Octave and LimeSDR

Danny Webster

Table of Contents

1. Introduction
2. SSB Demo
3. FSK Demo
4. ASK Demo
5. PSK Demo

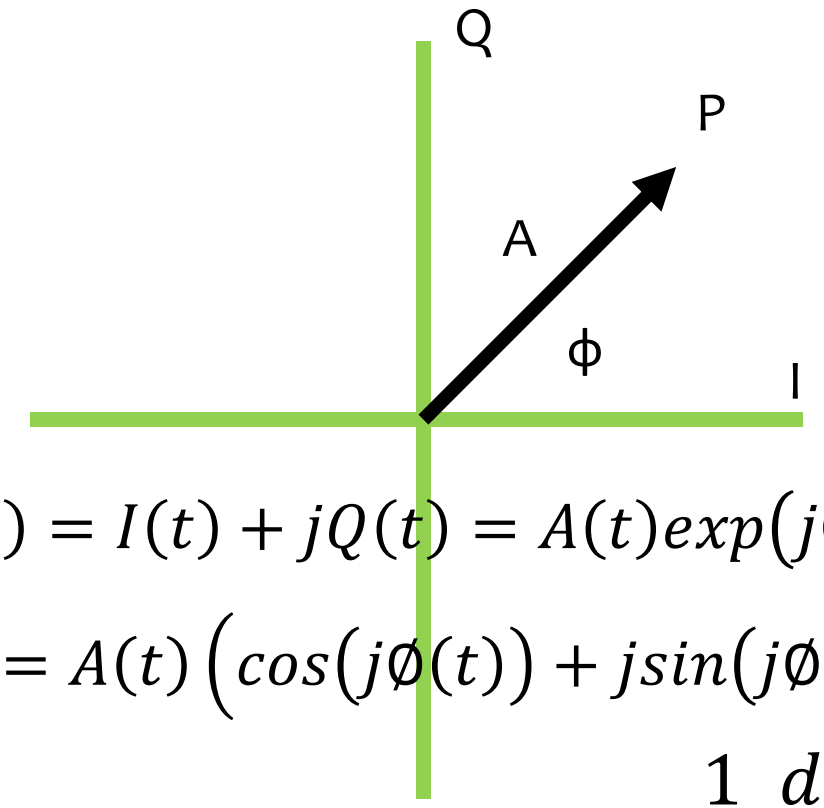
Getting started with Octave

- **Linux 4.0.0**
- **Dependencies**
  - Liboct-dev
  - General, Control, Communications
  - Signal, Socket
- **Lime Packages**
  - Limesdr-1.0.0.tar.gz
  - Limesp-1.0.0.tar.gz
  - Copy to ~/octave
  - Octave
  - Pkg install Limesdr-1.0.0.tar.gz
  - Pkg install Limesp-1.0.0.tar.gz

- **Windows 4.0.3**
- **Command/System**
  - Cd %USERPROFILE%
  - Mkdir octave
  - Add to PATH
- **Lime Packages**
  - Limesdr-1.0.0.tar.gz
  - Limesp-1.0.0.tar.gz
  - Copy to UserName\octave
  - Extract dll into this directory
  - Octave
  - Pkg install ~/octave/Limesdr-1.0.0.tar.gz
  - Pkg install ~/octave/Limesp-1.0.0.tar.gz

Representing Modulation in Octave

- **AM, FM and PM can be represented by**
- **Cartesian co-ordinates {x,y}**
  - In Radio, called Inphase and Quadrature
  - Real, Imaginary (Complex Numbers).
  - Programming real() imag()
  - Note i and j mean the same.
- **Polar co-ordinates (Vector Modulation)**
  - Natural language for describing Amplitude and Phase modulation.
  - Amplitude A, Phase φ
  - Phase is usually in radians not degrees.
  - Programming abs() arg() exp(i*)
  - Frequency is a phase that changes at a constant rate.



