MaxEye Digital Video Signal Analysis Toolkit

DVB-T2

Version 1.0.6.2

Getting Started Guide

Contents

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1. Introduction

The MaxEye DVB-T2 Signal analysis toolkit contains LabVIEW VIs to perform measurements on DVB-T2 signals that confirm ETSI standard EN 302755 version 1.3.1. Refer to the ETSI EN 302755 standard for the signal specifications and this document assumes that the user is familiar with the DVB-T2 standard specification. Thisguideexplainshowto use theDVB-T2SignalAnalysistoolkitusingtheprogramming examples.

2. InstalledFile Location

The example VIs are installed in,<LabVIEW>\examples\MaxEye\Digital VideoToolkits\DVB-T2Analysis.

The toolkit help file is installed in, <LabVIEW>\help\MaxEye\Digital Video Toolkits\DVB-T2 Signal Analysis Help.chm

The other documentation files are installed in <LabVIEW>\vi.lib\addons\MaxEye\Digital Video Toolkits\DVB-T2 Analysis\Analysis\Documentation

The toolkit APIfiles are installed in, <LabVIEW>\vi.lib\addons\MaxEye\DigitalVideoToolkits\DVB-T2Analysis\Analysis\API.

You can also findashortcut to the abovelocation from thewindows startmenu.

Start->AllPrograms->MaxEye->Digital VideoToolkits->DVB-T2

3. ProgrammingExamples

TheDVB-T2 SignalAnalysis toolkitcontains examples forperformingthefollowing

i. Modulation Accuracy of the DVB-T2 transmitter can be analyzed based on the signal acquired from the NI RFSA or NI USRP.

ii. Perform the Spectral Measurements of the signal acquired from the NI RFSA or NI USRP.

Theprogrammingexamplesarecreatedusing theLabVIEWAPI VIs.Formoreinformationabout theAPI VIusedintheexampleVIsrefertotheMaxEyeDVB-T2Signal AnalysisHelp.chm document, accessible atStart->AllPrograms->MaxEye->DigitalVideoToolkits->DVB-T2->\<LabVIEW>\Analysis ->Documentation.

3.1. Measure Modulation Accuracy

DVB-T2Signal Analysis toolkit measures the performance of the RF front end of the DVB-T2 transmitter. The DVB-T2Signal Analysis toolkit has an example to measure the modulation accuracy of the transmitter by performing the measurements on the signal acquired from the NI RFSA or NI USRP.

3.1.1 MaxEye DVBT2 RFSA Measure Modulation Accuracy

This Example is used to measure the modulation accuracy of the DVB-T2 transmitter. The measurements are performed on the signal acquired from the hardware. The Figure 1below shows the front panel of the Example VI.

The user configurations are divided in to four categories

1. Hardware Settings
2. Measurement Settings
3. Measurement Plots1
4. Measurement Plots2
5. L1 Signaling Parameters
6. L1 Post Signaling Parameters
7. Measurement Results

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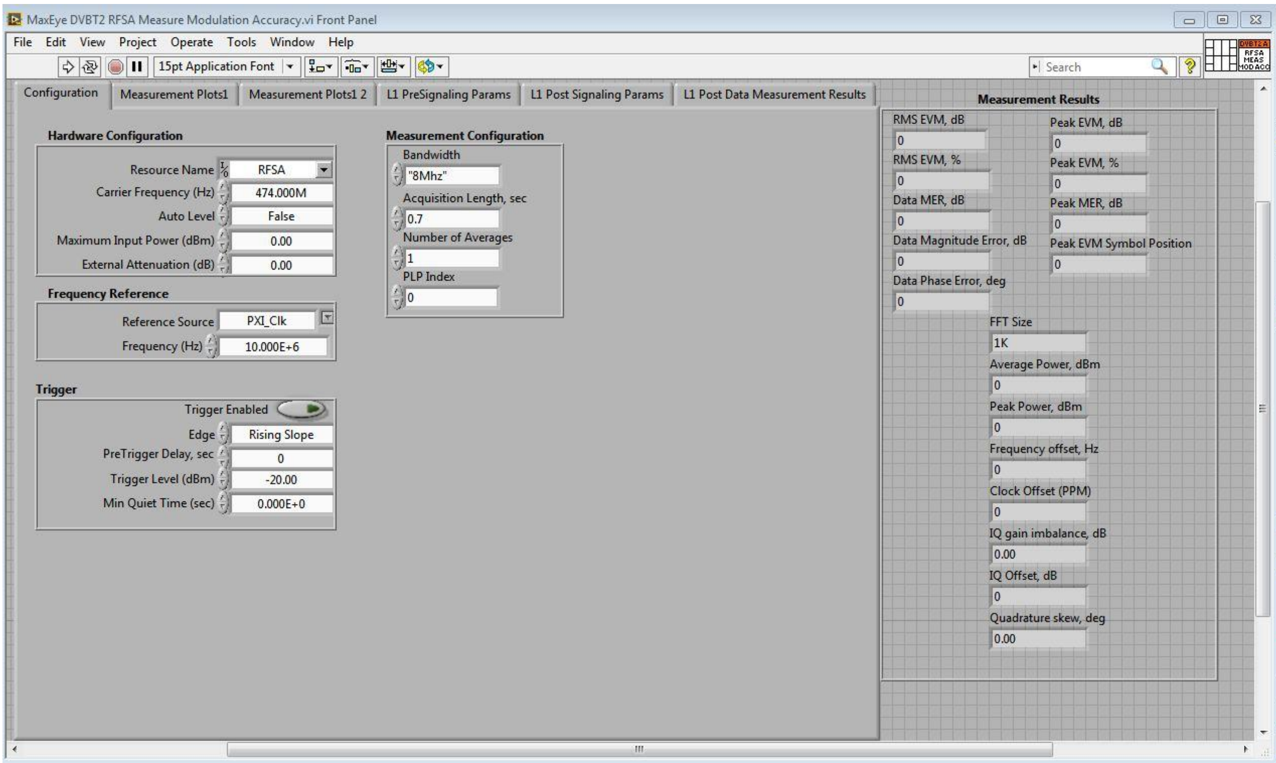

