FCC TEST REPORT (Bluetooth)

REPORT NO.:	RF981015H02-2
MODEL NO.:	MC3090Z
RECEIVED:	Oct. 15, 2009
TESTED:	Oct. 22 to 31, 2009
ISSUED:	Nov. 23, 2009

APPLICANT:	Motorola Inc.
ADDRESS:	One Motorola Plaza Holts ville NY 11742-1300 USA

ISSUED BY:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
LAB LOCATION:	No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

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1 CERTIFICATION

PRODUCT :	Mobile Computing Terminal
BRAND NAME :	MOTOROLA
MODEL NO. :	MC3090Z
APPLICANT :	Motorola Inc.
TESTED DATE :	Oct. 22 to 31, 2009
TEST SAMPLE :	ENGINEERING SAMPLE
STANDARDS :	47 CFR Part 15, Subpart C (Section 15.247), ANSI C63.4-2003

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 : Carol Liao , **DATE:** Nov. 23, 2009
(Carol Liao, Specialist)

TECHNICAL ACCEPTANCE : , **DATE:** Nov. 23, 2009
(Hank Chung, Deputy Manager)

APPROVED BY : , **DATE:** Nov. 23, 2009
(May Chen, Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C			
Standard Section	**Test Type and Limit**	**Result**	**REMARK**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit Minimum passing margin is –14.77dB at 0.205MHz
15.247(a)(1)(I)-(ii)	Number of Hopping Frequency Used Spec.: At least 75 channels	PASS	Meet the requirement of limit
15.247(a)(1)(ii)	Dwell Time on Each Channel Spec. : Max. 0.4 second within 31.6 second	PASS	Meet the requirement of limit
15.247(a)(1)(I)-(ii)	Hopping Channel Separation Spec. : Min. 25 kHz or 20 dB bandwidth, which ever is greater	PASS	Meet the requirement of limit
15.247(a)(2)	Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Report reference
15.247(b)	Maximum Peak Output Power Spec.: max. 1W	PASS	Meet the requirement of limit
15.247(c)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is -8.05dB at 500.00MHz
15.247(c)	Conducted Out-Band Emissions Measurement	PASS	Meet the requirement of limit
15.203	Antenna Requirement	PASS	No antenna connector is used.

NOTE:

1. There are Bluetooth technology, RFID technology and WLAN technology used for the EUT.
2. This report was recorded the Bluetooth technology.
3. For WLAN technology, the test data please refer "RF981015H02" and "RF981015H02-1".
4. For RFID technology, the test data please refer " RF981015H02-3".

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:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions	2.45 dB
Radiated emissions (30MHz-1GHz)	3.98 dB
Radiated emissions (1GHz ~18GHz)	2.49 dB
Radiated emissions (18GHz ~20GHz)	2.70 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Mobile Computing Terminal
MODEL NO.	MC3090Z
FCC ID	UZ7MC3090Z
POWER SUPPLY	DC 12V to cradle, DC 5.4V from power adapter or DC 3.7V from battery
MODULATION TYPE	For WLAN : CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
	For Bluetooth : GFSK
	For RFID : PR-ASK(DRM) , DSB-ASK(MRM), PR-ASK(XRM)
MODULATION TECHNOLOGY	For WLAN : DSSS, OFDM
	For Bluetooth : FHSS
	For RFID : FHSS
TRANSFER RATE	For WLAN : 802.11b: 11 / 5.5 / 2 / 1Mbps 802.11g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6Mbps 802.11a: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6Mbps
	For Bluetooth : DH 1, DH 3, DH 5
FREQUENCY RANGE	For WLAN : **For 15.407** 802.11a: 5.18 ~ 5.32GHz, 5.50 ~ 5.70GHz **For 15.247(2.4GHz)** 802.11b & 802.11g: 2412 ~ 2462MHz **For 15.247(5GHz)** 802.11a: 5.745 ~ 5.825GHz
	For Bluetooth :2402MHz ~ 2480MHz
	For RFID : 902.75MHz ~ 927.25MHz

NUMBER OF CHANNEL	For WLAN : **For 15.407** 19 for 802.11a **For 15.247(2.4GHz)** 11 for 802.11b, 802.11g **For 15.247(5GHz)** 5 for 802.11a
	For Bluetooth : 79
	For RFID : 50
MAXIMUM OUTPUT POWER	For WLAN : **For 15.407** 802.11a: 40.7mW **For 15.247(2.4GHz)** 802.11b: 83.2mW 802.11g: 93.3mW **For 15.247(5GHz)** 802.11a: 77.6mW
	For Bluetooth : 1.3 mW
	For RFID : PR-ASK(DRM): 660.7mW DSB-ASK(MRM): 977.2mW PR-ASK(XRM): 977.2mW
ANTENNA TYPE	Please see note 3
DATA CABLE	USB Cable x 1 (Part No.: 25-67868-03R) (only for test, not for sale together)
I/O PORTS	USB port x 1, Audio port x 1
ASSOCIATED DEVICES	Battery x 1

NOTE:

1. There are Bluetooth technology, RFID technology and WLAN technology used for the EUT. < the WLAN test data please refer " RF981015H02" and " RF981015H02-1", the RFID test data please refer "RF981015H02-3>

2. The EUT was pre-tested under the following modes:

Test Mode	Description
Mode A	**X-Y plane**
Mode B	Z-X plane
Mode C	Z-Y plane

From the above modes, the worst emission level was found in **Mode A**. Therefore only the test data of the mode was recorded in this report individually.

3. There are four antennas provided to this EUT, please refer to the following table:

For WLAN (RX has diversity function)					
No.	**Model**	**Antenna Type**	**Gain (dBi)**	**Connecter Type**	**Frequency range (MHz)**
1	OZONE WLAN 1	PCB(TX,RX)	2.96 (2.4G) 4.16 (5G)	N/A	2400~2850 4920~5850
2	OZONE WLAN 2	PIFA(RX only)	3.45 (2.4G) 3.32 (5G)	N/A	2400~2850 4920~5850
For Bluetooth					
No.	**Model**	**Antenna Type**	**Gain (dBi)**	**Connecter Type**	**Frequency range (MHz)**
1	Mica 2.4GHz	SMD	-0.45	N/A	2400~2500
For RFID					
No.	**Model**	**Antenna Type**	**Gain (dBi)**	**Connecter Type**	**Frequency range (MHz)**
1	OZONE RFID	Hor- dipole, outside antenna, Ver- slot, inside antenna	1.7483(Max)	N/A	902~928

4. The EUT could be supplied with the a charger, power adapter and Li-ion battery as below table:

Cradle (only for test, not for sale together)	
Brand:	SYMBOL
Part No.:	CRD3000-1001RR
Input power :	+12V-----3.3A
I/O Ports:	USB Port x 1 RJ-45(console) Port x 1
Associated devices:	USB cable x 1 (Part No.: 25-68596-01R) (1.6m, Unshielded without core) RJ-45(console) cable x 1 (Part No.: 25-63852-01R) (1.8m, Unshielded without core) Adapter x 1 (Part No.: 50-14000-148R)
Adapter (only for Cradle use, not for sale together)	
Brand:	HIPRO
Model No.:	HP-O2040D43
Part No.:	50-14000-148R
Input power :	100-240V, 50-60Hz, 1.5A
Output power :	+12V-----3.33A DC output cable (1.8m, Unshielded)

Adapter (only for test, not for sale together)	
Brand:	MOTOROLA
Model No.:	EADP-16BB A
Part No.:	50-14000-249R
Input power :	100-240V, 50-60Hz, 0.4A
Output power :	+5.4V-----3.0A DC output cable (1.8m, Unshielded)
Li-ion Battery 1	
Brand:	MOTOROLA/ Palladium Energy Inc
Model No.:	82-127909-01
RATING:	3.7V, 4800mAh
Li-ion Battery 2	
Brand:	Symbol/ Sole Energy Tech Corp.
Model No.:	55-060112-05
RATING:	3.7V, 4400mAh

5. The EUT operates in both the 5GHz and 2.4GHz Bands and compatibility with 802.11a, 802.11b, 802.11g, RFID technology and Bluetooth technology.
6. RFID and scanner have no function while the EUT is under charger condition.
7. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

Seventy-nine channels are provided to this EUT.

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		

3.3 TEST MODE APPLICABLITY AND TESTED CHANNEL DETAIL:

The device has different accessory, therefore the worst case base on investigation by different combination for each test item and its data was recorded in this report.

EUT configure mode	Applicable to				Description
	PLC	RE<1G	RE≥1G	APCM	
A			√	√	Scanner Stand-alone
B	√	√			Scanner + Cradle + adapter

Where PLC: Power Line Conducted Emission RE<1G RE: Radiated Emission below 1GHz
RE≥1G: Radiated Emission above 1GHz APCM: Antenna Port Conducted Measurement

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	EUT CONFIGURE MODE
0 to 78	0	FHSS	GFSK	DH5	B

Radiated Emission Test (Below 1 GHz):

☒ 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	EUT CONFIGURE MODE
0 to 78	0	FHSS	GFSK	DH5	B

Radiated Emission Test (Above 1 GHz):

☒ 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	EUT CONFIGURE MODE
0 to 78	0, 39, 78	FHSS	GFSK	DH5	A

Conducted Out-Band 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	EUT CONFIGURE MODE
0 to 78	0, 78	FHSS	GFSK	DH5	A

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	EUT CONFIGURE MODE
0 to 78	0, 39, 78	FHSS	GFSK	DH5	A

3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 15, Subpart C. (15.247)
ANSI C63.4 : 2003

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

3.5 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.

