

**KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**  
 Electronic Circuits II – EE303

*Experiment # 1*  
**Gain Frequency Characteristics of Single Transistor Amplifiers**

**OBJECTIVE**

To study the effects of coupling capacitors on the gain and frequency response of single transistor amplifiers.

**PRELAB WORK**

**Students must perform the following calculations and PSPICE before coming to the lab.**

1. For the circuit shown in Figure 1 perform a complete small signal ac analysis and obtain the MF gain, the LF poles, the HF poles and bandwidth of this amplifier. Also find the small signal input and output resistances.
2. From the results obtained in step 1, try to deduce the effect of introducing a  $50\mu\text{F}$  capacitor in parallel with  $R_E$ . Specifically, what is the effect of such a capacitor on the MF gain and the bandwidth?
3. Using SPICE simulate your circuit with and without the capacitor  $C_E$  and try to deduce from the SPICE output file, the MF gain, the LF poles, the HF poles (corner frequencies) and the bandwidth. You can also obtain the input resistance and the output resistance using SPICE. For the SPICE analysis use the frequency range 100Hz to 8MHz. Use  $\beta=100$ ,  $C_\mu=C_{bc}=8\text{pF}$  and  $C_\pi=C_{be}=30\text{pF}$ .
4. Tabulate the results obtained from your hand calculations and from SPICE simulation in Table I.

**You must have your SPICE output file with your hand calculations ready before you come to the lab.**

**EXPERIMENTAL WORK**

1. Construct the circuit shown in Figure 1 without the capacitor  $C_E$ . Apply a small ac signal  $v_s$  and make sure by monitoring the oscilloscope that the output voltage is not distorted. Change the input frequency from 100Hz to 3MHz. At each frequency measure the small signal voltage gain and plot it on the same graph supplied by SPICE output file.
2. Calculate the MF range, LF poles, HF poles and bandwidth from your measured gain-frequency characteristic.

3. Insert your experimental results into Table I.
4. Compare your hand calculations, SPICE simulations and experimental measurements.
5. Repeat steps 1-4 after connecting the capacitor  $C_E$ .
6. Comment on your results.

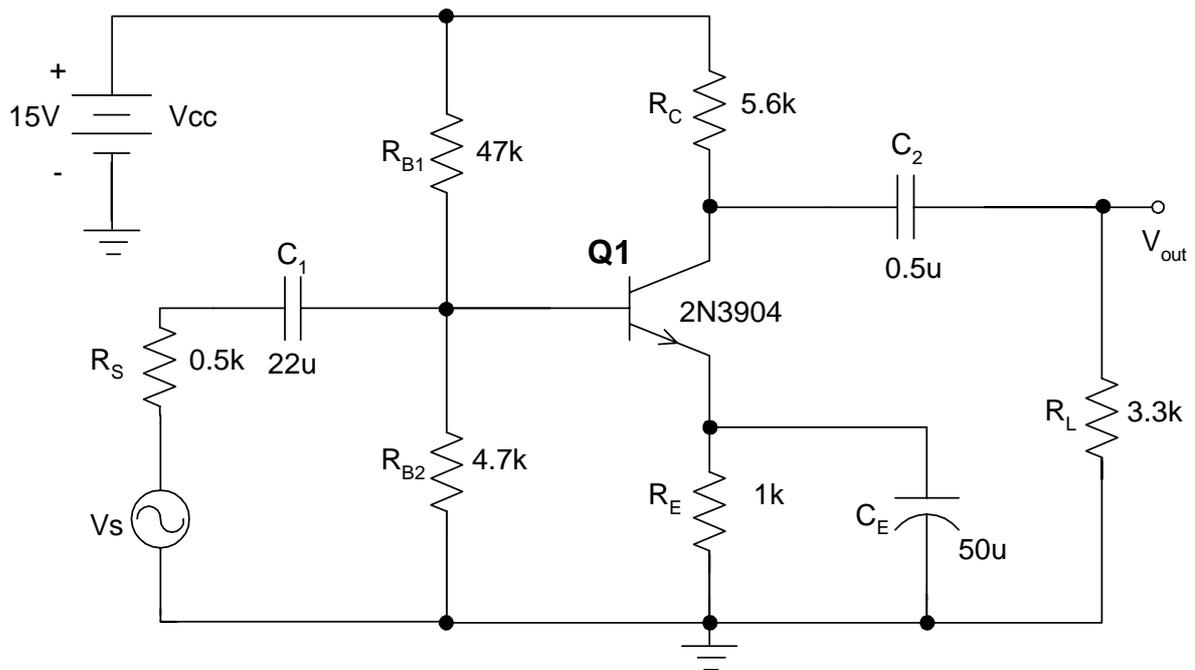


Figure 1

**Table I: Summary of hand calculations, SPICE simulation and experiment**

Parameter	Hand Calculation	SPICE Simulation	Experimental Result
MF Gain			
LF Poles (Corner Frequencies)			
HF Poles (Corner Frequencies)			
Bandwidth			