# 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	Туре	Size
\delta 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 Architectires are selected and click "Next".

Atmel Studio	
Atmel S	Studio 7.0
Select Arch	itecture
✓	AVR 8-bit MCU
	AVR 32-bit MCU
	SMART ARM MCU
	Back Next Cancel

4.1.6. Select ASF extensions and click "Next"

Atmel Studio
Atmel Studio 7.0
Select extensions
Atmel Software Framework and Example Projects
л
Back Next Cancel

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

Atmel Studio	
Atmel Studio 7.0	
System validation	
Operating System Version	1.
Running applications	1
Disk space availability	~
Million card Univer	A
Video card driver Found Intel(R) HD Graphics Family with driver version 9.18.1 might cause issues, please consider upgrading the driver. Refreets Riscs	0.3257 which

4.1.8. Click "Install".

Important notes	
with older versions of Atmel/AVR Studio and other third-party vendo	rs.
More information	
USB Driver Signing	
Due to new driver signing requirements in Microsoft Windows, K83033929 needs to be applied to Windows 7. Not doing this will car an error during the Jungo driver installation.	use
More information	
Xeam License Expired Dialog	
During installation, a dialog about an expired Xeam license may pop Just click Continue in this dialog to continue the installation.	up.
Anonymous Statistics Collection	
Atmel Studio collects data on usage for statistical purposes. No perso data is collected, and all data is handled in accordance with the Atme Privacy Policy, If you do not want to contribute, this can be disabled to going to Tools—Options—Atmel Studio Feedback.	nal 1 by
More information	

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

Atmel Studie		16
Atmel Studio 7.0		
Installing Plesse wait while setup installs Atmel Studio 7.0 on your computer	_	-
	_	-
🐑 Details		
11 A.		
	χ.e)	į



### 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

Name	Date modified	Туре	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
  - (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 notification as shown below.

	) instance	
EDBG Virtual COM Port (COM17)	🖌 Ready to use	

#### 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.

**USB for Programming/Testing Function** 

- ATTENNA 1

   ATTENNA 1
- 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





6.3. In Device Programming dialog box, select the edbg serial number and ensure the Device is "ATSAMR30G18A" and select 'SWD' as Interface. Then click "Apply"



Device Progra	amming					2.	*
Tool EDBG • EDBG attel 27200 Simulator	Device ATSAMR30G18A	SWD · Apply	Device signature not read	Reat	Target Voltage	0	
		S	elect tool, devic	ce and in	nterface.		
						Close	

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

ool Device	Interface	Device signature	9	Target Voltage		
EDBG - ATSAMR300	G18A ▼ SWD ▼ A	oppiy	Read	Read		
nterface settings	SWD Clock					
fool information						2 MHz
Device information					Reset to	default clock
vlemories	The clock frequency	should not exceed target (	CPU speed *	10.		
uses						C of
ecurity						Set

6.5. Read the Device signature and Target Voltage and ensure it is as follows Device Programming: 0x1081021E



Target Volatge: 3.3V

ool Device	Interface	Device signature	Target Voltage	
EDBG • ATSAMR30G1	.8A • SWD • Apply	0x1081021E	ead 3.3 V Read	E
interface settings	SWD Clock	17		
Tool information				2 MHz
Device information				Reset to default clock
vlemories	The clock frequency should	d not exceed target CPU s	peed * 10.	
uses				Set
ecurity				
ading device IDOK				
ading device IDOK				
ading device IDOK				
ading device IDOK				
ading device IDOK				

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.

Tool Device	Interface Device signat	ture Target Voltage	
EDBG - ATSAMR30G	18A • SWD • Apply 0x1081021E	Read 3.3 V Read	
Interface settings Tool information	Device Erase Chip • Erase now 2		3
Device information	Flash (264 KB)		
Memories	C:\Users\velmurugan.muthusamy\Desktop\	SAMR30_Performance_Analyzer_CW_With	nout_PSDU.h 🔻 🛄
Fuses 1 Security	Irase Flash before programming     Verify Flash after programming     Advanced	Program Verify 4	Read
	User Page (256 bytes)		•
	<ul> <li>Erase User Page before programming</li> <li>Verify User Page after programming</li> <li>Advanced</li> </ul>	Program	Réad
rasing device OK rogramming FlashOK erifying FlashOK			
verifying riashOK			

