Code to plot the FRFs, Phase diagrams and COH for the sine sweep data

The sine sweep goes from 0 to 55 HZ in 5 Hz increments.

The experiment was conducted with 3 accelerometers on the wing. However, the acceleration sensor that pertains to channel #1 gave bad readings. Therefore, for the analysis only channel 2 and 4 were used. Channel 3 measured the force input via the load cell.

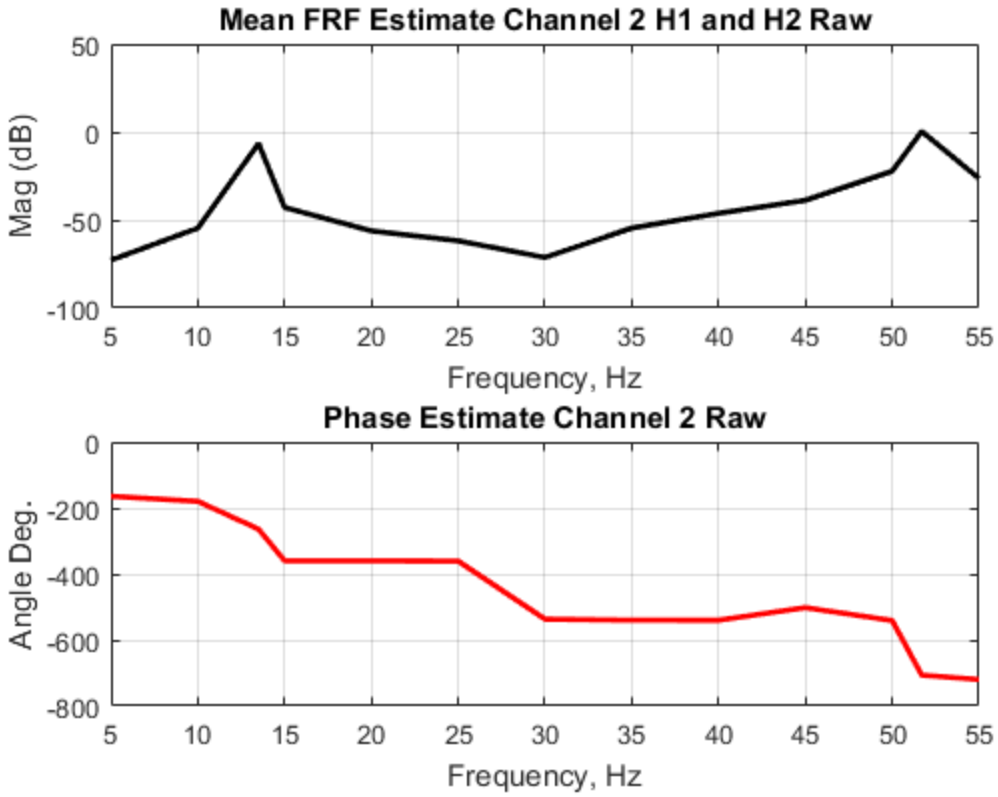
Raw data plots are for signals that were not modified in any before the FRF calculations.

