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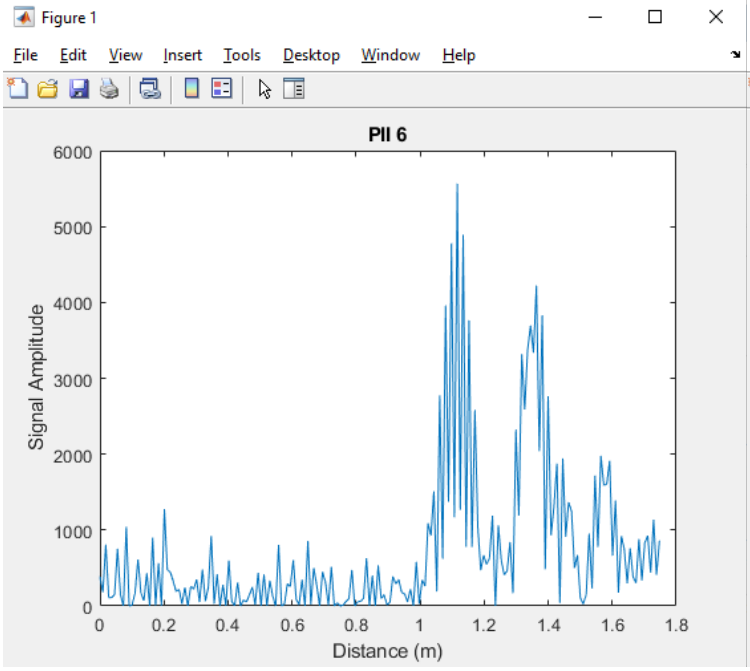
EE 384 Classwork 10 Due 24 October 2021

PDF Questions:

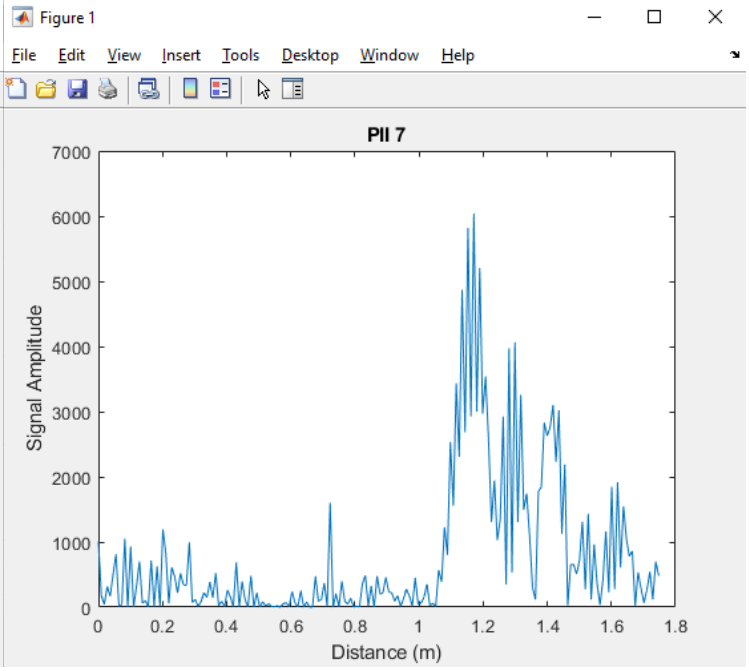
3:

All of the scans took 15 seconds.

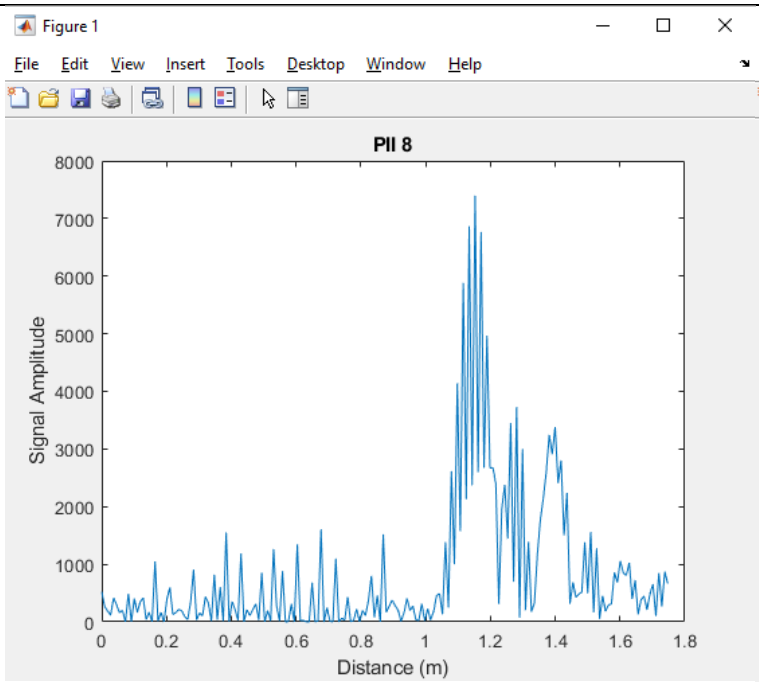
7b: MRM Plots.



