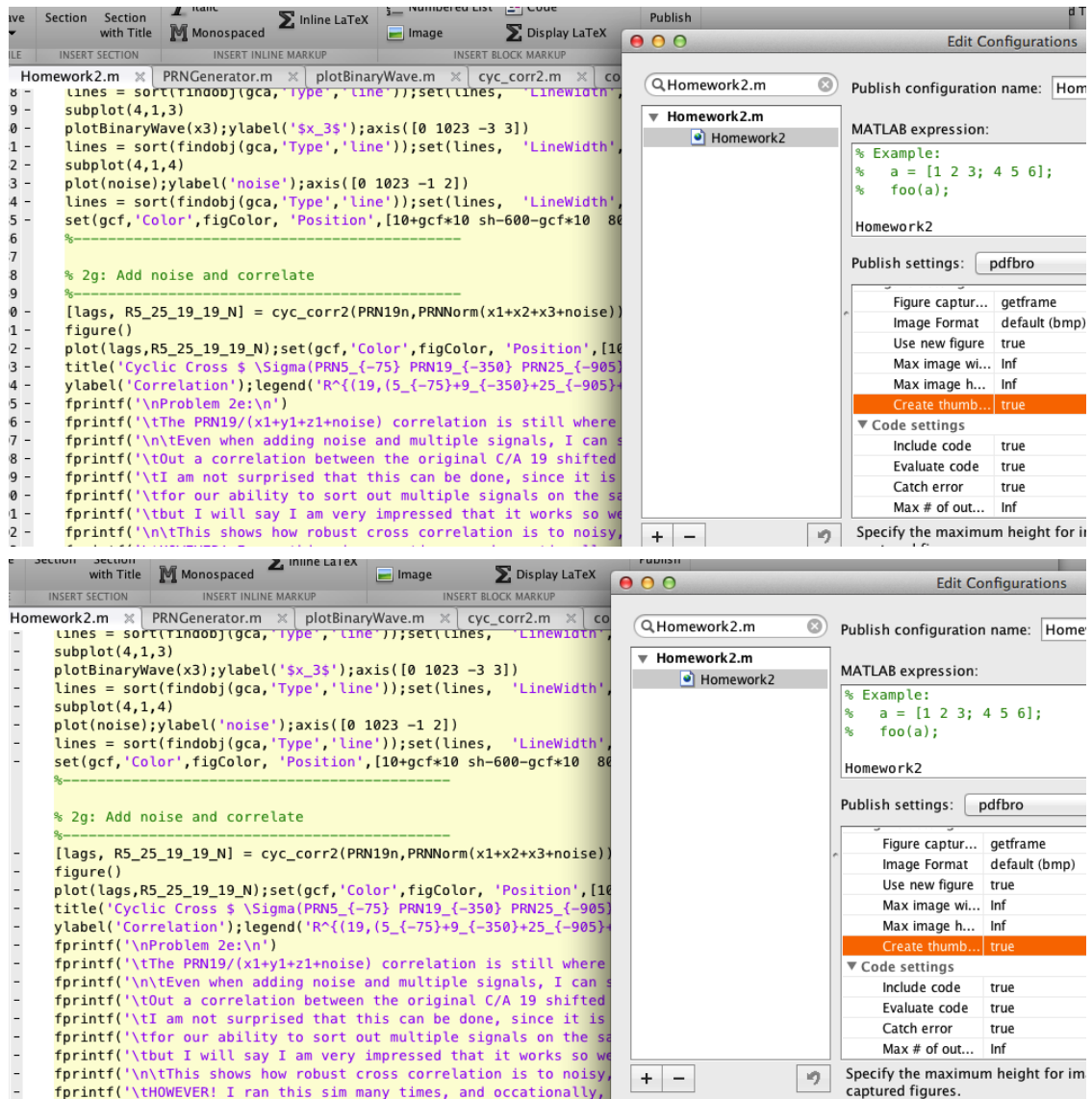
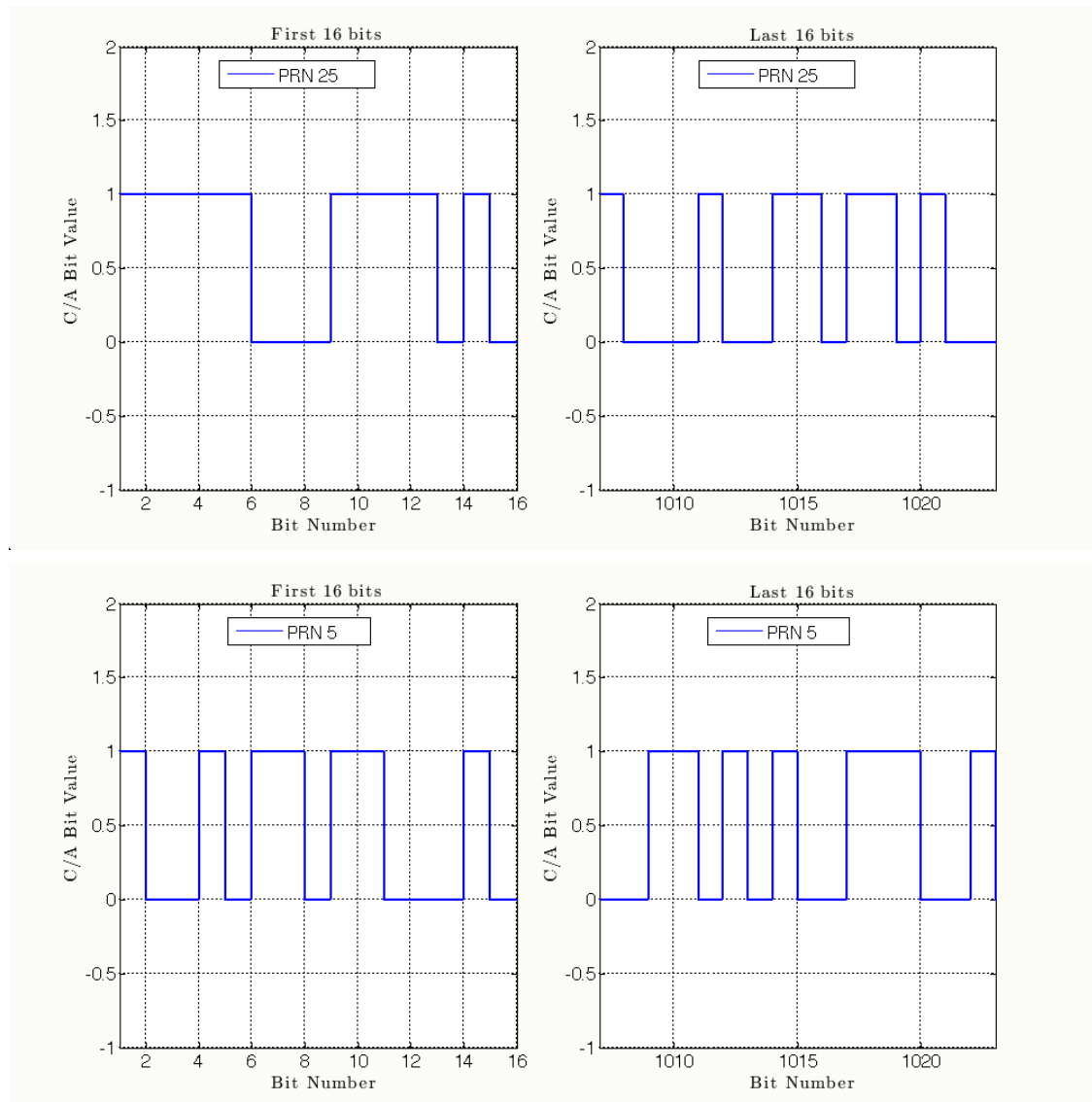


Problem 1c and 1d:

First 16bits of PRN 5's chip code is:

PRN ==> [1 0 0 1 0 1 1 0 1 1 0 0 0 1 0 0...]





