Etude de la PLL CD4046B

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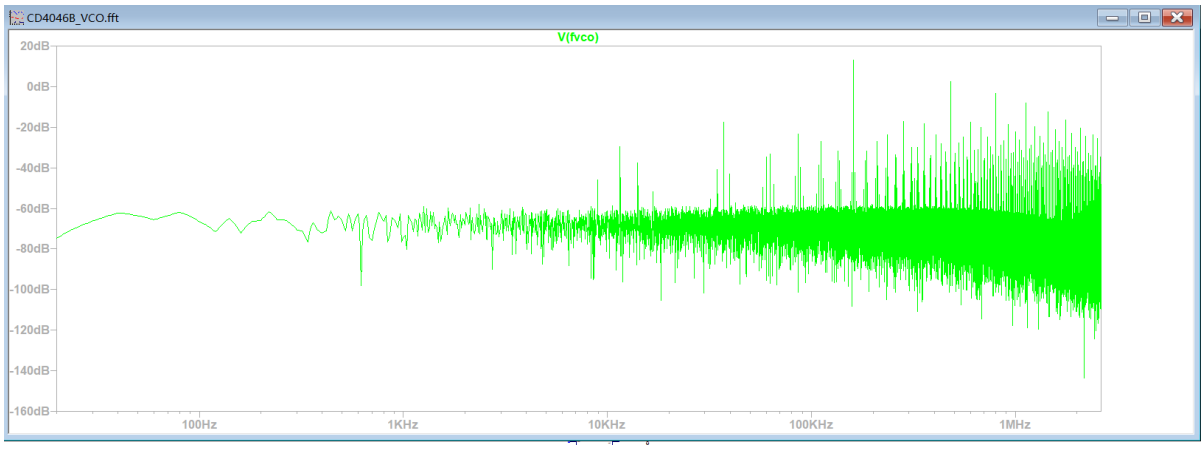
Numéro: SY1924144

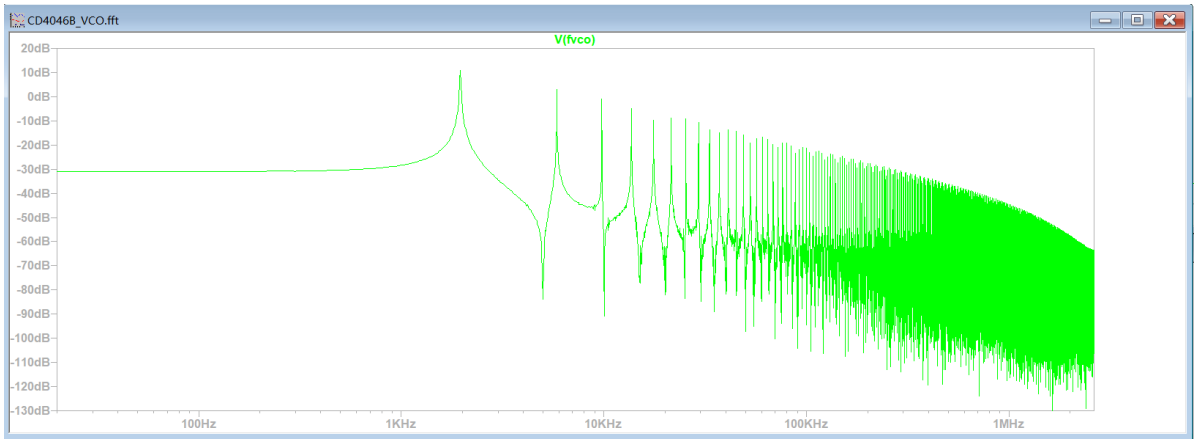
1. Caractérisation du VCO

1. En fonction de la notice technique : figure 7, on peut trouver que $f_0 = 80kHz$, donc $f_{max} = 160kHz$. la plage de fonctionnement du VCO est [80kHz,160kHz].

2. $f_{max} = 160kHz$, $f_{min} = 1Hz$.En changeant la tension d'entrée, je peux observer le changement de fréquence.Ensuite je vous donne un exemple de V=10V et V=1V



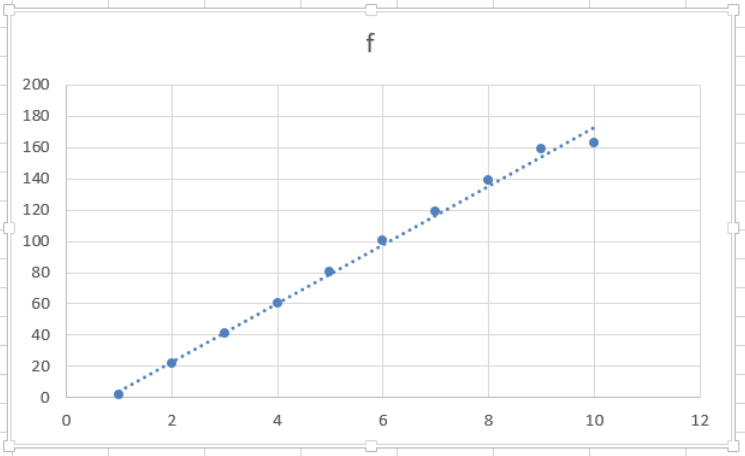
V=10V, FFT de fvco



V=1V, FFT de fvco

En collectant tous les datas, je peux construire un tableau de fréquence en fonction de tension :

V	f
1	1. 938
2	21. 552
3	41
4	60. 607
5	80. 411
6	100. 652
7	118. 865
8	139. 21
9	159. 022
10	163. 117

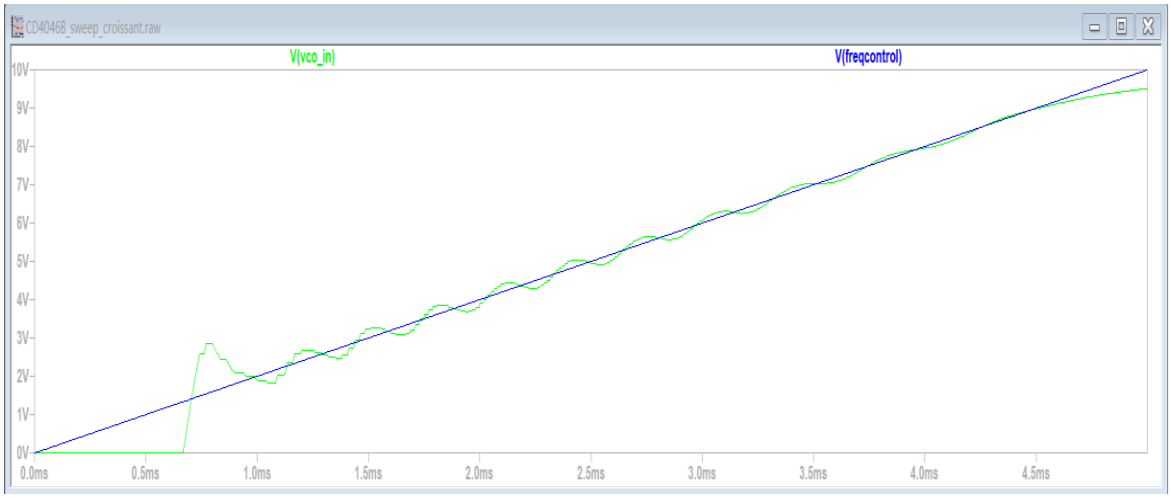


On peut voir qu'il change linéairement.

