

ATSAMR30-XPRO [USER MANUAL]

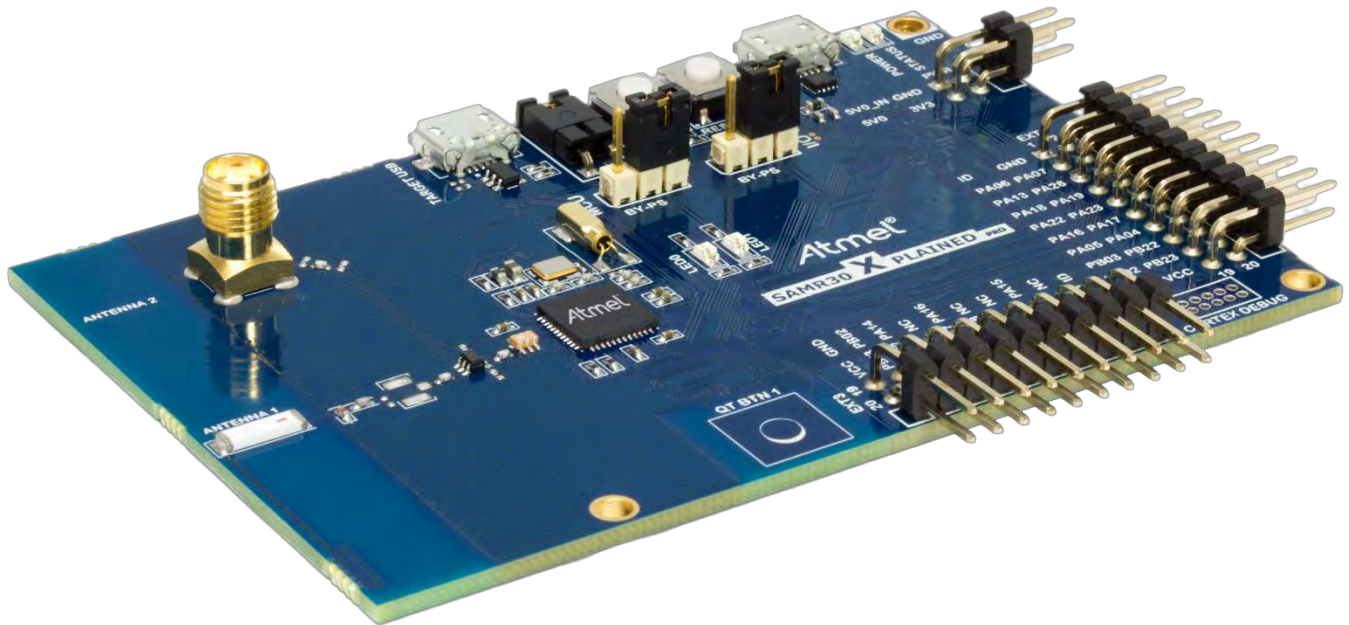


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1. Introduction

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.

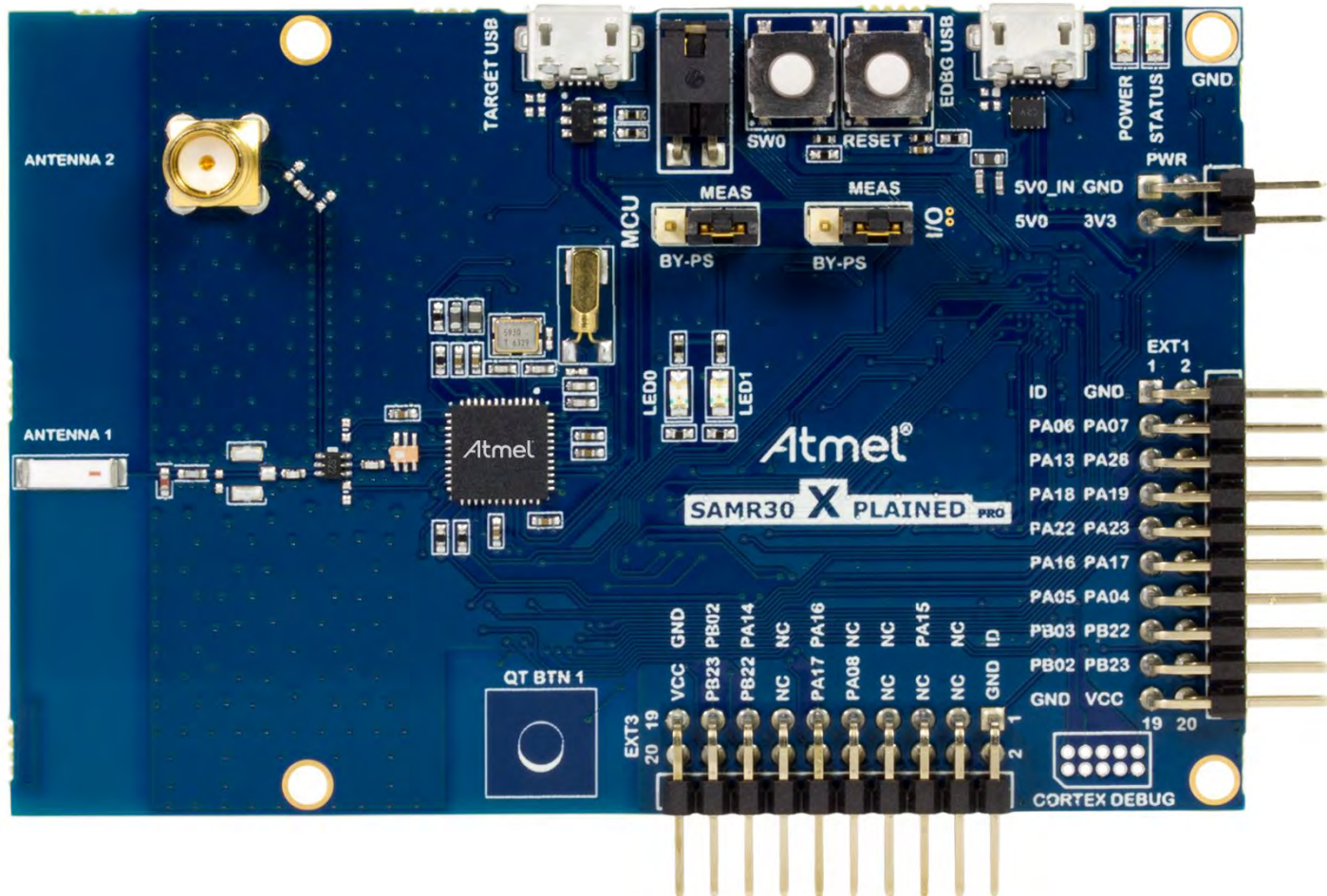


Figure 1 : Atmel ATSAMR30-XPRO Board

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

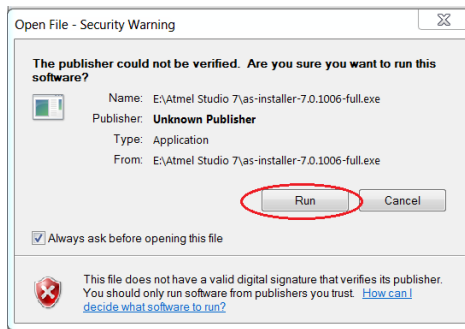
Note: If Atmel Studio 7 is already available in Test PC, jump to step 4.2 in this section and install wireless composer

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

Name	Date modified	Type	Size
 as-installer-7.0.1006-full	7/21/2016 4:58 PM	Application	876,683 KB
 Atmel.SAMR30_DFP-1.0.7	7/21/2016 4:30 PM	Atmel Pack File	495 KB
 SAMR30_PERFORMANCE_ANALYZER	11/21/2016 11:24 ...	HEX File	178 KB
 wireless-composer-7.0.130	5/26/2016 12:43 PM	VSIX File	3,079 KB

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

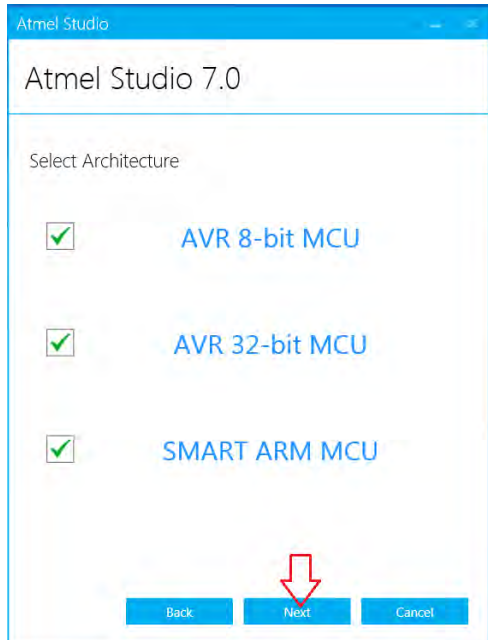
- 4.1.3. Click Run icon.



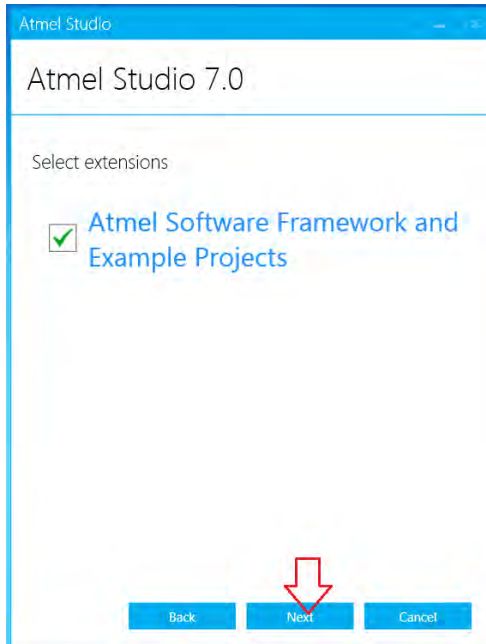
- 4.1.4. Once you clicked the Run icon, the Atmel Studio 7 installer Wizard dialog box opens and agree the licence terms and conditions. Then click “Next”



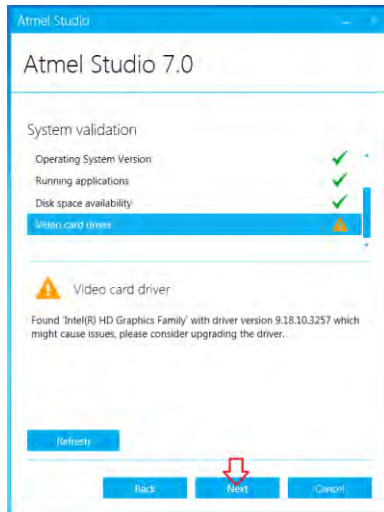
4.1.5. Ensure all the Architectures are selected and click “Next”.



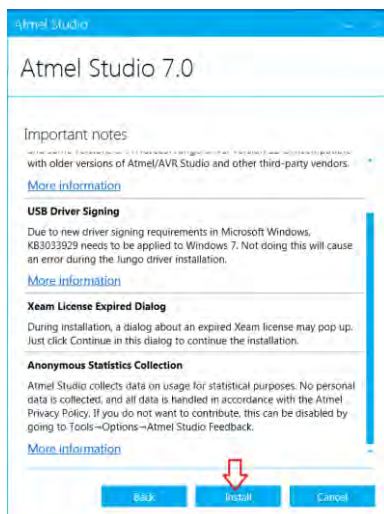
4.1.6. Select ASF extensions and click “Next”



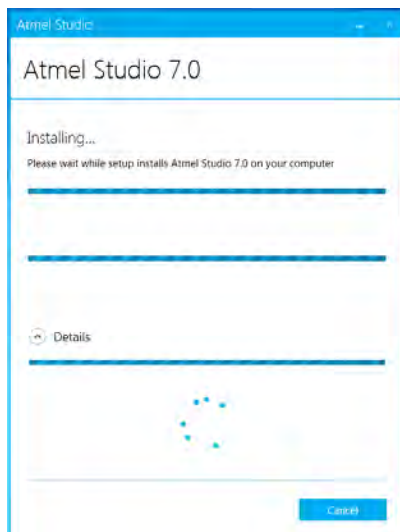
4.1.7. Click “Next”, ignore if any video card driver error shows,



4.1.8. Click “Install”.



4.1.9. Atmel Studio 7 installation 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 installation wizard to complete the installation





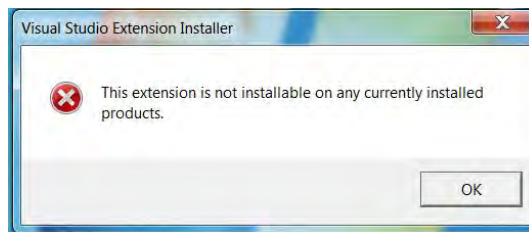
Name	Date modified	Type	Size
 as-installer-7.0.1006-full	7/21/2016 4:58 PM	Application	876,683 KB
 Atmel.SAMR30_DFP-1.0.7	7/21/2016 4:30 PM	Atmel Pack File	495 KB
 SAMR30_PERFORMANCE_ANALYZER	11/21/2016 11:24 ...	HEX File	178 KB
 wireless-composer-7.0.130	5/26/2016 12:43 PM	VSIX File	3,079 KB

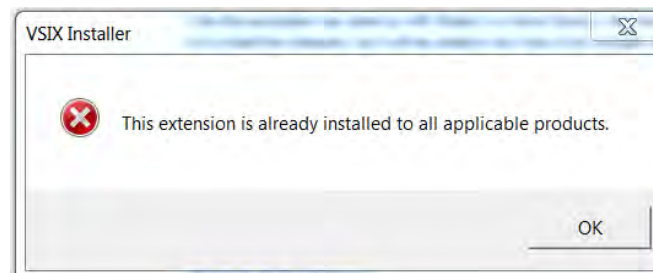
Figure 2 : Wireless Composer Installation

- 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

- Right click on the “wireless-composer-7.0.130.vsix” file and select 'Open with', and then 'Choose default program'.
- Click the 'Browse' button (Windows 7) or click on 'More' and 'Look for another app on this PC' (Windows 8 and newer).
- Browse to VSIXInstaller.exe located in C:\Program Files (x86)\Microsoft Visual Studio 14.0\Common7\IDE
- 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).

