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Receiver Impairments and compensation

Transmit and receive some symbols through an AWGN channel, taking into consideration that the IQ receiver has some DC offset and phase mismatch and crosstalk.

```
clc; clear; close all;
```

Parameters

```
mod_type = ModulationTypes.QAM;     % Modulation type.
M = 16;                             % Modulation order.
symbol_qtty = 1e4;                  % Amount of symbols to send.
L = 10;                             % Oversampling factor.
nTaps = 30;                         % Taps for pulse shaping FIR filters.
beta = 1;                           % Slope of the SRRC filter.
EsNo_dB = 20;                       % EsNo

% Change the behaviour of the IQ receiver here
gain = 0.9;                         % Gain mismatch [times]
phi = 8;                            % Phase mismatch [degree]
dc_i = 1.7;                         % DC offset for In-phase branch.
dc_q = 1.9;                         % DC offset for Quadrature branch.
```

Transmitter

```
d = randi([0, M-1], 1, symbol_qtty);
[u, constellation] = Modulator.modulate(d, mod_type, M);
v = Modulator.upsample(u, L);
[s, p, delay_tx] = Modulator.pulse_shaping_srrc(v, beta, L, nTaps);
```

Channel

```
[r, h_c] = Channel.add_awgn_noise(s, EsNo_dB, L);
```

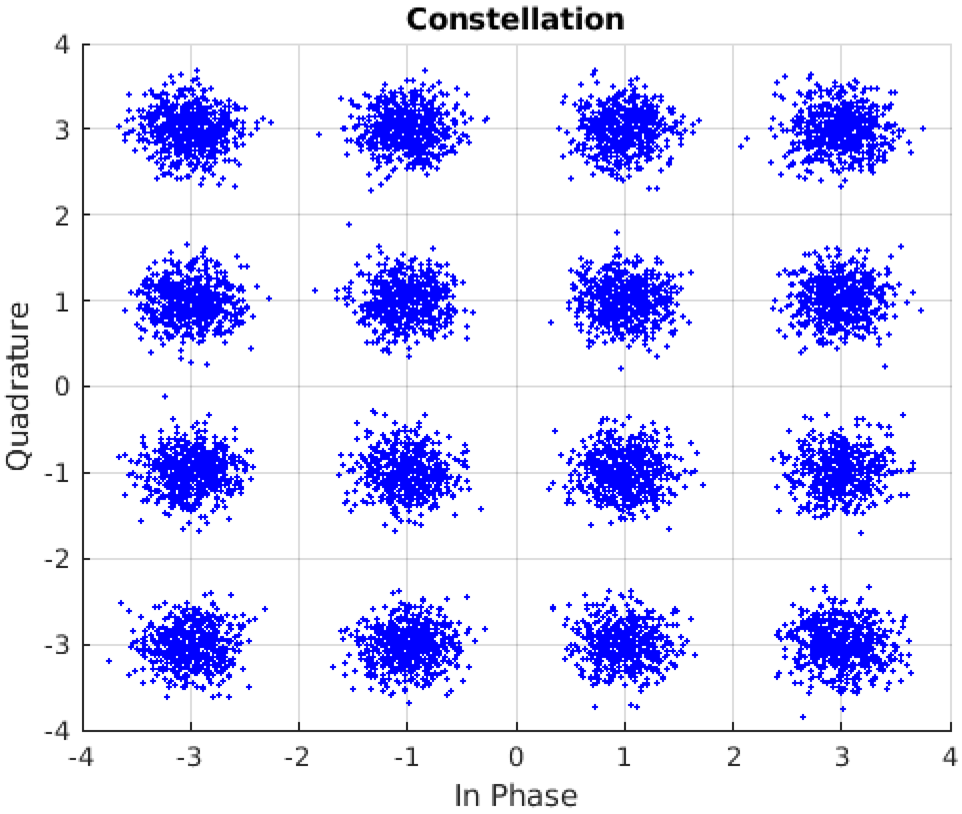
Receiver

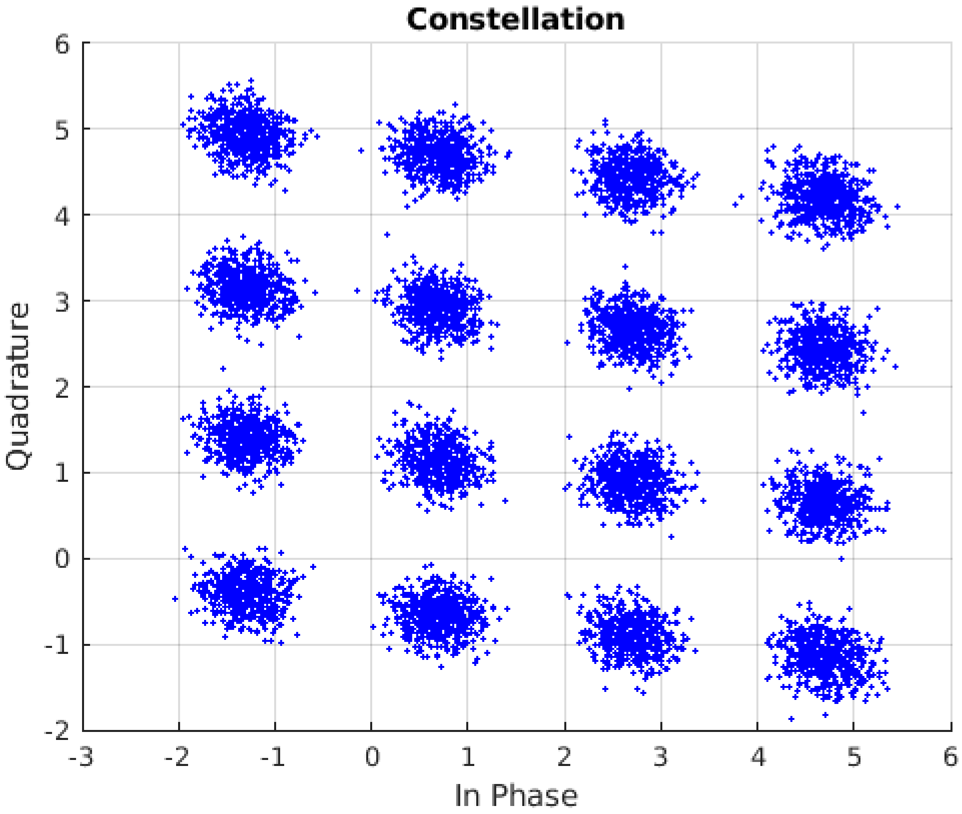
```
r = Demodulator.flat_fading_equalizer(r, h_c);
```

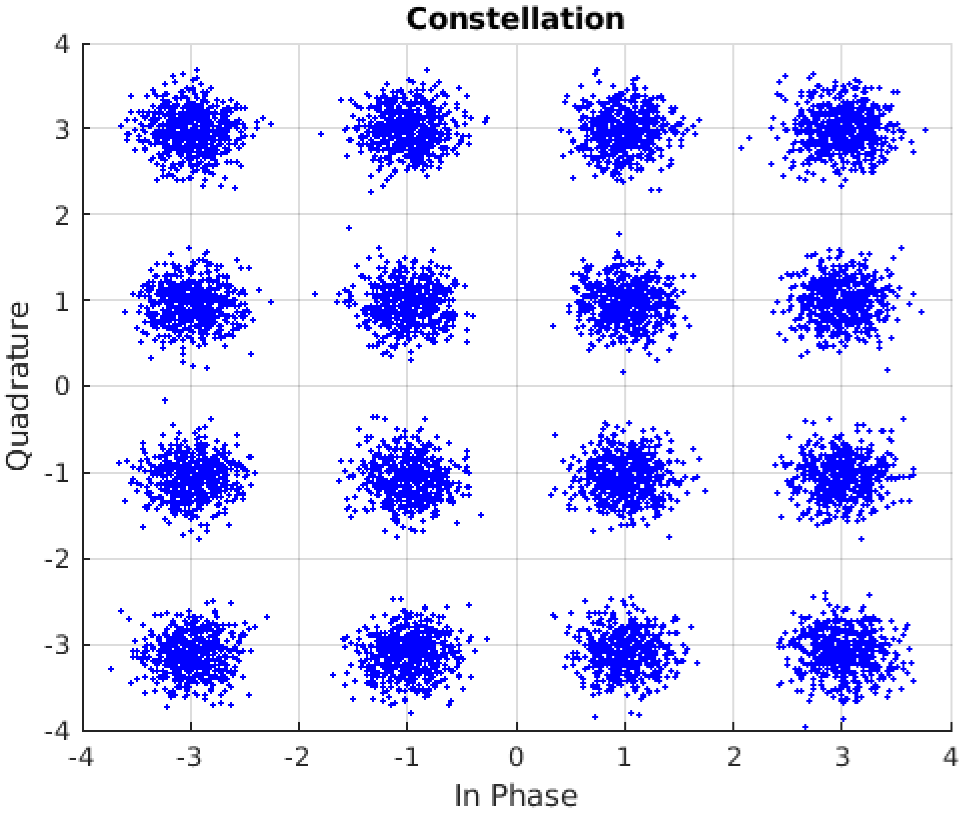
```
[v_r, g, delay_rx] = Demodulator.pulse_filter_srrc(r, beta, L, nTaps);
u_r = Demodulator.downsample(v_r, L, delay_tx + delay_rx);

z = Demodulator.receiver_impairments(u_r, gain, phi, dc_i, dc_q);
w = Demodulator.blind_iq_compensation(z, constellation);
d_r = Demodulator.demodulate(u_r, mod_type, M, constellation);
```

