Electronique-DM4-SY1924142-JIANZHU

Q1.

Dans la figure 7 du devoir, on peut voir que $f_0 = 80kHz$, et donc $f_{max} = 160kHz$. La plage de fonctionnement du VCO est de 80kHz à 160kHz.

Q2.

$f_{max} = 160kHz$, $f_{min} = 1Hz$. Si on donne une tension d'entreé de 10V et 1V, on peut voir la la changement de la fréquence.

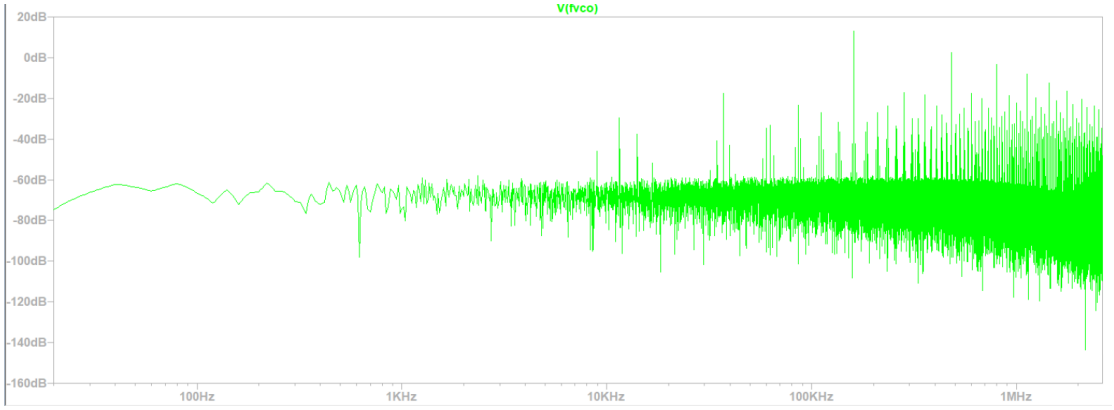


Figure 1 tension=10V

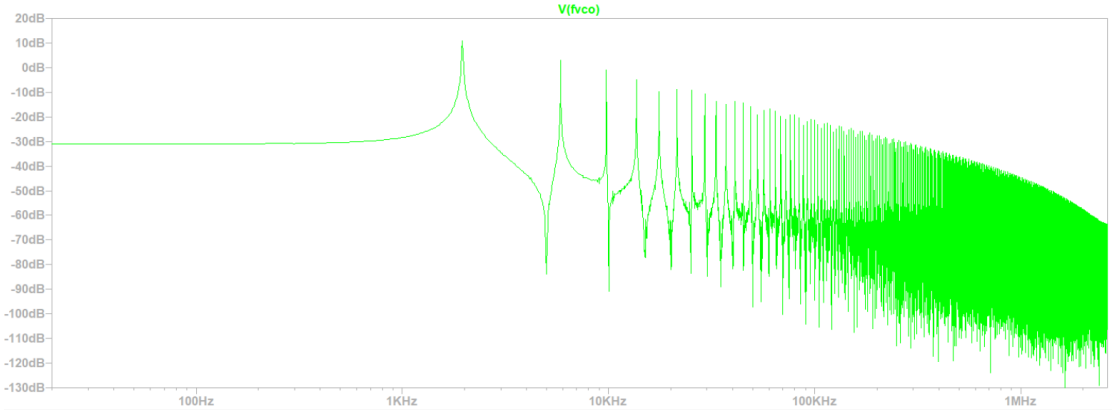
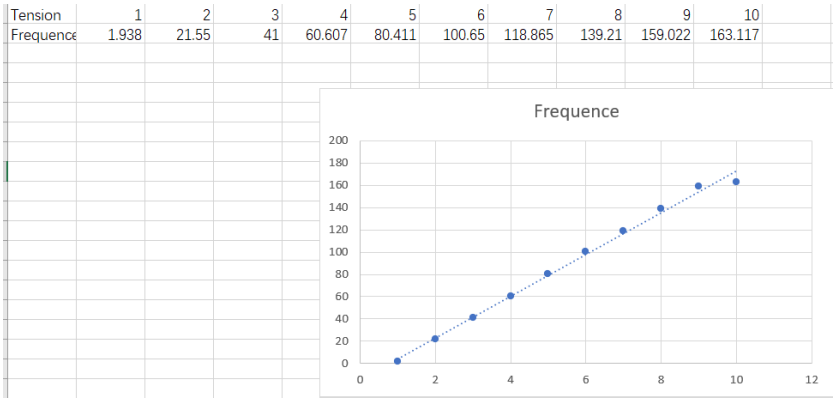