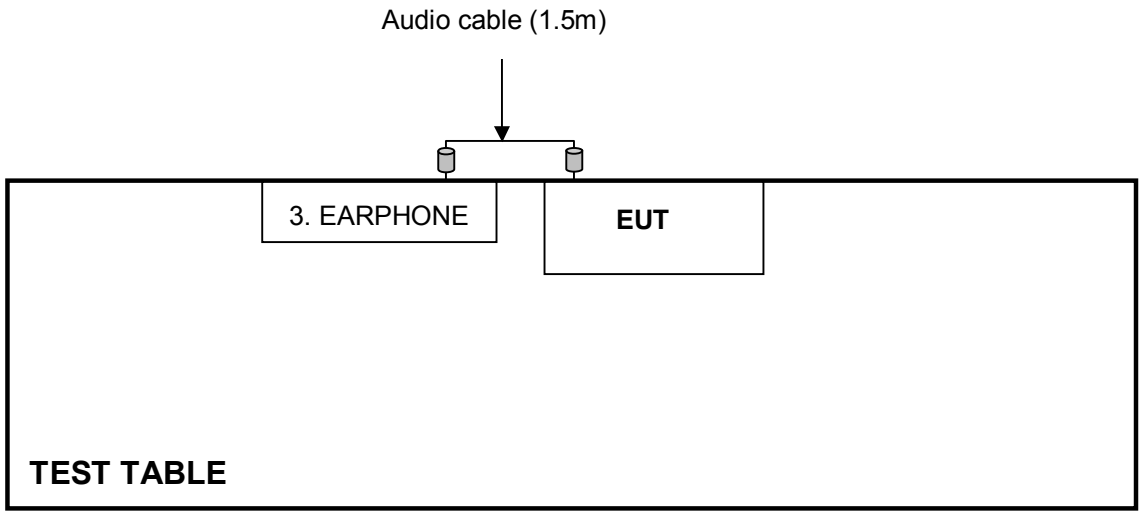
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP18L	12252644560	FCC DoC
2	MONITOR	DELL	E228WFPc	CN-OX765G-64180-88P-09ZM	FCC DoC
3	PRINTER	HP	hp deskjet 3535	TH45P164GT	NA
4	EARPHONE	VXI	A380800253	50-11300-050R	NA
5	MOUSE	DELL	M056UOA	FOROOBSN	FCC DoC
6	BETTERY	MOTOROLA	82-127909-01	N/A	NA
7	CRADLE	SYMBOL	CRD3000-1001RR	N/A	NA

No.	Signal cable description
1	USB Cable, 1.8m, Shielded and RS232 Cable, 1.8m
2	1.8 m braid shielded wire, terminated with VGA connector via metallic frame, with two cores.
3	1.8 m braid shielded wire, terminated with DB25 and centronics connector via metallic frame, w/o core
4	Audio Cable, 1.5m with two cores.
5	1.8m foil shielded wire, USB Connector, w/o core.
6	NA
7	NA

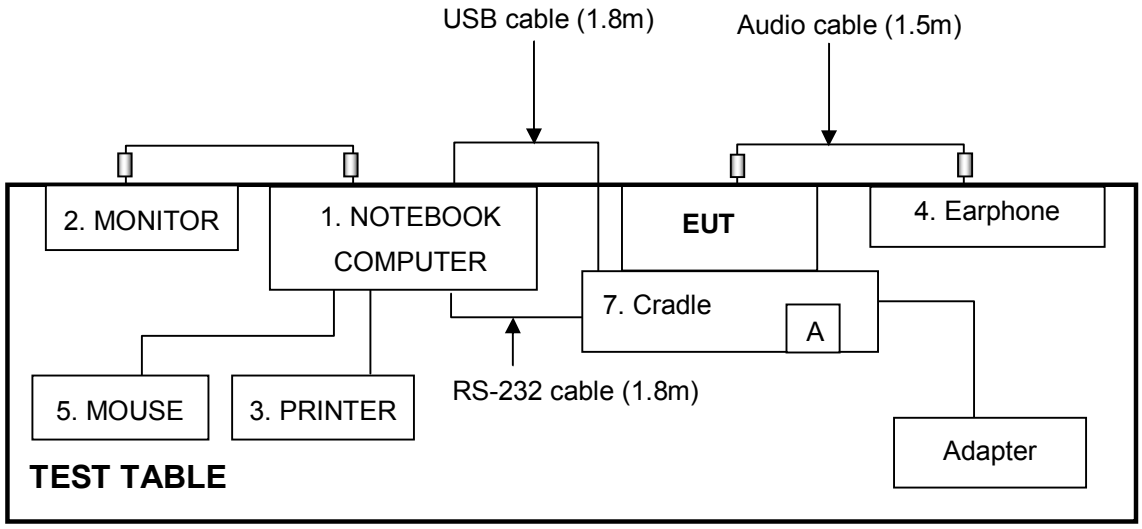
Note: 1. All power cords of the above support units are unshielded (1.8m).

3.6 CONFIGURATION OF SYSTEM UNDER TEST

For Scanner Stand-alone Mode:



For Scanner + Cradle + adapter Mode:



NOTE: 1. Item A is the Battery (Support unit 6).

4 TEST PROCEDURES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	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 0.50 MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS 30	100287	Mar. 05, 2009	Mar. 04, 2010
Line-Impedance Stabilization Network (for EUT)	KNW-407	8-1395-12	May 04, 2009	May 03, 2010
Line-Impedance Stabilization Network (for Peripheral)	ENV-216	100072	June 08, 2009	June 07, 2010
RF Cable (JYEBAO)	5DFB	COACAB-001	Dec 15, 2008	Dec 14, 2009
50 ohms Terminator	50	3	Nov. 05, 2008	Nov. 04, 2009
Software	BV ADT_ Cond_V7.3.7	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. A.
3 The VCCI Con A Registration No. is C-817.

4.1.3 TEST PROCEDURES

a. 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.

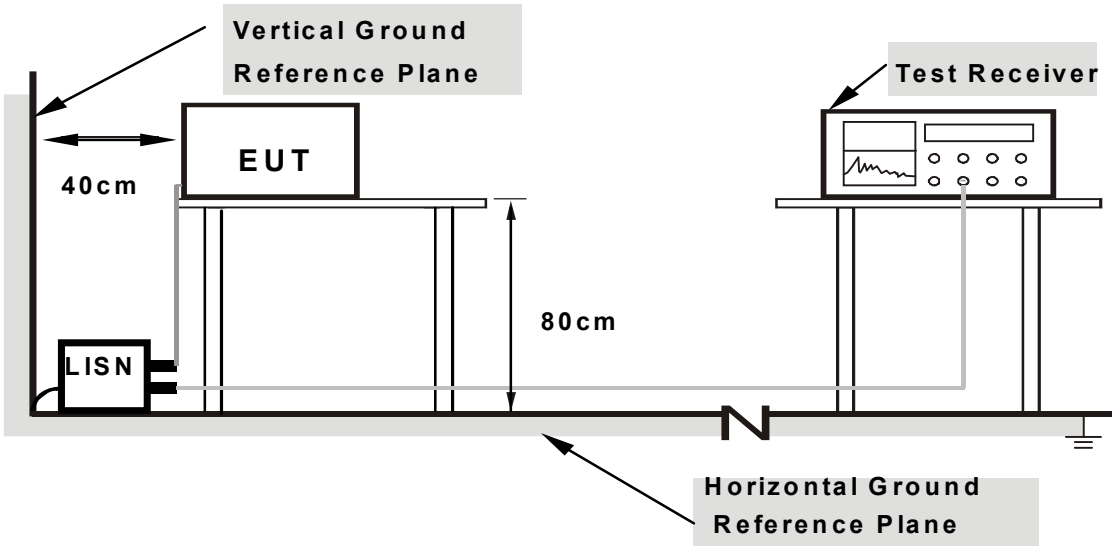
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITIONS

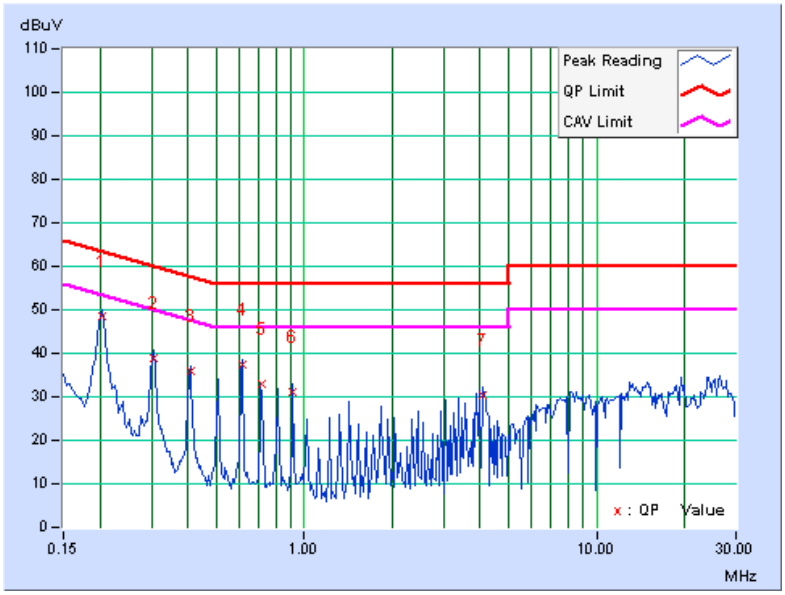
1 Set the EUT under charger condition via cradle.
2 EUT runs the test program "EMI.exe" to transmission/receiving condition continuously with Support unit 1 (Notebook Computer) via one USB cable
3 EUT plays music and sends "H" messages to printer, and the printer prints them on paper.
4 The support unit 6 (battery) is charging from cradle continuously.

4.0.1 TEST RESULTS

INPUT POWER (SYSTEM)	120Vac, 60 Hz	**6DB BANDWIDTH**	9 kHz
ENVIRONMENTAL CONDITIONS	25 deg. C, 66%RH, 965 hPa	**PHASE**	Line (L)
TESTED BY	Andy Ho		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.205**	**0.17**	**48.48**	**-**	**48.65**	**-**	**63.42**	**53.42**	**-14.77**	**-**
2	0.306	0.12	38.76	-	38.88	-	60.07	50.07	-21.19	-
3	0.409	0.08	35.68	-	35.76	-	57.68	47.68	-21.92	-
4	0.611	0.07	37.42	-	37.49	-	56.00	46.00	-18.51	-
5	0.713	0.07	32.90	-	32.97	-	56.00	46.00	-23.03	-
6	0.916	0.06	30.96	-	31.02	-	56.00	46.00	-24.98	-
7	4.069	0.14	30.38	-	30.52	-	56.00	46.00	-25.48	-

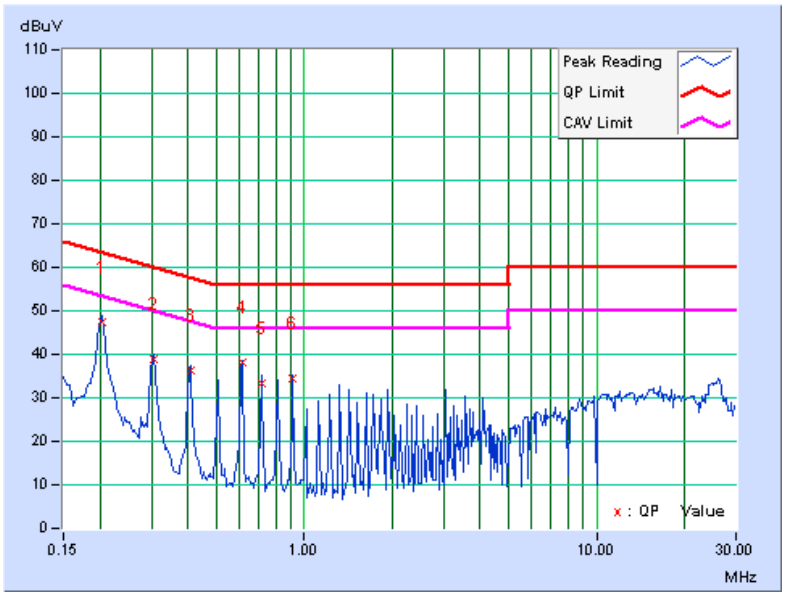
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



