RTX2018

User Manual

Version 1.0

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The purpose of this document is to provide guidance to users of the RTX2018 Multi-Level Modulation DECT RF Test Platform. The User Manual describes general functions of the system, use of the Windows-based Graphical User Interface, as well as interfacing with a test application program.

For further information about programming of the RTX2018, please refer to the “RTX2018 Interface Specification”.

Documentation Information

This User Manual contains essential items of information needed for general-purpose use of the RTX2018 along with a detailed description for high-throughput production purposes.

In this document you will find valuable information on how to install and operate your RTX2018 using the supplied PC application or a test program using the remote command set.

The separate RTX2018 Interface Specification provides programming guidance for users of the RTX2018 who would like to develop a test application software. The document includes a programming reference along with a detailed description of the SCPI commands supported by the tester. Furthermore, you also find information on how to use the provided RTX2018 DLL files and a few examples on how to use the DLL function calls in your source code are outlined. However, please note that the examples and code fragments are included for informational purposes only and should only be used as a guidance to aid test program development.

It is therefore strongly emphasized here that RTX takes no responsibility for debugging and verification of the actual test application developed by the customer.

Conventions Used in this Manual

The following text conventions are used in this manual:

Parameter	used to represent a parameter, value or data in an entry field
RUN	used to represent the text in the Windows-based graphical user interface

Abbreviations Used in this Manual

The following abbreviations are used in this manual:

ADC	**Analog to Digital Converter**
API	**Application Programming Interface**
ARB	**Arbitrary**
ATE	**Automatic Test Equipment**
BER	**Bit Error Rate**
COM	**Communication**
DECT	**Digitally Enhanced Cordless Telecommunications**
DLL	**Dynamic Link Library**
DNS	**Domain Name Server**
DUT	**Device Under Test**
ETSI	**European Telecommunications Standards Institute**
EVM	**Error Vector Magnitude**
FER	**Frame Error Rate**
FP	**Fixed Part**
GFSK	**Gaussian Frequency Shift Keying**
GUI	**Graphical User interface**
HW	**Hardware**
IP	**Internet Protocol**
IQ	**In phase/Quadrature phase signals**
NTP	**Normally Transmitted Power or Average Burst Power**
PP	**Portable Part**
PSK	**Phase-Shift Keying**
RF	**Radio Frequency**
RMS	**Root Mean Square**
RSSI	**Received Signal Strength Indicator**
RX	**Receive**
SPSRBS	**Static Pseudo Random Bit Sequence**
SW	**Software**
TX	**Transmit**

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1 Introduction

This document describes the installation, setup and use of the RTX2018 test platform consisting of a Rohde & Schwarz CMW100 Communications Manufacturing Test Set and an RTX DECT RF analysis software application.

1.1 Document History

Ver.	Description	Resp.	Date
0.1	First version	FA	20-Mar-2019
1.0	Official release	PNI	09-May-2019

1.2 References

Number	Document
[1]	Interface Specification
[2]	R&S ® CMW100 Communications Manufacturing Test Set Getting Started

2 RTX2018 Installation Requirements

2.1 RTX2018

To ensure that the user has the latest software and documentation for the RTX2018 prior to installation, it is recommended to visit the RTX Download Center.

https://www.rtx.dk/en/design-services/download-center/

2.2 R&S CMW100

RTX recommends the user to register the included R&S CMW100 in the RTX2018 in the Rohde & Schwartz Gloris system to get access to latest manuals for the CMW100.

https://gloris.rohde-schwarz.com/anonymous/en/pages/toplevel/home.html

2.3 Computer Requirements

The computer to be connected to the RTX2018/CMW100 must fulfil the minimum requirements stated in the following table:

	Minimum requirements	Recommended
Processor (CPU)	Intel Core i3, third generation	Intel Core i7, quad-core, fourth generation
Memory (RAM)	8 Gbyte	16 Gbyte
Storage medium [54]	64 Gbyte free space, HDD or SSD	128 Gbyte free space, SSD
Graphics	minimum resolution 1024 × 768 pixel	
Operating system	Windows 7 Professional, 64 bit or higher Windows versions, 64 bit, supporting English language; The compatibility of other Windows versions cannot be guaranteed.	
USB socket for connecting the radio test head	1 × USB 3.0; Use a socket mounted to the motherboard, not a socket connected to the motherboard via a cable. Typically, sockets on the front of the PC are not suitable.	

3 RTX2018 Pre-installation

3.1 System Overview

The RTX2018 tester can be installed in two ways:

- On a single PC, where both the CMW100 driver and RTX2018 DLL/GUI are installed
- On two PCs, where the CMW100 driver is installed on the PC connected to the CMW100 hardware (sometimes referred as the "server") and the RTX2018 DLL/GUI on another PC

The two above options exist as the connection between the CMW100 driver and the RTX2018 DLL and is an IP connection (on port 5025). In the first case, the connection is the "Localhost" or IP address 127.0.0.1

3.2 Driver Installation

The CMW100 driver needs to be installed on the server PC to which the CMW100 is connected via USB. Please refer to [2] for a detailed description of the installation.

Please note that the RTX2018 requires installation of the following two Rohde & Schwarz packages:

CMW_BASE (File name Setup_CMW1xx_BASE(RELEASE)_x.x.xx_64Bit.exe)
CMW_GPRF (File name: Setup_CMW1xx_GPRF(RELEASE)_x.x.xx_64Bit.exe)

This version of the RTX2018 has been tested with:

CMW BASE version 3.7.60
CMW GPRF version 3.7.30

3.3 Waveform Installation

For the BER measurements, it is necessary to install the included waveform files on the PC connected with the CMW100 hardware.

The default location for these waveform files is: C:\RTX2018

When using the RTX Dialog DA14495 firmware ***(Note 1)*** in the DUT, the following files are required to allow testing of the four modulation formats:

- gfsk.wv (for GFSK)
- pi2.wv (for PI/2-DBPSK)
- pi4.wv (for PI/4-DQPSK)
- pi8.wv (for PI/8-D8PSK)

Note 1: *RTX firmware including BER/FER test capability and Prod Test Interface for remote control*

4 RTX2018 Installation

The RTX2018 firmware and DLL is installed with the file:

RTX2018Setup.exe

When this program is launched, the first dialog box shows a selection option for the installation folder for the RTX2018 (see Figure 1 below).

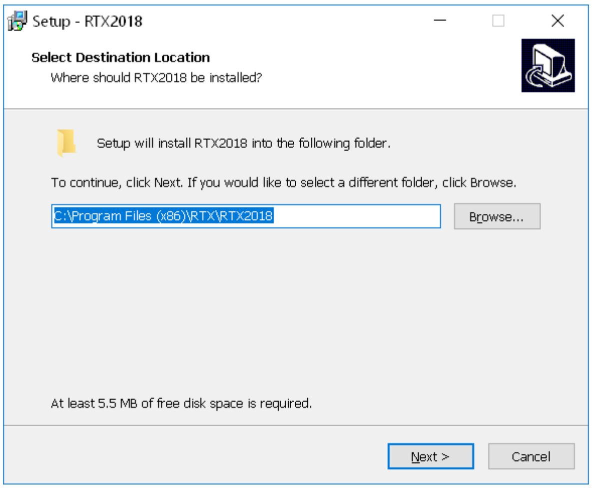


Figure 1. Installation screen shot of program folder selection.

The default folder is:

c:\Program Files (x86)\RTX\RTX2018\

This folder will contain the RTX2018 GUI files as well as the RTX2018 DLL (CMWIntf.dll).
The second dialog box (see Figure 2 below) is the installation of the license file. The license file (“License.json”) is provided by RTX and is included in the RTX 2018 package.

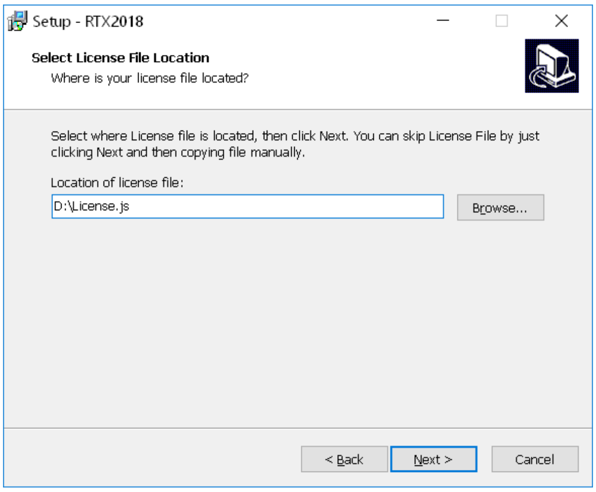


Figure 2. Installation screen shot for license file selection.

The license file will be copied to the RTX2018 program folder. For DLL operation, it is necessary that a valid license file is present in the same folder as the DLL.

The license file should look something like this:

```
{
"SerialNumber": "1201.0002k03/106863", "LicenseCode":
"0563467856cd1b4306ffa5ad8ee2b938", "ExpireDate": "31-03-2019"
}c
```

This license file allows the DLL to operate with the specific CMW100 HW and related serial number(s) as shown in the license file.

In case of multiple RTX 2018, the user can have up to 10 to serial numbers in a single license file to enhance the flexibility for the user:

```
{
"SerialNumber": "1201.0002k03/107463", "LicenseCode":
"0563467856cd1b4306ffa5ad8ee2b938", "ExpireDate": "31-03-2019"
"SerialNumber": "1201.0002k03/106573", "LicenseCode":
"1b4306ffa5ad8ee2b9380563467856cd", "ExpireDate": "31-06-2019"
}
```

The third dialog box (see Figure 3 below) describes how to install the waveform files.