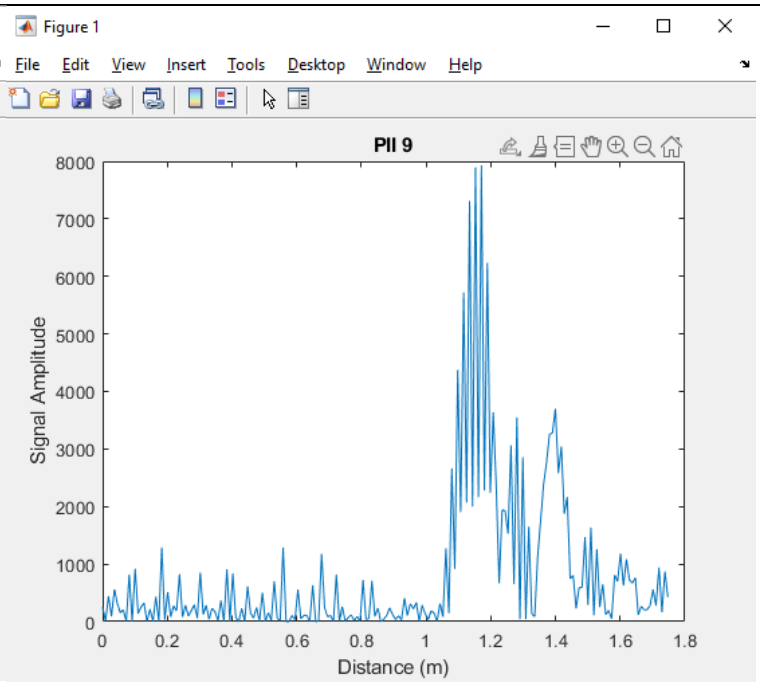
Difference of 1m for PII6



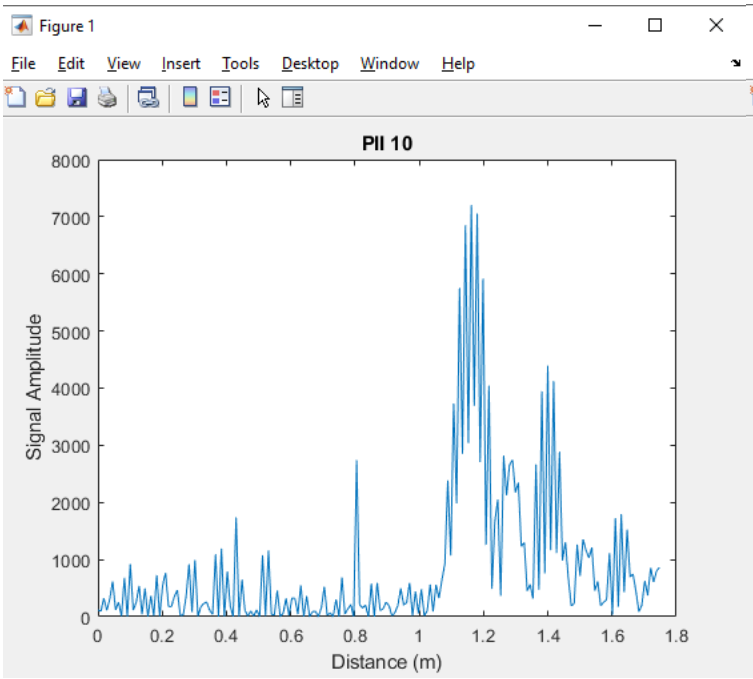
Difference of 1m for PII7



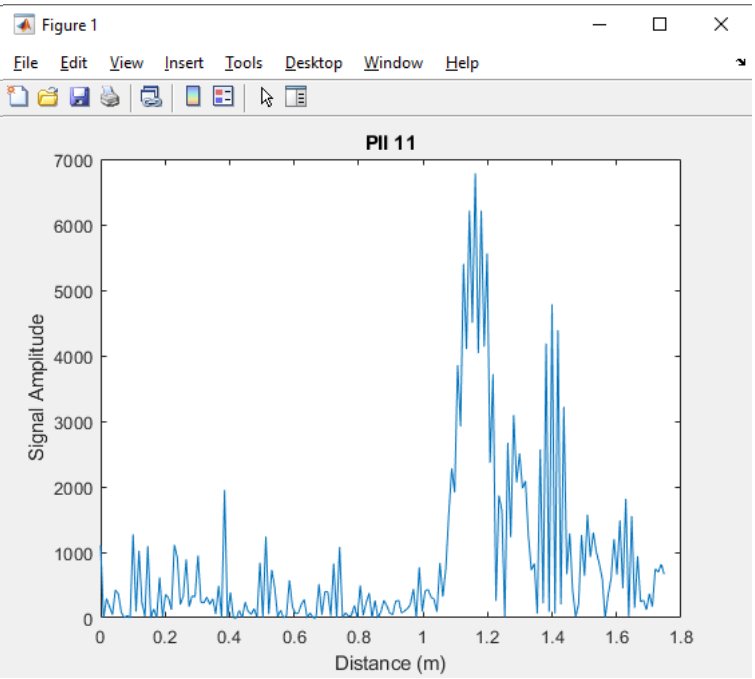
Difference of 1m for PII8