Figure 1

3.1.1.1 Hardware Settings

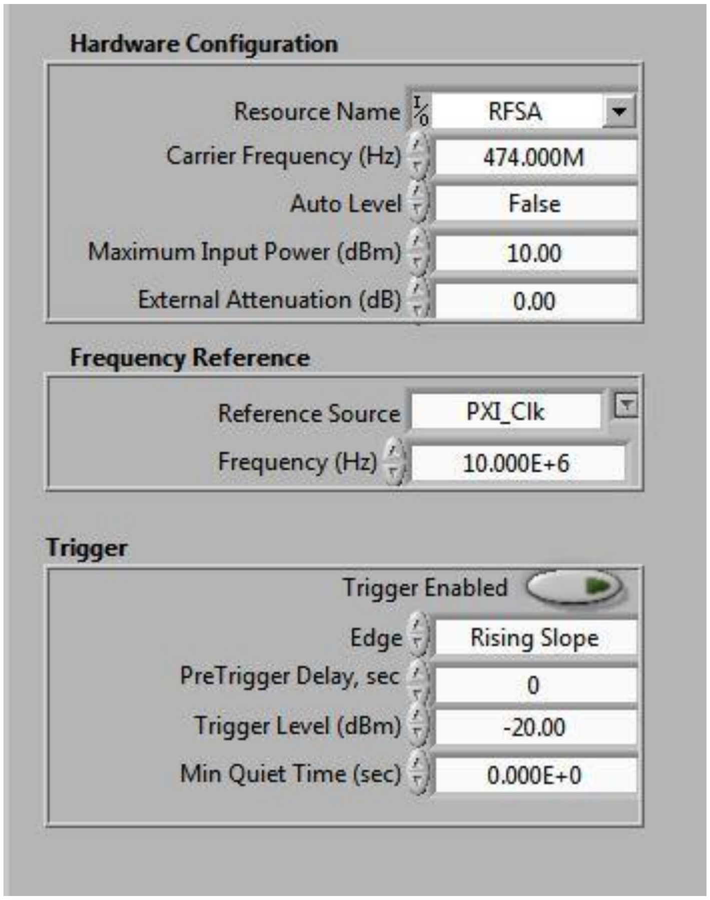

Figure 2

RFSA Resource– Configure the resource name used in NI Measurement and Automation explorer for the RFSA.

Carrier Frequency(Hz)–Center Frequency of theDVB-T2signal in Hz.

Auto Level (TRUE/FALSE) – Sets the best reference level for the instrument based on the peak power of the measured signal.

Maximum Input Power Level (dBm)– Maximum expected power of an input RF signal.

External Attenuation(dB), Reference Source, Frequency(Hz), Trigger settings– Refer NI RFSA Signal Analyzer help file.

3.1.1.2 Measurement Settings

The Measurement Settings for DVB-T2 Signal Analysis contains Measurement Mode property which specifies the type of measurement performed on the acquired signal. Two measurement modes are supported Demodulation Measurements or Spectral Measurements. The help for each of the properties is availableinDVB-T2 Signal Analysis Help.chm file.

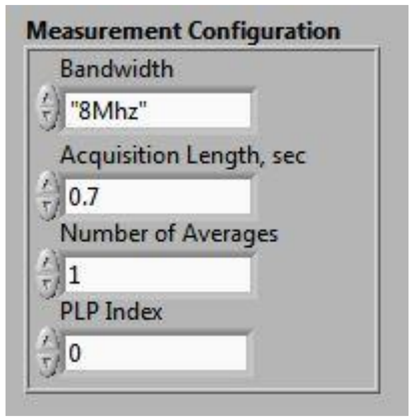

Figure 3

PLP Index – the EVM measurements are performed based on the value specified by this property.

Acquisition Length – Configure the Acquisition Length in seconds. The toolkit performs the measurements using one Time Interleaver block. So the minimum acquisition length should be twice the Interleaving Frame duration for the selected PLP Index.

