Study of the feedback amplifier using OPAMP (IC-741)

Analog Electronics Lab Experiment -4

Submitted by : Jash Shah **BITS Id** : 2018A8PS0507P
Lab Section: P5
Submitted to : Sambhavi Shukla, Teena Gakhar **Date** : 13/2/21

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1. Objective

To study the following feedback amplifiers made using Operational Amplifier and verify the same using LTSpice simulation of IC 741:

1) Voltage Series Feedback Amplifier (VCVS)
2) Voltage Shunt Feedback Amplifier (CCVS)
3) Current Series Feedback Amplifier (VCCS)
4) Current Shunt Feedback Amplifier (CCCS)

Report the following:

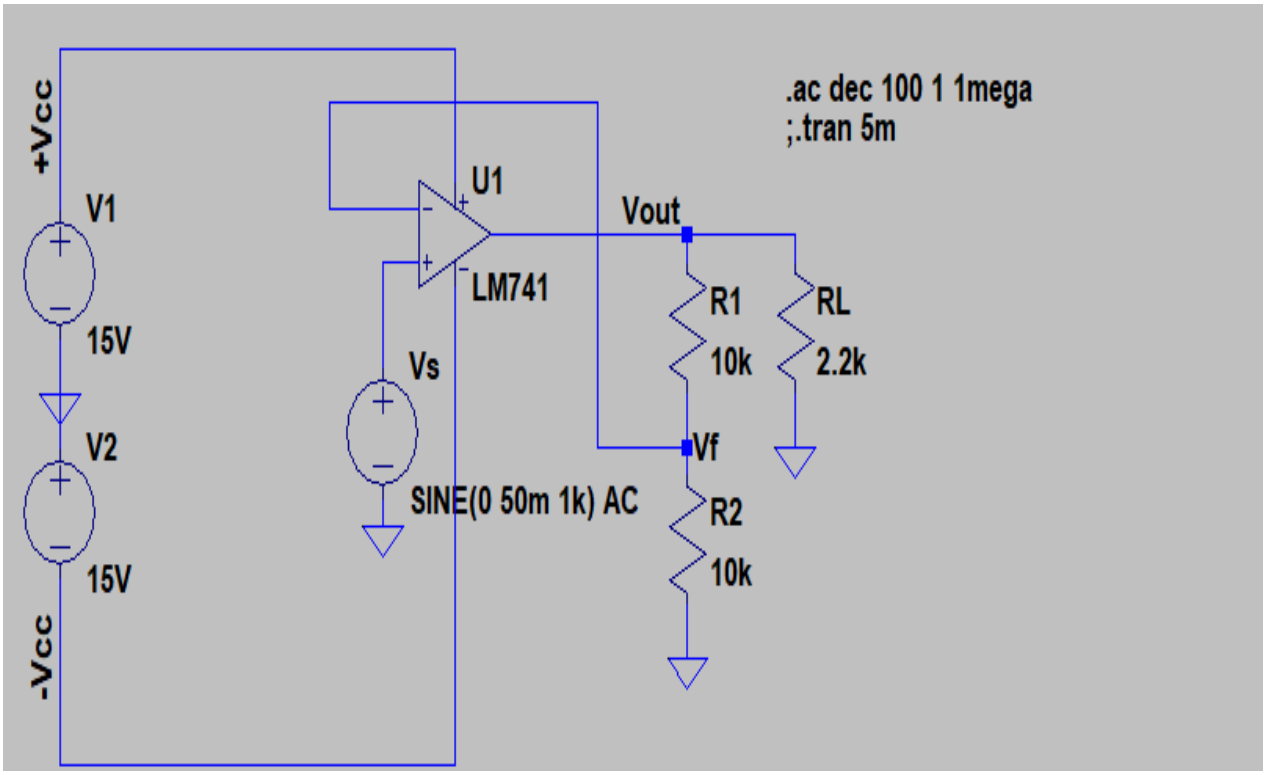
1) Circuit diagrams for all four configurations.
2) Calculate the Voltage gain (A_v) for all the 4 configurations by :
   a) Varying R_L with constant source
   b) Varying source with constant R_L
3) Theoretical Voltage gain value.

Assumptions:

1) Ideal behaviour of the OPAMP.
2) All the calculations to be done at 1kHz frequency.

2. VOLTAGE SERIES FEEDBACK AMPLIFIER (VCVS)

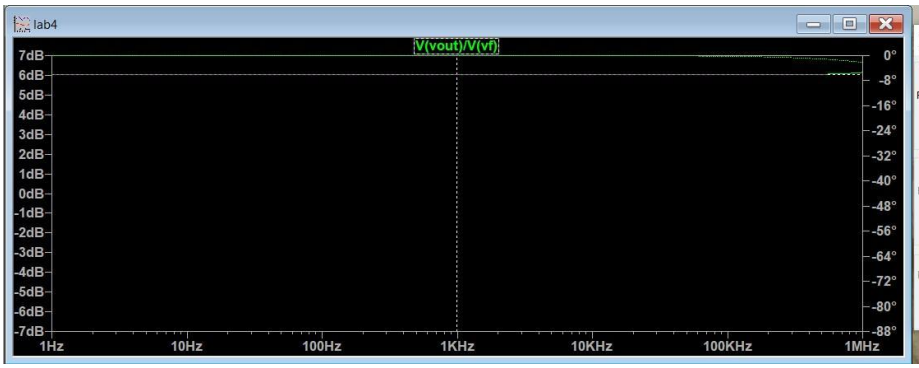
1. **CIRCUIT DIAGRAM**:



2. **Vs is Constant and R_L IS Varied**:

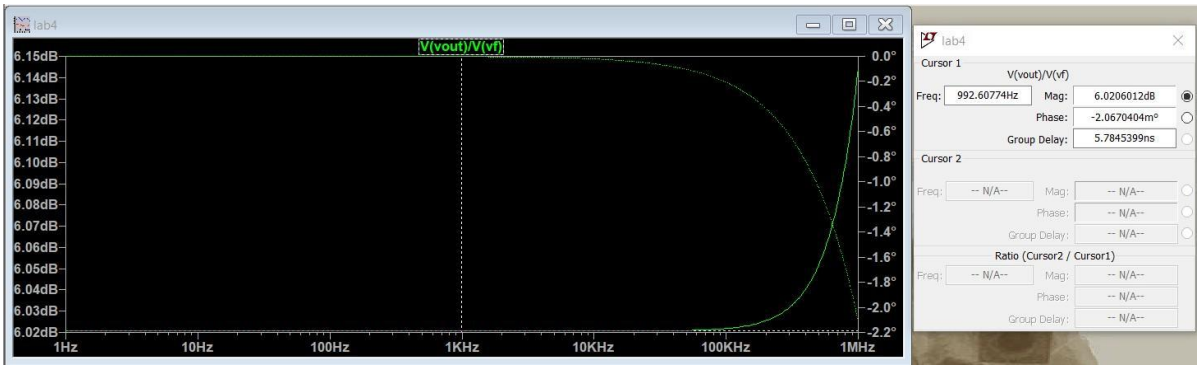
We consider 4 such cases over here.

