

# FCC TEST REPORT (BLUETOOTH)

**REPORT NO.:** RF981021L04-2

MODEL NO.: MC75A0

**RECEIVED:** Oct. 21, 2009

**TESTED:** Oct. 23 ~ Oct. 28, 2009

**ISSUED:** Oct. 30, 2009

**APPLICANT:** Symbol Technologies, Inc.

**ADDRESS:** One Motorola Plaza, Holtsville, NY-11742-1300,

U.S.A.

**ISSUED BY:** Bureau Veritas Consumer Products Services (H.K.)

Ltd., Taoyuan Branch

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**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei

Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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### 1. CERTIFICATION

**PRODUCT:** EDA (Enterprise Digital Assistant)

MODEL NO.: MC75A0

**BRAND**: Symbol

**APPLICANT:** Symbol Technologies, Inc.

**TESTED:** Oct. 23 ~ Oct. 28, 2009

**TEST SAMPLE:** ENGINEERING SAMPLE

STANDARDS: FCC Part 15, Subpart C (Section 15.247)

ANSI C63.4-2003

The above equipment (Model: MC75A0) 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 : Oct, 30, 2009

Joanna Mang / Senior Specialist

**TECHNICAL** 

ACCEPTANCE : Long Chen , DATE : Oct. 30, 2009

Responsible for RF Long Ched / Senior Engineer

Gary Chang'/ Assistant Manager



#### 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

	APPLIED STANDARD: FCC Part 15, Subpart C							
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK					
15.207	AC Power Conducted Emission		Meet the requirement of limit. Minimum passing margin is –18.7dB at 0.154MHz.					
15.247(a)(1) (iii)	Number of Hopping Frequency Used Spec.: At least 15 channels	PASS	Meet the requirement of limit.					
15.247(a)(1) (iii)	Dwell Time on Each Channel Spec.: Max. 0.4 second within 31.6 second	PASS	Meet the requirement of limit.					
15.247(a)(1)	Hopping Channel Separation     Spec.: Min. 25 kHz or 20 dB bandwidth,     whichever is greater     Spectrum Bandwidth of a Frequency     Hopping Sequence Spread Spectrum     System	PASS	Meet the requirement of limit.					
15.247(b)	Maximum Peak Output Power Spec.: max. 21dBm	PASS	Meet the requirement of limit.					
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209		Meet the requirement of limit. Minimum passing margin is –6.4dB at 74.62MHz.					
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.					
15.203	Antenna Requirement	PASS	No antenna connector is used.					

**NOTE:** 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.

#### 2.1 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	UNCERTAINTY
Conducted emissions	150kHz ~ 30MHz	2.44dB
	30MHz ~ 200MHz	2.93dB
Radiated emissions	200MHz ~1000MHz	2.95dB
Nadiated emissions	1GHz ~ 18GHz	2.26dB
	18GHz ~ 40GHz	1.94dB

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



# 3. GENERAL INFORMATION

# 3.1 GENERAL DESCRIPTION OF EUT

EUT	EDA (Enterprise Digital Assistant)		
MODEL NO.	MC75A0		
FCC ID	H9PMC75A0		
POWER SUPPLY	3.7Vdc (Li-Lon battery)		
POWER SUPPLY	5.4Vdc (Adapter)		
MODULATION TYPE	GFSK, $\pi$ /4-DQPSK, 8DPSK		
MODULATION	FHSS		
TECHNOLOGY	FR33		
TRANSFER RATE	1/2/3Mbps		
OPERATING FREQUENCY	2402 ~ 2480MHz		
NUMBER OF CHANNEL	79		
OUTPUT POWER	2.5mW		
ANTENNA TYPE	Chip antenna		
MAX. ANTENNA GAIN	-1.5dBi		
ANTENNA CONNECTOR	NA		
DATA CABLE	NA		
I/O PORTS	Refer to user's manual		
ACCESSORY DEVICES	Battery		

#### NOTE:

1. The EUT is an EDA (Enterprise Digital Assistant). The functions of EUT listed as below:

	TEST STANDARD	REFERENCE REPORT
WLAN 802.11b/g WLAN 802.11a (5745~5825 MHz)	FCC Part 15, Subpart C (Section 15.247)	RF981021L04
WLAN 802.11a (5180~5320MHz, 5500~5700MHz)	FCC Part 15, Subpart E (Section 15.407)	RF981021L04-1
WLAN 802.11a (For DFS report) (5260~5320MHz, 5500~5700MHz)	FCC Part 15, Subpart E (Section 15.407)	RF981021L04-3
BLUETOOTH	FCC Part 15, Subpart C (Section 15.247)	RF981021L04-2

- 2. The models identified as below are identical to each other except of the following options:
  - Keypad: Numeric / QWERTY
  - Barcode reader: 1D laser scanner / BB Imager

BRAND	MODEL DESCRIPTION				
Symbol	MC75A0	WLAN 1D Numeric			
Symbol	MC75A0	WLAN BB QWERTY			
**the worst case had been marked by boldface.					



3. The EUT uses the following Li-Lon batteries:

= 0 : de ce dire remerring =: = 0:: ballerree:						
BATTERY 1 (1X)						
BRAND: MOTOROLA						
PART NUMBER:	82-71364-04 Rev A					
RATING:	RATING: 3.7Vdc, 1950mAh, 7.21Wh					

BATTERY 2 (1.5X)					
BRAND:	BRAND: MOTOROLA				
PART NUMBER:	82-71364-05 Rev D				
RATING:	<b>RATING:</b> 3.7Vdc, 3600mAh, 13.3Wh				

<sup>\*</sup>Battery 2 was chosen as the representative for testing.