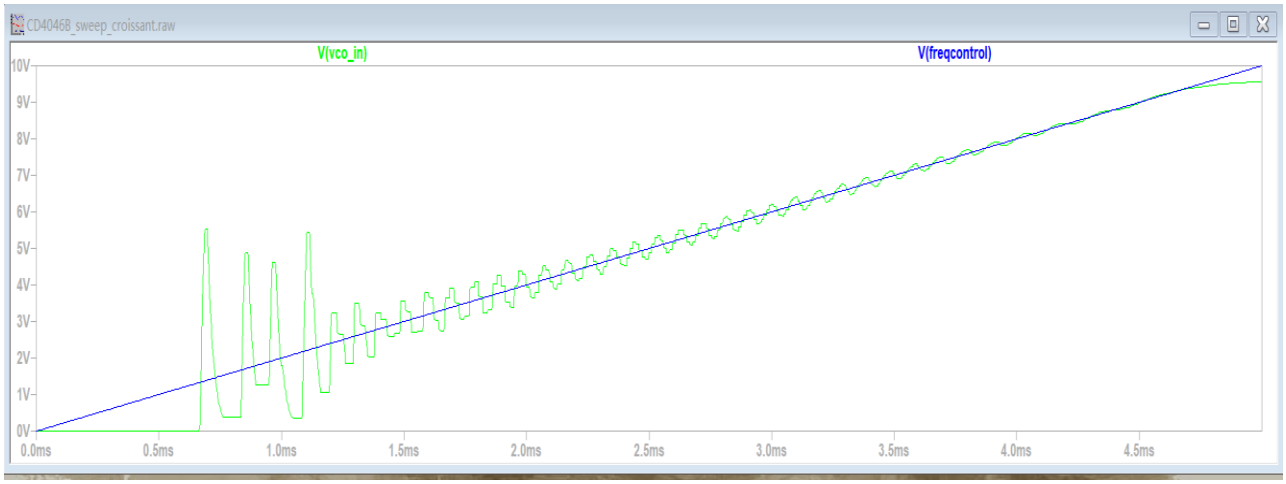
2 Mesure des plages de capture et de verrouillage

