

Supplementary FCC Test Report (BT-EDR)

Report No.: RF120522E09N-2

FCC ID: UZ7MC92N0

Test Model: MC92N0

Received Date: Mar. 23, 2015

Test Date: Mar. 31 to Apr. 13, 2015

Issued Date: May 13, 2015

Applicant: Zebra Technologies Corporation

Address: 1 Zebra Plaza, Holtsville, NY 11742

Manufacturer: Symbol Technologies, Inc.

Address: 1 Zebra Plaza, Holtsville, NY 11742

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

Test Location (1): No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

Test Location (2): No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies

Table of Contents

Report Issue History Record of EUT (MC92N0).....	3
Release Control Record.....	3
1 Certificate of Conformity.....	4
2 Summary of Test Results.....	5
2.1 Measurement Uncertainty.....	5
2.2 Modification Record	5
3 General Information.....	6
3.1 General Description of EUT	6
3.2 Description of Test Modes.....	10
3.2.1 Test Mode Applicability and Tested Channel Detail.....	11
3.3 Description of Support Units	13
3.3.1 Configuration of System under Test	14
3.4 General Description of Applied Standards	15
4 Test Types and Results	16
4.1 Radiated Emission and Bandedge Measurement.....	16
4.1.1 Limits of Radiated Emission and Bandedge Measurement	16
4.1.2 Test Instruments	17
4.1.3 Test Procedures.....	18
4.1.4 Deviation from Test Standard	18
4.1.5 Test Setup.....	19
4.1.6 EUT Operating Conditions.....	19
4.1.7 Test Results	20
4.2 Conducted Emission Measurement.....	24
4.2.1 Limits of Conducted Emission Measurement.....	24
4.2.2 Test Instruments	24
4.2.3 Test Procedures.....	25
4.2.4 Deviation from Test Standard	25
4.2.5 Test Setup.....	25
4.2.6 EUT Operating Condition	25
4.2.7 Test Results	26
4.3 Maximum Output Power.....	28
4.3.1 Limits of Maximum Output Power Measurement	28
4.3.2 Test Setup.....	28
4.3.3 Test Instruments	28
4.3.4 Test Procedure	28
4.3.5 Deviation from Test Standard	28
4.3.6 EUT Operating Condition	28
4.3.7 Test Results	29
5 Pictures of Test Arrangements.....	30
Appendix – Information on the Testing Laboratories	31



A D T

Report Issue History Record of EUT (MC92N0)

Attachment No.	Issue Date	Description
120522E09	July 31, 2012	Original
120522E09N	May 13, 2015	1. Added Bluetooth 4.0 technology used for the EUT 2. Added new SKU: SE4750 3. Changed the battery 4. Changed the version of EUT

Release Control Record

Issue No.	Description	Date Issued
RF120522E09N-2	Original release.	May 13, 2015



A D T

1 Certificate of Conformity

Product: Mobile Computer

Brand: Symbol

Test Model: MC92N0

Sample Status: MASS-PRODUCTION

Applicant: Zebra Technologies Corporation

Test Date: Mar. 31 to Apr. 13, 2015

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2009

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 standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : , **Date:** May 13, 2015
Elsie Hsu / Specialist

Approved by : , **Date:** May 13, 2015
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -9.25dB at 0.61625MHz.
15.247(b)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.205 15.209 15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -5.1dB at 178.42MHz.
15.203	Antenna Requirement	PASS	No antenna connector is used.

NOTE:

1. If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.
2. This report is prepared for FCC class II permissive change. Only radiated emissions / conducted power / conducted emission tests of SE4750 were presented in this test report.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.86 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.37 dB
Radiated Emissions above 1 GHz	1GHz ~6GHz	3.65 dB
	6GHz ~ 18GHz	3.88 dB
	18GHz ~ 40GHz	4.11 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Mobile Computer
Brand	Symbol
Test Model	MC92N0
Status of EUT	MASS-PRODUCTION
Power Supply Rating	DC 7.4V from battery DC 12V to direct charging adapter
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	79
Output Power	2.636mW
Antenna Type	Please see Note
Antenna Connector	Please see Note
Accessory Device	Battery x 1 (Part No.: 82-111734-01)
Data Cable Supplied	NA

