

Bluetooth RF / RF-PHY Test Report

REPORT NO.: BT180511E03

MODEL NO.: BX2400_QFN40

RECEIVED: May 11, 2018

TESTED: Aug. 23, 2018

ISSUED: Sep. 18, 2018

APPLICANT: BlueX Microelectronics (Hefei) Co., Ltd.

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ISSUED BY: Bureau Veritas Consumer Products Services
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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
BT180511E03	Original release	Sep. 18, 2018

1 CERTIFICATION INFO

Product Name: BX2400
Applicant: BlueX Microelectronics (Hefei) Co., Ltd.
Brand Name: BlueX
Model No.: BX2400_QFN40
Product Specification: 5.0
HW version: v01
SW version: v01
TCRL Version: TCRL 2018-1
Specification(s): RF-PHY.TS.5.0.3

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above test standards.

PREPARED BY : Rita Yi , **DATE:** Sep. 18, 2018
Rita Yi / Senior Specialist

APPROVED BY : Jason Yang , **DATE:** Sep. 18, 2018
Jason Yang / Assistant Manager

2 SUMMARY OF TEST RESULTS

The DUT has been tested according to the following specifications:

TEST SECTIONS	SUMMARY OF RESULT		
Specifications	PASS	FAIL	NA
RF-PHY	10	0	0
RF-PHY_5.0	9	0	0

Tested By: James Chen

2.1 TESTING EQUIPMENTS

InterLab BT RF Test Suite is a radio conformance test platform developed by 7Layers and qualified by the Bluetooth SIG for certification. This platform covers the official test cases for Core Test Requirement including Bluetooth v2.0(BR/EDR) /v3.0(HS) and v4.0 (LE) .The relative instrumentations used to perform the RF and RF-PHY Test Cases are listed below:

RF Test Platform Version	InterLab RF Test Suite v5.1.5
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Equipment	Model. No.	Serial No.	Calibration Until
Wireless Connection Tester	CMW270	100583	2019/4/28
Spectrum Analyzer	FSL3	104596	2018/10/10
Power Sensor	NRP-Z21	104818	2018/10/06
Power Supply	HMP2020	022770709	2018/10/11
Vector Signal Generator	SMBV100A	261361	2018/10/08
Signal Generator	SMF100A	104875	2018/10/08

2.2 MEASUREMENT UNCERTAINTY

Uncertainty (factor k=2) was calculated according to the 7Layers InterLab BT RF Test Suite uncertainty document.

