

MaxEye Digital Audio Signal Generation

DRM Signal Generation Toolkit

Version 1.0.0

Getting Started Guide

Contents

List of Abbreviations	2
1. Introduction	3
2. Installed File Location	3
1.1 Soft Front Panel	3
1.2 Programming Examples	3
1.3 Remote API VIs	4
1.4 Documentation	4
3. Soft Front Panel	5
3.1 MaxEye DRM Signal Generation SFP	5
3.1.1 Generate and Save Waveform/ Generate and Play Waveform	5
3.1.2 Generate and Play Waveform (Real-Time)	19
3.1.3 Play Waveform from File	20
3.2 General SFP Controls and Indicators Details	22
3.3 Remote Mode	25
3.3.1 DRM Signal Generator Remote Mode in SFP Procedure	25
3.3.2 Remote C Examples	26
3.3.3 Remote LabVIEW Examples	34
4 How to configure parameters for Single Carrier/ Multiple Carriers	40
4.1 Single Carrier	40
4.2 Multiple Carrier	40

For more information please contact info@maxeyetech.com

List of Abbreviations

DRM	Digital Radio Mondiale
SFP	Soft Front Panel
RFSG	Radio Frequency Signal Generator
OFDM	Orthogonal Frequency Division Multiplexing
AWG	Arbitrary Waveform Generator
BER	Bit Error Ratio
VST	Vector Signal Transceiver
AWGN	Additive White Gaussian Noise
FFT	Fast Fourier Transform
PAPR	Peak to average power ratio
API	Application Program Interface
FEC	Forward Error correction

For more information please contact info@maxeyetech.com

1. Introduction

MaxEye Technologies provides generation functions in LabVIEW and C for generating the standard complaint signals for various digital audio and video broadcasting standards. This guide explains how to use the DRM Signal Generation toolkit using the Soft Front Panel (SFP) and programming examples by Vector Signal Transceiver (VST).

The Digital Radio Mondiale (DRM) signal generation is based on the ETSI standard ES 201 980 (Digital Radio Mondiale (DRM); System Specification).

2. Installed File Location

1.1 Soft Front Panel

The DRM Signal Generation soft front panel is located in, C:\Program Files(x86)\MaxEye\Digital Video Toolkits\DRM Generation\Application

(Note: - For 32-bit Operating System, SFP is located in C:\Program Files\MaxEye\Digital Video Toolkits\DRM Generation\Application)

The Soft Front Panel can be automated from the remote computer by using both LabVIEW Remote APIs and C Remote Functions.

You can also find a shortcut to the above location from the windows start menu.
Start->All Programs->MaxEye->Digital Radio Toolkits->DRM Generation

Note: - For Windows 10, **Start ->MaxEye**

1.2 Programming Examples

The remote LabVIEW programming examples are installed in, <LabVIEW>\examples\MaxEye\Digital Video Toolkits\DRM Generation\Remote

The remote C Examples are located in, C:\Program Files(x86)\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C

(Note: - For 32-bit Operating System, C Examples are located in C:\Program Files\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C)

You can also find a shortcut to the above location from the windows start menu.
Start->All Programs->MaxEye->Digital Radio Toolkits->DRM Generation->Examples

Note: - For Windows 10, **Start ->MaxEye**

For more information please contact info@maxeyetech.com



1.3 Remote API VIs

The Remote APIs are installed in, <LabVIEW>\vi.lib\addons\MaxEye\Digital Video Toolkits\DRM Generation\Generation\API.

1.4 Documentation

The toolkit help file is installed in, <LabVIEW>\help\MaxEye\Digital Video Toolkits\MaxEye DRM Signal Generation Help.chm

The toolkit documentation files are installed in, C:\Program Files(x86)\MaxEye\Digital Video Toolkits\DRM Generation\Documentation.

*(**Note:** - For 32-bit Operating System, toolkit documentation are located in C:\Program Files\MaxEye\Digital Video Toolkits\DRM Generation\Documentation)*

You can also find a shortcut to the above location from the windows start menu.
Start->All Programs->MaxEye->Digital Radio Toolkits->DRM Generation->Documentation

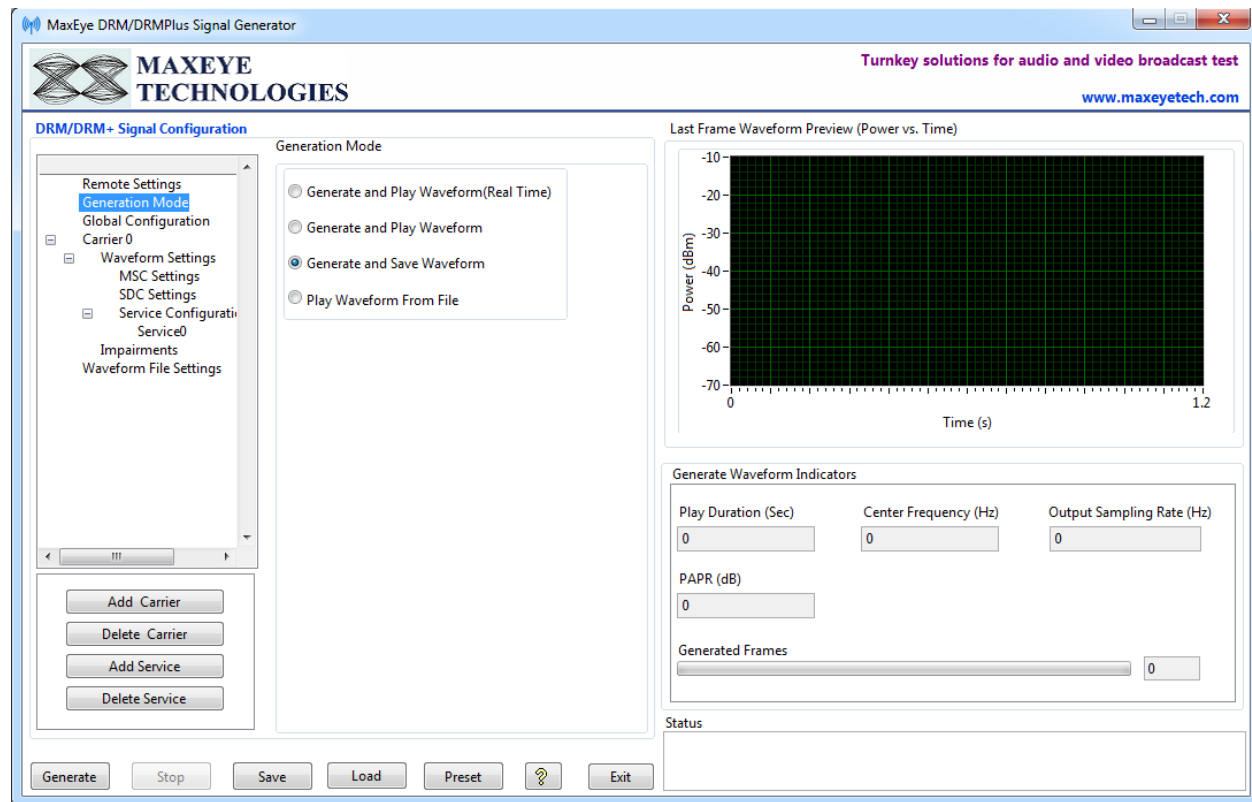
***Note:** - For Windows 10, Start ->MaxEye*

3. Soft Front Panel

The soft front panel (SFP) for DRM Signal Generation allows engineers to quickly generate the signals by selecting appropriate generation mode and other configurations. The default signal generation mode of the SFP is Generate and Save Waveform in File and in this mode the generated waveform is stored in a file.

3.1 MaxEye DRM Signal Generation SFP

The figure below shows the DRM Signal Generation SFP.



3.1.1 Generate and Save Waveform/ Generate and Play Waveform

Generate and Play waveform is used to generate DRM signal using hardware. Generate and Save Waveform is used to generate the baseband IQ waveform and store in a file. For this mode hardware is not required. The Play Waveform from File mode reads the DRM waveform from the file created using the Generate and Save Waveform and then downloads the waveform to NI RFSG Memory and then plays the waveform.

For more information please contact info@maxeyetech.com

Use the Generate and Save Waveform mode

- To generate and store the custom waveforms based on your test requirement.
- To avoid generating the waveform at the beginning of your test every time. 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 sensitivity measurement (BER) for longer duration.

Follow the procedure below to generate signals using these generation modes.

1. Select **Waveform Format -> Generation Mode -> Generate and Save Waveform** or **Generate and Play Waveform**
2. Select **Hardware Settings** to configure the following parameters.

DRM/DRM+ Signal Configuration

Remote Settings
Generation Mode
Hardware Settings
Global Configuration
Carrier 0
Waveform Settings
MSC Settings
SDC Settings
Service Configuration
Service0
Impairments

Hardware Settings
RFSG Resource:
Power Level (dBm):
External Attenuation (dB):
Arb:Pre-filter Gain (dB):
Ref clock source:
Frequency (Hz):
Clk Output terminal:

Add Carrier
Delete Carrier
Add Service
Delete Service

Generate Stop Save Load Preset ? Exit

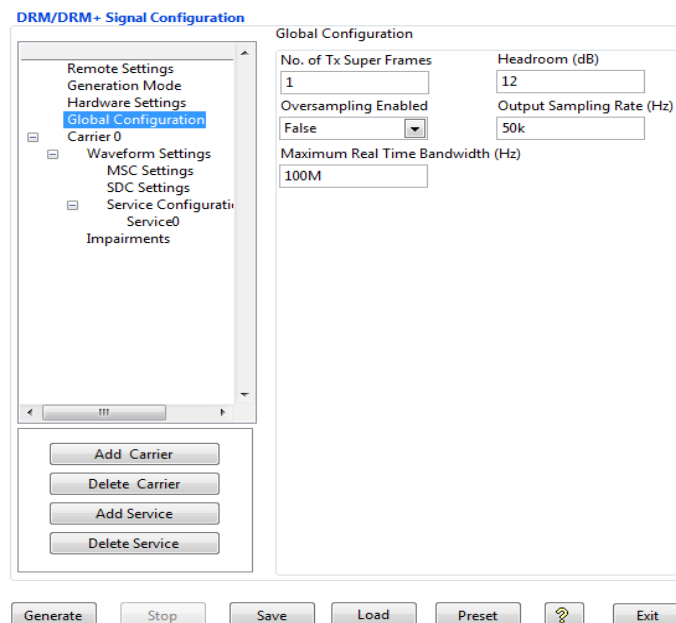
For more information please contact info@maxeyetech.com

Note: - These settings need not to be configured if the chosen Generation Mode is Generate and Save Waveform.

- **RFSG Resource** – Select the Resource Name used in NI Measurement and Automation Explorer (NI MAX) for the AST-1000 or NI 5840 device.
- **Power Level (dBm)** – Specifies the Average Power level of the signal in dBm.
- **External Attenuation (dB)** – Specifies the external amplification or attenuation, in dB, if any, between the NI RF signal generator and the device under test. Positive values for this property represent amplification, and negative values for this property represent attenuation.
- **Arb: Pre-filter Gain (dB)** – Specifies the Arbitrary Waveform Generator (AWG) Pre-filter Gain, in dB. The pre-filter gain is applied to the waveform data before any other signal processing. Reduce this value to prevent overflow in the AWG interpolation filters. Other gains on the NI-RFSG device are automatically adjusted to compensate for non-unity AWG pre-filter gain.
- **Ref Clock Source** – Specifies the source of the Reference Clock signal.
- **Frequency (Hz)** – Specifies the Reference Clock rate, in Hertz (Hz).
- **Clk Output Terminal** – Specifies the terminal where the signal will be exported..

For more information on External Attenuation (dB), Arb: Pre-filter Gain (dB), Reference Source, Frequency (Hz), Clk Output Terminal, please refer NI RFSG Signal Generators help file.

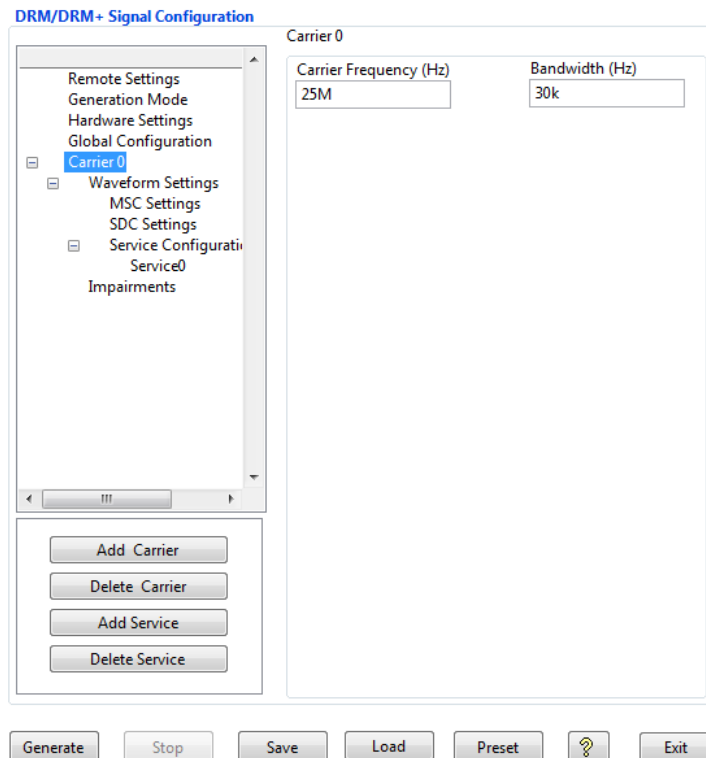
3. Select **Global Configuration** to configure the following parameters.