1)pc2

C=100nF

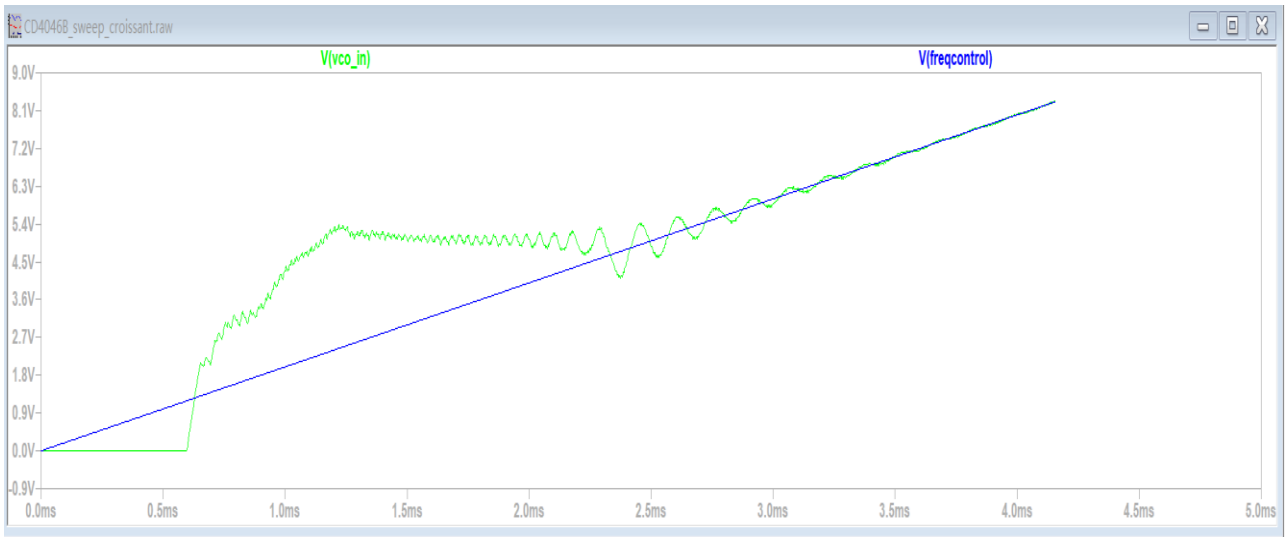


C=10nF

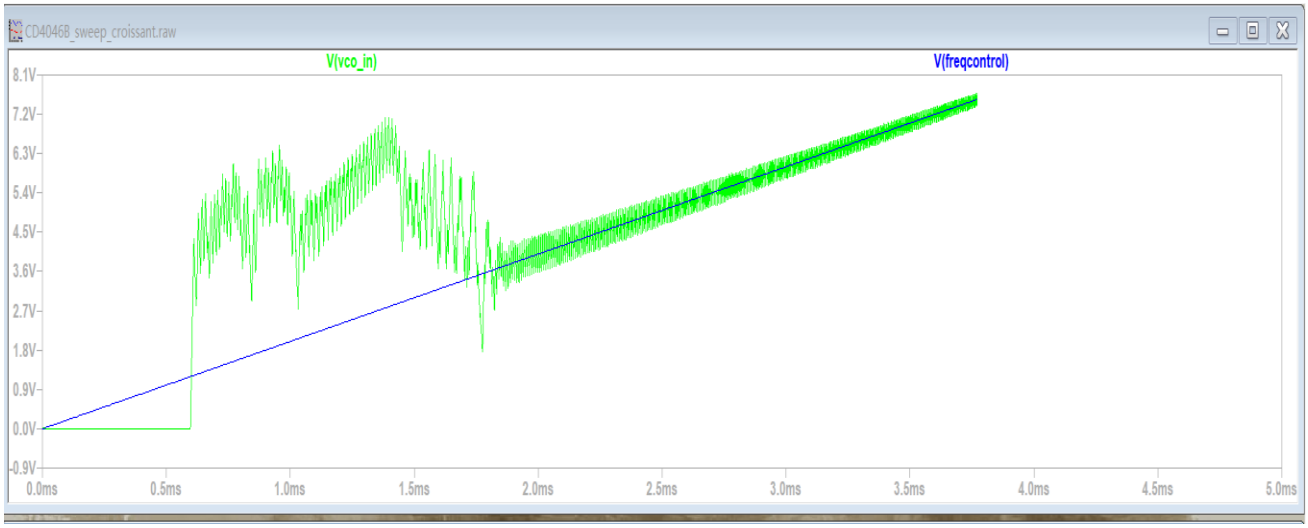


2) pc1

C=100nF



C=10nF



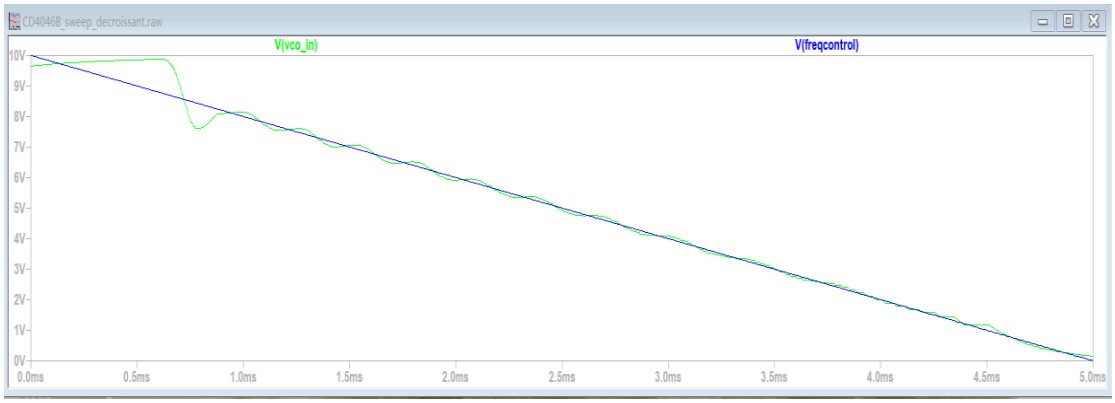
Les données dans le texte est comme ci-dessous :

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

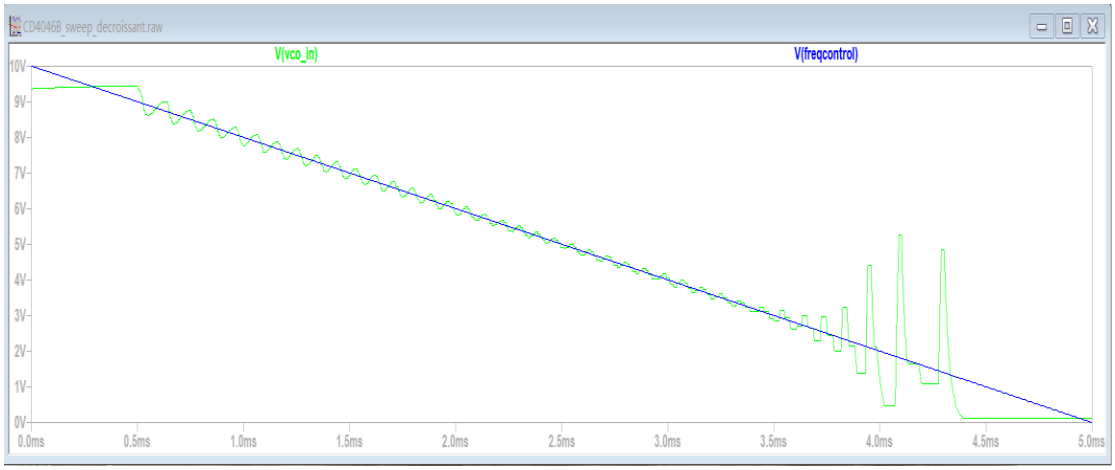
4.

