Contents


```
% plotMrmRetLog.m
% This script prompts the user for a MRM-RET logfile, reads, parses, and
% produces a "waterfall plot" of the motion filtered scans and detection lists
% in the logfile
clear all; close all; clc %#ok<*CLALL>
```

Query user for logfile

```
%dnm = '.'; fnm = 'MRM_002.csv';
[fnmb,dnmb] = uigetfile('*.csv');
fprintf('Reading logfile %s\n',fullfile(dnmb,fnmb));
[cfgb,reqb,scnb,det] = readMrmRetLog(fullfile(dnmb,fnmb));

[fnmt,dnmt] = uigetfile('*.csv');
fprintf('Reading logfile %s\n',fullfile(dnmt,fnmt));
[cfgt,reqt,scnt,dett] = readMrmRetLog(fullfile(dnmt,fnmt));
```

```
Reading logfile C:\Users\austinsbrown\Dropbox\ee384\lab11\background.csv
Reading logfile C:\Users\austinsbrown\Dropbox\ee384\lab11\scan.csv
```

Separate raw, bandpassed, and motion filtered data from scn structure

(only motion filtered is used)

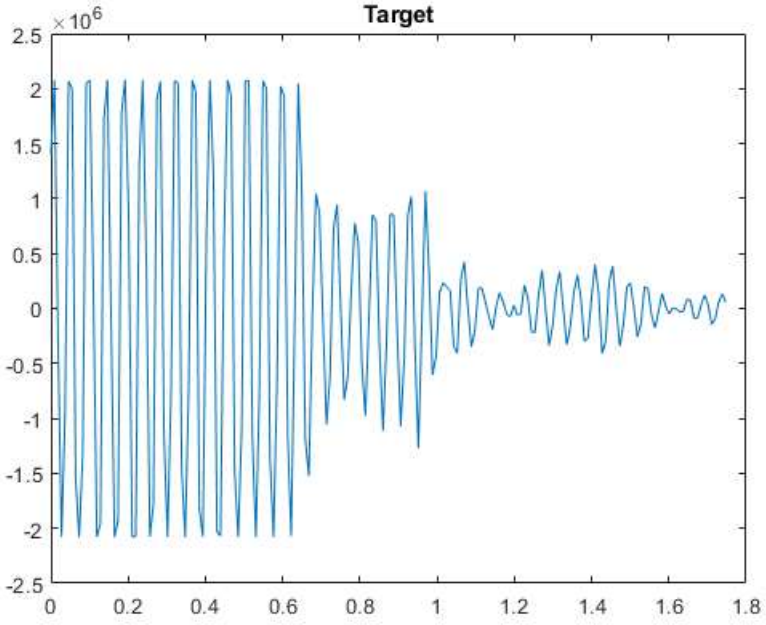
Pull out the raw scans (if saved)

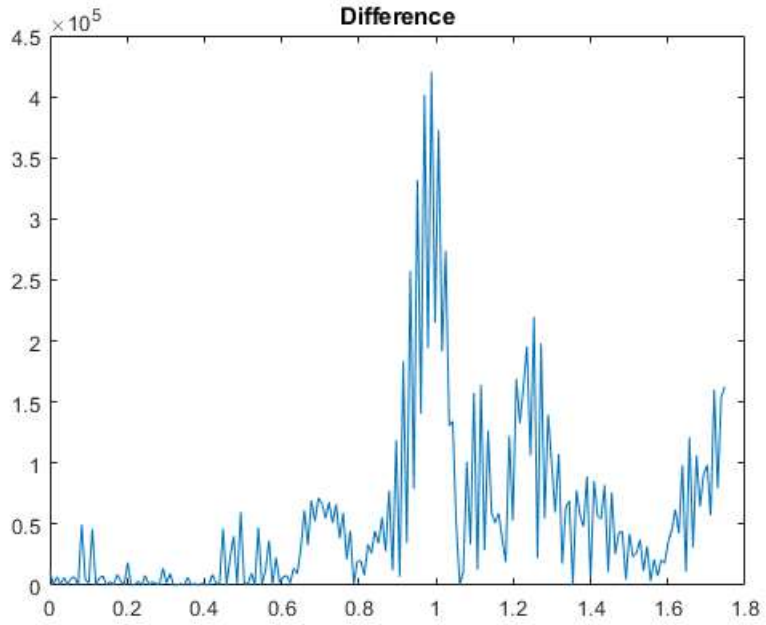
```
rawscansI = find([scnb.Nfilt] == 1);
rawscansV_background = reshape([scnb(rawscansI).scn],[],length(rawscansI))';

rawscansI1 = find([scnt.Nfilt] == 1);
rawscansV_target = reshape([scnt(rawscansI1).scn],[],length(rawscansI1))';

scan_difference = abs(rawscansV_background(1:10,:) - rawscansV_target(1:10,:));
```

