MAXEYE TECHNOLOGIES

DVB Test and Measurement Solutions

NATIONAL INSTRUMENTS™ Alliance Partner

Agenda

- Company Overview
- DVB Test Solution Overview
- DVB Product Features
- Awards and Recognitions
- Testimonials

Company Overview

- **Company Incorporation**: August 2011
- **Location**: Bangalore
- **Team**
  - 10+ Engineers
  - 100+ years of industry experience.
  - Employee owned and Self funded Organization.
  - Several IP and Patents (includes approved and pending patents)
- **Specializes in providing system integration and turnkey solutions in**
  - RF Test and Measurement, Wireless Communication, Signal processing
  - Image Processing, Machine Vision
  - VLSI and Embedded Systems,
  - Industrial Automation and Control systems Engineering.
- National Instruments Alliance Partner

MaxEye DVB Test Solutions Overview

MaxEye Digital Video Test and Measurement Solutions

- MaxEye Technologies provides generation and analysis functions in LabVIEW for various digital video and audio broadcasting standards used across different regions.

- The toolkit software can be easily integrated with any 3rd party hardware.

- Enables testing of multiple digital video and audio standards using one PXI RF hardware. **Ideal solution for multimode Digital Video SDRs.**

- Generation of multiple DVB carriers using single PXI RF hardware. Reduces the test system complexity and simplifies the ATE development.

- Ideal solution for testing the DTV transmitters and receivers in the lab, production test, field test etc.,

Applications

- MaxEye Digital Video Solutions can be used for testing the DTV transmitters and receivers during
  - Manufacturing or production test
  - Design and validation test in the Labs
  - To measure and log signal quality measurements in the field test
  - Video and Audio Signal quality measurements

- Our solution enables test of
  - Standalone DTV receivers
  - DTV tuners as part of CAR entertainment System
  - DTV tuners in the cellular phones and other handheld devices
  - DTV USB dongles
  - DTV tuners in the Television

DVB Product Features

DVB
Test Solution

Hardware

Powered by
LabVIEW Toolkits

Test Requirement		Software Toolkits
Analog Radio	AM	NI Modulation Toolkit
	FM/RDS	NI FM/RDS Measurement Suite
Digital Video Broadcasting (Satellite)	DVB-S	MaxEye DVB-S Measurement Suite
	DVB-S2	MaxEye DVB-S2 Measurement Suite
Digital Video Broadcasting (Terrestrial)	DVB-T/H	MaxEye DVB-T Measurement Suite
	DVB-T2	MaxEye DVB-T2 Measurement Suite
	T-DMB	MaxEye T-DMB Measurement Suite
	ISDB-T/Tb	MaxEye ISDB-T/Tb Signal Generation
	DTMB	MaxEye DTMB Signal Generation
	CMMB	MaxEye CMMB Signal Generation
	ATSC/ATSC-M/H	MaxEye ATSC Signal Generation
Digital Video Broadcasting (Cable)	DVB-C	MaxEye DVB-C Measurement Suite
	DVB-C2	MaxEye DVB-C2 Measurement Suite
Digital Audio Broadcasting	DAB/DAB Plus	MaxEye DAB Measurement Suite
	DRM/DRM Plus	MaxEye DRM Signal Generation

Digital Video/Audio Test and Measurement Solutions

- Powered by National Instruments LabVIEW Software, NI RFSG (NI PXI 5673/5673E, NI PXI 5672), NI VST (NI PXIe-5644R/5645R) and NI RFSA (NI PXI 5663/5663E, NI PXI5661)Hardware.

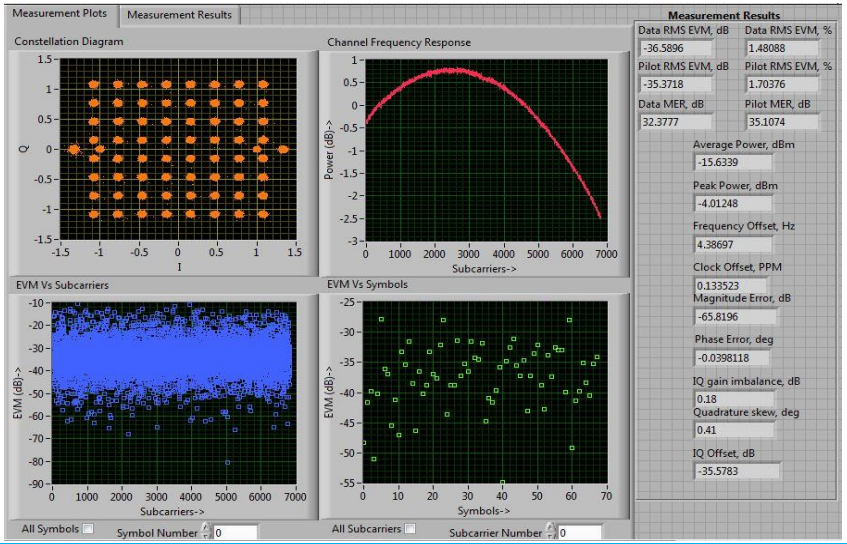
- Enables testing of multiple digital video and audio standards testing using one NI PXI RF hardware. **Ideal solution for testing multimode Digital Video/Audio SDR.**

- Real time streaming of the generated waveform using NI RFSG streaming mode. (Typical DTG testing requires 5 minutes of video to be played in real-time)

- Generation of Multiple DVB carriers using single NI RFSG and supports various Transmitter measurements.

