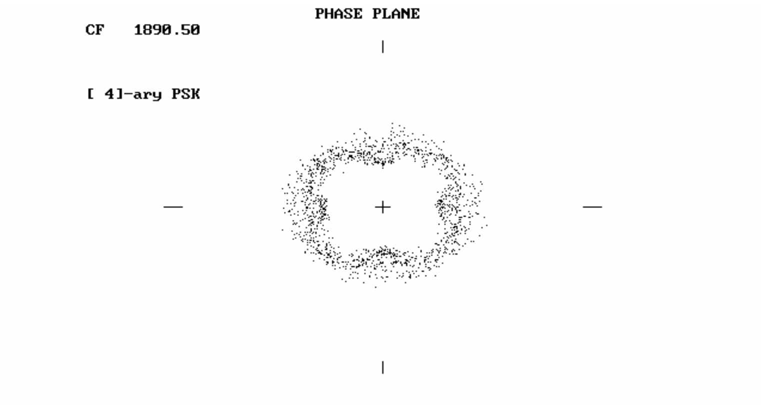
OQPSK

OQPSK (offset QPSK) is a special version of QPSK in which the transmitted signal has no amplitude modulation. This disadvantage of a amplitude modulation are a result of 180° shifting in the phase.
In OQPSK the incoming signal is divided in the modulator into two portions I and Q which are then transmitted shifted by a half symbol duration.

The phase plane of a OQPSK is shown in the following picture. There is no phase shift through the zero crossing which means there are no phase shifts by 180° as in a standard QPSK.



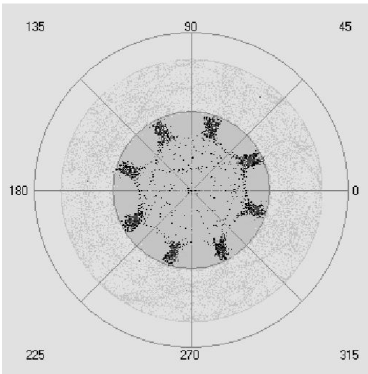
Picture 12: Phase plane of a OQPSK

SQPSK Modulation

Staggered quadriphase shift keying. Same as OQPSK

8-PSK

In a 8-PSK instead of 4 phase shifts 8 are used.



Picture 13: Phase Plane of 8-PSK

DBPSK

DPSK with 2 phase shifts at ± 180 degrees.

DPSK

In a DPSK (Dfferential Phase Shift Keying) information is transmitted based on phase shifts relative to preceding phase changes in the carrier. So only the total phase difference to the preceding shift will show the transmitted value.

With differential PSK the absolute carrier phase cannot be used for data recovery as is the case with BPSK and QPSK. To decode multiphase DPSK (up to 16DPSK) the input signal is mixed with a complex, phase regulated reference signal. The resulting data reduced signal is then filtered in a low pass filter. In the following phase comparator the phase difference is calculated from the integrator and the delayed signal.

DQPSK

DPSK but with four phase shifts at ± 90 and ± 180 degrees.

Di-bit value	DQPSK
00	π/4
01	3π/4
10	-π/4
11	-3π/4

Table 2: Bit values for DQPSK

D8PSK

DPSK but with eight phase shifts at ±45, ±90, ±135 and ± 180 degrees.

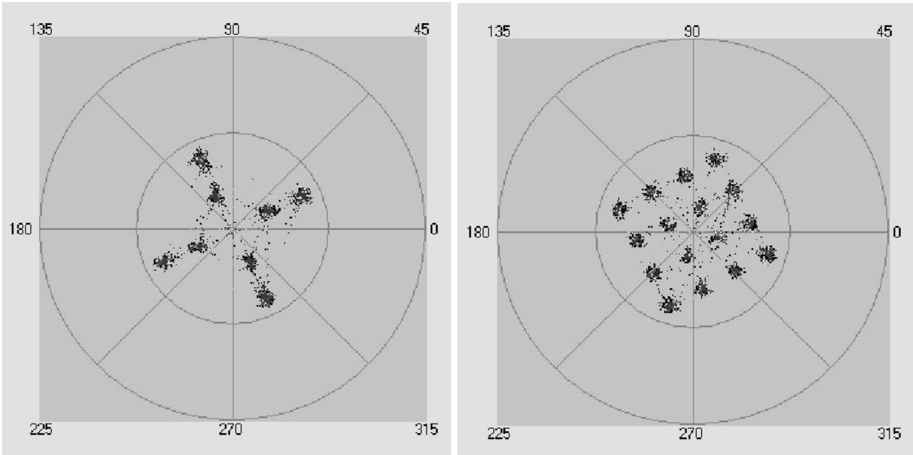
Quadrature Amplitude Modulation (QAM)

Quadrature amplitude modulation (QAM) is a modulation scheme in which two techniques are combined: amplitude modulation and phase shift keying (PSK). A combination of two amplitude levels and a QPSK would result in a 8QAM with 8 states representing 8 different bit sequences:

Bit Sequence	Amplitude Level	Phase Shift
000	1	0°
001	2	0°
010	1	90°
011	2	90°
100	1	180°

Bit Sequence	Amplitude Level	Phase Shift
101	2	180°
110	1	270°
111	2	270°

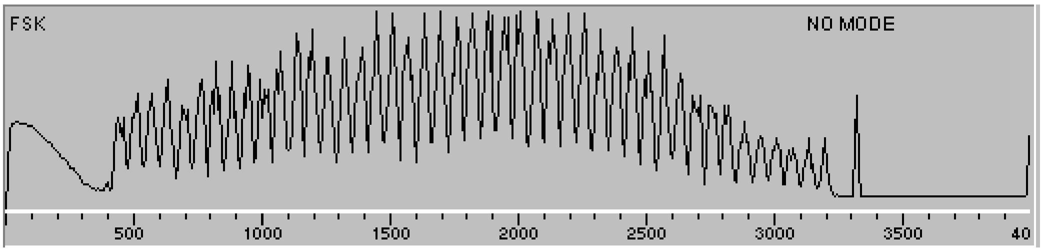
Table 3: Bit values for QAM



Picture 14: example of an 8QAM and 16QAM in the Phase Plane

Orthogonal Frequency Division Multiplexing (OFDM)

In an OFDM a single high-frequency carrier is replaced by multiple sub carriers, each operating at a significantly lower frequency. It is a special method of multi-carrier modulation. OFDM transmits multiple high data rate signals concurrently on different frequencies. The channel spectrum is passed into a number of independent non-selective frequency sub-channels and these sub channels are used for one transmission link between two stations.



Picture 15: Spectrum of OFDM with 45 channels