USB for Programming/Testing Function

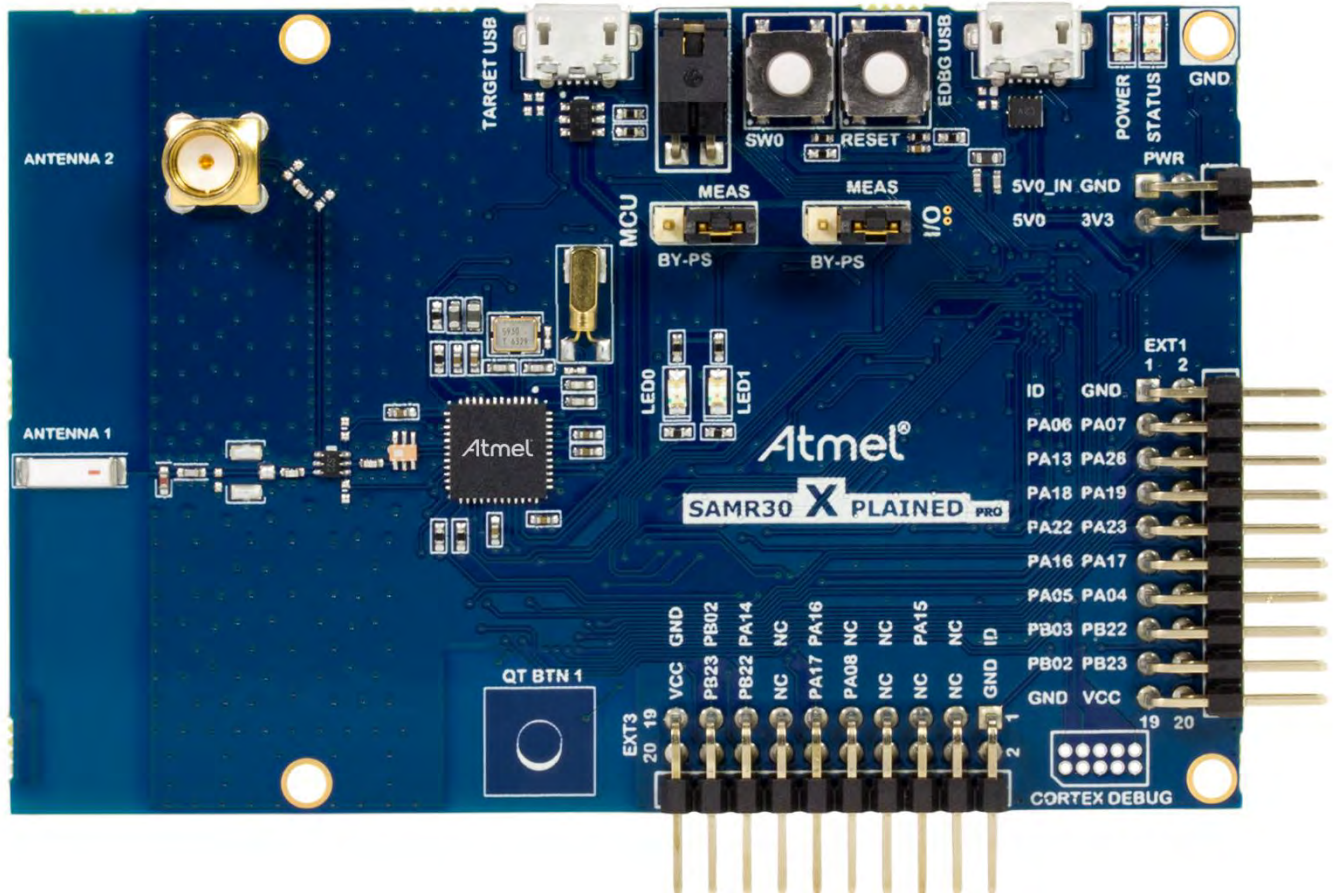


Figure.6 Hardware Setup

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

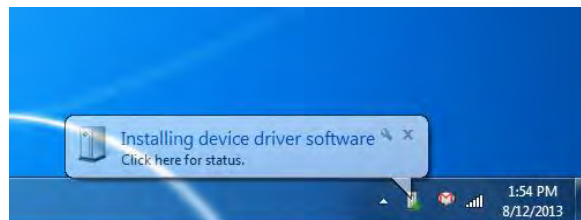


Figure.7 EDBG Virtual COM PORT Driver installation

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

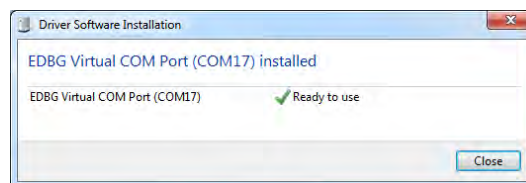


Figure.8 EDBG Virtual COM PORT Driver installation

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

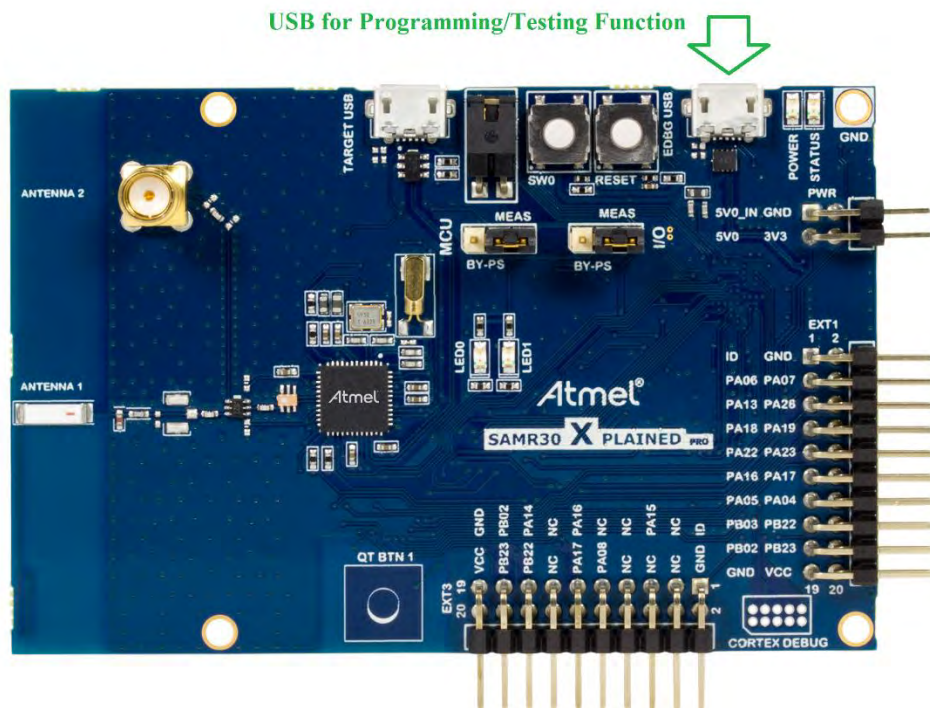
6. Programming the hex file in SAMR30-XPRO (If required):

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

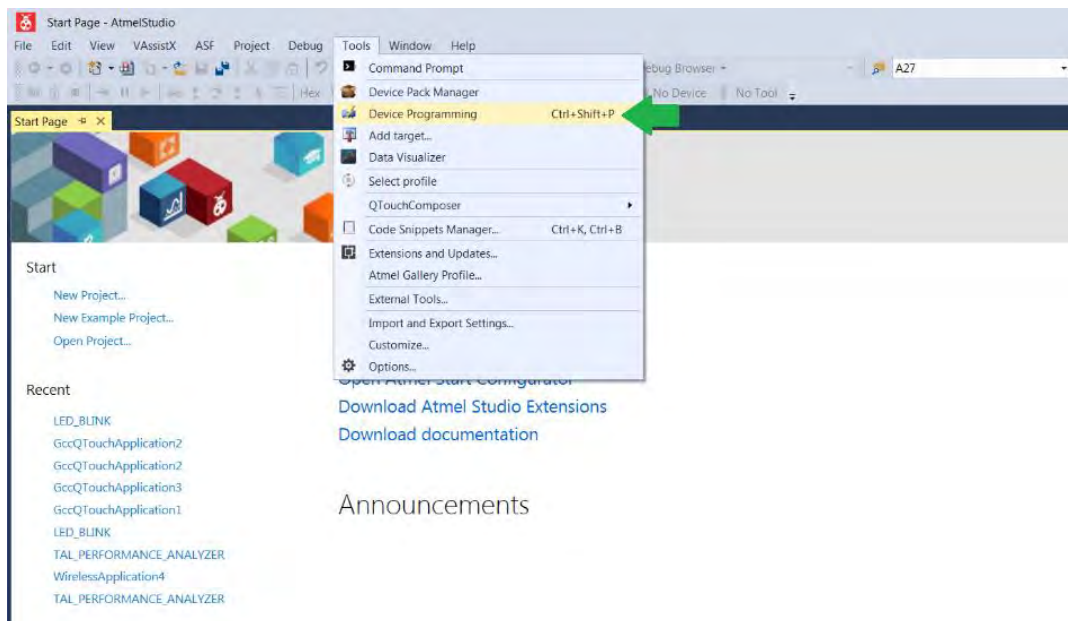
If programming the SAMR30-Xpro board for the first time, follow the section 7(SAMR30 part pack installation) before start programming.

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

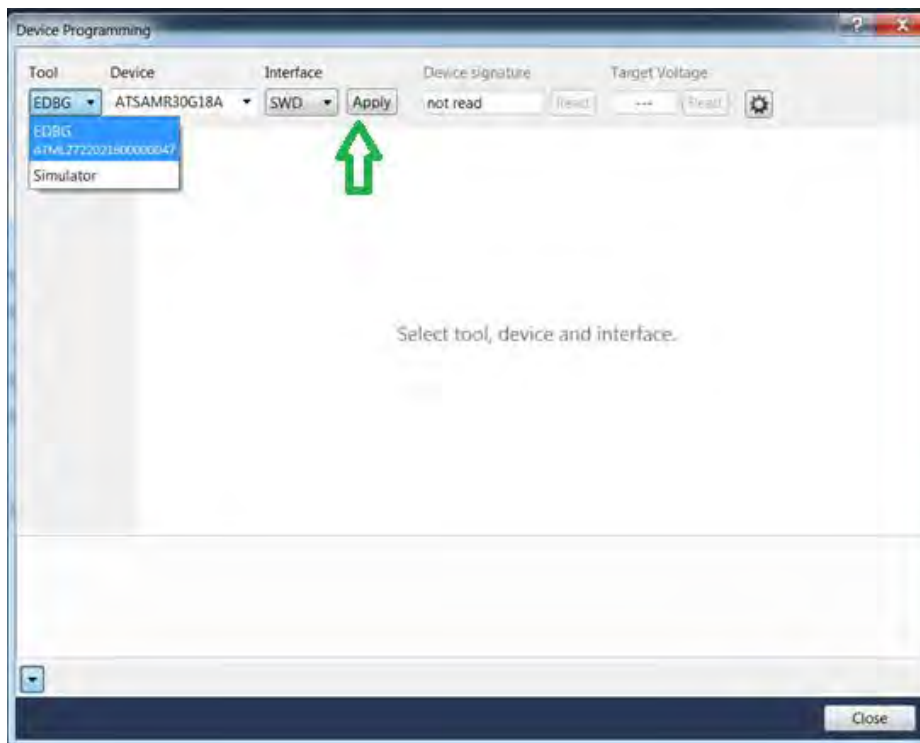
* PC should have the Atmel Studio 7 installed in it



