HOJA Nº

FECHA

EJ 5

$n = 5$

$Att_{MIN} = 43\ dB$

$Att_{MAX} = 0,4\ dB$

CHEBYSHEV

$$|T(s)|^2 = \frac{1}{1+\varepsilon^2 C_5^2} = \frac{1}{1+\varepsilon^2(16w^5 - 20w^3 - 4w)^2}$$

$C_4 = 2w(4w^3 - 3w) - 2w^2 - 1$

$C_5 = 4w^2(4w^3 - 3w) - 4w^3 - 2w - 4w^3 - 3w$

$C_5 = 16w^5 - 20w^3 - 8w^3 - 4w$

$C_5 = 16w^5 - 20w^3 - 4w$

$1 + \varepsilon^2(16w^2 - 16.20w + 1)$

$P_1 = -0,386$

$P_{2,3} = -0,312 \pm j0,63$

$P_{4,5} = -0,119 \pm j1,019$

$$\frac{0,386}{s+0,386} \cdot \frac{0,494}{s^2+0,624s+0,494} \cdot \frac{1,052}{s^2+0,239s+1,052}$$

SOS_1 SOS_2 SOS_3

$$\frac{S}{S+2,59}$$

SOS_HP1

$$\frac{S^2}{S^2+1,263S+2,024}$$

SOS_HP2

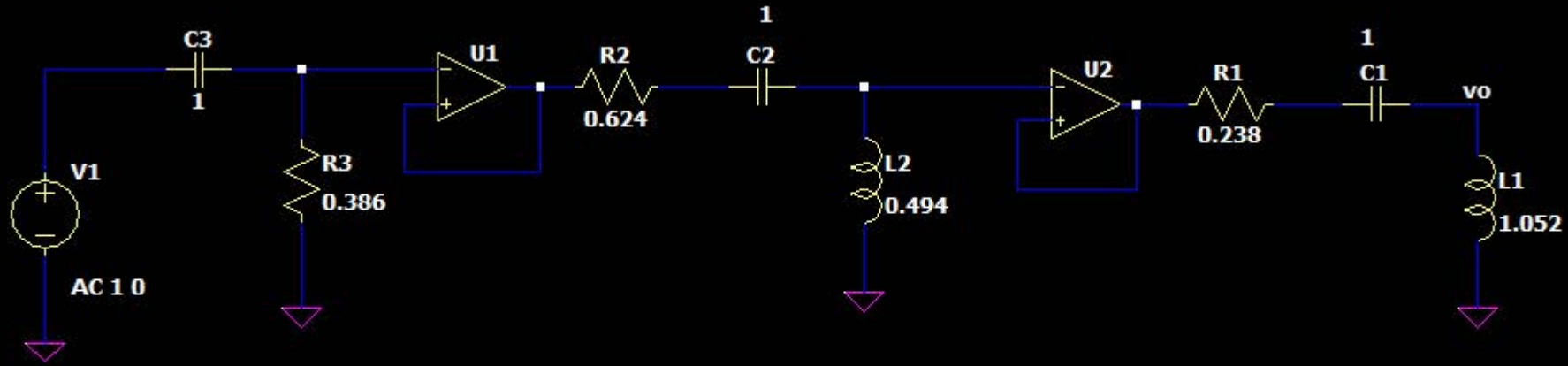
$$\frac{S^2}{S^2+S0,226+0,95}$$

SOS_HP3

$$\text{forma}_{HP} = \frac{S^2}{S^2+S\frac{R}{L}+\frac{1}{LC}}$$

~~L=0,01H~~

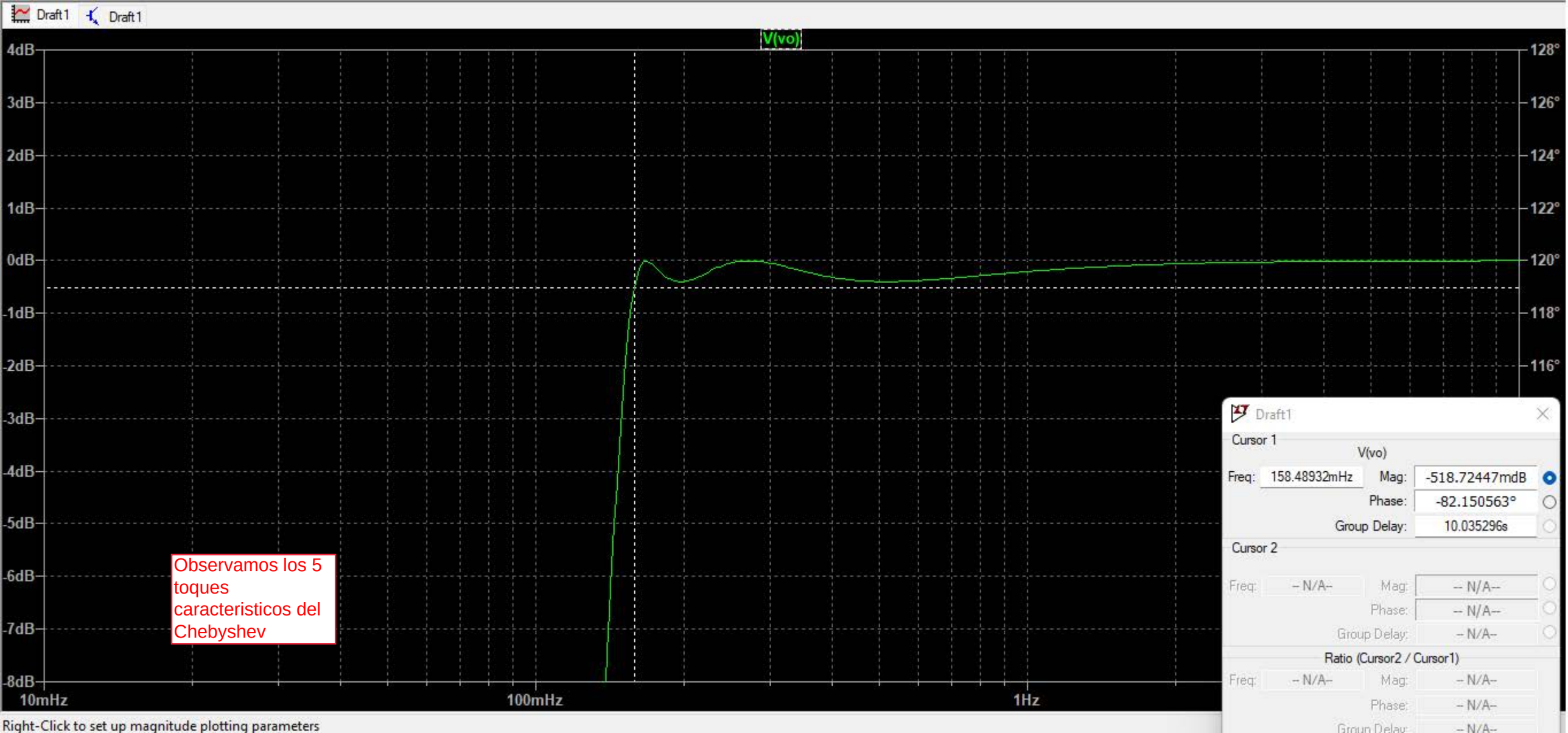
C = 1 f

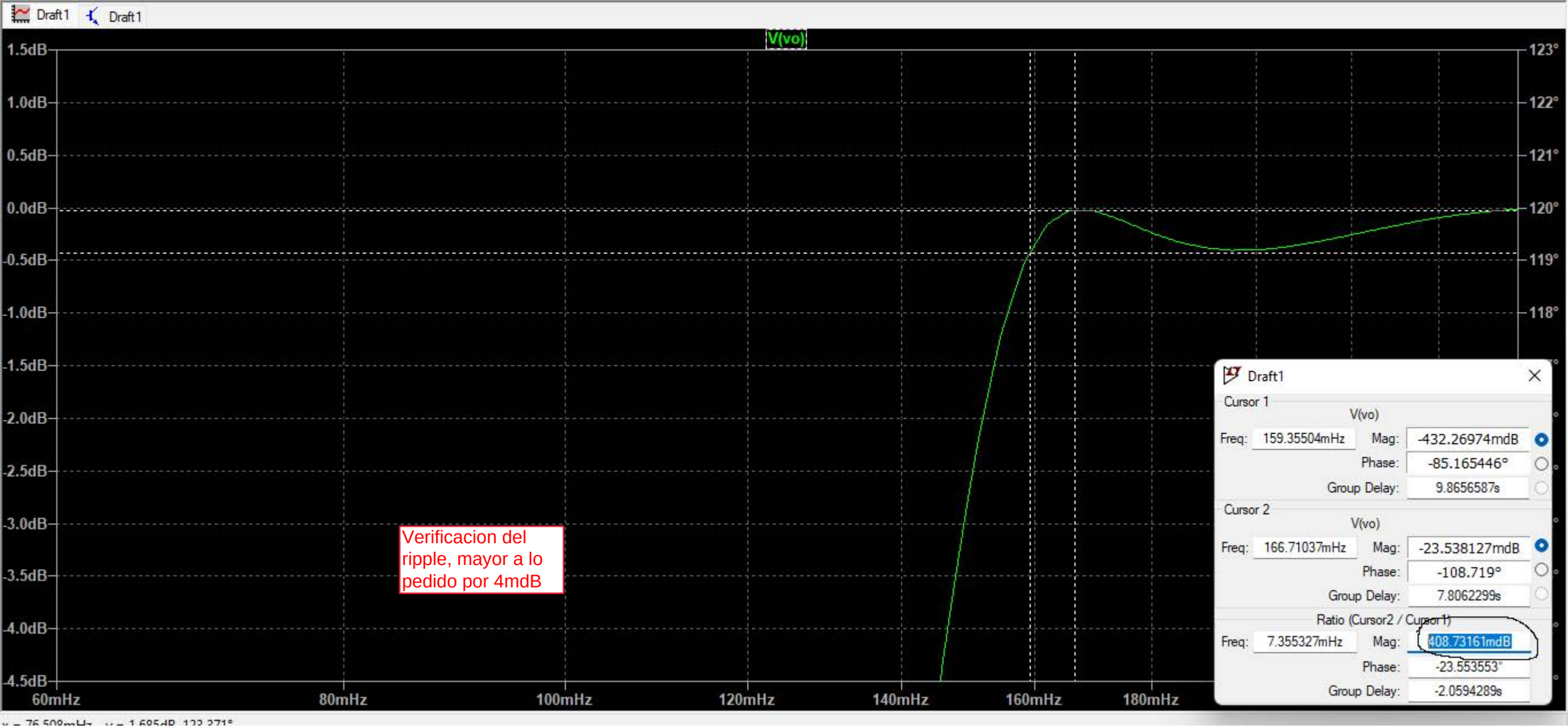


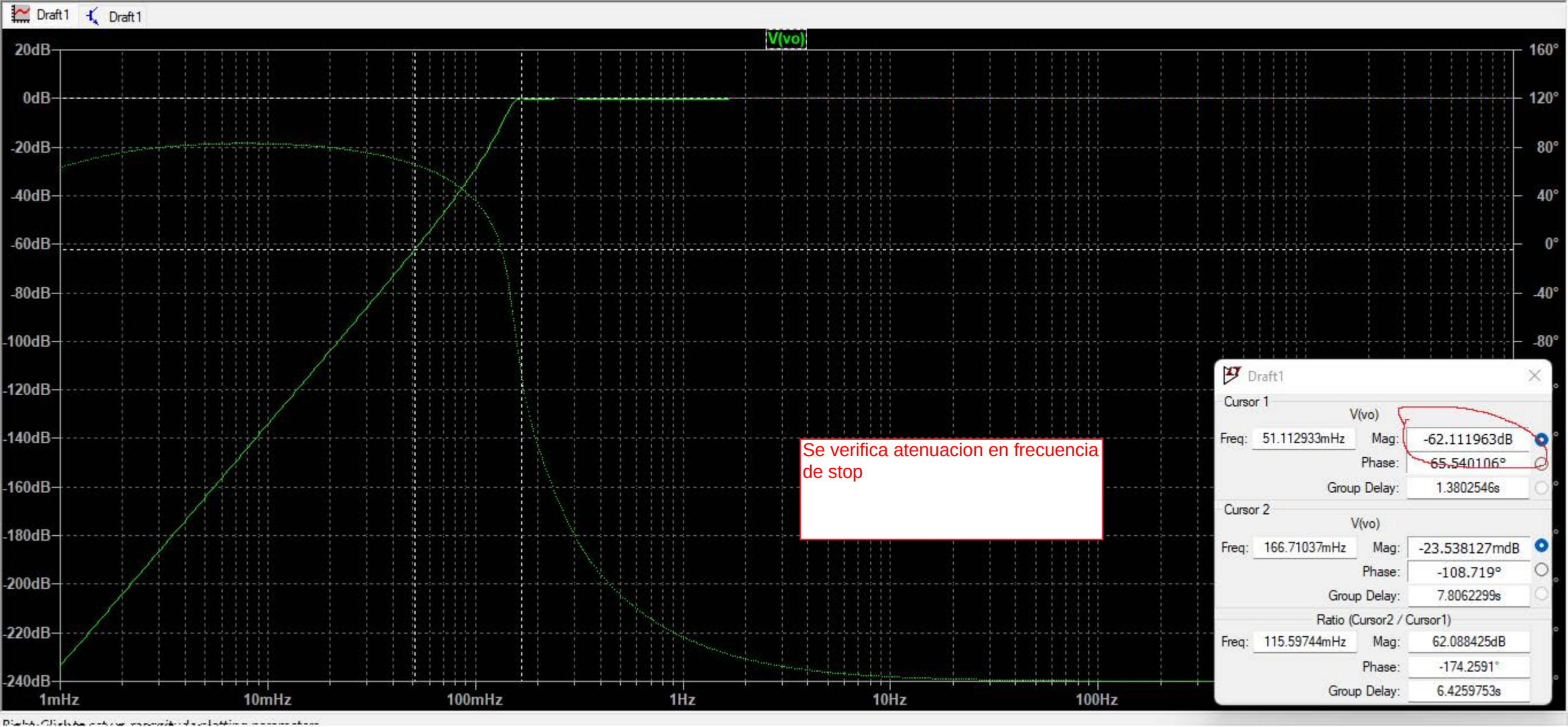
.lib opamp.sub

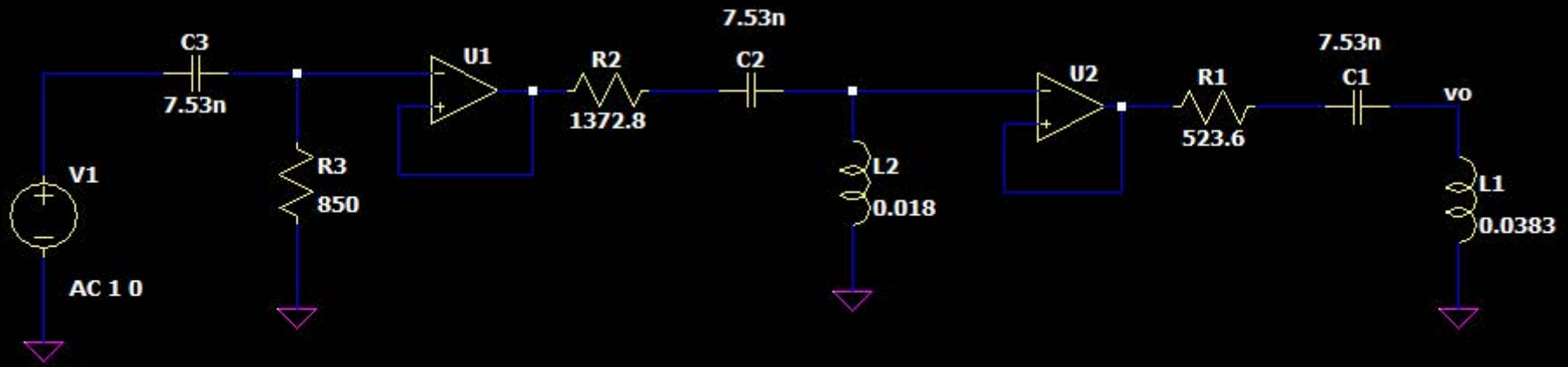
.ac dec 100 0.001 10K

Circuito normalizado


Draft1