Create the waterfall horizontal and vertical axes

```
Tbin = 32/(512*1.024);  % ns
T0 = 0; % ns
c = 0.29979;  % m/ns
Rbin = c*(Tbin*(0:size(scan_difference(1,:),2)-1) - T0)/2;% Range Bins in meters

rbin = 90;
```

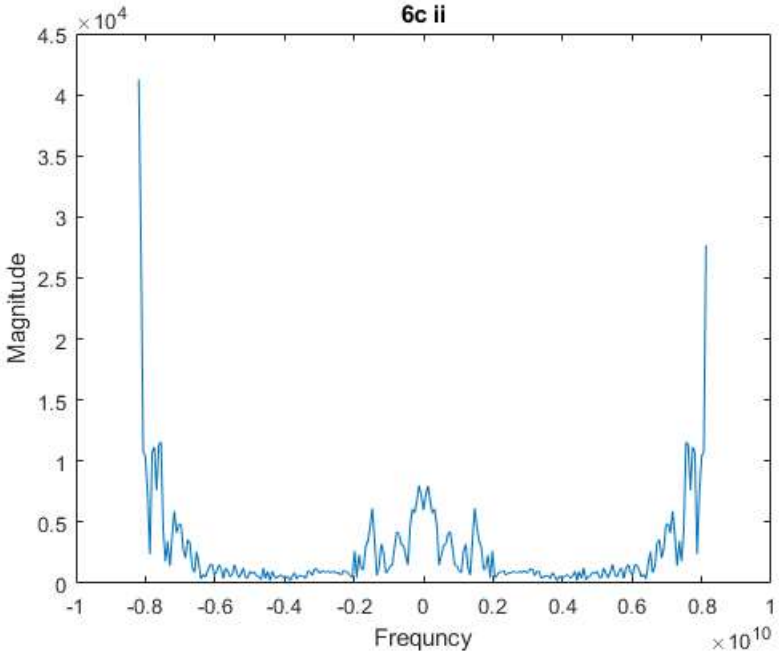
```
%Background plot
% plot(rbin,rawscansV_background(10,:))
%Taget plot
figure; plot(Rbin,rawscansV_target(10,:)), title('Target')
% Difference plot
figure;plot(Rbin,scan_difference(10,:)), title('Difference')

[a,i]=max(scan_difference(10,:));  %#ok<ASGLU>
distance=Rbin(i) %#ok<NOPTS>

distance =

    0.9881
```