- The following are the digital video broadcasting toolkits currently being supported by MaxEye Technologies.

  - DVB-S
  - DVB-S2
  - DVB-T /H
  - DVB-T2
  - ISDB-T/Tb
  - CMMB
  - DTMB
  - ATSC and ATSC-M/H
  - DAB/DAB Plus/T-DMB
  - DRM/DRM Plus



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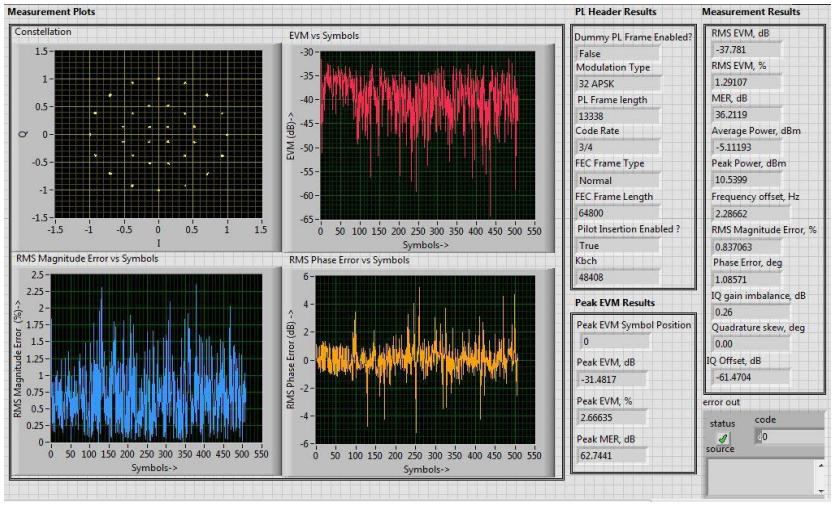
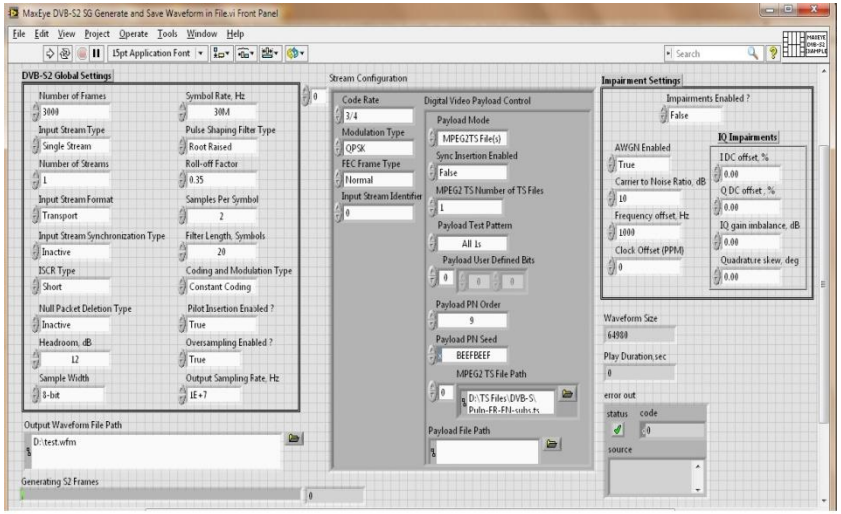
MaxEye DVB-S/S2 Measurement Suite

- **Generation**
  - Symbol Rate Upto 80MHz
  - Modulation: QPSK, 8PSK, 16APSK and 32APSK
  - Coding:
    - DVB-S : ReedSolomon + Convolutional Code
    - DVB-S2 : BCH + LDPC Encoder
  - Pulse Shaping Filter as per standard
  - Support for Single and Multiple Streams
  - All Standard configurations are supported
  - MPEG2 TS Remultiplexing to adopt to the standard bitrates
  - Real time Streaming of the Generated Waveform
  - Impairments: AWGN, Frequency and Clock Offset, IQ Offset, Gain Imbalance, Quadrature Skew.
- **Analysis**
  - RMS and Peak EVM
  - MER and Peak MER
  - Average Power and Peak Power
  - Frequency Offset, Clock Offset
  - IQ Offset
  - Gain Imbalance and Quadrature Skew
  - EVM Trace
  - Constellation Diagram
  - Decoded Bits
  - PL Header Decoding and Parameters Extraction
  - Magnitude Error and Phase Error Trace
  - Spectral Measurements (Channel Power, ACLR, Spectral Emission Mask, Spectral Mask Margin)

