RTX2254

Bluetooth RF Tester

Stand-alone Unit

Quick Installation Guide

Version: 2.13
PBB/MVC 2019.09.11

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1 Introduction

The **RTX2254 Bluetooth RF Tester** is a highly-optimized, automated test solution for calibration and functional test in the production of wireless Bluetooth Low Energy (BLE) devices. It supports Direct Test Mode (DTM) and optional Advertising Mode (ADV).

This quick installation guide will describe the basic hardware and software installation procedures for the **RTX2254 Bluetooth RF Tester** – Stand-alone unit, the configuration and the first test with a DUT supporting Direct Test Mode. However, Advertising Mode is very similar, but there is no communication interface available to control the DUT.

Please note that:
A test DUT must be available to complete this quick installation guide.

The DUT must be setup for production test (DTM) with either HCI or 2-Wire interface. A "Test DUT" with USB is used as example in this description.

RTX2254 with **"Test DUT"** on USB

Please note that:
RTX2254 is available as a single ported tester for one DUT (RTX no. 95101347) or as a dual ported tester for two DUTs (RTX no. 95101348).

2 Word and Abbreviation List

The following words and abbreviations are used in this document:

- 2-Wire   Bluetooth SIG specified test protocol where only Tx, Rx and GND is used and 16-bit commands and events
- ADV   Advertising Mode, see the Bluetooth Low Energy (BLE) specification for a description of BLE advertising
- API   Application programming interface
- BER   Bit Error Rate
- BLE   Bluetooth low energy
- BT   Bluetooth
- BTLE   Bluetooth low energy
- COM   Serial communication port referred to by a number
- CW   Continuous Waveform
- DLL   Dynamic Link Library
- Driver   SW that interfaces to a HW unit
- DTM   Direct Test Mode, see the Bluetooth test specification
- DUT   Device Under Test
- EAI   Enterprise Application Integration
- ESD   Electro-Static Discharge
- GND   Ground
- GUI   Graphical User Interface
- HCI   Host Controller Interface
- HW   Hardware
- ID   Identification
- IRR   Inquiry response rate
- ISM   Industrial Scientific and Medical
- LL   Link Layer
- LQ   Link Quality
- MAC   Media access control
- PC   Personal Computer
- PDU   Protocol data unit
- PER   Packet Error Rate
- Pop-Up   A smaller frame shown in windows
- PPM   Part Per Million
- RF   Radio frequency
- RS232   Serial port with +-12V signaling
- RSS   Received Signal Strength
- RSSI   Received signal strength indicator
- RTX2300   Test system with shielding, fixture and test HW
- Rx   Receive
- SIG   Special interest group for BT
- SW   Software (Programs)
- TI   Texas Instruments – Chip manufacturer
- Tx   Transmission
- UART   Serial port with logic level signaling (0-5V)
- USB   Universal Serial Bus

3 Hardware Installation Procedure

The section describes how to connect the RTX2254 Bluetooth RF tester.

3.1 Connection Overview
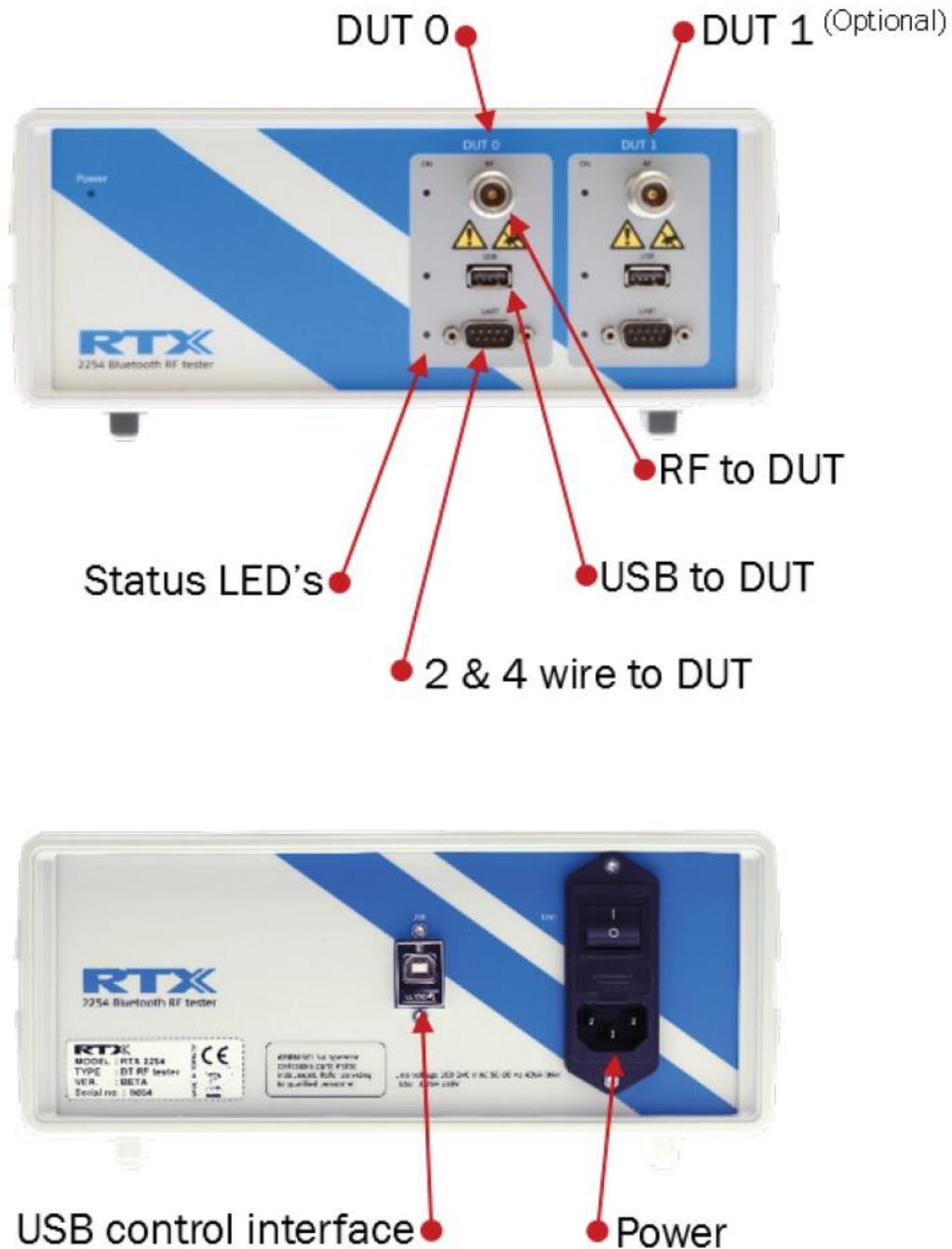
3.2 Installation

The RTX2254 test system comes preassembled and needs only the following:

1. Connect power cord (100-240 V)

2. Prepare, but do not connect a USB cable to PC

3. Turn on power on backside of RTX2254

4. Turn on PC
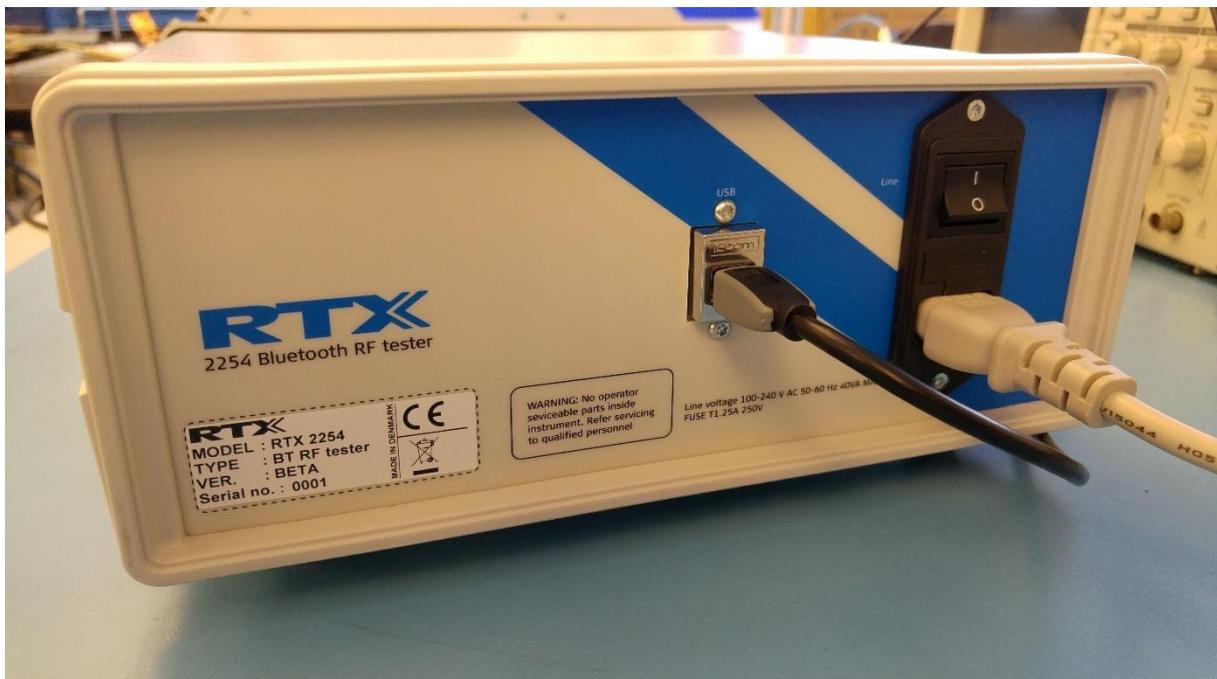
4 Software Installation Procedures

The RTX2254 SW package includes the necessary drivers and RTX2254 Bluetooth RF tester software. The following drivers and supporting Windows application are included:

- RTX EAI Port Server

- RTX USB Bridge Driver (CP210x USB to UART Bridge)

- Microsoft Visual Studio C++ 2010 Runtime Library (.net)

- RTX2254 demo application (a sample application project)

- RTX2254 Bluetooth RF tester application

Please refer to the RTX2254 User Manual for more information on how to use the tester.