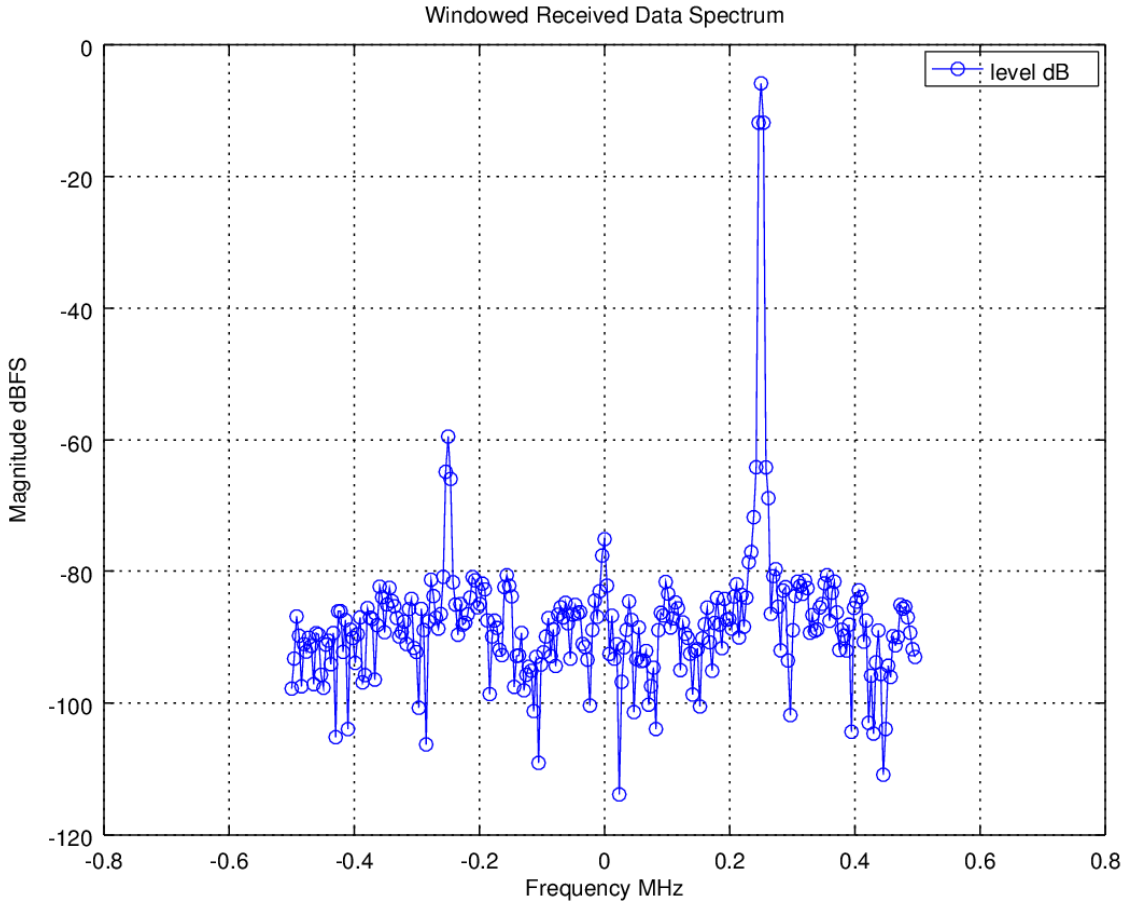
$$P(t) = I(t) + jQ(t) = A(t)exp\big(j\emptyset(t)\big)$$

$$P(t) = A(t)\Big(cos\big(j\emptyset(t)\big) + jsin\big(j\emptyset(t)\big)\Big)$$