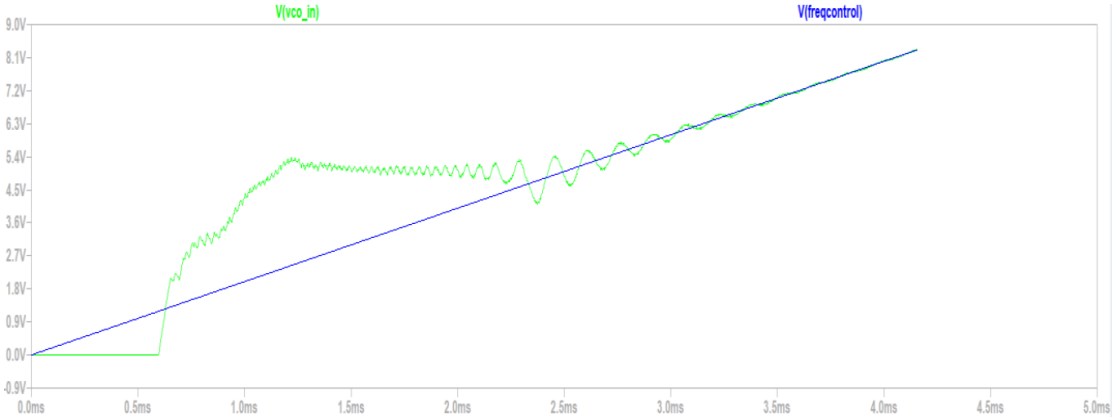
Figure 2 tension=1V

Pour illustrer les relation entre la fréquence et la tension, on utilise la figure de point de Excel. Elle est linéaire.

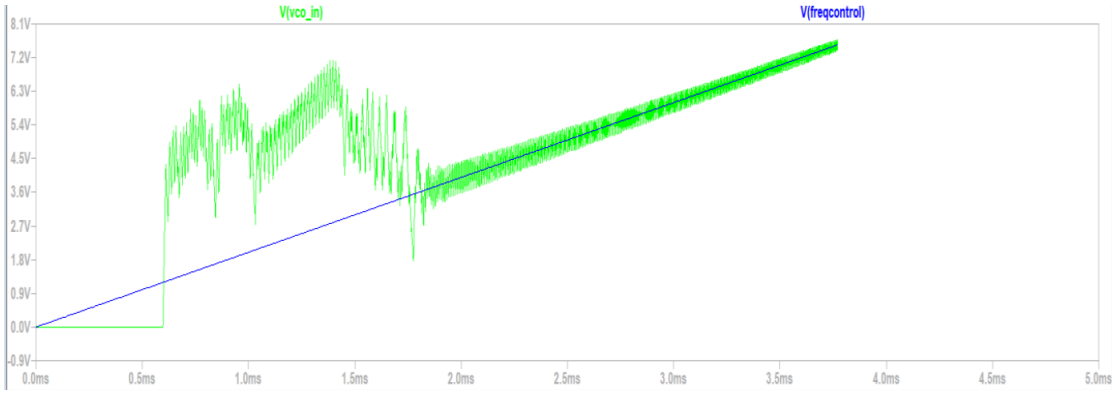


Q3.