Case 1 -> Vs=50mV and RL=2.2k
Theoretical Value = (1+R1/R2) = 2 i.e **6.0206db** & Simulated Value = **6.0206011db**



Case 2 -> Vs=50mV and RL=3.9k

Theoretical Value = (1+R1/R2) = 2 i.e **6.0206db** and Simulated Value = **6.0206012db**

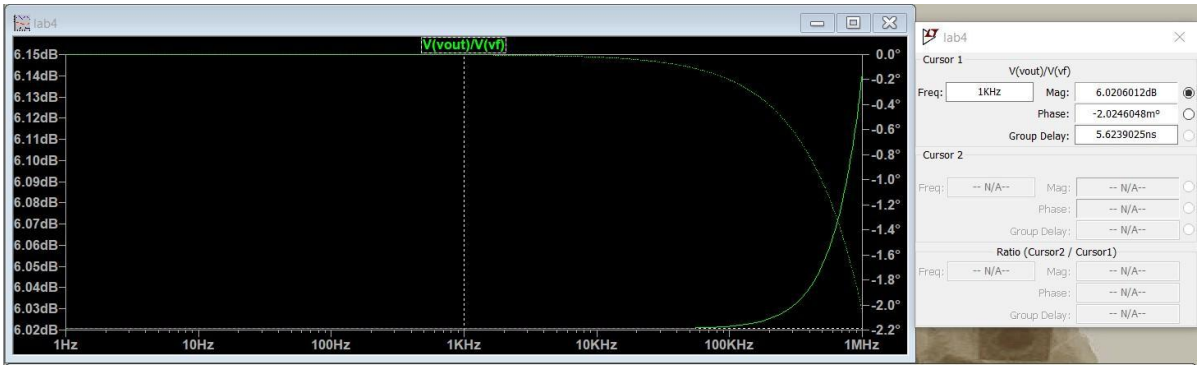


Case 3 -> Vs=50mV and RL=5.6k

Theoretical Value = (1+R1/R2) = 2 i.e **6.0206db** Simulated Value = **6.0206012db**

Case 4 -> Vs=50mV and RL=10k

Theoretical Value = (1+R1/R2) = 2 i.e **6.0206db** Simulated Value = **6.0206012db**



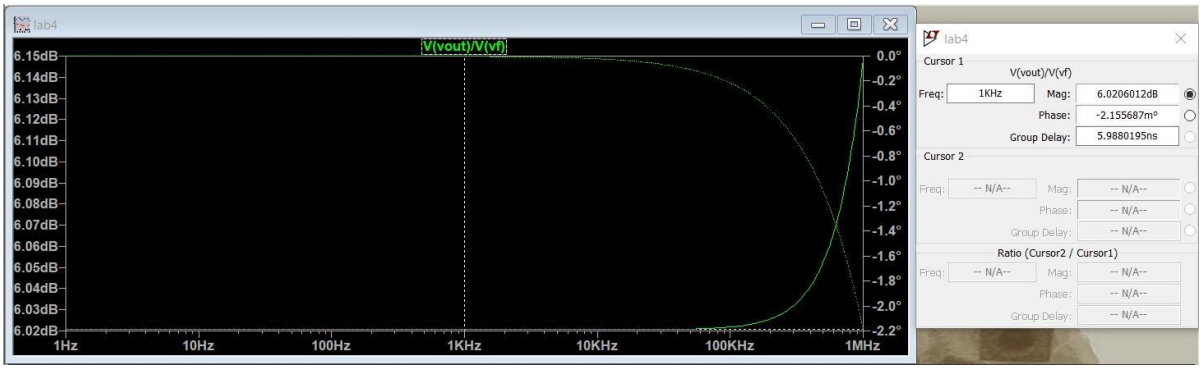
3. R_L IS CONSTANT Vs IS VARIED:

Case 1-> Vs=50mV and RL=2.2k

Theoretical Value = (1+R1/R2) = 2 i.e **6.0206db** Simulated Value = **6.0206011**

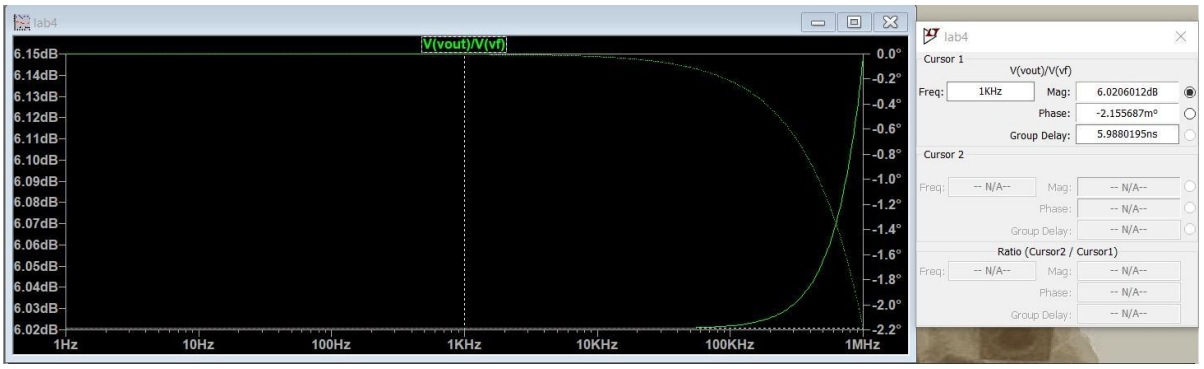
Case 2 -> Vs=100mV and RL=2.2k

Theoretical Value = (1+R1/R2) = 2 i.e **6.0206db** Simulated Value = **6.0206012db**



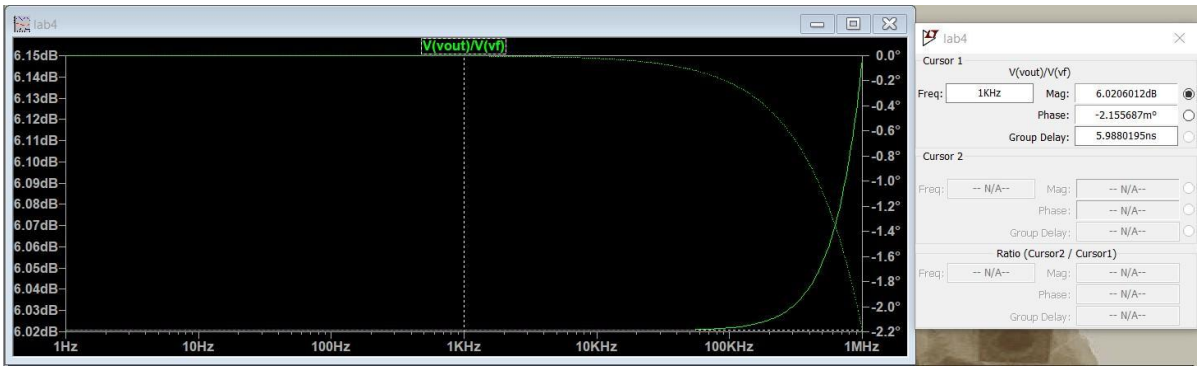
Case 3 -> Vs=150mV and RL=2.2k

Theoretical Value = (1+R1/R2) = 2 i.e **6.0206db** Simulated Value = **6.0206012db**