## 4.1 Software Installation File #1

4.1.1 RTX2254 Bluetooth RF Tester Software Installation

Locate the file: "**Setup_RTX2254_Bluetooth_RF_Tester_V0213.exe**" and execute it. The following pop-up will appear.
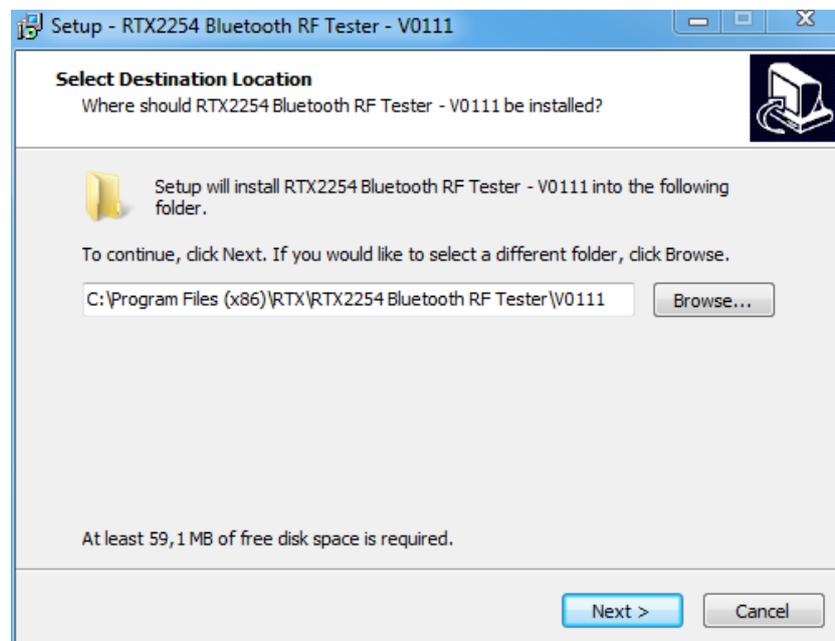

Select the preferred installation folder or stick with the proposed one.
Then click **[Next >]**.
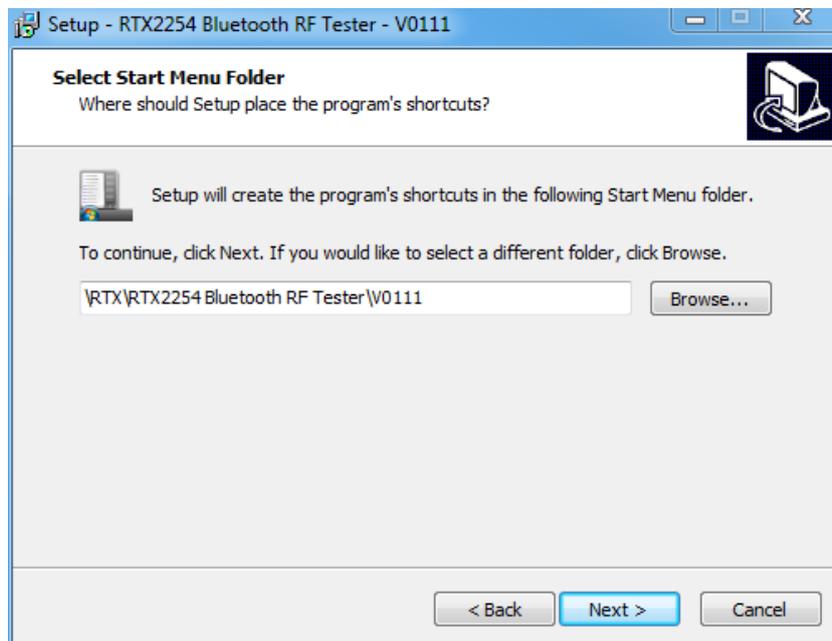
Click **[Next >]** again to continue
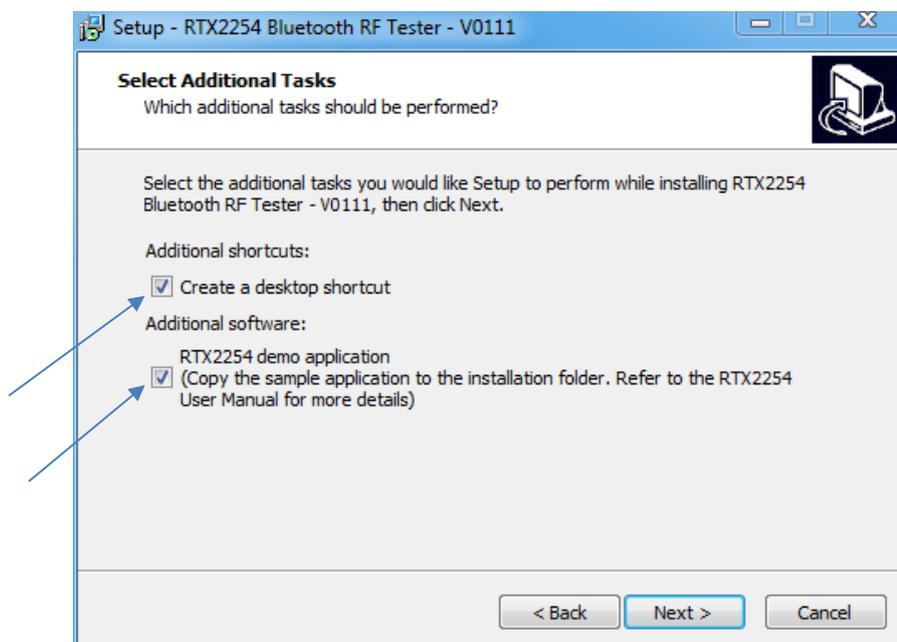
Select to add:

- An application shortcut to your desktop
- The RTX2254 demo application to your installation folder

Or deselect to skip item.

Then click **[Next >]**.
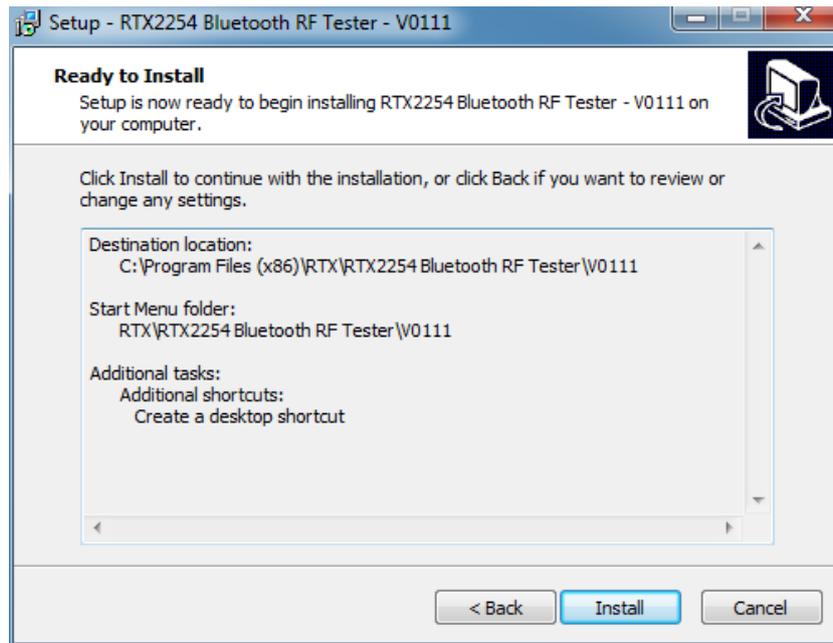
The programs are now ready to be installed.

Click **[Install]** to install the programs at the shown location.