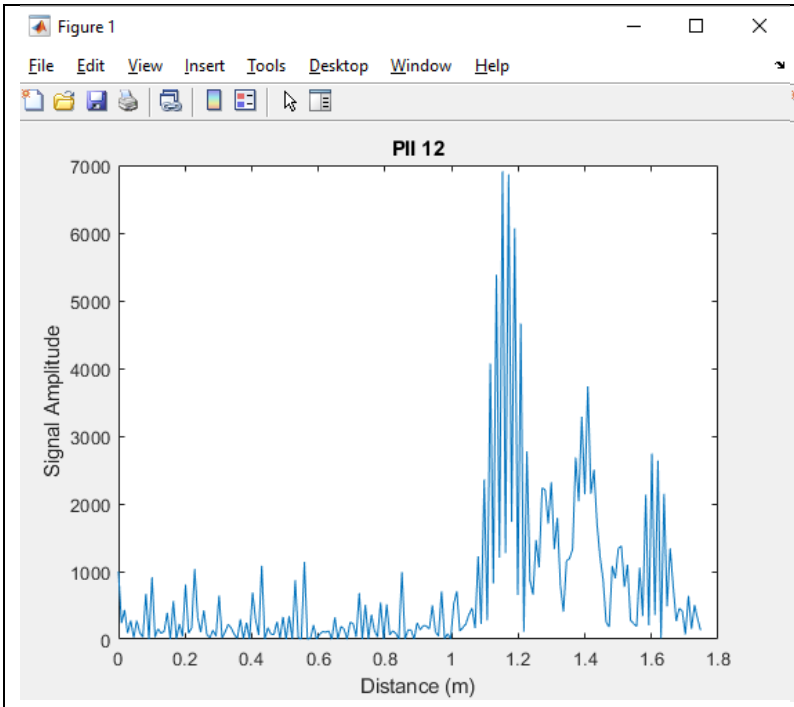
Difference of 1m for PII9



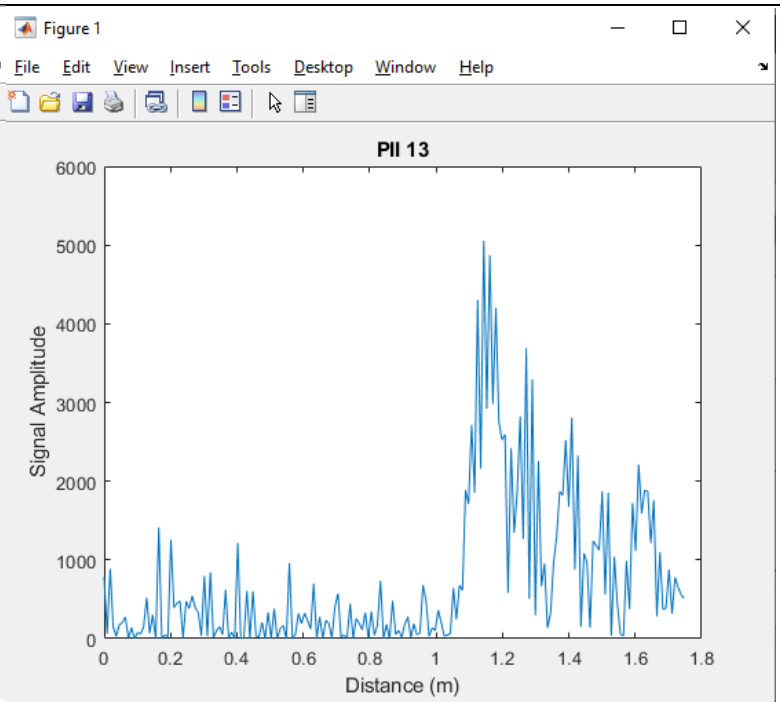
Difference of 1m for PII10



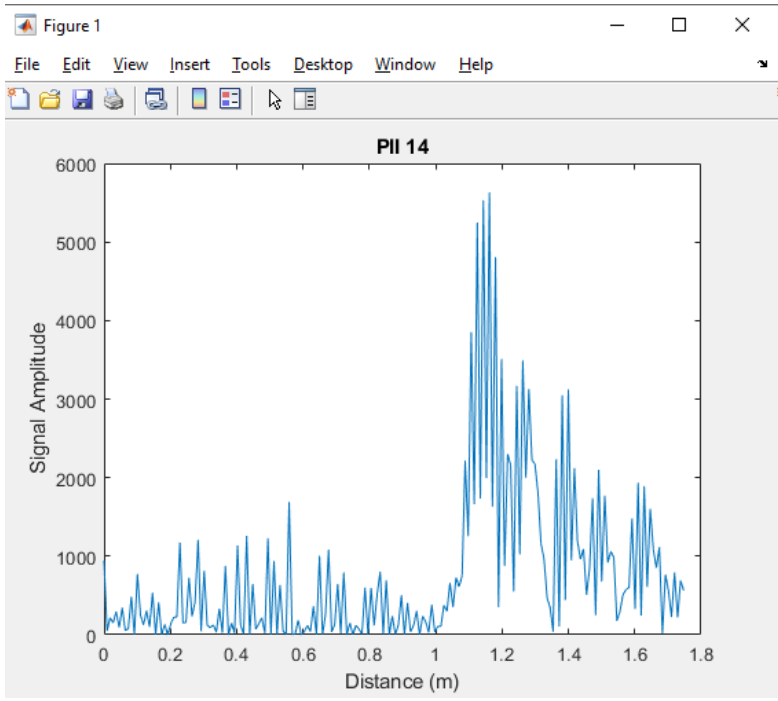