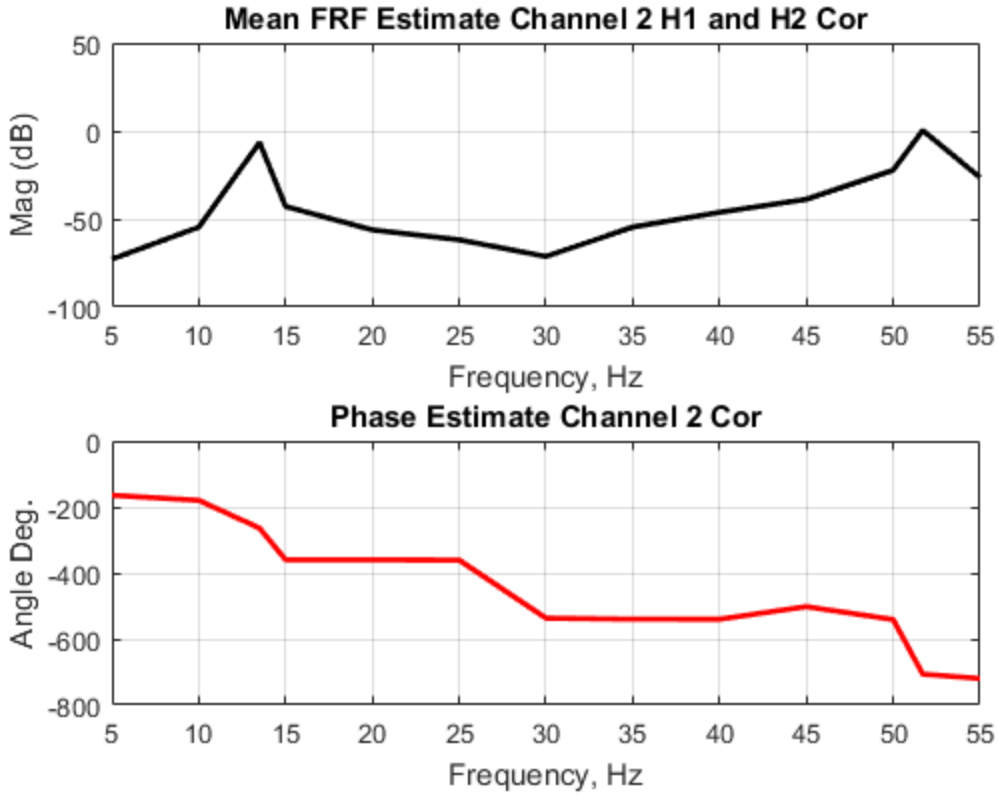
Cor data is corrected by removing the vertical shift that is present in the raw data. Function "ManFilt" was used to filter the data.

Following 2 plots show the FRF and phase plots for channel 2 RAW and COR data sets. The FRF plots have both H1 and H2 estimates ploted. However, they lie on top of each other. Removing the drift from the data has no significant impact on the FRF estimates.

```
%Plot FRF for Channel 2 Raw H1 and H2
figure
subplot(211);
plot(Freq, 20*log10(abs(Tf2rH1(:, 6))), 'r-', 'linewidth', 2);
title('Mean FRF Estimate Channel 2 H1 and H2 Raw');
xlabel('Frequency, Hz');
ylabel('Mag (dB)');
hold on
plot(Freq, 20*log10(abs(Tf2rH2(:, 6))), 'k-', 'linewidth', 2);
grid on
subplot(212);
phase_Tf2rH1 = unwrap(angle(Tf2rH1(:, 6)))*(180/pi);
plot(Freq, phase_Tf2rH1, 'r-', 'linewidth', 2);
title('Phase Estimate Channel 2 Raw');
xlabel('Frequency, Hz');
ylabel('Angle Deg.');
grid on
%
%Plot FRF for Channel 2 Cor H1 and H2
figure
subplot(211);
plot(Freq, 20*log10(abs(Tf2cH1(:, 6))), 'r-', 'linewidth', 2);
title('Mean FRF Estimate Channel 2 H1 and H2 Cor');
xlabel('Frequency, Hz');
ylabel('Mag (dB)');
hold on
plot(Freq, 20*log10(abs(Tf2cH2(:, 6))), 'k-', 'linewidth', 2);
grid on
subplot(212);
phase_Tf2cH1 = unwrap(angle(Tf2cH1(:, 6)))*(180/pi);
plot(Freq, phase_Tf2cH1, 'r-', 'linewidth', 2);
title('Phase Estimate Channel 2 Cor');
xlabel('Frequency, Hz');
```

```
ylabel('Angle Deg.');
grid on
%
%=========================================================================
```