For more information please contact info@maxeyetech.com

- **No. of Tx Super Frames** – Specifies the required number of Transmission Super Frames. This parameter defines the length of the waveform to be generated. To generate longer duration of the waveform, increase the Number of Tx Super Frames.
- **Headroom (dB)** – Specifies the Headroom value. The generator uses this value for scaling the waveform. If PAPR of the signal is higher than the Headroom value then the generator clips the signal. To avoid clipping, the Headroom value should be higher than the PAPR of the signal. For more information, please refer MaxEye DRM Signal Generation Help.chm.
- **Oversampling Enabled & Output Sampling Rate (Hz)** – Specifies whether the Oversampling Property is enabled or not. Use this configuration only when you want to resample the signal to different sampling rate. The toolkit resamples the generated signal to a sampling rate equal to the **Output Sampling Rate** only if the **Over Sampling Enabled** property is set to **True**.

4. Select Carrier to configure the following parameters.



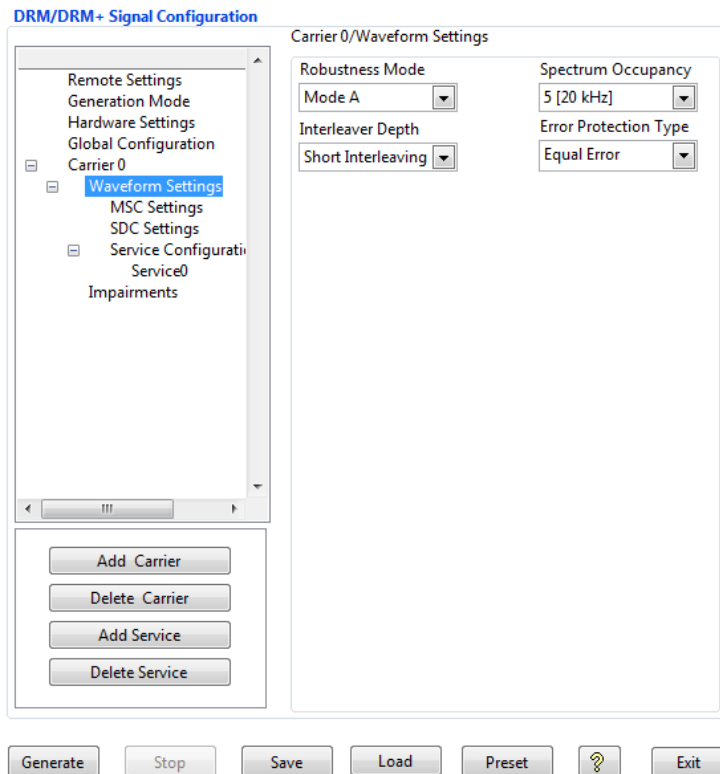
Note: - By default, the tree control shows Carrier 0. To configure more carriers, click the Add Carrier button and configure the following parameters for each carrier.

- **Carrier Frequency (Hz)** – Specifies the Carrier Frequency for the selected carrier in Hz.

For more information please contact info@maxeyetech.com

- **Bandwidth (Hz)** – Specifies the Bandwidth of the signal for the selected carrier. The toolkit internally uses the Carrier Frequency and Bandwidth property values internally to compute the overall bandwidth and sampling rate of the signal when more than one carrier is used.

4.1. Select **Waveform Settings** to configure the following parameters for the selected carrier



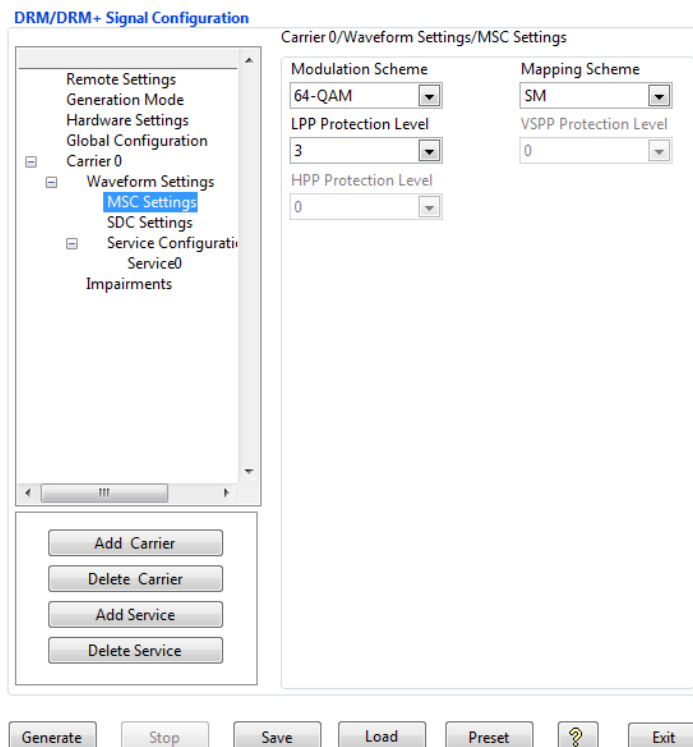
- **Robustness Mode** – Specifies the Robustness Mode of the DRM signal. Select one of the Robustness Mode as per the requirement. Supported modes are A, B, C, D and E. For the signal in a given Spectrum Occupancy, the different robustness mode along with the Spectrum Occupancy decides the data rate.
- **Spectrum Occupancy** – Specifies the Spectrum Occupancy. Select one of the spectrum occupancy as per the requirement.

Relationship between spectrum occupancy parameter and channel bandwidth is shown in the figure below.

	Spectrum occupancy					
	0	1	2	3	4	5
Channel bandwidth (kHz) robustness modes A, B, C and D	4,5	5	9	10	18	20
Channel bandwidth (kHz) robustness mode E	100	-	-	-	-	-

- **Interleaver Depth** – Specifies the Interleaver Depth. For robustness modes A, B, C and D user can choose short or long interleaving depth. For robustness mode E only Long Interleaving depth is supported by the standard.
- **Error Protection Type** – Specifies the Error Protection type of the DRM Signal. Select one of the Error Protection type as per the requirement. Equal error protection uses a single code rate to protect all the data in a channel. Unequal error protection can be used with two code rates to allow the data in the Main Service Channel to be assigned to the higher protected part and the lower protected part.

4.2. Select **MSC Settings** to configure the following Main Service Channel (MSC) parameters for the selected carrier



The screenshot shows the 'DRM/DRM+ Signal Configuration' window. On the left is a tree view with categories: Remote Settings, Generation Mode, Hardware Settings, Global Configuration, Carrier 0, Waveform Settings, MSC Settings (highlighted), SDC Settings, Service Configuration, Service0, and Impairments. Below the tree are buttons: Add Carrier, Delete Carrier, Add Service, and Delete Service. The main area is titled 'Carrier 0/Waveform Settings/MSC Settings' and contains the following settings:

- Modulation Scheme: 64-QAM
- Mapping Scheme: SM
- LPP Protection Level: 3
- VSP Protection Level: 0
- HPP Protection Level: 0

At the bottom of the window are buttons: Generate, Stop, Save, Load, Preset, a help icon, and Exit.

For more information please contact info@maxeyetech.com

- **Modulation Scheme** – Specifies the Modulation Scheme for Main Service Channel (MSC) of the DRM signal. Select one of the Modulation Scheme as per the requirement. Supporting schemes are 64-QAM, 16-QAM and 4-QAM.
- **Mapping Scheme** – Specifies the mapping scheme for MSC. Select one of the mapping schemes from the list. For the standard mapping and symmetrical hierarchical modulation (SM and HMsym), identical mappings shall be used for the real and imaginary components of the signal constellation. For the mixed mapping hierarchical modulation (HMmix) separate mappings shall be used for the real and imaginary components of the signal constellation.
***Note:** - Hierarchical Mapping Scheme works only with 64-QAM Modulation Scheme.*
- **LPP Protection Level** – Specifies the protection level for the lower protected part of the MSC. User have to choose the required value from the given options. It specifies the code rate of the lower protected part.
- **HPP Protection Level** – Specifies the protection level for the higher protected part of the MSC. Users have to choose the required value from the given options.
***Note:** - This parameter is applicable only if the Error Protection Type is set to Unequal Error Protection.*
- **VSPP Protection Level** – Specifies the protection level for the very strong protected part of the MSC. User have to choose the required value from the given options. It specifies the code rate of the very strongly protected part.
***Note:** - This parameter is applicable only if the Error Protection Type is set to Unequal Error Protection and the Mapping Scheme is set to any of the Hierarchical Mapping.*

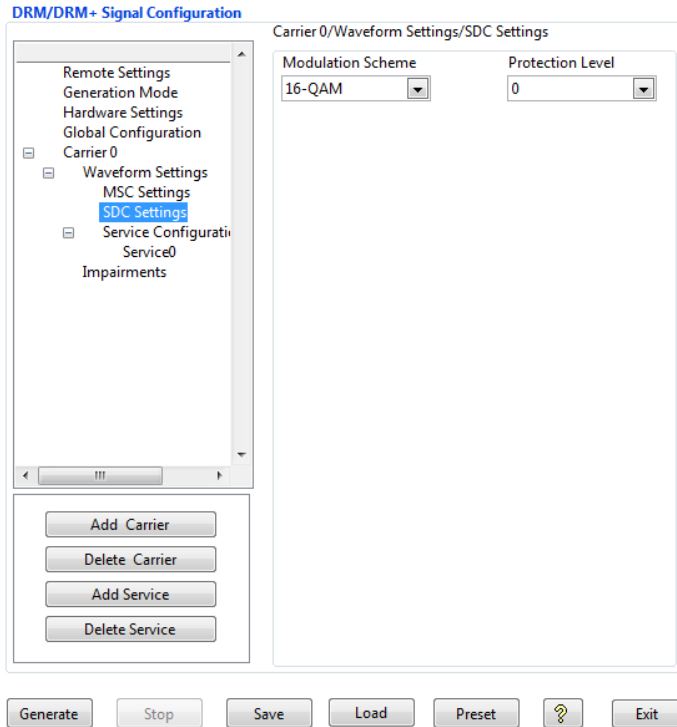
The figure below shows the code rate combinations for the MSC with 64-QAM (default) for Robustness Mode A, B, C and D

Protection level	R _{all}	R ₀	R ₁	R ₂	R _{Y_{lcm}}
0	0,5	1/4	1/2	3/4	4
1	0,6	1/3	2/3	4/5	15
2	0,71	1/2	3/4	7/8	8
3	0,78	2/3	4/5	8/9	45

***Note:** - The above table is applicable for LPP Protection Level, and HPP Protection Level. Protection Level 0 provides highest protection and Protection Level 3 provides weakest protection. For more information on code rates combinations for other configurations, please refer the DRM technical specification document ETSI ES 201 980 v4.1.1.*

4.3. Select **SDC Settings** to configure the following parameters for the selected carrier

For more information please contact info@maxeyetech.com



- **Modulation Scheme** – Specifies the Modulation Scheme for Service Description Channel (SDC) of the DRM Signal. Select one of the Modulation Scheme as per the requirement. Supporting schemes are 16-QAM and 4-QAM.
- **Protection level** – Specifies the protection level for SDC. The default value is 0. Choose 0 for 16-QAM SDC Modulation Scheme and 1 for 4-QAM SDC Modulation Scheme.

4.4. Select **Service Configuration** to configure the following service parameters for the selected carrier.

DRM/DRM+ Signal Configuration

Carrier 0/Waveform Settings/Service Configuration/Service0

<ul style="list-style-type: none"> Remote Settings Generation Mode Hardware Settings Global Configuration Carrier 0 <ul style="list-style-type: none"> Waveform Settings MSC Settings SDC Settings Service Configuration <ul style="list-style-type: none"> Service0 Impairments 	<p>Input Mode: Audio</p> <p>Stream ID: 0</p> <p>Short ID: 0</p> <p>Service Label: MaxEye DRM Test</p> <p>Text Message: DRM TEST & This is DRM Test Transmission from MaxEye Technologies Pvt. Ltd, Bangalore.</p> <p>Payload Settings</p> <p>Payload Mode: PN Sequence</p> <p>Payload PN Seed: x BEEFBEEF</p> <p>Payload PN Order: 9</p>	<p>Language: Hindi</p> <p>Programme Type: Education</p> <p>Service Identifier: F25236</p> <p>Display Text Message?: True</p>
--	---	--

Add Carrier
Delete Carrier
Add Service
Delete Service

Generate Stop Save Load Preset ? Exit

Note: - By default, the tree control shows Service 0. To configure more services, click the Add Service button and configure the following parameters for each service.