4.1.2 Drivers Installation
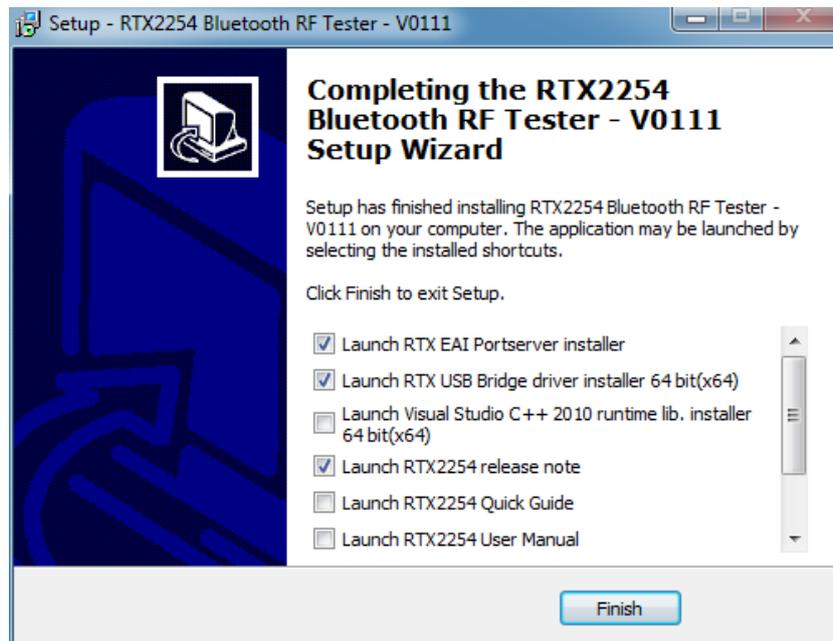
By default, 2 different drivers and optionally the development environment can be installed. The installer will present 32 bit (X86) or 64 bit (x64) drivers depending on the used PC's operating system.

Furthermore 4 different documents can be automatically opened after installation:

- ▪ Release note   The latest changes and information about new firmware

- ▪ Quick Guide   This quick guide to get you started

- ▪ User Manual   A description of the tester's features, i.e. how to perform a test and a more detailed hardware description

- ▪ API Specification A description of the different functions in the API and the required parameters

Please select the ones you would like to read and then click **[Finish]**.

Please note that:
All the documents can be found in the installation folder.

4.1.3 RTX EAI Port Server Installation
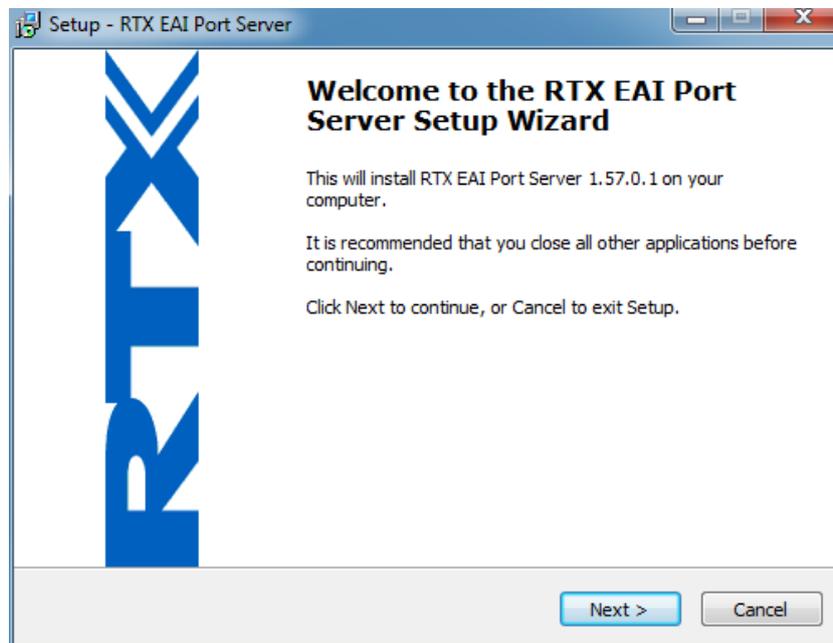
Now the EAI Port Server will be installed. Please click: **[Next >]**.
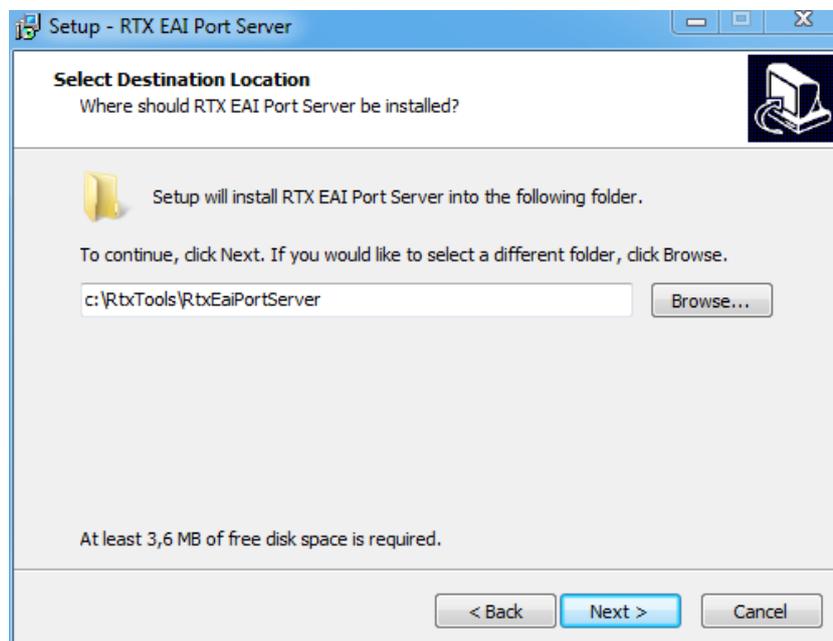
Select the preferred installation folder or stick with the proposed one.
Then click **[Next >]**.
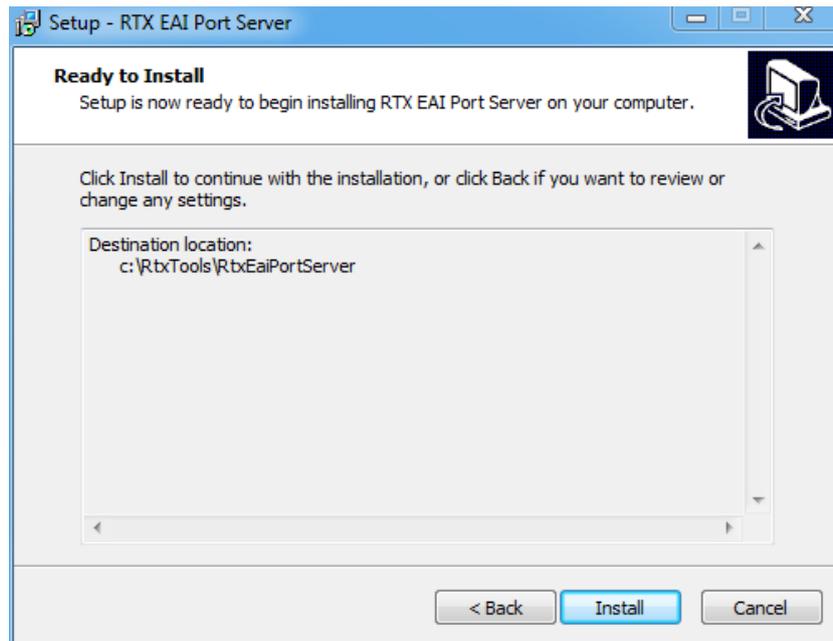
Now the EAI Port Server will be installed. Please click: **[Install >]**.
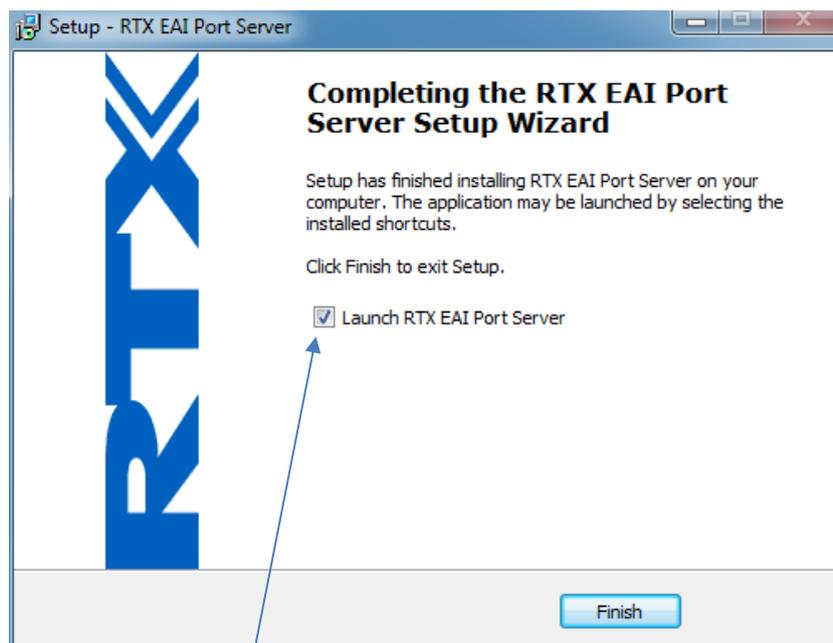
Remove the check mark in Launch RTX EAI Port Server.

Now click **[Finish]**.

