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```

clear;clc
% ==== System PARAMETERS ====
Rs = 1.92e6 ;
Ts = 1/Rs;
alpha = 0.5;
N_span = 6;           % Filter span (symbols)
OSR = 4;              % Upsampling factor
N= 144*1000;
SNR = 8;
refConstellation = (1/sqrt(2)) * [1+1i, -1+1i, -1-1i, 1-1i];

```

Design an RC filter

```

[h_filter1, t_filter1] = designPulseShapingFilter(Ts, alpha, 4, OSR, 'RRC');
[h_filter2, t_filter2] = designPulseShapingFilter(Ts, alpha, 6, OSR, 'RRC');
[h_filter3, t_filter3] = designPulseShapingFilter(Ts, alpha, 8, OSR, 'RRC');
[h_filter4, t_filter4] = designPulseShapingFilter(Ts, alpha, 10, OSR, 'RRC');
[h_filter5, t_filter5] = designPulseShapingFilter(Ts, alpha, 2, OSR, 'RRC');

```

```

figure;
subplot(3,2,1)
stem(t_filter1, h_filter1, 'filled');
hold on;
plot(t_filter1, h_filter1, '-');
hold off;
title('RRC Filter Impulse Response , span = 4');
xlabel('Time (s)');
ylabel('Amplitude');
grid on;
legend('Samples', 'Envelope', 'Location', 'best');

```

```

subplot(3,2,2)
stem(t_filter2, h_filter2, 'filled');
hold on;
plot(t_filter2, h_filter2, '-');
hold off;
title('RRC Filter Impulse Response , span = 6');
xlabel('Time (s)');
ylabel('Amplitude');
grid on;
legend('Samples', 'Envelope', 'Location', 'best');

```

```

subplot(3,2,3)
stem(t_filter3, h_filter3, 'filled');
hold on;
plot(t_filter3, h_filter3, '-');
hold off;
title('RRC Filter Impulse Response , span = 8');
xlabel('Time (s)');
ylabel('Amplitude');
grid on;
legend('Samples', 'Envelope', 'Location', 'best');

```

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```

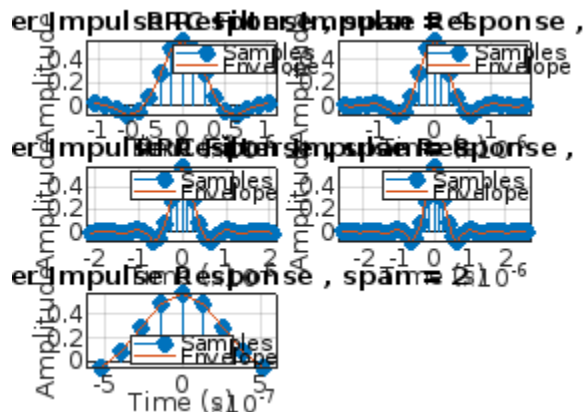
subplot(3,2,4)
stem(t_filter4, h_filter4, 'filled');
hold on;
plot(t_filter4, h_filter4, '-');
hold off;
title('RRC Filter Impulse Response , span = 10');
xlabel('Time (s)');
ylabel('Amplitude');
grid on;
legend('Samples', 'Envelope', 'Location', 'best');

```

```

subplot(3,2,5)
stem(t_filter5, h_filter5, 'filled');
hold on;
plot(t_filter5, h_filter5, '-');
hold off;
title('RRC Filter Impulse Response , span = 2');
xlabel('Time (s)');
ylabel('Amplitude');
grid on;
legend('Samples', 'Envelope', 'Location', 'best');