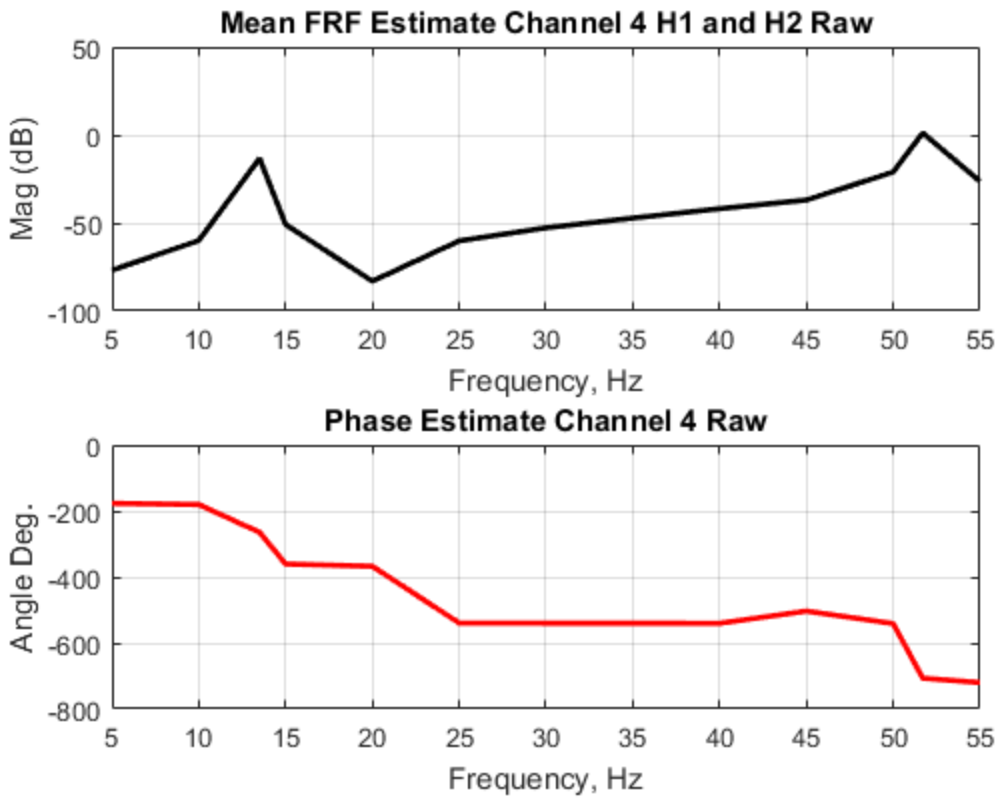


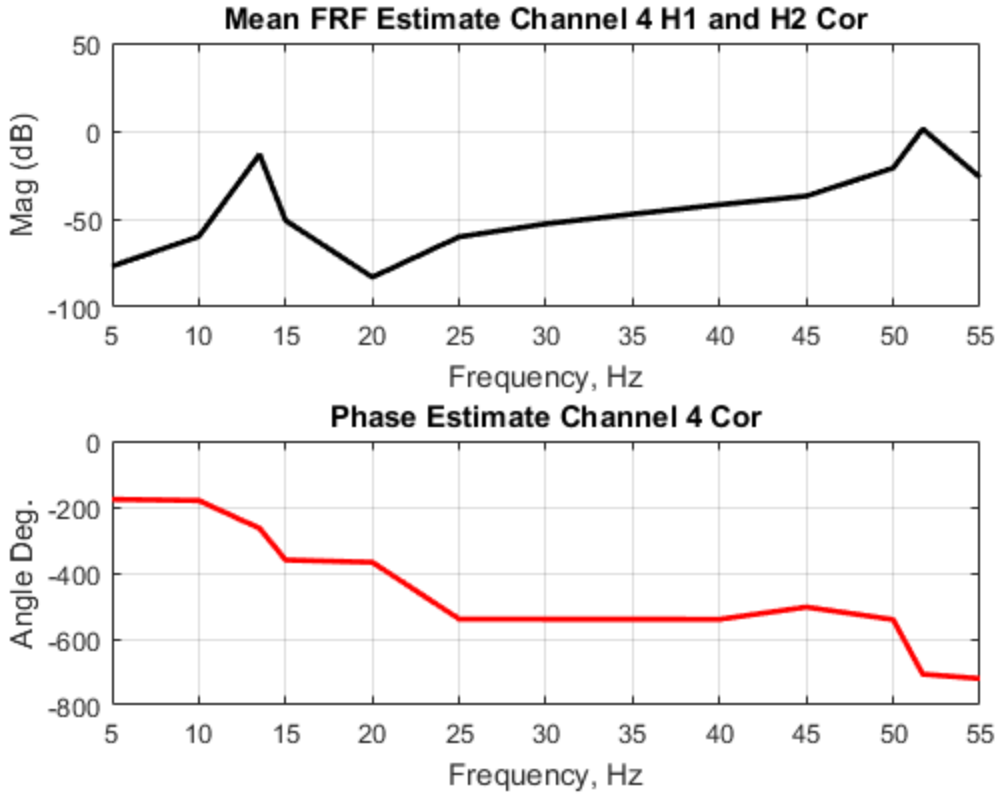


Next two plots show the FRF estimates for channel 4 data. It follows same trends that were observed for channel 2 data. Another thing that is obvious but should be mentioned is the fact that the sine sweep is not nearly sufficient to capture the response adequately. In reality the sweep should be far more refined. Also, there is about 3 points that define the peaks, which is not sufficient and can be seen in the phase plots as well.

```
%Plot FRF for Channel 4 Raw H1 and H2
figure
subplot(211);
plot(Freq, 20*log10(abs(Tf4rH1(:, 6))), 'r-', 'linewidth', 2);
title('Mean FRF Estimate Channel 4 H1 and H2 Raw');
xlabel('Frequency, Hz');
ylabel('Mag (dB)');
hold on
plot(Freq, 20*log10(abs(Tf4rH2(:, 6))), 'k-', 'linewidth', 2);
grid on
subplot(212);
phase_Tf4rH1 = unwrap(angle(Tf4rH1(:, 6)))*(180/pi);
plot(Freq, phase_Tf4rH1, 'r-', 'linewidth', 2);
title('Phase Estimate Channel 4 Raw');
xlabel('Frequency, Hz');
ylabel('Angle Deg.');
grid on
%
%
%Plot FRF for Channel 4 Cor H1 and H2
```

```
figure
subplot(211);
plot(Freq, 20*log10(abs(Tf4cH1(:, 6))), 'r-', 'linewidth', 2);
title('Mean FRF Estimate Channel 4 H1 and H2 Cor');
xlabel('Frequency, Hz');
ylabel('Mag (dB)');
hold on
plot(Freq, 20*log10(abs(Tf4cH2(:, 6))), 'k-', 'linewidth', 2);
grid on
subplot(212);
phase_Tf4cH1 = unwrap(angle(Tf4cH1(:, 6)))*(180/pi);
plot(Freq, phase_Tf4cH1, 'r-', 'linewidth', 2);
title('Phase Estimate Channel 4 Cor');
xlabel('Frequency, Hz');
ylabel('Angle Deg.');
grid on
%
%=========================================================================
```