- **Input mode** – Specifies whether the intended service is of Audio type or Data type.
- **Service Identifier** – Specifies the unique identifier for each service. It is recommended that domestic services construct the 24-bit Service Identifier by allocating the 8-most significant bits to Extended Country Code (ECC), the next 4-bits to Country Code (CC), and the remaining 12 bits for individual services. Eg: - **f25236** where **f2** is ECC for India, **5** is the CC and **235** is random service id.
- **Stream Id** – Specifies the stream Id of the stream which carries the data service (or data application). The valid values for stream Id is ranging from 0 to 4.

Note: - Each Service must be given different Stream Ids.

- **Short Id** – Specifies the short identifier assigned to each service and used as a reference in the SDC. The valid values for short Id is ranging from 0 to 4.

Note: - Each Audio Service must be given different Short Ids. If any Data Service is intended to

For more information please contact info@maxeyetech.com

be associated with any Audio Service, both the services shall be given same Short Id. Such associated Data Services need not to be accounted in the Number of Services parameter.

- **Language** – Specifies the language of the target audience.

The language details are defined in the table below.

Decimal number	Language	Decimal number	Language
0	No language specified	8	Hindi
1	Arabic	9	Japanese
2	Bengali	10	Javanese
3	Chinese (Mandarin)	11	Korean
4	Dutch	12	Portuguese
5	English	13	Russian
6	French	14	Spanish
7	German	15	Other language

- **Programme Type** – Specifies the program type of an audio service.

The language details are defined in the table below.

Decimal number	Programme type	Decimal number	Programme type
0	No programme type	16	Weather/meteorology
1	News	17	Finance/Business
2	Current Affairs	18	Children's programmes
3	Information	19	Social Affairs
4	Sport	20	Religion
5	Education	21	Phone In
6	Drama	22	Travel
7	Culture	23	Leisure
8	Science	24	Jazz Music
9	Varied	25	Country Music
10	Pop Music	26	National Music
11	Rock Music	27	Oldies Music
12	Easy Listening Music	28	Folk Music
13	Light Classical	29	Documentary
14	Serious Classical	30	<i>Not used</i>
15	Other Music	31	<i>Not used - skip indicator</i>

- **Audio Conditional Access Indication** – Specifies whether the audio service uses audio conditional access or not.
- **Data Conditional Access Indication** – Specifies whether the data service uses data conditional access or not.

For more information please contact info@maxeyetech.com

- **Service Label** – Specifies label for a particular service.
- **Display Text Message?** – Specifies whether to display text message or not in the receiver.
- **Text Message** – Specifies the text message to be transmitted. Maximum 1024 characters are supported.

➤ **Payload Settings**

- **PN Sequence** – Specifies **Payload PN Order** and **Payload PN Seed** properties. The toolkit generates pseudo 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 super frames.

Payload Mode

Payload PN Seed Payload PN Order

- **User defined bits** – Enter the desired bit pattern in the **Payload User Defined Bits** property. The generator repeats the entered bit pattern till the number of bits required for the frame, for the given configuration, is met.

Payload Mode

Payload User Defined Bits

- **Test Pattern** – 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.

Payload Mode

Payload Test Pattern

- **Test File** – This mode is used for generating signal with the binary data from the file.

For more information please contact info@maxeyetech.com

Payload Mode


Test File 

File Path



- **Input Wave File (*.wav)** – In this mode configure the File Path property. The inbuilt AAC encoder compresses the wave audio to AAC format compatible with DRM.

Payload Mode

Input Wave File 

File Path



Note: - Recommended wav file of type mono with sampling frequency 24 kHz.

- **DRM Modulated AAC** – In this mode configure the Audio File Path property and Num. of bytes in HPP (applicable only if Error Protection Type is Unequal Error Protection) and the toolkit ignores other properties in the Digital Audio Payload Control.

Note: - The input AAC audio should be encoded as per DRM standard

5. Select **Impairments** to configure the following impairment parameters

DRM/DRM+ Signal Configuration

Remote Settings
Generation Mode
Hardware Settings
Global Configuration
Carrier 0
Waveform Settings
MSC Settings
SDC Settings
Service Configuration
Service0
Impairments

Carrier 0/Impairments

Impairments Enabled
True

Sample Clock Offset (ppm)
0

Carrier Freq Offset (Hz)
0

Quadrature Skew (degree)
0

IQ Gain Imbalance (dB)
0

I DC Offset (%)
0

Q DC Offset (%)
0

AWGN Enabled
False

Carrier to Noise Ratio (dB)
0

Signal Loss Enabled?
False

Signal Loss Time Offset (s)
0.0

Signal Loss Duration (s)
0.0

Add Carrier
Delete Carrier
Add Service
Delete Service

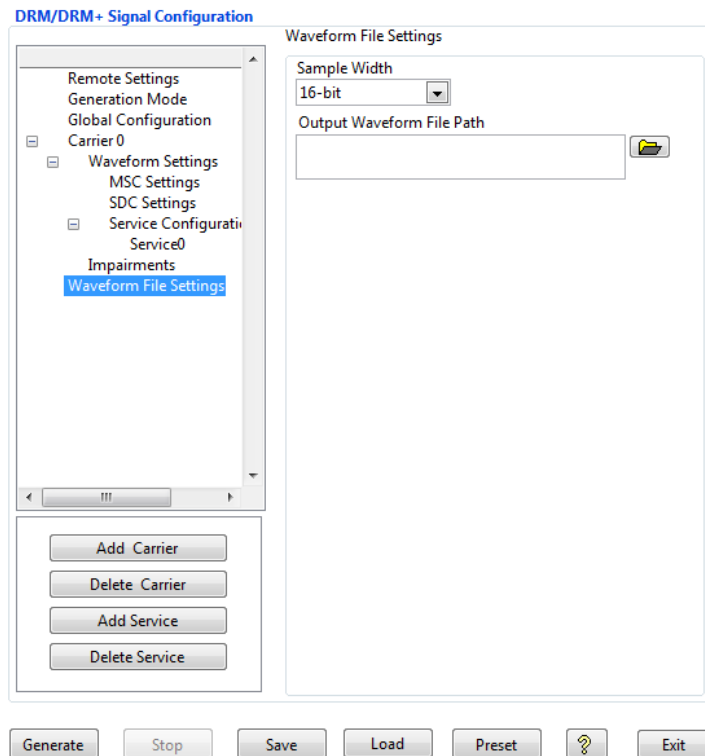
Generate Stop Save Load Preset ? Exit

- **Impairments Enabled** – Specifies whether the impairment addition is enabled or not. If this property is set to **True** then the toolkit adds the impairments to the generated signal as per the user configuration for the supported impairments.
- **Sample Clock Offset (ppm)** – Specifies the clock offset in parts per million (ppm). The toolkit applies the clock offset to the generated waveform based on this value. The applied clock offset is relative to the clock frequency of the signal generator. The default value is 0.
- **Carrier Freq Offset (Hz)** – Specifies the frequency offset in Hz. The toolkit applies frequency offset to the created waveform based on the value configured in this property. The applied frequency offset is relative to the signal generator's carrier frequency. The default value is 0.
- **Quadrature skew (degree)** – Specifies the deviation in angle from 90 degrees between the in-phase (I) and quadrature-phase (Q) signals. The default value for the Quadrature Skew is 0.
- **IQ gain imbalance (dB)** – Specifies the ratio, in dB, of the mean amplitude of the in-phase (I) signal to the mean amplitude of the quadrature-phase (Q) signal. The default value is 0.

For more information please contact info@maxeyetech.com

- **I DC offset (%)** – Specifies the In-phase DC offset value. The toolkit adds the DC offset to the in-phase signal component (I) of the complex waveform as a percentage of the root mean square magnitude of the unaltered I signal. The default value is 0.
- **Q DC Offset (%)** – Specifies the Quadrature DC offset value. The toolkit adds the DC offset to the quadrature-phase signal component (Q) of the complex waveform as a percentage of the root mean square magnitude of the unaltered Q signal. The default value is 0.
- **AWGN Enabled** – Specifies if the AWGN noise addition is enabled or not. If this property is set to True then the toolkit adds Additive White Gaussian Noise (AWGN) to the created waveform based on the value configured in the Carrier to Noise Ratio property.
- **Carrier to Noise Ratio (dB)** – Specifies the Carrier to Noise ratio of the generated signal. The default value is 0dB.

6. Select **Waveform File Settings** to configure the following parameters

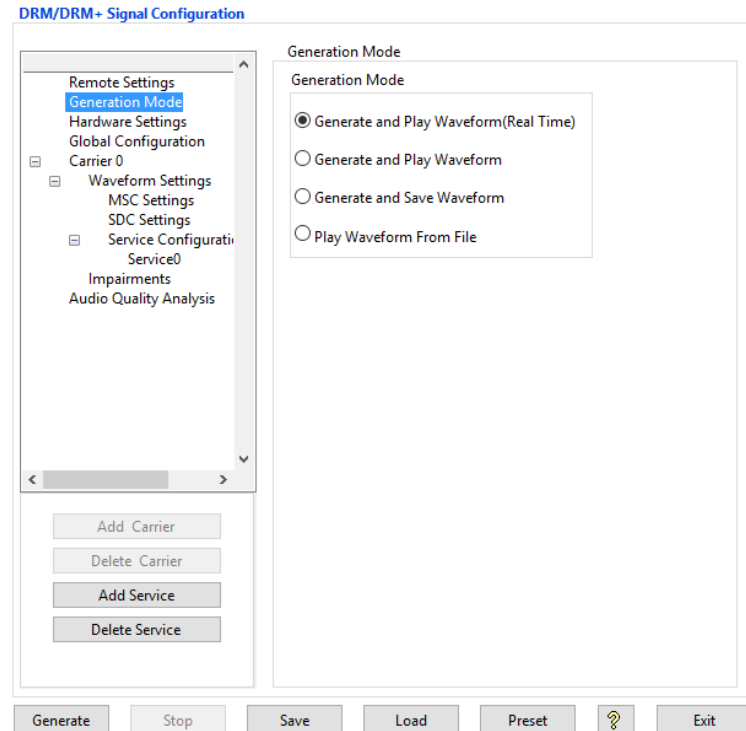


- **Sample Width** – Specifies the sample width to be used to generate the waveform. The default sample width of the output waveform is 16-bits. The available options are 8-bits and 16-bits. We recommend using 16-bits sample width for better signal quality of the generated waveform.

For more information please contact info@maxeyetech.com

- **Output Waveform file path-** Specifies a path to save the waveform.
***Note:** - Needs to be configured only when the generation mode is Generate and Save waveform.*

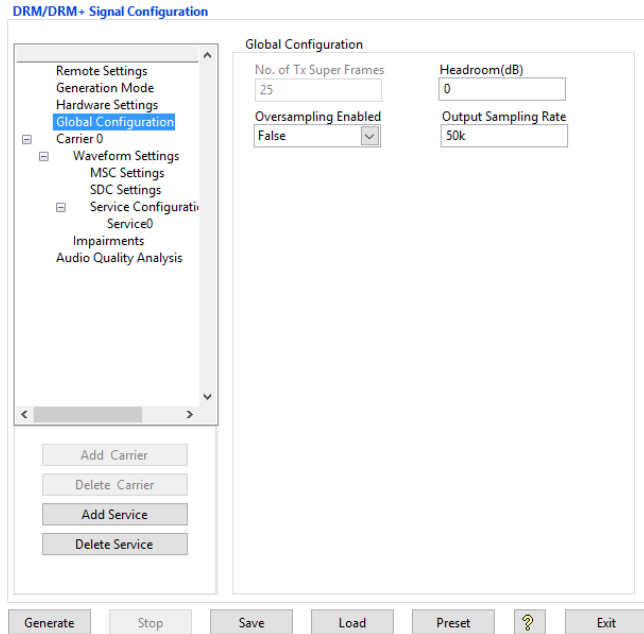
3.1.2 Generate and Play Waveform (Real-Time)



1. Select **Waveform Format** -> **Generation Mode** -> **Generate and Play Waveform (Real Time)**

In this mode the waveform is generated in real-time and the number of carriers supported is one. Follow the same procedure given in [section 3.1.1](#) of this document for signal configuration and hardware settings, except for the changes mentioned below.