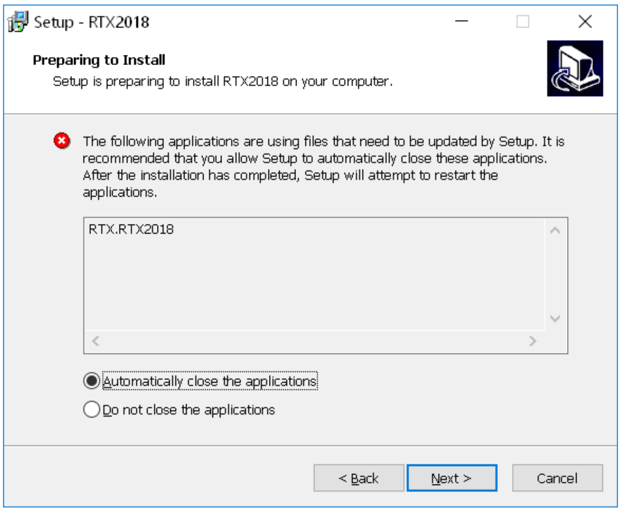


Figure 3. Installation screen shot for waveform installation instructions.

4.1 RTX2018 DLL

The RTX2018 DLL is installed into the RTX2018 program folder during installation.
The filename is:

CmwIntf.dll

This is the DLL that interacts with the CMW100 driver and performs the measurement calculations. Please refer to [1] for the DLL API.

This DLL can be used in ATE solutions or other applications where the user wants to integrate and automate the RTX2018.

4.2 Documentation

The documentation for the RTX2018 will during installation be copied to the "../RTX2018/docu" folder. This includes:

This document i.e. the RTX2018 User Manual
The DLL Interface description [1]

5 RTX2018 User Manual

The GUI (Graphical User Interface) is an application on top of the RTX2018 DLL. The GUI can be used for manual testing of DECT-based devices.

5.1 General GUI Description

Figure 4 below shows the start-up screen of the RTX2018 GUI application. The functionality is placed on 3 tabs (“RX”, “TX GFSK” and “TX PSK”) which can be selected by clicking on the tabs.

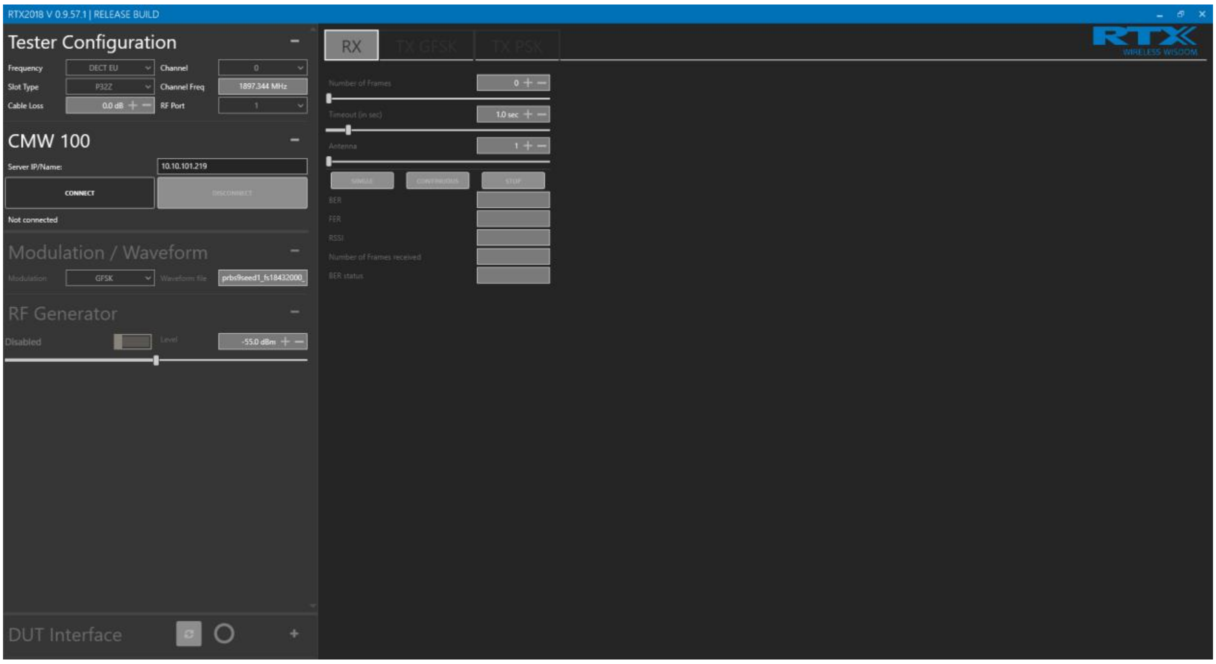


Figure 4. GUI start-up screen

Figure 5. below shows the "Tester Configuration" in detail. This part is always present in all tabs.

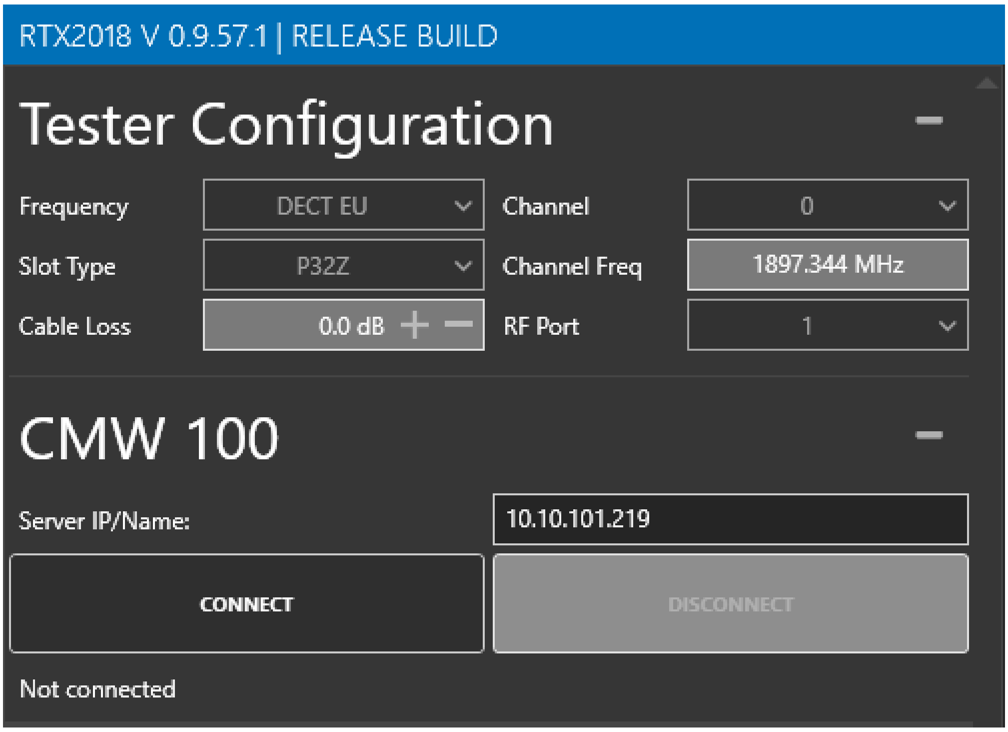


Figure 5. Tester configuration

5.1.1 Connect

In the case of a setup with two PC (as described in section 3.1), it is necessary to establish the connection between the PC running the RTX2018 GUI/DLL and the PC that has the USB connection to the CMW100 HW.

The address of the CMW100 PC can be entered in the "Server IP/Name" field as either an IPV4 address (e.g. 10.10.101.219) or by a DNS name (e.g. "IT-02965").

It will often be "Localhost" / "127.0.0.1" that will be used if the GUI is run on the same PC that has the USB connection to the CMW100. (Please note that "Localhost" should be with capital letter 'L')

When the "Connect" button is pressed, an instance of the DLL is established for doing setup and measurement on the CMW100 HW.

To confirm the connection to the CMW100, the "*IDN" string ("Identification string") for the CMW100 HW will be shown below the "Connect" button.

The string includes the Rohde & Schwarz part number, serial number and CMW100 SW version.

An error message will appear if the server cannot be found.

5.1.2 Frequency/Channel/Channel Frequency

The "Frequency" field is a drop-down menu that allows the user to select various DECT bands:

- DECT EU
- DECT US
- DECT Japan
- DECT Korea
- Manual

A set of channels can be selected for each band. The corresponding channel frequency is shown in the "Channel Freq" box.

The channel frequency is selected simultaneously for both RX and TX.

5.1.3 Slot Types

The "Slot Type" field drop-down menu is used to select between predefined slot types.

The slot types are used to configure the TX measurements with respect to capture time and evaluation window. The TX power ramp definition does also depend on this selection.

The following slots are available:

- P32Z
- PP32Z
- P64Z
- PP64Z

P32Z and PP32Z are standard DECT full slots with Z-field. PP32Z/PP654Z has a prolonged preamble (a 16-bit extension of the preamble in the beginning).

If the user adjusts either the "Capture Timing" or the "Evaluation Window" setting, the slot type will change to "User Defined".

5.1.4 Cable Loss

The "Cable Loss" field is used to adjust the results within the GUI for cable loss (or transmission loss). This value is used for both RX and TX. The range for the cable loss is -10 to +30 dB.

The cable loss correction is done within the GUI. The DLL does **NOT** contain a cable loss feature.

