ATREB215-XPRO-A Test User Manual

ATREB215-XPRO-A Extension Board



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1. Introduction

Scope

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



Figure 1: Atmel ATREB215-XPRO-A board

2. Hardware Setup

1.	ATREB215-XPRO-A Boards	- 2 Nos
2.	SAM4L-XplainedPro Boards	- 2 Nos
3.	micro USB cable	- 2 Nos
4.	2.4GHz Stubby Antenna (M01-SS2)	- 2No
5.	1/4 wave whip Antenna (CTA 868/0/WS/SM/H1)	-2No

Note: SMA cables not included in the box

3. Software Setup

- 1. Atmel Studio 6.2 (no need to install again if it is already available in Test PC)
- 2. SAM4L-XplainedPro Drivers Installed automatically

4. Software Installation

Note: If Atmel Studio 6.2 is already available in Test PC, jump to step 5 in this section and install wireless composer

- 1. Open the DVD containing the Atmel Studio 6.2 Software package.
- 2. Click the AStudio61sp2.exe icon to launch Atmel Studio Installation.

Name	Date modified	Туре	Size
Studio61sp2.exe	2/6/2014 12:40 PM	Application	653,729 KB
RF215_PERFORMANCE_ANALYZER_beta_4.hex	1/27/2014 10:59 AM	HEX File	188 KB
WirelessComposer-rf215.vsix	3/21/2014 11:33 AM	Microsoft Visual S	6,637 KB

Figure 3: Atmel Studio Installer

3. Now Atmel Studio will begin the installation



Figure 4: Atmel Studio Installation

4. Follow the on-screen instructions to complete the installation



Figure 5: Atmel Studio Installation

5. Next install the Wireless Composer extension by clicking the wireless-composer-vsix-stable icon found in the DVD as shown in the following figure.

Name	Date modified	Туре	Size
Studio61sp2.exe	2/6/2014 12:40 PM	Application	653,729 KB
RF215_PERFORMANCE_ANALYZER_beta_4.hex	1/27/2014 10:59 AM	HEX File	188 KB
WirelessComposer-rf215.vsix	3/21/2014 11:33 AM	Microsoft Visual S	6,637 KB

Figure 6: Wireless Composer Installation

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5. Hardware and Driver Installation

1. Connect one ATREB215-XPRO-A board to EXT1 connector of the SAM4L-Xplained Pro Board as shown in the figure





- Connect a micro USB cable from PC to the Debug USB port (USB for 900MHz) for 863MHz EU/915MHz US ISM band operation
- 3. Connect a micro USB cable from PC to SAM4L USB (USB for 2400MHz) for 2.4GHz ISM band operation.
- Connect 2.4GHz λ/4 Monopole Antenna (PSTG0-2400HS) with RF 2.4GHz port and connect Rubber Stubby Antenna with SMA Male Straight (IJ28-SS) with RF 900MHz port
- 5. Next, EDBG Virtual COM port driver installation will begin automatically

1	Installing device driver so Click here for status.	ftware 🌯 🗙		
		- 1	🧐 ail	1:54 PM 8/12/2013

Figure 8: EDBG Virtual COM PORT Driver installation

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

EDBG Virtual COM Port (COM1	7) installed	
EDBG Virtual COM Port (COM17)	Ready to use	

Figure 9: EDBG Virtual COM PORT Driver installation

Note: COM17 from the above figure is an example. The COM Port number varies depending upon the PC.⁵



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6. Programming SAM4L Xpro board to connect with ATREB215-Xpro-A

a. program the Test setup as follows: Open Atmel studio and Go to Tools menu and click Device Programming

SAM4L Xplained Pro - At	tmelStudio	Terrate and the second			0	×
File Edit View VAssestX	ASF Project Debug T	ools Window Help				
1 🛅 • 🖄 🖃 🚽 🏈	18-1219-9	Visual Micro	•	• • • • • • • • • • • • • • • • • • •	# 글길 - 글무국 유규님님 않	
10320534	1. J. IN D. 1	Command Prompt	100 . E :	TICT - E al No Dence No Tool -		
Visual Micro *	18.1	Device Programming	Ctrl+Shift+P			
ASE Winned SAMAI Yola	ined Pro . X Start Page	3 Add target			Solution Function	× ×
Mell based		MemoryLogger				
CALMIL Value and Dec	SAM4L Xplaine	Bluetooth Low Energy Performance Ana	lyzer			-1
Source Apparted File	Both un	Performance Analyzer				
Extension	1	Code Snippets Manager	Ctrl+K, Ctrl+B			
	AN ANT	Add-in Manager				- 1
	ACCESS CONTRACTOR	Extension Manager				- 1
		Atmel Gallery Profile				- 1
		External Tools			-	- 1
	The state of the state of the	Import and Export Settings				
	hardware platform to e	Customize				
	microcontroller. Suppo	Options				- 1
	the Atmel® SMART* S	AMUL and explains how to integrate the				- 1
	device in a custom design	n.				- 1
	Titra New Example Pro	Next_				- 1
					19	- 1
	Atmel Studio Help:					- 1
	🐼 Kit userguide					- 1
2 Show page on connect	External Links:				🗸 🔍 ASE 👙 VA VI 🌴 VA O 😎 So	lut.,
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Show output from:		121261710	H			
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						- 1
						- 1
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an overal will use victoria						
Ready						
8 E Q		📋 🚺 💁 💽	501		• 💹 庵 🖲 🕅 5111	2015

b. Select the tool as EDBG as shown below

	0	the second second	Bassission	T	
DBG	ATSAM4LC4C	SWD Apply	not read Read	Read	٥
mulato	or		Select tool, device and	d interface.	
					Clara

c. Click "Apply", Status LED (yellow color) which is near to power LED starts to glow. Click "Read" which reads Device signature and Target voltage. Next, Click memories for programming. Steps are shown below in sequence



EDBG -	Device ATSAM4L	.C4C •	Interface SWD -	Apply	OxAB0A09E1	Read	Target Vo 3.3 V	Read	ø	
Interface s	ettings	-SWD Cle	ck						Contraction of the second seco	
Tool infor	mation	0-								-
Device info	ormation	The close	k frequency :	should not	exceed target CPU	speed * 1	D.			
Fuses										
Security										
Reading dev	ice IDOK									
Reading dev	ice IDOK									

d. Save the "PERFORMANCE_ANALYZER_2_SAM4L_RF215v3.hex" file into your PC and choose the correct path of the saved hex file in Atmel Studio and click programming. Steps are shown below in sequence. After programming, close the below window and start using Performance Analyzer.