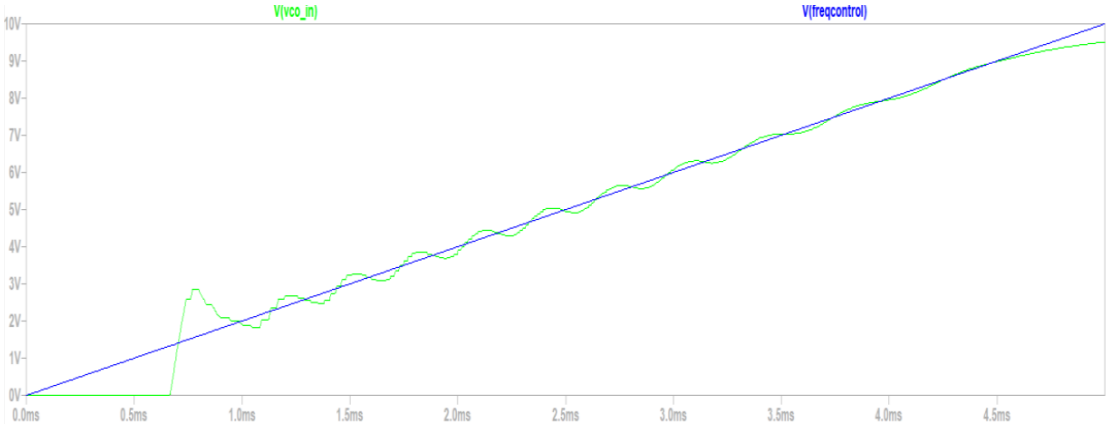
Pour pc1, C=100nF



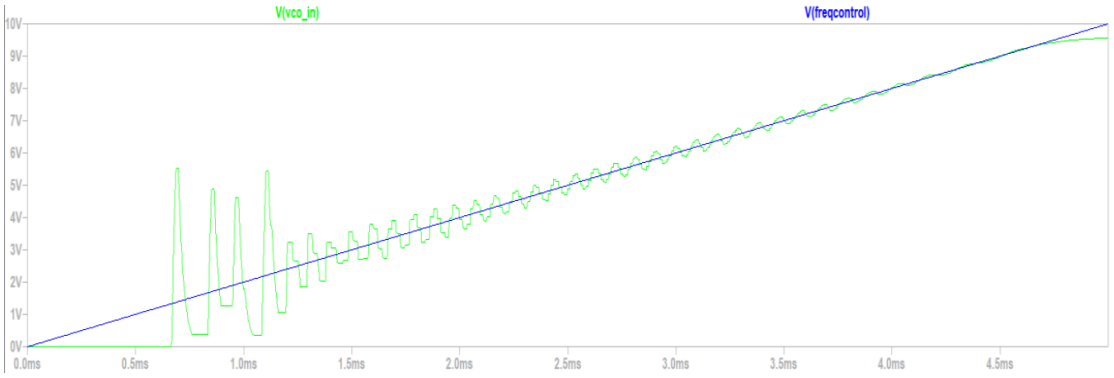
C=10nF



Pour pc2, C=100nF,



C=10nF

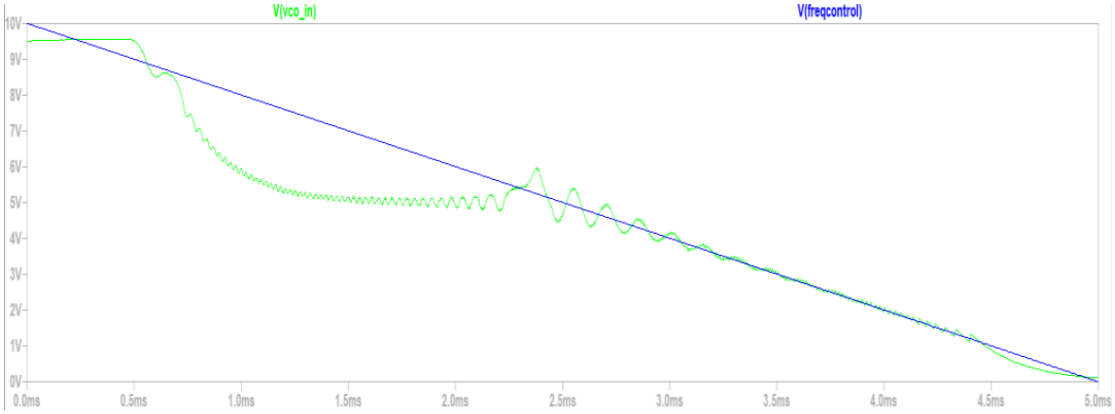


Enfin, on exporter les donnés.

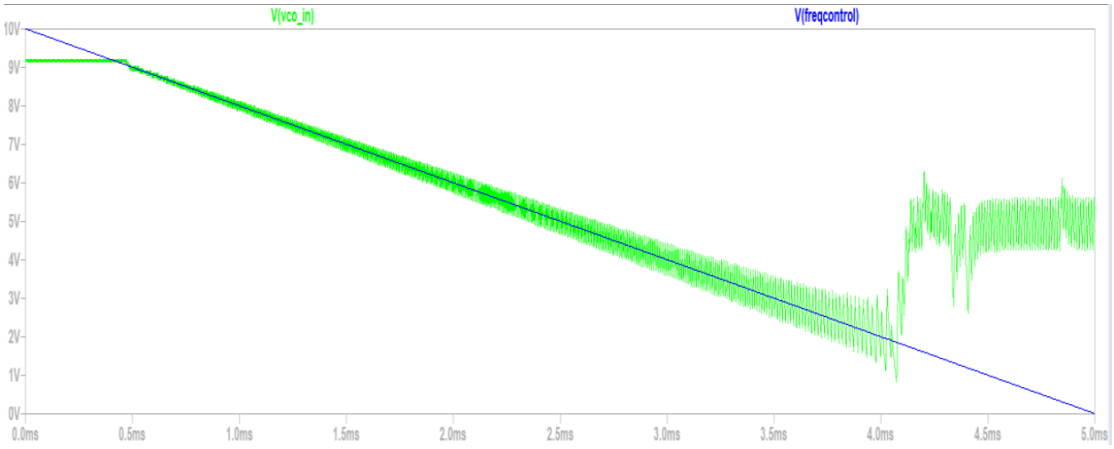
time	V(freqcontrol)	V(vco_in)
0.000000000000000e+000	1.022339e-008	2.057910e-006
3.051757793953031e-013	1.083374e-008	2.186631e-006
3.461313109639093e-013	1.091565e-008	2.204035e-006
4.280423741011225e-013	1.107947e-008	2.239131e-006
5.918645003755481e-013	1.140712e-008	2.309600e-006
9.195087529244002e-013	1.206241e-008	2.451186e-006
1.574797258022104e-012	1.337298e-008	2.735370e-006
2.724759223897450e-012	1.567291e-008	3.234924e-006
4.137219929934598e-012	1.849783e-008	3.848757e-006
6.641101205481487e-012	2.350559e-008	4.936930e-006
9.322644076431070e-012	2.886868e-008	6.102310e-006
1.305894883953869e-011	3.634129e-008	7.726084e-006
1.740820269658731e-011	4.503979e-008	9.616239e-006
2.459005012103647e-011	5.940349e-008	1.273742e-005
3.523005596681717e-011	8.068350e-008	1.736149e-005
5.389235748276427e-011	1.180081e-007	2.547199e-005
7.842771433226354e-011	1.670788e-007	3.613486e-005
1.246480099745535e-010	2.595194e-007	5.622181e-005
1.686879116492434e-010	3.475992e-007	7.536114e-005
2.400350640661027e-010	4.902935e-007	1.063679e-004
3.244333631612985e-010	6.590901e-007	1.430463e-004
4.932299613516900e-010	9.966833e-007	2.164029e-004
6.489310001473855e-010	1.308085e-006	2.840679e-004
7.525796875002298e-010	1.515383e-006	3.291116e-004
8.968643389403622e-010	1.803952e-006	3.918145e-004
1.060098213116585e-009	2.130420e-006	4.627518e-004
1.259765983657644e-009	2.529755e-006	5.495217e-004
1.472682380108527e-009	2.955588e-006	6.420483e-004
1.692914669976618e-009	3.396053e-006	7.377532e-004
1.871948139597271e-009	3.754120e-006	8.155541e-004
1.987510064190481e-009	3.985243e-006	8.657724e-004