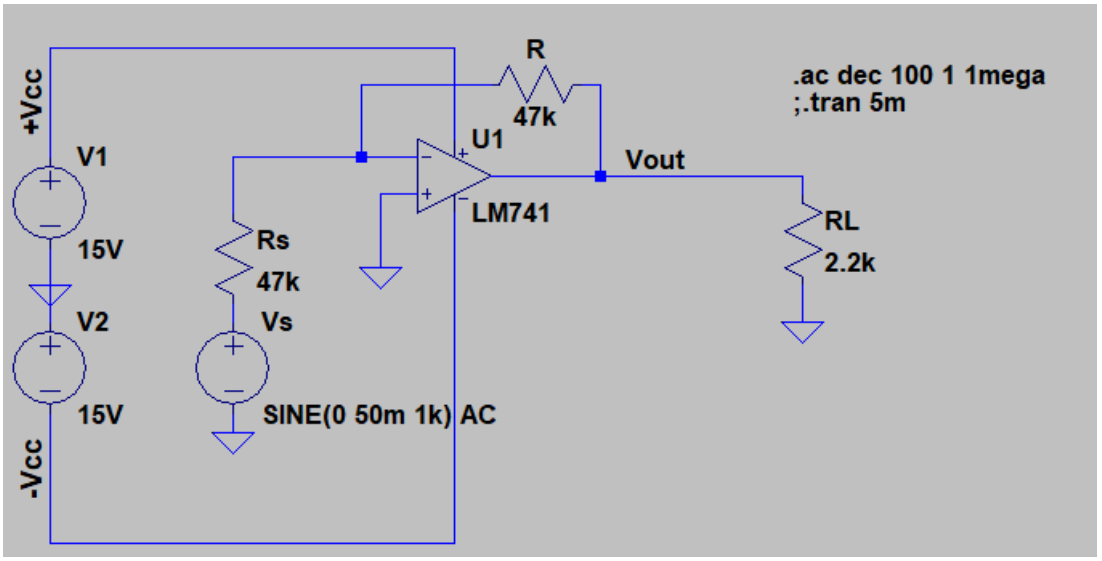
Case 4 -> Vs=200mV and RL=2.2k

Theoretical Value = (1+R1/R2) = 2 i.e **6.0206db** Simulated Value = **6.0206012d**



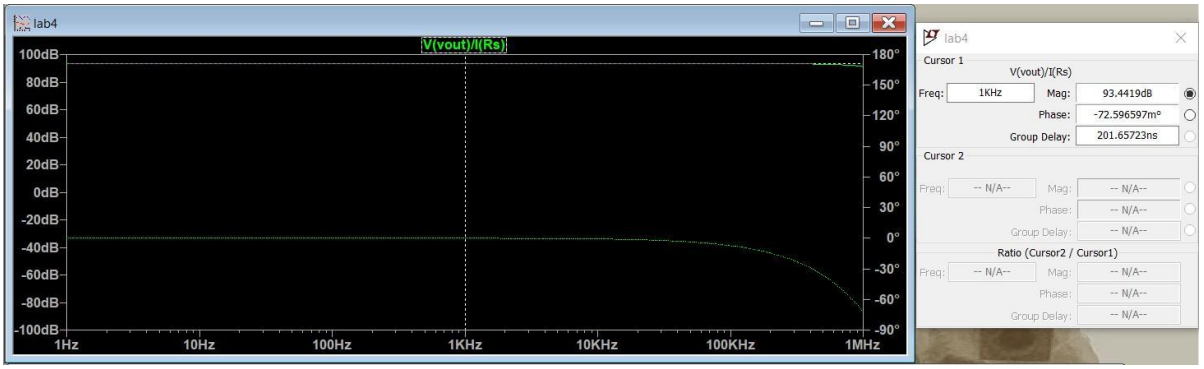
3. VOLTAGE SHUNT FEEDBACK AMPLIFIER (CCVS)

1. CIRCUIT DIAGRAM:



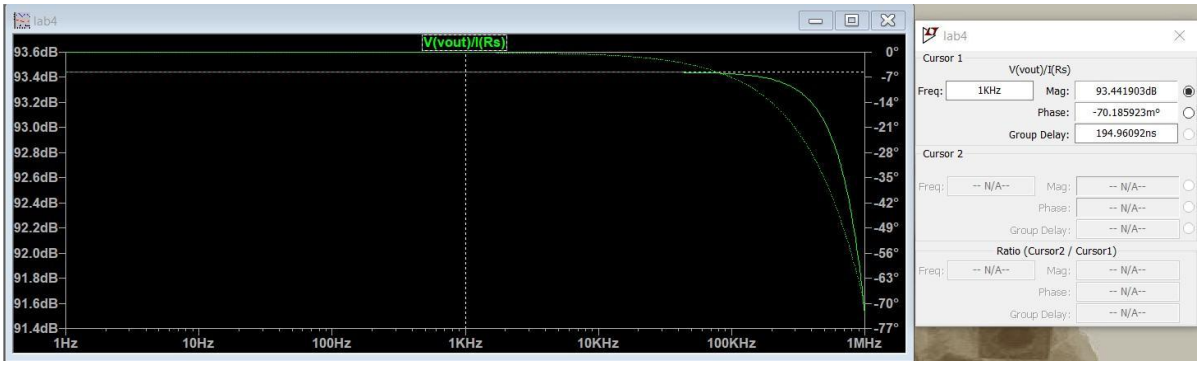
2. Vs IS VARIED RLOAD IS CONSTANT:

Vs=50mV RL=2.2k Theorotical Value = R = 47k i.e **93.4419572db** Simulated Value = **93.4419db**