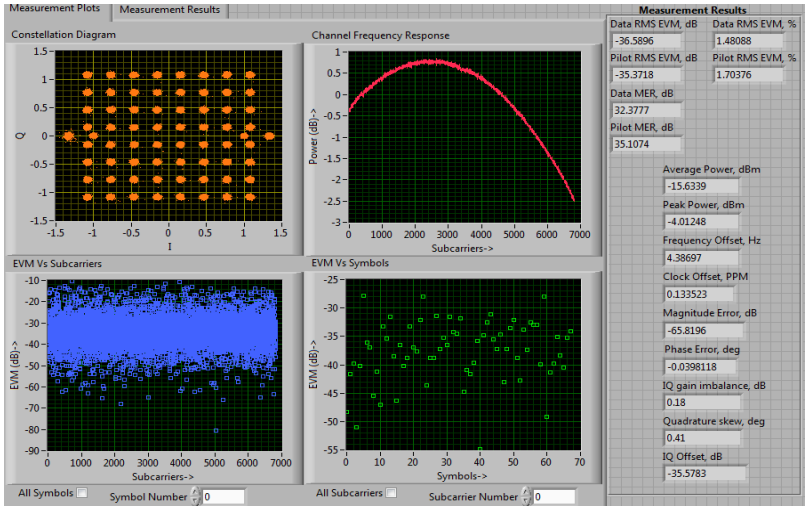


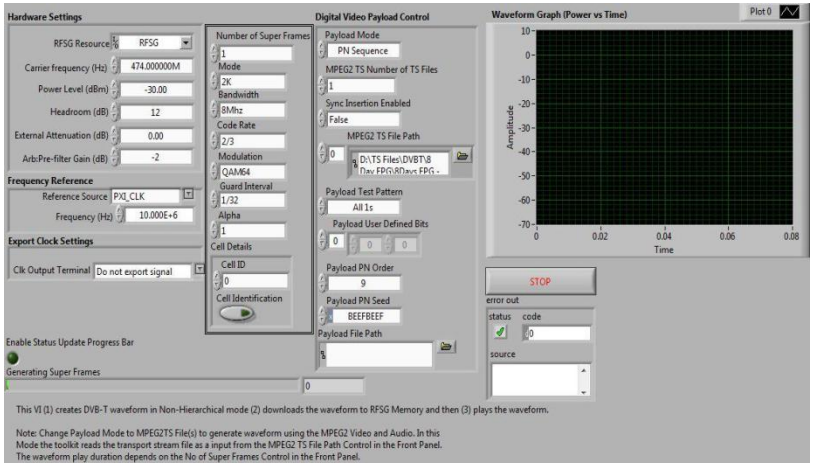


MAXEYE TECHNOLOGIES

MaxEye DVB-T/H/T2 Measurement Suite

- **Generation**
  - Bandwidth:
    - DVB-T2 : 1.7Mhz, 5Mhz, 6Mhz, 7Mhz, 8Mhz and 10Mhz
    - DVB-T : 5,6,7 and 8 MHz
  - Modulation: QPSK, 16QAM, 64QAM and 256 QAM
  - Coding:
    - DVB-T : ReedSolomon + Convolutional Code
    - DVB-T2 : BCH + LDPC Encoder
  - DVB-T2 Version 1.3.1 (Multiple PLP with MISO mode)
  - MPEG2 TS Remultiplexing to adopt to the standard bitrates
  - OFDM Windowing
  - Real time Streaming of the Generated Waveform
  - Impairments: AWGN, Frequency and Clock Offset, IQ Offset, Gain Imbalance, Quadrature Skew.





- **Analysis**
  - RMS and Peak EVM
  - MER and Peak MER
  - Average Power and Peak Power
  - Frequency Offset, Clock Offset, IQ Offset
  - Gain Imbalance and Quadrature Skew
  - EVM Trace, Constellation Diagram, Decoded Bits, Spectral Flatness
  - L1 Signal Decoding
  - Magnitude Error and Phase Error Trace
  - Spectral Measurements (Channel Power, ACLR, Spectral Emission Mask, Spectral Mask Margin)