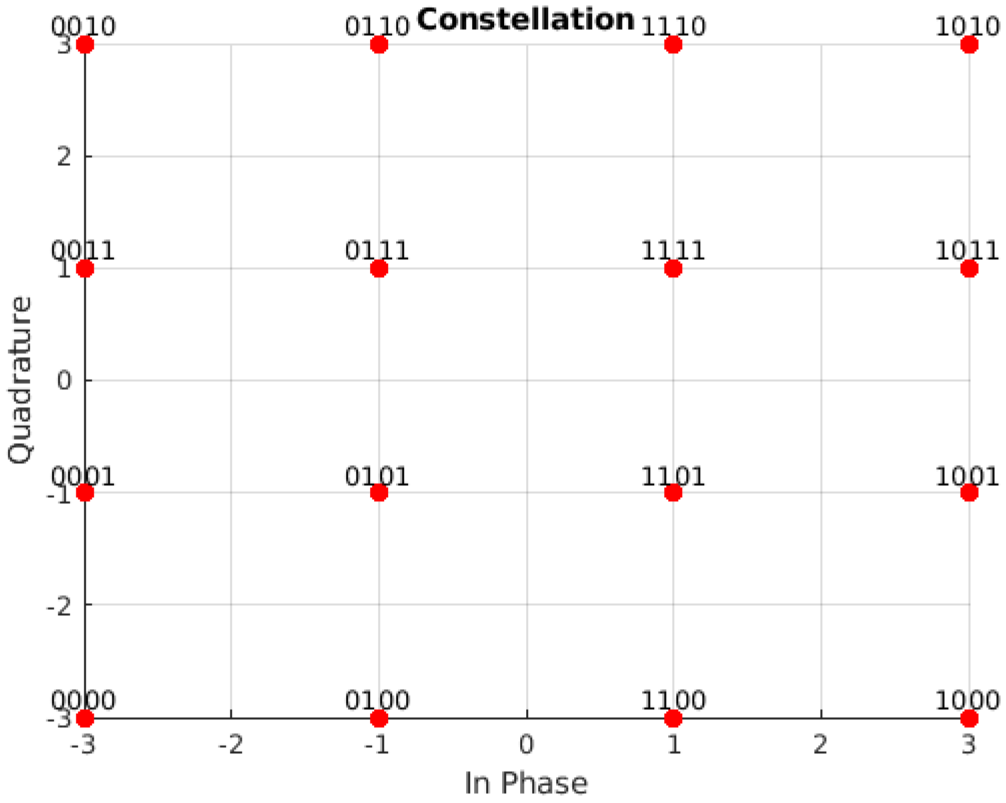
Plotting

```
Scope.plot_IQ(u_r);
Scope.plot_IQ(z);
Scope.plot_IQ(w);
Scope.plot_constellation(constellation);
```




Constellation
Quadrature
In Phase
6
5
4
3
2
1
0
-1
-2
-3
-2
-1
0
1
2
3
4
5
6


Constellation
Quadrature
In Phase
4
3
2
1
0
-1
-2
-3
-4
-4
-3
-2
-1
0
1
2
3
4



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