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.

dvanced		
Pack Manager adds and removes device support for Atmel Studio	564 devices suppo All pack Last update	orted by 44 installed packs is are up to date isd on 21-7-16 16:36 Search Packs, Davies, (Cirl-
Pack	Device Name	Family Core
ATautomotive_DFP Up to date I.1.84 (2016-02-15) - Modified ISP programming algorithm for and EEPROM address size for ATA5702M322.	ATA5272	ATautomotive AVR8
ATmega_DFP Up to date     I0.98 (2016-02-18) - Removed Full-Swing Crystal field for SUT_CKSEL of ATmega P8 devices. Updated documentation	ATA5505 ATA5702M322 ATA5781	ATautomotive AVR8 ATautomotive AVR8 ATautomotive AVR8
ATtiny_DFP     Up to date     10.78 (2016-02-18) - Added ATtiny102, ATtiny104, ATtiny80 and ATtiny840. Updated documentation links.	ATA5782 ATA5783	ATautomotive AVR8 ATautomotive AVR8
➢ CMSIS Up to date           ■ 4.2.0 (2014-09-24) -	ATA5790 ATA5790N ATA5791	ATautomotive AVR8 ATautomotive AVR8 ATautomotive AVR8
SAM3A_DFP Up to date U10.34 (2016-02-18) - Updated documentation links.	ATA5795 ATA5831	ATautomotive AVR8 ATautomotive AVR8
SAM3N_DFP Up to date     10.43 (2016-02-18) - Updated documentation links.	ATA5832 ATA5833 ATA6285	Alautomotive AVR8 ATautomotive AVR8 ATautomotive AVR8
SAM35_DFP Up to date     10.54 (2016-02-18) - Updated documentation links.	ATA6286 ATA6612C ATA6613C	ATautomotive AVR8 ATautomotive AVR8 ATautomotive AVR8
SAM3U_DFP Up to date Up to date 1.0.34 (2016-02-18) - Updated documentation links,	ATA6614Q ATA6616C	ATautomotive AVR8 ATautomotive AVR8
SAM3X_DFP Up to date Up to date Up to date	ATA6617C ATA664251 ATA8210	ATautomotive AVR8 ATautomotive AVR8 ATautomotive AVR8
SAM4C DFP Up to date	ATA8215	ATautomotive AVR8

Pack location: C:\Program Files (x86)\Atmel\Studio\7.0\Packs

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.

Connected Kits eet port to connect: COM17  Connect	Several Load Kit 😨 Version : 7.0.130	
Kit/Transceiver Properties Transceiver Registers	Connection- 2) Select the port to which the kit is connected. Performance Analyzer Connect a With the kit is connected. Performance Analyzer Connected Kits Select port to connect ( COM1	Starting PER test on connected kit- 1) Right click on the connected kit and select the operating mode to start the PER test. Performance Analyzer Connected Kits Select port to connect: COM14 Connect Comtinue Analyzer Continue Analyzer Continue Analyzer Continue Analyzer Disconnect 2) Click on Play button to run PER test Single Test Single Test
	Parity None + Stop Bits One + Flow Control None + Defaults Cancel Ok	Suite ren

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"

IEEE 802.15.4 Performance Analyzer			*
Connected Kits Select port to connect: COM17 COM1 COM17 COM1	Secretal Load Kit @ Vetsion : 7.0.130		
Configuration	Ouick Start : Connection- 1) Connect a wirders kit to the system. 2) Select the port to which the kit is connected. Performance Analyzer Connected Kits Select port to connect : COM1 COM1 COM1 COM1 COM1 COM1 COM1 COM1 COM1 COM1 COM1 COM1 COM1 COM1 COM1 COM1 Connect COM1	Stating PRE test on connected kita         19. Bight click on the connected kita sleet the bearling mode to start the PER test.         Performance Analyzer         Connected Kits         Select port to connect:         COMI14         Proformance Analyzer         Continue of Connected Kits         Select port to connect:         COMI14         Proformance Analyzer         Continue As Single Node         O'Exclassion File         Disconnect         O'Exclassion File         Disconnect         O'Exclassion File         Disconnect         Continue As Single Node         Disconnect         Disconnect         Disconnect         Continue As Single Node         Disconnect         Continue As Single Node         Disconnect         Disconnect     <	