2. In step 3, **Global Configuration, No. of Tx Super Frames** parameter need not to be configured.

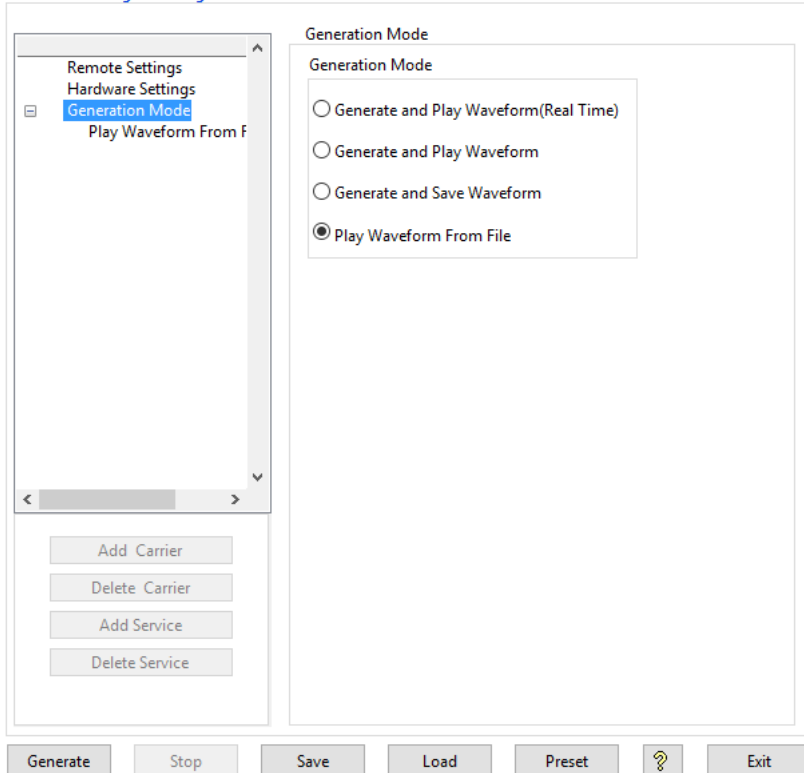


3. In step 4, **Carrier Configuration**, only Carrier 0 needs to be configured. More than 1 carrier is not supported in Real-Time generation mode.
4. Skip the Step 6, **Waveform Settings**, since this generation mode does not save the waveform in any file.

3.1.3 Play Waveform from File

In this generation mode DRM Signal Generator reads the waveform from the file created using the Generate and Save waveform generation mode, explained in the section 3.1.1 of this section, and then downloads the 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 the CPU and available RAM memory.

DRM/DRM+ Signal Configuration

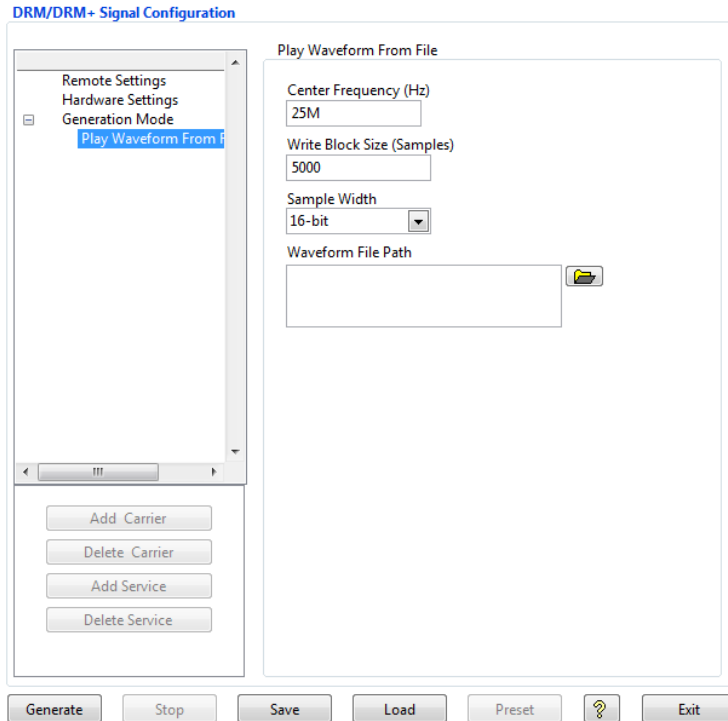
Follow the procedure below to generate waveform using this generation mode

1. Select **Waveform Format -> Generation Mode -> Play Waveform from File**
2. Select **Hardware Settings** to configure the parameters.

Refer [section 3.1.1](#) of this document to configure the desired hardware

3. Select **Play Waveform from File** to configure the following parameters

For more information please contact info@maxeyetech.com



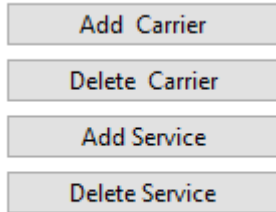
- **Center Frequency (Hz)** – Specify the center frequency of the DRM signal in Hz.
- **Write Blocks Size (Samples)** – The waveform is written in the hardware as blocks. This parameter configures the size of the block in samples.
- **Sample Width** – Use the same sample width value used for saving the waveform in the file.
- **Waveform File Path** – Give the absolute path of the saved waveform intended to play in this generation mode.

3.2 General SFP Controls and Indicators Details

- **Add carrier** – Click to add new carrier configuration with default values.
- **Delete Carrier** – Click to delete the selected carrier. Click on the appropriate **carrier tag** in a tree control or on any **child tag** like Waveform Settings, Layer and Impairments under specific **parent carrier tag** (carrier 0, carrier 1 etc.) can delete the respective carrier configurations. If any of the other tree items selected like Remote Settings, Generation Mode, Hardware Settings, Global Configurations and press delete carrier button will delete the last carrier.

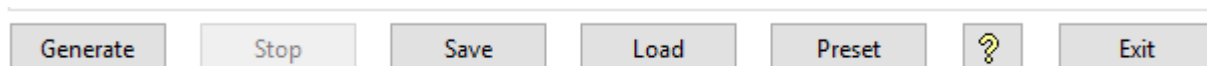
Note: - One carrier configuration is default which can't be deleted.

For more information please contact info@maxeyetech.com



All the items under the **parent carrier tag** specify configuration that need to be configured for each and every unique carrier.

- **Add Service** – Click to add **service settings** under specific carrier configuration. Click on the appropriate **carrier tag** in a tree control or on any **child tag** like waveform settings, impairments, MSC Settings, SDC settings under specific **parent carrier tag** (carrier 0, carrier 1 etc.) to select under which **carrier** the new **service settings** is going to be added.
- **Delete Service** – Click on the specific **Service tag** under from which carrier **Service** are going to be deleted.
- **Generate** – Click to generate signal as per the parameters configured.
Note: - Parameters can be changed at run time ones **Generate** button has been pressed.
- **Stop** – Click to stop the signal generation.
- **Save** – Saves the entire configuration in the INI file.
- **Load** – Load the entire configuration back to the application which has been saved previously by Clicking **Save button**.
- **Preset** – Click to reinitialize all parameters to their defaults values.
- **Exit** – Click to exit the application.



- **Status** – Displays warning or error.
- **Play Duration (sec)** – Returns the total duration, in seconds, of waveform generated.
- **Waveform Length (Samples)** – Returns the size of the generated waveform in number of samples.
- **Number of Carriers (Actual)** – An indication of number of carriers currently being configured.

For more information please contact info@maxeyetech.com

- **PAPR** – Indicates Peak to Average Power Ratio, which is calculated by dividing the peak power by the Root Mean Square (RMS) value of the waveform. This value is used to set the Headroom (dB) value.
- **Waveform Sampling Rate (Hz)** – Returns the sampling frequency of the generated IQ baseband waveform. Same sampling rate/IQ rate must be used when using **Play Waveform from File** examples.
- **Generated Frames** – Visualizes the progress of generating signal.
- **Center Frequency (Hz)** – Returns the center frequency of the multiple carrier waveform. The same frequency must be used when using **Play Waveform from File** examples.
- **Stop** – Click to this button to abort the generation at any time.

Generate Waveform Indicators

Play Duration (Sec)

Center Frequency (Hz)

Output Sampling Rate (Hz)

PAPR (dB)

Generated Frames

Status

Waveform File Indicators

Waveform File Indicators

Play Waveform Duration (Sec)

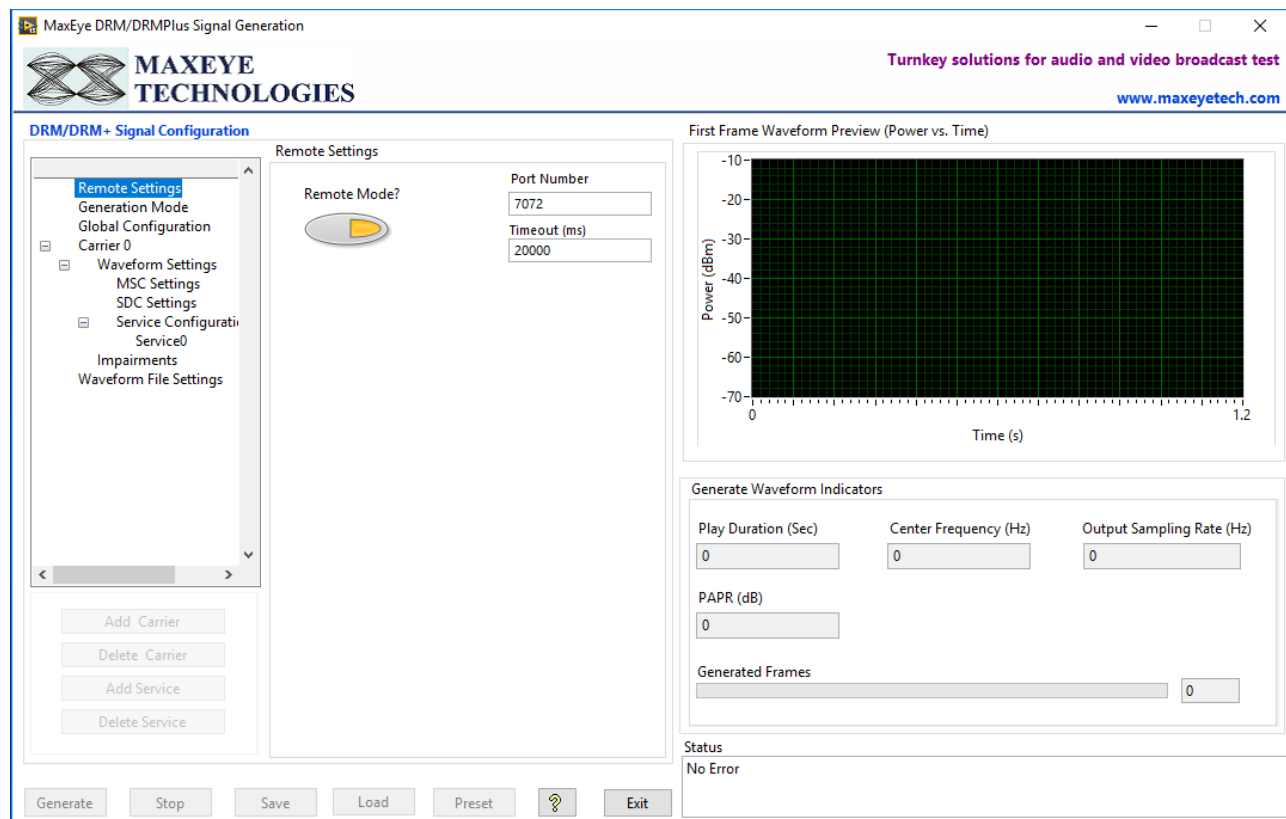
File Progress

For more information please contact info@maxeyetech.com

- **Play Waveform Duration (sec)** – Indicates the total duration, in seconds, of waveform generated. To generate longer duration of the waveform increase the Number of Frames value.
- **File Progress** – Indicates the file progress of a generating waveform.
- **Status** – Displays warning or error.

3.3 Remote Mode

Remote mode allows user to control the MaxEye Universal Radio Generator software remotely using server application (LabVIEW or C) to generate signals. This Server application/examples/APIs is provided with the DRM signal generation toolkit.



3.3.1 DRM Signal Generator Remote Mode in SFP Procedure

1. Select **Remote Settings** to configure the following parameters
 - **Remote Mode?** – Turn **Remote Mode?** switch **ON** (Remote) or **OFF** (Local) as required. The glowing yellow LED indicates ON state of the switch. By default, the Remote Mode? switch is in **OFF** state.

For more information please contact info@maxeyetech.com

- **Port Number** – Configure this control if **Remote Mode is ON**. Both client (MaxEye DRM Radio Generator) and server application must have same port number. The default Port Number is **7072**.
- **Timeout (ms)** – Configure this control if **Remote Mode is ON**. Timeout specifies the time in milliseconds that the client waits for a connection to be established with the server application. If a connection is not established in the specified time, the MaxEye Universal Radio Generator returns an error. The default Timeout is **20 seconds**.

