Experiment No. 7 c) **Date :**	**CHARACTERISTICS OF BJT (CE CONFIGURATION)**
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Register Number:	**RA2011026010022**
Date of Experiment:	**10.12.2020**
Date of submission:	**14.12.2020**

Aim

To plot the transistor (BJT) characteristics of CE configuration.

Apparatus Required

S.No.	Name	Range	Qty
1	R.P.S	(0-30)V	2
2	Ammeter	(0–30) mA MC	1
		(0–250) µA MC	1
3	Voltmeter	(0–30)V MC	1
		(0–1)V MC	1

Components Required

S.No.	Name	Range	Qty
1	Transistor	BC 107	1
2	Resistor	10 K	1
	Resistor	1 K	1
3	Bread Board		1
4	Wires		

Theory

A BJT is a three terminal two – junction semiconductor device in which the conduction is due to both the charge carrier. Hence it is a bipolar device. BJT is classified into two types – NPN & PNP. A NPN transistor consists of two N types in between which a layer of P is sandwiched. The transistor consists of three terminal emitter, collector and base. The emitter layer is the source of the charge carriers and it is heavily doped with a moderate cross sectional area. The collector collects the charge carries and hence moderate doping

and large cross sectional area. The base region acts a path for the movement of the charge carriers. In order to reduce the recombination of holes and electrons the base region is lightly doped and is of hollow cross sectional area. Normally the transistor operates with the EB (emitter-base) junction forward biased.

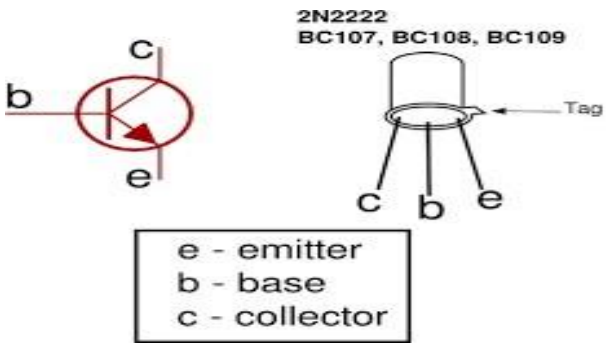
Procedure

Input Characteristics

1. Connect the circuit as per the circuit diagram.
2. Set V_{CE}, vary V_{BE} in regular interval of steps and note down the corresponding I_B reading. Repeat the above procedure for different values of V_{CE}.
3. Plot the graph: V_{BE} Vs I_B for a constant V_{CE}. **Output Characteristics**

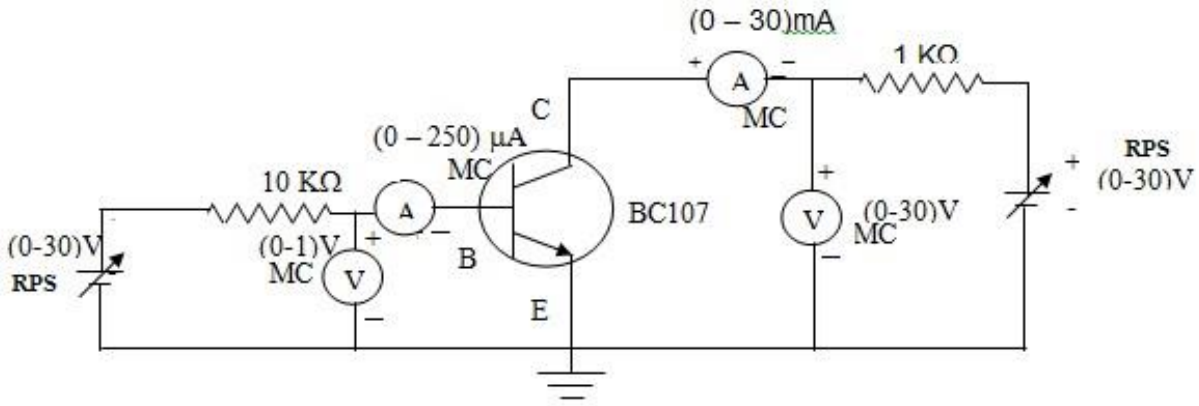
1. Connect the circuit as per the circuit diagram.
2. Set I_B, Vary V_{CE} in regular interval of steps and note down the corresponding I_C reading. Repeat the above procedure for different values of I_B.
3. Plot the graph: V_{CE} Vs I_C for a constant I_B.

