Électronique
Étude de la PLL CD4046B

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1 Caractérisation du VCO

Q1

D'après la figure 7 de la notice technique de la PLL HEF 4046B, on trouve que quand $C_1 = 1nF$, $R_1 = 10k\Omega$, R_2 infinie et $V_{dd} = 10V$, on a la fréquence $f_0 = 8 \times 10^4 Hz$. Et $f_0 = \frac{1}{2} f_{max}$, alors $f_{max} = 160kHz$, la plage de fonctionnement du VCO est de $0Hz$ à $160kHz$.

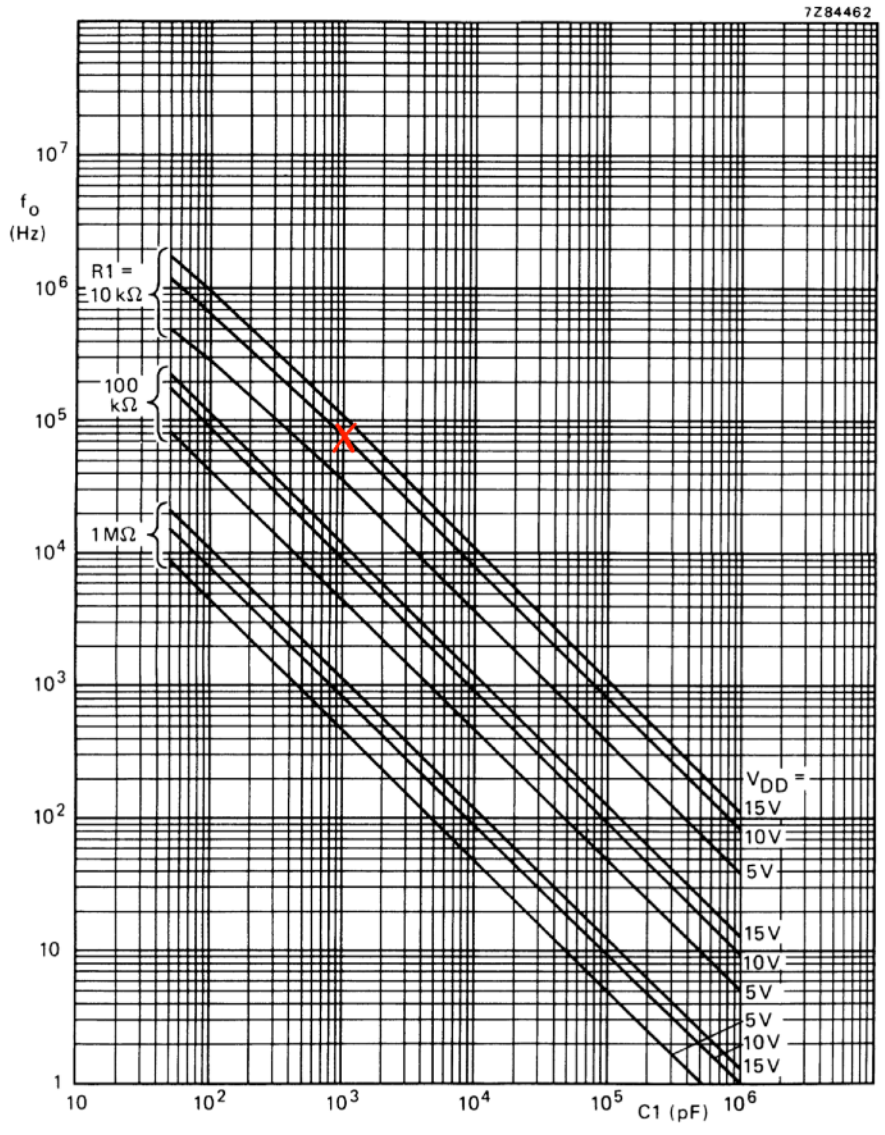
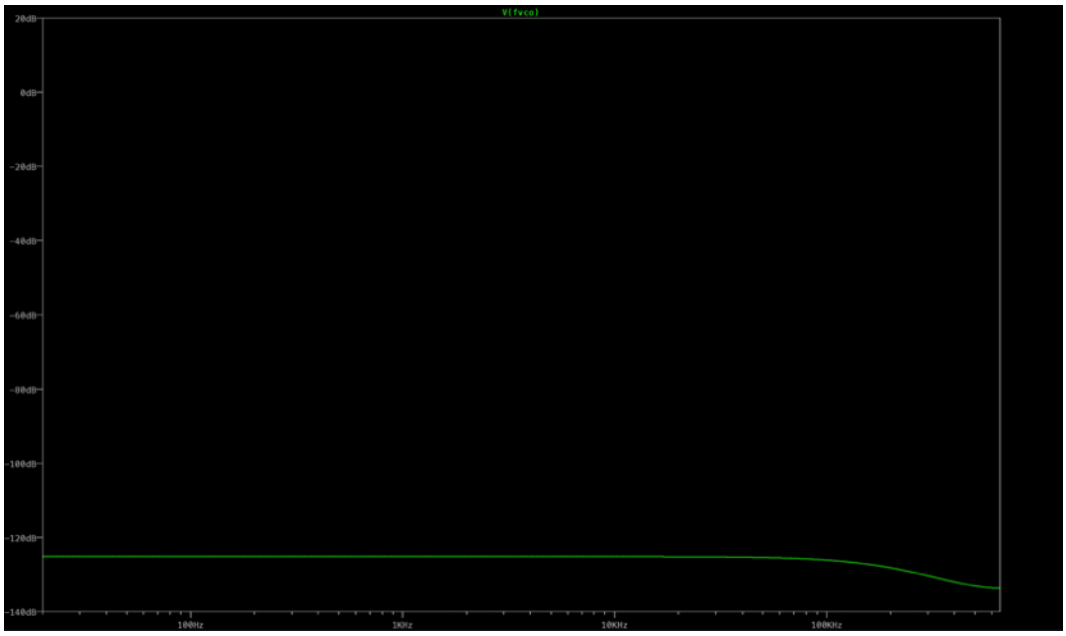


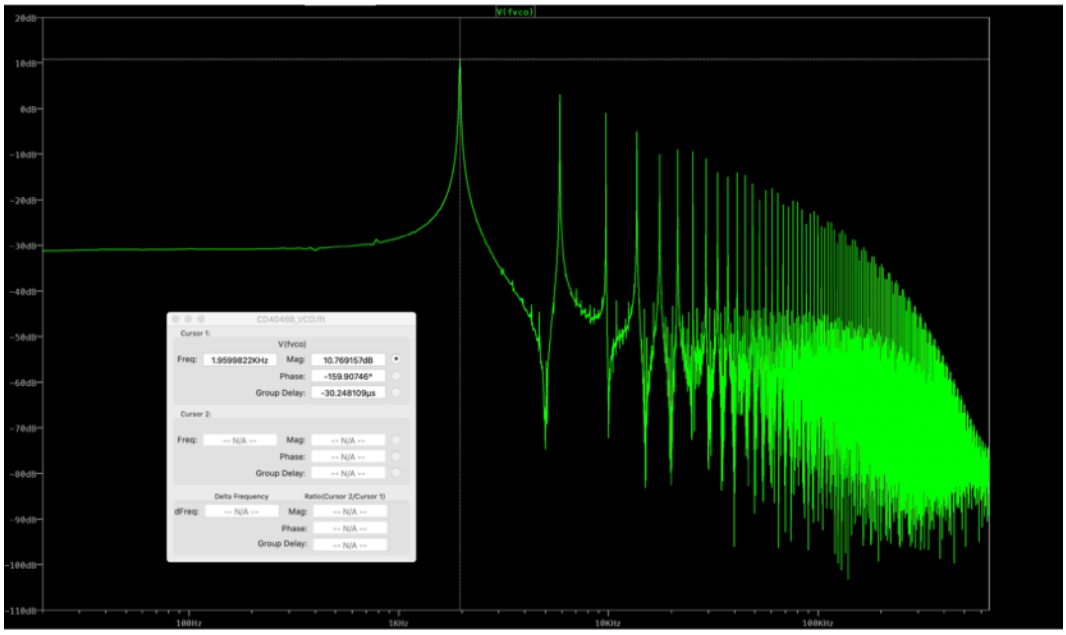
Fig.7 Typical centre frequency as a function of capacitor C1; T_{amb} = 25 °C; VCO_{IN} at ½ V_{DD}; INH at V_{SS}; $R_2 = \infty$.