Note: The duration of Interleaving Frame depends on the following parameters,

- ➔ Frame Interval
- ➔ TIME_IL_Length
- ➔ TIME_IL_TYPE
- ➔ T2 Frame duration

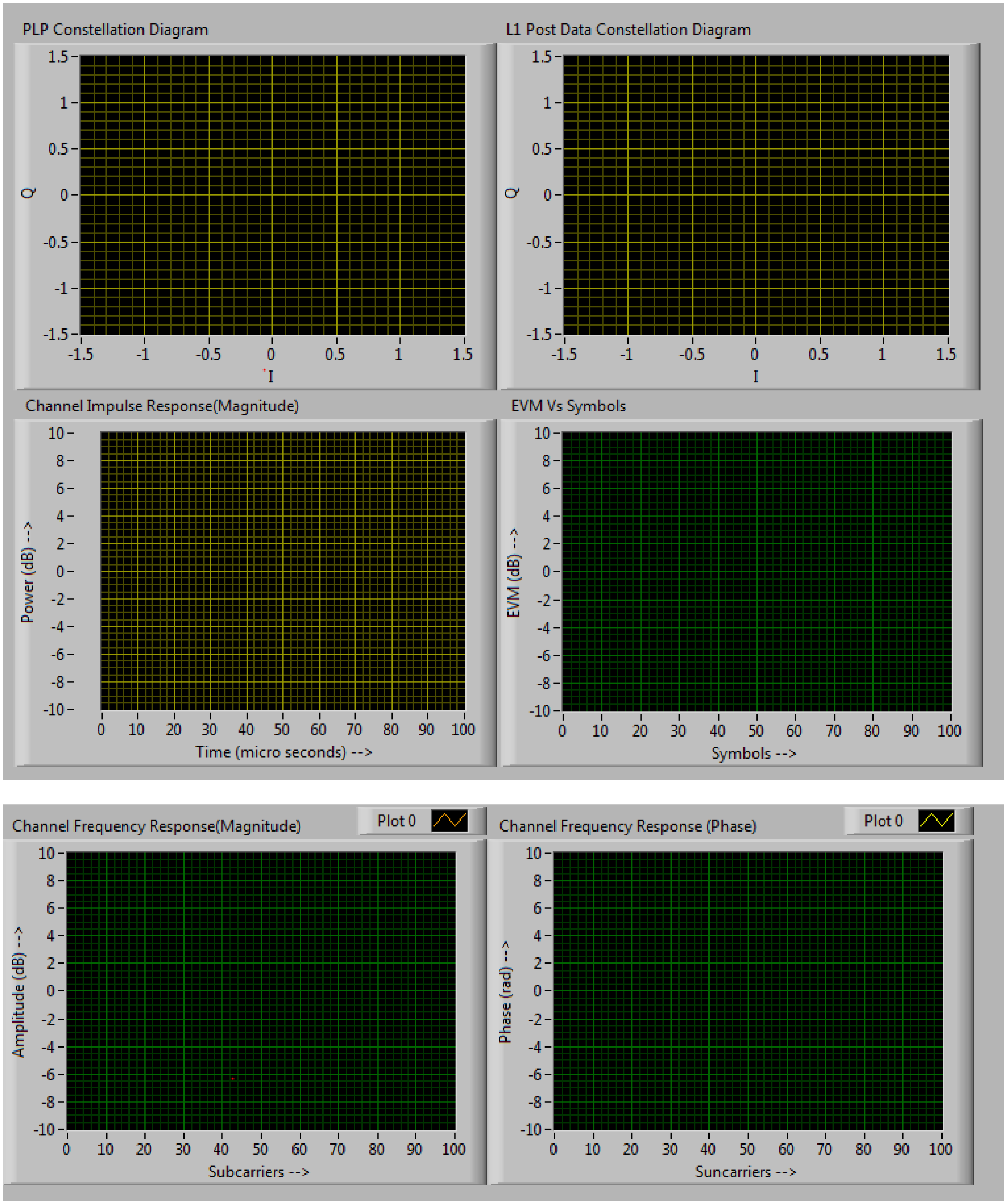
PLP Constellation Diagram
L1 Post Data Constellation Diagram
Q
I
Channel Impulse Response(Magnitude)
Power (dB) -->
Time (micro seconds) -->
EVM Vs Symbols
EVM (dB) -->
Symbols -->
Channel Frequency Response(Magnitude)
Plot 0
Amplitude (dB) -->
Subcarriers -->
Channel Frequency Response (Phase)
Plot 0
Phase (rad) -->
Suncarriers -->

Figure4

3.1.1.3 Measurement Plots

The DVB-T2 Signal Analysis Toolkit returns several plots to analyze the measurement results. Among them important ones are shown in the Figure 4.

i. Data PLP Constellation Graph
ii. L1 Post Signaling Data Constellation Graph
iii. Channel Impulse Response (Magnitude)
iv. EVM Vs Symbols
v. Channel Frequency Response (Magnitude)
vi. Channel Frequency Response (Phase)

Refer to the DVB-T2 Signal Analysis Help.chm file for more information about the measurement traces.