5.1.5 RF Ports

The CMW100 has 8 RF ports that can be used for both RX and TX measurements. The field is used to select which RF port (connector) is used. The GUI has one common selection for the RF port which is valid for both RX and TX.

5.2 RX Measurements

5.2.1 Theory of RX (BER) Measurements

The RTX2018 (CMW100) RF tester does not test the RX performance utilizing the ETSI specified “RF loopback connection” as is the case for e.g. the RTX2012 DECT RF tester.

The RTX2018 uses the “Non-signalling mode” which means that there is no RF connection established between the tester and the DUT for control and RX measurements. The DUT will therefore need to calculate the BER/FER internally as there is no return path from the DUT to the tester - unless the DUT is a Dialog DA14495 with RTX firmware (*Note 1*).

The RTX2018 allows the user to download a predefined packet into the ARB (Arbitrary waveform) generator. The generator will then replay this waveform continuously. The power level of the signal generator can be changed. The DUT will then try to receive the transmitted signal. As the DUT already knows what the waveform looks like, it can calculate the BER/FER.

The RTX2018 GUI application integrates the RTX-firmware-specific control interfaces allowing the RTX2018 GUI to display BER and FER results (see Figure 6 below).

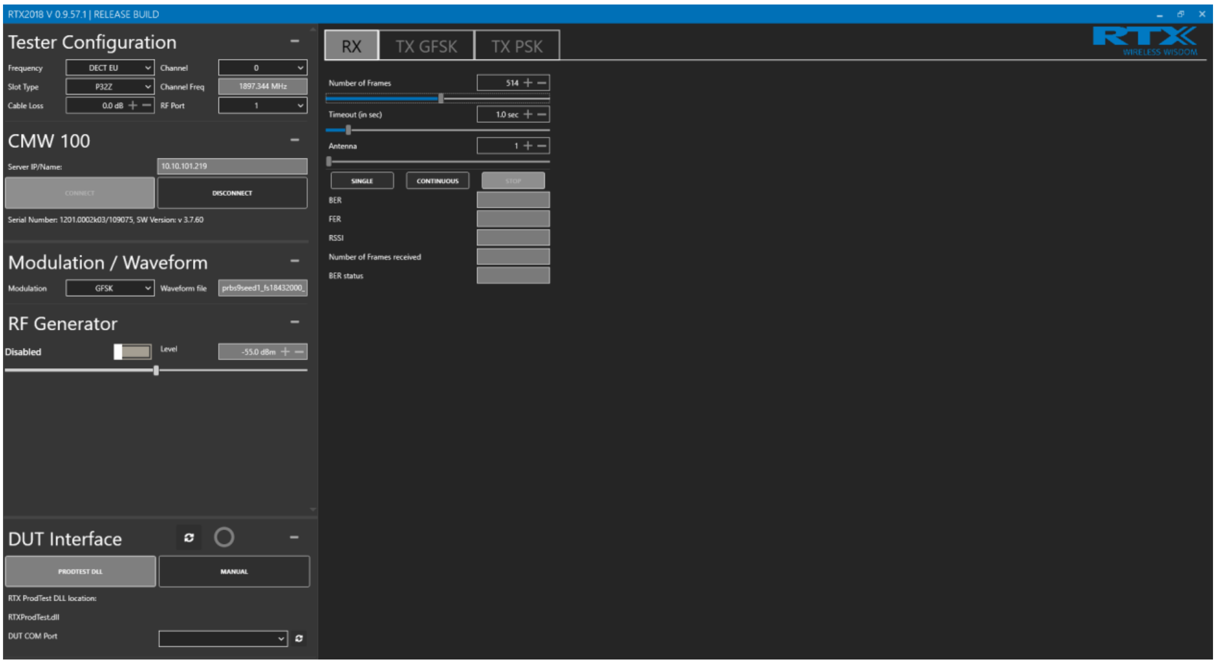


Figure 6. RX measurement tab

5.2.2 Manual DUT Control

If the “Manual” button is pressed (see Figure 77 below) in the “DUT Interface” area, the DUT control functionality is disabled.

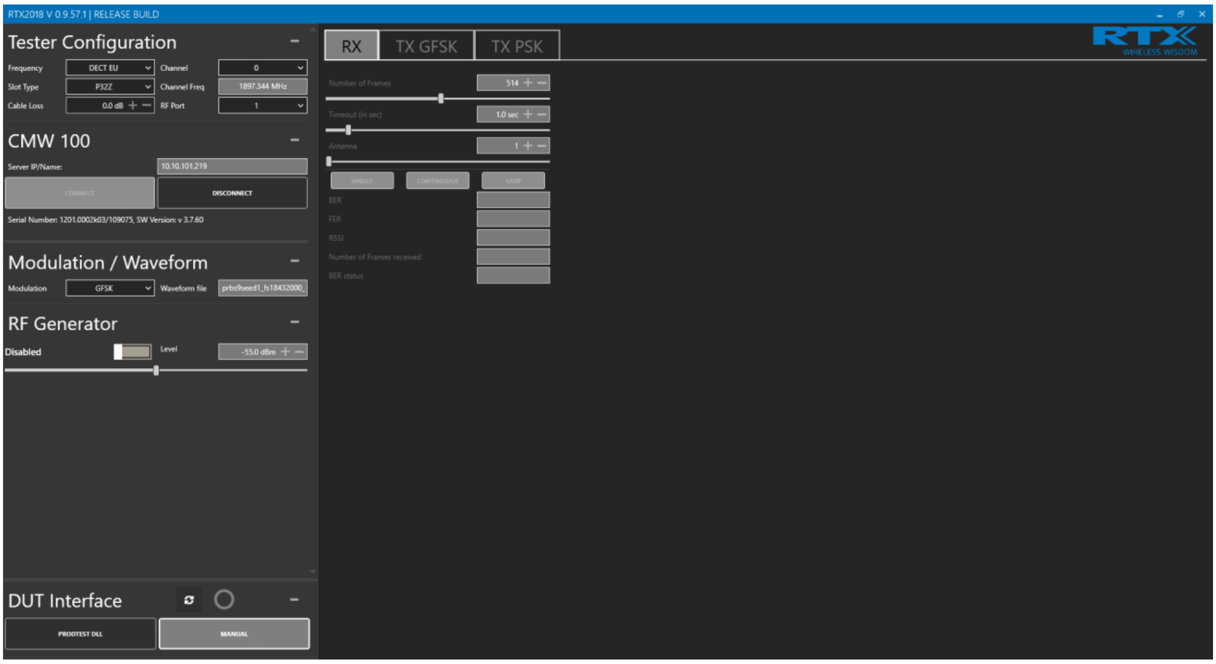


Figure 7. RX tab in manual DUT mode

This means that the only operation possible in the RX mode is control of the signal that is transmitted by the CMW100 RF generator. The DUT control area and the “Measurement area” will be disabled.

The BER/FER in this case will need to be read out from the DUT by other means (and outside the RTX2018 application).

5.2.3 RF Generator Setup

The RF generator setup details are shown in Figure 8 below.

The “Modulation/Waveform” field is a drop-down menu used to select which modulation format (and hence waveform file) for the ARB generator.

If the DUT uses the RTX DA14495 stack, there is a specific waveform file for each modulation type. This selection is done automatically.

If “Manual” is chosen as modulation, the user can manually type in the file name to be used.

Please note that the waveform files need to be stored on the PC that is physically connected to the CMW100 via USB.

The default path to waveform files is:

“c:\RTX2018\”

The slider is used to “Enable” or “Disable” the RF generator.

The RF output level controlled either by entering a numeric value in the “Level” box or by the by slider below.

The range is from -100 to -10 dBm. The “Cable Loss” is considered before the value is transmitted to the CMW100.

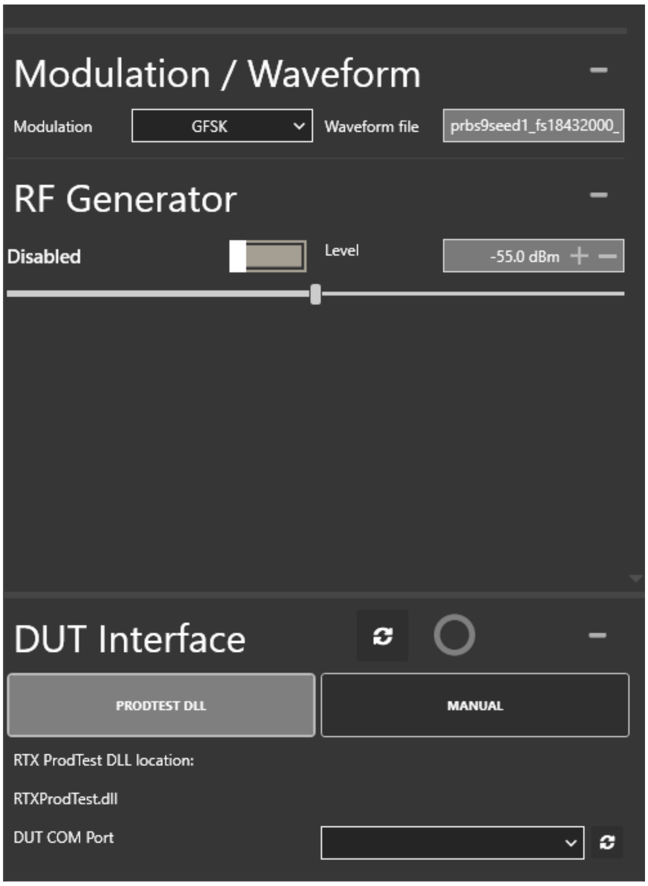


Figure 8. RX setup details

5.2.4 DUT Interface

The DUT interface is used to configure and control the DUT. If the “RtxProdtest DLL” button is pressed, a file dialog box is opened to allow the user to select another RTXProdTest.DLL” file.