Draft1
V(vo)
4dB
3dB
2dB
1dB
0dB
-1dB
-2dB
-3dB
-4dB
-5dB
-6dB
-7dB
-8dB
128°
126°
124°
122°
120°
118°
116°
10mHz
100mHz
1Hz
Observamos los 5 toques caracteristicos del Chebyshev
Draft1
Cursor 1
V(vo)
Freq: 158.48932mHz
Mag: -518.72447mdB
Phase: -82.150563°
Group Delay: 10.035296s
Cursor 2
Freq: -- N/A--
Mag: -- N/A--
Phase: -- N/A--
Group Delay: -- N/A--
Ratio (Cursor2 / Cursor1)
Freq: -- N/A--
Mag: -- N/A--
Phase: -- N/A--
Group Delay: -- N/A--
Right-Click to set up magnitude plotting parameters


Draft1
Draft1
V(vo)
1.5dB
1.0dB
0.5dB
0.0dB
-0.5dB
-1.0dB
-1.5dB
-2.0dB
-2.5dB
-3.0dB
-3.5dB
-4.0dB
-4.5dB
123°
122°
121°
120°
119°
118°
60mHz
80mHz
100mHz
120mHz
140mHz
160mHz
180mHz
Verificacion del ripple, mayor a lo pedido por 4mdB
Draft1
Cursor 1
V(vo)
Freq: 159.35504mHz
Mag: -432.26974mdB
Phase: -85.165446°
Group Delay: 9.8656587s
Cursor 2
V(vo)
Freq: 166.71037mHz
Mag: -23.538127mdB
Phase: -108.719°
Group Delay: 7.8062299s
Ratio (Cursor2 / Cursor1)
Freq: 7.355327mHz
Mag: 408.73161mdB
Phase: -23.553553°
Group Delay: -2.0594289s