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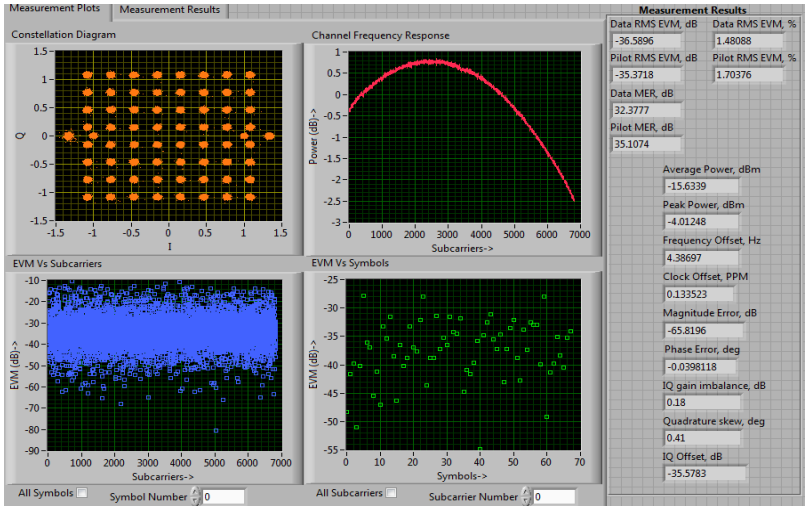
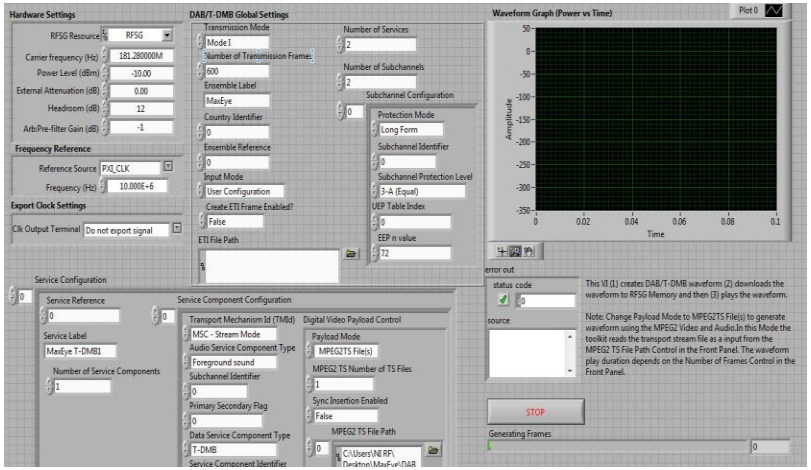
MaxEye DAB/DAB Plus/T-DMB Measurement Suite

- **Generation**
  - Transmission Mode: I, II, III and IV
  - Modulation: QPSK
  - Coding:
    - ReedSolomon + Convolutional Code
    - Time and Frequency Interleaving
  - Guard Interval: All formats supported
  - All Standard Configurations Supported
  - MPEG2 TS Remultiplexing to adopt to the standard bitrates
  - OFDM Windowing
  - Real time Streaming of the Generated Waveform
  - Impairments: AWGN, Frequency and Clock Offset, IQ Offset, Gain Imbalance, Quadrature Skew.
- **Analysis**
  - RMS and Peak EVM
  - MER and Peak MER
  - Average Power and Peak Power
  - Frequency Offset, Clock Offset, IQ Offset
  - Gain Imbalance and Quadrature Skew
  - EVM Trace, Constellation Diagram
  - Magnitude Error and Phase Error Trace
  - Spectral Flatness
  - Spectral Measurements (Channel Power, ACLR, Spectral Emission Mask, Spectral Mask Margin)

