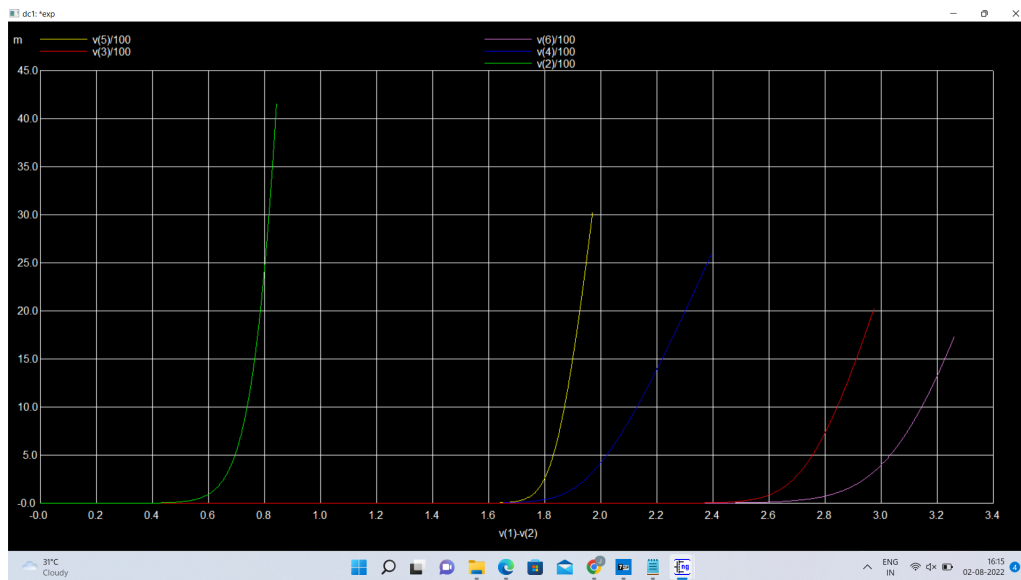
        r1 2 0 100
r2 3 0 100
r3 4 0 100
r4 5 0 100
r5 6 0 100

        d1 1 2 1N914
d2 1 3 BLUE
d3 1 4 GREEN
d4 1 5 RED
d5 1 6 WHITE

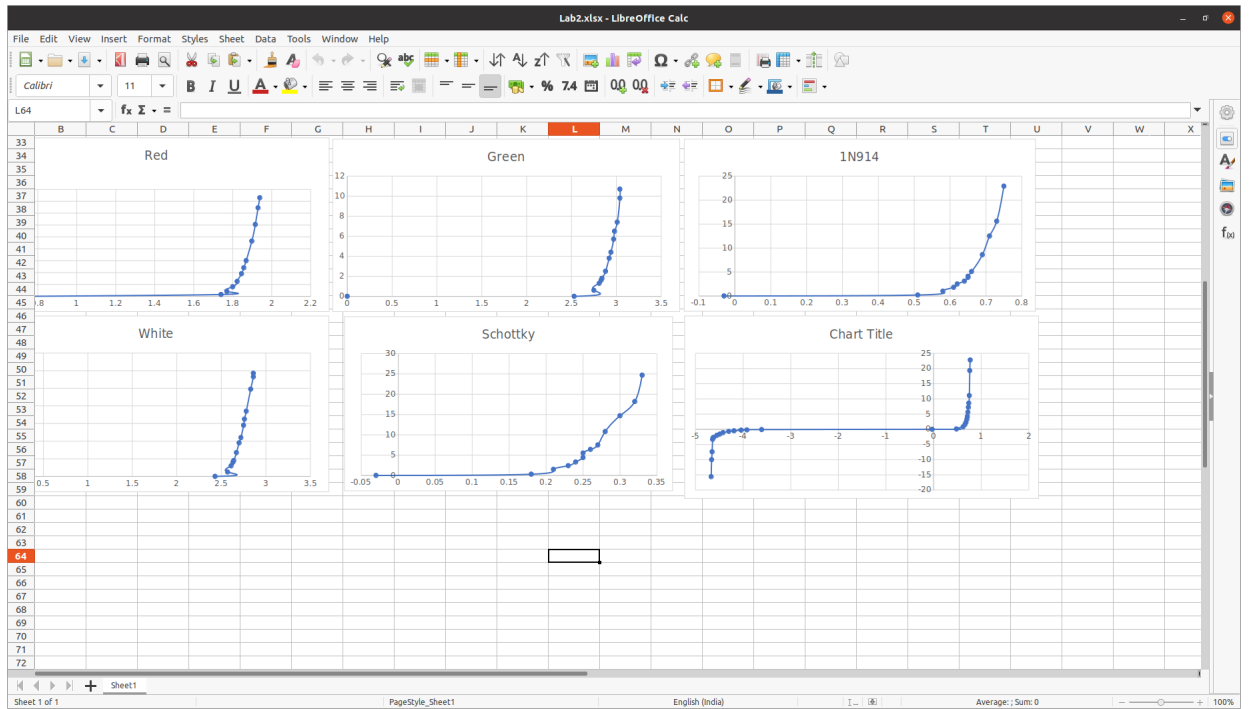
        vin 1 0 dc 0
.dc vin 0 5 0.01
.control
run
plot ln(abs(v(2)/100)) vs v(1)-v(2) ln(abs(v(3)/100)) vs v(1)-v(3) ln(abs(v(4)/100))
vs v(1)-v(4) ln(abs(v(5)/100)) vs v(1)-v(5) ln(abs(v(6)/100)) vs v(1)-v(6)
