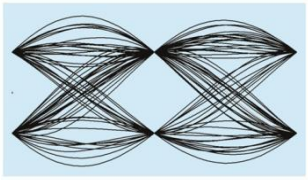


MaxEye Digital Video Signal Generation Toolkit

DTMB

Version 1.0

Getting Started Guide

MAXEYE TECHNOLOGIES

Contents

MAXEYE TECHNOLOGIES

1. Introduction

MaxEye Technologies provides generation functions in Labview for generating the standard complaint signals for various digital video broadcasting standards. This guide explains how to use the DTMB signal generation toolkit using the programming examples.

2. Installed File Location

The example VIs are installed in, <LabVIEW>\vi.lib\addons\MaxEye\Digital Video Toolkits\DTMB\Generation\Examples.

The toolkit help files are installed in, <LabVIEW>\vi.lib\addons\MaxEye\Digital Video Toolkits\DTMB\Generation\Documentation.

The toolkit API files are intalled in, <LabVIEW>\vi.lib\addons\MaxEye\Digital Video Toolkits\DTMB\Generation\API.

You can also find a shortcut to the above location from the windows start menu.

Start->All Programs->MaxEye->Digital Video Toolkits-> DTMB

3. Programming Examples

The DTMB Signal generation toolkit contains examples for performing the following

i. Creating the waveform based on the standard specific user input parameters and then downloads the waveform to NI RFSG.
ii. Creating the waveform based on the standard specific user input parameters and then writes the waveform to the file.
iii. Playing the waveform using NIRFSG

The programming examples are created using the Labview API VIs. For more information about the API VI used in the example VIs refer to the **MaxEye DTMB Signal Generation Help.chm** document, accessible at **Start->All Programs->MaxEye->Digital Video Toolkits-> DTMB ->Documentation.**

3.1. Create and Download Waveform

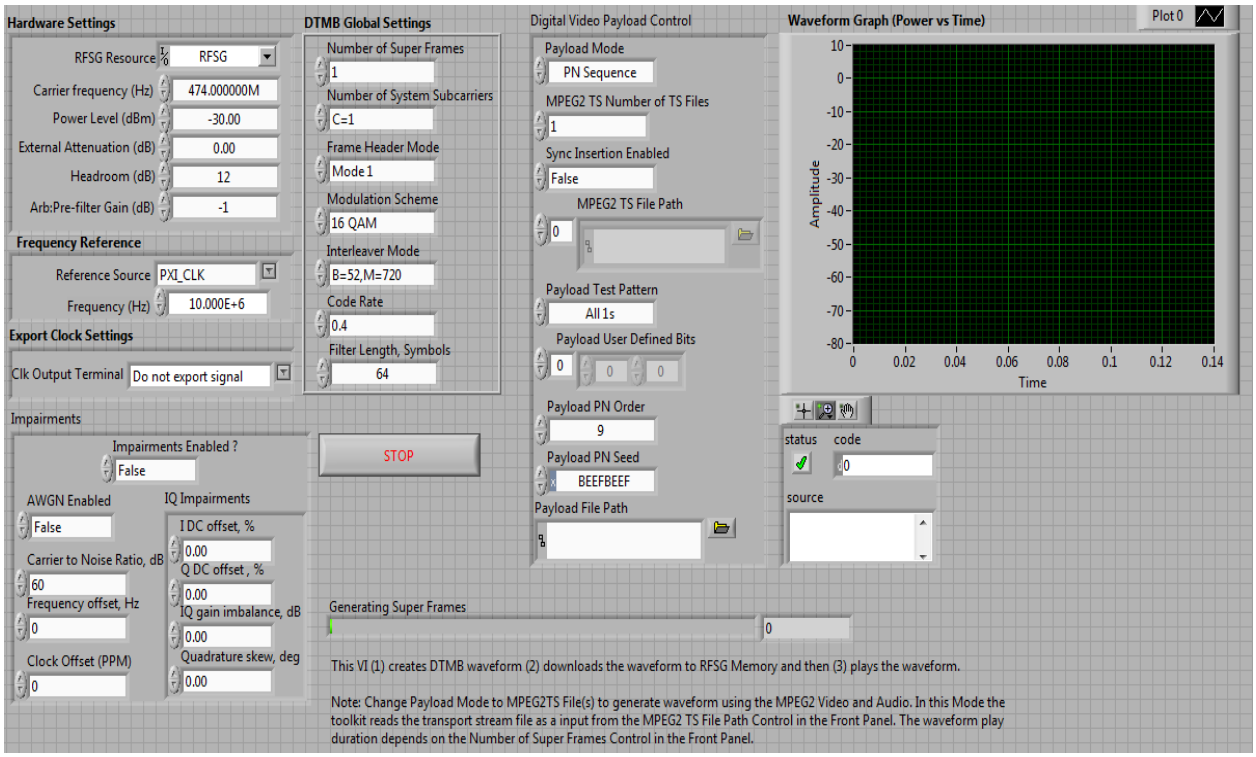
The DTMB is a TV standard for mobile and fixed terminals used in China, HongKong and Macau. DTMB supports two modes of signal generation, single carrier and multicarrier mode. DTMB uses MPEG2 TS stream format for carrying the audio, video and data elementary streams. The payload data is encoded using BCH and LDPC error correction code..

