



AM/FM Test

Proposal by BSK TECHNOLOGY



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Structure



PXI-4461 Audio Analyzer



Acquire Audio signal



PXI-5672 RF generator

Generate AM/FM signal



DUT



PXI Structure



- Hardware
 - PXIe-8133 Embedded controller
 - PXIe-1062Q 8-slot PXIe chassis
 - PXIe-5672 RFSG
 - PXI-4461 Dynamic signal analyzer (Audio)
- Software
 - LabVIEW
 - Modulation toolkit
 - Sound & Vibration measurement suite





Hardware



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PXIe-8133



- PXI Express 系統控制器
- 1.73 GHz quad-core Intel Core i7-820 processor (3.06 GHz maximum in single-core, Turbo Boost mode)
- 標準配備 2 GB (1 x 2 GB DIMM) 雙通道 1333 MHz DDR3 RAM，最多可擴充至 4 GB
- 高頻寬 PXI Express 嵌入式控制器，可達最高 8 GB/s 系統頻寬與 2 GB/s 插槽頻寬
- 共 2 組 10/100/1000 BASE-TX (Gigabit) 乙太網路、4 組 Hi-Speed USB、ExpressCard/34、GPIB、序列，與其他 I/O

PXIe-1062Q



- 提供 4 PXI 槽、1 個 PXI Express 系統時脈槽，以及 2 個 PXI Express 混合槽
- 0 ~ 55 °C 電源 354 W
- 0 ~ 30 °C，43.6 dBA 靜音作業
- 與 PXI、PXI Express、CompactPCI，以及 CompactPCI Express 周邊模組相容
- 適用於搭配 PXI Express 控制裝置使用：NI PXIe-8103、NI PXIe-PCIe836x，以及 NI PXIe-ExpressCard8360
- 每槽獨立頻寬高達 1 GB/s，系統頻寬超過 3 GB/s



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PXIe-5672



NI PXIe-5672 為 2.7 GHz RF 向量訊號產生器，並包含相位差數位升轉換。數位升轉換可有效產生波形，可大幅縮短下載與產生訊號的時間。NI PXIe-5672 以 100 MS/s (內插為 400 MS/s) 的速率，進行 16 位元解析度的任意波形產生、最高 512 MB 記憶體，與 20 MHz 即時頻寬。NI PXIe-5672 可產生標準與客制調變格式，如 AM、FM、PM、ASK、FSK、MSK、GMSK、PSK、QPSK、PAM，與 QAM。LabVIEW 的 NI 調變工具組 (Modulation Toolkit)，可搭配使用 NI PXIe-5672，針對訊號產生、分析、視覺化，與標準/客制的數位/類比調變格式的处理，提供多種功能與工具。



PXI-4461



- 輸入範圍 $\pm 316 \text{ mV} \sim 42.4 \text{ V}$
- 118 dB 動態範圍、24 位元解析度
- 2 個同步取樣的類比輸入
- 最高取樣速率 204.8 kS/s
- 2 個同步更新類比輸出
- IEPE 處理程序，可用軟體設定



Software



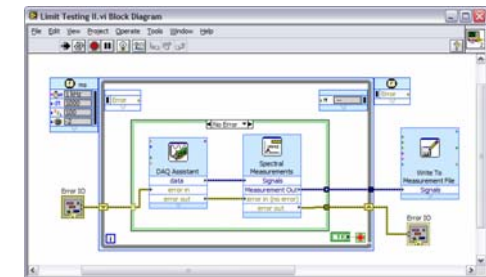
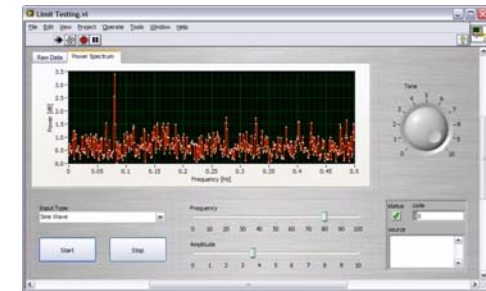
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LabVIEW

- Graphical development environment
- Diverse analog and/or digital I/O
- Signal processing and analysis
- Sophisticated logic and decision-making
- Parallel task execution
- Data visualization
- File I/O and/or data communication
- Extreme reliability
- Distributed monitoring and control