#### 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"

Bits Per Second	9600	
Data Bits	8	-
Parity	None	
Stop Bits	One	
Flow Control	None	

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.

onnected Kits			
ct port to connect : COM17 +	Save Kit: Load Kit 👔 Version : 7.0.130		
COM12 2			
ATS6RF212B			
MR30_XPLAINE Jo Initiate Peer Search			
3348980268F856 I Continue As Single Node			
Disconnect			
Transceiver Properties Transceiver Regist	ers		
TAL	Ouick Start :	Starting PER test on connected kit-	
Search	Connection-	1) Right click on the connected kit and select the	
	1) Connect a wireless kit to the system.	operating mode to start the PER test.	
	2) select the port to which the kit is connected.	Performance Analyzer	
	Performance Analyzer	Connected Kits	
	Connected Kits	Select port to connect : COM14 * Connect Sel	
	Select port to connect : COM1 Connect		
	COMI		
	Comit	AT86RF212 Jab Initiate Peer Search	
		RZ600 Continue As Single Node	
	3) Set COM Settings for the connected kit.	ACBE1BSF03E70B6F Disconnect	
	(Dird Sutting)		
	Port Settings	2) Click on Play button to run PER test	
	Bits Per Second 9600 +	Packet Error Rate Test Energy Detection Scan Continuous Transmission	
	Data Bits 8 +	Contract of the local state of t	
	None T	angle rest	
	Parky		
	Stop Bits		
	Flow Control None •		
	Defaulte Cancel Ok		

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.

802.15.4 Performance Analyzer		
Connected Kits	Save Kit Toad Kit 2 Version 70.130	
Port to connects and the		
COM17		
ATSAMR30G18A		
ATS6RF212B		
AMR30_XPLAINE 5		
BF3348980268F856		
Kit/Transceiver Properties Transceiver Registers	Energy Detection Scan Certification Tests	
	ED Scan Duration 4 🖾 🕨 Approximate Time To Complete: 00:00:06	
Search 🗙	Channels: J All Channels J 0 J 1 J 2 J 3 J 4 J 5 J 6 J 7 J 8 J 9 J 10	
PER Test Configuration	Test Parameters	
Antenna Diversity on Peer Enable		
CRC on Peer	Channel vs Received Input Power	
Frame length 20		
Test Frames Count 100	-11-	
Transceiver Channel Configurations		
Channel 1	-21-	
Transceiver Configurations	2 m	
ACK Request		
Antenna Diversity Select Antenna A1/X2 -	22 -41-	
CSMA CA	ower	
Frame Retry	6. 5-51-	
Tx Power Register Value		
Tx Power(dbm) 7	-61-	
Transceiver State Selection     Receiver Decepcitization	Reo	
PP[-	-71	
Trx State TRX_OFF +	01	
	-01	
Channel	91	
The current 802.15.4 channel in which the Performance	Channels	
test is running, valid range is 0 to 10.	rrequency range : channel (0) 606,5Minz, channel (1-10) 902/Minz-926Minz	
Write Read		