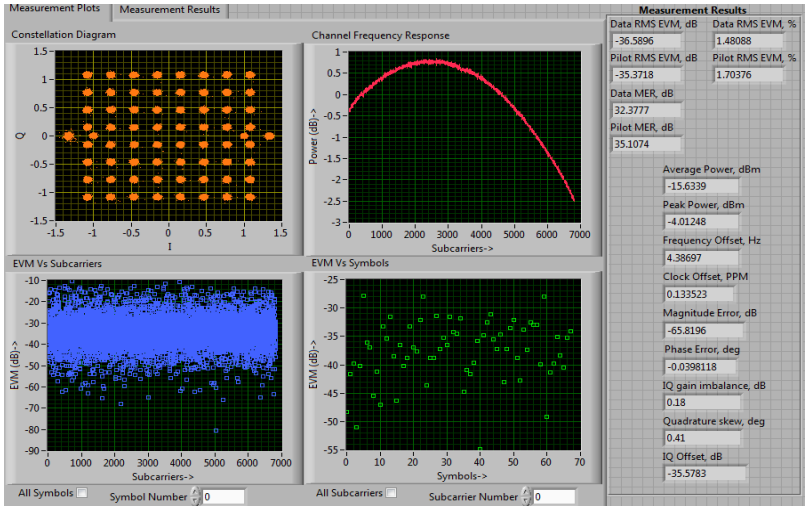


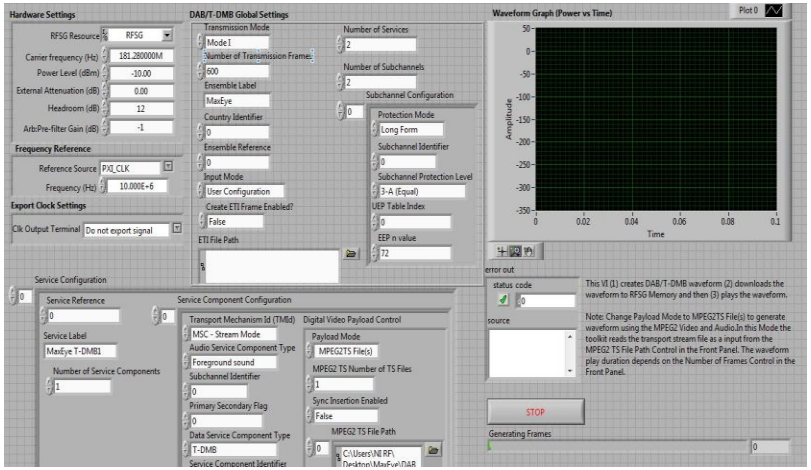


MAXEYE TECHNOLOGIES

MaxEye DVB-C/C2 Measurement Suite*

- **Generation**
  - Symbol Rate : Upto 80MHz
  - Modulation: 16QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM
  - Coding:
    - ReedSolomon + Convolutional Interleaver
    - Differential Encoding and Mapping
  - All Standard Configurations Supported
  - MPEG2 TS Remultiplexing to adopt to the standard bitrates
  - Real time Streaming of the Generated Waveform
  - Impairments: AWGN, Frequency and Clock Offset, IQ Offset, Gain Imbalance, Quadrature Skew.
- **Analysis**
  - RMS and Peak EVM
  - MER and Peak MER
  - Average Power and Peak Power
  - Frequency Offset, Clock Offset, IQ Offset
  - Gain Imbalance and Quadrature Skew
  - EVM Trace, Constellation Diagram
  - Magnitude Error and Phase Error Trace
  - Spectral Measurements (Channel Power, ACLR, Spectral Emission Mask, Spectral Mask Margin)





Note: *DVB-C2 Under development

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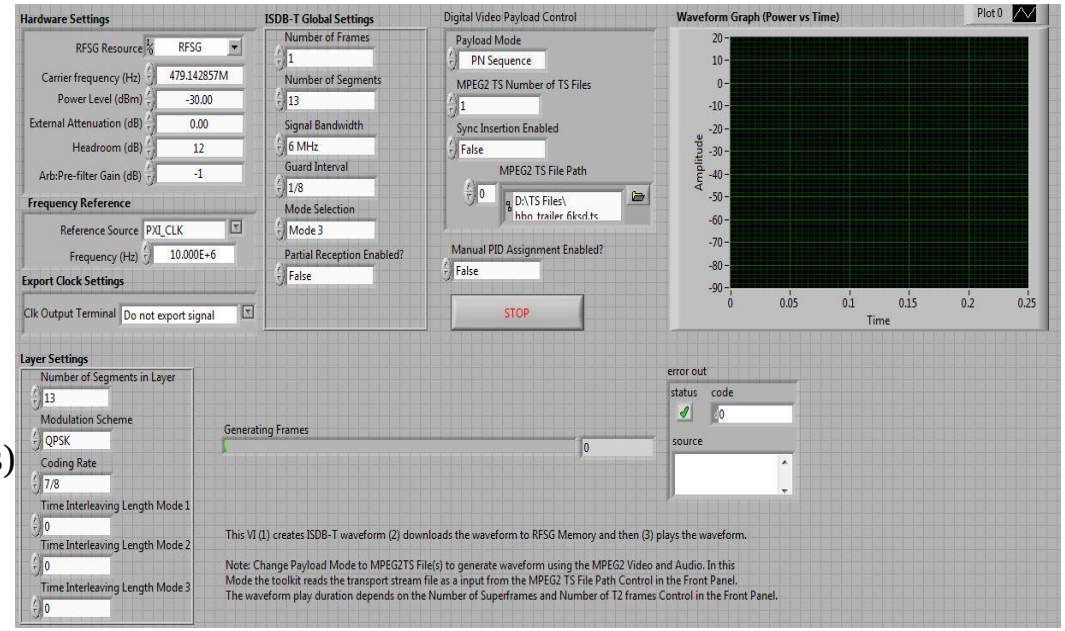
MaxEye ISDB-T/Tb Signal Generation Toolkit

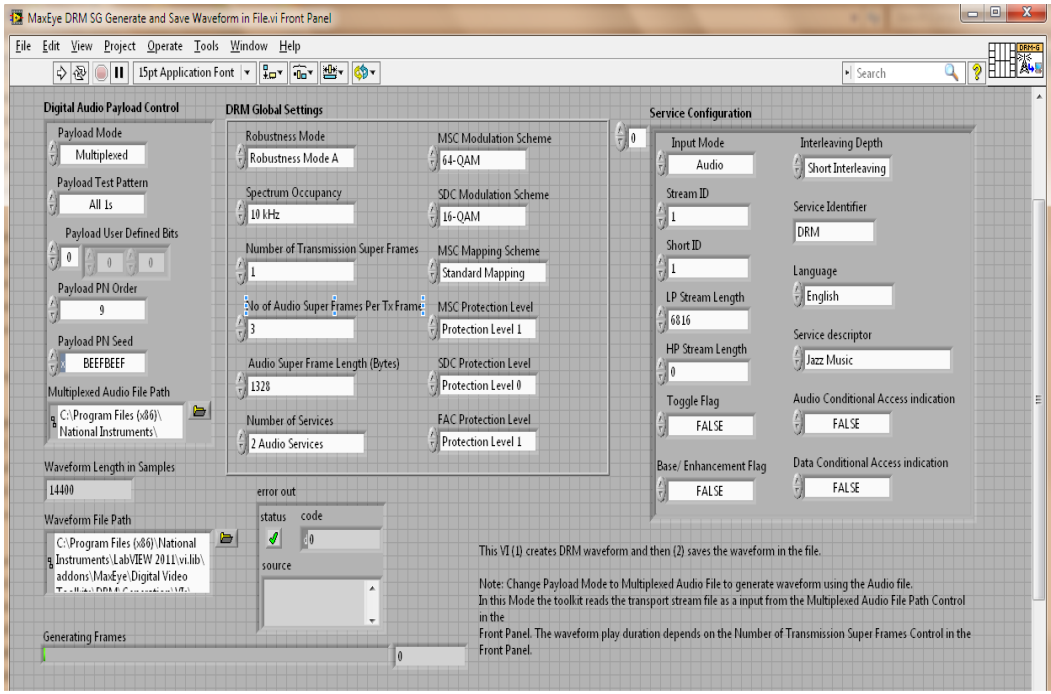
- **Generation**
  - Hierarchical layers: A, B, and C
  - Versions: Japan and Brazil Format
  - BW: 6 MHz/7 MHz/8 MHz (all bandwidths)
  - Mapping: DQPSK/QPSK/QAM16/QAM64
  - Support for all guard intervals
  - Support for full and partial reception mode service
  - MPEG-2 TS Remultiplexing
  - FEC: RS + Convolutional code(all code rates)
  - Payload configuration:
    - MPEG TS files
    - PN sequence
    - Test pattern
    - User-defined bits
  - LabVIEW API VIs, programming examples
  - All Standard Configurations Supported
  - Real time Streaming of the Generated Waveform
  - Impairments: AWGN, Frequency and Clock Offset, IQ Offset, Gain Imbalance, Quadrature Skew.



