

1 Caractérisation du VCO

1.

$$R_1 = 10k\Omega, R_2 = +\infty \quad C_1 = 1nF \quad V_{dd} = 10V$$

On peut trouver les informations sur la notice technique de la PLL HEF 4046B

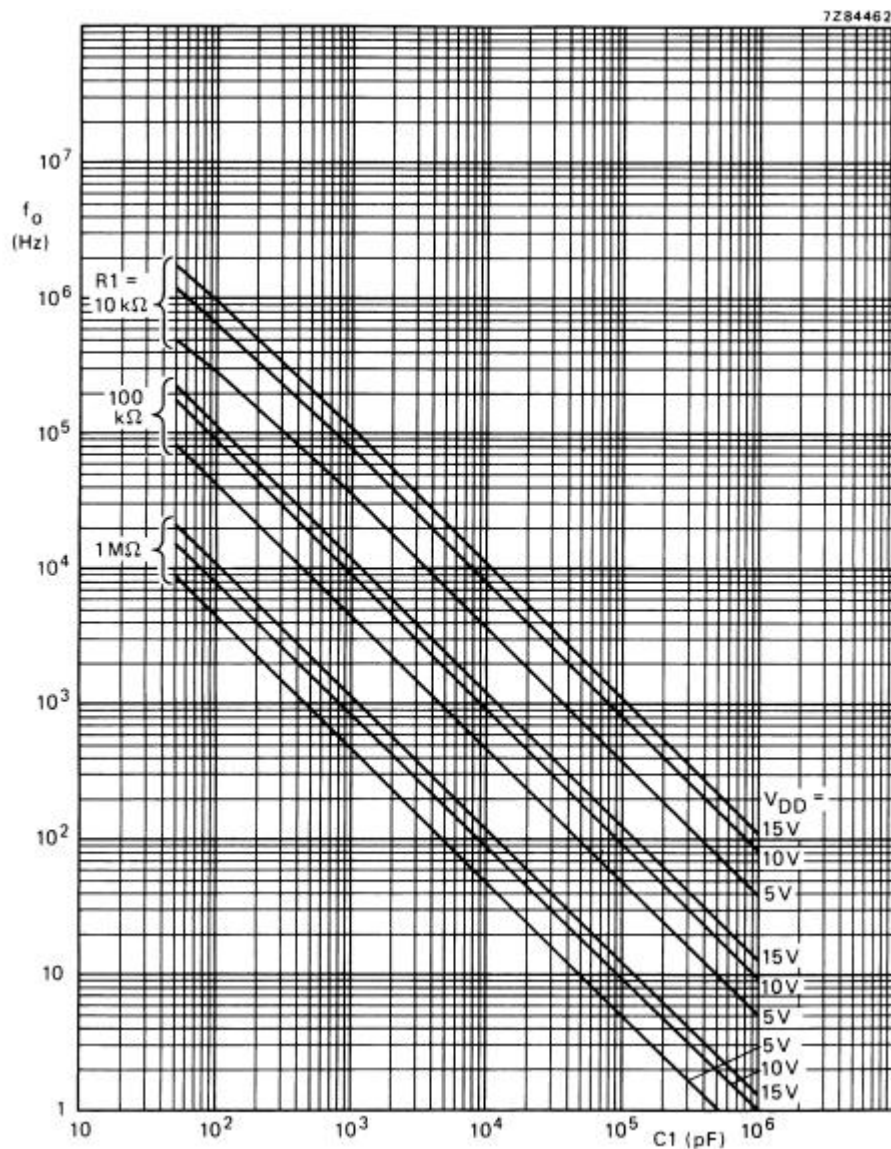
VCO component selection

Recommended range for R1 and R2: 10 kΩ to 1 MΩ; for C1: 50 pF to any practical value.

1. VCO without frequency offset ($R_2 = \infty$).

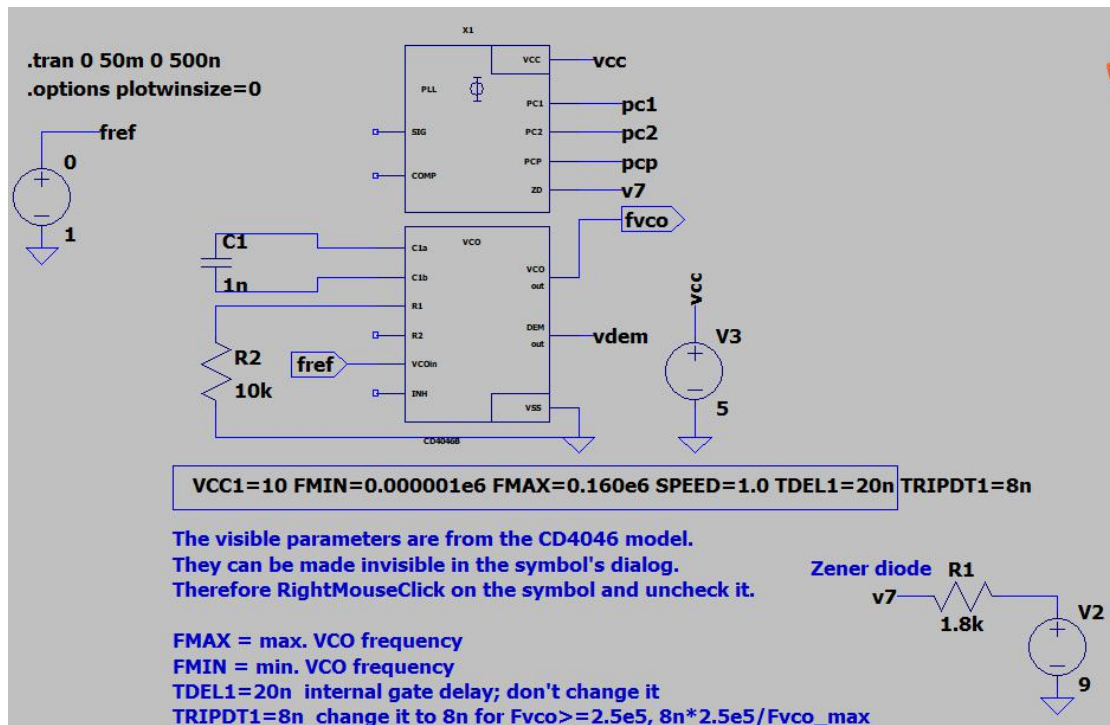
a) Given f_o : use f_o with Fig.7 to determine R1 and C1.

b) Given f_{max} : calculate f_o from $f_o = \frac{1}{2} f_{max}$; use f_o with Fig.7 to determine R1 and C1.

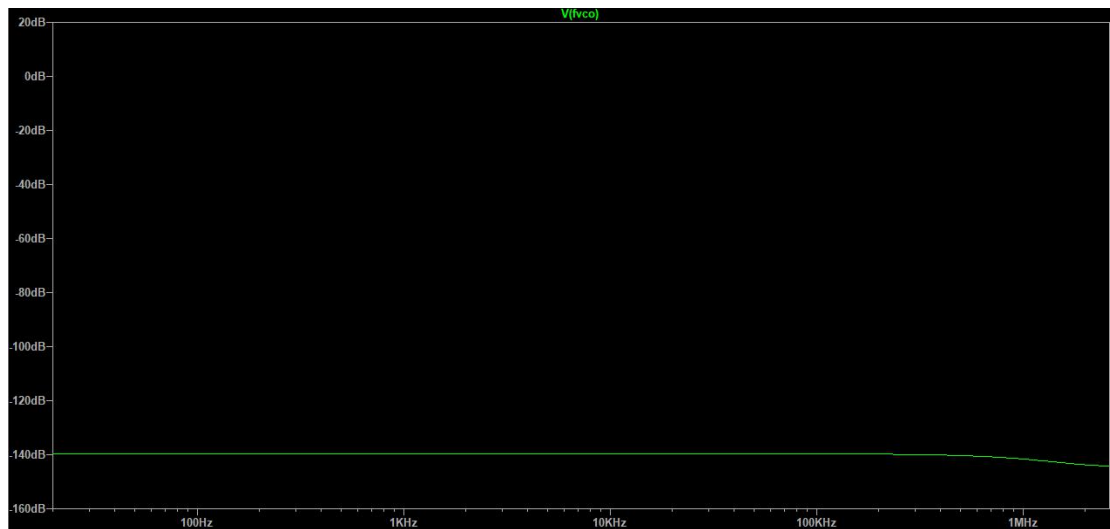


On peut obtenir $f_o \approx 7.5 \times 10^4 \text{ Hz}$, donc $f_{max} = 2f_o = 150\text{ kHz}$

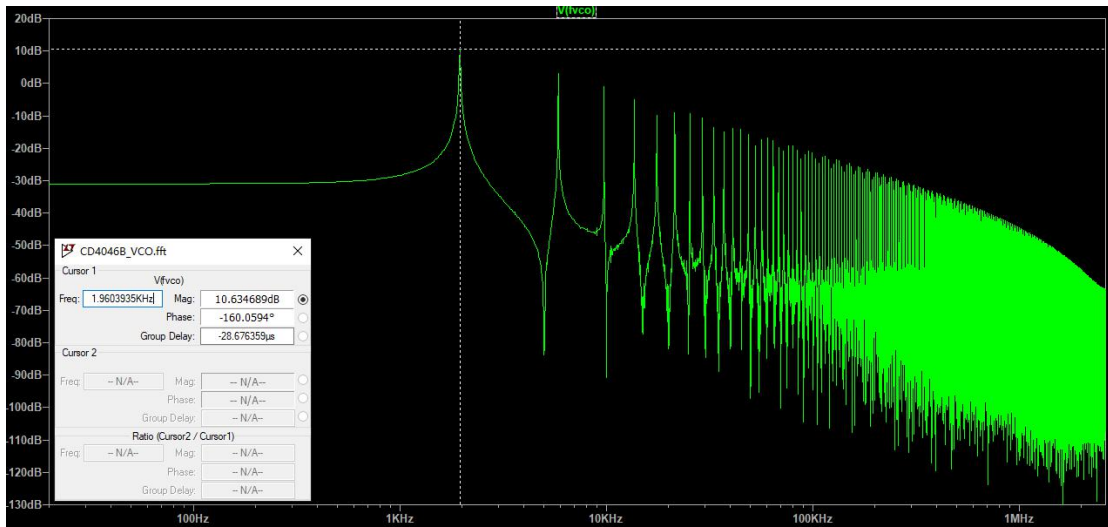
2.



