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Instructor:	Md Sadid Haque Waselul
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<i>Assignment/Lab Number:</i>	6
<i>Assignment/Lab Title:</i>	CB amplifiers

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Student LAST Name	Student FIRST Name	Student Number	Section	Signature*
Taing	Ryan	501093407	11	R.T.
Malik	Hamza	501112545	11	H.M.

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Introduction and Objective:

The purpose of this lab is to implement and analyze a common-base amplifier using a 2N304 BJT, measuring the many different parameters and properties of the amplifier, such as the input resistance, output resistance, and most importantly, the open-loaded and loaded gain of the amplifier.

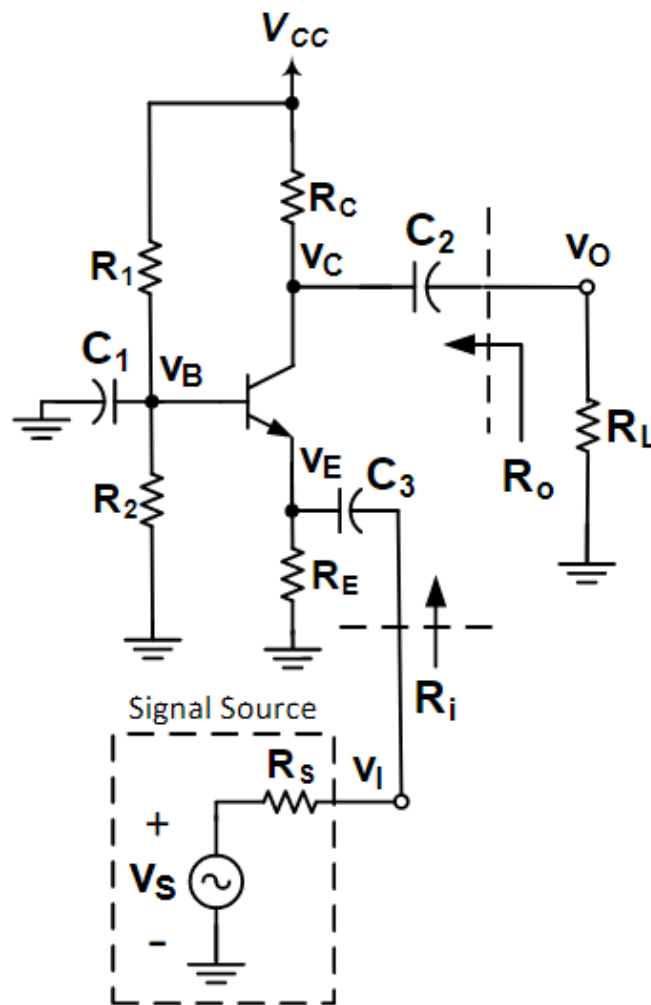


Figure 1.0 Common-base BJT amplifier to be built and implemented.

Experiment and Results:

Table E2(a). Input and output AC voltages and gain of the CB amplifier, with $R_L = 10\text{ k}\Omega$.

V_i [Vrms]	V_o [Vrms]	A_v [V/V]	V_i [dB]	V_o [dB]	A_v [dB]
0.5×10^{-3}	40×10^{-3}	80	-31	0.6	31.6

Table 1.0 Input and output AC voltages and gain of the CB amplifier, with $R_L = 10\text{ k}\Omega$.

Table E2(b). Input and output AC voltages and gain of the CB amplifier, with $R_L = \infty$.

V_i [Vrms]	V_o [Vrms]	A_{vo} [V/V]	V_i [dB]	V_o [dB]	A_{vo} [dB]
0.5×10^{-3}	87×10^{-3}	174	-30	13.4	43.4

Table 2.0 Input and output AC voltages and gain of the CB amplifier, with $R_L = \infty$.

Table E3. Parameters of the CB amplifier for determining its input resistance.

$R_{t,in}$ [k Ω]	V_t [Vrms]	V_i [Vrms]	R_i [k Ω]
100k Ω	0.325×10^{-3}	0.349×10^{-3}	1.2

Table 3.0 Parameters of the CB amplifier for determining its input resistance.

Table E4. Parameters of the CB amplifier for determining its output resistance.

$R_{t,out}$ [k Ω] (i.e., the load)	V_o [Vrms] without load (i.e., $A_{vo} v_i$)	V_o [Vrms] with load	R_o [k Ω]
100k Ω	0.285×10^{-3}	0.247×10^{-3}	-4.04

Table 4.0 Parameters of the CE amplifier for determining its output resistance.

Conclusion and Remarks:

C1.

	$A_v[V/V]$	$A_{vo}[V/V]$	$R_i[k\Omega]$	$R_o[k\Omega]$
Calculated Values (from Table P1(b))	59.6	184.58	114.6×10^{-3}	6.875
Measured Values (from Tables E2, E3, and E4)	80	174	1.2	-4.04
Percent Error, $e\%$	25.5%	6.08%	90%	270%

Table 5.0 Calculated and measured AC parameters for the CB amplifier of Figure 1.0

A possible reason for this large percent error is most likely due to the usage of a different set of resistor values as instructed by the TA, seen as the provided function generators were not able to supply a voltage of less than 50 mV, which was required for the original set of resistor values, ultimately affecting the values of the gain and other parameters.

C2.

$$i_o = \frac{v_o}{R_{t,out}}$$

$$i_i = \frac{V_t - V_i}{R_{t,in}}$$

Using the values from Table 3.0 and Table 4.0:

$$i_o = 0.00297 \text{ mA}$$

$$i_i = -0.000024 \text{ mA}$$

$$A_i = \frac{i_o}{i_i} = -123.75$$

$$A_p = A_v A_i = (59.6)(-123.75) = -7389$$