The DUT interface can only work if the DUT is utilizing an RTX-supplied firmware (*Note 1*).

The default “RTXProdtest.dll” will work for most products. It is located in the RTX2018 folder.

5.2.5 DUT Control

The "DUT COM Port" field is a drop-down menu to select the COM port number used for the DUT communication. The drop-down menu will be populated with the existing COM ports during program launch, or by pressing the "Refresh" button next to the drop-down menu. The (Refresh) button next to the "DUT Interface" text will verify the communication link with the DUT. This is done by sending a "IsTargetConnected()" call to the DUT. If this is successful, a green connected icon appears; if not a red icon appears.

5.2.6 BER/FER Measurements

The idea behind the BER/FER measurement is that the RF generator transmits a known, fixed packet. The firmware in the DUT should recognize this packet. So, when the DUT receives a packet it can compare the received packet with the expected pattern and calculate the received BER.

If the DUT is using an RTX firmware (*Note 1*) , the RTX2018 GUI can control the BER/FER measurement using the controls shown in Figure 99 below.

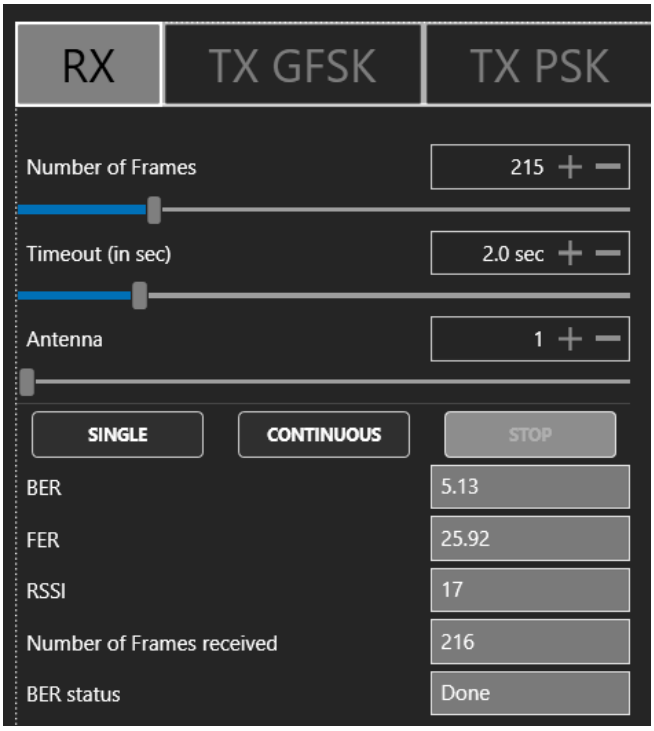


Figure 9. RX measurement detail

When the BER/FER measurement function in the RTX firmware is called, it will try to receive a number of frames. This number of frames is controlled via the "Number of Frames" slider; alternatively, by entering the number in the box to the right. It is also possible to increment or decrement the number using the "+" or "-" button.

The BER measurement functionality in the firmware has an antenna selection function "Antenna" for control of the antenna selection of the DUT for the BER measurement.

The BER/FER measurement is initiated using the “Single” or “Continuous” button. “Single” will initiate a single measurement of BER up to the “Number of Frames”.

“Continuous” will initiate a continuous measurement of BER and will report for every “Number of Frames” chosen.

The BER/FER results are written in the boxes below:

- BER is the Bit Error Rate measured in percent
- FER is the Frame Error Rate. (Frame Error is defined as reception of a packet with Sync Error and/or more than 25% BER in a single packet)
- RSSI is the reported RSSI value from the DUT.
- “Number of Frames” is the number of frames that the DUT has tried to receive.
- “BER State” shows the current state of the DUT which can be:
    - “Idle” - no measurement has been initiated
    - “Searching” - the DUT is searching to obtain time synchronization
    - “Adjusting Frequency” - the DUT is adjusting crystal frequency to be fully synchronized
    - “Measuring” - the DUT is receiving and calculating BER/FER
    - “Done” - measurements are complete and the DUT is now idle

5.3 TX Measurements

The idea behind the TX measurements is to have the DUT transmit a number of TX packets (or bursts). These TX packets from the DUT are then captured by the CMW100 measurement HW and analyzed in the RTX2018 DLL.

The concept of TX measurements is that the CMW100 will capture a number of samples from a trigger event. The trigger event is the rising edge of the power envelope of the measured signal.

These samples are then transferred from the CMW100 into the analysis DLL for processing. The TX parameters are then calculated and shown (see Figure 10 below).

The TX measurement are divided into two tabs, the “TX GFSK” and “TX PSK”. The “TX GFSK” is used to analyze signals with GFSK modulation which is the legacy DECT modulation scheme.

The “TX PSK” tab (see Figure 10 below) is used to analyze the PI/2-BPSK, PI/4-QPSK and PI/8-8PSK modulation schemes. These are the new modulation schemes supported by Dialog Semiconductor’s DA14495 DECT chip.

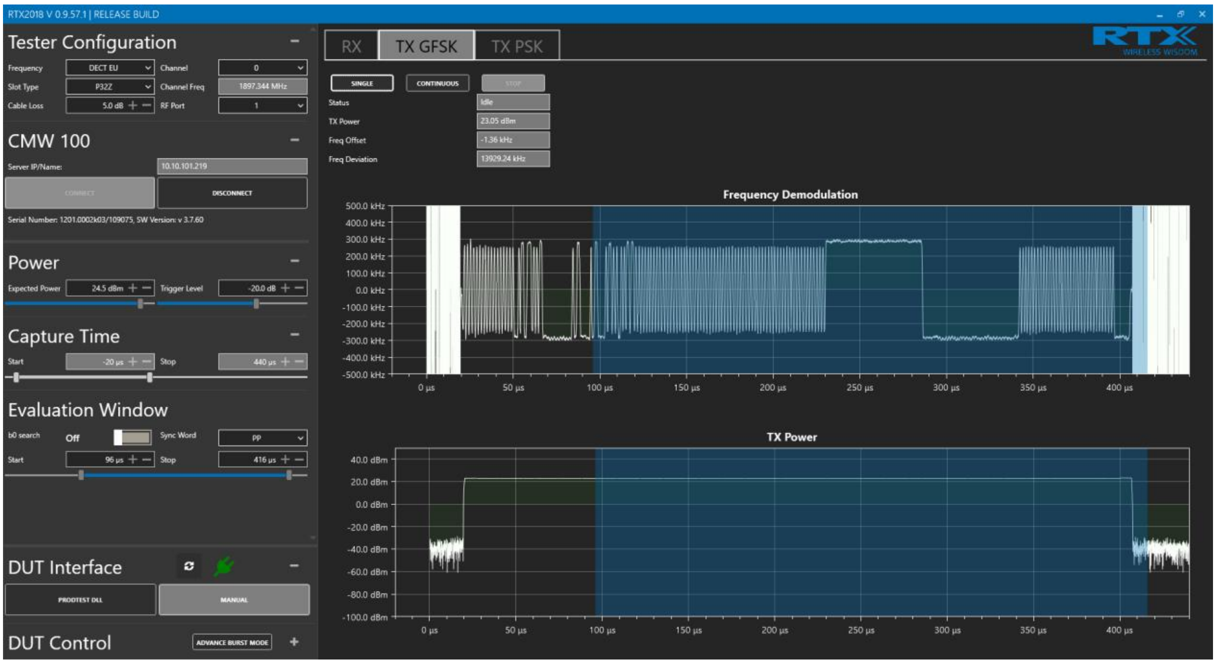


Figure 10. TX GFSK measurement tab

The setup interface is quite similar for both tabs and therefore, a common description is given in the next section.

5.3.1 TX Measurement Setup

The "Expected Power" is a configuration value for the CMW100. The "Expected Power" should be set close to the measured TX power. The dynamic range of the CMW100 ADC (Analog to Digital Converter) is adjusted based on the expected power value.

If the "Expected Power" is too low, the ADC will go into saturation and a "Signal Overload" will occur.

All captures of measurement signals are triggered on the positive power flank as seen in Figure 11 below.

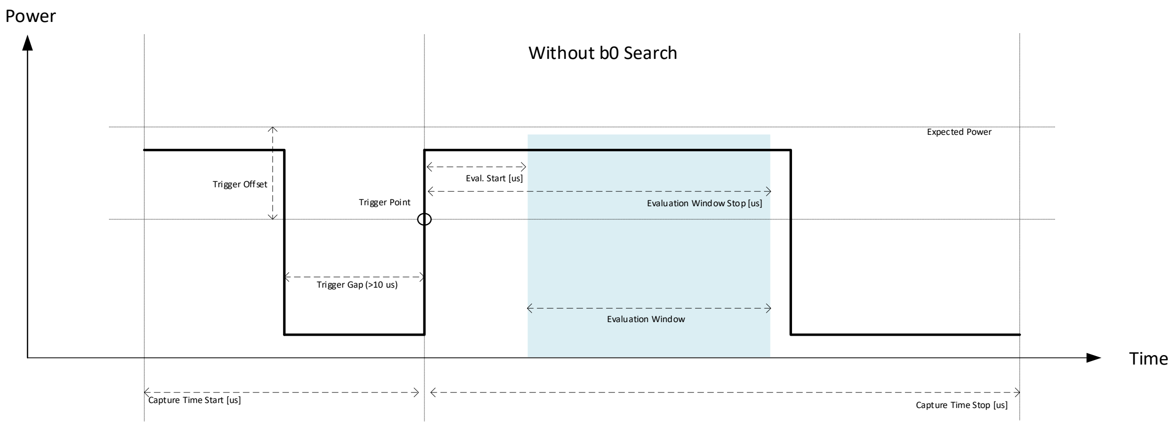


Figure 11. Capture and evaluation timing in the RTX2018 without b0 search.