3.3.2 Remote C Examples

3.3.2.1 DRM Generate and Save Waveform

```

Function Name: MaxEye DRM Generate and Save Init
Description:

The Main aim of this function is to define all the User Configurable DRM parameters.
=====
#include "..\Includes\MaxEye Utilities Typedefs.h"
#include "..\Includes\MaxEye DRM Generate and Save Defines.h"
#include "..\Includes\MaxEye DRM Generate and Save Typedefs.h"
#include "..\Includes\MaxEye DRM Generate and Save Externs.h"

char IP_Address[]="10.21.0.5"; //IP Address of the client system
UINT16 Command_Type=0; //0- StartGeneration, 1- StopGeneration
UINT16 SaveConfiguration = 1; //0- Disabled, 1- Enabled to Save configurations in file.
char SaveConfiguration_FilePath[]="C:\\Users\\URTadmin\\Desktop\\MaxEye\\Test Vectors\\DRM\\DRM_1Carrier_4Service_saveconfig.bin"; //Configure file path to save the configuration
double Headroom=10; //Headroom (dB)
UINT16 Sample_Width=1; //0- 8-Bit, 1- 16-Bit (Applicable for Generation_Mode -1 & 2)
UINT16 Over_Sampling_Enabled=0; //0- False, 1- True
double Output_Sampling_Rate=50000;
char Waveform_File_Path[] = "C:\\Users\\URTadmin\\Desktop\\MaxEye\\Test Vectors\\DRM\\DRM_C_1Carrier_4Service_gen.bin"; //Specify appropriate file path to save waveform
double Carrier_Frequency[MAX_NUM_CARRIERS] = {25000000, 25050000, 25100000}; //Multi Carrier Frequency
UINT16 Carrier_Bandwidth[MAX_NUM_CARRIERS] = {30000, 30000, 30000}; //0- 6kHz, 1- 8kHz, 2- 12kHz, 3- 16kHz, 4- 24kHz, 5- 32kHz
UINT16 Number_of_Services[MAX_NUM_CARRIERS] = {4, 1, 1};
INT32 Actual_Services[MAX_NUM_CARRIERS]={4,1,1}; //Actual services must be greater than or equal to number of services
UINT16 Input_Mode[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] =
{
    {0, 0, 0, 0},
    {0, 0, 0, 0},
    {0, 0, 0, 1}
}; //0- Audio Service, 1- Data Service
double Stream_Id[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] =
{
    {0, 1, 2, 3},{0, 1, 2, 3},{0, 1, 2, 3}
};
double Short_Id[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] = {{0, 1, 2, 3},{0, 1, 2, 3},{0, 1, 2, 3}}; //0- 0, 1- 1, 2- 2

```

Follow the procedure below to configure the example

1. Find the C example in, C:\Program Files(x86)\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\DRM Generate and Save Waveform
(**Note:** - For 32-bit Operating System, C Examples are located in C:\Program Files\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\DRM Generate and Save Waveform)
2. Open the desired example directory and open the solution file **DRM Generate and Save Waveform.sln** in **Microsoft Visual C++**.
3. Navigate to **MaxEye DRM Generate and Save Init.c** from the solution explorer.

(**Note :-**

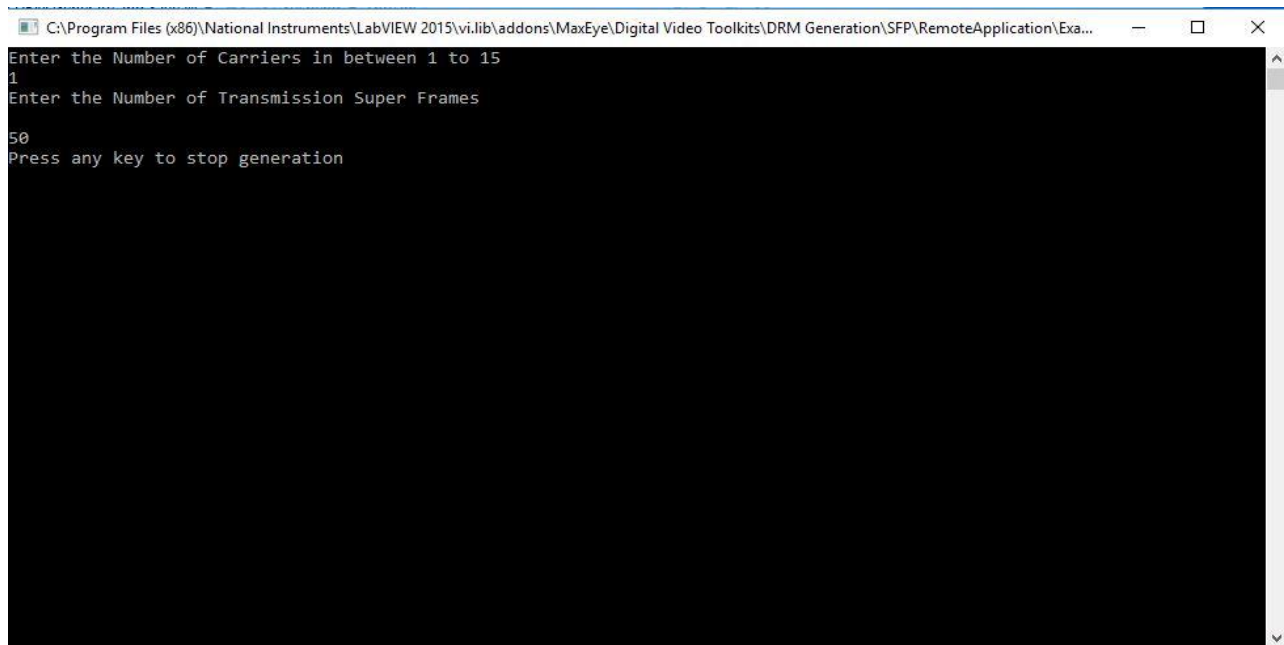
- **Save Configuration** – Configure this value to Enabled, if configuration to be saved in a file.

For more information please contact info@maxeyetech.com

- **Save Configuration File Path** – Configure the file path to save the configurations in file.

This file path is used for Load the Saved Configuration data to Load Configuration from File remote Example)

4. Configure the parameters listed as required. For help, please follow the comments given against each configuration parameter.
5. Navigate to **MaxEye DRM Generate and Save Main.c** and press Run button or (Ctrl + F5) for running the example. Enter the values in the console application window that appears after running the example.



```
C:\Program Files (x86)\National Instruments\LabVIEW 2015\vi.lib\addons\MaxEye\Digital Video Toolkits\DRM Generation\SFP\RemoteApplication\Exa...
Enter the Number of Carriers in between 1 to 15
1
Enter the Number of Transmission Super Frames
50
Press any key to stop generation
```

6. Enter the required **Number of Carriers**.
7. Enter the desired **Number of Transmission Super Frames**.

Now the MaxEye DRM Generator validates the user configuration and reports error to the user if the configuration is not as per standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

8. Press any key, to stop the generation.

3.3.2.2 DRM Generate Multiple Frames

```
Function Name: MaxEye DRM Generate and Play Init

Description:

The Main aim of this function is to define all the User Configurable DRM parameters.
*****/

#include "..\Includes\MaxEye Utilities Typedefs.h"
#include "..\Includes\MaxEye DRM Generate and Play Defines.h"
#include "..\Includes\MaxEye DRM Generate and Play Typedefs.h"
#include "..\Includes\MaxEye DRM Generate and Play Externs.h"

char IP_Address[]="10.21.0.5"; //IP Address of the client system
UINT16 Command_Type=0; //0- StartGeneration, 1- StopGeneration
UINT32 Hardware_Type=0; //Select Hardware Type 0 - VSG/VST, 1-USRP
char *RFSG_Resource = "PXI1Slot3"; //RFSG Resource Name
UINT16 SaveConfiguration = 1; //0- Disabled, 1- Enabled to Save configurations in file.
char SaveConfiguration_FilePath[]="C:\\Users\\URAdmin\\Desktop\\MaxEye\\Test Vectors\\DRM\\DRM Generation 1Carrier_4Service_Savecon.bin"; //Configure file path to save the configuration
double Headroom=10; //Headroom (dB)
UINT16 Sample_Width=1; //0- 8-Bit, 1- 16-Bit (Applicable for Generation_Mode -1 & 2)
UINT16 Over_Sampling_Enabled=0; //0- False, 1- True
double Output_Sampling_Rate=50000;
char *REF_Clock_Source = "OnboardClock"; //Reference Clock Source;
char *Clock_Output_Terminal = "Do not export signal"; //Clock Output Terminal;
UINT16 Number_of_Services[MAX_NUM_CARRIERS] = {2,2,2}; //Actual services must be greater than or equal to number of services
INT32 Actual_Services[MAX_NUM_CARRIERS] = {2,2,2}; //Multi Carrier Frequency
double Carrier_Frequency[MAX_NUM_CARRIERS] = {25000000, 25050000, 25100000}; //Give the bandwidth of each carrier in Hz.
UINT16 Carrier_Bandwidth[MAX_NUM_CARRIERS] = {30000, 30000, 30000};
UINT16 Input_Mode[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] =
{
    {0, 0, 0},
    {0, 0, 0},
    {0, 0, 0}
};
//0- Audio Service, 1- Data Service
double Stream_Id[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] = {{0, 1, 2,3},{0, 1, 2,3},{0, 1, 2,3}}; //0- 0, 1- 1, 2- 2
double Short_Id[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] = {{0, 1, 2,3},{0, 1, 2,3},{0, 1, 2,3}}; //0- 0, 1- 1, 2- 2
```

Follow the procedure below to configure the example

- Find the C example in, C:\Program Files(x86)\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\DRM Generate Multiple Frames
(**Note:** - For 32-bit Operating System, C Examples are located in C:\Program Files\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\ DRM Generate Multiple Frames)
- Open the desired example directory and open the solution file **MaxEye Generate Multiple Frames.sln** in Microsoft Visual C++.
- Navigate to **MaxEye DRM Generate and Play Init.c** from the solution explorer.

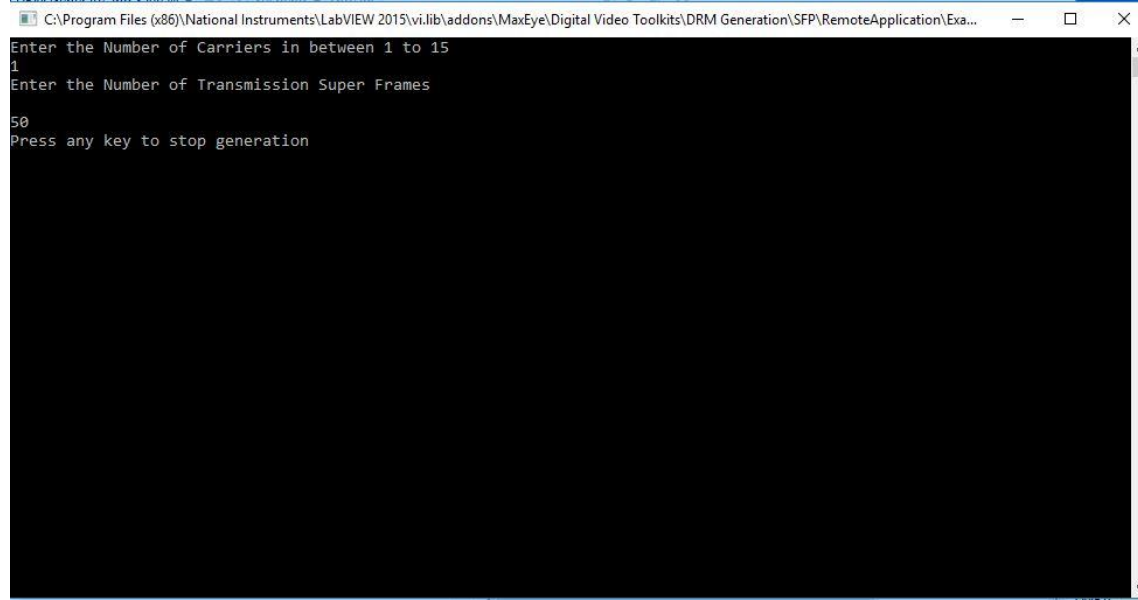
(**Note :-**

- Save Configuration** – Configure this value to Enabled, if configuration to be saved in a file.
- Save Configuration File Path** – Configure the file path to save the configurations in file.

This file path is used for Load the Saved Configuration data to Load Configuration from File remote Example)

- Configure the parameters listed as required. For help, please follow the comments given against each configuration parameter.
- Navigate to **MaxEye DRM Generate and Play Main.c** and press Run button or (Ctrl + F5) for running the example. Enter the values in the console application window that appears after running the example.