$$f = \frac{1}{2\pi}\frac{d\emptyset(t)}{dt}$$

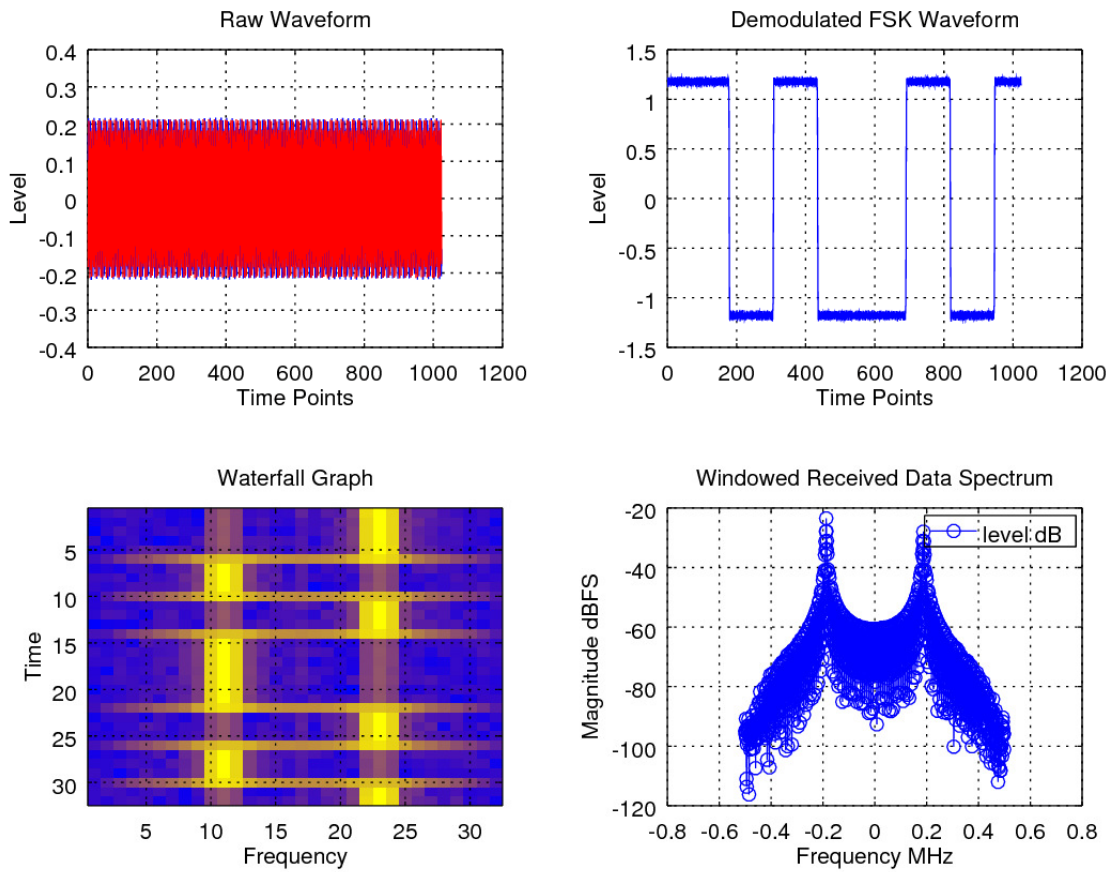
Single Sideband Demo

- **Demonstrates**
  - Octave link with LimeSDR
  - SSB Generation
  - FFT with Hanning Window
- **Settings File**
  - .ini generated in LimeSuite
  - 866MHz -50dBm for table top license exempt transmission.