1) pc2

C=100nF

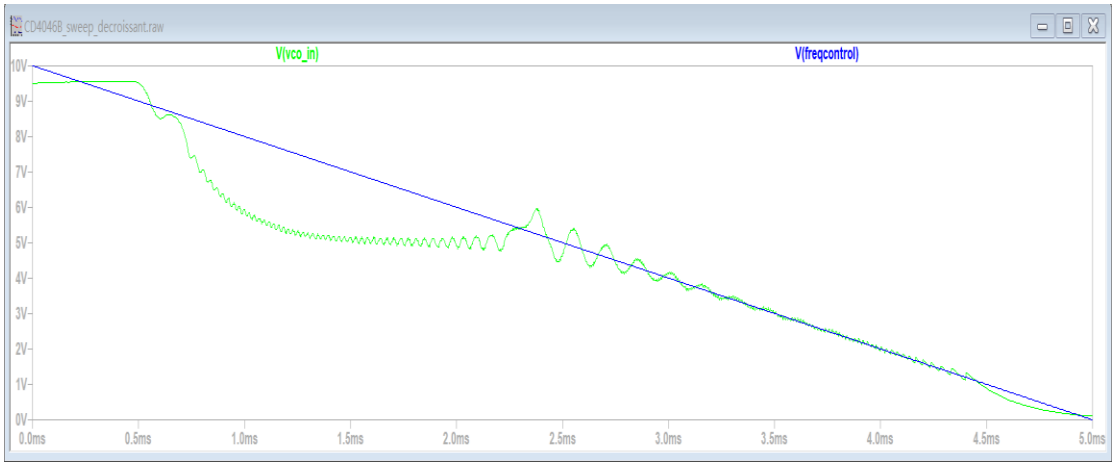


C=10nF

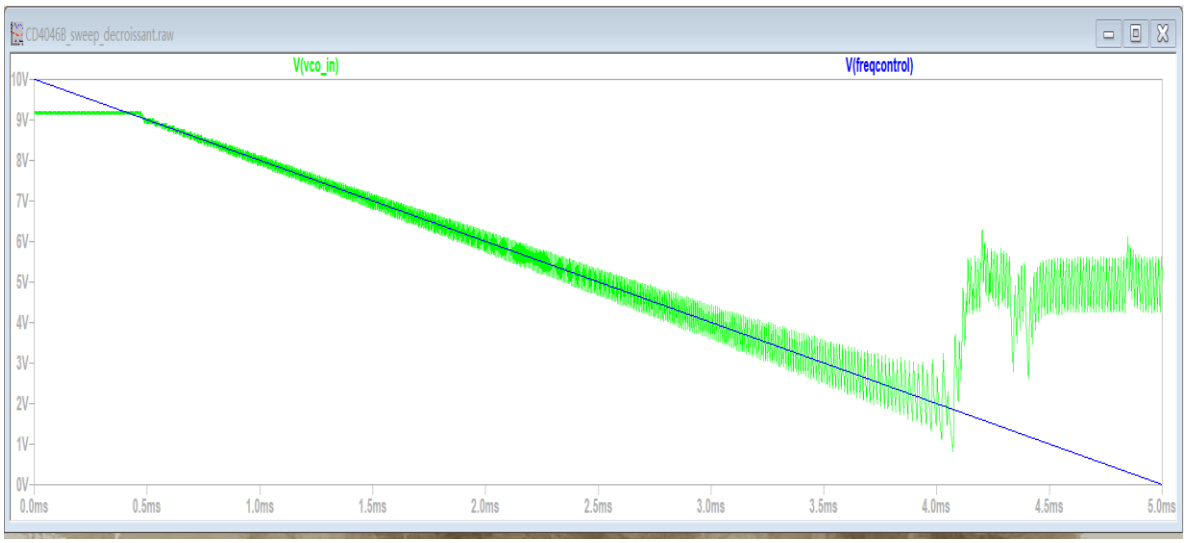


2) PC1

C=100nF



C=10nF



5. on doit faire très attention aux limites de V qui est très grand ou petit.

Si 1<V<10, f=18.782V-14.661

Si 0<V<1, f=1.94V

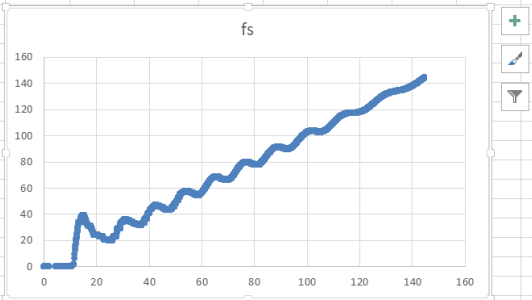
Si V=10, V=4.1V+122.12

En utilisant le logiciel Excel, j'obtiens :

1)pc2 C=100pF

Croissant

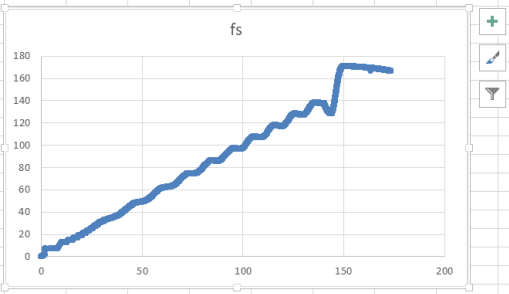
	A	B	C	D	E
1	time	V(freqcontrol)	V(vco_in)	fe	fs
2	0.00E+00	1.02E-08	2.36E-09	1.98E-08	4.58E-09
3	3.05E-13	1.08E-08	2.51E-09	2.1E-08	4.87E-09
4	3.46E-13	1.09E-08	2.53E-09	2.12E-08	4.91E-09
5	4.28E-13	1.11E-08	2.57E-09	2.15E-08	4.98E-09
6	5.92E-13	1.14E-08	2.65E-09	2.21E-08	5.14E-09
7	9.20E-13	1.21E-08	2.82E-09	2.34E-08	5.46E-09
8	1.57E-12	1.34E-08	3.14E-09	2.59E-08	6.1E-09
9	2.72E-12	1.57E-08	3.72E-09	3.04E-08	7.21E-09
10	4.14E-12	1.85E-08	4.42E-09	3.59E-08	8.57E-09
11	6.64E-12	2.35E-08	5.65E-09	4.56E-08	1.1E-08
12	9.32E-12	2.89E-08	6.95E-09	5.6E-08	1.35E-08
13	1.31E-11	3.63E-08	8.73E-09	7.05E-08	1.69E-08
14	1.74E-11	4.50E-08	1.08E-08	8.74E-08	2.09E-08
15	2.46E-11	5.94E-08	1.41E-08	1.15E-07	2.73E-08
16	3.52E-11	8.07E-08	1.88E-08	1.57E-07	3.65E-08
17	5.39E-11	1.18E-07	2.68E-08	2.29E-07	5.2E-08
18	7.84E-11	1.67E-07	3.69E-08	3.24E-07	7.15E-08
19	1.25E-10	2.60E-07	5.48E-08	5.03E-07	1.06E-07
20	1.69E-10	3.48E-07	7.09E-08	6.74E-07	1.38E-07
21	2.40E-10	4.90E-07	9.53E-08	9.51E-07	1.85E-07
22	3.24E-10	6.59E-07	1.22E-07	1.28E-06	2.37E-07
23	4.93E-10	9.97E-07	1.72E-07	1.93E-06	3.34E-07
24	6.49E-10	1.31E-06	2.16E-07	2.54E-06	4.19E-07
25	7.53E-10	1.52E-06	2.44E-07	2.94E-06	4.72E-07
26	8.97E-10	1.80E-06	2.81E-07	3.5E-06	5.45E-07
27	1.06E-09	2.13E-06	3.22E-07	4.13E-06	6.24E-07
28	1.26E-09	2.53E-06	3.71E-07	4.91E-06	7.2E-07
29	1.47E-09	2.96E-06	4.23E-07	5.73E-06	8.2E-07
30	1.69E-09	3.40E-06	4.75E-07	6.59E-06	9.22E-07



f1=20kHz,f2=144.57kHz

Décroissant

time	V(freqcontrol)	V(vco_in)	fe	fs
0.00E+00	1.00E+01	9.65E+00	163.21	166.6713
1.24E-08	1.00E+01	9.65E+00	173.1585	166.6716
3.73E-08	1.00E+01	9.65E+00	173.1576	166.6723
8.70E-08	1.00E+01	9.65E+00	173.1557	166.6735
1.86E-07	1.00E+01	9.65E+00	173.152	166.6761
3.85E-07	1.00E+01	9.66E+00	173.1445	166.6813
6.45E-07	1.00E+01	9.66E+00	173.1348	166.688
6.51E-07	1.00E+01	9.66E+00	173.1345	166.6882
6.64E-07	1.00E+01	9.66E+00	173.1341	166.6885
6.90E-07	1.00E+01	9.66E+00	173.1331	166.6892
7.41E-07	1.00E+01	9.66E+00	173.1312	166.6905
8.44E-07	1.00E+01	9.66E+00	173.1273	166.6932
8.69E-07	1.00E+01	9.66E+00	173.1263	166.6938
9.21E-07	1.00E+01	9.66E+00	173.1244	166.6952
1.02E-06	1.00E+01	9.66E+00	173.1206	166.6978
1.03E-06	1.00E+01	9.66E+00	173.1204	166.6979
1.03E-06	1.00E+01	9.66E+00	173.1202	166.6981
1.03E-06	1.00E+01	9.66E+00	173.1201	166.6981
1.04E-06	1.00E+01	9.66E+00	173.12	166.6982
1.04E-06	1.00E+01	9.66E+00	173.1198	166.6983
1.05E-06	1.00E+01	9.66E+00	173.1196	166.6984
1.05E-06	1.00E+01	9.66E+00	173.1194	166.6986
1.06E-06	1.00E+01	9.66E+00	173.1194	166.6986
1.06E-06	1.00E+01	9.66E+00	173.1193	166.6987
1.06E-06	1.00E+01	9.66E+00	173.1192	166.6987
1.06E-06	1.00E+01	9.66E+00	173.1192	166.6987
1.06E-06	1.00E+01	9.66E+00	173.1192	166.6987
1.06E-06	1.00E+01	9.66E+00	173.1192	166.6987
1.06E-06	1.00E+01	9.66E+00	173.1192	166.6988



