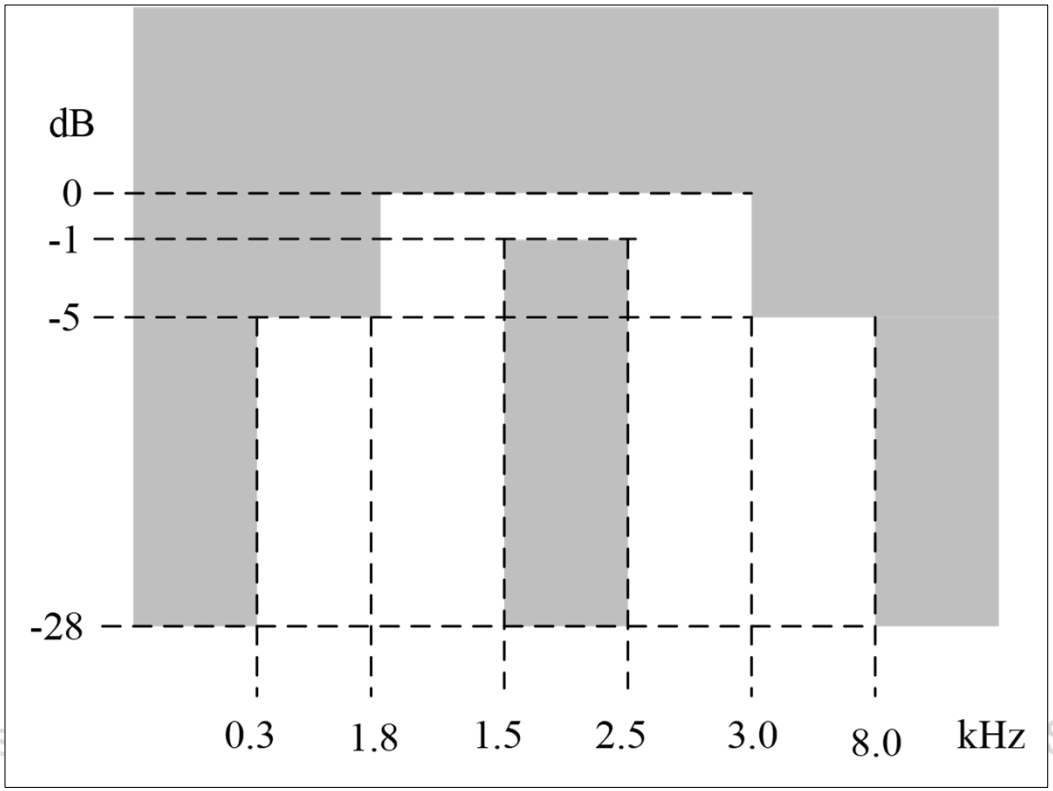
Combining Bandpass Filters

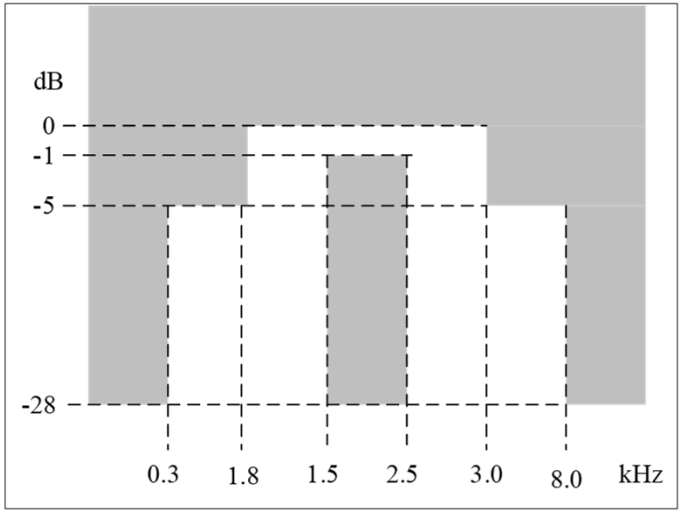
Hz	dB
300	≤ -28
1000	≤ -5
1500	0 to -1
2500	0 to -1
3000	≤ -5
8000	≤ -28