LabVIEW Toolkit for RF Application

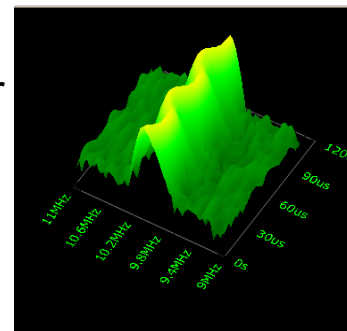
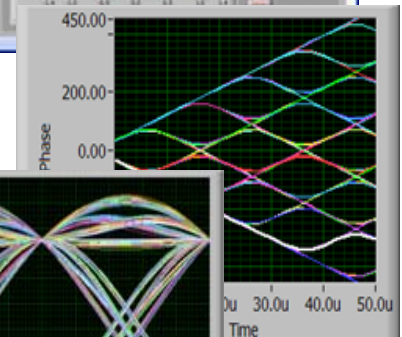
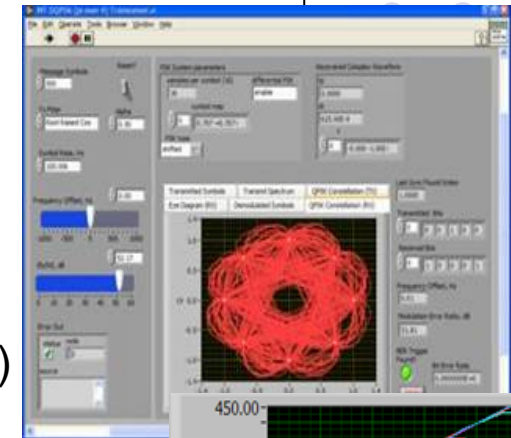


Modulation Toolkit

- Analog and Digital modulation formats
 - AM, FM, PM, ASK, FSK, MSK, GMSK, PAM, PSK, QAM, custom
- Visualization
 - 2D and 3D Eye, Trellis, Constellation, JTF Analysis (Waterfall)
- Modulation Analysis
 - BER, MER, EVM, burst timing, frequency deviation, ρ (rho)
- Impairments
 - Additive White Gaussian Noise (AWGN), DC offset, Quadrature skew, IQ gain imbalance, phase noise
- Equalization, Channel Coding, Channel Models

Spectral Measurements Toolkit

- Common spectral measurement functions
 - in-band power and adjacent-channel power
- 3D spectrogram visualization
- Highly optimized FFT processing



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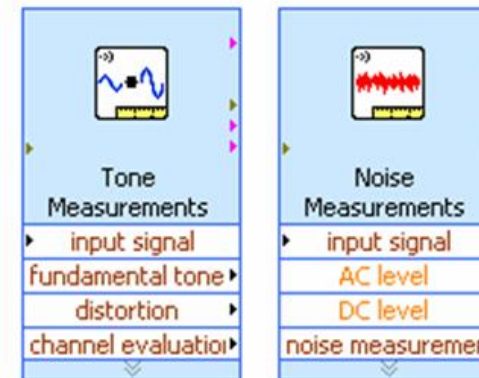
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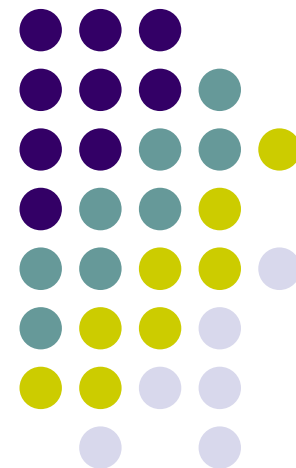
Sound & Vibration measurement suite for Audio



- Distortion (non-linearity)
 - THD, THD+Noise, SINAD: Measured with a pure tone (fundamental)
 - Total Harmonic Distortion = Distortion / Fundamental
 - SINAD = Signal / (Noise + Distortion)
Signal = Fundamental + Noise + Distortion
 - IMD (Intermodulation Distortion): dual tone excitation
- Crosstalk
- Gain/phase
- Sound Pressure Level
 - Logarithmic scale (dB)
 - 20 mPa reference
 - Frequency weighting: A, B, C



Thank You!!



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