f1=0kHz, f2=141kHz

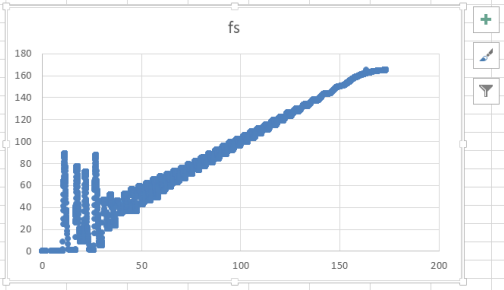
la plage de capture :20-141kHz

la plage de verrouillage :0-144.57kHz

2)pc2 C=10nF

Croissant

time	V(freqcontrol)	V(vco_in)	fe	fs
0.00E+00	1.02E-08	2.36E-08	1.98E-08	4.58E-08
3.05E-13	1.08E-08	2.51E-08	2.1E-08	4.87E-08
3.46E-13	1.09E-08	2.53E-08	2.12E-08	4.91E-08
4.28E-13	1.11E-08	2.57E-08	2.15E-08	4.98E-08
5.92E-13	1.14E-08	2.65E-08	2.21E-08	5.14E-08
9.20E-13	1.21E-08	2.82E-08	2.34E-08	5.46E-08
1.57E-12	1.34E-08	3.14E-08	2.59E-08	6.1E-08
2.72E-12	1.57E-08	3.72E-08	3.04E-08	7.21E-08
4.14E-12	1.85E-08	4.42E-08	3.59E-08	8.57E-08
6.64E-12	2.35E-08	5.65E-08	4.56E-08	1.1E-07
9.32E-12	2.89E-08	6.95E-08	5.6E-08	1.35E-07
1.31E-11	3.63E-08	8.73E-08	7.05E-08	1.69E-07
1.74E-11	4.50E-08	1.08E-07	8.74E-08	2.09E-07
2.46E-11	5.94E-08	1.41E-07	1.15E-07	2.73E-07
3.52E-11	8.07E-08	1.88E-07	1.57E-07	3.65E-07
5.39E-11	1.18E-07	2.68E-07	2.29E-07	5.2E-07
7.84E-11	1.67E-07	3.69E-07	3.24E-07	7.15E-07
1.25E-10	2.60E-07	5.48E-07	5.03E-07	1.06E-06
1.69E-10	3.48E-07	7.09E-07	6.74E-07	1.38E-06
2.40E-10	4.90E-07	9.53E-07	9.51E-07	1.85E-06
3.24E-10	6.59E-07	1.22E-06	1.28E-06	2.37E-06
4.93E-10	9.97E-07	1.72E-06	1.93E-06	3.34E-06
6.49E-10	1.31E-06	2.16E-06	2.54E-06	4.19E-06
7.53E-10	1.52E-06	2.44E-06	2.94E-06	4.72E-06
8.97E-10	1.80E-06	2.81E-06	3.5E-06	5.45E-06
1.06E-09	2.13E-06	3.22E-06	4.13E-06	6.24E-06
1.26E-09	2.53E-06	3.71E-06	4.91E-06	7.2E-06
1.47E-09	2.96E-06	4.23E-06	5.73E-06	8.2E-06
1.69E-09	3.40E-06	4.75E-06	6.59E-06	9.22E-06

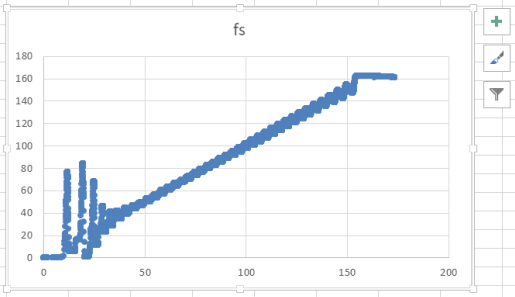


Feuil1 | Sheet1 | Sheet2

f1=40kHz,f2=163kHz

décroissant

	A	B	C	D	E
1	time	V(freqcontrol)	V(vco_in)	fe	fs
2	0.00E+00	1.00E+01	9.37E+00	163.21	161.2704
3	2.85E-08	1.00E+01	9.37E+00	173.1579	161.2704
4	8.54E-08	1.00E+01	9.37E+00	173.1558	161.2704
5	1.99E-07	1.00E+01	9.37E+00	173.1515	161.2704
6	4.27E-07	1.00E+01	9.37E+00	173.143	161.2704
7	8.82E-07	1.00E+01	9.37E+00	173.1259	161.2704
8	8.93E-07	1.00E+01	9.37E+00	173.1254	161.2704
9	9.16E-07	1.00E+01	9.37E+00	173.1246	161.2704
10	9.62E-07	1.00E+01	9.37E+00	173.1228	161.2704
11	9.74E-07	1.00E+01	9.37E+00	173.1224	161.2704
12	9.97E-07	1.00E+01	9.37E+00	173.1216	161.2704
13	1.00E-06	1.00E+01	9.37E+00	173.1213	161.2704
14	1.01E-06	1.00E+01	9.37E+00	173.1209	161.2704
15	1.02E-06	1.00E+01	9.37E+00	173.1208	161.2704
16	1.02E-06	1.00E+01	9.37E+00	173.1206	161.2704
17	1.03E-06	1.00E+01	9.37E+00	173.1202	161.2704
18	1.04E-06	1.00E+01	9.37E+00	173.1201	161.2704
19	1.04E-06	1.00E+01	9.37E+00	173.1198	161.2704
20	1.04E-06	1.00E+01	9.37E+00	173.1197	161.2704
21	1.05E-06	1.00E+01	9.37E+00	173.1196	161.2704
22	1.05E-06	1.00E+01	9.37E+00	173.1195	161.2704
23	1.05E-06	1.00E+01	9.37E+00	173.1194	161.2704
24	1.05E-06	1.00E+01	9.37E+00	173.1194	161.2704
25	1.05E-06	1.00E+01	9.37E+00	173.1194	161.2704
26	1.05E-06	1.00E+01	9.37E+00	173.1194	161.2704
27	1.05E-06	1.00E+01	9.37E+00	173.1194	161.2704
28	1.05E-06	1.00E+01	9.37E+00	173.1194	161.2704
29	1.05E-06	1.00E+01	9.37E+00	173.1194	161.2704
30	1.06E-06	1.00E+01	9.37E+00	173.1194	161.2704