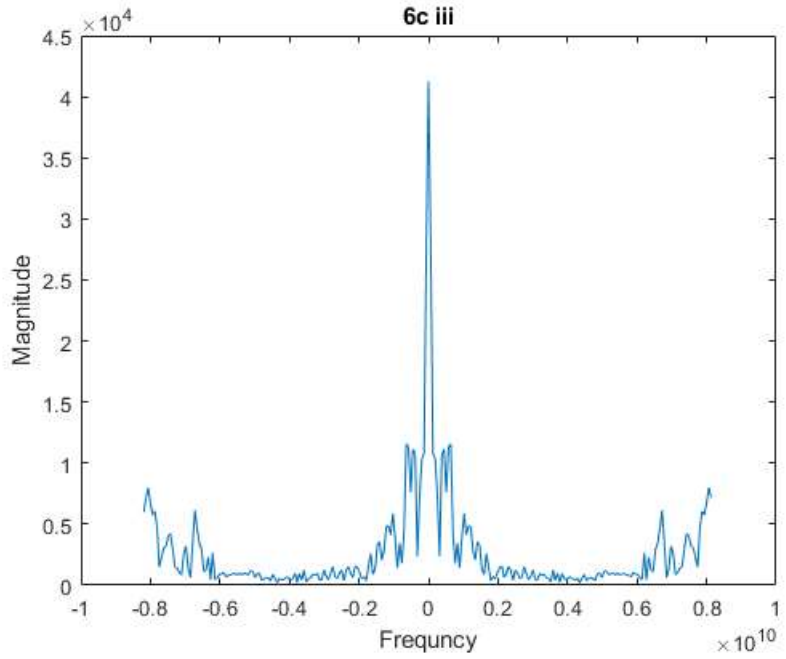




6

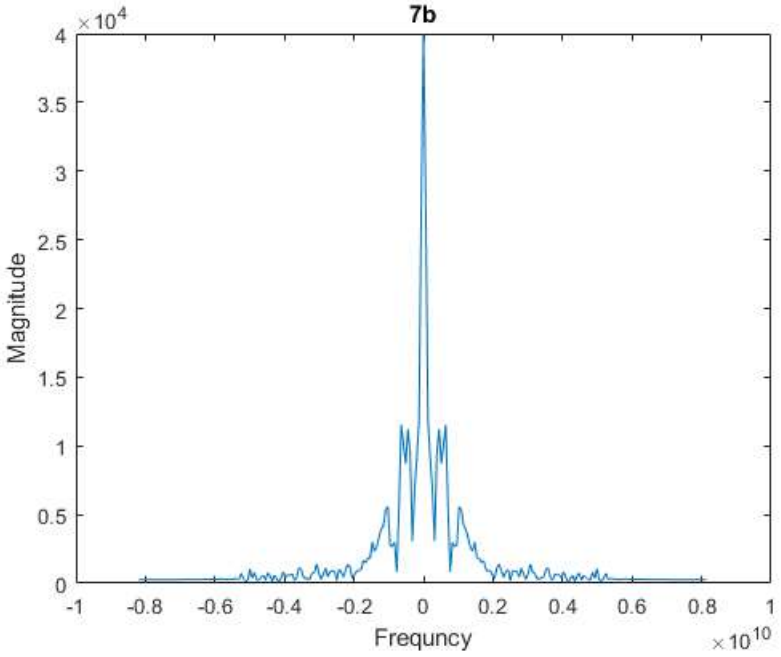
```
fs = 1/(Tbin*10^-9);

figure
l = length(scan_difference(10,:));
n = pow2(nextpow2(l));
y_dft = fft(scan_difference(10,:), n);
f = (-n/2:n/2-1)*(fs/n);
plot(f, abs(y_dft)/n);
title('6c ii'), xlabel('Frequncy'), ylabel('Magnitude')

figure
spectrum_plot(scan_difference(10,:), fs)
title('6c iii'), xlabel('Frequncy'), ylabel('Magnitude')
```

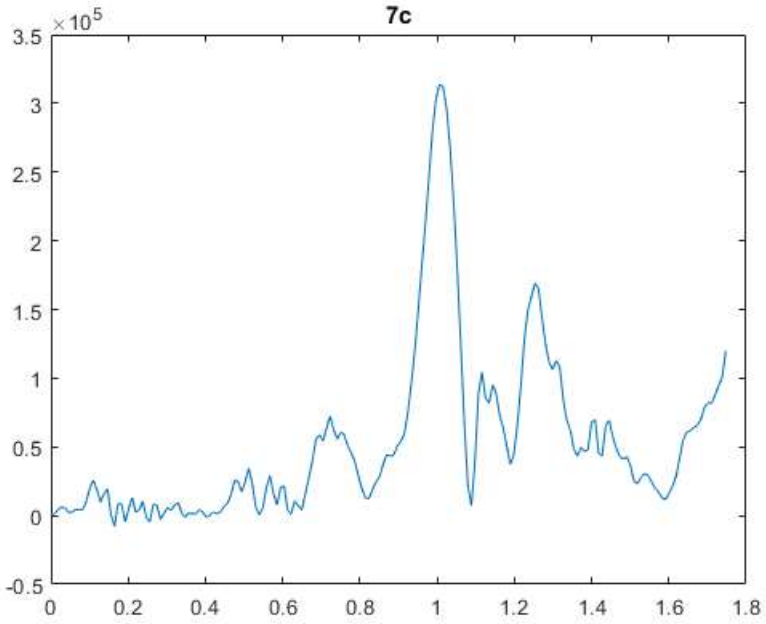




7

```
Wp = (2*(4.9*10^9))/fs;
Ws = (2*(5.6*10^9))/fs;
Rp = 1;
Rs = 20;

[Ord, Wn] = buttord(Wp, Ws, Rp, Rs);
[b,a] = butter(Ord, Wn, 'low');
yf = filter(b, a, scan_difference(10,:));

figure
spectrum_plot(yf, fs)
title('7b'), xlabel('Frequncy'), ylabel('Magnitude')

figure
plot(Rbin, yf)
title('7c')
```