Tool Device	Interface	Device signature	Target Voltage	
EDBG - ATSAM4	LC4C • SWD • Apply	0xA80A09E1 Read	3.3 V Read	0
Interface settings Tool information Device information	Device Erase Chip Erase now Flash (256 KB)			
Memories Fuses Security	C:Usersisadagopal.venugopal.vb Frase Flash before programming Verify Flash after programming Program flash from RAM RAM Address: User Page (512 bytes) Verify User Page before program Verify User Page after program	scuments/Certification Proj 9 mming ming	Program	Verify Read
eading device IDOK				

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7. Performance Analyzer

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



Figure 10: Launch Atmel Studio 6.1

2. For the first time launch, Atmel studio will show the below error for Wireless Composer. Click Ok.



Figure 11: Wirless composer Error

3. From the Atmel Studio Start page, launch Performance Analyzer utility by clicking the icon as shown in below figure.



Figure 12: Atmel Studio 6.1 – Start Page

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

Connected Kits	See Ver Load Kt.	
K&/Transceiver Properties. Transceiver Registers	Ouick Start : Connection: 1 Ocnica wireless kit to the system. 2) Select the port to which the kit is connected. Performance Analyzer Connected Kits Select port to connect: COMI COMI	Starting PER test on connected kit- 1) Right click on the connected kit and select the operating mode to start the PER test. Performance Analycer © Connected Kits Select port to connect © COM14 © Commit COM14 © Connected Kits Select port to connect © COM14 © Commit Commit Descriptions Continue As Single Nede
	b) set Com settings for the connected bit. Port Settings Bits Per Second 9600 party None Party None	2) Click on Play button to run PER test Packet Erner Rate Test Energy Detection Scan Continuous Transmission Single Test

Ensure the DuT is connected to the PC as explained in Section 5 and step 1

8. Tx Test (Single node / Continuous Transmission) for Sub-1GHz CE Testing

1. Select the COM Port from the dropdown menu and select a COM port to which the kit to be connected and click "Connect"

Concerted Riv Series port to convert: COM Control Con	erformance Analyzer		+ 0
Conserver Property Instance Conserver Registry Instance <	Connected Kits elect port to connect: COMI COMI	Source Load 62	
This Paul	R2/Tonicove Properties Transcove Registers	Duck Start : Concernent of the start is the substrate of the substrate is the substrate is the substrate is the substrate of	Starting PER text on connected Min 1: Split cick on the connected Min split cick on the connected Min (Connected Min) (Connected Min) (Co
	Ten Fast		

Figure 14: Performance Analyzer – COM Port Selection

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

- 2. Set the COM settings from the pop-up window. Click "Defaults" and then click "OK"
- 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.



Performance Anolyzer Command Commenter COMEI Select our file connect: COMEI COMSI COMSI Status Peer Search Savet Spin Command Single Node Disconnect Command Single Node	Sentin Lood KK 🔮 Vesion : 62321.0		* 8 ×
Configuration	Ouick Start : Cennection: 3) Sent the port to the system. 2) Set the port to which the kill is connected. Performance Analyzer Connected Kits: Soliet port to connect: COM1 Comest Set COM Settings for the connected kit. Port Setting:	Starting PER test on connected kit- 1) Bight click on the connected kit and select the operating mode to start the PER test. Performance Analyzer Comment Analyzer Comment Analyzer Comment Analyzer Comment Comment Comment Comment Comment Comment Comment Comment Comment Comment Comment Comment Comment Comment C	,
uner sast	Bits Per Second (9600) Data Bits (800) Data Bits (900) Part Mane (900) Stop Bits (900) Plow Control (900) Plow Control (900) Plow Control (900) Cancel (900) Canc	2) Click on Pizy button to run PER tent Proceed Enror Rate Test Single Test • Proceed Enror Rate Te	

Figure 15: Performance Analyzer – Kit Information

4. Kit / Transceiver properties, Channel Page, Frequency Band, Channel Number, Modulation Scheme and Power level can also be changed in the Performance Analyzer window.

COM12 COM12 ATSAM4LC4C ATS6RF215-RF09 AM4_Xelaned	• Kannest	Se	ve Kit Load K	a.
Kit/Transceiver Properties 1	ransceiver Registers	En ED X Chu	engy Detection Sc Scan Duration nnels : 💚 All (A Contification Tess 4 (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)
PER Test Configuration (50:00 Pero Daries Lengths Tell Fremen Cauce		0	Test Peremeters	Channel vs Received Input Power
Transceiver Channel Confi	gurations		11	Charmels Page 9 for SON Networ Application
Channel Page	9	-		962MHz ELL or 015MHz US
Frequency Band	863MHz EU	-	-21-	803WHZ EU 01 915WHZ 03
Channel	0		-	Channel Selection
Modulation	FSK	-	2 -31-	Channel Gelection
FSK/ModulationOrder	2FSK		8	Modulation scheme selection: ESK_OEDM and OORSK
FSK/DataRate	50	-	-41	Modulation scheme selection. FSK, OFDM and OQPSK
FSK/FEC	Off	1	1	
FSK/ModIdx	1.0		-51	
FSK/BT	2.0	•	de la	
Dette-fccpplane		- 1	61	
O/DMM/C1			2	
COQHIQ Coomittee		4	2	
COQUER COLINE NUMBER				
LEC ODDUOChipline				
(Ki), (1)) 9 (1)				
4 Transceiver Configuration	6			
ACK Knouch			34-	Channels
COMANCO				Frequency Range :
FEROM HIRDS				
Tx Power Register Value	.21			Tx Power Value: '0' for min & '31' for Max
Transceiver State Selection	n			
neceiver Desensitization	10			
Tex State	TRY OFF			
	(Indiane	-		
Frequency Band Select the frequency band use	d by the Transceiver.	_		Click 'write' to program the board after setting all the parameters

