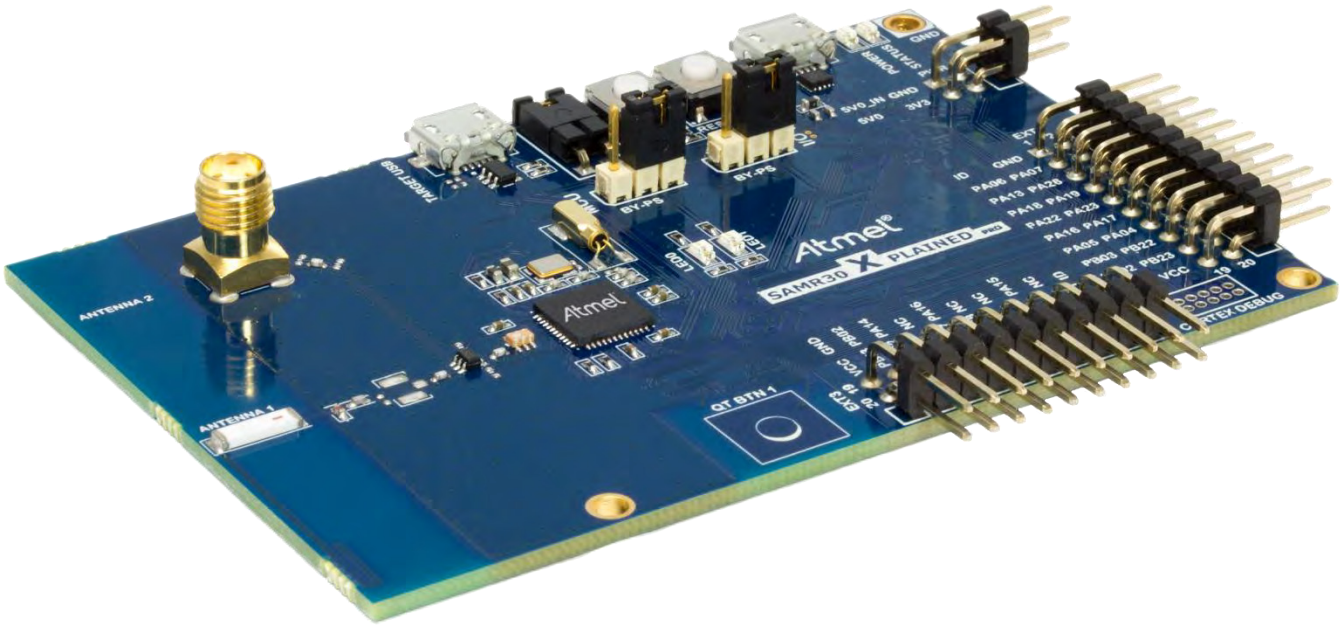
ATSAMR30-XPRO [USER MANUAL]



Atmel

Table of Contents

1. Introduction

1.1. Scope:

The scope of this document is to explain how to install and setup up the required hardware and programming tool for the certification test.

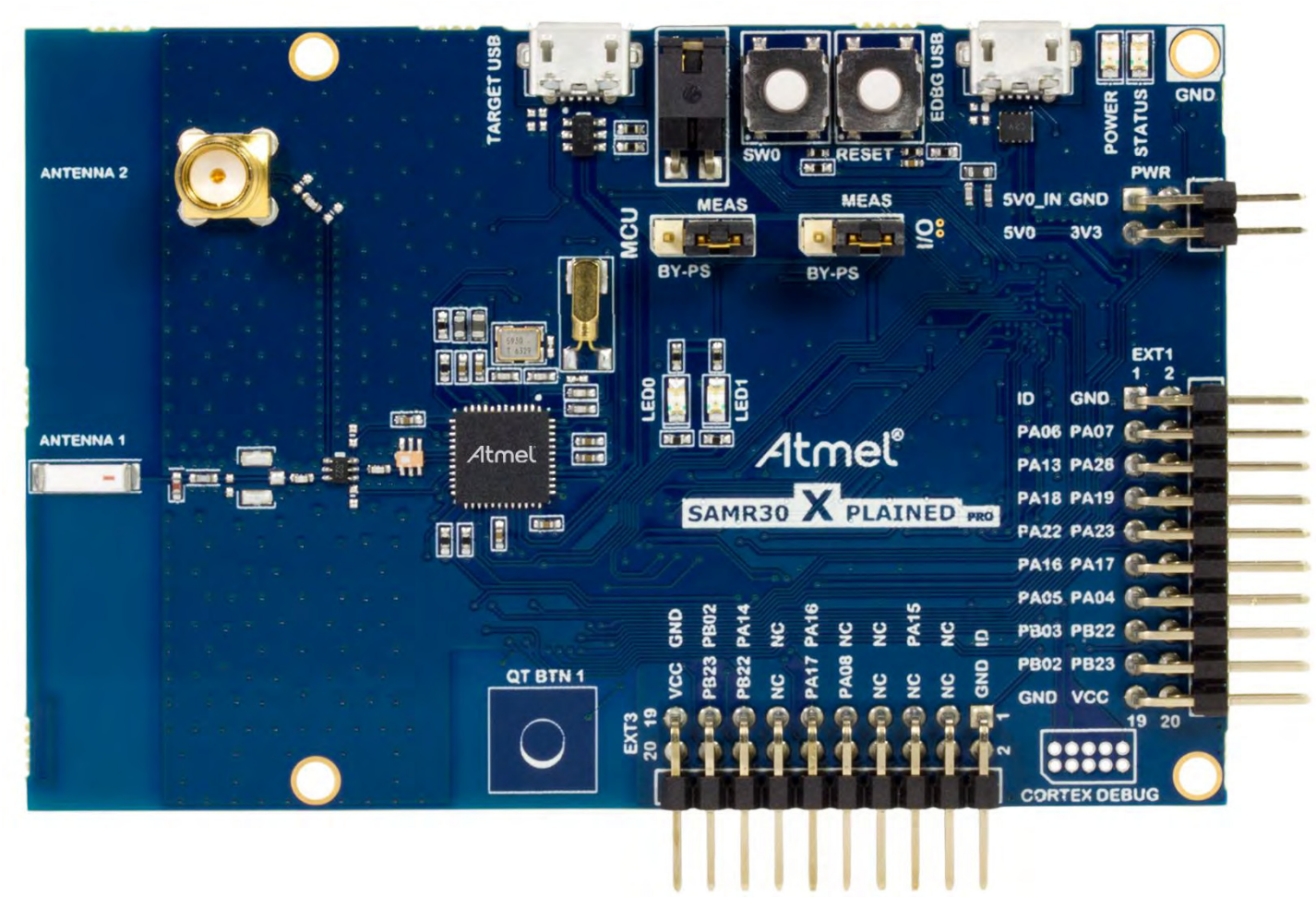


Figure 1 : Atmel ATSAMR30-XPRO Board

2. Hardware Setup

2.1. ATSAMR30-XPRO Boards - 2 Nos

2.2. Micro USB cable - 2 Nos

Note: SMA cables not included in the box

3. Software Setup

3.1. Atmel Studio 7 (no need to install again if it is already available in Test PC)

3.2. Wireless Composer

3.3. ATSAMR30-XPRO Drivers - Installed automatically

3.4. ATSAMR30-XPRO Performance Analyzer firmware flash-Install if required

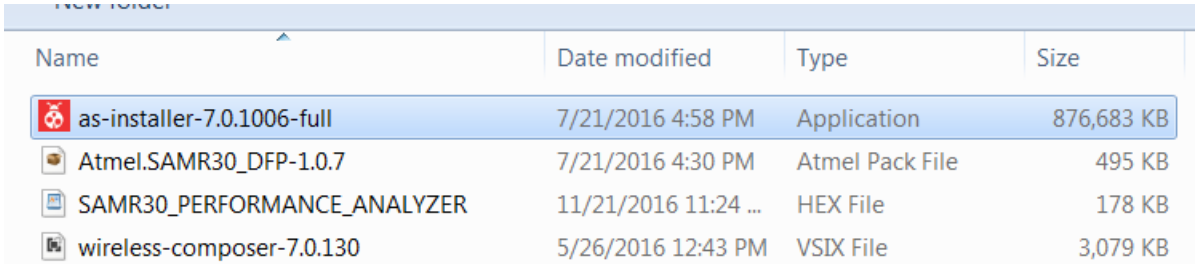
3.5. ATSAMR30-XPRO Part Pack Intallation

4. Software Installation

4.1. Atmel Studio 7 Installation

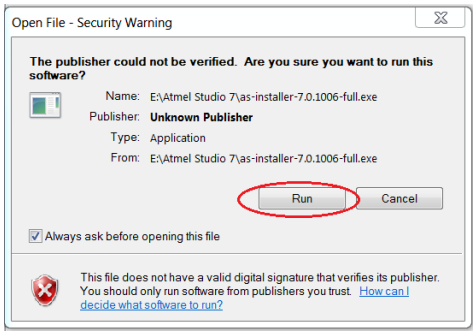
Note: If Atmel Studio 7 is already available in Test PC, jump to step 4.2 in this section and install wireless composer

4.1.1. Open the DVD containing the Atmel Studio 7 Software package.



4.1.2. Double click the "**as-installer-7.0.1006-full.exe**" icon to launch Atmel Studio Installation.

4.1.3. Click Run icon.



4.1.4. Once you clicked the Run icon,the Atmel Studio 7 installer Wizard dialog box opens and agree the licence terms and conditions.Then click "Next"

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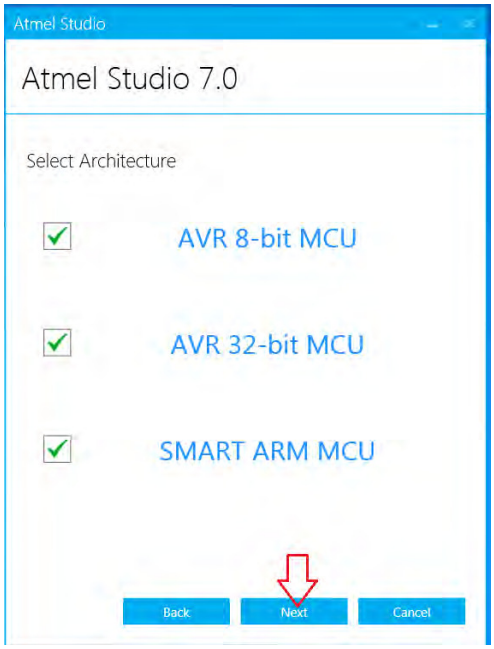
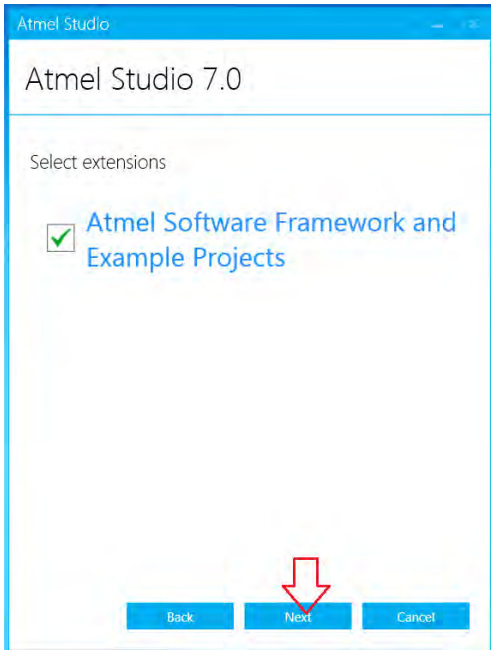
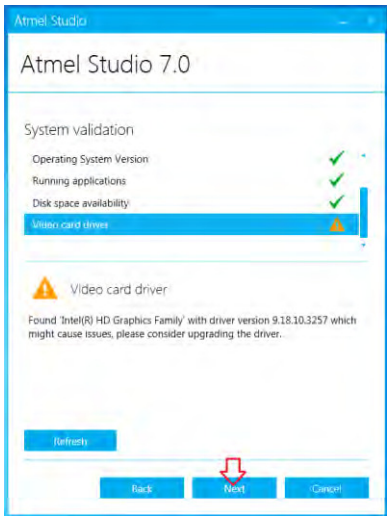
4.1.5. Ensure all the Architectires are selected and click “Next”.



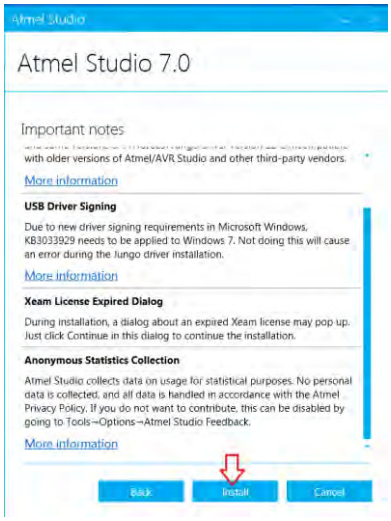
4.1.6. Select ASF extensions and click “Next”



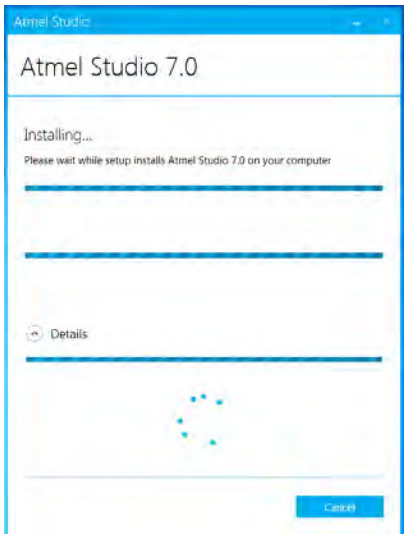
4.1.7. Click “Next”,ignore if any video card driver error shows,



4.1.8. Click “Install”.



4.1.9. Atmel Studio 7 installion starts and once completed click ok.



4.2. Wireless Composer Installation

4.2.1. Next install the Wireless Composer extension by double clicking the “wireless-composer-7.0.130.vsix” icon found in the DVD as shown in the following figure and follow the instakkation wizard to comple the installation

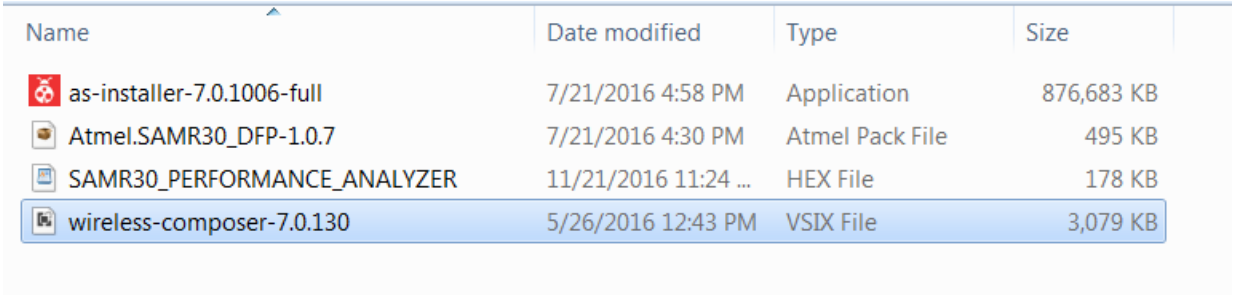
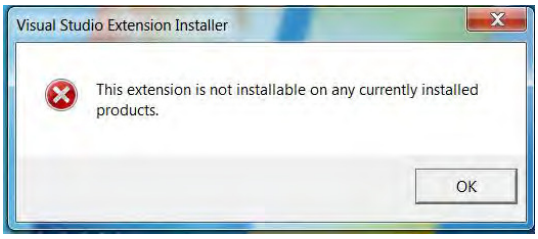


Figure 2 : Wireless Composer Installation

4.2.2. In case if you I get an error message saying,



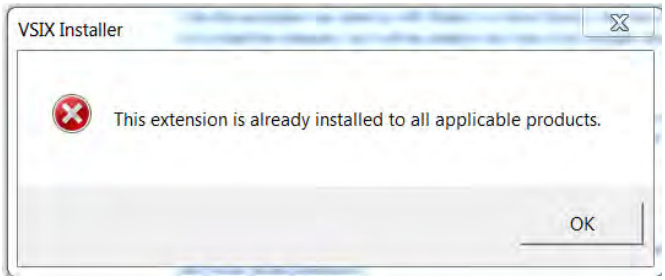
4.2.3. To overcome the above error, you have to change the file association as follows

(i) Right click on the “wireless-composer-7.0.130.vsix” file and select 'Open with', and then 'Choose default program'.

(ii) Click the 'Browse' button (Windows 7) or click on 'More' and 'Look for another app on this PC' (Windows 8 and newer).

(iii) Browse to VSIXInstaller.exe located in C:\Program Files (x86)\Microsoft Visual Studio 14.0\Common7\IDE

(iv) After initializing, it will pop-up as follows.Click ‘ok’ and now the installation gets completed.