Q.4

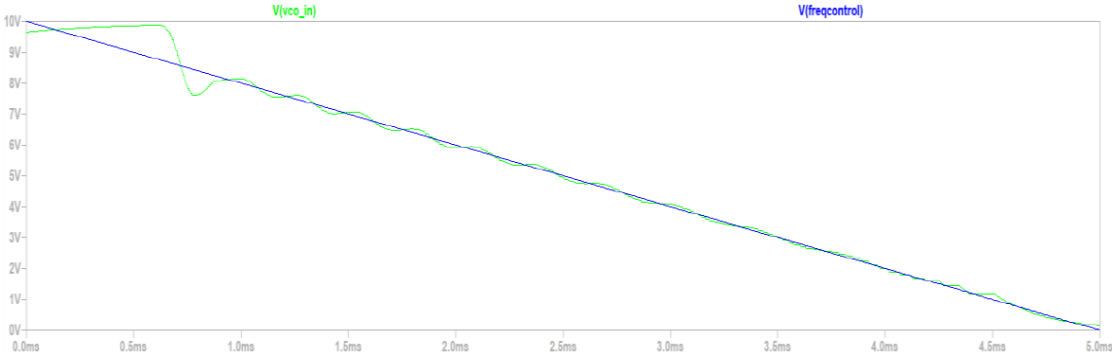
Pour pc1, C=100nF



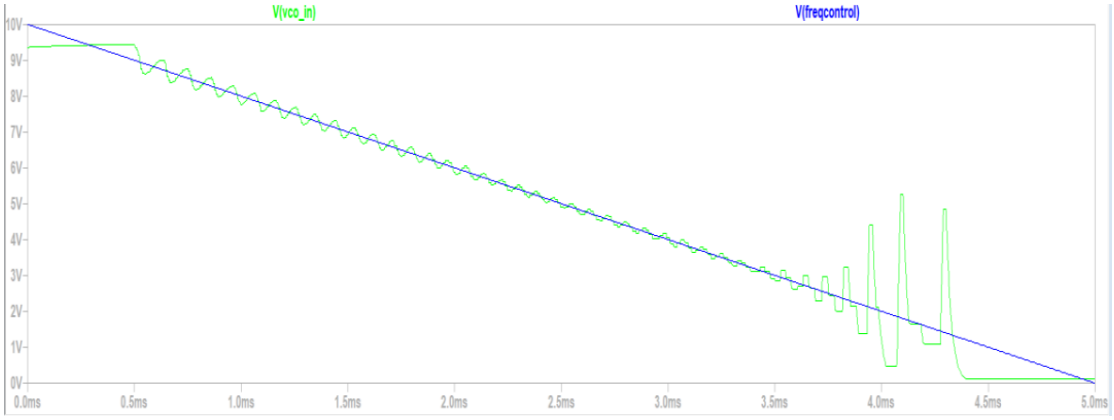
C=10nF



Pour pc2, C=100nF



C=10nF



Q5.