EEE 8	802.15.4 Performance Analyzer			▼ @ X
	Connected Kits			
Sel	ect port to connect · COM17	- Connect	Save Kit Load Kit 🕜 Version : 7.0.130	
s	COM17 ATSAMR30G18A AT86RF212B AMR30_XPLAINE \$F5348990TF 2856			
	Kit/Transceiver Properties	Transceiver Registers	Energy Detection Scan Certification Tests	
0			ED Scan Duration 4 🔁 🕨 a Approximate Time To Complete: 00:00:06	
onfi	Search	×	Channels: 2 All Channels 20 21 22 23 24 25 26 27 28 29 210	
gura	4 DED Test Configuration			
Ition	Antenna Diversity on Peer		V les Palametes	
	CRC on Peer		Page Speed Modulation 0 20 Addbac BSSK Channel vs Rereived Input Power	
	Frame Length			
	Test Frames Count		11 17 400kbps,1Mbps O-QPSK	
	Transceiver Channel Confi	igurations		
	Channel Page	0	-21 Channel Selection:	
	Channel	1	0 · 868 3MHz	
	Transceiver Configuration	15	$\hat{\mathbf{g}}_{-31}$ 1 10 · 006 MHz to 024 MHz	
	ACK Request	V		
	Antenna Diversity	Select Antenna A1/X2 🔻	ê -41	
	CSMA-CA		§         Antenna Diversity:	
	Frame Retry		<sup>3</sup> β -51 Enable Antenna Diversity Mode	
	Tx Power Register Value		Antenna A1/X2 : Chip Antenna	
	Tx Power(dbm)	7	Antenna A2/X3 : SMA Connector	
	4 Transceiver State Selectio	n		
	Receiver Desensitization		-71	
	RPC		Change Tx Power(dBm) Value $\cdot$ '-25' for min and '7' for max	
	Trx State	TRX_OFF •	-81	
	Channel The current 802.15.4 channel ir test is running. Valid range is 0 Write	n which the Performance 0 to 10.	Channels Frequency Range : Channel (1-10) 902MHz-928MHz	_
	wine	neud	<b>I CHCK</b> write to program the board after setting an the above parameters.	

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<sub>C</sub>[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.

IEE	802.15.4 Performance Analyzer				
~	Connected Kits				
	elect port to connect · COM17	- Connect	Save Kit Load Kit Q Version : 7.0.130		
	COM17 ATSAMR30G18A AT86RF212B SAMR30_XPLAINE				
	Kit/Transceiver Properties	Transceiver Registers	Energy Detection Scan Certification Tests		
<		,, <u>,</u>			
S		~			
figu	Search	×	Test Parameters		
ratio	PER Test Configuration     Antenna Diversity on Peer Enable		Transmit		
ă					
	CRC on Peer		Continuous Pulse Transmission (transmits energy pulse on the current channel )		
	Frame Length	20	Continuous Transmission		
	Test Frames Count	100	CW (Continuous Ways)		
	Transceiver Channel Confi	igurations	Continuous wave)		
	Channel Page	0 •	Transmits continuous sine wave by writing tand PSDU data into the Frame buffer.		
	Channel	1	PRBS (Pseudo Random Binary Sequence)		
	Transceiver Configurations     ACK Request		Transmits modulated wave by writing a frame of maximum length into the Frame buffer		
	Antenna Diversity	Select Antenna A1/X2 🔻	Packet Streaming		
	CSMA-CA		Transmits packet continuous with delay between frames without acknowledgement		
	Frame Retry		Delay Between Frames 3 ms Transmit as fast as possible		
	Tx Power Register Value		body between manies 5 mis intraismit as fast as possible		
	Tx Power(dbm)	7	Frame Length 127		
	Transceiver State Selection     A     Selection     A     Selection     Select	n			
	Receiver Desensitization		Receive		
	RPC		Continue Design Mode		
Trx State TRX_OFF		TRX_OFF •	Continuous Receive Mode		
	Write	Read	Enables KA_UN (ACLIVE listening mode without ack transmission) mode of the transceiver.		

