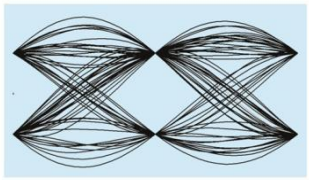

MaxEye Wi-SUN (IEEE 802.15.4g) Measurement Suite

Version 1.1.0

C# .NET API Manual

Contents

1 Introduction

MaxEye Technologies provides generation functions in C# for generating the standard complaint signals for various digital audio and video broadcasting standards. This guide explains C# .NET APIs structure and how to make use of the APIs to run the Wi-SUN Measurement Suite programming examples by using NI hardware Vector Signal Generator (NI VSG), Vector Signal Analyzer (NI VSA), Vector Signal Transceiver (NI VST).

The Wi-SUN Signal Generation is based on the standard IEEE 802.15.4g.

2 Installed File Location

The C# .NET API documentation file is located in, C:\Program Files (x86)\MaxEye\Wi-SUN\Documentation.

(***Note**: - For 32-bit Operating System*, C# .NET API documentation files are installed in C:\Program Files\MaxEye\Wi-SUN\Documentation)

The C# .NET Generation Examples are located in, C:\Program Files (x86)\MaxEye\Wi-SUN\Examples\Generation\cs.

(***Note**: - For 32-bit Operating System*, C# .NET Generation examples are installed in, C:\Program Files\ MaxEye\Examples\Generation\Examples\cs)

The Wi-SUN MR OFDM signal analysis examples are installed in, C:\Program Files (x86)\MaxEye\Wi-SUN\Examples\Analysis\CS.

***(Note**: - For 32-bit Operating System*, Analysis Examples are located in C:\Program Files\MaxEye\Wi-SUN\Examples\Analysis\CS)

You can also find a shortcut to the above location from the windows start menu. **Start->All Programs->MaxEye->Wi-SUN**

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

3 C# .NET APIs

The C# .NET APIs allow user to configure the Wi-SUN Signal Generation and Analysis Examples. MaxEye Wi-SUN Measurement Toolkit provides set of C# .NET APIs to configure parameters, initiating and stopping the signal generation/analysis and to read the output parameters.

3.1 Wi-SUN Signal Generation APIs

3.1.1 CloseHandle

NAME CloseHandle

DESCRIPTION Closes the Wi-SUN MR OFDM Signal Generation handle and resources associated with it.

FUNCTION PROTOTYPE

```
public static void CloseHandle
(
LVBaseRefnum generationHandleIn
)
```

INPUT PARAMETERS

- `generationHandleIn` – Handles the WI-SUN Generation Session

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.2 GetPAPR

NAME Get_PAPR

DESCRIPTION This function returns the PAPR value

FUNCTION PROTOTYPE

```
public static void Get_PAPR
(
LVBaseRefnum generationHandleIn,
out LVBaseRefnum generationHandleOut,
out double pAPR
)
```

INPUT PARAMETERS

- `generationHandleIn` – Handles the WI-SUN Generation Session

OUTPUT PARAMETERS

- `generationHandleOut` – Returns the WI-SUN Generation Session Handle.
- `pAPR` – Peak To Average Power Ratio

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.3 OpenHandle

NAME OpenHandle

DESCRIPTION This Function creates Wi-SUN MR OFDM Generation Handle with the default values and passes the handle to the later APIs.

FUNCTION PROTOTYPE

```
public static void OpenHandle
(
string NameofQueue,
```

```
out LVBaseRefnum wiSUN_GenerationHandle
)
```

INPUT PARAMETERS

- NameofQueue – Specifies the Name of the Queue.

OUTPUT PARAMETERS

- wiSUN_GenerationHandle – Returns the Wi-SUN MR OFDM Handle Session.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.4 ReadWaveformFromFile

NAME ReadWaveformFromFile

DESCRIPTION Reads the IQ values from the file path

FUNCTION PROTOTYPE

```
 public static void ReadWaveformFromFile
(
LVBaseRefnum fileRefnum,
int count,
ushort samplewidth,
out LVBaseRefnum refnumout,
out short[] array
)
```

INPUT PARAMETERS

- fileRefnum – Handles the Waveform file Refnum
- count – configure the count value
- samplewidth – Configure the sample width, use 0 for 8bit, 1 for 16 bit

OUTPUT PARAMETERS

- refnumout – Handles the Waveform file Refnum
- array – Gives the iq values

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.5 RFSG_CreateandDownloadWaveform

NAME RFSG_CreateandDownloadWaveform

DESCRIPTION This Function perfoms the following.

i. Checks the configuration parameters in the Wi-SUN MR OFDM Signal Generation handle and returns an error if the configuration is not valid.

ii. Computes the waveform size, allocates on board memory space for writing waveform.

iii. Creates the waveform as per the configured parameters.

iv. Writes the created waveform in the RFSG on board memory.

FUNCTION PROTOTYPE

```
 public static void RFSG_CreateandDownloadWaveform
(
ulong session,
LVBaseRefnum wiSUN_GenerationHandle,
string waveformname,
out ulong sessionout,
out LVBaseRefnum wiSUN_GenerationHandleOut,
out ComplexWaveform complexWaveform,
out double pAPR,
out uint currentFrameNumber
)
```

INPUT PARAMETERS

- session – Configure the RFSG session in ulong form
- wiSUN_GenerationHandle – Configure the WiSUN Generation Handle.
- waveformname – Configure the required waveform name.

OUTPUT PARAMETERS

- sessionout – Returns the RFSG session handles in ulong form
- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.
- complexWaveform – Gives the complex iq modulated waveform
- pAPR – Gives the peak to average power ratio
- currentFrameNumber – Gives the number of frames generated.

3.1.6 SaveWaveforminFile

NAME `SaveWaveforminFile`

DESCRIPTION This function performs the following:

(i) Checks the configuration parameters in Wi-SUN MR OFDM signal generation handle and returns an error if the configuration is not valid.

(ii) Computes the waveform size and returns it to the user.

(iii) Creates the waveform as per the configured parameters.

(iv) Writes the created waveform in the file as per the waveform file path location configured by the user.