## 4.1.4 UART Bridge Driver Installation

Now click **[Next >]**.
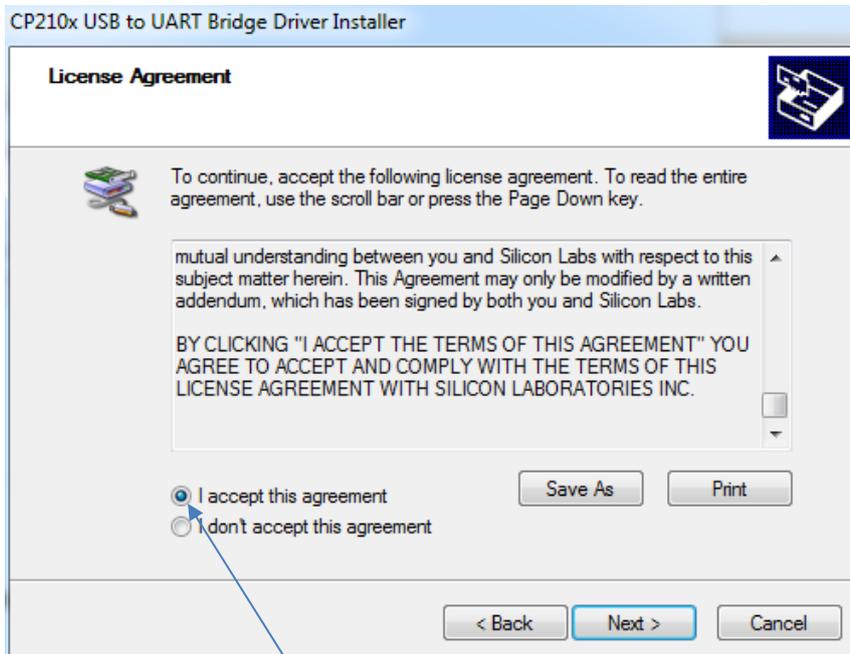
Please read and select the **[I accept this agreement]** and then click **[Next >]**.
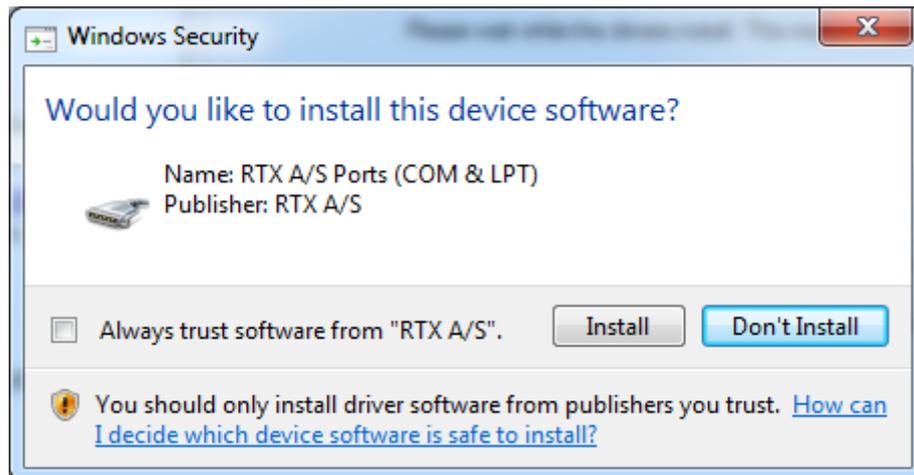
If this window appears, then please click **[Install]**.
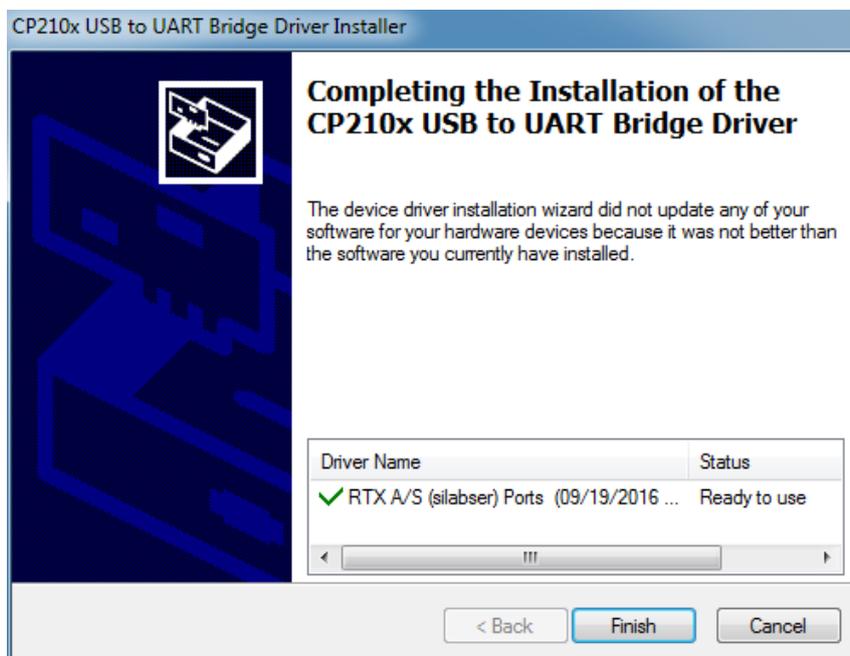
Now click **[Finish]**.

4.1.5 Microsoft Drivers Installation

The Microsoft C++ run time libraries might already be installed on the PC.
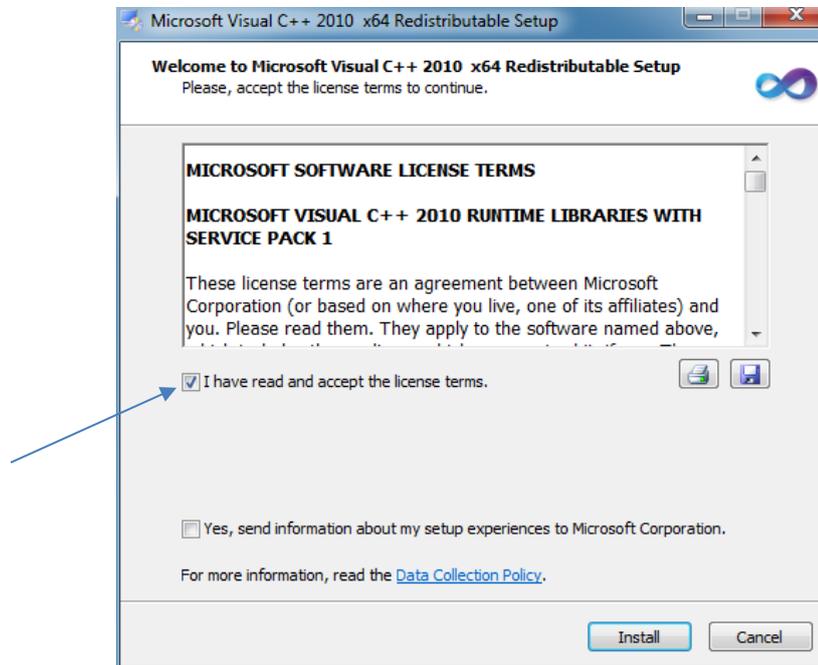
Please read and select the **[I have read and accept the license terms]** and then click **[Install]**.
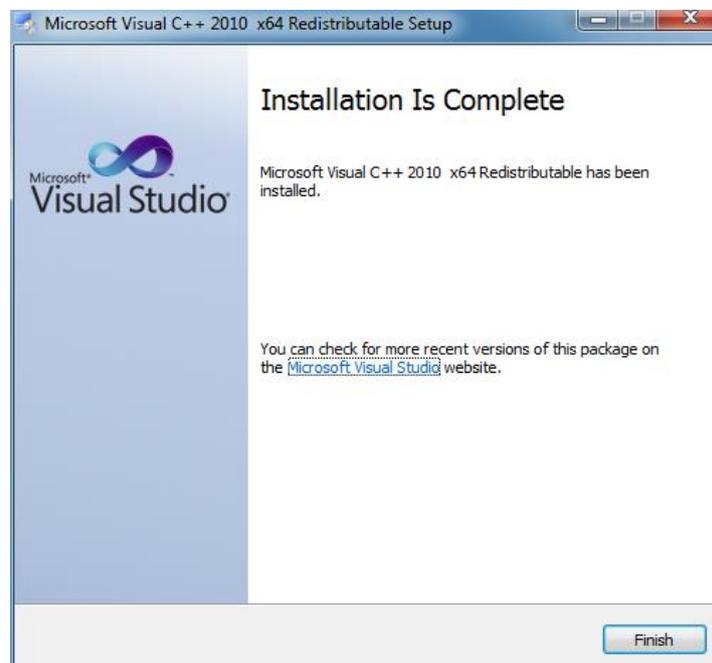
Click **[Finish]**.

Now all needed programs and drivers are installed on your PC.

4.2 Software Installation File #2

This is a separate delivery containing a demo project which shows how the API is used in a production test system. Microsoft Visual Studio C++ must be installed.

Please note that:
This is not required for the RTX2254 Bluetooth RF Tester SW to function. If not needed you can skip this section.

4.2.1 RTX Demo Software Installation

Locate the file: "**TestProj_RTX2254_BT-D0213.zip**" in <installation folder>\RTX\RTX2254 Bluetooth RF Tester\V0213\Sample_app\".

Unpack the ZIP-file and copy it to your preferred folder.

Please note that:
The most resent version will have the highest version number in the filename. Please use the newest one for best experience.

Microsoft Visual Studio C++ will automatically start when selecting the file "**TestProj_RTX2254_BT.sln**".

