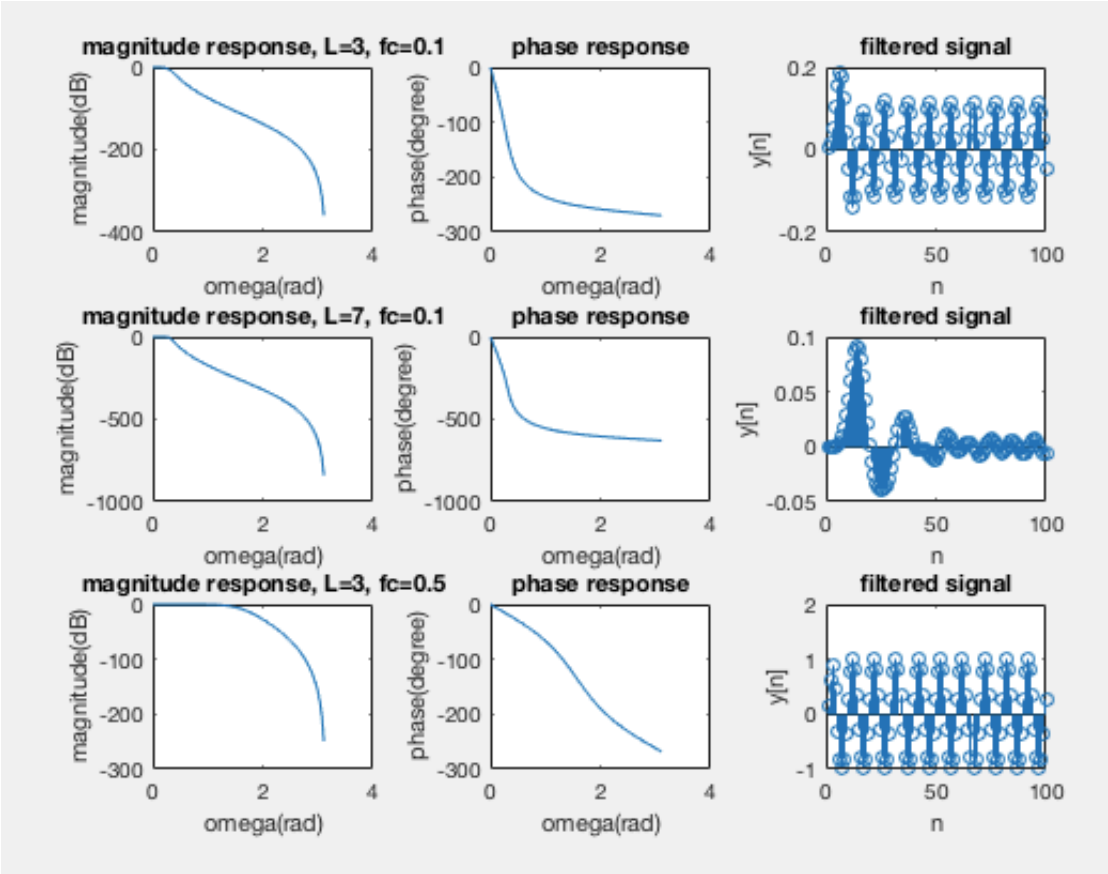
分佈圖如下：

sec 1 –Design filter

Problem1

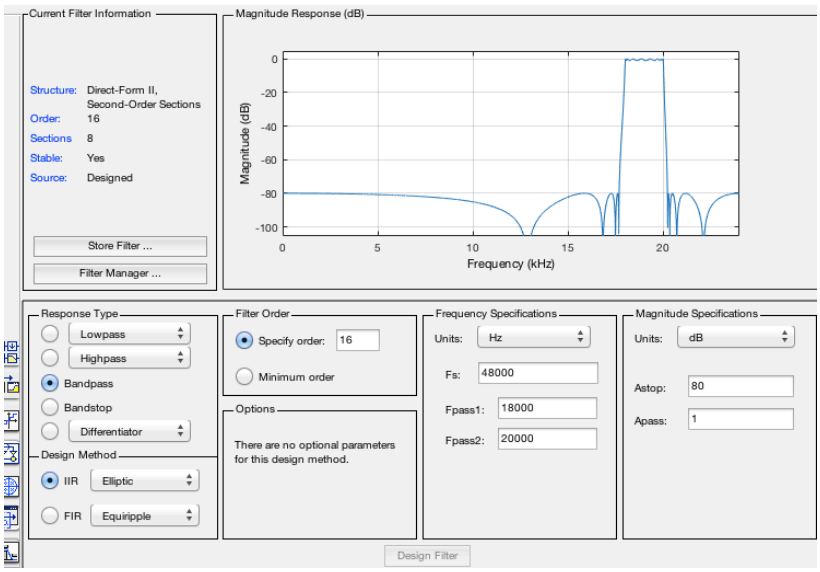


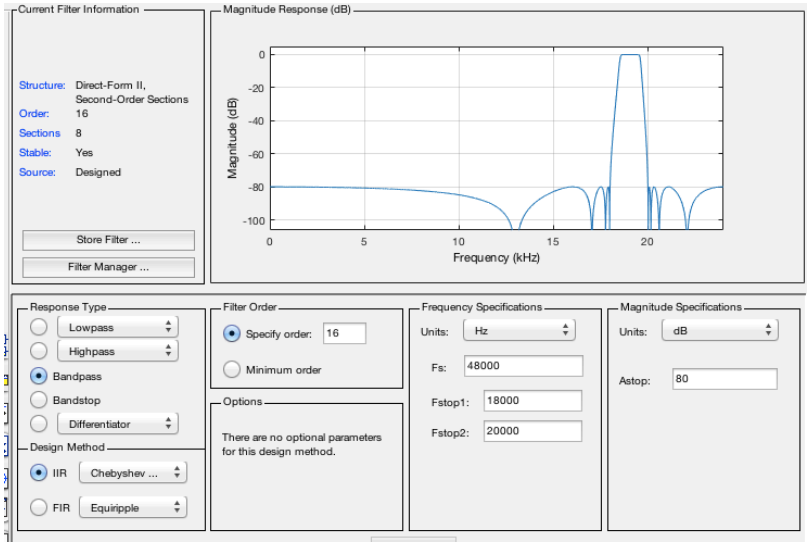