4. The following accessories are for support units only.

PRODUCT	BRAND	MODEL	DESCRIPTION
RS232 charging cable	Motorola	25-102776-01R	1.2m non-shielded cable with one core
USB charging cable Motoro		25-102775-01R	1.5m shielded cable with one core
Headset	Motorola	50-11300-050R	VR10 headset 0.8m non-shielded cable with one core
Power Supply Adaptor	Motorola	EADP-16BB A	I/P: 100-240Vac, 50-60Hz, 0.4A O/P: 5.4Vdc, 3A 1.8m non-shielded cable without core

<sup>5.</sup> The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

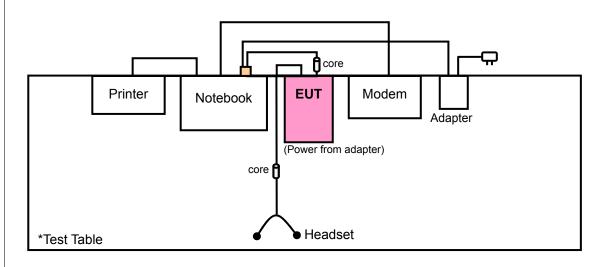


# 3.2 DESCRIPTION OF TEST MODES

79 channels are provided 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		

# 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST





#### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT		APPLICA	ABLE TO		
CONFIGURE MODE	RE≥1G	RE<1G	PLC	APCM	DESCRIPTION
-	<b>V</b>	<b>√</b>	<b>√</b>	√	-

Where RE≥1G: Radiated Emission above 1GHz
PLC: Power Line Conducted Emission

RE<1G: Radiated Emission below 1GHz
APCM: Antenna Port Conducted Measurement

#### **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, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.

Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE	AXIS
0 to 78	0, 39, 78	FHSS	GFSK	DH5	Υ
0 to 78	0, 39, 78	FHSS	8DPSK	DH5	Υ

#### **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, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.

Following channel(s) was (were) selected for the final test as listed below.

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

#### POWER LINE CONDUCTED EMISSION TEST:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.

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



#### **BANDEDGE MEASUREMENT:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- 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, 78	FHSS	GFSK	DH5
0 to 78	0, 78	FHSS	8DPSK	DH5

# ANTENNA PORT CONDUCTED MEASUREMENT:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- 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, 39, 78	FHSS	GFSK	DH5
0 to 78	0, 39, 78	FHSS	8DPSK	DH5

#### **TEST CONDITION:**

APPLICABLE TO	APPLICABLE TO ENVIRONMENTAL CONDITIONS		TESTED BY
<b>RE≥1G</b> 25deg. C, 65%RH, 1010 hPa		120Vac, 60Hz	Brad Wu
RE<1G	25deg. C, 65%RH, 1015 hPa	120Vac, 60Hz	Mark Liao
PLC	25deg. C, 62%RH, 1015 hPa	120Vac, 60Hz	Sam Chang
APCM	25deg. C, 65%RH, 1016 hPa	120Vac, 60Hz	Brad Wu



#### 3.3 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) ANSI C63.4-2003

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

**NOTE**: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

#### 3.4 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	DELL	D600	CN-0G5152-48643 -47H-7666	FCC DoC Approved
2	PRINTER	EPSON	LQ-300+	DCGY054011	FCC DoC Approved
3	MODEM	ACEEX	1414V/3	0401008253	IFAXDM1414

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.8m braid shielded wire, DB25 connector, w/o core.
3	1.2m braid shielded wire, DB25 & DB9 connector, w/o core.

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



# 4. TEST TYPES AND RESULTS

#### 4.1 RADIATED EMISSION MEASUREMENT

# 4.1.1 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

#### NOTE:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 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.



# 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100212	May 25, 2009	May 24, 2010
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Apr. 30, 2009	Apr. 29, 2010
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-563	Aug. 10, 2009	Aug. 09, 2010
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 06, 2009	Jan. 05, 2010
Preamplifier Agilent	8449B	3008A01910	Sep. 11, 2009	Sep. 10, 2010
Preamplifier Agilent	8447D	2944A10638	Dec. 26, 2008	Dec. 25, 2009
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	218190/4 231241/4	May 13, 2009	May 12, 2010
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Aug. 17, 2009	Aug. 16, 2010
Software	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn Table Controller EMCO	2090	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 HwaYa Chamber 9.
  - 3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  - 4. The FCC Site Registration No. is 460141.
  - 5. The IC Site Registration No. is IC 7450F-4.



#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

#### NOTE:

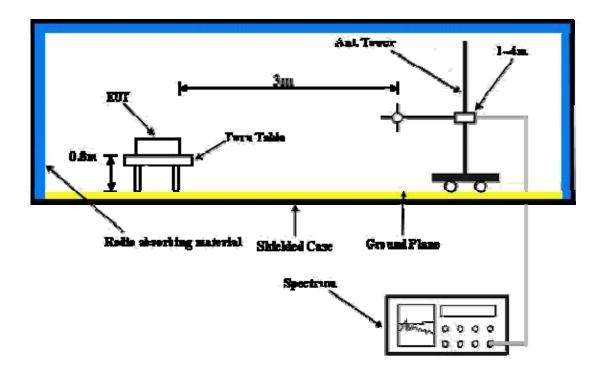
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
- 3. All modes 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



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

#### 4.1.6 EUT OPERATING CONDITIONS

- a. Connected the EUT to a notebook via USB cable and placed on a testing table.
- b. The EUT runs a test program (provided by manufacture) to transmit at specific channel.
- c. The necessary accessories enable the system in full functions.



#### 4.1.7 TEST RESULTS

#### **ABOVE 1GHz WORST-CASE DATA: GFSK**

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL Channel 0		FREQUENCY RANGE	1 ~ 25GHz	
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)	
	25deg. C, 65%RH 1010 hPa	TESTED BY	Brad Wu	

		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	44.1 PK	74.00	-29.9	1.26 H	256	11.89	32.22		
2	2390.00	31.3 AV	54.00	-22.7	1.26 H	256	-0.95	32.22		
3	#2400.00	38.9 PK	75.47	-36.6	1.26 H	256	6.59	32.26		
4	#2400.00	8.8 AV	45.37	-36.6	1.26 H	256	-23.51	32.26		
5	*2402.00	95.5 PK			1.26 H	256	63.20	32.27		
6	*2402.00	65.4 AV			1.26 H	256	33.10	32.27		
7	4804.00	47.7 PK	74.00	-26.3	1.03 H	214	9.42	38.30		
8	4804.00	17.6 AV	54.00	-36.4	1.03 H	214	-20.68	38.30		
		ANTENNA	A POLARIT	/ & TEST DI	STANCE: V	ERTICAL A	T 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	43.9 PK	74.00	-30.2	1.02 V	305	11.63	32.22		
2	2390.00	31.0 AV	54.00	-23.0	1.02 V	305	-1.18	32.22		
3	#2400.00	34.6 PK	71.24	-36.6	1.02 V	305	2.36	32.26		
4	#2400.00	4.5 AV	41.14	-36.6	1.02 V	305	-27.74	32.26		
5	*2402.00	91.2 PK			1.02 V	305	58.97	32.27		
6	*2402.00	61.1 AV			1.02 V	305	28.87	32.27		
7	4804.00	48.9 PK	74.00	-25.1	1.01 V	162	10.62	38.30		
8	4804.00	18.8 AV	54.00	-35.2	1.01 V	162	-19.48	38.30		

- 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).
- 8. "#":The radiated frequency is out the restricted band.



EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL Channel 39  NPUT POWER 120Vac. 60 Hz		FREQUENCY RANGE	1 ~ 25GHz	
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)	
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 1010 hPa	TESTED BY	Brad Wu	

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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	94.4 PK			1.21 H	256	61.95	32.41		
2	*2441.00	64.3 AV			1.21 H	256	31.85	32.41		
3	4882.00	49.3 PK	74.00	-24.7	1.02 H	24	10.85	38.42		
4	4882.00	19.2 AV	54.00	-34.8	1.02 H	24	-19.25	38.42		
		ANTENNA	A POLARIT	/ & TEST DI	STANCE: V	ERTICAL A	T 3 M			
NO.	EMISSION LIMIT ANTENNA TABLE RAW VALUE CORRECTION									
1	*2441.00	90.2 PK			1.03 V	306	57.74	32.41		
2	*2441.00	60.1 AV			1.03 V	306	27.64	32.41		
3	4882.00	48.7 PK	74.00	-25.3	1.22 V	218	10.26	38.42		
		18.6 AV	54.00	-35.4	1.22 V	218	-19.84	38.42		

- 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  120Vac, 60 Hz  DETECTOR FUNCTION  25deg. C, 65%RH  TESTED BY		1 ~ 25GHz	
INPUT POWER (SYSTEM)	120Vac, 60 Hz		Peak (PK) Average (AV)	
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 1010 hPa	TESTED BY	Brad Wu	

		ΔΝΤΕΝΝΔ	POLARITY .	& TEST DIS	TANCE: HO	RIZONTAI	ΔT 3 M	
NO.	FREQ. (MHz)	EMISSION	LIMIT	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	94.3 PK			1.18 H	262	61.76	32.55
2	*2480.00	64.2 AV			1.18 H	262	31.66	32.55
3	2483.50	39.5 PK	74.00	-34.5	1.18 H	262	6.94	32.56
4	2483.50	9.4 AV	54.00	-44.6	1.18 H	262	-23.16	32.56
5	4960.00	48.7 PK	74.00	-25.3	1.13 H	215	10.07	38.61
6	4960.00	18.6 AV	54.00	-35.4	1.13 H	215	-20.03	38.61
		ANTENNA	POLARITY	/ & TEST DI	STANCE: V	ERTICAL A	T 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	90.0 PK			1.05 V	308	57.41	32.55
2	*2480.00	59.9 AV			1.05 V	308	27.31	32.55
3	2483.50	35.2 PK	74.00	-38.9	1.05 V	308	2.59	32.56
4	2483.50	5.1 AV	54.00	-49.0	1.05 V	308	-27.51	32.56
5	4960.00	48.2 PK	74.00	-25.8	1.03 V	219	9.60	38.61
6	4960.00	18.1 AV	54.00	-35.9	1.03 V	219	-20.50	38.61

- 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).



#### 8DPSK

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	25deg. C, 65%RH 1010 hPa	TESTED BY	Brad Wu	

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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	44.6 PK	74.00	-29.4	1.00 H	160	12.34	32.22
2	2390.00	31.8 AV	54.00	-22.3	1.00 H	160	-0.47	32.22
3	#2400.00	43.8 PK	76.38	-32.5	1.00 H	160	11.58	32.26
4	#2400.00	13.7 AV	46.28	-32.5	1.00 H	160	-18.52	32.26
5	*2402.00	96.4 PK			1.00 H	160	64.11	32.27
6	*2402.00	66.3 AV			1.00 H	160	34.01	32.27
7	4804.00	48.3 PK	74.00	-25.7	1.05 H	211	9.96	38.30
8	4804.00	18.2 AV	54.00	-35.8	1.05 H	211	-20.14	38.30
		ANTENNA	POLARITY	/ & TEST DI	STANCE: V	ERTICAL A	T 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	44.0 PK	74.00	-30.0	1.04 V	312	11.76	32.22
2	2390.00	31.3 AV	54.00	-22.8	1.04 V	312	-0.97	32.22
3	#2400.00	39.1 PK	71.65	-32.5	1.04 V	312	6.85	32.26
4	#2400.00	9.0 AV	41.55	-32.5	1.04 V	312	-23.25	32.26
5	*2402.00	91.7 PK			1.04 V	312	59.38	32.27
6	*2402.00	61.6 AV			1.04 V	312	29.28	32.27
7	4804.00	49.0 PK	74.00	-25.1	1.03 V	219	10.65	38.30
8	4804.00	18.9 AV	54.00	-35.2	1.03 V	219	-19.45	38.30

- 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).
- 8. "#":The radiated frequency is out the restricted band.



EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL Channel 39		FREQUENCY RANGE	1 ~ 25GHz	
CHANNEL Channel 39  NPUT POWER (SYSTEM) 120Vac, 60 Hz  ENVIRONMENTAL 25deg. C, 65%RH		DETECTOR FUNCTION	Peak (PK) Average (AV)	
	25deg. C, 65%RH 1010 hPa	TESTED BY	Brad Wu	

	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	95.8 PK			1.01 H	162	63.41	32.41		
2	*2441.00	65.7 AV			1.01 H	162	33.31	32.41		
3	4882.00	48.5 PK	74.00	-25.5	1.02 H	65	10.07	38.42		
4	4882.00	18.4 AV	54.00	-35.6	1.02 H	65	-20.03	38.42		
	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
		ANTENNA	A POLARITY	Y & TEST DI	STANCE: V	ERTICAL A	T 3 M			
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	Y & TEST DI	STANCE: V  ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	T 3 M RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)		
<b>NO</b> .	FREQ. (MHz) *2441.00	EMISSION LEVEL	LIMIT		ANTENNA	TABLE ANGLE	RAW VALUE	FACTOR		
	` '	EMISSION LEVEL (dBuV/m)	LIMIT		ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	FACTOR (dB/m)		
1	*2441.00	EMISSION LEVEL (dBuV/m) 91.3 PK	LIMIT		ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	FACTOR (dB/m) 32.41		

- **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 78  NPUT POWER  120Vac. 60 Hz		FREQUENCY RANGE	1 ~ 25GHz	
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)	
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 1010 hPa	TESTED BY	Brad Wu	