FUNCTION PROTOTYPE

```
 public static void SaveWaveforminFile
(
LVBaseRefnum wiSUN_GenerationHandle,
out LVBaseRefnum wiSUN_GenerationHandleOut,
out ComplexWaveform complexWaveform,
out uint currentFrameNumber,
out double pAPR
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.
- complexWaveform – Gives the complex iq modulated waveform
- pAPR – Gives the peak to average power ratio

3.1.7 SetAddressingFields

NAME `SetAddressingFields`

DESCRIPTION Configures the Destination and Source PAN Identifier and MAC Address properties in the Wi-SUN MR OFDM Signal Generation handle.

FUNCTION PROTOTYPE

```
 public static void SetAddressingFields
(
LVBaseRefnum wiSUN_GenerationHandle,
ushort destinationPANIdentifier,
ulong destinationMACAddress,
ushort sourcePANIdentifier,
ulong sourceMACAddress,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session
- destinationPANIdentifier – This field specifies the unique PAN identifier of the intended recipient of the frame. A value of 0xffff in this field shall represent the broadcast PAN identifier
- destinationMACAddress – The Destination Address field specifies the address of the intended recipient of the frame. A value of 0xffff in this field shall represent the broadcast short address. This field shall be included in the MAC frame only if the Destination Addressing Mode field is nonzero.

- sourcePANIdentifier – The Source PAN Identifier field specifies the unique PAN identifier of the originator of the frame.
- sourceMACAddress – The Source Address field specifies the address of the originator of the frame. This field shall be included in the MAC frame only if the Source Addressing Mode field is nonzero.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.8 SetAssociationRequest

NAME SetAssociationRequest

DESCRIPTION This function configures the Association Request property in the Wi-SUN MR OFDM signal generation handle. The Association Request command contains information defining the device type, power source, receiver on when idle, security capability and allocate address. Association Request allows to send a request to make a association with a PAN through the PAN coordinator or a coordinator.

FUNCTION PROTOTYPE

```
public static void SetAssociationRequest
(
LVBaseRefnum wiSUN_GenerationHandle   ,
AssociationRequest AssociationRequest,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- `GenerationHandle` – Handles the WI-SUN Generation Session
- `AssociationRequest` –

```
public struct AssociationRequest
  {
      [Index(4)]
      public AllocateAddress allocateAddress;
      [Index(0)]
      public ushort deviceType;
      [Index(1)]
      public ushort powerSource;
      [Index(2)]
      public ReceiverOnWhenIdle receiverOnWhenIdle;
      [Index(3)]
```

```
        public SecurityCapability securityCapability;
    }
```

The valid values are

- Device type - Select the device type as either full functioned device or Reduced Function Device .The Default Value is 1.Given below the possible values are
    - 0 - Reduced function device.
    - 1 - Full Function Device
- Power source - Select AC Mains, if the device is receiving power from the alternating current mains. Otherwise, the Power Source field shall be set to Not From AC Mains.The default value is 0.Given below the possible values are
    - 0 - AC mains.
    - 1 - Not From AC Mains
- Receiver on when idle: Select True if the device does not disable its receiver to conserve power during idle periods. Otherwise, Select False.
    - False
    - 1 - True
- Security capability: Select Enabled, if the device is capable of sending and receiving cryptographically protected MAC frames; Otherwise select Disabled The Default value is Disabled .Given below the possible values are
    - Disabled
    - Enabled
- Allocate address - Select True, if the device wishes the coordinator to allocate a short address as a result of the association procedure. Otherwise, Select False .The default value is true.
    - False
    - True

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.9 SetAssociationResponse

NAME `SetAssociationResponse`

DESCRIPTION This Function configures the Association Response property in the Wi-SUN MR OFDM signal generation handle. The Association Response command contains information defining the short address and association status. Association Response allows PAN coordinator or

a coordinator to communicate the results of an association attempt back to the device requesting association.

FUNCTION PROTOTYPE

```
public static void SetAssociationResponse
(
LVBaseRefnum wiSUN_GenerationHandle
AssociationResponse AssociationResponse,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session
- AssociationResponse – The valid values are

  Short address : 0000 to FFFF

  Association status:

  0 - Association successful

  1 - PAN at capacity

  2 - PAN access denied.

  3 - Reserved for MAC primitive enumeration values

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.10 SetCommandFrameIdentifier

NAME SetCommandFrameIdentifier

DESCRIPTION This function configures the Command Frame Identifier property in the Wi-SUN MR OFDM signal generation handle. The Command Frame Identifier field identifies the MAC command being used.

FUNCTION PROTOTYPE

```
public static void SetCommandFrameIdentifier
(
LVBaseRefnum wiSUN_GenerationHandle,
CommandFrameIdentifier commandFrameIdentifier,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session
- commandFrameIdentifier – The valid values are

0 - Association Request
1 - Association Response
2 - Disassociation Notification
3 - Data Request
4 - PAN ID Conflict Notification
5 - Orphan notification
6 - Beacon request
7 - Coordinator realignment
8 - GTS request
9 - Reserved

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.11 SetCoordinatorRealignment

NAME SetCoordinatorRealignment

DESCRIPTION This Function configures the Coordinator Realignment property in the Wi-SUN MR OFDM signal generation handle. The Coordinator Realignment command contains information defining the realignment command, PAN identifier, coordinator short address, channel number, short address and channel page .If this Coordinator Realignment command is sent following the reception of an orphan notification command, it is sent directly to the orphaned device. If this command is sent when any PAN configuration attributes (i.e., PAN identifier, short address, channel, or channel page) change, it is broadcast to the PAN.

FUNCTION PROTOTYPE

```
public static void SetCoordinatorRealignment
(
LVBaseRefnum wiSUN_GenerationHandle    ,
CoordinatorRealignment coordinatorRealignment,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session
- coordinatorRealignment – The valid values are
  - Realignment command :
    - 0 - Broadcast to the PAN,
    - 1 - Sent to orphaned device
  - PAN identifier : 0000 to FFFF
  - Coordinator short address : 0000 to FFFF
  - Channel number : 0 to 255
  - Short address : 0000 to FFFF
  - Channel page : 0 to 255

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.12 SetDataConfiguration

NAME SetDataConfiguration

DESCRIPTION This function configures the Modulation and Coding Scheme for PHY Header and Data Symbols. It also configures the scrambling Seed.