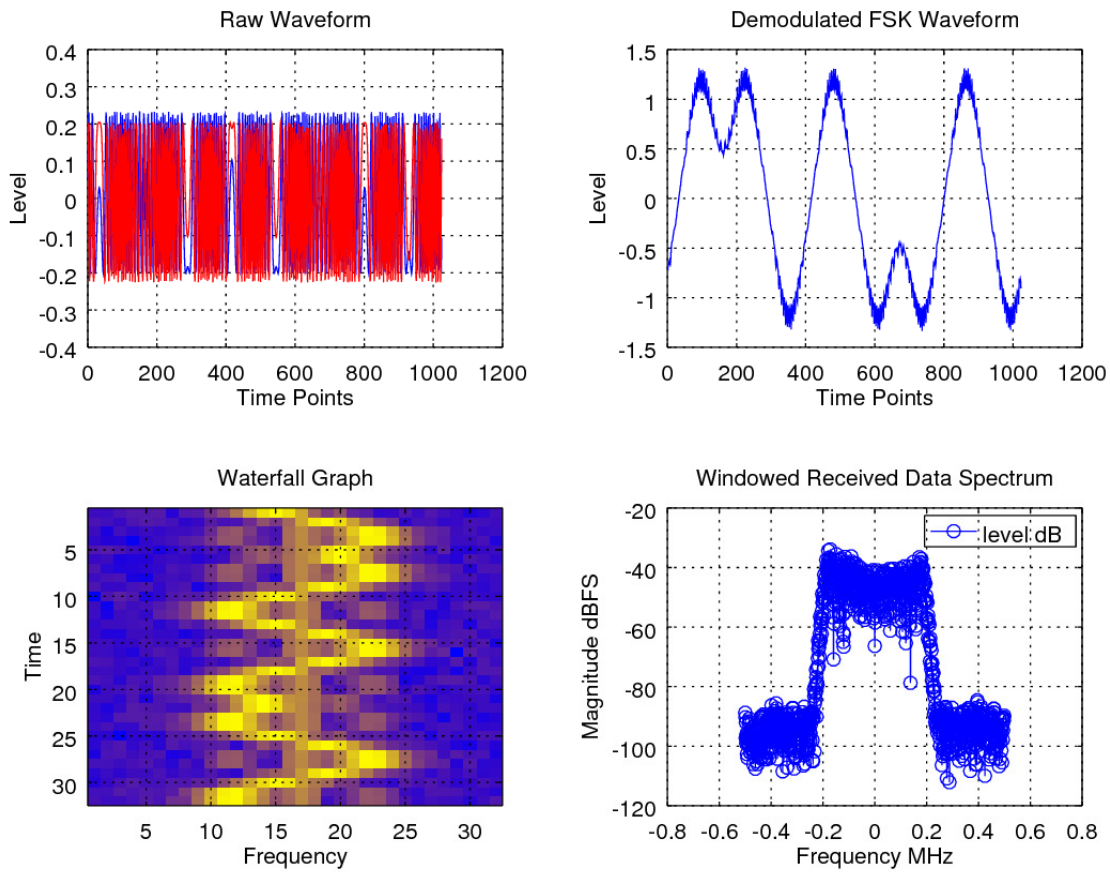
Frequency Shift Keying Demo

- **FSK.m**
  - Fir=0
- **Demonstrates**
  - Octave link with LimeSDR
  - FSK generation
  - FM/FSK demodulation.
  - Waterfall type graphs
- **Settings File**
  - .ini generated in LimeSuite
  - 866MHz -50dBm for table top license exempt transmission.