.endc
.end

```

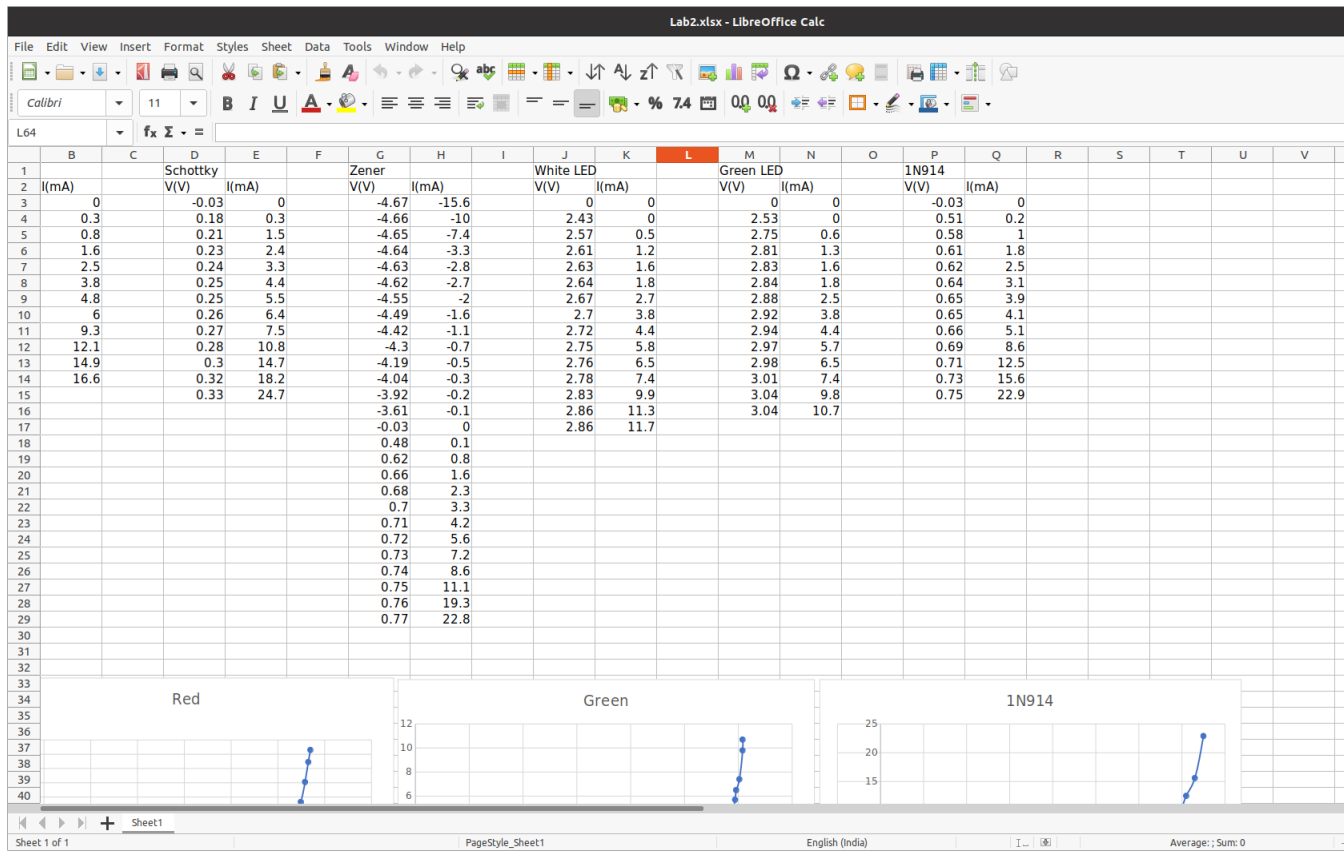
3.2 Simulation results



4 Experimental results



Values obtained are :



5 Experiment completion status

cutin voltages of simulation:

d1 0.6v

red 1.3v

blue 2.5v

green 1.85v

yellow 1.73

white 2.9v

cutin voltages of experiment:

d1 0.5v

red 1.5v

blue 2.2v

green 1.3v

yellow 1.75

white 2.4v

Ideality factor:

White - 1.63

Green - 1.45

Blue - 1.49

Red - 1.47