		ANTENNA	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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	94.5 PK			1.00 H	159	61.96	32.55
2	*2480.00	64.4 AV			1.00 H	159	31.86	32.55
3	2483.50	41.0 PK	74.00	-33.0	1.00 H	159	8.45	32.56
4	2483.50	10.9 AV	54.00	-43.1	1.00 H	159	-21.65	32.56
5	4960.00	49.5 PK	74.00	-24.5	1.01 H	22	10.93	38.61
6	4960.00	19.4 AV	54.00	-34.6	1.01 H	22	-19.17	38.61
		ANTENNA	A POLARIT	Y & TEST DI	STANCE: V	ERTICAL A	T 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	90.2 PK			1.03 V	316	57.68	32.55
2	*2480.00	60.1 AV			1.03 V	316	27.58	32.55
3	2483.50	36.7 PK	74.00	-37.3	1.03 V	316	4.18	32.56
4	2483.50	6.6 AV	54.00	-47.4	1.03 V	316	-25.92	32.56
5	4960.00	49.3 PK	74.00	-24.7	1.03 V	54	10.65	38.61
6	4960.00	19.2 AV	54.00	-34.8	1.03 V	54	-19.45	38.61

- 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).



#### **BELOW 1GHz WORST-CASE DATA: 8DPSK**

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL Channel 0		FREQUENCY RANGE	Below 1000MHz	
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak	
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH 1015 hPa	TESTED BY	Mark Liao	

		ANTENNA I	POLARITY	& TEST DIS	TANCE: HO	RIZONTAL	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	57.12	32.3 QP	40.00	-7.7	2.00 H	226	18.83	13.48
2	129.06	32.6 QP	43.50	-10.9	1.50 H	244	20.49	12.10
3	440.14	30.9 QP	46.00	-15.2	2.00 H	229	13.45	17.39
4	558.75	32.0 QP	46.00	-14.0	1.00 H	262	11.05	20.97
5	718.18	35.5 QP	46.00	-10.5	1.50 H	307	12.37	23.17
6	797.89	35.9 QP	46.00	-10.1	2.00 H	289	10.68	25.26
		ANTENNA	POLARITY	/ & TEST DI	STANCE: V	ERTICAL A	T 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	57.12	33.5 QP	40.00	-6.5	1.00 V	310	20.03	13.48
2	74.62	33.7 QP	40.00	-6.4	1.25 V	193	23.71	9.94
3	164.06	33.7 QP	43.50	-9.8	1.00 V	163	20.26	13.40
4	716.23	37.7 QP	46.00	-8.3	1.50 V	322	14.54	23.12
5	879.55	36.3 QP	46.00	-9.8	1.25 V	175	10.34	25.91

- 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.



#### 4.2 CONDUCTED EMISSION MEASUREMENT

#### 4.2.1 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.

#### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Sep. 24, 2009	Sep. 23, 2010
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 31, 2008	Dec. 30, 2009
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Dec. 29, 2008	Dec. 28, 2009
LISN ROHDE & SCHWARZ	ESH3-Z5	100311	Jul. 29, 2009	Jul. 28, 2010
Software ADT	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 HwaYa Shielded Room 2.
- 3. The VCCI Site Registration No. is C-2047.



#### 4.2.3 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.

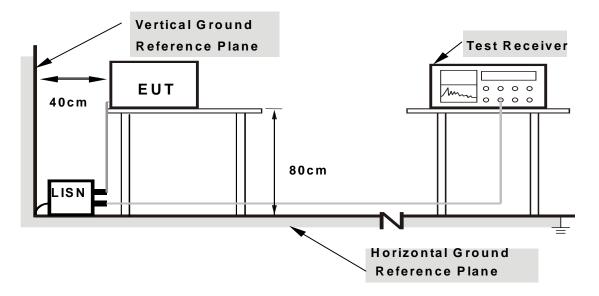
**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation



#### 4.2.5 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 attached file (Test Setup Photo).

#### 4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.



#### 4.2.7 TEST RESULTS

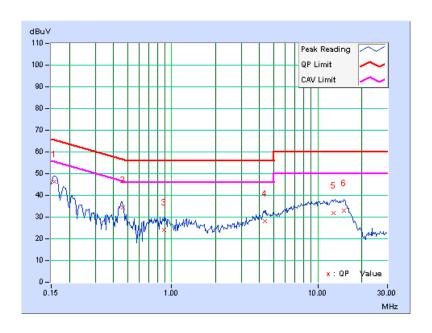
#### **CONDUCTED WORST CASE DATA: 8DPSK**

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL	Channel 0	PHASE	Line 1	
ENVIRONMENTAL CONDITIONS	25deg. C, 62% RH, 1015 hPa	6dB BANDWIDTH	9kHz	
INPUT POWER (SYSTEM)	120Vac, 60 Hz	TESTED BY	Sam Chang	

	Freq.	Corr.	Readin	g Value	Emis Le	sion vel	Lir	nit	Mar	gin
No		Factor	[dB (	(uV)]	[dB (	(uV)]	[dB	(uV)]	(dl	B)
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.158	0.13	46.22	-	46.35	-	65.58	55.58	-19.23	-
2	0.464	0.14	34.31	-	34.45	-	56.62	46.62	-22.17	-
3	0.892	0.16	23.73	-	23.89	-	56.00	46.00	-32.11	-
4	4.332	0.29	28.01	-	28.30	-	56.00	46.00	-27.70	-
5	12.754	0.50	31.42	-	31.92	-	60.00	50.00	-28.08	-
6	15.105	0.56	32.52	-	33.08	-	60.00	50.00	-26.92	-

**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.



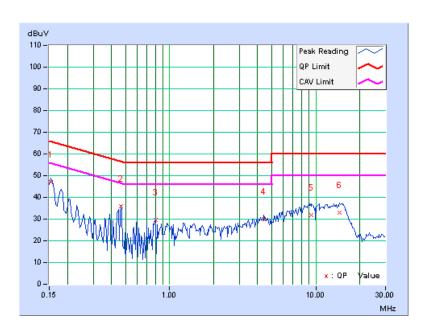


EUT TEST CONDITION	V	MEASUREMENT DETAIL		
CHANNEL Channel 0		PHASE	Line 2	
ENVIRONMENTAL CONDITIONS	25deg. C, 62% RH, 1015 hPa	6dB BANDWIDTH	9kHz	
INPUT POWER (SYSTEM)	120Vac, 60 Hz	TESTED BY	Sam Chang	

	Freq.	Corr.	Readin	g Value		sion vel	Lir	nit	Mar	gin
No		Factor	[dB (	(uV)]	[dB (	(uV)]	[dB	(uV)]	(dl	B)
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.154	0.13	47.01	-	47.14	-	65.79	55.79	-18.65	-
2	0.463	0.15	35.68	-	35.83	-	56.65	46.65	-20.82	-
3	0.798	0.16	29.53	-	29.69	-	56.00	46.00	-26.31	-
4	4.398	0.31	29.80	-	30.11	-	56.00	46.00	-25.89	-
5	9.375	0.48	31.47	-	31.95	-	60.00	50.00	-28.05	-
6	14.539	0.65	32.48	-	33.13	-	60.00	50.00	-26.87	-

**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.





#### 4.3 NUMBER OF HOPPING FREQUENCY USED

#### 4.3.1 LIMIT OF HOPPING FREQUENCY USED

At least 15 channels frequencies, and should be equally spaced.