The “Trigger Offset” is the offset from the “Expected Power” to the trigger level. A good value would be approx. -30 to -20 dB relative to the “Expected Power”.

Please note that if the “Expected Power” is much higher than the real TX power level and the Trigger Offset value is low e.g. -6 dB, there will be no trigger event as the instantaneous TX power level will never be above the trigger level.

The RTX2018 requires that there is a “Trigger Gap” before the trigger event of minimum 10 us. The power in the “Trigger Gap” should be below the trigger level. To work as intended, it is necessary that the preamble is captured to enable the demodulation.

TX GFSK and TX PSK tester setup details are shown in Figures 12 and 13 below.

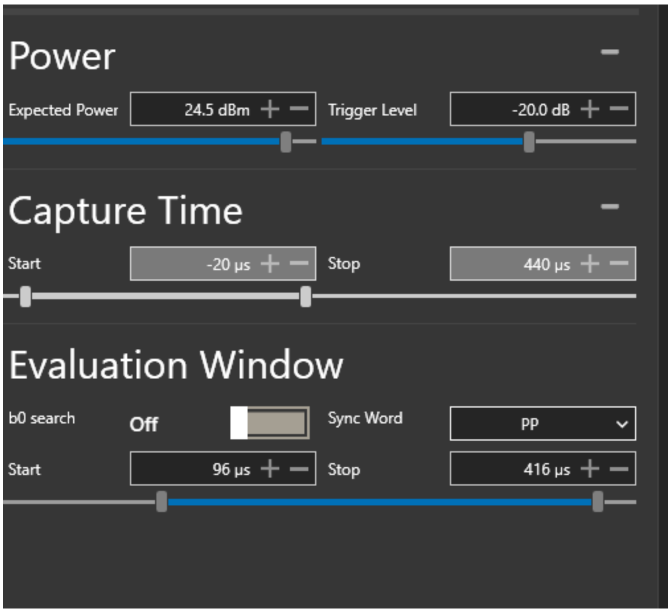


Figure 12. TX GFSK tester setup details

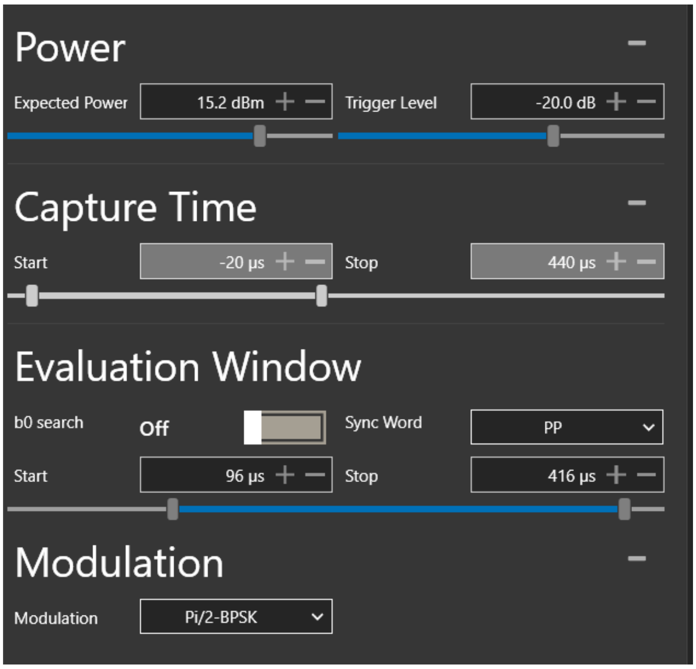


Figure 13. TX PSK tester setup detail

5.3.2 Capture Time

The “Capture Time” filed shows the time period where the analysis DLL will get samples from the CMW100. The “Start” and “Stop” time is adjusted by entered values in the box or by using the slider. The “Capture Time” can also be fine-tuned using the “+” or “–“ button.

The shorter the capture length, the smaller the amount of data transferred to the DLL (which also will decrease the computation time).

The allowed range for the start of capture time is -50 to -11 us.

The DLL will try to demodulate the capture signal for the part of the signal where the power level is above the trigger level. The DLL analysis engine will do an iterative frequency offset compensation and demodulation to find the best estimate for the frequency offset of the signal.

This also implies that the estimated frequency offset will be independent of the weight of 0’s and 1’s in the signal.

The capture time is shown in µs. The values of the “Capture Time” are adjusted every time a slot type is selected in the “Slot Type” drop-down menu at the top.

5.3.3 Evaluation Window

The “Evaluation Window” file is the window in which the TX parameters are evaluated. This window is shown with a blue shade in the graph.

The evaluation window is adjusted the same way as the capture time. The evaluation window will be also be changed depending of the selected slot type.

The range for the evaluation window is 0 to 1000 us.

5.3.4 B0 Search

The time reference for the evaluation has two options:

- Trigger Event (same as for the Capture Time)
- b0 Search

The “b0 Search” field can be enabled with the small slider . In this case the analysis program will search for a sync word within the capture signal.

The sync word is selected from a dropdown menu. Two sync words are available - either a PP (Portable Part) or FP (Fixed Part) sync word.

If the analysis finds this sync word within the received signal, the time reference for the evaluation window will be the first symbol in the sync word (see Figure 14 below).

The time unit for the evaluation window will also change to symbol periods in this case.

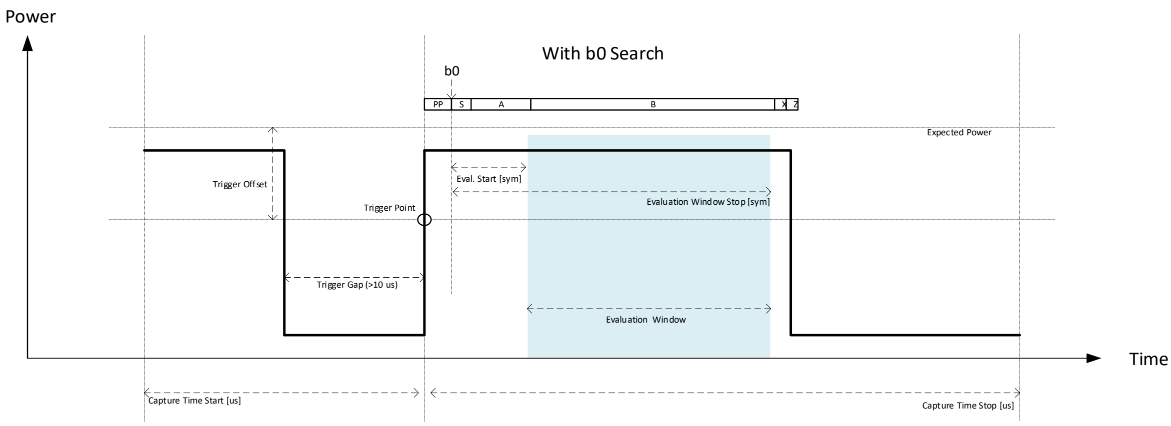


Figure 14. Capture and evaluation timing with b0 search.

5.4 Modulation

In the “TX PSK” tab there is also a dropdown menu to select which of the 3 different PSK modulation schemes is to be used:

- π/2-DBPSK
- π/4-DQPSK
- π/8-D8PSK

5.4.1 DUT Control for TX Measurements

The “DUT Interface” and “DUT Control” fields (see Figure 15 below) in the lower left-hand corner of the window can be used to control the DUT. This will only work when the DUT is running with an RTX-supplied firmware (*Note 1*).

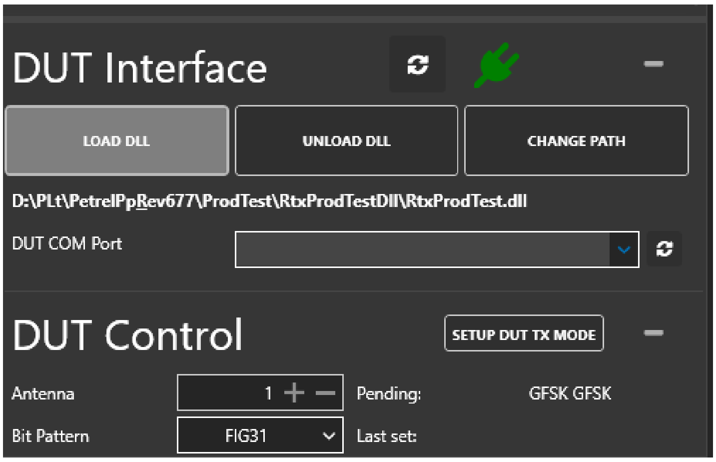


Figure 15. DUT interface TX

Communication with the DUT is done via a product-specific “RtxProdTest.DLL”. To load this DLL, press “Load DLL”. The previously loaded DLL will be loaded. If none has been selected, a ‘Open file menu’ will appear and the desired DLL can be selected.

The “DUT COM Port” field is a drop-down menu for selection of the COM port to be used for communication. The drop-down menu will be populated at program launch and whenever the “Refresh” button is pressed next to it.

A new DLL can be selected and opened at any time using the “Change Path” button.

