Devoir4 Étude de la PLL CD4046B

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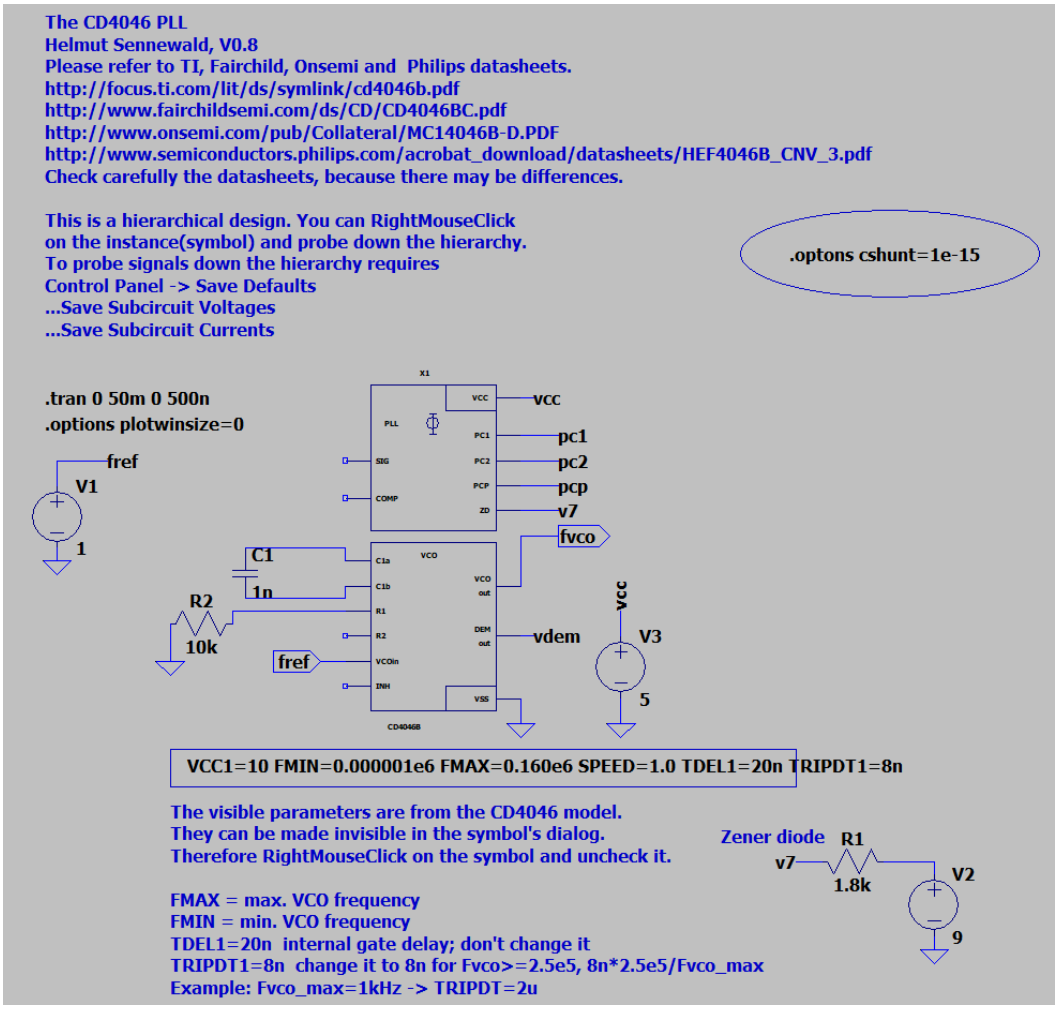
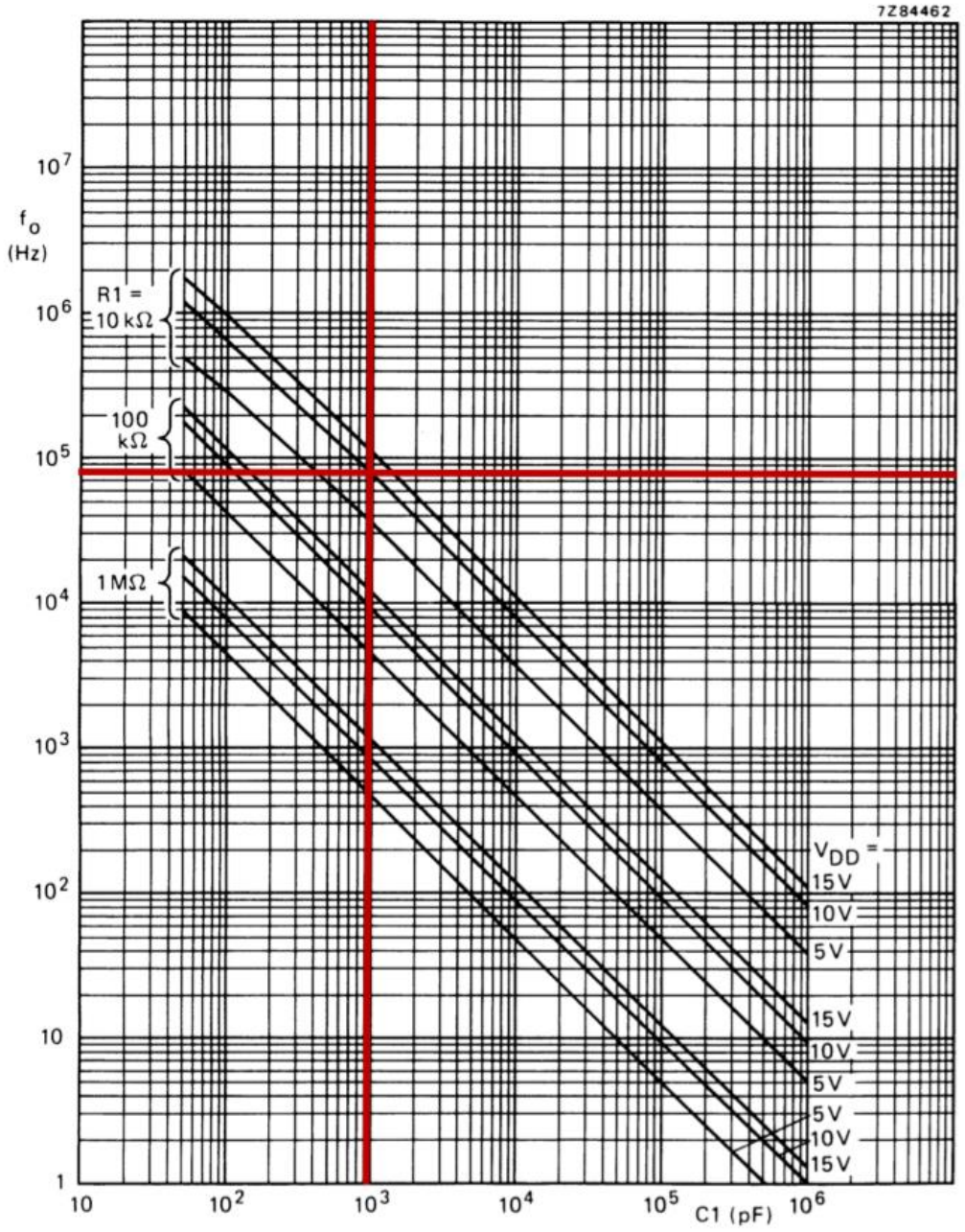
1 Caractérisation du VCO

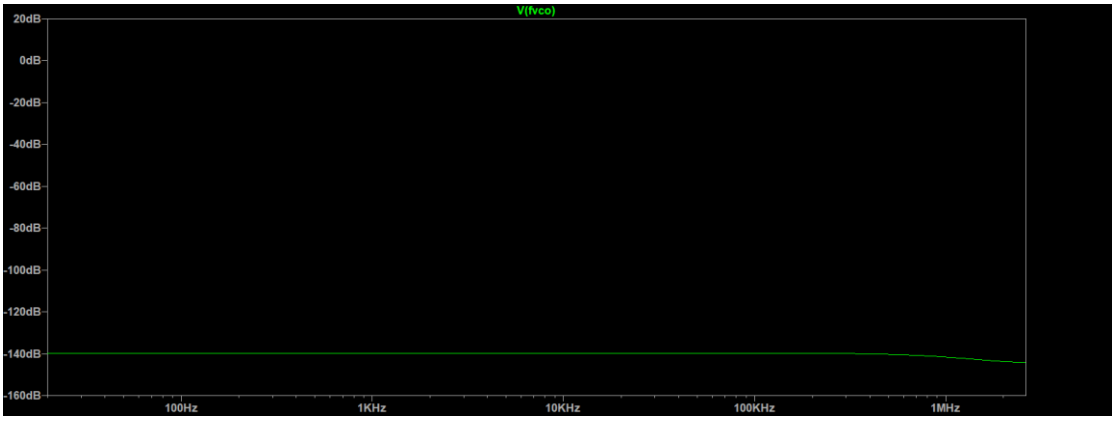
1.