f1=30kHz,f2=150kHz

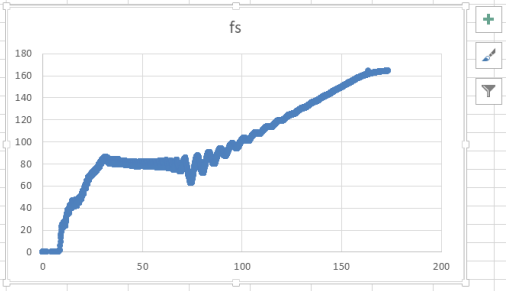
la plage de capture :40-150kHz

la plage de verrouillage :30-163kHz

3)pc1 C=100nF

Croissant

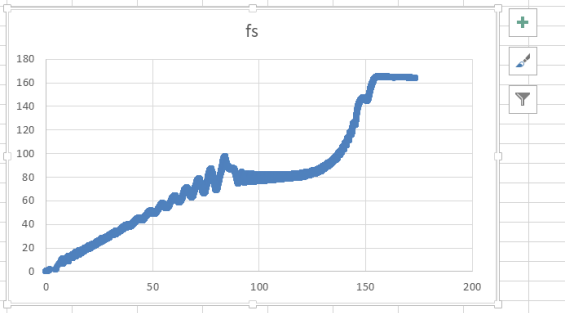
	A	B	C	D	E
1	time	V(freqcontrol)	V(vco_in)	fe	fs
2	0.00E+00	1.02E-08	2.06E-07	1.98E-08	3.99E-07
3	3.05E-13	1.08E-08	2.19E-07	2.1E-08	4.24E-07
4	3.46E-13	1.09E-08	2.20E-07	2.12E-08	4.28E-07
5	4.28E-13	1.11E-08	2.24E-07	2.15E-08	4.34E-07
6	5.92E-13	1.14E-08	2.31E-07	2.21E-08	4.48E-07
7	9.20E-13	1.21E-08	2.45E-07	2.34E-08	4.76E-07
8	1.57E-12	1.34E-08	2.74E-07	2.59E-08	5.31E-07
9	2.72E-12	1.57E-08	3.23E-07	3.04E-08	6.28E-07
10	4.14E-12	1.85E-08	3.85E-07	3.59E-08	7.47E-07
11	6.64E-12	2.35E-08	4.94E-07	4.56E-08	9.58E-07
12	9.32E-12	2.89E-08	6.10E-07	5.6E-08	1.18E-06
13	1.31E-11	3.63E-08	7.73E-07	7.05E-08	1.5E-06
14	1.74E-11	4.50E-08	9.62E-07	8.74E-08	1.87E-06
15	2.46E-11	5.94E-08	1.27E-06	1.15E-07	2.47E-06
16	3.52E-11	8.07E-08	1.74E-06	1.57E-07	3.37E-06
17	5.39E-11	1.18E-07	2.55E-06	2.29E-07	4.94E-06
18	7.84E-11	1.67E-07	3.61E-06	3.24E-07	7.01E-06
19	1.25E-10	2.60E-07	5.62E-06	5.03E-07	1.09E-05
20	1.69E-10	3.48E-07	7.54E-06	6.74E-07	1.46E-05
21	2.40E-10	4.90E-07	1.06E-05	9.51E-07	2.06E-05
22	3.24E-10	6.59E-07	1.43E-05	1.28E-06	2.78E-05
23	4.93E-10	9.97E-07	2.16E-05	1.93E-06	4.2E-05
24	6.49E-10	1.31E-06	2.84E-05	2.54E-06	5.51E-05
25	7.53E-10	1.52E-06	3.29E-05	2.94E-06	6.38E-05
26	8.97E-10	1.80E-06	3.92E-05	3.5E-06	7.6E-05
27	1.06E-09	2.13E-06	4.63E-05	4.13E-06	8.98E-05
28	1.26E-09	2.53E-06	5.50E-05	4.91E-06	0.000107
29	1.47E-09	2.96E-06	6.42E-05	5.73E-06	0.000125
30	1.69E-09	3.40E-06	7.38E-05	6.59E-06	0.000143



f1=75kHz,f2=163kHz

décroissant

	A	B	C	D	E
1	time	V(freqcontrol)	V(vco_in)	fe	fs
2	0.00E+00	1.00E+01	9.51E+00	163.21	163.9495
3	3.61E-08	1.00E+01	9.51E+00	173.1576	163.9509
4	1.08E-07	1.00E+01	9.51E+00	173.1549	163.9538
5	2.52E-07	1.00E+01	9.51E+00	173.1495	163.9596
6	5.41E-07	1.00E+01	9.51E+00	173.1387	163.9711
7	5.50E-07	1.00E+01	9.51E+00	173.1383	163.9714
8	5.68E-07	1.00E+01	9.51E+00	173.1377	163.9722
9	6.04E-07	1.00E+01	9.51E+00	173.1363	163.9736
10	6.76E-07	1.00E+01	9.51E+00	173.1336	163.9765
11	8.20E-07	1.00E+01	9.51E+00	173.1282	163.9822
12	8.57E-07	1.00E+01	9.51E+00	173.1268	163.9837
13	9.29E-07	1.00E+01	9.51E+00	173.1241	163.9866
14	9.47E-07	1.00E+01	9.51E+00	173.1234	163.9873
15	9.83E-07	1.00E+01	9.51E+00	173.1221	163.9887
16	9.92E-07	1.00E+01	9.51E+00	173.1217	163.9891
17	1.01E-06	1.00E+01	9.51E+00	173.1211	163.9898
18	1.01E-06	1.00E+01	9.51E+00	173.1209	163.99
19	1.02E-06	1.00E+01	9.51E+00	173.1206	163.9903
20	1.03E-06	1.00E+01	9.51E+00	173.1205	163.9904
21	1.03E-06	1.00E+01	9.51E+00	173.1203	163.9906
22	1.04E-06	1.00E+01	9.51E+00	173.1201	163.9908
23	1.04E-06	1.00E+01	9.51E+00	173.12	163.9909
24	1.04E-06	1.00E+01	9.51E+00	173.1199	163.991
25	1.04E-06	1.00E+01	9.51E+00	173.1199	163.9911
26	1.04E-06	1.00E+01	9.51E+00	173.1198	163.9911
27	1.04E-06	1.00E+01	9.51E+00	173.1198	163.9911
28	1.04E-06	1.00E+01	9.51E+00	173.1198	163.9911
29	1.04E-06	1.00E+01	9.51E+00	173.1198	163.9911