6.2. In Atmel studio,select Tools →Device Programming

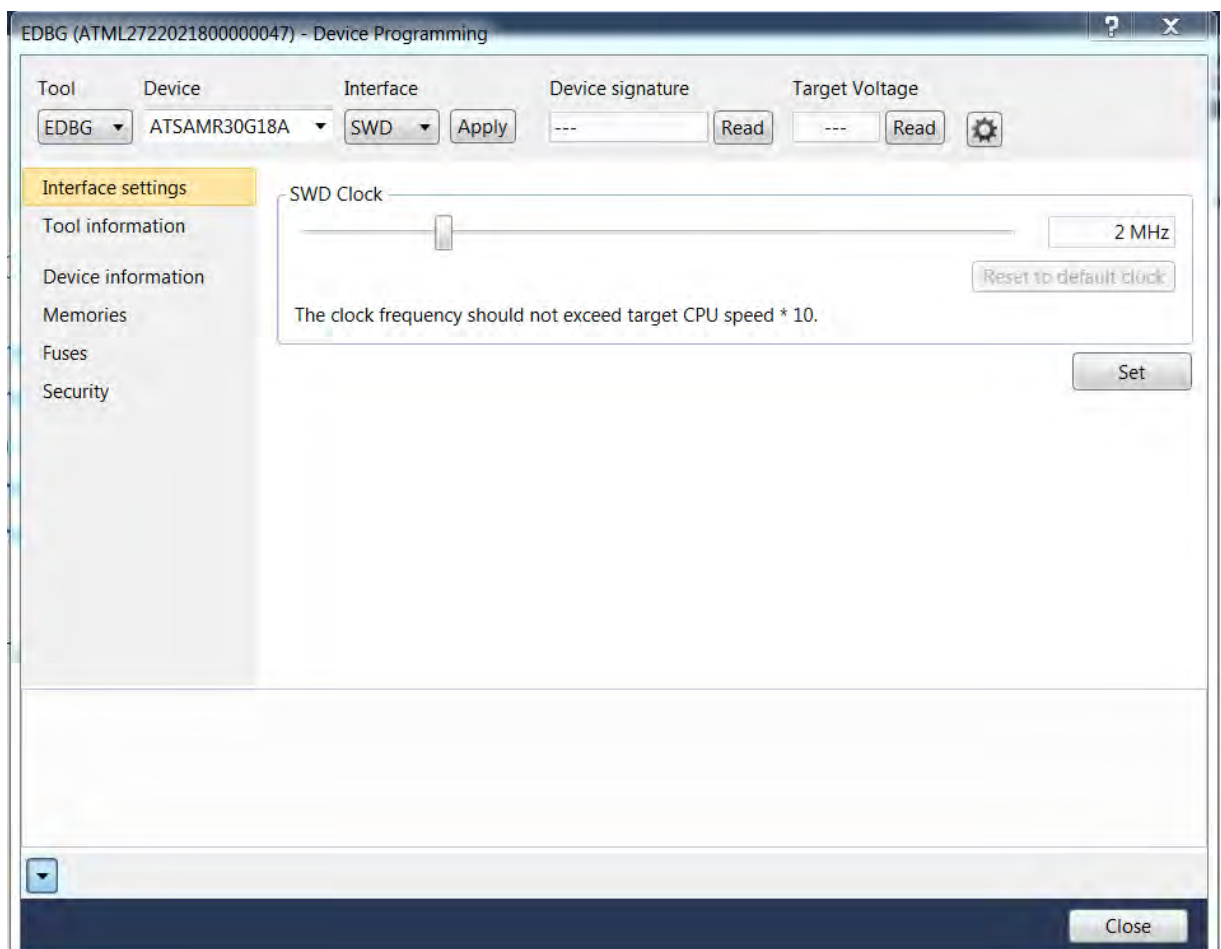


6.3. In Device Programming dialog box, select the edbg serial number and ensure the Device is “ATSAMR30G18A” and select ‘SWD’ as Interface. Then click “Apply”



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

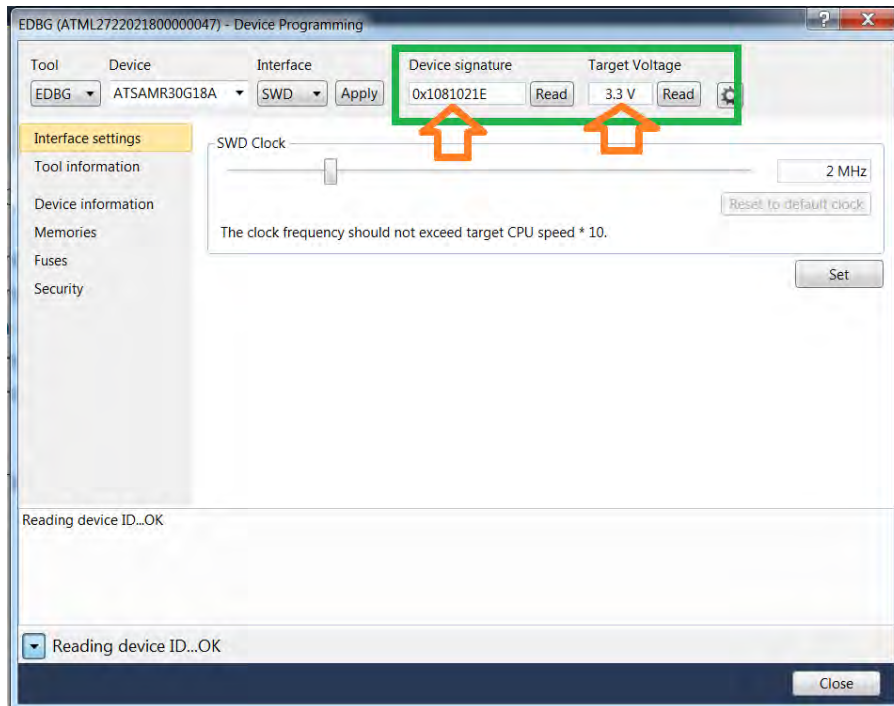
6.4. Once connected to the board, the device programming window will look like as follows



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

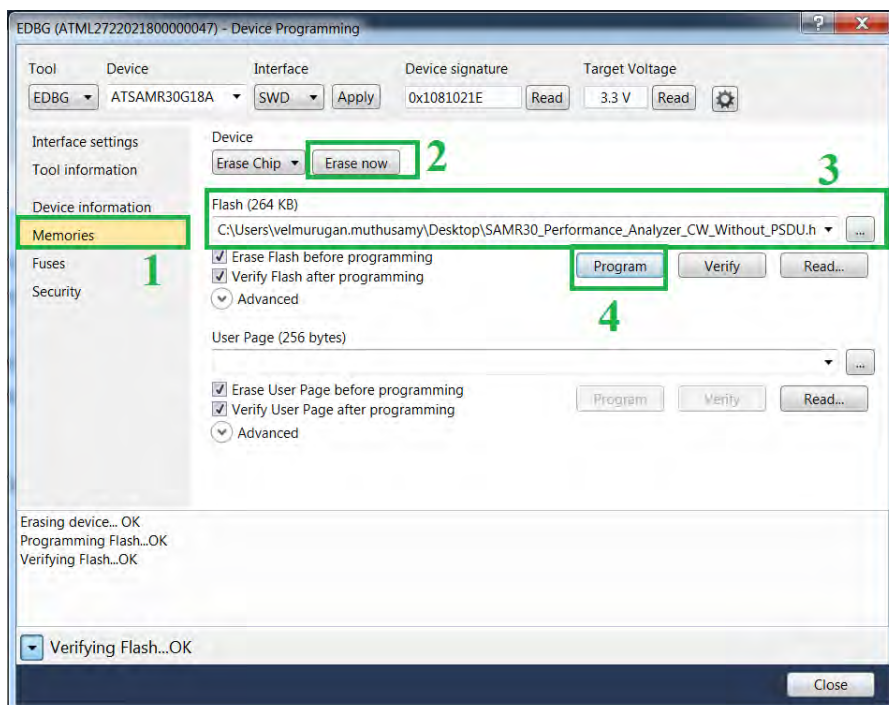
Device Programming: 0x1081021E

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.

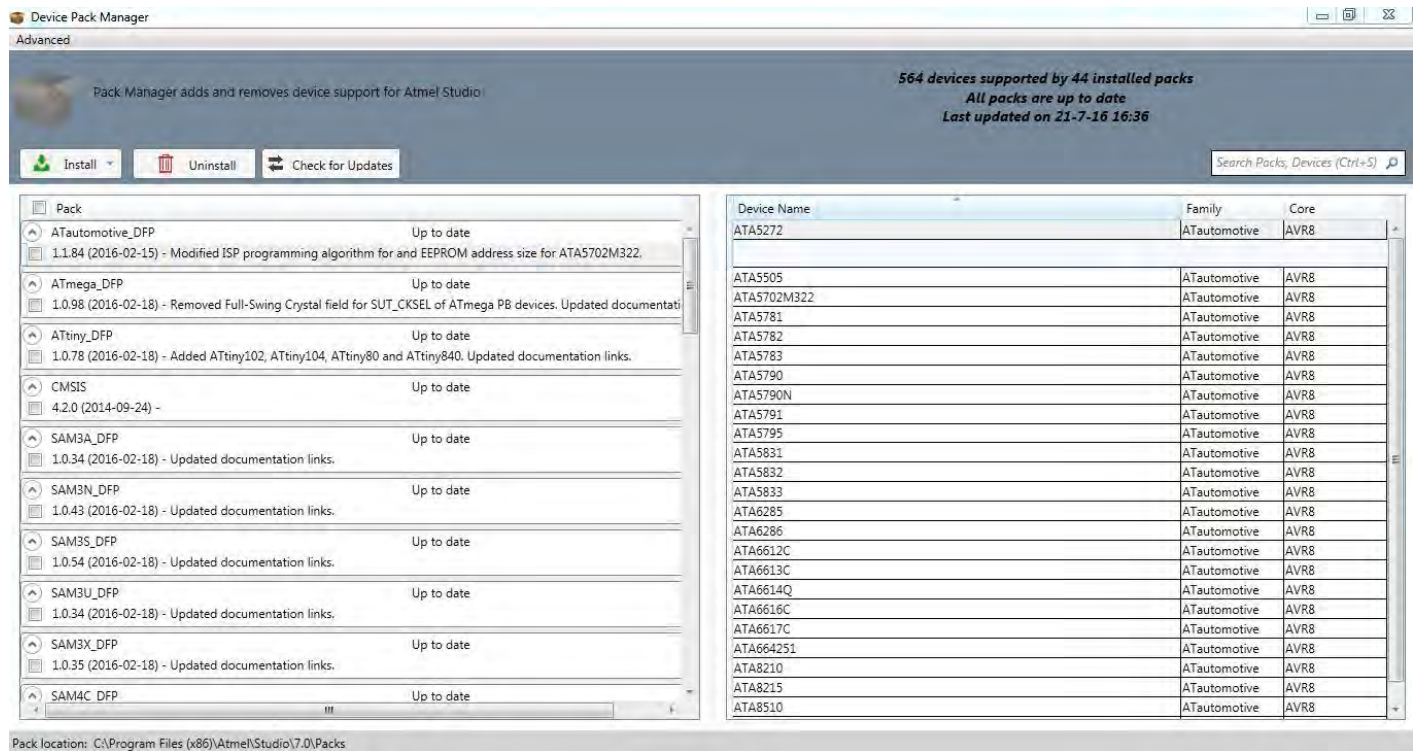


6.7. Flashing the hex file in the SAMR30-XPRO board completed.

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](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

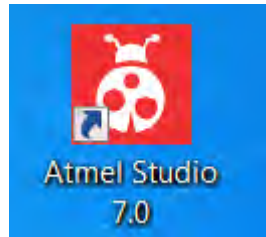


Figure.9 Launch Atmel Studio 7.0

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".

