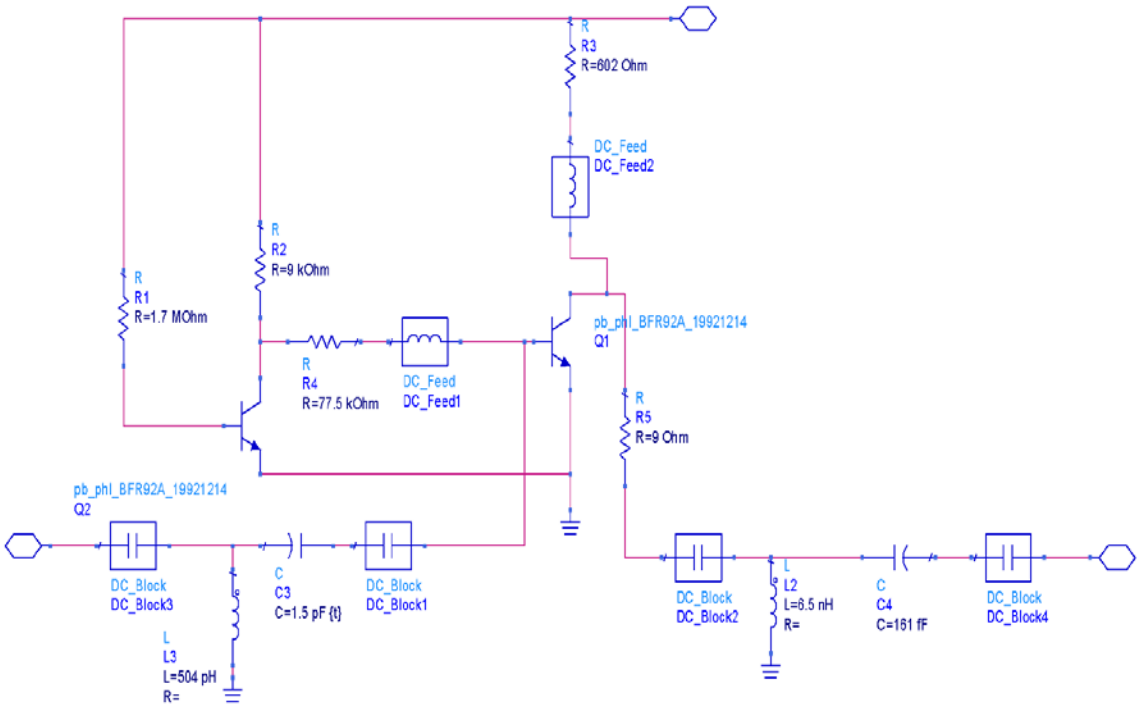
ECE 3113

GAIN COMPRESSION OF AN ACTIVE RF TRANSITOR

Objective

This project asks you to investigate the gain compression behavior of an amplifier. As we all know, an amplifier cannot provide the same gain as you increase the input power. At a certain point the amplifier begins to compress and ultimately reaches saturation. An important figure of merit is the 1dB gain compression point. This project asks you to determine the input power at which the output power is reduced by 1dB from the original power gain. For your research you may use the actively biased design shown below.



1. Use the Harmonic Balance analysis controller and plot the output power versus input power of the amplifier.

2. Plot the gain of the amplifier versus input power and determine the input power level at which the gain compresses by 1dB.

Solution:

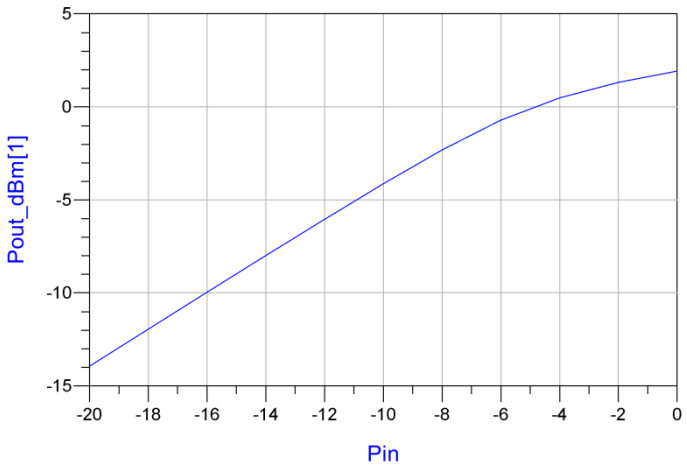
1) For the input power, output power, and gain we used the following equations:

Eqn Pout=0.5*real(Vload*conj(I_Probe1.i))

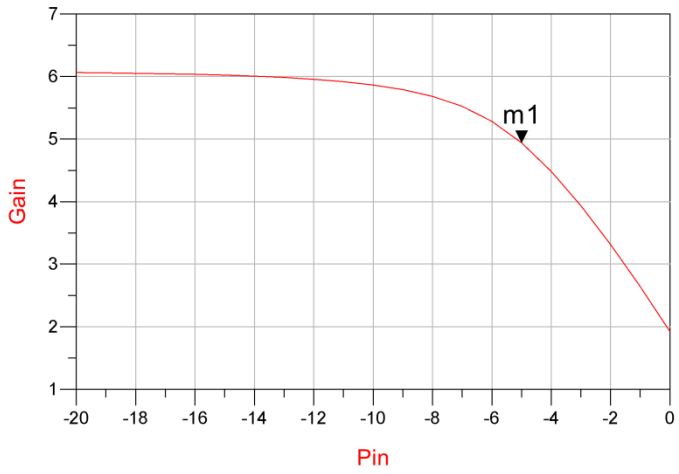
Eqn Pout_dBm=10*log(Pout)+30

Eqn Gain=Pout_dBm[1]-Pin

The input versus output graph in dBm results in the following graph.



2) The gain in dB versus input power in dBm is as follows:



m1
indep(m1)=-5.000
plot_vs(Gain, Pin)=4.938

Pin	Gain
-20.000	6.062
-19.000	6.057
-18.000	6.051
-17.000	6.044
-16.000	6.034
-15.000	6.021
-14.000	6.005
-13.000	5.983
-12.000	5.955
-11.000	5.916
-10.000	5.863
-9.000	5.789
-8.000	5.682
-7.000	5.522
-6.000	5.283
-5.000	4.938
-4.000	4.481
-3.000	3.931
-2.000	3.312
-1.000	2.638
0.000	1.919