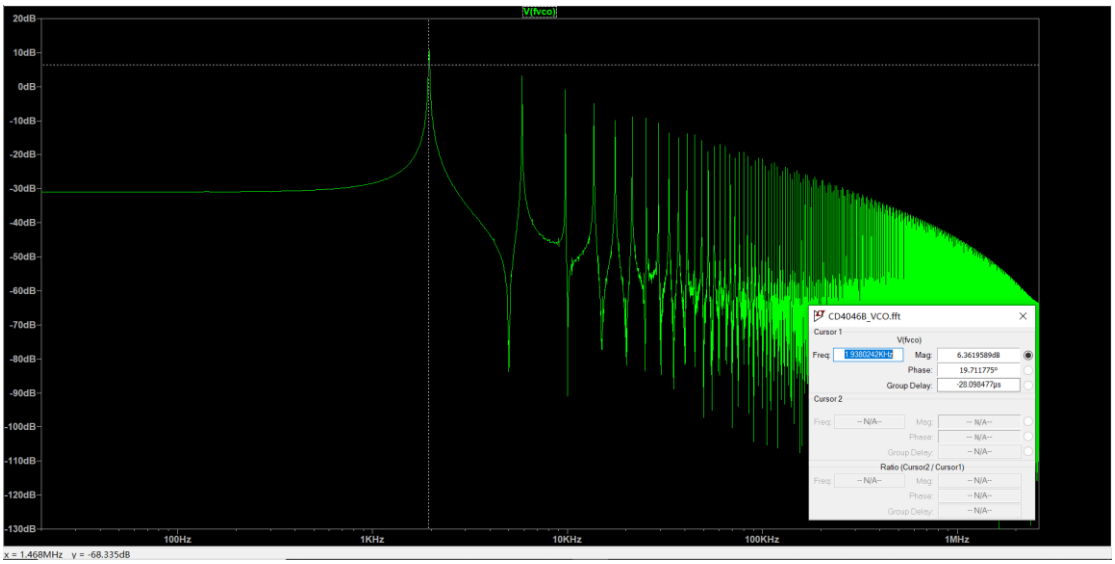


Par lecture de l'abaque, on sait que la plage de fonctionnement du VCO est de largeur $2f_L = 160kHz$ centrée autour $f_0 = 80kHz$.

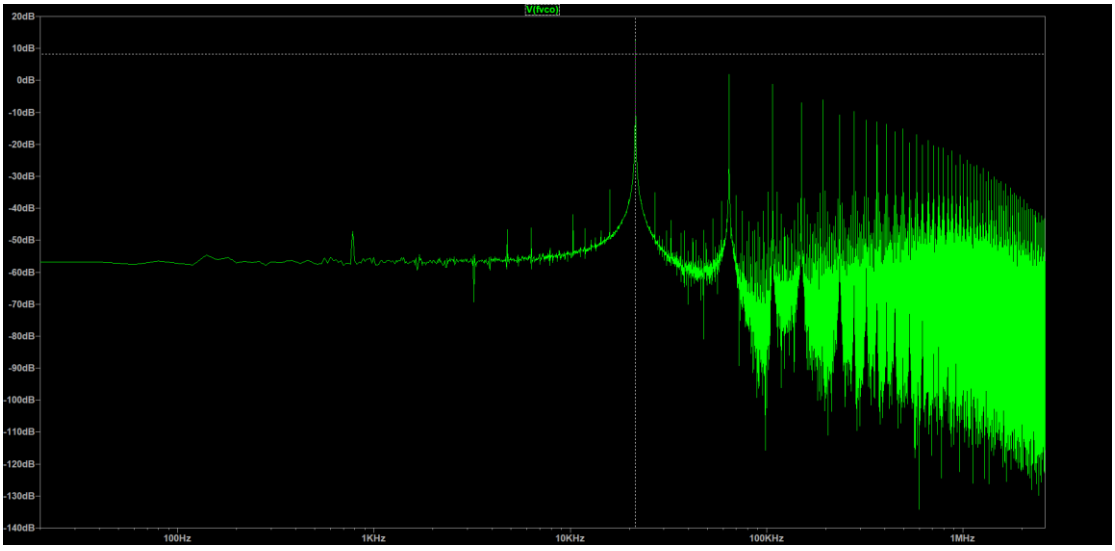
2. $f_{min} = 0Hz, f_{max} = 160kHz$
   V1=0V