MAXEYE TECHNOLOGIES

MaxEye DRM/DRM Plus Signal Generation Toolkit

- **Generation**
  - Robustness Mode : A, B, C, D and E
  - BW : 4.5 , 5 ,9 , 10, 8 and 20 KHz
  - Mapping: QPSK, 16QAM and 64QAM
    - Standard Mapping
    - Symmetrical Hierarchical Modulation
  - Number of Services: 4
  - Multilevel Coding: 1, 2 and 3
  - FEC: Convolutional code with all protection levels
  - Channels:
    - Main Service Channel
    - Service Description Channel
    - Fast Access Channel
  - Payload configuration:
    - Multiplexed Audio File
    - PN sequence
    - Test pattern
    - User-defined bits
  - LabVIEW API VIs, programming examples
  - Real time Streaming of the Generated Waveform
  - Impairments: AWGN, Frequency and Clock Offset, IQ Offset, Gain Imbalance, Quadrature Skew.



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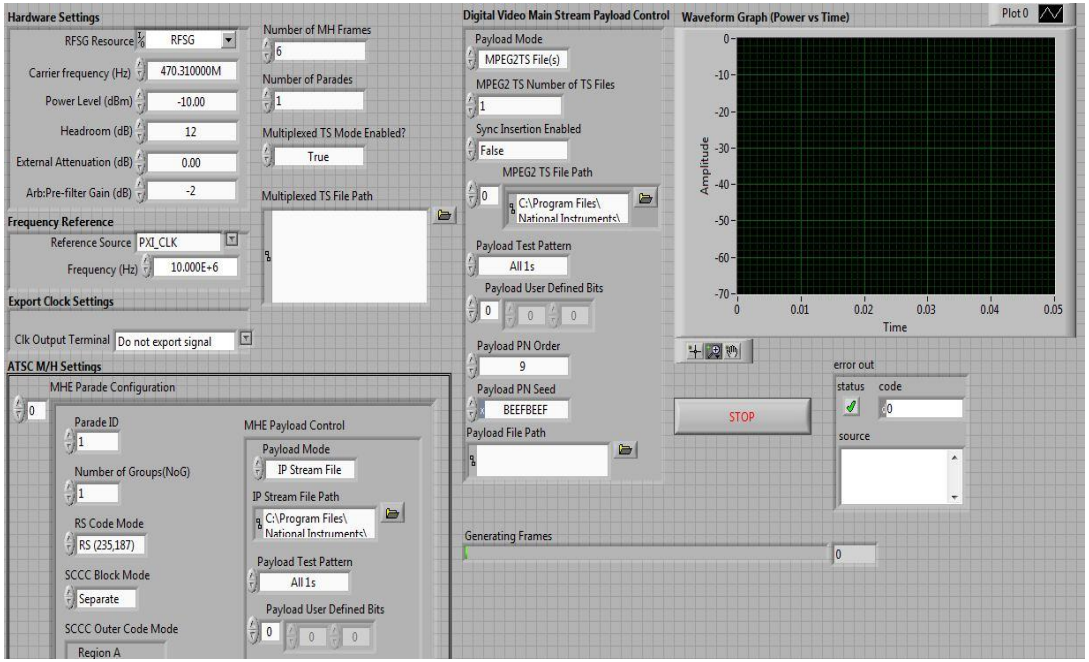
MaxEye ATSC/ATSC-MH Signal Generation Toolkit

- **Generation**
  - Support for main and multiplexed M/H service
  - Support for multiple M/H parades
  - 8 VSB modulation
  - FEC: SCCC ¼ and ½
    - RS (235, 187),
    - RS (223, 187),
    - RS (211, 187)
  - Pulse shaping: RRC Filter with Roll off of 0.1152
  - M/H Signalling Channel : TPC
  - Payload configuration:
    - TS File
    - Multiplexed TS file
    - PN sequence
    - Test pattern
    - User-defined bits
  - LabVIEW API VIs, programming examples
  - Real time Streaming of the Generated Waveform
  - Impairments: AWGN, Frequency and Clock Offset, IQ Offset, Gain Imbalance, Quadrature Skew.