3.1.1.4 L1 Signaling Parameters

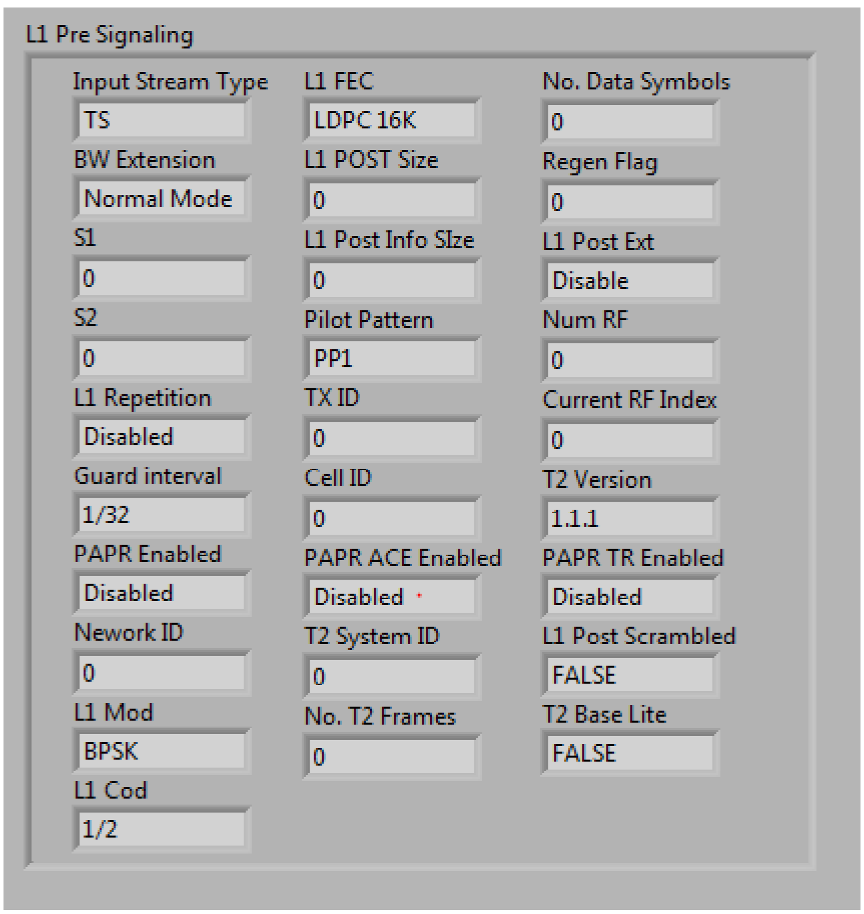

Figure 5

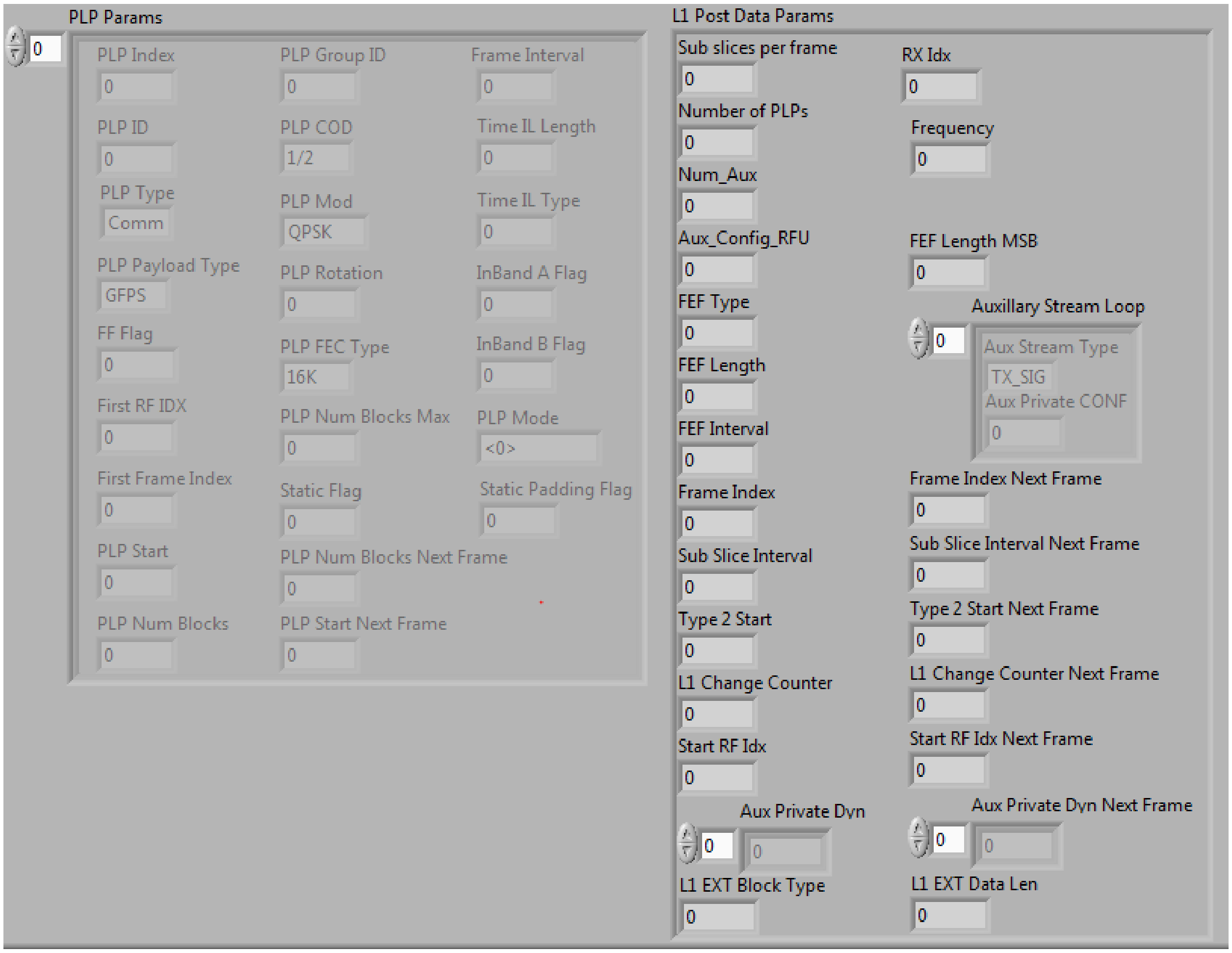

Figure 6

3.1.1.4 Measurement Results

The most important measurement results are shown separately as shown in the Figure7. The toolkit averages these measurement results over the number of acquisitions specified by the Number of Averages value.

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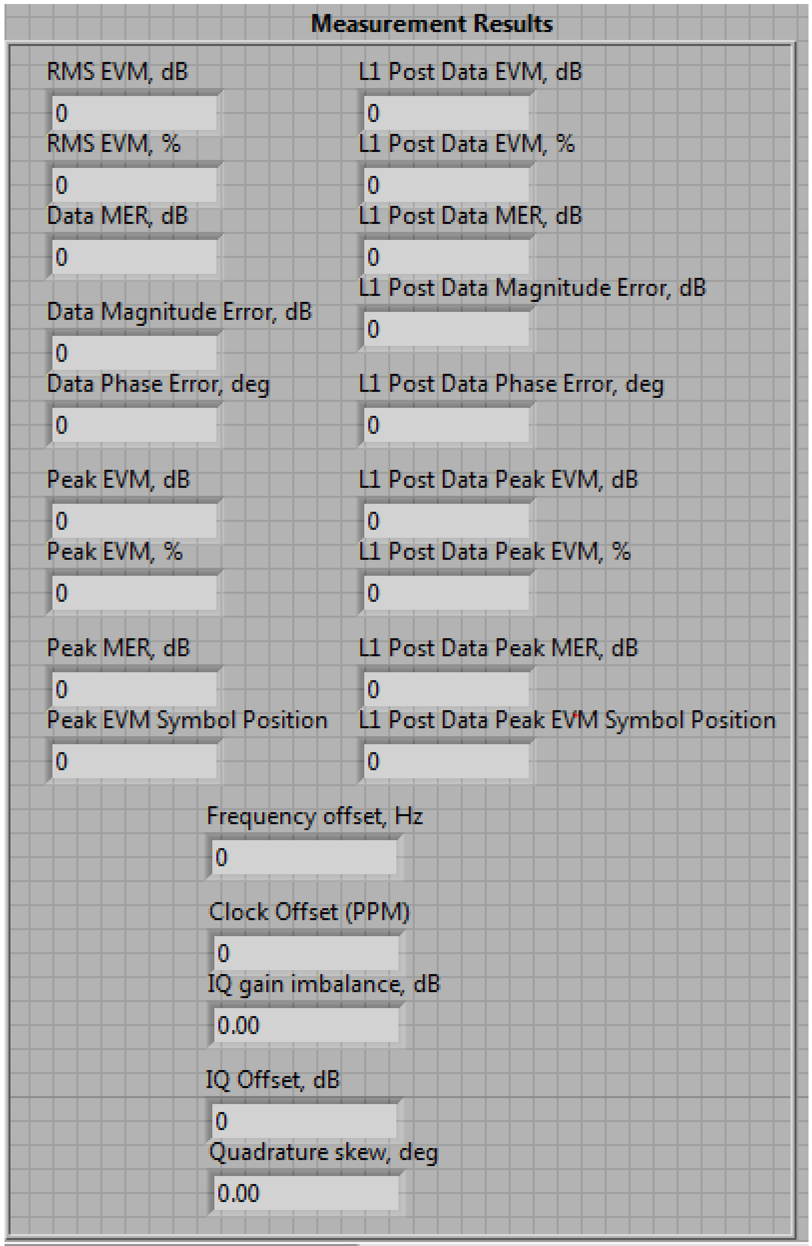