5. Hardware and Driver Installation (Automatic):

5.1. Connect a micro USB cable from PC to the micro USB port (USB for programming).

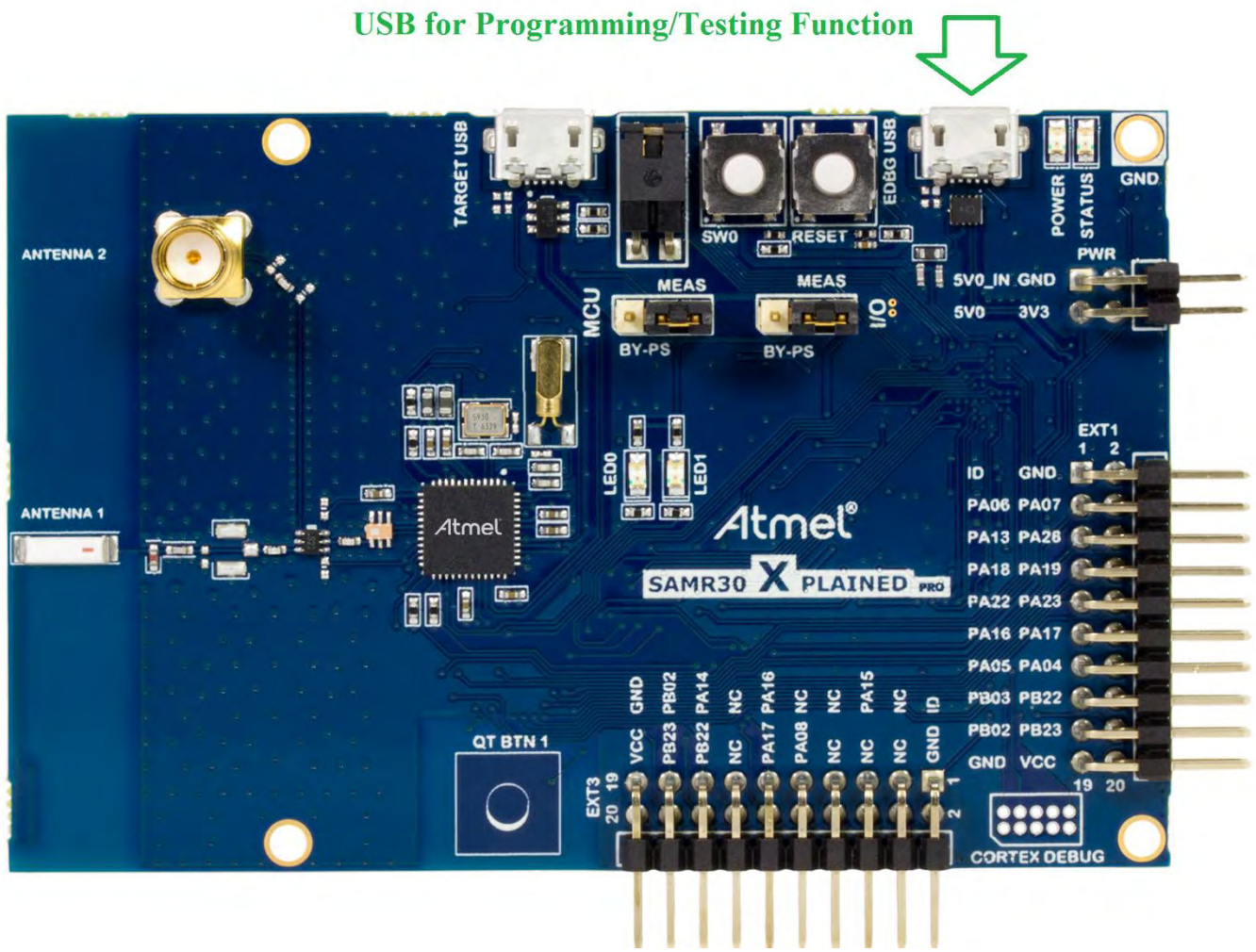


Figure.6 Hardware Setup

5.2. Next, EDBG Virtual COM port driver installation will begin automatically

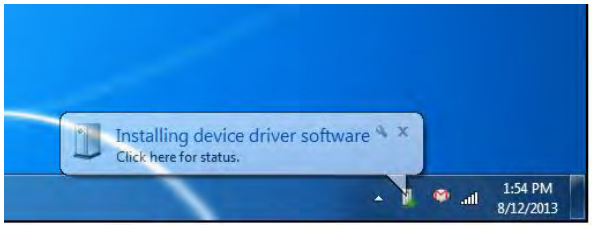


Figure.7 EDBG Virtual COM PORT Driver installation

5.3. Click the taskbar notification. When the driver installation is successfully completed, there will be a notificaion as shown below.

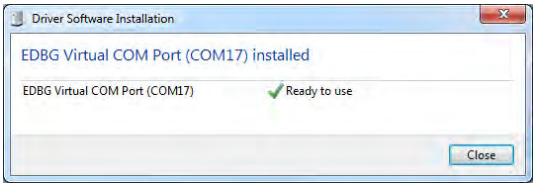


Figure.8 EDBG Virtual COM PORT Driver installation

Note: COM17 from the above figure is an example. The COM Port number varies depending upon the PC.

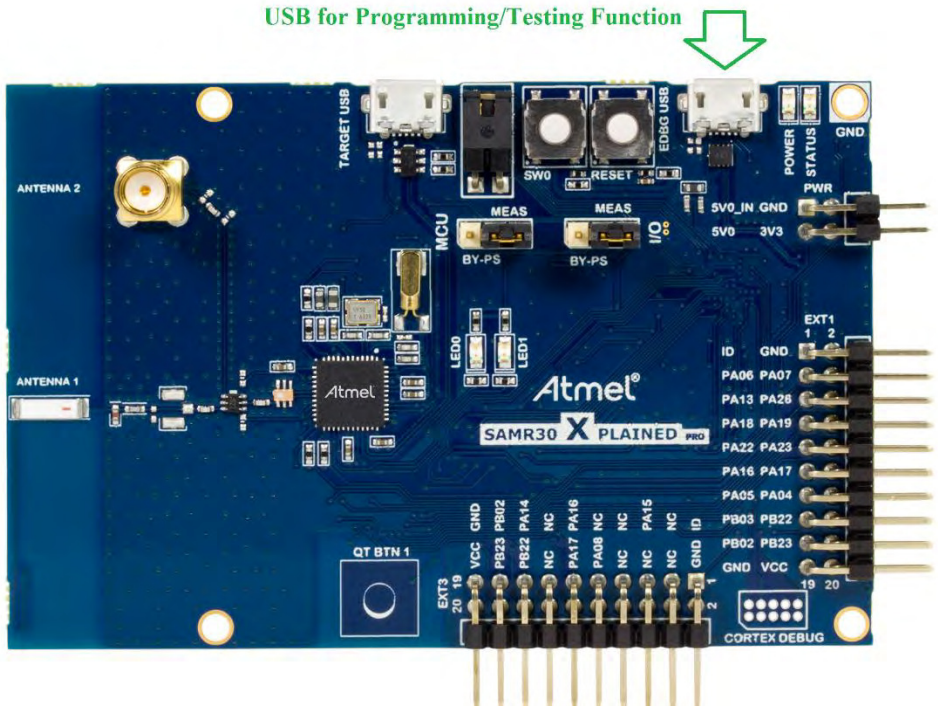
6. Programming the hex file in SAMR30-XPRO (If required):

Board was already programmed with certification software/performance analyzer. In case if required to flash the program file, follow the below steps.

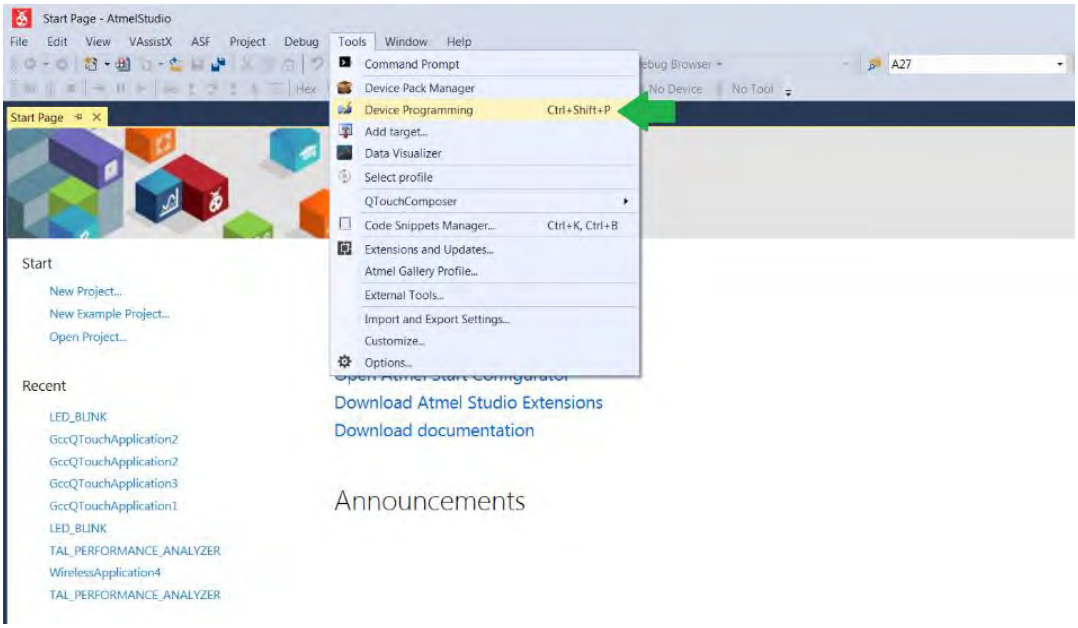
If programming the SAMR30-Xpro board for the first time, follow the section 7(SAMR30 part pack installation) before start programming.

6.1. Connect the SAMR30 XPRO board to the PC via EDBG micro USB connector.

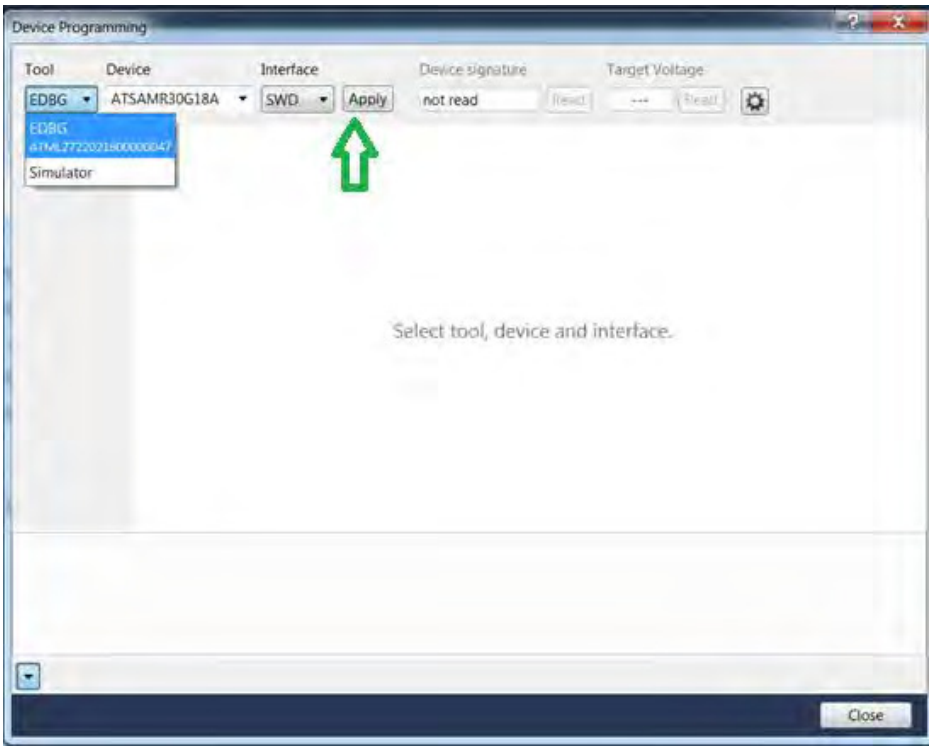
* PC should have the Atmel Studio 7 installed in it



6.2. In Atmel studio,select Tools →Device Programming

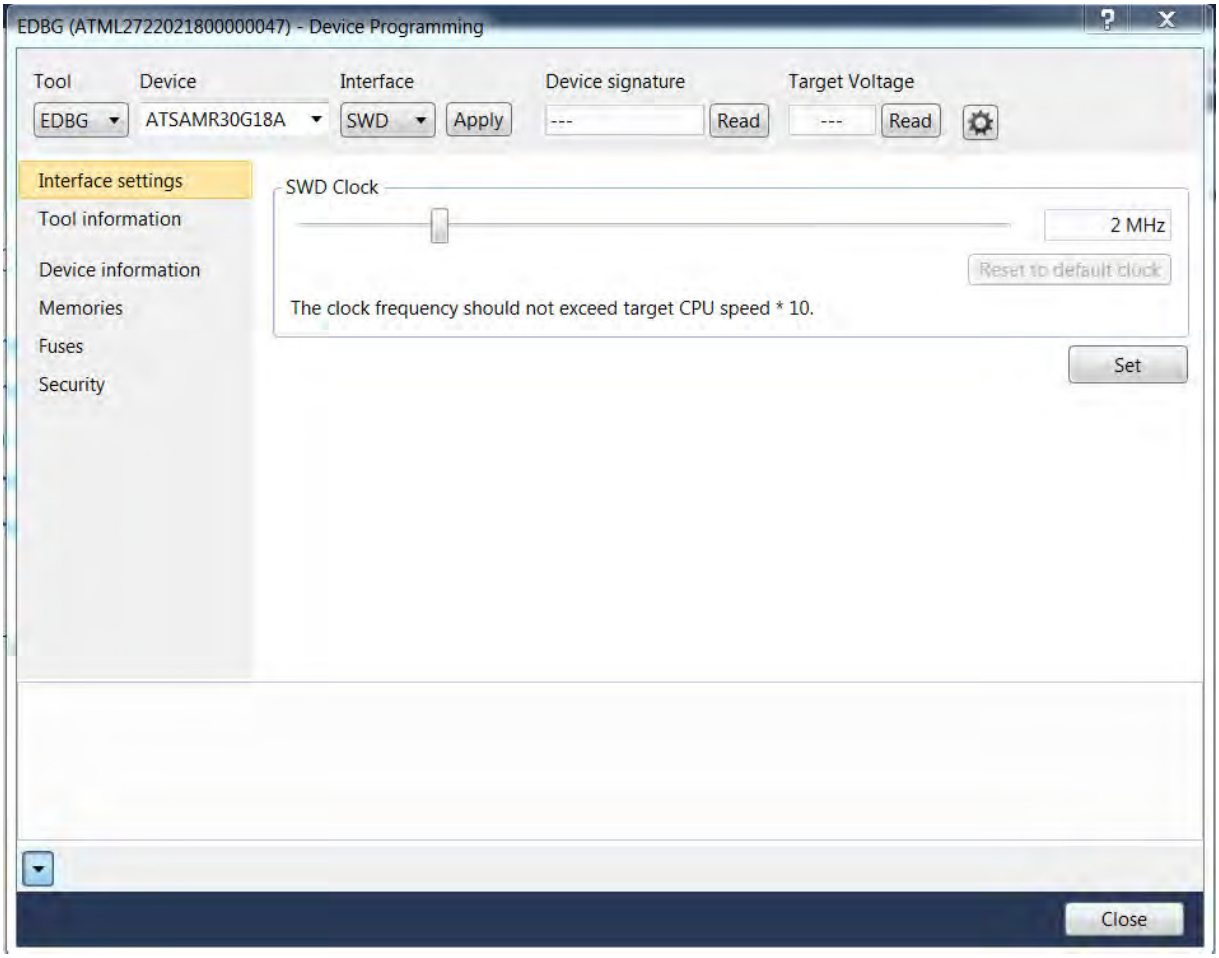


6.3. In Device Programming dialog box, select the edbg serial number and ensure the Device is “ATSAMR30G18A” and select ‘SWD’ as Interface. Then click “Apply”



In case if you noticed that the Device “ATSAMR30G18A” is unsupported,see the section 7 to overcome the error.