For more information please contact info@maxeyetech.com



6. Enter the required **Number of Carriers**.
7. Enter the desired **Number of Transmission Super Frames**.

Now the MaxEye DRM Generator validates the user configuration and reports error to the user if the configuration is not as per standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

8. Press any key, to stop the generation.

3.3.2.3 DRM VST Play Waveform

```

Function Name: MaxEye DRM VST Play Waveform Init

Description:
The Main aim of this function is to define all the User Configurable DRM parameters.
=====
#include <stdio.h>
#include "..\Includes\MaxEye Utilities Typedefs.h"
#include "..\Includes\MaxEye DRM VST2.0 Play Waveform Defines.h"
#include "..\Includes\MaxEye DRM VST2.0 Play Waveform Externs.h"

char IP_Address[]="10.21.0.5"; //IP Address of the client system
char Waveform_File_Path[]="C:\\Users\\URTAdmin\\Desktop\\MaxEye\\Test Vectors\\DRM\\DRM_C_1Carrier_4Service_gen.bin"; //Specify appropriate file path to save waveform
char "RFSG_Resource" = "PXI1Slot3"; //RFSG Resource Name
char "REF_Clock_Source" = "OnboardClock"; //Reference Clock Source;
char "Clock_Output_Terminal" = "Do not export signal"; //Clock Output Terminal;
UINT16 Sample_Width =1; //Sample Width (Applicable for Generation_Mode -1 & 2)
double Center_Frequency=250000000; //Wrtie Block Size (Samples)
INT32 Write_Block_Size=10000; //0- Disabled, 1- Enabled to Save configurations in file.
UINT16 SaveConfiguration = 1; //Configure file path to save the configuration
char SaveConfiguration_FilePath[]="C:\\Users\\URTAdmin\\Desktop\\MaxEye\\Test Vectors\\DRM\\DRM_C_1Carrier_4Service_saveconfig_play.bin";
UINT16 Command_Type = 0; //0- Start Generation, 1- Stop Generation, 2- Save Generation, 3- Load Generation

Hardware HardwareSettings;

int DRM_init()
{
    // VSG/VST Hardware Settings for Each Carrier
    HardwareSettings.PowerLevelDBm=-10; //Power Level (dB)
    HardwareSettings.ArbPreFilterGainDB=-1; //Arbitrary Prefilter Gain (dB)
    //HardwareSettings.FrequencyHz=100000000; //Frequency Reference (Hz)

    return 0;
}

```

For more information please contact info@maxeyetech.com

Follow the procedure below to configure the example

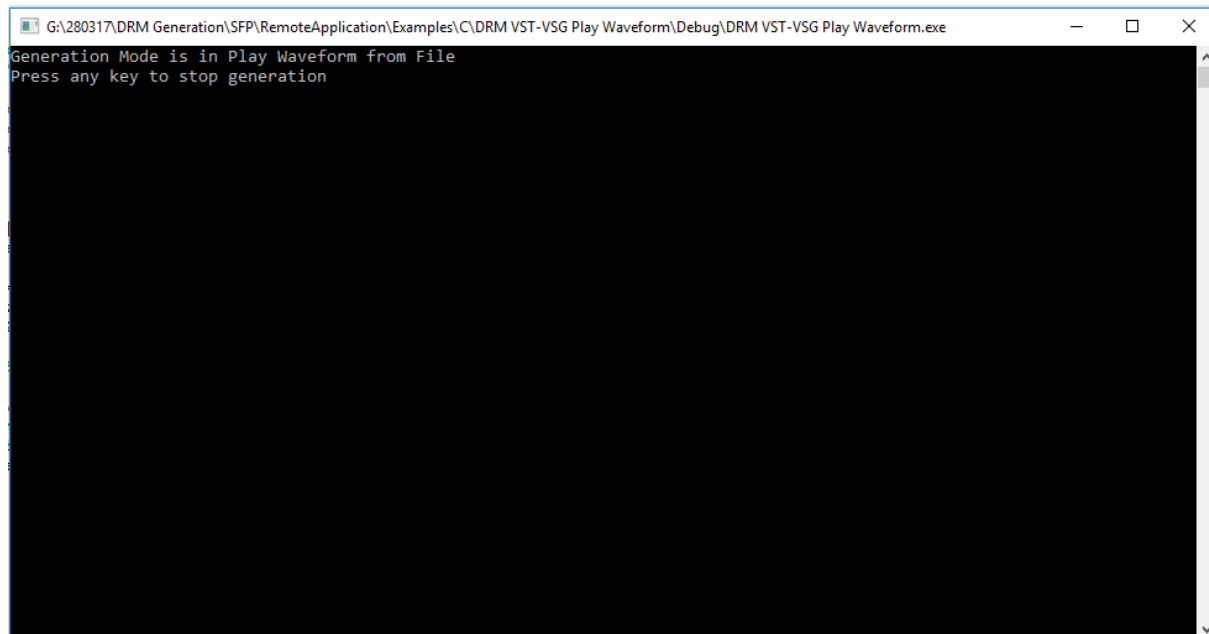
1. Find the C example in, C:\Program Files(x86)\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\DRM VST Play Waveform
(**Note:** - For 32-bit Operating System, C Examples are located in C:\Program Files\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\ DRM VST Play Waveform)
2. Open the desired example directory and open the solution file **DRM VST2.0 Play Waveform.sln** in **Microsoft Visual C++**.
3. Navigate to **MaxEye DRM VST2.0 Play Waveform Init.c** from the solution explorer.

(**Note :-**

- **Save Configuration** – Configure this value to Enabled, if configuration to be saved in a file.
- **Save Configuration File Path** – Configure the file path to save the configurations in file.

This file path is used for Load the Saved Configuration data to Load Configuration from File remote Example)

4. Configure the parameters listed as required. For help, please follow the comments given against each configuration parameter.
5. Navigate to **MaxEye DRM VST2.0 Play Waveform Main.c** and press Run button or (Ctrl + F5) for running the example. Generator status is displayed in the console application window that appears after running the example.



For more information please contact info@maxeyetech.com

Now the MaxEye DRM Generator validates the user configuration and reports error to the user if the configuration is not as per standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

6. Press any key, to stop the generation.

3.3.2.4 DRM Generate and Play RFSG Real Time

```

Function Name: MaxEye DRM Generate and Play Init
Description:
The Main aim of this function is to define all the User Configurable DRM parameters.
=====
#include "..\Includes\MaxEye Utilities Typedefs.h"
#include "..\Includes\MaxEye DRM Generate and Play RFSG RT Defines.h"
#include "..\Includes\MaxEye DRM Generate and Play RFSG RT Typedefs.h"
#include "..\Includes\MaxEye DRM Generate and Play RFSG RT Externs.h"

char IP_Address[]="192.168.1.104";           //IP Address of the client system
UINT16 Command_Type=0;                     //0- StartGeneration, 1- StopGeneration
UINT32 Hardware_Type=0;                     //Select Hardware Type 0 - VSG/VST, 1-USRP
char *RFSG_Resource = "Dev1";              //RFSG Resource Name
//=====
//SaveConfiguration = 1;                    //0- Disabled, 1- Enabled to Save configurations in file.
char SaveConfiguration_FilePath[]="C:\MAXEYE\ITS_Files\DRM\DRM_Carr_01.SM.bin"; //Configure file path to save the configuration
char *REF_Clock_Source = "OnboardClock";    //Reference Clock Source;
char *Clock_Output_Terminal = "Do not export signal"; //Clock Output Terminal;
double Headroom=15;                        //Headroom (dB)
UINT16 Sample_Width=1;                     //0- 8-Bit, 1- 16-Bit (Applicable for Generation_Mode -1 & 2)
//0- False, 1- True
UINT16 Over_Sampling_Enabled=1;
double Output_Sampling_Rate=50000;
INT32 Streaming_Waveform_size=26214400;
UINT16 Number_of_Services[MAX_NUM_CARRIERS] = {1};
INT32 Actual_Services[MAX_NUM_CARRIERS]={1}; //Actual services must be greater than or equal to number of services
double Carrier_Frequency[MAX_NUM_CARRIERS] = {25000000}; //Multi Carrier Frequency
//0- 6kHz, 1- 8kHz, 2- 12kHz, 3- 16kHz, 4- 24kHz, 5- 32kHz
UINT16 Carrier_Bandwidth[MAX_NUM_CARRIERS] = {30000}; //0- Audio Service, 1- Data Service
//0- 0, 1- 1, 2- 2
UINT16 Input_Mode[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] = {{0}}; //0- 0, 1- 1, 2- 2
double Stream_Id[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] = {{0, 1, 2}};
double Short_Id[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] = {{0, 1, 2}};
UINT16 Language[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] = {{5, 5, 5}}; //1- Arabic, 2- Bengali, 4- Dutch, 5- English, 7- German, 8- Hindi, 9- Japanese, 11- Korean, 13- Russian
//1- News, 3- Information, 5- Education
UINT16 Programme_Type[MAX_NUM_CARRIERS][MAX_NUM_SERVICES] = {{5, 1, 3}}; //0- PM Sequence, 1- User Defined Bits, 2- Test Pattern, 3- Test File, 4-Input Wave File, 5- DRM Modulated AAC
//Robustness Mode 0- Mode A, 1- Mode B, 2- Mode C, 3- Mode D, 4- Mode E
UINT16 Payload_Mode[MAX_NUM_CARRIERS][MAX_NUM_SERVICES]={{4,4,4,4}}; //Robustness Mode 0- Mode A, 1- Mode B, 2- Mode C, 3- Mode D, 4- Mode E
//Spectrum Occupancy 0- 4.5kHz, 1- 5kHz, 2- 9kHz, 3- 10kHz, 4- 18kHz, 5- 20kHz
UINT16 Robustness_Mode[MAX_NUM_CARRIERS]={0}; //Error Protection Type 0- Equal Error Protection, 1- Unequal Error Protection
//Interleaver Depth 0- Long Interleaving, 1- Short Interleaving
UINT16 Error_Protection_Type[MAX_NUM_CARRIERS]={0}; //Base/Enhancement Flag 0- Base Layer, 1- Enhancement Layer
//Base/Enhancement Flag 0- Base Layer, 1- Enhancement Layer
UINT16 Interleaver_Depth[MAX_NUM_CARRIERS]={1}; //MCS modulation Scheme 0- 64QAM, 1- 16QAM, 2- 4QAM
UINT16 Base_Enhancement_Flag[MAX_NUM_CARRIERS]={0};
UINT16 ModulationScheme[MAX_NUM_CARRIERS]={0};

```

Follow the procedure below to configure the example

1. Find the C example in, C:\Program Files(x86)\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\DRM Generate and Play RFSG Real Time
(**Note:** - For 32-bit Operating System, C Examples are located in C:\Program Files\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\ DRM Generate and Play RFSG Real Time)
2. Open the desired example directory and open the solution file **DRM Generate and Play RFSG RT.sln** in **Microsoft Visual C++**.
3. Navigate to **MaxEye DRM Generate and Play RFSG RT Init.c** from the solution explorer.

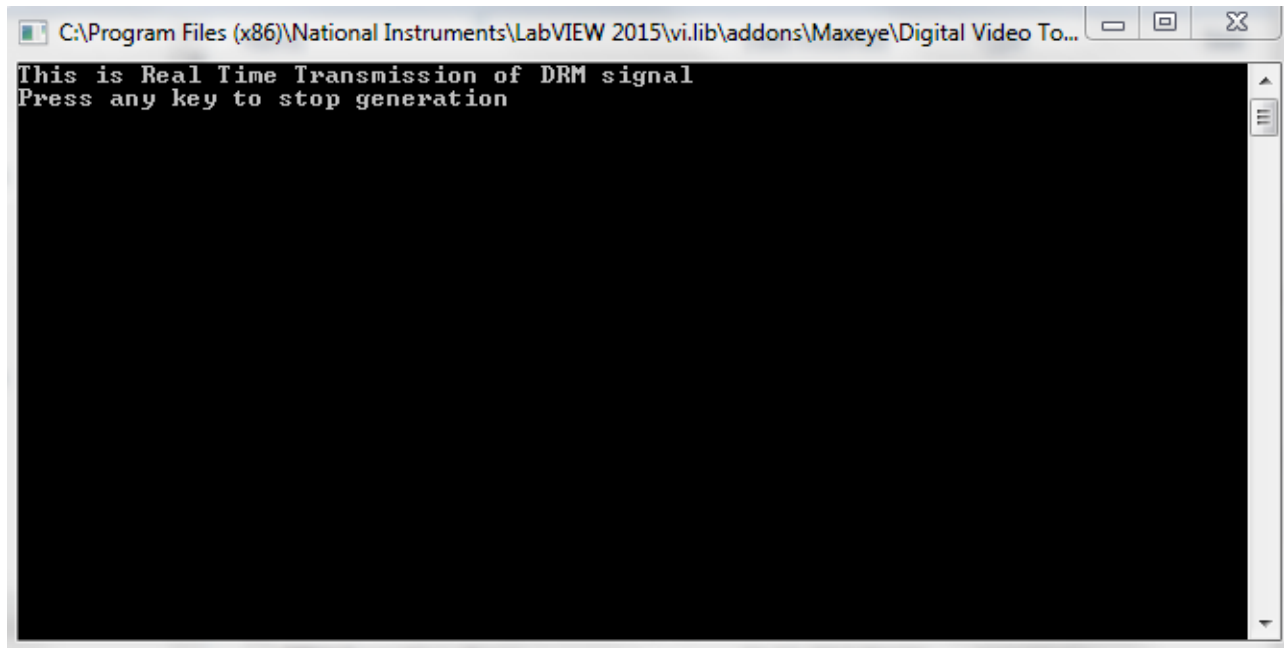
(**Note** :-

- **Save Configuration** – Configure this value to Enabled, if configuration to be saved in a file.
- **Save Configuration File Path** – Configure the file path to save the configurations in file.

For more information please contact info@maxeyetech.com

This file path is used for Load the Saved Configuration data to Load Configuration from File remote Example)

4. Configure the parameters listed as required. For help, please follow the comments given against each configuration parameter.
5. Navigate to **MaxEye DRM Generate and Play RFSG RT Main.c** and press Run button or (Ctrl + F5) for running the example. Generator status is displayed in the console application window that appears after running the example.