3.1.1 MaxEye DTMB RFSG Generate Multiple Frames

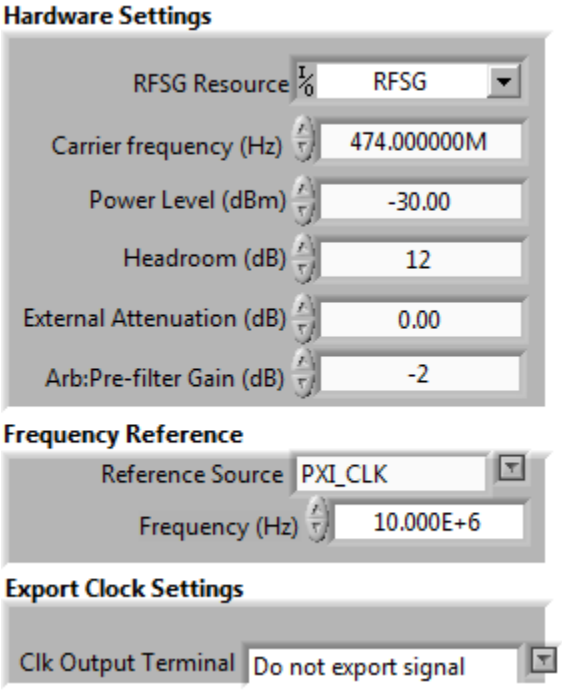
This Example is used to generate multiple Transmission Frames. TS stream is used for generating the signal for DTMB waveforms. The figure below shows the front panel of the Example VI.

The user configurations are divided in to three categories

i. Hardware Settings
ii. DTMB Global Settings
iii. Digital Video Payload Control Settings.



3.1.1.1 Hardware Settings



RFSG Resource – Configure the resource name used in NI Measurement and Automation explorer for the NI PXIe-5611 device.

Carrier Frequency (Hz) – Center Frequency of the DTMB signal in Hz.

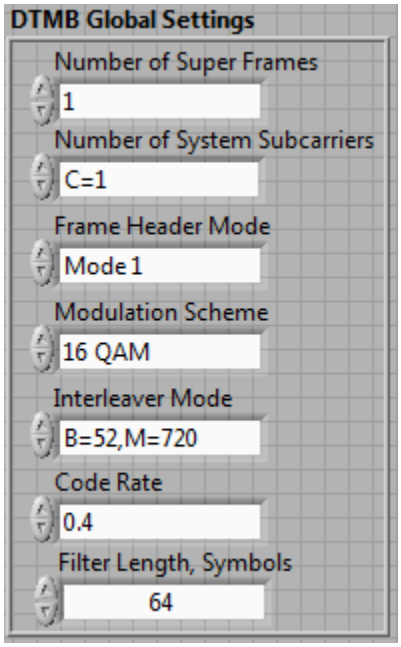
Power Level (dBm) – Average Power level of the signal in dBm.