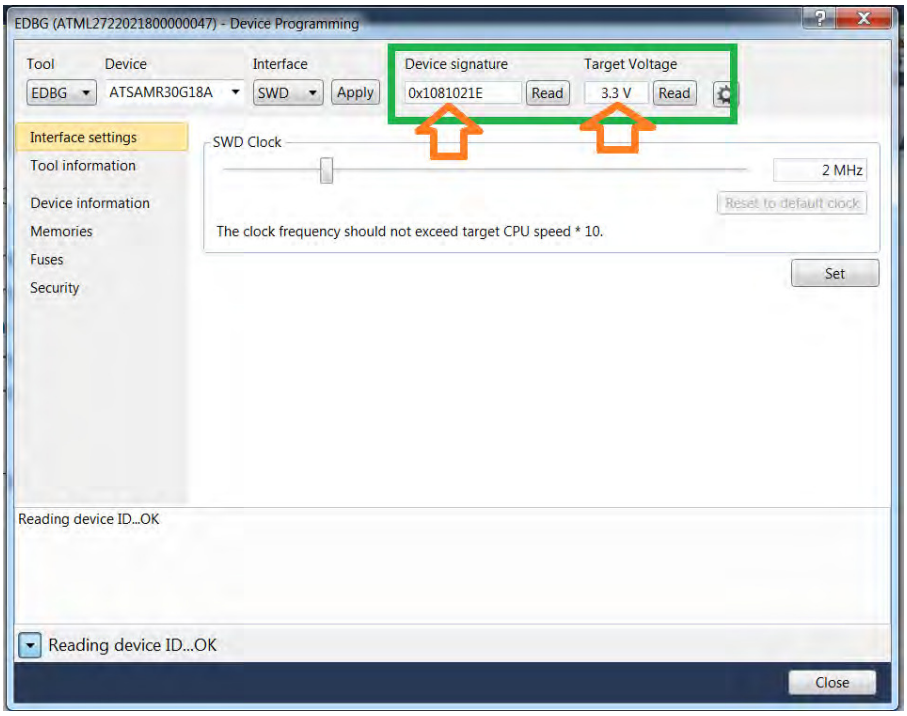
6.4. Once connected to the board,the device programming window will look like as follows



6.5. Read the Device signature and Target Voltage and ensure it is as follows

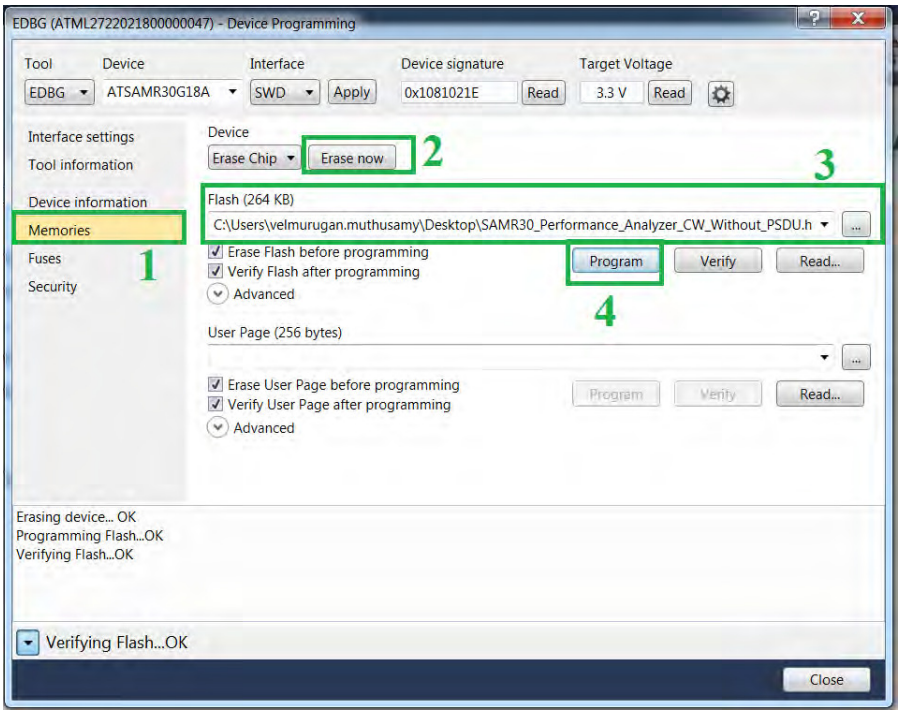
Device Programming: 0x1081021E

Target Volatge: 3.3V



6.6. Once ensured the device signature and Target Voltage, Click on Memories and then click “Erase now” to erase the already existing program in the chip.

Then browse the hex file which you would like to program into the device and click Program.



6.7. Flashing the hex file in the SAMR30-XPRO board completed.

7. SAM R30 Part Pack Intallation

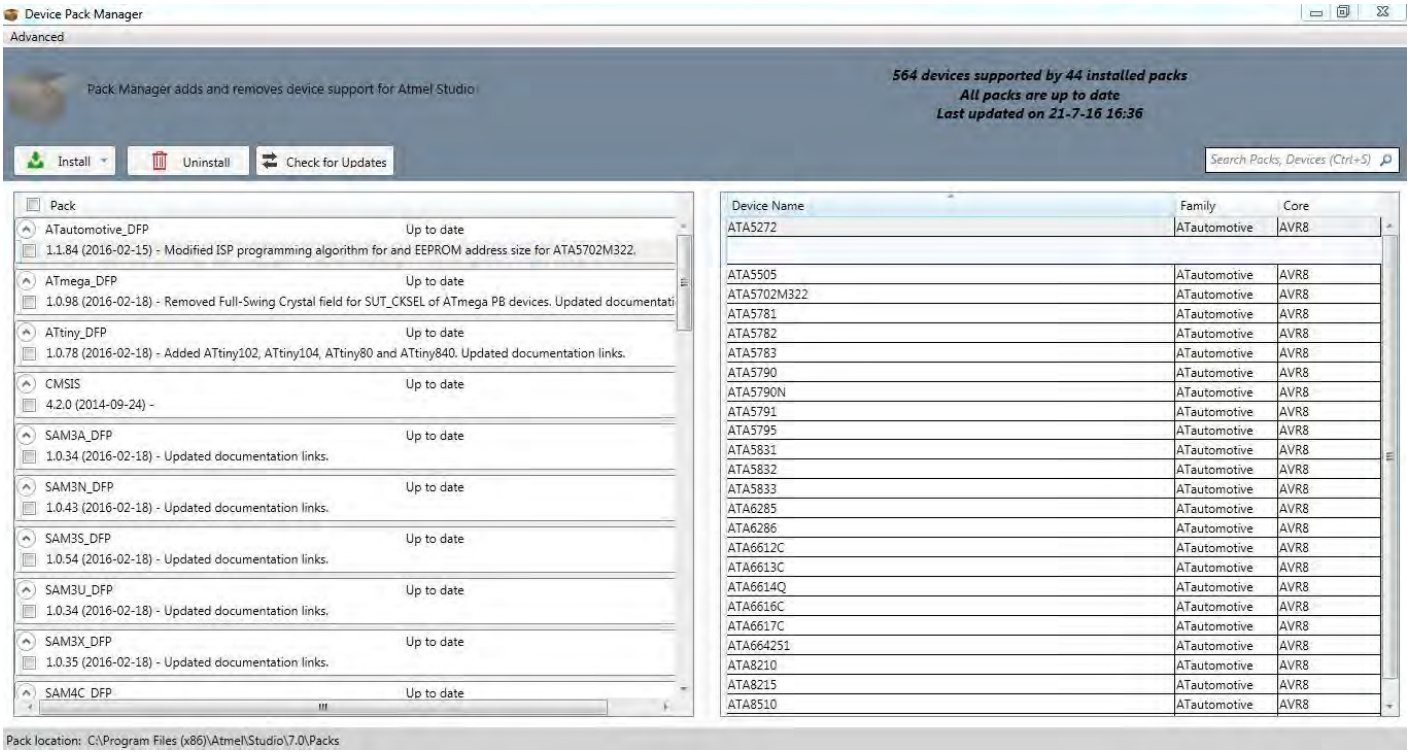
Before using Atmel Studio 7 for programming/debugging in any new device/board, don't forget to install the part pack of the device using following steps,

7.1. Get the part pack of the device.For SAM R30, it is available in the DVD

7.2. Goto the below link C:\Program Files (x86)\Atmel\Studio\7.0\atpackmanager

7.3. Double click on "**PackManager.exe**".

7.4. Device Part Manager window opens as follows and it will list all the device part packs installed.



7.5. To install new part pack, select Install->Browse pack file and choose "DFP" pack and click install.

For SAM R30, DFP pack (*.atpack) is available in the DVD.

8. Performance Analyzer

8.1. Launch Atmel Studio tool by clicking the Atmel Studio icon

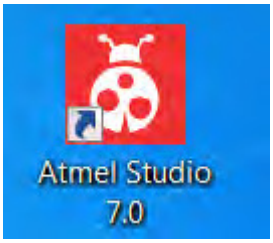


Figure.9 Launch Atmel Studio 7.0

8.2. From the Atmel Studio Start page, launch Performance Analyzer utility by clicking the icon as shown in below figure (or) select Tools → "IEEE 802.15.4 Performance Analyzer".

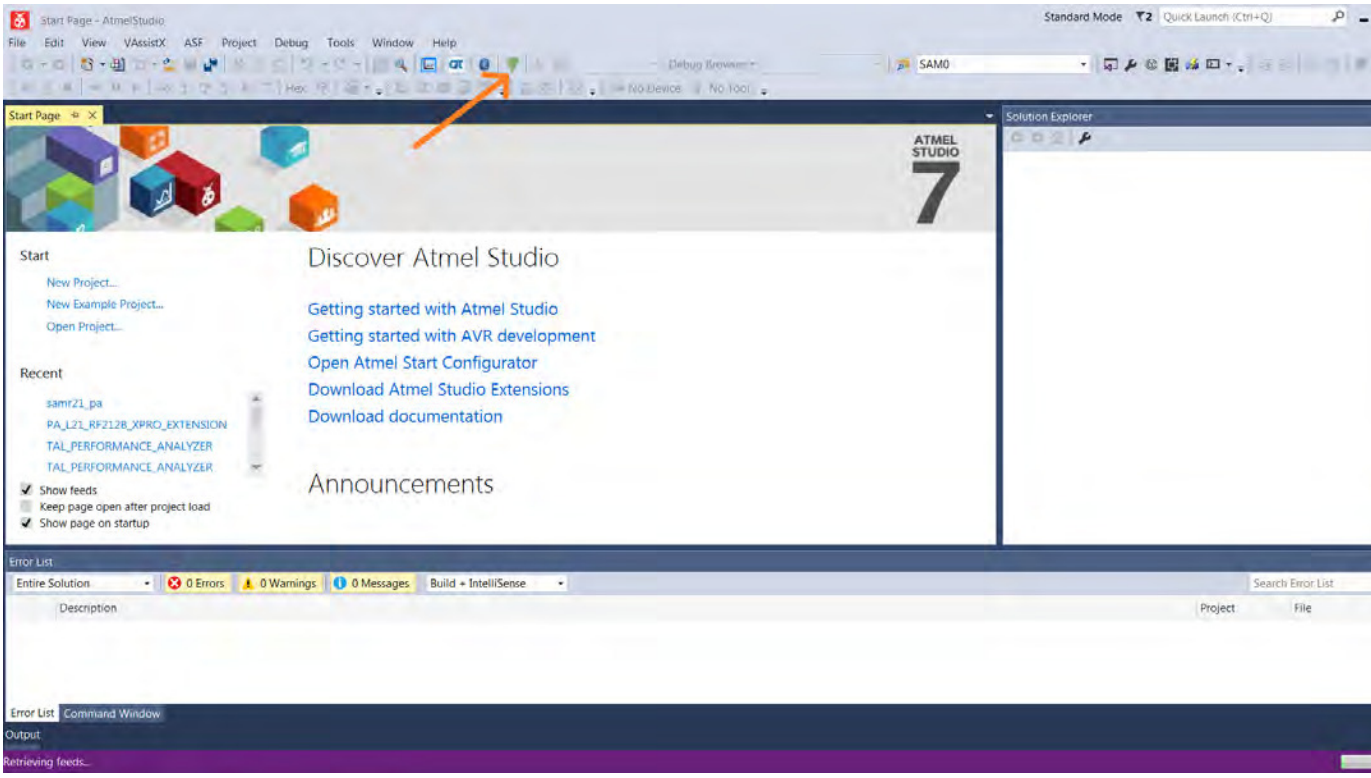


Figure.11 Atmel Studio 7.0 – Start Page

8.3. After clicking the Performance Analyzer icon, Performance Analyzer window will open as shown in the following figure.

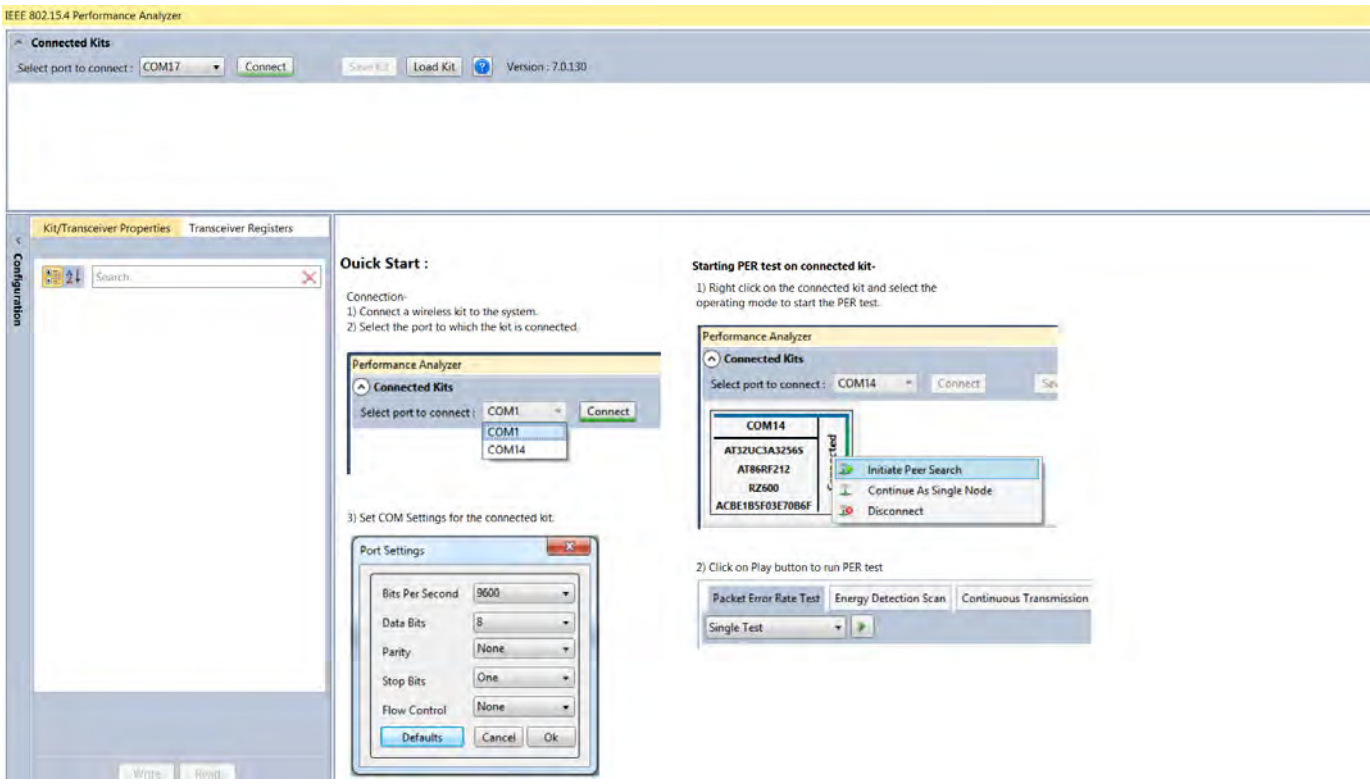


Figure.12 Performance Analyzer

8.4. Ensure the DUT is connected to the PC as explained in Step 1 of Section 5.

9. Connecting kit in Tx Test (Single node / CW):

CW – Continuous Wave Transmission

9.1. Select the COM Port from the dropdown menu and select a COM port to which the kit to be connected and click “Connect”

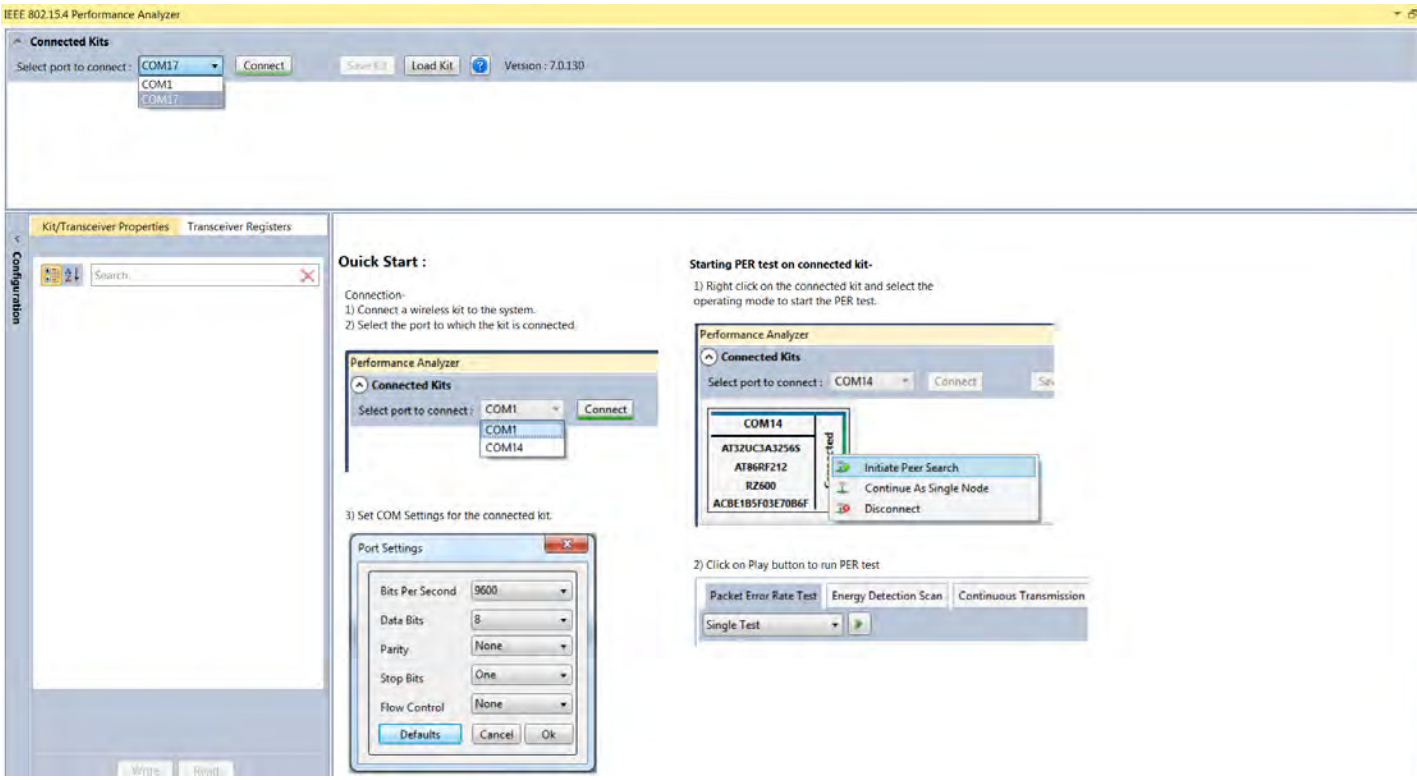
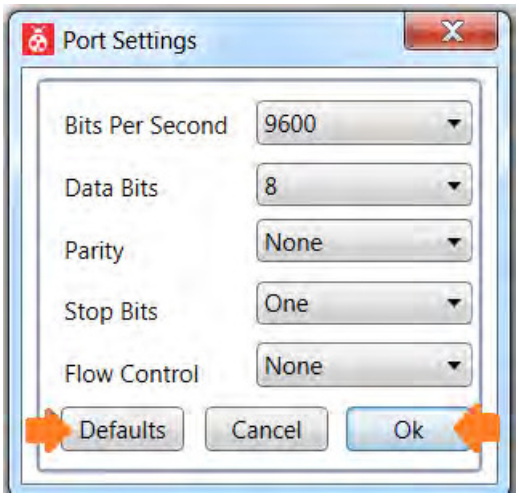


Figure.13 Performance Analyzer – COM Port Selection

Note: COM17 from the above figure is an example. The COM Port number varies depending upon the PC.