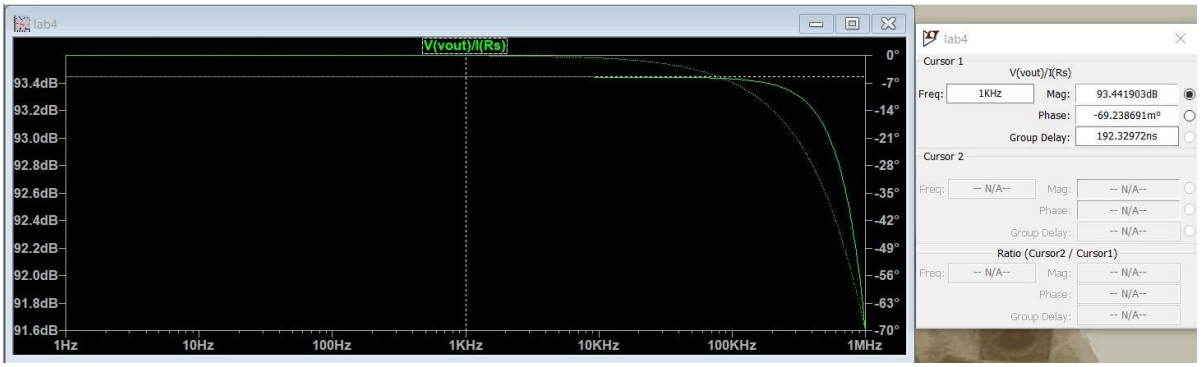


Vs=50mV RL=3.9k

Theoretical Value = R = 47k i.e **93.4419572db** Simulated Value = **93.441903db**

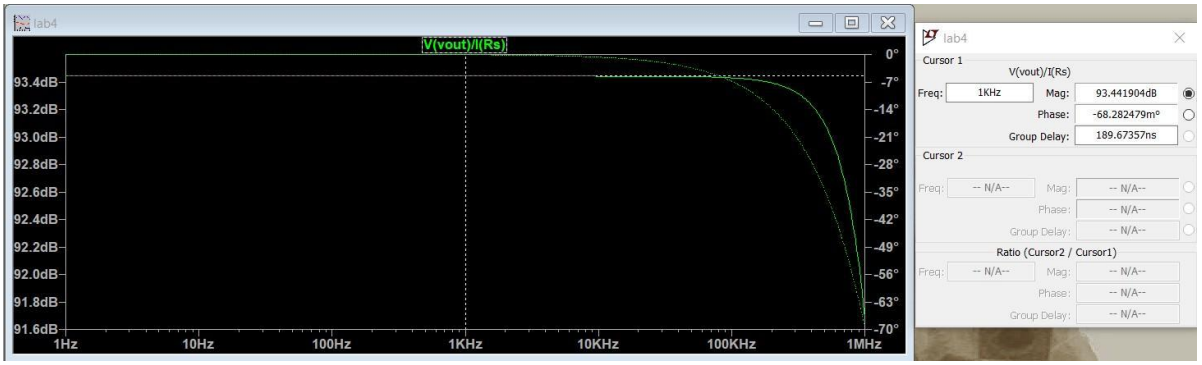


Vs=50mV RL=5.6k Theorotical Value = R = 47k i.e **93.4419572db** Simulated Value = **93.441903db**



Vs=50mV RL=10k

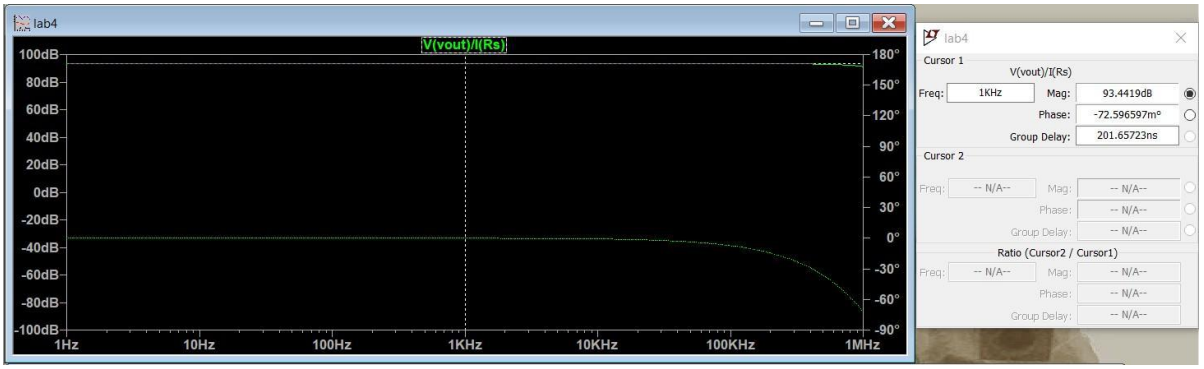
Theoretical Value = R = 47k i.e **93.4419572db** Simulated Value = **93.441904db**



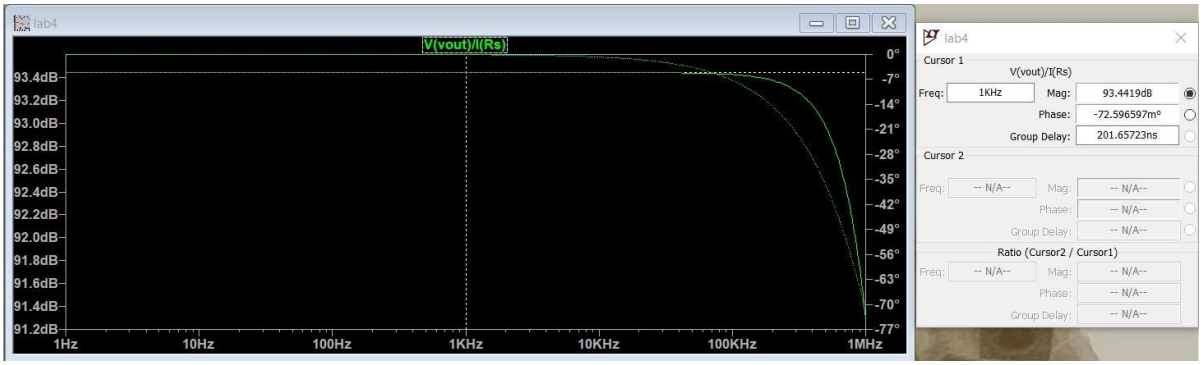
3. RLOAD IS CONTANT Vs IS VARIED:

Vs=50mV RL=2.2k

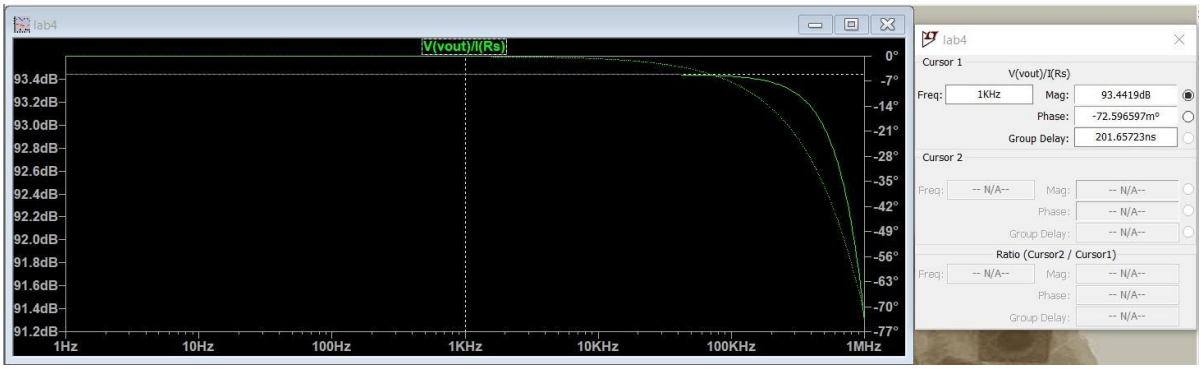
Theorotical Value = R = 47k i.e **93.4419572db** Simulated Value = **93.4419db**



Vs=100mV RL=2.2k Theorotical Value = R = 47k i.e **93.4419572db** Simulated Value = **93.4419db**

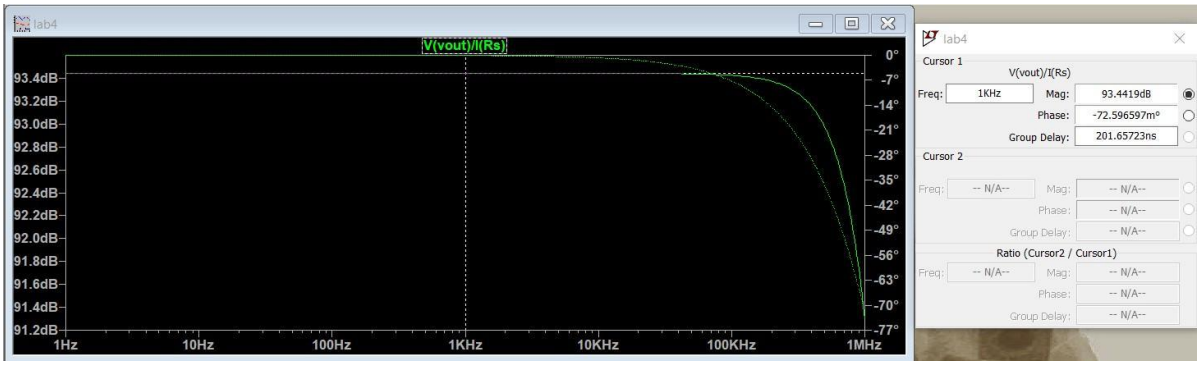


Vs=150mV RL=2.2k Theorotical Value = R = 47k i.e **93.4419572db** Simulated Value = **93.4419db**



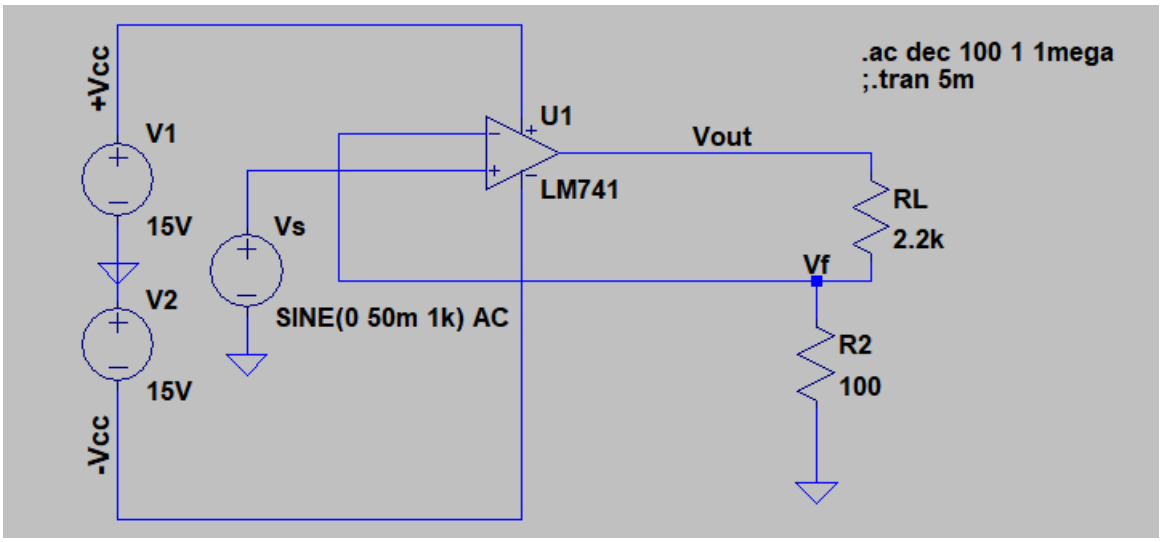
Vs=200mV RL=2.2k

Theoretical Value = R = 47k i.e **93.4419572db** Simulated Value = **93.4419db**



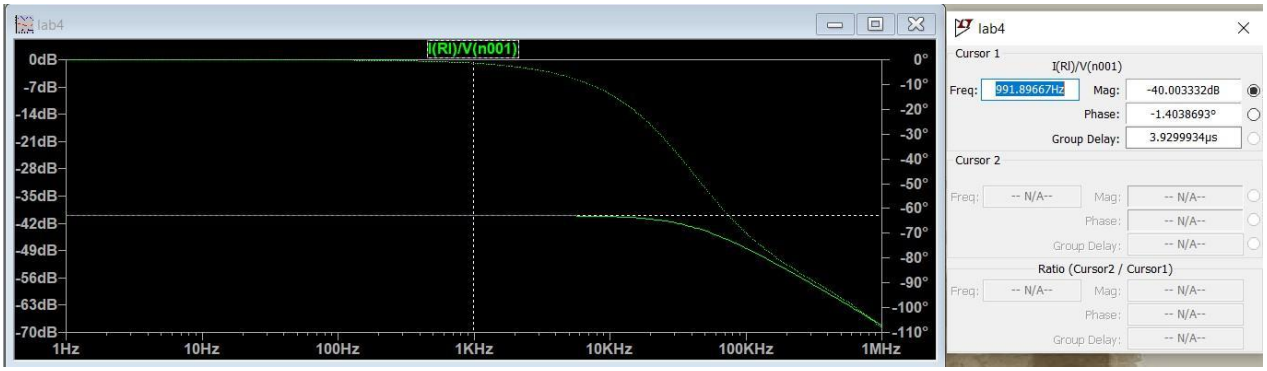
4. CURRENT SERIES FEEDBACK AMPLIFIER (VCCS)

1. <u>CIRCUIT DIAGRAM</u>:



2. <u>Vs IS CONSTANT RLOAD IS VARIED</u>:

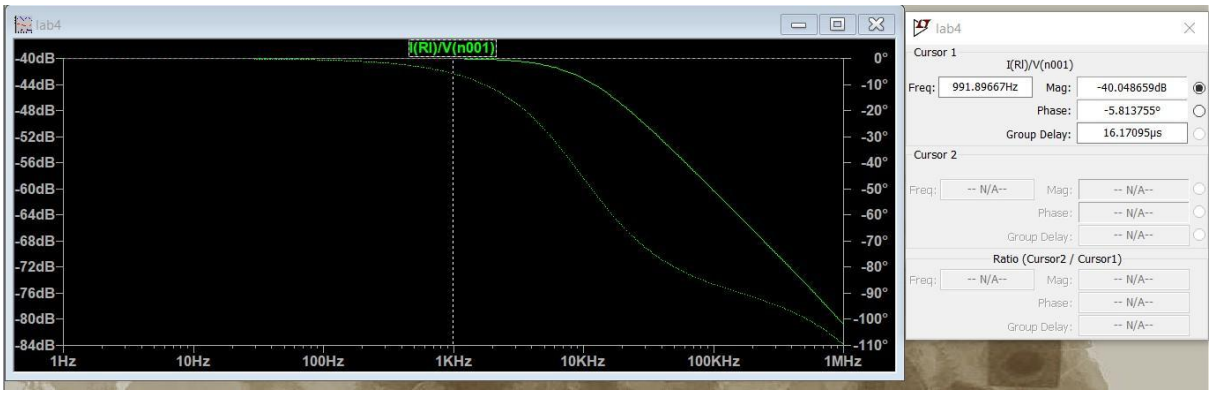
Vs=50mV RL=2.2k Theorotical Value = 1/R2 = 0.01 i.e **-40db** Simulated Value = **-40.003332db**



Vs=50mV RL=3.9k Theorotical Value = 1/R2 = 0.01 i.e **-40db** Simulated Value = **-40.008832db**

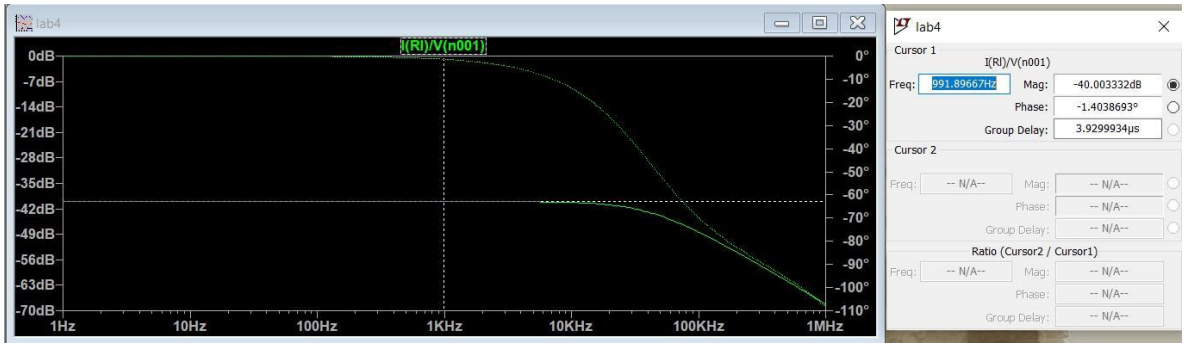
Vs=50mV RL=5.6k Theorotical Value = 1/R2 = 0.01 i.e **-40db** Simulated Value = **-40.008832db**

Vs=50mV RL=10k Theorotical Value = 1/R2 = 0.01 i.e **-40db** Simulated Value = **-40.04866db**

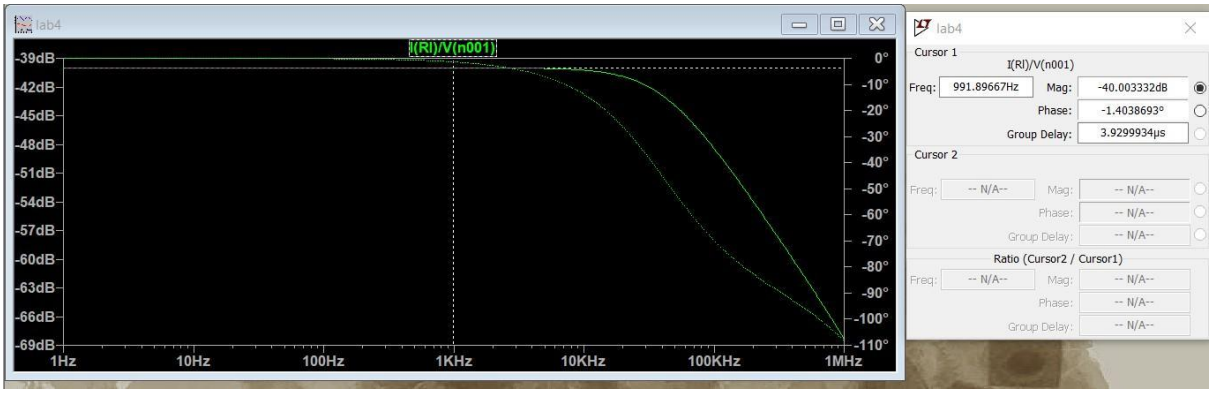


3. R_L IS CONTANT Vs IS VARIED:

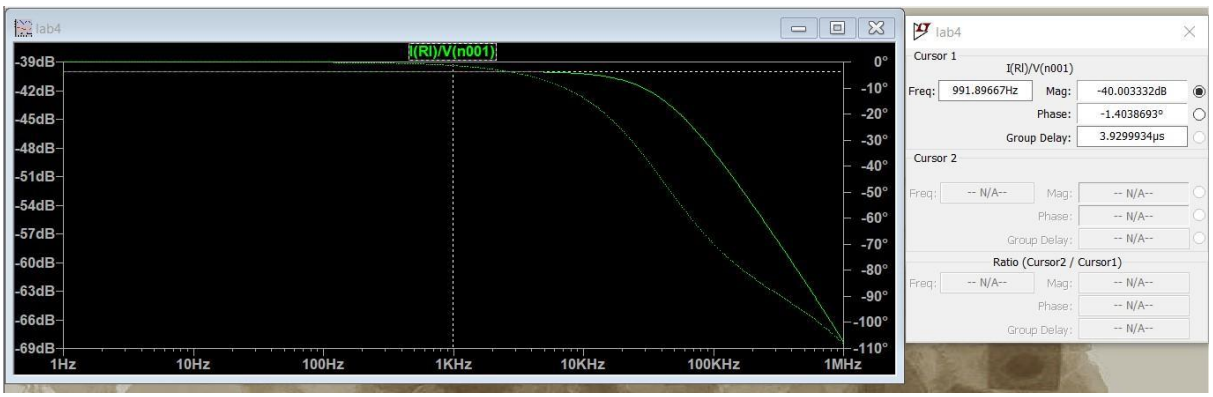
Vs=50mV RL=2.2k Theorotical Value = 1/R2 = 0.01 i.e **-40db** Simulated Value = **-40.003332db**