Headroom (dB) – Configure the Headroom value higher than PAPR of the signal to be generated. Refer MaxEye DABTDMB Signal Generation Help.chm.

External Attenuation (dB), Arb:Pre-filter Gain (dB), Reference Source, Frequency (Hz), Clk Output Terminal – Refer NI RFSG Signal Generators help file.

3.1.1.2 DTMB Global Settings

The Signal Settings includes the DTMB standard specific configuration. The help for each of the properties is available in DTMB Signal Generation Help.chm file.



The Number of Super Frames property decides the length of waveform to be generated. To generate longer duration of the wavefrom increase the Number of Super Frames. The duration of one Super Frame is 125msec. For more information Frame Structure refer section 4.5.1 of the DTMB standard GB 20600-2006.

3.1.1.3 Digital Video Payload Control Settings

MaxEye Digital Video Toolkit allows you to configure various payload settings. The possible payload options are

i. PN Sequence – In this mode configure Sync Insertion Enabled, Payload PN order and PN Seed properties and the toolkit ignores other properties in the Digital Video Payload Control. The toolkit generates pseduo random sequence based on the PN order and seed value, the generated bit sequence is used as a payload for generating the signal. Use this mode for testing the receiver performance for random payload values. When the number of super frames is more than 1 then the toolkit maintains payload continuity across the superframes.

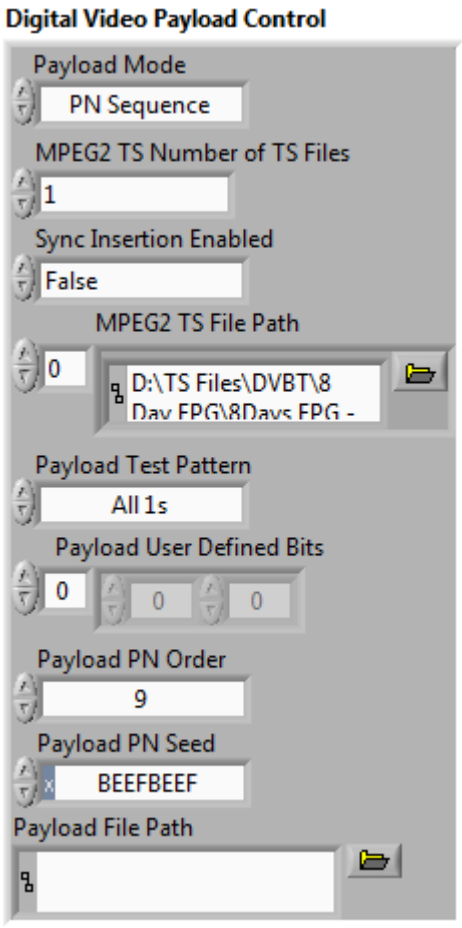
ii. User defined bits – In this mode configure Sync Insertion Enabled and Payload User Defined Bits property and the toolkit ignores other properties in the Digital Video Payload Control.

iii. Test Pattern – In this mode configure Sync Insertion Enabled and Payload Test Pattern property and the toolkit ignores other properties in the Digital Video Payload Control. The possible values for the Test Pattern are All 1s, All 0s, 10101010 and 01010101. This mode is used for generating signal with known test patterns.

iv. Test File – In this mode configure the Sync Insertion Enabled and Payload File Path property and the toolkit ignores other properties in the Digital Video Payload Control. This mode is used for generating signal with the data from the file.

v. MPEG2TS File(s) – In this mode configure the MPEG2 TS Number of TS Files and MPEG2 TS File Path property and the toolkit ignores other properties in the Digital Video Payload Control.