9.2. Set the COM settings from the pop-up window. Click “Defaults” and then click “OK”



9.3. To check “transmit only” functionality; right click on the Kit information area select “Continue as a single node”. This setting is used for continuous transmission.

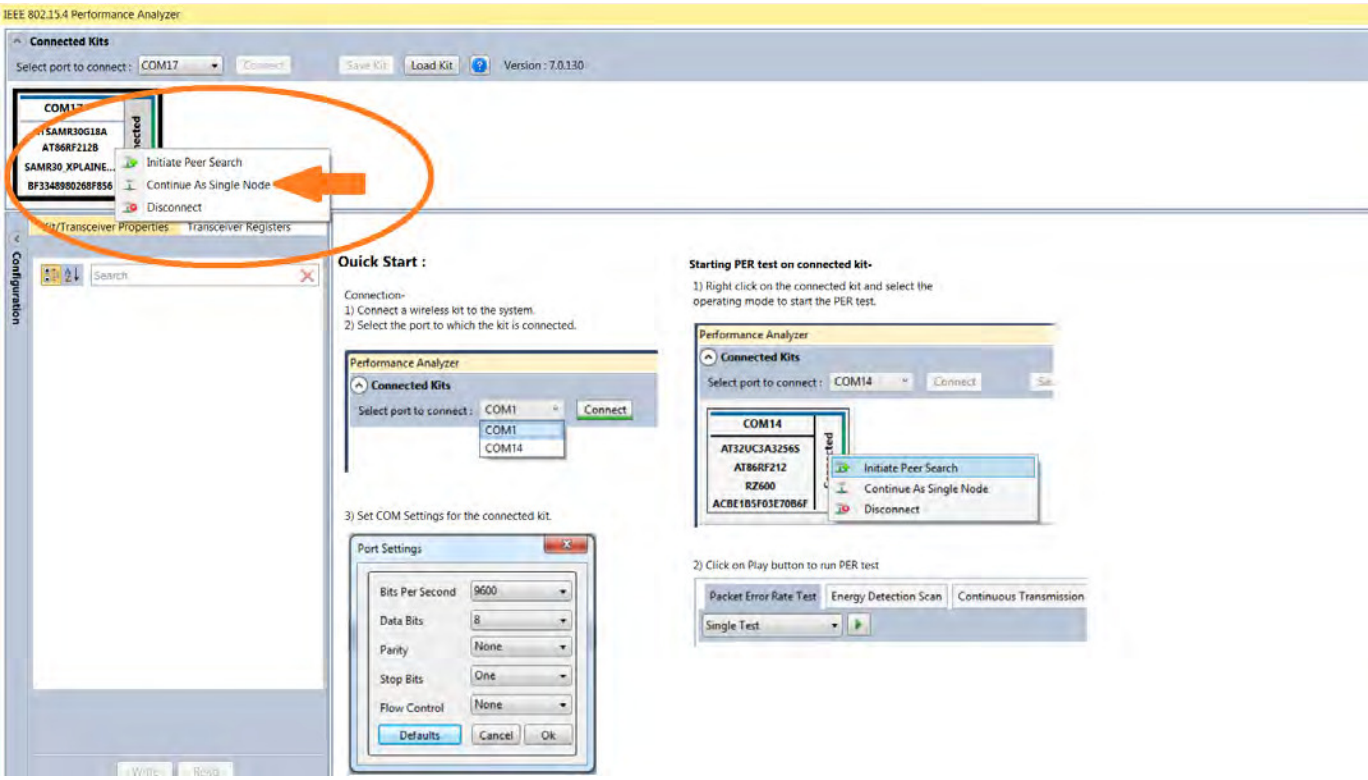
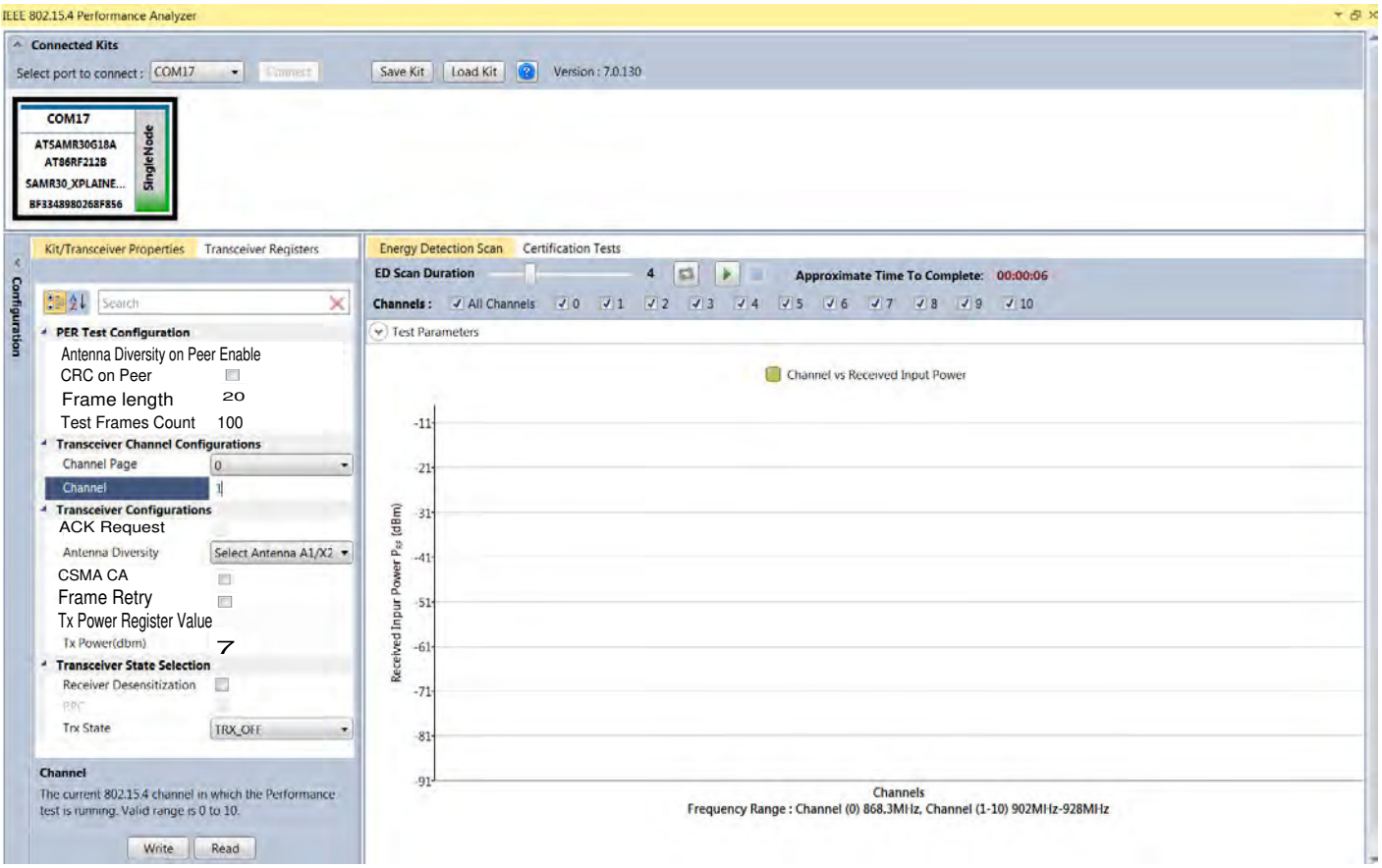


Figure.14 Performance Analyzer – Kit Information

9.4. Kit / Transceiver properties, Channel Page, Channel Number, Antenna Selection and Power level can also be changed in the Performance Analyzer window.



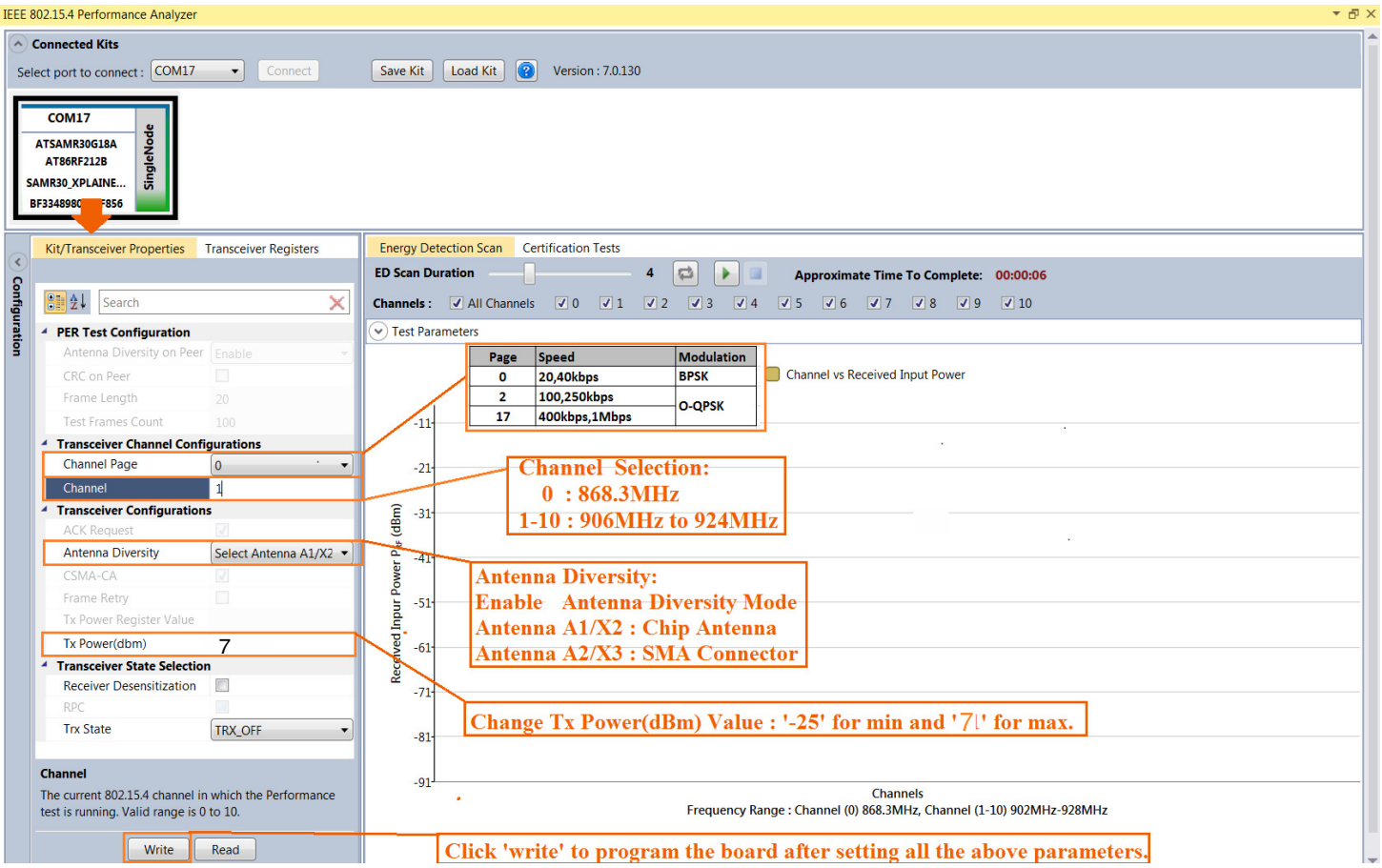


Figure.15 Performance Analyzer – Transceiver configuration

- One channel in the European SRD band from 863MHz to 870MHz at 868.3MHz according to IEEE 802.15.4 (channel k = 0)
- 10 channels in the North American ISM band from 902MHz to 928MHz with a channel spacing of 2MHz according to IEEE 802.15.4. The center frequency of these channels is defined as:
  F_C[MHz] = 906[MHz] + 2[MHz] x (k – 1), for k = 1, 2, ..., 10

  where k is the channel number.

9.5. To Transmit CW mode or PRBS mode, click on Certification tab and Continuous transmission and CW or PRBS.

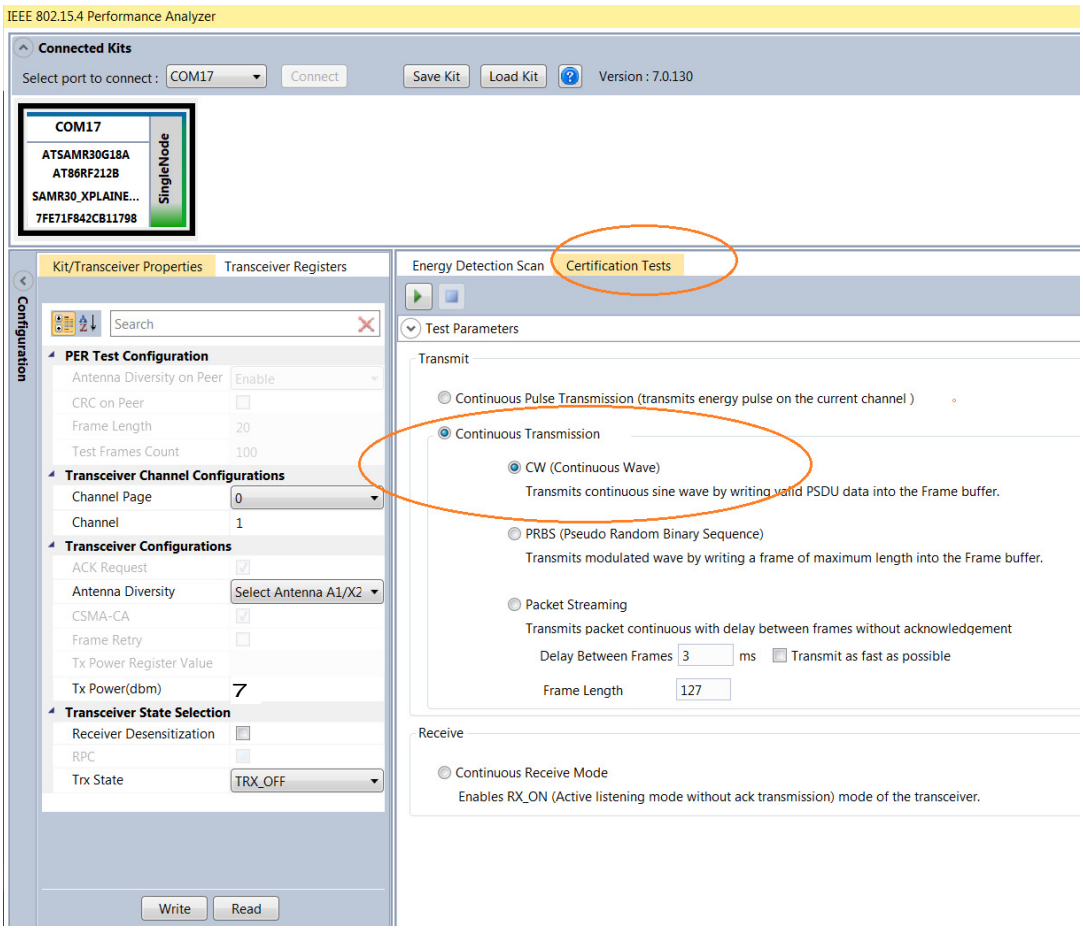
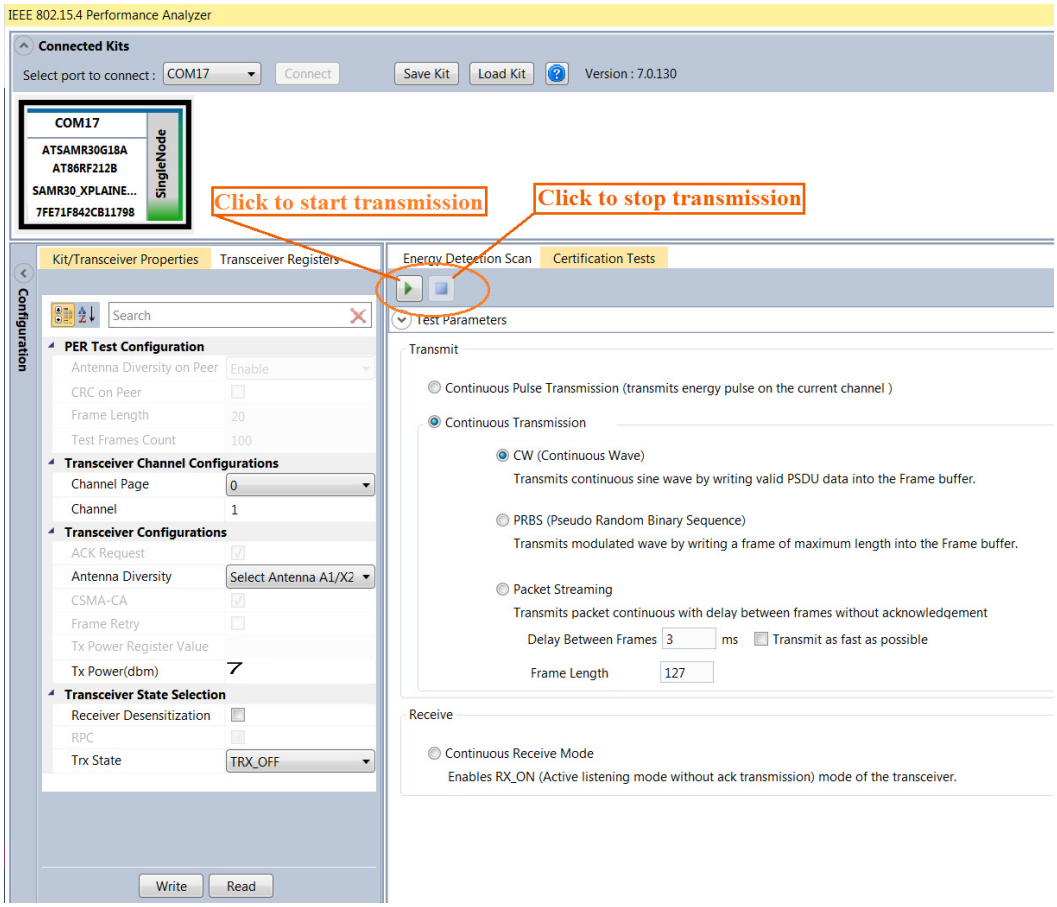


