PROGRAM :

```
close()
clear()
%butterworth lpf hpf
ap=input('enter the passband attenuation');
as=input('enter the stopband attenuation');
fp=input('enter the passband frequency');
fs=input('enter the stopband frequency');
f=input('enter the sampling frequency');
ws=(2*fs)/f;
wp=(2*fp)/f;
[N,wc]=buttord(wp,ws,ap,as);
disp('order');
disp(N);
disp('normalised cut off frequency');
disp(wc);
[b,a]=butter(N,wc);
disp(b);
disp(a);
figure(1);
freqz(b,a,[],f);
title('low pass butterworth filter');
[b,a]=butter(N,wc,'high');
disp(b);
disp(a);
figure(2);
freqz(b,a,[],f);
title('high pass butterworth filter');

%butterworth bpf bsf
ap=input('enter the passband attenuation');
as=input('enter the stopband attenuation');
fp=input('enter the passband frequency');
fs=input('enter the stopband frequency');
f=input('enter the sampling frequency');
ws=(2*fs)/f;
wp=(2*fp)/f;
[N,wc]=buttord(wp,ws,ap,as);
disp('order');
disp(N);
disp('normalised cut off frequency');
disp(wc);
[b,a]=butter(N,wc);
disp(b);
disp(a);
figure(3);
```

```
freqz(b,a,[],f);
title('band pass butterworth filter');
disp(b);
disp(a);
[b,a]=butter(N,wc,'stop');
figure(4);
freqz(b,a,[],f);
title('band stop butterworth filter');

%chebyshev1 lpf hpf
ap=input('enter the passband attenuation');
as=input('enter the stopband attenuation');
fp=input('enter the passband frequency');
fs=input('enter the stopband frequency');
f=input('enter the sampling frequency');
ws=(2*fs)/f;
wp=(2*fp)/f;
[N,wc]=cheb1ord(wp,ws,ap,as);
disp('order');
disp(N);
disp('normalised cut off frequency');
disp(wc);
[b,a]=cheby1(N,ap,wc);
disp(b);
disp(a);
figure(5);
freqz(b,a,[],f);
title('low pass chebyshev1 filter');
[b,a]=cheby1(N,ap,wc,'high');
disp(b);