Pressing the “Unload DLL” will unload the DLL and disallow any DUT communications. This will “gray out” (disable) the DUT control in the TX tabs and the BER measurement buttons in the RX field as these are now longer functional.

There is a refresh button to the right of the “DUT Interface” field that will check the communication with the DUT using the “IsTargetConnected()” call.

If the connection is ok, a green icon appears, if not, an exclamation mark will be shown.

There is a “Setup DUT in Tx Mode” button in the “DUT Control” area. Pressing this button will send a “SetAdvancedBurstMode” test command to the DUT.
As this command holds a large number of parameters, the GUI itself will determine the correct values for the command.

The command will make the DUT send DECT full slot frames with the:

- GFSK (A+B field) in the “TX GFSK” tab
- PI2-DBPSK in the A-field on the “TX PSK” tab
- B-field modulation as selected in the “Modulation” box
- Slot type as specified in the “Slot Type” menu
- Channel is specified in the “Channel” field
- Antenna selection is chosen in the “Antenna” box
- The Bit pattern in B-field (either Fig 31 or Static Pseudo Random Sequence, SPSRB) is as selected in the “Bit Pattern” box

5.5 TX GFSK Measurement Results

The measurement results for the GFSK are shown in
Figure 166 below.

Figure 16. TX GFSK results

After the setup has been completed, the measurement can be initiated by pressing either the “Single” or “Continuous” buttons.

“Single” will capture and analyze a single burst.

“Continuous” will capture and analyse a burst continuously until “Stop” is pressed

The output is:

- “Status” shows the TX measurement status which can be “Idle” or “Running”
- “TX Power” shows the TX power measured in dBm evaluated in the “Evaluation Window”.
- “Freq Offset” shows the frequency offset measured in kHz of the signal evaluated in the “Evaluation Window”. The modulated signal is estimated and subtracted, so that the frequency offset will not be affected by unbalanced numbers of 0 and 1 in the signal.
- “Freq Deviation” shows the peak frequency deviation measured in kHz of the signal within the “Evaluation Window”. Please note that in cases of a very large and

incorrect frequency deviation, the evaluation window can extend outside the transmitted burst.

The RTX2018 will also show the results graphically as shown in **Error! Reference source not found.** and
Figure 18 below.

Error! Reference source not found. below shows the result as it looks without b0 search.

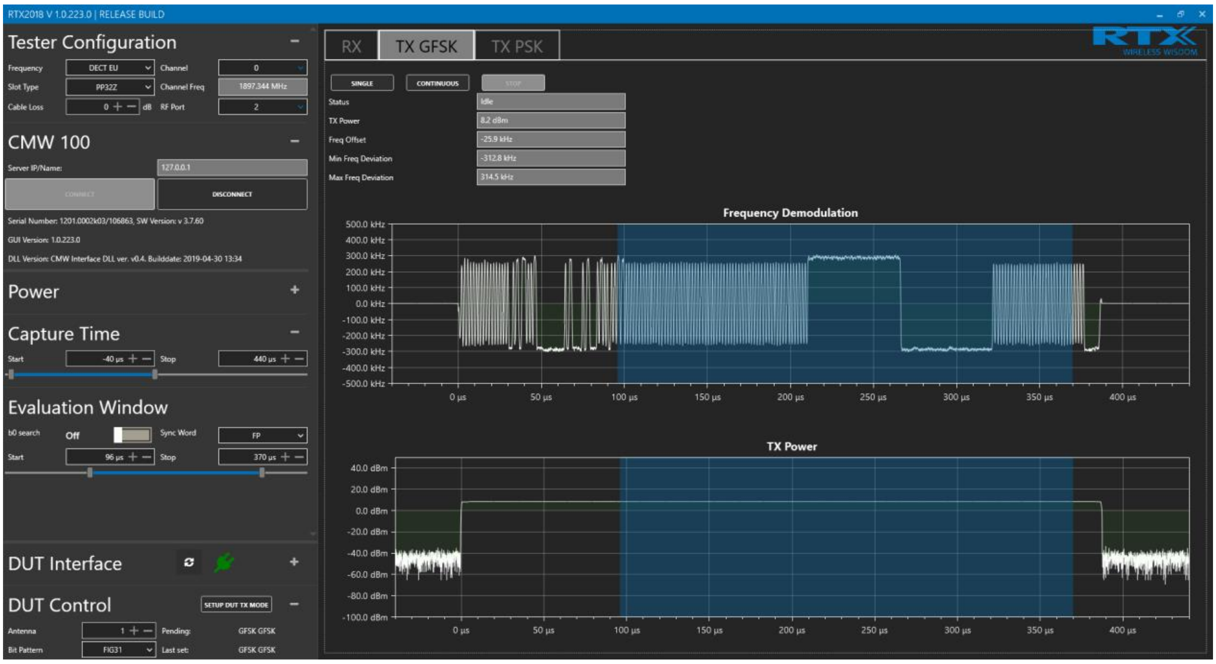


Figure 17. TX GFSK graphical results (no b0 search)

The upper graph “Frequency Demodulation” shows the frequency of the signal vs time.

The lower graph “TX Power” shows the instantaneous power vs time (often referred to as the TX power template).

Figure 18 below shows when b0 search is enabled. With the b0 search enabled, the graph can be shown relative to the ETSI-specified TX power template as the results are synchronized to the nominal DECT burst.

The time axis is also changed to symbols rather that µs.

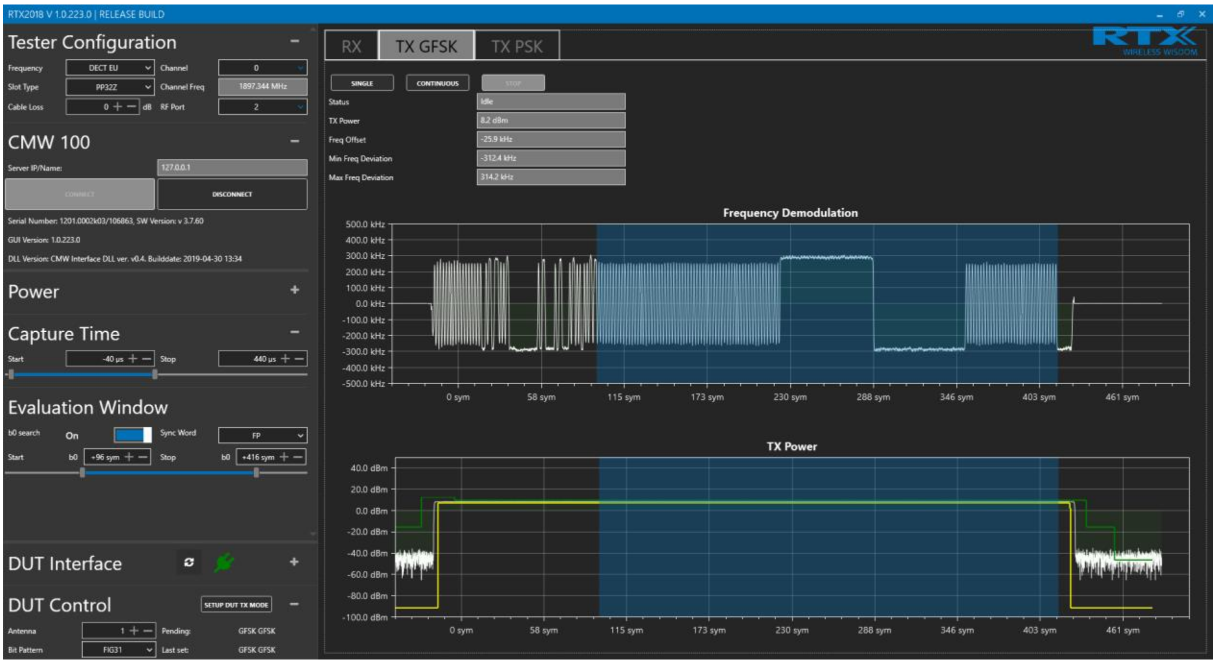


Figure 18. TX GFSK graphical results (b0 search enabled)

5.6 TX PSK Measurement Results

The “TX PSK” tab is used to perform measurements when the DUT is transmitting any of the three possible PSK variants - PI2-DBPSK, PI4-QPSK or PI8-D8PSK.

The numerical results are shown in
Figure 19 below.