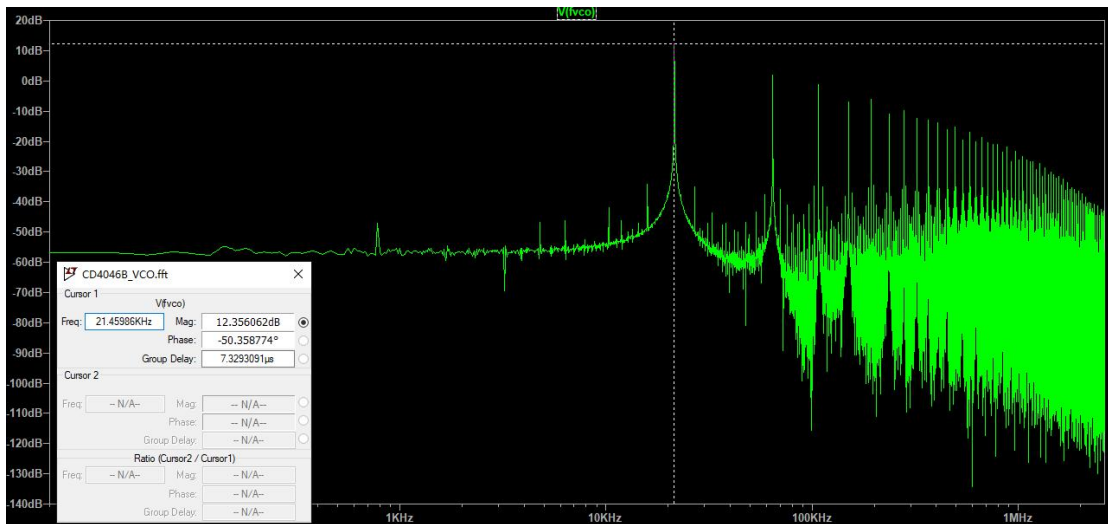
V1 = 0V



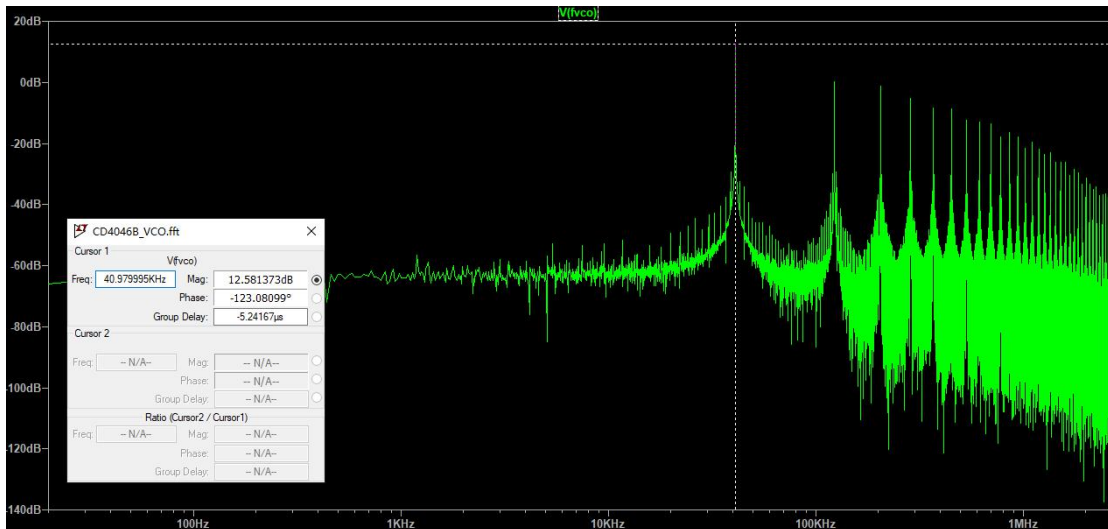
V1 = 1V



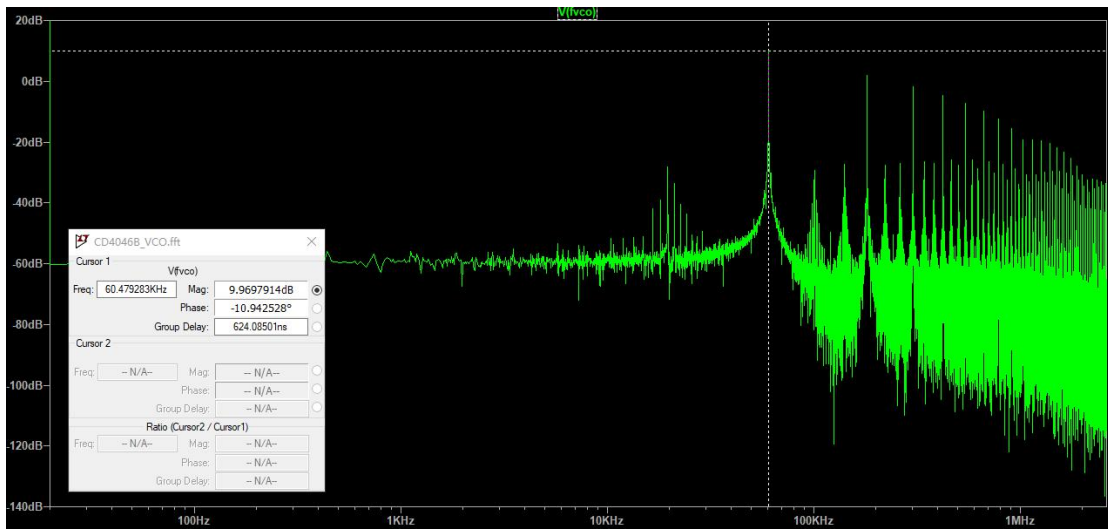
V1 = 2V



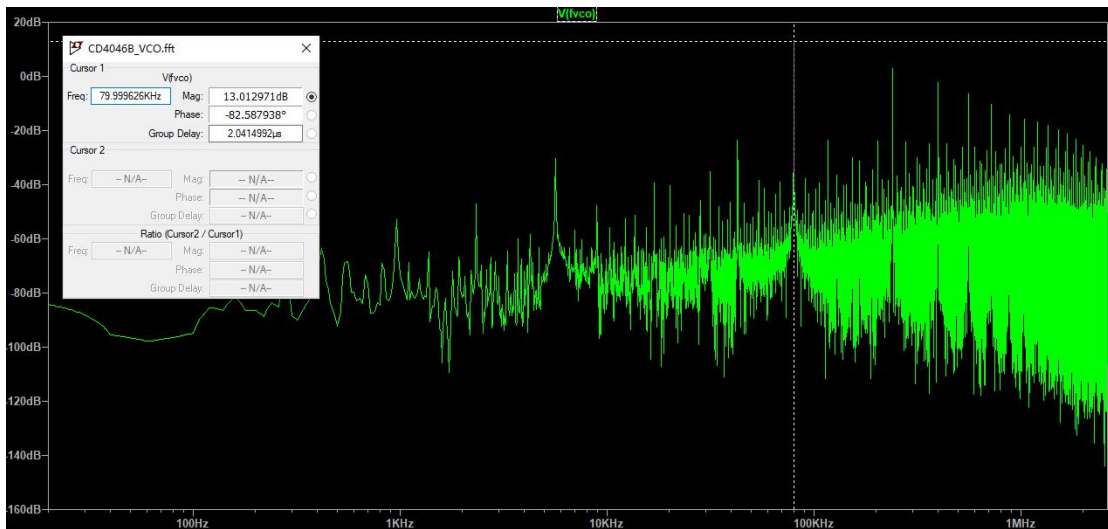
V1 = 3V



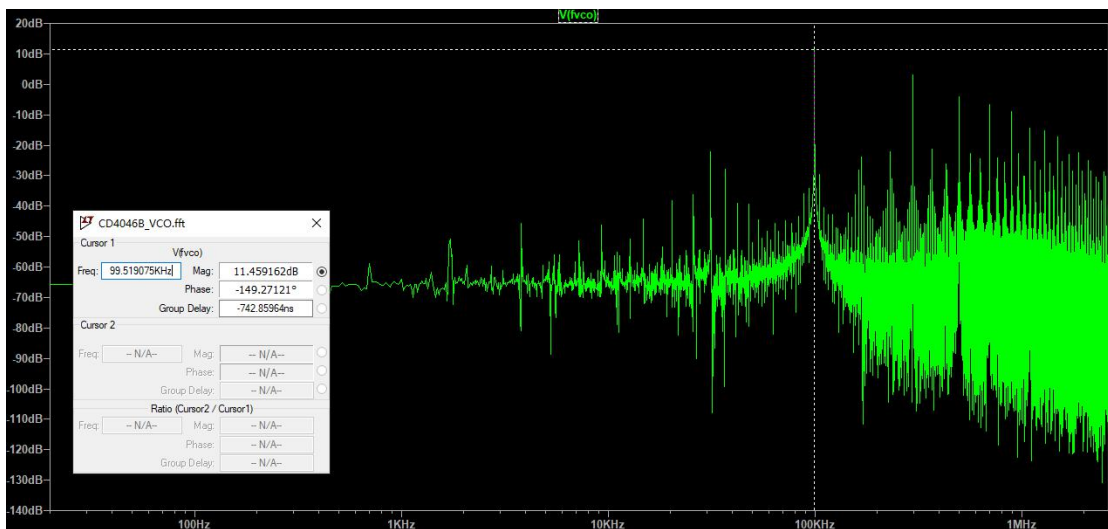
V1 = 4V



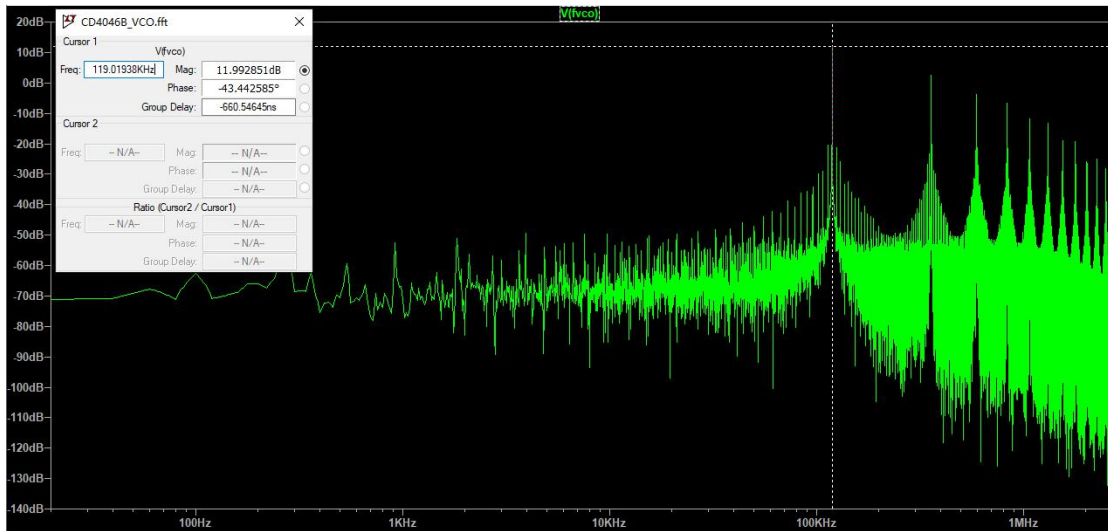
V1 = 5V



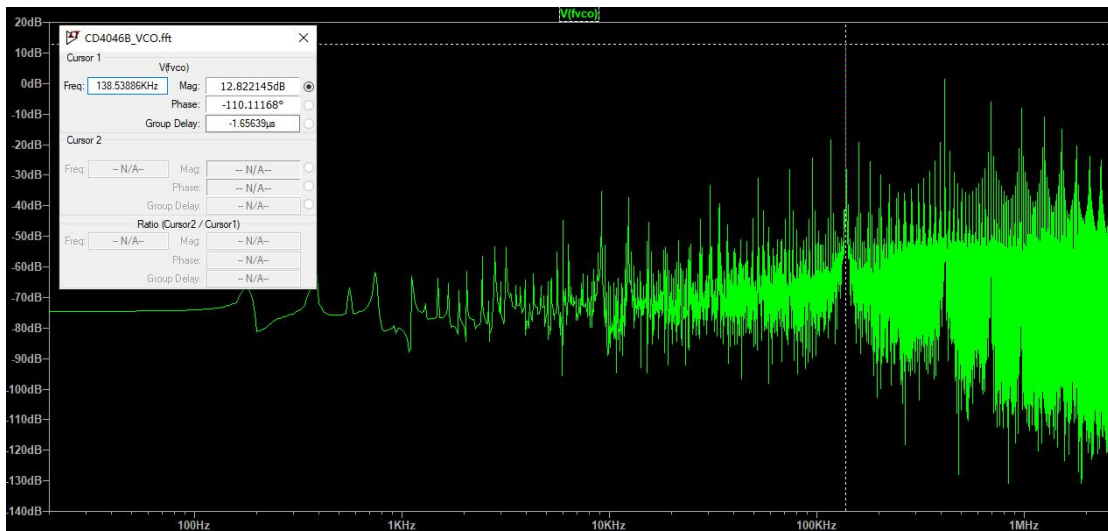
V1 = 6V