INPUT POWER (SYSTEM)	120Vac, 60 Hz	**6dB BANDWIDTH**	9 kHz
ENVIRONMENTAL CONDITIONS	25 deg. C, 66%RH, 965 hPa	**PHASE**	Neutral (N)
TESTED BY	Andy Ho		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.205	0.18	47.29	-	47.47	-	63.42	53.42	-15.95	-
2	0.306	0.13	38.58	-	38.71	-	60.07	50.07	-21.36	-
3	0.408	0.09	36.32	-	36.41	-	57.69	47.69	-21.28	-
4	0.611	0.09	38.00	-	38.09	-	56.00	46.00	-17.91	-
5	0.713	0.08	33.37	-	33.45	-	56.00	46.00	-22.55	-
6	0.916	0.08	34.45	-	34.53	-	56.00	46.00	-21.47	-

REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



4.1 NUMBER OF HOPPING FREQUENCY USED

4.1.1 LIMIT OF HOPPING FREQUENCY USED

At least 75 hopping frequencies, and should be equally spaced.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 03, 2009	Aug. 02, 2010

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

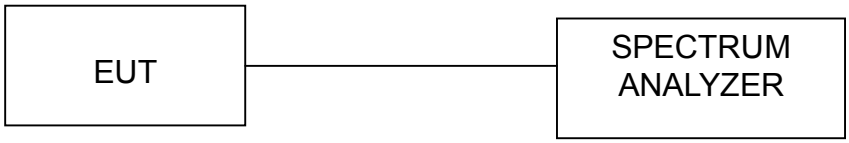
4.1.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.1.4 DEVIATION FROM TEST STANDARD

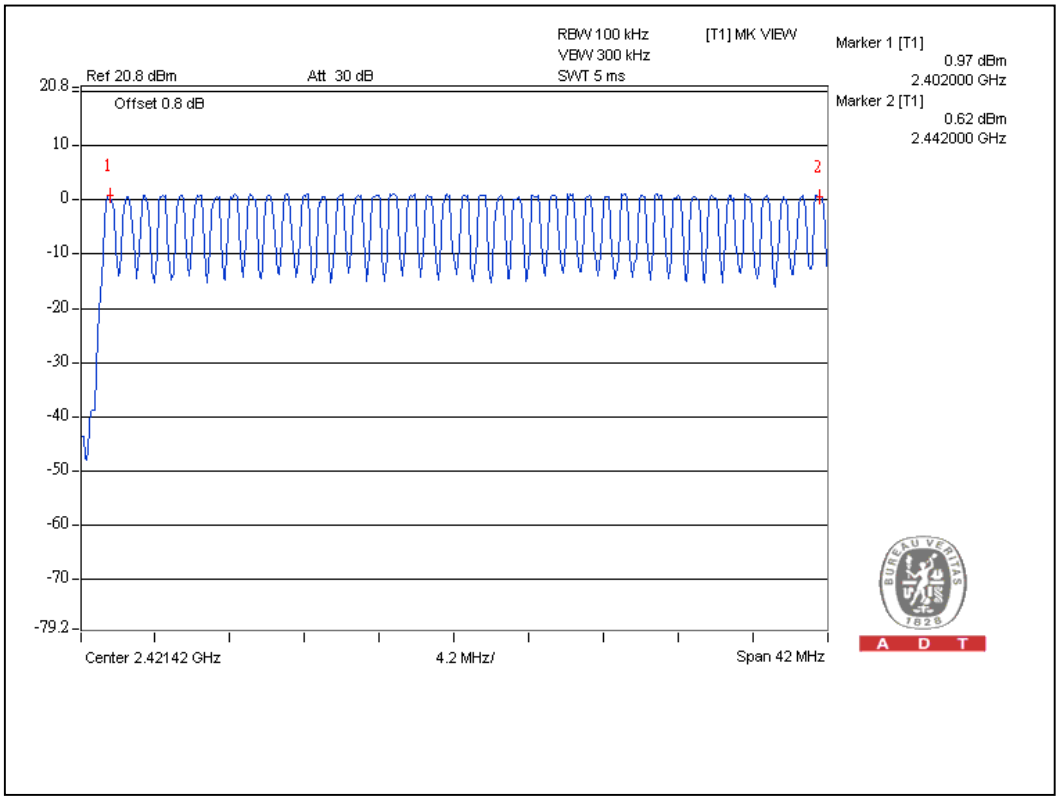
No deviation

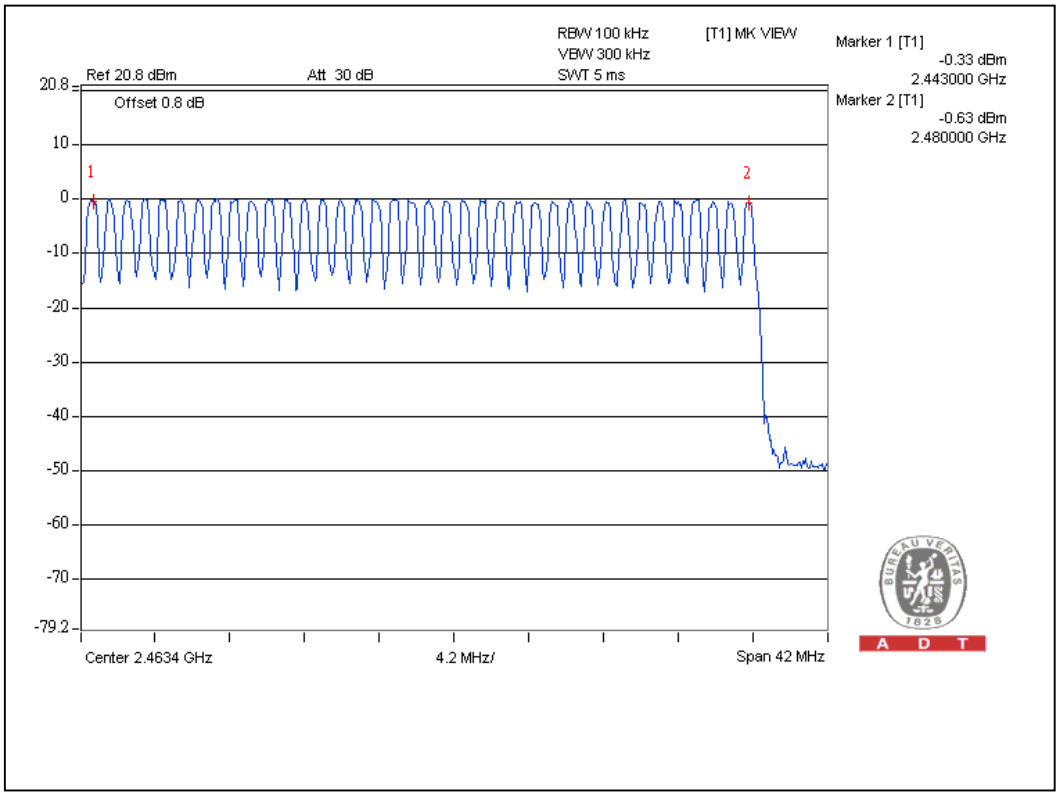
4.1.5 TEST SETUP



4.1.6 TEST RESULTS

There are 79 hopping frequencies in the hopping mode. Please refer to next pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
0.97 dBm
2.402000 GHz
Marker 2 [T1]
0.62 dBm
2.442000 GHz
Ref 20.8 dBm
Att 30 dB
Offset 0.8 dB
20.8
10
0
-10
-20
-30
-40
-50
-60
-70
-79.2
1
2
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-0.33 dBm
2.443000 GHz
Marker 2 [T1]
-0.63 dBm
2.480000 GHz
Ref 20.8 dBm
Att 30 dB
Offset 0.8 dB
20.8
10
0
-10
-20
-30
-40
-50
-60
-70
-79.2
1
2
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

4.2 DWELL TIME ON EACH CHANNEL

4.2.1 LIMIT OF DWELL TIME USED

For FHSS, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 31.6 second period. For hybrid systems, the average time of occupancy on any frequency should not exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 03, 2009	Aug. 02, 2010

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

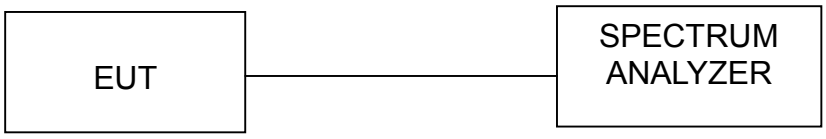
4.2.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP