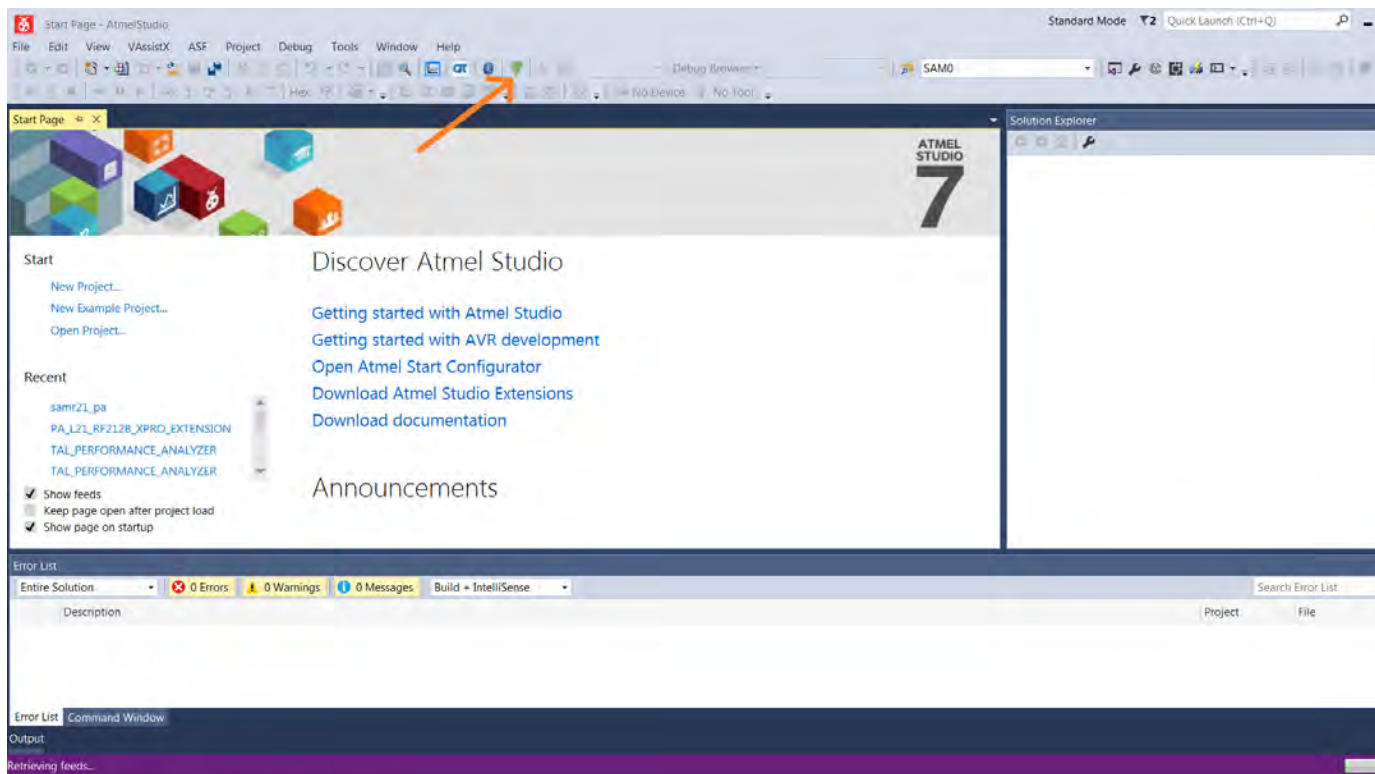


Figure.11 Atmel Studio 7.0 – Start Page

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

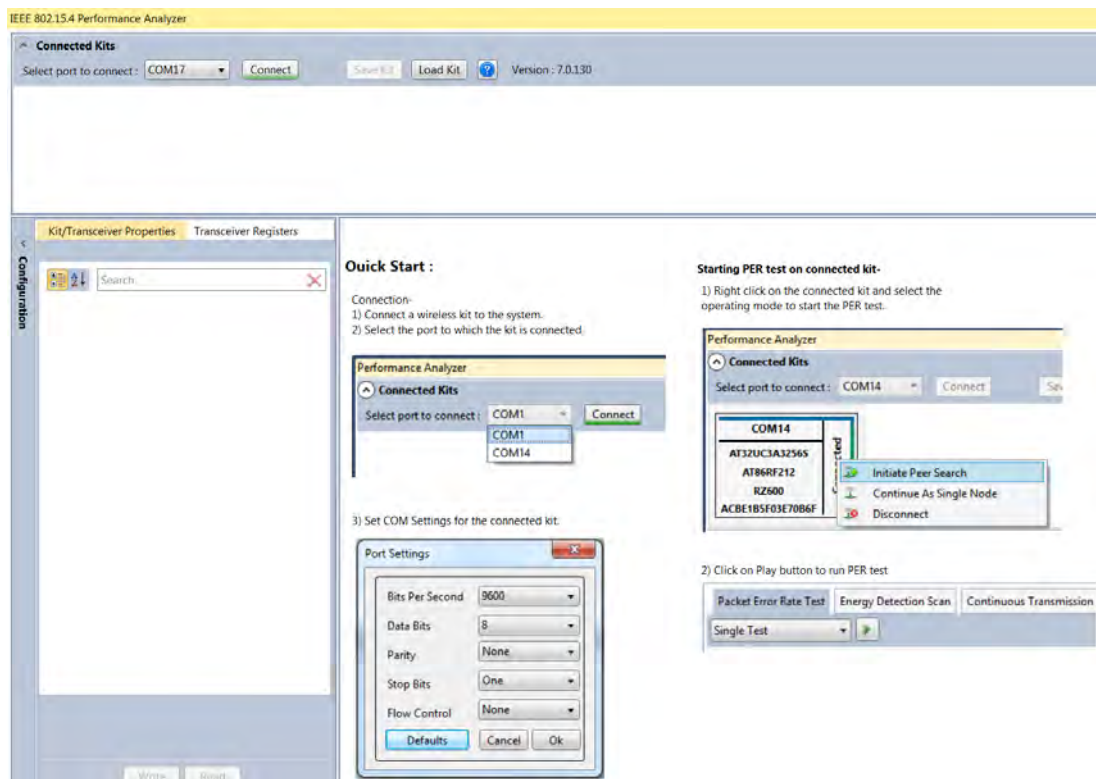


Figure.12 Performance Analyzer

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”

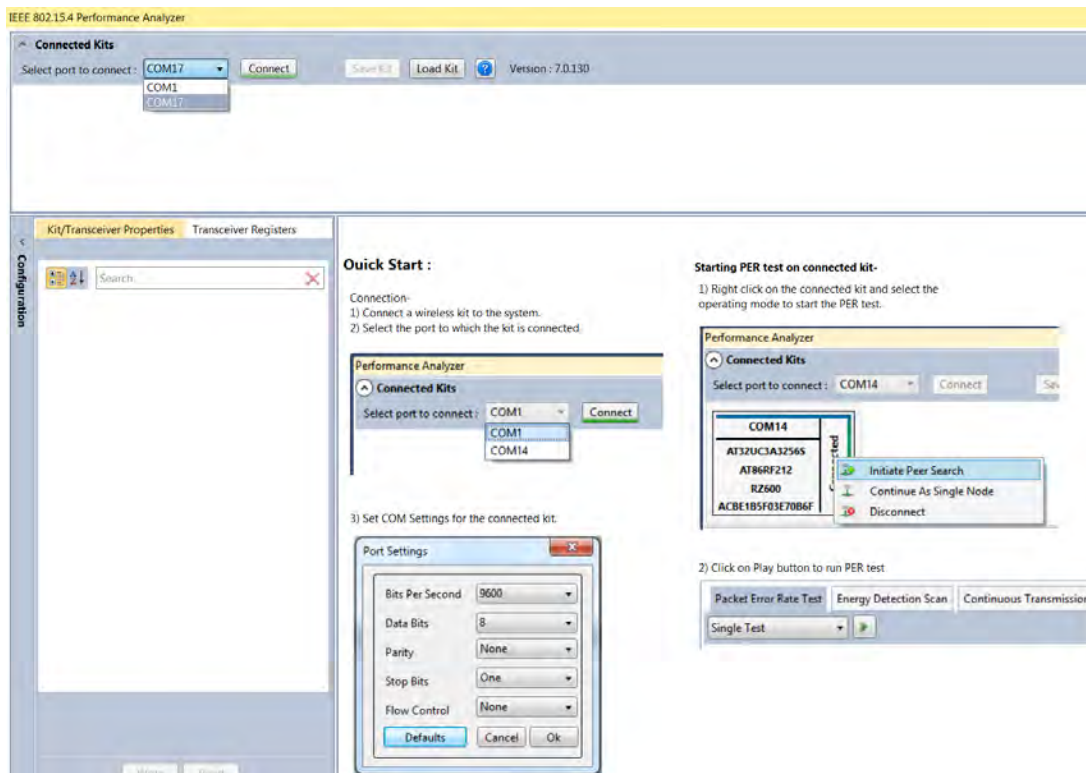
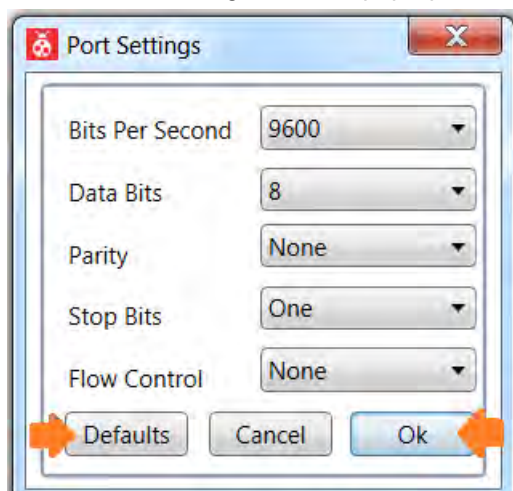


Figure.13 Performance Analyzer – COM Port Selection

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.

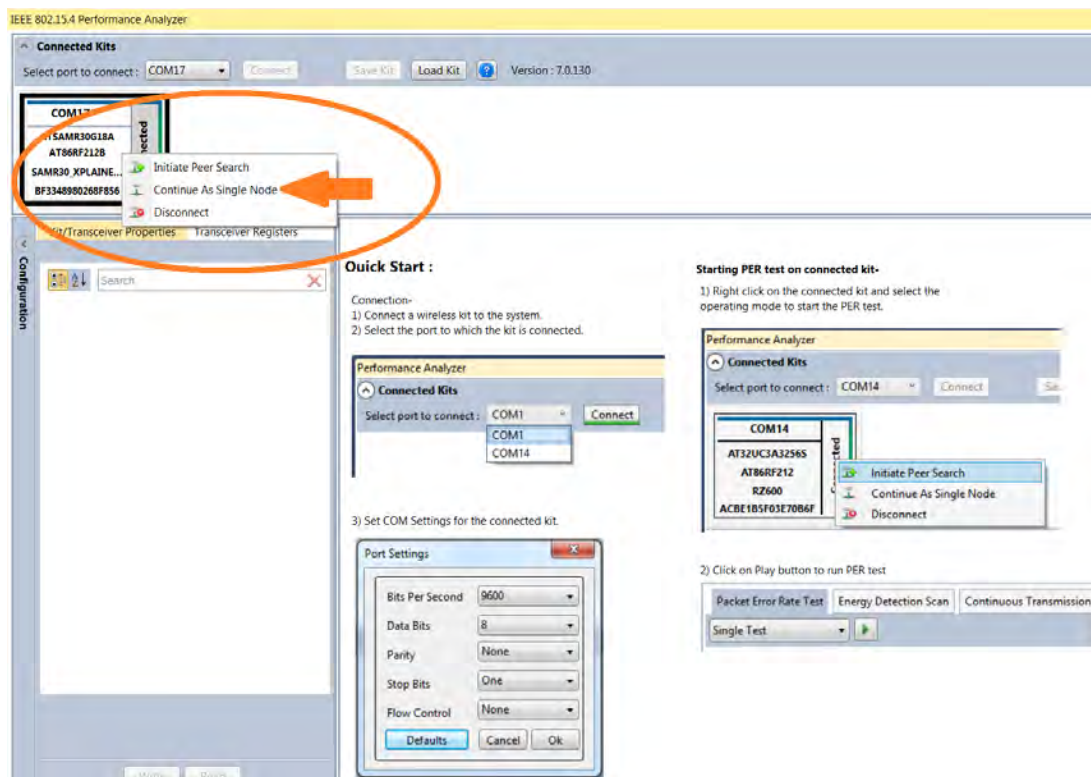
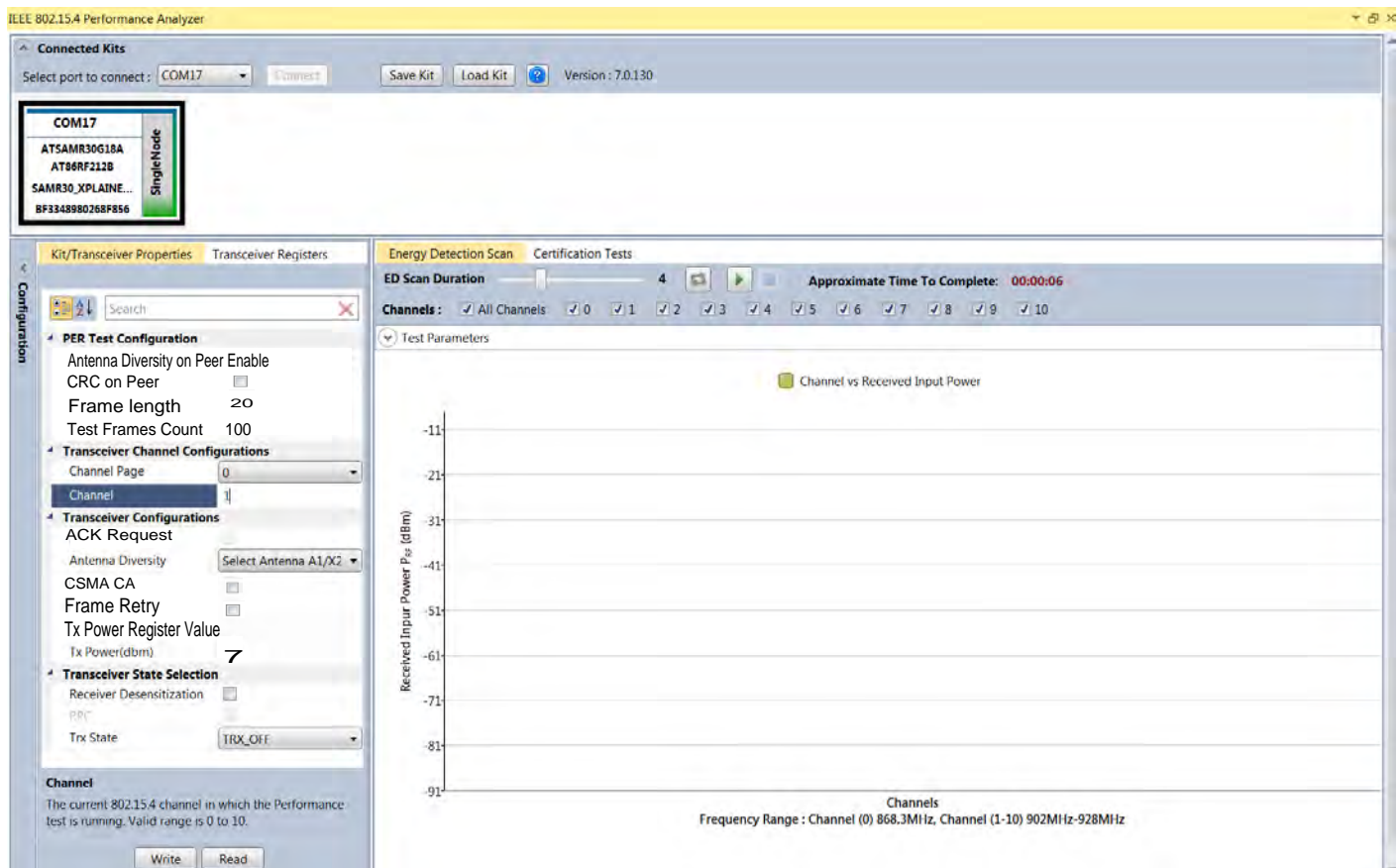