If the Sync Insertion Enabled property is set to True, the toolkit inserts MPEG2 TS packet sync byte (0x47) after every 187 bytes. The length of the TS packet is 188 bytes and the first byte is a sync byte (0x47).



3.2. Create and Save Waveform in File

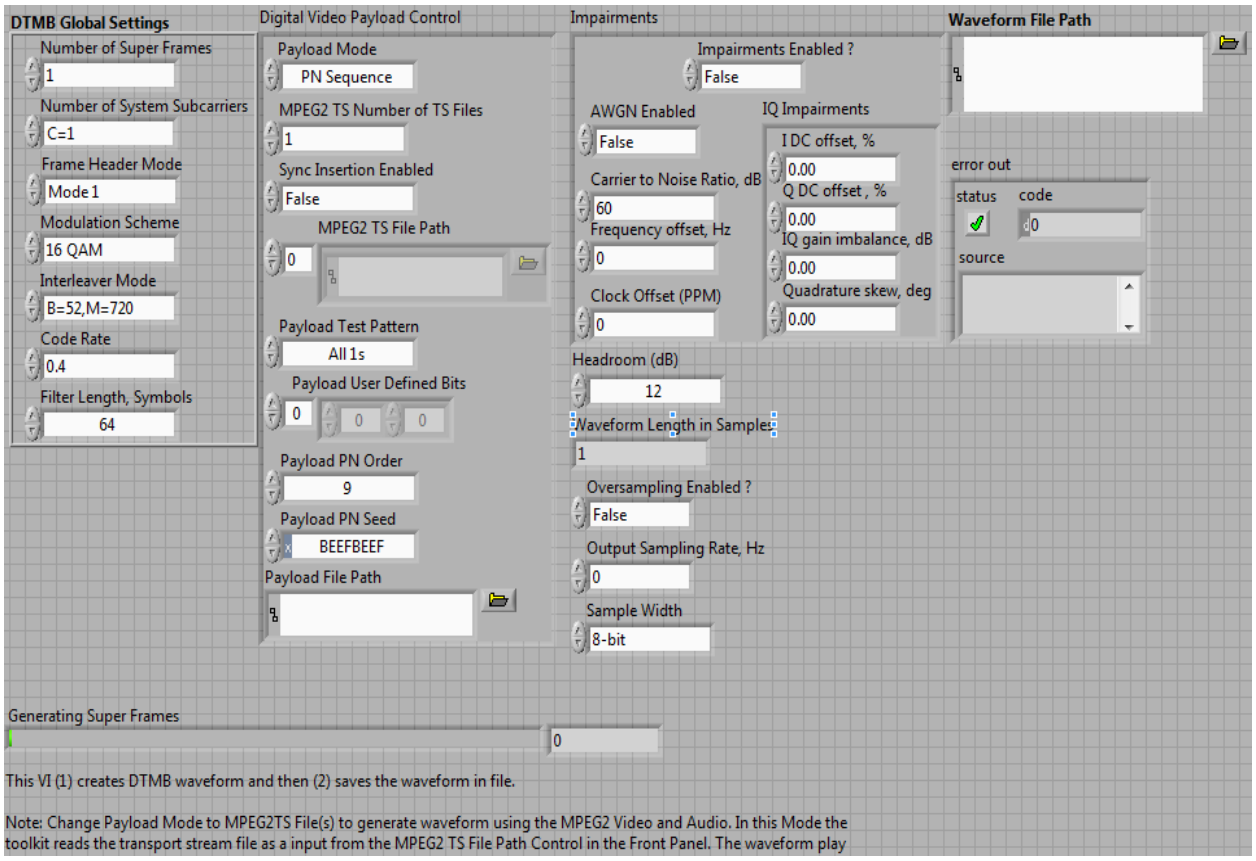
This Example is used to generate multiple DTMB transmission frames and the generated waveform is stored in a file for play back. Use this example

- To generate and store the custom waveforms based on your test requirment.
- To avoid generating the waveform at the beginning of your test everytime. This reduces your test starting time as some of the signal configuration will take longer to generate the waveform.
- For generating the longer duration waveform as the RFSG memory size is limited.
- For testing your receiver for continuous signal reception.
- For receiver functionality verification tests that require longer duration of video to be played.
- For receiver sensitivity measurement (BER) for longer duration.