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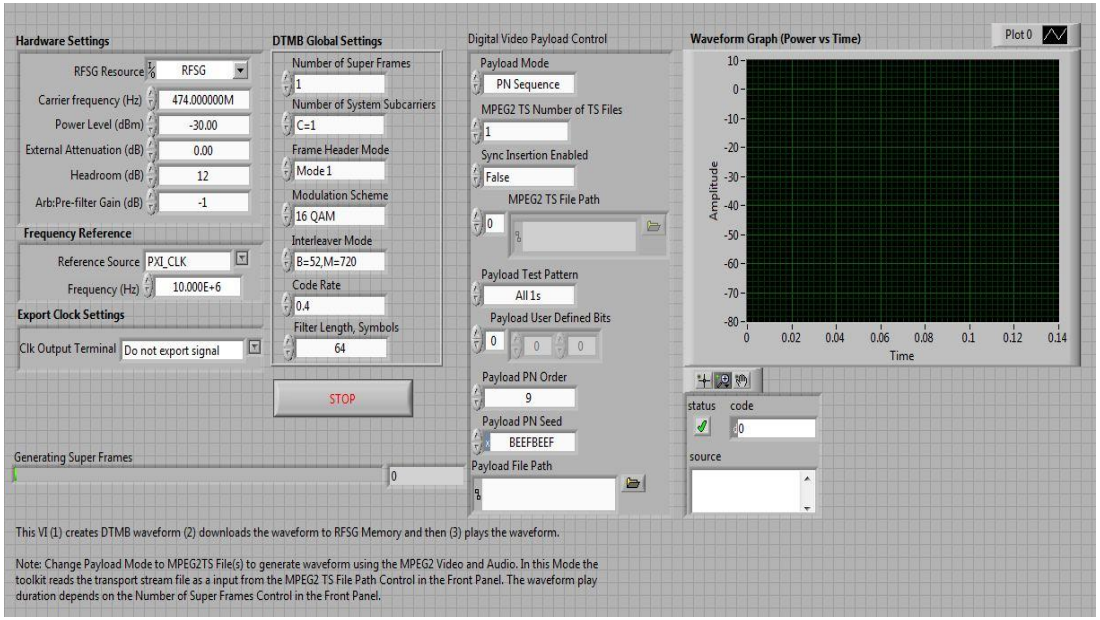
MaxEye DTMB Signal Generation Toolkit

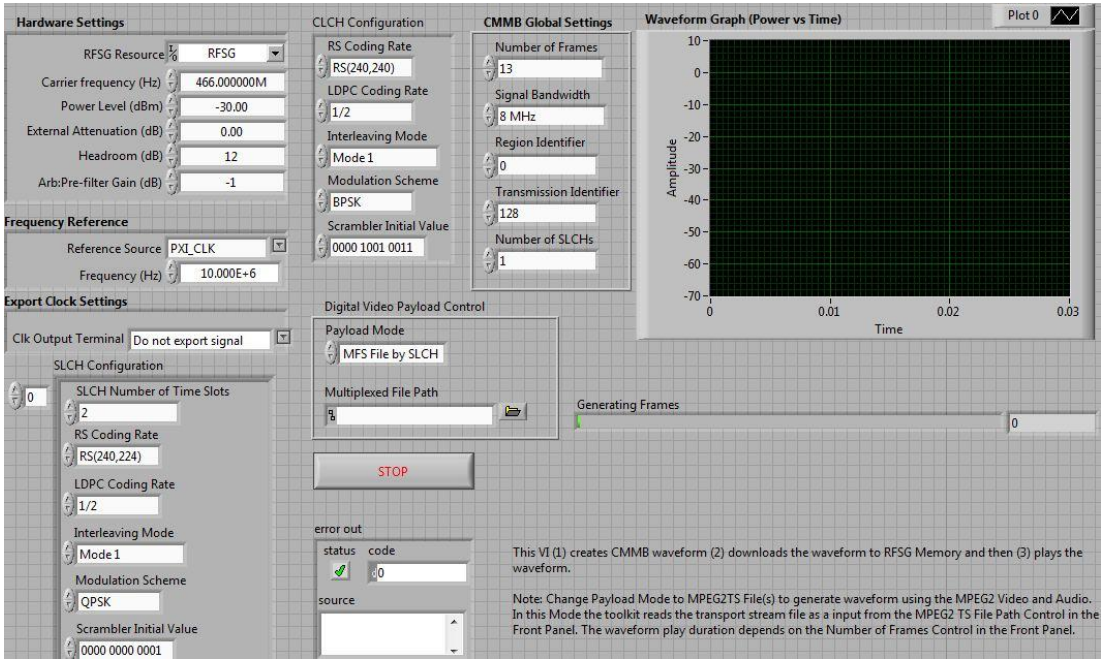
- **Generation**
  - Support for Single and Multi-Carrier Mode
  - Symbol Rate : 7.56 MHz
  - Frame Header Mode : Mode 1, Mode 2 and Mode 3
  - Modulation: 4 QAM, 4 QAM NR, 16 QAM and 32 QAM
  - FEC: BCH + LDPC Code
  - Code Rate : 0.4, 0.6 and 0.8
  - All Interleaver modes supported
  - Pulse shaping: RRC Filter with Roll off of 0.1152
  - M/H Signalling Channel : TPC
  - Payload configuration:
    - TS File
    - Multiplexed TS file
    - PN sequence
    - Test pattern
    - User-defined bits
  - LabVIEW API VIs, programming examples
  - Real time Streaming of the Generated Waveform
  - **Impairments**: AWGN, Frequency and Clock Offset, IQ Offset, Gain Imbalance, Quadrature Skew.