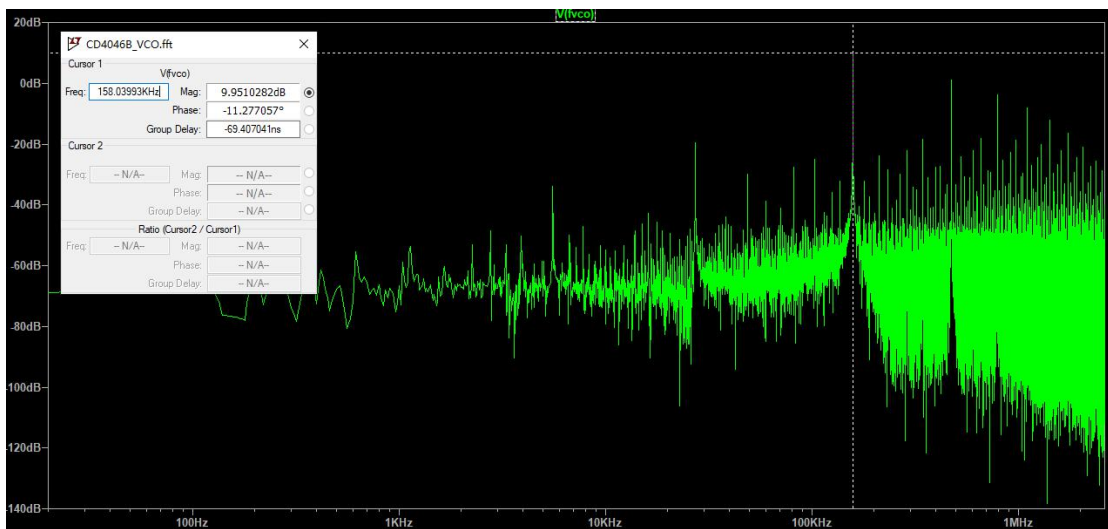
V1 = 7V



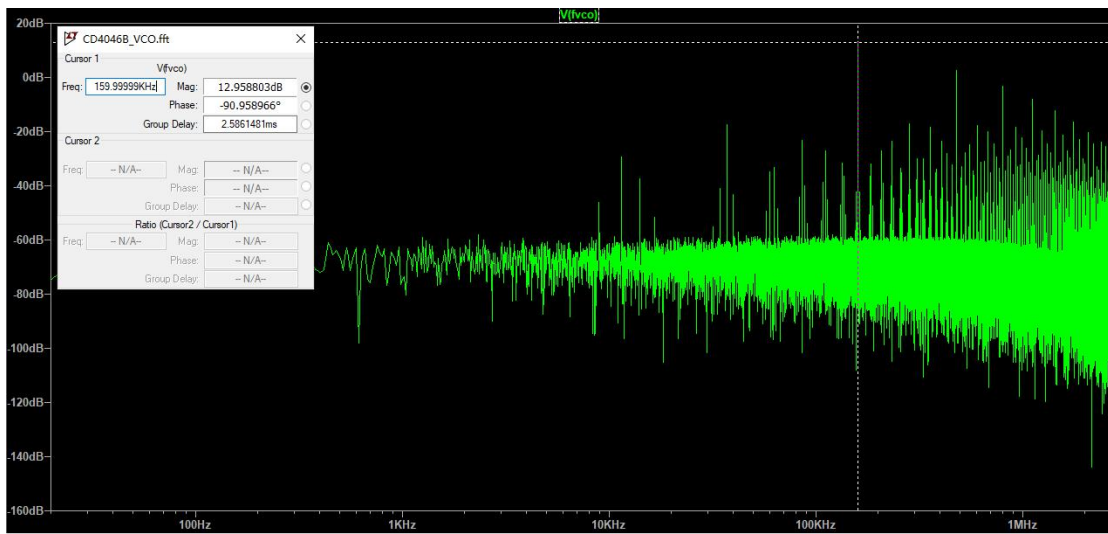
V1 = 8V



V1 = 9V



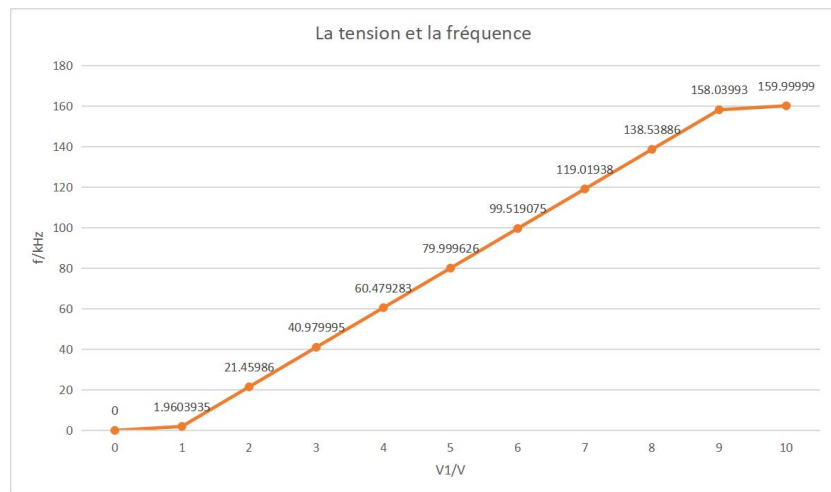
V1 = 10V



On peut obtenir les résultats et la figure

V1/V f/kHz

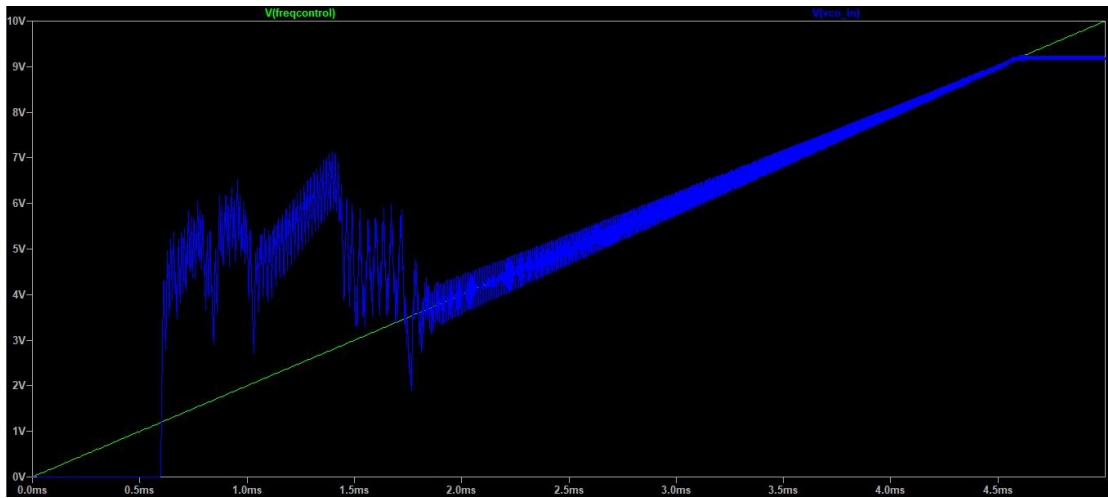
0	0
1	1.9603935
2	21.45986
3	40.979995
4	60.479283
5	79.999626
6	99.519075
7	119.01938
8	138.53886