Figure 7

3.1.2 MaxEye DVB-T2 USRP Measure Modulation Accuracy

This Example is used to measure the modulation accuracy of the DVB-T2 transmitter. The measurements are performed on the signal acquired from the USRP. The Figure 8 shows the front panel of the Example VI.

The user configurations are divided in to three categories

1. Hardware Settings
2. Measurement Settings
3. Measurement Plots1
4. Measurement Plots2
5. L1 Pre Signaling Parameters
6. L2 Post Signaling Parameters
7. Measurement Results

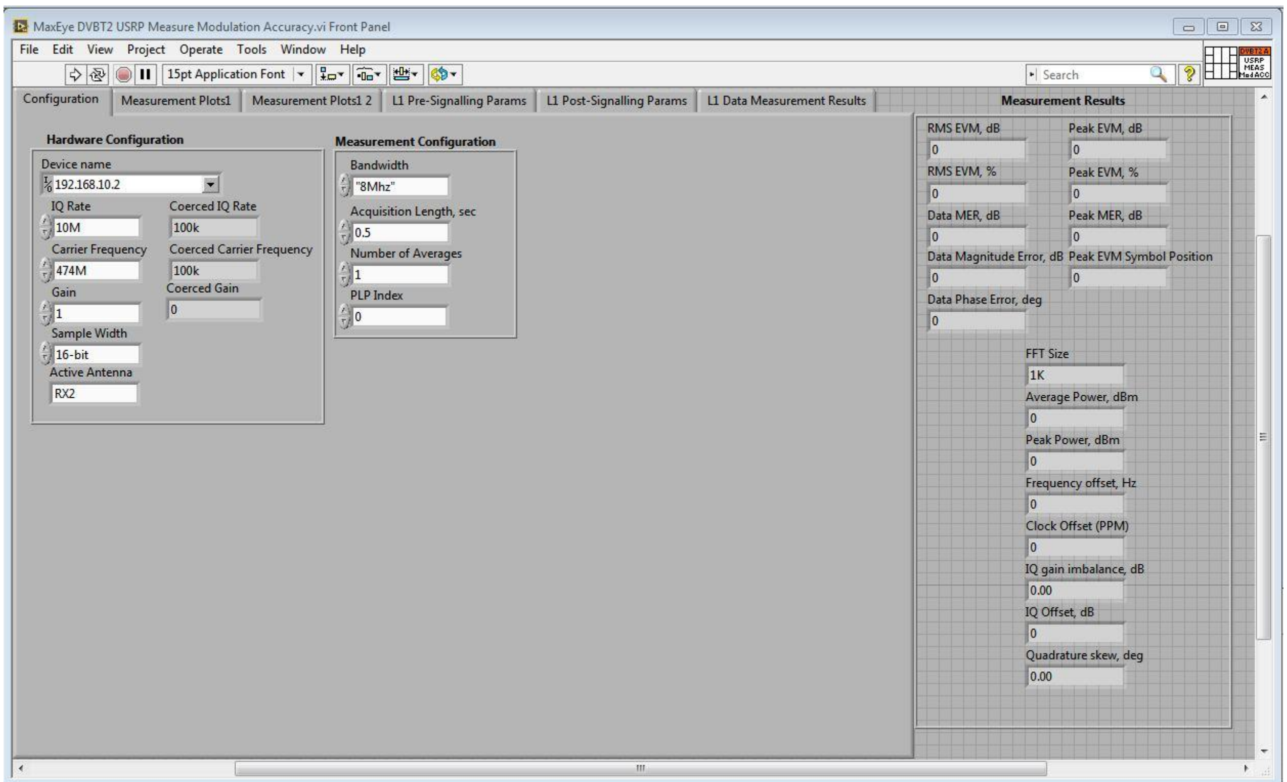

Figure 8

3.1.2.1 Hardware Settings

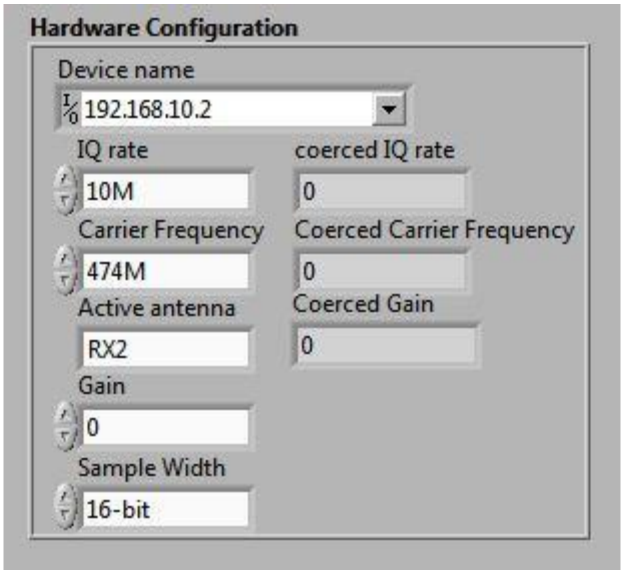

Figure 9

Device Name – specifies the IP address of the NI USRP device**.**

IQ Rate – sampling rate of the signal to be acquired. Configure this value based on the signal bandwidth of the transmitted DVB-T2 signal.

Carrier Frequency – Center Frequency of the DVB-T2 signal in Hz.

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

Note: The rest of the front panel controls are similar to the example **MaxEye DVBT2 RFSA Measure Modulation Accuracy**.