Note:

- This report is prepared for FCC Class II change. The difference compared with the Report No.: RF120522E09-2 design is as the following:

◆ Added Bluetooth 4.0 technology used for the EUT

◆ Added new SKU: SE4750

Original						
Scanner	With CR	Without CR	Keypad			
			53 key	43 key	33 key	28 key
SE4500	V	-	V	V	V	V
SE4500	-	V	V	V	V	V
SE4600	V	-	V	V	V	V
SE4600	-	V	V	V	V	V
SE965	V	-	V	V	V	V
SE965	-	V	V	V	V	V
SE1524	V	-	V	V	V	V
SE1524		V	V	V	V	V
Addition						
Scanner	With CR	Without CR	Keypad			
			53 key	43 key	33 key	28 key
SE4750	V	-	V	V	V	V
CR : Condensation Resistant						

◆ Changed the battery as below table.

Original	
Brand:	SYMBOL
Part No.:	21-65587-03
Rating:	7.4V, 2200mAh, 16.3Wh
Newly	
Brand:	SYMBOL
Part No.:	82-111734-01
Rating:	7.4V, 2400mAh, 17.76Wh

◆ Changed the version of EUT information as below table.

Mobile Computer	OS Version	07.00.2806
	OEM Version	00.20.0005
Wireless(Fusion)	Part Number	31-FUSION-X2.00
	Version	X_2.00.0.0.063R
XW2DMT	Version	X_2.00.0.0.028
	Fusion	X_2.00.0.0.040E
BTRRegTest Ver4.1	Version	4.1

2. According to above conditions, only radiated emissions / conducted power / conducted emission tests of SE4750 need to be performed. And all data was verified to meet the requirements.
3. There are Bluetooth and WLAN technology used for the EUT.
4. WLAN and Bluetooth technology can transmit at same time.
5. The associated devices(optional) of EUT information are as below:

Product	Brand	Model	S/N
28keypad	NA	KYPD-MC9XMR000-01R	40A11W40H
33keypad	NA	KYPD-MC9XMX000-01R	40B52K50A
43keypad	NA	KYPD-MC9XMT000-01R	40A11R93G
53keypad	NA	KYPD-MC9XMS000-01R	40B63U43F
Product	Brand	Model	P/N
Headset	MOTOROLA	RCH50	RCH50
Headset	VXI	VR10	50-11300-050R
Power adapter (for Direct charging)	HIPRO	HP-A0502R3D	PWRS-14000-148R
Direct charging adapter	SYMBOL	ADP9000-110R	NA
AC Line cord	NA	NA	23844-00-00R
USB cable	NA	NA	25-62166-01R

6. The EUT could be supplied with a direct charging and battery as below table:

Direct charging adapter (not for sale together)	
Brand:	SYMBOL
Part No.:	ADP9000-110R
I/O Ports:	RS232 Port * 1 RJ45 Port *2
Associated Devices:	USB cable (unshielded, 1.8m with one core) USB cable (Part No.: 25-62166-01R)
Power Adapter (for Direct charging, and not for sale together)	
Brand:	HIPRO
Model No.:	HP-A0502R3D
Part No.:	PWRS-14000-148R
Input power :	100-240V, 50-60Hz, 2.4A
Output power :	+12V , 4.16A
	AC Line cord (unshielded, 2.2m without core) (Part No.: 23844-00-00R)
Battery	
Brand:	SYMBOL
Part No.:	82-111734-01
Rating:	7.4V, 2400mAh, 17.76Wh

7. The antennas provided to the EUT, please refer to the following table:

WLAN Antenna Spec.			
Antenna	Type	Connector	Gain (dBi)
Lant (Aux)	PIFA	NA	4.07 (2.4GHz) 4.96 (5GHz)
Rant (Main)	PIFA	NA	6.03 (2.4GHz) 4.51 (5GHz)
Bluetooth Antenna Spec			
Type	Connector		Gain (dBi)
Chip	NA		-3.31

Note: This report chose the max. Antenna gain to do final test.

8. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

79 channels are provided for BT-EDR mode:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
A	-	-	√	-	EUT(Y-Z) + Scanner (SE4750) + Headset(RCH50) + Keypad(53) + Direct charging & Without CR
B	-	√	-	-	EUT(X-Y) + Scanner (SE4750) + Headset(VR10) + Keypad(43) + Direct charging & Without CR
C	√	-	-	√	EUT(Y-Z) + Scanner (SE4750) + Headset(VR10) + Keypad(43) + Direct charging & Without CR

Where **RE≥1G**: Radiated Emission above 1GHz

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

NOTE:

1. The test mode was reference to the worst case in the original test report.
2. "-" means no effect.

Radiated Emission Test (Above 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	0	FHSS	GFSK	DH5
0 to 78	0	FHSS	8DPSK	DH5

Radiated Emission Test (Below 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	0	FHSS	GFSK	DH5
0 to 78	0	FHSS	8DPSK	DH5

Power Line Conducted Emission Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	0	FHSS	8DPSK	DH5

Antenna Port Conducted Measurement:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	0	FHSS	GFSK	DH5
0 to 78	0	FHSS	8DPSK	DH5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	22deg. C, 68%RH	120Vac, 60Hz	Robert Cheng
RE<1G	24deg. C, 71%RH	120Vac, 60Hz	Robert Cheng
PLC	25deg. C, 70%RH	120Vac, 60Hz	Eagle Chen
APCM	25deg. C, 60%RH	120Vac, 60Hz	Andy Ho

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

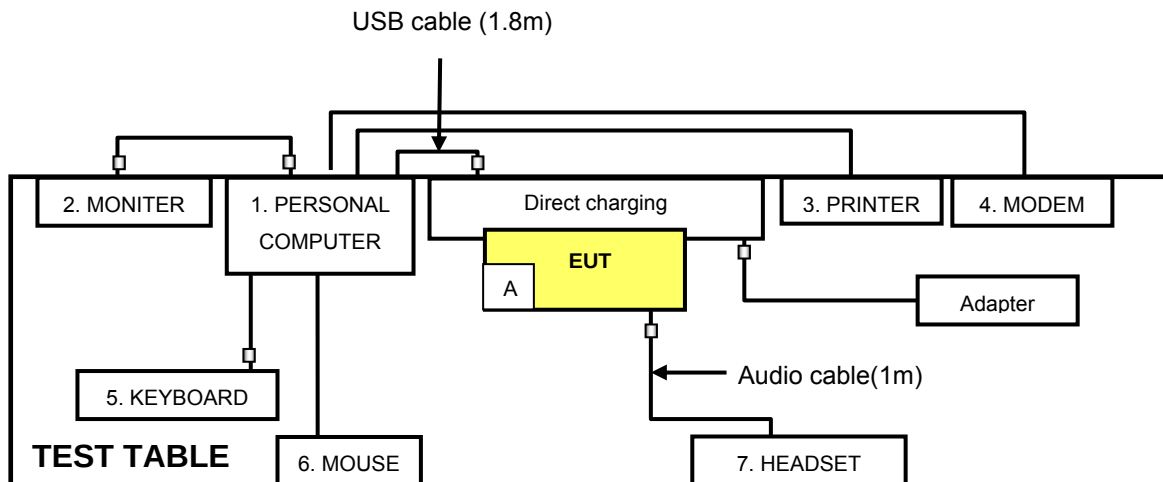
For conducted emission test					
No.	Product	Brand	Model No.	Serial No.	FCC ID
1	PERSONAL COMPUTER	DELL	DCSCMF	9KKB32S	FCC DoC
2	MONITOR	DELL	E2210Hc	CN-OG337R-64180-97S-OQDS	FCC DoC
3	PRINTER	EPSON	LQ-300+II	G88Y074083	FCC DoC
4	MODEM	ACEEX	1414	0206026778	IFAXDM1414
5	KEYBOARD	DELL	SK-8115	MY-0DJ325-71619-99B-0476	FCC DoC
6	MOUSE	DELL	M056UOA	FORO0BF9	FCC DoC
7	HEADSET	Motorola	RCH50	NA	NA
For other test items					
No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC
2	iPod shuffle	Apple	MC749TA/A	CC4DMFJUDFDM	NA
3	HEADSET	VXI	VR10	NA	NA