On a f=18.782V-14.661 quand 1<V<10,

F=1.94V quand 0<V<1,

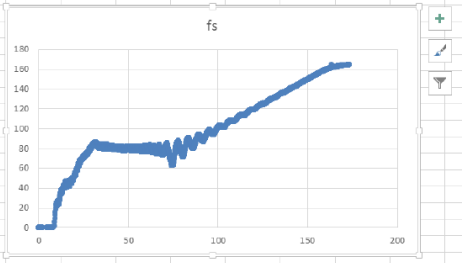
F=4.1V+122.12 quand V=10.

Avec l'aide de Excel, on a

1. Pour pc1, C=100nF,

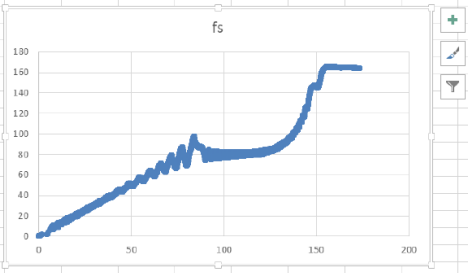
f_1=75kHz, f_2=163kHz, Croissant

time	V(freqcontrol)	V(vco_in)	fe	fs
0.00E+00	1.02E-08	2.06E-07	1.98E-08	3.99E-07
3.05E-13	1.08E-08	2.19E-07	2.1E-08	4.24E-07
3.46E-13	1.09E-08	2.20E-07	2.12E-08	4.28E-07
4.28E-13	1.11E-08	2.24E-07	2.15E-08	4.34E-07
5.92E-13	1.14E-08	2.31E-07	2.21E-08	4.48E-07
9.20E-13	1.21E-08	2.45E-07	2.34E-08	4.76E-07
1.57E-12	1.34E-08	2.74E-07	2.59E-08	5.31E-07
2.72E-12	1.57E-08	3.23E-07	3.04E-08	6.29E-07
4.14E-12	1.85E-08	3.85E-07	3.59E-08	7.47E-07
6.64E-12	2.35E-08	4.94E-07	4.56E-08	9.58E-07
9.32E-12	2.89E-08	6.10E-07	5.6E-08	1.18E-06
1.31E-11	3.63E-08	7.73E-07	7.05E-08	1.5E-06
1.74E-11	4.50E-08	9.62E-07	8.74E-08	1.87E-06
2.46E-11	5.94E-08	1.27E-06	1.15E-07	2.47E-06
3.52E-11	8.07E-08	1.74E-06	1.57E-07	3.37E-06
5.39E-11	1.18E-07	2.55E-06	2.29E-07	4.94E-06
7.84E-11	1.67E-07	3.61E-06	3.24E-07	7.01E-06
1.25E-10	2.60E-07	5.62E-06	5.03E-07	1.09E-05
1.69E-10	3.48E-07	7.54E-06	6.74E-07	1.46E-05
2.40E-10	4.90E-07	1.06E-05	9.51E-07	2.06E-05
3.24E-10	6.59E-07	1.43E-05	1.28E-06	2.78E-05
4.93E-10	9.97E-07	2.16E-05	1.93E-06	4.2E-05
6.49E-10	1.31E-06	2.84E-05	2.54E-06	5.51E-05
7.53E-10	1.52E-06	3.29E-05	2.94E-06	6.38E-05
8.97E-10	1.80E-06	3.92E-05	3.5E-06	7.6E-05
1.06E-09	2.13E-06	4.63E-05	4.13E-06	8.98E-05
1.26E-09	2.53E-06	5.50E-05	4.91E-06	0.000107
1.47E-09	2.96E-06	6.42E-05	5.73E-06	0.000125
1.69E-09	3.40E-06	7.38E-05	6.59E-06	0.000143