FUNCTION PROTOTYPE

```
public static void SetDataConfiguration
(
LVBaseRefnum wiSUN_GenerationHandle    ,
ModulationandCoding modulationandCoding,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- `wiSUN_GenerationHandle` – Handles the WI-SUN Generation Session
- `modulationandCoding` – The default value is 1.The possible Modulation and Coding Schemes are
  - 0 - BPSK 1/2 Rate 4x (4x frequency spreading)
  - 1 - BPSK 1/2 Rate 2x (2x frequency spreading)
  - 2 - QPSK 1/2 Rate 2x (2x frequency spreading)
  - 3- QPSK 1/2 Rate (No frequency spreading)
  - 4 - QPSK 3/4 Rate (No frequency spreading)
  - 5 - 16 QAM 1/2 Rate (No frequency spreading)

- 6 - 16 QAM 3/4 Rate (No frequency spreading)

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.13 SetDFTSize

NAME SetDFTSize

DESCRIPTION This function Configures the DFT Size. The possible DFT sizes are 128, 64, 32, 16

FUNCTION PROTOTYPE

```
public static void SetDFTSize
(
LVBaseRefnum wiSUN_GenerationHandle,
ushort DFTSize,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- GenerationHandle – Specifies the Wi-SUN MR OFDM Session
- `DFTSize` –The possible DFT sizes are 128, 64, 32, 16.

OUTPUT PARAMETERS

- `wiSUN_GenerationHandleOut` – Returns the Wi-SUN MR OFDM Session.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.14 SetDisassociationNotification

NAME SetDisassociationNotification

DESCRIPTION This function configures the Disassociation Notification property in the Wi-SUN MR OFDM signal generation handle. The PAN coordinator, a coordinator, or an associated device may send the disassociate notification command.

FUNCTION PROTOTYPE

```
public static void SetDisassociationNotification
(
LVBaseRefnum wiSUN_GenerationHandle    ,
DisassociationReason disassociationReason,
```

```
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session
- disassociationReason – Configure the dissociation reason in the Wi-SUN MR OFDM signal generation handle.The default value is 1.Given below the possible values are
  - 0 – Reserved,
  - 1 – The coordinator wishes the device to leave the PAN,
  - 2 – The device wishes to leave the PAN,
  - 3 - Reserved for MAC primitive enumeration values.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.15 SetFrameControlFields

NAME SetFrameControlFields

DESCRIPTION Configures the MAC Frame Control Fields properties in the Wi-SUN MR OFDM Signal Generation Handle. The Frame Control field contains information defining the frame type, addressing fields, and other control flags. For more information about the Frame control fields please refer section 5.2.1.1 of the IEEE standard 802.15.4.

FUNCTION PROTOTYPE

```
public static void SetFrameControlFields
(
LVBaseRefnum wiSUN_GenerationHandle
FrameControlFields frameControlFields
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session
- frameControlFields – The frame control fields can be configured as follows

```
public struct FrameControlFields
{
    [Index(3)]
    public ushort ackRequestField;
    [Index(5)]
    public ushort destinationAddrMode;
```

```
    [Index(2)]
    public ushort framePendingField;
    [Index(0)]
    public ushort frameType;
    [Index(6)]
    public ushort frameVersion;
    [Index(4)]
    public ushort intraPANPANIDCompression;
    [Index(1)]
    public ushort securityEnabled;
    [Index(7)]
    public ushort sourceAddrMode;
}
```

- **Frame Type-** Select the frame type as per required generation.The default value is 4.Given below the possible values are
  - 0 – Beacon,
  - 4 – Data,
  - 2 – Acknowledgment,
  - 6 - MAC Command.
- **Security Enabled-** shall be set to True if the frame is protected bythe MAC sublayer and shall be set to False otherwise.
- **Frame Pending Field-** shall be set to True if the device sending the frame has more data for the recipient. This field shall be set to False otherwise.
- **Ack Request Field-** specifies whether an acknowledgment is required from the recipient device on receipt of a data or MAC command frame. If this field is set to True, the recipient device shall send an acknowledgment frame only if, upon reception. If this field is set to False, the recipient device shall not send an acknowledgment frame.
- **PAN ID Compression-** specifies whether the MAC frame is to be sent containing only one of the PAN identifier fields when both source and destination addresses are present.If this field is set to Intra-PAN and both the source and destination addresses are present, the frame shall contain only the Destination PAN Identifier field, and the Source PAN Identifier field shall be assumed equal to that of the destination. If this field is set to inter-PAN, then the PAN Identifier field shall be present if and only if the corresponding address is present.The default Value is 0.Given below the possible values are
  - 0 – inter-PAN,
  - 1 - Intra-PAN.
- **Destination Address Mode-** Select the required destination address mode.The Default value is 3.Given below the possible values are
  - 0 – PAN Id and Address Fields Not Present,
  - 1 – Short Address Field (16 bit),
  - 2 – Reserved,
  - 3 - Extended Address Field (64 bit).

- **Frame Version-** specifies the version number corresponding to the frame.The Default value is 0.Given below the possible values are
  - 0 – Compatible with 802.15.4 – 2003,
  - 2 – Compatible with 802.15.4 – 2011.
- **Source Address Mode-** Select the required source addressing mode. The Default value is 3.Given below the possible values are
  - 0 – PAN Id and Address Fields Not Present,
  - 1 – Short Address Field (16 bit),
  - 2 – Reserved,
  - 3 - Extended Address Field (64 bit).

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.16 SetGTSRequest

NAME SetGTSRequest

DESCRIPTION This function configures the GTS Request property in the Wi-SUN MR OFDM signal generation handle. The GTS Request command contains information defining the GTS length(in slots),GTS direction and GTS characteristics type. GTS Request command is used by an associated device that is requesting the allocation of a new GTS or the deallocation of an existing GTS from the PAN coordinator.