Figure.16 Performance Analyzer – Continuous Tx mode configuration



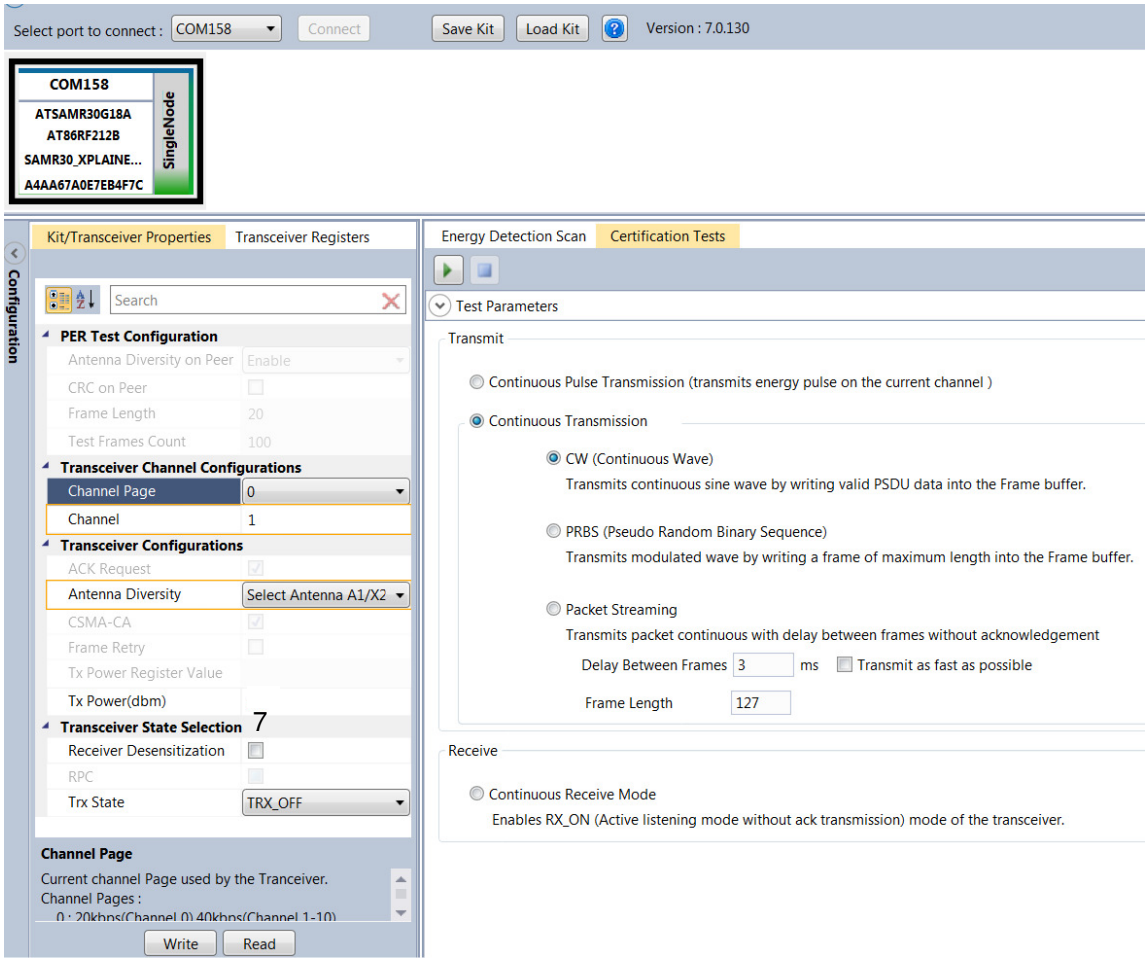
10. Tx Test Modes:

10.1. Tx Test (Single node / CW) for Sub-1GHz FCCTesting:

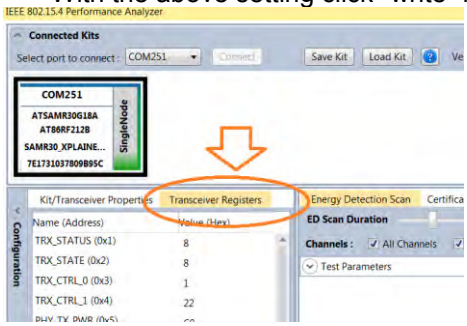
10.1.1. Operating mode #1: BPSK-40-ALT , 40kbps, 7dBm:

Connect and test the DUT in single test mode as mentioned in Section-9 with the following configuration,

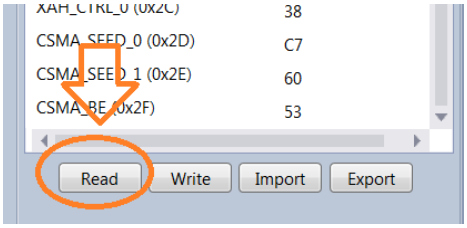
Performance Analyzer Parameter	Setting
Channel Page	0
Channel	1 to 10
Antenna Diversity	Select Anetnna A1/X2
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	TRX_OFF
TRX_CTRL_2 (0xC)	B4



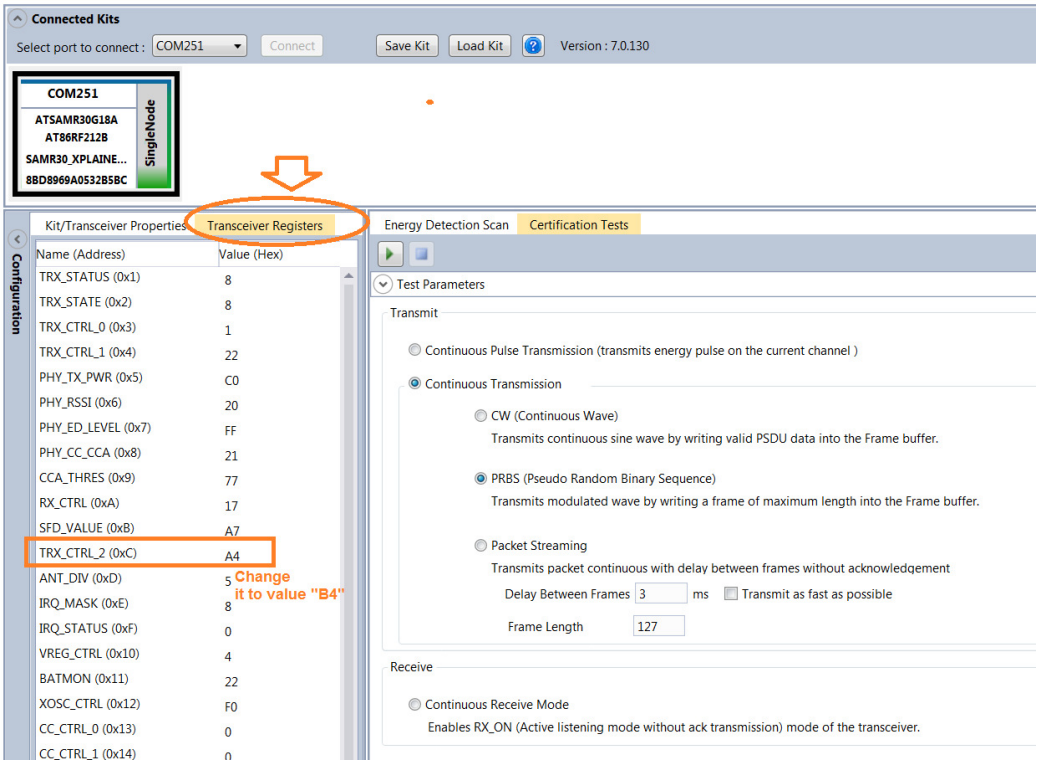
- With the above setting click “write” icon and go to “Transceiver Registers” tab.



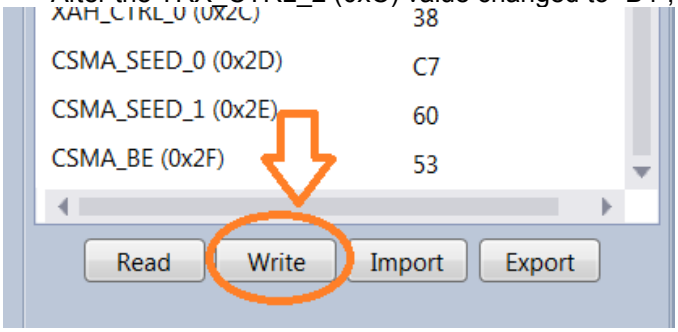
- At the bottom corner, there is an icon called “Read”, click it.



- Then Change the register value of TRX_CTRL_2 (0xC) to “B4” as shown in the below image and press ‘Enter’ in keyboard



- After the TRX_CTRL_2 (0xC) value changed to “B4”, click the “Write” icon and do the test.

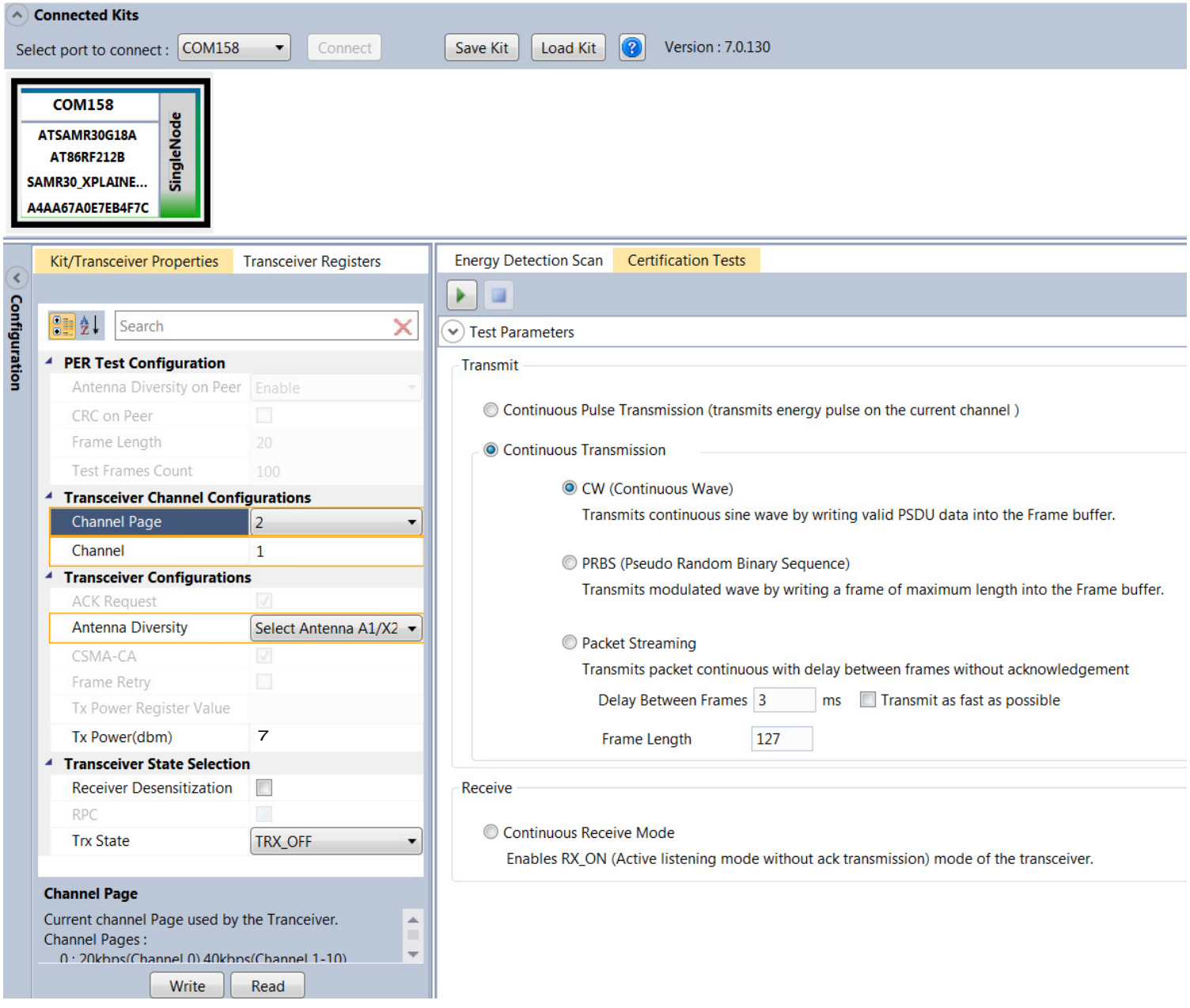


Important Note: Everytime when you change the channel or power or channel page, we need to change the TRX_CTRL_2 register value to “B4”.