f1=0kHz, f2=90kHz, décroissant

time	V(freqcontrol)	V(vco_in)	fe	fs
0.00E+00	1.00E+01	9.51E+00	163.21	163.9495
3.61E-08	1.00E+01	9.51E+00	173.1576	163.9509
1.08E-07	1.00E+01	9.51E+00	173.1549	163.9538
2.52E-07	1.00E+01	9.51E+00	173.1495	163.9596
5.41E-07	1.00E+01	9.51E+00	173.1387	163.9711
5.50E-07	1.00E+01	9.51E+00	173.1383	163.9714
5.68E-07	1.00E+01	9.51E+00	173.1377	163.9722
6.04E-07	1.00E+01	9.51E+00	173.1363	163.9736
6.76E-07	1.00E+01	9.51E+00	173.1336	163.9765
8.20E-07	1.00E+01	9.51E+00	173.1282	163.9822
8.57E-07	1.00E+01	9.51E+00	173.1268	163.9837
9.29E-07	1.00E+01	9.51E+00	173.1241	163.9866
9.47E-07	1.00E+01	9.51E+00	173.1234	163.9873
9.83E-07	1.00E+01	9.51E+00	173.1221	163.9887
9.92E-07	1.00E+01	9.51E+00	173.1217	163.9891
1.01E-06	1.00E+01	9.51E+00	173.1211	163.9898
1.01E-06	1.00E+01	9.51E+00	173.1209	163.99
1.02E-06	1.00E+01	9.51E+00	173.1206	163.9903
1.03E-06	1.00E+01	9.51E+00	173.1205	163.9904
1.03E-06	1.00E+01	9.51E+00	173.1203	163.9906
1.04E-06	1.00E+01	9.51E+00	173.1201	163.9908
1.04E-06	1.00E+01	9.51E+00	173.12	163.9909
1.04E-06	1.00E+01	9.51E+00	173.1199	163.991
1.04E-06	1.00E+01	9.51E+00	173.1199	163.9911
1.04E-06	1.00E+01	9.51E+00	173.1198	163.9911
1.04E-06	1.00E+01	9.51E+00	173.1198	163.9911
1.04E-06	1.00E+01	9.51E+00	173.1198	163.9911
1.04E-06	1.00E+01	9.51E+00	173.1198	163.9911