Problem 2

2a: Plot autocorrelation of C/A code 19

```
%-----
PRN19n = PRNNorm(PRN(19,:));
PRN19=PRN(19,:);
[R19,lags] = xcorr(PRN19n);
figure()
plot(lags,R19);
set(gcf,'Color',figColor, 'Position',[10+gcf*10 sh-600-gcf*10 500 500])
title('PRN 19 Autocorrelation');xlabel('Lag');ylabel('Correlation');legend('R^{19}');
%-----
```

% 2b: Plot autocorrelation of C/A Code 19 delayed by 200 chips

```
%-----
PRN19n_200 = [PRN19n(end-199:end),PRN19n(1:end-200)];
```

```

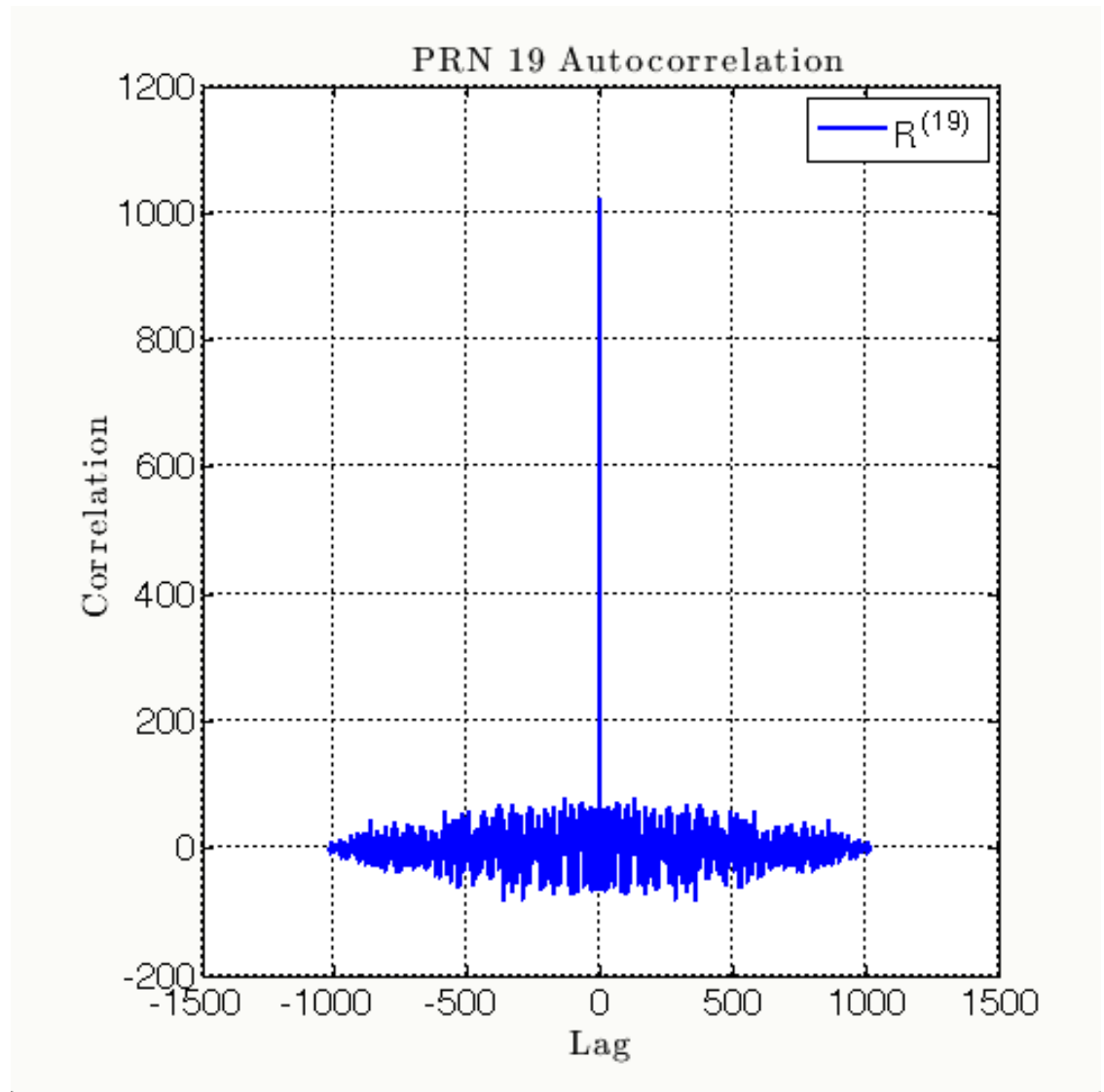
set(gcf,'Color',figColor, 'Position',[10+gcf*10 sh-600-gcf*10 700 500])