For conducted emission test	
No.	Signal cable description
1	USB cable (unshielded, 1.8m with one core)
2	VGA cable. (1.8m with two cores)
3	USB cable.(1.8m)
4	RS232 cable.(1.1m)
5	USB cable.(1.8m with one core)
6	USB cable.(1.8m)
7	Audio cable (1m with one core)
For other test items	
No.	Signal cable description
1	USB cable (unshielded, 1.8m with one core)
2	USB cable (shielded, 0.1m)
3	Audio cable (1.1m with one core)

NOTE: All power cords of the above support units are non shielded (1.8m).

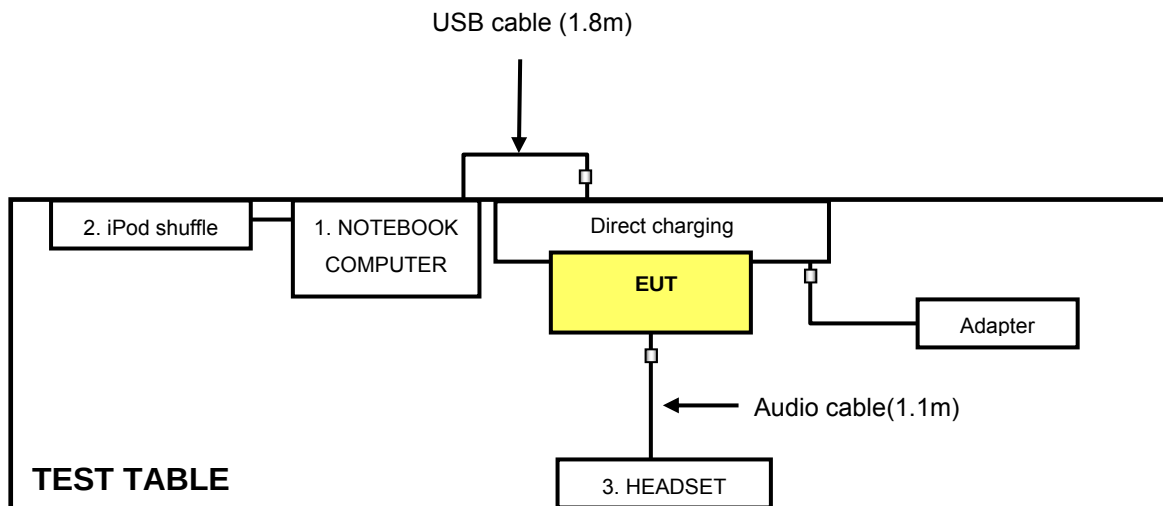
3.3.1 Configuration of System under Test

For Conducted emission test:



NOTE: 1. Item A is the SD Card.

For other test items



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)

FCC Public Notice DA 00-705

ANSI C63.10-2009

All test items have been performed and recorded as per the above standards.

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY51210105	July 21,2014	July 20,2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Feb. 06, 2015	Feb. 05, 2016
RF Cable	NA	CHGCAB_001	Oct. 04, 2014	Oct. 03, 2015
Horn_Antenna AISl	AIH.8018	0000320091110	Aug. 27, 2014	Aug. 26, 2015
Pre-Amplifier Agilent	8449B	3008A02578	June 24, 2014	June 23, 2015
RF Cable	NA	131205 131214 SNMY23684/4	Jan. 16, 2015	Jan. 15, 2016
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Pre-Amplifier EMCl	EMC184045	980143	Jan. 16, 2015	Jan. 15, 2016
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Aug. 26, 2014	Aug. 25, 2015
RF Cable	NA	RF104-121 RF104-204	Dec. 11, 2014	Dec. 10, 2015
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 3 The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
- 5 The VCCI Site Registration No. is G-137.
- 6 The CANADA Site Registration No. is IC 7450H-2.
- 7 Tested Date: Apr. 02, 2015

4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note:

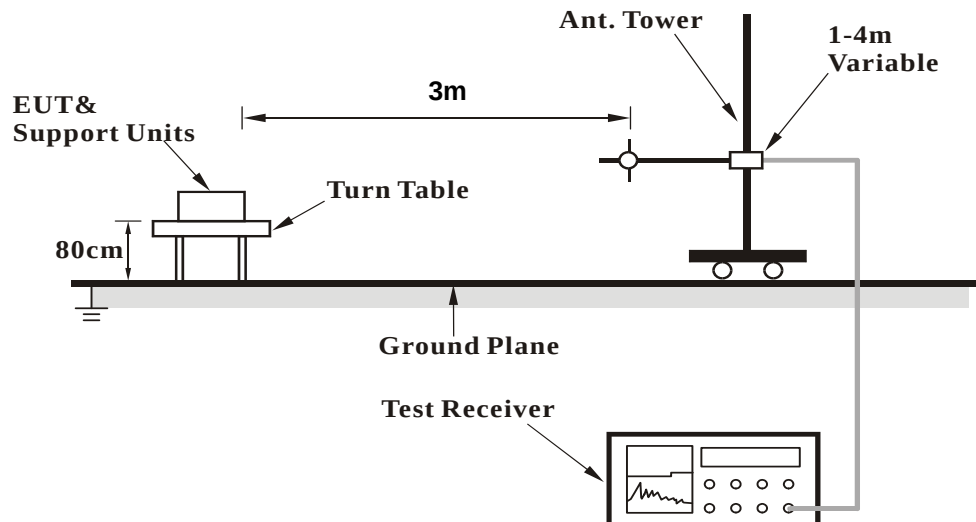
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. For Average measurement, due to the DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on $0.625 * 5$ per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB, therefore Average value = peak reading + $20\log(\text{duty cycle})$.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

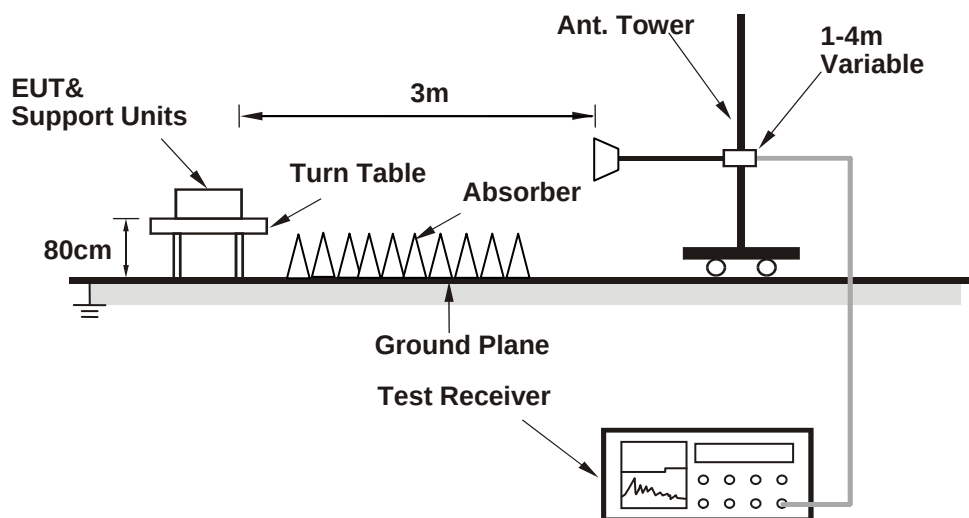
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

ABOVE 1GHz DATA :

BT_GFSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	49.6 PK	74.0	-24.4	1.01 H	14	55.18	-5.58
2	2390.00	19.5 AV	54.0	-34.5	1.01 H	14	25.08	-5.58
3	*2402.00	94.2 PK			1.01 H	14	99.74	-5.54
4	*2402.00	64.1 AV			1.01 H	14	69.64	-5.54
5	4804.00	56.9 PK	74.0	-17.1	1.00 H	35	54.60	2.30
6	4804.00	26.8 AV	54.0	-27.2	1.00 H	35	24.50	2.30
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	49.3 PK	74.0	-24.7	1.00 V	309	54.88	-5.58
2	2390.00	19.2 AV	54.0	-34.8	1.00 V	309	24.78	-5.58
3	*2402.00	91.1 PK			1.00 V	309	96.64	-5.54
4	*2402.00	61.0 AV			1.00 V	309	66.54	-5.54
5	4804.00	54.6 PK	74.0	-19.4	1.40 V	165	52.30	2.30
6	4804.00	24.5 AV	54.0	-29.5	1.40 V	165	22.20	2.30

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading + $20\log(\text{duty cycle})$.