Figure 16: Performance Analyzer – Transceiver configuration

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



Figure 17: Performance Analyzer – Continuous Tx mode configuration

The center frequency of the MR-FSK, OFDM and OQPSK channels (*except the OQPSK operating in the 868–870 MHz*) band is defined as follows:

ChanCenterFreq = ChanCenterFreq₀ + NumChan × ChanSpacing

where $ChanCenterFreq_0$ is the first channel center frequency in MHz, ChanSpacing is the separation between adjacent channels in MHz, *NumChan* is the channel number from 0 to *TotalNumChan*-1, and *TotalNumChan* is the total number of channels for the available frequency band.

8.1 Tx Test: MR-FSK operating mode #1, 50kbit/s, 14dBm

Performance Analyzer configuration settings are

T	ab	le	1:-	B	oard	setti	ino
					oui u	0000	

Performance Analyzer Parameter	Setting for MR-FSK operating mode #1
Channel Page	9
Frequency band	863MHz EU (863MHz to 870MHz)
Channel	0 to 33
Modulation	FSK
FSK/ModulationOrder	2FSK
FSK/DataRate	50 kb/s
FSK/FEC	On
FSK/ModIdx	1.0
FSK/BT	Leave at default value; this is applicable only for GFSK mode
Tx Power Register Value	'31' for Max Power (14dBm)

Table 2:

Frequency band (MHz)	Parameter	MR-FSK Operating mode #1
(863MHz to 870MHz)	Channel spacing (kHz)	200
	ChanCenterFreq0 (MHz)	863.125



Figure 18: MR-FSK operating mode #1– Countinous transmit mode configuration

8.2 Tx Test: OFDM Option 4, MCS3, 14dBm

Performance Analyzer configuration settings are

Table 3:- Board setting

Performance Analyzer Parameter	Setting for OFDM Option 4, MCS3
Channel Page	9
Frequency band	863MHz EU (863MHz to 870MHz)
Channel	0 to 33
Modulation	OFDM
OFDM/Option	Option4
OFDM/MCS	MCS3
Tx Power Register Value	'31' for Max Power (14dBm)

Table 4:

Frequency band (MHz)	Parameter	OFDM Option 4, MCS 3 mode
	Nominal bandwidth (KHz)	156
(863MHz to 870MHz)	Data rate	100 kb/s
	Channel spacing (kHz)	200
	ChanCenterFreq0 (MHz)	863.125



Figure 19: OFDM option 4, MCS3 – Countinous transmit mode configuration

8.3 Tx Test: O-QPSK RateMode 0, 14dBm

Performance Analyser configuration settings are

Table 5

Performance Analyzer Parameter	Setting for O-QPSK RateMode 0
Channel Page	9
Frequency band	863MHz EU (868MHz to 870MHz)
Channel	0, 1 and 2
Modulation	OQPSK
OQPSK/ChipRate	ChipRate 100
OQPSK/RateMode	RateMode 0
Tx Power Register Value	'31' for Max Power

Table 6:

Frequency band	Channel Number	Channel Center Frequency (MHz)
	0	868.3
	1	868.95
(868MHz to 870MHz)	2	869.525

Data Rate: 6.25 kb/s



Figure 20: O-QPSK RateMode 0 – Countinous transmit mode configuration

8.4 Tx Test: O-QPSK RateMode 3, 14dBm

Performance Analyser configuration settings are

Table 7

Performance Analyzer Parameter	Setting for O-QPSK RateMode 3
Channel Page	9
Frequency band	863MHz EU (868MHz to 870MHz)
Channel	0, 1 and 2
Modulation	OQPSK
OQPSK/ChipRate	ChipRate 100
OQPSK/RateMode	RateMode 3
Tx Power Register Value	'31' for Max Power

Table 8:

Frequency band	Channel Number	Channel Center Frequency (MHz)
	0	863.3
	1	868.95
(868MHz to 870MHz)	2	869.525

Data Rate: 50 kb/s

Figure 21: O-QPSK RateMode 3 – Countinous transmit mode configuration

9. Tx Test (Single node / Continuous Transmission) for Sub-1GHz FCC Testing

9.1 Tx Test: MR-FSK operating mode #1, 50kbit/s, 14dBm

Performance Analyzer configuration settings are

Table 9:- Board setting

Performance Analyzer Parameter	Setting for MR-FSK operating mode #1
Channel Page	9
Frequency band	915MHz US (902MHz to 928MHz)
Channel	1 to 127
Modulation	FSK
FSK/ModulationOrder	2FSK
FSK/DataRate	50 kb/s
FSK/FEC	on
FSK/ModIdx	1.0
FSK/BT	Leave at default value; this is applicable only for GFSK mode
Tx Power Register Value	'31' for Max Power (14dBm)

Table 10:

Frequency band (MHz)	Parameter	MR-FSK Operating mode #1	
	Channel spacing (kHz)	200	
915MHz ISM Band	ChanCenterFreq1 (MHz)	902.4	15



Figure 22: MR-FSK operating mode #1– Countinous transmit mode configuration

9.2 Tx Test: OFDM Option 1, MCS3, 14dBm

Table 44. Deevel eatting

Performance Analyzer configuration settings are

Performance Analyzer Parameter	Setting for OFDM Option 1, MCS3
Channel Page	9
Frequency band	915MHz US (902MHz to 928MHz)
Channel	0 to 19
Modulation	OFDM
OFDM/Option	Option1
OFDM/MCS	MCS3
Tx Power Register Value	'31' for Max Power (14dBm)

Table 12:

Frequency band (MHz)	Parameter	OFDM Option 1, MCS 3 mode
	Nominal bandwidth (KHz)	1094
915MHz ISM Band	Data rate	800 kb/s
	Channel spacing (kHz)	1200
	ChanCenterFreq0 (MHz)	903.2



Figure 23: OFDM option1, MCS3 – Countinous transmit mode configuration

9.3 Tx Test: O-QPSK RateMode 0, 14dBm

Performance Analyser configuration settings are

Table 13

Performance Analyzer Parameter	Setting for O-QPSK RateMode 0
Channel Page	9
Frequency band	915MHz US (902MHz to 928MHz)
Channel	0 to 11
Modulation	OQPSK
OQPSK/ChipRate	ChipRate 1000
OQPSK/RateMode	RateMode 0
Tx Power Register Value	'31' for Max Power

Table 14:

Frequency band (MHz)	Parameter	O-QPSK RateMode 0
915MHz ISM Band	Channel spacing (MHz)	2
	ChanCenterFreq0 (MHz)	904

Data Rate: 31.25 kb/s

COM12 ATSAM4LC4C XT86RF215-RF09 M41. Xplained A6C744S10F36F2	Clic	chere to start ansmission Transmission
Kit/Transceiver Properties	Transceiver Registers	nergy Detection from Certification Tests
20 21 Search	×	Test Parameters
· PER Test Configuration		Transmit
ERCon Peer		
Frame Length		Continuous Pulse Transmission (transmits energy pulse on the current channel)
Test Rimmes Count		Continuous Transmission
Transceiver Channel Con	figurations	
Channel Page	9 -	CW (Continuous Wave)
Frequency Band	915MHz US	Transmits continuous sine wave by writing valid PSDU data into the Frame buffer.
Channel	0	DDDC (Draudo Pandom Dinas)
Modulation	OQPSK •	Transmits modulated wave by writing a frame of maximum length into the Frame buffer
FSIO Modulation/Endit/		Handhied never by whong a nume of maximum ronger and the runne burer.
FSIC/D stationar		
12054.02		
E200-640-0008		
1285.021		
DFDMVOption		
DEDMVMCS	3	
OQPSK/ChipRate	1000 -	
OQPSK/RateMode	0 +	
LEG_DOPSICIE/EN/PRALE		
LEG_OQPSE/DataRate		
Transceiver Configuration	ins	
ACK Request		
Estima Rates		
To Device Desister Value	21	
Transceiver State Select	ion .	
Receiver Desensitization	17	
RPC.		
Trx State	TRX_OFF .	
OQPSK/ChipRate Select the chip rate used by t	he Transceiver.	

Figure 24: O-QPSK RateMode 0 – Countinous transmit mode configuration

10. Tx Test for 2.4GHz Band (Single node / Continuous Transmission (CW/PRBS))

1. Select the COM Port from the dropdown menu and select a COM port to which the kit to be connected and click "Connect"

lerformance Analyzer			+ 30
Connected Kits Select part to connect COM31 Connect	Last & Venion: 5.111.0		
Kit/Transover Properties Transcewer Begitten	Oulck Start: Connection: 1 General set of the system. 3 Set the port to which the k is connected. Performance Dashger Connected Bits Set connected COM1 Set COM Settings for the connected ket. Performance Bits Set COM Settings for the connected ket. Parenty Heres Bits Per Second Bits Per Second Bits Per Second Bits Per Second Dense Bits Bits Per Second Here Flow Context	Stating PIR text on connected kit. 1) aght text on the connected kit as sheet the some mode to at the MORE Profermance Analyzer Stating PIR text on connect (COM14) Stating PIR text on the pIR text on	
		S III II. A	- 😸 🕅 🌜 🎠 347 PM

Figure 14: Performance Analyzer – COM Port Selection

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



- 2. Set the COM settings from the pop-up window. Click "Defaults" and then click "OK"
- 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.

mance Analyzer	1		
COMB31 ATSAMLCCC: Billion Comparison Met Zop Disconnext Disconnext Met Zop Disconnext Met Zop Disconnext	Sector LogdAt () venentis/323/		
and the sector of the sector o	Ouick Start: Connection 3) Concet averlies kit to the system. 2) Select the port to which the kit is connected. Select port to connect: COM1 COM1 COM1 B) Set COM Settings for the connected kit.	Starting FTR fext on connected kit- 1) Regist cirk on the connected kit and select the optening mode to test the PERtext. Performance Analyzer Connected Kits Select port to connect: COM14 Connect Comment Select Distribution of the	
	Port Settings	2) Click on Play button to run PER text Placet Error Bate Text Energy Detection Scan Single Text	
6 8 0 1 0	bathanaci uch an unu hag		+ # 6 N

Figure 15: Performance Analyzer – Kit Information

4. Kit / Transceiver properties, Channel Page, Frequency Band, Channel Number, Modulation Scheme and Power level can also be changed in the Performance Analyzer window.

Performance Analyzer		
· Connected Kits		
Select nort to connect : COMB1	· ·	Severite Load Kt (2) Version: 6.2121.0
and particular and a second		
COM31		
ATSAMOUN		
ATROPEDIS OF 2		
SAMIL Xplained		
ETF78C4815780153		
Kit/Transceiver Properties	Transceiver Registers	Energy Detection Scan Certification Tests
0		ED Scan Duration 4 C Approximate Time To Complete 00:00:05
AL DANK	~	
A NONDI	~	Channels / J all Channels / 11 / 12 / 13 / 14 / 15 / 16 / 17 / 18 / 19 / 20 / 21 / 22 / 23 / 24 / 25 / 26
PER Test Configuration		v Test Parameters
CHC IN Nor		
Control Lawrence		Channel vs Received Input Power
A Transcolour Character	ferentions	Channel Page 10 for SLIN Network Application
Channel Page	a .	Channel Page 9 for SUN Network Application
Frequency fland	2450MH+ ISM Road .	
Channel	G.	-2 Channel selection
Modulation	186 00PSK .	Charner selection
Pin Meenhoin of Tom	real advantage	
and an and a second		Modulation Scheme selection: FSK, OFDM, OQPSK and LED, OQPSK
1 OUTPEC		6 41
And and a second second		
territi - T		3 -33
Contract of Contra		2
Communities		2
DOTIO HIM ADV		-11-
LEG_OQPSK/ChipRate	2000 -	
LEG_DQPSK/DutaRate	250 .	94
Transceiver Configuration	ns	
Act fagard.		Ohannels
Deurca		Hequency Kange : 2405MHz - 2480MHz
and the second s		Change Tx Power Value: '0' for min. '31' for Max
Transplan State Select	31	
Receiver Desensitiontion		
RC .		
Tex State	TRX_OFF .	
Tx Power Register Value		
Transceiver TX power register	value. Valid range is 0 to 20.	Click 'write' to program the board after setting all the above parameters
Wetz	Keld	





