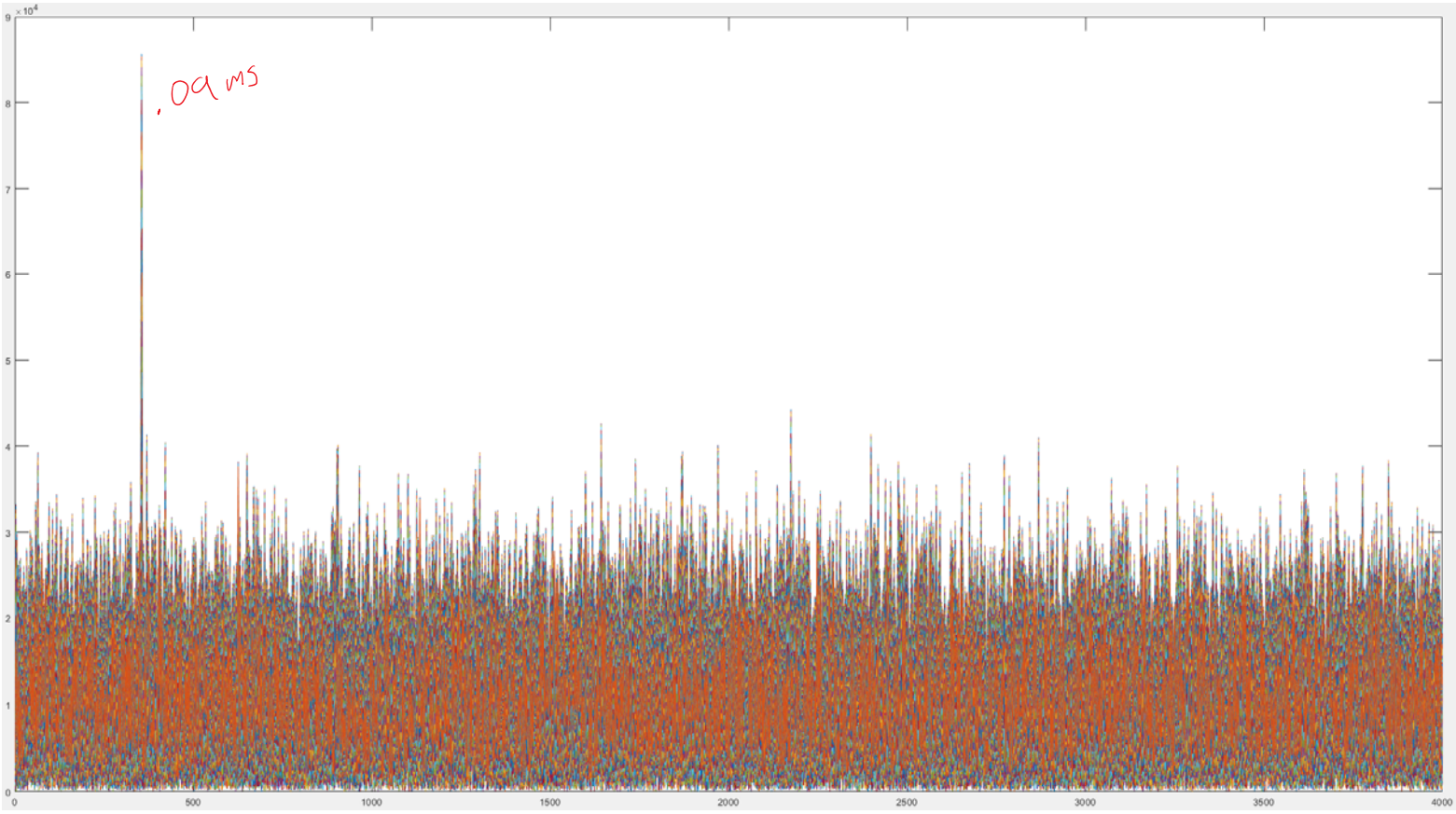
CA5 - pt. 2

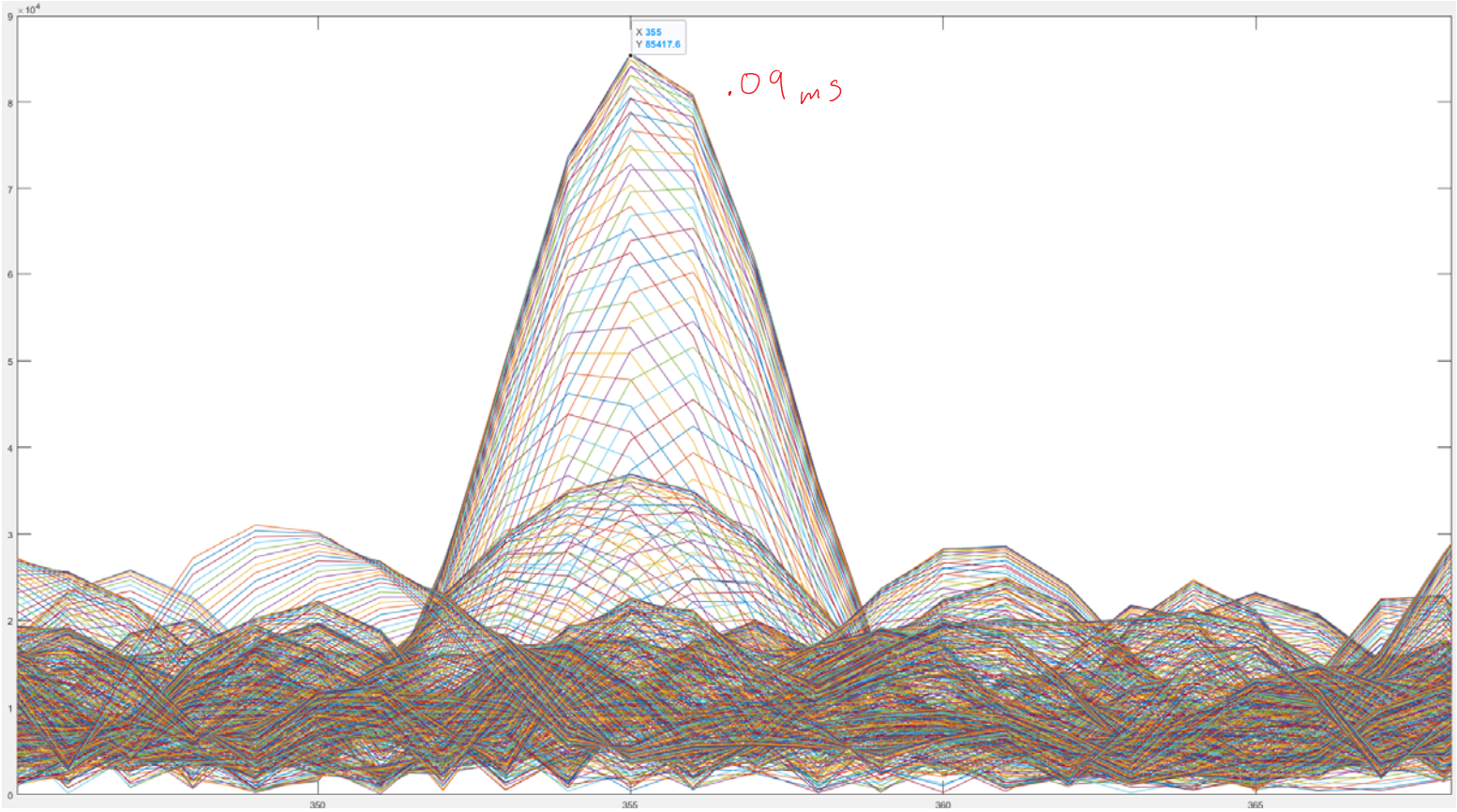
Thursday, February 24, 2022 2:18 AM

Visible Satellites:	Time delay (milliseconds)	Doppler Frequency (Hertz)
1	.997	
11	.089	
20	.313	
32	.923	-6500

Satellite #11



Satellite #11




```
% Set up some important variables

Fs = 4e6; % Sample rate of data [samples/second]

% GPS matched filter impulse responses
prn_code_id = [1:37]; %#ok<*NBRAK> % PRN code IDs
for GPS satellites (32 + extras = 37)
for i=1:length(prn_code_id)
  mf(:,i) = build_matched_filter(prn_code_id(i),Fs);
end
[Nh,~] = size(mf); % Get the length of the matched filter
impulse response

% Parameters for fast convolution
N = 2^17; % FFT size [samples]
MF = fft(mf,N); % Compute zero-padded DFT of matched
filters for frequency-domain processing

% Parameters for doppler frequency search
Fmax = 8000; % Maximum doppler frequency [Hz]
Fmin = -Fmax; % Minimum doppler frequency [Hz]
Fbin = Fs/N; % FFT bin width [Hz]
KFmax = ceil(Fmax/Fbin); % Number of frequency bins
(positive side)
KFmin = floor(Fmin/Fbin); % Number of frequency bins
(negative side)
ksearch = [KFmin:KFmax]; % Set of bins for doppler
frequency sesarch


% Read gps.dat
fid = fopen('gps.dat','rb'); % Open the file for binary read
Nx = N - Nh + 1; % Number of data samples so that Nx +
```

```
Nh - 1 = N
x = fread(fid,2*Nx,'int16=>float32'); % Read samples and
convert from short to float
fclose(fid); % Close the file
x = complex(x(1:2:end), x(2:2:end)); % Convert
interleaved real-imaginary to complex


% Transform and search

X = fft(x,N); % Compute zero-padded DFT of samples in x

% Begin search
for i=1:size(MF,2) % For loop over satellites
   figure(i);
 for k=1:length(ksearch) % For loop over cyclic shifts
(doppler frequency search)
      %shift, convolve, inverse FFT
    y = ifft(circshift(X,ksearch(k)).*MF(:,i));
      %trim
    y = y(Nh:2*Nh-1); % trim
      %add to plot
    plot(abs(y)); hold on;
 end
 hold off;
end
```