FUNCTION PROTOTYPE

```
public static void SetGTSRequest
(
LVBaseRefnum wiSUN_GenerationHandle   ,
GTSRequest GTSRequest,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – The valid value are
- GTSRequest – The valid value are

  GTS length(in slots) : 1 to 255

  GTS direction :

  0 - Tx only GTS

1 - Rx only GTS

GTS characteristics type:

0 - GTS deallocation

1- GTS allocation

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.17 SetHeadroomdB

NAME SetHeadroomdB

DESCRIPTION This function configures the Head room property in the Wi-SUN MR OFDM Signal Generation handle. The toolkit uses this value for scaling the waveform. If the PAPR of the signal is higher than the Head room value then the toolkit clips the signal. To avoid clipping Head room value should be higher than PAPR of the signal.

FUNCTION PROTOTYPE

```
public static void SetHeadroomdB
(
LVBaseRefnum wiSUN_GenerationHandle   ,
double headroomdB,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session
- headroomdB – Use Head room value higher than PAPR of the signal.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Handles the WI-SUN Generation Session

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.18 SetImpairmentConfiguration

NAME SetImpairmentConfiguration

DESCRIPTION Configures the Impairment properties for the Wi-SUN MR OFDM Signal generation handle.

FUNCTION PROTOTYPE

```
public static void SetImpairmentConfiguration
(
LVBaseRefnum wiSUN_GenerationHandle   ,
Impairments impairments,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session
- Impairments – Specifies the Following properties

```
public struct Impairments
{
 [Index(4)]
 public AWGNEnabled aWGNEnabled;
 [Index(0)]
 public double carriertoNoiseRatiodB;
 [Index(3)]
 public double clockOffsetPPM;
 [Index(1)]
 public double frequencyoffsetHz;
 [Index(5)]
 public ImpairmentsEnabled impairmentsEnabled;
 [Index(2)]
 public IQImpairments iQImpairments;
}
```

- **AWGN Enabled-** 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.
- **Impairments Enabled-** 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.
- **Clock Offset (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.
- **Frequency Offset, 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. For data rate R1 the frequency offset is 20 KHz and for other data rates the frequency offset is 0.
- **Quadrature skew-** Quadrature Skew 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.

```
public struct IQImpairments
 {
     [Index(0)]
     public double iDCoffsetPercent;
     [Index(2)]
     public double iQgainimbalancedB;
     [Index(1)]
     public double qDCoffsetPercent;
     [Index(3)]
     public double quadratureskewdeg;
    }
```

- **IQ gain imbalance, dB-** This value 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.
- **I DC offset, %-** 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, %-** 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.
- **Carrier to Noise Ratio, dB-** This value specifies the Carrier to Noise ratio of the generated signal. The default value is 40dB.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.19 SetInterFrameSpacing

NAME SetInterFrameSpacing

DESCRIPTION Configures the Inter Frame Spacing property in the Wi-SUN MR OFDM Signal Generation handle.

FUNCTION PROTOTYPE

```
SetInterFrameSpacing
(
LVBaseRefnum wiSUN_GenerationHandle   ,
double interFrameSpacingSeconds,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session

- interFrameSpacingSeconds – This property specifies the gap duration in seconds between the frames.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Handles the WI-SUN Generation Session.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.20 SetMACFraming Enabled

NAME SetMACFramingEnabled

DESCRIPTION Configures the MAC Framing Enabled field in the Wi-SUN MR OFDM Signal Generation Handle. If this property is set to true then the toolkit adds MAC layer headers and then creates payload for the physical layer

FUNCTION PROTOTYPE

```
SetMACFramingEnabled
(
LVBaseRefnum wiSUN_GenerationHandle
ushort MACFramingEnabled,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session.
- MACFramingEnabled – If this property is set to true then the toolkit adds MAC layer headers and then creates payload for the physical layer

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.21 SetNumberofFrames

NAME SetNumberofFrames

DESCRIPTION This Function configures the Number of Frames property in the Wi-SUN MR OFDM signal generation handle. The toolkit uses the same frame configuration for all the frames and the payload is continuous across frames. The valid value should be greater than 0. The default value is 1

FUNCTION PROTOTYPE

```
public static void SetNumberofFrames
(
LVBaseRefnum wiSUN_GenerationHandle   ,
uint numberofFrames,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session.
- numberofFrames – The valid value should be greater than 0. The default value is 1

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.22 SetOutputSamplingRate

NAME SetOutputSamplingRate

DESCRIPTION Configures the Output Sampling Rate (Hz) property of the Wi-SUN MR OFDM Signal Generation handle.

FUNCTION PROTOTYPE

```
SetOutputSamplingRate
(
LVBaseRefnum wiSUN_GenerationHandle   ,
double outputSamplingRate,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session.
- outputSamplingRate – 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 1(True). If this value is zero then toolkit generates the signal at a default sampling rate which is in turn dependent on the Bandwidth.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.23 SetOutputWaveformFilePath

NAME SetOutputWaveformFilePath

DESCRIPTION The function configures the file location for the Waveform File Path property in Wi-SUN MR OFDM Signal Generation handle. The toolkit saves the generated waveform in the file when MaxEye Wi-SUN MR OFDM RFSG Create and Save Waveform API is used for the waveform creation.

FUNCTION PROTOTYPE

```
SetOutputWaveformFilePath
(
LVBaseRefnum wiSUN_GenerationHandle,
LVPath outputWaveformFilePath,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- GenerationHandleIn – Handles the WI-SUN Generation Session.
- outputWaveformFilePath – Specify the path to save the Wi-SUN MR OFDM modulated waveform.

OUTPUT PARAMETERS

- GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.24 SetOverSamplingEnabled

NAME SetOversamplingEnabled

DESCRIPTION This function configures the Oversampling Enabled? Property in the Wi-SUN MR OFDM signal generation handle.

FUNCTION PROTOTYPE

```
public static void SetOversamplingEnabled
(
LVBaseRefnum wiSUN_GenerationHandle
OversamplingEnabled oversamplingEnabled,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session.

- oversamplingEnabled – The valid value is either TRUE or FALSE. The default value is FALSE.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.25 SetPayloadConfiguration

NAME SetPayloadConfiguration

DESCRIPTION This Function configures the Payload properties for the Wi-SUN MR OFDM Signal generation handle. The help for the each of the payload property can be found in the property specific APIs. This Function is used for configuring the multiple function properties using the payload Structure.

FUNCTION PROTOTYPE