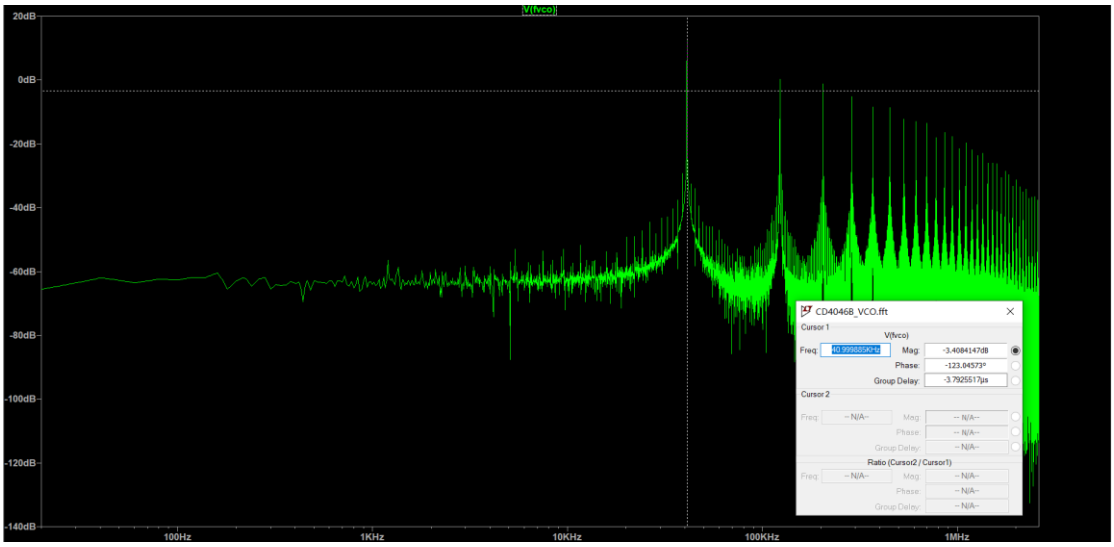
V1=1V, **fvco=1.9380242KHz**



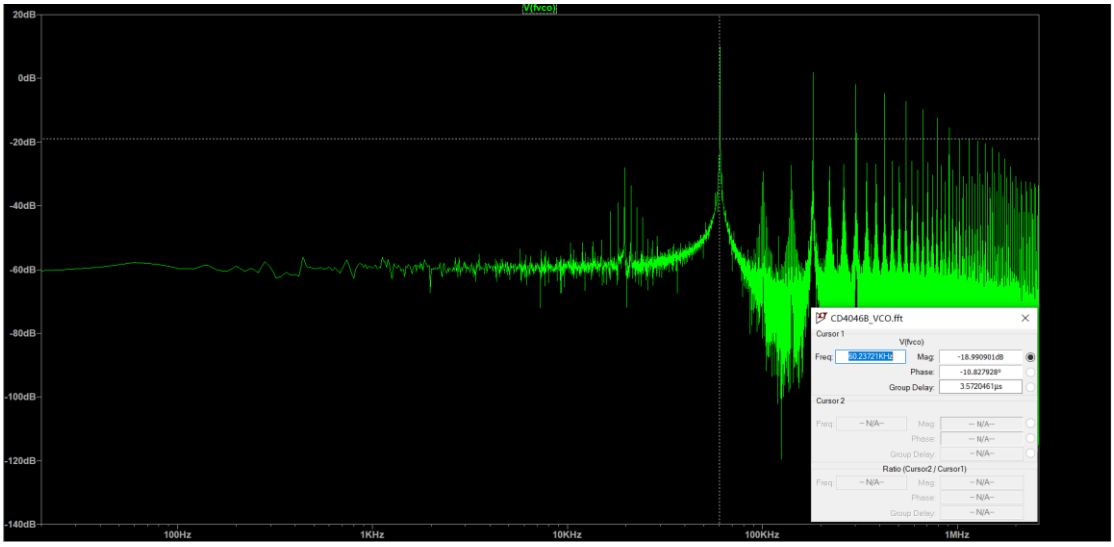
V1=2V, **fvco= 21.450631KHz**



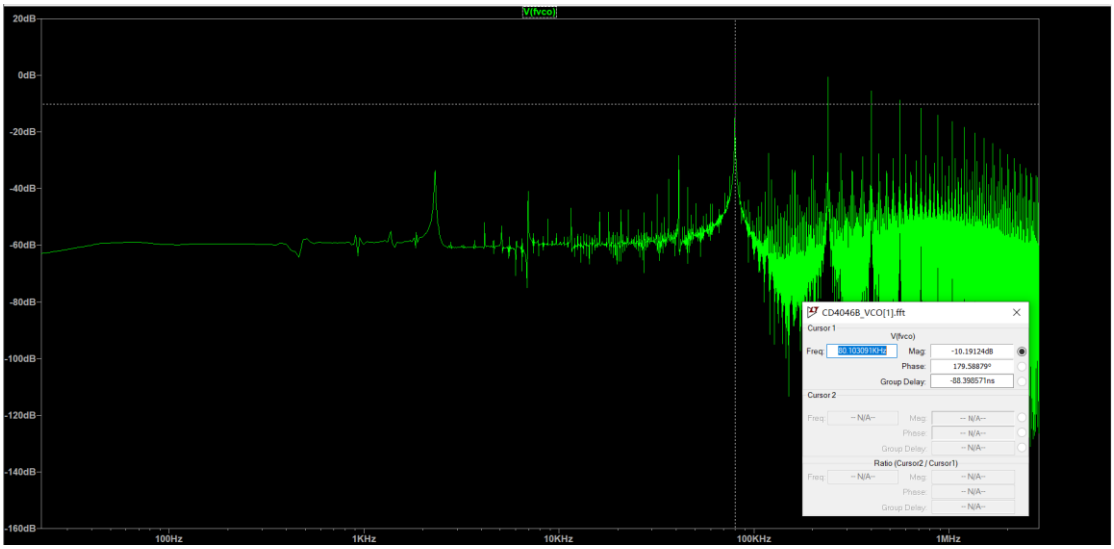
V1=3V, **fvco=40.999885KHz**



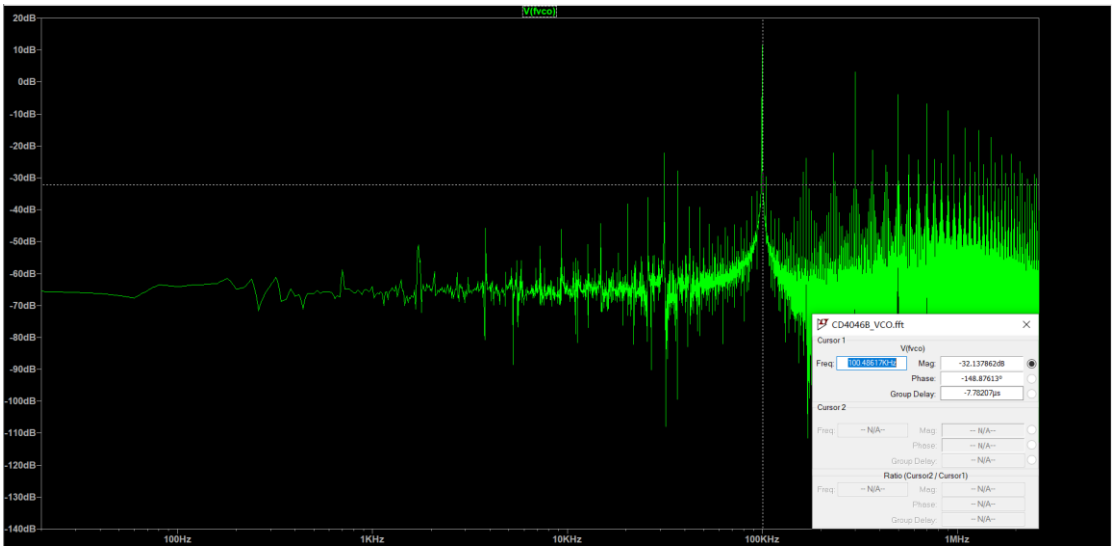
V1=4V, **fvco=60.23721KHz**



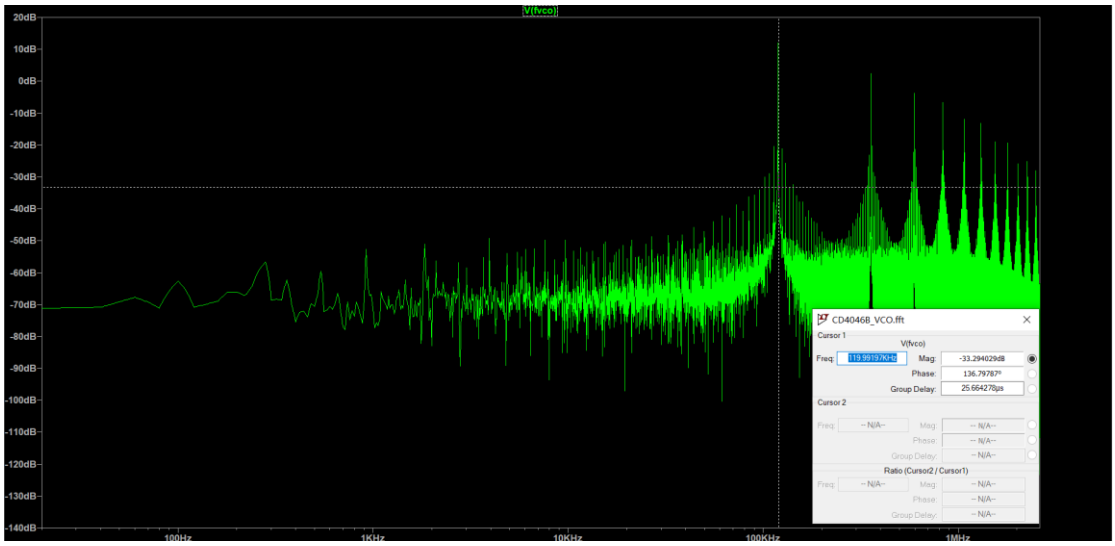
V1=5V, **fvco=80.103091KHz**



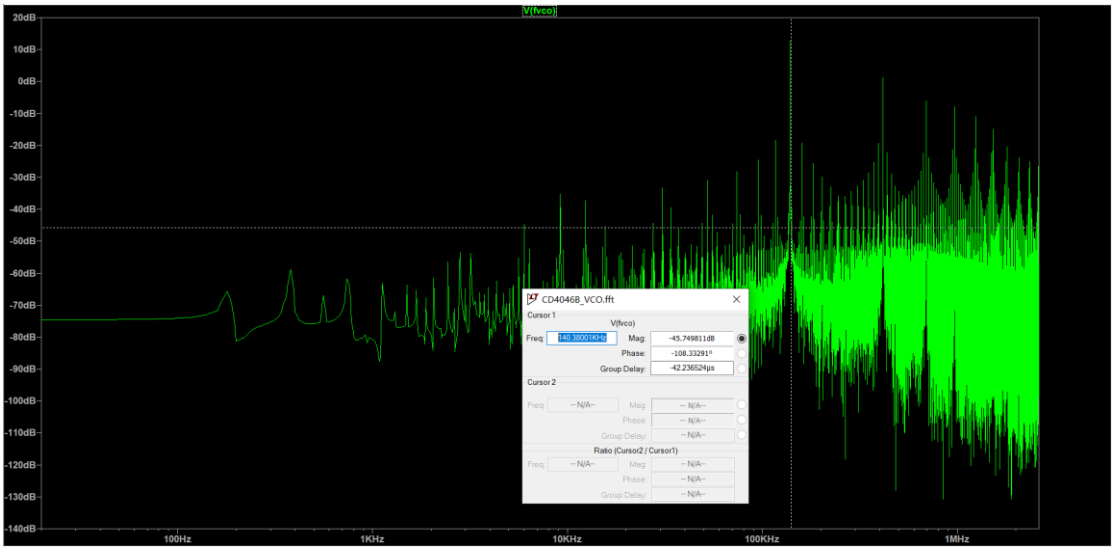
V1=6V, **fvco=100.48617KHz**