```



==== Generate random symbols (e.g., QPSK) ====

```

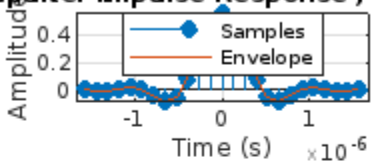
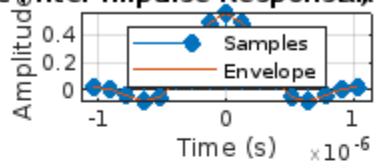
data = randi([0 1],1,N);
[I,Q] = QPSK(data);
% ==== Upsample symbols ====
I_upsampled = zero_stuffing(I,OSR);

% ==== Apply RRC Filter ====
I_filtered1 = conv(I_upsampled,h_filter1,'same') ;
I_filtered2 = conv(I_upsampled,h_filter2,'same') ;
I_filtered3 = conv(I_upsampled,h_filter3,'same') ;
I_filtered4 = conv(I_upsampled,h_filter4,'same') ;
I_filtered5 = conv(I_upsampled,h_filter5,'same') ;

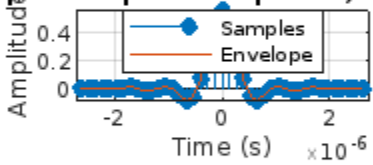
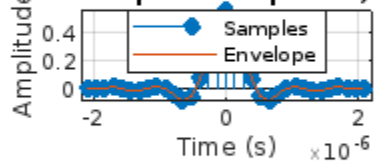
eyediagram(I_filtered1,OSR)

```

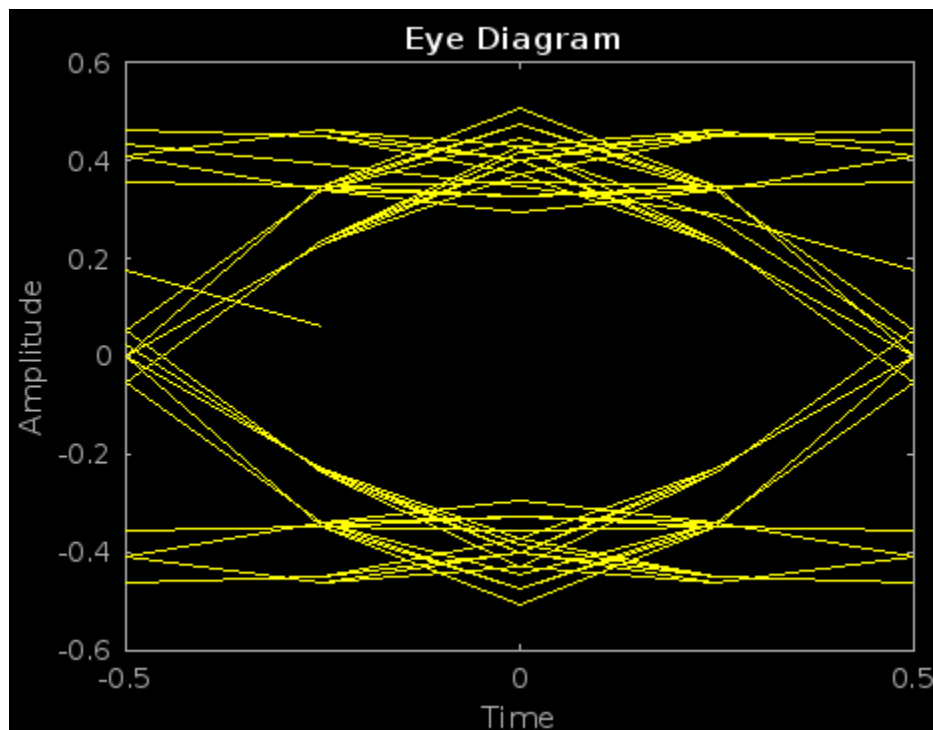
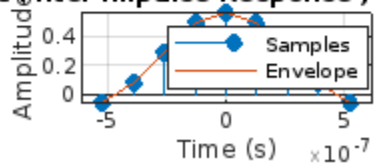
IRC Filter Impulse Response, span = 6