#### 4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION	
SPECTRUM ANALYZER R&S	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010	

**NOTE:** 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 PROCEDURES

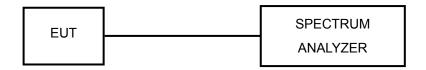
- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- c. 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.
- d. Set the SA on View mode and then plot the result on SA screen.
- e. Repeat above procedures until all frequencies measured were complete.



#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

# 4.3.5 TEST SETUP

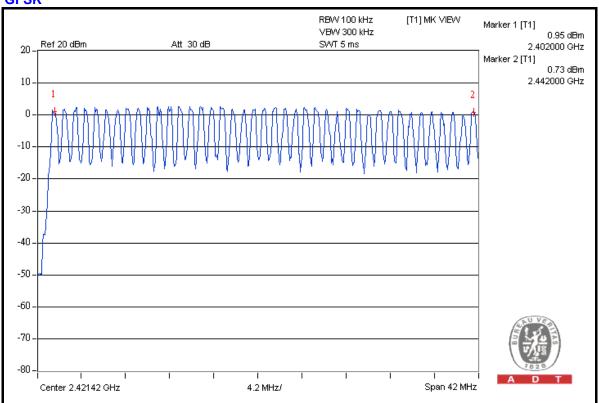


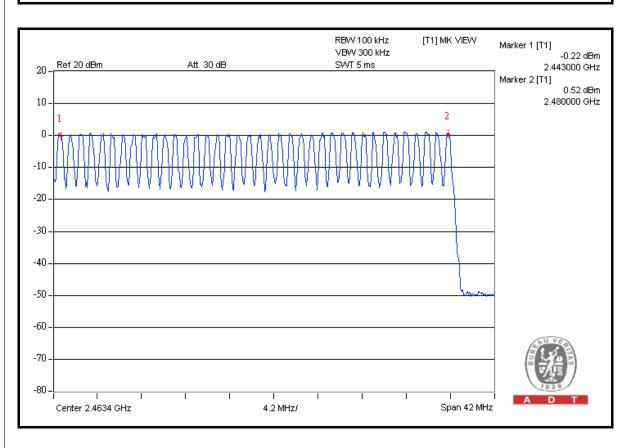
#### 4.3.6 TEST RESULTS

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



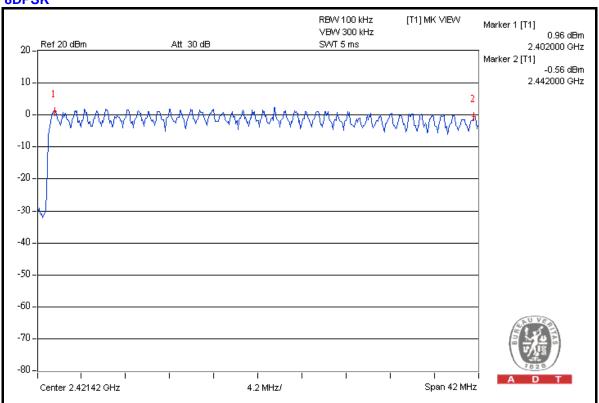


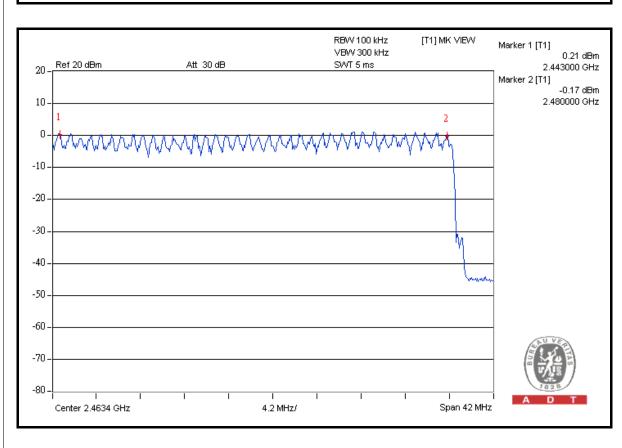














#### 4.4 DWELL TIME ON EACH CHANNEL

#### 4.4.1 LIMIT OF DWELL TIME USED

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

#### 4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION	
SPECTRUM ANALYZER R&S	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010	

**NOTE:** 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

- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. 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.
- c. 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.
- d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- e. Repeat above procedures until all different time-slot modes have been completed.

#### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation.



# 4.4.5 TEST SETUP

Same as 4.3.5.

# 4.4.6 TEST RESULTS

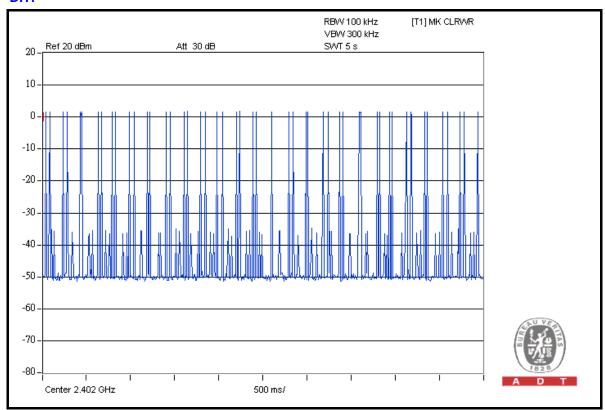
#### **GFSK**

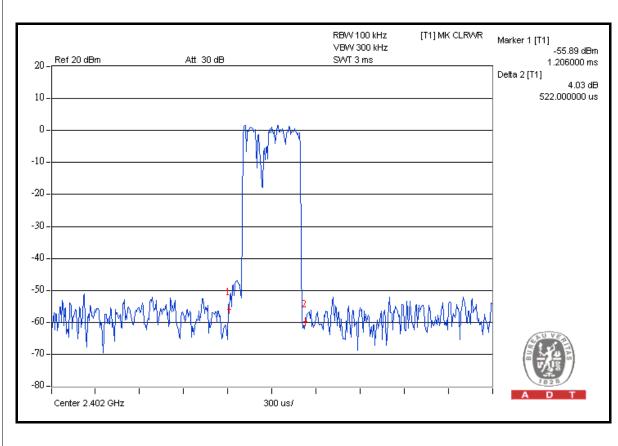
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) * 6.32 = 316.00 times	0.522	164.952	400
DH3	27 (times / 5 sec) * 6.32 = 170.64 times	1.746	297.937	400
DH5	16 (times / 5 sec) * 6.32 = 101.12 times	3.050	308.416	400