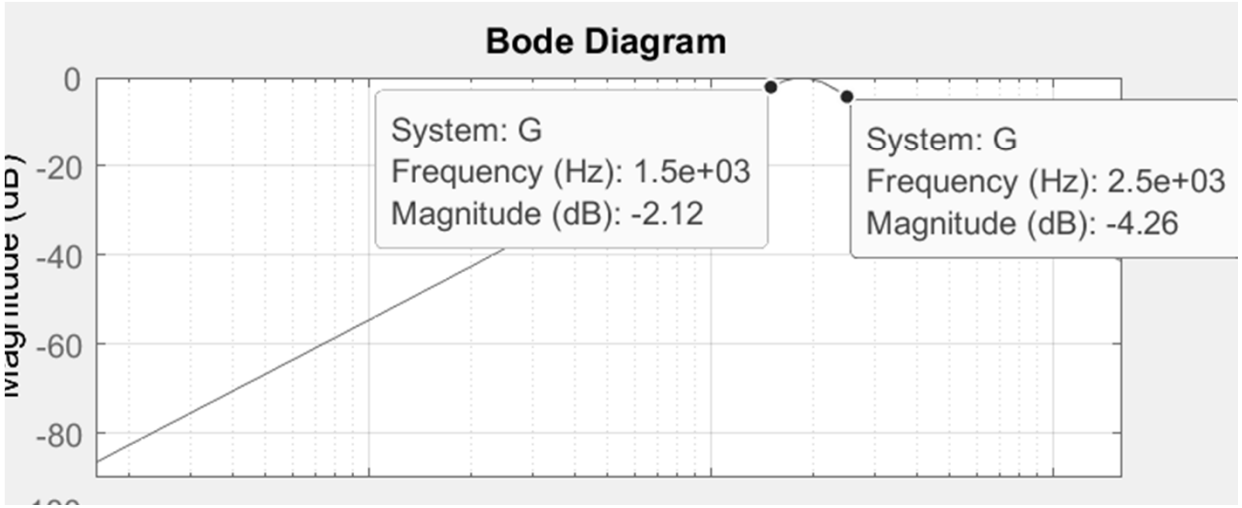
4^{th} Order ??

- f_l=1250 Hz f_h=2500Hz ?

Hz	dB
300	≤ -28
1000	≤ -5
1500	0 to -1
2500	0 to -1
3000	≤ -5
8000	≤ -28



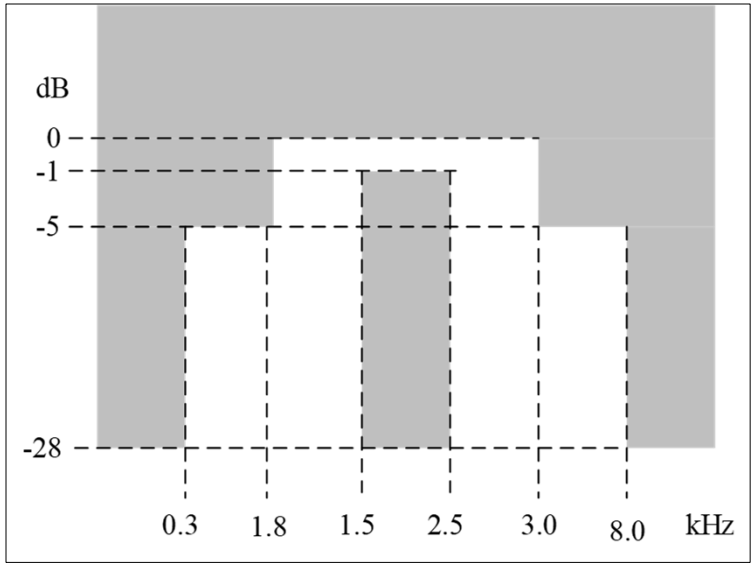

```
clear
format short G
s=tf('s')

AodB=0;
Ao= 10^(AodB/20);
fl=1250
fh=2700;
fo=sqrt(fh*fl);
wo=2*pi*fo;
Q=fo/(fh-fl);
alpha=1/Q;

G1=alpha*wo*s/(s^2+alpha*wo*s+wo^2)
G2=alpha*wo*s/(s^2+alpha*wo*s+wo^2)
G=G1*G2*Ao

opts = bodeoptions('cstprefs');
opts.FreqUnits = 'Hz';
opts.grid = 'on';
opts.PhaseWrapping = 'on';
opts.MagLowerLimMode = 'manual';
opts.MagLowerLim = -90;

bodeplot(G,{1e2,1e5},opts);
```



