ECE 3113

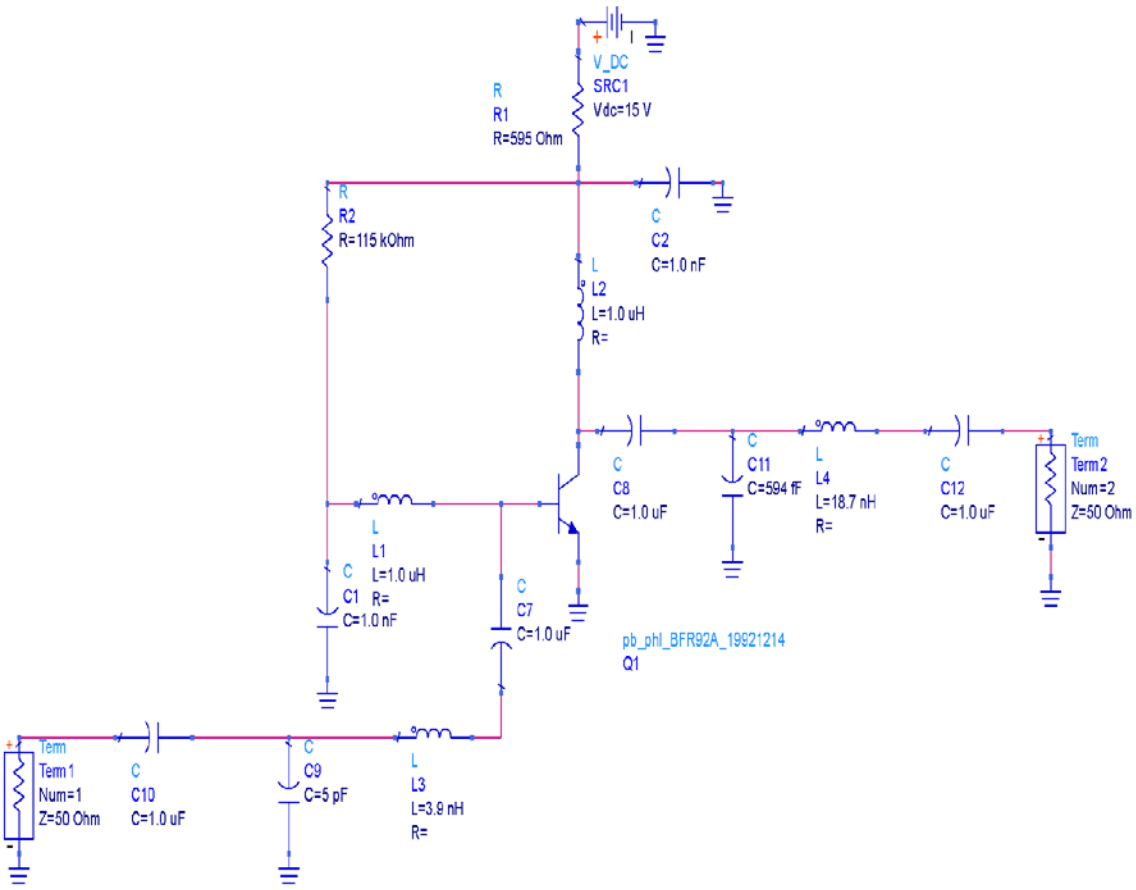
HARMONIC BALANCE ANALYSIS

OF AN AMPLIFIER

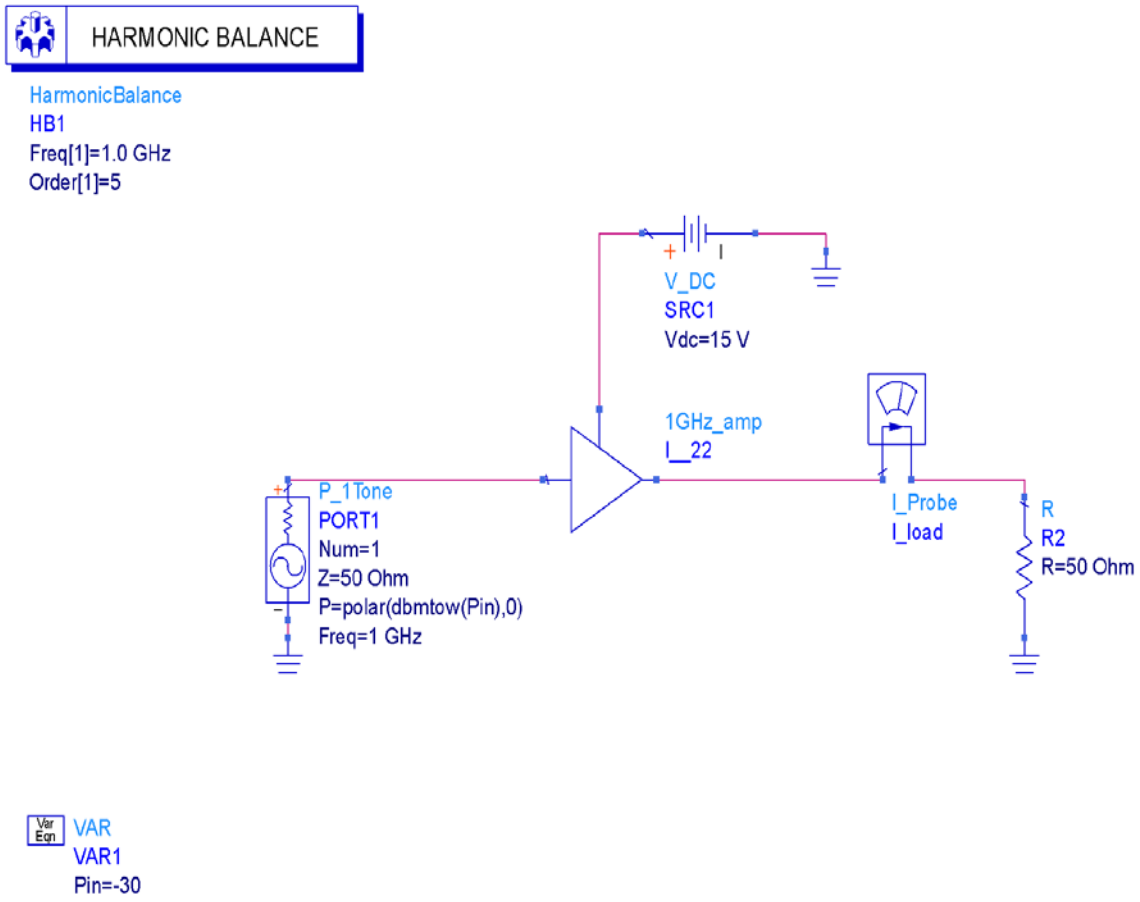
Objective

This project asks you to conduct a non-linear analysis of the BFR92A networks for the npn BJT MRF92A device biased and matched at 1GHz. The goal is to predict the spectral response of the transistor due to a single tone input signal. In other words, as the single frequency is applied to the input and gets amplified the transistor produces multiple frequencies, or tones. This phenomenon can be investigated in ADS with the so-called HARMONIC BALANCE controller.

As the basis of our investigation, we will use the following biased and matched transistor configuration:



1. Create a template and that uses a one-tone input signal at a power level of -30 dBm at 1 GHz and where the output is connected to 50 Ω. Plot the output power for the first 5 harmonics, i.e. at 1 GHz, 2 GHz,…, 5 GHz.



