Telecoms Lab Equipment EXPERIMENT CAPABILITIES Comparison
Emona DATEx™ - Emona TIMS™

Emona DATEx™ Experiment Capabilities

Compact, cost effective experiment board for basic, qualitative experiments using NI ELVIS™.

- ❒ AM - Amplitude Modulation
- ❒ AM - Amplitude Modulation II
- ❒ Armstrong's Phase Modulator
- ❒ ASK - Modulation - Introduction
- ❒ ASK - Demodulation
- ❒ BPSK - Modulation - Introduction
- ❒ BPSK - Demodulation
- ❒ Carrier Acquisition - PLL
- ❒ DPSK Modulation
- ❒ DPSK Demodulation
- ❒ DSB - Modulation
- ❒ DSB - Demodulation
- ❒ Envelope Detection
- ❒ Eye Patterns
- ❒ FM, by VCO
- ❒ FM - Demodulation by Zero Crossing Counting
- ❒ FSK - Envelope Demodulation
- ❒ FSK - Modulation
- ❒ GFSK - Intro to principles
- ❒ Line-Coding Encoding (4 line codes)
- ❒ Modeling Equations
- ❒ Noise Generation using Binary Sequences
- ❒ Noisy Channel
- ❒ PAM & TDM (Mod)
- ❒ PCM Decoding
- ❒ PCM Encoding
- ❒ PCM TDM
- ❒ Phase Division Mux
- ❒ Product Demodulation
- ❒ PLL - Phase Lock Loop
- ❒ PRBS spectrum
- ❒ Pulse Shaping - Introduction
- ❒ PWM - Pulse Width Modulation
- ❒ QAM - Demodulation (1 branch)
- ❒ QAM - Modulation
- ❒ QPSK - Modulation
- ❒ QPSK - Demodulation (one branch)
- ❒ Sampling & Reconstruction
- ❒ SNR
- ❒ SNR performance of SSB & DSBSC
- ❒ Speech in Telecommunications
- ❒ Spread Spectrum Principles
- ❒ SSB Modulation
- ❒ Superheterodyne (INTRO)
- ❒ Under Sampling in SDR (INTRO)

Additional DATEx Capabilities

- ❒ Introduction to Control Systems
- ❒ Using **LabVIEW™** to control external electronic circuits
- ❒ **Integration with NI ELVIS™**

Emona TIMS™ Experiment Capabilities

Complete, hands-on telecommunications modeling system, covering all aspects of the theory and math relating to teaching telecommunications. Modular, infinitely expandable and an excellent platform for student projects. Realizes detailed quantitative experiments comparing theory with real world signals.

- ❒ AM - Amplitude Modulation
- ❒ AM - Amplitude Modulation II
- ❒ Armstrong's Phase Modulator
- ❒ **ASK - Modulation - Advanced**
- ❒ **ASK - Demodulation with BER**
- ❒ **BPSK - Modulation - Advanced**
- ❒ **BPSK - Demodulation with BER**
- ❒ **Carrier Acquisition - PLL**
- ❒ **DPSK Modulation - Advanced**
- ❒ **DPSK Demodulation with BER**
- ❒ DSB - Modulation
- ❒ DSB - Demodulation
- ❒ Envelope Detection
- ❒ Eye Patterns
- ❒ **FM, by VCO & Harmonic Multiplier**
- ❒ **FM - Demodulation by Zero Crossing Counting & PLL**
- ❒ **FSK - Demodulation 2 methods/BER**
- ❒ FSK - Modulation
- ❒ **GFSK - Mod and Demod**
- ❒ **Line-Coding Encoding (8 line codes) - with BER & Clk Regen**
- ❒ Modeling Equations
- ❒ Noise Generation using Binary Sequences
- ❒ **Noisy Channel**
- ❒ **PAM & TDM - Mod & Demod**
- ❒ **PCM Decoding - A-Law & μ-Law**
- ❒ **PCM Encoding - A-Law & μ-Law**
- ❒ PCM TDM
- ❒ **Phase Division Mux & Demux**
- ❒ Product Demodulation
- ❒ PLL - Phase Lock Loop
- ❒ PRBS spectrum
- ❒ **Pulse Shaping - selection of filters**
- ❒ PWM - Pulse Width Modulation
- ❒ **QAM - Demodulation with BER**
- ❒ QAM - Modulation
- ❒ QPSK - Modulation
- ❒ **QPSK - Demodulation with BER**
- ❒ Sampling & Reconstruction
- ❒ **SNR with BER**
- ❒ SNR performance of SSB & DSBSC
- ❒ Speech in Telecommunications
- ❒ **Spread Spectrum, CDMA, FHSS**
- ❒ **SSB Modulation & Demodulation**
- ❒ **Superheterodyne (DETAILED)**
- ❒ **Under Sampling in SDR (DETAILED)**

Experiments listed above in **BOLD** *are in depth and specifically for* **3rd/4th year university-level courses**.