title('Cyclic Cross $ \Sigma(\text{PRN5}_{-75} \text{PRN19}_{-350} \text{PRN25}_{-905})$');xlabel('Lag')
ylabel('Correlation');legend('R^{(19,(5_{-75}+9_{-350}+25_{-905}))}');
fprintf('\nProblem 2e:\n')
fprintf('\tThe PRN19/(x1+y1+z1) correlation is exactly where I expect.\n')
fprintf('\n\tEven when adding signals, the summed signal correlates with \n')
fprintf('\tC/A 19 at the 350 chip offset. C/A 19 is still in the summed\n')
fprintf('\tsignal, just shifted by 350 chips. So the plot matches intuition\n')
%-----

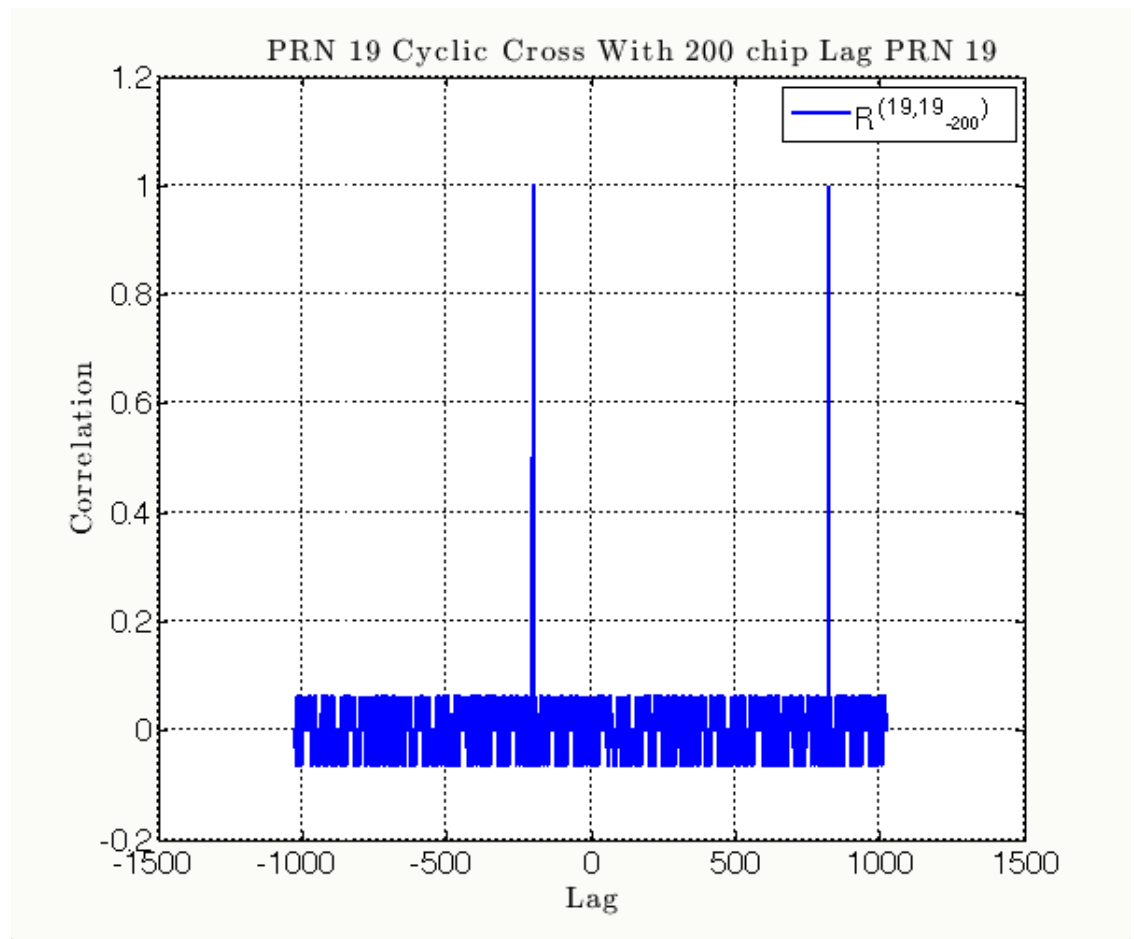