Now the MaxEye DRM Generator validates the user configuration and reports error to the user if the configuration is not as per standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

6. Press any key, to stop the generation.

3.3.2.5 DRM Load Configurations from File

```

Function Name: MaxEye DRM Load Configuration Init
Description:
The Main aim of this function is to define all the User Configurable ISDB-T parameters.
*****/

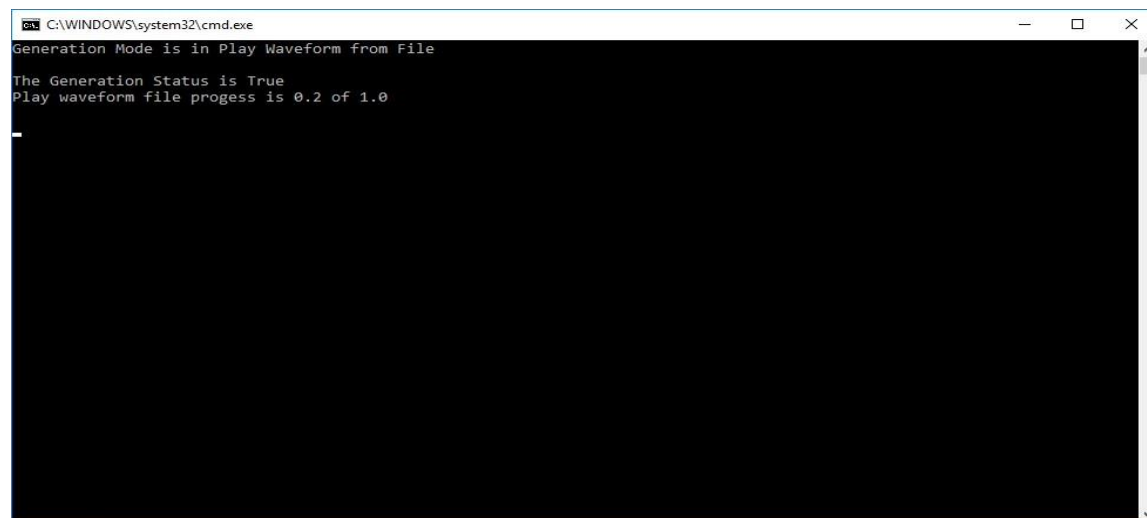
#include <string.h>
#include "..\Includes\MaxEye Utilities Typedefs.h"
#include "..\Includes\MaxEye DRM Load Configuration Defines.h"
#include "..\Includes\MaxEye DRM Load Configuration Externs.h"

char IP_Address[]="localhost"; //IP Address of the client system
char LoadConfiguration_FilePath[]="C:\MAXEYE\TS_Files\DRM\DRM_Load_Config.bin"; //Specify appropriate file path to save waveform
UINT16 Generation_Type=0; //0- StartGeneration, 1- StopGeneration, 2- Save Configuration, 3- Load Configuration

```

Follow the below procedure to configure the example

1. Find the C example in, C:\Program Files(x86)\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\Load Configuration from File
(**Note:** - For 32-bit Operating System, C Examples are located in C:\Program Files\MaxEye\Digital Video Toolkits\DRM Generation\Examples\C\Load Configuration from File)
2. Open the desired example directory and locate the project file **Load Configuration from File.sln** in Microsoft visual C++.
3. Navigate to **MaxEye DRM Load Configuration Init.c** from the solution explorer.
(**Note:** - **Load Configuration FilePath** – Configure the file path to load the saved configurations from Save Configuration File)
4. Configure the parameters listed as required. For help, please follow the comments given against each configuration parameter.
5. Navigate to **MaxEye DRM Load Configuration Main.c** and press Run button or (Ctrl + F5) for running the example. Enter the values in the console application window that appears after running the example.



```

C:\WINDOWS\system32\cmd.exe
Generation Mode is in Play Waveform from File
The Generation Status is True
Play waveform file progress is 0.2 of 1.0

```

For more information please contact info@maxeyetech.com

Now the MaxEye DRM Generator validates the user configuration and reports error to the user if the configuration is not as per standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

6. Press any key, to stop the generation.

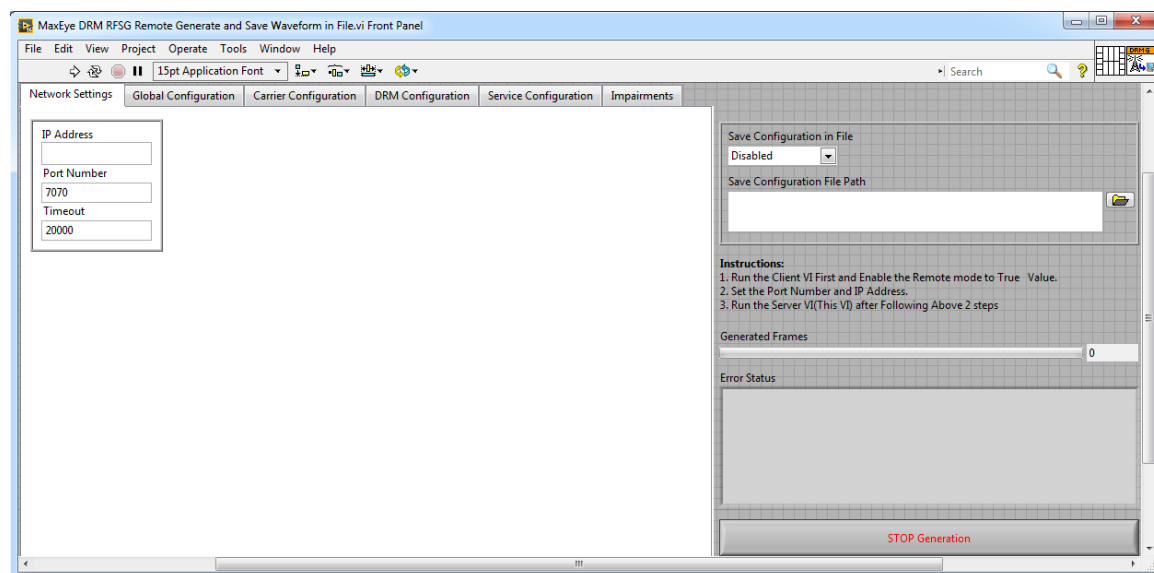
3.3.3 Remote LabVIEW Examples

3.3.3.1 DRM Remote Generate and Save Waveform

Follow the below procedure to configure the example

1. Find the LabVIEW example in, <LabVIEW>examples\MaxEye\Digital Video Toolkits\DRM Generation\Remote
2. Open **MaxEye DRM RFSG Remote Generate and Save Waveform in File.vi**
3. The user configurations are organized into the following categories displayed in multiple Tabs
 - Network Settings
 - Global Configuration
 - Carrier Configuration
 - DRM Configuration
 - Service Configuration
 - Impairments

Navigate to the **Network Settings** tab to configure the following parameters



For more information please contact info@maxeyetech.com

- **IP Address** – Configure the IP address of the client system in which the MaxEye DRM Radio Generator is intended to run.
- **Port Number** – Both client (MaxEye DRM Radio Generator) and server application must have same port number. The default Port Number is **7070**.
- **Timeout (ms)** – Timeout specifies the time in milliseconds that the client waits for a connection to be established with the server application. If a connection is not established in the specified time, the MaxEye DRM Radio Generator returns an error. The default Timeout is **20 seconds**.

For configuring other configuration parameters, please refer [section 3.1.1](#) of this document.

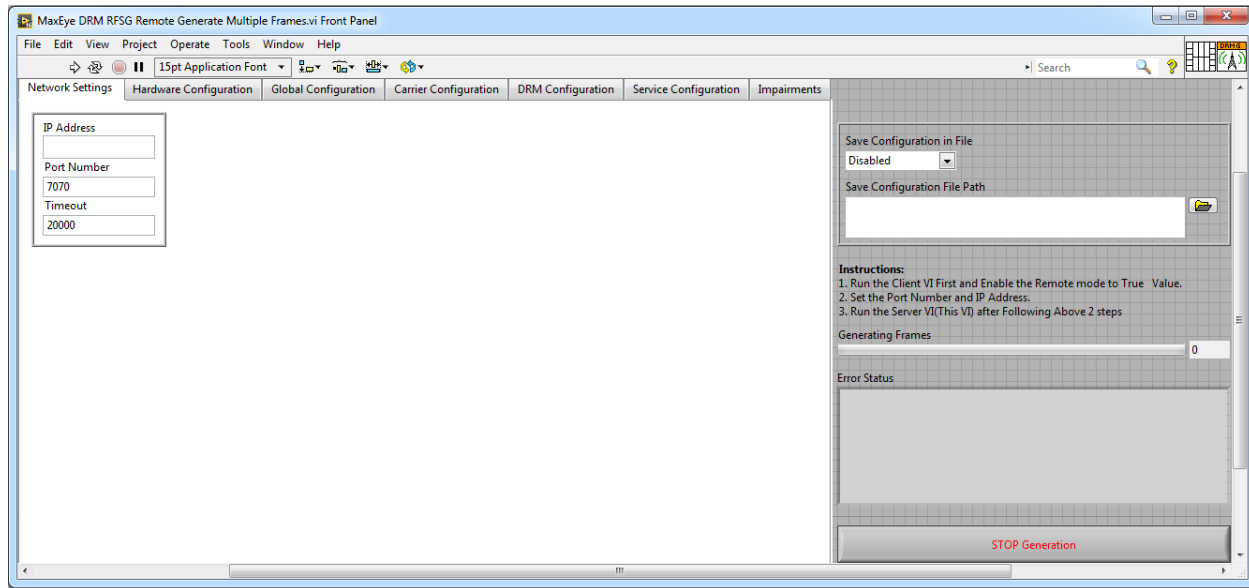
4. Run the example. Now the MaxEye DRM Generator validates the user configuration and reports error to the user if the configuration is not as per standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

3.3.3.2 DRM Remote Generate Multiple Frames

Follow the below procedure to configure the example

1. Find the LabVIEW example in, <LabVIEW>examples\MaxEye\Digital Video Toolkits\DRM Generation\Remote
2. Open **MaxEye DRM RFSG Remote Generate Multiple Frames.vi**
3. The user configurations are organized into the following categories displayed in multiple Tabs
 - Network Settings
 - Hardware Configuration
 - Global Configuration
 - Carrier Configuration
 - DRM Configuration
 - Service Configuration
 - Impairments

Navigate to the **Network Settings** tab to configure the following parameters



- **IP Address** – Configure the IP address of the client system in which the MaxEye DRM Radio Generator is intended to run.
- **Port Number** – Both client (MaxEye DRM Radio Generator) and server application must have same port number. The default Port Number is **7070**.
- **Timeout (ms)** – Timeout specifies the time in milliseconds that the client waits for a connection to be established with the server application. If a connection is not established in the specified time, the MaxEye DRM Radio Generator returns an error. The default Timeout is **20 seconds**.

For configuring other configuration parameters, please refer [section 3.1.1](#) of this document.

4. Run the example. Now the MaxEye DRM Generator validates the user configuration and reports error to the user if the configuration is not as per standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

3.3.3.3 DRM Remote VST Play Waveform from File

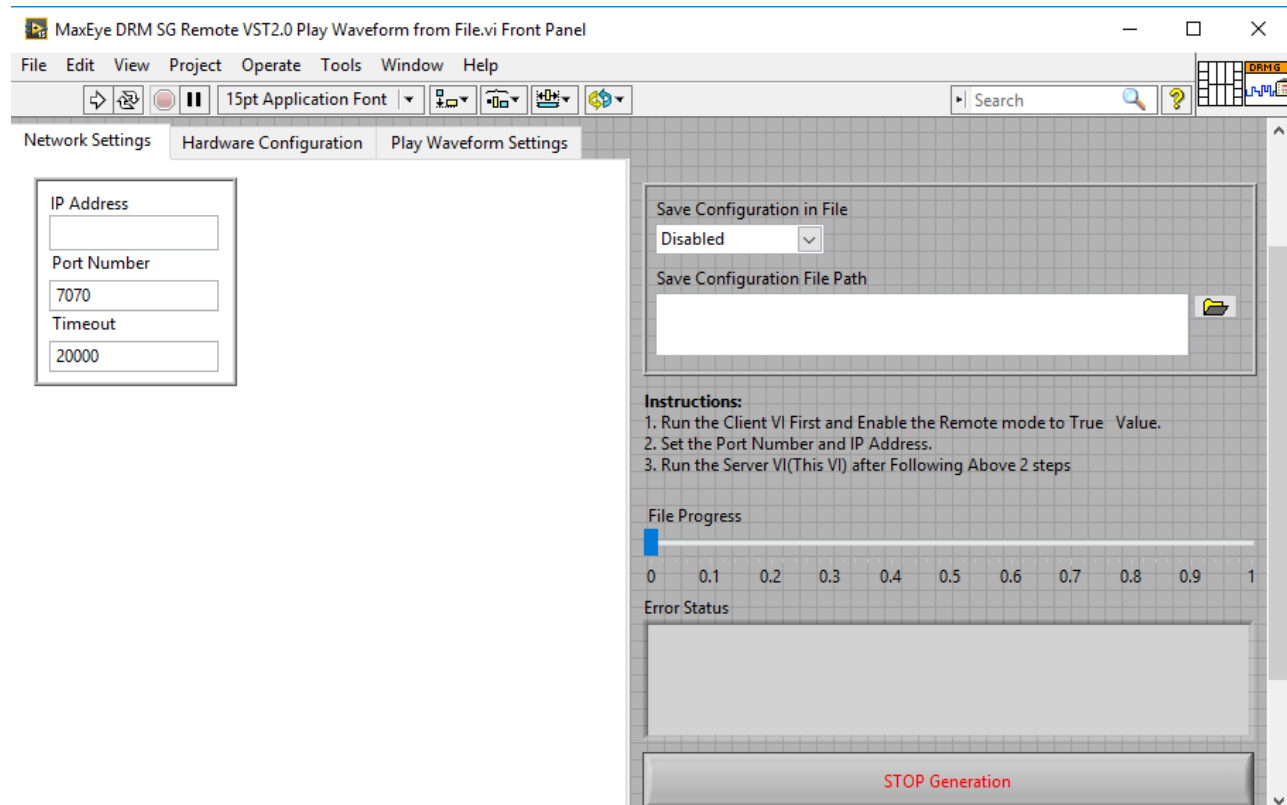
Follow the below procedure to configure the example

1. Find the LabVIEW example in, <LabVIEW>examples\MaxEye\Digital Video Toolkits\DRM Generation\Remote
2. Open **MaxEye DRM SG Remote VST2.0 Play Waveform from File.vi**
3. The user configurations are divided into following categories displayed in multiple Tabs

For more information please contact info@maxeyetech.com

- Network Settings
- Hardware Configuration
- Play Waveform Settings

Navigate to the **Network Settings** tab to configure the following parameters



- **IP Address** – Configure the IP address of the client system in which the MaxEye DRM Radio Generator is intended to run.
- **Port Number** – Both client (MaxEye DRM Radio Generator) and server application must have same port number. The default Port Number is **7070**.
- **Timeout (ms)** – Timeout specifies the time in milliseconds that the client waits for a connection to be established with the server application. If a connection is not established in the specified time, the MaxEye DRM Radio Generator returns an error. The default Timeout is **20 seconds**.

