



Application Note #5479

Discussion of CPFSK and GFSK Modulation

April 10, 2009

CPFSK (Continuous-phase frequency-shift keying) and GFSK (Gaussian frequency-shift keying) are both form of FSK (Frequency-shift keying).

FSK is a way of modulating digital data onto a sinusoidal carrier wave, encoding the data as variations in the carrier's instantaneous frequency between the "space frequency" (generally encoding a Binary 0) and the "mark frequency" (generally encoding a Binary 1). The modulated waveform in FSK switches instantaneously between the two frequency waveforms. This switching leads to discontinuities in the signal. The discontinuities lead to a large percentage of the signal's power to occur outside of the intended band (i.e. the signal "splatters" outside of its specified channel frequency).

CPFSK is a variant of FSK that keeps the phase of the signal continuous, avoiding the discontinuities of FSK that can cause the signal "splatter". This keeps a signal's power more within its specified band.

GFSK (used by FreeWave® radios) is also a variant of FSK. GFSK is also continuous-phase, like CPFSK. In addition, the baseband pulses are passed through a Gaussian filter prior to the data modulation. This helps to shape the signal pulses into a smoother form. This "shaping" smoothes out the phase of the signal, preventing signal "splatter" and keeping the signal's power within its specified band.

GFSK, as used by FreeWave® radios, is an improved extension of CPFSK where additional filtering is used. It can be thought of like this: If CPFSK is an economy coupe, then GFSK is a luxury sedan. They are both cars, but one is much better than the other.