MSK Demodulator Component

FM3TR Waveform Reference Implementation

SDR Forum Contract

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Revision 1.0

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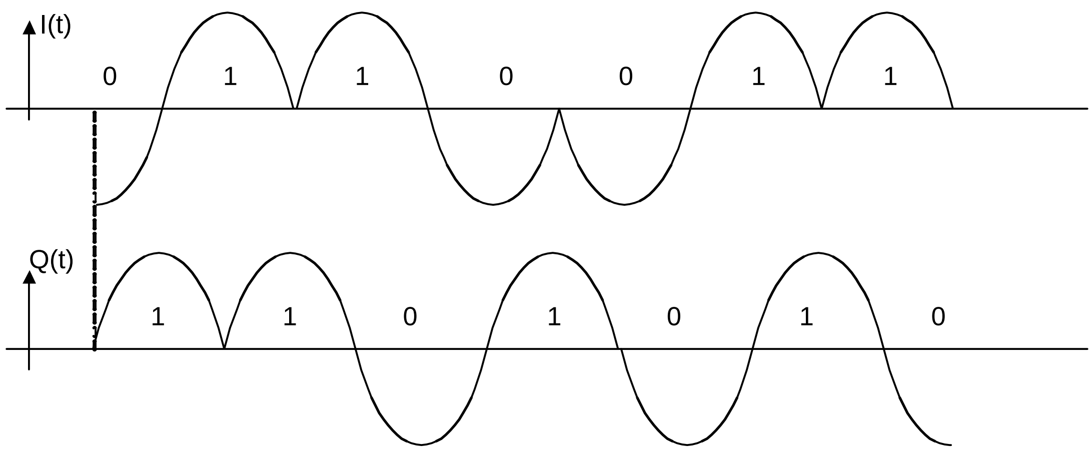
1 Component Name

MSK Demodulator

2 Component Processing Summary

Minimum shift keying (MSK) is a spectrally efficient digital modulation scheme used to represent data bits as an analog signal. Although MSK is actually a variant of binary frequency shift keying (BFSK), it is more commonly understood to operate similar to the well-known quadrature phase shift keying (QPSK) with a half sine-wave pulse shapes with in-phase (I) and quadrature (Q) symbols offset by exactly one symbol period. This translates to a complex baseband envelope with a constant amplitude and linear transitions between the symbols. The figure below depicts the baseband I/Q signal for MSK modulation:



3 Where used

The MSK Demodulator is used in all waveforms with an RF interface. This includes both voice and data waveforms.

4 Data Input and Output Ports

The MSK demodulator component has one uses and one provides data port. The input data port (MSK_DeodulatorIn) accepts a sequence of signed complex short integers representing the time domain baseband signal. After demodulating, the component pushes a sequence of signed octets, one byte for each data “bit,” to the output data port (MSK_DemodulatorOut).

5 Control Interfaces

The MSK demodulator inherits the control interfaces from CF::Resource.

6 Component SCA Properties

Aside from the DLL execparams, the MSK demodulator contains no additional SCA properties.

7 Component Attributes/Key Variables

Below is a list of several key variables to the MSK decoder component with a brief description of their purpose.

`m_j_pulse_shape`	Half sine-wave pulse shape
`m_pulseEnergy`	Energy of `m_j_pulse_shape` used for matched filter
`m_uiSamplesPerSymbol`	The number of samples in `m_j_pulse_shape` and incoming signal

8 Processing Details

The MSK demodulator uses a matched filter to translate the incoming waveform into a stream of bits. The matched filter is implemented in the Demodulate() method, while SymbolSync() determines the initial optimal sampling times.

8.1 Method: Demodulate()

The Demodulate() method implements a matched filter by correlating the incoming baseband signal with the template pulse shape, `m_j_pulse_shape`. The method makes assumptions about the incoming signal:

1. The signal is at true baseband and has absolutly no carrier offset
2. There exists no phase ambiguity between the in-phase and quadrature channels

8.2 Method: SymbolSync()

Incoming signals might be offset by a fraction of a symbol duration, thus symbol synchronization for over-the-air signals is necessary. The SymbolSync() method uses an energy detector for determining the optimal sampling time.