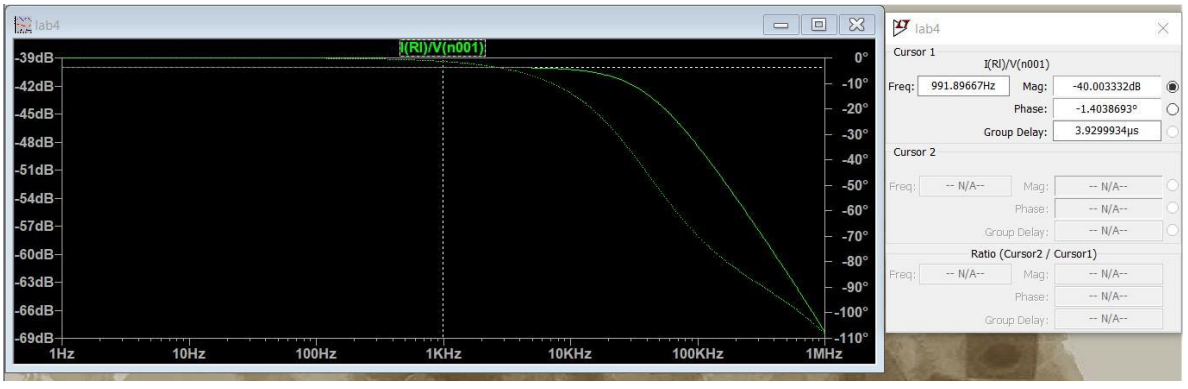
Vs=100mV RL=2.2k Theorotical Value = 1/R2 = 0.01 i.e **-40db** Simulated Value = **-40.003332db**



Vs=150mV RL=2.2k Theorotical Value = 1/R2 = 0.01 i.e **-40db** Simulated Value = **-40.003332db**

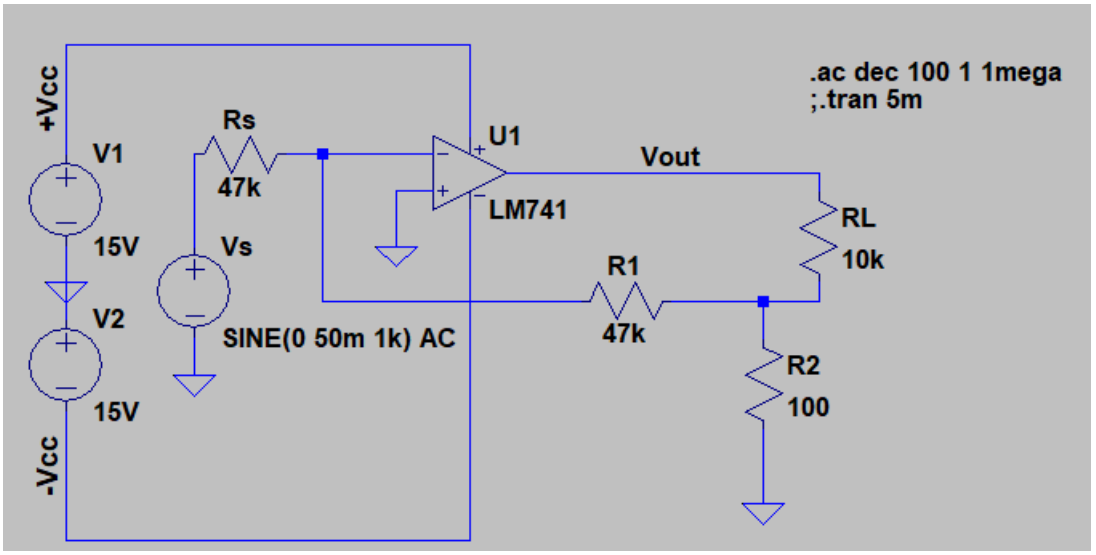


Vs=200mV RL=2.2k Theorotical Value = 1/R2 = 0.01 i.e **-40db** Simulated Value = **-40.003332db**



5, CURRENT SHUNT FEEDBACK AMPLIFIER (CCCS)

1. CIRCUIT DIAGRAM:



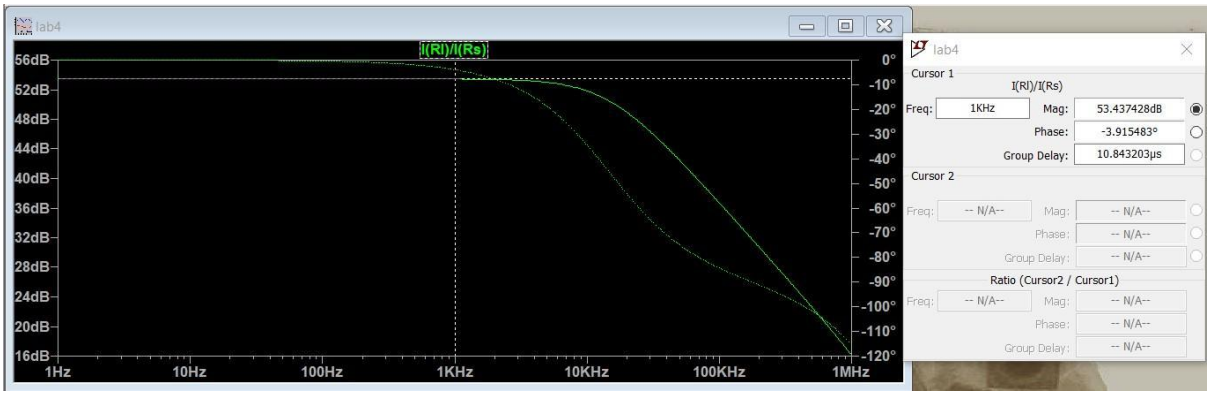
2. Vs CONSTANT RLOAD IS VARIED:

Vs = 50mV RL = 2.2k Theorotical Value = 1+R1/R2 = 471 i.e **53.4604db** Simulated Value = **53.455db**