Q2

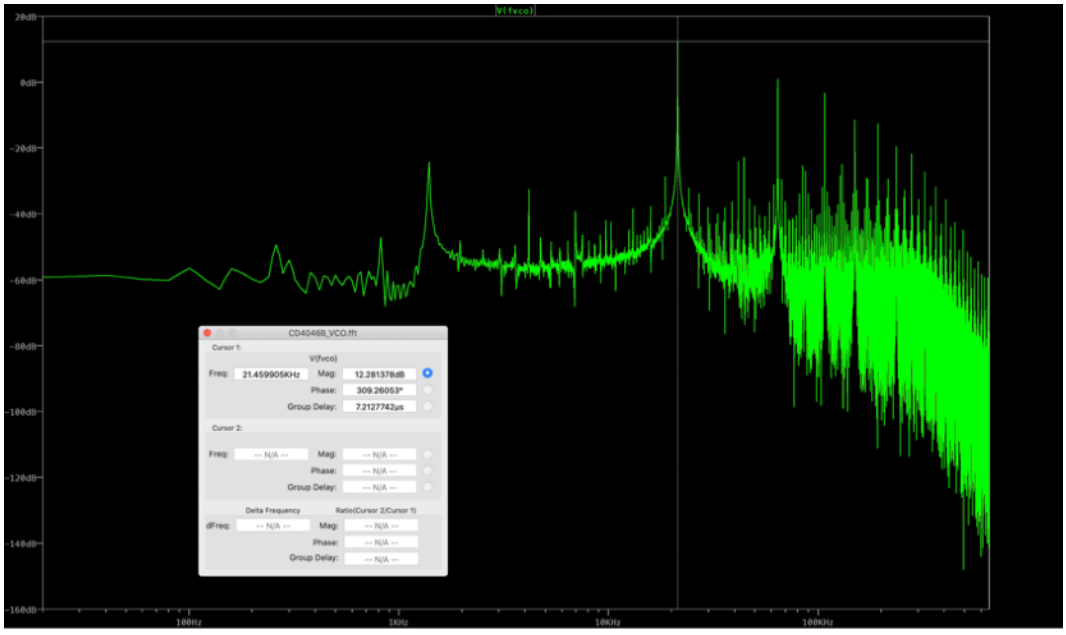
$V_1 = 0V$:



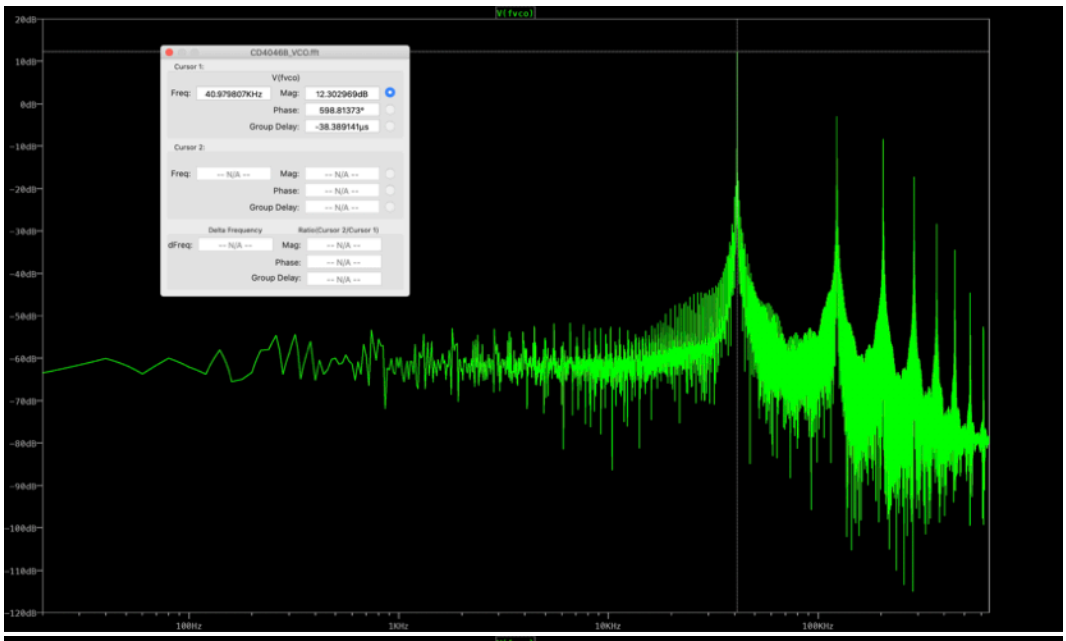
$V_1 = 1V$:



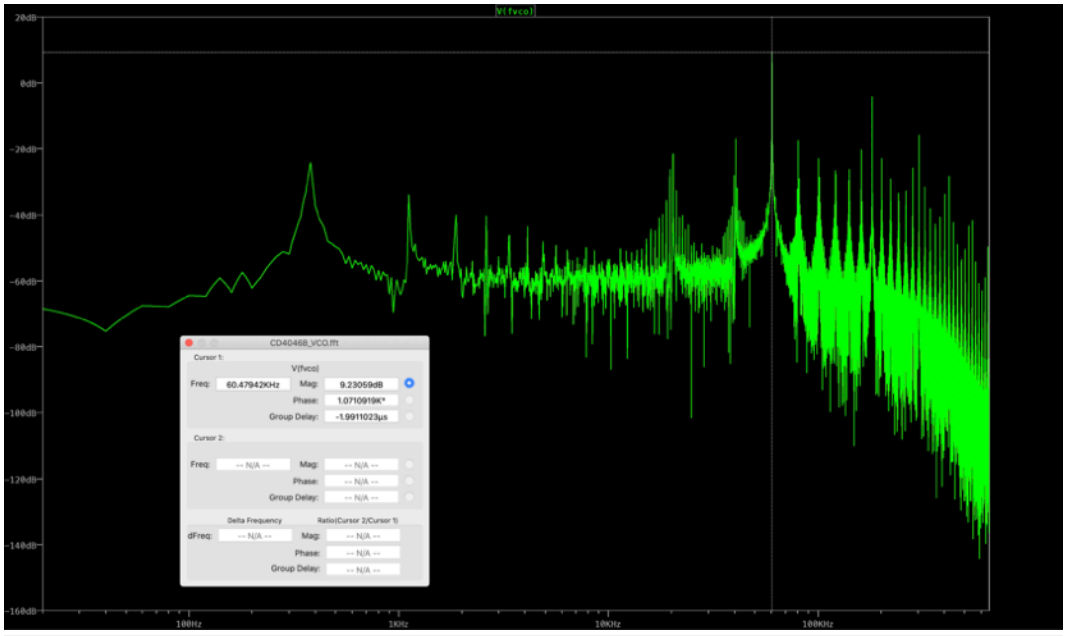
$V_1 = 2V$:



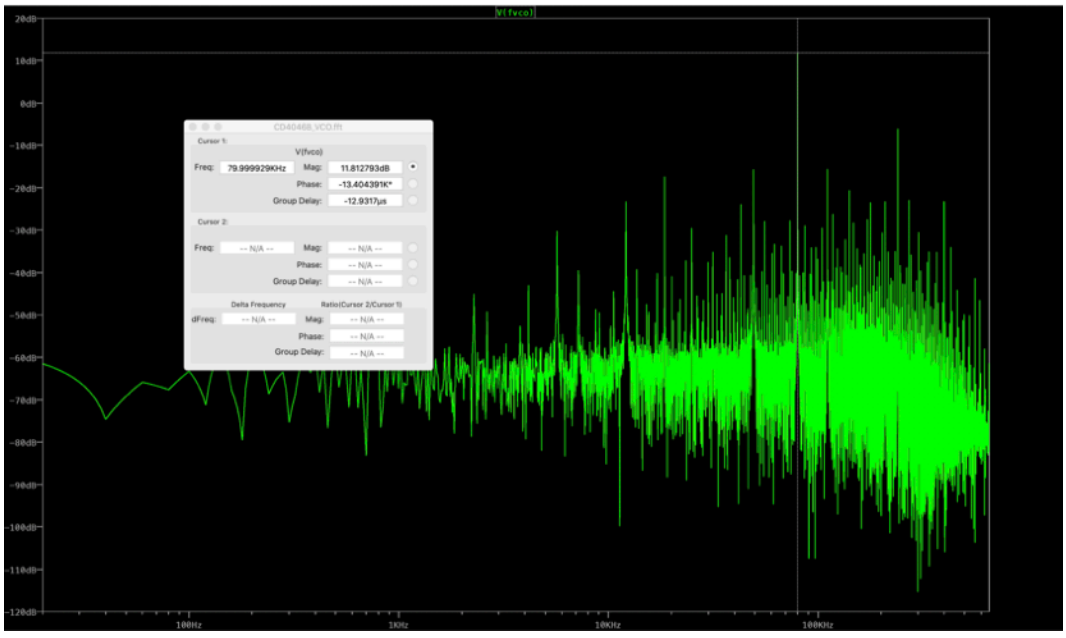
$V_1 = 3V$:



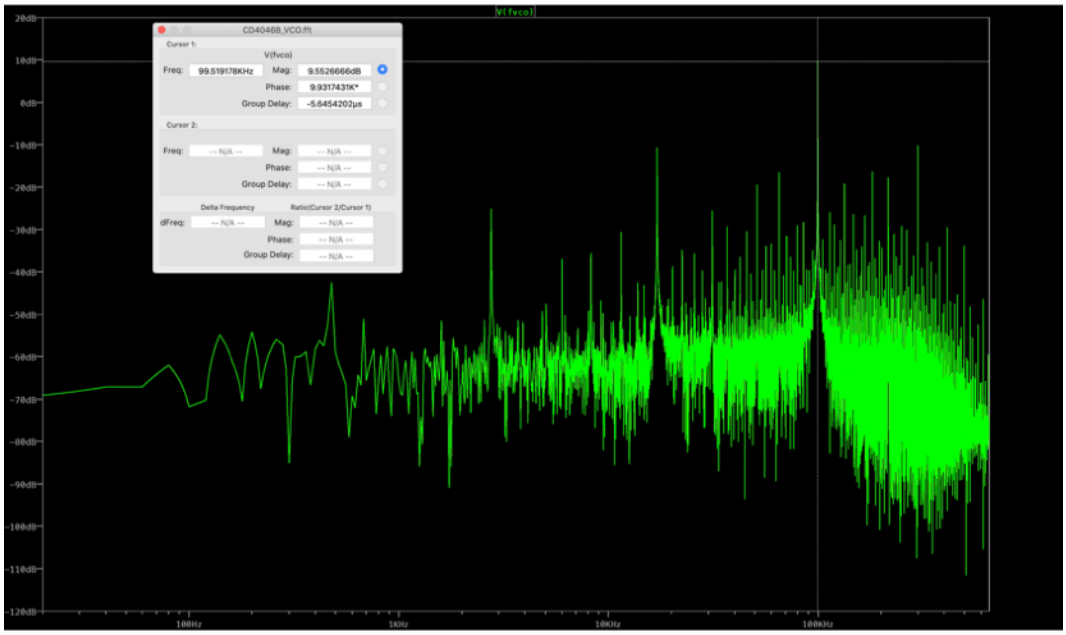
$V_1 = 4V$:



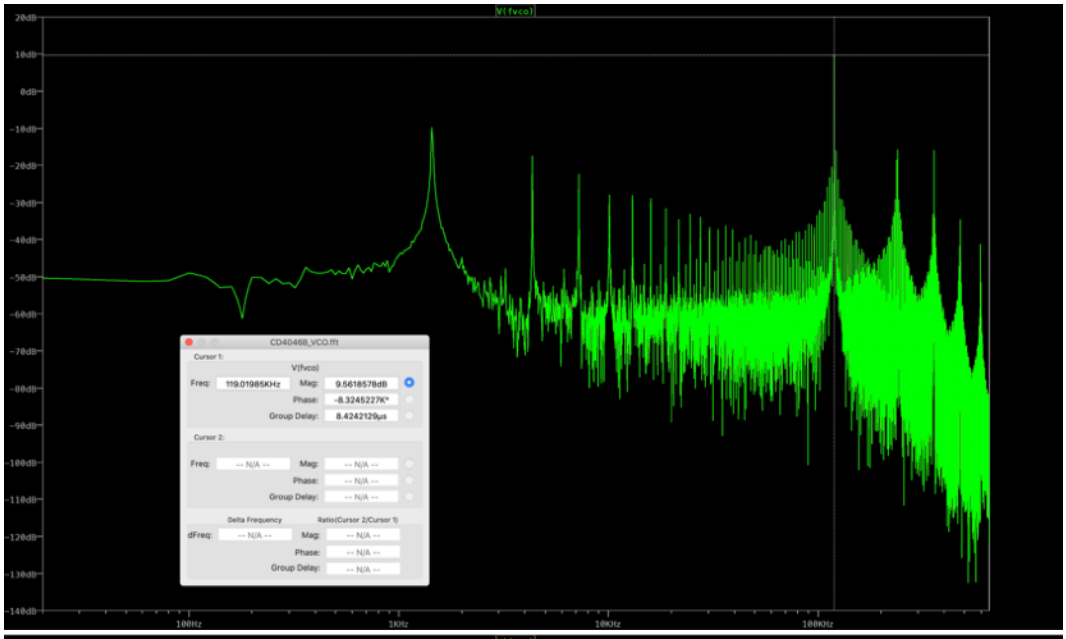
$V_1 = 5V$:



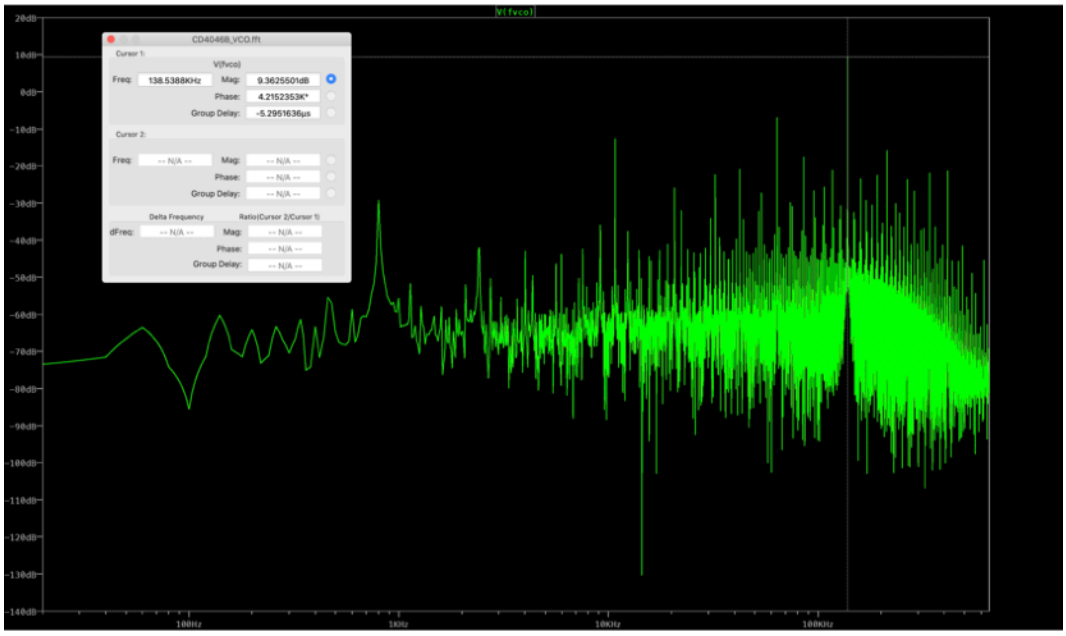
$V_1 = 6V$:



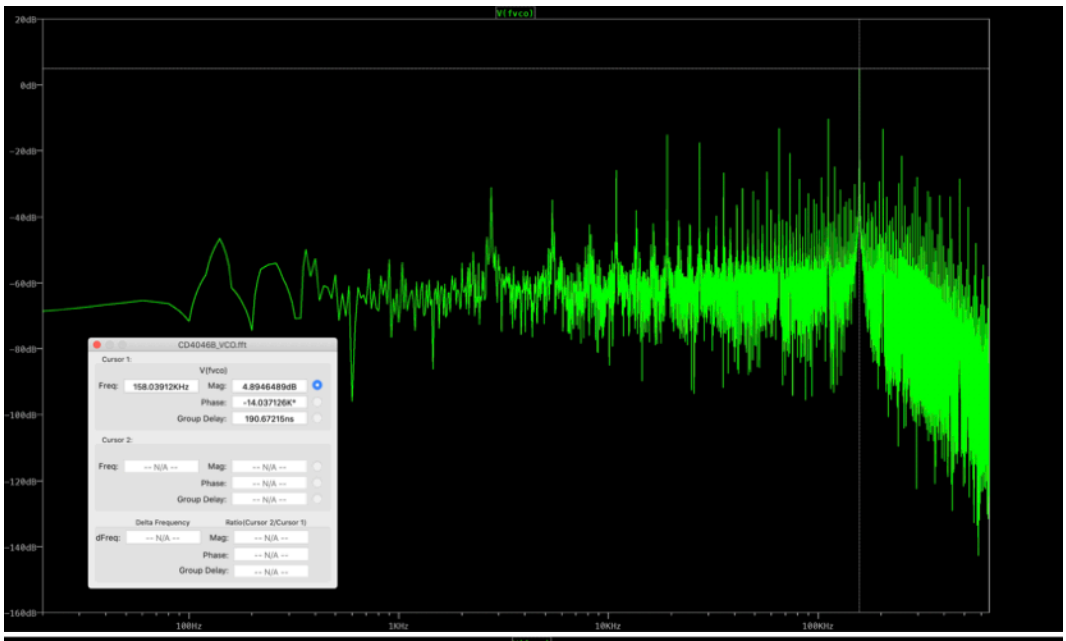
$V_1 = 7V$:



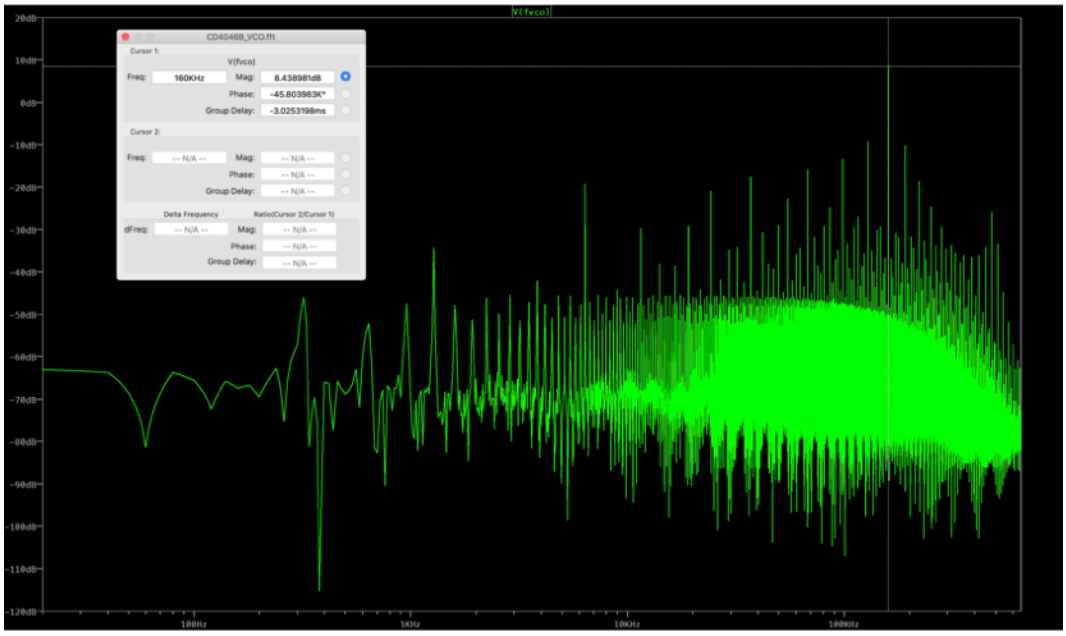
$V_1 = 8V$:



$V_1 = 9V$:



$V_1 = 10V$:

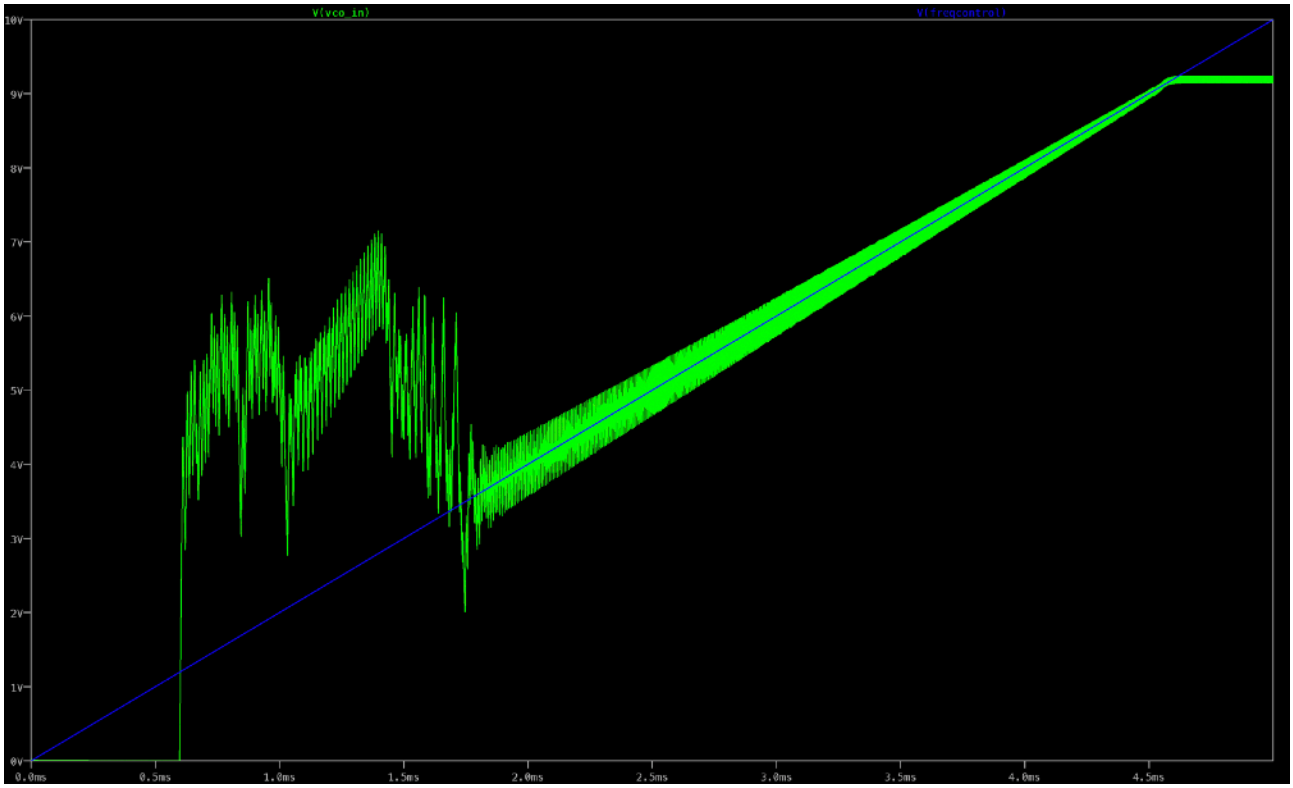


En variant la tension d'entrée V_1 de $0V$ à $10V$ par pas de $1V$, on peut recevoir les 11 images de FFT. D'après ces images, on peut trouver la simulation de VCO fonctionne correctement à sa caractéristique.

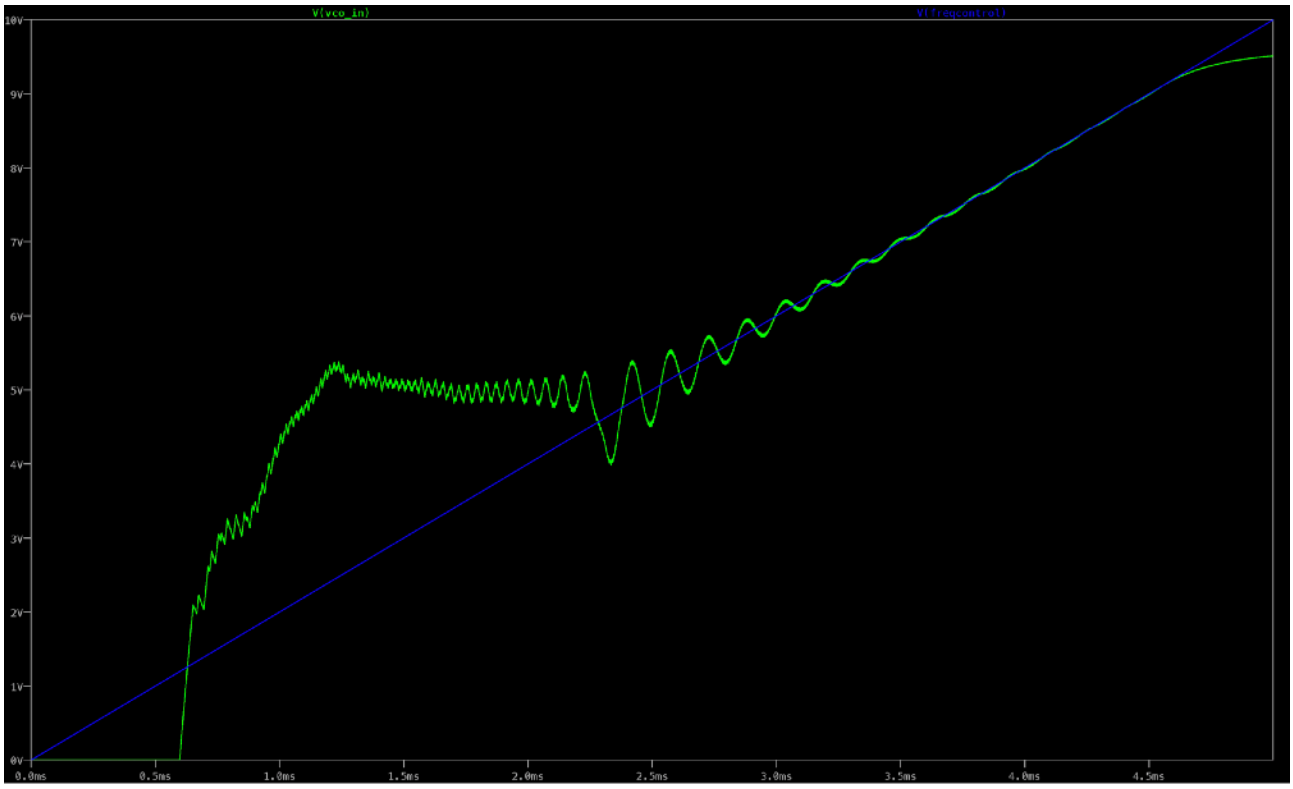
2 Mesure des plages de capture et de verrouillage