Please enter the COM port number for your system and recompile the project before running the example.

Refer to the RTX2254 User Manual for more info about the demo test project.

Demo project

5 Software Configuration

The different USB COM port drivers should be configured as shown in the following:

With a powered RTX2254 Bluetooth RF tester and PC, please connect USB cable between them.

Now the drivers should automatically be installed. If not, then please use the options: "*No, not this time*" and "*Install the software automatically (Recommended)*", when or if prompted.

5.1 Configuration of RTX EAI Server

It is strongly emphasized here that it is crucial to configure the RTX EAI Port Server correctly. Hence, if an error is encountered when launching the RTX2254 Bluetooth RF tester application it is most likely related to an erroneous configuration of the port server. Please configure it as described below.

5.1.1 Find the COM Port to use

Open the "**Device Manager**" by selecting "**Control Panel**" from the Windows main menu or type "devmgmt.msc" in Windows search.

Then unfold the "**Ports (COM & LPT)**" line. The COM port numbers shown are system specific and vary from PC to PC:
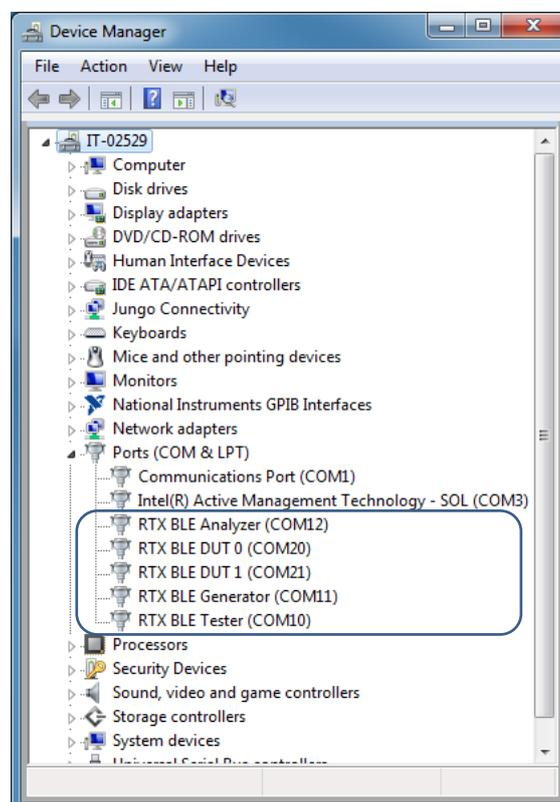
RTX2254 COM port 10,11,12

DUT UART COM 20 and 21

The "**RTX EAI Port Server**" needs the communication port number from: "**RTX BLE Tester (COM10)**" line
– please note this no. "10" for later use.

The "**RTX2254 Bluetooth RF tester SW**" needs the communication port number from: "**RTX BLE generator (COM11)**" line for the generator communication
– please note this no. "11" for later use.

The "**RTX2254 Bluetooth RF tester SW**" needs the communication port number from: "**RTX BLE Analyser (COM12)**" line for the analyser communication
– please note this no. "12" for later use.

Please note that:
The 2 UART COM ports are shown (See picture above with DUT 0 and DUT 1 as COM20 and COM21). UART is selected by default.

The 2 USB Ports (here only one "Test DUT" is connected as COM22) are only shown when USB interface is selected from the program.
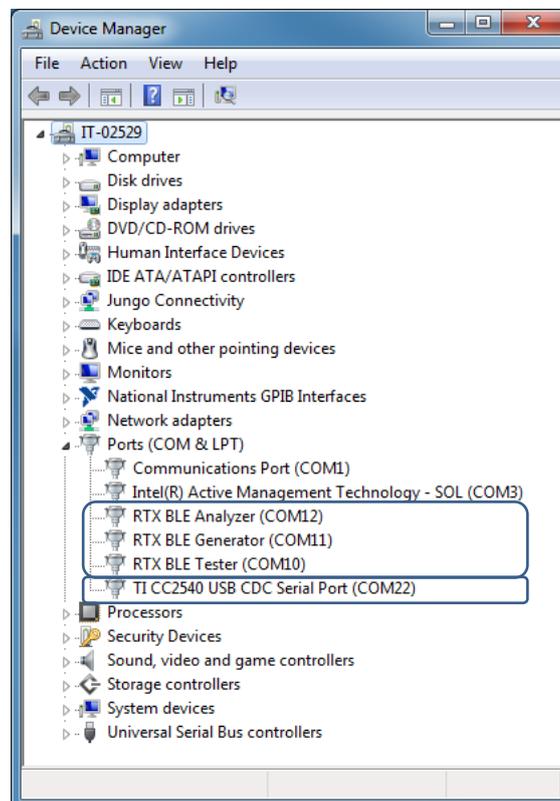
RTX2254 COM port 10,11,12

"Test DUT" on USB COM 22

Direct Test Mode requires a minimum of 4 COM port numbers. 3 COM ports (Tester, Generator and Analyzer) for the RTX2254 Bluetooth RF tester and 1 COM port for a test DUT is required when configuring the program later. Advertising Mode only requires 3 COM ports (Tester, Generator and Analyzer) but no COM port for the DUT.

Please note that:
You must first setup the 3 COM ports (Tester, Generator and Analyzer) to be able to select USB as DUT interface to get the test DUT COM port.

5.1.2 Setup the RTX EAI Server

Please check that the icon "**RTX EAI**" is present in the task bar, like below picture:

If not started, then start it manually from Windows start button:

"**Start → All programs → RTX Telecom → RTX EAI Port Server**"

Now right click on the icon on the task bar and select the Setup window (see below).
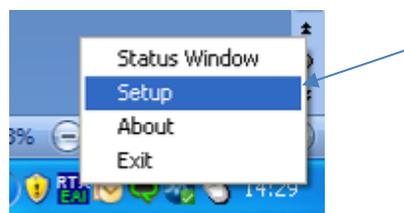
When selecting the **Setup** line, the following window will pop-up.
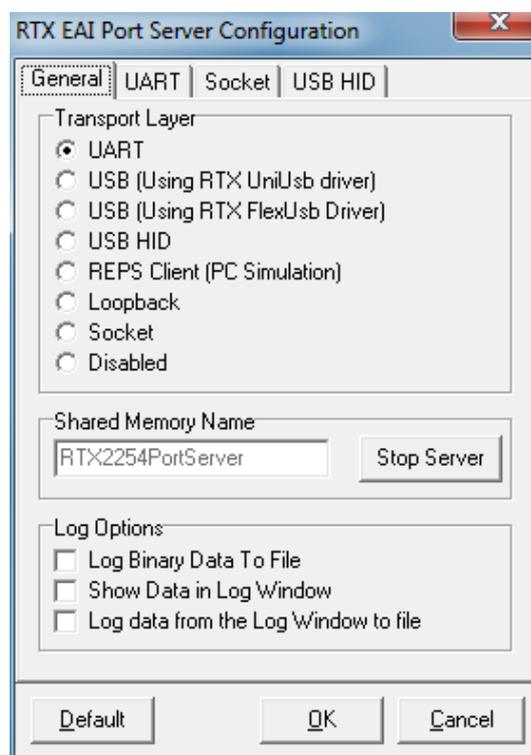
Please note that:
The **Transport Layer** will be set to **Disabled** if communication is not possible. In that case – go here, correct the HW problem and enable it again.
Now please set the "**UART**" window as shown below.
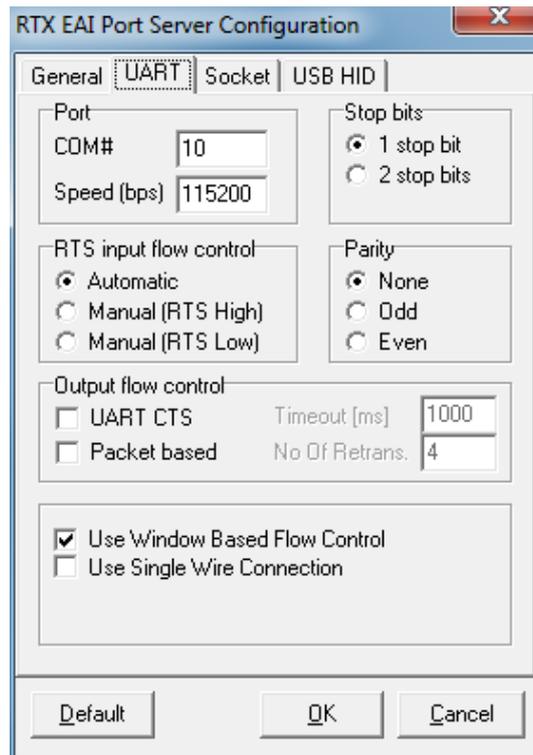
Please enter the COM port number from "**Device Manager**" page. Here it is 10 and be sure to check that the other fields are set as shown above.

The same apply for the following 2 pages.

Please note that:
The Tester COM port number can also be setup in the RTX2254 application.

In RTX2254 application, set Tester COM = 255 to use the manually setup COM port in the RTX Portserver application above.