BT_8DPSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	49.7 PK	74.0	-24.3	1.00 H	17	55.28	-5.58
2	2390.00	19.6 AV	54.0	-34.4	1.00 H	17	25.18	-5.58
3	*2402.00	93.4 PK			1.00 H	11	98.94	-5.54
4	*2402.00	63.3 AV			1.00 H	11	68.84	-5.54
5	4804.00	57.1 PK	74.0	-16.9	1.00 H	22	54.80	2.30
6	4804.00	27.0 AV	54.0	-27.0	1.00 H	22	24.70	2.30
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	49.4 PK	74.0	-24.6	1.00 V	313	54.98	-5.58
2	2390.00	19.3 AV	54.0	-34.7	1.00 V	313	24.88	-5.58
3	*2402.00	90.2 PK			1.00 V	313	95.74	-5.54
4	*2402.00	60.1 AV			1.00 V	313	65.64	-5.54
5	4804.00	54.0 PK	74.0	-20.0	1.35 V	160	51.70	2.30
6	4804.00	23.9 AV	54.0	-30.1	1.35 V	160	21.60	2.30

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.
- The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1 \text{ dB}$
- Average value = peak reading + $20\log(\text{duty cycle})$.

BELOW 1GHz DATA :

BT_GFSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	178.42	38.4 QP	43.5	-5.1	1.64 H	211	53.36	-14.94
2	324.67	39.6 QP	46.0	-6.4	1.24 H	101	51.68	-12.12
3	482.35	34.4 QP	46.0	-11.6	1.01 H	54	42.52	-8.11
4	605.21	35.5 QP	46.0	-10.6	1.24 H	214	40.72	-5.27
5	696.34	33.2 QP	46.0	-12.8	1.24 H	208	37.21	-3.97
6	757.34	37.5 QP	46.0	-8.5	1.24 H	301	40.29	-2.78
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	191.11	34.4 QP	43.5	-9.1	1.34 V	51	50.48	-16.07
2	212.25	38.1 QP	43.5	-5.4	1.78 V	68	54.45	-16.33
3	294.35	36.2 QP	46.0	-9.8	1.75 V	278	49.23	-13.02
4	319.65	37.1 QP	46.0	-8.9	1.78 V	204	49.38	-12.26
5	475.21	35.3 QP	46.0	-10.7	1.64 V	89	43.63	-8.29
6	521.24	34.6 QP	46.0	-11.4	1.54 V	312	41.81	-7.17

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

BT_8DPSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	178.21	37.2 QP	43.5	-6.4	1.45 H	175	52.07	-14.92
2	324.21	39.2 QP	46.0	-6.8	1.34 H	67	51.34	-12.13
3	482.12	34.2 QP	46.0	-11.8	1.24 H	111	42.32	-8.11
4	605.11	35.2 QP	46.0	-10.8	1.67 H	199	40.48	-5.27
5	696.12	33.1 QP	46.0	-12.9	1.67 H	154	37.08	-3.97
6	757.21	37.2 QP	46.0	-8.8	1.64 H	177	40.02	-2.78
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	161.42	34.1 QP	43.5	-9.4	1.24 V	222	47.90	-13.80
2	212.15	38.3 QP	43.5	-5.3	1.45 V	164	54.58	-16.33
3	294.42	36.0 QP	46.0	-10.0	1.24 V	241	49.03	-13.01
4	319.71	37.3 QP	46.0	-8.7	1.24 V	167	49.60	-12.26
5	475.37	35.1 QP	46.0	-10.9	1.45 V	267	43.43	-8.29
6	521.45	36.4 QP	46.0	-9.6	1.24 V	34	43.59	-7.17