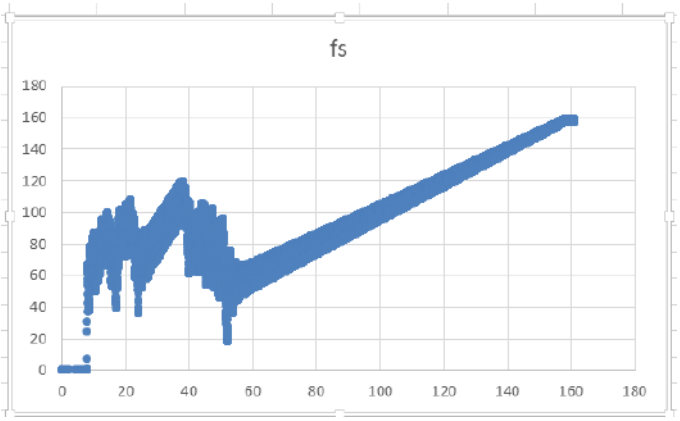


Donc, la plage de capture : 75kHz-90kHz

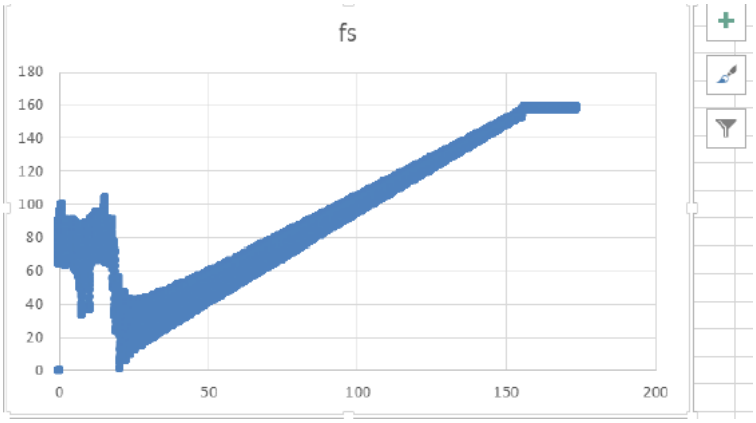
La plage de verrouillage : 0kHz-163kHz

2. Pour pc1, C=10nF,

f_1=55kHz,f_2=160kHz, croissant



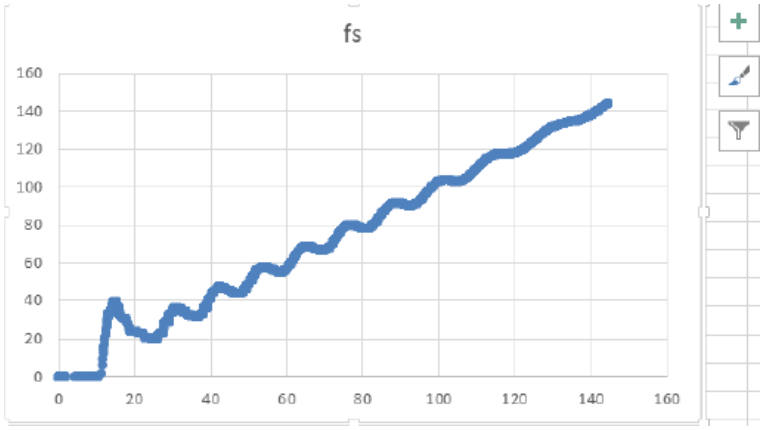
f_1=22kHz, f_2=153kHz, décroissant



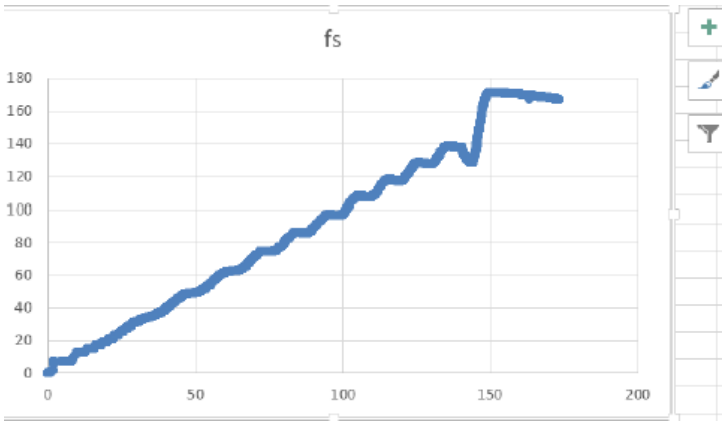
La plage de capture : 55kHz-153kHz

La plage de verrouillage : 22kHz-160kHz

3. Pour pc2, C=100nF, croissant, f_1=20kHz, f_2=144.57kHz



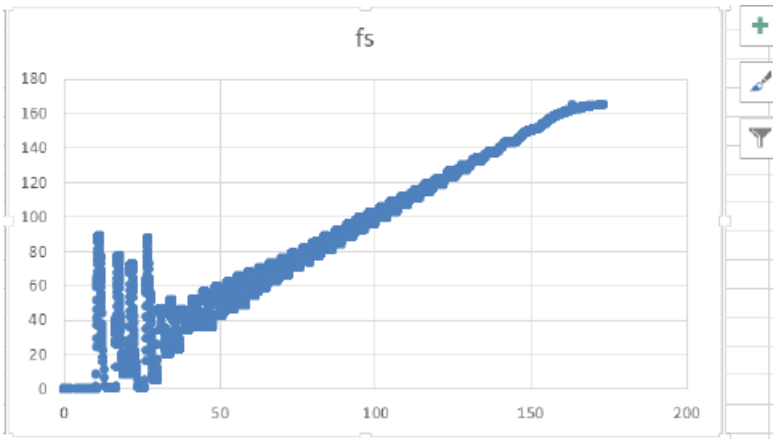
f_1=0kHz, f_2=141kHz, décroissant,



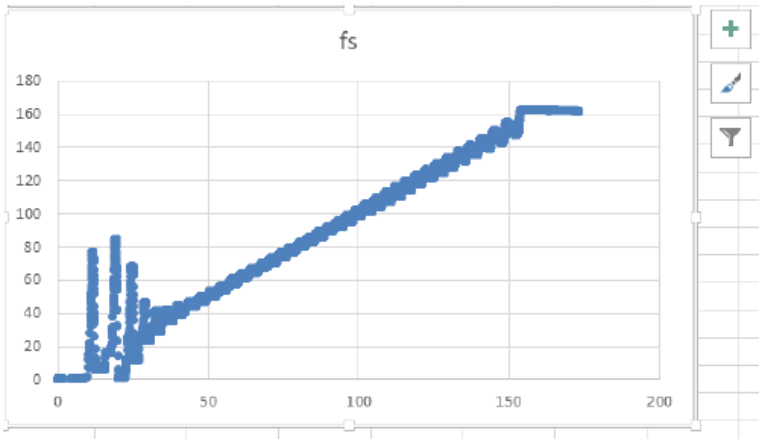
La plage de capture : 20kHz-141kHz

La plage de verrouillage : 0kHz-144.57kHz

4. Pour pc2, C=10nF, f_1=40kHz,f_2=163kHz, croissant,



f_1=30kHz, f_2=150kHz, décroissant