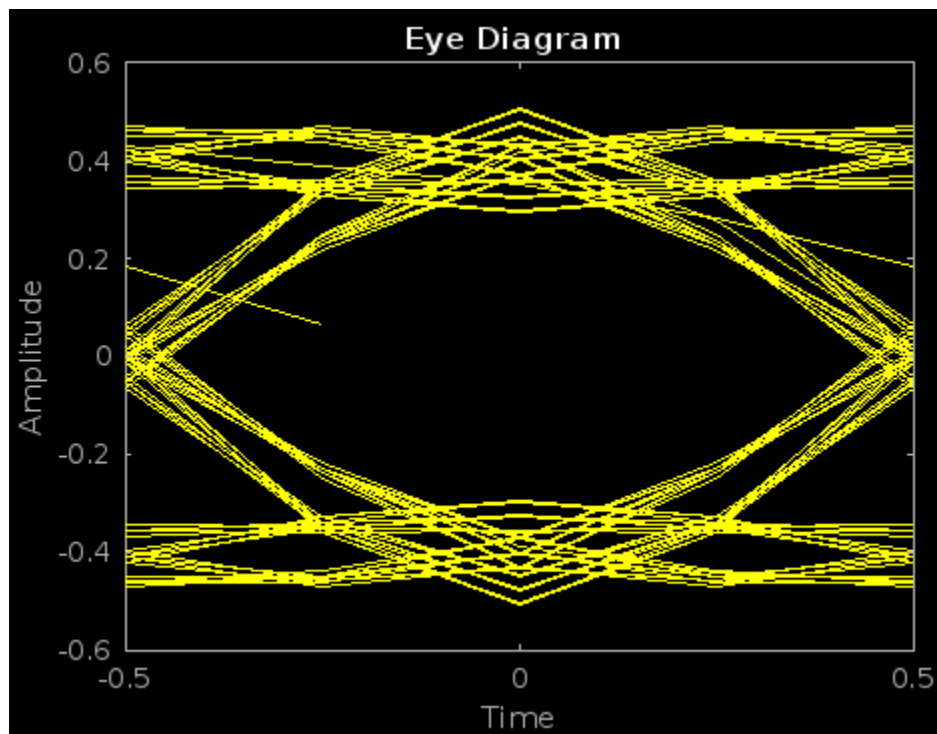
IRC Filter Impulse Response, span = 10



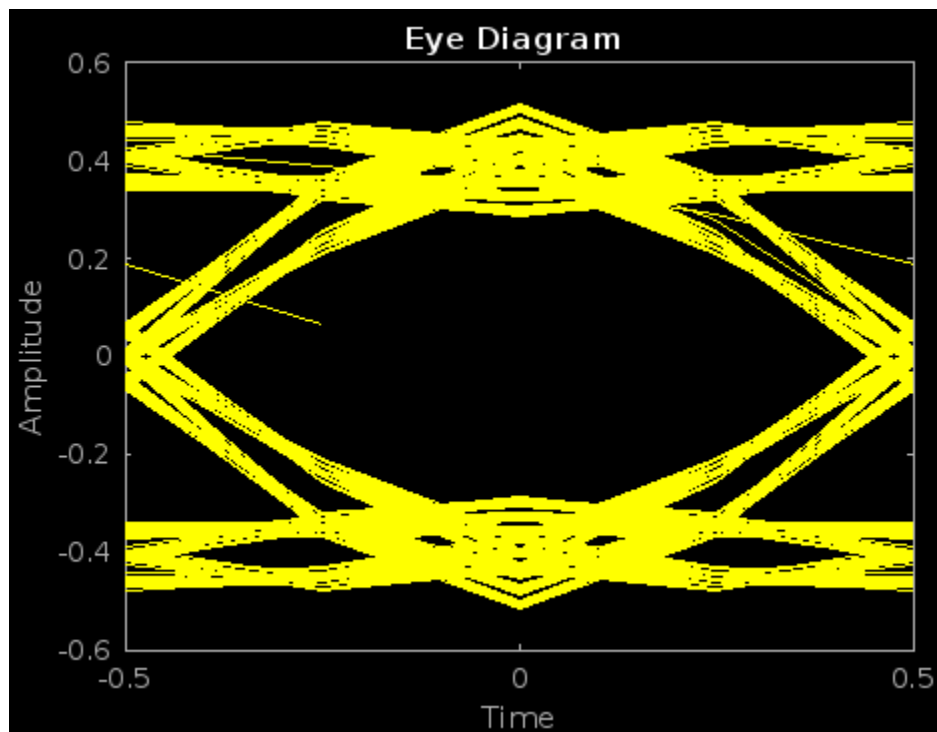
IRC Filter Impulse Response, span = 2



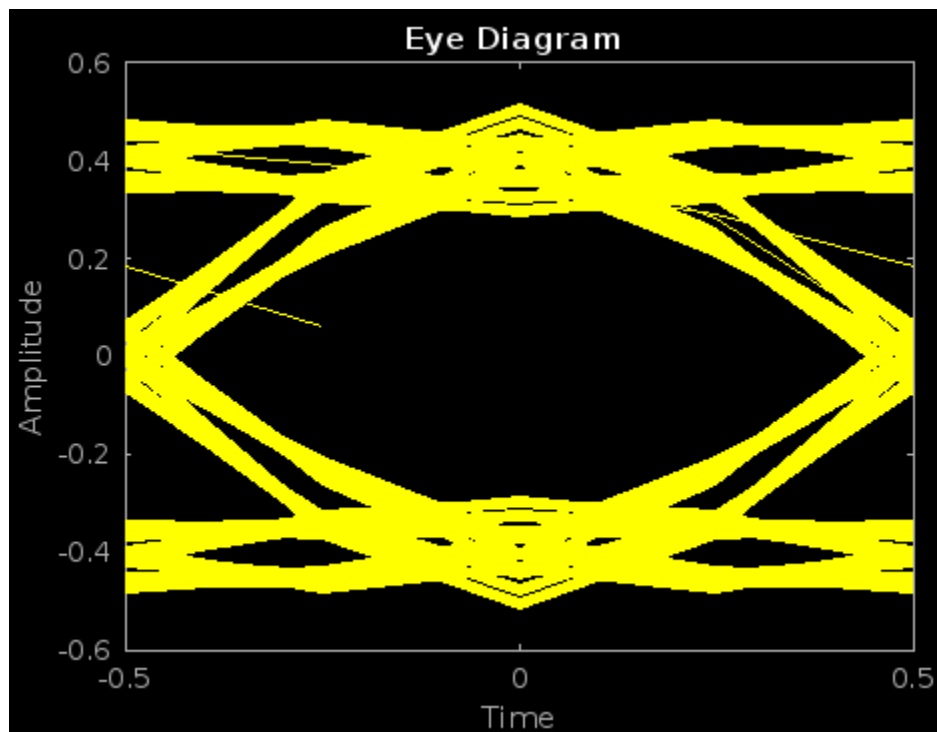