RTX EAI Port Server Configuration

General | UART | **Socket** | USB HID

Socket Type
- ⦿ Client
- ◯ Server

IP Config
Host IP `127.0.0.1`
Port `20000`

Socket Protocol
- ⦿ Raw
- ◯ TI GSM Trace multiplexer

Trace ID `24`

EAP options
- ☐ Ignore check sum

- ☑ Auto re-connect

Default   OK   Cancel

RTX EAI Port Server Configuration

General | UART | Socket | **USB HID**

Device Selection
- ☐ Use Specific Device:

VID `0000`   PID `0000`

- ☐ Use Specific Serial Number:

Default   OK   Cancel

Now click **[OK]**. This will save the current setup configuration.

It can be found in the file: "**c:\Program Files (x86)\RTX\RTX2254 Bluetooth RF Tester\Vxxxx\RtxEaiPortServer.ini**"

6 The First Test

To guide the user through the first test in Direct Test Mode, the following simple test are shown.

A test DUT, setup for production test, must be available. A DUT with USB is used in this description.

6.1 Set-up of HW for First Test

Please do the following:

1. Place tester and PC on a solid table

2. Connect power cables

3. Connect PC and Tester with a USB cable

4. Insert the **"Test DUT"** in appropriate DUT interface (UART / USB), e.g. USB0

5. Connect RF cable from **"Test DUT",** e.g. DUT0 RF port as shown in below picture.

6. Now turn on PC and the **RTX2254 Bluetooth RF tester** hardware.

"Test DUT" is connected to DUT0 RF and USB

Please note that:
RTX2254 is available as a single ported tester for one DUT (RTX no. 95101347) or as a dual ported tester for two DUTs (RTX no. 95101348).

6.2 Set-up of SW for First Test

Start the "**RTX2254 Bluetooth RF tester**" SW by clicking the Windows start button and selecting:

"**Start → All programs → RTX → RTX2254 Bluetooth RF tester → V0213 → RTX2254 Bluetooth RF tester**".

The below picture will be shown:

If it doesn't disappear then an error probably has occurred. This error pop-up is hidden below the splash screen (Will be corrected in a later release) and can be shown in the following way:

- Press **[ALT]** + **[TAB]** until error pop-up has been selected
- Press **[ALT]** + **[SPACE]** once
- Press **[M]** for move window
- Press **[Arrow-down]** several times
- When fully visible press **[ENTER]**

The first time you will see the below error – because the program has not been configured yet.
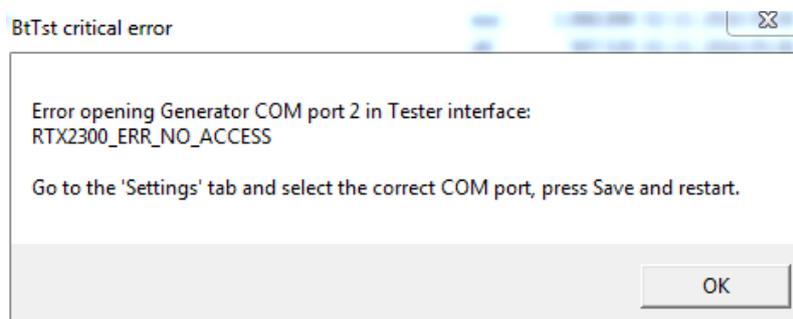
Click **[OK]** and the real program will appear.

If the error pop-up looks like the following, then the RTX EAI Port Server are probably failing and you must configure it correctly.

BtTst DLL fatal error

Reps client reported an error 14

Error msg: REPS_ERROR_FAILED_TO_SET_TL

The transport layer has been disabled!

Continue execution?

OK   Cancel

Or

BtTst DLL fatal error

Mail handler reported an error

Error msg: RTX2300_ERR_TIMEOUT

Tester portserver timeout. Check portserver settings.

Continue execution?

OK   Cancel

If the error pop-up looks like the following, then the RTX EAI Port Server are probably failing and you must configure it correctly.

BtTst critical error

Error opening the Tester interface: RTX2300_ERR_NO_ACCESS

OK
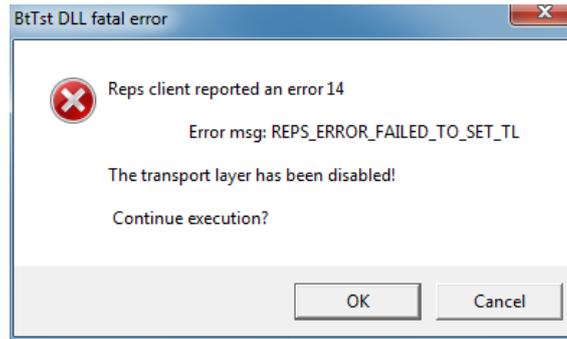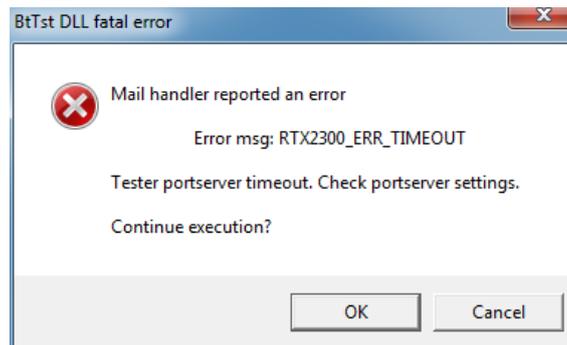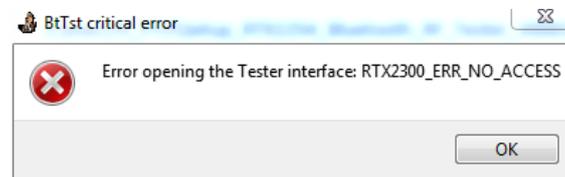
6.2.1 Select DUT Test Protocol

Please select the **[Configuration]** tab.

Set the limit numbers to meaningful values, like below picture shows.

The DUT cable loss depends on your selected cable, e.g. here it is set to 1 dBm loss.

Select the test protocol (HCI or 2-wire) to use with the **"Test DUT"**. In this example, HCI is selected as "DUT Communication Protocol".
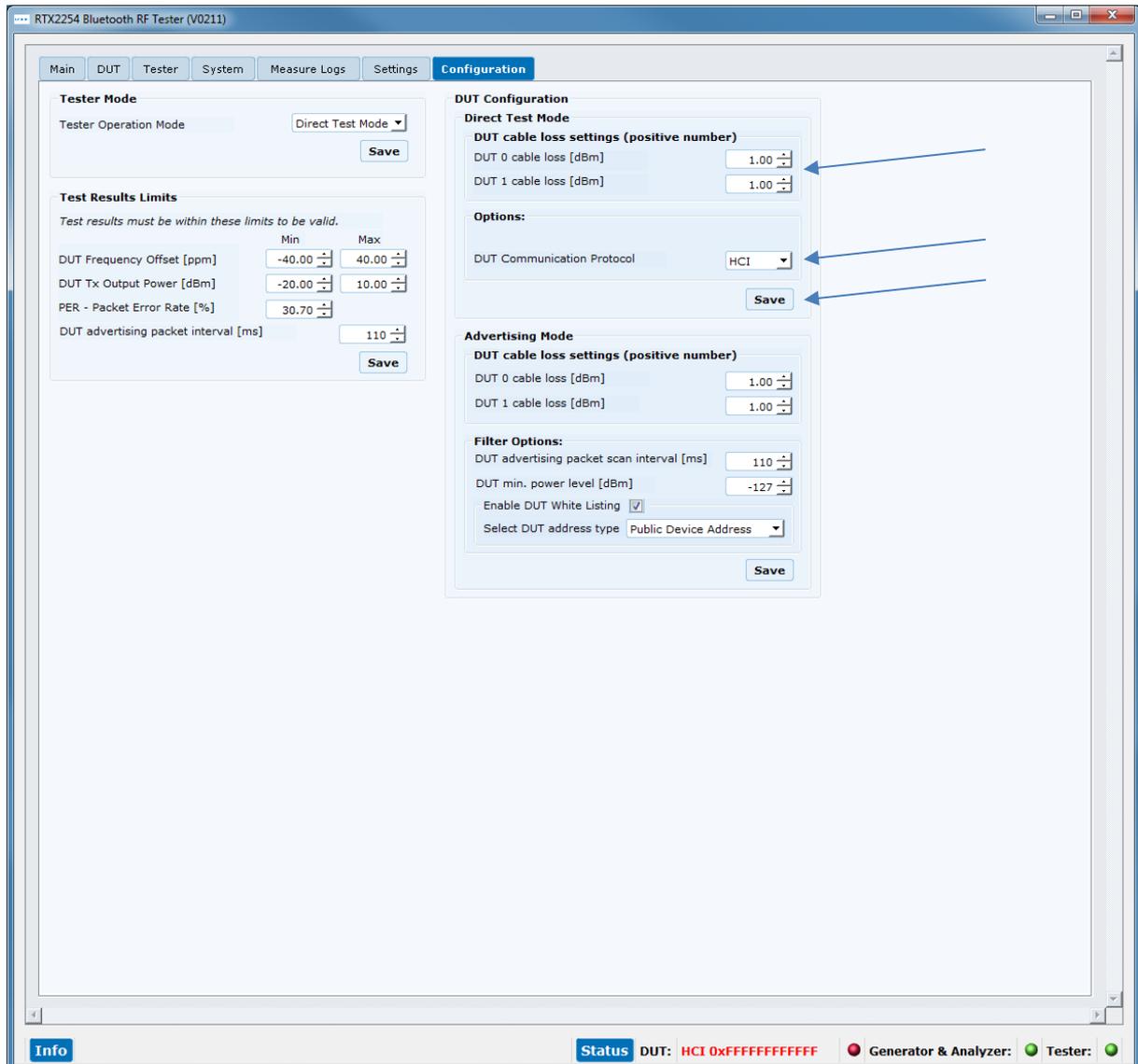
Then click **[Save]**.