10.1.2. Operating mode #2: OQPSK-SIN-250, 250kbps, 7dBm:

Connect and test the DUT in single test mode as mentioned in Section-9 with the following configuration,

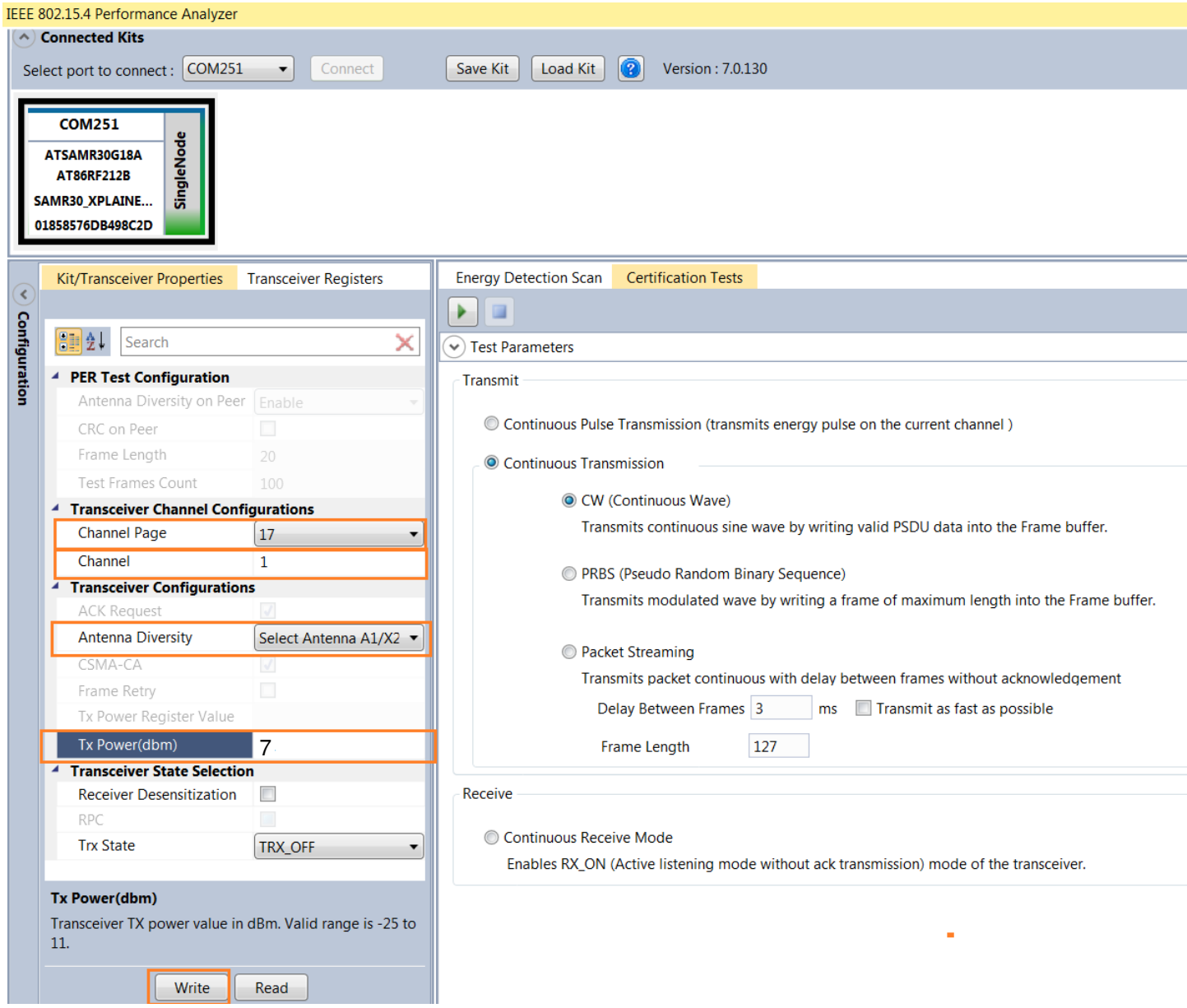
Performance Analyzer Parameter	Setting
Channel Page	2
Channel	1 to 10
Antenna Diversity	Select Anetnna A1/X2
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	TRX_OFF



10.1.3. Operating mode #3: OQPSK-SIN-1000-SCR-ON , 1Mbps, 7dBm:

Connect and test the DUT in single test mode as mentioned in Section-9 with the following configuration,

Performance Analyzer Parameter	Setting
Channel Page	17
Channel	1 to 10
Antenna Diversity	Select Anetnna A1/X2
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	TRX_OFF

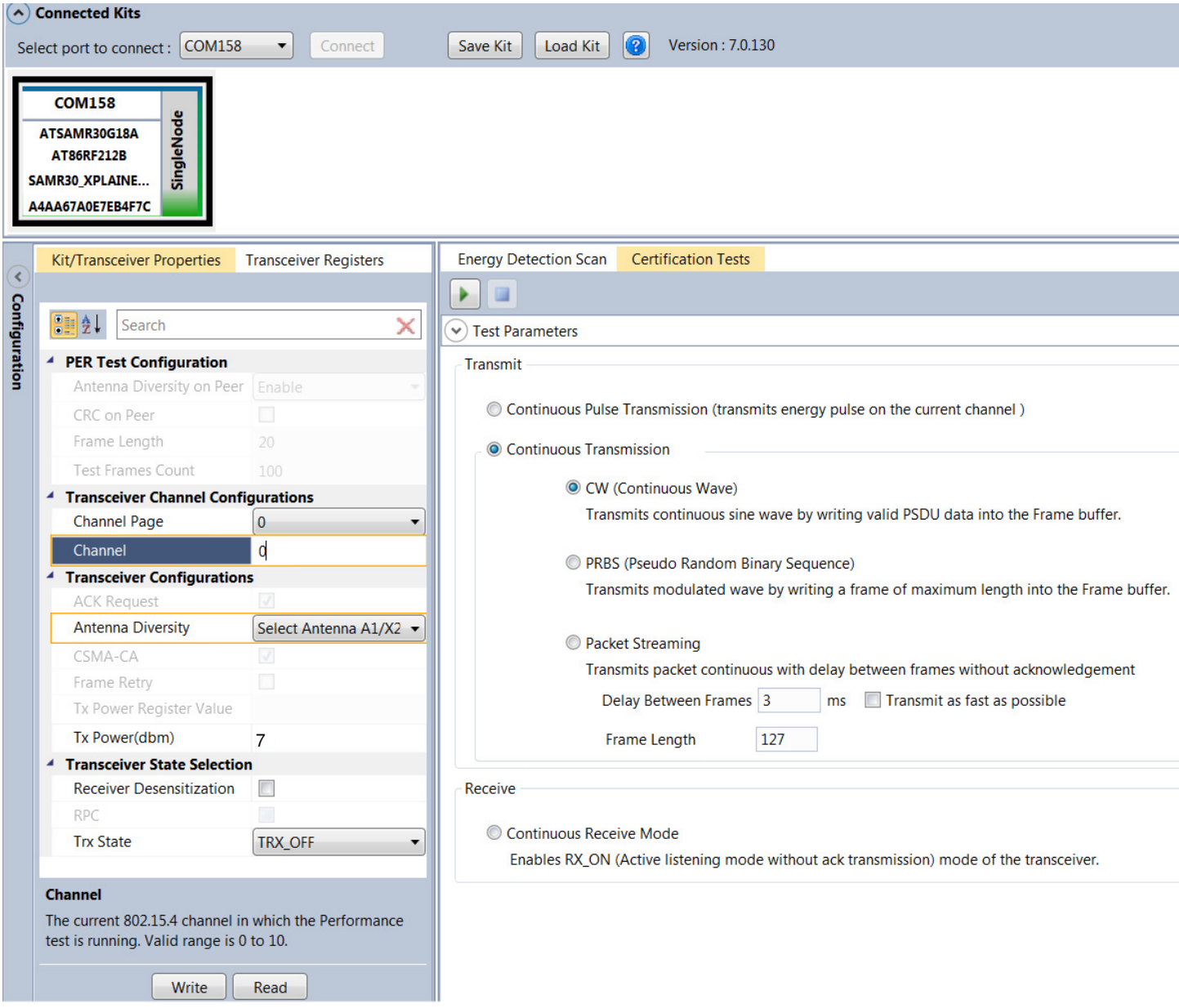


10.2. Tx Test (Single node / CW) for Sub-1GHz CE Testing

10.2.1. Operating Mode#4: BPSK-20, 20kbps, 7dBm:

Connect and test the DUT in single test mode as mentioned in Section-9 with the following configuration,

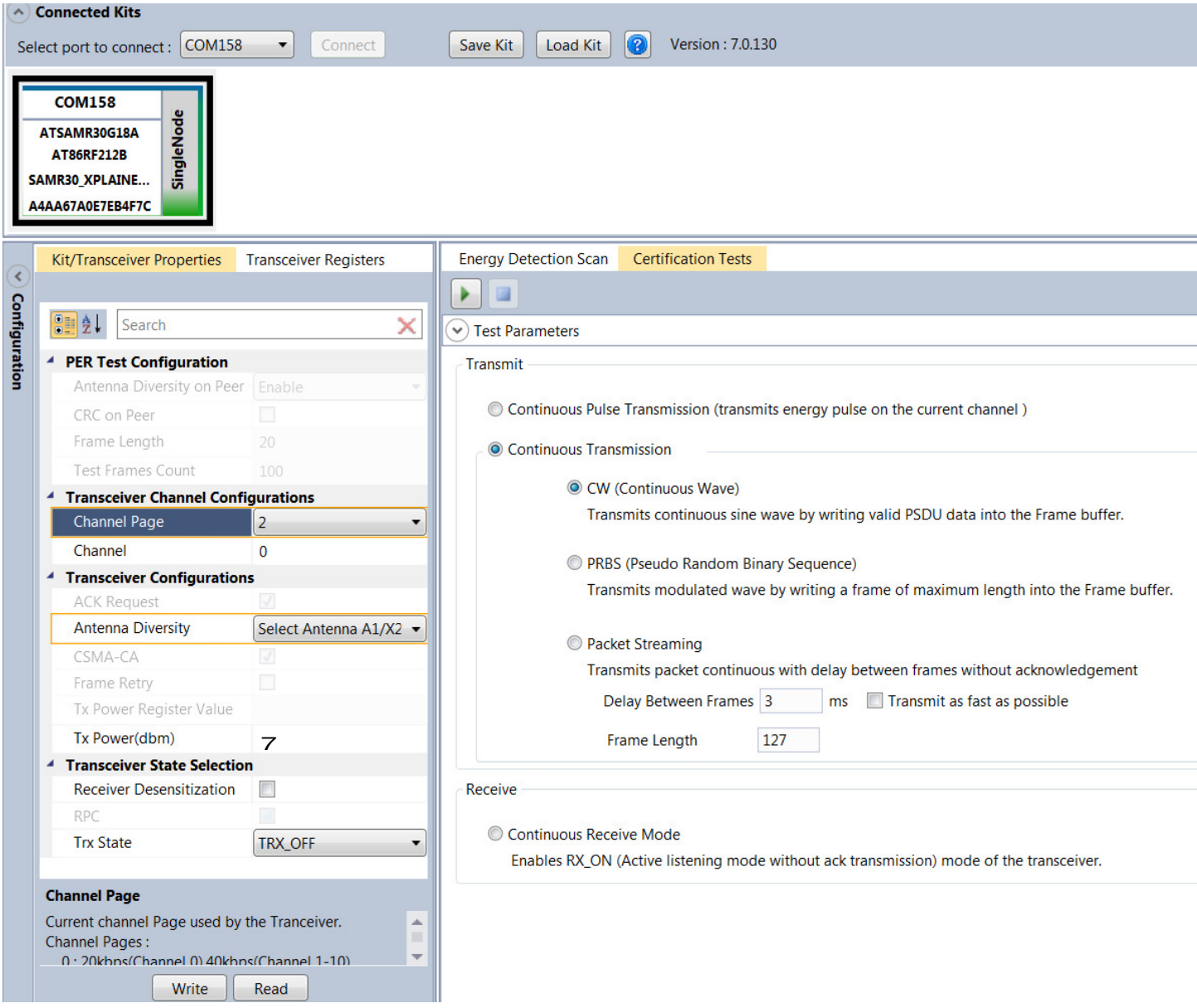
Performance Analyzer Parameter	Setting
Channel Page	0
Channel	0
Antenna Diversity	Select Anetnna A1/X2
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	TRX_OFF



10.2.2. Operating Mode#5: OQPSK-SIN-RC-100, 100kbps, 7dBm:

Connect and test the DUT in single test mode as mentioned in Section-9 with the following configuration,

Performance Analyzer Parameter	Setting
Channel Page	2
Channel	0
Antenna Diversity	Select Anetnna A1/X2
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	TRX_OFF



11. Connecting kit in Tx-Rx Test mode (Transmit and Receive test):

11.1. Connect two devices with PC by USB cables and so both are power up.

11.2. Select one COM Port and click ‘connect’ the device corresponding to that COM port is connected and select “Initiate Peer Search” So other device connect by RF (RF Pairring). (Device connected to COM Port is transmitter and other device is receiver)

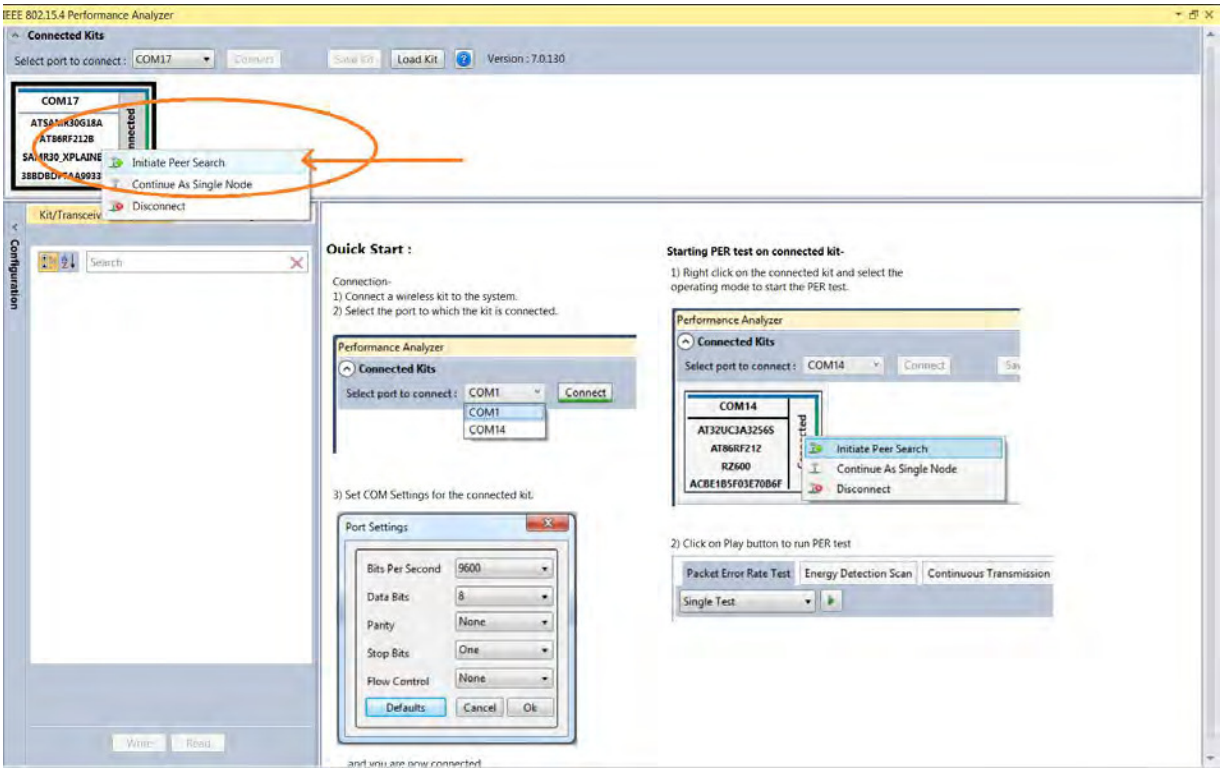


Figure 21: Performance Analyzer – Paring devices

11.3. When both the devices are paired, the following window appears and it is ready to perform PER (Packet Error Rate) test. Tranmitting channel, number of frames (packets), Tx Power value can be configured from the left side of the window.

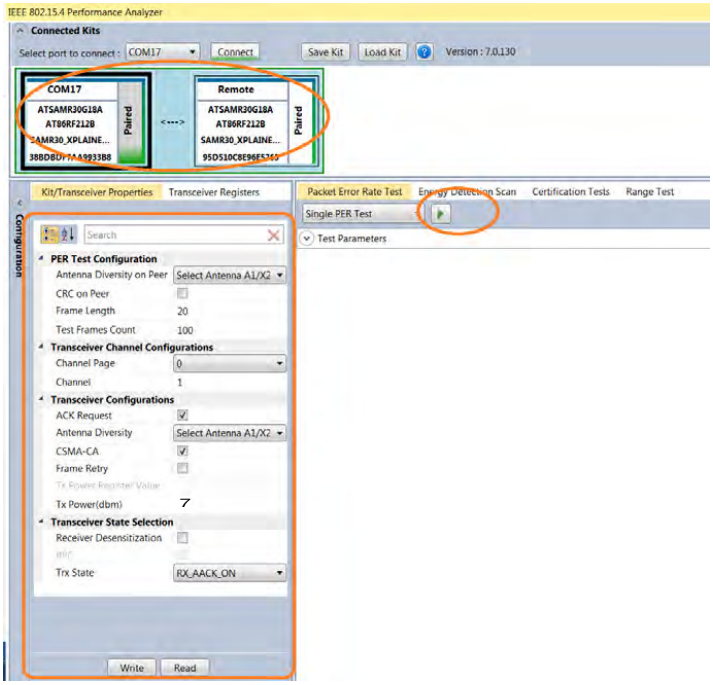


Figure 22: Performance Analyzer – PER Test Configuration

11.4. PER test is Transmit and Receive test. Number of transmit packets can be set by changing “Test Frames Count”

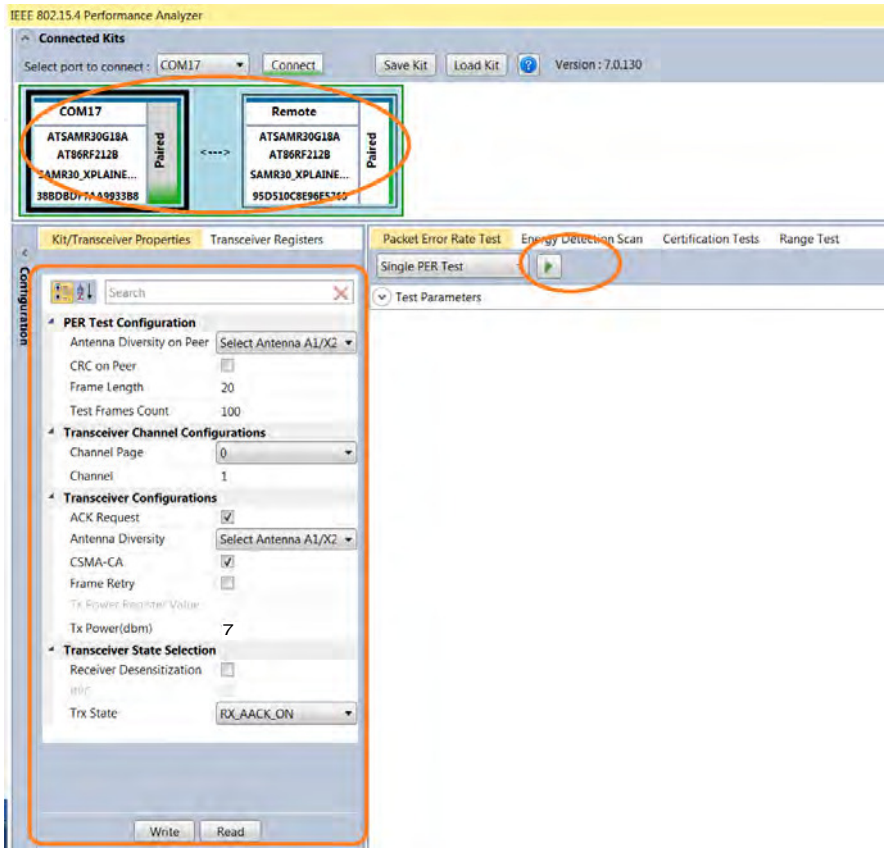


Figure 23: Performance Analyzer – Transmit Packets

11.5. Run Single PER Test. Test parameter window display the Transmit packets (Frames transmitted), Receive packets (Frames received) and RSSI (receive signal strength)

