Laboratory 6, JFET self-bias & CS amplifier

By Mateusz Pluta (22354107)

Introduction:

In this lab, the JFET self-bias circuit will be constructed where the LED current will be independent of the drain resistance while JFET is in active region. Then the CS amplifier will be built, and results will be taken for both circuits and displayed in tabular format.

Results:

[1]

Rd (kΩ)	Vds (V)	Vs (V)	Id = Vs/Rs (mA)
0.1 (98)	6.2	1.74	280
1.0 (998)	3.69	1.72	277
2.2 (2.13)	1.23	1.49	240
3.3 (3.24)	0.428	1.225	197
4.7 (4.64)	0.297	0.926	149
6.8 (6.75)	0.239	0.672	108
8.2 (8.12)	0.163	0.568	91
10 (9.85)	0.133	0.478	77
15 (14.8)	0.091	0.332	53
22 (21.6)	0.062	0.229	36
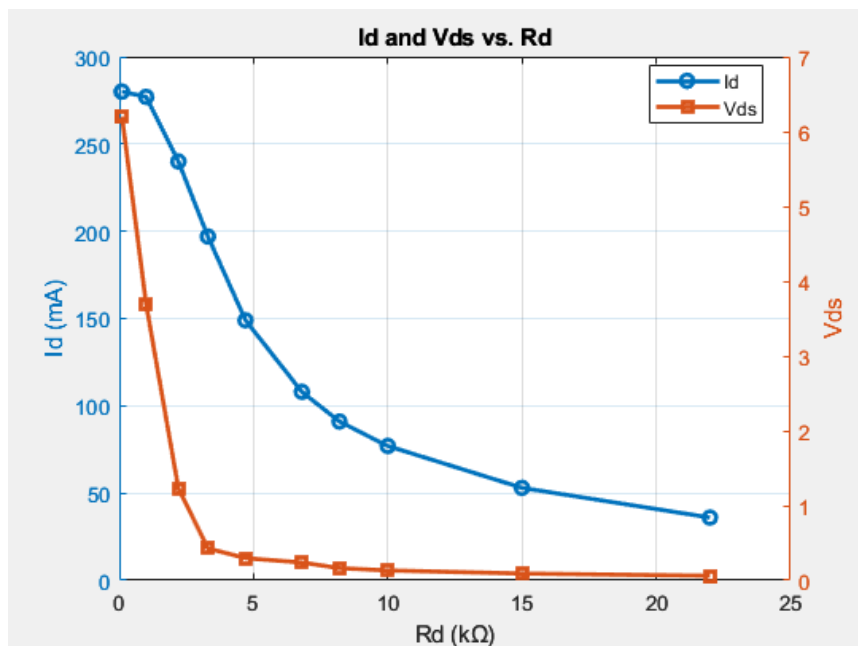
Figure 1 Two graphs using MATLAB.

[2]

(a)

Vg	1.74V
Vd	15.77V
Vs	4.04V
Vds	19.6V
Vgs	-2.3V
Id = Vs/Rs	4.3mA

(b)