**NOTE:** Test plots of the transmitting time slot are shown on next 3 pages.



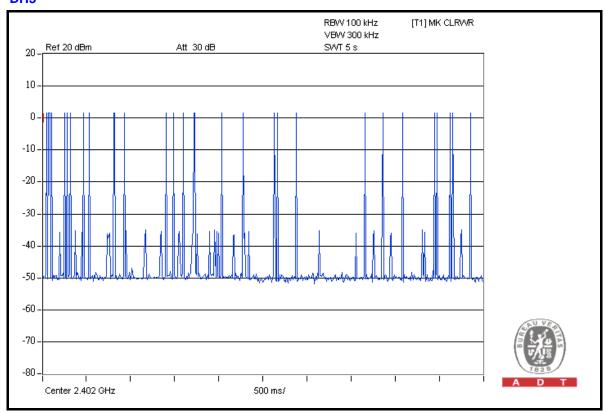
#### DH1

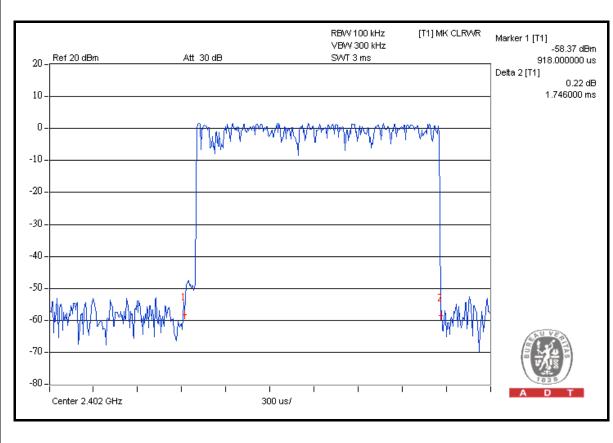






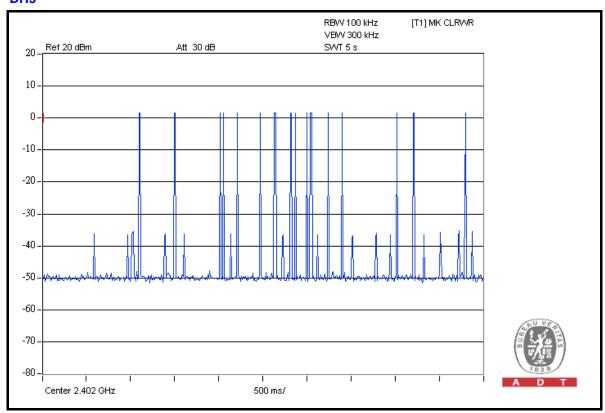
#### DH3

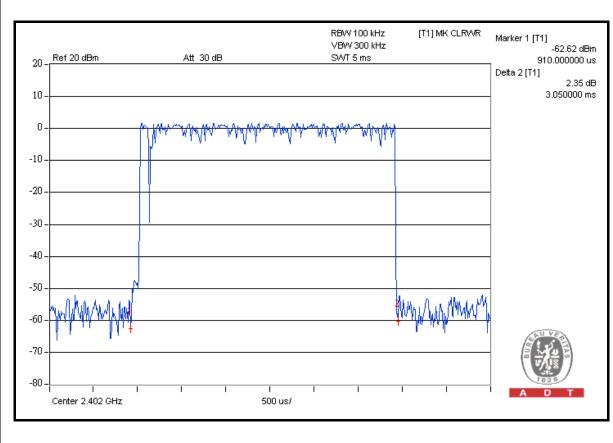






#### DH5





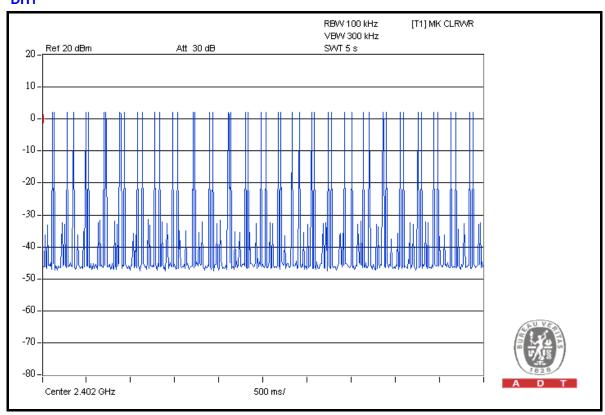


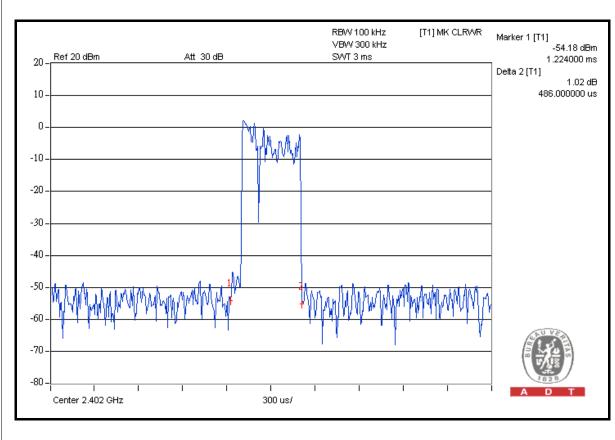
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) * 6.32 = 316.00 times	0.486	153.576	400
DH3	26 (times / 5 sec) * 6.32 = 164.32 times	1.722	282.959	400
DH5	17 (times / 5 sec) * 6.32 = 107.44 times	3.050	327.692	400