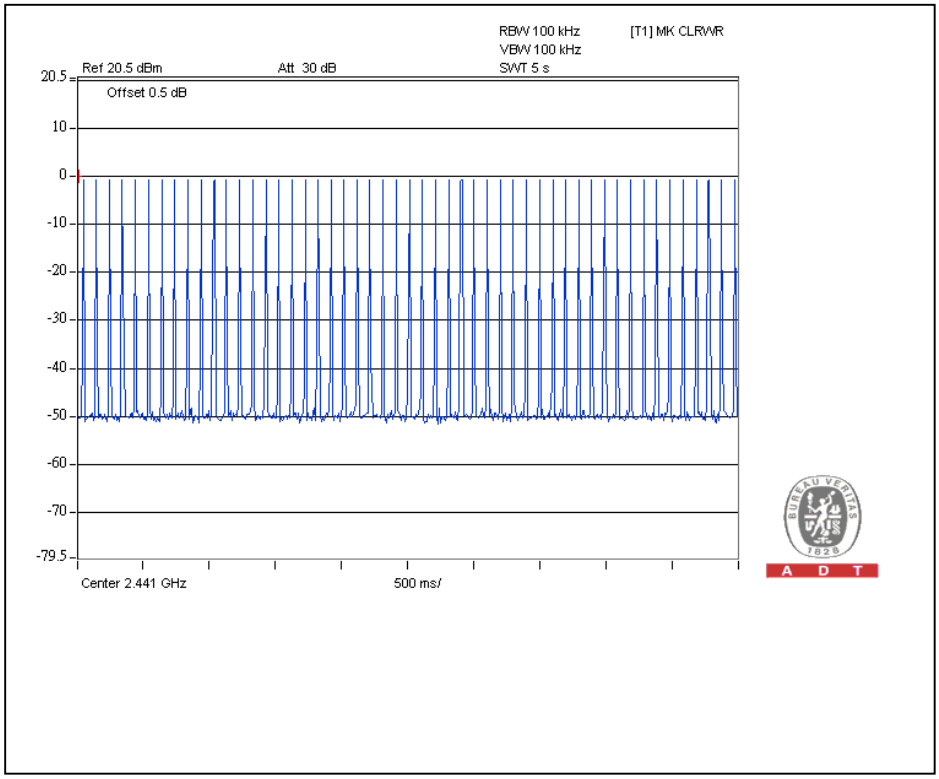


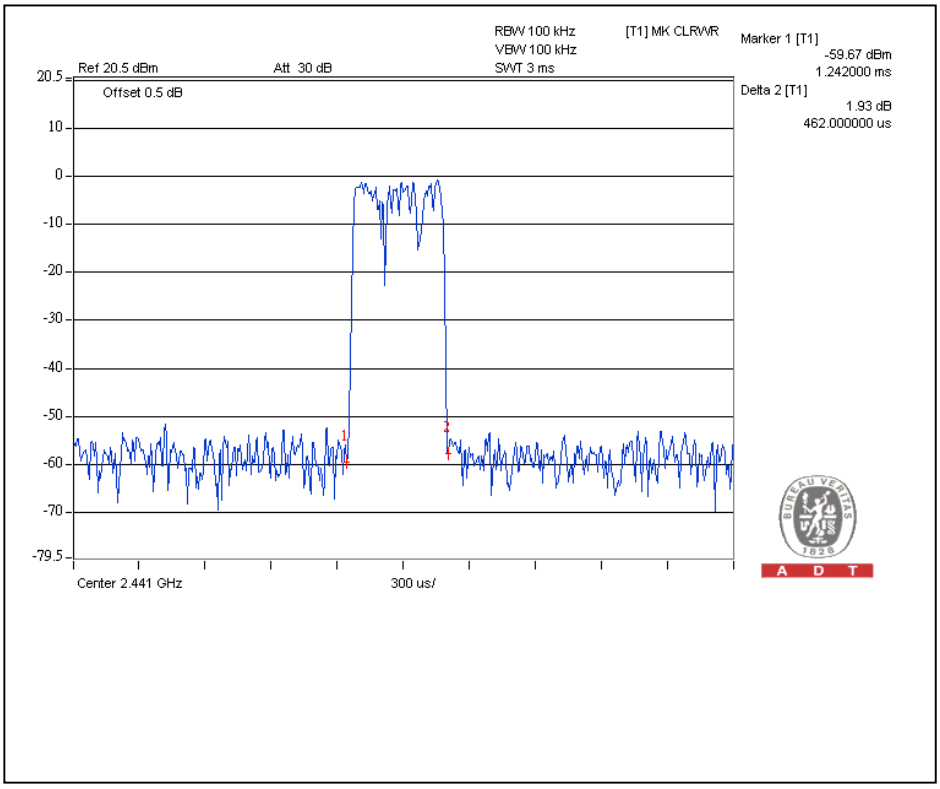
4.2.6 TEST RESULTS

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	51 (times / 5 sec) *6.32=322.32 times	0.462	148.9	400
DH3	26 (times / 5 sec) *6.32=164.32 times	1.716	282.0	400
DH5	16 (times / 5 sec) *6.32=101.12 times	2.970	300.3	400

Test plots of the transmitting time slot are shown on next three pages.

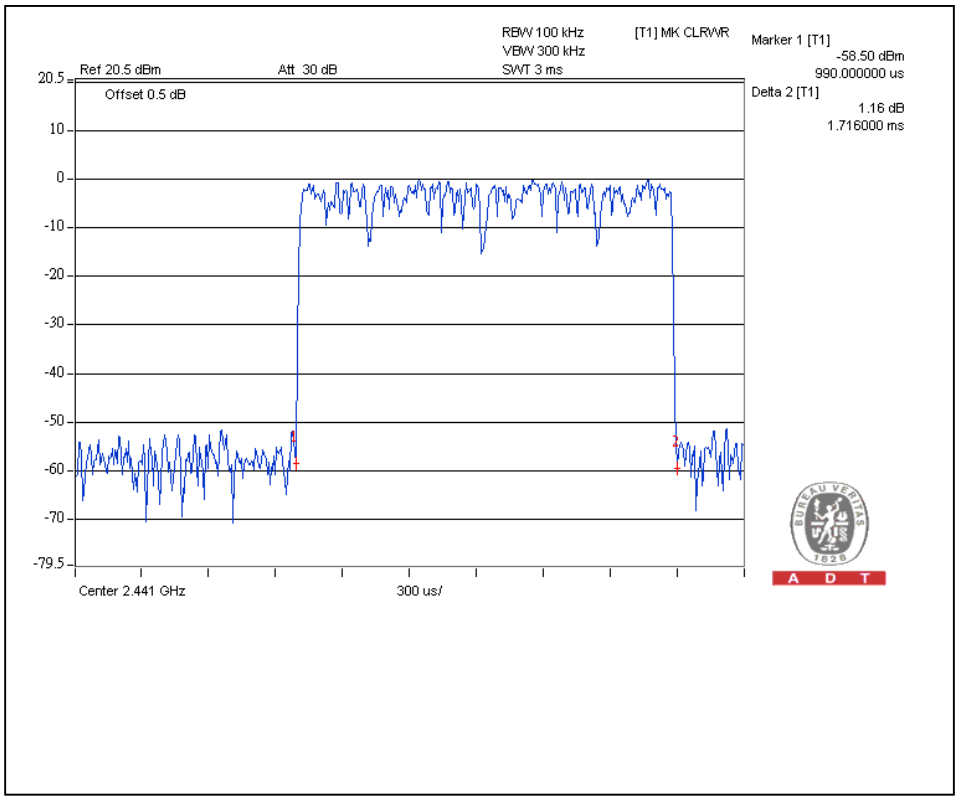
DH1


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 ms/

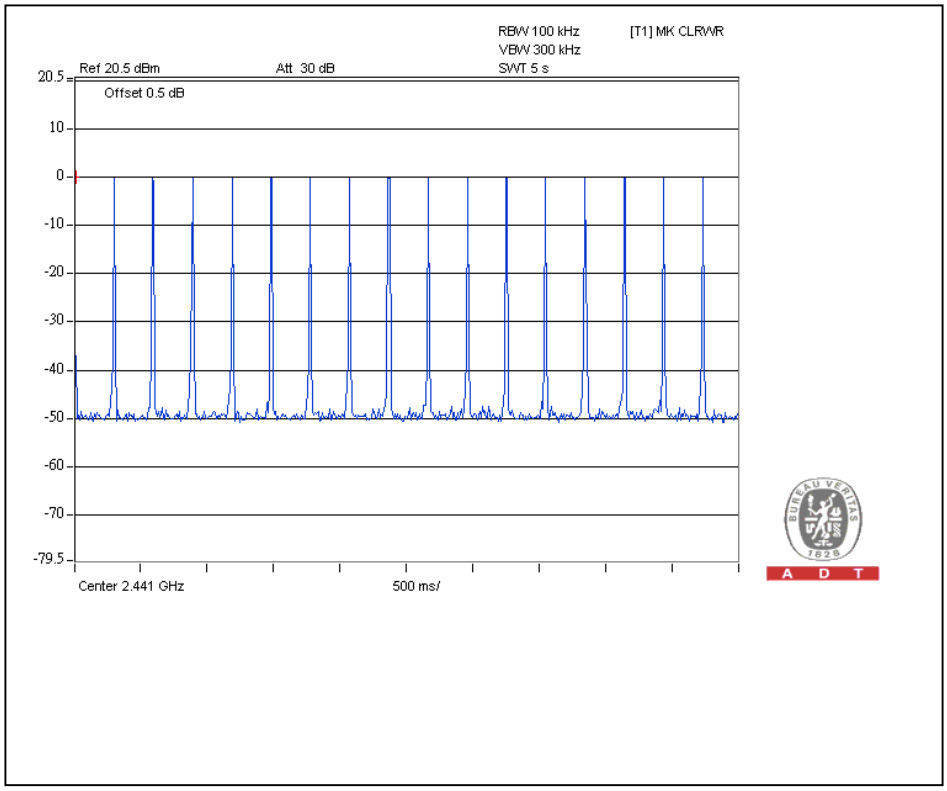

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MK CLRWR
Marker 1 [T1]
-59.67 dBm
1.242000 ms
Delta 2 [T1]
1.93 dB
462.000000 us
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
300 us/

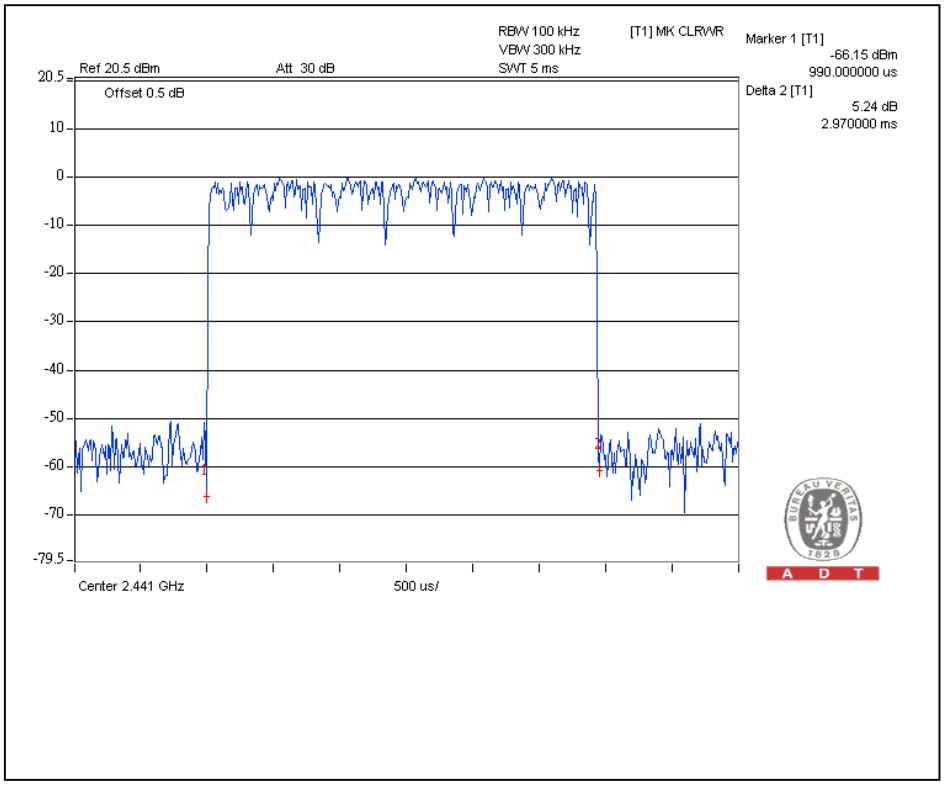
DH3


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 3 ms
[T1] MK CLRWR
Marker 1 [T1]
-58.50 dBm
990.000000 us
Delta 2 [T1]
1.16 dB
1.716000 ms
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
300 us/

DH5


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK CLRWR
Marker 1 [T1]
-66.15 dBm
990.000000 us
Delta 2 [T1]
5.24 dB
2.970000 ms
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 us/

4.3 CHANNEL BANDWIDTH

4.3.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 03, 2009	Aug. 02, 2010

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.3 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. 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.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP

4.3.6 EUT OPERATING CONDITION

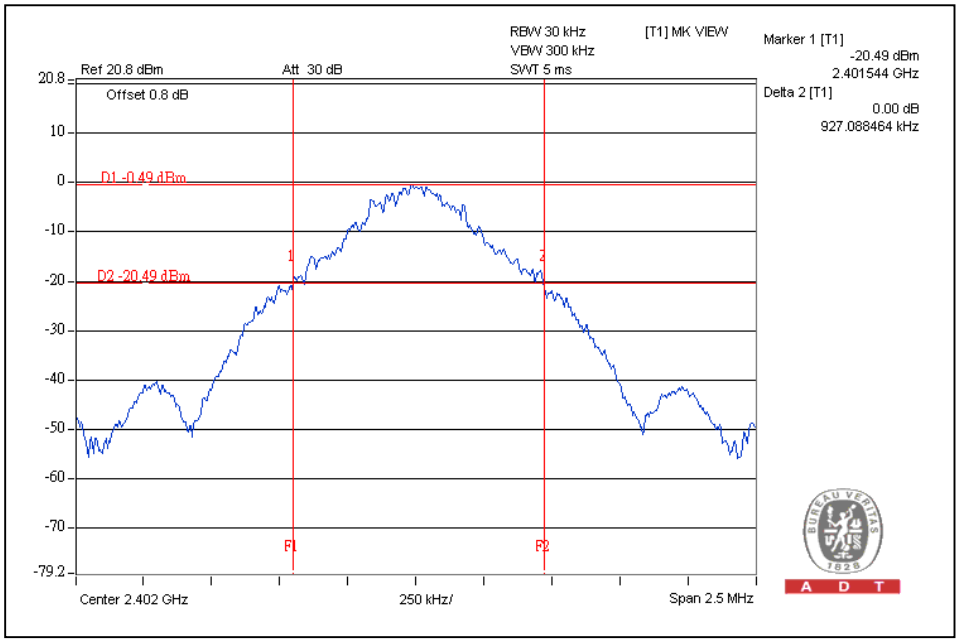
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.7 TEST RESULTS

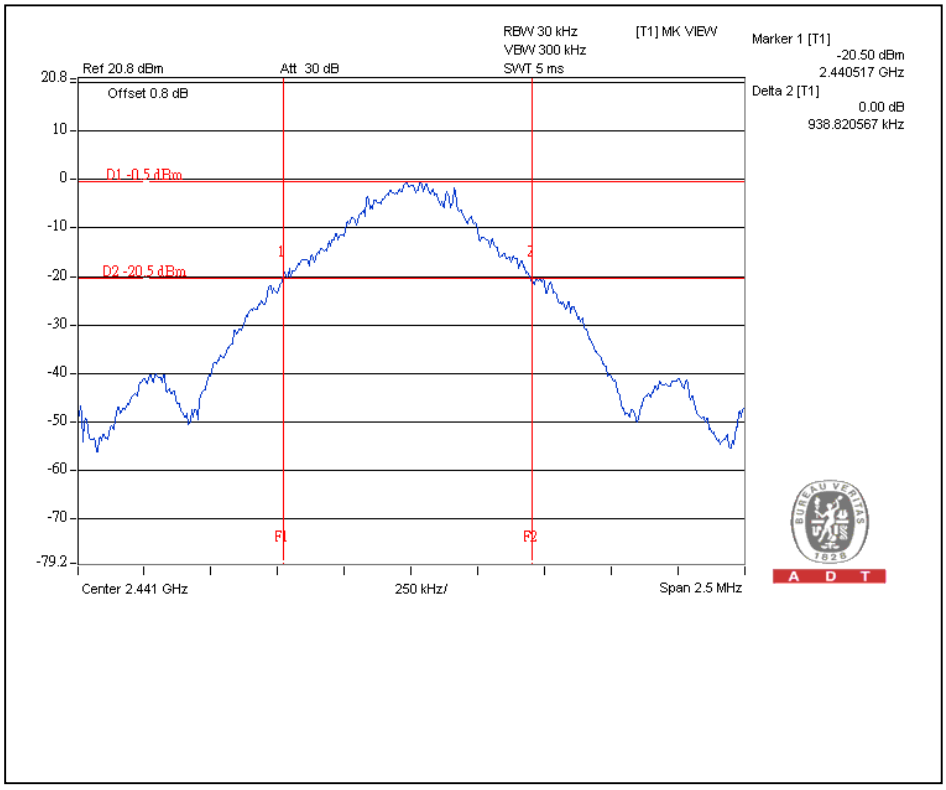
MODULATION TYPE	GFSK	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 60%RH, 965 hPa	TESTED BY	Rex Huang

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (kHz)
0	2402	927
39	2441	939
78	2480	966

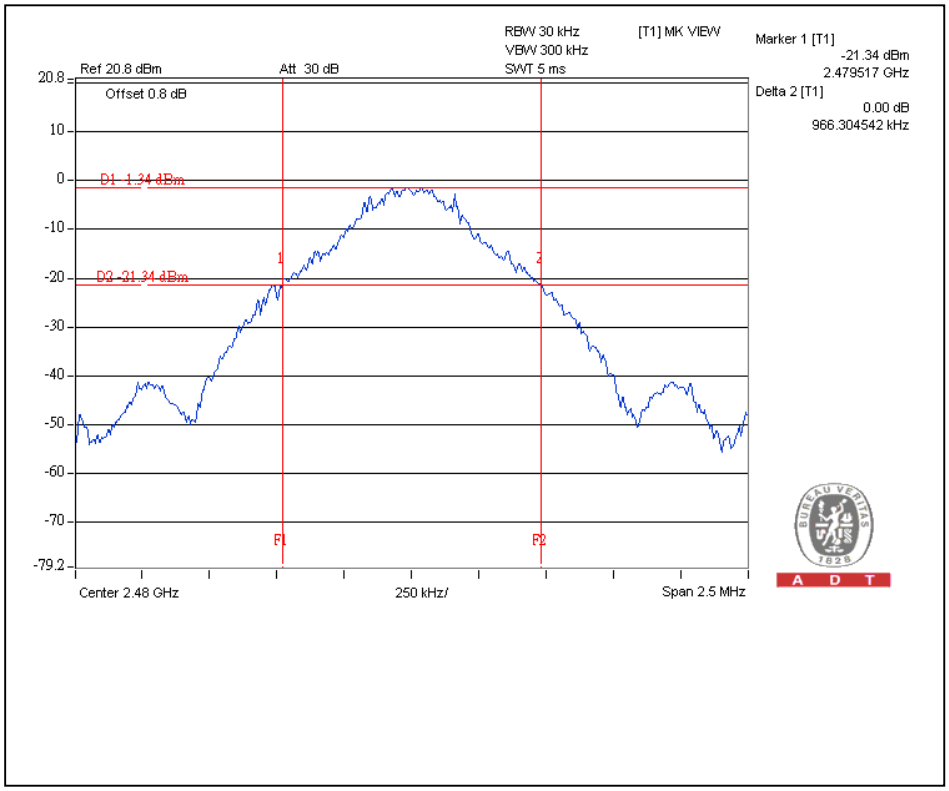
Channel 0



Channel 39



Channel 78



4.4 HOPPING CHANNEL SEPARATION

4.4.1 LIMIT OF HOPPING CHANNEL SEPARATION

At least 25 kHz or 20dB hopping channel bandwidth (whichever is greater).

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 03, 2009	Aug. 02, 2010

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

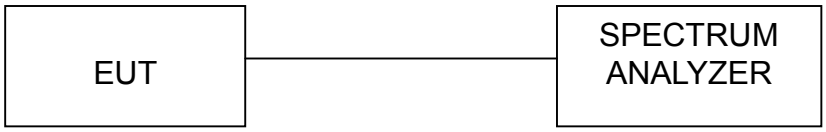
4.4.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP

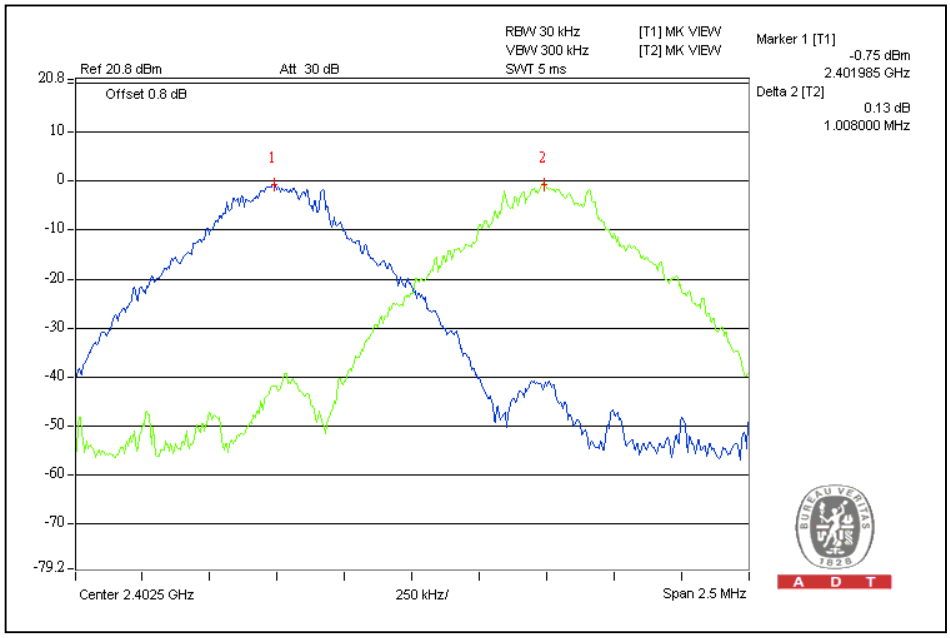


4.4.6 TEST RESULTS

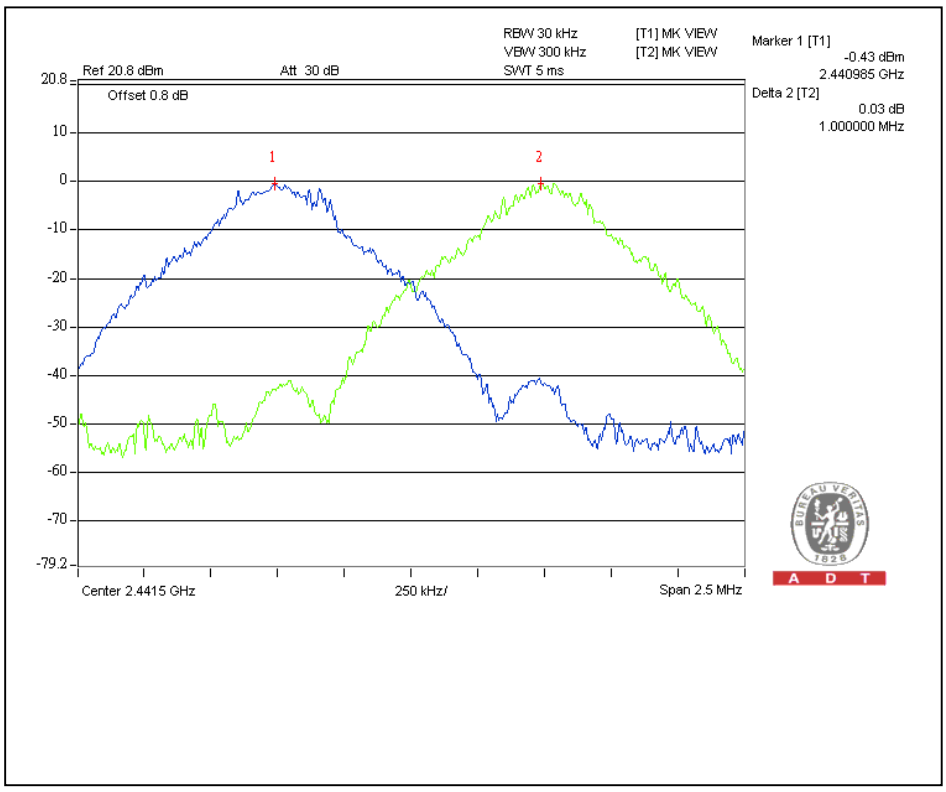
MODULATION TYPE	GFSK	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 60%RH, 965 hPa	TESTED BY	Rex Huang