% 2f: Add noise
%-----
noise = 4*randn(1,1023);
figure();subplot(4,1,1)
plotBinaryWave(x1);ylabel('$x_1$');axis([0 1023 -3 3])
lines = sort(findobj(gca,'Type','line'));set(lines, 'LineWidth',1)
subplot(4,1,2)
plotBinaryWave(x2);ylabel('$x_2$');axis([0 1023 -3 3])
lines = sort(findobj(gca,'Type','line'));set(lines, 'LineWidth',1)
subplot(4,1,3)
plotBinaryWave(x3);ylabel('$x_3$');axis([0 1023 -3 3])
lines = sort(findobj(gca,'Type','line'));set(lines, 'LineWidth',1)
subplot(4,1,4)
plot(noise);ylabel('noise');axis([0 1023 -1 2])
lines = sort(findobj(gca,'Type','line'));set(lines, 'LineWidth',1)
set(gcf,'Color',figColor, 'Position',[10+gcf*10 sh-600-gcf*10 800 700])
%-----

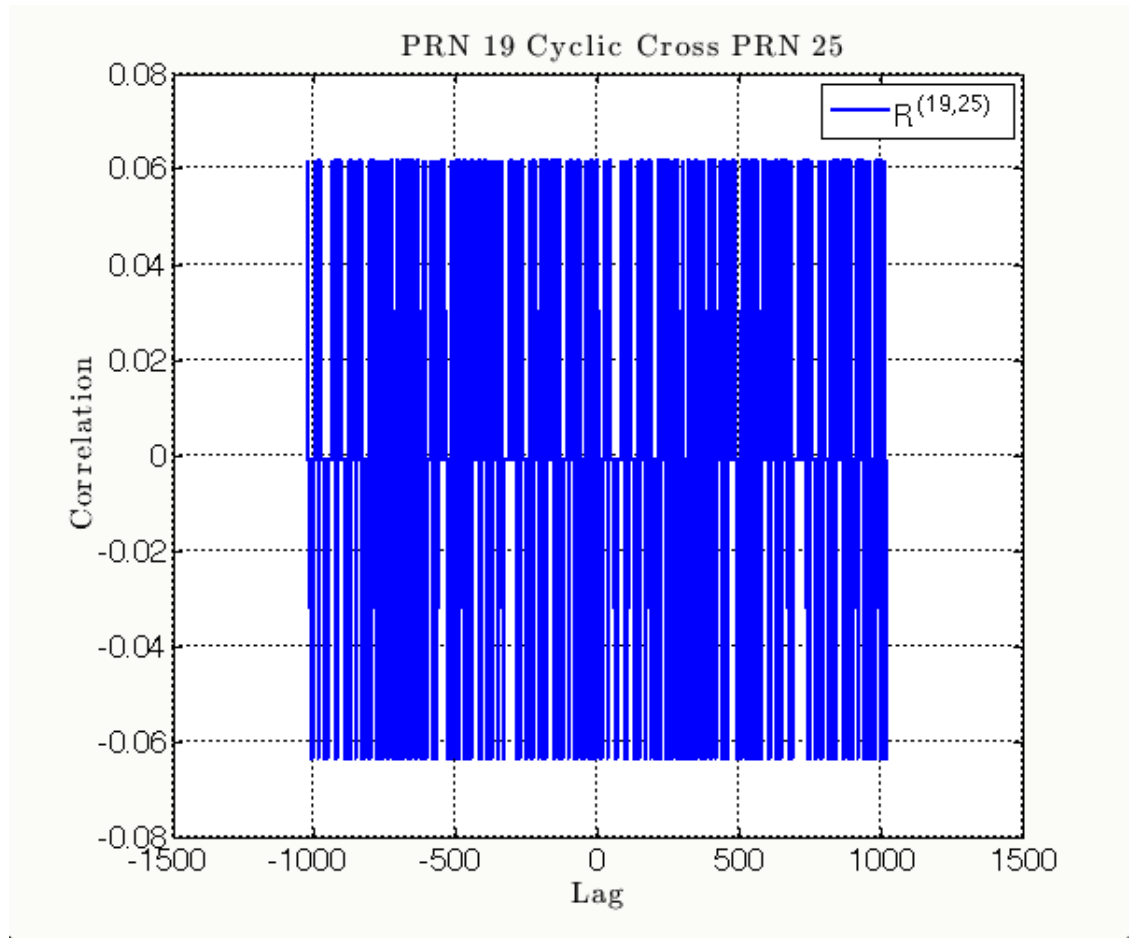
% 2g: Add noise and correlate
%-----
[lags, R5_25_19_19_N] = cyc_corr2(PRN19n,PRNNorm(x1+x2+x3+noise));
figure()
plot(lags,R5_25_19_19_N);set(gcf,'Color',figColor, 'Position',[10+gcf*10 sh-600-gc
title('Cyclic Cross $ \Sigma(\text{PRN5}_{-75} \text{PRN19}_{-350} \text{PRN25}_{-905})$ Noise)');xlabel
ylabel('Correlation');legend('R^{(19,(5_{-75}+9_{-350}+25_{-905}+Noise))}');
fprintf('\nProblem 2e:\n')