9	158.03993
10	159.99999



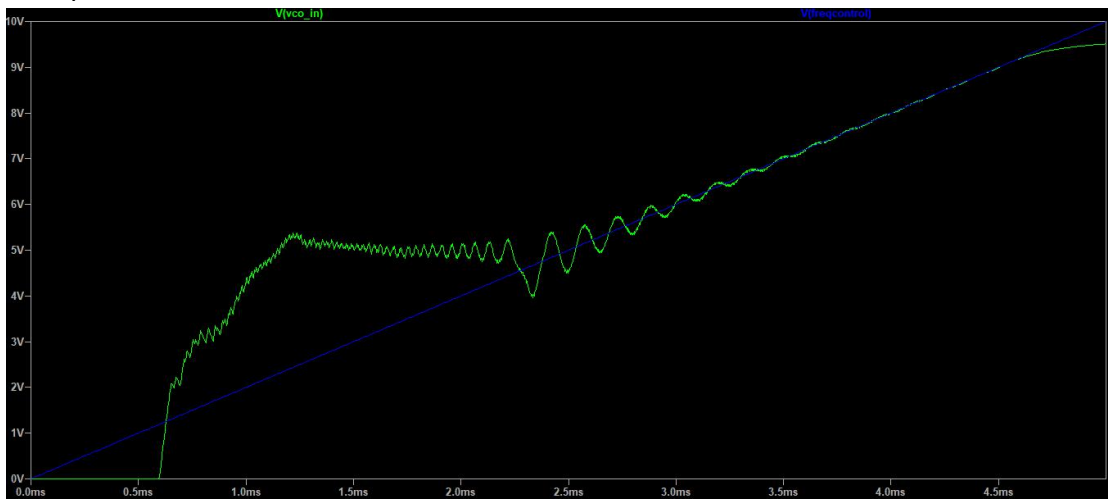
2 Mesure des plages de capture et de verrouillage

3.

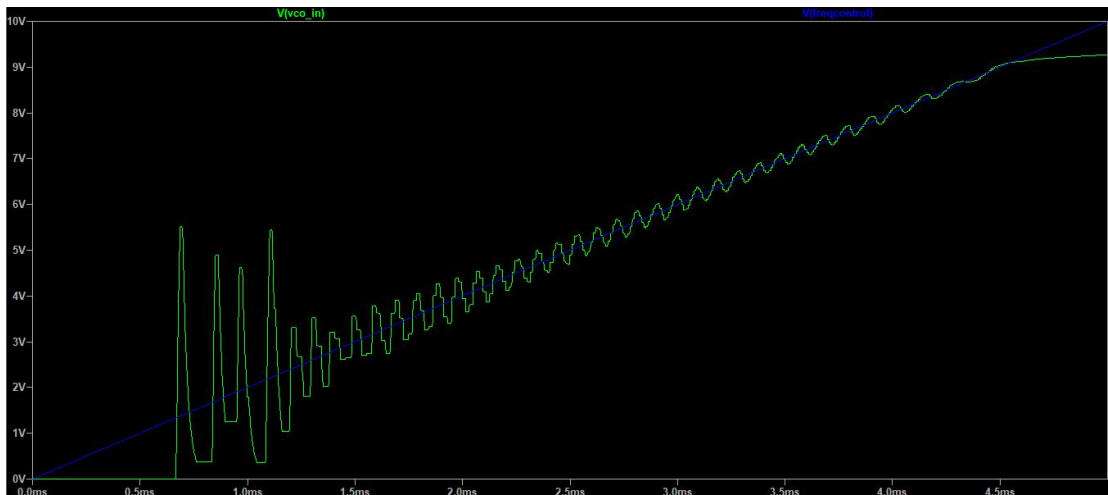
pc1, C2 = 10nF



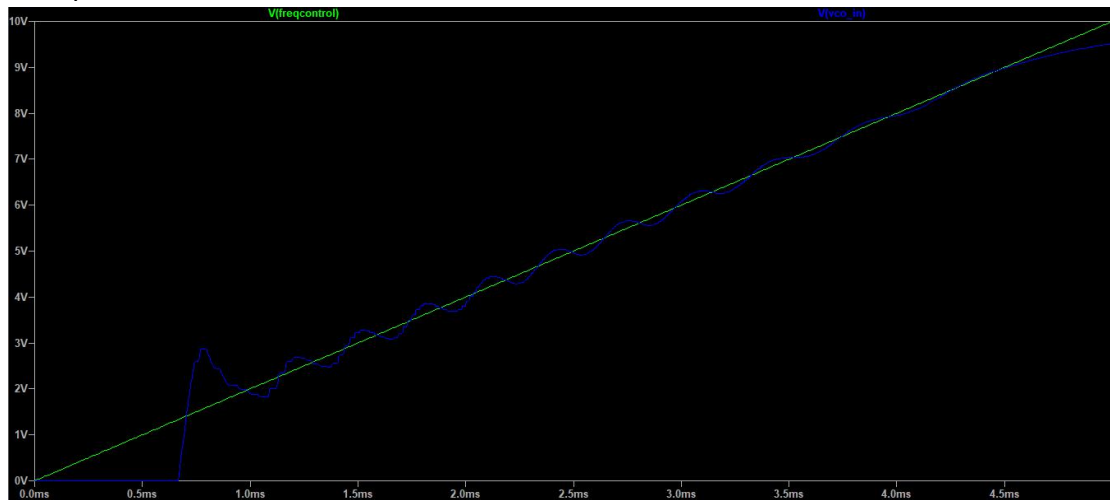
pc1, C2 = 100nF



pc2, C2 = 10nF

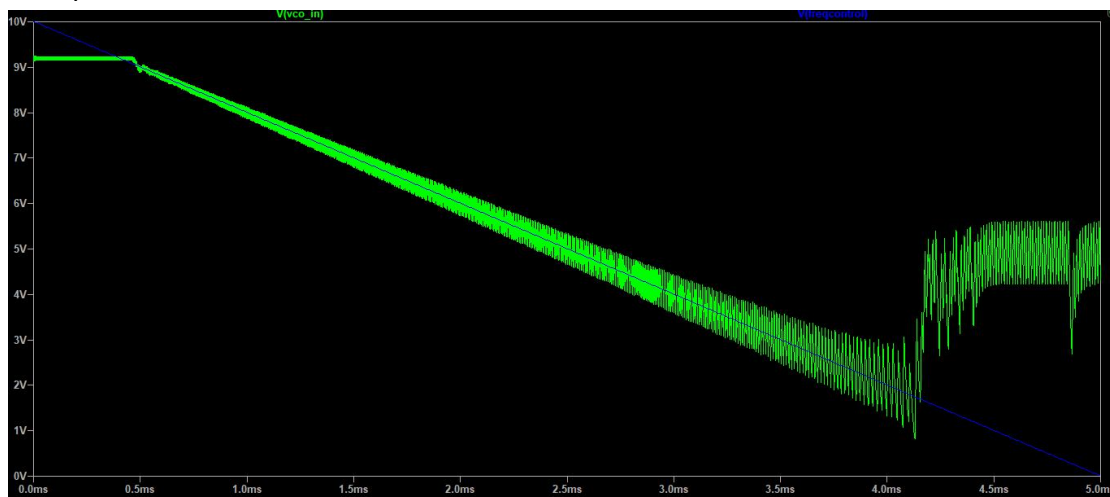


pc2, C2 = 100nF

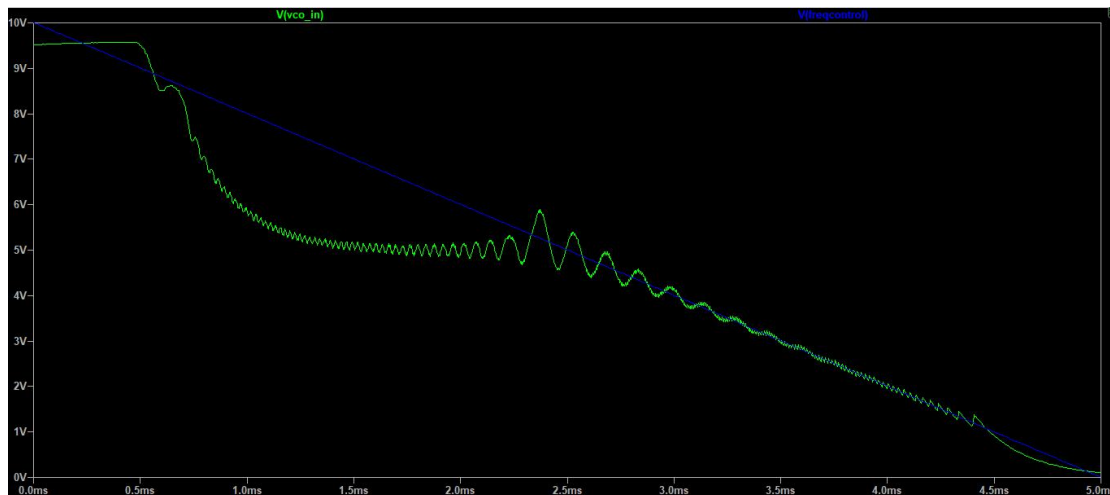


4.