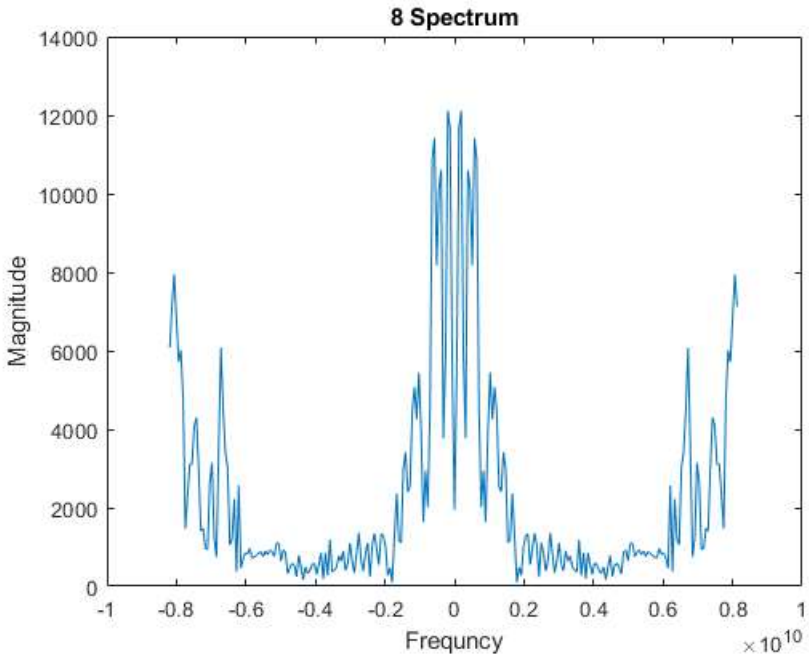


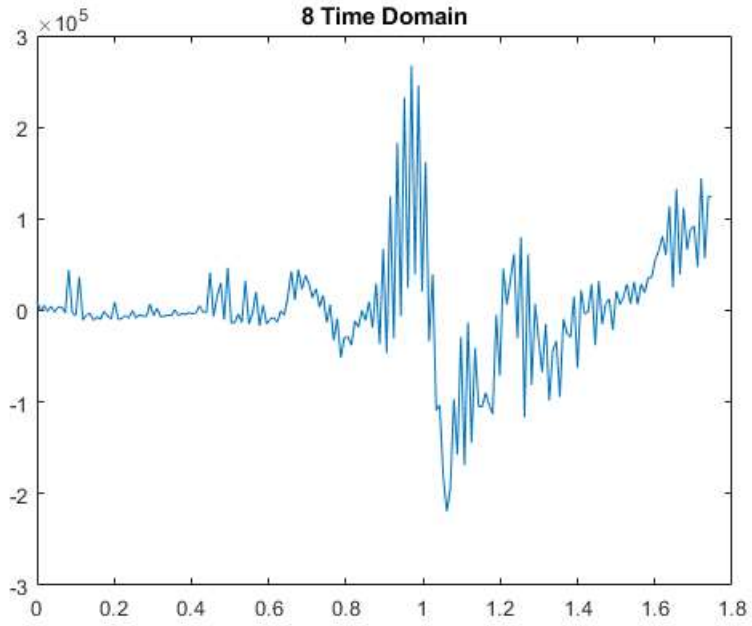


8

```
Wp = (2*(.1*10^9))/fs;
Ws = (2*(.05*10^9))/fs;
Rp = 1;
Rs = 20;

[Ord, Wn] = buttord(Wp, Ws, Rp, Rs);
[b,a] = butter(Ord, Wn, 'high');
yf = filter(b, a, scan_difference(10,:));

figure
spectrum_plot(yf, fs)
```

```
title('8 Spectrum'), xlabel('Frequncy'), ylabel('Magnitude')

figure
plot(Rbin, yf)
title('8 Time Domain')
```