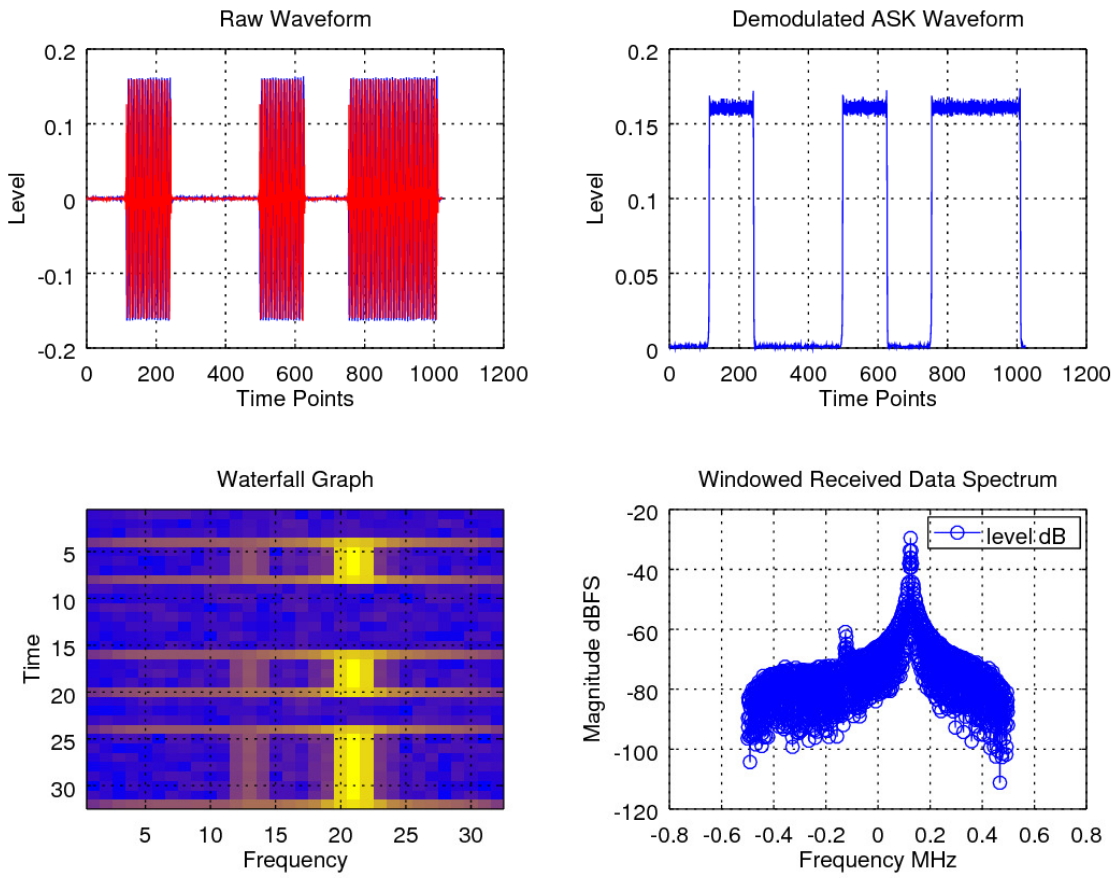
Frequency Shift Keying Demo

- **FSK.m**
  - Fir=1
- **Demonstrates**
  - FIR filtering
  - Bandwidth limiting
- **Settings File**
  - .ini generated in LimeSuite
  - 866MHz -50dBm for table top license exempt transmission.