This example requires the following additional input parameters.

1. **Waveform File Path** – The toolkit writes the generated waveform in a file specified by this file path control.
2. **Oversampling Enabled** – set this property value to TRUE if resampling is required.
3. **Output Sampling Rate (Hz) –** Configure this control to a suitable value if Oversampling Enabled property is set to TRUE.
4. **Output Sample Width –** The default sample width of the output waveform is 8-bits. The available options are 8-bits and 16-bits. We recommend 16-bits sample width for better signal quality of the generated waveform.

The figure below shows the front panel of the Example VI.



The toolkit configurations are same as specified in section 3.1. This example requires additional input Waveform File Path to store the generated waveform in a file.

3.3. Play Waveform from File

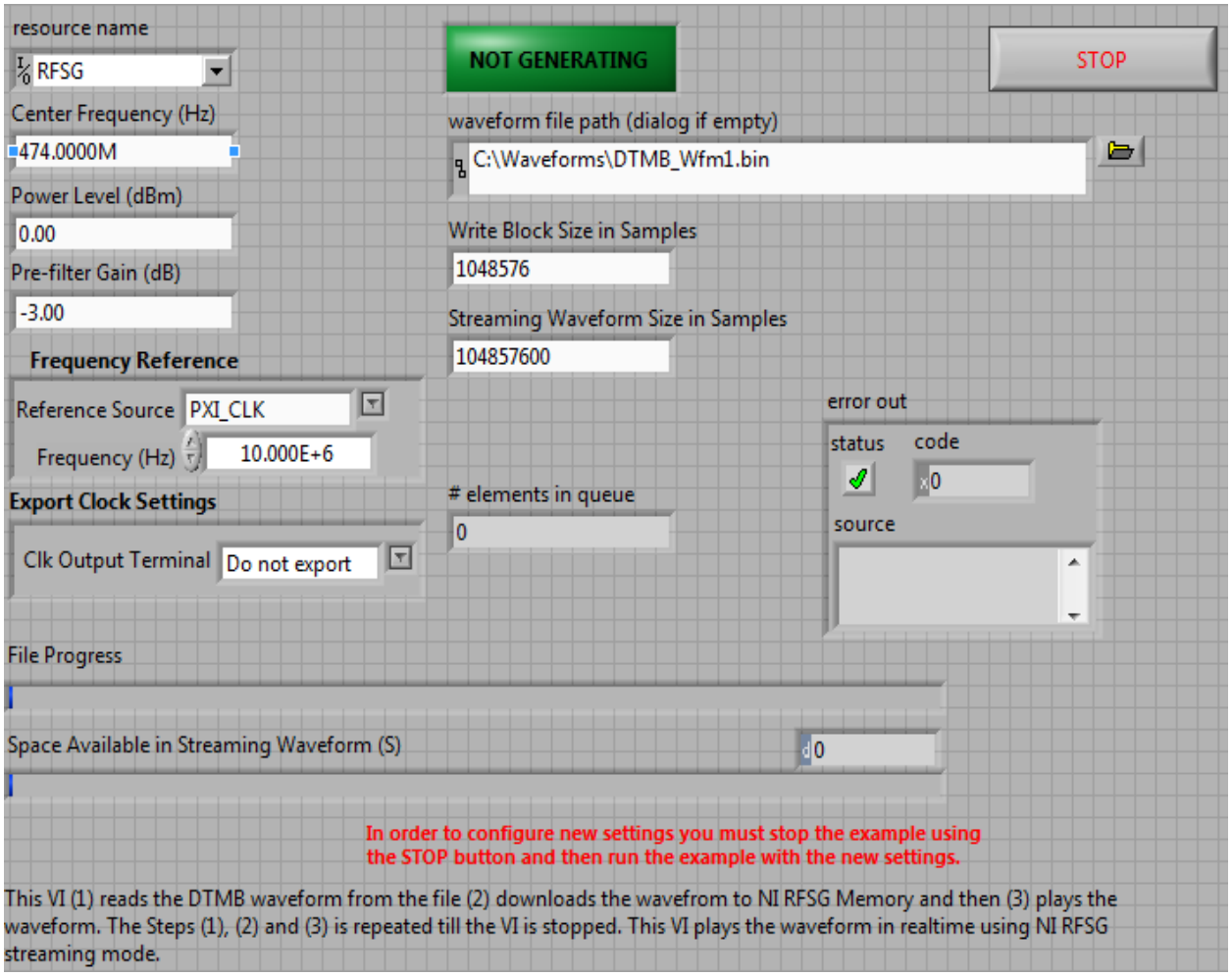
This example reads the DTMB waveform from the file created using the previous example in section 3.2 and then realtime downloads the wavefrom to NI RFSG Memory and then plays the waveform. This example is created using the NI RFSG streaming example available in the NI website.