Difference of 1m for PII11



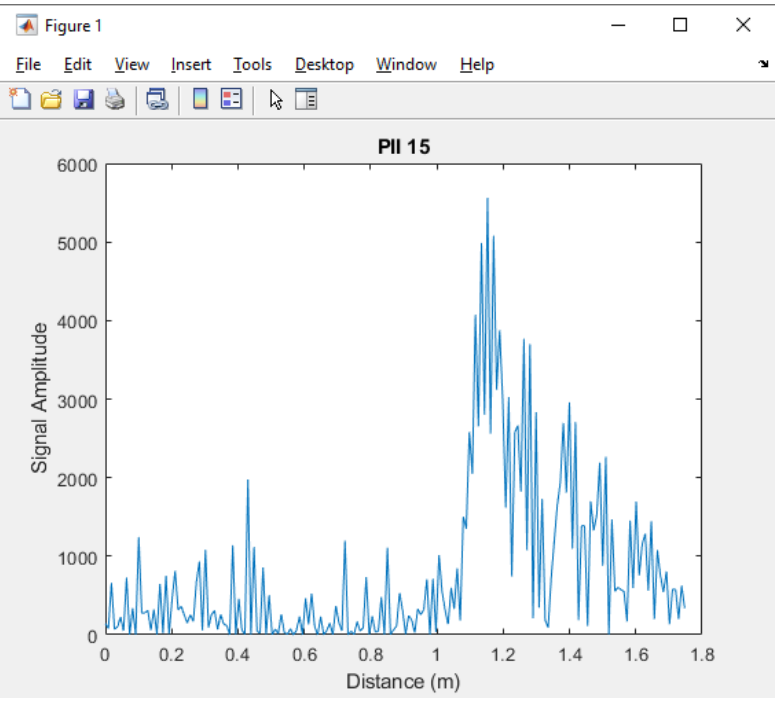
Difference of 1m for PII12



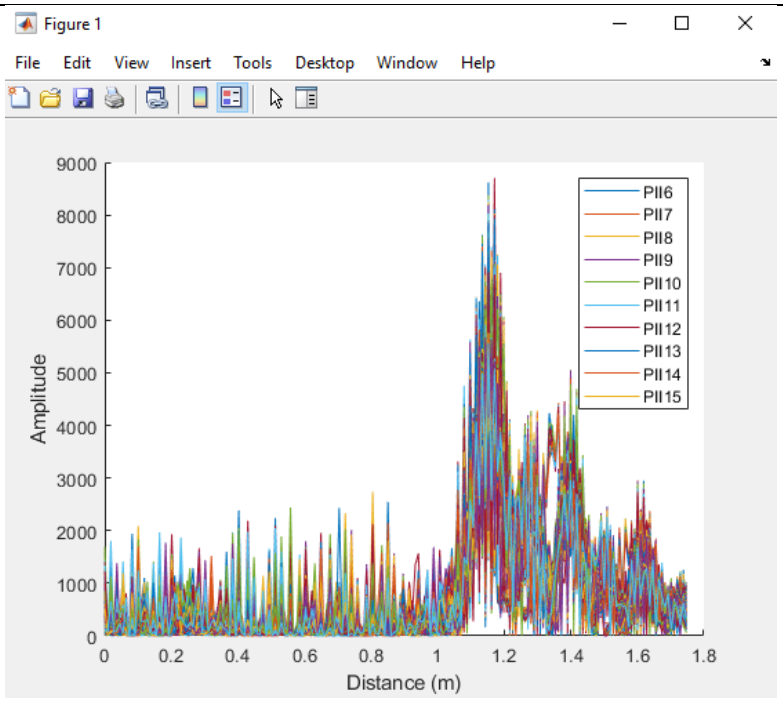
Difference of 1m for PII13



Difference of 1m for PII14