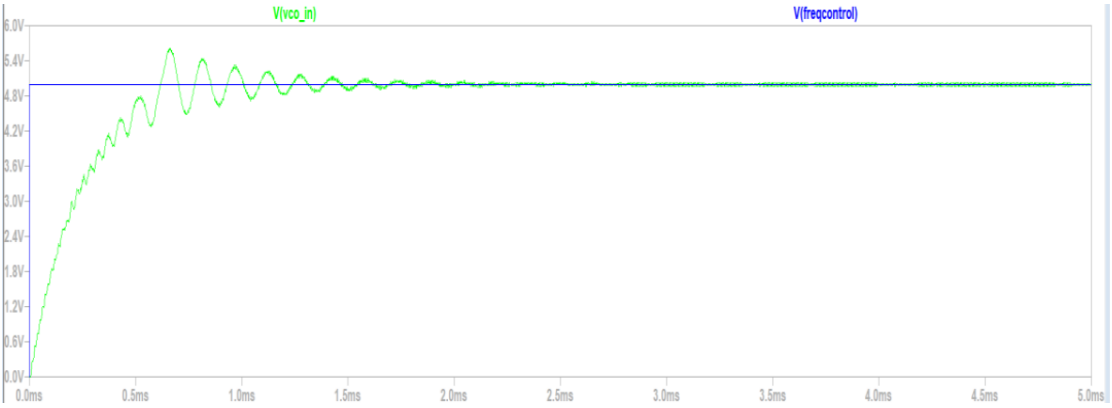


La plage de capture : 40kHz-150kHz

La plage de verrouillage : 30kHz-163kHz

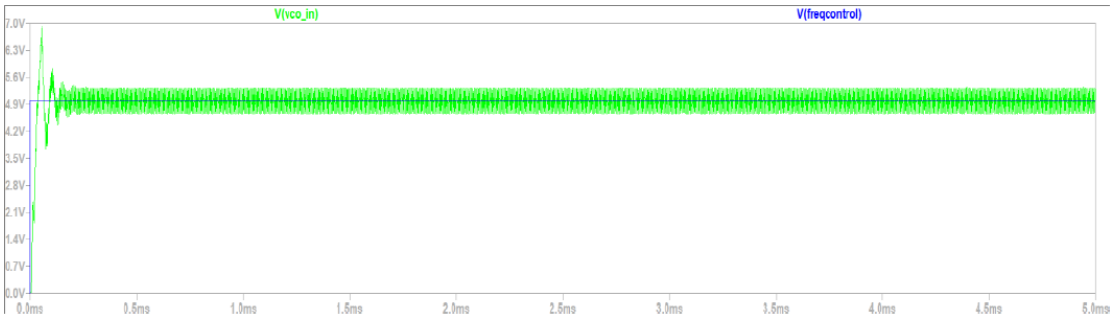
Q6.Q7.

Pour pc1, C=100nF,



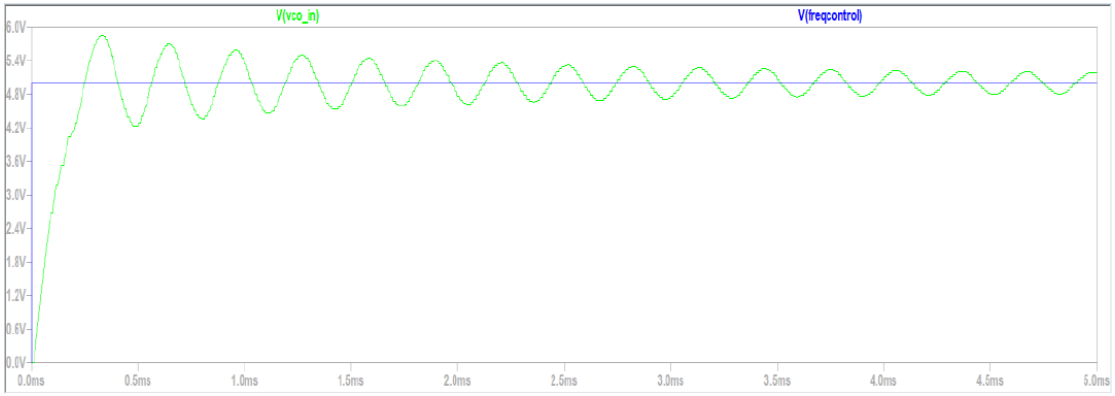
Le temps nécessaire pour attendre 90% de V est environs 0.48ms.

Pour pc1, C=10nF,



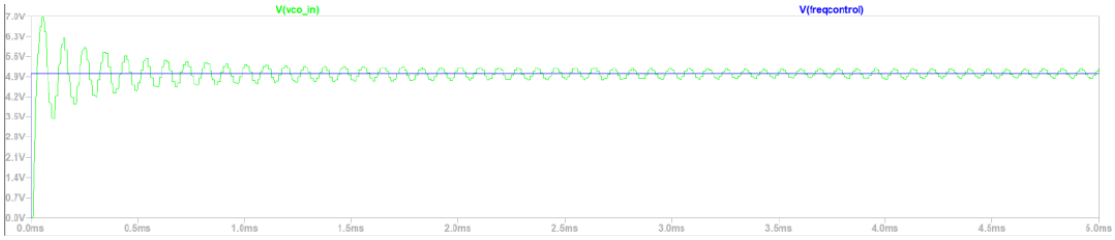
Le temps nécessaire pour attendre 90% de V est environs 0.026ms.

Pour pc2, C=100nF,



Le temps nécessaire pour attendre 90% de V est environs 0.02ms.

Pour pc2, C=10nF,



Le temps nécessaire pour attendre 90% de V est environs 0.025ms.

Q8.

On a $\tau = RC$, $\tau = 0.18ms$ quand R_3=18kΩ et C_2=100nF,

$\tau = 0.018ms$, quand R_3=1.8kΩ et C_2=10nF.

Ils ont presque les même valeurs.