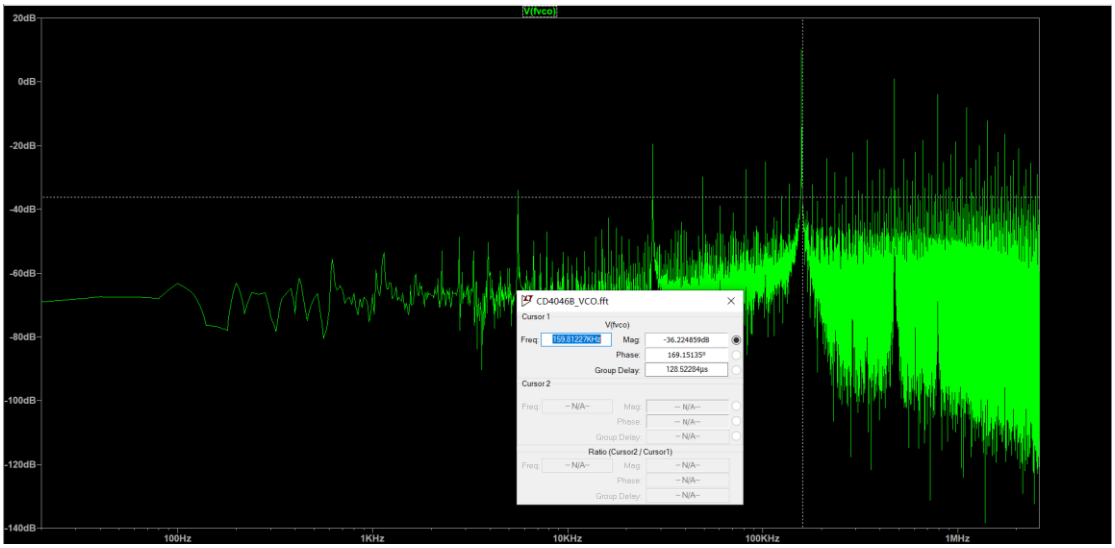
V1=7V, **fvco=119.99197KHz**



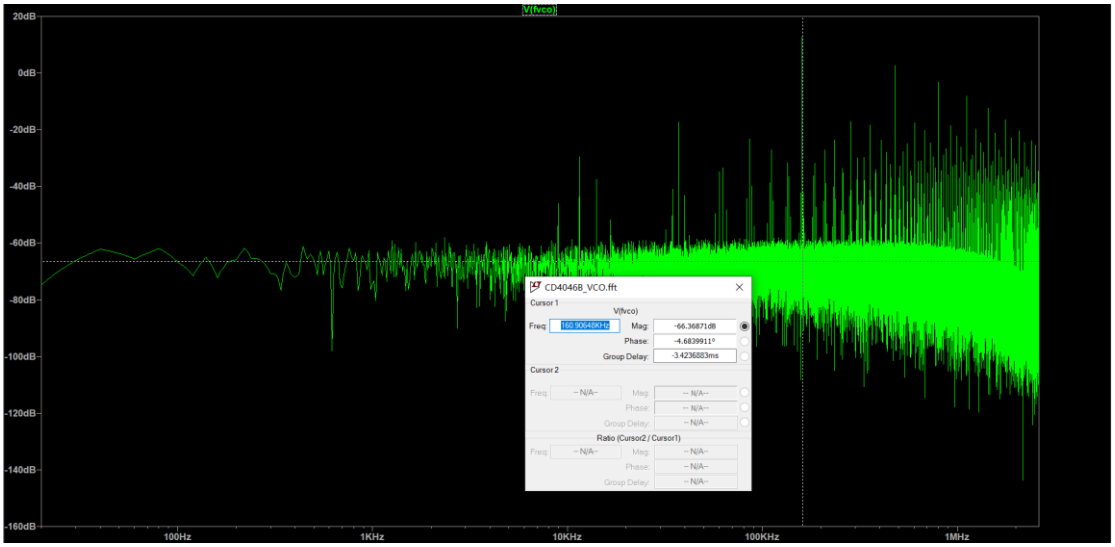
V1=8V, **fvco=140.38001KHz**



V1=9V, **fvco=159.81227KHz**



V1=10V, **fvco=160.90648KHz**

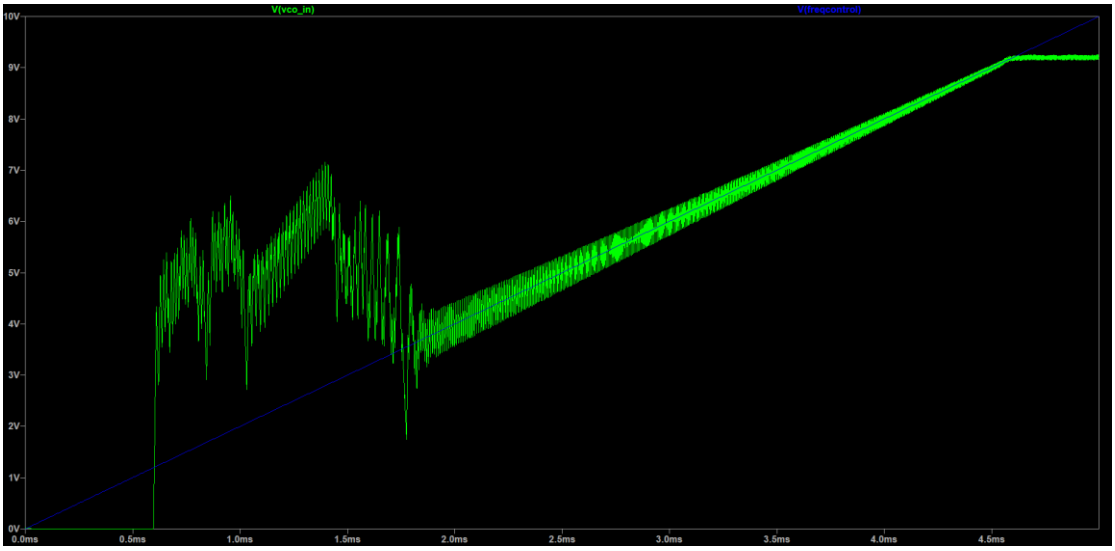


On peut voir que la fréquence du signal fmin=0Hz, fmax=160kHz. On vérifie bien la plage de fonctionnement de PLL HEF 4046B.

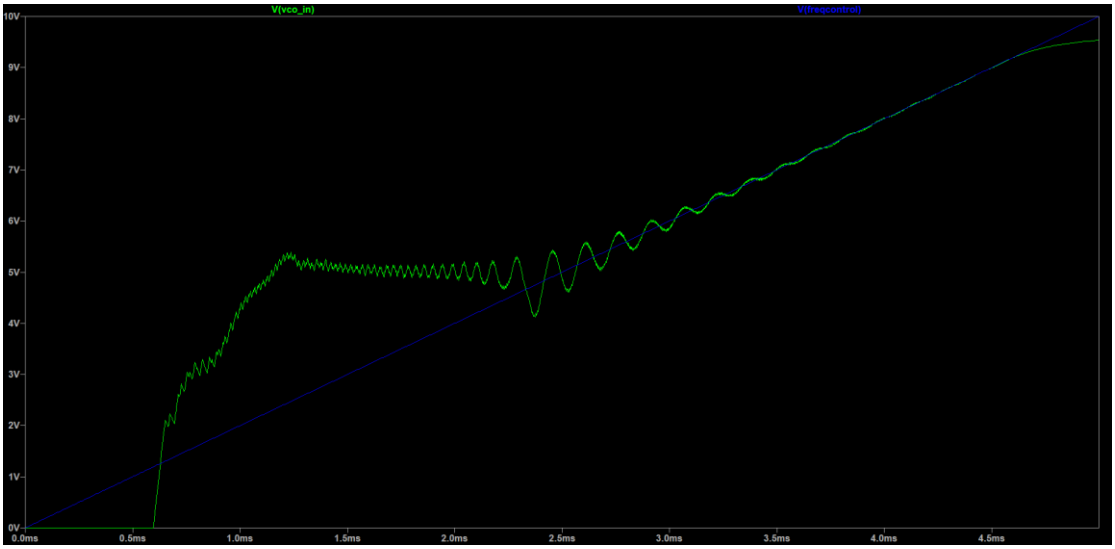
2 Mesure des plages de capture et de verrouillage