Pin Diagram



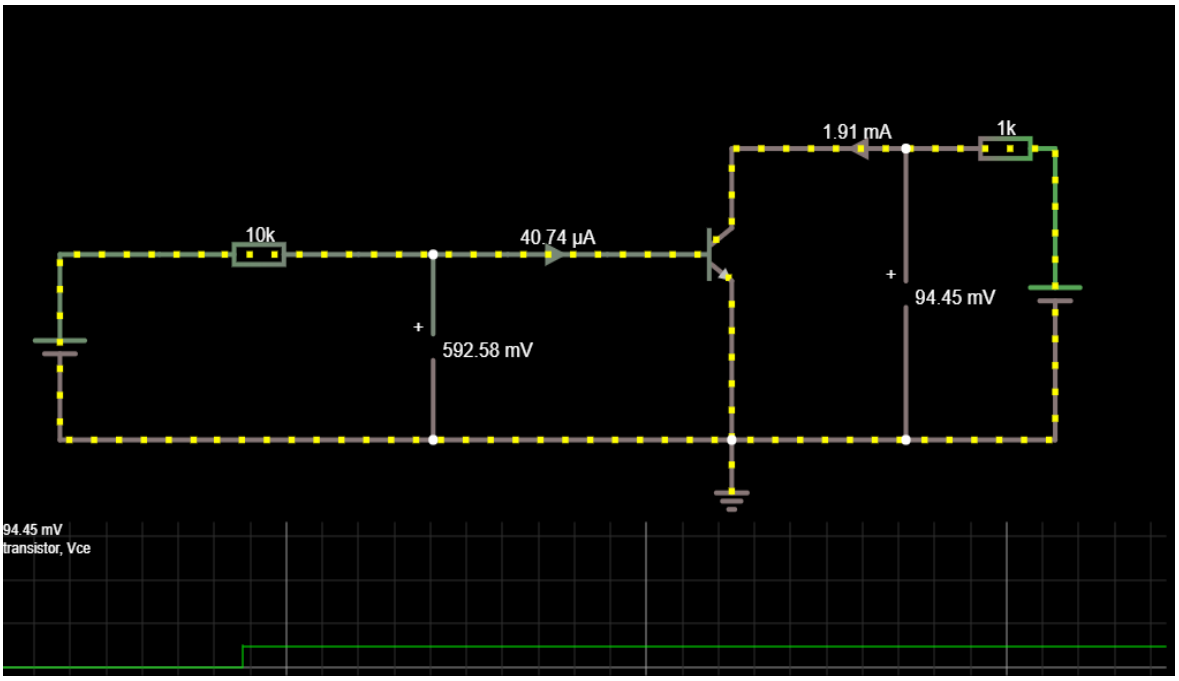
Specification: BC107/50V/0.1A,0.3W,300 MH