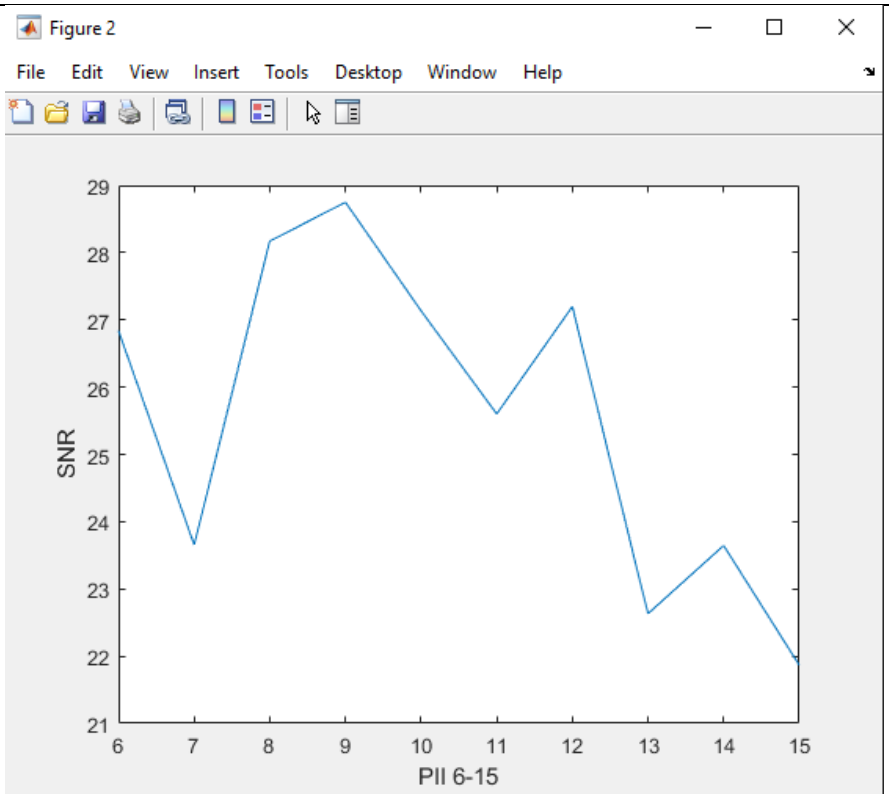


Difference of 1m for PII15



Difference of 1m for PII6 – PII15

7f: PII vs SNR



PII vs SNR. Certainly no positive trend here. Likely an issue with taking data, most likely.