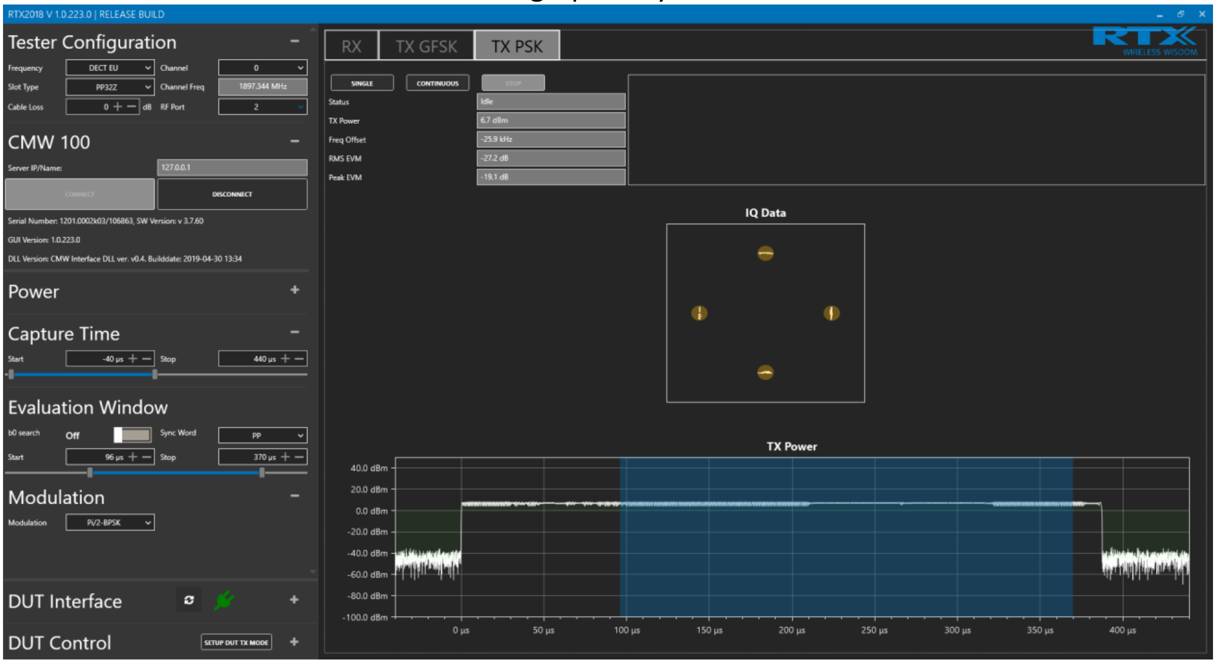
Figure 19. TX PSK numerical results

The numerical results are:

- “Status” which is either “Idle” or “Running”
- “TX Power” shows the TX power measured in dBm of the signal in the evaluation window.

- "Freq Offset" shows the frequency offset measured in kHz of the signal. The offset is estimated on the demodulated signal.
- "RMS EVM" shows the RMS (Root mean square) EVM (Error Vector Magnitude) of the signal within the evaluation window.
- "Peak EVM" shows the Peak EVM (Error Vector Magnitude) of the signal within the evaluation window.

The RTX2018 GUI also shows the results graphically.



below shows the graphs for a PI2-BPSK signal without b0 synchronisation. Thus, there is no power template match again.

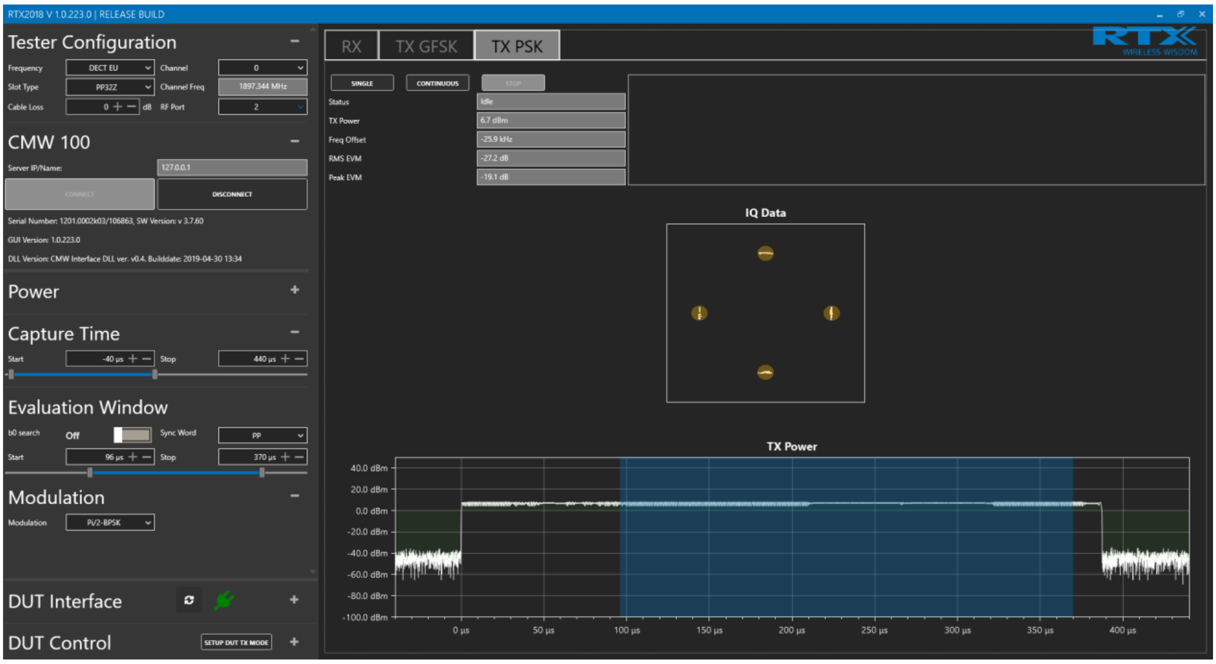


Figure 20. TX graphical PI2-DBPSK results (no b0 search)

The upper window “IQ Data” shows the constellation diagram of the received signal. The brown circles show the locations of reference points for the modulation. The size of the circles corresponds to the limit of RMS value for the selected modulation. This means the RMS mean of the dots should be inside the brown circle.

The lower graph “TX Power” shows the instantaneous power vs time (often referred to as the TX power template).

Error! Reference source not found. below shows the results with b0 synchronization with the power template.

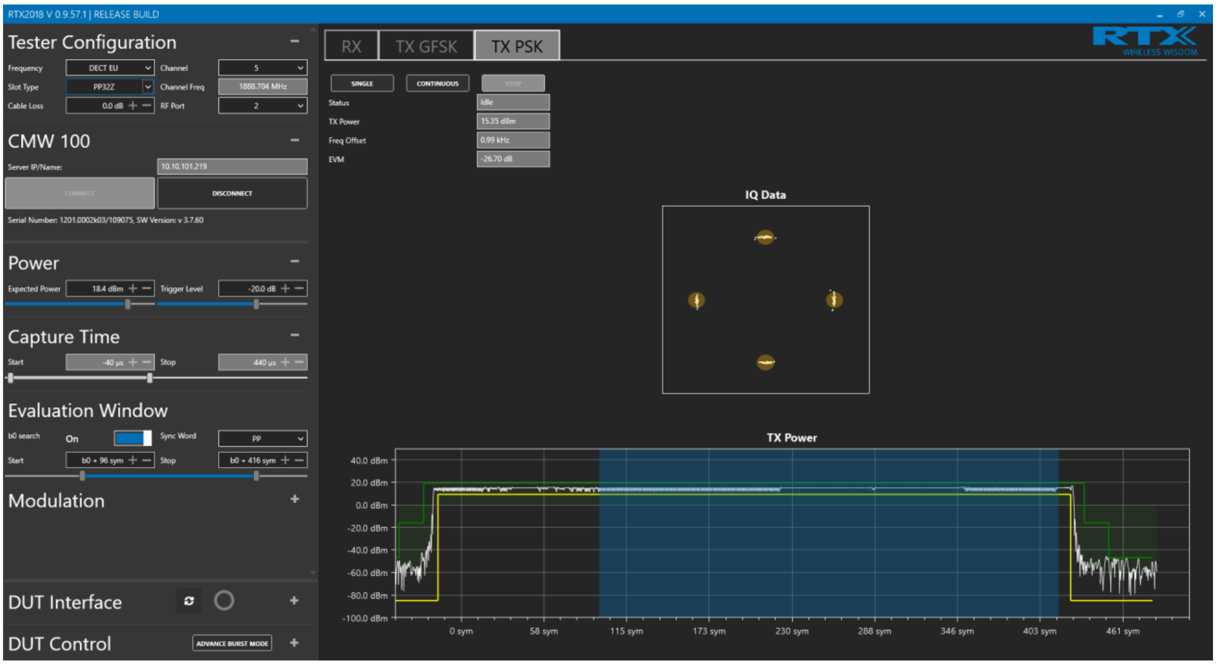
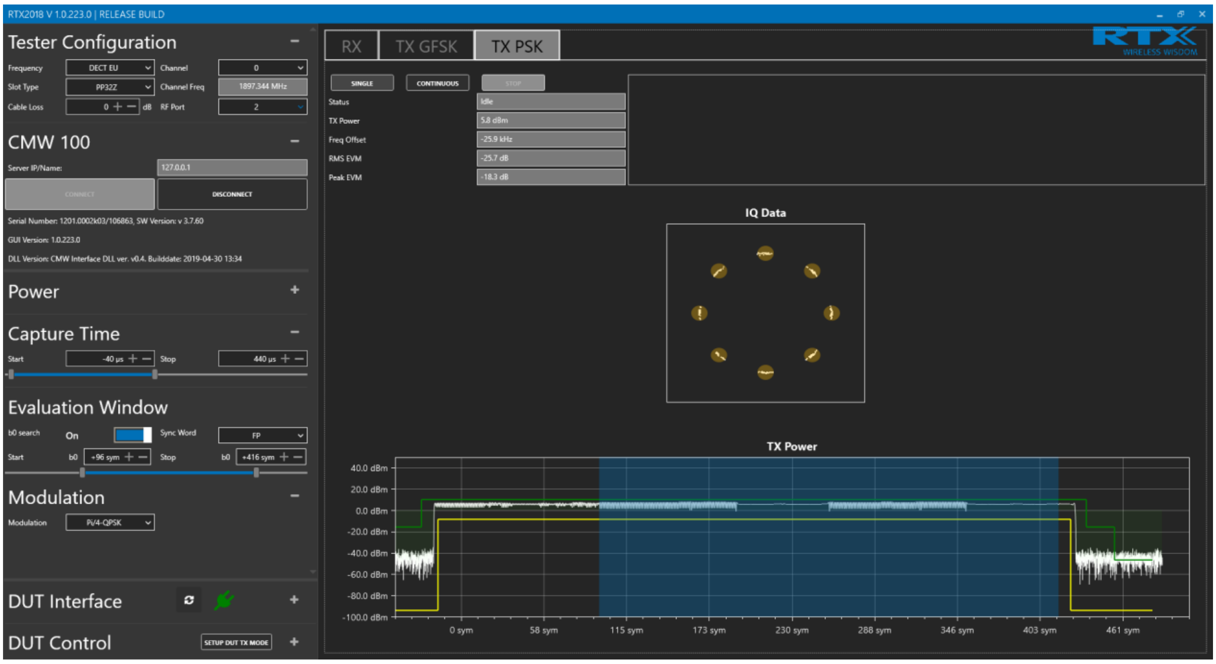


Figure 21. TX graphical PI2-DBPSK results (b0 search enabled)



below shows the results for the PI4-DQPSK modulation scheme.