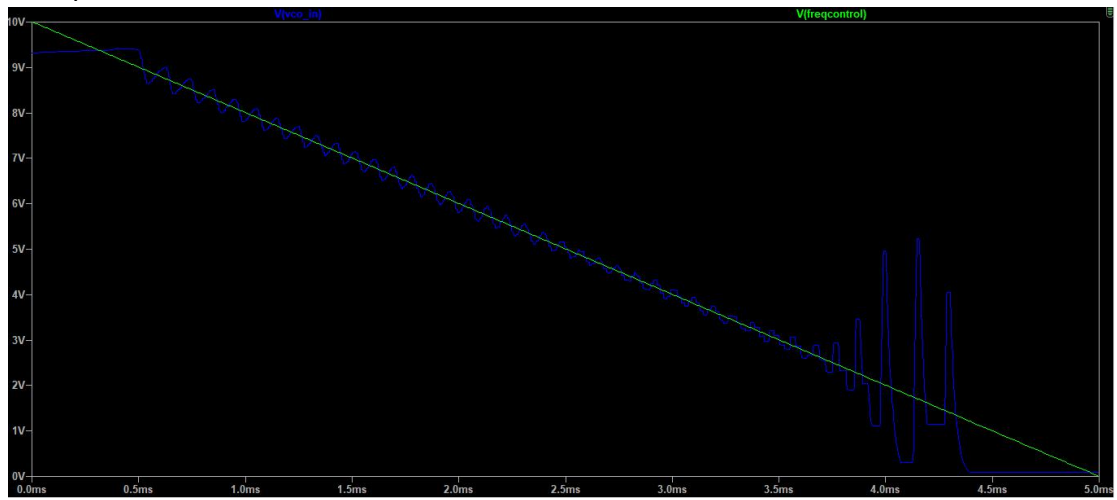
pc1, C2 = 10nF



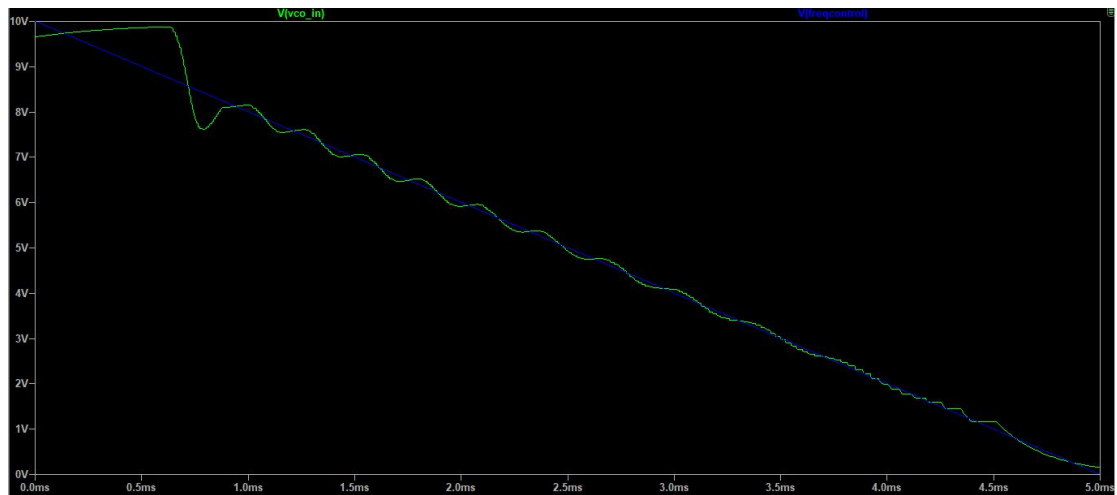
pc1, C2 = 100nF



pc2, C2 = 10nF

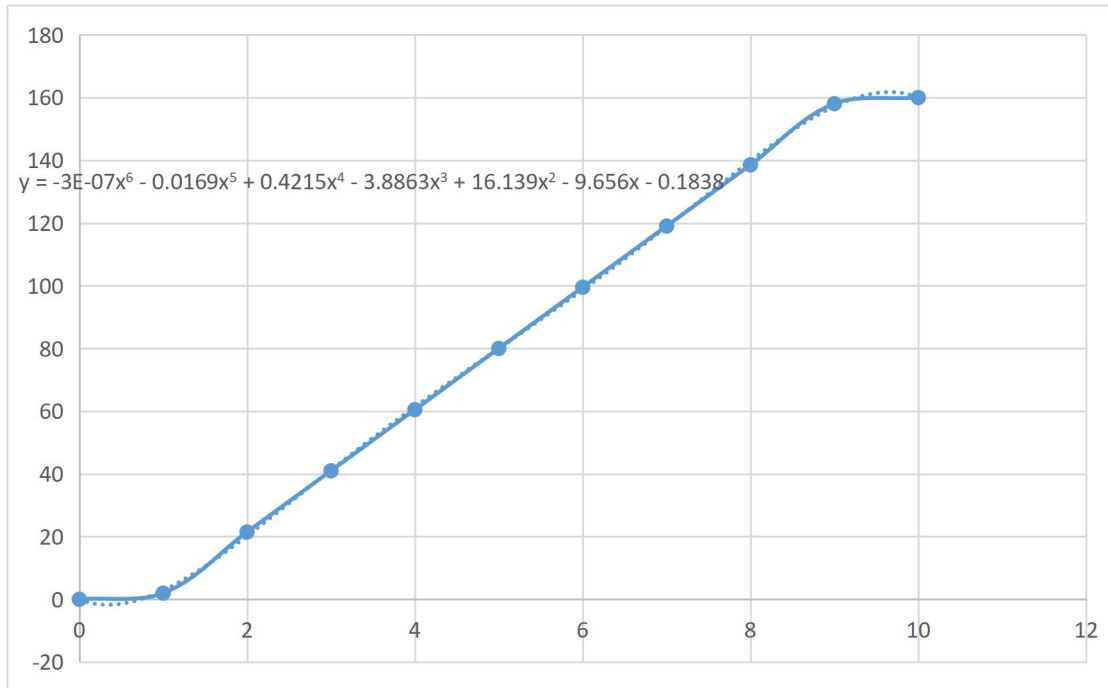


pc2, C2 = 100nF

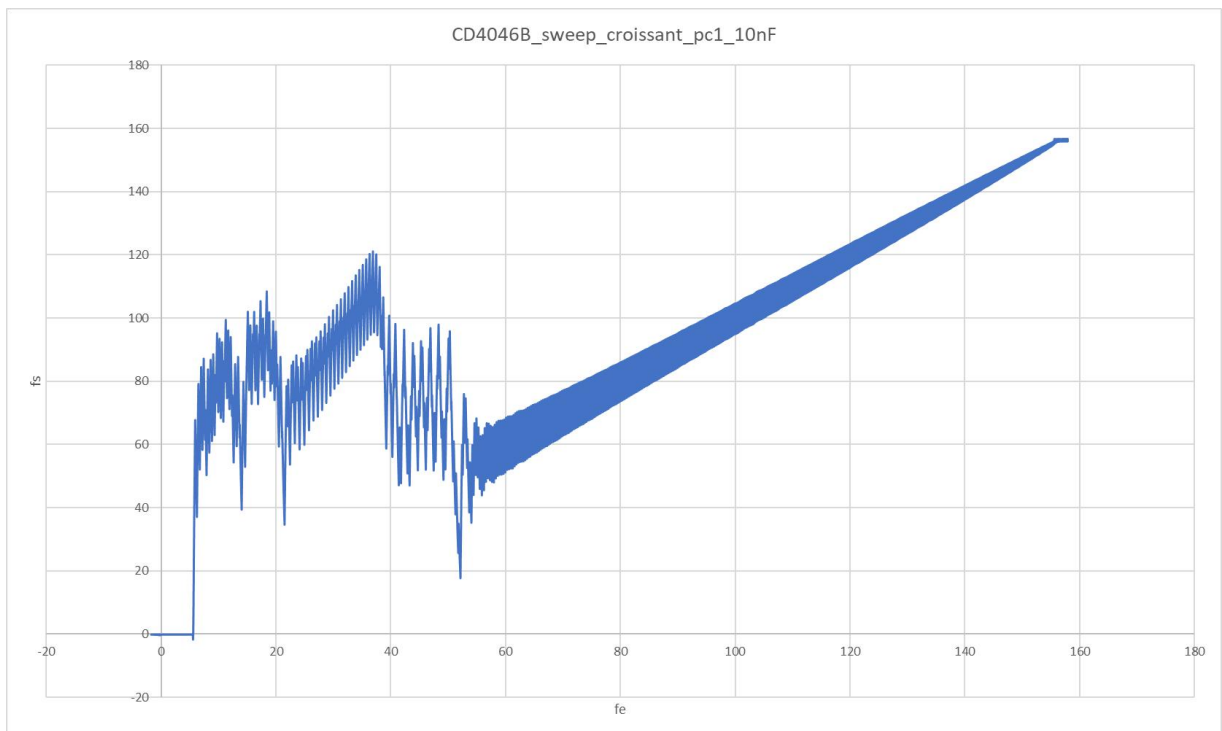


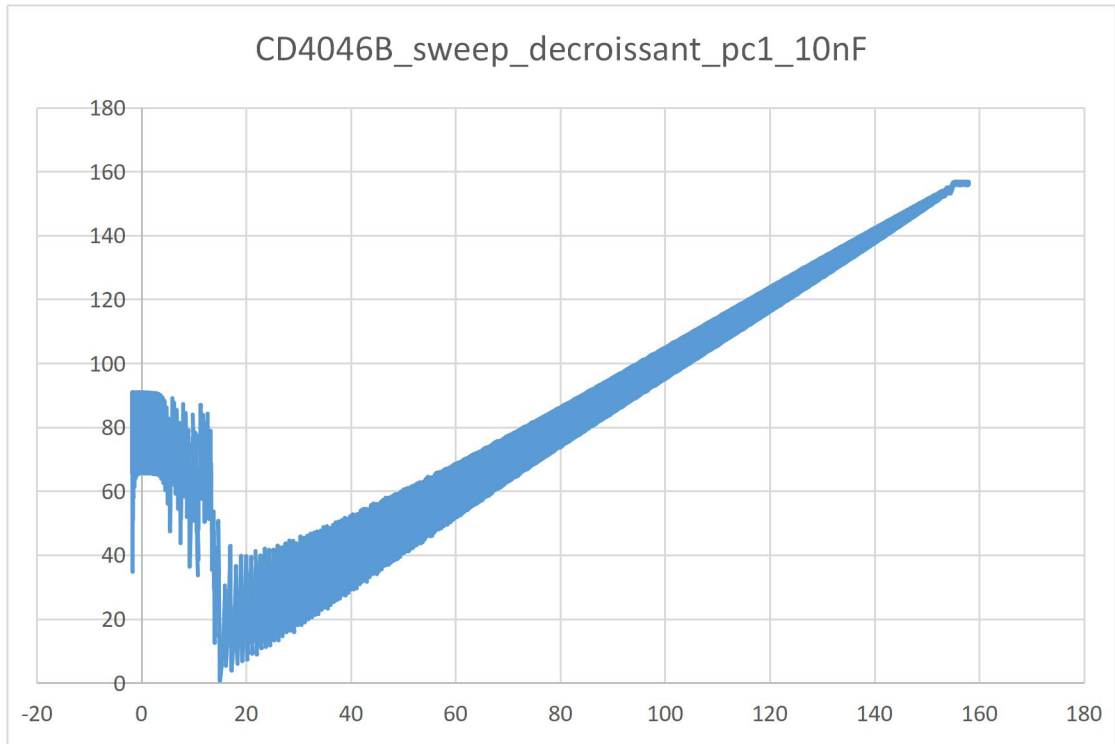