This example uses NI RFSG in streaming mode for playing the waveform in real-time. The performance of this example is related to the performance of your CPU and available RAM memory.

The figure below shows the front panel of the Example VI. For more information about NI RFSG streaming refer to the web link below.

http://zone.ni.com/reference/en-XX/help/371025K-01/rfsg/streaming/

Sample Width – use the same sample width value used for storing the waveform in the file.



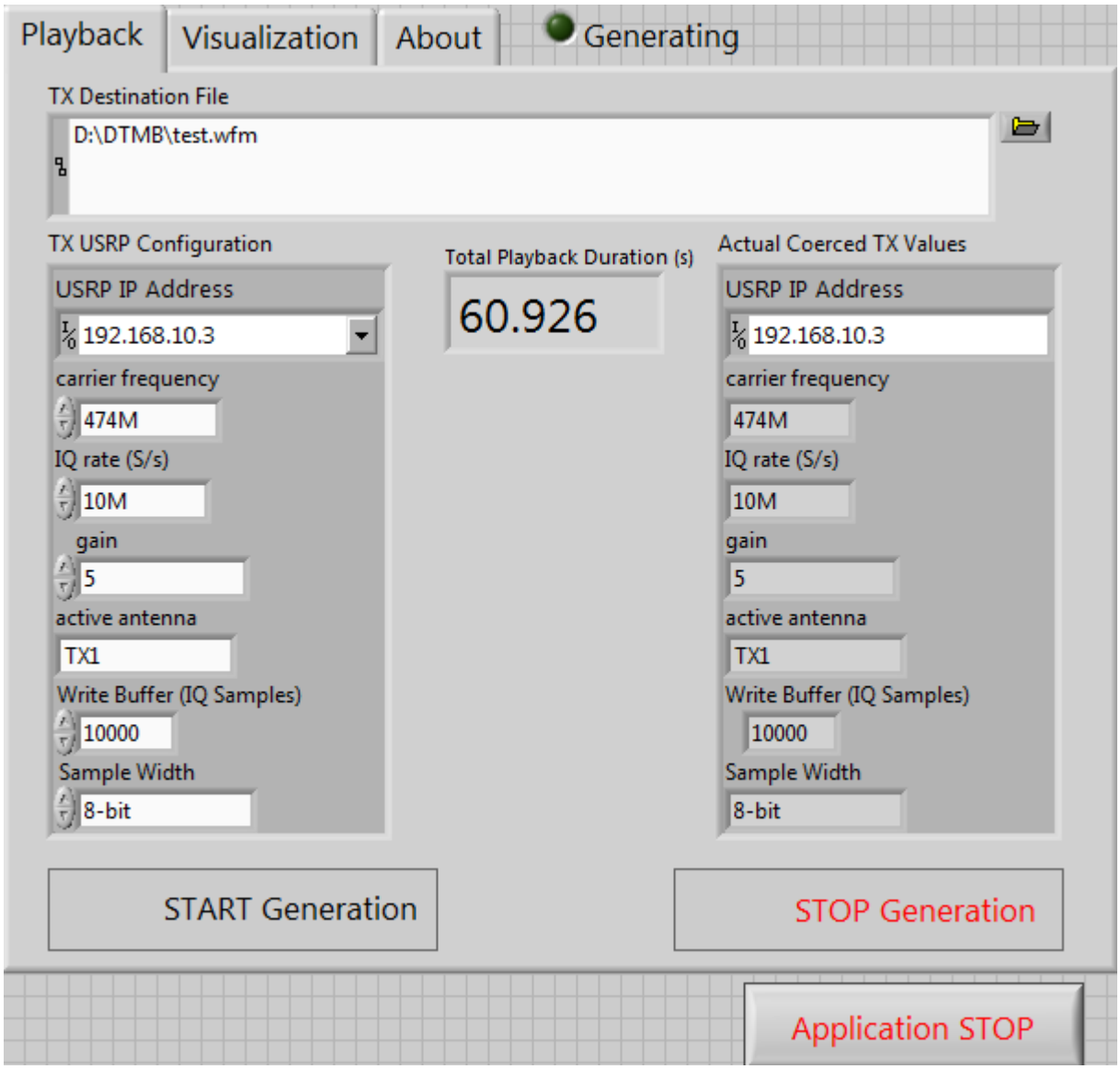
3.4 Play Waveform from File (USRP)