Additional TIMS 3rd/4th Year University-Level Capabilities:

- ❒ Adaptive Delta Modulation
- ❒ Amplifier Overload
- ❒ ASK - Generation Advanced
- ❒ Baseline Wander and Line Coding
- ❒ BER Instrumentation
- ❒ BER Measurement - Introduction
- ❒ Bit Clock Regeneration
- ❒ Block Coding and Decoding
- ❒ Block Coding Gain
- ❒ Block Coding - error correcting
- ❒ BPSK - Demodulation Advanced
- ❒ BPSK - Modulation Advanced
- ❒ BPSK and BER
- ❒ Broadcasting
- ❒ CDMA - 2 Channel
- ❒ CDMA - Introduction
- ❒ CDMA - Multichannel
- ❒ CDMA - Processing Gain
- ❒ CDMA at Carrier Frequencies
- ❒ Complex Analog Messages
- ❒ Convolutional Coding
- ❒ Costas Loop
- ❒ Delta Demodulation
- ❒ Delta Modulation
- ❒ Delta-sigma Modulation
- ❒ Digital Signal Recovery with the Decision Maker
- ❒ Digital Noise in Baseband & Block Coded Channels
- ❒ DPSK and BER
- ❒ DPSK and Carrier Acquisition
- ❒ DSSS - Spread Spectrum
- ❒ Envelopes
- ❒ Equalization for ISI
- ❒ Eye Patterns & BER
- ❒ FDM - Frequency Division Multiplex
- ❒ FHSS: Fast & Slow Hopping
- ❒ FHSS and Bit Error Rate
- ❒ FHSS: Hybrid DSSS/FHSS System
- ❒ Fiber Optic Tx, Splitting & Combine
- ❒ Fiber Optic - Bidirectional Tx
- ❒ Fiber Optic - WDM Transmission
- ❒ FM - Demodulation by PLL
- ❒ FM - Deviation Multiplication
- ❒ FM - Synchronous Demodulation
- ❒ FM and Bessel Zeros
- ❒ Frequency Synthesis with the PLL
- ❒ Intro to DSP
- ❒ Introduction to TIMS
- ❒ ISB - Independent Sideband
- ❒ ISI: PAM & ASK over band-limited channels
- ❒ Line-Coding & Decoding
- ❒ Matched Filter Detection
- ❒ MSK, OQPSK, π/4-QPSK, π/4-DQPSK
- ❒ Modem: Binary Data via Voiceband
- ❒ Modem: Multi-Level Data via Voiceband
- ❒ Modem: Data Rates & Voiceband Modems -TX and RX
- ❒ Multi-channel Digital Fiber Link
- ❒ Multi-level QAM & PSK
- ❒ Noise Generation using Binary Sequences
- ❒ OFDM Principles - Introduction
- ❒ PAM & TDM
- ❒ PCM & Bit Clock Regeneration
- ❒ PCM-TDM 'T1' Implementation
- ❒ PDM - Phase Division Mux
- ❒ Power Measurements
- ❒ PPM - Pulse Position Modulation
- ❒ PRBS Messages & Synchronization
- ❒ Pulse shaping for band-limited ch
- ❒ QAM and 4-PSK
- ❒ QASK - Modulation
- ❒ QASK - Demodulation
- ❒ Sampling with Sample-&-Hold
- ❒ Signal Constellations 4/8/16QAM and 4/8/16PSK
- ❒ SNR in AM Demodulated Signals
- ❒ SONET - TDM, Byte Interleave Mux
- ❒ SONET Data Frame
- ❒ SONET optical link
- ❒ SSB Demodulation
- ❒ SSB Linear Amplifier Measurements
- ❒ System fault finding
- ❒ TCM - Coding Gain
- ❒ TCM - Trellis Coding
- ❒ TDM
- ❒ Timing jitter in Band Limited Ch
- ❒ UWB - Pulse Shapes & Spectra
- ❒ UWB -with BER
- ❒ UWB - Multiband Modulation
- ❒ UWB - Multiple Access Orthogonal Pulse Modulation with MHP
- ❒ UWB - OOK, PPM, BPM & OPM
- ❒ Unknown Signals - 1
- ❒ Wave Analyzer - Spectrum Analysis
- ❒ Weaver's SSB Demodulator
- ❒ Weaver's SSB Generator

SIGNALS & SYSTEMS EXPERIMENTS MANUAL:

- ❒ Special Signals
- ❒ Linear and Non-linear Systems
- ❒ Unraveling Convolution
- ❒ Comparing Time and Freq Domains
- ❒ A Fourier Series Analyzer
- ❒ Spectrum Analysis of Signal Types
- ❒ Poles & Zeros in Laplace Domain
- ❒ Sampling and Aliasing
- ❒ Analog-Digital Conversion
- ❒ Discrete-Time Filters - Finite Impulse Response
- ❒ Poles and Zeros in the z plane
- ❒ Discrete-time Filters - Practical

STUDENT PROJECT CAPABILITIES:

- ❒ Building electronic circuits with the **Wire-wrapping Project Module**
- ❒ Implementing functions in a CPLD **Prog. Digital Project Module**
- ❒ Solderless breadboarding electronic circuits with **Circuit Experimenter**
- ❒ Programming DSP implementation with the **TIMS-DSP Module Set**

THIS LIST OF TIMS EXPERIMENTS IS CONSTANTLY INCREASING

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