Channel	Frequency (MHz)	Adjacent Channel Separation	Minimum Limit (kHz)	Pass / Fail
0	2402	1.008MHz	927	PASS
39	2441	1.000MHz	939	PASS
78	2480	1.006MHz	966	PASS

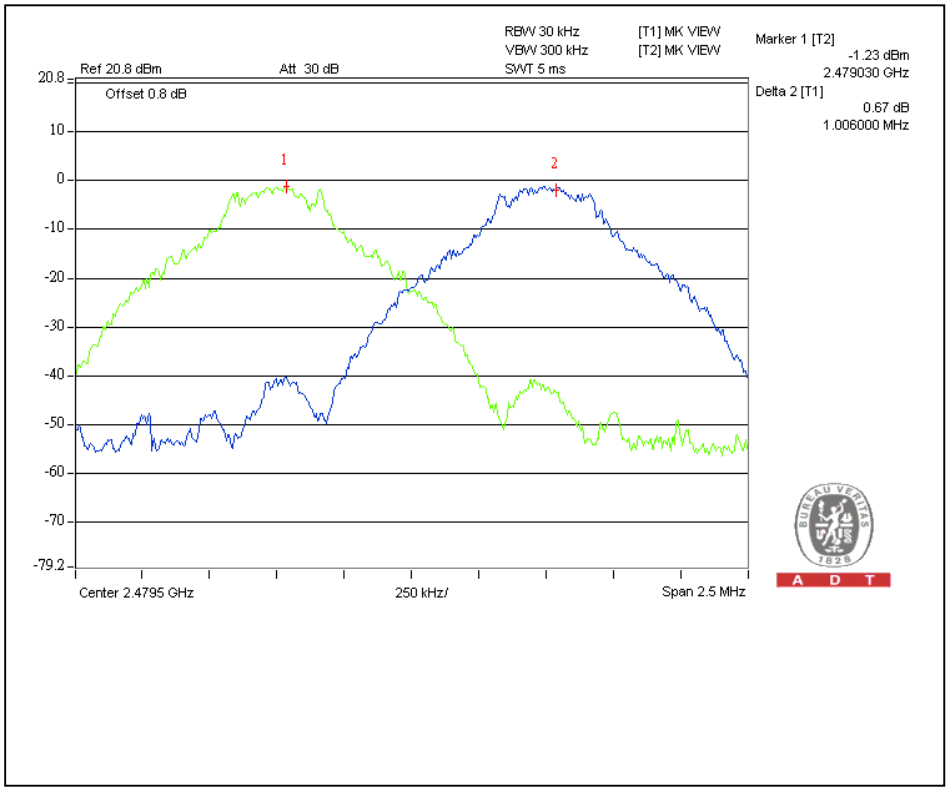
Channel 0



Channel 39



Channel 78



4.5 MAXIMUM PEAK OUTPUT POWER

4.5.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 1W.

4.5.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 03, 2009	Aug. 02, 2010

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

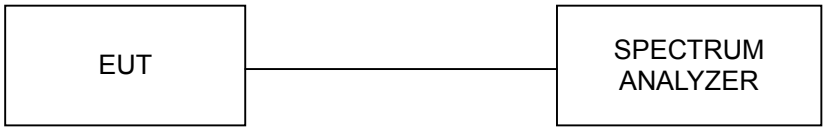
4.5.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. 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.
3. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 10 MHz VBW.
4. Measure the captured power within the band and recording the plot.
5. Repeat above procedures until all frequencies measured were complete.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

4.5.6 EUT OPERATING CONDITION

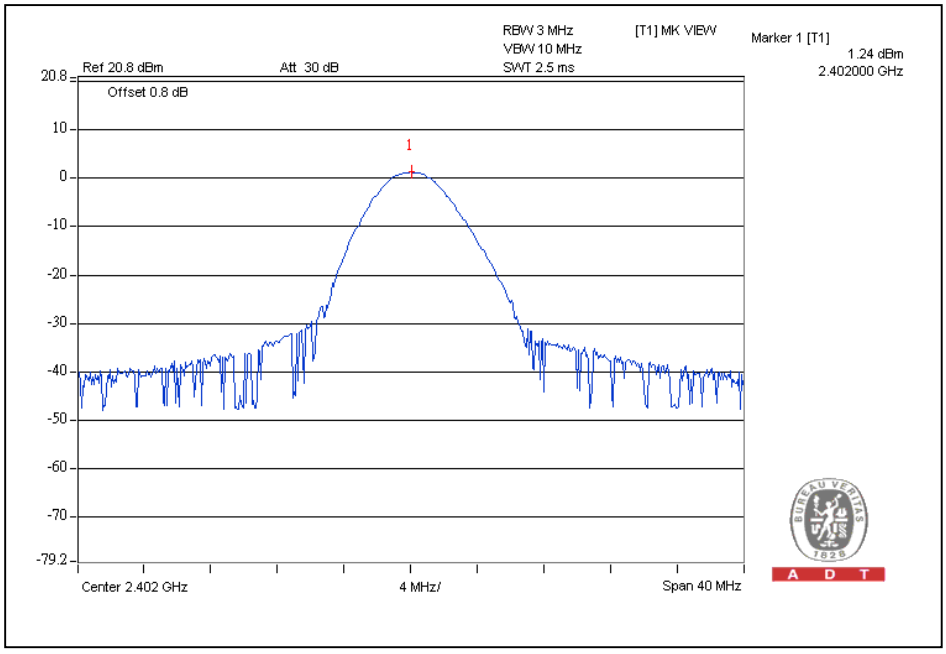
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

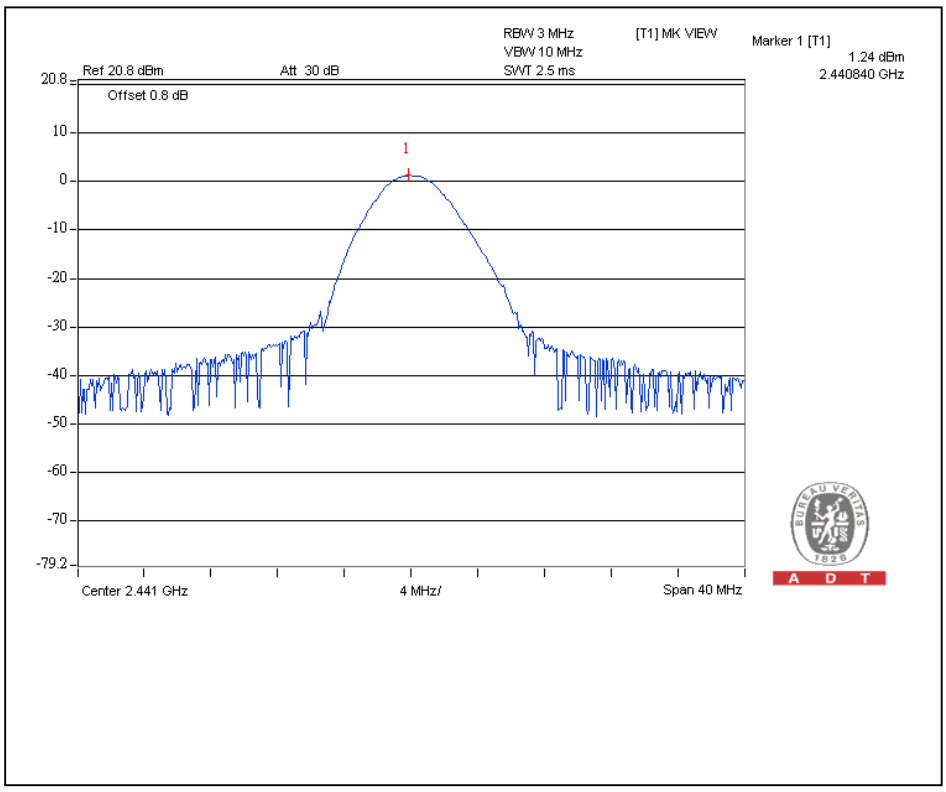
MODULATION TYPE	GFSK	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 60%RH, 965 hPa	TESTED BY	Rex Huang

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
0	2402	1.3	1.2	30	PASS
39	2441	1.3	1.2	30	PASS
78	2480	1.2	0.8	30	PASS

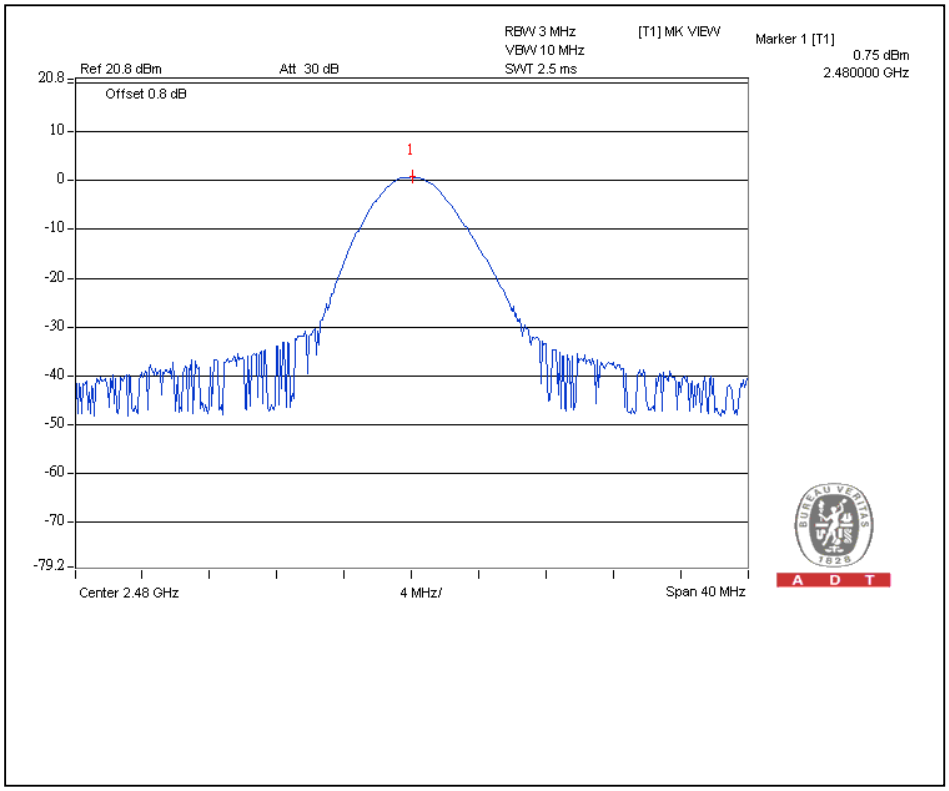
Channel 0



Channel 39



Channel 78



4.6 RADIATED EMISSION MEASUREMENT

4.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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

As shown in 15.35(b), 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.