Q3

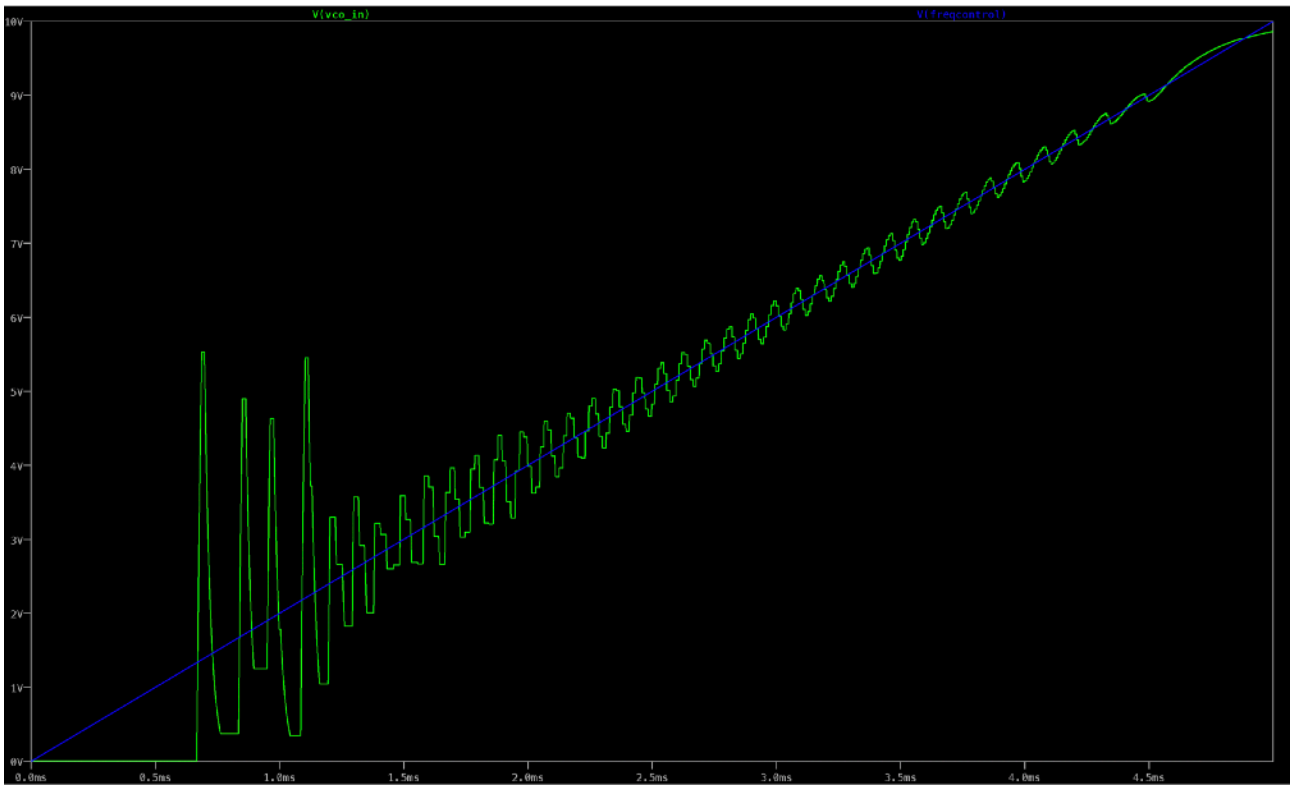
Pour PC1, quand $C_2 = 10nF$:



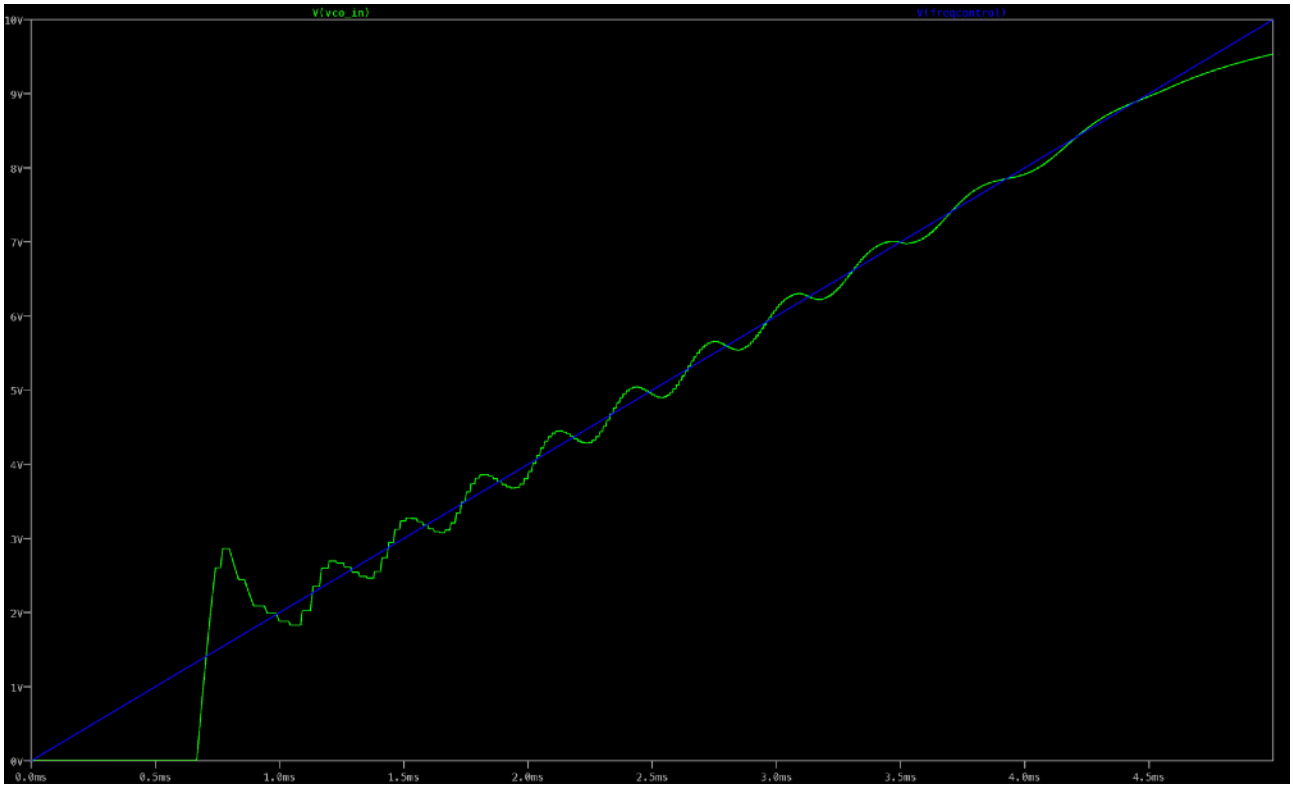
Quand $C_2 = 100nF$:



Pour PC2, quand $C_2 = 10nF$:

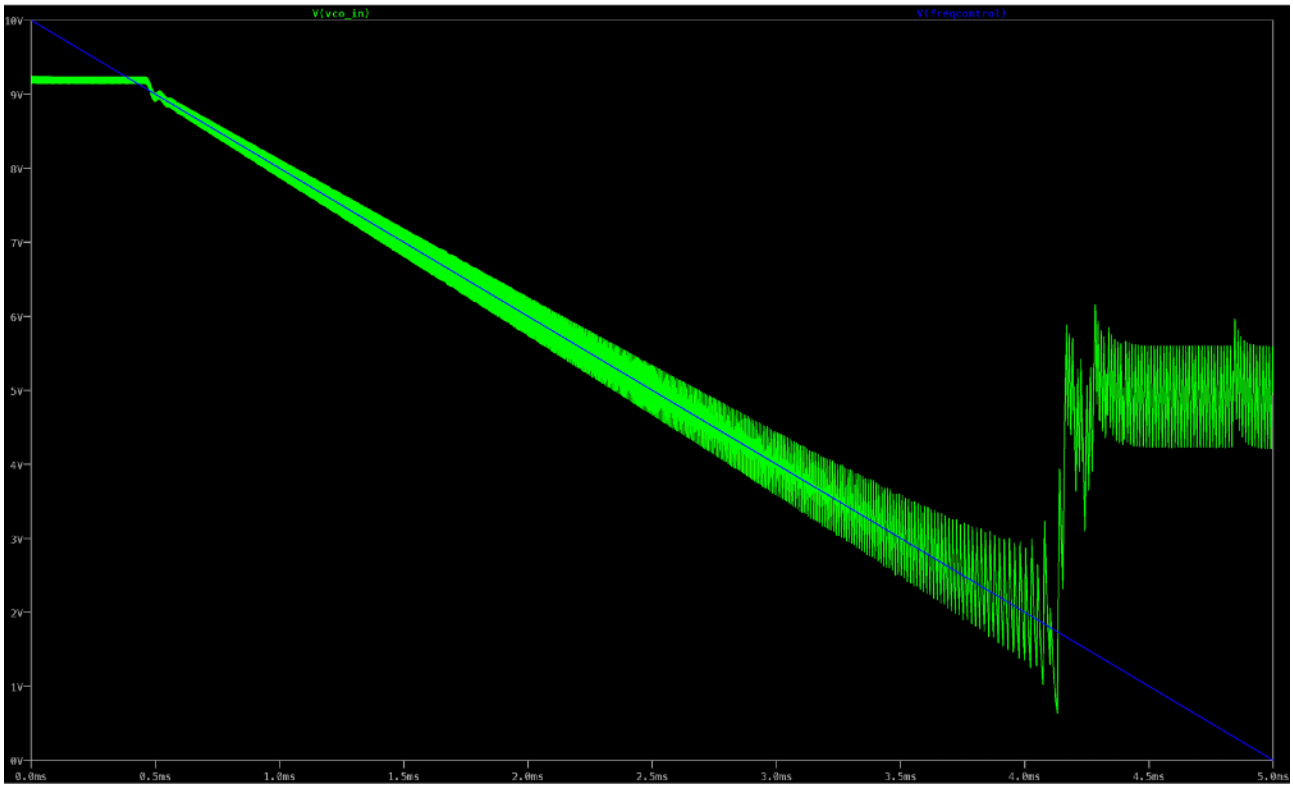


Quand $C_2 = 100nF$:

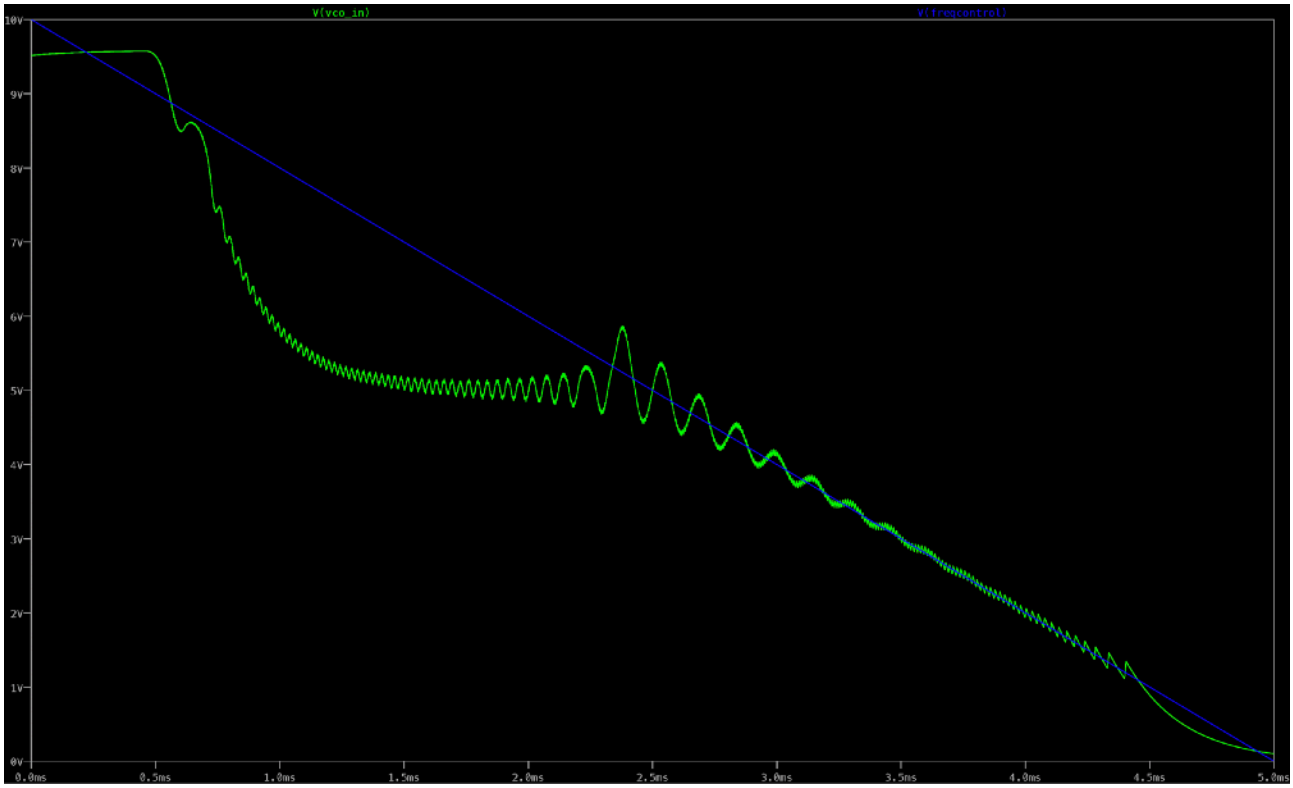


Q4

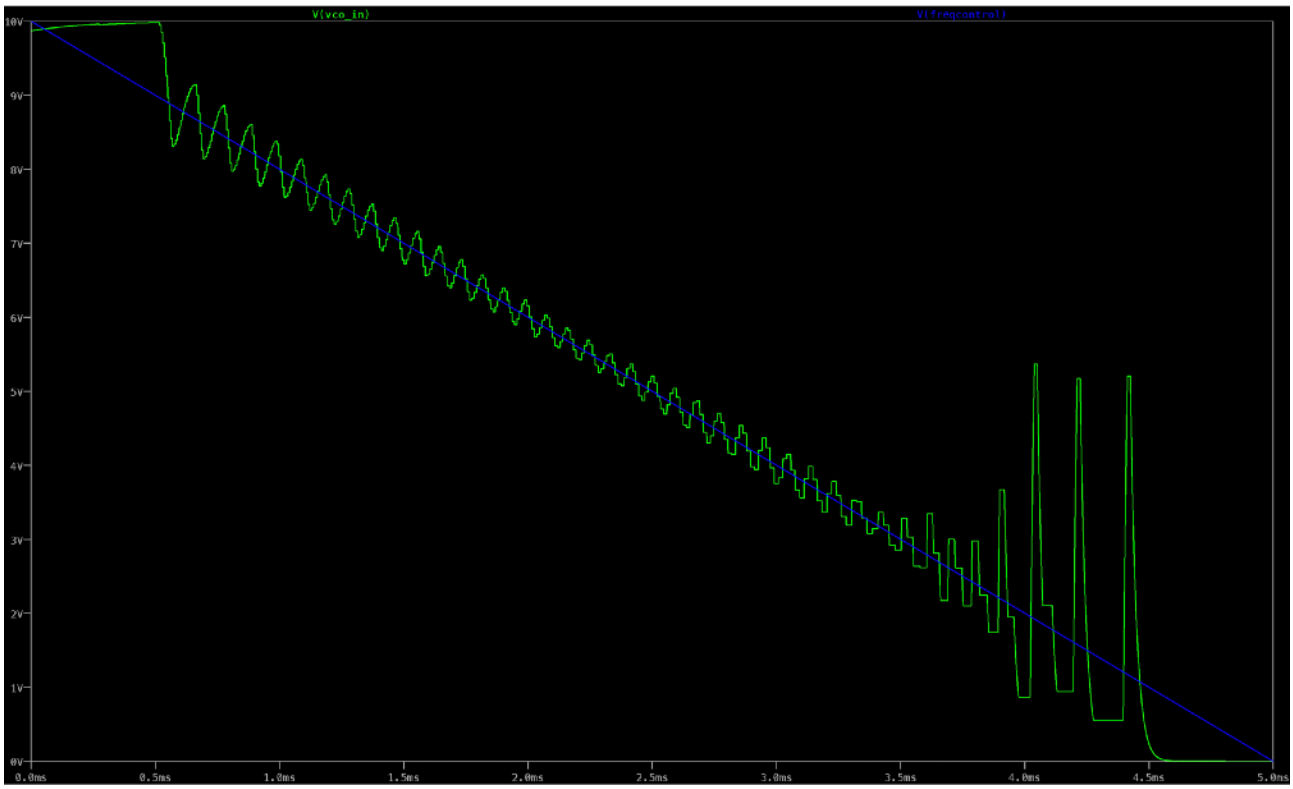
De même pour pour un sweep décroissant, pour PC1, quand $C_2 = 10nF$:



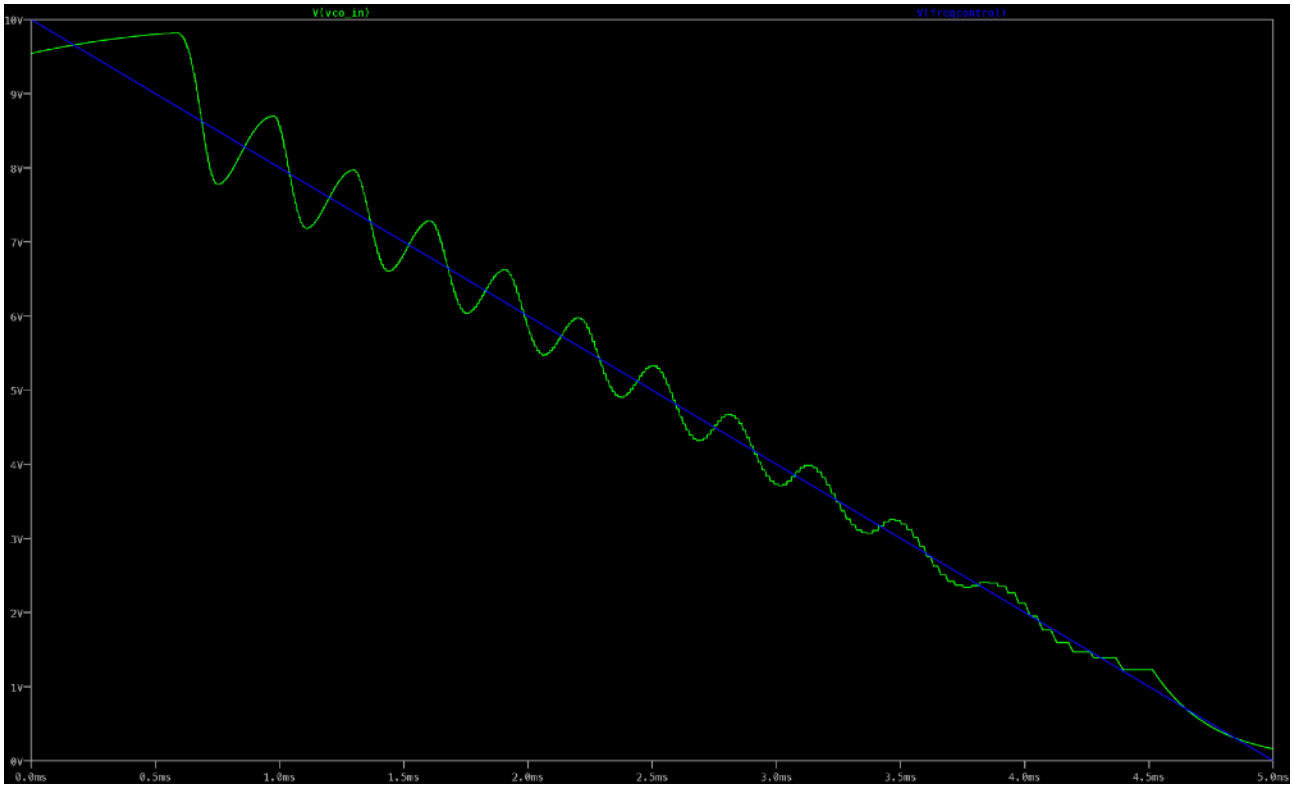
Quand $C_2 = 100nF$:



Pour PC2, quand $C_2 = 10nF$:



Quand $C_2 = 100nF$:

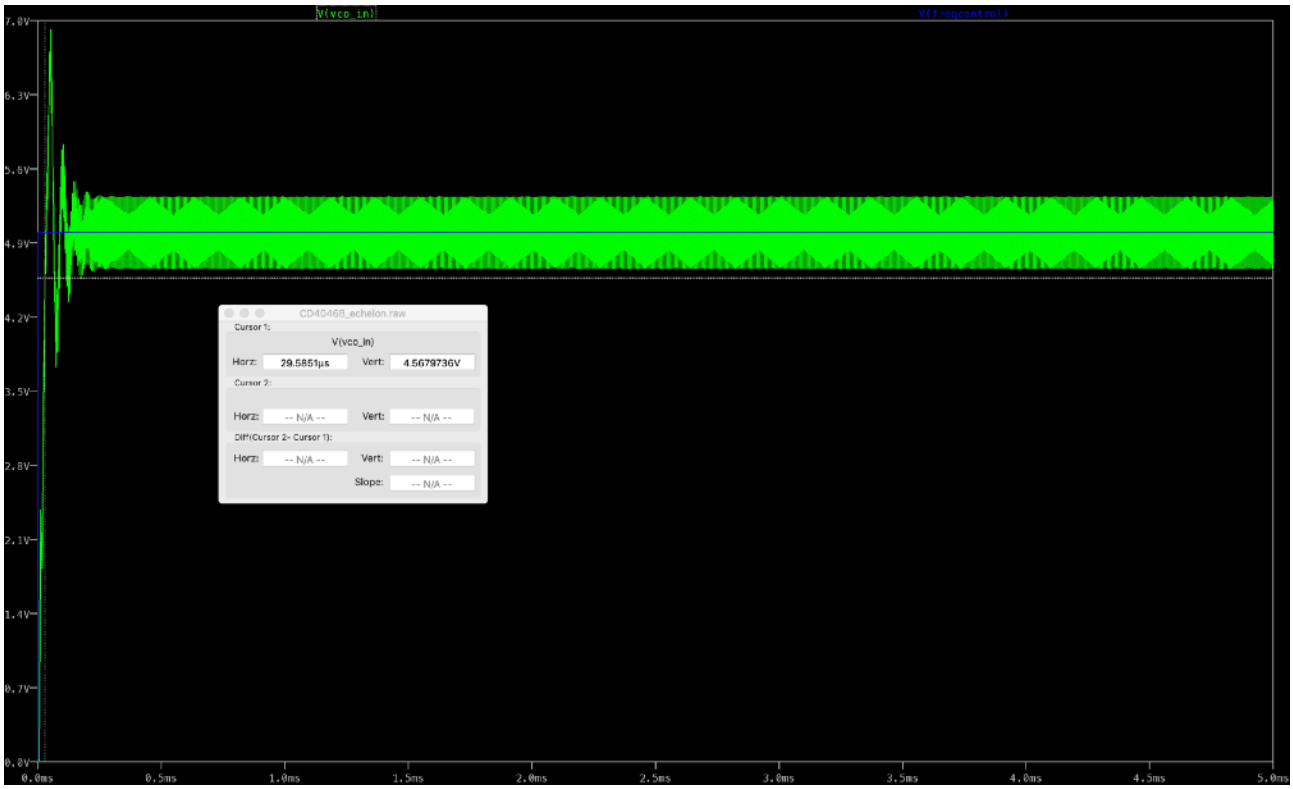


Q5

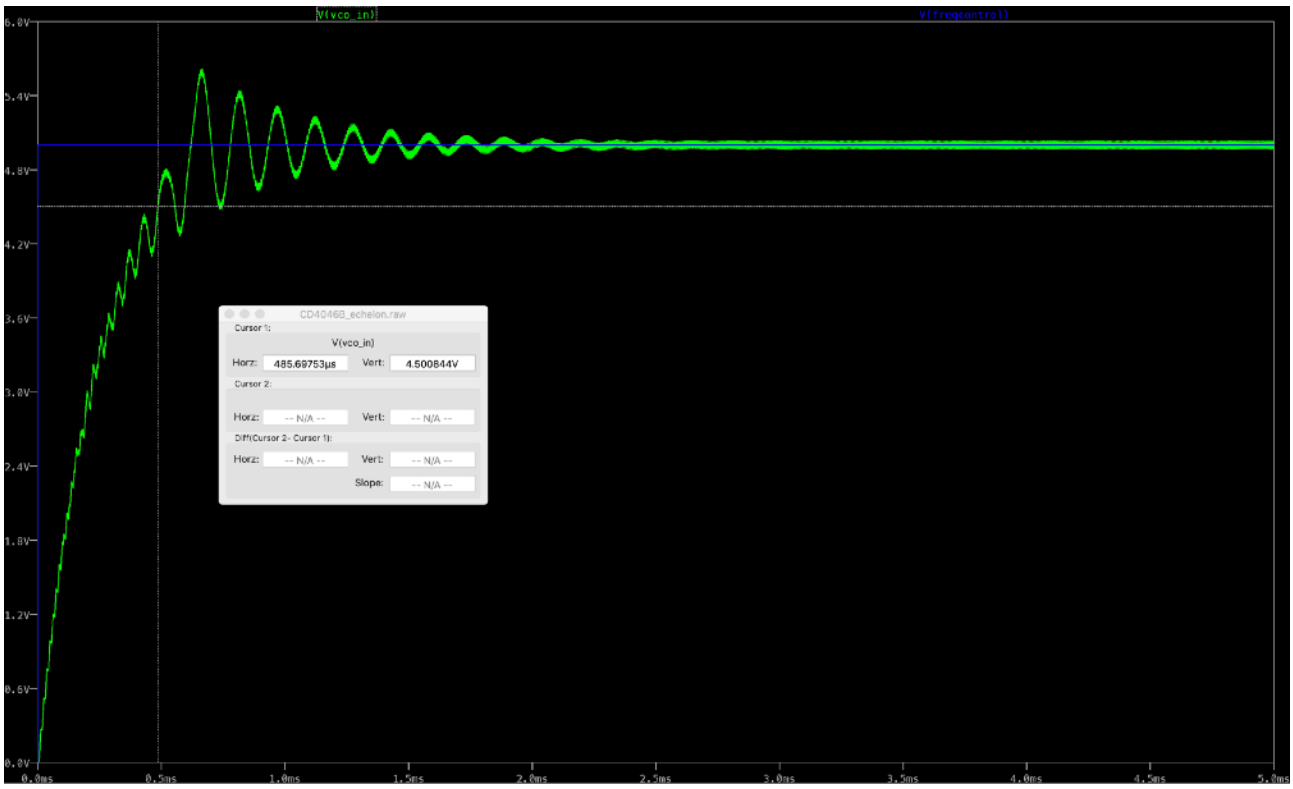
3 Réponse de la PLL à un échelon

Q1 et Q2

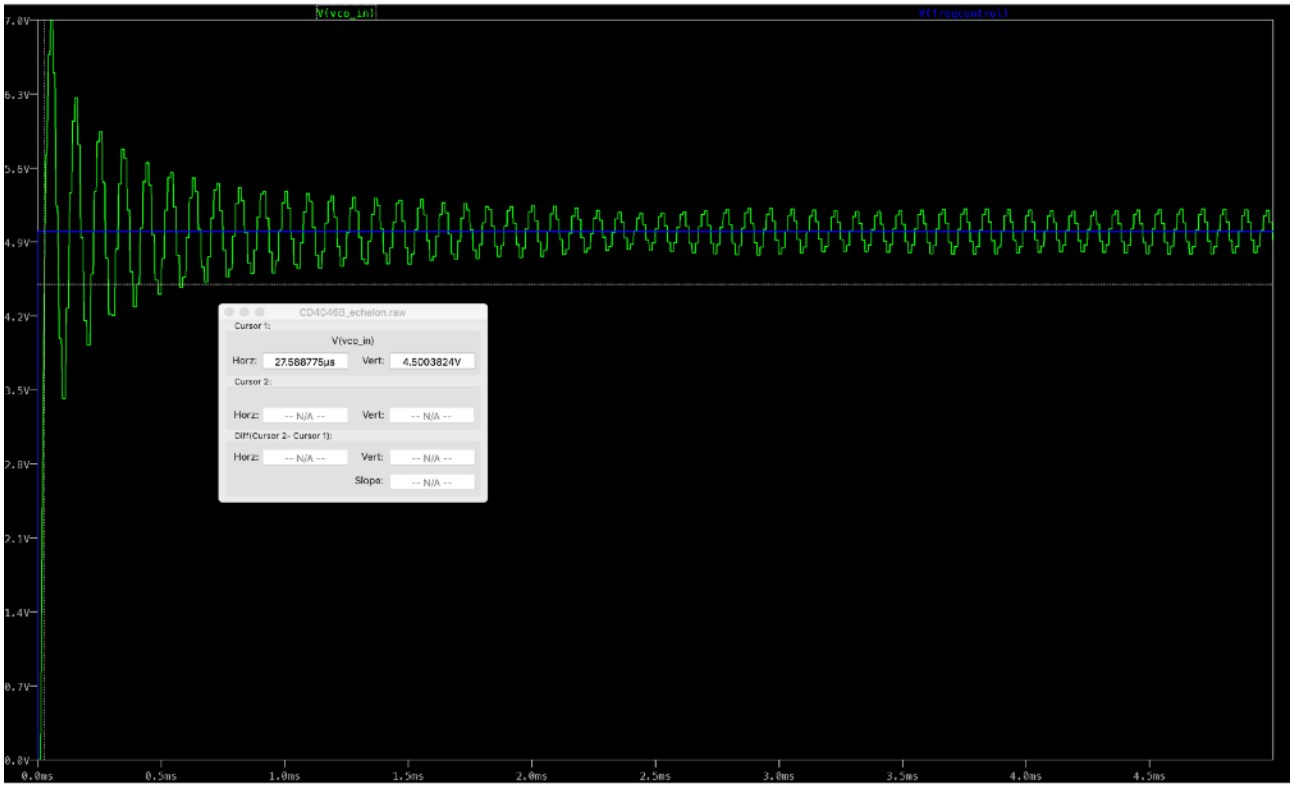
Pour PC1, quand $C_2 = 10nF$, $t_{90\%} = 29.59\mu s$:



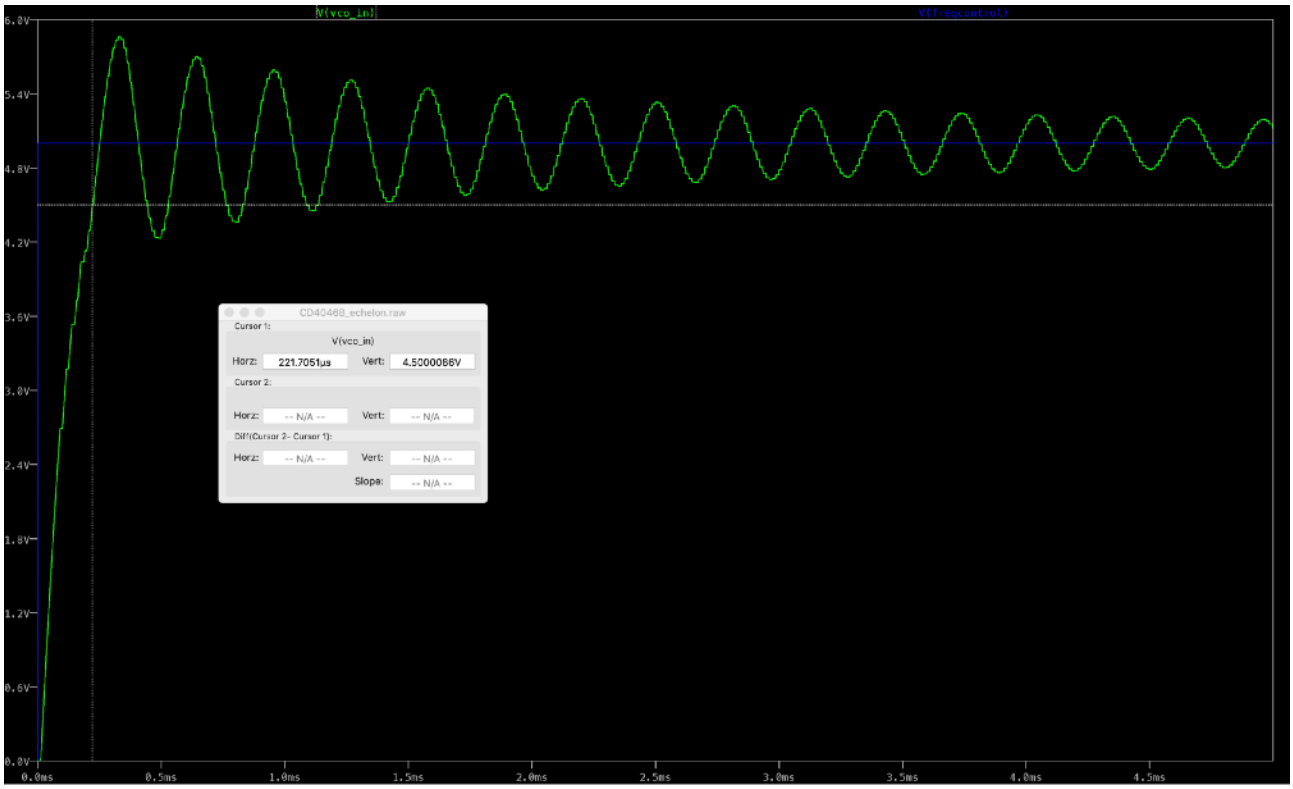
Quand $C_2 = 100nF$, $t_{90\%} = 485.70\mu s$:



Pour PC2, quand $C_2 = 10nF$, $t_{90\%} = 27.59\mu s$:



Quand $C_2 = 100nF$, $t_{90\%} = 221.71\mu s$:



Q3

Le temps caractéristique $t = RC$ et $R_3 = 1.8k\Omega$.

Alors, quand $C_2 = 10nF$, $t = 18\mu s$, est plus petit que le résultat de PC1 ($t_{90\%} = 29.59\mu s$) et PC2 ($t_{90\%} = 27.59\mu s$).

Et quand $C_2 = 100nF$, $t = 180\mu s$, est aussi plus petit que le résultat de PC1 ($t_{90\%} = 485.70\mu s$) et PC2 ($t_{90\%} = 221.71\mu s$).