#### Figure.16 Performance Analyzer – Continuous Tx mode configuration



## 10. Tx Test Modes:

S

Configuration

### 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 Pa	arameter	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	
COM158 ATSAMR30G18A AT86RF212B SAMR30_XPLAINE A44667A02FF84F7C	COM158 Connect	Save Kit Lo.	ad Kit Version : 7.0.130	
Kit/Transceiver Pro	operties Transceiver Registers	Energy Detectio	on Scan Certification Tests	
PER Test Confid	X	Test Paramete  Transmit	ers	
Antenna Divers	sity on Peer Enable	Continuous Pulse Transmission (transmits energy pulse on the current channel )		
CRC on Peer				
Frame Length	20	<ul> <li>Ontinuo</li> </ul>	ous Transmission	
Transceiver Cha	annel Configurations		CW (Continuous Wave)	
Channel Page	0		Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.	
Channel Transceiver Con ACK Request	1 nfigurations		PRBS (Pseudo Random Binary Sequence) Transmits modulated wave by writing a frame of maximum length into the Frame buffer.	
Antenna Divers	sity Select Antenna A1/X2		Packet Streaming Transmits packet continuous with delay between frames without acknowledgement	
Tx Power Regis	ster Value		Delay Between Frames 3 ms 🔲 Transmit as fast as possible	
Tx Power(dbm	) –		Frame Length 127	
<ul> <li>Transceiver Sta</li> </ul>	te Selection /	Dessive		
Receiver Deser	Isiuzauon	Receive		
Trx State	TRX_OFF •	Continuo Enables	ous Receive Mode RX_ON (Active listening mode without ack transmission) mode of the transceiver.	
Channel Page				
Current channel Pages : 0 · 20kbns(Channel Channel Pages )	ge used by the Tranceiver.			

• 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.

XAH_CIKL_U (UX2C)	38	
CSMA_SEED_0 (0x2D)	C7	
CSMA_SEE ) 1 (0x2E)	60	
CSMA_BE (Jx2F)	53	-
		•
Read Write	Import Expo	rt

• Then Change the register value of TRX\_CTRL\_2 (0xC) to "B4" as shown in the below image and press 'Enter' in keyboard

$\frown$	Connected Kits		
Se	elect port to connect : COM251 •	Connect Save Kit	Load Kit 😰 Version : 7.0.130
	COM251 p ATSAMR30G18A V AT86R7212B b SAMR30 XPLAINE US BBDB969A053285BC	Ţ	
	Kit/Transceiver Properties Transce	er Registers Energy Det	etection Scan Certification Tests
S S	Name (Address) Value	Hex)	
onfig	TRX_STATUS (0x1) 8	Test Para	rameters
Jurat	TRX_STATE (0x2) 8	Transmit	
ion	TRX_CTRL_0 (0x3) 1	Transini,	•
	TRX_CTRL_1 (0x4) 22	Con	ontinuous Pulse Transmission (transmits energy pulse on the current channel )
	PHY_TX_PWR (0x5) C0	© Con	ontinuous Transmission
	PHY_RSSI (0x6) 20		CW (Continuous Wave)
	PHY_ED_LEVEL (0x7) FF		Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.
	PHY_CC_CCA (0x8) 21		
	CCA_THRES (0x9) 77		PRBS (Pseudo Random Binary Sequence)
	RX_CTRL (0xA) 17		Transmits modulated wave by writing a frame of maximum length into the Frame buffer.
	SFD_VALUE (UXB) A7	-	Packet Streaming
		ange	Transmits packet continuous with delay between frames without acknowledgement
	IRO MASK (0xE)	value "B4"	Delay Between Frames 3 ms 🔲 Transmit as fast as possible
	IRO STATUS (0xF)		Frame Length 127
	VREG_CTRL (0x10) 4		
	BATMON (0x11) 22	Receive	
	XOSC_CTRL (0x12) F0	Con	ontinuous Receive Mode
	CC_CTRL_0 (0x13) 0	Ena	nables RX_ON (Active listening mode without ack transmission) mode of the transceiver.
	CC_CTRL_1 (0x14) 0		
•	After the TRX_C XAH_CTRL_U (UX2C CSMA_SEED_0 (0X2 CSMA_SEED_1 (0X2 CSMA_BE (0X2F)	RL_2 (0xC) valu 38 D) C7 E) 60 53	lue changed to "B4", click the "Write" icon and do the te
	Read	/rite 🕖 Import	t Export