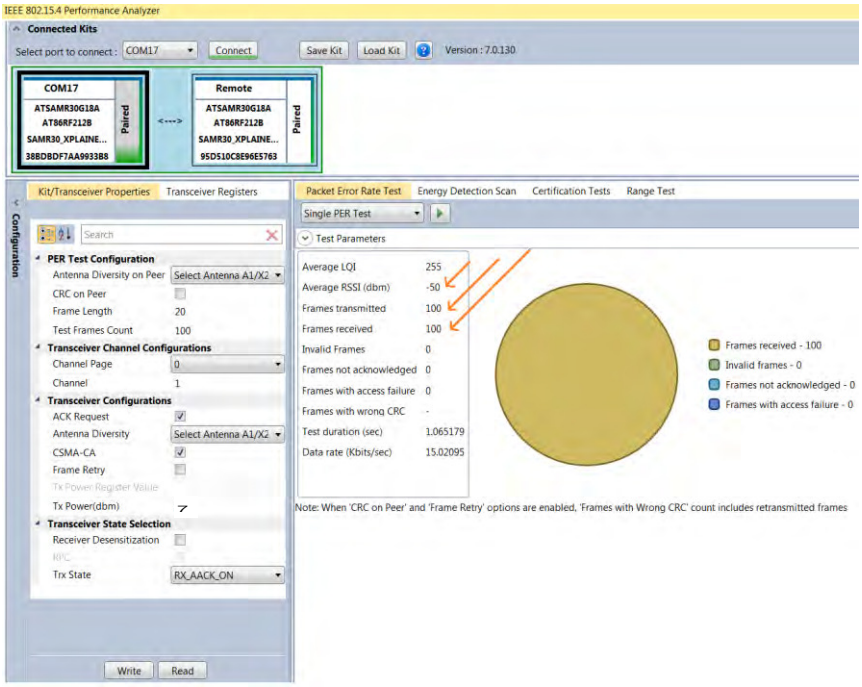


Figure 24: Performance Analyzer – PER Test

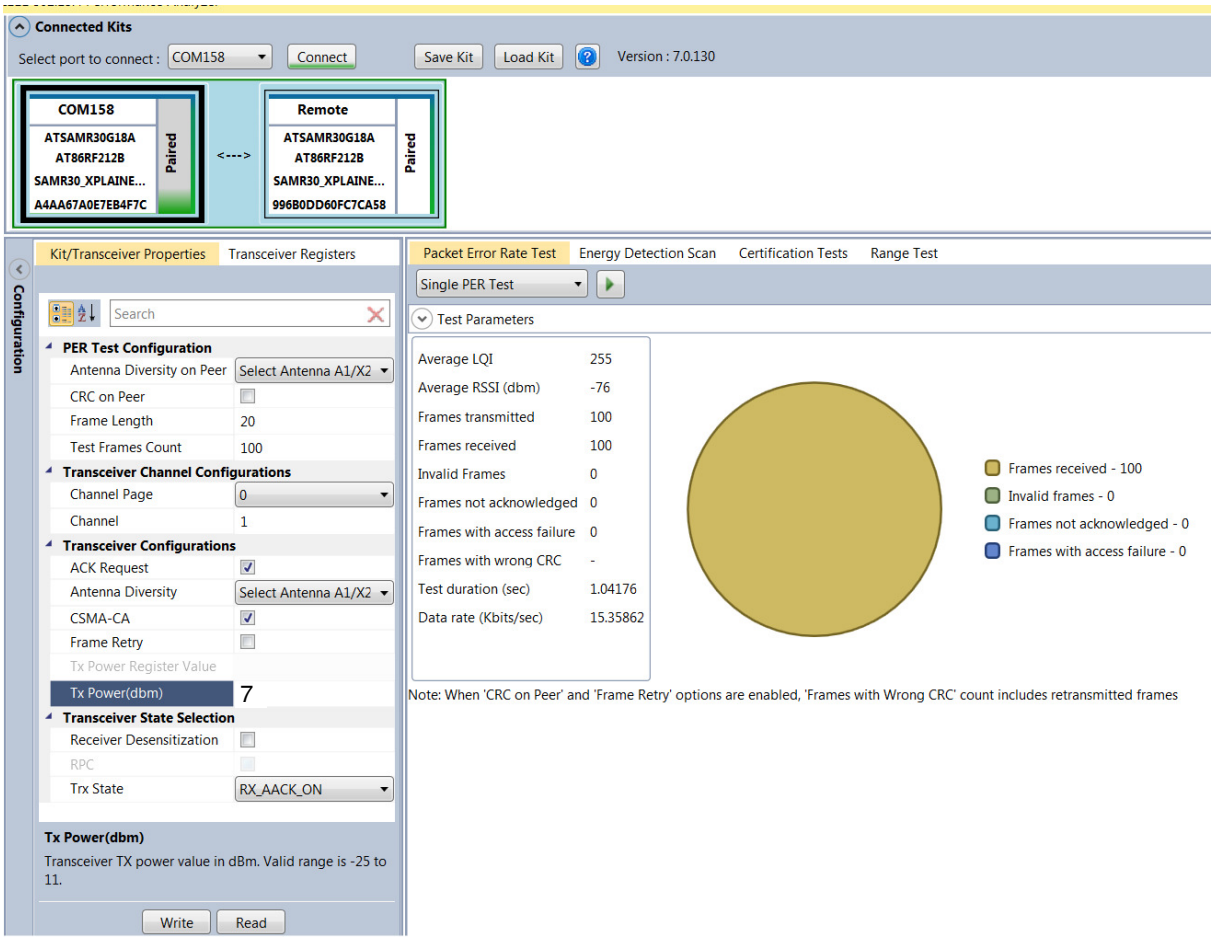
12. TRX Test Modes:

12.1.1. Tx-Rx Test (Transmit and Receive test) for Sub-1GHz FCC Testing

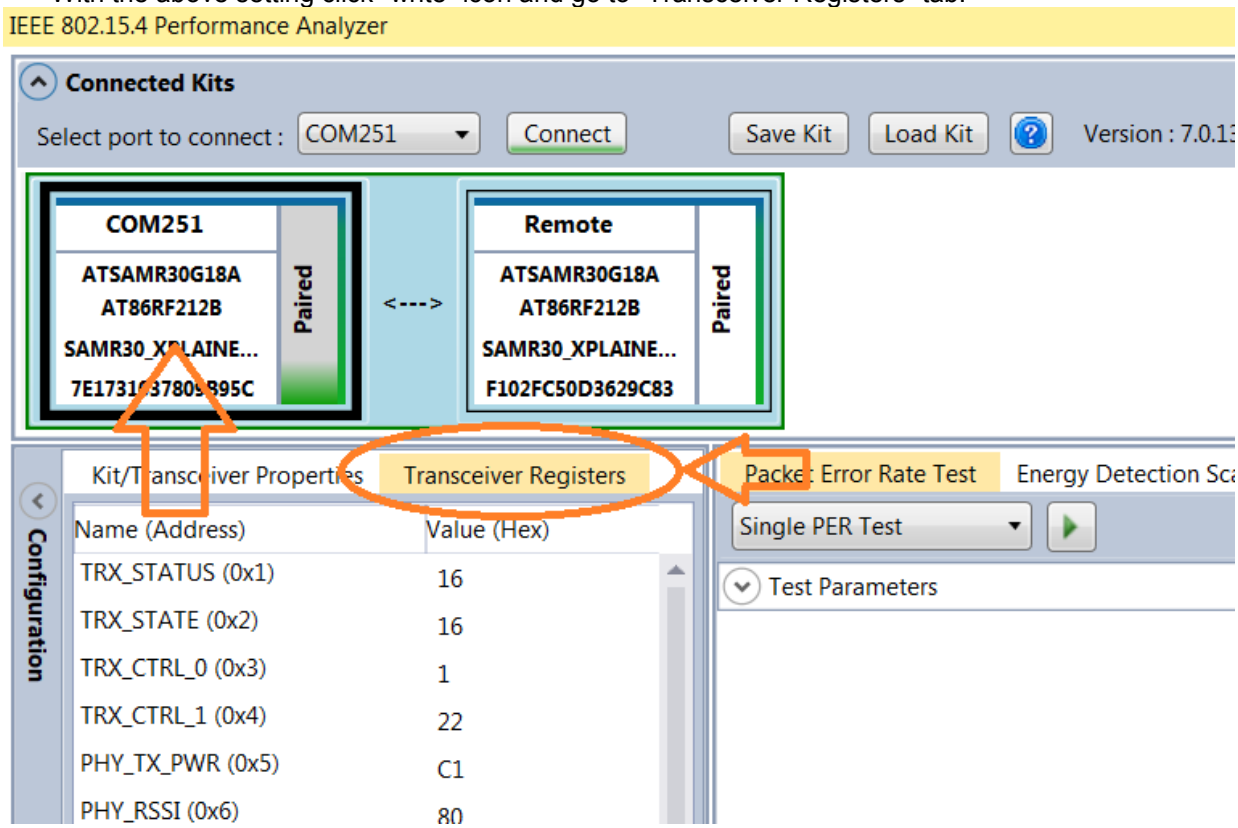
12.1.2. Tx-Rx Test - Operating mode #1 : BPSK-40-ALT , 40kbps, 7dBm:

Connect and test the DUT in single test mode as mentioned in Section-11 with the following configuration,

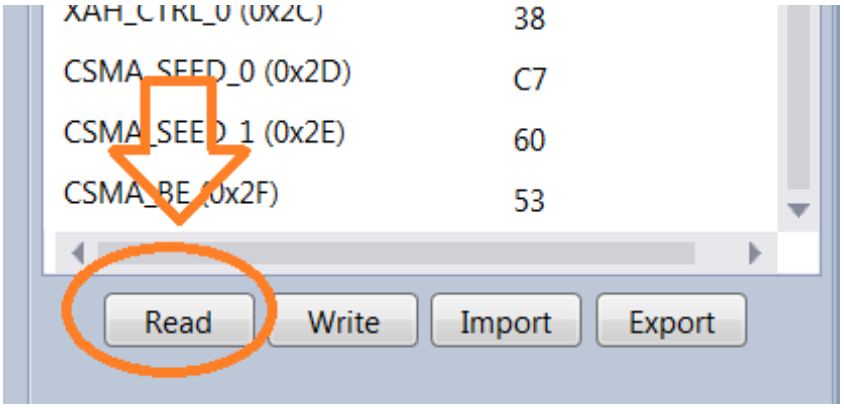
Performance Analyzer Parameter	Setting
Antenna Diversity on Peer	Select Anetnna A1/X2
CRC on Peer	- (Unchecked)
Frame Length	20
Test Frame Count	100
Channel Page	0
Channel	1 to 10
ACK Request	Checked
Antenna Diversity	Select Anetnna A1/X2
CSMA-CA	Checked
Frame Retry	- (Unchecked)
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	RX_AACK_ON
TRX_CTRL_2 (0xC)	B4



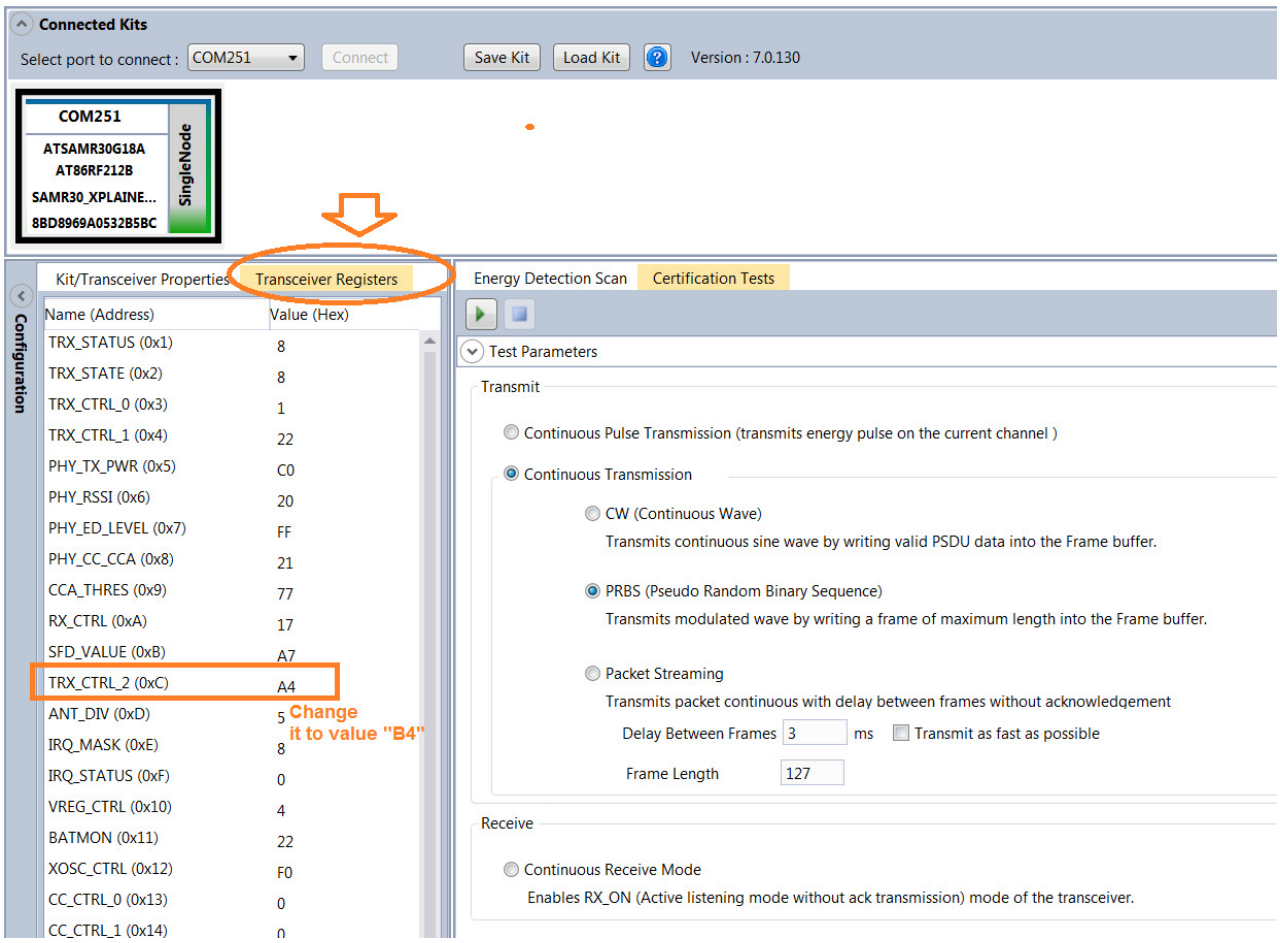
- With the above setting click “write” icon and go to “Transceiver Registers” tab.



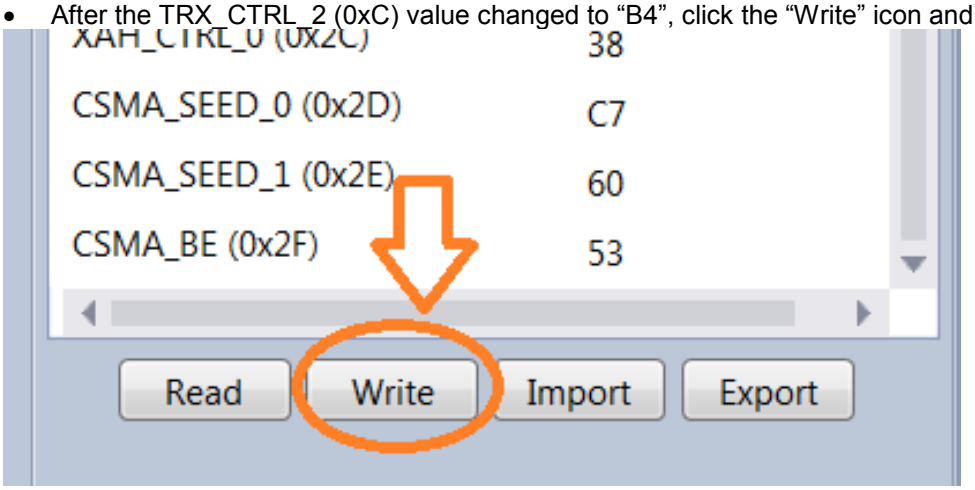
- At the bottom corner, there is an icon called “Read”, click it.



- Then Change the register value of TRX_CTRL_2 (0xC) to “B4” as shown in the below image and press ‘Enter’ in keyboard



- After the TRX_CTRL_2 (0xC) value changed to “B4”, click the “Write” icon and do the test.