disp(a);
figure(6);
freqz(b,a,[],f);
title('high pass chebyshev1 filter');

%chebyshev1 bpf bsf
ap=input('enter the passband attenuation');
as=input('enter the stopband attenuation');
fp=input('enter the passband frequency');
fs=input('enter the stopband frequency');
f=input('enter the sampling frequency');
ws=(2*fs)/f;
wp=(2*fp)/f;
[N,wc]=cheb1ord(wp,ws,ap,as);
disp('order');
disp(N);
disp('normalised cut off frequency');
```

```matlab
disp(wc);
[b,a]=cheby1(N,ap,wc);
disp(b);
disp(a);
figure(7);
freqz(b,a,[],f);
title('band pass chebyshev1 filter');
[b,a]=cheby1(N,ap,wc,'stop');
disp(b);
disp(a);
figure(8);
freqz(b,a,[],f);
title('band reject chebyshev1 filter');


%chebyshev2 lpf hpf
ap=input('enter the passband attenuation');
as=input('enter the stopband attenuation');
fp=input('enter the passband frequency');
fs=input('enter the stopband frequency');
f=input('enter the sampling frequency');
ws=(2*fs)/f;
wp=(2*fp)/f;
[N,wc]=cheb2ord(wp,ws,ap,as);
disp('order');
disp(N);
disp('normalised cut off frequency');
disp(wc);
[b,a]=cheby2(N,ap,wc);
disp(b);
disp(a);
figure(9);
freqz(b,a,[],f);
title('low pass chebyshev2 filter');
[b,a]=cheby2(N,ap,wc,'high');
disp(b);
disp(a);
figure(10);
freqz(b,a,[],f);
title('high pass chebyshev2 filter');

%chebyshev2 bpf bsf
ap=input('enter the passband attenuation');
as=input('enter the stopband attenuation');
fp=input('enter the passband frequency');
fs=input('enter the stopband frequency');
f=input('enter the sampling frequency');
ws=(2*fs)/f;
```

```
wp=(2*fp)/f;
[N,wc]=cheb2ord(wp,ws,ap,as);
disp('order');
disp(N);
disp('normalized cut off frequency');
disp(wc);
[b,a]=cheby2(N,ap,wc);
disp(b);
disp(a);
figure(11);
freqz(b,a,[],f);