4.6.2 TEST INSTRUMENTS

For radiated emission test (Below 1 GHz):

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ADVANTEST Spectrum Analyzer	U3751	170100022	Nov. 17, 2008	Nov. 16, 2009
ADVANTEST Spectrum Analyzer	U3772	160100280	July 26, 2009	July 25, 2010
HP Pre_Amplifier	8449B	3008A01922	Sep. 25, 2009	Sep. 24, 2010
ROHDE & SCHWARZ Test Receiver	ESCS 30	100027	May 05, 2009	May 04, 2010
SCHWARZBECK Broadband Antenna	VULB-9168	263	April 29, 2009	April 28, 2010
Schwarzbeck Horn_Antenna	BBHA9120	D123	Sep. 21, 2009	Sep. 20, 2010
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 23, 2009	Jan. 22, 2010
RF Switches	EM-H-01-1	1009	Aug. 10, 2009	Aug. 09, 2010
RF Cable	8DFB	STACAB-30M-1GHz-091	Feb. 19, 2009	Feb. 18, 2010
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	TT100	ADT01	NA	NA
CORCOM AC Filter	MRI2030	107/108	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, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: U3772) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Open Site No. A.
4. The VCCI Site Registration No. is R-782.
5. The FCC Site Registration No. is 91097.
6. The CANADA Site Registration No. is IC 7450G-1.

For radiated emission test (Above 1 GHz):

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100036	Dec. 09, 2008	Dec. 08, 2009
Agilent PSA Spectrum Analyzer	E4446A	MY46180622	Apr. 24 , 2009	Apr. 23 , 2010
HP Pre_Amplifier	8449B	3008A01923	Nov. 10, 2008	Nov. 09, 2009
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Aug. 28, 2009	Aug. 28, 2010
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	Apr. 29, 2009	Apr. 28, 2010
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 09, 2008	Dec. 08, 2009
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 22, 2009	Jan. 21, 2010
RF Switches	EMH-011	08009	Sep. 26, 2009	Sep. 25, 2010
RF CABLE (Chaintek)	Sucoflex 106	28077	Aug. 14, 2009	Aug. 13, 2010
RF Cable	8D	STCCAB-001	Sep. 26, 2009	Sep. 25, 2010
Software	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	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, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: FSP40) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Open Site No. C.
4. The FCC Site Registration No. is 656396.
5. The VCCI Site Registration No. is R-1626.
6. The CANADA Site Registration No. is IC 7450G-3.

4.6.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

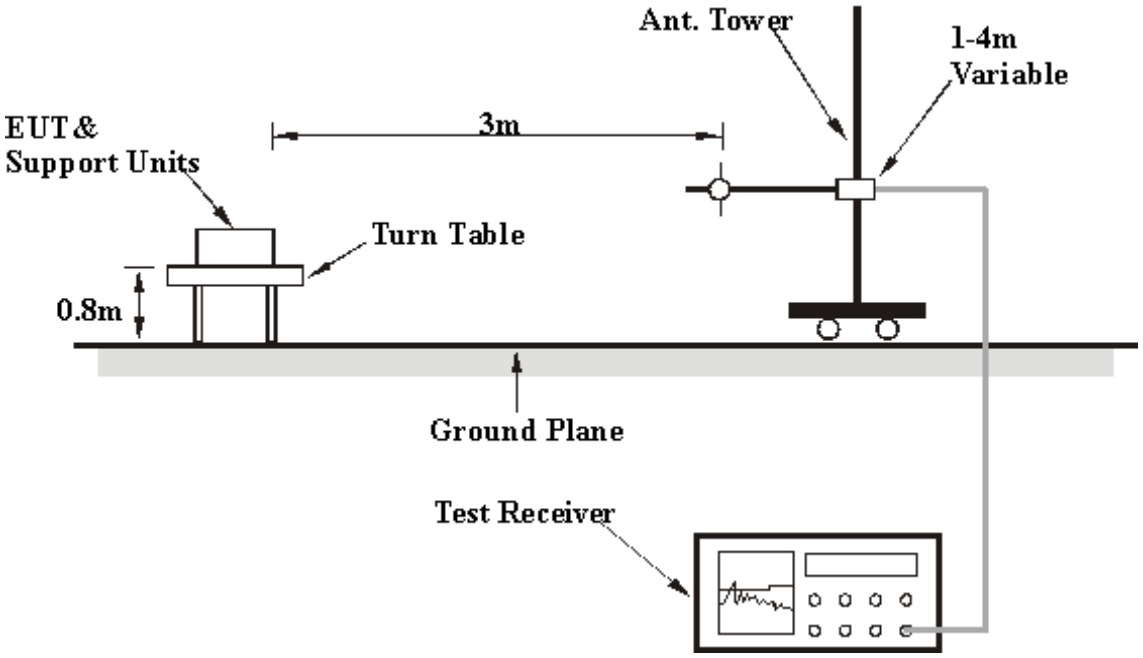
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.6.6 TEST RESULTS

BELOW 1GHz WORST-CASE DATA：GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 68%RH 965 hPa	TESTED BY	Max Tseng

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	115.00	32.49 QP	43.50	-11.01	2.46 H	241	20.82	11.67
2	149.65	32.48 QP	43.50	-11.02	2.14 H	322	17.06	15.42
3	196.00	32.03 QP	43.50	-11.47	1.90 H	226	20.11	11.92
4	212.82	29.45 QP	43.50	-14.05	2.28 H	303	17.36	12.09
5	400.00	35.60 QP	46.00	-10.40	1.79 H	121	17.34	18.26
6	**500.00**	**37.95 QP**	**46.00**	**-8.05**	**1.60 H**	**121**	**16.89**	**21.06**
7	998.36	39.59 QP	54.00	-14.41	1.00 H	194	10.76	28.83
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	71.19	29.80 QP	40.00	-10.20	1.00 V	111	17.67	12.13
2	111.04	31.95 QP	43.50	-11.55	1.00 V	0	20.69	11.26
3	152.45	32.70 QP	43.50	-10.80	1.00 V	157	17.44	15.26
4	196.60	30.80 QP	43.50	-12.70	1.00 V	260	18.93	11.87
5	500.00	37.01 QP	46.00	-8.99	1.00 V	99	15.95	21.06
6	998.40	38.12 QP	54.00	-15.88	1.46 V	278	9.29	28.83

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 65%RH 965 hPa	TESTED BY	Phoenix Huang

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	54.24 PK	74.00	-19.76	1.60 H	269	23.96	30.28
2	2390.00	24.24 AV	54.00	-29.76	1.60 H	269	-6.04	30.28
3	*2402.00	96.40 PK			1.60 H	273	66.07	30.33
4	*2402.00	66.40 AV			1.60 H	273	36.07	30.33
5	4804.00	47.60 PK	74.00	-26.40	1.32 H	282	10.87	36.73
6	4804.00	17.60 AV	54.00	-36.40	1.32 H	282	-19.13	36.73
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	54.00 PK	74.00	-20.00	1.00 V	86	23.72	30.28
2	2390.00	24.00 AV	54.00	-30.00	1.00 V	86	-6.28	30.28
3	*2402.00	90.80 PK			1.00 V	83	60.47	30.33
4	*2402.00	60.80 AV			1.00 V	83	30.47	30.33
5	4804.00	48.00 PK	74.00	-26.00	1.30 V	311	11.27	36.73
6	4804.00	18.00 AV	54.00	-36.00	1.30 V	311	-18.73	36.73

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).
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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 65%RH 965 hPa	TESTED BY	Phoenix Huang

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	*2441.00	96.80 PK			1.64 H	269	66.33	30.47
2	*2441.00	66.80 AV			1.64 H	269	36.33	30.47
3	4882.00	47.80 PK	74.00	-26.20	1.33 H	284	10.86	36.94
4	4882.00	17.80 AV	54.00	-36.20	1.33 H	284	-19.14	36.94
5	7323.00	50.50 PK	74.00	-23.50	1.03 H	29	7.37	43.13
6	7323.00	20.50 AV	54.00	-33.50	1.03 H	29	-22.63	43.13
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	*2441.00	91.20 PK			1.00 V	84	60.73	30.47
2	*2441.00	61.20 AV			1.00 V	84	30.73	30.47
3	4882.00	48.60 PK	74.00	-25.40	1.31 V	308	11.66	36.94
4	4882.00	18.60 AV	54.00	-35.40	1.31 V	308	-18.34	36.94
5	7323.00	51.20 PK	74.00	-22.80	1.24 V	331	8.07	43.13
6	7323.00	21.20 AV	54.00	-32.80	1.24 V	331	-21.93	43.13

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).
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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 65%RH 965 hPa	TESTED BY	Phoenix Huang

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	*2480.00	96.30 PK			1.45 H	347	65.68	30.62
2	*2480.00	66.30 AV			1.45 H	347	35.68	30.62
3	2483.50	56.03 PK	74.00	-17.97	1.45 H	347	25.40	30.63
4	2483.50	26.03 AV	54.00	-27.97	1.45 H	347	-4.60	30.63
5	4960.00	48.01 PK	74.00	-25.99	1.31 H	26	10.86	37.15
6	4960.00	18.01 AV	54.00	-35.99	1.31 H	26	-19.14	37.15
7	7440.00	48.46 PK	74.00	-25.54	1.13 H	104	5.34	43.12
8	7440.00	18.46 AV	54.00	-35.54	1.13 H	104	-24.66	43.12
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	*2480.00	90.00 PK			1.30 V	282	59.38	30.62
2	*2480.00	60.00 AV			1.30 V	282	29.38	30.62
3	2483.50	52.85 PK	74.00	-21.15	1.30 V	282	22.22	30.63
4	2483.50	22.85 AV	54.00	-31.15	1.30 V	282	-7.78	30.63
5	4960.00	50.29 PK	74.00	-23.71	1.19 V	309	13.14	37.15
6	4960.00	20.29 AV	54.00	-33.71	1.19 V	309	-16.86	37.15
7	7440.00	49.43 PK	74.00	-24.57	1.48 V	19	6.31	43.12
8	7440.00	19.43 AV	54.00	-34.57	1.48 V	19	-23.69	43.12

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).