Dans la question 1, on peut obtenir le polynôme ajusté

$$y = -3E-07x^6 - 0.0169x^5 + 0.4215x^4 - 3.8863x^3 + 16.139x^2 - 9.656x - 0.1838$$



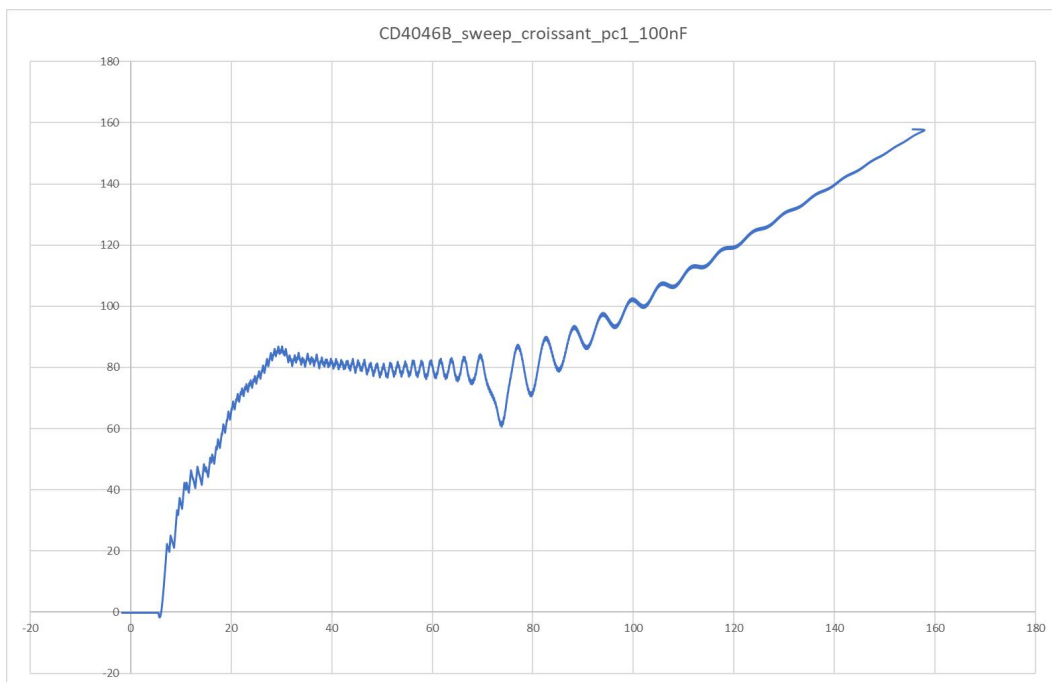
On importe les données sous Excel et peut avoir les figures