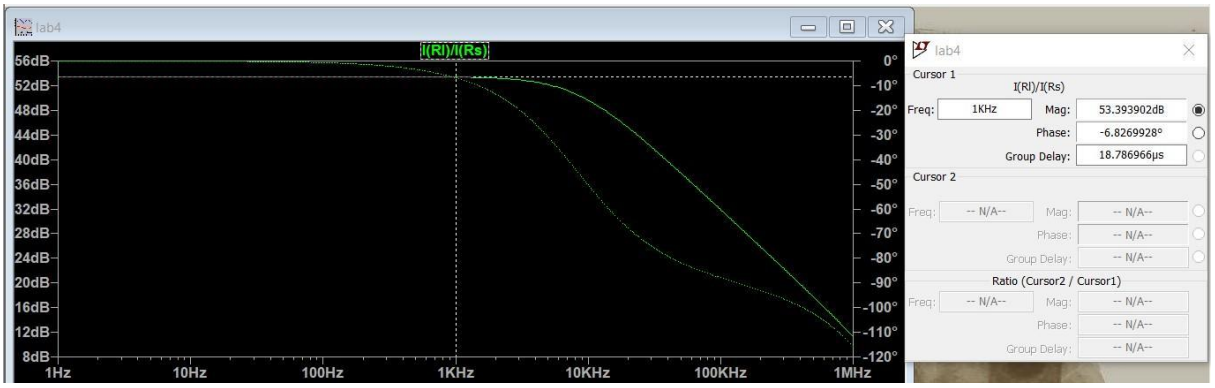
Vs = 50mV RL = 3.9k Theorotical Value = 1+R1/R2 = 471 i.e **53.4604db** Simulated Value = **53.4482db**

Vs = 50mV RL = 5.6k

Theorotical Value = 1+R1/R2 = 471 i.e **53.4604db** Simulated Value = **53.4374db**



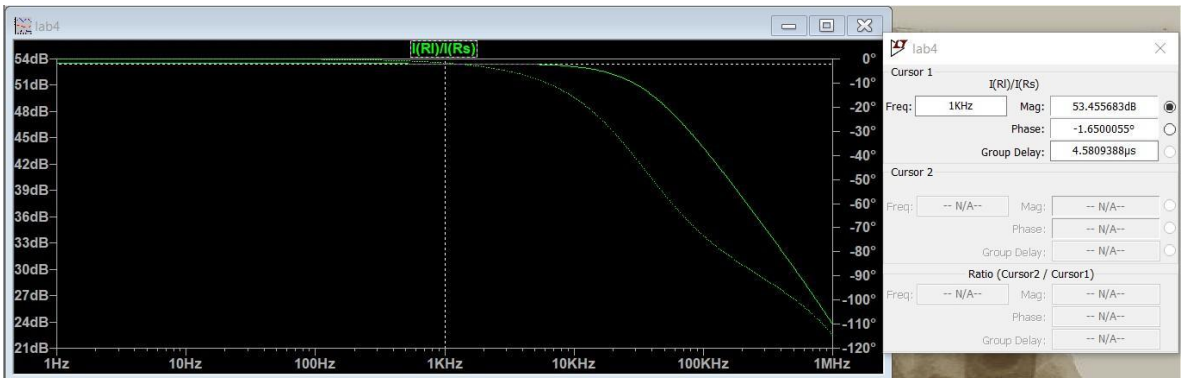
Vs = 50mV RL = 10k Theorotical Value = 1+R1/R2 = 471 i.e **53.4604db** Simulated Value = **53.3939db**



3. <u>RLOAD IS CONSTANT VS IS VARIED</u>:

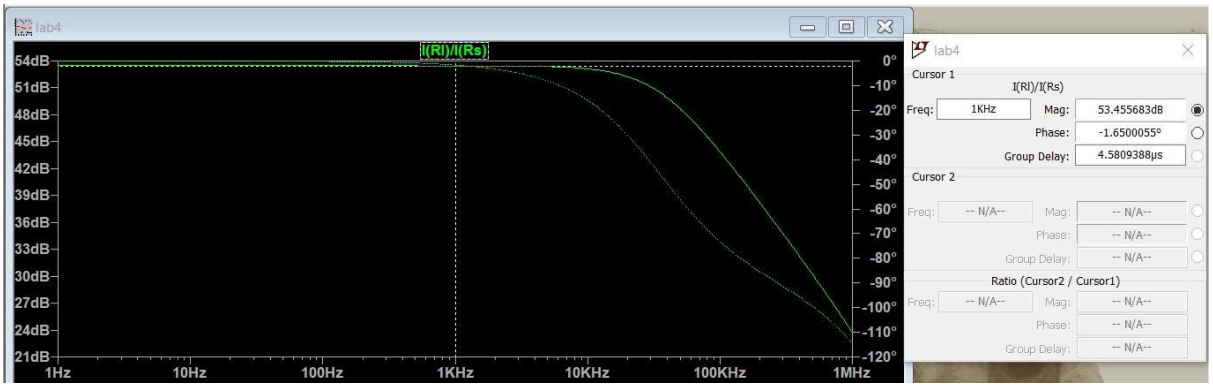
Vs = 50mV RL = 2.2k

Theorotical Value = 1+R1/R2 = 471 i.e **53.4604db** Simulated Value = **53.4557db**



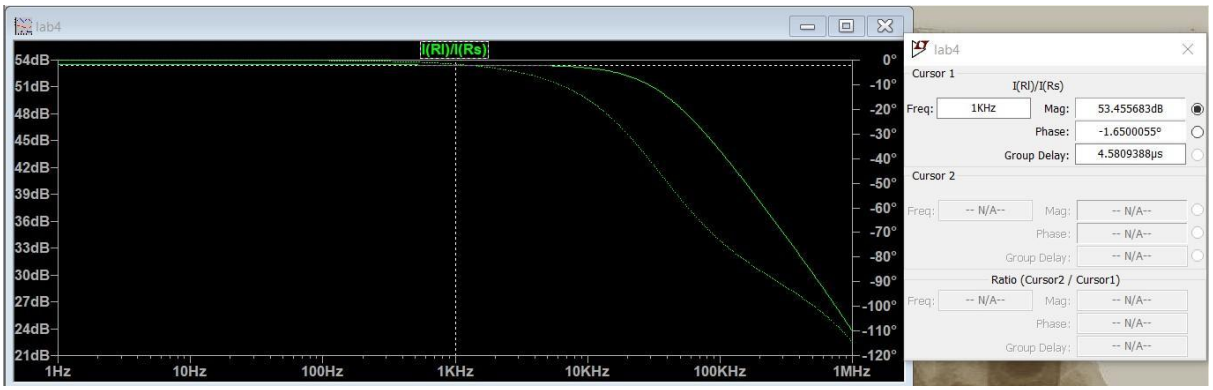
Vs = 100mV RL = 2.2k

Theorotical Value = 1+R1/R2 = 471 i.e **53.4604db** Simulated Value =**53.4557db**



Vs = 150mV RL = 2.2k

Theorotical Value = 1+R1/R2 = 471 i.e **53.4604db** Simulated Value =**53.4557db**



Vs = 200mV RL = 2.2k

Theorotical Value = 1+R1/R2 = 471 i.e **53.4604db** Simulated Value =**53.4557db**