Circuit Diagram

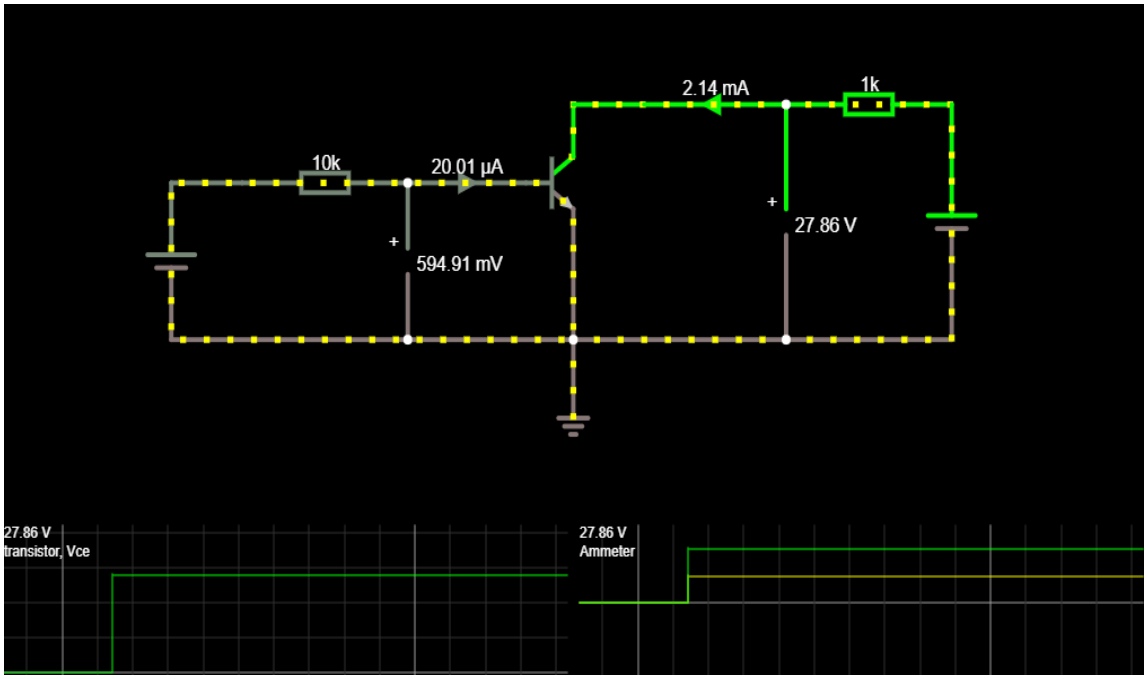


E-Circuit Diagrams:

(a) <u>Input Characteristics</u>:

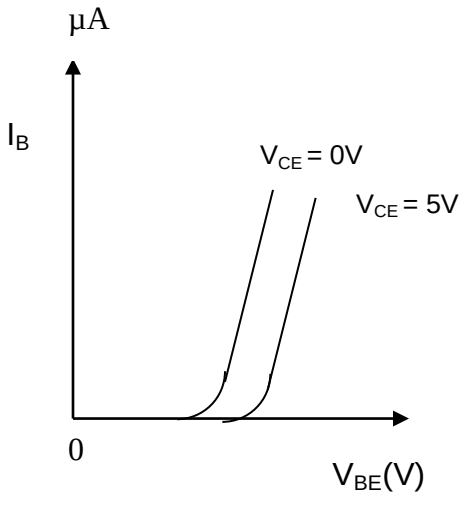


(b) Output Characteristics:

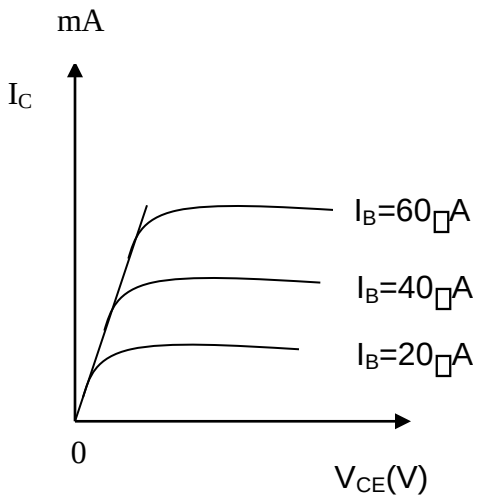


Model Graph

Input Characteristics



Output Characteristics



Tabular Column

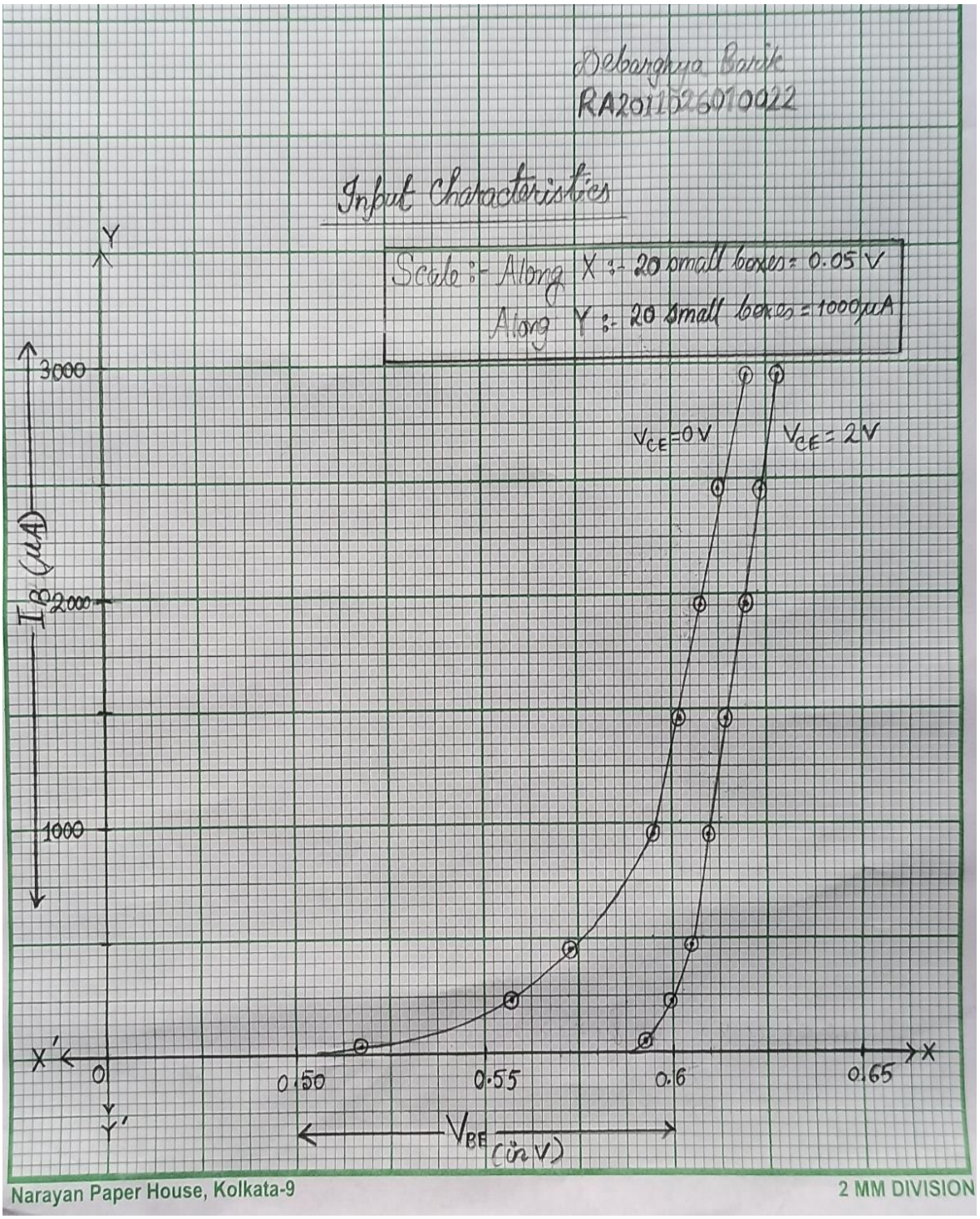
Input Characteristics

V_{CE} = 0 V		V_{CE} = 2V	
V_{BE}(V)	I_B(µA)	V_{BE}(V)	I_B(µA)
0.517	48.31	0.593	40.74
0.558	244.25	0.598	240.23
0.572	442.76	0.602	439.84
0.591	940.88	0.609	940.08
0.601	1440	0.615	1440
0.609	1940	0.620	1940
0.615	2440	0.624	2440
0.620	2940	0.627	2940