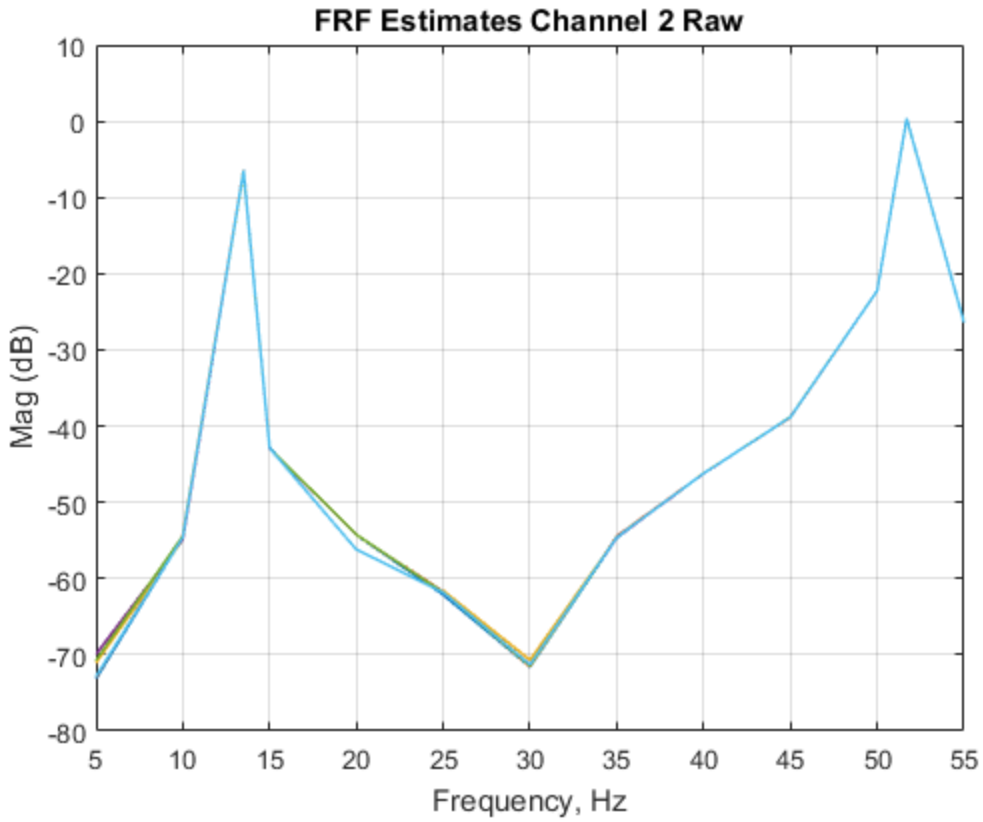


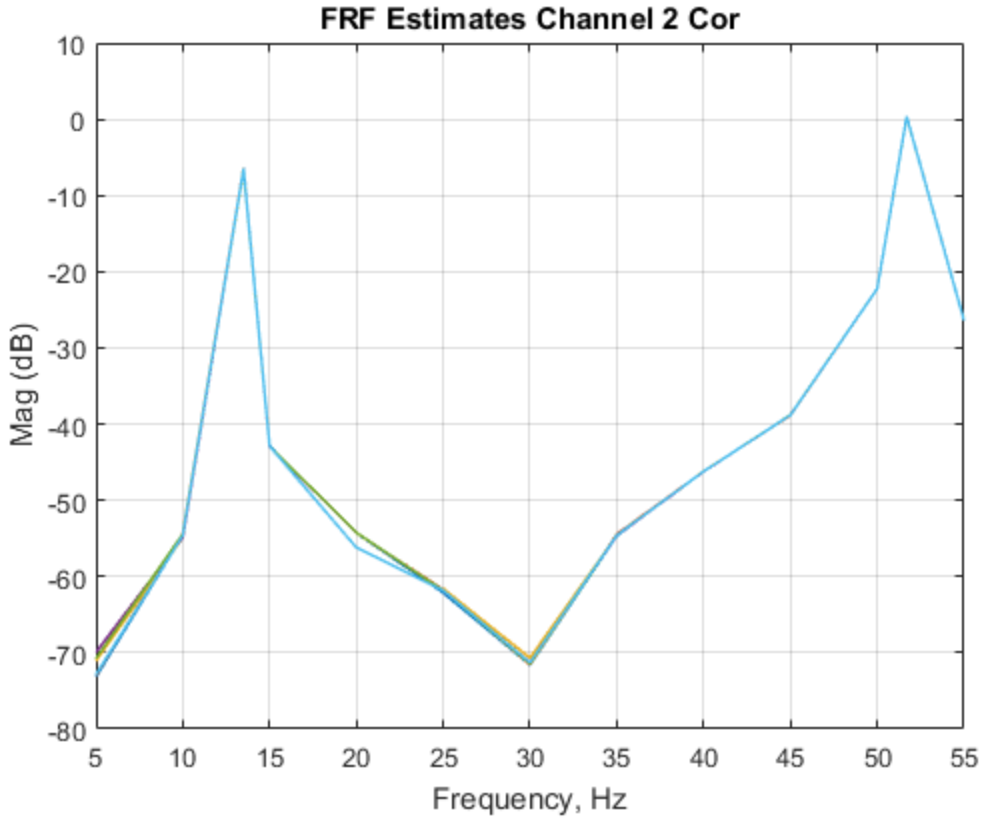


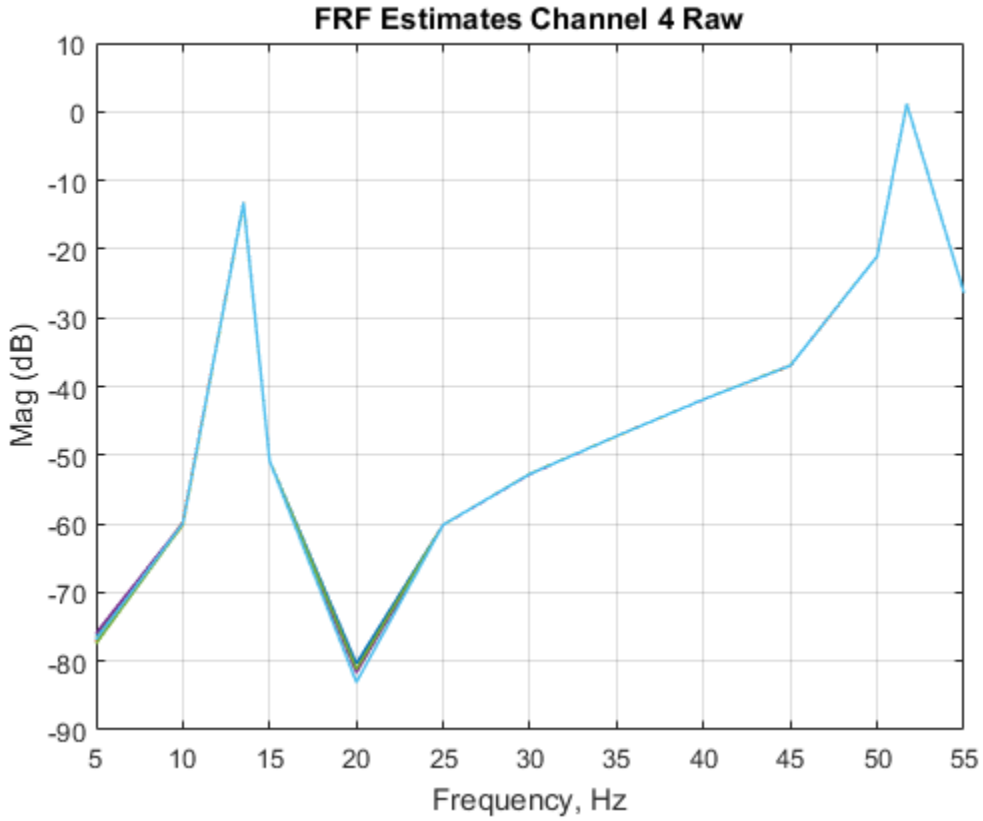
This section of plots shows channel 2 and 4 FRF estimates before all the data sets were averaged.

