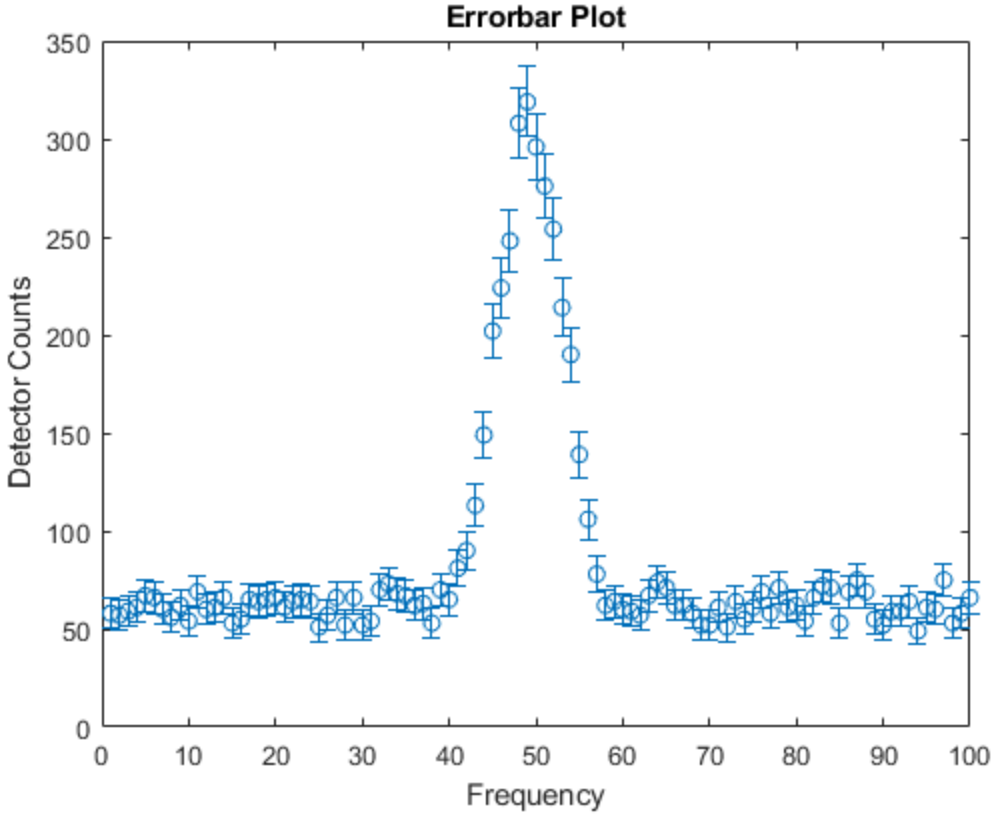
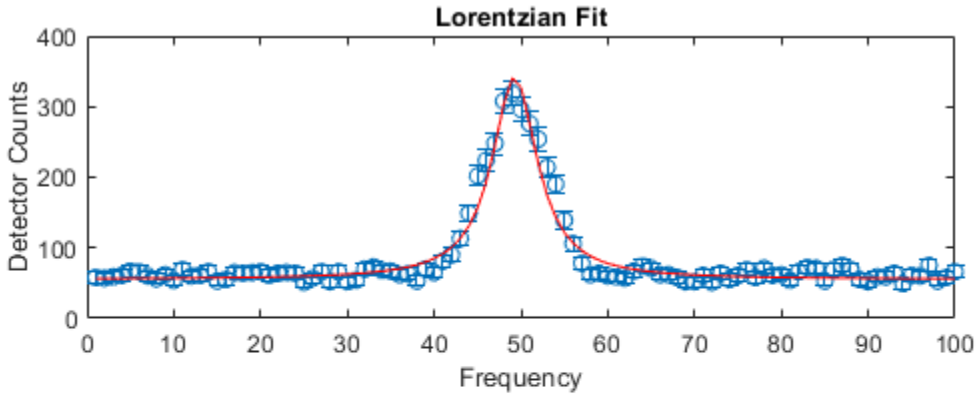
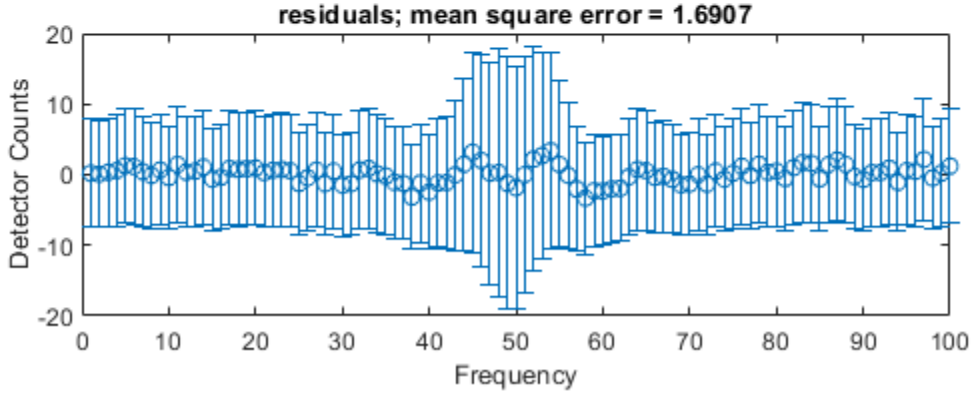
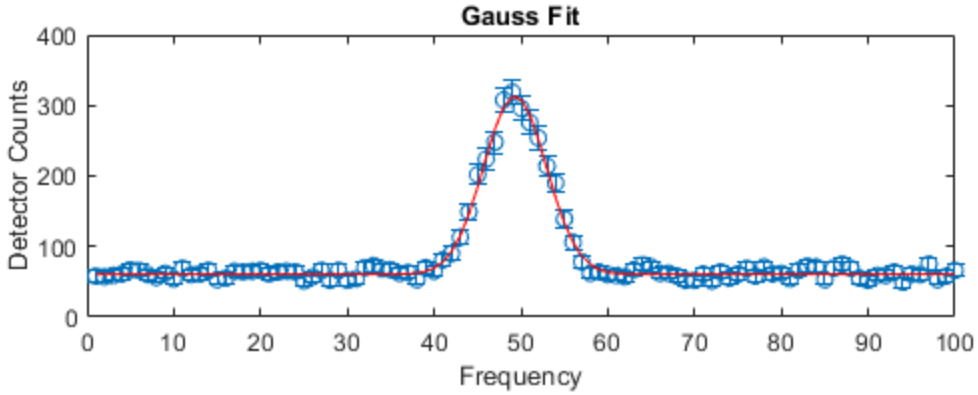
```
clear

filename = 'spectrum.txt';
delimiter = ' ';
headerLinesIn = 0;
spectrum = importdata(filename, delimiter, headerLinesIn);

x = spectrum(:,1);
y = spectrum(:,2);


dy = sqrt(y);
w = dy.^-2;

% Plot the error bars
errorbar(x,y,dy,'o')
title('Errorbar Plot')
xlabel('Frequency')
ylabel('Detector Counts')

% --- Lorentz Fit ---
[beta1,R1,J,covb,MSE1,ERRORMODELINFO] = nlinfit(x,y,@lorentzfit,
[45,8,30,10],'Weights',w);
%here beta1 are the fitted coefficients, R1 are the residuals, MSE1 is the
%mean square error. We'll ignore J. covb is the covariance matrix, and you
%can find uncertainties in your fit coefficients using sqrt(diag(covb))
figure
subplot(2,1,1)

errorbar(x,y,dy,'o')
hold on
plot(x,lorentzfit(beta1,x),'r-')
title('Lorentzian Fit')
xlabel('Frequency')
ylabel('Detector Counts')
subplot(2,1,2)
errorbar(x,R1,dy,'o')
title(['residuals; mean square error = ',num2str(MSE1)])
xlabel('Frequency')
ylabel('Detector Counts')
hold off

% Peak Uncertainty
standUncertLor = (sqrt(diag(covb)));
peakUncertLor = standUncertLor(1);

% --- Gauss Fit ---
[beta1,R1,J,covb,MSE1,ERRORMODELINFO] = nlinfit(x,y,@gaussfit,
[45,8,30,10],'Weights',w);
%here beta1 are the fitted coefficients, R1 are the residuals, MSE1 is the
%mean square error. We'll ignore J. covb is the covariance matrix, and you
%can find uncertainties in your fit coefficients using sqrt(diag(covb))
```