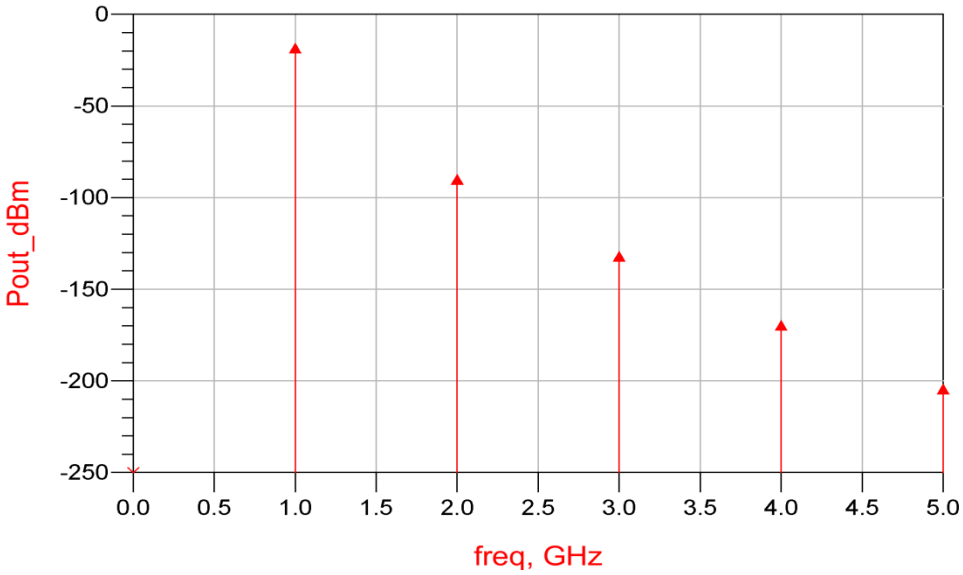
The ADS simulation results are as follows:

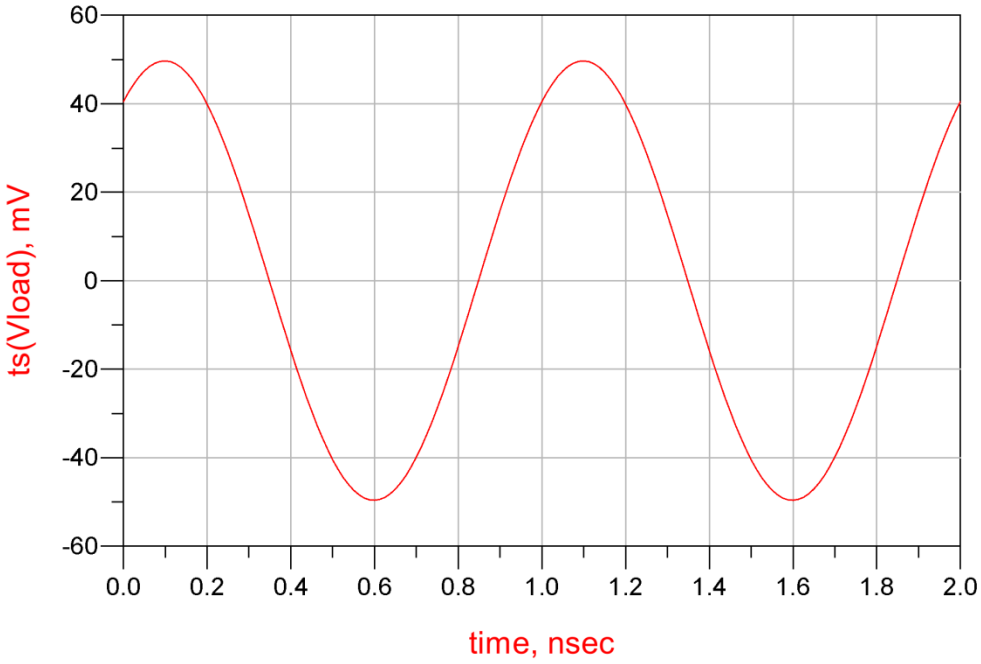
Fundamental Frequency

1 GHz

Eqn P_gain=Pout_dBm[1]-Pin[0]

Eqn Pout_dBm=10*log(0.5*real(Vload*conj(I_load.i)))+30





Power Gain dB

13.92