**NOTE:** Test plots of the transmitting time slot are shown on next 3 pages.



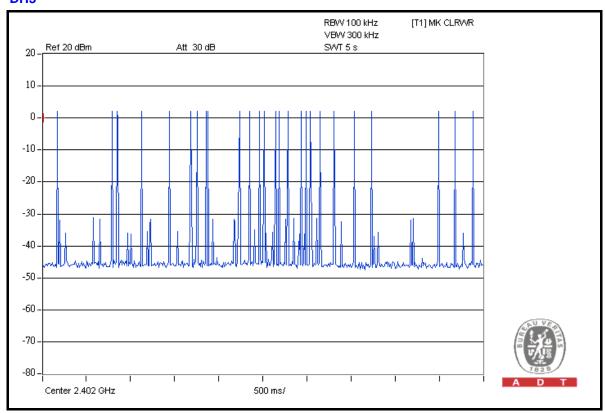
# DH1

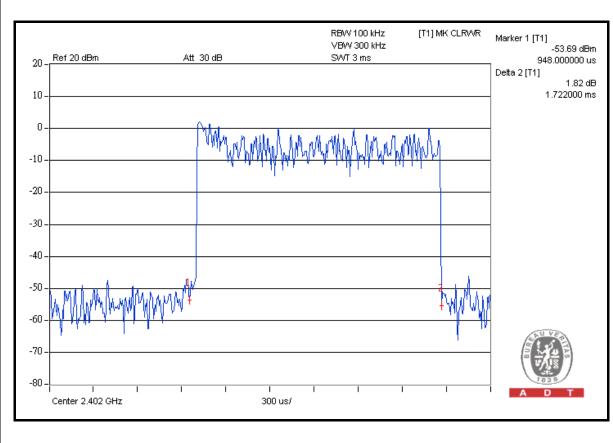






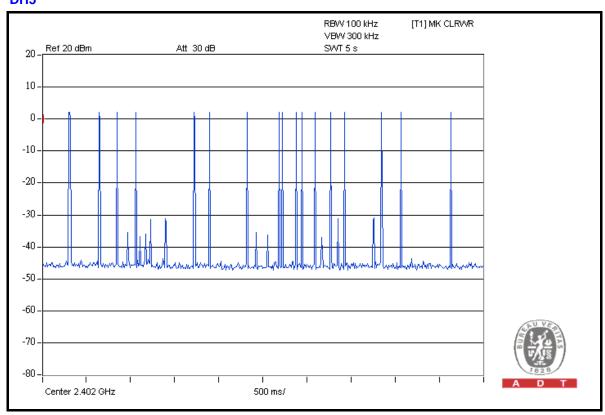
# DH3

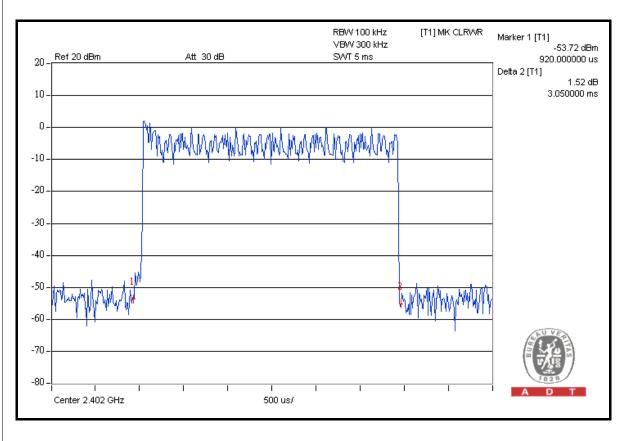






# DH5







# 4.5 CHANNEL BANDWIDTH

# 4.5.1 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, two-thirds 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

#### 4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
SPECTRUM ANALYZER R&S	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010

**NOTE:** 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 PROCEDURE

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



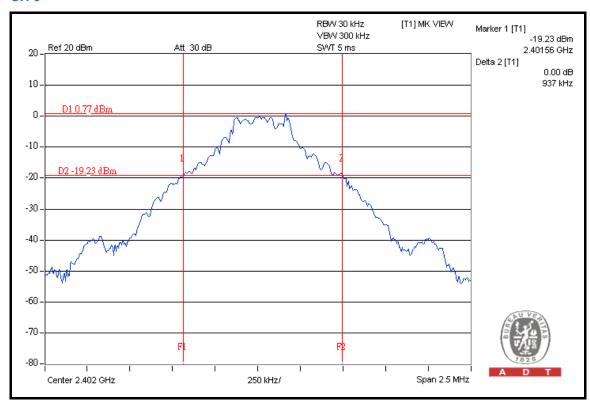
A D T
4.5.4 DEVIATION FROM TEST STANDARD
No deviation.
4.5.5 TEST SETUP
Same as 4.3.5.
4.5.6 EUT OPERATING CONDITION
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



# 4.5.7 TEST RESULTS

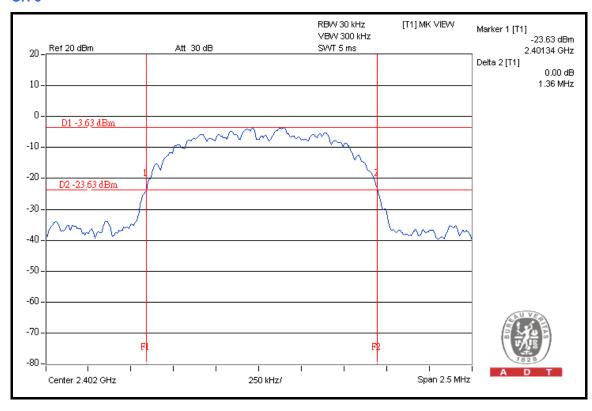
# **GFSK**

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.937
39	2441	0.932
78	2480	0.928





CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.360
39	2441	1.360
78	2480	1.360





# 4.6 HOPPING CHANNEL SEPARATION

#### 4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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

# 4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
SPECTRUM ANALYZER R&S	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010

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

#### 4.6.3 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.

# 4.6.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.6.5 TEST SETUP

Same as 4.3.5.