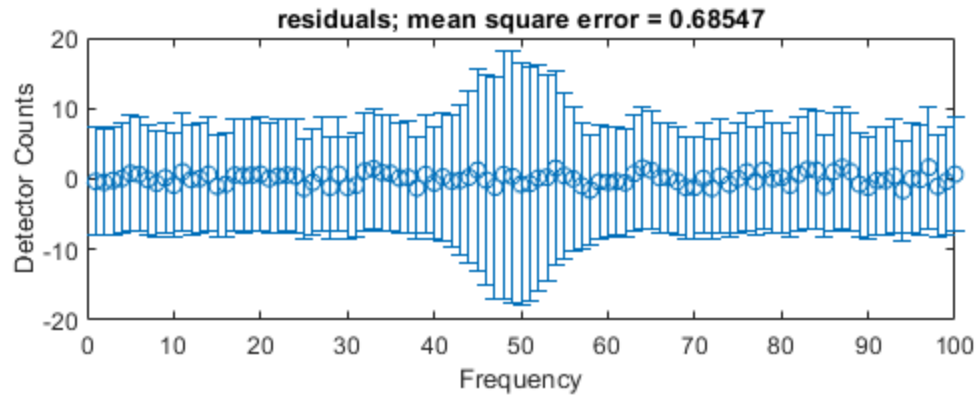
```
figure
subplot(2,1,1)

errorbar(x,y,dy,'o')
hold on
plot(x,gaussfit(beta1,x),'r-')
title('Gauss Fit')
xlabel('Frequency')
ylabel('Detector Counts')
subplot(2,1,2)
errorbar(x,R1,dy,'o')
title(['residuals; mean square error = ',num2str(MSE1)])
xlabel('Frequency')
ylabel('Detector Counts')
hold off

% Peak Uncertainty
standUncertGauss = (sqrt(diag(covb)));
peakUncertGauss = standUncertGauss(1);

i = 49;
indivYGauss = abs(y(i) - y(i+1));

% --- Sinc^2 Fit ---
[beta1,R1,J,covb,MSE1,ERRORMODELINFO] = nlinfit(x,y,@sincfit,
[45,8,30,1],'Weights',w);
%here beta1 are the fitted coefficients, R1 are the residuals, MSE1 is the
%mean square error. We'll ignore J. covb is the covariance matrix, and you
%can find uncertainties in your fit coefficients using sqrt(diag(covb))
figure
subplot(2,1,1)

errorbar(x,y,dy,'o')
hold on
plot(x,sincfit(beta1,x),'r-')
title('Sinc^2 Fit')
xlabel('Frequency')
ylabel('Detector Counts')
subplot(2,1,2)
errorbar(x,R1,dy,'o')
title(['residuals; mean square error = ',num2str(MSE1)])
xlabel('Frequency')
ylabel('Detector Counts')
hold off

% Peak Uncertainty
standUncertSinc = (sqrt(diag(covb)));
peakUncertSinc = standUncertSinc(1);
```