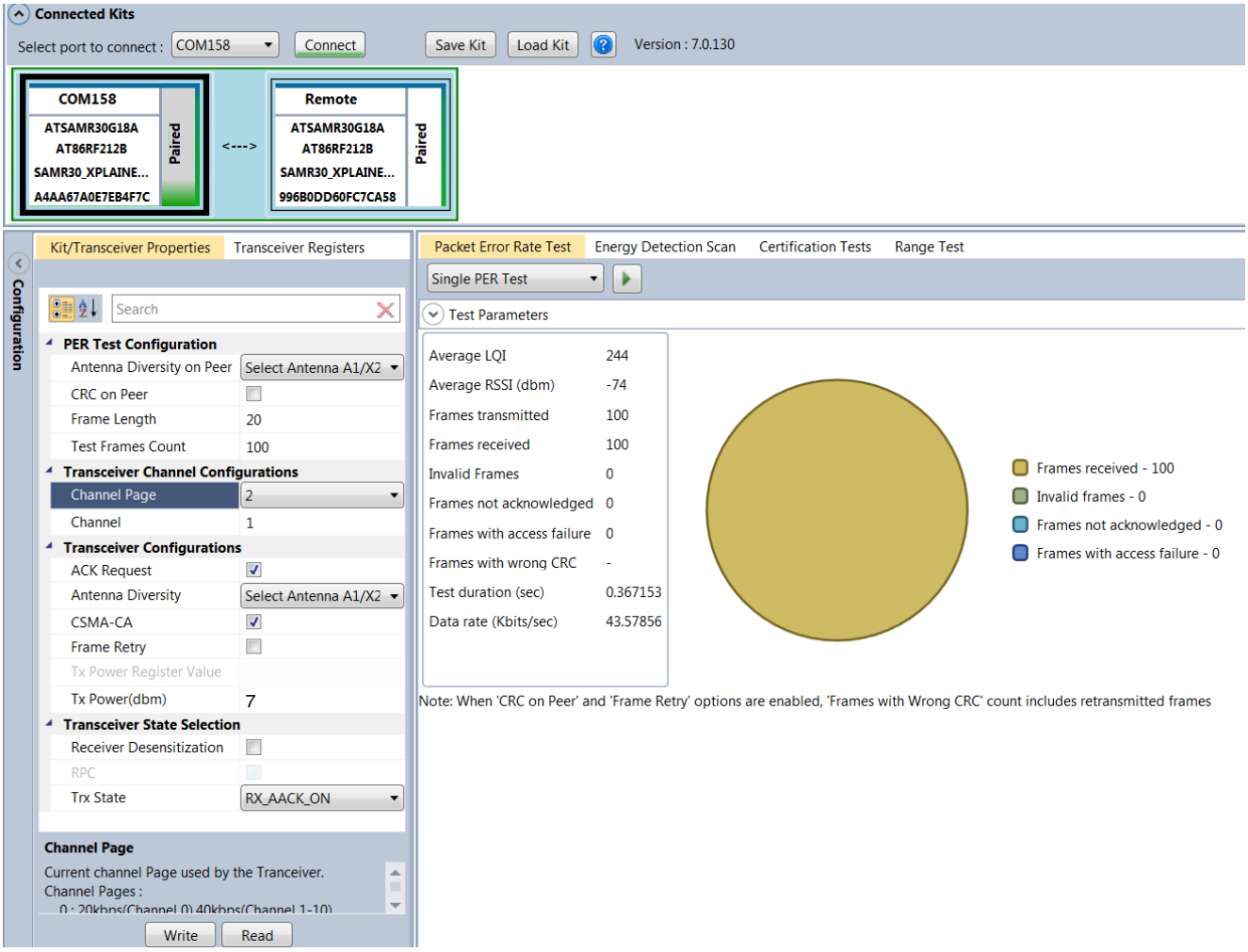


Important Note: Everytime when you change the channel or power or channel page, we need to change the TRX_CTRL_2 register value to “B4”.

12.1.3. Tx-Rx Test - Operating mode #2: OQPSK-SIN-250, 250kbps, 7dBm:

Connect and test the DUT in single test mode as mentioned in Section-11 with the following configuration,

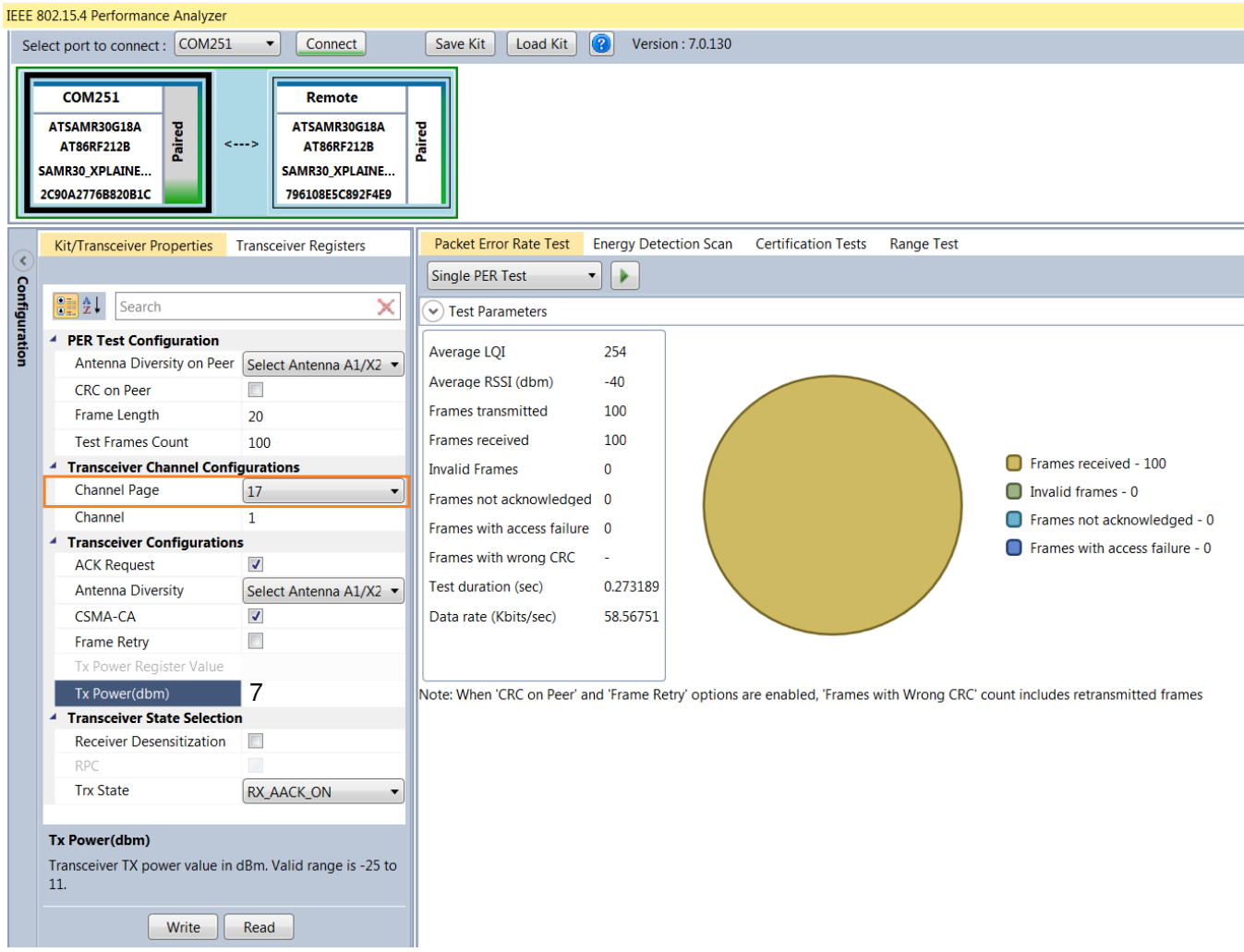
Performance Analyzer Parameter	Setting
Antenna Diversity on Peer	Select Anetnna A1/X2
CRC on Peer	- (Unchecked)
Frame Length	20
Test Frame Count	100
Channel Page	2
Channel	1 to 10
ACK Request	Checked
Antenna Diversity	Select Anetnna A1/X2
CSMA-CA	Checked
Frame Retry	- (Unchecked)
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	RX_AACK_ON



12.1.4. Tx-Rx Test - Operating mode #3: OQPSK-SIN-1000-SCR-ON, 1Mbps, 7dBm:

Connect and test the DUT in single test mode as mentioned in Section-11 with the following configuration,

Performance Analyzer Parameter	Setting
Antenna Diversity on Peer	Select Anetnna A1/X2
CRC on Peer	- (Unchecked)
Frame Length	20
Test Frame Count	100
Channel Page	17
Channel	1 to 10
ACK Request	Checked
Antenna Diversity	Select Anetnna A1/X2
CSMA-CA	Checked
Frame Retry	- (Unchecked)
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	RX_AACK_ON

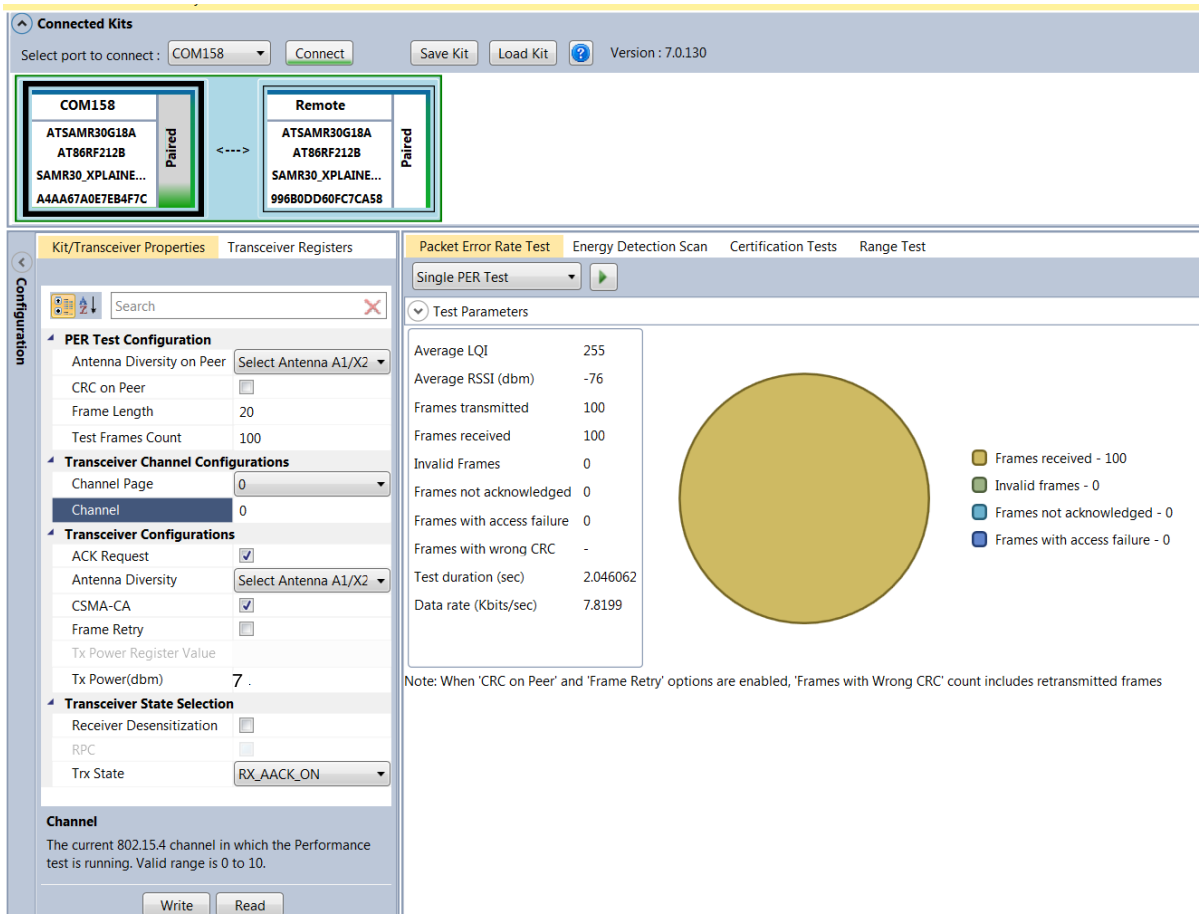


12.2. Tx-Rx Test (Transmit and Receive test) for Sub-1GHz CE Testing

12.2.1. Tx-Rx Test - Operating Mode#4: BPSK-20, 20kbps, 7dBm:

Connect and test the DUT in single test mode as mentioned in Section-11 with the following configuration,

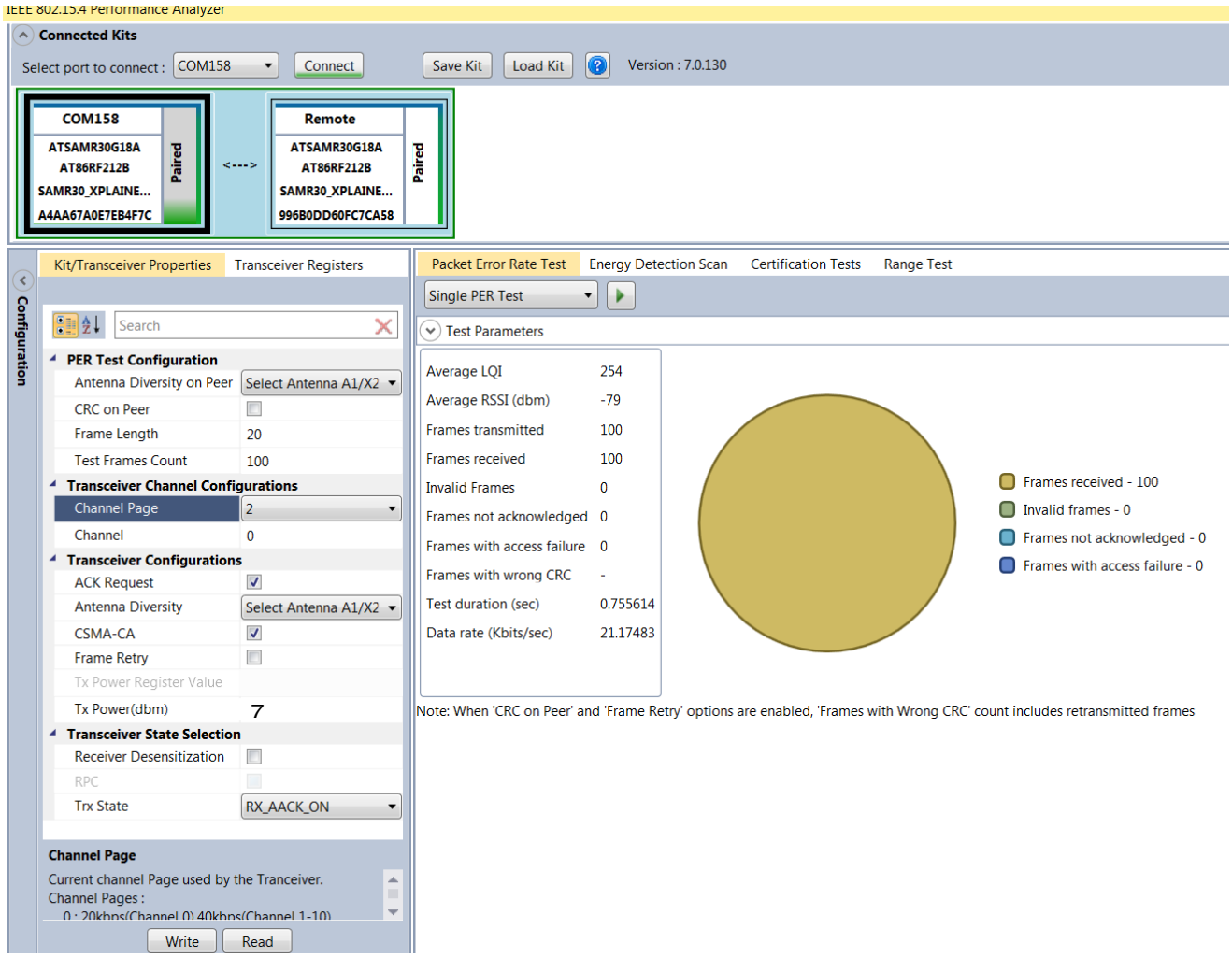
Performance Analyzer Parameter	Setting
Antenna Diversity on Peer	Select Anetnna A1/X2
CRC on Peer	- (Unchecked)
Frame Length	20
Test Frame Count	100
Channel Page	0
Channel	0
ACK Request	Checked
Antenna Diversity	Select Anetnna A1/X2
CSMA-CA	Checked
Frame Retry	- (Unchecked)
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	RX_AACK_ON



12.2.2. Tx-RxTest - Operating Mode#5: OQPSK-SIN-RC-100, 100kbps,7dBm:

Connect and test the DUT in single test mode as mentioned in Section-11 with the following configuration,

Performance Analyzer Parameter	Setting
Antenna Diversity on Peer	Select Anetnna A1/X2
CRC on Peer	- (Unchecked)
Frame Length	20
Test Frame Count	100
Channel Page	2
Channel	0
ACK Request	Checked
Antenna Diversity	Select Anetnna A1/X2
CSMA-CA	Checked
Frame Retry	- (Unchecked)
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	RX_AACK_ON



FCC Caution:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module. The final end product must be labeled in a visible area with the following" Contains FCC ID: VM4A092722

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for uncontrolled environment .This equipment should be installed and operated with minimum distance 20cm between the radiator& your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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