3.1.3 MaxEye DVB-T2 USRP Measure Modulation Accuracy – External Wfm Acqtn

This Example is used to measure the modulation accuracy of the DVB-T2 transmitter. **The measurements are performed on the single acquisition of the signal from the USRP**. Hence the measurements cannot be averaged. The front panel is identical to the example mentioned in the Section 3.1.2.

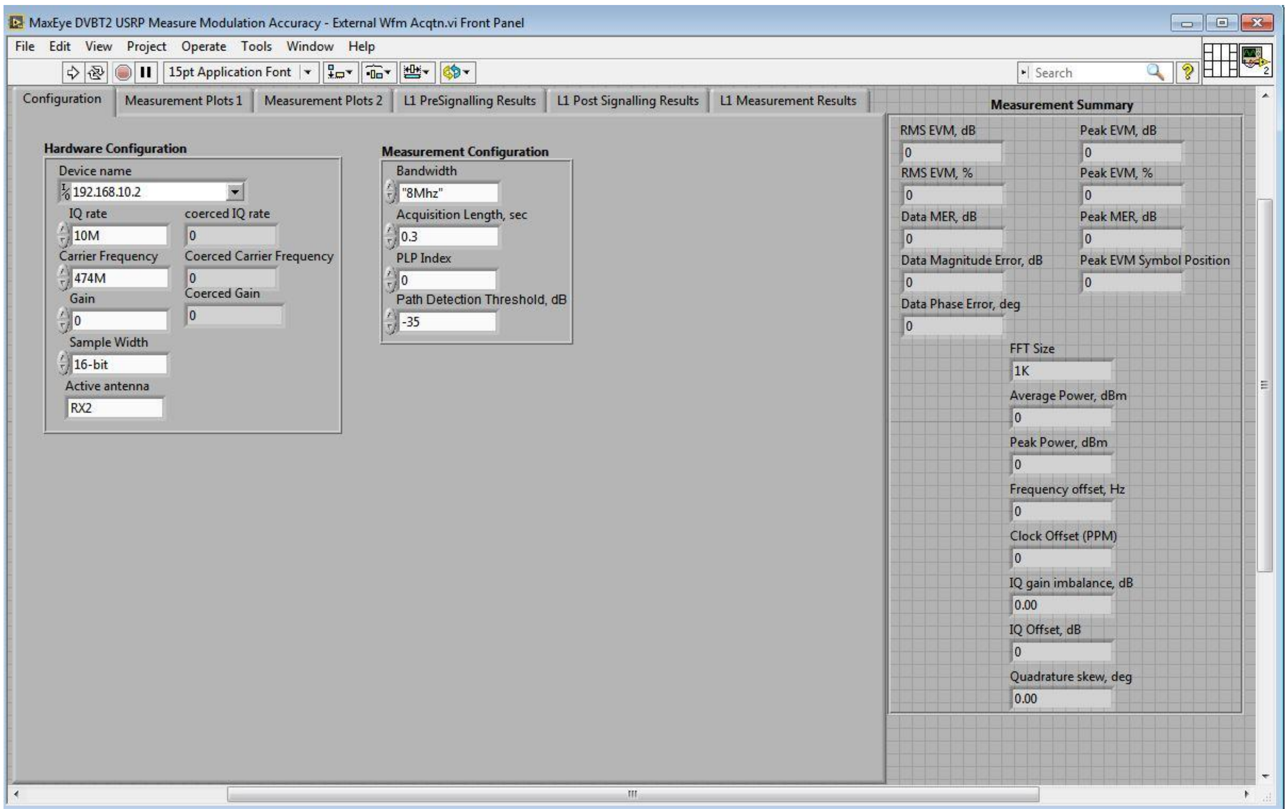

Figure 10

3.2. Spectral Measurements

3.2.1 MaxEye DVB-T2 RFSA Spectral Measurements

This example is used to perform the spectral measurements of the signal received from the RFSA. The front panel of the Example VI is shown in the Figure 11.

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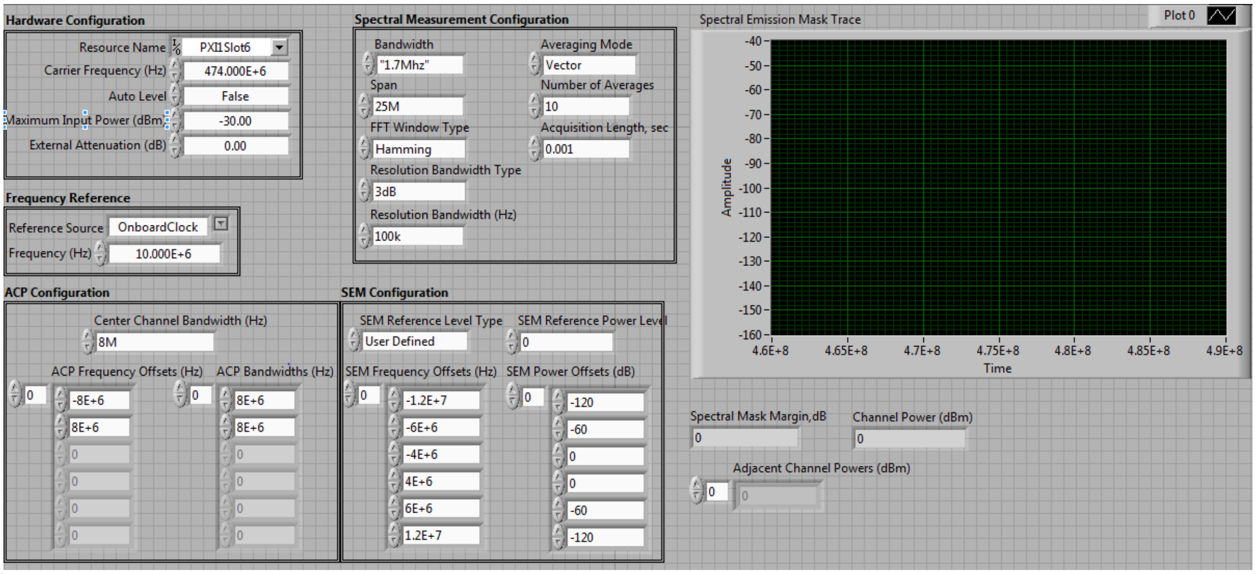