Figure.14 Performance Analyzer – Kit Information

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



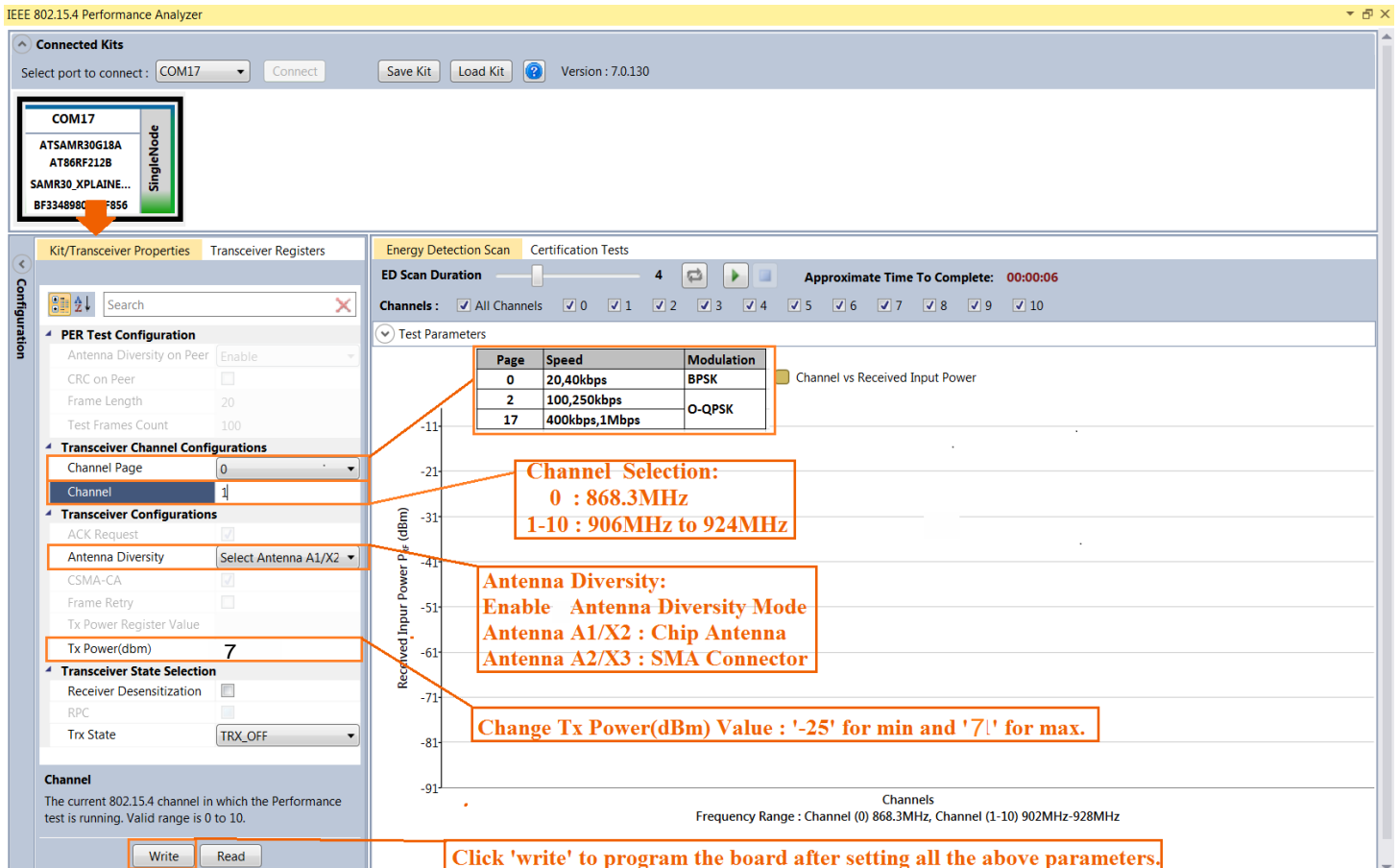


Figure.15 Performance Analyzer – Transceiver configuration

- 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:

$$F_c[\text{MHz}] = 906[\text{MHz}] + 2[\text{MHz}] \times (k - 1), \text{ for } k = 1, 2, \dots, 10$$
 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.

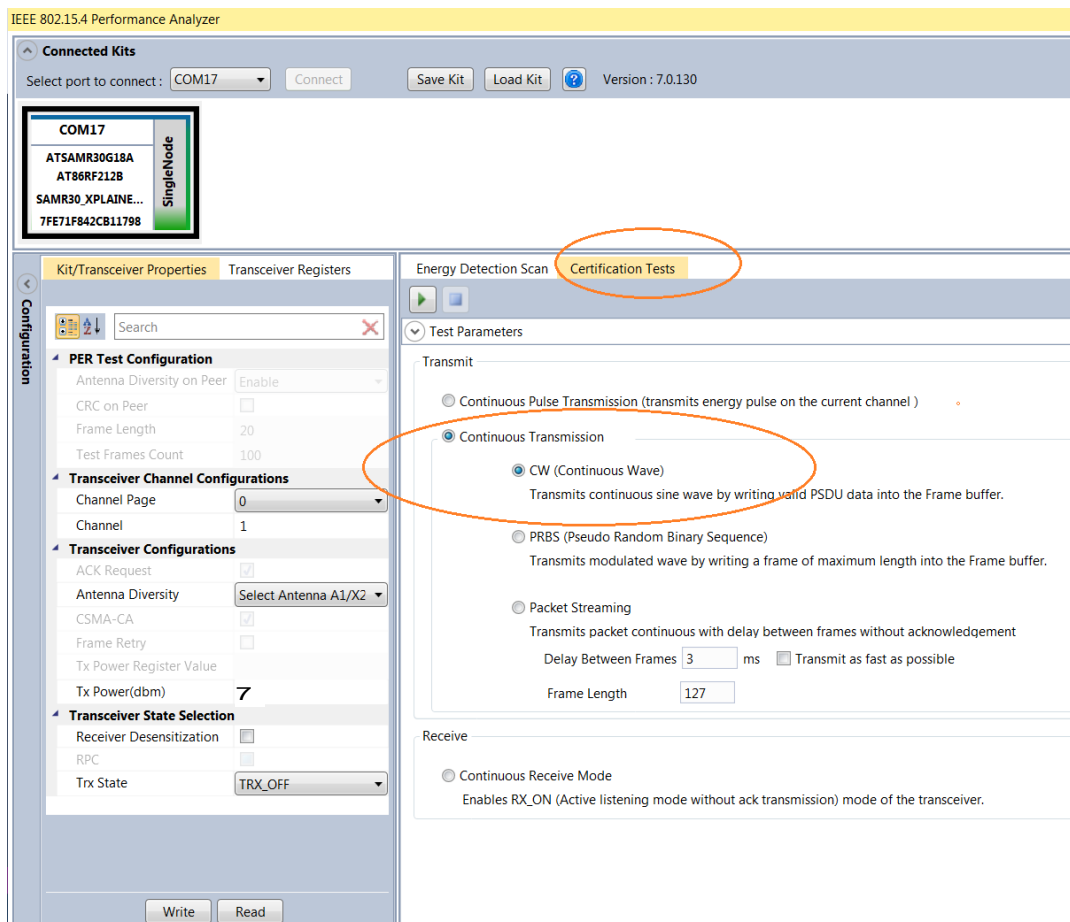
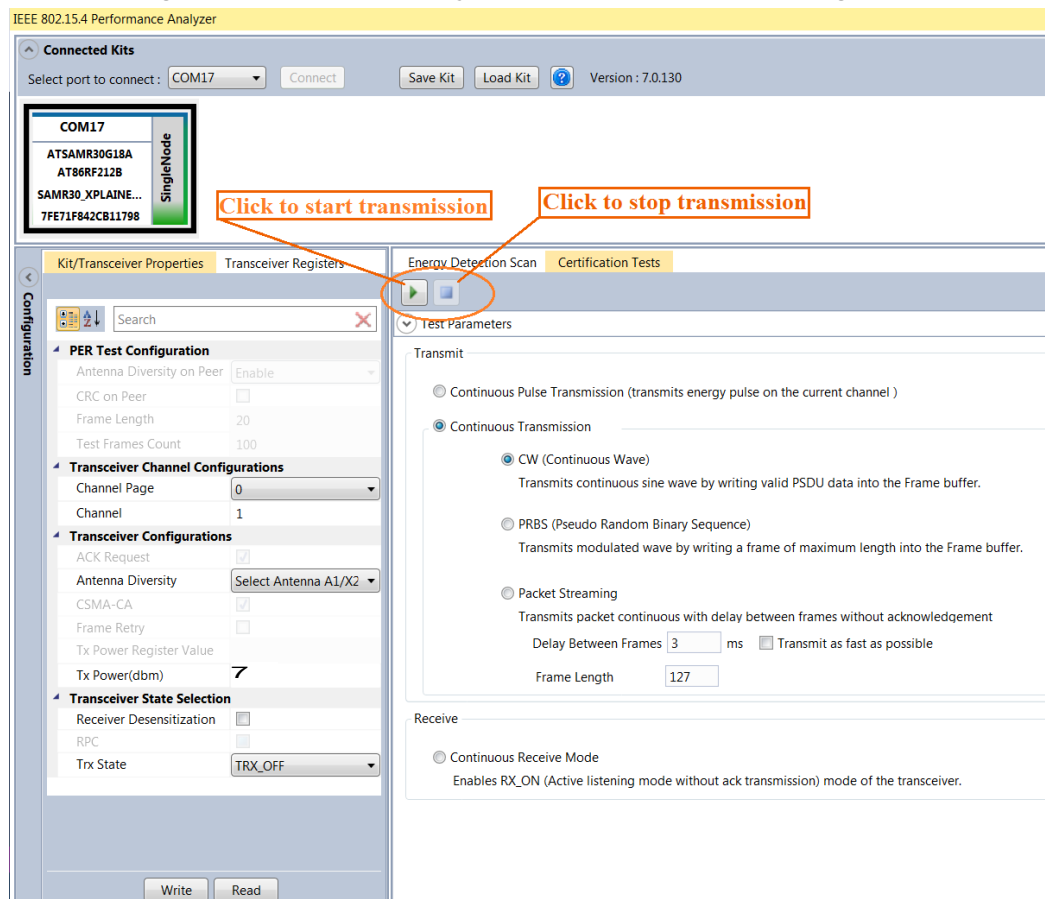


Figure.16 Performance Analyzer – Continuous Tx mode configuration



10. Tx Test Modes:

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

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 Antenna A1/X2
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	TRX_OFF
TRX_CTRL_2 (0xC)	B4

Select port to connect: COM158 Connect Save Kit Load Kit ? Version : 7.0.130

COM158
ATSAMR30G18A
AT86RF212B
SAMR30_XPLAINE...
A4AA67A0E7EB4F7C

SingleNode

Kit/Transceiver Properties Transceiver Registers

PER Test Configuration

Antenna Diversity on Peer: Enable
CRC on Peer: ☐
Frame Length: 20
Test Frames Count: 100

Transceiver Channel Configurations

Channel Page: 0
Channel: 1

Transceiver Configurations

ACK Request: ☒
Antenna Diversity: Select Antenna A1/X2
CSMA-CA: ☒
Frame Retry: ☐
Tx Power Register Value:
Tx Power(dBm): 7

Transceiver State Selection 7

Receiver Desensitization: ☐
RPC: ☐
Trx State: TRX_OFF

Channel Page

Current channel Page used by the Transceiver.
Channel Pages:
0 ~ 20kHzs(Channel 0) 40kHzs(Channel 1-10)

Write

Read

Energy Detection Scan Certification Tests

Test Parameters

Transmit

☐ Continuous Pulse Transmission (transmits energy pulse on the current channel)
☒ Continuous Transmission

☒ CW (Continuous Wave)
Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.

☐ PRBS (Pseudo Random Binary Sequence)
Transmits modulated wave by writing a frame of maximum length into the Frame buffer.