eyediagram(I\_filtered2,OSR)



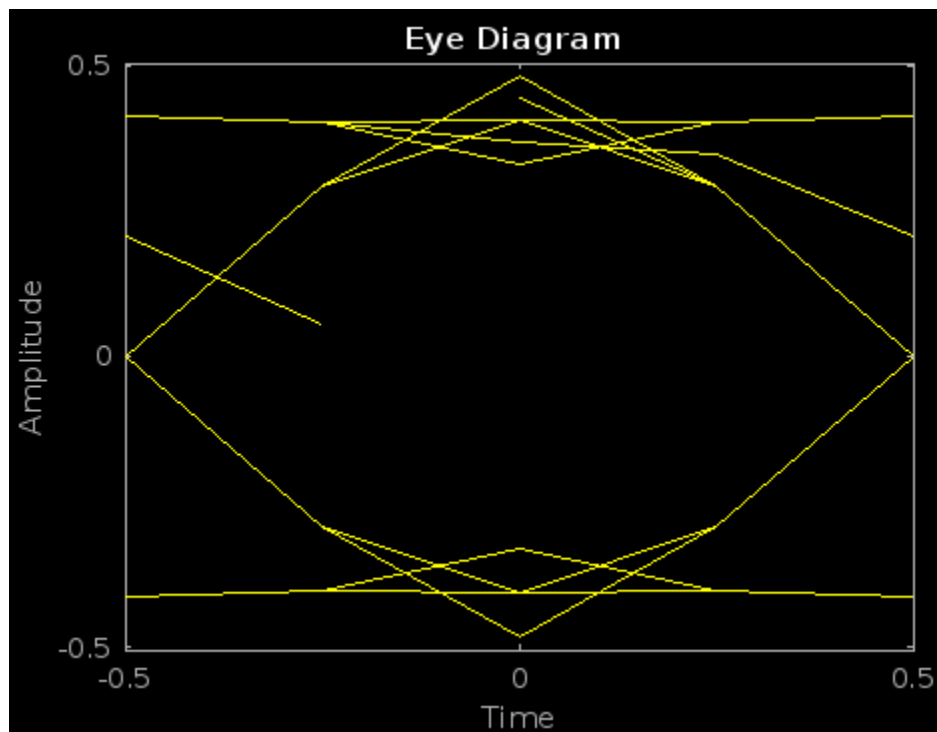
`eyediagram(I_filtered3,OSR)`



`eyediagram(I_filtered4,OSR)`



`eyediagram(I_filtered5,OSR)`



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