3.4.1 MaxEye DTMB USRP Play Waveform from File

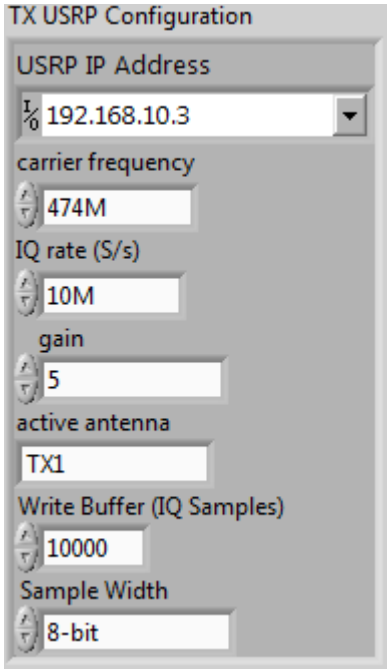
This example reads the DTMB waveform from the file created using the example mentioned in the Section 3.2 and then downloads the waveform in real time to NI USRP memory and then plays the waveform.

The performance of this example is related to the performance of your CPU and available RAM memory.

The figure below shows the front panel of the Example VI.



3.4.1.1 TX USRP Configuration



USRP IP Address – IP address of the NI USRP

Carrier Frequency – Center Frequency of the DTMB signal in Hz.