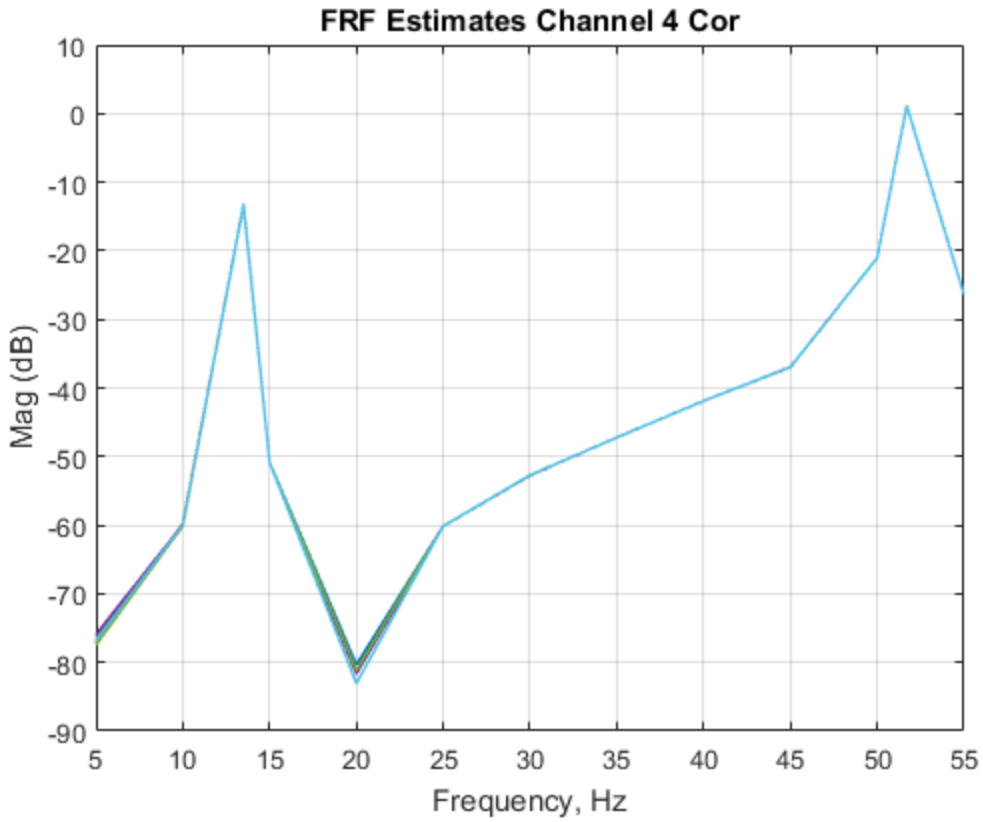
```
figure
plot(Freq, 20*log10(abs(Tf2rH1)), 'linewidth', 1);
title('FRF Estimates Channel 2 Raw');
xlabel('Frequency, Hz');
ylabel('Mag (dB)');
grid on
%
figure
plot(Freq, 20*log10(abs(Tf2cH1)), 'linewidth', 1);
title('FRF Estimates Channel 2 Cor');
xlabel('Frequency, Hz');
ylabel('Mag (dB)');
grid on
%
figure
plot(Freq, 20*log10(abs(Tf4rH1)), 'linewidth', 1);
title('FRF Estimates Channel 4 Raw');
xlabel('Frequency, Hz');
ylabel('Mag (dB)');
grid on
%
figure
plot(Freq, 20*log10(abs(Tf4cH1)), 'linewidth', 1);
title('FRF Estimates Channel 4 Cor');
```

```
xlabel('Frequency, Hz');
ylabel('Mag (dB)');
grid on
%
%=========================================================================
```