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS 30	100375	Apr. 29, 2014	Apr. 28, 2015
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 15, 2014	Sep. 14, 2015
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ENV216	100071	Nov. 10, 2014	Nov. 09, 2015
RF Cable (JYEBAO)	5D-FB	COCCAB-001	Mar. 09, 2015	Mar. 08, 2016
50 ohms Terminator	N/A	EMC-03	Sep. 22, 2014	Sep. 21, 2015
50 ohms Terminator	N/A	EMC-02	Sep. 30, 2014	Sep. 29, 2015
Software ADT	BV ADT_Cond_V7.3.7. 3	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: Mar. 31, 2015

4.2.3 Test Procedures

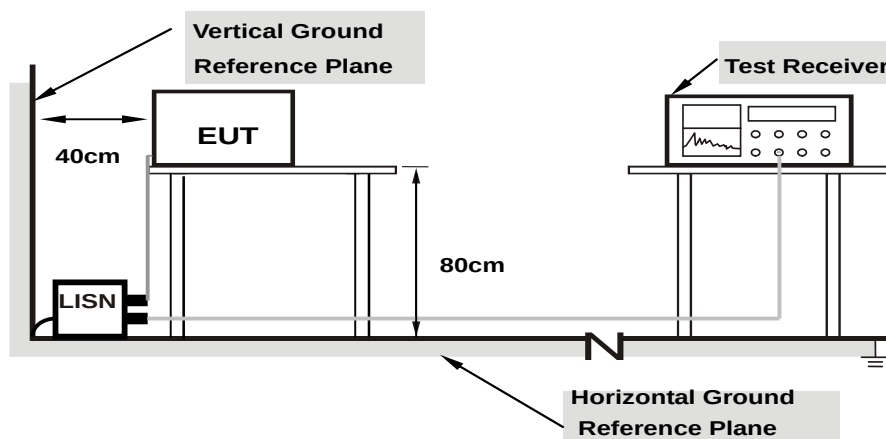
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Condition

Same as 4.1.6.

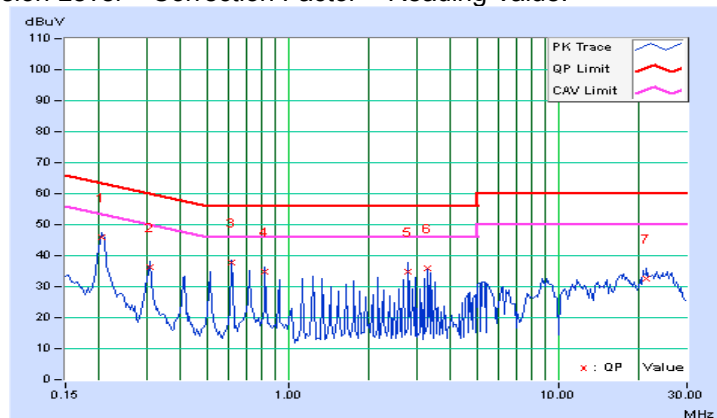
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	----------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20469	0.09	45.70	39.70	45.79	39.79	63.42	53.42	-17.63	-13.63
2	0.30775	0.10	36.36	32.74	36.46	32.84	60.03	50.03	-23.58	-17.20
3	0.61625	0.11	37.54	36.64	37.65	36.75	56.00	46.00	-18.35	-9.25
4	0.82275	0.12	34.86	33.52	34.98	33.64	56.00	46.00	-21.02	-12.36
5	2.77619	0.19	34.80	26.48	34.99	26.67	56.00	46.00	-21.01	-19.33
6	3.29256	0.20	35.68	27.28	35.88	27.48	56.00	46.00	-20.12	-18.52
7	21.29434	0.73	31.68	27.20	32.41	27.93	60.00	50.00	-27.59	-22.07

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

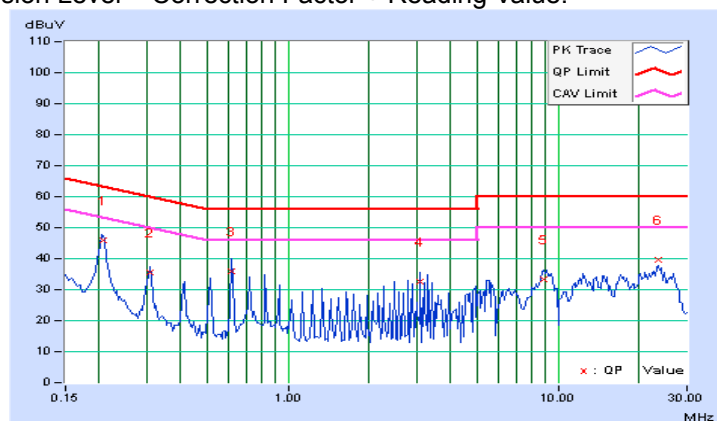


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	----------	-------------------	--------------------------------

