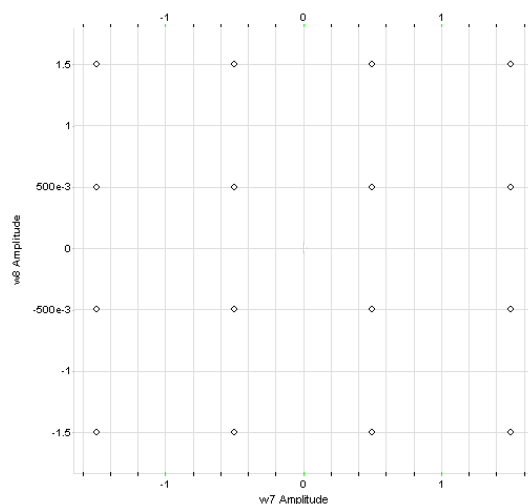
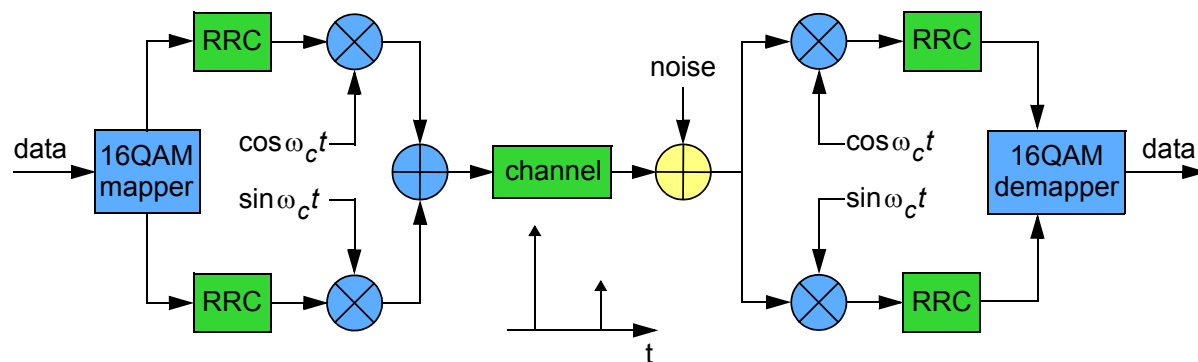
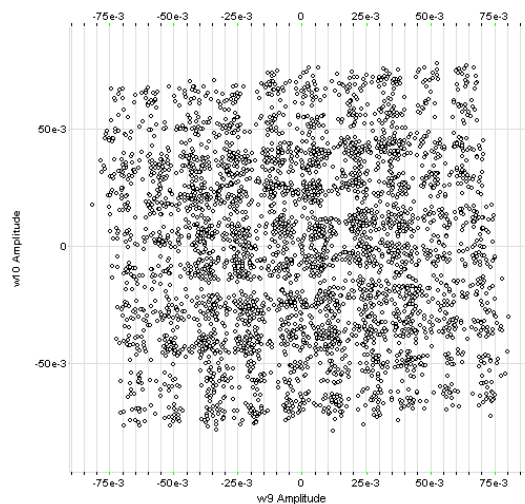


# Block Diagram: 16QAM System

6.18



transmitted signal constellation



received signal constellation

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## Notes:

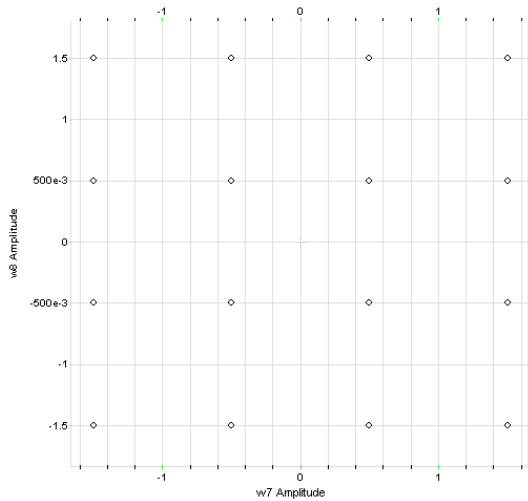
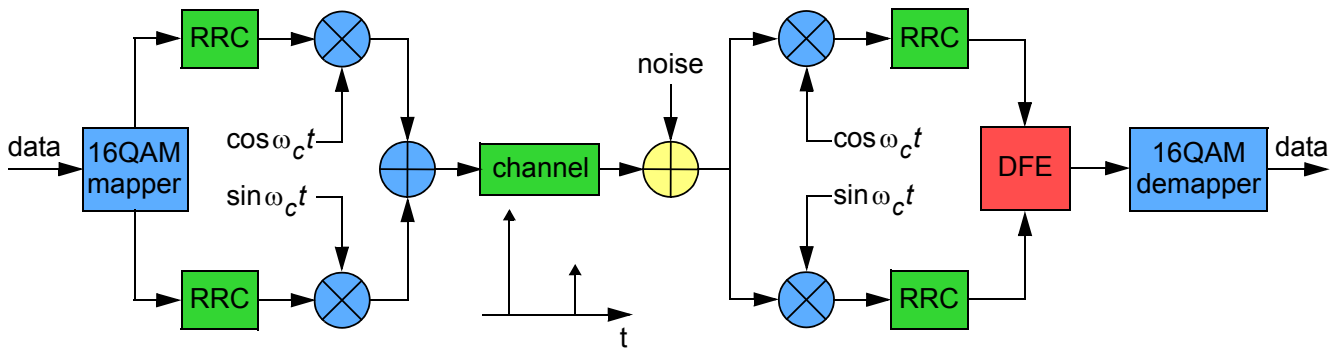
The block diagram of the 16QAM system under consideration is shown above. A multipath static channel with two multipath components is considered. The constellation of transmitted and received signals are shown. Observe the effect of the channel on the received signal constellation. Three main elements can be observed:

- change in amplitude: the amplitude of the received signal constellation is different from that of the transmitted signal. This is due to attenuation suffered during propagation;
- change in phase: the constellation block appears slightly rotated;
- dispersion of the constellation points: the well defined points of the original constellation are dispersed over a larger area, this is due mainly to the additive white Gaussian noise introduced in the channel and to the multipath.

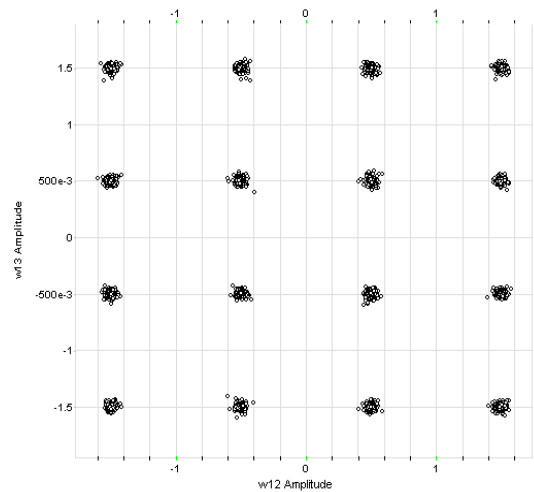
Next the use of an equaliser is presented. Its aim is to compensate for the distortion introduced in the channel.

# 16QAM System: Equalisation

6.19



transmitted signal constellation



equalised signal constellation

## Notes:

The use of a decision feedback equaliser (DFE) has corrected the distortion introduced by the channel. Observe the constellation of the received signal and note how the amplitude change, phase rotation and constellation dispersion due to multipath has been removed. The imperfection which can be observed in the constellation as a dispersion of the points (they appear as a cloud rather than as individual points) is due to the noise introduced in the channel which the equaliser cannot remove.

The structure of the decision feedback equaliser (baud spaced) is shown below, where  $\Delta$  is the sampling period.