Fourth Order Staggered tuning ?

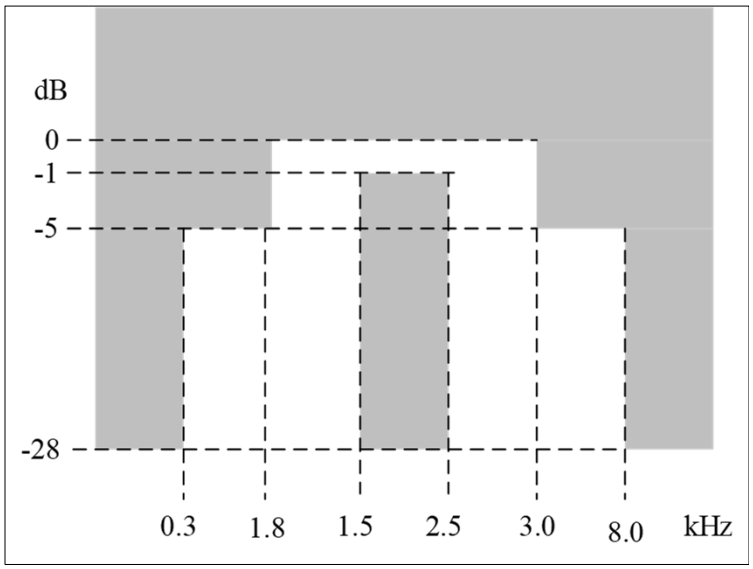
Hz	dB
300	≤ -28
1000	≤ -5
1500	0 to -1
2500	0 to -1
3000	≤ -5
8000	≤ -28

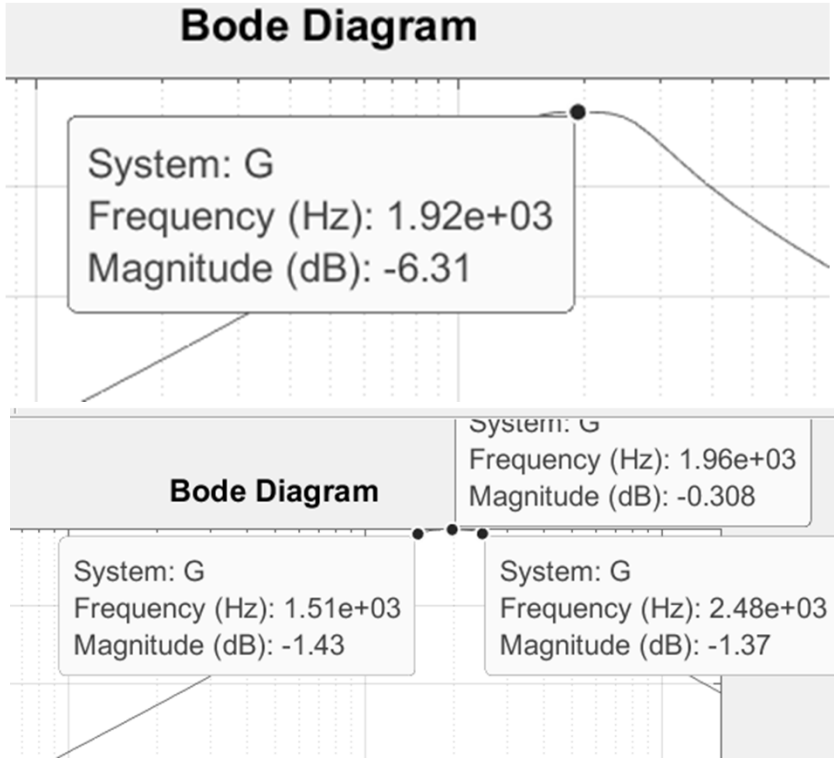
- Steeper roll off
- Damping (alpha) down => more ripple across top
- Fo1=1500Hz fo2=2500
- $Q = \frac{\sqrt{f_h \times f_l}}{f_h - f_l} = \frac{\sqrt{2500Hz \times 1500Hz}}{2500\,Hz - 1500Hz} = 1.9$
- alpha = 1/Q = 0.5