Figure11

The user configurations are divided in to four categories

1. Hardware Configuration
2. Spectral Measurement Configuration
3. ACP/SEM Configuration
4. Spectral Measurement Results

3.2.1.1 Hardware Settings

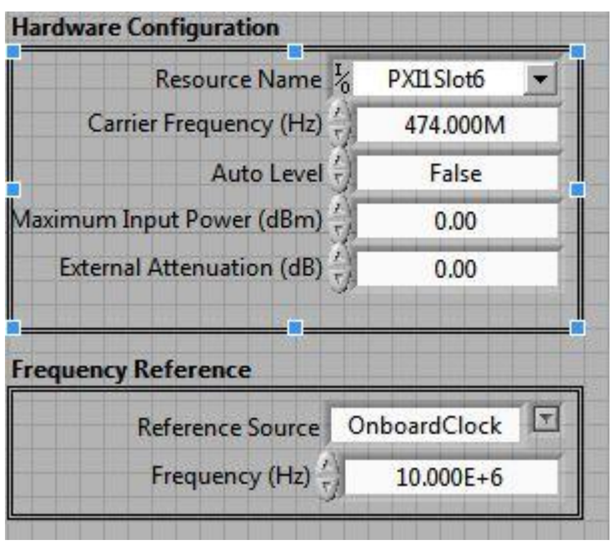

Figure 12

RFSA Resource – Configure the resource name used in NI Measurement and Automation explorer for the RFSA.

Carrier Frequency (Hz) – Center Frequency of the DVB-T2 signal in Hz.

Auto Level (TRUE/FALSE) – Sets the best reference level for the instrument based on the peak power of the measured signal.

Maximum Input Power Level (dBm) –Maximum expected power of an input RF signal.

External Attenuation (dB), Reference Source, Frequency (Hz), – Refer NI RFSA Signal Analyzer help file.

3.2.1.2 ACP/SEM Configuration

The ACP/SEM configurations for DVB-T2 Signal Analysis are shown in the Figure 13. Thehelpforeachofthe properties is availablein DVB-T2 SignalAnalysis Help.chm file.

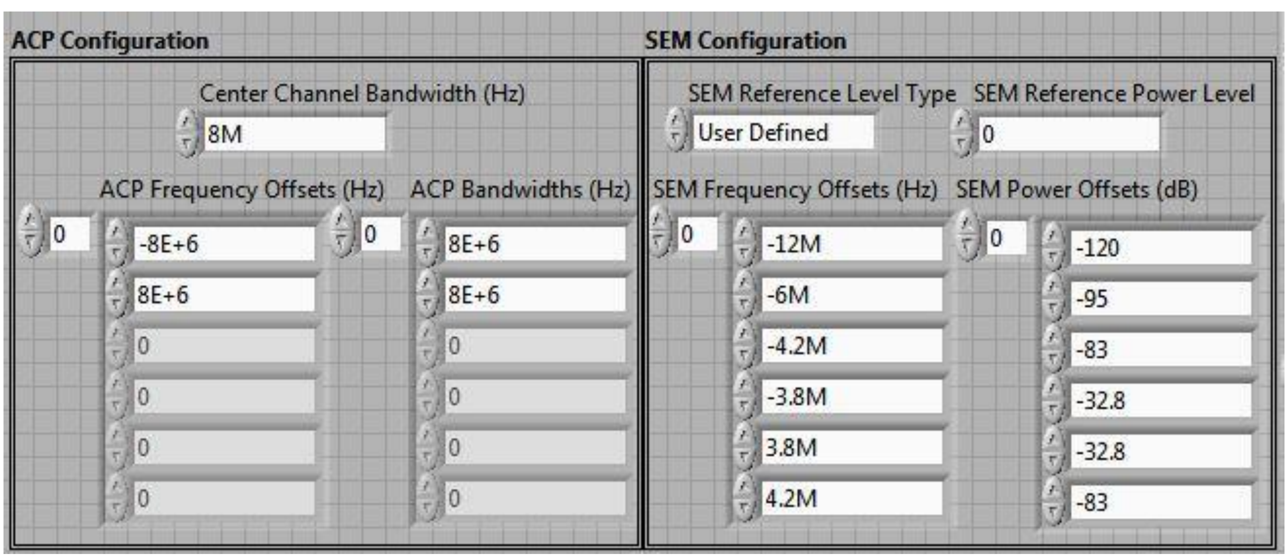

Figure 13

3.2.1.3 Spectral Measurement Results

DVB-T2 Signal Analysis tool kit returns the following results

1. Spectral Mask Trace

2. Spectral Mask Margin
3. Channel Power (dBm)
4. Adjacent Channel Powers (dBm)

The help for each of the spectral measurement results is available in DVB-T2 Signal Analysis Help.chm file.