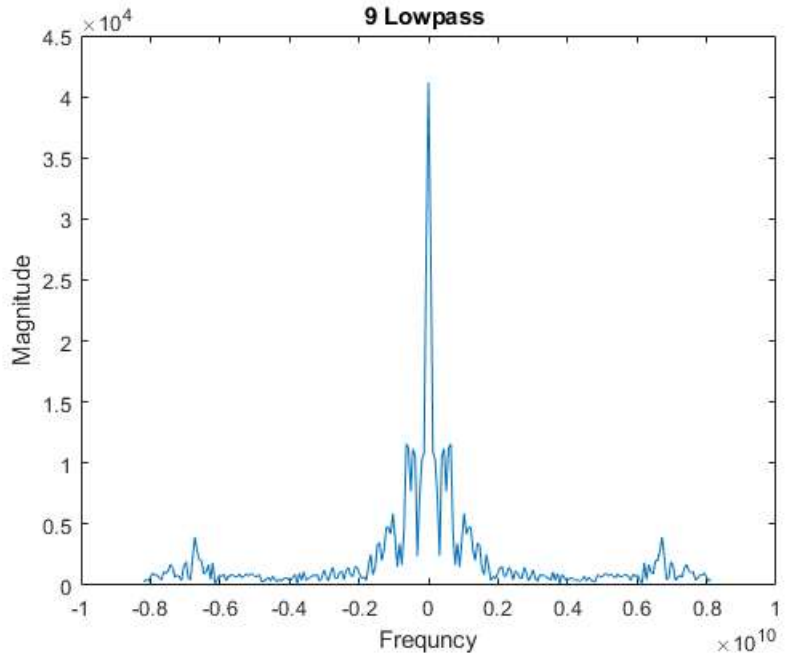


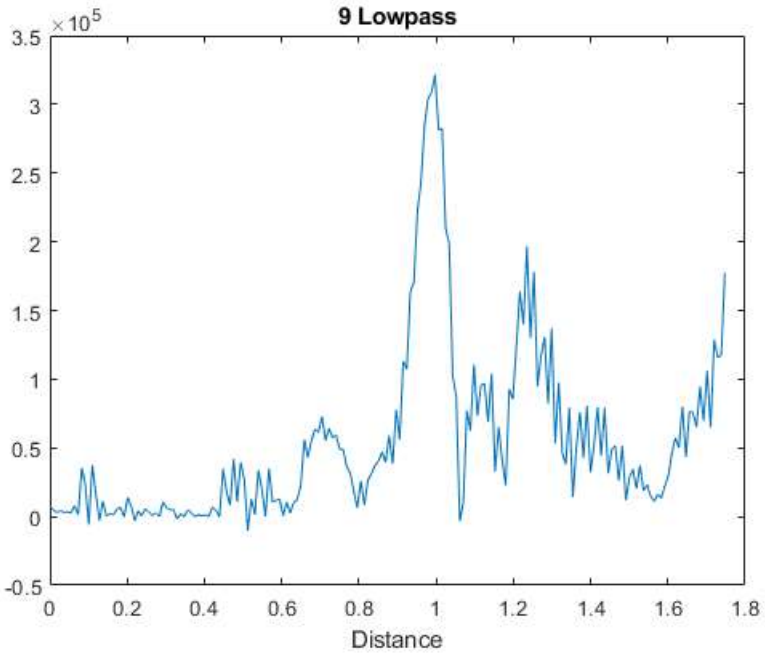


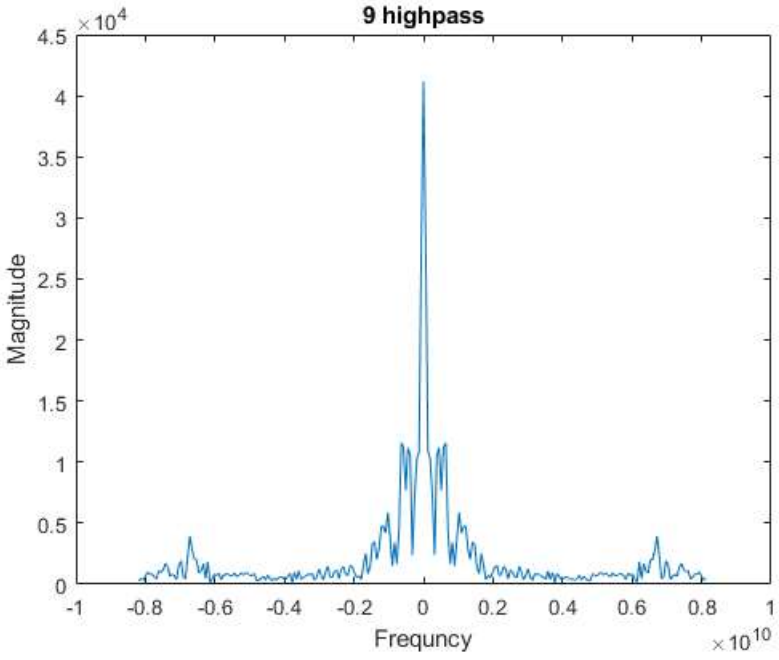
9

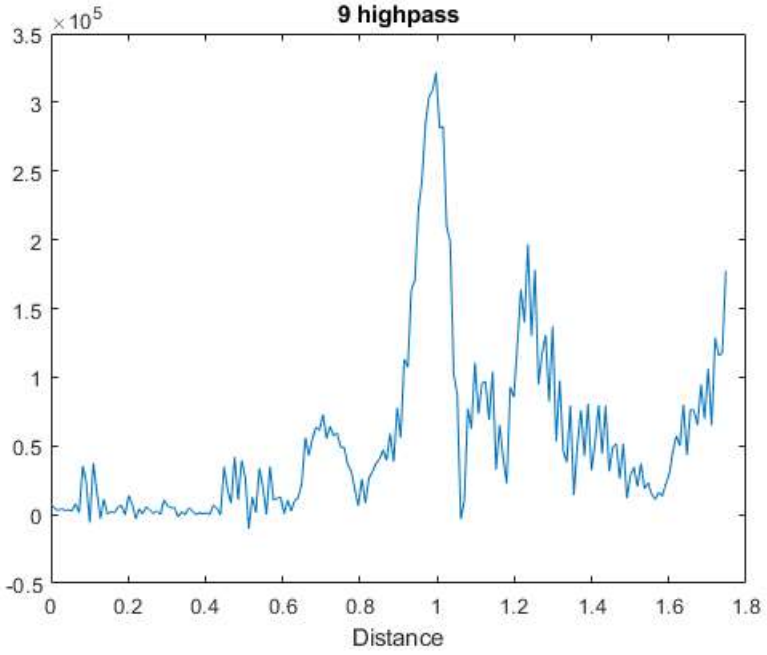
```
Wp = (2*(4.9*10^9))/fs;
Rp = 1;
Rs = 20;

[n1,Wn] = ellipord(Wp,Ws,Rp,Rs);
```

```
[b,a] = ellip(n1,Rp,Rs,Wp,'low');
yf = filter(b, a, scan_difference(10,:));

figure
spectrum_plot(yf, fs)
title('9 Lowpass '), xlabel('Frequncy'), ylabel('Magnitude')

figure
plot(Rbin, yf)
title('9 Lowpass'), xlabel('Distance')

Wp = (2*(4.9*10^9))/fs;
Rp = 1;
Rs = 20;

[n2,Wn] = ellipord(Wp,Ws,Rp,Rs);
[b,a] = ellip(n2,Rp,Rs,Wp,'low');
yf = filter(b, a, scan_difference(10,:));

figure
spectrum_plot(yf, fs)
title('9 highpass'), xlabel('Frequncy'), ylabel('Magnitude')

figure
plot(Rbin, yf)
title('9 highpass'), xlabel('Distance')
```




9 Lowpass
×10^5
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Distance


9 highpass
×10^4
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Magnitude
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Frequncy
×10^10



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Questions

1. It is inaccurate because we are using the abs function on the complex numbers. This causes some inaccurate measurements along the x axis.

2. It centers the spectrum along the x axis.

3. It gets rid of the peak at zero as well as smoothing out the other peaks.

4. It also smooths out the top peaks. It also made the amplitude less than 0.

5. I used 10 for the low pass Butterworth filter, 5 for the high pass. I used 3 for both elliptic filters. The elliptic filter performed better.