(f) 比較高的 order 可以讓在 cutoff frequency 附近的 magnitude 有比較明顯的大小差異,也就是能比較有效壓抑不要的頻率。

比較高的 cut off frequency 可以讓原本頻率的頻寬增大

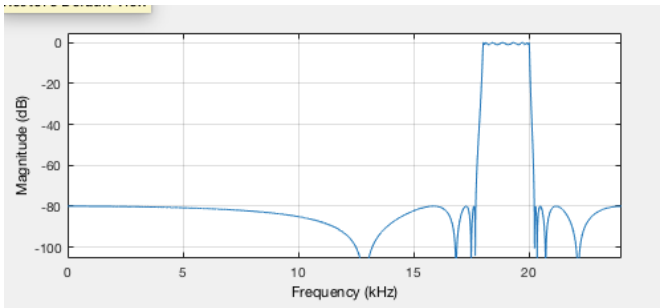
problem 2

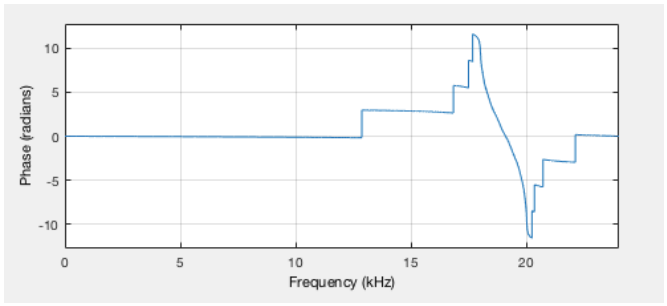
(a)