☐ Packet Streaming
Transmits packet continuous with delay between frames without acknowledgement
Delay Between Frames: 3 ms ☐ Transmit as fast as possible
Frame Length: 127

Receive

☐ Continuous Receive Mode
Enables RX_ON (Active listening mode without ack transmission) mode of the transceiver.

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

Connected Kits

Select port to connect: COM251 Connect Save Kit Load Kit ?

COM251
ATSAMR30G18A
AT86RF212B
SAMR30_XPLAINE...
7E1731037809B95C

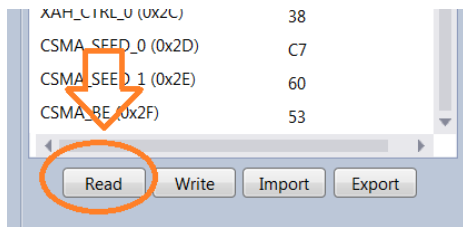
SingleNode

Kit/Transceiver Properties **Transceiver Registers** Energy Detection Scan Certification Tests

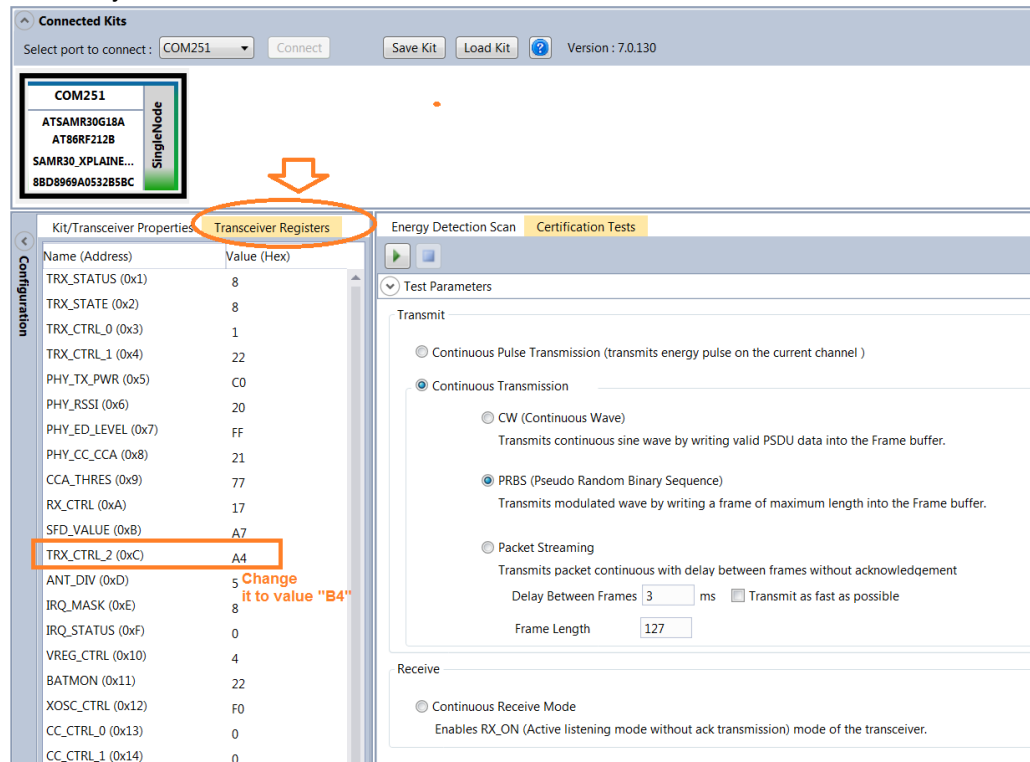
Name (Address) Value (Hex)

TRX_STATUS (0x1) 8
TRX_STATE (0x2) 8
TRX_CTRL_0 (0x3) 1
TRX_CTRL_1 (0x4) 22
TRX_CTRL_2 (0xC) B4

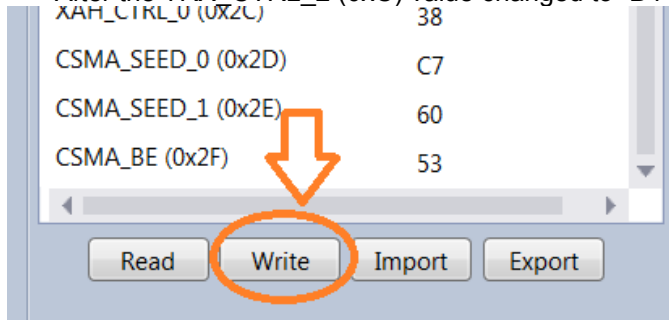
- At the bottom corner, there is an icon called “Read”, click it.



- 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 Antenna A1/X2
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	TRX_OFF

Connected Kits
 Select port to connect : COM158 Connect Save Kit Load Kit ? Version : 7.0.130

COM158
 ATSAMR30G18A
 AT86RF212B
 SAMR30_XPLAINE...
 A4AA67A0E7EB4F7C

SingleNode

Kit/Transceiver Properties Transceiver Registers

Search

PER Test Configuration
 Antenna Diversity on Peer Enable
 CRC on Peer ☐
 Frame Length 20
 Test Frames Count 100

Transceiver Channel Configurations
 Channel Page 2
 Channel 1

Transceiver Configurations
 ACK Request ☒
 Antenna Diversity Select Antenna A1/X2
 CSMA-CA ☒
 Frame Retry ☐
 Tx Power Register Value
 Tx Power(dbm) 7

Transceiver State Selection
 Receiver Desensitization ☐
 RPC ☐
 Trx State TRX_OFF

Channel Page
 Current channel Page used by the Transceiver.
 Channel Pages :
 0 : 20khns(Channel 0) 40khns(Channel 1-10)

Write Read

Energy Detection Scan Certification Tests

▶ ■

Test Parameters

Transmit

- ☐ Continuous Pulse Transmission (transmits energy pulse on the current channel)
- ☒ Continuous Transmission
 - ☒ CW (Continuous Wave)
Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.
 - ☐ PRBS (Pseudo Random Binary Sequence)
Transmits modulated wave by writing a frame of maximum length into the Frame buffer.
 - ☐ Packet Streaming
Transmits packet continuous with delay between frames without acknowledgement
Delay Between Frames 3 ms ☐ Transmit as fast as possible
Frame Length 127

Receive

- ☐ Continuous Receive Mode
Enables RX_ON (Active listening mode without ack transmission) mode of the transceiver.

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

IEEE 802.15.4 Performance Analyzer

The screenshot displays the IEEE 802.15.4 Performance Analyzer software interface. At the top, a yellow banner reads "IEEE 802.15.4 Performance Analyzer". Below this, a "Connected Kits" section shows a dropdown menu set to "COM251" and buttons for "Connect", "Save Kit", "Load Kit", and a help icon. The version is listed as "7.0.130".

A list of connected kits is shown, including "COM251", "ATSAMR30G18A", "AT86RF212B", "SAMR30_XPLAINE...", and "01858576DB498C2D". A "SingleNode" label is visible next to the list.

The main configuration area is divided into two tabs: "Kit/Transceiver Properties" and "Transceiver Registers". The "Kit/Transceiver Properties" tab is active, showing various configuration options. The "PER Test Configuration" section includes "Antenna Diversity on Peer" (set to "Enable"), "CRC on Peer" (unchecked), "Frame Length" (20), and "Test Frames Count" (100). The "Transceiver Channel Configurations" section shows "Channel Page" (17) and "Channel" (1). The "Transceiver Configurations" section includes "ACK Request" (checked), "Antenna Diversity" (set to "Select Antenna A1/X2"), "CSMA-CA" (checked), "Frame Retry" (unchecked), and "Tx Power Register Value" (7). The "Transceiver State Selection" section includes "Receiver Desensitization" (unchecked), "RPC" (unchecked), and "Trx State" (set to "TRX_OFF").

At the bottom of the configuration area, there is a "Tx Power(dBm)" section with a description: "Transceiver TX power value in dBm. Valid range is -25 to 11." and buttons for "Write" and "Read".

The right-hand side of the interface shows the "Energy Detection Scan" and "Certification Tests" tabs. The "Certification Tests" tab is active, displaying "Test Parameters" for "Transmit" and "Receive". The "Transmit" section includes options for "Continuous Pulse Transmission", "Continuous Transmission" (selected), "CW (Continuous Wave)", "PRBS (Pseudo Random Binary Sequence)", and "Packet Streaming". The "Receive" section includes "Continuous Receive Mode".

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 Antenna A1/X2
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	TRX_OFF

Connected Kits

Select port to connect : COM158 Connect Save Kit Load Kit ? Version : 7.0.130

COM158
 ATSAMR30G18A
 AT86RF212B
 SAMR30_XPLAINE...
 A4AA67A0E7EB47C

Kit/Transceiver Properties **Transceiver Registers**

PER Test Configuration

- Antenna Diversity on Peer: Enable
- CRC on Peer: ☐
- Frame Length: 20
- Test Frames Count: 100

Transceiver Channel Configurations

- Channel Page: 0
- Channel: 0

Transceiver Configurations

- ACK Request: ☒
- Antenna Diversity: Select Antenna A1/X2
- CSMA-CA: ☒
- Frame Retry: ☐
- Tx Power Register Value: 7

Transceiver State Selection

- Receiver Desensitization: ☐
- RPC: ☐
- Trx State: TRX_OFF

Channel

The current 802.15.4 channel in which the Performance test is running. Valid range is 0 to 10.

Write Read

Energy Detection Scan **Certification Tests**

Test Parameters

Transmit

- ☐ Continuous Pulse Transmission (transmits energy pulse on the current channel)
- ☒ Continuous Transmission
 - ☒ CW (Continuous Wave)

Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.
 - ☐ PRBS (Pseudo Random Binary Sequence)

Transmits modulated wave by writing a frame of maximum length into the Frame buffer.
 - ☐ Packet Streaming

Transmits packet continuous with delay between frames without acknowledgement

Delay Between Frames: 3 ms ☐ Transmit as fast as possible

Frame Length: 127

Receive

- ☐ Continuous Receive Mode

Enables RX_ON (Active listening mode without ack transmission) mode of the transceiver.

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 Antenna A1/X2
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	TRX_OFF

Connected Kits

Select port to connect : COM158 Connect Save Kit Load Kit ? Version : 7.0.130

COM158

ATSAMR30G18A
AT86RF212B
SAMR30_XPLAINE...
A4AA67A0E7EB4F7C

SingleNode

Configuration

Kit/Transceiver Properties **Transceiver Registers**

Search

PER Test Configuration

Antenna Diversity on Peer: Enable

CRC on Peer: ☐

Frame Length: 20

Test Frames Count: 100

Transceiver Channel Configurations

Channel Page: 2

Channel: 0

Transceiver Configurations

ACK Request: ☒

Antenna Diversity: Select Antenna A1/X2

CSMA-CA: ☒

Frame Retry: ☐

Tx Power Register Value: 7

Tx Power(dBm): 7

Transceiver State Selection

Receiver Desensitization: ☐

RPC: ☐

Trx State: TRX_OFF

Channel Page

Current channel Page used by the Transceiver.

Channel Pages : 0 - 20kHz/(Channel 0) 40kHz/(Channel 1-10)

Write Read

Energy Detection Scan **Certification Tests**

▶ □

Test Parameters

Transmit

☐ Continuous Pulse Transmission (transmits energy pulse on the current channel)

☒ Continuous Transmission

☒ CW (Continuous Wave)

Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.

☐ PRBS (Pseudo Random Binary Sequence)

Transmits modulated wave by writing a frame of maximum length into the Frame buffer.

☐ Packet Streaming

Transmits packet continuous with delay between frames without acknowledgement

Delay Between Frames: 3 ms ☐ Transmit as fast as possible

Frame Length: 127

Receive

☐ Continuous Receive Mode

Enables RX_ON (Active listening mode without ack transmission) mode of the transceiver.