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

zard SAM4L Xplained P	ro - Start Page Perf	mance Analyzer × Error List	- Solution Explorer	
	te barrige ren			
Kit/Transceiver Properties	Transceiver Registers	Energy Detection Scare Certification Tests		
Search	×	Test Parameters		
PER Test Configuration		Transmit		
CRC on Peer				
Frame Length	20	© Continuous Pulse Transmission (transmits energy pulse on the current channel)		
Test Frames Count	0.0	Continuous Transmission		
I ransceiver Channel Con	figurations	Chill Continuous Ware)		
Channel Page	9 ·	Cw (Continuous wave)		
Chappel	24JUIVIEZ ISIVI Band			
Modulation	LEG OOPSK	PRBS (Pseudo Random Binary Sequence)	=	
FSK/ModulationOrder	(realise 1)	Transmits modulated wave by writing a frame of maximum length into the Frame buffer.		
FSK/DataRate	55			
FSK/FEC	OFF			
FSK/ModIdx	1.0			
FSK/BT	2.0			
OFDM/Option	-			
OFDM/MICS	1			
OQPSK/ChipRate	100 -			
OQPSK/RateMode	a			
LEG_OQPSK/ChipRate	2000 🔹			
LEG_OQPSK/DataRate	250 🔹			
Transceiver Configuratio	ons			
GCK Request				
COMPLEX.				

Figure 17: Performance Analyzer – Continuous Tx mode configuration

10.1 Tx Test - Legacy O-QPSK, 14dBm

Performance Analyzer configuration settings are

Table 15

Channel Page	9
Frequency band	2450MHz ISM Band
Channel	11 to 26 (2400MHz to 2483.5MHz)
Modulation	LEG_OQPSK
LEG_OQPSK/ChipRate	2000
LEG_OQPSK/DataRate	250
Tx Power Register Value	'31' for Max Power (14dBm)

Table 16:

Frequency band (MHz)	Parameter	Legacy O-QPSK mode
2400–2483.5 (Worldwide)	Channel spacing	5MHz

The center frequency of the Legacy O-QPSK channels is defined as follows:

 F_c = 2405 + 5 (k - 11) in MHz, for k = 11, 12... 26

Where, k is the channel number.

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Figure 18: Legacy O-QPSK - Countinous transmit mode configuration

10.2 Tx Test – MR-FSK operating mode #1, 50kbit/s, 14dBm

Performance Analyzer configuration settings are

Table 47. Deevel eatting

Table 17:- Board Setting	
Channel Page	9
Frequency band	2450MHz ISM Band
Channel	3 to 409 (2400MHz to 2483.5MHz)
Modulation	FSK
FSK/ModulationOrder	2FSK
FSK/DataRate	50
FSK/FEC	off
FSK/ModIdx	1.0
FSK/BT	Leave at default value; this is applicable only for GFSK mode
Tx Power Register Value	'31' for Max Power (14dBm)

Table 18:

Frequency band (MHz)	Parameter	MR-FSK Operating mode #1
	Channel spacing (kHz)	200
2400–2483.5 (Worldwide)	ChanCenterFreq0 (MHz)	2400.2

The center frequency of the MR-FSK and OFDM channels is defined as follows:

ChanCenterFreq = ChanCenterFreq₀ + NumChan × ChanSpacing

where $ChanCenterFreq_0$ is the first channel center frequency in MHz, ChanSpacing is the separation between adjacent channels in MHz, *NumChan* is the channel number from 0 to *TotalNumChan*-1, and *TotalNumChan* is the total number of channels for the available frequency band.



Figure 19: MR-FSK operating mode #1– Countinous transmit mode configuration

10.3 Tx Test - OFDM Option 1, MCS3, 14dBm

Performance Analyzer configuration settings are

Table 19:- Board setting	
Channel Page	9
Frequency band	2450MHz ISM Band
Channel	0 to 63 (2400MHz to 2483.5MHz)
Modulation	OFDM
OFDM/Option	Option1
OFDM/MCS	MCS3
Tx Power Register Value	'31' for Max Power (14dBm)



Table 20:		
Frequency band (MHz)	Parameter	OFDM Option 1, MCS 3 mode
2400–2483.5 (Worldwide)	Nominal bandwidth (KHz)	1094
	Data rate	800Kbps
	Channel spacing (kHz)	1200
	ChanCenterFreq0 (MHz)	2401.2



Figure 20: OFDM option1– Countinous transmit mode configuration

10.4 Tx Test - OFDM Option 2, MCS3, 14dBm

Performance Analyzer configuration settings are

Table 21:- Board setting		
Channel Page	9	
Frequency band	2450MHz ISM Band	
Channel	0 to 96 (2400MHz to 2483.5MHz)	
Modulation	OFDM	
OFDM/Option	Option 2	
OFDM/MCS	MCS 3	
Tx Power Register Value	'31' for Max Power (14dBm)	



Table 22:		
Frequency band (MHz)	Parameter	OFDM Option 2, MCS 3 mode
2400–2483.5 (Worldwide)	Nominal bandwidth (KHz)	552
	Data rate	400Kbps
	Channel spacing (kHz)	800
	ChanCenterFreq0 (MHz)	2400.8