Draft1
Draft1
V(vo)
20dB
0dB
-20dB
-40dB
-60dB
-80dB
-100dB
-120dB
-140dB
-160dB
-180dB
-200dB
-220dB
-240dB
160°
120°
80°
40°
0°
-40°
-80°
1mHz
10mHz
100mHz
1Hz
10Hz
100Hz
Se verifica atenuacion en frecuencia de stop
Draft1
Cursor 1
V(vo)
Freq: 51.112933mHz
Mag: -62.111963dB
Phase: 65.540106°
Group Delay: 1.3802546s
Cursor 2
V(vo)
Freq: 166.71037mHz
Mag: -23.538127mdB
Phase: -108.719°
Group Delay: 7.8062299s
Ratio (Cursor2 / Cursor1)
Freq: 115.59744mHz
Mag: 62.088425dB
Phase: -174.2591°
Group Delay: 6.4259753s



.lib opamp.sub

.ac dec 100 0.001 1Meg

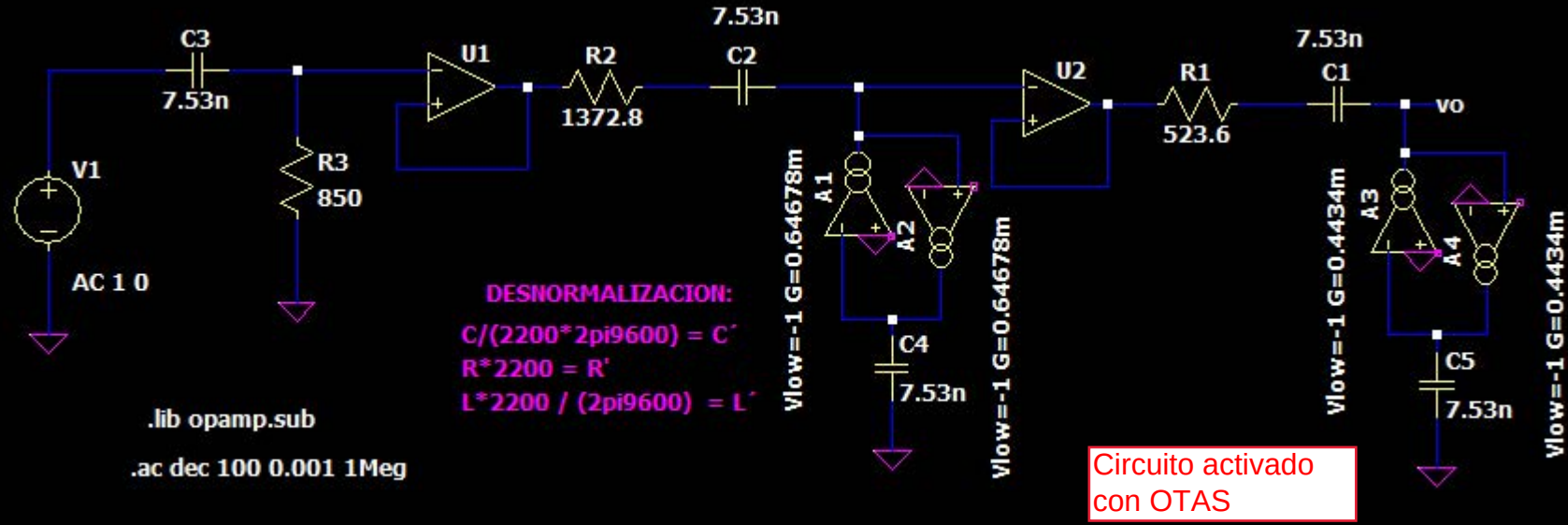
DESNORMALIZACION:

C/(2200*2pi9600) = C´

R*2200 = R'

L*2200 / (2pi9600) = L´

Circuito desnormalizado


C3
7.53n
U1
R2
1372.8
7.53n
C2
U2
R1
523.6
7.53n
C1
vo
V1
AC 1 0
R3
850
A1
A2
Vlow=-1 G=0.64678m
C4
7.53n
Vlow=-1 G=0.64678m
A3
A4
Vlow=-1 G=0.4434m
C5
7.53n
Vlow=-1 G=0.4434m
DESNORMALIZACION:
C/(2200*2pi9600) = C´
R*2200 = R'
L*2200 / (2pi9600) = L´
.lib opamp.sub
.ac dec 100 0.001 1Meg
Circuito activado
con OTAS