Please note that:
The DUT has not been opened yet and DUT status is red.

6.2.2 Setup COM Ports

Under this **[Settings]** Tab, set the COM port value found earlier, for each of the 4 DUT interfaces and for the 3 internal instruments (Tester / Analyzer / Generator).

Please note that:
If Tester COM = 255 is entered, the COM port specified in the "RTX EAI Server" is used. Select the 'Auto open' option to automatically open the RTX2254 tester COM ports.

Set the DUT configuration as required by your specific DUT.

Click **[Save]** for each section to store setting.

Click **[Open]** to open the COM ports.
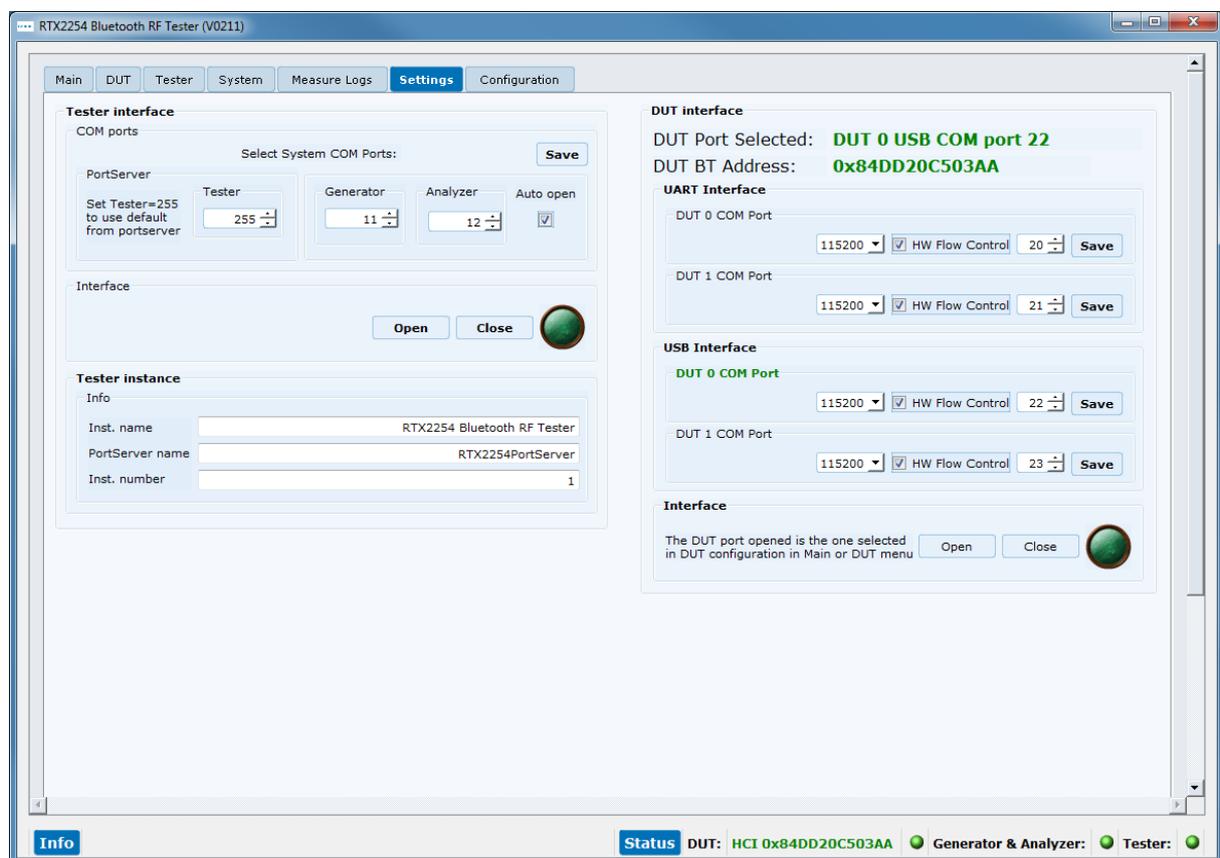
Please note that:
The firmware in the **RTX2254 Bluetooth RF tester** is checked when starting the application. Please follow the instructions to update the firmware if required.

Then please select the tab called **[Main]** as in the following.

6.2.3 Setup DUT for Test

In **[DUT Port Selection]** frame, please select the correct RF port and interface to use for tests. Then click **[Select]**.

Now check that **DUT** are checked in the **[Open interface]** box and that the 3 status LED's are green in the lower, right frame.

To store the settings, click **[Save]**.
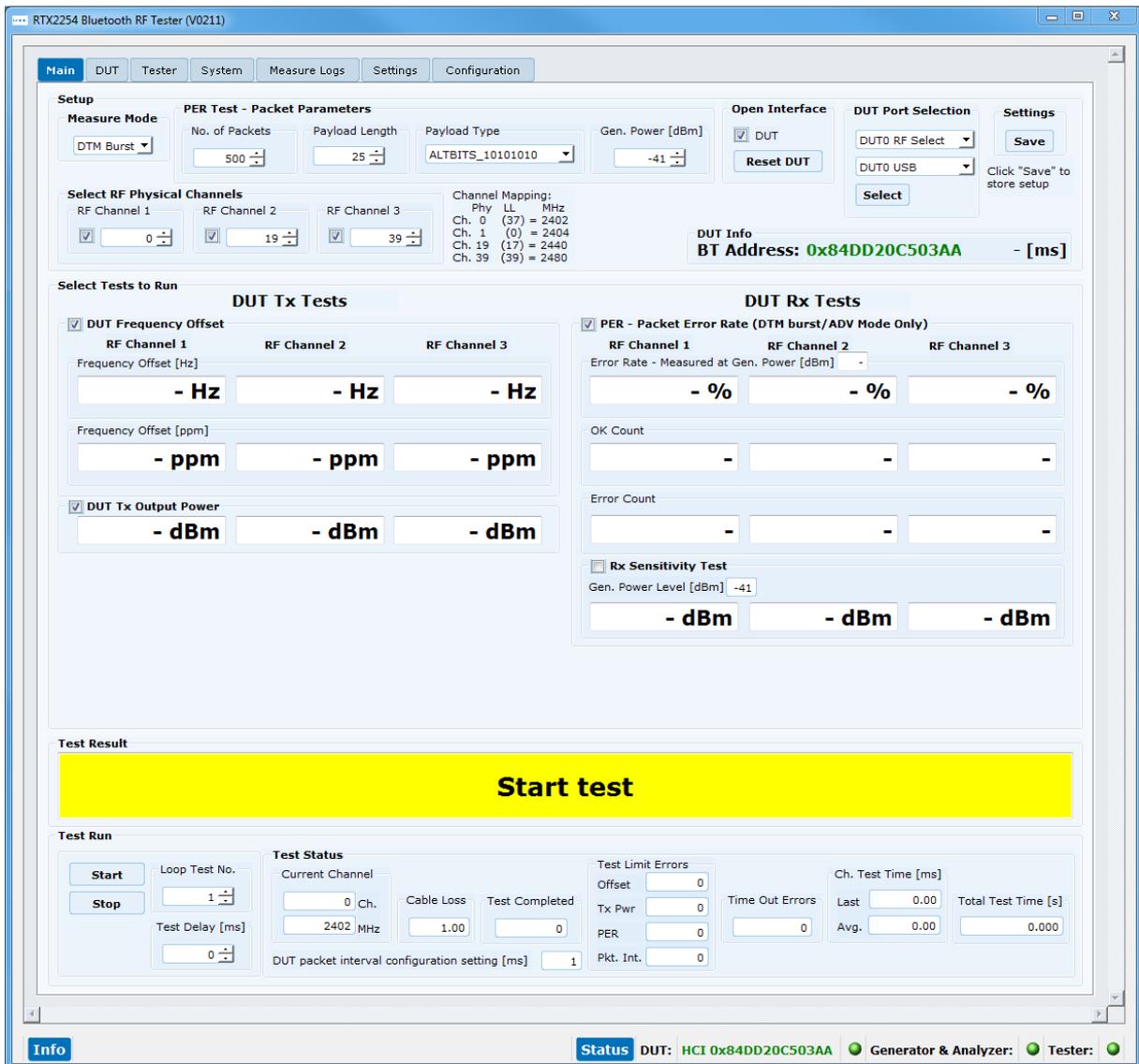
The **RTX2254 Bluetooth RF tester** is now configured and ready for testing. Close the application.

Please note that:
RTX2254 is available as a single ported tester for one DUT (RTX no. 95101347) or as a dual ported tester for two DUTs (RTX no. 95101348).