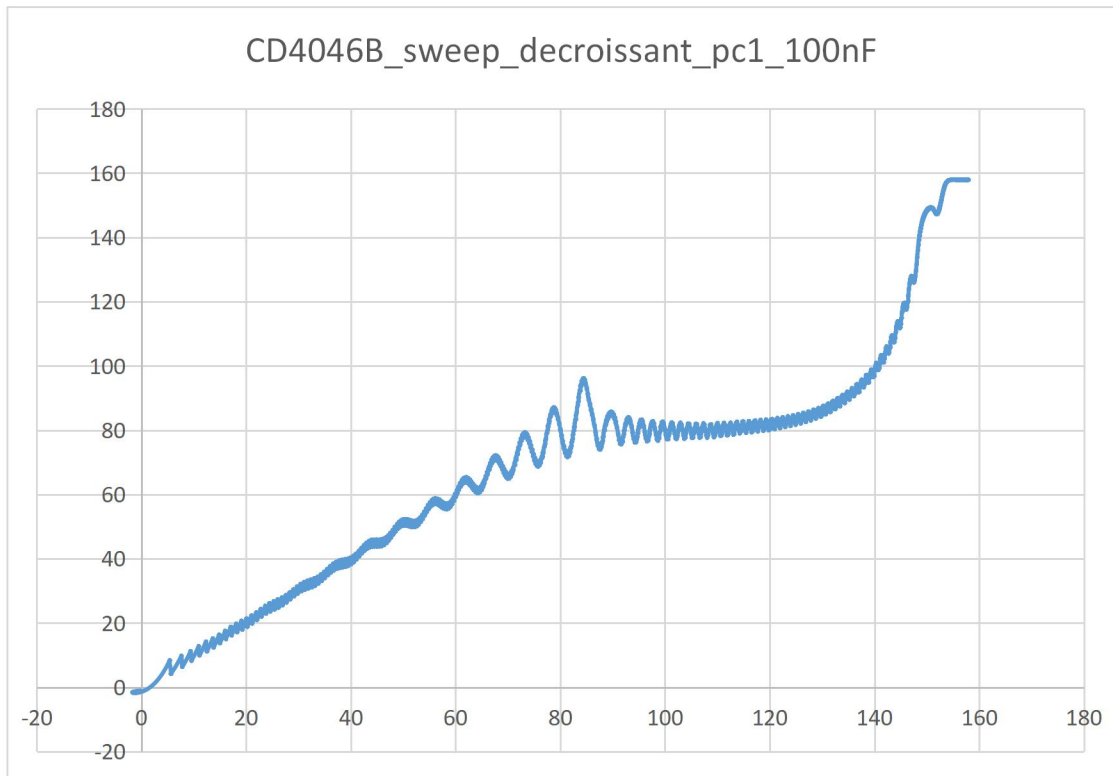




La plage de capture est 40-150kHz

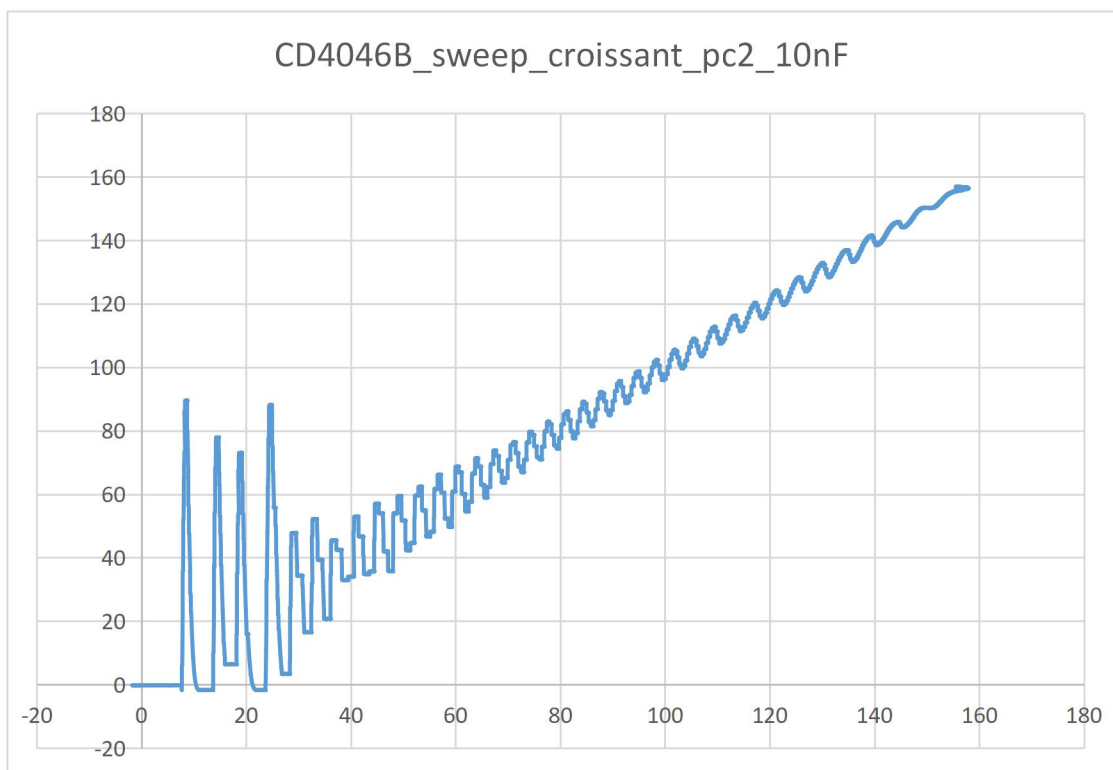
La plage de verrouillage est 15-160kHz

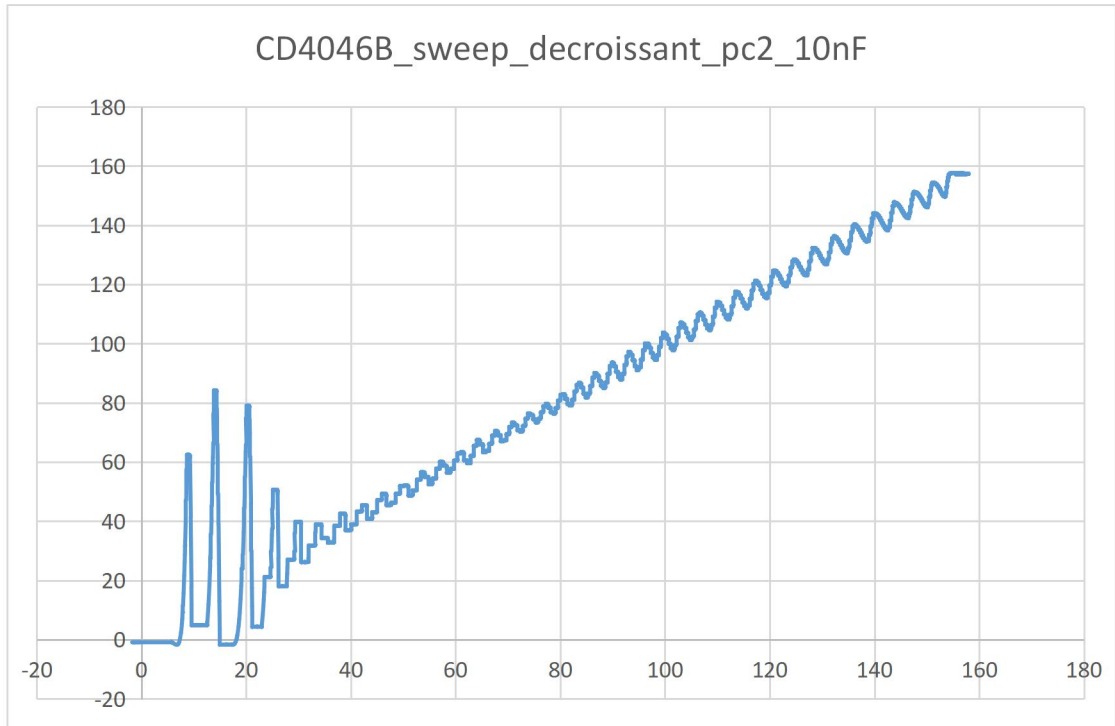




La plage de capture est 30-120kHz

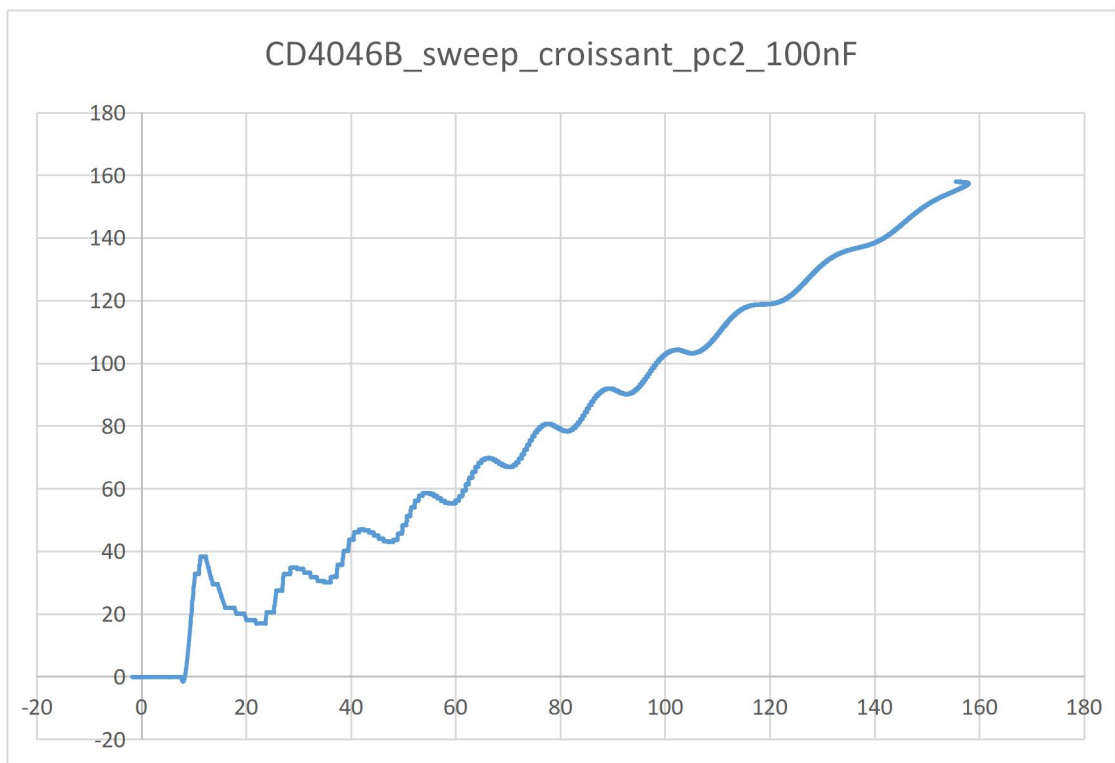
La plage de verrouillage est 5-160kHz

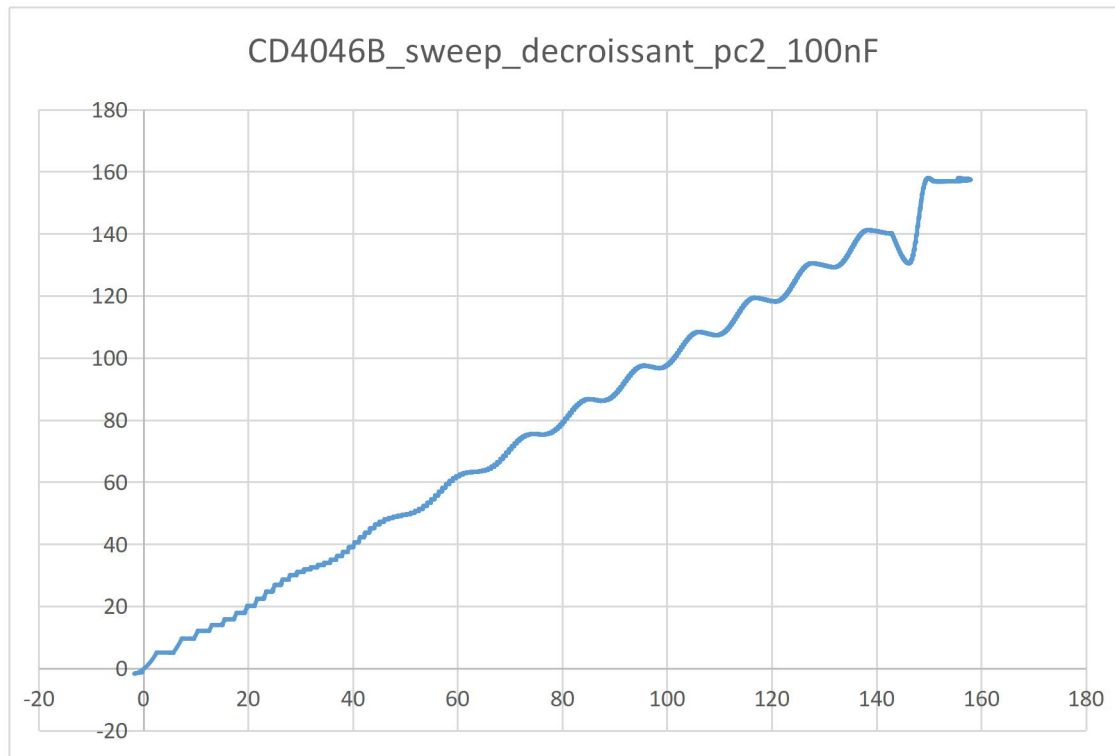




La plage de capture est 8-150kHz

La plage de verrouillage est 4-160kHz





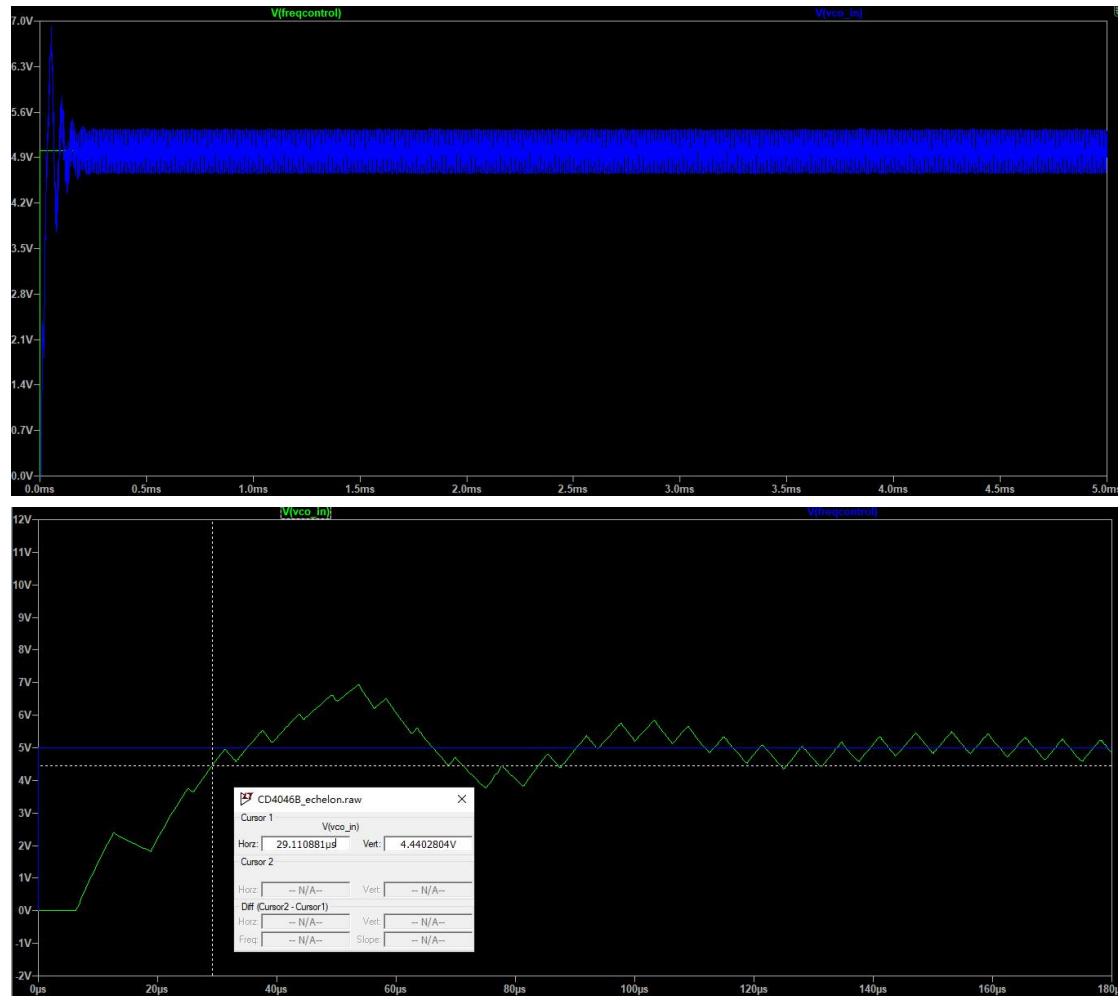