Figure 21: OFDM option2– Countinous transmit mode configuration

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

- 1. Connect two DuTs with PC by USB cables to Debug USB for 863MHz EU/915 MHz US ISM band operations and connect with SAM4L USB for 2.4GHz operation.
- 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)

Performance Analyzer		* 8×
- Connected Kits		
Select port a connect ; COMD		
COND.		
ATSAMALCAC		
AT86RF215-RF24		
SAM4L Xplanned U jay Initiate Peer Search D42A3C2099C4E0ED		
Disconnet		
Contrasteriver Properties and a second second		
Quick Start :	Starting PER test on connected kit-	
Connection-	 Right click on the connected kit and select the operating mode to start the PER test. 	
g 2) Select the port to which the kit is connected.	Reduction Archive	
Badamana hashar	Connected Kits	
Connected Kits	Select port to connect; COM14 * Connect Sen	
Select part to connect ; COM1 - Connect		4
COMI		
Comm.	ATBERF212 Imitate Peer Search	
	RZ600 L Continue As Single Node	
3) Set COM Settings for the connected kit.	Disconnect	
Port Settings		
	2) Click on Play button to run PER test	
BIS PEr Second 3000	Packet Error Rate Test Energy Detection Scan Continuous Transmission	
Data Bets 0 *	Single Test	
Farty Tools -		
Stop Bids One		
Flow Control Plane		
Utrauts Lance UK		
The Part Part		
		319 PM
		* 🔟 🕼 🍁 🏙 10/12/2015

Figure 25: Performance Analyzer – Paring devices

 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.

Performance Analyzer	* D X
A Connected Kits	*
C	Curriera Turidita (C) Version (6.1121.0
Select port to connect: COM/9 • Connec	Save Kit Load Kit e Vesion 02.1210
COM/9 Remote	
ATSAM4LC4C B ATSAM4L	C4C B
AT86RF215-RF09	-RF09
SAM4L Xplained SAM4L Xpla	ined
0C264514683	LDC65E
Kit/Transceiver Properties Transceiver Register	Packet Error Kate Test Energy Detection Scan Certification Tests Kange Test
Con Con	Single PER Test
2 10 2 4 Sept	X Test Parameters
PER Text Configuration	
S CRC on Peer	Average LQI 240
Frame Length 20	Average RSSI (dbm) -34
Test Frames Count 100	Frames transmitted 100
Transceiver Channel Configurations	Frames received 100
Channel Page 9	Invalid Framer 0
Frequency Band 863MHz EU	Invalid Homes O Frames received at
Channel 0	Frames not acknowledged -
Modulation FSK	Frames with access failure -
FSK/ModulationOrder 2FSK	Frames with wrong CRC -
FSK/DataRate 50	Test duration (sec) 0.78339
FSK/FEC Off	Data rate (Kbits/sec) 20.42406
FSK/ModIdx 1.0	•
FSK/BT 2.0	•
OFDMV@phion	Note: When 'CRC on Peer' and 'Frame Retry' options are enabled, 'Frames with Wrong CRC' count includes retransmitted fram
OFDM//MCS	
GQPSK/ChipRate	
OQPSR/RateMode	
LEG_OQPSI/ChipRate	
LEG_OQPSK/DataRate:	
* Transceiver Configurations	
ACK Request	
CSMA-CA	
Tx Rower Reporter Value 21	
Transceiver State Selection	
Receiver Desensitization	
195	
Tx State RX_AACK_ON	•
Tx Power Register Value	
Transceiver & power register value. Value range is	0 to 31.
Write Read	
* [m

Figure 26: Performance Analyzer – PER Test Configuration

4. PER test is Transmit and Receive test. Number of transmit packets can be set by changing "Test Frames Count"

COM79 ATSAM4LC4C AT86RF215-RF09 SAM4L Xplained M37586C0180F9E5	Remote ATSAM4LC4C AT86RF215-RF09 SAM4L Xplained 6C264514881DC66E	Pared
Kit/Transceiver Properties	Transceiver Registers	Packet Error Rate Test Energy/Detection Scan Certification Tests Range Test Single PER-Test V Test Executor V Test Executor
 PER Test Configuration Chan Peer Trans-Level Channel Configuration Channel Page Frequency Band Channel Bage Frequency Band Modulation PSV Modulation/Order PSV/Rodulation/Order PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulation PSV/Rodulati	20 100 100 9 9 9 9 9 9 9 9 9 9 9 9 9	Average IQI 240 Average SSI (dom) -34 France transmitted 100 France net active standard - France with average

Figure 27: Performance Analyzer – Transmit Packets

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

COM79 ATSAM4LC4C AT86RF215-RF09 AM4L Xplained B37586C018DF9F5	Remote ATSAM4LC4C AT86RF215-RF09 SAM4L Xplained 6C264514881DC66E	Paired
Kit/Transceiver Properties	Transceiver Registers	Packet Error Rate Test Energy Detection Scan Certification Tests Range Test Single PER Test • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • </th
YER Test Configuration CRC on Peer Frame Length Test Frames Count	20 100	Test Parameters Average LQI 240 Average RSSI (dbm) -34 Frames transmitted 100
 Transceiver Channel Cont Channel Page Frequency Band Channel Modulation FSK/ModulationOrder FSK/ModaRate FSK/FEC FSK/Moddk Count 	igurations 9	Frames received 100 Invalid Frames 0 Frames not chooledgad - Frames not chooledgad - Frames with access failure - Frames with wrong CRC - Test duration (sec) 0.78339 Data rate (Nobitylec) 20.42406
OFDM/DDN/ACS OFDM/IACS OQPSI/ChipRate OOPSI/RateMode LEG_OQPSI/ChipRate LEG_OQPSI/ChipRate LEG_OQPSI/ChipRate	20	Note: When 'CRC on Peer' and 'Frame Reby' options are enabled, 'Frames with Wrong CRC' count includes retransmitte
rransceiver Configuration ACK Request CSMA-CA Frame Retry Tx Power Register Value Transceiver State Selecti Receiver Desensitization POC	21 on	
Trx State Tx Power Register Value Transceiver TX power register	RX_AACK_ON •	