title('band pass chebyshev2 filter');
[b,a]=cheby2(N,ap,wc,'stop');
disp(b);
disp(a);
figure(12);
freqz(b,a,[],f);
title('band reject chebyshev2 filter');
```

OUTPUT :


```
>> DSPEXP8
enter the passband attenuation
1
enter the stopband attenuation
20
enter the passband frequency
500
enter the stopband frequency
1000
enter the sampling frequency
5000
order
     4


normalised cut off frequency
    0.2472


    0.0098    0.0393    0.0590    0.0393    0.0098


    1.0000   -1.9908    1.7650   -0.7403    0.1235


    0.3512   -1.4049    2.1073   -1.4049    0.3512


    1.0000   -1.9908    1.7650   -0.7403    0.1235
```

```
enter the passband attenuation
1
enter the stopband attenuation
20
enter the passband frequency
[100, 1900]
enter the stopband frequency
[500, 1000]
enter the sampling frequency
5000
order
     2


normalised cut off frequency
    0.1040    0.6119


    0.3002         0   -0.6005          0    0.3002
enter the passband attenuation
1
enter the stopband attenuation
20
enter the passband frequency
500
enter the stopband frequency
1000
enter the sampling frequency
5000
order
     3


normalised cut off frequency
    0.2000


    0.0115    0.0344    0.0344    0.0115


    1.0000   -2.1378    1.7693   -0.5398


    0.4759   -1.4278    1.4278   -0.4759


    1.0000   -1.6168    1.0366   -0.1540
```
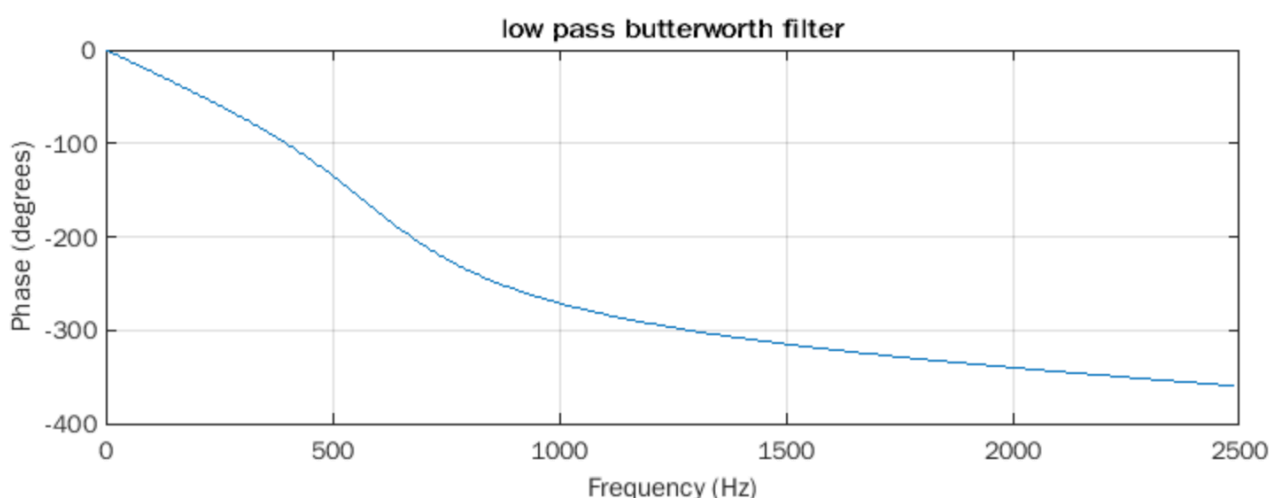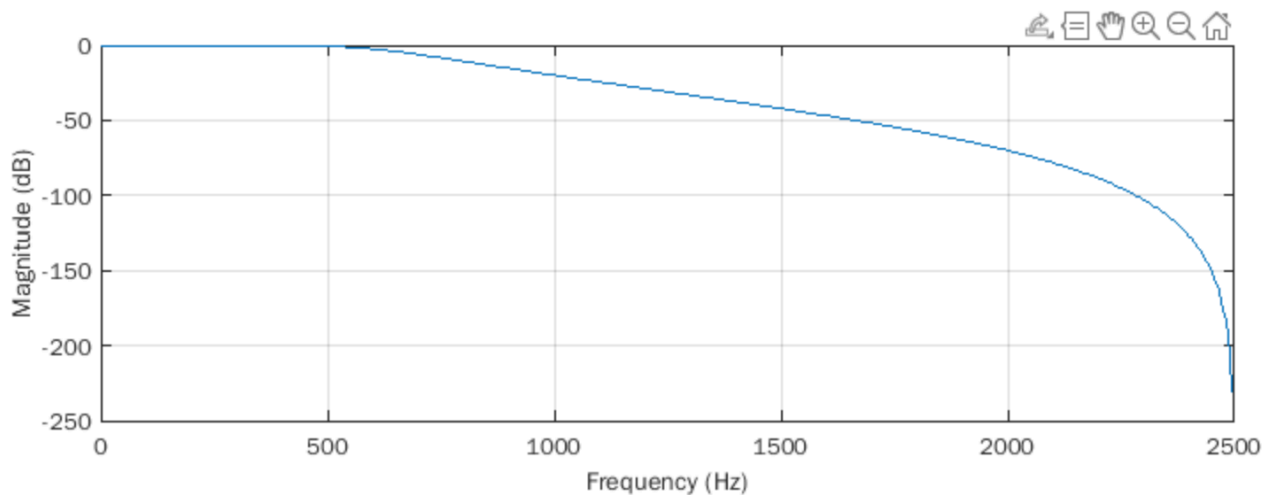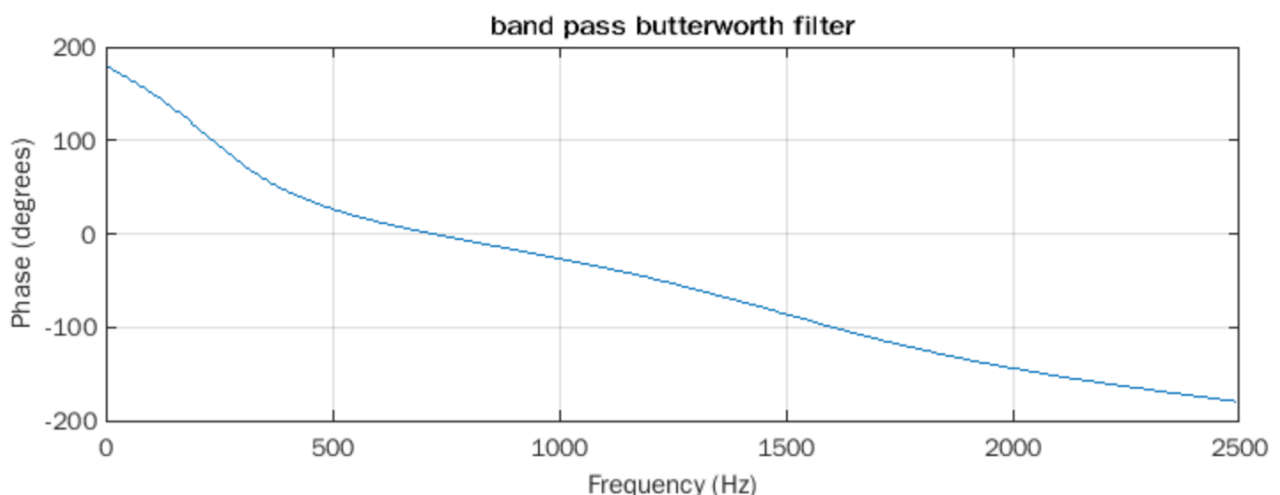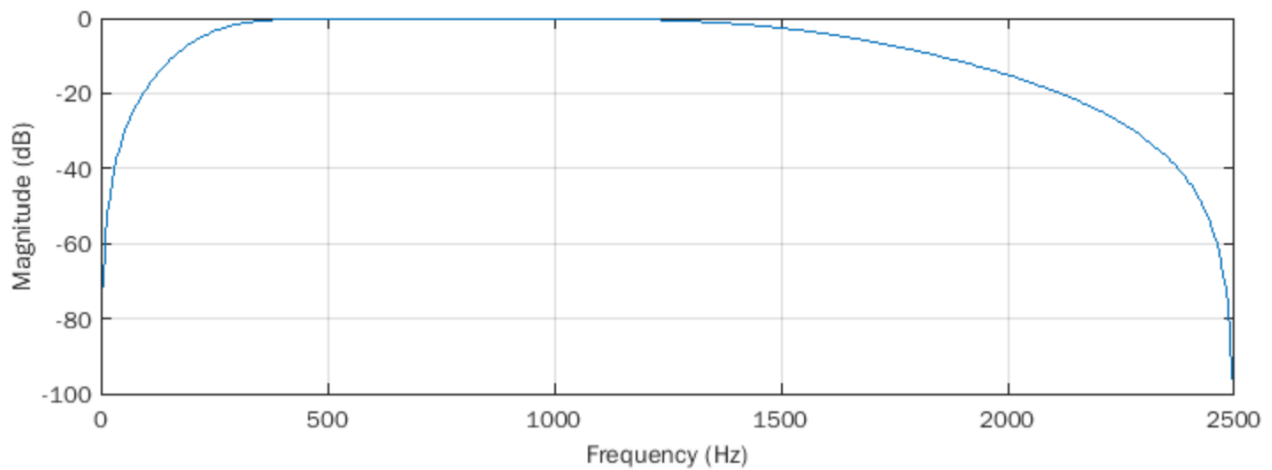
```
enter the passband attenuation
1
enter the stopband attenuation
20
enter the passband frequency
[100, 1900]
enter the stopband frequency
[500, 1000]
enter the sampling frequency
5000
order
     2