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 Pairing). (Device connected to COM Port is transmitter and other device is receiver)

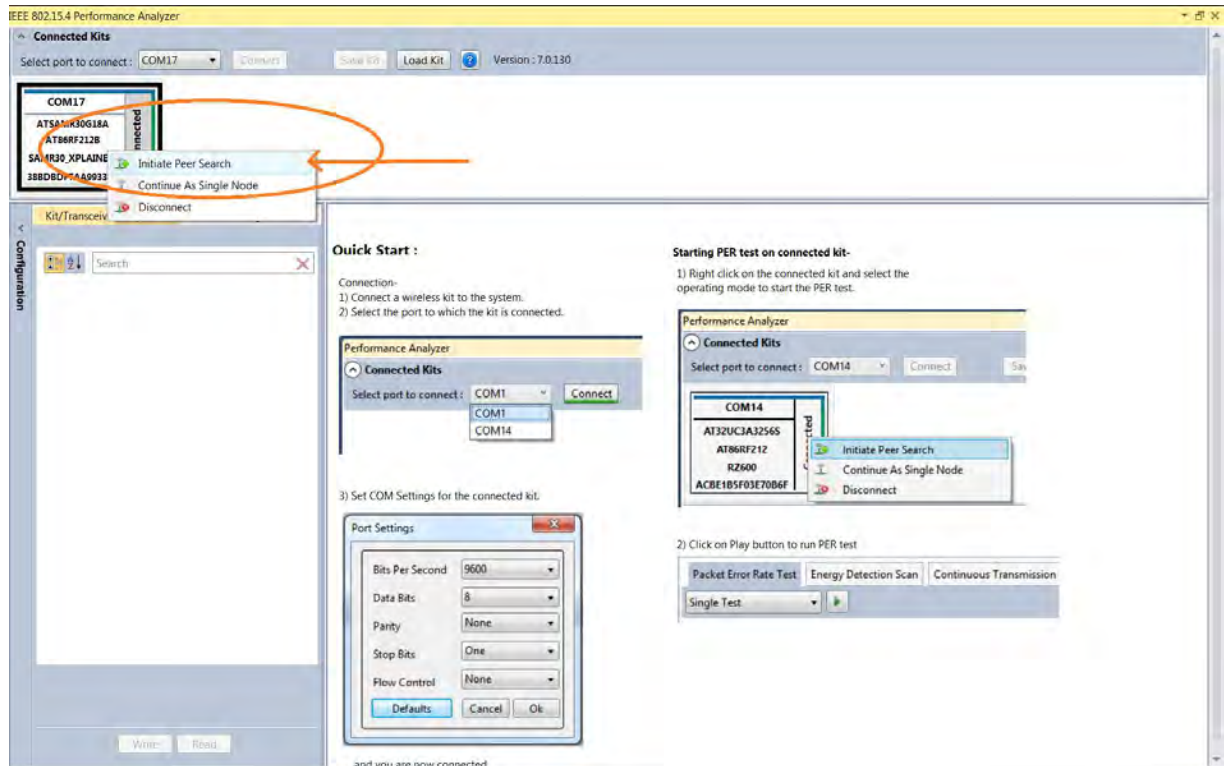


Figure 21: Performance Analyzer – Pairing devices

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

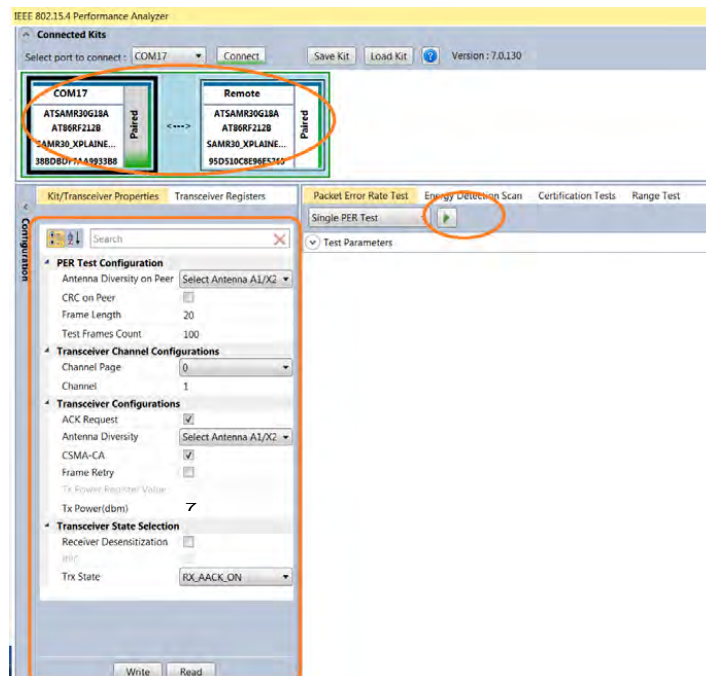


Figure 22: Performance Analyzer – PER Test Configuration

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

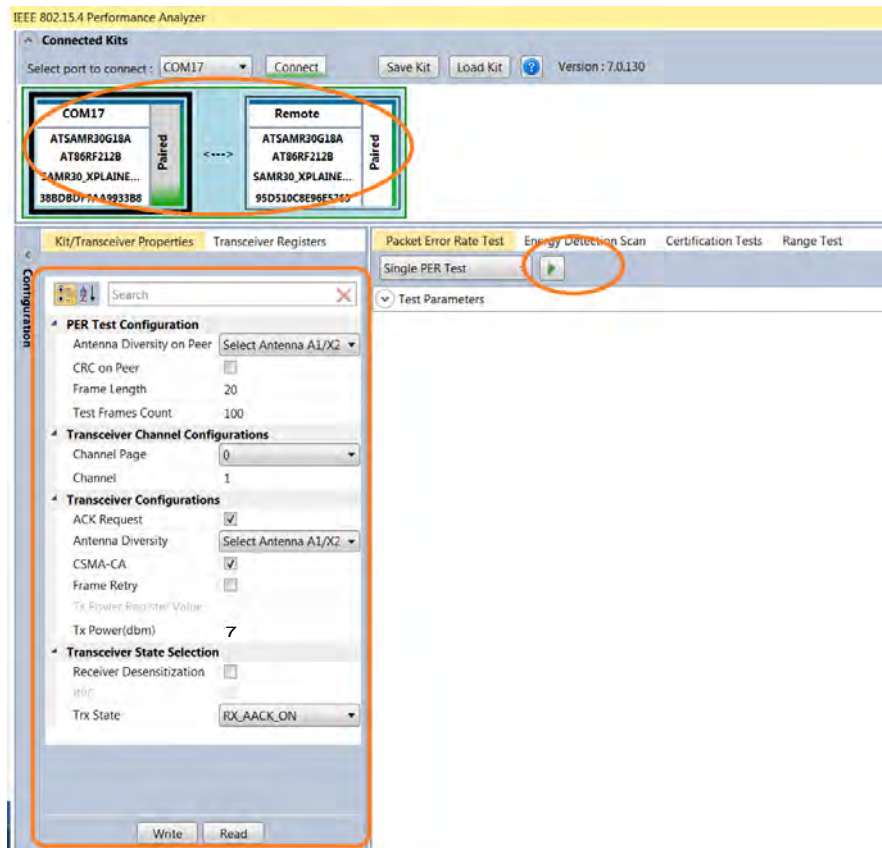


Figure 23: Performance Analyzer – Transmit Packets

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

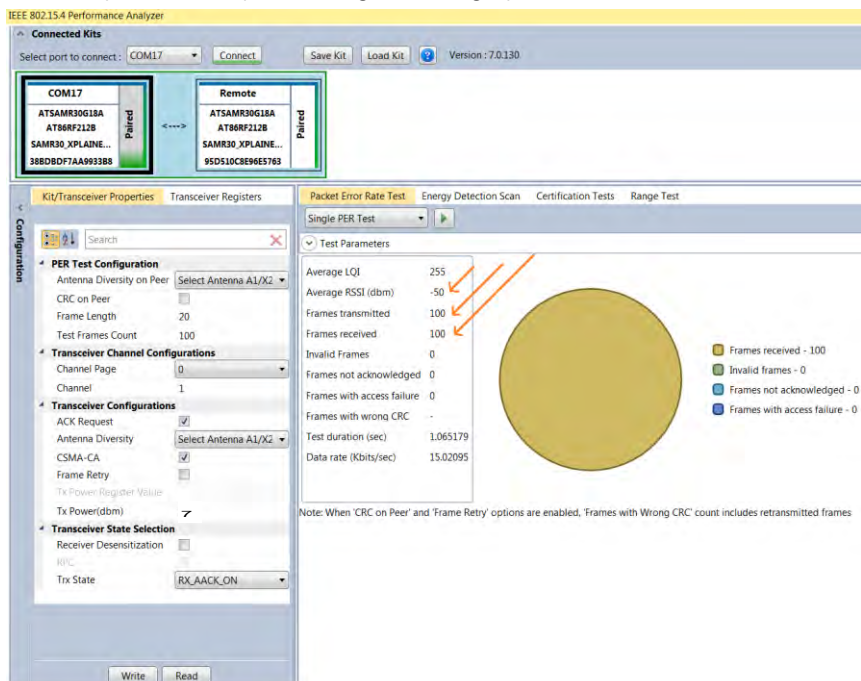


Figure 24: Performance Analyzer – PER Test

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 Antenna 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 Antenna 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

Connected Kits

Select port to connect: COM158 Connect Save Kit Load Kit ? Version : 7.0.130

COM158
 ATSAMR30G18A
 AT86RF212B
 SAMR30_XPLAINE...
 A4AA67A0E7EB47C

Remote
 ATSAMR30G18A
 AT86RF212B
 SAMR30_XPLAINE...
 996B0DD60FC7CA58

Configuration

Kit/Transceiver Properties **Transceiver Registers**

PER Test Configuration

- Antenna Diversity on Peer: Select Antenna A1/X2
- CRC on Peer: ☐
- Frame Length: 20
- Test Frames Count: 100

Transceiver Channel Configurations

- Channel Page: 0
- Channel: 1

Transceiver Configurations

- ACK Request: ☒
- Antenna Diversity: Select Antenna A1/X2
- CSMA-CA: ☒
- Frame Retry: ☐
- Tx Power Register Value: 7

Transceiver State Selection

- Receiver Desensitization: ☐
- RPC: ☐
- Trx State: RX_AACK_ON

Tx Power(dbm)

Transceiver TX power value in dBm. Valid range is -25 to 11.

Write Read

Packet Error Rate Test **Energy Detection Scan** **Certification Tests** **Range Test**

Single PER Test ▶

Test Parameters

- Average LQI: 255
- Average RSSI (dbm): -76
- Frames transmitted: 100
- Frames received: 100
- Invalid Frames: 0
- Frames not acknowledged: 0
- Frames with access failure: 0
- Frames with wrong CRC: -
- Test duration (sec): 1.04176
- Data rate (Kbits/sec): 15.35862

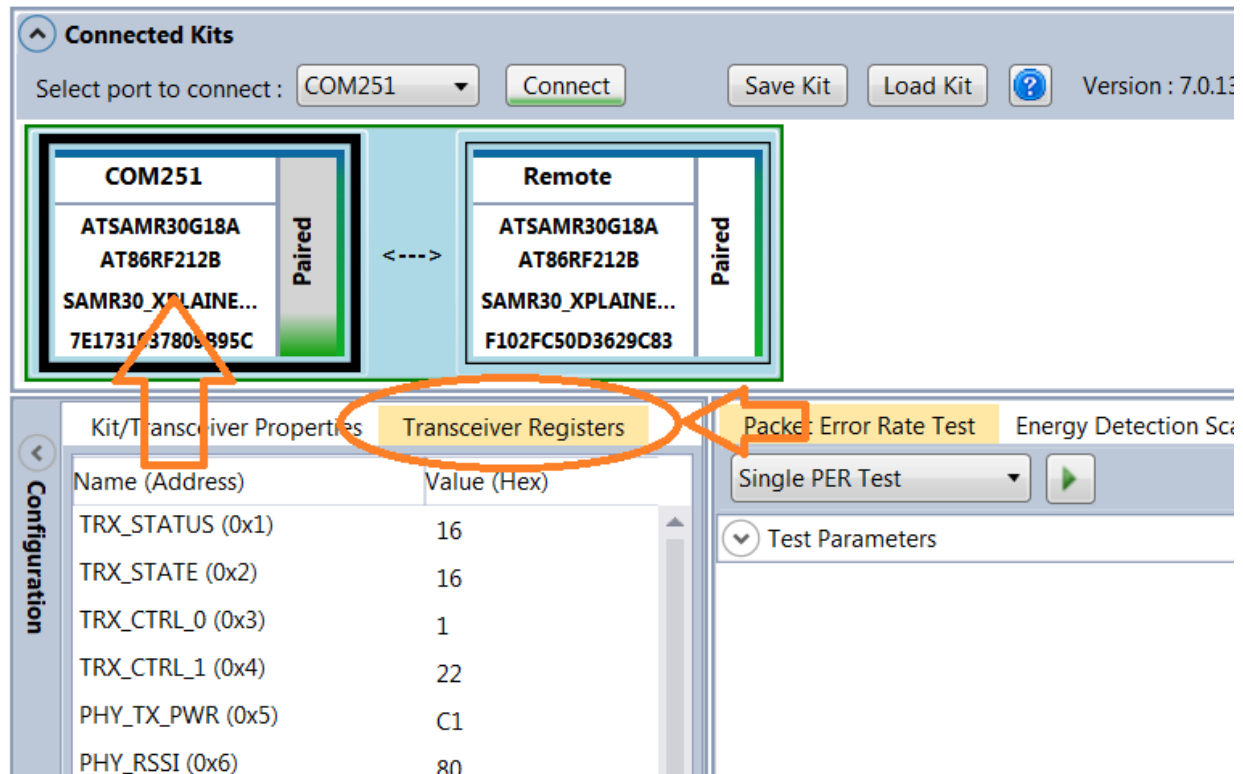
Legend:

- Frames received - 100
- Invalid frames - 0
- Frames not acknowledged - 0
- Frames with access failure - 0