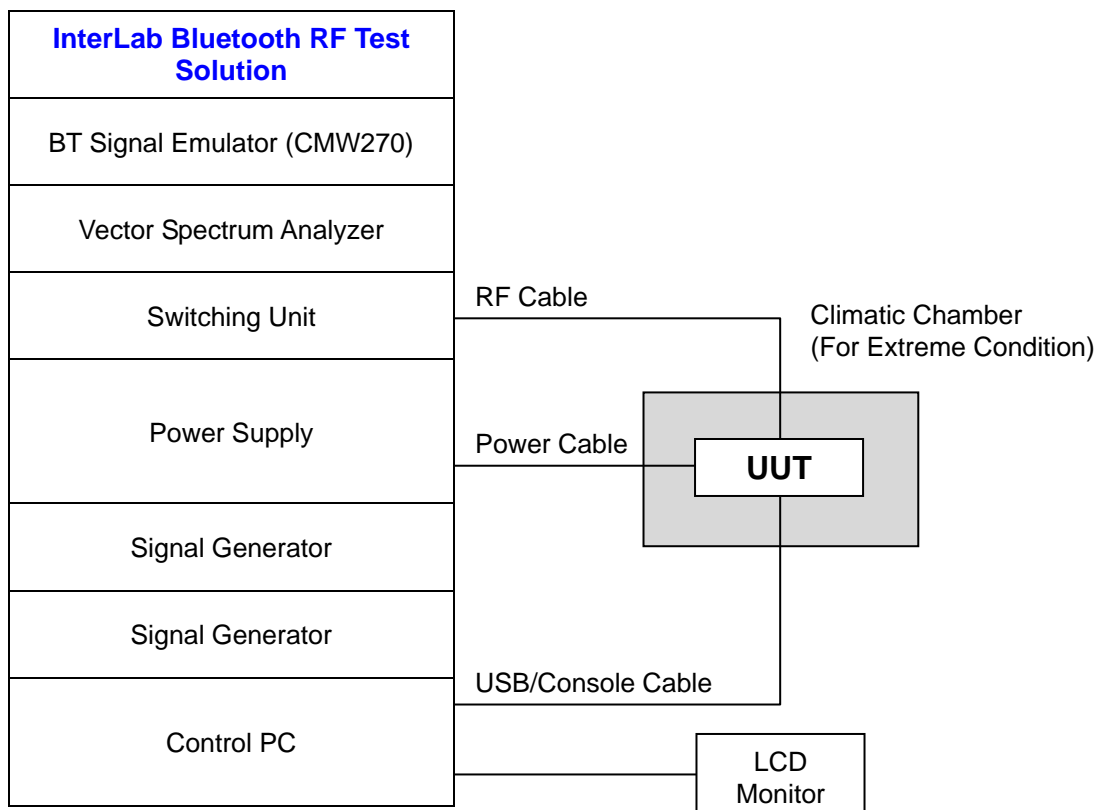
Testcase	Measurement	Specification	InterLab Bluetooth RF Test Solution
TRM/CA/01/C: Output Power	Absolute RF power:	± 1.2 dB	± 0.87 dB
TRM/CA/02/C: Power Density	Absolute RF power:	± 1.2 dB	± 0.87 dB
TRM/CA/03/C: Power Control	Absolute RF power:	± 1.2 dB	± 0.87 dB
TRM/CA/04/C: TX Output Spectrum - Frequency range	Absolute RF power:	± 1.2 dB	± 0.87 dB
TRM/CA/05/C: TX Output Spectrum - 20 dB Bandwidth	Absolute RF power:	± 1.2 dB	± 0.87 dB
TRM/CA/06/C: TX Output Spectrum - Adjacent channel power	Absolute RF power (for unwanted emissions in the BT band):	± 3 dB	± 0.87 dB
	Absolute RF power (wanted channel):	± 1.2 dB	± 0.87 dB
TRM/CA/07/C: Modulation Characteristics	Freq dev uncertainty in payload (GFSK)	± 4 kHz	± 4 kHz
	Freq drift uncertainty (GFSK)	± 1 kHz	± 1 kHz
	Absolute radio frequency	± 5 kHz	± 5 kHz
TRM/CA/08/C: Initial Carrier Frequency Tolerance	Freq dev uncertainty in payload (GFSK)	± 4 kHz	± 4 kHz
	Freq drift uncertainty (GFSK)	± 1 kHz	± 1 kHz
	Absolute radio frequency	± 5 kHz	± 5 kHz
TRM/CA/09/C: Carrier Frequency Drift	Freq dev uncertainty in payload (GFSK)	± 4 kHz	± 4 kHz
	Freq drift uncertainty (GFSK)	± 1 kHz	± 1 kHz
	Absolute radio frequency	± 5 kHz	± 5 kHz
TRM/CA/10/C: EDR Relative Transmit Power	Relative RF power:	± 1 dB	± 0.50 dB
TRM/CA/11/C: EDR Carrier Frequency Stability and Modulation Accuracy	Absolute radio frequency:	± 5 kHz	± 5 kHz
	RMS DEVM	$<5\%$	3%
	Relative drift radio frequency:	± 1 kHz	± 1 kHz
TRM/CA/12/C: EDR Differential Phase Encoding	Symbol Error	± 1 ppm	± 1 ppm
	Frequency Accuracy	± 1 ppm	$<0.5\mu s$ or ± 1 ppm
TRM/CA/13/C: EDR In-band Spurious Emissions	Absolute RF power (for unwanted emissions in the BT band):	± 3 dB	± 0.87 dB
	Absolute RF power (wanted channel):	± 1.2 dB	± 0.87 dB
TRM/CA/14/C: EDR Enhanced Power Control	Absolute RF power:	± 1.2 dB	± 0.87 dB
RCV/CA/01/C: Sensitivity - single slot packets	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
RCV/CA/02/C: Sensitivity - multi slot packets	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
RCV/CA/03/C: C/I Performance	Absolute RF power (wanted channel):	± 1.2 dB	± 0.88 dB
	Absolute RF power (for interfering signal):	± 3 dB	± 1.13 dB
RCV/CA/04/C: Blocking Performance	Absolute RF power (wanted channel):	± 1.2 dB	± 0.88 dB
	Absolute RF power (for 1st interfering signal):	± 3 dB	± 1.13 dB
	Absolute RF power (2nd interfering signal):	± 3 dB	± 1.56 dB
RCV/CA/05/C: Intermodulation Performance	Absolute RF power (wanted channel):	± 1.2 dB	± 0.88 dB

