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EE 384 Classwork 7 Due 3 October 2021

PDF Questions:

4e:

-Pulse Integration Index: 12-4096
-Transmit Gain: 44
-Scan Start: 10,000 ps
-Scan Stop: 39297 ps

6b:

-Peak signal value: ~500,000

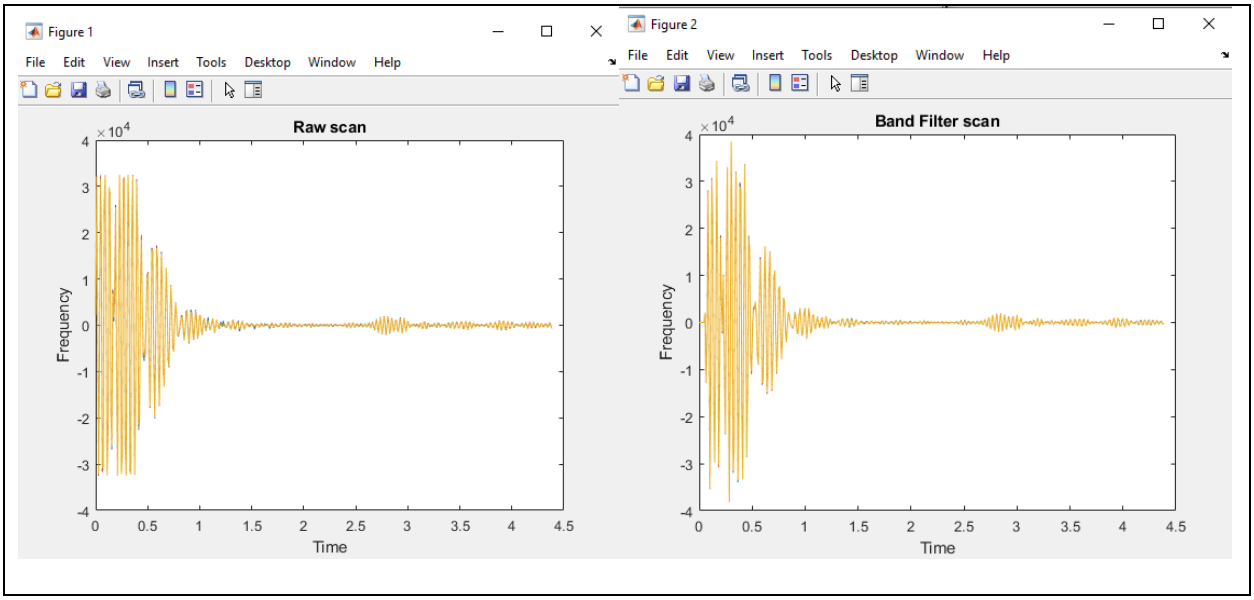
7:

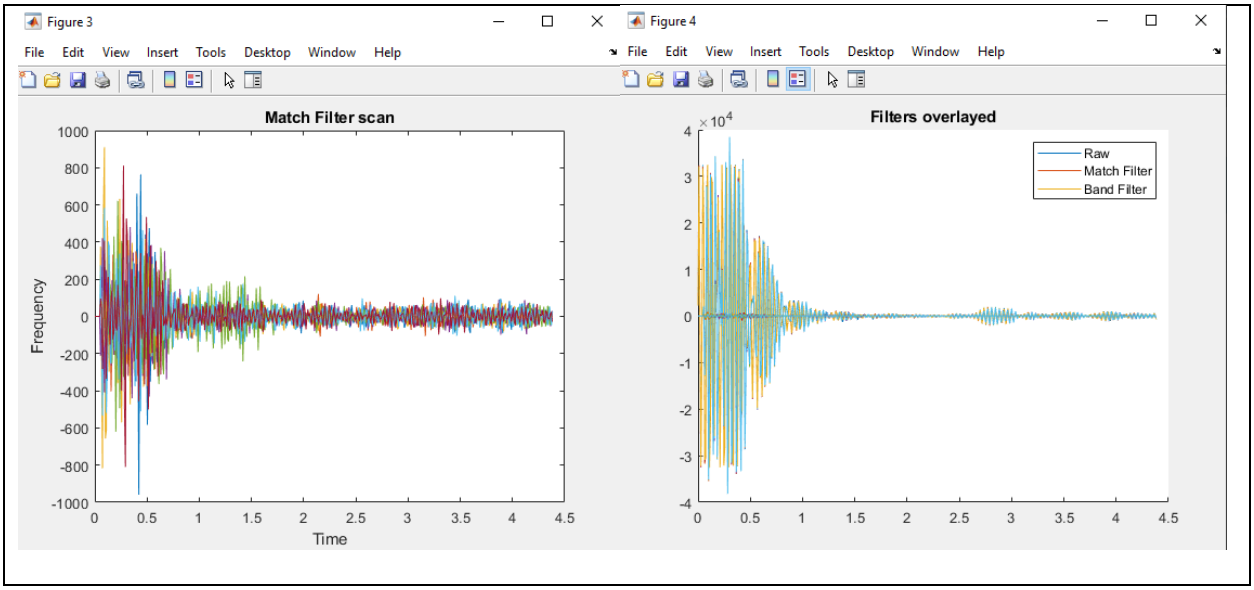
-Peak signal value: ~500,000

8:

Overall strength is lower, but the peak value is the same.

MRM Plotter, Raw, Band, Match filters.





Questions and Further Explorations:

1. Consider Appendix C of the MRM RET Users Guide. Determine the power in Watts at the transmit antenna port for a transmit gain setting of 63 and of 0.

Gain	P400	P410	P410 w Amps
0	-14.53	-31.6	-14.48
63	2.1	-12.64	0.71

2. In the MRMplotter.m code, explain how Rbin vector (the x-axis for your plots) was constructed. Where does Tbin come from? (Hint: see the MRM RET Users Guide)

PDF:
Distance = (Detection0_ps –ScanStart_ps)*(Seconds/picoseconds)*C/2

MATLAB:

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

ANSWER:
C = C = speed of light
Tbin = Seconds/picoseconds = the time conversion (we're using nanoseconds here)
Rbin = Distance = target to the face of the antenna (I.e. radar range)
T0 = ScanStart_ps = Scan start time
Detection0_ps: Detection time in picoseconds

3. Modify MRMplotter.m to produce plots of the bandpass and motion filtered data.

See plots above.

4. Modify MRMplotter.m to overlay all of the raw scans on one plot. Comment on the differences in the scans and what would cause the differences.

See plots above.
Raw vs band pass: some of the values will be let through, others will not. That's why on the band pass plot there are some values missing that the raw scan does have.
Raw vs Match Filter: The match filter's frequencies are much lower than the raw or band pass. The reason we have these lower values is the match filter tries to maximize the ratio between the signal and noise. Since it is a ratio of these values, that's why they are lower.

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';
[fnm,dnm] = uigetfile('*.csv');
fprintf('Reading logfile %s\n',fullfile(dnm,fnm));
[cfg,req,scn,det] = readMrmRetLog(fullfile(dnm,fnm));

%% Separate raw, bandpassed, and motion filtered data from scn structure
% (only motion filtered is used)

%% Pull out the raw scans (if saved)
rawscansI = find([scn.Nfilt] == 1);
rawscansV = reshape([scn(rawscansI).scn],[],length(rawscansI))';
% band-pass filtered scans
bpfscansI = find([scn.Nfilt] == 2);
bpfscansV = reshape([scn(bpfscansI).scn],[],length(bpfscansI))';
% motion filtered scans
mfscansI = find([scn.Nfilt] == 4);
mfscansV = reshape([scn(mfscansI).scn],[],length(mfscansI))';


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

figure
plot(Rbin, rawscansV), title('Raw scan'), xlabel('Time'),
ylabel('Frequency');
figure
```

```
plot(Rbin, bpfscansV), title('Band Filter scan'), xlabel('Time'),
ylabel('Frequency');
figure
plot(Rbin, mfscansV), title('Match Filter scan'), xlabel('Time'),
ylabel('Frequency');
figure
hold on
plot(Rbin, rawscansV);
plot(Rbin, bpfscansV);
plot(Rbin, mfscansV);
title('Filters overlayed');
legend('Raw', 'Match Filter', 'Band Filter');
```