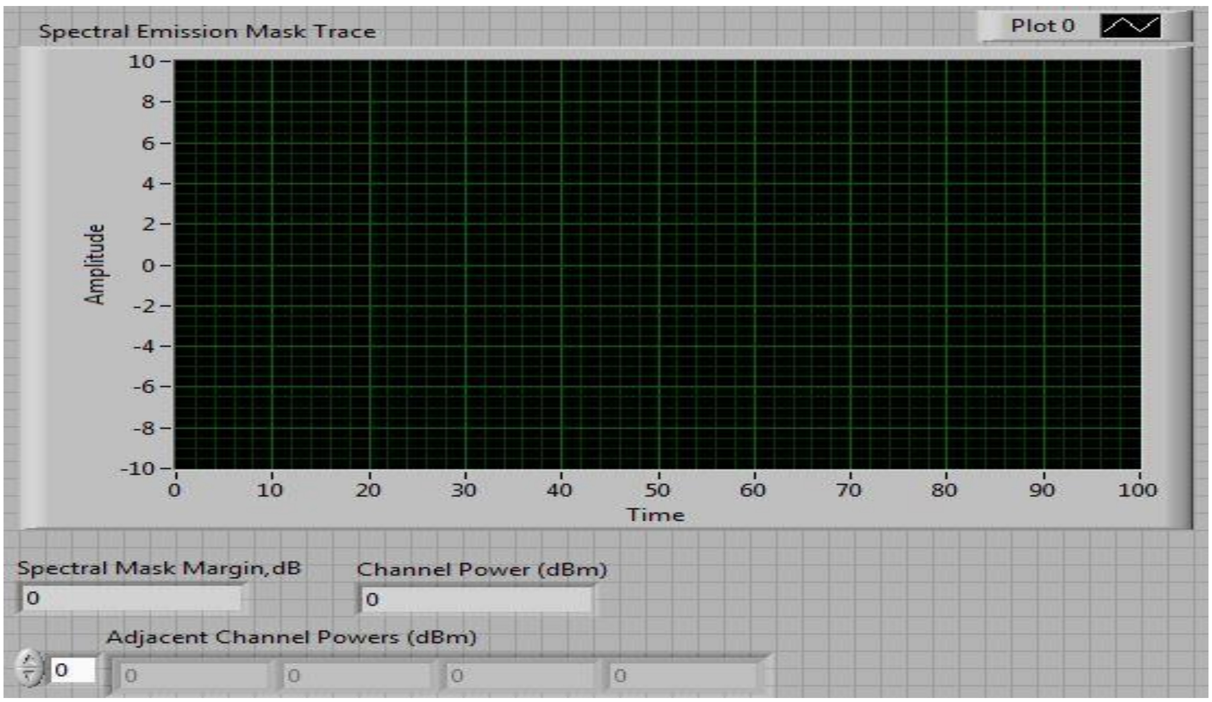

Figure 14

3.2.2 MaxEye DVB-T2 USRP Spectral Measurements

This example is used to perform the spectral measurements of the signal received from the USRP. The front panel of the Example VI is shown in the Figure 15

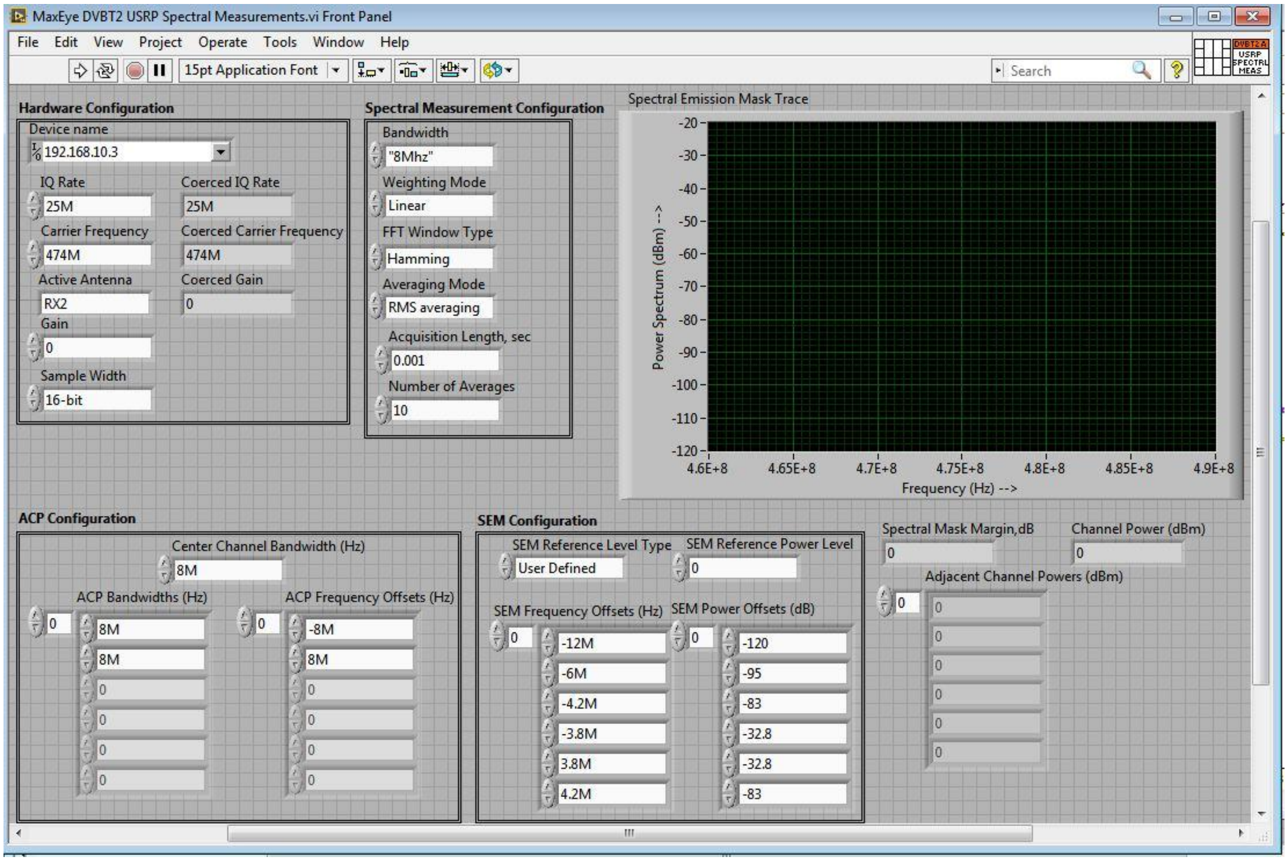

Figure 15

3.2.2.1 Hardware Settings

The hardware settings of the USRP is similar to the example **MaxEye DVBT2 USRP Measure Modulation Accuracy** explained in the Section 3.1.2.1

Note: Apart from the hardware setting the front panel of the Example VI is similar to the example MaxEye DVB-T2 RFSA Spectral Measurements. For each of the properties please refer the DVB-T2 Signal Analysis help file.

4. Tips for searching examples in NI Example Finder

Use any of the following keywords to search DVB-T2 Signal Analysis examples in the NI Example Finder,

Keywords: dvb-t2, spectral, measurements, modulation, accuracy