WICOMM-T

The Ultimate Wireless Digital Communication Training System – SDR Platform

Over the past two decades, a major transition has occurred from analog modulation to digital modulation techniques in communication systems. Moreover, while communication systems were initially established as voice networks, they now have to accommodate computer data as well as multimedia content. And, as more and more users join the communication network the need for efficient use of available bandwidth in the RF spectrum becomes even more important. Especially given that every service provider has to pack as much data as possible – into the allotted RF bandwidth – to meet establishment expenses and recurring spectrum license fees.

Digital modulation techniques provide more information carrying capacity, better quality communication, data security and RF spectrum sharing to accommodate more services when compared to analog modulation. All modern communication systems and gadgets today use various forms of digital modulation techniques, such as PSK, MSK, QAM as well as multiplexing techniques such as TDMA and CDMA, to pack more in the available RF bandwidth.

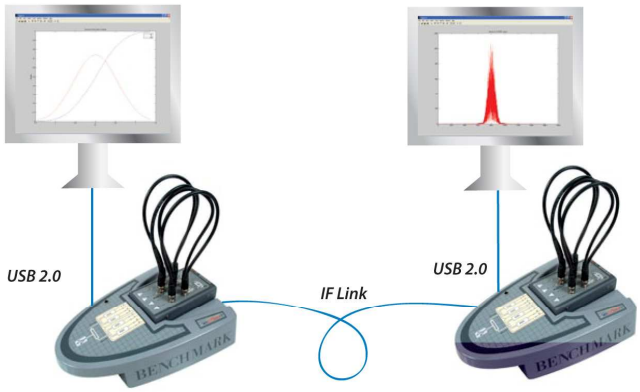
Digital modulations are often expressed in terms of I (in-phase) and Q (quadrature) signals, and all modern digital communication systems and gadgets have three main blocks namely:

- Data processing block
- ADC and DAC conversion block
- RF block

All the blocks process the I and Q signals simultaneously, leading to the use of complex algebra and analysis in their design and implementation. This standardized and uniform approach in building digital communication systems or gadgets results in lower cost of development and manufacturing. The focus is also turned towards adding more features and bringing in more techniques within the available RF spectrum.

The WiCOMM-T – the ultimate Wireless Digital Communication Training Platform – is the actual implementation of modern digital communication systems with direct interface to MATLAB through the Hi-Speed USB port of a PC.

MATLAB Enabled
MathWorks Partner



The WiCOMM-T with the pluggable IF module to study key topics in Baseband and IF

The WiCOMM-T is based on the curriculum developed in the Intel Wireless Laboratory of IIT Madras.

The WiCOMM-T provides maximum flexibility in learning complete digital communication system concepts, which includes digital modulation techniques, Baseband Equalization, Filtering concepts, and the basics of CDMA, GSM etc. MATLAB codes of all suggested experiment topics are available to users as reference. A MATLAB interface to the Platform also allows users to try out other topics on their own.

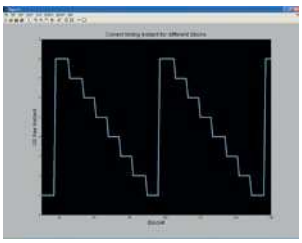
FEATURES

- Typical implementation of modern communication systems
- Interface with MATLAB
  Gives the ability to generate required signal and pass it through the transmitter and receiver providing a real life wireless digital communication system
- Comprehensive manual – describes wide range of experiments
- Loop back options at Baseband and at IF

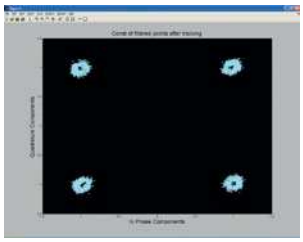
EXPERIMENT TOPICS

Baseband Digital Communication Link (Baseband)

- Raised Cosine spectrum pulses
- Timing acquisition algorithm
- Clock tracking & slip control
- Matched filtering – performance in noise



Quadrature Modulation Schemes (Baseband & IF)
- QPSK (Phase and frequency offset)
- Constellation plots
- Carrier recovery algorithm
- Carrier and Clock Tracking