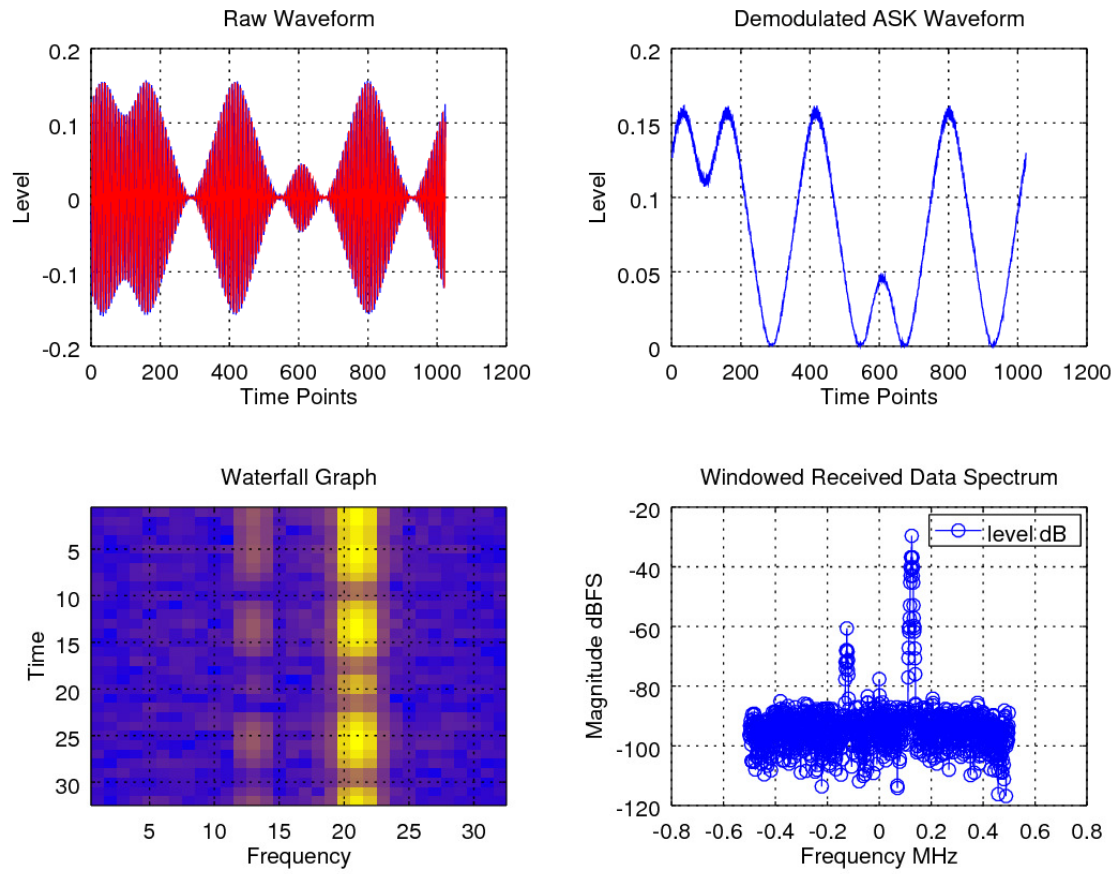
Amplitude Shift Keying Demo

- **ASK.m**
  - Fir=0
- **Demonstrates**
  - Octave link with LimeSDR
  - ASK generation
  - AM/ASK demodulation.
  - Waterfall type graphs
- **Settings File**
  - .ini generated in LimeSuite
  - 866MHz -50dBm for table top license exempt transmission.