normalised cut off frequency
    0.0400    0.7600


    0.5339        0   -1.0678        0    0.5339



enter the passband attenuation
1
enter the stopband attenuation
20
enter the passband frequency
500
enter the stopband frequency
1000
enter the sampling frequency
5000
order
     3


normalised cut off frequency
    0.4000


    0.7325    0.4778    0.4778    0.7325


    1.0000    0.2824    0.6118    0.5265


    0.8159   -1.5220    1.5220   -0.8159


    1.0000   -1.5590    1.4519   -0.6648
```

```
enter the passband attenuation
1
enter the stopband attenuation
20
enter the passband frequency
[100, 1900]
enter the stopband frequency
[500, 1000]
enter the sampling frequency
5000
order
    2


normalised cut off frequency
    0.2000    0.4000

    0.7763    -1.5845    1.9905    -1.5845    0.7763

    1.0000    -1.9577    2.2665    -1.5980    0.7090

    0.8977    -2.1080    2.9182    -2.1080    0.8977
```
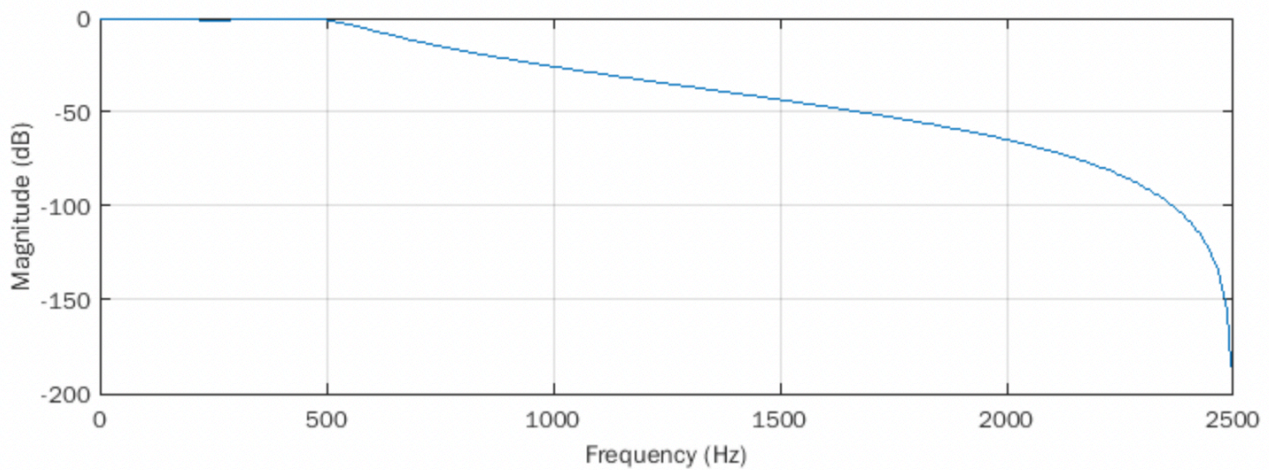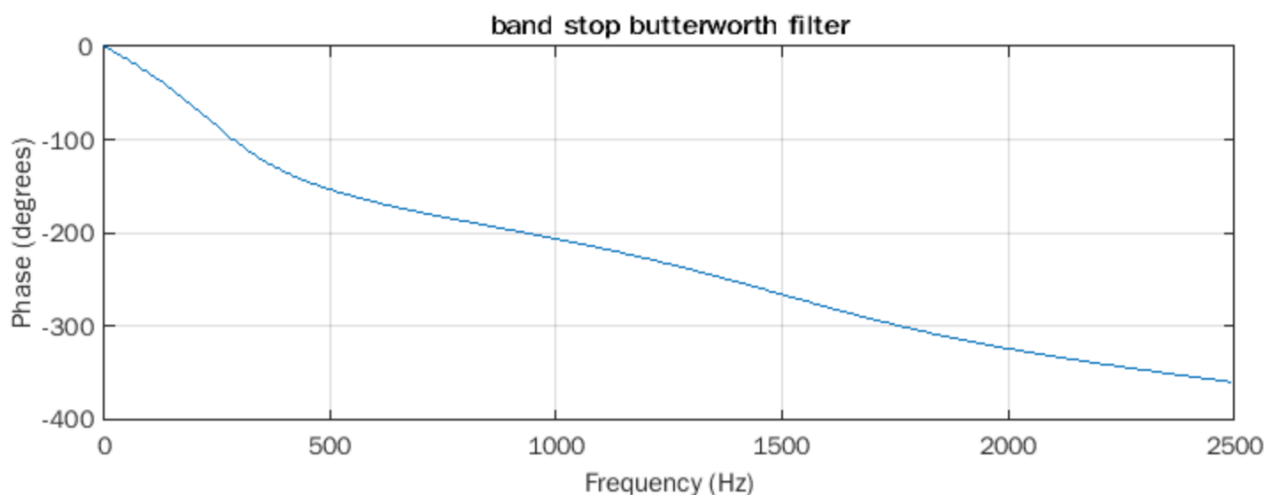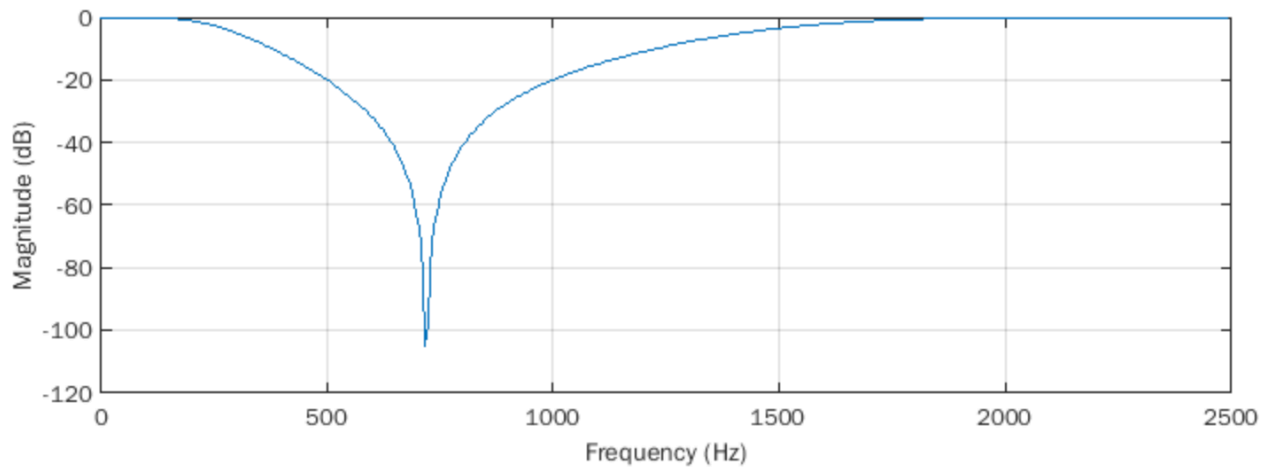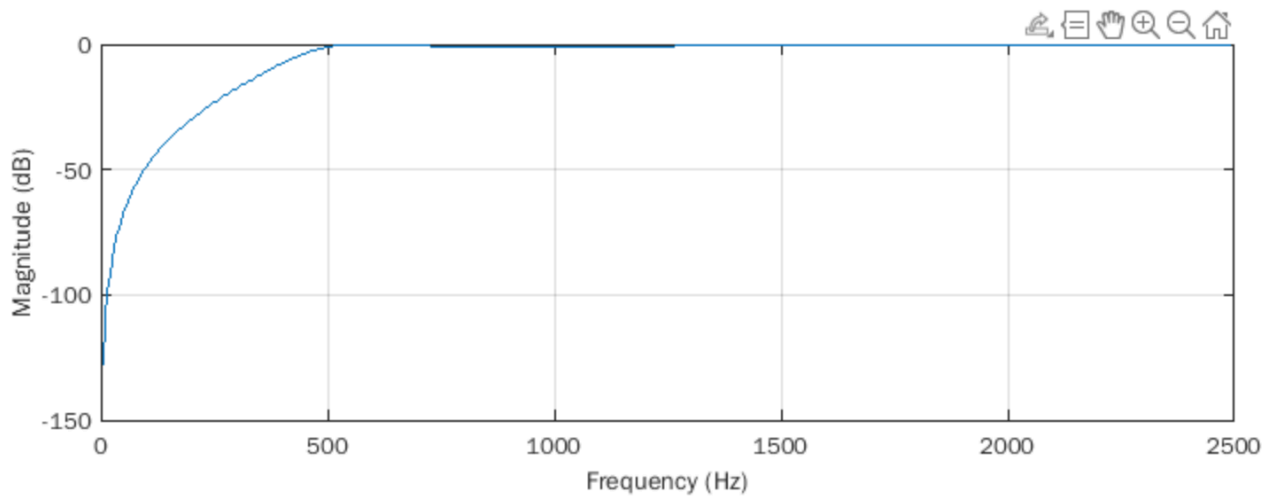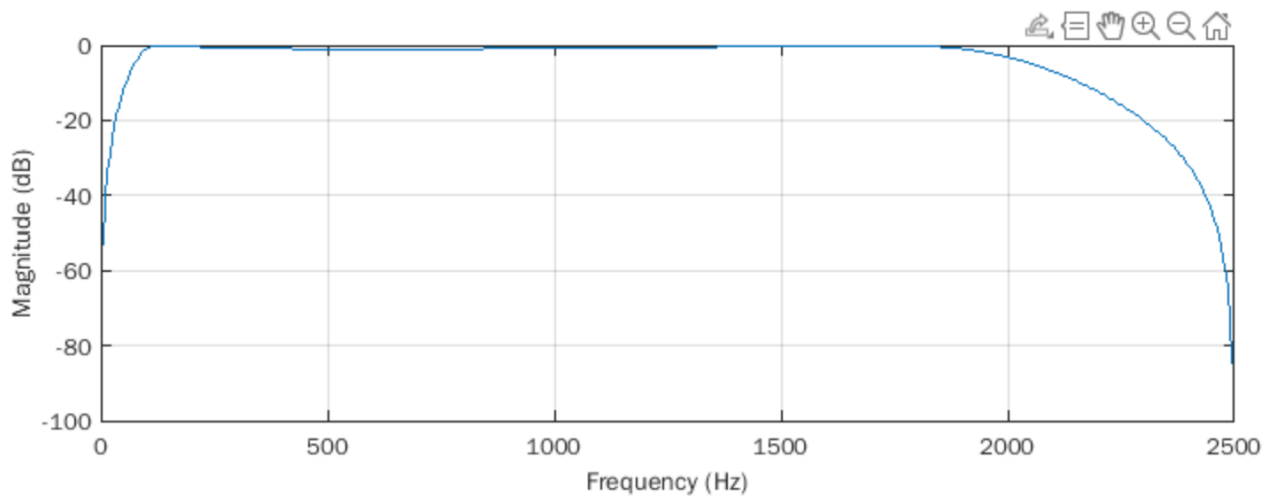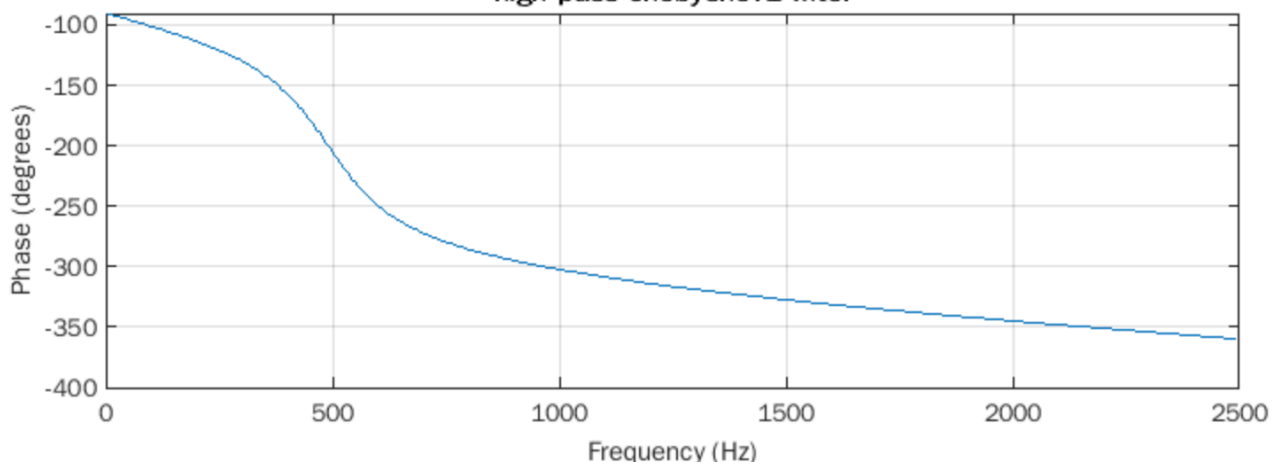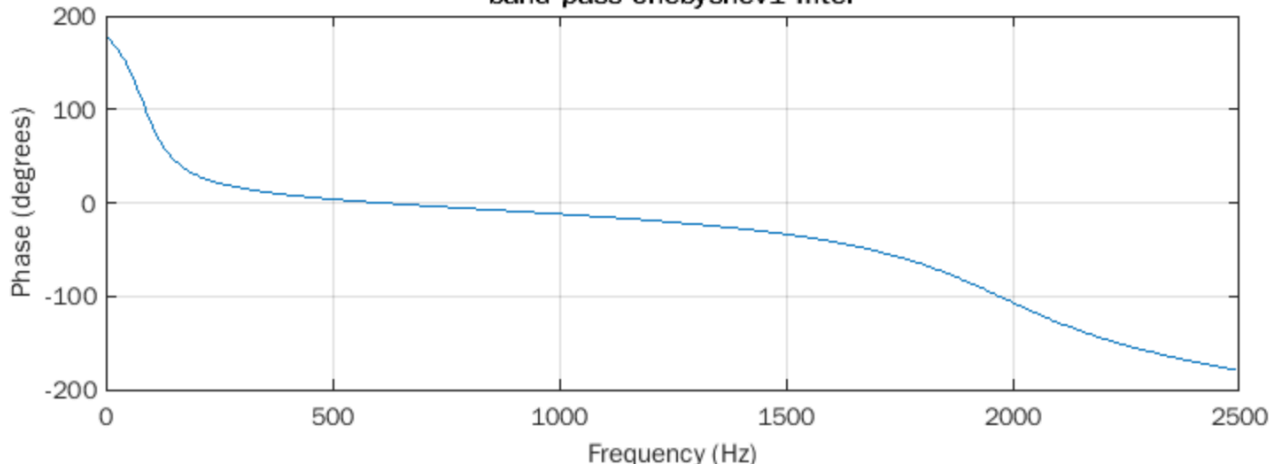

low pass butterworth filter

high pass butterworth filter

band pass butterworth filter

band stop butterworth filter

low pass chebyshev1 filter
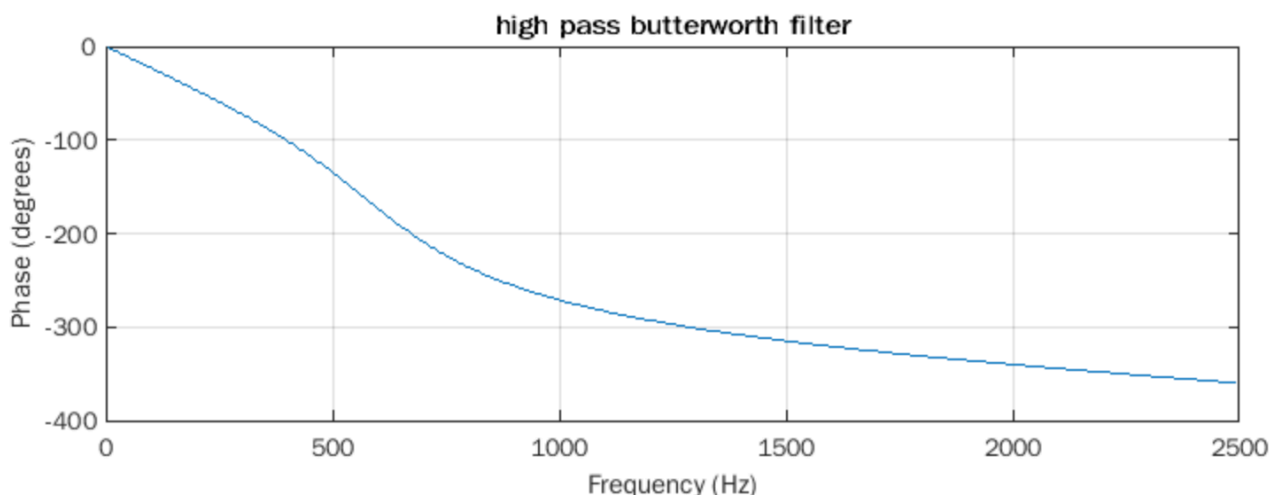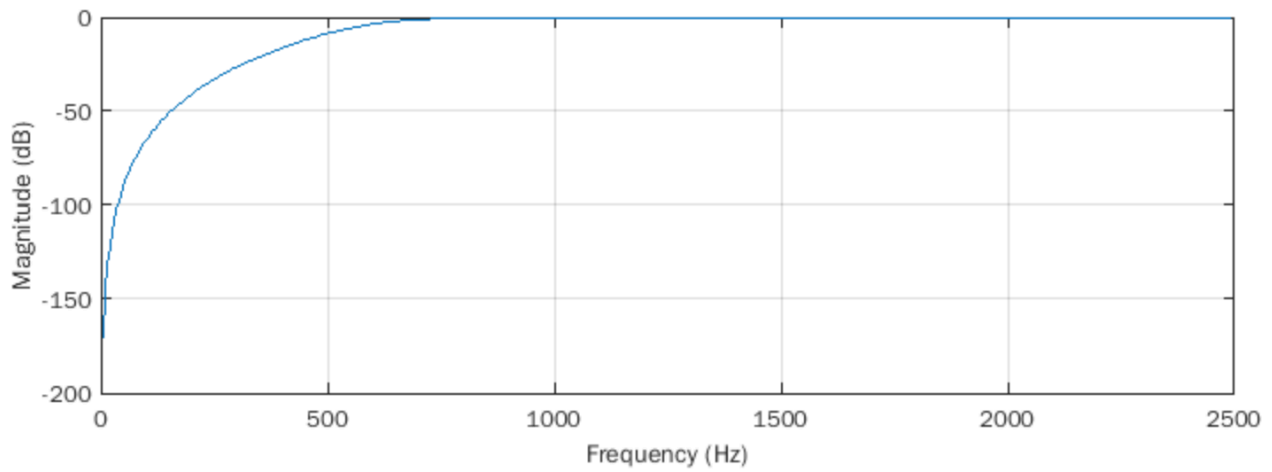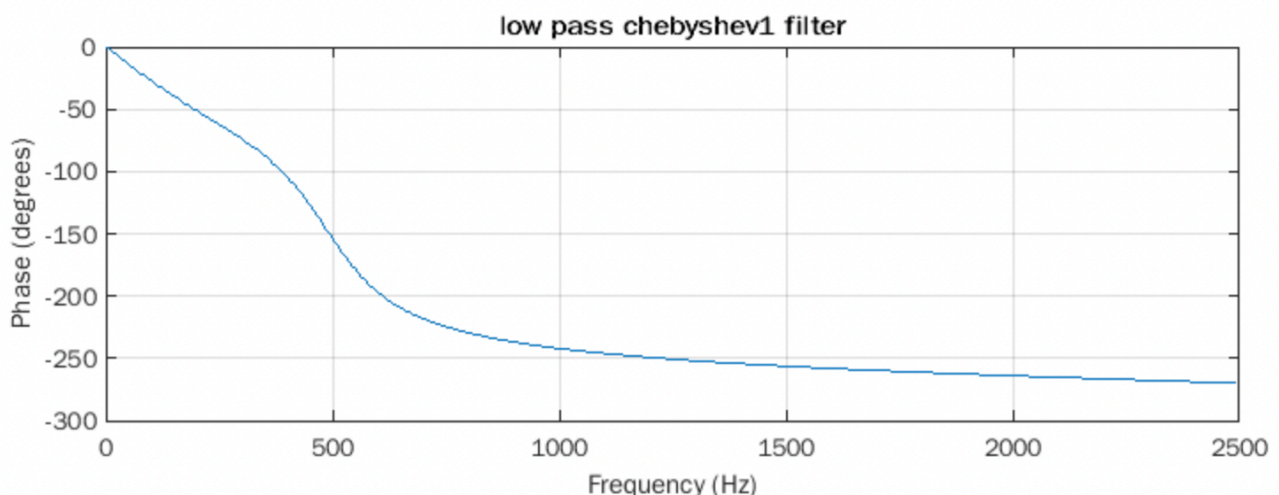
high pass chebyshev1 filter

band pass chebyshev1 filter
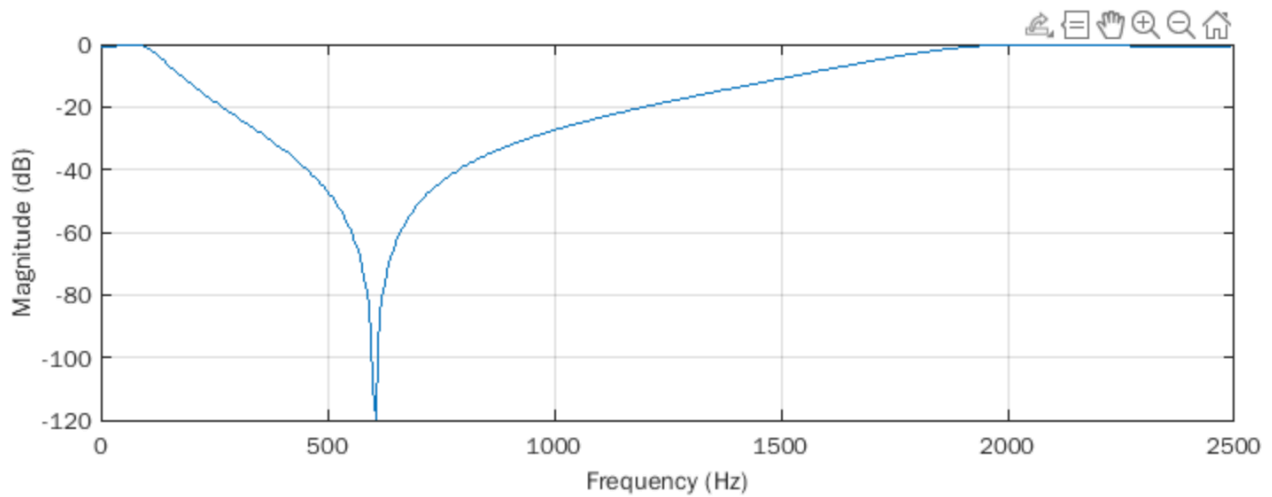
band reject chebyshev1 filter

low pass chebyshev2 filter

high pass chebyshev2 filter

band pass chebyshev2 filter

band reject chebyshev2 filter