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	

♪ Se	Connected Kits lect port to connect : COM158	Connect	Save Kit Load Kit Version : 7.0.130			
S A	COM158 ATSAMR30G18A AT86RF212B AMR30_XPLAINE MAAA67A0E7EB4F7C					
	Kit/Transceiver Properties	Transceiver Registers	Energy Detection Scan Certification Tests			
$\langle \rangle$						
onfi	Search	×	That Descentary			
gura		~				
atio	PER Test Configuration		Transmit			
3	Antenna Diversity on Peer	Enable	Continuous Pulse Transmission (transmits energy pulse on the current channel.)			
	CRC on Peer	20				
	Test France Court	20	Continuous Transmission			
	Transceiver Channel Configurations		CW (Continuous Wave)			
	Channel Page		Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.			
	Channel	2				
	Transceiver Configurations     ACK Request		PRBS (Pseudo Random Binary Sequence) Transmits modulated wave by writing a frame of maximum length into the Frame buffer.			
	Antenna Diversity	Select Antenna A1/X2				
	CSMA-CA		Packet Streaming			
	Frame Retry		Transmits packet continuous with delay between frames without acknowledgement			
	Tx Power Register Value		Delay Between Frames 3 ms 🔲 Transmit as fast as possible			
	Tx Power(dbm)	7	Frame Length 127			
	4 Transceiver State Selectio	n				
	Receiver Desensitization		Receive			
	RPC					
	Trx State	TRX_OFF •	Continuous Receive Mode Enables RX_ON (Active listening mode without ack transmission) mode of the transceiver.			
	Channel Page Current channel Page used by Channel Pages : 0 * 20kbns(Channel 0) 40kbn Write	the Tranceiver.				

#### 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	

	COM251 ATSAMR30G18A AT86RF212B SAMR30_XPLAINE 01858576DB498C2D	L   Connect	Save Kit Load Kit 😨 Version : 7.0.130		
G	Kit/Transceiver Properties	Transceiver Registers	Energy Detection Scan Certification Tests		
0					
ontig	e 🔡 ⊉↓ Search	×	Test Parameters		
urat	PER Test Configuration				
Ī	Antenna Diversity on Pee	r Enable 🔹			
	CRC on Peer		igodot Continuous Pulse Transmission (transmits energy pulse on the current channel )		
	Frame Length		Ontinuous Transmission		
	Test Frames Count 100  Transceiver Channel Configurations		CW (Continuous Wave)		
					Channel Page
		Channel	1	PRBS (Pseudo Random Binary Sequence)	
	Transceiver Configurations		Transmits modulated wave by writing a frame of maximum length into the Frame buffer.		
	Ack Request	Coloct Antenno A1/V2 -			
		Select Antenna A1/X2	Packet Streaming		
	Erame Retry		Transmits packet continuous with delay between frames without acknowledgement		
	Tx Power Register Value		Delay Between Frames 3 ms 🔲 Transmit as fast as possible		
	Tx Power(dbm)	7	Frame Length 127		
	Transceiver State Selection	on			
	Receiver Desensitization		Receive		
	RPC				
	Trx State	TRX_OFF	Continuous Receive Mode Enables RX_ON (Active listening mode without ack transmission) mode of the transceiver.		
	Tx Power(dbm) Transceiver TX power value in 11. Write	n dBm. Valid range is -25 to Read	-		

### 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

Sel	Connected Kits ect port to connect : COM158 COM158 ATSAMR30G18A AT86RF212B AMR30_XPLAINE 4AA67A0E7EB4F7C	8  Connect	Save Kit Load Kit 😨 Version : 7.0.130		
0	Kit/Transceiver Properties	Transceiver Registers	Energy Detection Scan Certification Tests		
<pre>C</pre>					
onfig	Search	×	♥ Test Parameters		
Jurat	PER Test Configuration		Transmit		
ation	Antenna Diversity on Pee CRC on Peer	Antenna Diversity on Peer Enable - CRC on Peer  CRC on Pe	Continuous Pulse Transmission (transmits energy pulse on the current channel )		
	Tost Frames Count	100	O Continuous Transmission		
	Transceiver Channel Configurations		OCW (Continuous Wave)		
	Channel Page	0 •	Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.		
	Channel	d			
	Transceiver Configurations     ACK Request		PRBS (Pseudo Random Binary Sequence) Transmits modulated wave by writing a frame of maximum length into the Frame buffer.		
	Antenna Diversity	Select Antenna A1/X2 🔻	De det Characian		
	CSMA-CA	<b>V</b>	Packet Streaming      Transmite packet continuous with delay between frames without asknowledgement		
	Frame Retry				
	Tx Power Register Value		Delay Between Frames 3 ms I Transmit as fast as possible		
	Tx Power(dbm)	7	Frame Length 127		
	Transceiver State Selection	on			
	Receiver Desensitization		Receive		
	RPC				
	Trx State	TRX_OFF •	Enables RX_ON (Active listening mode without ack transmission) mode of the transceiver.		
	Channel The current 802.15.4 channel test is running. Valid range is Write	in which the Performance 0 to 10. Read			