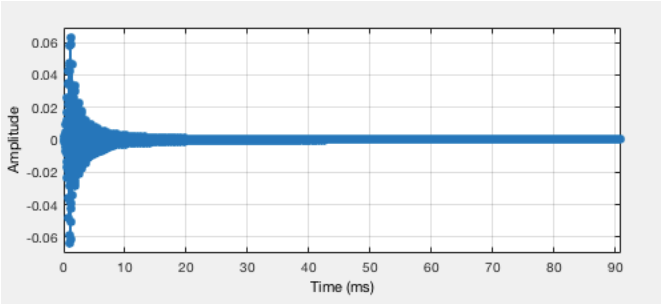

Current Filter Information
Structure: Direct-Form II, Second-Order Sections
Order: 16
Sections 8
Stable: Yes
Source: Designed
Store Filter ...
Filter Manager ...
Magnitude Response (dB)
Magnitude (dB)
Frequency (kHz)
Response Type
Lowpass
Highpass
Bandpass
Bandstop
Differentiator
Design Method
IIR
Elliptic
FIR
Equiripple
Filter Order
Specify order: 16
Minimum order
Options
There are no optional parameters for this design method.
Frequency Specifications
Units: Hz
Fs: 48000
Fpass1: 18000
Fpass2: 20000
Magnitude Specifications
Units: dB
Astop: 80
Apass: 1
Design Filter


Current Filter Information
Structure: Direct-Form II, Second-Order Sections
Order: 16
Sections 8
Stable: Yes
Source: Designed
Store Filter ...
Filter Manager ...
Magnitude Response (dB)
Magnitude (dB)
Frequency (kHz)
Response Type
Lowpass
Highpass
Bandpass
Bandstop
Differentiator
Design Method
IIR
Chebyshev ...
FIR
Equiripple
Filter Order
Specify order: 16
Minimum order
Options
There are no optional parameters for this design method.
Frequency Specifications
Units: Hz
Fs: 48000
Fstop1: 18000
Fstop2: 20000
Magnitude Specifications
Units: dB
Astop: 80

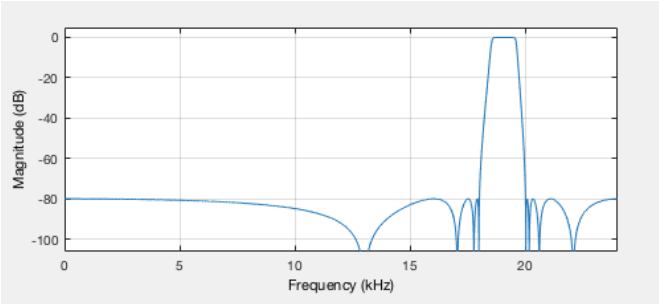
(b)

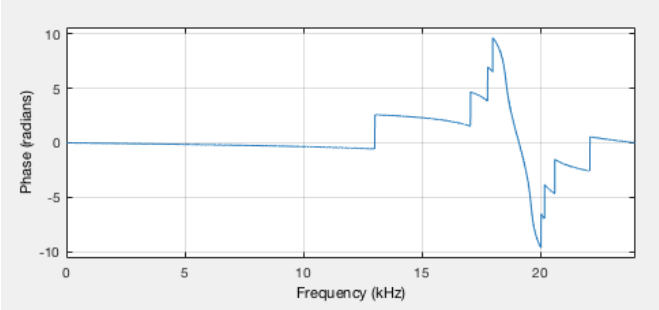

Magnitude (dB)
Frequency (kHz)