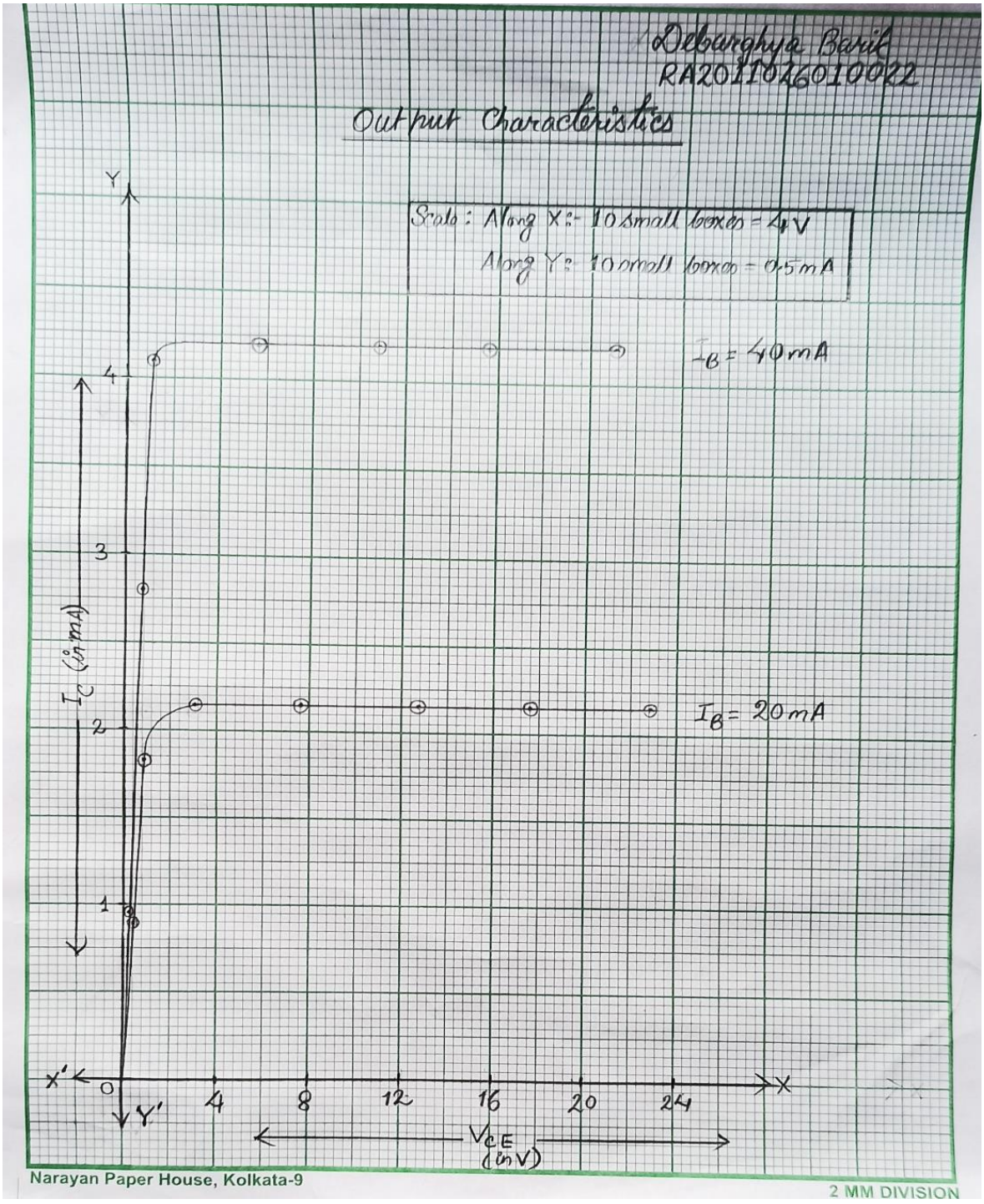
Output Characteristics

I_B=20µA		I_B=40µA	
VCE(V)	IC(mA)	VCE(V)	IC(mA)
0.089	0.907	0.070	0.930
0.859	2.14	0.118	2.88
2.86	2.14	0.722	4.28
7.86	2.14	5.72	4.28
12.86	2.14	10.72	4.28
17.86	2.14	15.72	4.28
22.86	2.14	20.72	4.28

Graph:



Input Characteristics Graph



Output Characteristics Graph

Result:

The circuit was drawn, the readings were tabulated and the graphs were drawn and from the calculations Input characteristics and Output Characteristics of the BJT were studied

POST LAB QUESTIONS

1 What is Punch through voltage?

Ans: The reverse-bias voltage applied to the drain terminal that results in significant drain-to-source current even though the transistor is biased in its off state. Also, it is defined as emitter-to-collector breakdown which can occur in a junction transistor with very narrow base region at sufficiently high collector voltage when the space-charge layer extends completely across the base region

2 What is early effect?

Ans: The Early effect, is the variation in the effective width of the base in a bipolar junction transistor (BJT) due to a variation in the applied base-to-collector voltage. It is caused when a greater reverse bias across the collector- base junction increases the collector-base depletion width.

3 What are the differences between NPN and PNP transistors?

Ans:

A NPN Transistor	A PNP Transistor
In an **NPN transistor**, a positive voltage is given to the collector terminal to produce a current flow from the collector to the emitter.	In a **PNP transistor**, a positive voltage is given to the emitter terminal to produce current flow from the emitter to collector.

4. What is leakage current and mention its range?

Ans: Leakage current is the current due to the minority charge carriers, flowing in the transistor. It flows in the same direction as the current due to the majority charge carriers. When the supply at the emitter base junction is open circuited, there is only reverse biasing in the base collector junction. Therefore, this sets up a small amount of current called the leakage current.

The range of leakage current is typically very low, usually in either the low μA (micro-amps, or 10-6 amps) **range** or even the nA (nanoamps, or 10-9 amps) **range**.

5. What is base – width modulation?

Ans: The base width modulation is the variation in the width of the base in a bipolar transistor due to a variation in the applied base-to-collector voltage. The effective base width is the function of the voltage Vce. So, when voltage Vce is increased, the effective base width reduces and because of that, the chances of recombination in the base region reduces.

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