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EE 384 Classwork 9 Due 17 October 2021

PDF Questions:

**3:**

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| 10,000ps - 26666ps |

**7b:**

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**MRM 8:**

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Questions and Further Explorations:

**1. How closely did your measurements of received signal power follow the 1𝑅4⁄ prediction? How could you improve these results?**

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| My measurements followed the prediction closely, but not completely accurate. To improve my results I would need to be more careful and precise when taking measurements. |

**2. Based on your measurements of signal power as a function of target range, what would you predict the received signal power to be at a range of 10m? 30m? How could you increase the received signal power?**

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| 1 / (10m)^4 = 0.0001  1 / (30m)^4 = 0.0000012346 |

**3. How did the received signal power vary with respect to the different targets? Did the received signal powers vary as you expected?**

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| Yes. As the targets got further away the power dropped significantly from 0.5m – 1m and a bit less of a drop from 1m – 1.5m. |

Matlab code:

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| % 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';  [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));  [cfgt05,reqt05,scnt05,dett05] = readMrmRetLog(fullfile(dnmt,fnmt));    [fnmt,dnmt] = uigetfile('\*.csv');  fprintf('Reading logfile %s\n',fullfile(dnmt,fnmt));  [cfgt1,reqt1,scnt1,dett1] = readMrmRetLog(fullfile(dnmt,fnmt));    [fnmt,dnmt] = uigetfile('\*.csv');  fprintf('Reading logfile %s\n',fullfile(dnmt,fnmt));  [cfgt15,reqt15,scnt15,dett15] = readMrmRetLog(fullfile(dnmt,fnmt));    %% Pull out the raw scans (if saved)    [diff05, back05, tar05] = readscan(scnb, scnt05);  [diff1, back1, tar1] = readscan(scnb, scnt1);  [diff15, back15, tar15] = readscan(scnb, scnt15);    %% Plot difference, background, target.  [Rbin05, distance05, pow05, i1, a05] = RbinPlot(diff05, back05, tar05, '0.5 Meters');  [Rbin1, distance1, pow1, i2, a1] = RbinPlot(diff1, back1, tar1, '1 Meter');  [Rbin15, distance15, pow15, i3, a15] = RbinPlot(diff15, back15, tar15, '1.5 Meters');    figure  hold on;  plot(Rbin05,diff05(10,:));  plot(Rbin1,diff1(10,:));  plot(Rbin15,diff15(10,:));  legend('0.5m', '1.0m', '1.5m');  title('Target distances vs background');    figure  hold on;  scatter(i1,pow05, 'filled');  scatter(i2,pow1, 'filled');  scatter(i3,pow15, 'filled');  legend('0.5m', '1.0m', '1.5m');  title('Target distance signal power');    %% Create the waterfall horizontal and vertical axes  [avg05, new\_distance05, max05, i] = difference(diff05, Rbin05);  [avg1, new\_distance1, max1, j] = difference(diff1, Rbin1);  [avg15, new\_distance15, max15, k] = difference(diff15, Rbin15);    %% Create the amplitude plot.  figure;  hold on;  plot(Rbin05, avg05);  plot(Rbin1, avg1);  plot(Rbin15, avg15);  legend('0.5m', '1.0m', '1.5m');  title('Average signal amplitidue');    %% Get the power of each Measurement.  figure;  hold on;  powavg05 = max05^2;  powavg10 = max1^2;  powavg15 = max15^2;  scatter(i,powavg05, 'filled');  scatter(j,powavg10, 'filled');  scatter(k,powavg15, 'filled');  scatter(i1,pow05, '\*');  scatter(i2,pow1, '\*');  scatter(i3,pow15, '\*');    legend('0.5m', '1.0m', '1.5m');  title('Average signal power vs raw signal power');    %% Functions  function[diff, back, tar] = readscan(scnb, scnt)  rawscansIb = find([scnb.Nfilt] == 1);  back = reshape([scnb(rawscansIb).scn],[],length(rawscansIb))';    rawscansIt = find([scnt.Nfilt] == 1);  tar = reshape([scnt(rawscansIt).scn],[],length(rawscansIt))';    diff = abs(back - tar);  end    function[Rbin, distance, pow, i, a05] = RbinPlot(diff, back, tar, name)  Tbin = 32/(512\*1.024); % ns  T0 = 0; % ns  c = 0.29979; % m/ns  Rbin = c\*(Tbin\*(0:size(diff(1,:),2)-1) - T0)/2;  target = append('Target', ' ', name);  difference = append('Difference',' ', name);  %Background plot  figure  subplot(3,1,1);  plot(Rbin,back(10,:)), xlabel('Distance'), ylabel('Amplitude'), title('Background')  %Taget plot  subplot(3,1,2);  plot(Rbin,tar(10,:)), xlabel('Distance'), ylabel('Amplitude'), title(target)  % Difference plot  subplot(3,1,3);  plot(Rbin,diff(10,:)), xlabel('Distance'), ylabel('Amplitude'), title(difference)    [a05,i]=max(diff(10,:));  distance = Rbin(i);    pow =a05^2;  end    function[avg, distance, c, i] = difference(diff, Rbin)  avg = zeros(1,length(diff(1,:)));  for i=1:10  avg = avg + diff(i,:);  end  avg = avg / 10;  [c, i] = max(avg);  distance = Rbin(i);  end |