3. Pour le comparateur pc1

$C_2 = 10nF$

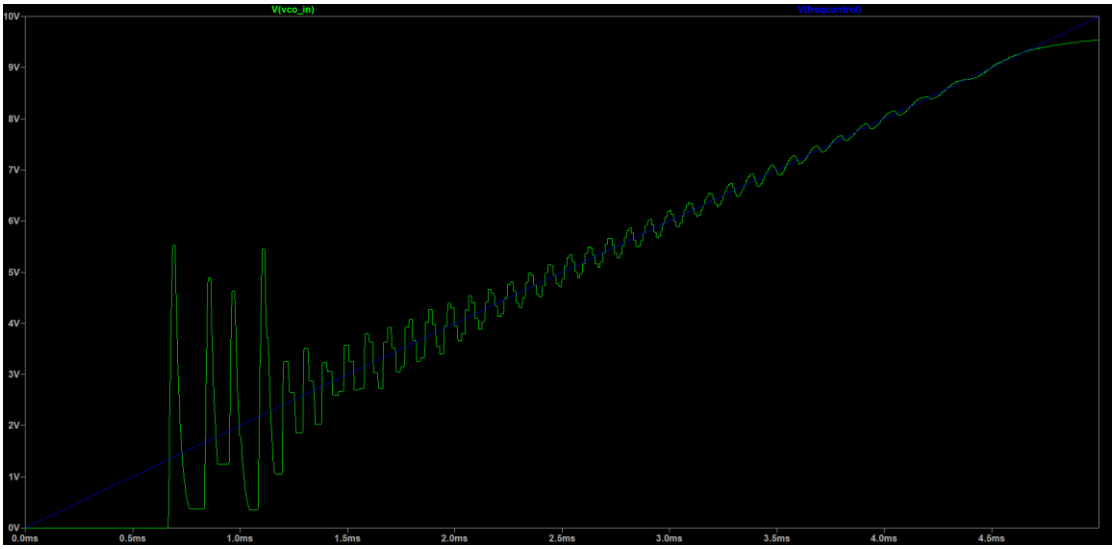


$C_2 = 100nF$



Pour le comparateur pc2

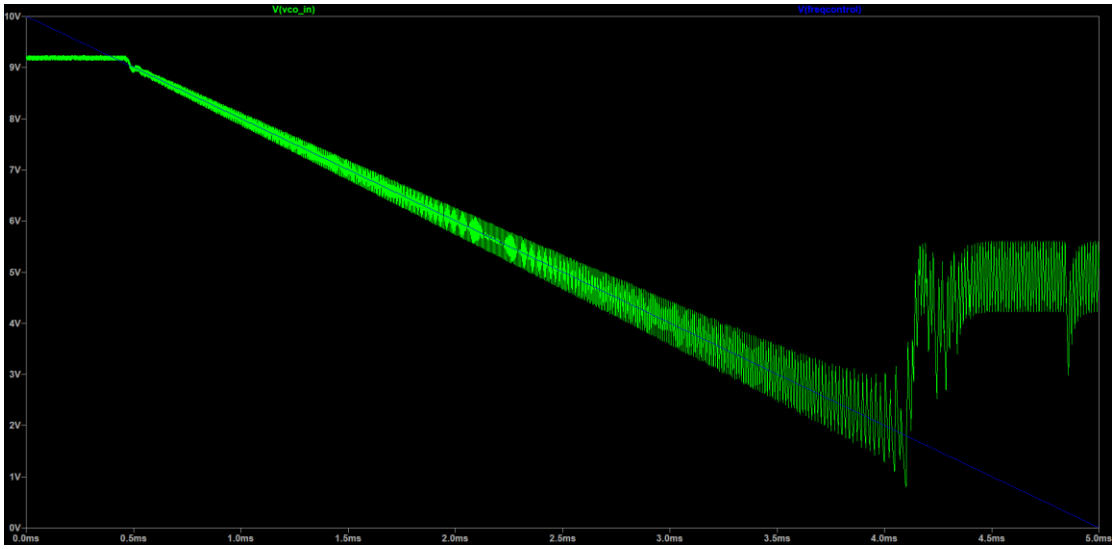
$C_2 = 10nF$



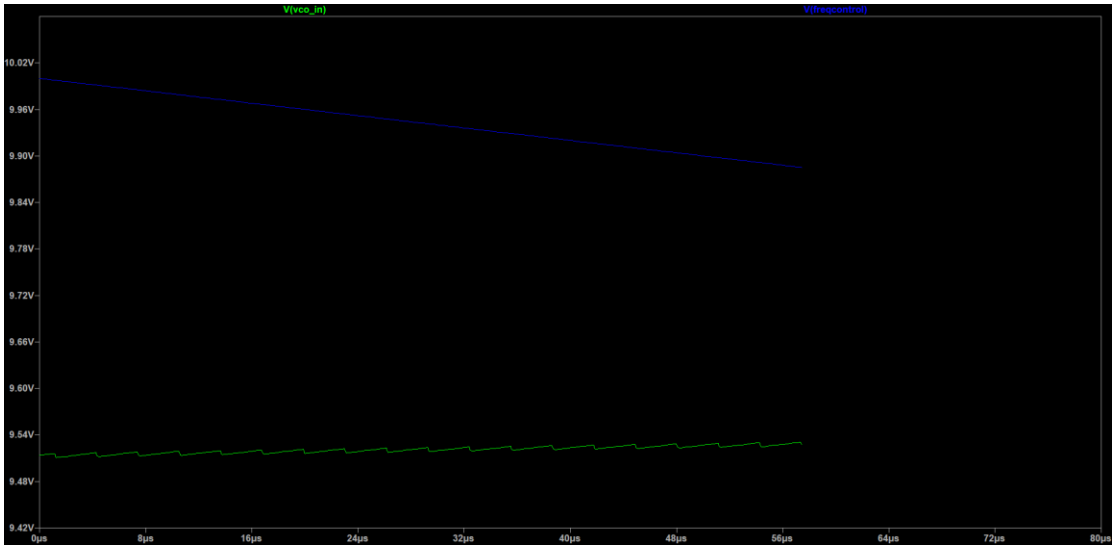
$C_2 = 100nF$

4. Pour le comparateur pc1

$C_2 = 10nF$

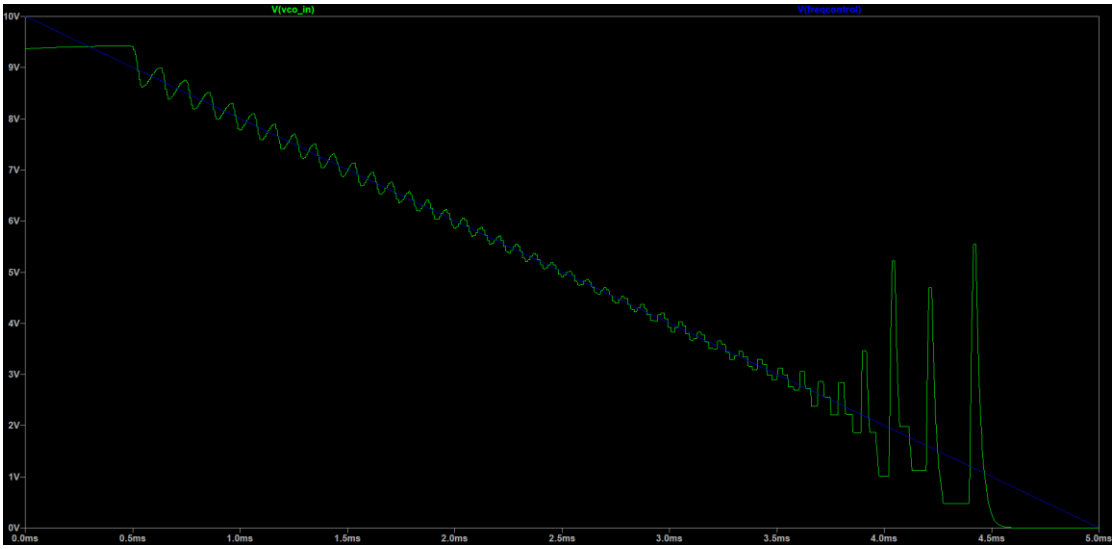


$C_2 = 100nF$

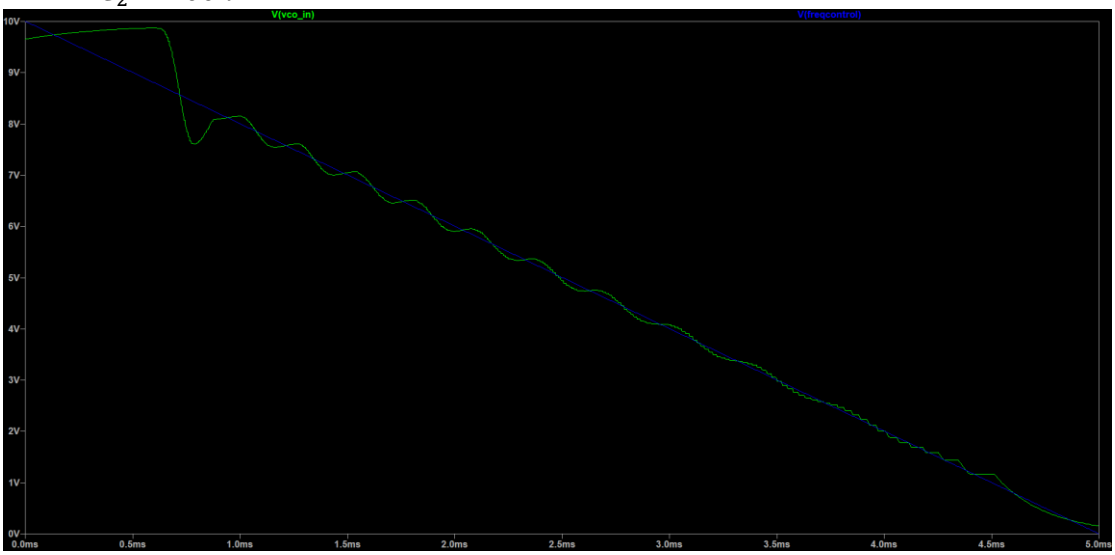


Pour le comparateur pc2

