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EE 384 Classwork 7 Due 3 October 2021

PDF Questions:

**4e:**

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

**6b:**

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| -Peak signal value: ~500,000 |

**7:**

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| -Peak signal value: ~500,000 |

**8:**

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

MRM Plotter, Raw, Band, Match filters.

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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.**

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| |  |  |  |  | | --- | --- | --- | --- | | 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)**

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| 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.**

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| 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.**

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| 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:

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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';  [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'); |