#### 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

Se	COM158 COM158 ATSAMR30G18A ATS6RF212B SAMR30_XPLAINE A4AA67A0E7EB4F7C	Connect	Save Kit Load Kit Version : 7.0.130
	Kit/Transceiver Properties	Transceiver Registers	Energy Detection Scan Certification Tests
$\langle \rangle$			
Onf	Search	~	
igur		~	V Test Parameters
atio	PER Test Configuration		Transmit
-	Antenna Diversity on Peer	Enable	Continuous Pulse Transmission (transmits energy pulse on the current channel )
	CRC on Peer		Continuous ruise mansmission (alansmissionegy puse on the carent chamer)
	Frame Length		Continuous Transmission
	lest Frames Count	100	CW (Continuous Wave)
	Transceiver Channel Confi	igurations	Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.
	Channel Page	<u> </u>	
	Channel	0	PRBS (Pseudo Random Binary Sequence)
	ACK Request	15	Transmits modulated wave by writing a frame of maximum length into the Frame buffer.
	Antenna Diversity	Select Antenna A1/X2	
	CSMA-CA		Packet Streaming
	Frame Retry		Transmits packet continuous with delay between frames without acknowledgement
	Tx Power Register Value		Delay Between Frames 3 ms 🔲 Transmit as fast as possible
	Tx Power(dbm)	7	Frame Length 127
	Transceiver State Selectio	/ n	
	Receiver Desensitization		Receive
	RPC		
	Trx State	TRX_OFF	Continuous Receive Mode
			Enables RX_ON (Active listening mode without ack transmission) mode of the transceiver.
	Channel Page Current channel Page used by Channel Pages : 0 · 20kbps(Channel 0) 40kbr Write	the Tranceiver.	

## 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)

EE 802.15.4 Performance Analyzer			*
Connected Kits			
Select port to connect : COM17   Comuta	Satur Kit Load Kit @ Version : 7.0.130		
Select port to connect: COM17  ATSANGOSIA  ATSANGOSIA  ATSANGOSIA  Continue As Single Node  Kit/Transcev  Selecth  Continue As Single Node  Contin	Save FO       Load Kit       Version: 7.0.130         Ouick Start:       Connection-         1) Connect a wireless kit to the system.       2) Select the port to which the kit is connected.         Performance Analyzer       Connect Kits         Select part to connect:       COM1         COM14       Connect         3) Set COM Settings for the connected kit.	Starting PER test on connected kit- 1) Right click on the connected kit and select the operating mode to start the PER test. Performance Analyzer Connected Kits Select port to connect: COM14 Connect San COM14 AT3202(JA3258 AT86NF712 R5600 Continue As Single Node Continue As Single Node Disconnect	
Vinc- Rend.	Port Settings Bits Per Second 9600  Data Bas Parthy None Parthy Stop Bas Dise Plow Control Defaults Cancel Ob	2) Click on Play button to run PER test           Packet Error Rate Test         Energy Detection Scan         Continuous Transmission           Single Test <ul> <li>Image: Single Test</li> </ul>	

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"

ATSAMR30G18A ATS6RF212B	> Remote ATSAMR30G18A AT86RF212B SAMR30_XPLAINE	Paired	
Kit/Transceiver Properties	Transceiver Registers	Packet Error Rate Test Energy Detection Scan	Certification Tests Range Test
Rectard L		Single PER Test	
Search	×	Test Parameters	
PER Test Configuration			
Antenna Diversity on Peer	Select Antenna A1/X2 •		
CRC on Peer	10		
Frame Length	20		
Test Frames Count	100		
4 Transceiver Channel Conf	igurations		
Channel Page	0 -		
Channel	1		
<ul> <li>Transceiver Configuration</li> </ul>	ns		
ACK Request			
Antenna Diversity	Select Antenna A1/X2 +		
CSMA-CA	V		
Frame Retry			
Tr. Fower Reported Value			
Tx Power(dbm)	7		
* Transceiver State Selectio	m		
Receiver Desensitization			
nor	10		
Trx State	RX_AACK_ON +		