Testcase	Measurement	Specification	InterLab Bluetooth RF Test Solution
	Absolute RF power (for 1st interfering signal):	± 3 dB	± 1.13 dB
	Absolute RF power (for 2nd interfering signal):	± 3 dB	± 1.22 dB
RCV/CA/06/C: Maximum Input Level	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
RCV/CA/07/C: EDR Sensitivity	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
RCV/CA/08/C: EDR BER Floor Performance	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
RCV/CA/09/C: EDR C/I Performance	Absolute RF power (wanted channel):	± 1.2 dB	± 0.88 dB
	Absolute RF power (for interfering signal):	± 3 dB	± 1.13 dB
RCV/CA/10/C: EDR Maximum Input Level	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
TP/PHYS/TRX/BV-06-E (EDR Guard Time)	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
	Symbol timing Error	$\pm 1.5\mu\text{s}$	$\pm 0.125\mu\text{s}$
	Symbol Rate	1ppm	± 1 ppm
TP/PHYS/TRX/BV-07-E (EDR Synchronization Sequence and Trailer)	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
	Symbol timing Error	$\pm 1.5\mu\text{s}$	$\pm 0.125\mu\text{s}$
	Symbol Rate	1ppm	± 1 ppm
TRM-LE/CA/01/C: Output Power at NOC	Absolute RF power:	± 1.2 dB	± 0.87 dB
TRM-LE/CA/02/C: Output Power at EOC	Absolute RF power:	± 1.2 dB	± 0.87 dB
TRM-LE/CA/03/C: In-band Spurious Emissions at NOC	Absolute RF power (for unwanted emissions in the BT band):	± 3 dB	± 0.87 dB
	Absolute RF power (wanted channel):	± 1.2 dB	± 0.87 dB
TRM-LE/CA/04/C: In-band Spurious Emissions at EOC	Absolute RF power (for unwanted emissions in the BT band):	± 3 dB	± 0.87 dB
	Absolute RF power (wanted channel):	± 1.2 dB	± 0.87 dB
TRM-LE/CA/05/C: Modulation Characteristics	Freq dev uncertainty in payload (GFSK)	± 4 kHz	± 4 kHz
	Freq drift uncertainty (GFSK)	± 1 kHz	± 1 kHz
	Absolute radio frequency	± 5 kHz	± 5 kHz
TRM-LE/CA/06/C: Carrier Frequency offset and drift at NOC	Freq dev uncertainty in payload (GFSK)	± 4 kHz	± 4 kHz
	Freq drift uncertainty (GFSK)	± 1 kHz	± 1 kHz
	Absolute radio frequency	± 5 kHz	± 5 kHz
TRM-LE/CA/07/C: Carrier Frequency offset and drift at EOC	Freq dev uncertainty in payload (GFSK)	± 4 kHz	± 4 kHz
	Freq drift uncertainty (GFSK)	± 1 kHz	± 1 kHz
	Absolute radio frequency	± 5 kHz	± 5 kHz
RCV-LE/CA/01/C: Receiver sensitivity at NOC	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
RCV-LE/CA/02/C: Receiver sensitivity at EOC	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
RCV-LE/CA/03/C: C/I and receiver selectivity performance	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB

Testcase	Measurement	Specification	InterLab Bluetooth RF Test Solution
	Absolute RF power (for interfering signal):	± 3 dB	± 1.13 dB
RCV-LE/CA/04/C: Blocking performance	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
	Absolute RF power (for 1st interfering signal):	± 3 dB	± 1.13 dB
	Absolute RF power (2nd interfering signal):	± 3 dB	± 1.56 dB
RCV-LE/CA/05/C: Intermodulation performance	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
	Absolute RF power (for 1st interfering signal):	± 3 dB	± 1.13 dB
	Absolute RF power (for 2nd interfering signal):	± 3 dB	± 1.22 dB
RCV-LE/CA/06/C: Maximum input signal level	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB
RCV-LE/CA/07/C: PER report integrity	Absolute RF power (wanted channel):	± 1.2 dB	± 0.69 dB

2.3 CONFIGURATION OF DEVICE UNDER TEST

RF/RF-PHY Testing Configuration:



2.4 COMPETENCE AND GUARANTEES

Bureau Veritas is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, Bureau Veritas has a calibration and maintenance program for its measurement equipment.