Figure 28: Performance Analyzer – PER Test

9.1 Tx-Rx Test: MR-FSK operating mode #1, 50kbit/s, 14dBm

Performance Analyzer configuration settings for transmit and receive test

Table 23 Doard Setting		
Performance Analyzer Parameter	Setting for MR-FSK operating mode #1	
Frame length	20	
Test Frames count	100	
Channel Page	9	
Frequency band	863MHz EU (863MHz to 870MHz)	
Channel	0 to 33	
Modulation	FSK	
FSK/ModulationOrder	2FSK	
FSK/DataRate	50 kb/s	
FSK/FEC	on	
FSK/ModIdx	1.0	
FSK/BT	Leave at default value; this is applicable only for GFSK mode	
Tx Power Register Value	'31' for Max Power (14dBm)	



Figure 29: MR-FSK operating mode #1- PER Test

9.2 Tx-Rx Test: OFDM Option 4, MCS3, 14dBm

Performance Analyzer configuration settings for transmit and receive test

Table 24:- Board setting

Performance Analyzer Parameter	Setting for OFDM Option 4, MCS3 mode
Frame length	20
Test Frames count	100
Channel Page	9
Frequency band	863MHz EU (863MHz to 870MHz)
Channel	0 to 33
Modulation	OFDM
OFDM/Option	Option4
OFDM/MCS	MCS3
Tx Power Register Value	'31' for Max Power (14dBm)



Figure 30: OFDM Option4, MCS3 mode - PER Test

9.3 Tx-Rx Test: OQPSK, RateMode 0, 14dBm

Performance Analyser configuration settings for transmit and receive test

Table 25:- Board setting

Performance Analyzer Parameter	Setting for OQPSK, RateMode 0
Frame Length	20
Test Frames count	100
Channel Page	9
Frequency band	863MHz EU (868MHz to 870MHz)
Channel	0, 1 and 2
Modulation	OQPSK
OQPSK/ChipRate	ChipRate 100
OQPSK/RateMode	RateMode 0
Tx Power Register Value	31



Figure 31: OQPSK, RateMode 0 - PER Test

9.4 Tx-Rx Test: OQPSK, RateMode 3, 14dBm

Performance Analyser configuration settings for transmit and receive test

Table 26:- Board setting

Performance Analyzer Parameter	Setting for OQPSK, RateMode 3
Frame Length	20
Test Frames count	100
Channel Page	9
Frequency band	863MHz EU (868MHz to 870MHz)
Channel	0, 1 and 2
Modulation	OQPSK
OQPSK/ChipRate	ChipRate 100
OQPSK/RateMode	RateMode 3
Tx Power Register Value	31



Figure 32: OQPSK, RateMode 3 - PER Test

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

12.1 Tx-Rx Test: MR-FSK operating mode #1, 50kbit/s, 14dBm

Performance Analyzer configuration settings for transmit and receive test

Table 27:- Board setting	
Performance Analyzer Parameter	Setting for MR-FSK operating mode #1
Frame length	20



Test Frames count	100
Channel Page	9
Frequency band	915MHz US (902MHz to 928MHz)
Channel	1 to 127
Modulation	FSK
FSK/DataRate	50 kb/s
FSK/ModulationOrder	2FSK
FSK/FEC	on
FSK/ModIdx	1.0
FSK/BT	Leave at default value; this is applicable only for GFSK mode
Tx Power Register Value	'31' for Max Power (14dBm)



Figure 33: MR-FSK operating mode #1- PER Test

12.2 Tx-Rx Test: OFDM Option 1, MCS3, 14dBm

Performance Analyzer configuration settings for transmit and receive test

Table 28:- Board setting		
Performance Analyzer Parameter	Setting for OFDM Option 1, MCS3 mode	
Frame length	20	
Test Frames count	100	
Channel Page	9	



Figure 34: OFDM Option 1, MCS3 mode - PER Test

12.3 Tx-Rx Test: OQPSK, RateMode 0, 14dBm

Performance Analyser configuration settings for transmit and receive test

Table 29:- Board setting

Performance Analyzer Parameter	Setting for O-QPSK RateMode 0
Frame Length	20
Test Frames count	100
Channel Page	9
Frequency band	915MHz US (902MHz to928MHz)
Channel	0 to 11



Modulation	OQPSK
OQPSK/ChipRate	ChipRate 1000
OQPSK/RateMode	RateMode 0
Tx Power Register Value	31



Figure 35: OQPSK, RateMode 0 - PER Test

13. Tx-Rx Test for 2.4GHz Band (Transmit and Receive test)

- 1. Connect two devices with PC by USB cables and so both are power up.
- 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)

Performance Analyze Generative Mission Select and Control Coldin Control Coldin Control Coldin Control Coldin Control Coldin Control Coldina Control Control Coldina Control Control Coldina Control Control Control Coldina Control Control Contr	Last(2 Q Version, 6.3.32).5		- 8×
	Uclick Start : Control 2.0000 remote lates the system 2.0000 remote lates the system 2.00000 remote lates the system 2.0000 remote lates the system 2.00	<section-header></section-header>	
💿 (ĉ 🔗 o 📋 🔯	i 🧔 📭 📕 📓 🗕 i		+ 🗐 🕅 🍓 隆 319 PM

Figure 22: Performance Analyzer – Paring devices

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 23: Performance Analyzer – PER Test Configuration