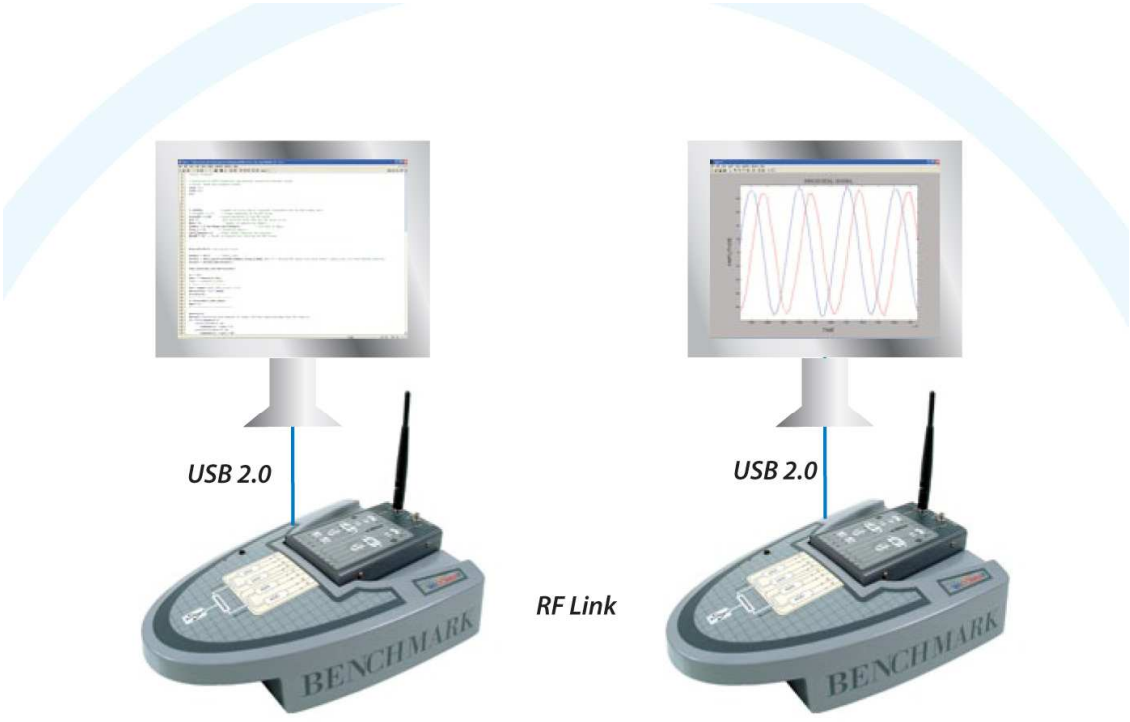


Adaptive Equalization Techniques (Baseband & IF)
- Adaptive linear equaliser
- Adaptive decision feedback equaliser
- MSE convergence
- Decision aided channel tracking

GSM (Baseband)
- GMSK modulation and demodulation
- Viterbi equaliser for GSM

Basics of DS-CDMA (Baseband & IF)
- Orthogonal and non-orthogonal spreading codes
- Multipath channel estimation for RAKE receiver
- SER performance of RAKE combiner

Basics of OFDM (Baseband & IF)
- Timing and Frequency synchronisation
- Channel estimation using FFT processing
- Channel estimation using modified LS
- Mean Square Error Performance



The WiCOMM-T with the pluggable RF module

PROJECTS

(Need additional hardware / RF block and MATLAB codes development by user)

A simple Software De ned Radio (SDR)
- Transmission and reception at various frequencies

Any Arbitrary Modulation Scheme
- 8PSK, QAM (16, 64 etc.), EDGE, WCDMA*, WiFi, WiMAX*
- Compare at base-band and IF loop-back

FM Radio Reception

Spectrum Analysis at the IF frequencies (need spectrum analyzer)

Reception of local GSM broadcast channel
- Channel Coder / Decoder
- Turbo decoder
- LDPC coder / decoder

Access WiCOMM-T platform remotely through TCP/IP via internet

V.32 Modem

Frequency Hopping Spread Spectrum (FHSS)

Discrete Multi-Tone (DMT) modem

*Data rate scaled down such that bandwidth is <1MHz

SYSTEM REQUIREMENTS

- Pentium IV or higher with Hi-Speed USB port (USB 2.0)
- Windows 2000 with SP4 or Windows XP with SP2
- At least 512 MB RAM (1 GB preferred)
- MATLAB Version 7.0 (R14) and above with Signal Processing, Communication and Instrument Control tool boxes for each system

ORDERING INFORMATION

WiCOMM-T: Wireless Digital Communication Training System comprising:

- WiCOMM-T BU: Base Unit
- IFX70MHz: 70 MHz IF Module
- WiCOMM-T PS: Power Supply
- WiCOMM-T SW: Experiment Software
- WiCOMM-T MAN: Manual

OPTIONAL EXTRAS

RFX2.4GHz:	2.4 GHz Module Tx & Rx (Two WiCOMM-Ts required)

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