f1=0kHz,f2=90kHz

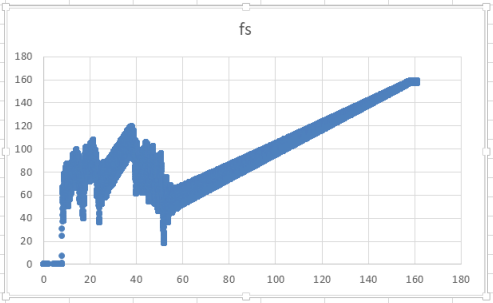
la plage de capture :75-90kHz

la plage de verrouillage :0-163kHz

4)PC1 C=10nF

Croissant

	A	B	C	D	E
1	time	V(freqcontrol)	V(vco_in)	fe	fs
2	0.00E+00	1.02E-08	2.06E-06	1.98E-08	3.99E-06
3	3.05E-13	1.08E-08	2.19E-06	2.1E-08	4.24E-06
4	3.46E-13	1.09E-08	2.20E-06	2.12E-08	4.28E-06
5	4.28E-13	1.11E-08	2.24E-06	2.15E-08	4.34E-06
6	5.92E-13	1.14E-08	2.31E-06	2.21E-08	4.48E-06
7	9.20E-13	1.21E-08	2.45E-06	2.34E-08	4.76E-06
8	1.57E-12	1.34E-08	2.74E-06	2.59E-08	5.31E-06
9	2.72E-12	1.57E-08	3.23E-06	3.04E-08	6.28E-06
10	4.14E-12	1.85E-08	3.85E-06	3.59E-08	7.47E-06
11	6.64E-12	2.35E-08	4.94E-06	4.56E-08	9.58E-06
12	9.32E-12	2.89E-08	6.10E-06	5.6E-08	1.18E-05
13	1.31E-11	3.63E-08	7.73E-06	7.05E-08	1.5E-05
14	1.74E-11	4.50E-08	9.62E-06	8.74E-08	1.87E-05
15	2.46E-11	5.94E-08	1.27E-05	1.15E-07	2.47E-05
16	3.52E-11	8.07E-08	1.74E-05	1.57E-07	3.37E-05
17	5.39E-11	1.18E-07	2.55E-05	2.29E-07	4.94E-05
18	7.84E-11	1.67E-07	3.61E-05	3.24E-07	7.01E-05
19	1.25E-10	2.60E-07	5.62E-05	5.03E-07	0.000109
20	1.69E-10	3.48E-07	7.54E-05	6.74E-07	0.000146
21	2.40E-10	4.90E-07	1.06E-04	9.51E-07	0.000206
22	3.24E-10	6.59E-07	1.43E-04	1.28E-06	0.000278
23	4.93E-10	9.97E-07	2.16E-04	1.93E-06	0.00042
24	6.49E-10	1.31E-06	2.84E-04	2.54E-06	0.000551
25	7.53E-10	1.52E-06	3.29E-04	2.94E-06	0.000638
26	8.97E-10	1.80E-06	3.92E-04	3.5E-06	0.00076
27	1.06E-09	2.13E-06	4.63E-04	4.13E-06	0.000898
28	1.26E-09	2.53E-06	5.50E-04	4.91E-06	0.001066
29	1.47E-09	2.96E-06	6.42E-04	5.73E-06	0.001246
30	1.69E-09	3.40E-06	7.38E-04	6.59E-06	0.001431

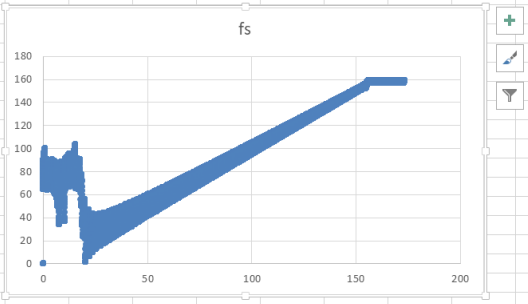


Feuil1 | Sheet1 | Sheet2 | Sheet3 | Sheet4 | Sheet5 | Sheet6

f1=55kHz,f2=160kHz

décroissant

	A	B	C	D	E
1	time	V(freqcontrol)	V(vco_in)	fe	fs
2	0.00E+00	1.00E+01	9.21E+00	163.21	158.285
3	2.99E-08	1.00E+01	9.21E+00	173.1579	158.3043
4	8.97E-08	1.00E+01	9.21E+00	173.1556	158.3428
5	2.09E-07	1.00E+01	9.22E+00	173.1511	158.4195
6	4.49E-07	1.00E+01	9.22E+00	173.1422	158.5713
7	9.27E-07	1.00E+01	9.24E+00	173.1242	158.8722
8	9.39E-07	1.00E+01	9.24E+00	173.1237	158.8797
9	9.42E-07	1.00E+01	9.24E+00	173.1236	158.8816
10	9.48E-07	1.00E+01	9.24E+00	173.1234	158.8854
11	9.50E-07	1.00E+01	9.24E+00	173.1233	158.8863
12	9.53E-07	1.00E+01	9.24E+00	173.1232	158.8882
13	9.59E-07	1.00E+01	9.24E+00	173.123	158.8919
14	9.64E-07	1.00E+01	9.24E+00	173.1228	158.895
15	9.66E-07	1.00E+01	9.24E+00	173.1227	158.8964
16	9.71E-07	1.00E+01	9.24E+00	173.1225	158.8994
17	9.73E-07	1.00E+01	9.24E+00	173.1225	158.9009
18	9.74E-07	1.00E+01	9.24E+00	173.1224	158.9012
19	9.75E-07	1.00E+01	9.24E+00	173.1224	158.9018
20	9.75E-07	1.00E+01	9.24E+00	173.1224	158.9021
21	9.75E-07	1.00E+01	9.24E+00	173.1224	158.9022
22	9.75E-07	1.00E+01	9.24E+00	173.1224	158.9022
23	9.75E-07	1.00E+01	9.24E+00	173.1224	158.9023
24	9.75E-07	1.00E+01	9.24E+00	173.1224	158.9023
25	9.76E-07	1.00E+01	9.24E+00	173.1224	158.9024
26	9.76E-07	1.00E+01	9.24E+00	173.1224	158.9024
27	9.76E-07	1.00E+01	9.24E+00	173.1224	158.9024
28	9.76E-07	1.00E+01	9.24E+00	173.1224	158.9024
29	9.76E-07	1.00E+01	9.24E+00	173.1224	158.9024
30	9.76E-07	1.00E+01	9.24E+00	173.1224	158.9024