```
public static void SetPayloadConfiguration
(
LVBaseRefnum wiSUN_GenerationHandle   ,
PayloadControl payloadControl,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- `wiSUN_GenerationHandle` – Handles the WI-SUN Generation Session.
- `payloadControl` – The payload settings can be configured as follows.

```
public struct PayloadControl
{
    [Index(6)]
    public LVPath payloadFilePath;
    [Index(7)]
    public LVBaseRefnum payloadFileRefnum;
    [Index(1)]
    public uint payloadLengthbytes;
    [Index(0)]
    public ushort payloadMode;
    [Index(3)]
    public uint payloadPNOrder;
    [Index(4)]
    public uint payloadPNSeed;
    [Index(2)]
    public ushort payloadTestPattern;
    [Index(5)]
    public byte[] payloadUserDefinedBits;
```

```
}
```

- **payloadMode**: Choose the appropriate mode. PN sequence is used to generate the PN sequence. In the User defined bits, user can configure the transmitting bits. In Test Pattern, some predefined bit patterns can be used for transmitting .The default value is 2.
  - 0 – PN Sequence,
  - 1 – User Defined Bits,
  - 2 – Test Pattern,
  - 3 - From File.
- **Payload Length** ,Bytes- Specifies the number of bytes to be transmitted
- **Payload PN Order-** specifies the order of the PN bit sequence to be generated. The valid values is 5 to 31, inclusive. Configure this field when the Payload mode is PN sequence.
- **Payload PN Seed-** specifies the initial state of the PN generator shift register. Configure this field when the Payload mode is PN Sequence
- **Payload Test Pattern-** Select the required Test Pattern. Configure this field when the Payload mode is Test Pattern
- **Payload User Defined Bits-** Configure this field when Payload mode is User Defined bits.
- **Payload File Path-** Choose the file path when the payload mode is From File.

OUTPUT PARAMETERS

- `wiSUN_GenerationHandleOut` – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.26 SetphyOFDMInterleaving

NAME SetphyOFDMInterleaving

DESCRIPTION This function configures the OFDM Interleaving Depth. A value of one indicates an interleaving depth of one symbol. A value of SF Symbols indicates an interleaving depth of the number of symbolsequal to the frequency domain spreading factor (SF).

FUNCTION PROTOTYPE

```
public static void SetphyOFDMInterleaving
(
LVBaseRefnum wiSUN_GenerationHandle
ushort interleavingDepth,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.27 SetSampleWidth

NAME SetSamplewidth

DESCRIPTION This function configures the Sample width. The possible values are 8 bit and 16 bit. This function is used for MaxEye Wi-SUN MR OFDM Signal Generation (Data Frame) Save Waveform in File Example.

FUNCTION PROTOTYPE

```
public static void SetSamplewidth
(
LVBaseRefnum wiSUN_GenerationHandle   ,
ushort sampleWidth,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- `wiSUN_GenerationHandle` – Handles the WI-SUN Generation Session.
- `sampleWidth` – Configure the Sample width in the Wi-SUN MR OFDM signal generation handle.The default value is 1.Given below the possible values are
  - 0 – 8-bit,
  - 1 – 16-bit.

OUTPUT PARAMETERS

- `wiSUN_GenerationHandleOut` – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.28 SetSequenceNumber

NAME SetSequenceNumber

DESCRIPTION Configures the Sequence Number field in the Wi-SUN MR OFDM Signal Generation Handle.

FUNCTION PROTOTYPE

```
public static void SetSequenceNumber
(
LVBaseRefnum wiSUN_GenerationHandle   ,
byte sequenceNumber,
out LVBaseRefnum wiSUN_GenerationHandleOut
```

```
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session.
- sequenceNumber – The Sequence Number field specifies the sequence identifier for the frame. For a beacon frame, the Sequence Number field shall specify a BSN (Beacon Sequence Number). For a data, acknowledgment, or MAC command frame, the Sequence Number field shall specify a DSN (Data Sequence Number) that is used to match an acknowledgment frame to the data or MAC command frame.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the WI-SUN Generation Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.1.29 SetSuperframeSpecification

NAME SetSuperframeSpecification

DESCRIPTION Configures the Beacon Order and Superframe Order properties in the Wi-SUN MR OFDM Signal Generation Handle. For more information about Beacon Order and Super Frame Order properties, please refer section 5.1.1.1 and 5.2.2.1 of the IEEE 802.15.4 2011 standard.

FUNCTION PROTOTYPE

```
public static void SetSuperframeSpecification
(
LVBaseRefnum wiSUN_GenerationHandle    ,
byte beaconOrder,
byte superframeOrder,
out LVBaseRefnum wiSUN_GenerationHandleOut
)
```

INPUT PARAMETERS

- wiSUN_GenerationHandle – Handles the WI-SUN Generation Session.
- beaconOrder – This field shall specify the transmission interval of the beacon
- superframeOrder – This field shall specify the length of time during which the superframe is active.

OUTPUT PARAMETERS

- wiSUN_GenerationHandleOut – Returns the Wi-SUN MR OFDM Signal Generation Session.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SG
- DLL – MaxEyeWiSUN_SG.dll

3.2 Wi-SUN Signal Analysis APIs

3.2.1 CloseHandle

NAME CloseHandle

DESCRIPTION Closes the Wi-SUN MR OFDM Analysis Handle and resources associated with it.

FUNCTION PROTOTYPE

```
public static void CloseHandle
(
LVBaseRefnum AnalysisHandleIn
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.2 ConfigureSEMOffsetSegments

NAME ConfigureSEMOffsetSegments

DESCRIPTION This function configures the SEM Offset Segment properties. The SEM Offset Segment includes the following properties.

i. SEM Offset Segment Enabled

ii. Offset Frequency (Start, Stop and Sideband)

iii. RBW Filter Type and RBW

iv. Mask Limits both Absolute and Relative

FUNCTION PROTOTYPE

```
public static void ConfigureSEMOffsetSegments
(
LVBaseRefnum InstrumentHandleIn,
OffsetSegment[] OffsetSegments,
int LimitFailMask,
string SelectorString,
out LVBaseRefnum InstrumentHandleOut
)
```

INPUT PARAMETERS

- `InstrumentHandleIn` – Handles the Wi-SUN Signal Analysis Session.
- `OffsetSegments` – Specifies the Offset segments properties

```
public struct Offset__32Segment
    {
        [Index(2)]
        public AbsoluteLimit absoluteLimit;
       [Index(4)]
        public int enabled;
        [Index(0)]
        public OffsetFrequency offsetFrequency;
        [Index(1)]
        public RBWFilter rBWFilter;
       [Index(3)]
        public AbsoluteLimit relativeLimit;
    }
   public struct AbsoluteLimit
   {
    [Index(0)]
    public int mode;
    [Index(1)]
    public double startdBm;
    [Index(2)]
    public double stopdBm;
    }
```