For configuring other configuration parameters, please refer [section 3.1.3](#) of this document.

For more information please contact info@maxeyetech.com

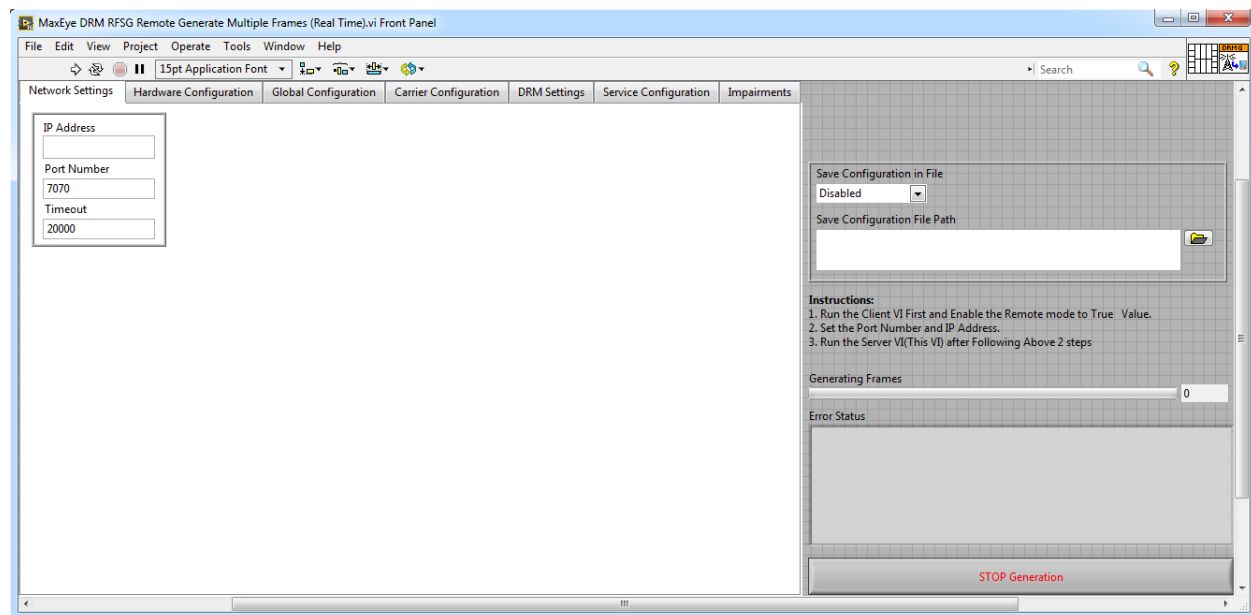
1. Run the example. Now the MaxEye DRM Generator validates the user configuration and reports error to the user if the configuration is not as per standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

3.3.3.4 DRM Remote Generate Multiple Frames (Real-Time)

Follow the below procedure to configure the example

1. Find the LabVIEW example in, <LabVIEW>examples\MaxEye\Digital Video Toolkits\DRM Generation\Remote
2. Open **MaxEye DRM RFSG Remote Generate Multiple Frames (Real Time).vi**
3. The user configurations are divided into following categories displayed in multiple Tabs
 - Network Settings
 - Hardware Configuration
 - Global Configuration
 - Carrier Configuration
 - DRM Configuration
 - Service Configuration
 - Impairments

Navigate to the **Network Settings** tab to configure the following parameters



For more information please contact info@maxeyetech.com

- **IP Address** – Configure the IP address of the client system in which the MaxEye DRM Radio Generator is intended to run.
- **Port Number** – Both client (MaxEye DRM Radio Generator) and server application must have same port number. The default Port Number is **7070**.
- **Timeout (ms)** – Timeout specifies the time in milliseconds that the client waits for a connection to be established with the server application. If a connection is not established in the specified time, the MaxEye DRM Radio Generator returns an error. The default Timeout is **20 seconds**.

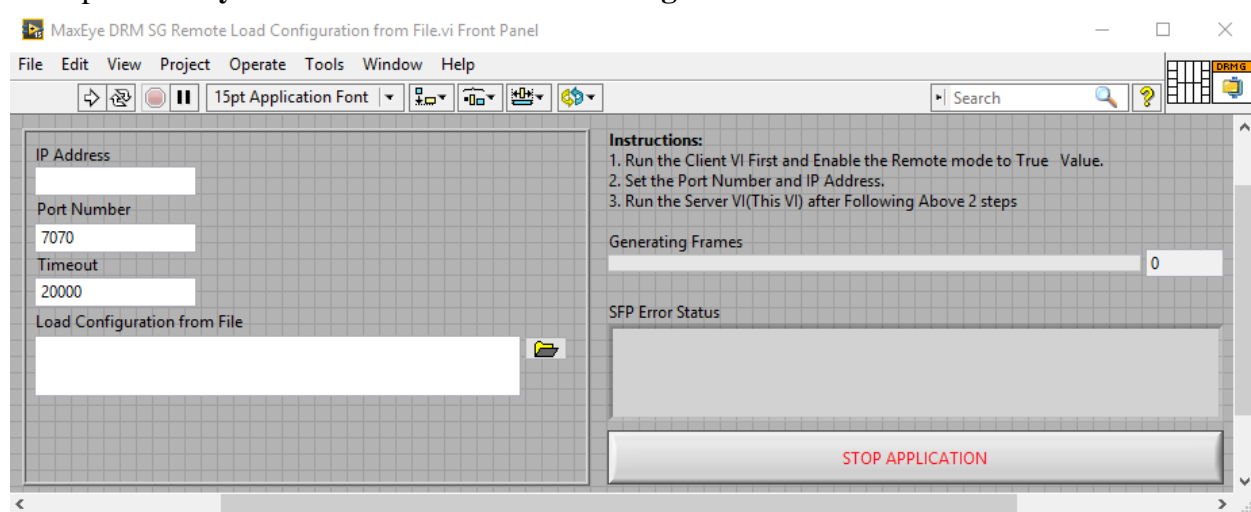
For configuring other configuration parameters, please refer [section 3.1.2](#) of this document.

4. Run the example. Now the MaxEye DRM Generator validates the user configuration and reports error to the user if the configuration is not as per standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

3.3.3.5 DRM Load Configurations from File

Follow the below procedure to configure the example

1. Find the DRM LabVIEW Remote example in, <LabVIEW>\examples\MaxEye\Digital Video Toolkits\DRM Generation\Remote
2. Open **MaxEye DRM SG Remote Load Configuration from File.vi**



- **IP Address** – Configure the IP address of the client system in which the MaxEye DRM Signal Generator is intended to run.

For more information please contact info@maxeyetech.com

- **Port Number** – Both client (MaxEye DRM Signal Generator) and server application must have same port number. The default Port Number is **7070**.
 - **Timeout (ms)** – Timeout specifies the time in milliseconds that the client waits for a connection to be established with the server application. If a connection is not established in the specified time, the MaxEye DRM Signal Generator returns an error. The default Timeout is **20 seconds**.
 - **Load Configuration from File** – Configure the file path to load the saved configurations from file.
3. Run the example. Now the MaxEye DRM Signal Generator validates the user configuration and reports error to the user if the configuration is not as per the standard or not supported by the toolkit. If the configuration is successfully validated the remote system starts generating the waveform.

How to Configure for Single Carrier/ Multiple Carriers

Please refer [section 4](#) of this document for information on configuring for Single Carrier and Multiple Carriers.

After configuring all the parameters, run the example to start generating the waveform. Press **Stop** to stop generation at any time. Error dialog box pops up to the user if any error occurs. The user can click either **Continue** or **Stop** from the error dialog box to abort the generation.

4 How to configure parameters for Single Carrier/ Multiple Carriers

The controls Carrier Configuration, DRM Configuration, Service Configuration and Impairments are configured for each carrier. Hence the controls are given in an array where each element corresponds to one carrier. Since the index value starts from 0, the index 0 corresponds to 1st carrier, index 1 corresponds to 2nd carrier and so on.

4.1 Single Carrier

For single carrier configuration, configure only index 0 of the above controls.

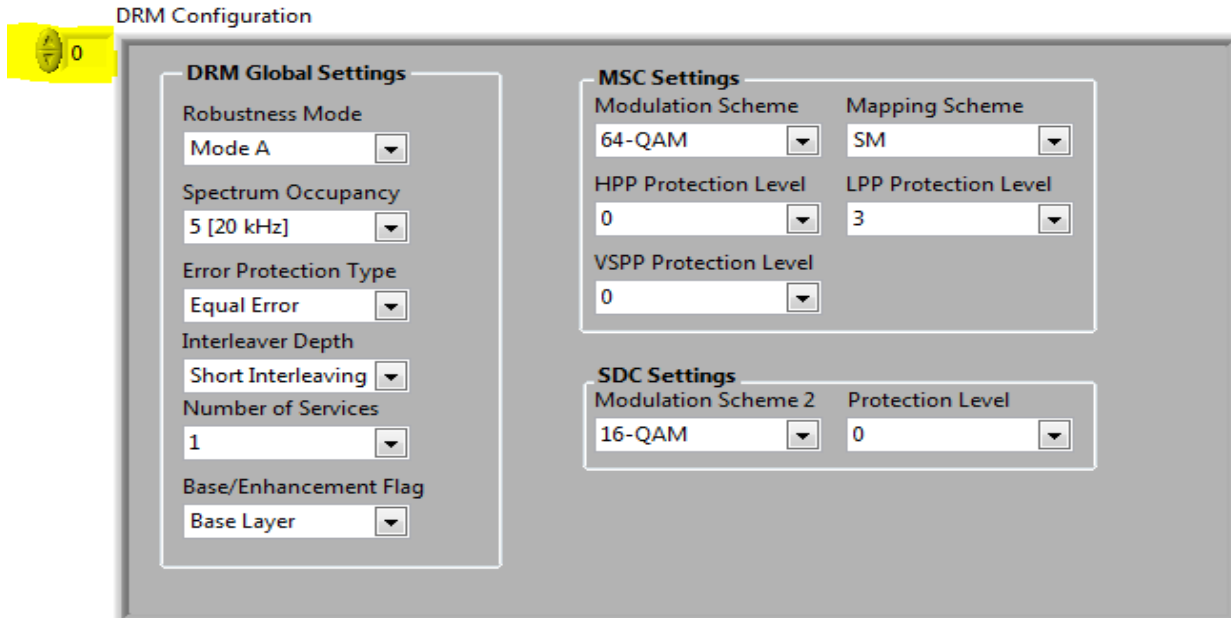
4.2 Multiple Carrier

For multiple carriers, use the index display to navigate through different elements and configure for the required number of carriers. For N carriers, configure upto index N-1.

For more information please contact info@maxeyetech.com

The figure below shows the DRM Configuration Control array with index display (highlighted in yellow).

DRM Configuration



DRM Global Settings		MSC Settings		SDC Settings	
Robustness Mode	Mode A	Modulation Scheme	64-QAM	Mapping Scheme	SM
Spectrum Occupancy	5 [20 kHz]	HPP Protection Level	0	LPP Protection Level	3
Error Protection Type	Equal Error	VSPP Protection Level	0		
Interleaver Depth	Short Interleaving				
Number of Services	1				
Base/Enhancement Flag	Base Layer				
		Modulation Scheme 2	16-QAM	Protection Level	0

For more information please contact info@maxeyetech.com