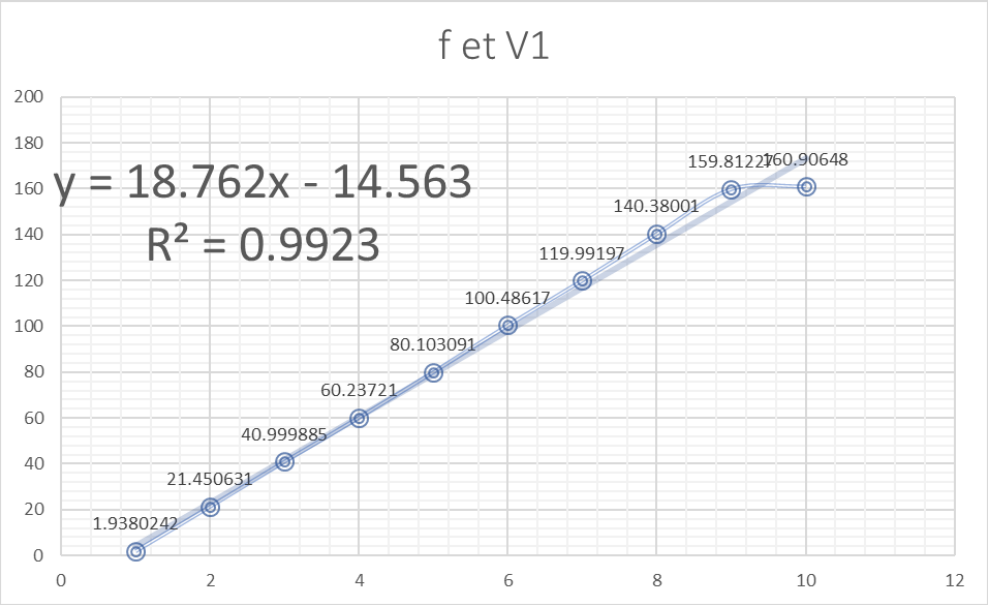
$C_2 = 10nF$



$C_2 = 100nF$

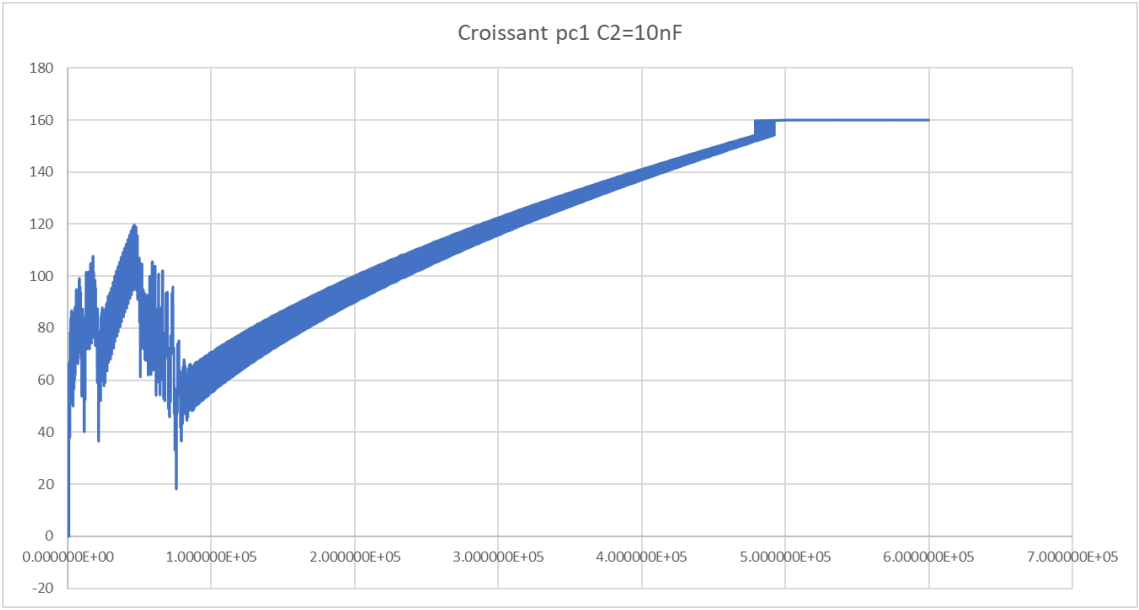


5. D'après la question 2,
   On sait la relation entre f et V

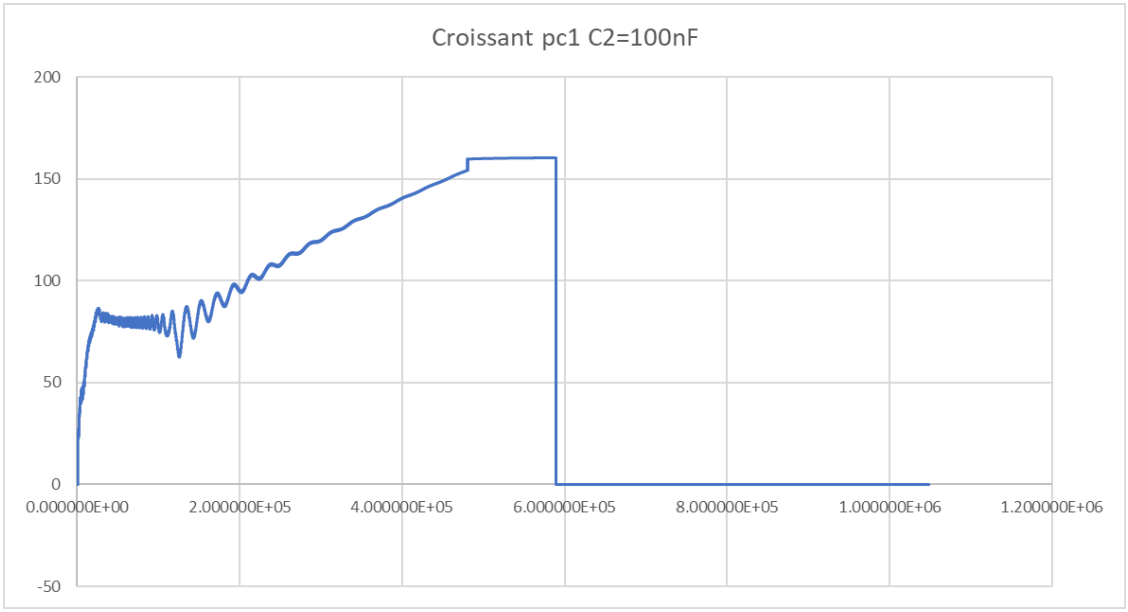


Si V est dans l'intervalle [0,1], $f = 1.938\text{V}$
Si V est dans l'intervalle [1,9], $f = 18.762\text{V} - 14.563$
Si V est dans l'intervalle [9,10], $f = 1.0942\text{V} + 149.96$