La plage de capture est 13-150kHz

La plage de verrouillage est 0-155kHz

3 Réponse de la PLL à un échelon

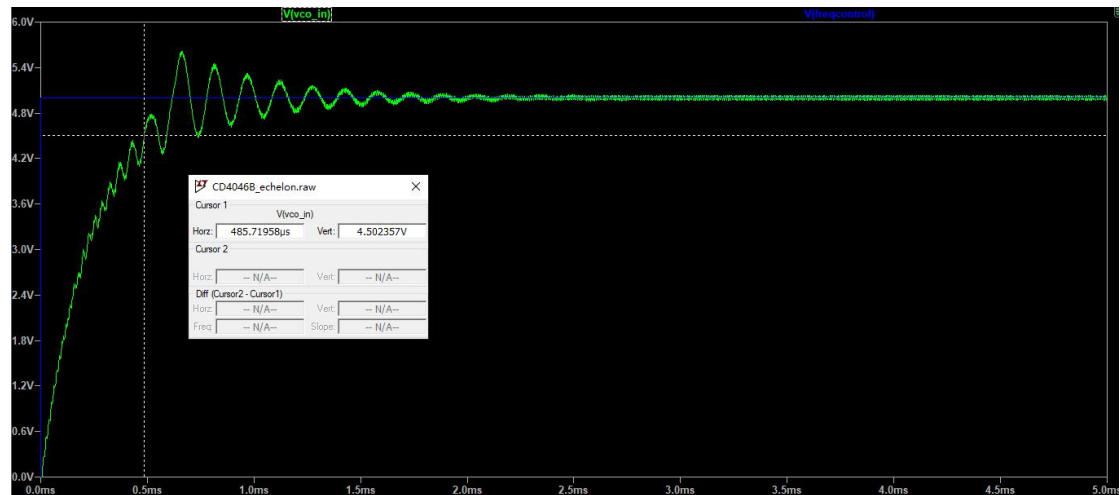
1.

pc1, C2 = 10nF



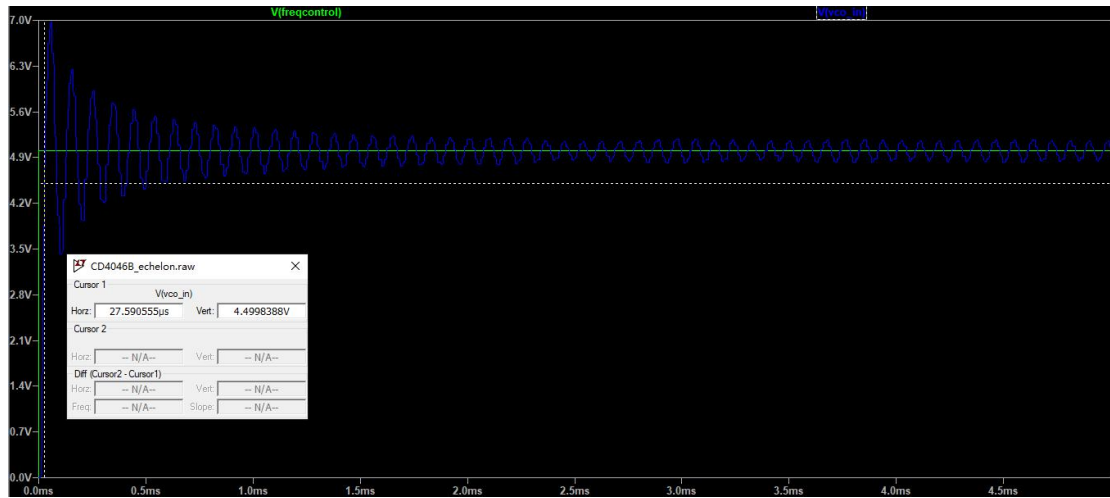
$T = 29.11 \mu\text{s}$

pc1, C2 = 100nF



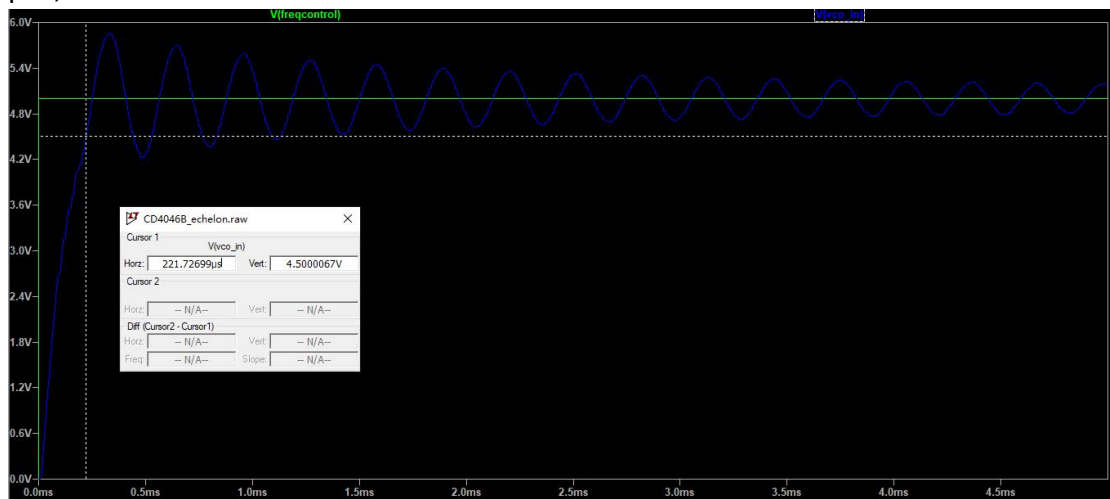
$T=485.72 \mu s$

pc2, C2 = 10nF



$T=27.59 \mu s$

pc2, C2 = 100nF



$T=221.72 \mu s$

3.

Quand C2 = 10nF, $\tau = RC = 18 \mu s$

Quand C2 = 100nF, $\tau = RC = 180 \mu s$

Donc, le résultat est environ correct.