Vd, rms = 0.64V

Id, rms = Rms/Rd = 0.64/4.74 = 0.14mA

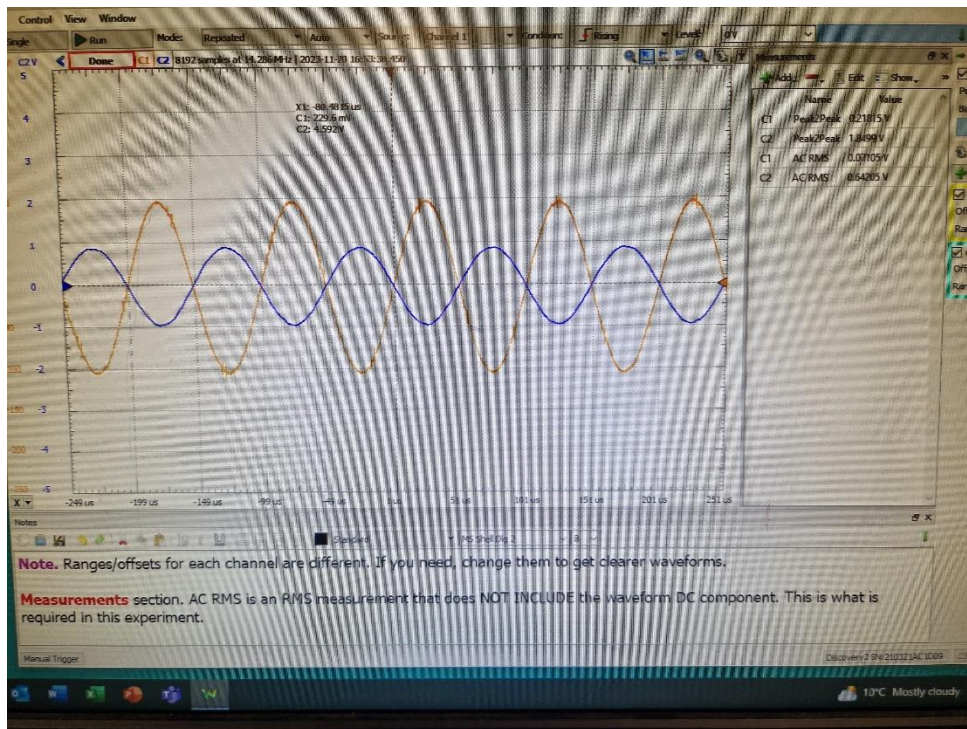**Vgs, rms** = 0.07V

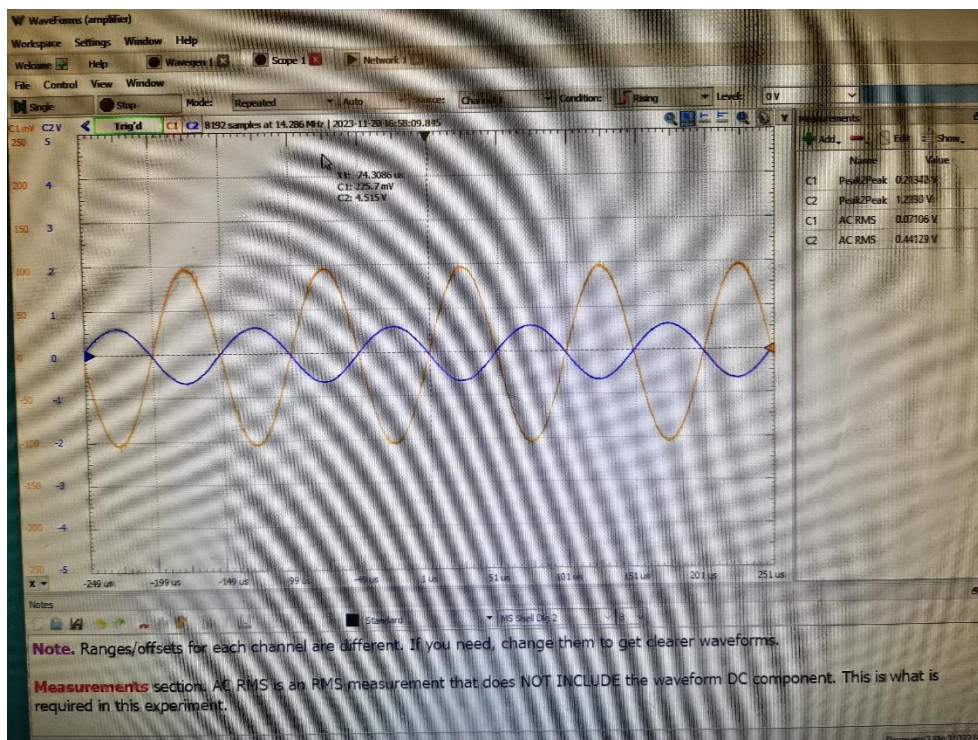**Gm** = Id, rms / Vgs, rms = 2

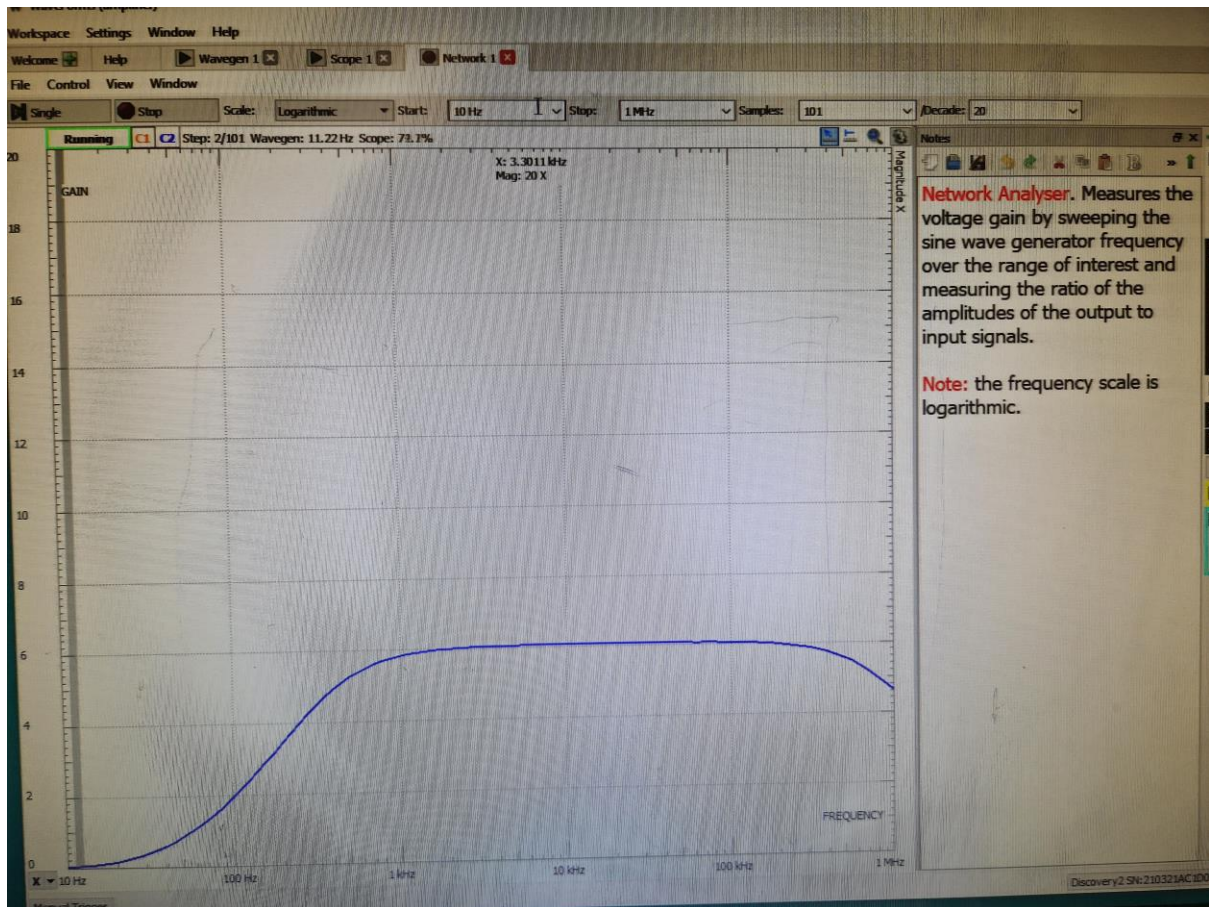*Figure 2 Graph 1*

Figure 3 Graph 2
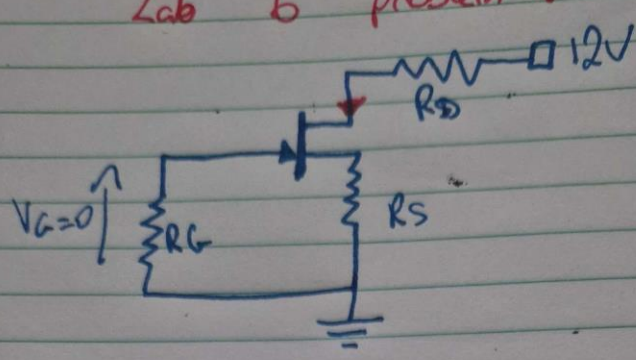
(c)

Figure 4 100Hz to 5Mhz

(Sorry for not having the screenshots of the graphs however our software didn't want to work properly therefore we had to use one of the lab technician's computers and we didn't want to change anything with their account, so we took a photo instead)

Conclusion

In conclusion we were able to build both circuits. We have gathered the data and have put them in tabular format. We have gotten the graphs as well.

Problem

$$R_S = \frac{V_{DD} - V_{GS(off)}}{I_D}$$

$$R_S = \frac{8V}{0.002A} = 4k\Omega$$

$$V_{GS} \rightarrow -2.6V$$

Q-point = 6V $I_D = 0.67mA$

$$P_D = (0.67)(6) = 4.02mW$$