fprintf('\tThe PRN19/(x1+y1+z1+noise) correlation is still where I expect.\n')
fprintf('\n\tEven when adding noise and multiple signals, I can still pull \n')
fprintf('\tOut a correlation between the original C/A 19 shifted signal and C/A 19\n')
fprintf('\tI am not surprised that this can be done, since it is the basis\n')
fprintf('\tfor our ability to sort out multiple signals on the same frequency\n')
fprintf('\tbut I will say I am very impressed that it works so well\n')
fprintf('\n\tThis shows how robust cross correlation is to noisy, overlaid signal\n')
fprintf('\tHOWEVER! I ran this sim many times, and occasionally, there was no corr\n')
fprintf('\tevident. I guess this is the nature of noise! Sometimes it is \n')
fprintf('\tprecisely the wrong kind of noise\n')
%-----

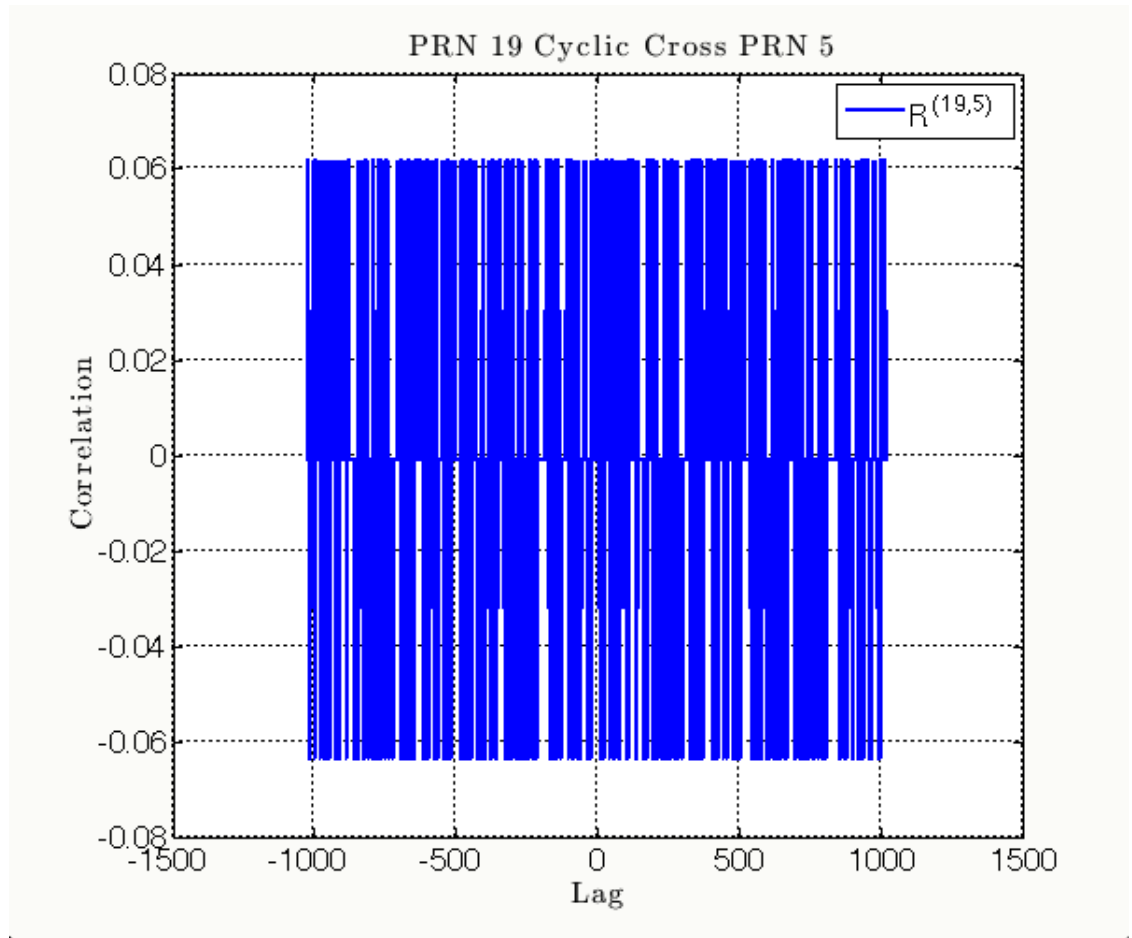
% [lag,R19] = cyc_corr2(PRNNorm(PRN19),PRNNorm(PRN19));
% figure
% subplot(1,2,1)
% plot(R19); title('$R^{(19)}$');
% subplot(1,2,2)
% plot(R19); title('Lag');

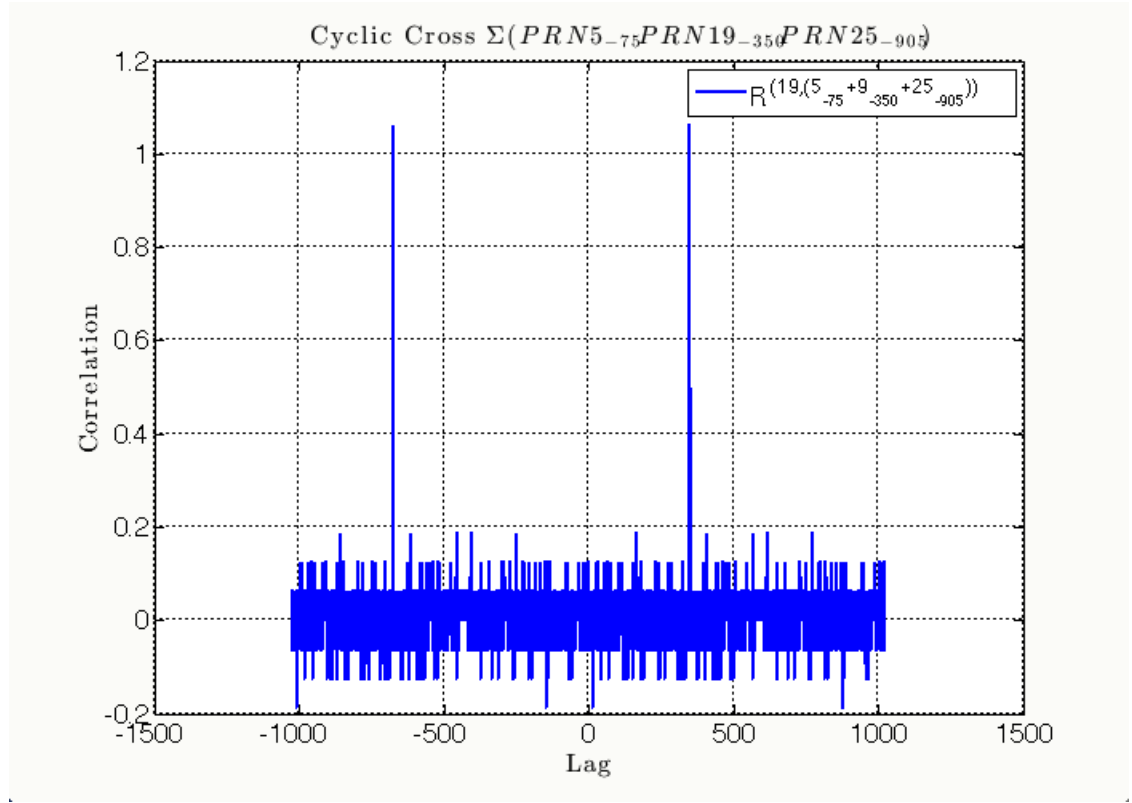
```

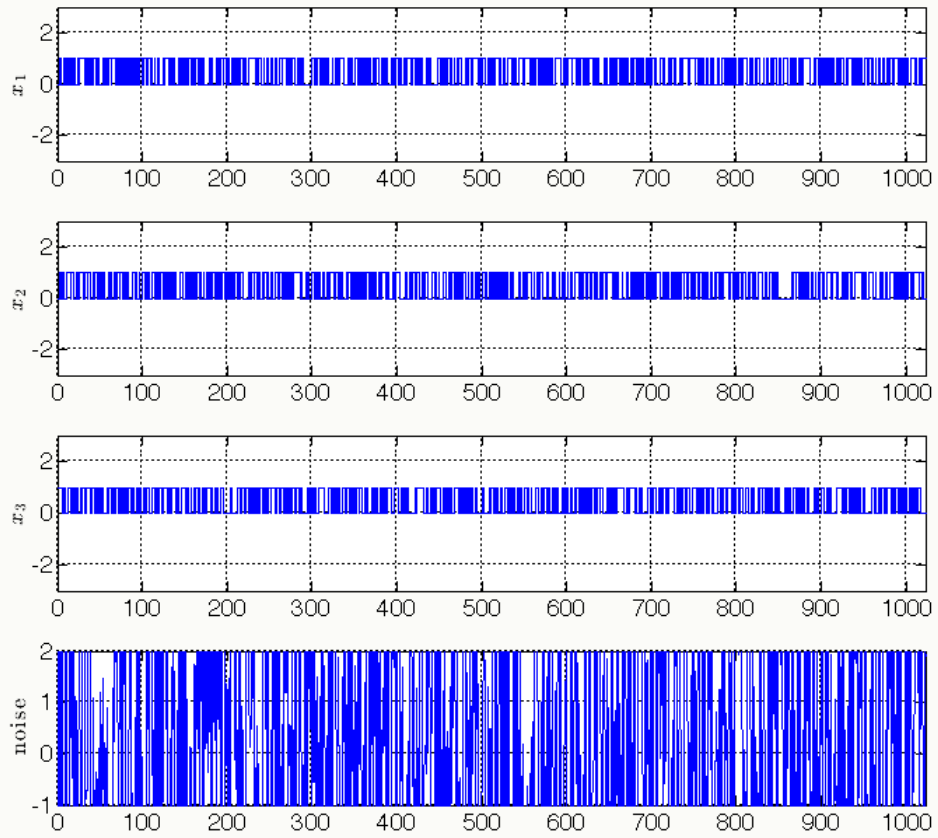


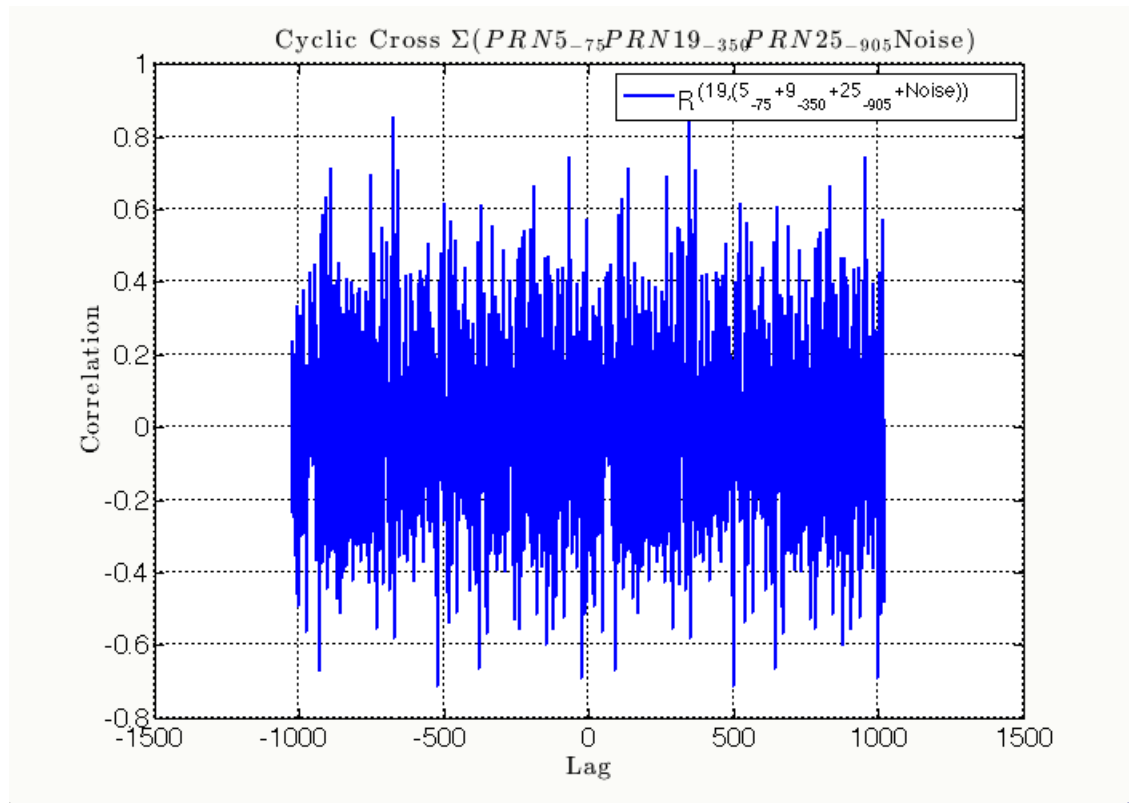












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