Sweep Croissant
Pour le comparateur pc1
C2=10nF

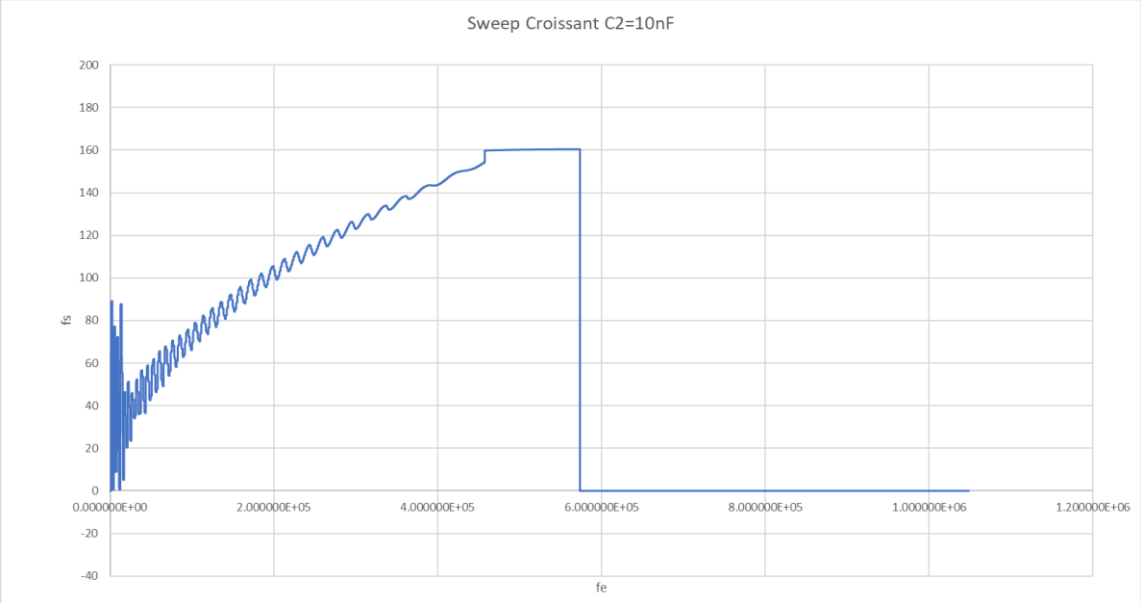


C2=100nF

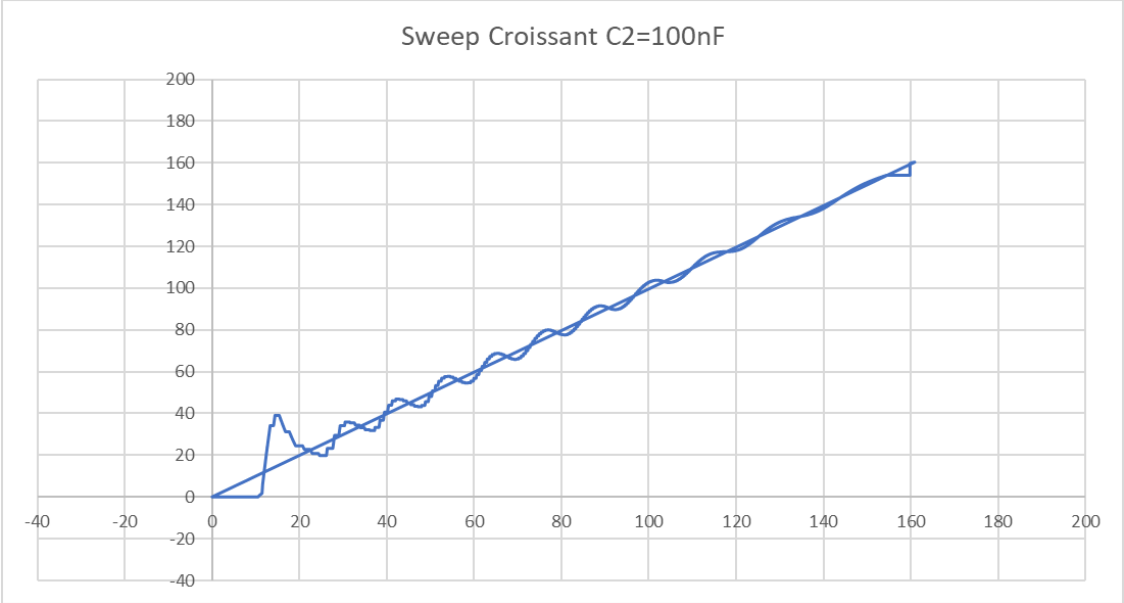


Pour le comparateur pc2

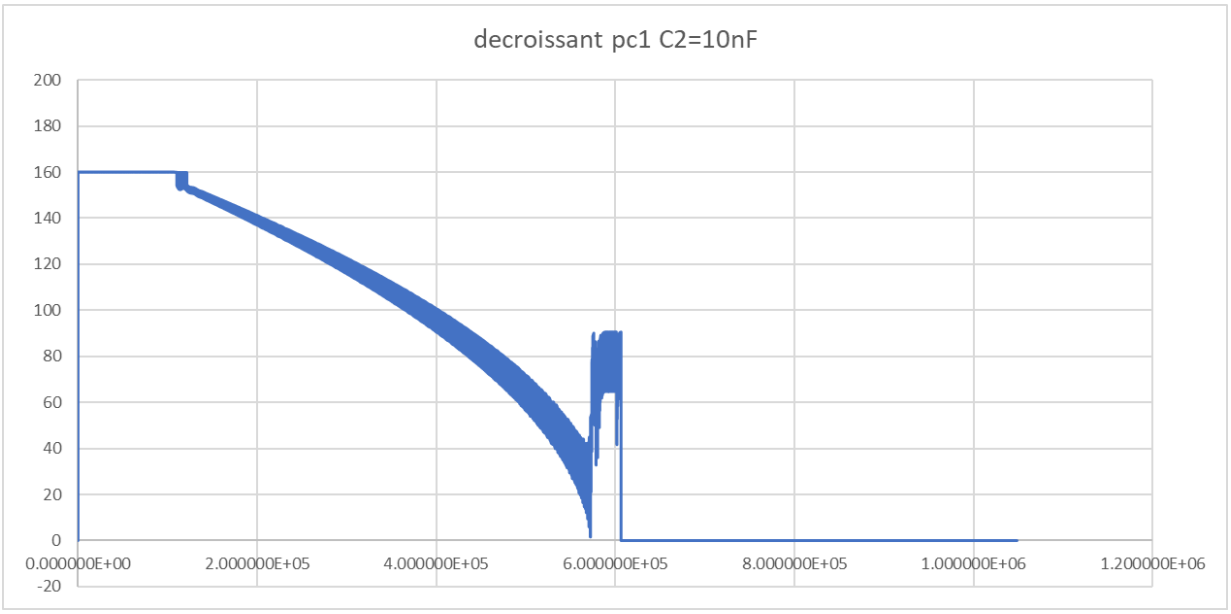
C2=10nF



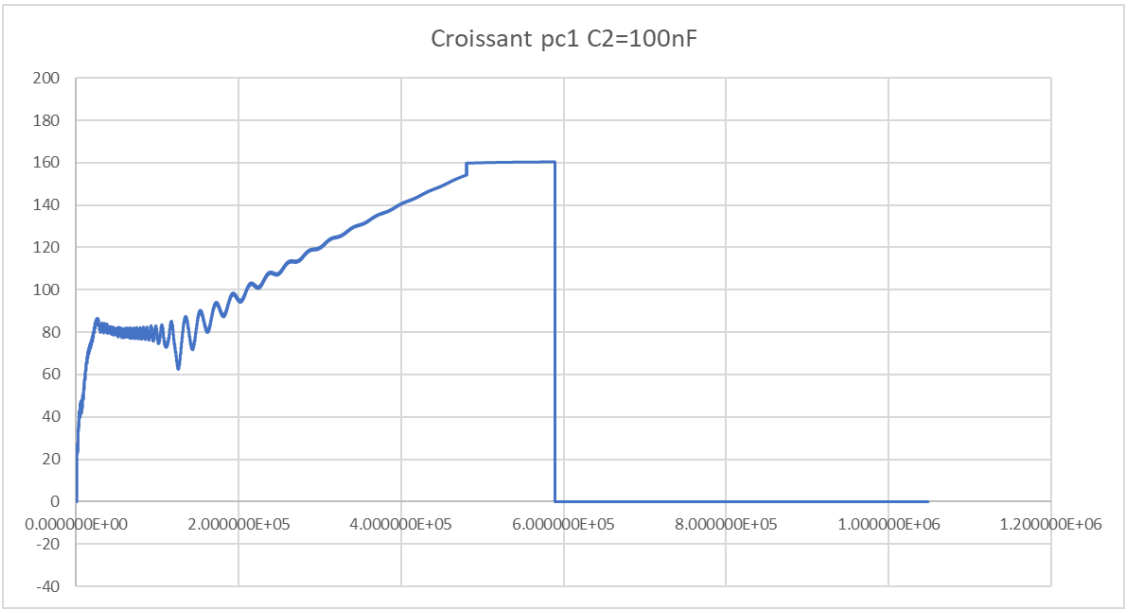
C2=100nF



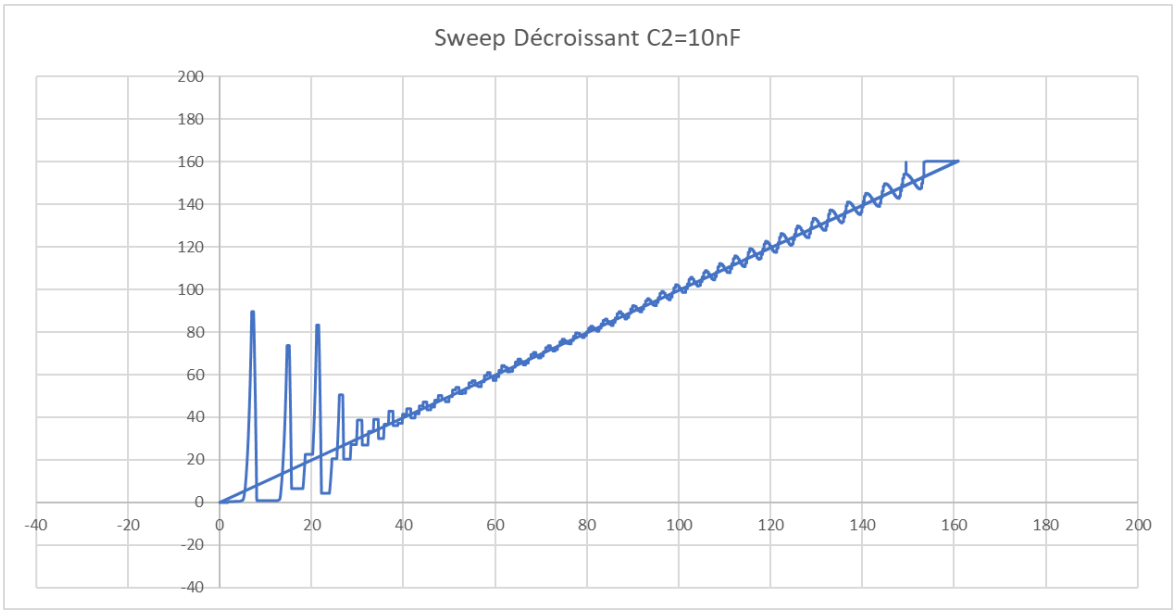
Sweep Décroissant
Pour le comparateur pc1
C2=10nF