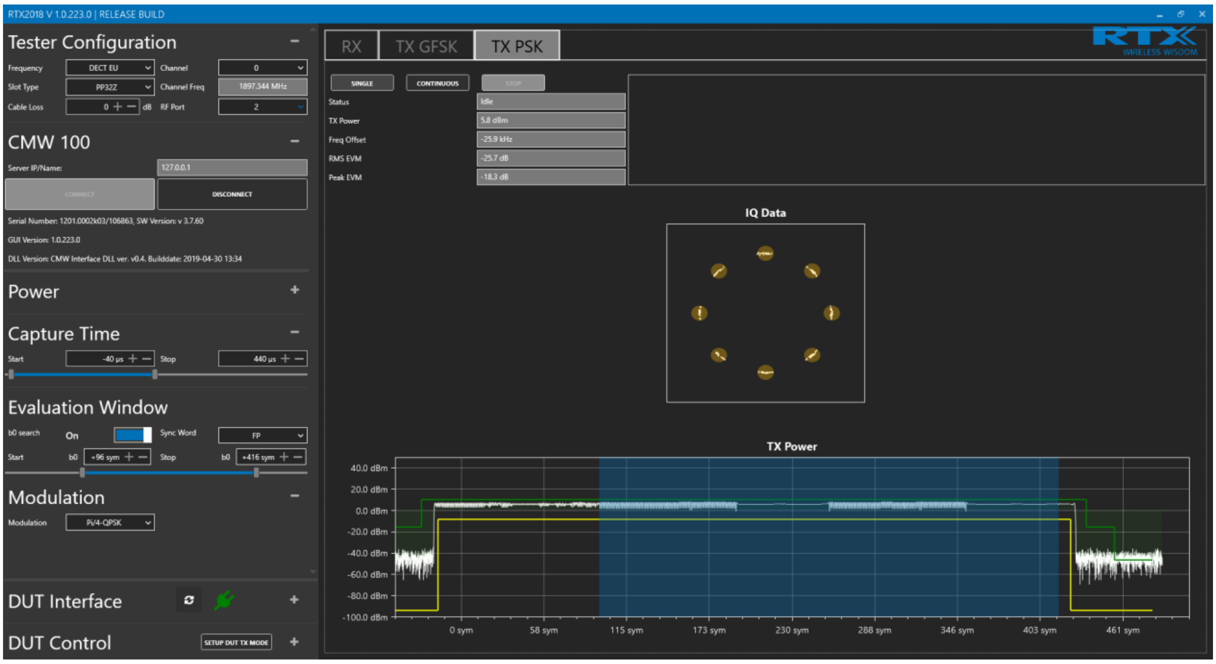
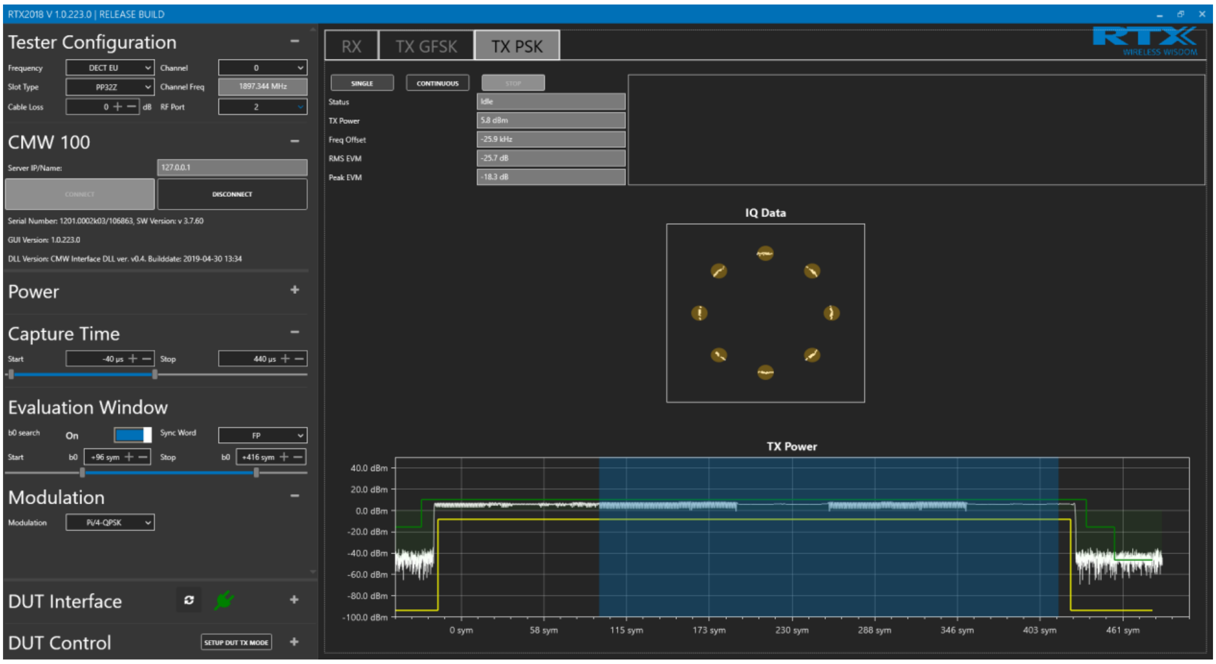


Figure 22.TX graphical PI4-DQPSK results (b0 search enabled)



3 below shows the results for the PI8-D8PSK modulation scheme.

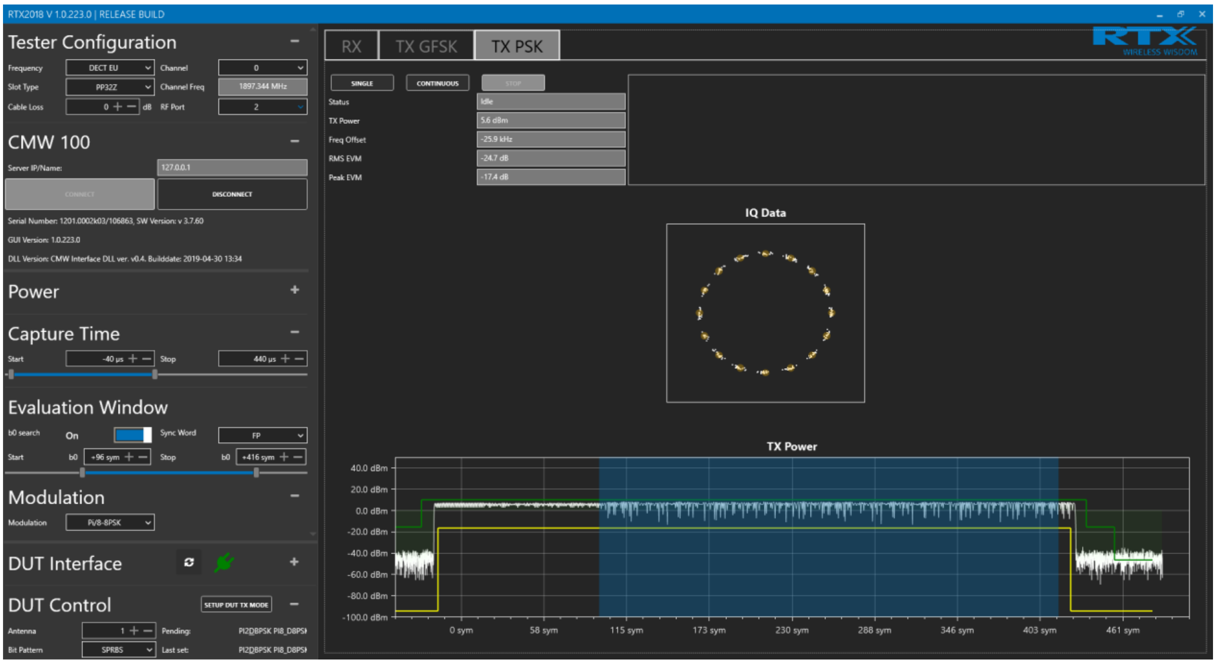


Figure 23. TX graphical PI8-D8PSK results (b0 search enabled)

6 Test Application Development

RTX provides the interface components and small coding examples to aid the user in integrating the RTX2018 into an automatic application.

The RTX2018 DLL (“CmwIntf.dll”) is the Dynamic Link Library file which provides API for remote control of the instrument . These files are located in subfolders of the RTX2018 program folder (“ c:\Program Files (x86)\RTX\RTX2018\ ”).

32-bit and 64-bit versions of the DLL are provided and is located in the “/Interface/DLL/Win32” and “/Interface/DLL/x64” folders.

In the “/Interface/Source/” folder the header/wrapper files are included to ease implementation of C# and Python applications.

Example codes are located in the “/ Examples/” folder and are small example files intended for showing how an application can use the “CmwIntf.dll”.