f1=22kHz,f2=153kHz

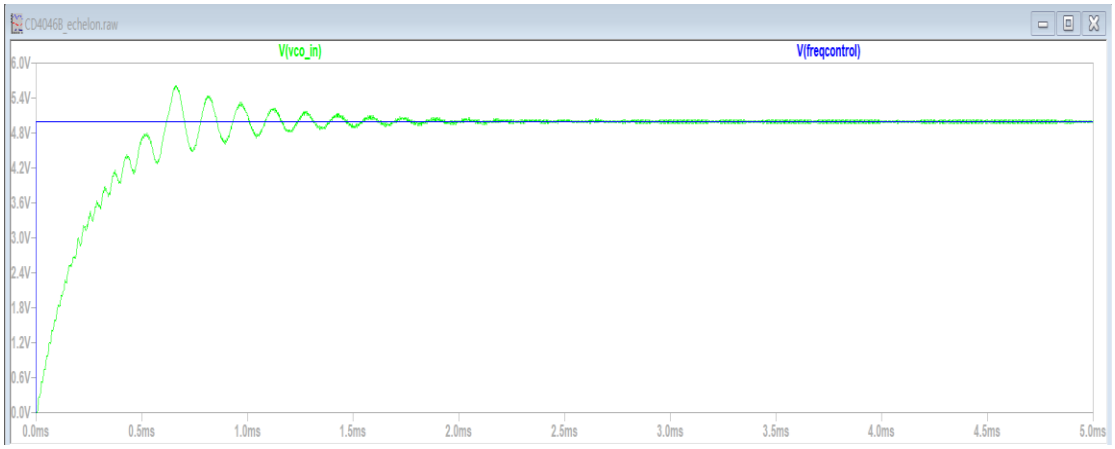
la plage de capture :55-153kHz

la plage de verrouillage :22-160kHz

3 Réponse de la PLL à un échelon

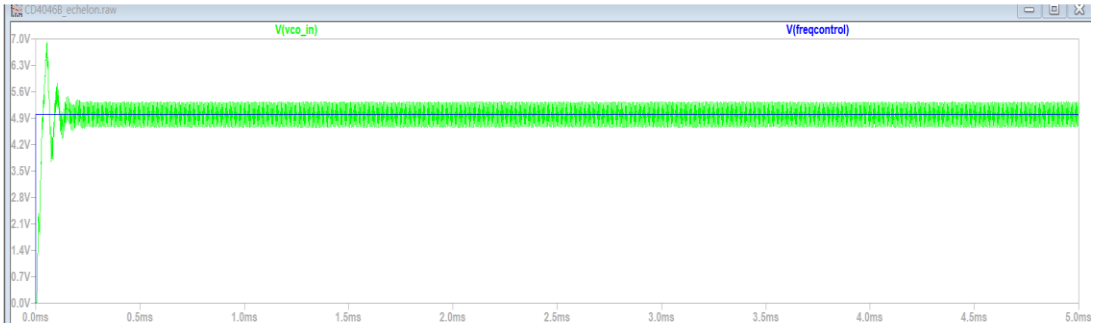
Question 1 et 2

1)Pc1 C=100nF



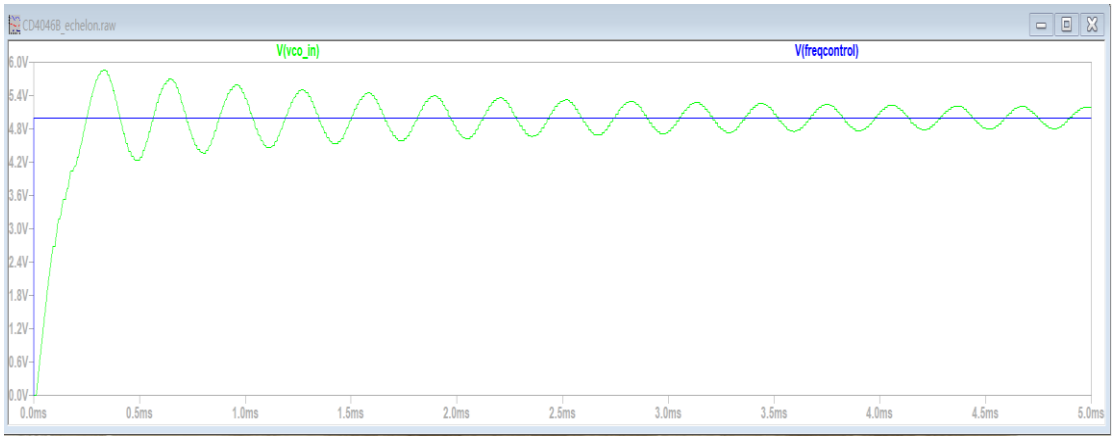
Le temps nécessaire pour attendre 90% de V est 0.49ms

2)Pc1 C=10nF



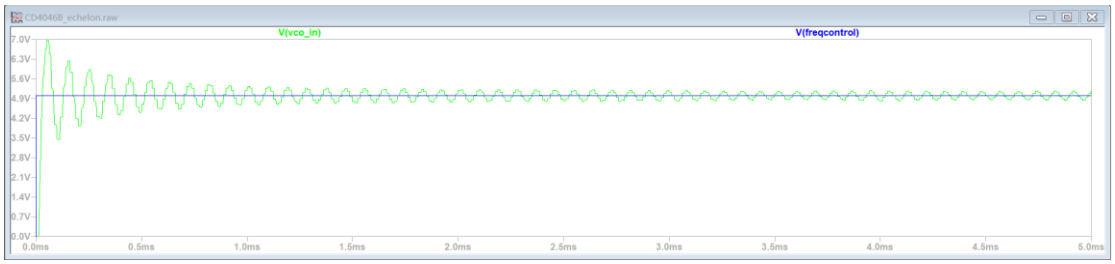
Le temps nécessaire pour attendre 90% de V est 0.027ms

3)PC2 C=100nF



Le temps nécessaire pour attendre 90% de V est 0.222ms

4)PC2 C=10nF



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

3.$\tau = RC$, pour $R3 = 1.8k\,\Omega$, $\mathrm{C2} = 100\mathrm{nF}, \tau = 0.18\mathrm{ms}$

pour $R3 = 1.8k\,\Omega$, $\mathrm{C2} = 10\mathrm{nF}, \tau = 0.018\mathrm{ms}$

ces résultats sont presque les mêmes.