6.3 Starting the Test

Start the "**RTX2254 Bluetooth RF tester**" SW by clicking the Windows start button and selecting:

"**Start → All programs → RTX → RTX2254 Bluetooth RF tester → V0213 → RTX2254 Bluetooth RF tester**".

The below or similar screen will appear after a short time.
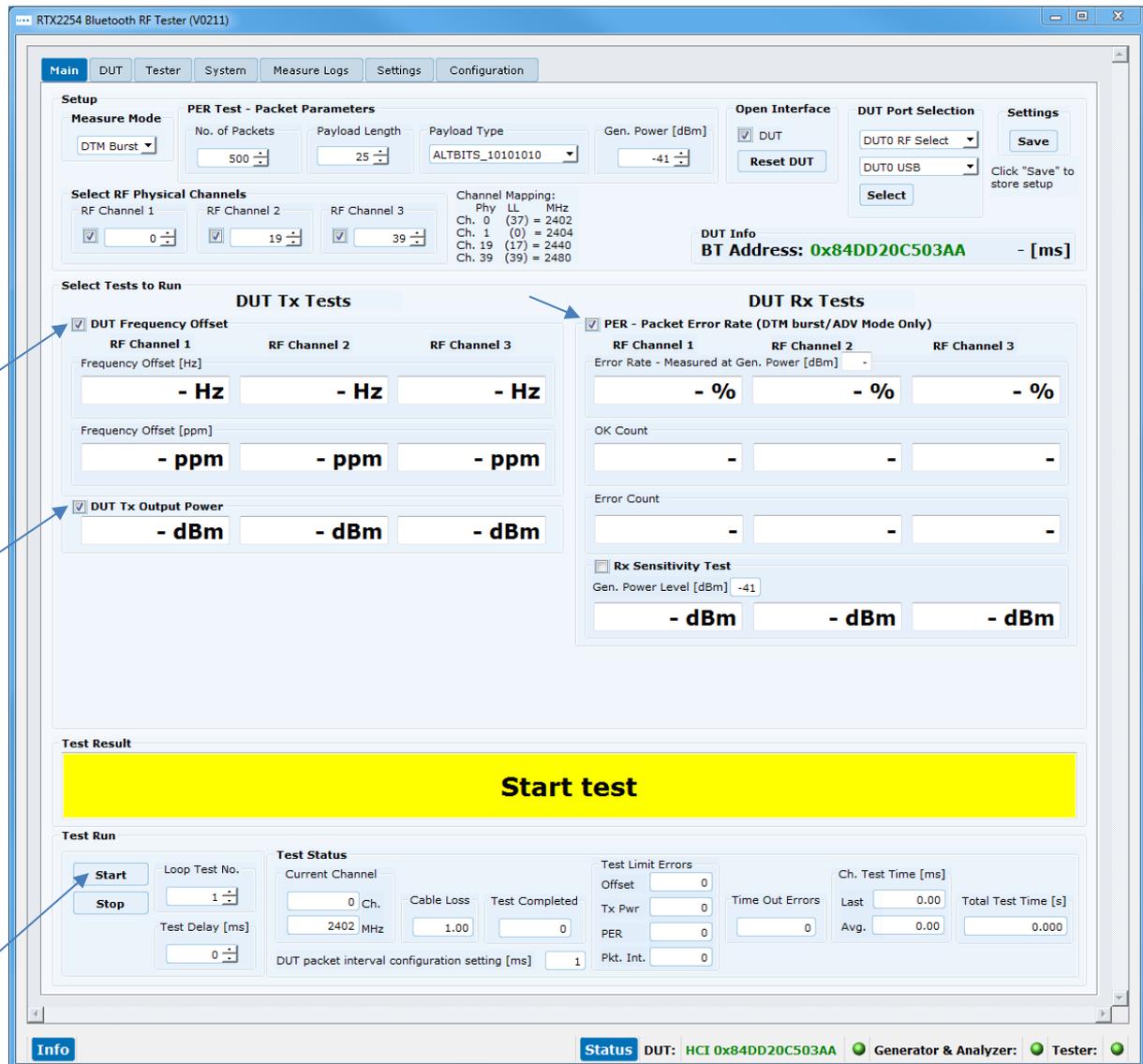
Make sure that the requested tests are enabled "DUT Frequency Offset", "DUT Tx Output Power" and "PER – Packet Error Rate".

Now click **[Start]** and the testing will commence.
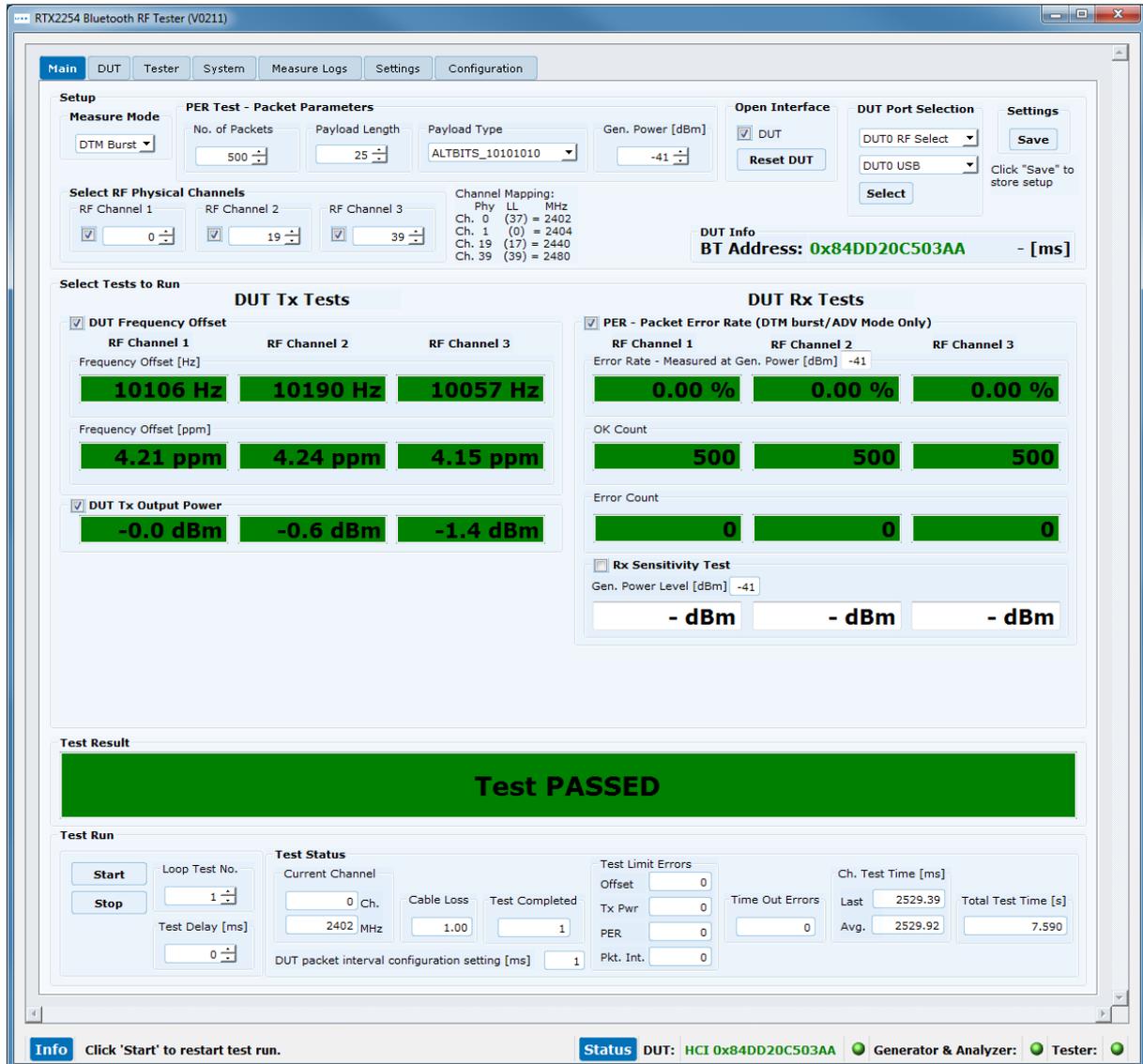
When the test has completed the following picture should look like the above.

> **Please refer to the instructions in the "RTX2254 User Manual" on how to use other features of the RTX2254 Bluetooth RF tester and a more detailed hardware description.**

7   Safety Information

7.1   General

The following general safety precautions must be observed during all phases of operation and service of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. RTX A/S assumes no liability for the customer's failure to comply with these requirements.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gasses or fumes.

DO NOT use repaired fuses or short-circuited fuse holders: For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type.

DO NOT perform procedures involving cover or shield removal unless you are qualified to do so – it is therefore strongly emphasized here that operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers and shields are for use by service-trained personnel at RTX A/S only.

7.2   Electrostatic Discharge

Electrostatic discharge (ESD) can damage electronic test equipment. Working with electronic components or test equipment should always be performed at a static-safe place.

7.3   High Voltage

Some power supplies can generate high voltage, which can damage any of the ports of the unit.

To prevent damage to the RTX2254 Bluetooth RF tester please make sure that the device is properly earthed. Connect the RF cable path before applying DC power to the test device. Be careful when connecting RF connectors, i.e. avoid touching any unearthed metal with the centre core.