MAXEYE TECHNOLOGIES

MaxEye CMMB Signal Generation Toolkit

- **Generation**
  - PLCH: Supports both CLCH (Control Logical Channel) and SLCH (Service Logical Channel)Generation
  - Supports 1-39 SLCH in one frame
  - BW: 2 and 8 MHz
  - Modulation: BPSK, QPSK and 16QAM
  - FEC: RS + LDPC code
  - Code Rate : ½ and ¾
  - All Interleaver modes supported
  - MFS File Handling: Automatic detection of service channel configuration from the MFS file.
  - OFDM Windowing
  - Payload configuration:
    - MFS File
    - PN sequence
    - Test pattern
    - User-defined bits
  - LabVIEW API VIs, programming examples
  - Real time Streaming of the Generated Waveform
  - **Impairments**: AWGN, Frequency and Clock Offset, IQ Offset, Gain Imbalance, Quadrature Skew.



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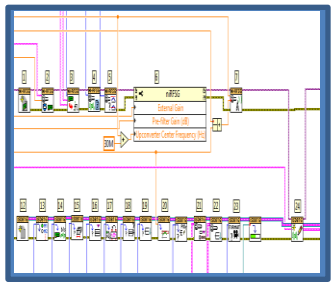
Test Methodology - Conceptual Flow Diagram

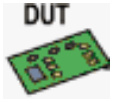
Design/Develop Test Code



Measure/Reporting

Transfer data PXI Bus

Generate Signal



Validation

Analyze Signal

Design Test Software (LabVIEW/TestStand)

Initiate Execution (PXI Controller)

Generate Test Signal (LabVIEW Toolkits)

DUT

Analyzer Test Signal (LabVIEW Toolkits)

Measure/Reporting Go to Next Test Sequence

MaxEye Technologies

Awards & Recognitions

MAXEYE
TECHNOLOGIES

Awards and Recognitions

- NI Week 2013 – LabVIEW Tools Network Awards
  - MaxEye Technologies Multi-Carrier Multi Standard DVB RF Test and Measurement product received 2013 LabVIEW Tools Network - Runner up for the test product of the year award at the NI Week 2013 Graphical System Design Conference held at Austin, Texas.
  - MaxEye Technologies is the Only Alliance Partner from India Company represented in the LabVIEW Tools Network Award.

- MaxEye DVB Products received compatible with LabVIEW Certification and available online in NI Website.

http://search.ni.com/nisearch/app/main/p/bot/no/ap/global/lang/en/pg/1/q/maxeye/

- NI Days 2013, Bangalore GSD Award Runner Up – Alliance Partner Category

Customer Testimonials (1/2)

- "We have worked with **MaxEye Technologies** for RF test and measurement solution in one of our business opportunities. MaxEye delivered the complete turnkey test solution, integrated with NI RF hardware, within the specified delivery time. We were happy with their professional approach to the development and testing of the system. We recommend their skills in the RF, Signal Processing and Communication domain and appreciate their commitment towards the deliverables and support after the delivery"

... Jayaram Pillai, Managing Director - IndRA (India, Russia and Arabia) at National Instruments, Bangalore (India)

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- "**MaxEye** delivers on its commitments and provides great after sales support. In retrospect, I am very pleased with our decision to work with them"

... Sujeeth Pai, Country Sales Manager, National Instruments, Bangalore (India)

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Customer Testimonials (2/2)

- Simple and easy to use GUI.
- Easy to configure and generate DVB-T signal.
- Easy to convert from .ts to .bin file, through which the memory related issues are reduced.
- Good error handling by which the error are identified very easily and fast.
- Last but not least good support from the MaxEye Technologies has enabled us in completing the project on time.
  - Leading IT Services, consulting and Business Solutions Partner in India (More details can be shared on request)

Summary

- MaxEye Technologies Provides complete DVB test solution using NI Hardware, Software and MaxEye Digital Video and Audio test and measurement solutions
- Proven solution used by leading manufactures in the world.
- Software defined and scalable solution for future wireless standard evolution.
- LabVIEW and TestStand based powerful programming environment for test automation.

Thank You

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