#### 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. IEEE 802.15.4 Performance Analyzer

	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
$\bigcirc$	Connected Kits		
S	elect port to connect : COM25	51 • Connect	Save Kit Load Kit 😨 Version : 7.0.1:
	1		
	COM251	Remote	
	ATSAMR30G18A	ATSAMR30G18	A
	AT86RF212B	<> AT86RF212B	Pair
	SAMR30_XPLAINE	SAMR30_XPLAIN	(E
	7E1731037805895C	F102FC50D36290	283
	Kit/Transcriver Properties	Transceiver Registers	Packet Error Rate Test Energy Detection Sci
<	Kity Talisci wei Properties	Transceiver Registers	Circle DED Test
G	Name (Address)	Value (Hex)	
figu	TRX_STATUS (0x1)	16	Test Parameters
Irati	TRX_STATE (0x2)	16	
3	TRX_CTRL_0 (0x3)	1	
	TRX_CTRL_1 (0x4)	22	
	PHY_TX_PWR (0x5)	C1	
	PHY_RSSI (0x6)	80	
•	At the bottom corner, there i	s an icon called "Read	", click it.
	XAH_CTKL_U (UX2C)	38	
	CSMA_SEED_0 (0x2D)	C7	
		07	
	CSMALSEED 1 (0x2E)	60	
	CSMA_BE_(0x2F)	53	<b>—</b>
	1		•
	Pand Militar	Import	unot l
	Kead Write	Import	xport

• Then Change the register value of TRX\_CTRL\_2 (0xC) to "B4" as shown in the below image and press 'Enter' in keyboard

Connected Kits Select port to connect : COM	Connect	Save Kit Load Kit 😨 Version : 7.0.130
COM251 ATSAMR30G18A AT86RF212B SAMR30_XPLAINE BBD8969A0532B5BC	<u> </u>	•
Kit/Transceiver Propertie	Transceiver Registers	Energy Detection Scan Certification Tests
Name (Address)	Value (Hex)	
TRX_STATUS (0x1)	8	Test Parameters
TRX_STATE (0x2)	8	Transmit
TRX_CTRL_0 (0x3)	1	
TRX_CTRL_1 (0x4)	22	$\odot$ Continuous Pulse Transmission (transmits energy pulse on the current channel )
PHY_TX_PWR (0x5)	CO	Continuous Transmission
PHY_RSSI (0x6)	20	CW (Continuous Wave)
PHY_ED_LEVEL (0x7)	FF	Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.
PHY_CC_CCA (0x8)	21	
CCA_THRES (0x9)	77	PRBS (Pseudo Random Binary Sequence)
RX_CTRL (0xA)	17	Transmits modulated wave by writing a frame of maximum length into the Frame buffer.
SFD_VALUE (0xB)	A7	
TRX_CTRL_2 (0xC)	A4	Packet streaming     Transmits packet continuous with delay between frames without acknowledgement
ANT_DIV (0xD)	5 Change	Dolay Potucon Frames 2 me. Transmit as fact as possible
IRQ_MASK (0xE)	8	Delay between manes 5 mis antisinit as last as possible
IRQ_STATUS (0xF)	0	Frame Length 127
VREG_CTRL (0x10)	4	Receive
BATMON (0x11)	22	
XOSC_CTRL (0x12)	FO	Continuous Receive Mode
CC_CTRL_0 (0x13)	0	Enables RX_ON (Active listening mode without ack transmission) mode of the transceiver.
After the TRX	CTRL_2 (0xC) val U (UX2C)	lue changed to "B4", click the "Write" icon and do the test.
CSMA_SEE	D_0 (0x2D)	C7
CSMA_SEE	ED_1 (0x2E)	60
CSMA_BE	(0x2F)	53 🗸
•		
Read	d Write	Import Export

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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