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: 20log(3.125 / 100)= -30.1 dB.

7. Average value = peak reading + 20log(duty cycle).

4.7 CONDUCTED OUT-BAND EMISSION MEASUREMENT

4.8.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100KHz RBW).

4.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2009	Aug. 08, 2010

NOTE:

1.The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set RBW a of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 DEVIATION FROM TEST STANDARD

No deviation

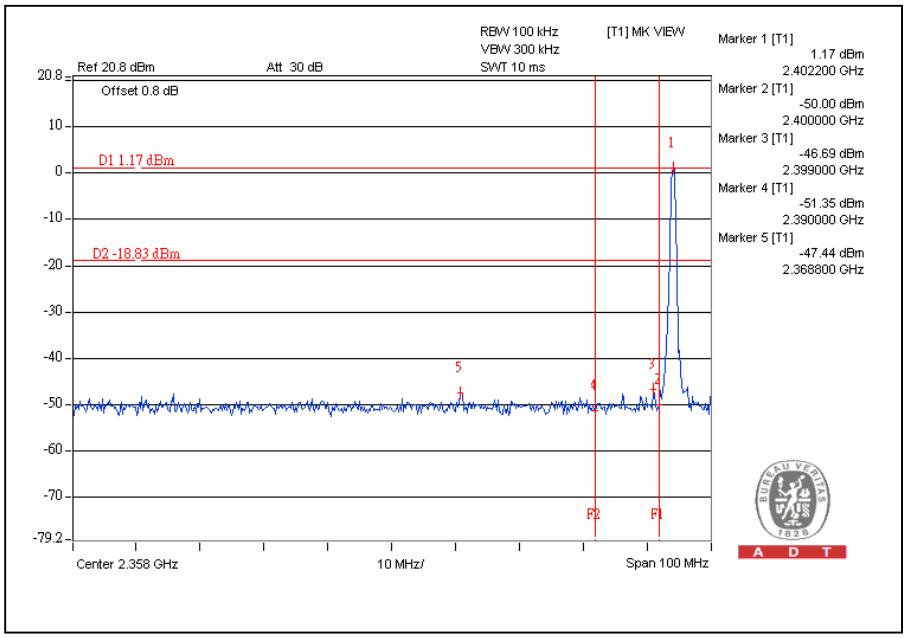
4.8.5 EUT OPERATING CONDITION

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

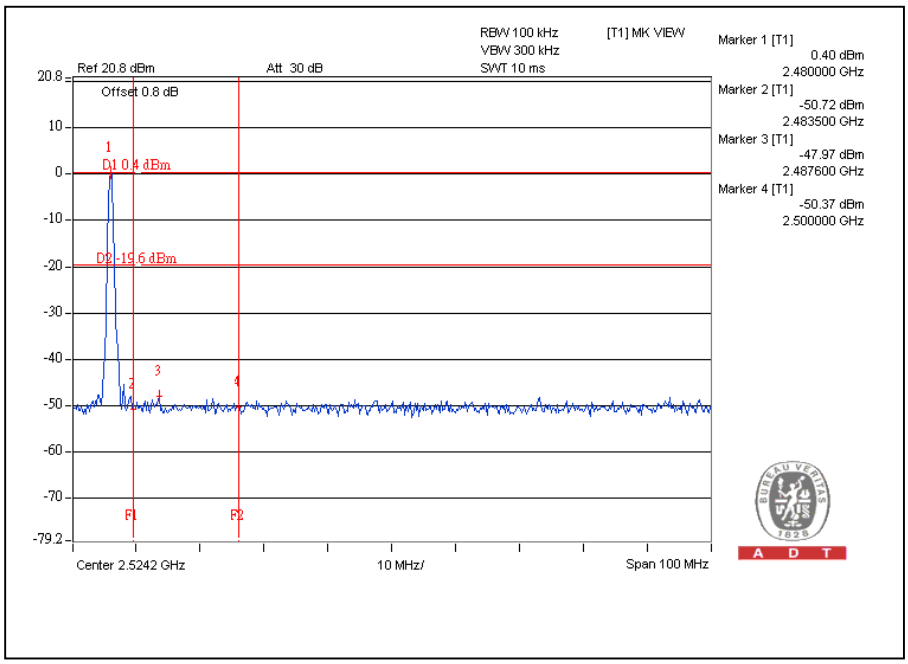
4.8.6 TEST RESULTS

Emissions radiated outside of the specified frequency bands, please refer pages form 48 to 51 for met the requirement of the general radiated emission limits in § 15.209.

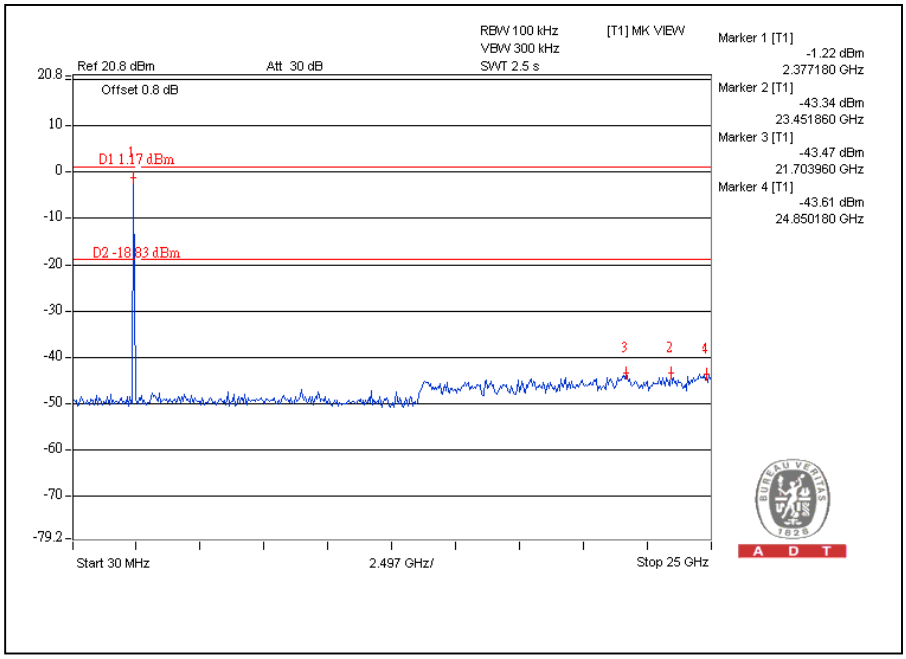
CH0



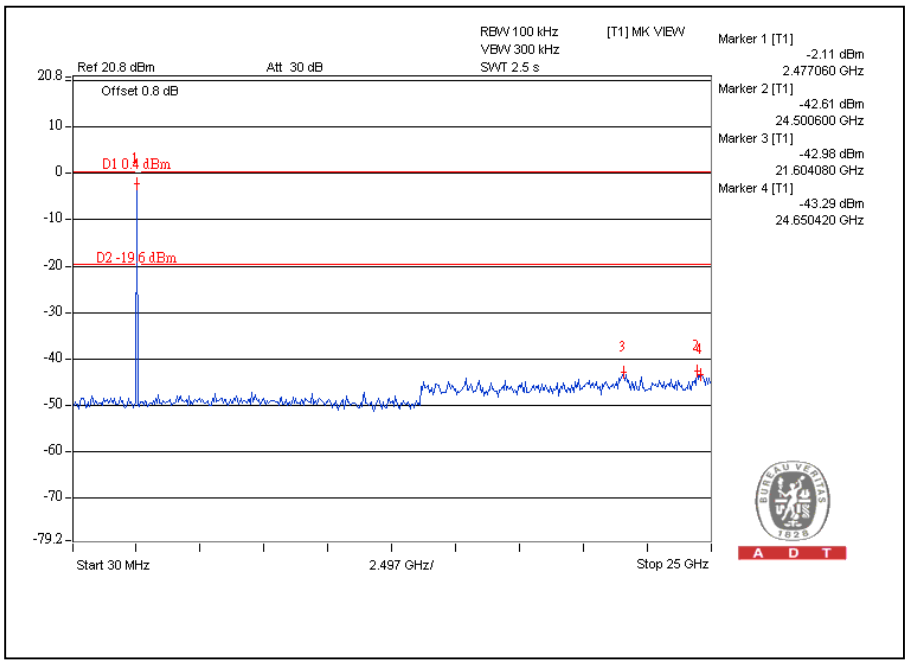
CH78



CH0


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20.8 dBm
Att 30 dB
Offset 0.8 dB
D1 1.17 dBm
D2 -18.83 dBm
Marker 1 [T1]
-1.22 dBm
2.377180 GHz
Marker 2 [T1]
-43.34 dBm
23.451860 GHz
Marker 3 [T1]
-43.47 dBm
21.703960 GHz
Marker 4 [T1]
-43.61 dBm
24.850180 GHz
Start 30 MHz
2.497 GHz/
Stop 25 GHz

CH78


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20.8 dBm
Att 30 dB
Offset 0.8 dB
D1 0.4 dBm
D2 -19.6 dBm
Marker 1 [T1]
-2.11 dBm
2.477060 GHz
Marker 2 [T1]
-42.61 dBm
24.500600 GHz
Marker 3 [T1]
-42.98 dBm
21.604080 GHz
Marker 4 [T1]
-43.29 dBm
24.650420 GHz
Start 30 MHz
2.497 GHz/
Stop 25 GHz

4.9 ANTENNA REQUIREMENT

4.9.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.9.2 ANTENNA CONNECTED CONSTRUCTION

There are four antennas provided to this EUT, please refer to the following table:

For WLAN (RX has diversity function)					
No.	**Model**	**Antenna Type**	**Gain (dBi)**	**Connecter Type**	**Frequency range (MHz)**
1	OZONE WLAN 1	PCB(TX,RX)	2.96 (2.4G) 4.16 (5G)	N/A	2400~2850 4920~5850
2	OZONE WLAN 2	PIFA(RX only)	3.45 (2.4G) 3.32 (5G)	N/A	2400~2850 4920~5850

For Bluetooth					
No.	**Model**	**Antenna Type**	**Gain (dBi)**	**Connecter Type**	**Frequency range (MHz)**
1	Mica 2.4GHz	SMD	-0.45	N/A	2400~2500

For RFID					
No.	**Model**	**Antenna Type**	**Gain (dBi)**	**Connecter Type**	**Frequency range (MHz)**
1	OZONE RFID	Hor- dipole, outside antenna, Ver- slot, inside antenna	1.7483(Max)	N/A	902~928

5 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 by the following approval agencies according to ISO/IEC 17025:

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA, CSA
R.O.C.	TAF, BSMI, NCC
Netherlands	Telefication
Singapore	GOST-ASIA (MOU)
Russia	CERTIS (MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml.
If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

Email: service@adt.com.tw
Web Site: www.adt.com.tw

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

6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

--- END ---