4. PER test is Transmit and Receive test. Number of transmit packets can be set by changing "Test Frames Count"



Figure 24: Performance Analyzer – Transmit Packets

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

formance Analyzer			* D
Connected Kits			
elect part to compect. COMBL	* Connect	Sive Kit Load Kit Q Version : 6,2121.0	
reserved to contiect.	Connect		
(000)	0		
COMSI	Kemote		
ATSAM4LC4C 2	ATSAM4LC4C	2	
ATB6RF215-RF24	AT86RF215-RF24	2	
SAM4L Xplained	SAM4L Xplained		
D42ASC7097C4EBED	EC9PD0EB353086/7		
	A CONTRACTOR OF		
Kit/Transcerver Properties	Transceiver Registers	Packet Entror Rate Test Energy Detection Scan Certification Tests Range Lest	_
2		Single PER Test	
15 21 Search	X	Tart Dromster	-
A PEP Text Configuration			_
CRC on Peer	10	Average LQI 25	
Frame Length	20	Average RSSI (dbm) -93	
Test Frames Count	100	Frames transmitted 100	
A Transceiver Channel Cont	finurations		
Channel Page	0 -	Frames received 100	
Eternetics Fanu	e	Invalid Frames 0	
Channel	21	Frames not acknowledged -	
Channe	-11	Frames with access failure -	
IN TRADACTOR			
Pair Officentiation Uro		Pranes wan wong CKC	
PIN/Oper/Rele		Test duration (sec) 0.251447	
FRK(FE)		Data rate (Kbits/sec) 63.6317	
PSk /Maddai			
BOA/B1			
OFDM Option		Note: When 'CRC on Peer' and 'Frame Retry' options are enabled, 'Frames with Wrong CRC' count includes retransmitted frames	
OFDSWMCD			
OQPSI/Chymne/			
OQPSHITLM eMake			
LEG/DDPSC/CnipRaine			
LEG, DQPS#DataRine			
4 Transceiver Configuration	ns		
ACK Request	0		
CSMA-CA	0		
Frame Retry	p.,		
Tx Power Register Value	21		
* Transceiver State Selecti	on		
Receiver Desensitization	E.		
RPC			
Trx State	RX_AACK_ON +		
Church			
Channel			
test is running.	in which the refrontance		
Write	Read		
			_

Figure 25: Performance Analyzer – PER Test

9.5 Rx Test – Legacy O-QPSK, 14dBm

Performance Analyzer configuration settings for transmit and receive test

Table 30:- Board setting

Table 66 Doard Setting		
	Frame Length	20
	Test Frames count	100



Channel Page	9
Frequency band	2450MHz ISM Band
Channel	11 to 26 (2400MHz to 2483.5MHz)
Modulation	LEG_OQPSK
LEG_OQPSK/ChipRate	ChipRate 2000
LEG_OQPSK/DataRate	DataRate 250
Tx Power Register Value	'31' for Max Power (14dBm)



Figure 26: Legacy O-QPSK PER Test

9.6 Rx Test: MR-FSK operating mode #1, 50kbit/s, 14dBm

Performance Analyzer configuration settings for transmit and receive test

Table 31:- Board setting		
	Frame length	20
	Test Frames count	100
	Channel Page	9
	Frequency band	2450MHz ISM Band
	Channel	3 to 409 (2400MHz to 2483.5MHz)
	Modulation	FSK
	FSK/DataRate	50Kbps
	FSK/ModulationOrder	2FSK

Table 31:- Board setting

FSK/FEC	off
FSK/ModIdx	1.0
FSK/BT	Leave at default value; this is applicable only for GFSK mode
Tx Power Register Value	'31' for Max Power (14dBm)



Figure 27: MR-FSK operating mode #1- PER Test

9.7 Rx Test - OFDM Option 1, MCS3, 14dBm

Performance Analyzer configuration settings for transmit and receive test

Table 32:- Board setting

Frame length	20
Test Frames count	100
Channel Page	9
Frequency band	2450MHz ISM Band
Channel	0 to 63 (2400MHz to 2483.5MHz)
Modulation	OFDM
OFDM/Option	Option1
OFDM/MCS	MCS3
Tx Power Register Value	'31' for Max Power (14dBm)





Figure 28: OFDM Option1- PER Test

9.8 Rx Test - OFDM Option 2, MCS 3, 14dBm

Performance Analyzer configuration settings for transmit and receive test

Table 33:- Board setting	
Frame Length	20
Test Frames count	100
Channel Page	9
Frequency band	2450MHz ISM Band
Channel	0 to 96 (2400MHz to 2483.5MHz)
Modulation	OFDM
OFDM/Option	Option2
OFDM/MCS	MCS 3
Tx Power Register Value	'31' for Max Power (14dBm)

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Figure 29: OFDM Option2- PER Test

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: VM4A092353

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.

IC Warning:

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and

(2) This device must accept any interference, including interference that may cause undesired operation of the device. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil nedoit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The device been tested is compliance with RF field strength limits, users can obtain Canadian information on RF exposure and compliance. The minimum distance from body to use the device is 20cm.

Le présent appareil est conforme

Après examen de ce matériel aux conformité ou aux limites d'intensité de champ RF,

les utilisateurs peuvent sur l'exposition aux radiofréquences et la conformité and compliance d'acquérir les informations correspondantes. La distance minimale du corps à utiliser le dispositif est de 20cm.

Contains transmitter module IC: 11019A-092353Where 11019A-092353 is the module's certification number.

Atmel Enabling Unlimited Possibilities®

Atmel Corporation 1600 Technology Drive San Jose, CA 95110 USA Tel: (+1)(408) 441-0311 Fax: (+1)(408) 487-2600 www.atmel.com

Atmel Asia Limited

Unit 01-5 & 16, 19F BEA Tower, Millennium City 5 418 Kwun Tong Road Kwun Tong, Kowloon HONG KONG **Tel:** (+852) 2245-6100 **Fax:** (+852) 2722-1369

Atmel Munich GmbH

Business Campus Parkring 4 D-85748 Garching b. Munich GERMANY Tel: (+49) 89-31970-0 Fax: (+49) 89-3194621 Atmel Japan G.K.

16F Shin-Osaki Kangyo Bldg. 1-6-4 Osaki, Shinagawa-ku Tokyo 141-0032 JAPAN **Tel:** (+81)(3) 6417-0300 **Fax:** (+81)(3) 6417-0370

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