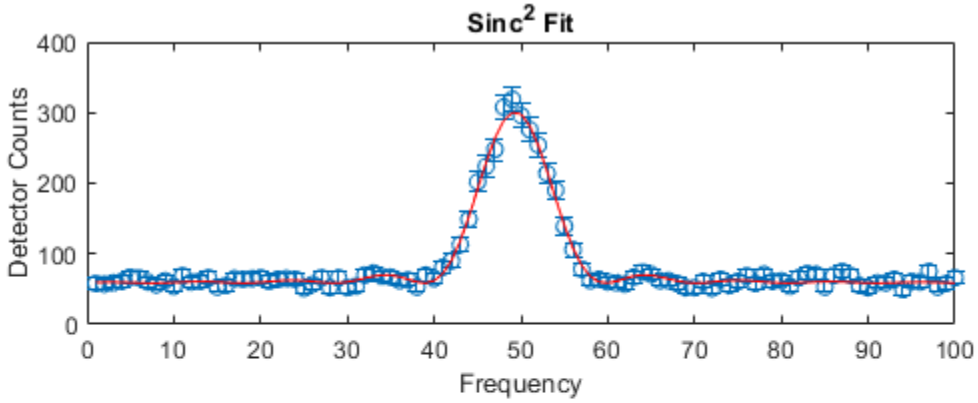

Errorbar Plot
Detector Counts
Frequency
0
50
100
150
200
250
300
350
0
10
20
30
40
50
60
70
80
90
100

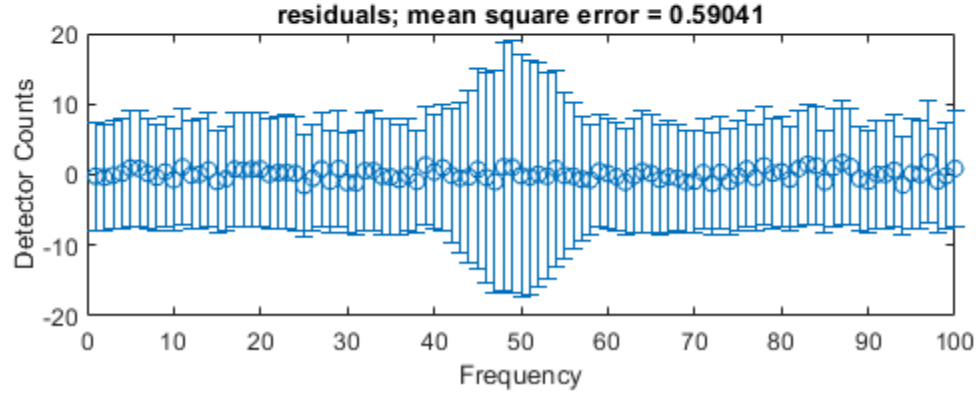

Lorentzian Fit
Detector Counts
Frequency
0
100
200
300
400
0
10
20
30
40
50
60
70
80
90
100


residuals; mean square error = 1.6907
Detector Counts
Frequency
-20
-10
0
10
20
0
10
20
30
40
50
60
70
80
90
100


Gauss Fit
Detector Counts
Frequency


residuals; mean square error = 0.68547
Detector Counts
Frequency


Sinc2 Fit
Detector Counts
Frequency


residuals; mean square error = 0.59041
Detector Counts
Frequency

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