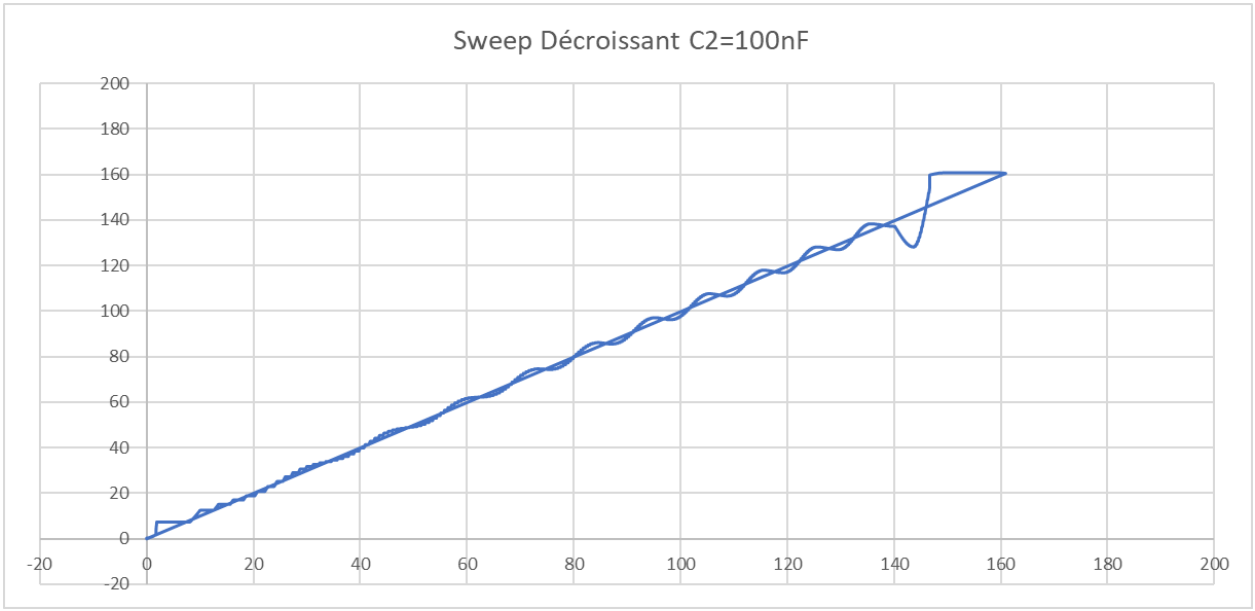
C2=100nF



Pour le comparateur pc2
C2=10nF



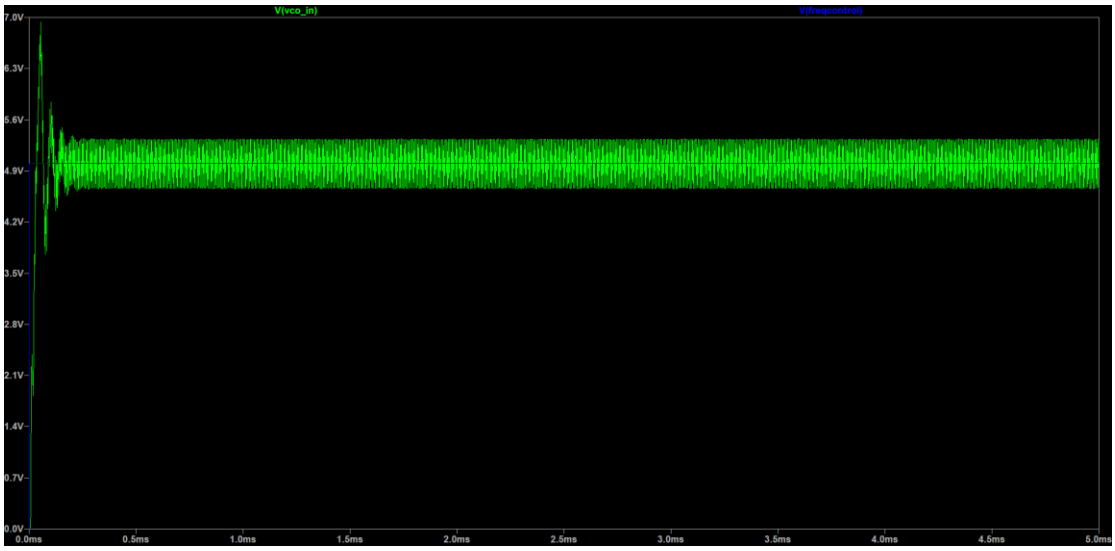
C2=100nF



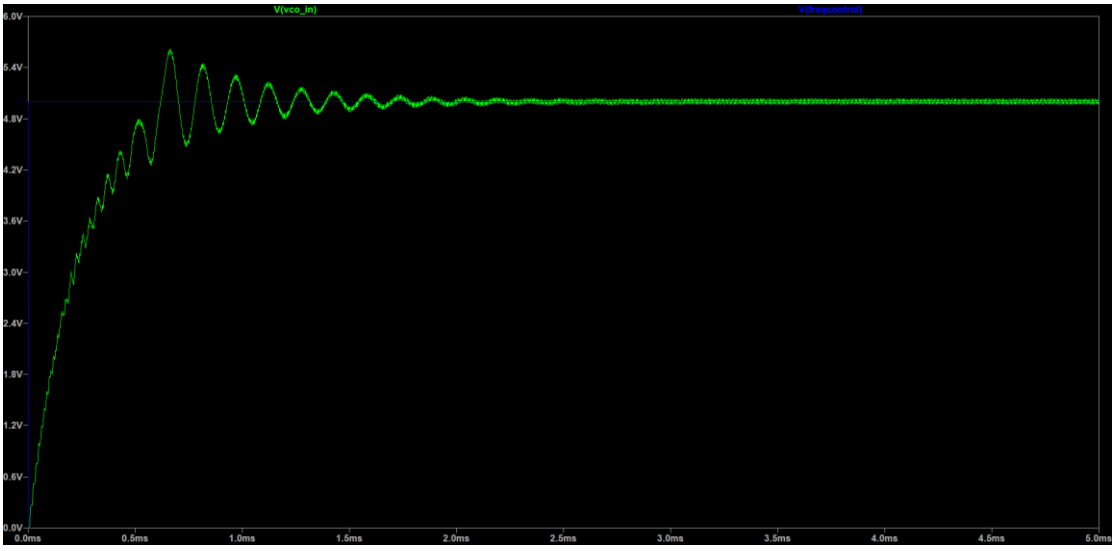
3 Réponse de la PLL à un échelon

1. Pour le comparateur pc1

   C2=10nF

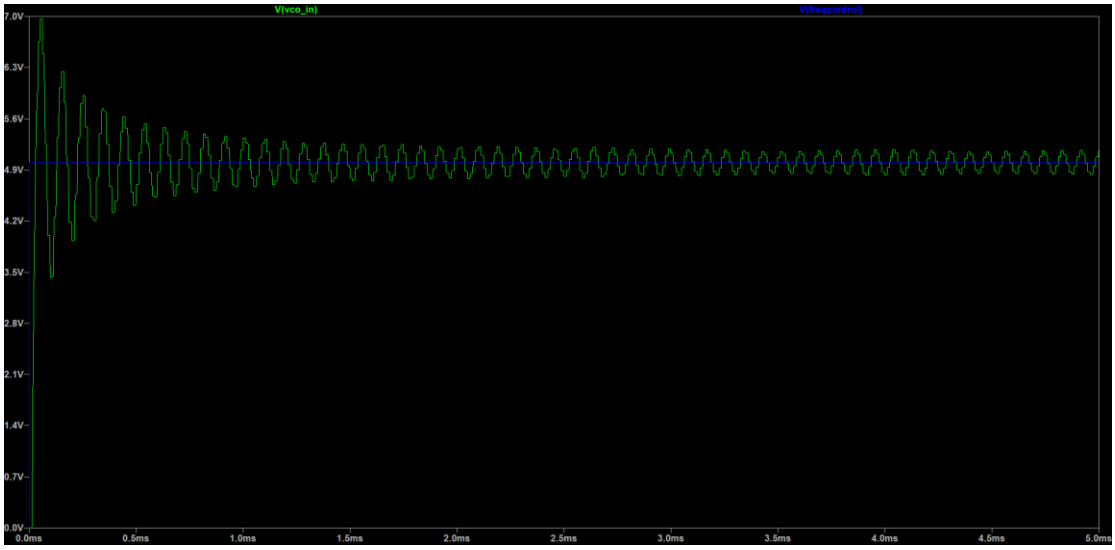


   C2=100nF

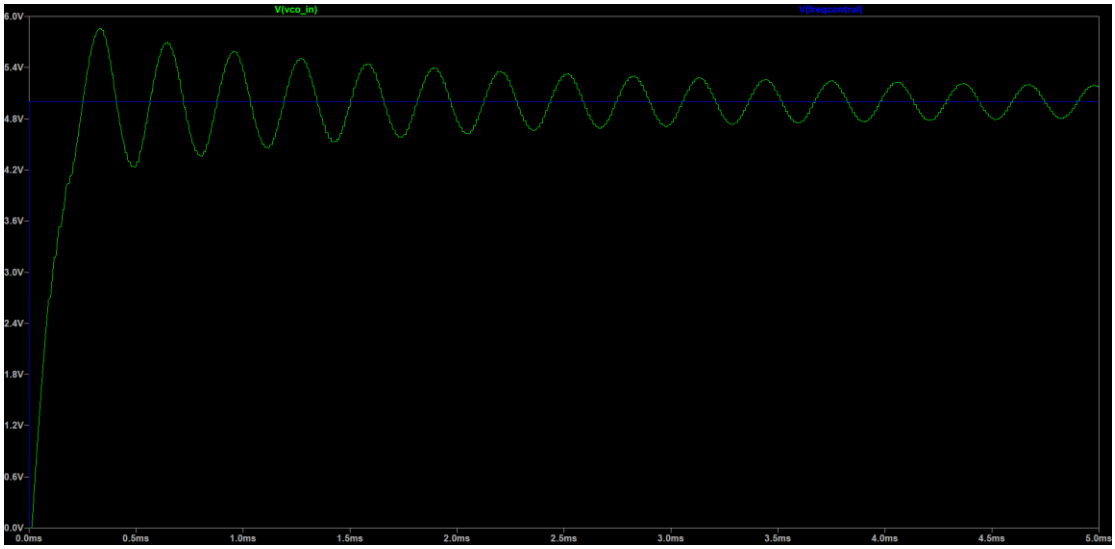


Pour le comparateur pc2

C2=10nF



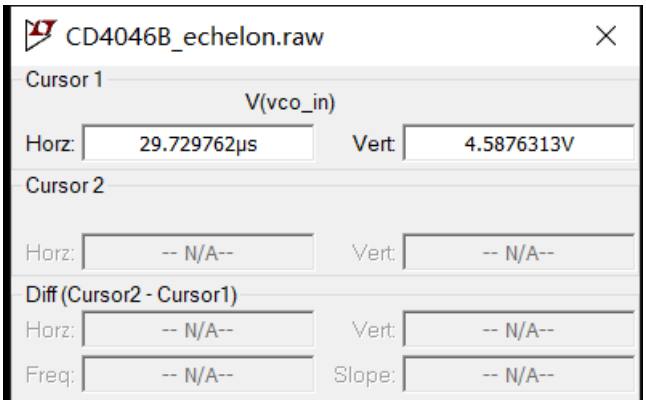
C2=100nF



2. V(freqcontrol)=5V, 90%V(freqcontrol)=4.5V

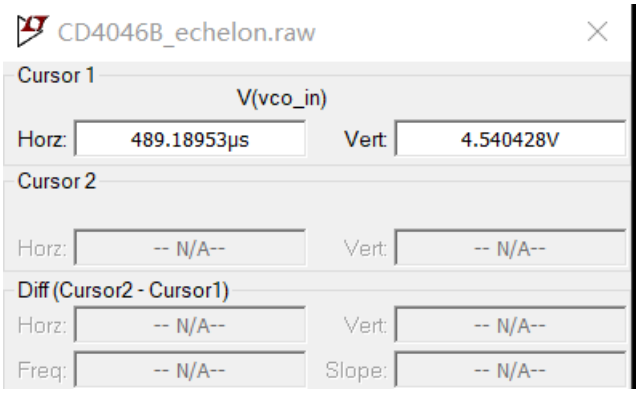
Pour le comparateur pc1

C2=10nF,



On mesure que le temps nécessaire pour atteindre 90% de la valeur de V(freqcontrol) est **29.729762µs**.

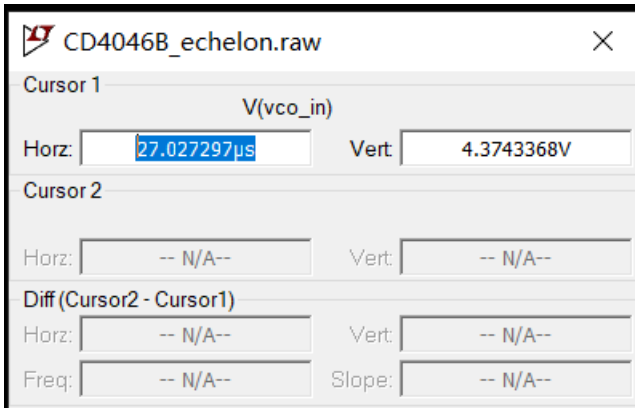
C2=100nF,



On mesure que le temps nécessaire pour atteindre 90% de la valeur de V(freqcontrol) est **489.18953µs**

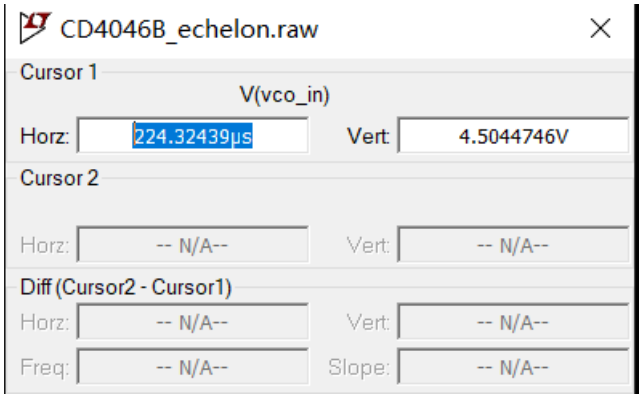
Pour le comparateur pc2

C2=10nF



On mesure que le temps nécessaire pour atteindre 90% de la valeur de V(freqcontrol) est **27.027297µs**

C2=100nF



On mesure que le temps nécessaire pour atteindre 90% de la valeur de V(freqcontrol) est **224.32439µs**

3. Pour C2=10nF, le temps caractéristique de filtre est 18µs.
   Pour C2=100nF, le temps caractéristique de filtre est 180µs.
   Les temps nécessaires pour atteindre 90% de la valeur de V(freqcontrol) sont tous supérieur aux temps caractéristiques des filtres utilisés.