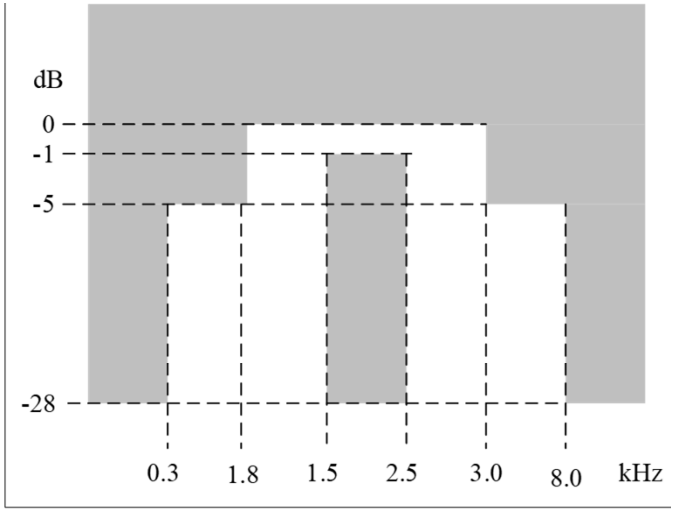
```
clear
format short G
s=tf('s')

AodB=0;
Ao= 10^(AodB/20);
fo1=1500;
fo2=2500;
wo1=2*pi*fo1;
wo2=2*pi*fo2
Q=2;
alpha=1/Q;

G1=alpha*wo1*s/(s^2+alpha*wo1*s+wo1^2)
G2=alpha*wo2*s/(s^2+alpha*wo2*s+wo2^2)
G=G1*G2*Ao

opts = bodeoptions('cstprefs');
opts.FreqUnits = 'Hz';
opts.grid = 'on';
opts.PhaseWrapping = 'on';
opts.MagLowerLimMode = 'manual';
opts.MagLowerLim = -90;

bodeplot(G,{1e2,1e5},opts);
```

Hz	dB
300	≤ -28
1000	≤ -5
1500	0 to -1
2500	0 to -1
3000	≤ -5
8000	≤ -28





```
clear
format short G
s=tf('s')

AodB=10;
Ao= 10^(AodB/20);
fo1=1500;
fo2=2500;
wo1=2*pi*fo1;
wo2=2*pi*fo2
Q=3;
alpha=1/Q;

G1=alpha*wo1*s/(s^2+alpha*wo1*s+wo1^2)
G2=alpha*wo2*s/(s^2+alpha*wo2*s+wo2^2)
G=G1*G2*Ao

opts = bodeoptions('cstprefs');
opts.FreqUnits = 'Hz';
opts.grid = 'on';
opts.PhaseWrapping = 'on';
opts.MagLowerLimMode = 'manual';
opts.MagLowerLim = -90;

bodeplot(G,{1e2,1e5},opts);
```



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3000	≤ -5
8000	≤ -28