- `Mode` – specifies whether the absolute limit mask is a flat line or a line with a slope
- `startdBm` – specifies the array of absolute power limits, in dBm, corresponding to the beginning of the offset segment. The value of this parameter is also set as the stop limit for the offset segment when you set the Absolute Limit Mode parameter to Couple.
- `stopdBm` – specifies the array of absolute power limits, in dBm, corresponding to the end of the offset segment. This parameter is ignored when you set the Absolute Limit Mode parameter to Couple
- `enabled` – specifies whether to enable the offset segment for the SEM measurement. The default value is True.

```
public struct OffsetFrequency
    {
        [Index(2)]
        public int sideband;
        [Index(0)]
        public double startHz;
        [Index(1)]
        public double stopHz;
    }
```

- `sideband` – specifies whether the offset segment is present on one side, or on both sides of the carriers. The default value is Both.
- `startHz` – specifies the array of start frequencies, in Hz, of each offset segment relative to the closest configured carrier channel bandwidth center or carrier channel bandwidth edge based on the value of the SEM Offset Freq Definition property.

- `stopHz` – specifies the array of stop frequencies, in Hz, of each offset segment relative to the closest configured carrier channel bandwidth center or carrier channel bandwidth edge based on the value of the SEM Offset Freq Definition property.

```
public struct RBWFilter
    {
        [Index(0)]
        public int rBWAuto;
        [Index(1)]
        public int rBWFilterType;
        [Index(2)]
        public double rBWHz;
    }
```

.

- `rBWAuto` – specifies whether the measurement computes the RBW
- `rBWHz` – specifies the array of bandwidths, in Hz, of the resolution bandwidth (RBW) filter used to sweep the acquired offset segment, when you set the RBW Auto parameter to False.

OUTPUT PARAMETERS

- `InstrumentHandleOut` – Handles the Wi-SUN Signal Analysis Session.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.3 FetchCWFrequencyOffset

NAME FetchCWFrequencyOffset

DESCRIPTION This function returns the following.

i. Average Absolute Frequency in Hz

ii. Frequency Offset in Hz

iii. Frequency Error vs Time trace

FUNCTION PROTOTYPE

```
public static void FetchCWFrequencyOffset
(
ulong session,
double centerFrequency,
string resourceName,
string selectorString,
double timeout,
out ulong sessionOut,
out double averageAbsoluteFrequencyHz,
out double frequencyOffset,
out AbsoluteMaskdBmordBmperHz absoluteMaskdBmordBmperHz
)
```

INPUT PARAMETERS

- `session` – Specifies the RFSA session Handles in ulong form.
- carrierFrequency - Specifies the Carrier Frequency of the Generated Signal.
- timeoutSec - Specifies the timeout, in seconds, for fetching the specified measurement. Set this value to an appropriate time, longer than expected for fetching the measurement. A value of -1 specifies that the Function waits until the measurement is complete. The default value is 10.
- resourceName - Specifies a resourceName or Hardware Name.
- `selectorString` - Specifies a selectorString comprising of the signal name and result name. If you do not specify the result name, the default result instance is used. The default value is "".

OUTPUT PARAMETERS

- `sessionOut` – Returns the RFSA session Handles in ulong form.
- `averageAbsoluteFrequencyHz` – Returns the RF signal frequency.
- `frequencyOffset`- Returns the RF frequencyOffset.
- `absoluteMaskdBmordBmperHz` - Returns the frequency versus time trace.

```
public struct AbsoluteMaskdBmordBmperHz
{
 [Index(1)]
 public double dx;
 [Index(0)]
 public double x0;
 [Index(2)]
 public float[] y;
}
```

  - `dx` - Returns the sample duration, in seconds.
  - `x0` - Returns the start time, in seconds.
  - `y` - Returns the frequency, in Hz, measured at each time instance.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.4 RFSAAutoLevel

NAME RFSAAutoLevel

DESCRIPTION Performs an acquisition and sets the best reference level for the instrument based on the peak power of the measured signal.

FUNCTION PROTOTYPE

```
public static void RFSAAutoLevel
(
ulong instrumentsHandleIn,
double bandwidthHz,
double measurementIntervalsec,
int maxNumberofIterations,
out LVBaseRefnum instrumenthandleout,
out double resultantReferenceLeveldBm
)
```

INPUT PARAMETERS

- `instrumentsHandleIn` – Specifies the RFSA session Handles in ulong form.
- `bandwidthHz` - Configure the Bandwidth.
- `MeasurementIntervalsec` - Configure the MeasurementIntervalsec.The default value is 0.01.
- `MaxNumberofIterations` - Configure the Maximum Number of Iterations. The default value is 5.

OUTPUT PARAMETERS

- `instrumenthandleout` – Returns the RFSA session Handles in ulong form..
- `resultantReferenceLeveldBm` –.Returns the Resultant reference level in dBm is used to configure the Maximum input power.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.5 SetAcquisitionLengthSeconds

NAME SetAcquisitionLengthSeconds

DESCRIPTION Configures the Acquisition Length, in seconds property in the Wi-SUN MR OFDM Signal Analysis handle. The toolkit computes the number of samples based on this value and configures the NI RFSA session. The default value is 5 milliseconds.

FUNCTION PROTOTYPE

```
public static void SetAcquisitionLengthSeconds
(
LVBaseRefnum AnalysisHandleIn,
double acquisitionLengthSeconds,
out LVBaseRefnum wiSUN_OFDM_AnalysisHandleOut
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session.
- `acquisitionLengthSeconds` – Needs to be configured for OFDM modulation. Number of Samples to Acquire= IQ Rate* Acquisition Length

OUTPUT PARAMETERS

- `wiSUN_OFDM_AnalysisHandleOut` – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.6 SetAveragingEnabled

NAME SetAveragingEnabled

DESCRIPTION Configures the Averaging Enabled property in the Wi-SUN MR OFDM Signal Analysis handle. Set this property to True to average the measurements over number of iterations. The default value is False.

FUNCTION PROTOTYPE

```
public static void SetAveragingEnabled
(
LVBaseRefnum AnalysisHandleIn,
int averagingEnabled,
out LVBaseRefnum AnalysisHandleOut
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session.
- `averagingEnabled` – specifies whether to enable averaging for the measurement. The default value is False.