Bureau Veritas guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at Bureau Veritas at the time of performance of the test.

Bureau Veritas is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

3 GENERAL CONDITIONS

1. This report is only referred to the item/s that has/have undergone the test/s.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of Bureau Veritas.
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4 USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS

4.1 USAGE OF SAMPLES

Samples below were composed of the following elements:

Item	Sample Log-in ID	Description	Model	Serial No
M01	E180511-009-005-003	BT Module	BX2400_QFN40	00325107D3B8

Samples have undergone the following test(s): As specified in section 6.2.

4.2 TESTING PERIOD

The performed started from [2018/05/22](#) and finished on [2018/08/23](#).

The tests have been performed at Bureau Veritas.

4.3 ENVIRONMENT CONDITIONS

General environmental conditions during tests:

Temperature	Min. = 23°C Max. = 28°C
Relative humidity	Min. = 30% Max. = 50%

5 DUT CONFORMANCE STATUS

5.1 DYNAMIC CONFORMANCE SUMMARY

The test campaign did NOT reveal any errors on the DUT.

6 TEST RESULTS

6.1 DEFINITION

Abbreviations used in the header row of the test campaign report tables are:

Test Case: This Field contains Test Case ID, Test Case Name, and Test Case Category. Test Conditions are defined in NOC (Normal Operation Condition) and EOC (Extreme Operation Condition) for High, Normal and Low Temperature and Voltage conditions defined by manufacture in IXIT.

Test Case Verdict: Records the verdict of each test case run to completion.

Pass: for test cases whose requirements where fulfilled.

Fail: for test case whose requirements where NOT fulfilled.

NA: for test cases not applicable for testing

Test Execution Date: The execution Date for the test case

6.2 TEST RESULTS

TESTED BY: James Chen

Test Cases for RF-PHY		Verdict	Execution Date	IUT Configuration
TP/RCV-LE/CA/BV-01-C	Receiver sensitivity	Pass	2018/5/22	M01
TP/RCV-LE/CA/BV-03-C	C/I and receiver selectivity performance	Pass	2018/5/22	M01
TP/RCV-LE/CA/BV-04-C	Blocking performance	Pass	2018/5/22	M01
TP/RCV-LE/CA/BV-05-C	Intermodulation performance	Pass	2018/5/22	M01
TP/RCV-LE/CA/BV-06-C	Maximum input signal level	Pass	2018/5/22	M01
TP/RCV-LE/CA/BV-07-C	PER Report Integrity	Pass	2018/5/22	M01
TP/TRM-LE/CA/BV-01-C	Output power	Pass	2018/5/22	M01
TP/TRM-LE/CA/BV-03-C	In-band emissions	Pass	2018/5/22	M01
TP/TRM-LE/CA/BV-05-C	Modulation characteristics	Pass	2018/5/22	M01
TP/TRM-LE/CA/BV-06-C	Carrier frequency offset and drift	Pass	2018/5/22	M01

Test Cases for RF-PHY_5.0		Verdict	Execution Date	IUT Configuration
TP/RCV-LE/CA/BV-08-C	Receiver sensitivity at 2 Ms/s	Pass	2018/8/23	M01
TP/RCV-LE/CA/BV-09-C	C/I and Receiver Selectivity Performance at 2 Ms/s	Pass	2018/8/14	M01
TP/RCV-LE/CA/BV-10-C	Blocking performance at 2 Ms/s	Pass	2018/8/23	M01
TP/RCV-LE/CA/BV-11-C	Intermodulation performance at 2 Ms/s	Pass	2018/8/23	M01
TP/RCV-LE/CA/BV-12-C	Maximum input signal level at 2 Ms/s	Pass	2018/8/23	M01
TP/RCV-LE/CA/BV-13-C	PER Report Integrity at 2 Ms/s	Pass	2018/8/23	M01
TP/TRM-LE/CA/BV-08-C	In-band emissions at 2 Ms/s	Pass	2018/6/14	M01
TP/TRM-LE/CA/BV-10-C	Modulation Characteristics at 2 Ms/s	Pass	2018/6/14	M01
TP/TRM-LE/CA/BV-12-C	Carrier frequency offset and drift at 2 Ms/s	Pass	2018/6/14	M01

6.3 REMARKS AND COMMENTS

There are no remarks or comments.