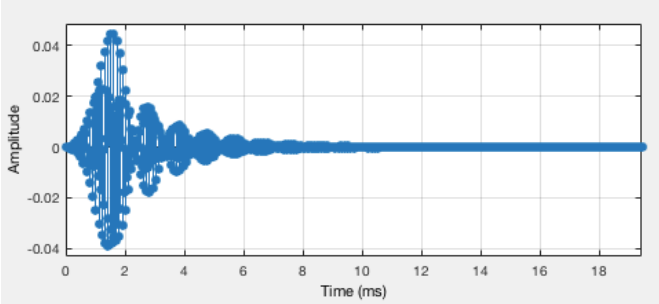

Phase (radians)
Frequency (kHz)



(c)

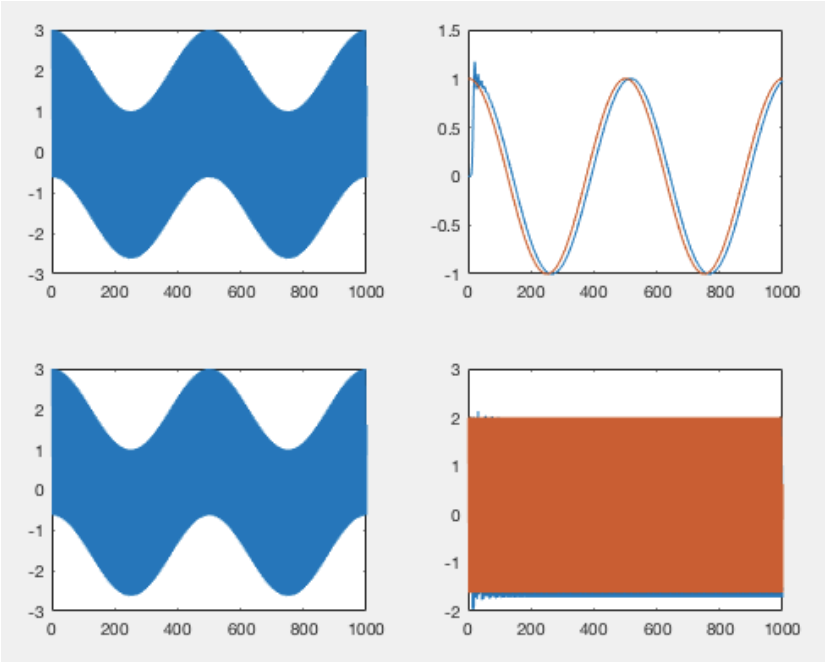






elliptic filter 有較大的通帶以及較好的delay效果，但是其卻有不理想的ripples 出現在通帶中，會使濾出來的訊號不佳，然而雖然chebyshev filter 沒有這樣的問題，但是其delay效果明顯，所以在設計使用上，各取所需。

sec 2 – filtering unwanted signal



filter coefficients(a,b)

Low pass filter		Band pass filter	
a	b (e^-5)	a	b
1	0.0001	1	0.0024
-9.5922	0.0009	5.007	0
43.9955	0.007	7.3143	-0.0389
-127.7924	0.0326	-2.1643	0
262.6519	0.106	-10.3618	0.2920
-404.4528	0.2544	8.172	0
482.1181	0.4664	24.6144	-1.3627
-453.3463	0.6663	-4.2091	0
339.5554	0.7496	-27.5569	4.4288
-203.1005	0.6663	7.4108	0
96.6268	0.4664	30.0754	-10.6291
-36.1596	0.2544	-6.2779	0
10.4286	0.106	-23.5436	19.4866
-2.2398	0.0326	6.6264	0
0.3377	0.007	15.7094	-27.8380
-0.0319	0.0009	-5.0730	0
0.0014	0.0001	-8.1758	31.3178

		3.2877	0
		3.4209	-27.8380
		-1.6516	0
		-1.0981	19.4866
		0.6513	0
		0.2608	-10.6291
		-0.1957	0
		-0.0410	4.4288
		0.0435	0
		0.0029	-1.3627
		-0.0067	0
		0.0003	0.2920
		0.0007	0
		-0.0001	-0.0389
		0	0
		0	0.0024