OUTPUT PARAMETERS

- `AnalysisHandleOut` Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL –MaxEyeWiSUNAnalysis.dll

3.2.7 Set Averaging Mode

NAME `SetAveragingMode`

DESCRIPTION Configures the averaging mode required to analyse the signal waveform.

FUNCTION PROTOTYPE

```
SetAveragingMode
(
LVBaseRefnum AnalysisHandleIn,
ushort AveragingMode,
out LVBaseRefnum AnalysisHandleOut
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session.
- `AveragingMode` - Configure the averagingMode.The default value is 2.Given below the possible values are
  - 0-No averaging,
  - 1-Vector averaging,
  - 2-RMS averaging,
  - 3-Peak hold.

OUTPUT PARAMETERS

- `AnalysisHandleOut` – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.8 SetCodingandModulationScheme

NAME SetCodingandModulationScheme

DESCRIPTION This Function Configures the Modulation and Coding Scheme for the PHY Header.

FUNCTION PROTOTYPE

```
public static void SetCodingandModulationScheme
(
LVBaseRefnum AnalysisHandleIn,
ModulationAndCodingPHR ModulationAndCodingPHR,
out LVBaseRefnum AnalysisHandleOut)
```

INPUT PARAMETERS

- AnalysisHandleIn – Handles the Wi-SUN Signal Analysis Session
- ModulationAndCodingPHR – Configure this handle as same as generated waveform. The Possible values are
  - 0 - BPSK 1/2 Rate 4x(4x frequency Spreading)
  - 1 - BPSK 1/2 Rate 2x(2x Frequency Spreading)
  - 2 - QPSK 1/2 Rate 2x(2x Frequency Spreading)
  - 3 - QPSK 1/2 Rate(No Frequency Spreading)
  - 4 - QPSK 3/4 Rate(No Frequency Spreading)
  - 5 - 16 QAM 1/2 Rate(No Frequency Spreading)
  - 6 - 16 QAM 3/4 Rate(No Frequency Spreading)

OUTPUT PARAMETERS

- AnalysisHandleOut – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.9 SetMeasurementMode

NAME SetMeasurementMode

DESCRIPTION Configure the measurement mode either as modulation accuracy measurement or spectral measurements

FUNCTION PROTOTYPE

```
public static void SetMeasurementMode
(
LVBaseRefnum AnalysisHandleIn,
ushort measurementMode,
out LVBaseRefnum AnalysisHandleOut
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session
- `measurementMode` – Configure the MeasurementMode.The default value is 1.Given below the Possible Values are
  - 0-Demodulation Measurements,
  - 1-Spectral Measurements

OUTPUT PARAMETERS

- `AnalysisHandleOut` – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.10 SetMinimumQuietTimeSeconds

NAME SetMinimumQuietTimeSeconds

DESCRIPTION Configures the Minimum Quite Time property in the Wi-SUN MR OFDM Signal Analysis handle. Specifies a time duration, in seconds, for which the signal must be quiet before the device arms the IQ Power Edge trigger. The signal is quiet when it is below the trigger level if the trigger slope, specified by the Reference Trigger IQ Power Edge Slope property, is set to Rising Slope or when it is above the trigger level if the trigger slope is set to Falling Slope. By default, this value is set to 0, which means the device does not wait for a quiet time before arming the trigger. This property is useful to trigger the acquisition on signals containing repeated bursts, but for which each burst may have large changes in signal power within itself. By configuring the minimum quiet time to the time between bursts, you can ensure that the trigger occurs at the beginning of a burst rather than at a signal power change within a burst.

FUNCTION PROTOTYPE

```
public static void SetMinimumQuietTimeSeconds
(
LVBaseRefnum AnalysisHandleIn,
double MinimumQuietTimeSeconds,
out LVBaseRefnum AnalysisHandleOut
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session
- `MinimumQuietTimeSeconds` – Specifies a time duration, in seconds, for which the signal must be quiet before the device arms the IQ Power Edge trigger. The signal is quiet when it is below the trigger level if the trigger slope, specified by the Reference Trigger IQ Power Edge Slope property, is set to Rising Slope or when it is above the trigger level if the trigger slope is set to Falling Slope.

OUTPUT PARAMETERS

- `AnalysisHandleOut` – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.11 SetNumberofAverages

NAME SetNumberofAverages

DESCRIPTION Configures the Number of Averages property of the Wi-SUN MR OFDM Signal Analysis handle. The measurement results are averaged over the number specified by Number of Averages.

FUNCTION PROTOTYPE

```
public static void SetNumberofAverages
(
LVBaseRefnum AnalysisHandleIn,
int numberofAverages,
out LVBaseRefnum AnalysisHandleOut
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session.
- `numberofAverages` – specifies the number of acquisitions used for averaging when you set the Averaging Enabled parameter to True.

OUTPUT PARAMETERS

- `AnalysisHandleOut` – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.12 SetNumberofFramesorBursts

NAME SetNumberofFramesorBursts

DESCRIPTION Configures the Number of Frames property in the Wi-SUN MR OFDM Signal Analysis handle. Configure this property when multiple frame decoding is required, if this property is set to more than one then the toolkit decodes each frame and the respective MAC level frame parameters are returned in an array. Configure acquisition length such that the acquired waveform contains all the required frames for analysis. The default value is 1.

FUNCTION PROTOTYPE

```
public static void SetNumberofFramesorBursts
(
LVBaseRefnum AnalysisHandleIn,
int numberofFramesorBursts,
out LVBaseRefnum AnalysisHandleOut
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session
- `numberofFramesorBursts` – Configure the number of frames to be acquired.

OUTPUT PARAMETERS

- `AnalysisHandleOut` – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.13 SetNumberofSymbols

NAME SetNumberofSymbols

DESCRIPTION Configures the Number of Symbols property in the Wi-SUN MR OFDM Signal Analysis handle. The toolkit uses this property to compute the the demodulation measurements such as EVM, MER etc., The default value is 1000.

FUNCTION PROTOTYPE

```
public static void SetNumberofSymbols
(
LVBaseRefnum AnalysisHandleIn,
int NumberofSymbols,
out LVBaseRefnum AnalysisHandleOut
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session
- `NumberofSymbols` – Configure the number of symbols to be acquired.