7 SUMMARY

Considering the results of the performed test, stated in section 6.2, the item/s under test is/are IN COMPLIANCE with the specifications listed in section 1
“CERTIFICATION INFO”.

NOTE: The results presented in this Test Report apply only to the particular item under test established in section 4, “USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS”

8 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, RF, Safety, GCF/PTCRB, OTA, Wi-Fi, WiMAX and Energy Efficiency. Our laboratories are accredited and approved according to ISO/IEC 17025.

Linko Lab:

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Hsin Chu Lab:

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Fax: 886-3-5935342

Hwa Ya Lab:

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and more detail information of all our labs can be found in our web site also.

ANNEX A – PICS/PIXIT

IMPLEMENTATION CONFORMANCE STATEMENT (ICS) for RF-PHY

Item	Bluetooth LE RF Capability	Status	Supported
1	LE Transmitter (Non-connectable, Broadcaster)	C.1	<input checked="" type="checkbox"/>
2	LE Receiver (Non-connectable, Observer)	C.1	<input checked="" type="checkbox"/>
3	LE Transceiver (Connectable, Peripheral/Central)	C.1	<input checked="" type="checkbox"/>
4	LE 2M PHY	C.2	<input checked="" type="checkbox"/>
5	Stable Modulation Index - Transmitter	C.3	<input type="checkbox"/>
6	Stable Modulation Index - Receiver	C.4	<input type="checkbox"/>
7	LE Coded PHY	C.2	<input type="checkbox"/>

C.1: Mandatory to support at least one of these capabilities.

Item	Bluetooth LE RF Capability	Status	Supported
1	HCI Test Interface	C.1	<input checked="" type="checkbox"/>
2	UART Test Interface	C.1	<input type="checkbox"/>

C.1: Mandatory to support at least one of these capabilities.

IMPLEMENTATION EXTRA INFORMATION (IXIT) FOR RF-PHY

IXIT Reference	Identifier	Sub-Identifier (Optional)	Units	Value
RF-PHY:P1:1	Inband Image frequency	Low frequency	MHz	-3
RF-PHY:P1:2		Middle frequency	MHz	-3
RF-PHY:P1:3		High frequency	MHz	-3
RF-PHY:P2:1	Value n for Intermodulation test	Low frequency	Integer	5
RF-PHY:P2:2		Middle frequency	Integer	5
RF-PHY:P2:3		High frequency	Integer	5
RF-PHY:P4	Power source voltage	Nominal (NOC)	V	3.7
RF-PHY:P5	Normal operating temperature	Nominal (NOC)	°C	21
RF-PHY:P6:1	Operating air humidity range (relative)	Maximum	%	
RF-PHY:P6:2		Minimum	%	
RF-PHY:P6:3		Air humidity level for NOC tests	%	
RF-PHY:P7:1	Test interface implementation	HCI or 2-wire UART		HCI
RF-PHY:P7:2		Datarate	bps	N/A
RF-PHY:P9:1	Maximum TX packet length		Bytes	37
RF-PHY:P9:2	Maximum RX packet length		Bytes	37
RF-PHY:P9:3	Maximum TX packet length 2M		Bytes	37
RF-PHY:P9:6	Maximum RX packet length 2M		Bytes	37
RF-PHY:11:1	Inband Image Frequency (2Ms/s)	Low frequency	MHz	-4
RF-PHY:11:2		Middle frequency	MHz	-4
RF-PHY:11:3		High frequency	MHz	-4
RF-PHY:12:1	Value n for Intermodulation test (2Ms/s)	Low frequency	Integer	5
RF-PHY:12:2		Middle frequency	Integer	5
RF-PHY:12:3		High frequency	Integer	5

ANNEX B – PHOTOGRAPHS



---END---