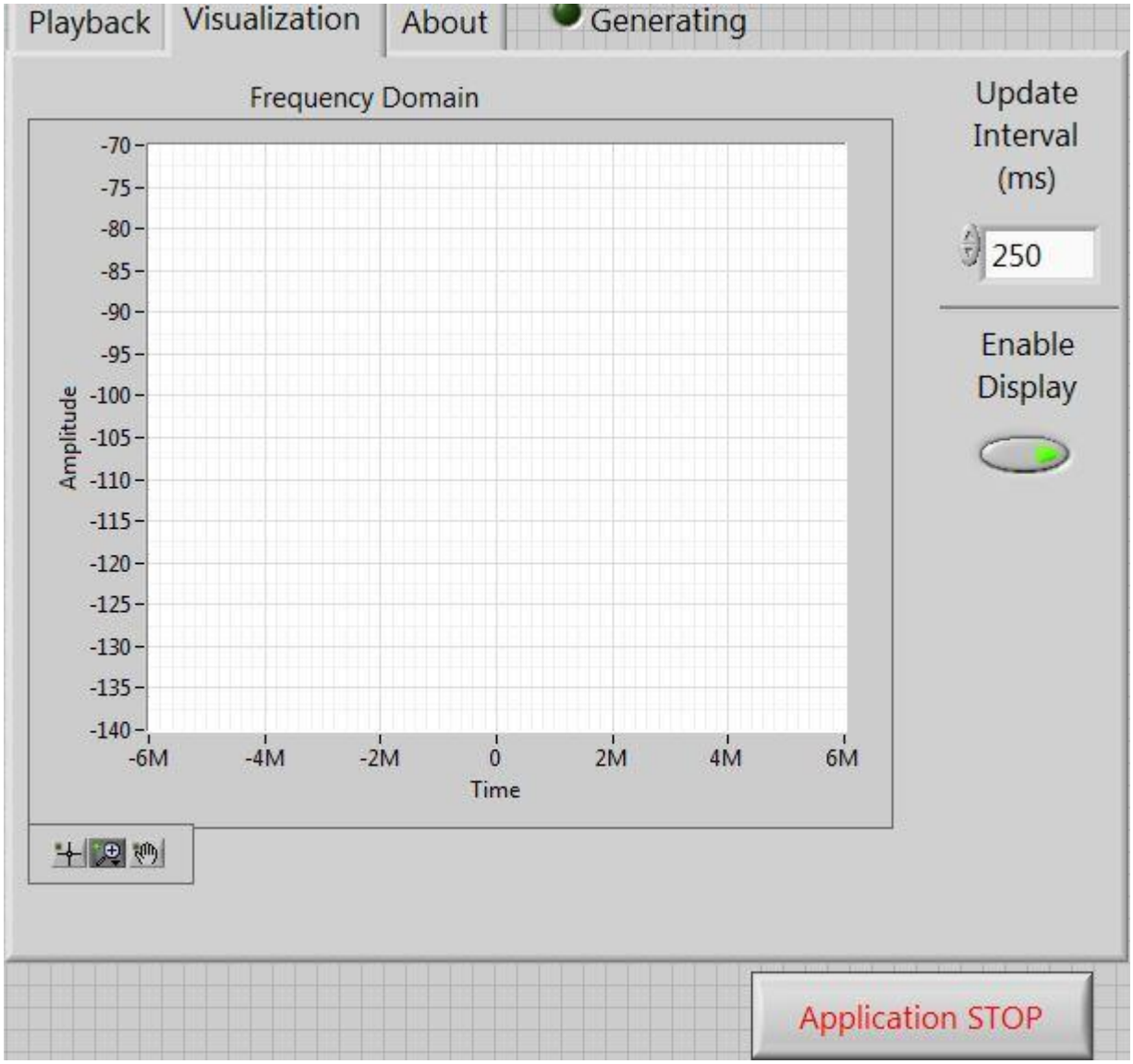
IQ Rate (S/s) – Rate of the baseband I/Q data in samples per second (S/s).

Sample Width – configure the sample width used to generate waveform file.

Active Antenna, Gain, Expected Peak, coerced IQ rare, coerced carrier frequency, and coerced gain – Refer NI USRP help file.

3.4.1.2 Visualization

The spectrum of the generated waveform can be monitored in the Visualization Tab as in the example VI shown below. Enable Display button needs to be set to ON state in order to view the spectrum.


Playback
Visualization
About
Generating
Frequency Domain
Amplitude
-70
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-80
-85
-90
-95
-100
-105
-110
-115
-120
-125
-130
-135
-140
-6M
-4M
-2M
0
2M
4M
6M
Time
Update Interval (ms)
250
Enable Display
Application STOP