OUTPUT PARAMETERS

- `AnalysisHandleOut` – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.14 SetPretriggerDelaySeconds

NAME SetPreTriggerDelaySeconds

DESCRIPTION Configures the PreTrigger Delay property of the Wi-SUN MR OFDM Signal Analysis handle, in seconds. The toolkit computes the number of pretrigger samples based on the IQ Rate, Specifies the number of pretrigger samples—the samples acquired before the Reference Trigger is received—to be acquired per record.

FUNCTION PROTOTYPE

```
public static void SetPreTriggerDelaySeconds
(
LVBaseRefnum AnalysisHandleIn,
double PreTriggerDelaySeconds,
out LVBaseRefnum AnalysisHandleOut
)
```

INPUT PARAMETERS

- `AnalysisHandleIn` – Handles the Wi-SUN Signal Analysis Session
- `PreTriggerDelaySeconds` – Specifies the number of pretrigger samples—the samples acquired before the Reference Trigger is received to be acquired per record.

OUTPUT PARAMETERS

- `AnalysisHandleOut` – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.15 SetResetPERMeasurement

NAME SetResetPERMeasurement

DESCRIPTION Configures the Reset PER Measurement property in the Wi-SUN MR OFDM Signal Analysis handle. If this property is set to True the toolkit internal resets the Number of Packets Received and Number of Packet Errors to 0. To measure PER measurement continuously set this property to True only in the first iteration. The default value is True.

FUNCTION PROTOTYPE

```
public static void SetResetPERMeasurement
```

```
(
LVBaseRefnum AnalysisHandleIn,
ResetPERMeasurement ResetPERMeasurement,
out LVBaseRefnum AnalysisHandleOut
)
```

INPUT PARAMETERS

- AnalysisHandleIn – Handles the Wi-SUN Signal Analysis Session.
- `ResetPERMeasurement` – If this property is set to True the toolkit internal resets the Number of Packets Received and Number of Packet Errors to 0. To measure PER measurement continuously set this property to True only in the first iteration.

OUTPUT PARAMETERS

- AnalysisHandleOut – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.16 SetSEMFrequencyOffsets

NAME SetSEMFrequencyOffsets

DESCRIPTION This function saves the SEM Frequency Offsets in the global cluster.

FUNCTION PROTOTYPE

```
public static void SetSEMFrequencyOffsets
(
LVBaseRefnum wiSUN_AnalysisHandle,
double[] sEMFrequencyOffsets,
out LVBaseRefnum wiSUN_AnalysisHandleOut)
```

INPUT PARAMETERS

- wiSUN_AnalysisHandle – Handles the Wi-SUN Signal Analysis Session
- sEMFrequencyOffsets – Configure the SEM frequency offset segments value.

OUTPUT PARAMETERS

- wiSUN_AnalysisHandleOut – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.17 SetSEMPowerOffsets

NAME `SetSEMPowerOffsets`

DESCRIPTION This function saves the SEM Power Offsets in the global cluster.

FUNCTION PROTOTYPE

```
public static void SetSEMPowerOffsets
(
```

```
LVBaseRefnum wiSUN_AnalysisHandle,
double[] sEMPowerOffsetsdB,
out LVBaseRefnum wiSUN_AnalysisHandleOut
)
```

INPUT PARAMETERS

- wiSUN_AnalysisHandle – Handles the Wi-SUN Signal Analysis Session
- sEMPowerOffsetsdB – Configure the SEM Power Offsets segments value in dB.

OUTPUT PARAMETERS

- wiSUN_AnalysisHandleOut – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.18 SetSEMReferenceLevelType

NAME SetSEMReferenceLevelType

DESCRIPTION This function saves the SEM Frequency Reference Level Type in the global cluster.

FUNCTION PROTOTYPE

```
public static void SetSEMReferenceLevelType
(
LVBaseRefnum wiSUN_AnalysisHandle,
ushort sEMReferenceLevelType,
out LVBaseRefnum wiSUN_AnalysisHandleOut
)
```

INPUT PARAMETERS

- wiSUN_AnalysisHandle – Handles the Wi-SUN Signal Analysis Session
- sEMReferenceLevelType – Configure the SEM Reference Level Type.The Default Value is 1.Given below the Possible Values are
  - 0-Peak Power,
  - 1-Total Channel Power,
  - 2-User Defined Power Level

OUTPUT PARAMETERS

- wiSUN_AnalysisHandleOut – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.19 SetSEMReferencePowerLevel

NAME SetSEMReferencePowerLevel

DESCRIPTION This function save the SEM Reference Power Level in the global cluster.

FUNCTION PROTOTYPE

```
public static void SetSEMReferencePowerLevel
(
LVBaseRefnum wiSUN_AnalysisHandle,
double sEMReferencePowerLevel,
out LVBaseRefnum wiSUN_AnalysisHandleOut
)
```

INPUT PARAMETERS

- wiSUN_AnalysisHandle – Handles the Wi-SUN Signal Analysis Session
- sEMReferencePowerLevel – Configure the SEM ReferencePowerLevel.The default value is 0.

OUTPUT PARAMETERS

- wiSUN_AnalysisHandleOut – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA
- DLL – MaxEyeWiSUNAnalysis.dll

3.2.20 SetWeightingMode

NAME SetWeightingMode

DESCRIPTION This function Configure the weighting mode in the Wi-SUN Analysis Handle

FUNCTION PROTOTYPE

```
public static void SetWeightingMode
(
LVBaseRefnum wiSUN_AnalysisHandle,
ushort weightingMode,
out LVBaseRefnum wiSUN_AnalysisHandleOut
)
```

INPUT PARAMETERS

- wiSUN_AnalysisHandle – Handles the Wi-SUN Signal Analysis Session
- `weightingMode` – Selects the Weighting mode.The default value is 0.Given below the possible values are
  - 0 – Linear,
  - 1 – Exponential.

OUTPUT PARAMETERS

- wiSUN_AnalysisHandleOut – Returns the Wi-SUN Signal Analysis Session Handle.

DEPENDENCIES

- Namespace – MaxEyeWiSUN_SA

- DLL – MaxEyeWiSUNAnalysis.dll