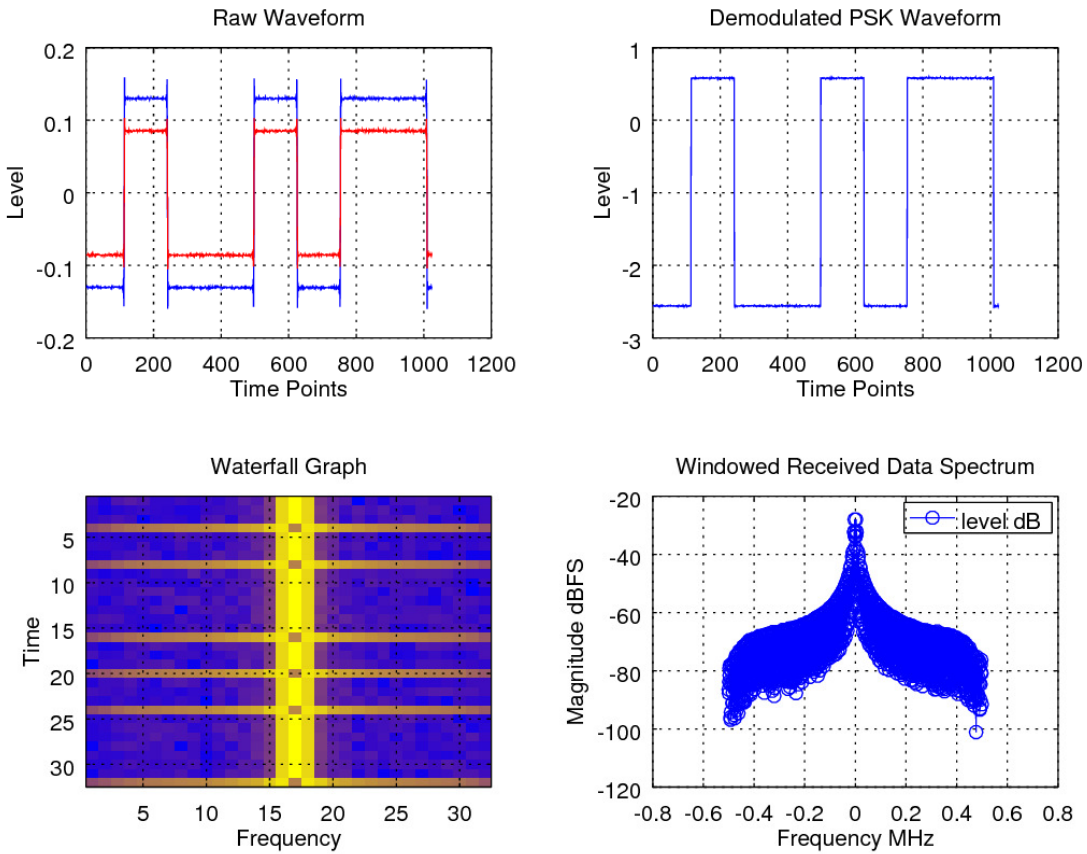
Amplitude Shift Keying Demo

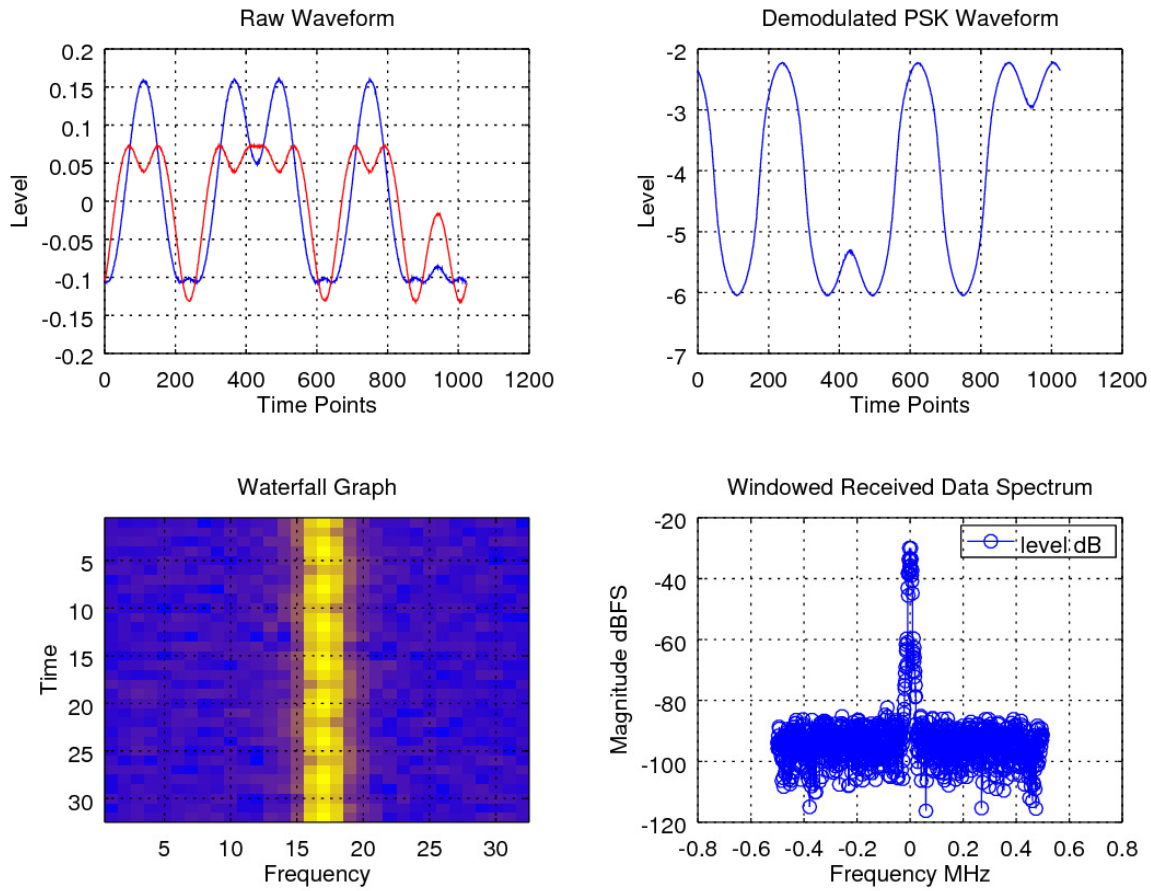
- **ASK.m**
  - Fir=0
- **Demonstrates**
  - FIR filtering
  - Bandwidth limiting
- **Settings File**
  - .ini generated in LimeSuite
  - 866MHz -50dBm for table top license exempt transmission.



Phase Shift Keying Demo

- **PSK.m**
  - Fir=0
- **Demonstrates**
  - Octave link with LimeSDR
  - PSK generation
  - PM/PSK demodulation.
  - Waterfall type graphs
- **Settings File**
  - .ini generated in LimeSuite
  - 866MHz -50dBm for table top license exempt transmission.



Phase Shift Keying Demo

- **PSK.m**
  - Fir=0
- **Demonstrates**
  - FIR filtering
  - Bandwidth limiting
- **Settings File**
  - .ini generated in LimeSuite
  - 866MHz -50dBm for table top license exempt transmission.