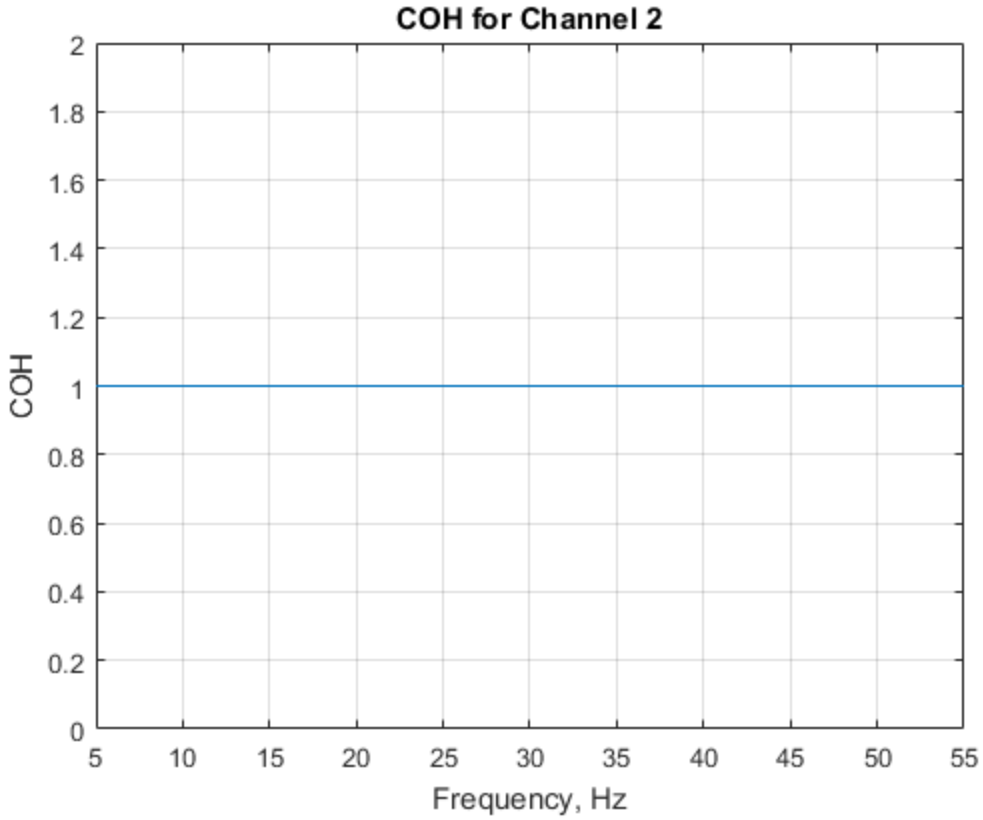

FRF Estimates Channel 2 Cor
Mag (dB)
Frequency, Hz
10
0
-10
-20
-30
-40
-50
-60
-70
-80
5
10
15
20
25
30
35
40
45
50
55

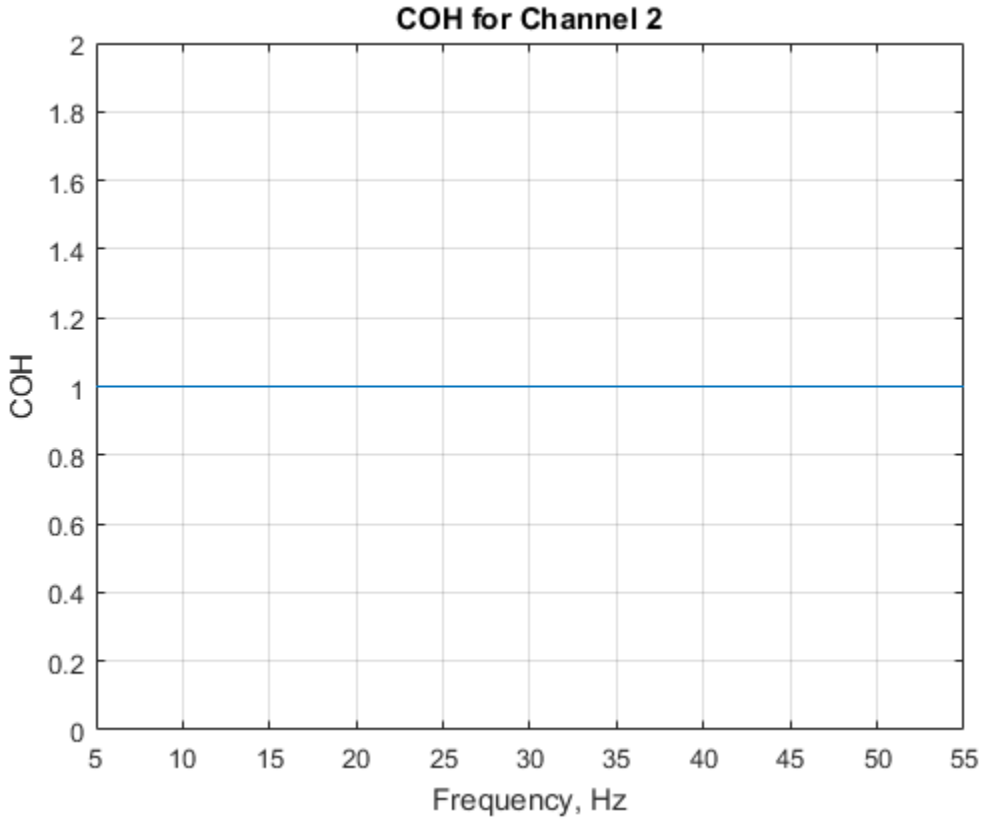

FRF Estimates Channel 4 Raw
Mag (dB)
Frequency, Hz
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
5
10
15
20
25
30
35
40
45
50
55



This section plots the coherence plots for channels 2 and 4.

```
figure
plot(Freq, COH2r)
title('COH for Channel 2');
xlabel('Frequency, Hz');
ylabel('COH');
grid on
%
figure
plot(Freq, COH4r)
title('COH for Channel 2');
xlabel('Frequency, Hz');
ylabel('COH');
grid on
```


COH for Channel 2
COH
Frequency, Hz
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
5
10
15
20
25
30
35
40
45
50
55


COH for Channel 2
COH
Frequency, Hz
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
5
10
15
20
25
30
35
40
45
50
55

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