Questions and Further Explorations:

1. How closely did your measurements of signal to noise ratio follow the predicted increase by 3 dB as PII increases by one? How could you improve these results?

My results did not match the 3db increase whatsoever. I could improve my results by redoing all of the scans, or taking more samples per scan. Either way, it is apparent something needs to change with how I am taking the scans.

2. Discuss how the amount of time to take a scan varies with the increase in PII.

As PII increases, the scans will take longer. This is because each pulse represents a power of two, 2^7 = 128 pulses combined to produce a scan. For some reason, however, my scans took the same amount of time for each target and background. This most likely must come from the scan start and stop times.

Matlab code:

```
% 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

%% Query user for logfile
%dnm = '.'; fnm = 'MRM_002.csv';
for count = 6:15
    [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));

    %% Pull out the raw scans (if saved)
    rawscansIb = find([scnb.Nfilt] == 1);
    rawback = reshape([scnb(rawscansIb).scn],[],length(rawscansIb))';

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

    if count == 6
        sdiff6 = abs(rawback - rawtar);
        s6 = sdiff6;
    elseif count == 7
        sdiff6 = abs(rawback - rawtar);
        s7 = sdiff6;
```

```
    elseif count == 8
        sdiff6 = abs(rawback - rawtar);
        s8 = sdiff6;
    elseif count == 9
        sdiff6 = abs(rawback - rawtar);
        s9 = sdiff6;
    elseif count == 10
        sdiff6 = abs(rawback - rawtar);
        s10 = sdiff6;
    elseif count == 11
        sdiff6 = abs(rawback - rawtar);
        s11 = sdiff6;
    elseif count == 12
        sdiff6 = abs(rawback - rawtar);
        s12 = sdiff6;
    elseif count == 13
        sdiff6 = abs(rawback - rawtar);
        s13 = sdiff6;
    elseif count == 14
        sdiff6 = abs(rawback - rawtar);
        s14 = sdiff6;
    elseif count == 15
        sdiff6 = abs(rawback - rawtar);
        s15 = sdiff6;
    end

    %% 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(sdiff6(1,:),2)-1) - T0)/2;% Range Bins in meters

    % Difference plot
    % plot(Rbin,sdiff6(10,:))
    [a6,i]=max(sdiff6(10,:));
    if count == 6
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR6 = 10*log10(a6^2/var);
    elseif count == 7
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR7 = 10*log10(a6^2/var);
    elseif count == 8
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR8 = 10*log10(a6^2/var);
    elseif count == 9
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR9 = 10*log10(a6^2/var);
    elseif count == 10
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR10 = 10*log10(a6^2/var);
    elseif count == 11
```

```
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR11 = 10*log10(a6^2/var);
    elseif count == 12
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR12 = 10*log10(a6^2/var);
    elseif count == 13
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR13 = 10*log10(a6^2/var);
    elseif count == 14
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR14 = 10*log10(a6^2/var);
    elseif count == 15
        sample = sdiff6(10,23:67);
        var = var(sample);
        SNR15 = 10*log10(a6^2/var);
    end
end
figure(1);
hold on;
xlabel("Distance (m)");
ylabel("Amplitude");
plot(Rbin, s6), plot(Rbin, s7), plot(Rbin, s8), plot(Rbin, s9), plot(Rbin,
s10)
plot(Rbin, s11), plot(Rbin, s12), plot(Rbin, s13), plot(Rbin, s14),
plot(Rbin, s15)
legend('PII6', 'PII7', 'PII8', 'PII9', 'PII10', 'PII11', 'PII12', 'PII13',
'PII14', 'PII15');
hold off;
PII = (6:15);
SNR = [SNR6 SNR7 SNR8 SNR9 SNR10 SNR11 SNR12 SNR13 SNR14 SNR15];
figure(2);
plot(PII, SNR);
xlabel('PII 6-15');
ylabel('SNR');
```