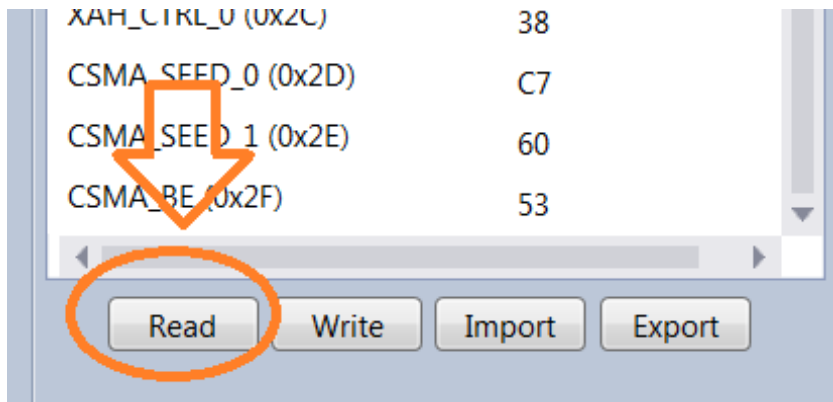
Note: When 'CRC on Peer' and 'Frame Retry' options are enabled, 'Frames with Wrong CRC' count includes retransmitted frames

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

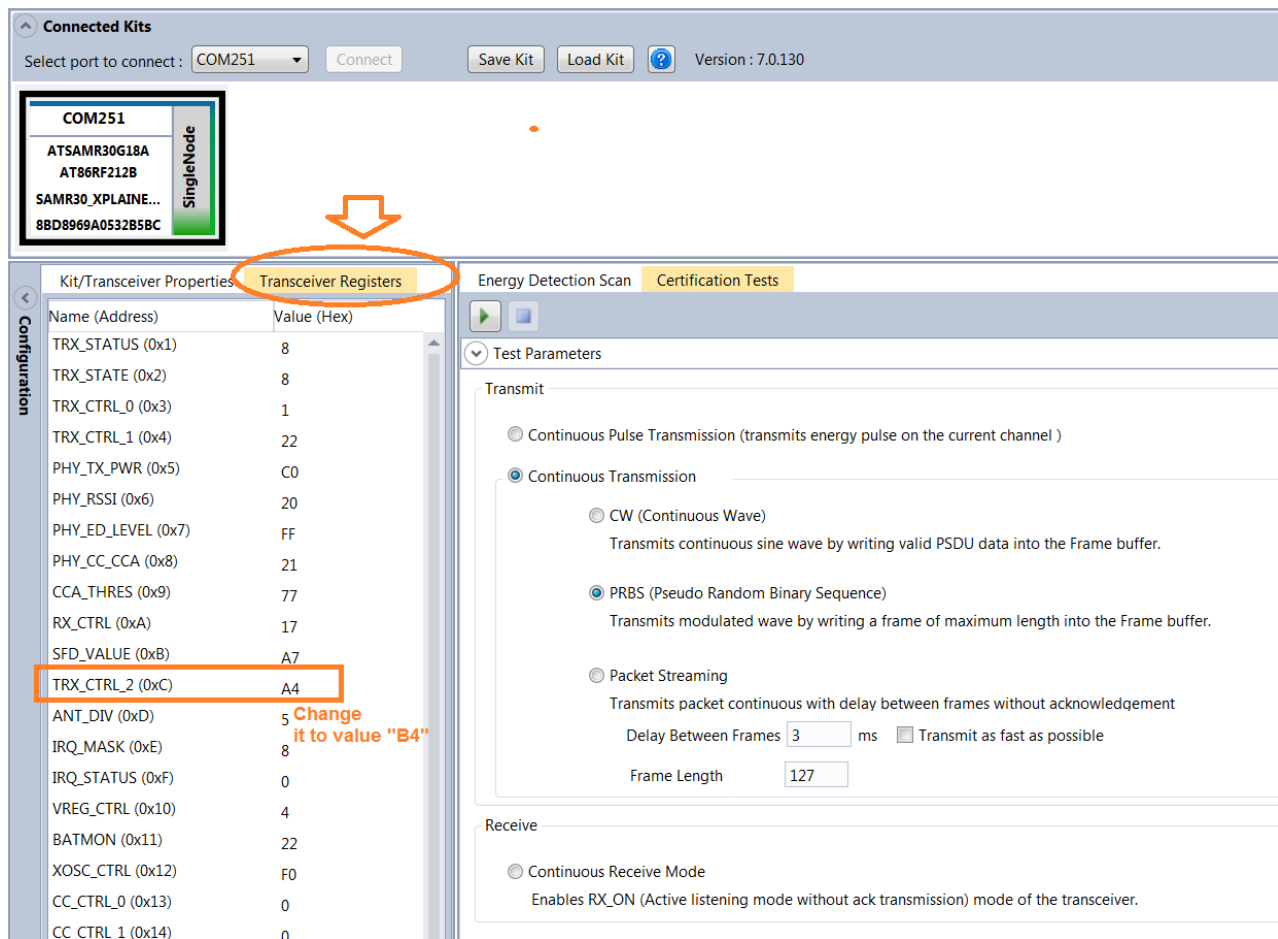
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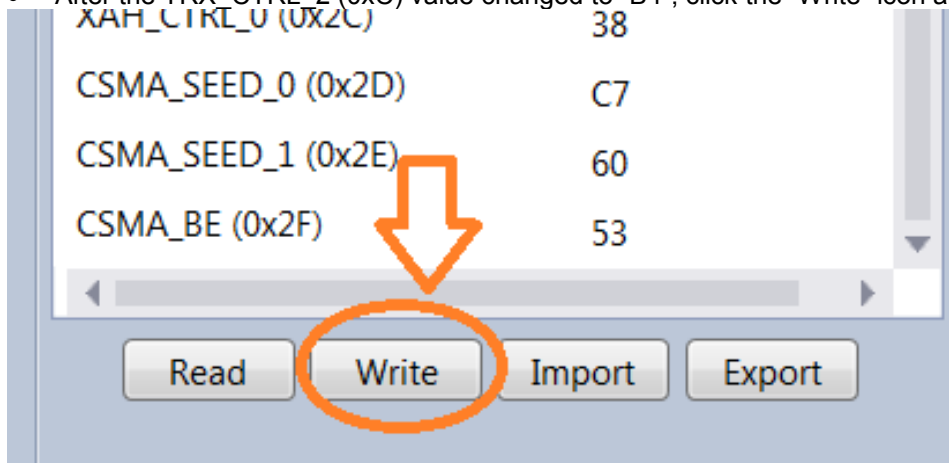
- At the bottom corner, there is an icon called “Read”, click it.



- 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 Antenna 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 Antenna A1/X2
CSMA-CA	Checked
Frame Retry	- (Unchecked)
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	RX_AACK_ON

Connected Kits
 Select port to connect : COM158 Connect Save Kit Load Kit ? Version : 7.0.130

COM158
 ATSAMR30G18A
 AT86RF212B
 SAMR30_XPLAINE...
 A4AA67A0E7B4F7C

Paired
<-->

Remote
 ATSAMR30G18A
 AT86RF212B
 SAMR30_XPLAINE...
 996B0DD60FC7CA58

Paired

Configuration
 Kit/Transceiver Properties Transceiver Registers

PER Test Configuration
 Antenna Diversity on Peer Select Antenna A1/X2
 CRC on Peer ☐
 Frame Length 20
 Test Frames Count 100

Transceiver Channel Configurations
 Channel Page 2
 Channel 1

Transceiver Configurations
 ACK Request ☒
 Antenna Diversity Select Antenna A1/X2
 CSMA-CA ☒
 Frame Retry ☐
 Tx Power Register Value
 Tx Power(dBm) 7

Transceiver State Selection
 Receiver Desensitization ☐
 RPC ☐
 Trx State RX_AACK_ON

Channel Page
 Current channel Page used by the Transceiver.
 Channel Pages :
 0 : 20khns(Channel 0) 40khns(Channel 1-10)

Write Read

Packet Error Rate Test Energy Detection Scan Certification Tests Range Test
 Single PER Test ▶
 Test Parameters
 Average LQI 244
 Average RSSI (dbm) -74
 Frames transmitted 100
 Frames received 100
 Invalid Frames 0
 Frames not acknowledged 0
 Frames with access failure 0
 Frames with wrong CRC -
 Test duration (sec) 0.367153
 Data rate (Kbits/sec) 43.57856

Note: When 'CRC on Peer' and 'Frame Retry' options are enabled, 'Frames with Wrong CRC' count includes retransmitted frames

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 Antenna 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 Antenna A1/X2
CSMA-CA	Checked
Frame Retry	- (Unchecked)
Tx Power(dBm)	7
Receiver Desensitization	- (Unchecked)
Trx State	RX_AACK_ON

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Select port to connect: COM251 Connect Save Kit Load Kit ? Version : 7.0.130

COM251
ATSAMR30G18A
AT86RF212B
SAMR30_XPLAINE...
2C90A2776B820B1C
Paired

<--->

Remote
ATSAMR30G18A
AT86RF212B
SAMR30_XPLAINE...
796108E5C892F4E9
Paired

Kit/Transceiver Properties **Transceiver Registers** **Packet Error Rate Test** **Energy Detection Scan** **Certification Tests** **Range Test**

Single PER Test ▶

Test Parameters

Average LQI	254
Average RSSI (dbm)	-40
Frames transmitted	100
Frames received	100
Invalid Frames	0
Frames not acknowledged	0
Frames with access failure	0
Frames with wrong CRC	-
Test duration (sec)	0.273189
Data rate (Kbits/sec)	58.56751

Note: When 'CRC on Peer' and 'Frame Retry' options are enabled, 'Frames with Wrong CRC' count includes retransmitted frames

Configuration
PER Test Configuration
Antenna Diversity on Peer: Select Antenna A1/X2
CRC on Peer: ☐
Frame Length: 20
Test Frames Count: 100
Transceiver Channel Configurations
Channel Page: 17
Channel: 1
Transceiver Configurations
ACK Request: ☒
Antenna Diversity: Select Antenna A1/X2
CSMA-CA: ☒
Frame Retry: ☐
Tx Power Register Value:
Tx Power(dBm): 7
Transceiver State Selection
Receiver Desensitization: ☐
RPC: ☐
Trx State: RX_AACK_ON
Tx Power(dBm)
Transceiver TX power value in dBm. Valid range is -25 to 11.
Write Read

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

The screenshot displays the Performance Analyzer software interface. At the top, the 'Connected Kits' section shows two kits, 'COM158' and 'Remote', both marked as 'Paired'. Below this, the 'Configuration' pane on the left shows the 'PER Test Configuration' with settings: Antenna Diversity on Peer (Select Antenna A1/X2), CRC on Peer (unchecked), Frame Length (20), Test Frames Count (100), Transceiver Channel Configurations (Channel Page 0, Channel 0), Transceiver Configurations (ACK Request checked, Antenna Diversity Select Antenna A1/X2, CSMA-CA checked, Frame Retry unchecked, Tx Power Register Value 7, Tx Power(dBm) 7), and Transceiver State Selection (Receiver Desensitization unchecked, RPC unchecked, Trx State RX_AACK_ON). The 'Channel' section at the bottom indicates the current channel is 802.15.4.

The main window shows the 'Packet Error Rate Test' results. The 'Test Parameters' table lists: Average LQI (255), Average RSSI (dbm) (-76), Frames transmitted (100), Frames received (100), Invalid Frames (0), Frames not acknowledged (0), Frames with access failure (0), Frames with wrong CRC (-), Test duration (sec) (2.046062), and Data rate (Kbits/sec) (7.8199). A large yellow circle represents the 'Frames received - 100' data point. A legend on the right lists: Frames received - 100 (yellow), Invalid frames - 0 (green), Frames not acknowledged - 0 (blue), and Frames with access failure - 0 (dark blue).

Note: When 'CRC on Peer' and 'Frame Retry' options are enabled, 'Frames with Wrong CRC' count includes retransmitted frames

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

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Connected Kits

Select port to connect : COM158 Connect Save Kit Load Kit ? Version : 7.0.130

COM158
ATSAMR30G18A
AT86RF212B
SAMR30_XPLAINE...
A4AA67A0E7EB4F7C

Remote
ATSAMR30G18A
AT86RF212B
SAMR30_XPLAINE...
996B0DD60FC7CA58

Kit/Transceiver Properties Transceiver Registers Packet Error Rate Test Energy Detection Scan Certification Tests Range Test

Single PER Test ▶

Test Parameters

Average LQI	254
Average RSSI (dbm)	-79
Frames transmitted	100
Frames received	100
Invalid Frames	0
Frames not acknowledged	0
Frames with access failure	0
Frames with wrong CRC	-
Test duration (sec)	0.755614
Data rate (Kbits/sec)	21.17483

Note: When 'CRC on Peer' and 'Frame Retry' options are enabled, 'Frames with Wrong CRC' count includes retransmitted frames

Legend:

- Frames received - 100
- Invalid frames - 0
- Frames not acknowledged - 0
- Frames with access failure - 0

Configuration

PER Test Configuration

- Antenna Diversity on Peer: Select Antenna A1/X2
- CRC on Peer: ☐
- Frame Length: 20
- Test Frames Count: 100

Transceiver Channel Configurations

- Channel Page: 2
- Channel: 0

Transceiver Configurations

- ACK Request: ☒
- Antenna Diversity: Select Antenna A1/X2
- CSMA-CA: ☒
- Frame Retry: ☐
- Tx Power Register Value: 7
- Tx Power(dBm): 7

Transceiver State Selection

- Receiver Desensitization: ☐
- RPC: ☐
- Trx State: RX_AACK_ON

Channel Page

Current channel Page used by the Transceiver.

Channel Pages:

0 - 20khz/(Channel 0) 40khz/(Channel 1-10)

Write Read

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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