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20734	0.08	46.00	39.48	46.08	39.56	63.31	53.31	-17.23	-13.75
2	0.31016	0.09	35.62	31.40	35.71	31.49	59.97	49.97	-24.26	-18.48
3	0.61775	0.11	35.64	34.72	35.75	34.83	56.00	46.00	-20.25	-11.17
4	3.08594	0.20	32.26	23.06	32.46	23.26	56.00	46.00	-23.54	-22.74
5	8.85156	0.42	32.86	30.72	33.28	31.14	60.00	50.00	-26.72	-18.86
6	23.46366	0.82	38.94	34.52	39.76	35.34	60.00	50.00	-20.24	-14.66

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

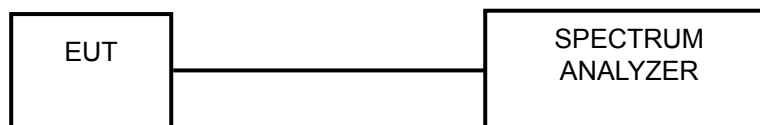


4.3 Maximum Output Power

4.3.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125mW.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10 MHz VBW.
- Measure the captured power within the band and recording the plot.
- Repeat above procedures until all frequencies required were complete.

4.3.5 Deviation from Test Standard

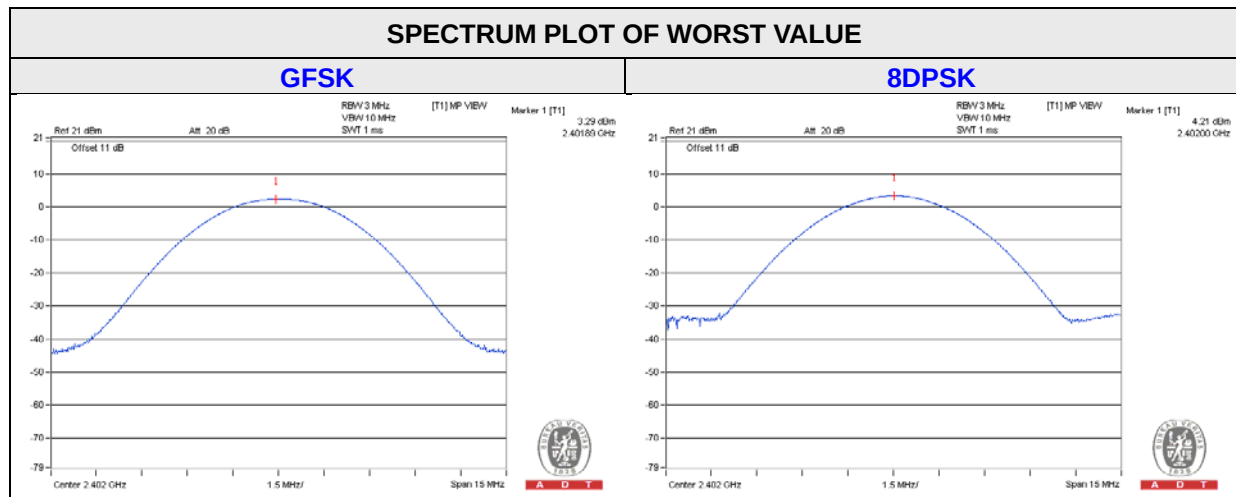
No deviation.

4.3.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.7 Test Results

CHANNEL	FREQUENCY (MHZ)	OUTPUT POWER (MW)		OUTPUT POWER (DBM)		POWER LIMIT (MW)	PASS / FAIL
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	2.133	2.636	3.29	4.21	125	PASS



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – 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, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab/Telecom Lab

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

--- END ---