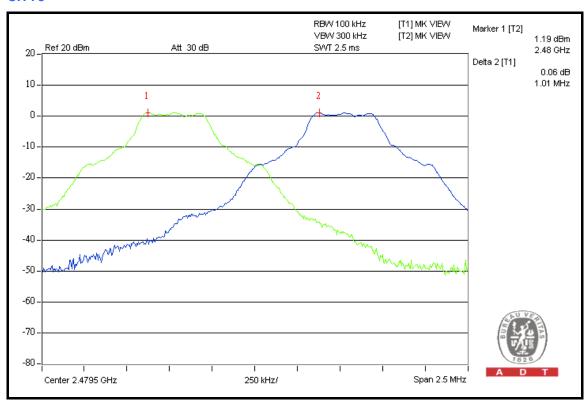


# 4.6.6 TEST RESULTS

# **GFSK**

CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.000	0.937	0.625	PASS
39	2441	1.000	0.932	0.621	PASS
78	2480	1.010	0.928	0.619	PASS

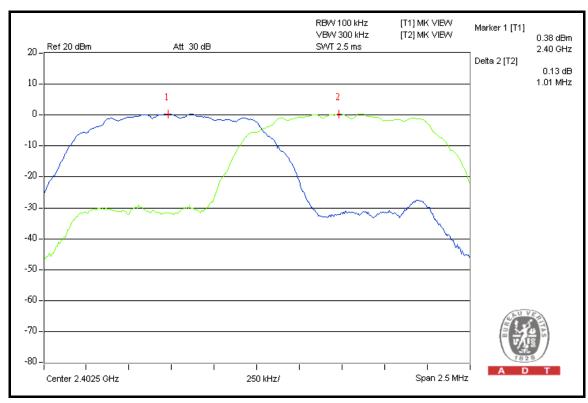
**NOTE:** The minimum limit is two-third 20dB bandwidth.





CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.010	1.360	0.907	PASS
39	2441	1.010	1.360	0.907	PASS
78	2480	1.000	1.360	0.907	PASS

**NOTE:** The minimum limit is two-third 20dB bandwidth.





# 4.7 MAXIMUM OUTPUT POWER

#### 4.7.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 125mW.

#### 4.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
SPECTRUM ANALYZER R&S	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010

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

#### 4.7.3 TEST PROCEDURES

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

#### 4.7.4 DEVIATION FROM TEST STANDARD

No deviation.



# 4.7.5 TEST SETUP

Same as 4.3.5.

# 4.7.6 EUT OPERATING CONDITION

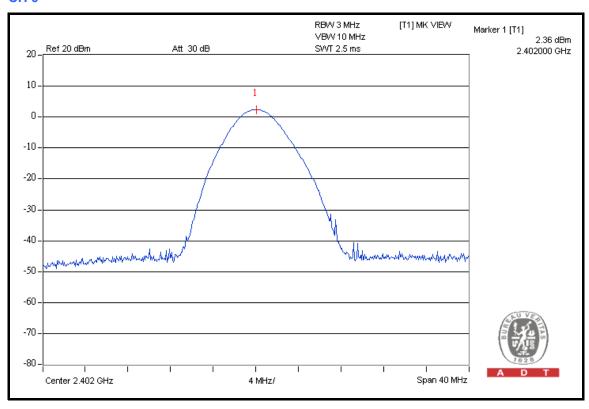
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

# 4.7.7 TEST RESULTS

# **GFSK**

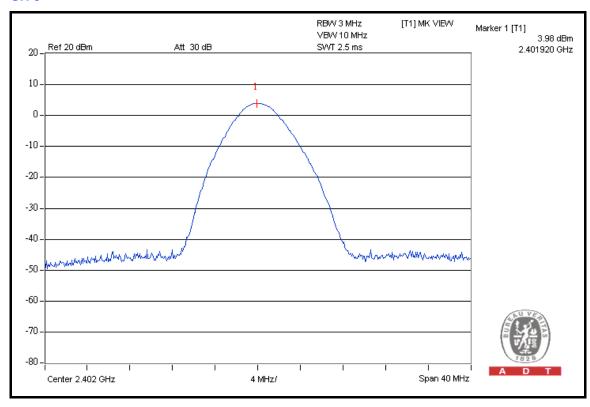
CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (mW)	POWER OUTPUT (dBm)	POWER LIMIT (mW)	PASS/FAIL
0	2402	1.7	2.4	125	PASS
39	2441	1.3	1.3	125	PASS
78	2480	1.4	1.4	125	PASS

# CH<sub>0</sub>





CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (mW)	POWER OUTPUT (dBm)	POWER LIMIT (mW)	PASS/FAIL
0	2402	2.5	4.0	125	PASS
39	2441	2.1	3.2	125	PASS
78	2480	2.0	2.9	125	PASS





# 4.8 BAND EDGES MEASUREMENT

#### 4.8.1 LIMITS OF BAND EDGES 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.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
SPECTRUM ANALYZER R&S	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010

**NOTE:** 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 both RBW and VBW of spectrum analyzer to 100 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

The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

#### **GFSK**

#### RESTRICT BAND (2310 ~ 2390 MHz)

FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
2402.00 (PK)	95.47	49.83	45.64	74.00
2402.00 (AV)	-	-	15.54	54.00

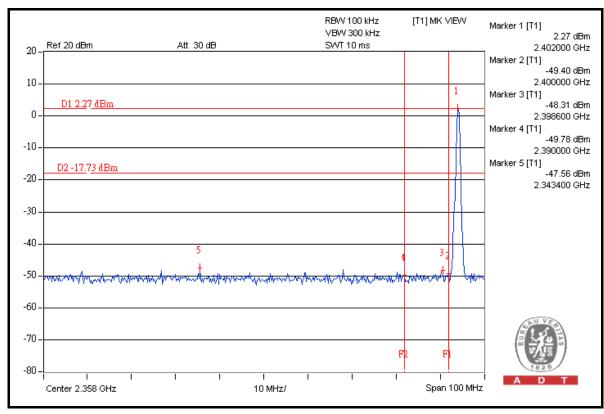
#### **RESTRICT BAND (2483.5 ~ 2500 MHz)**

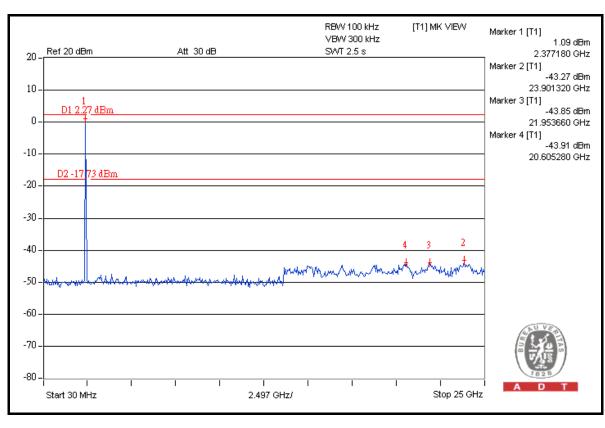
FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
2480.00 (PK)	94.31	49.31	45.00	74.00
2480.00 (AV)	-	-	14.90	54.00

#### NOTE:

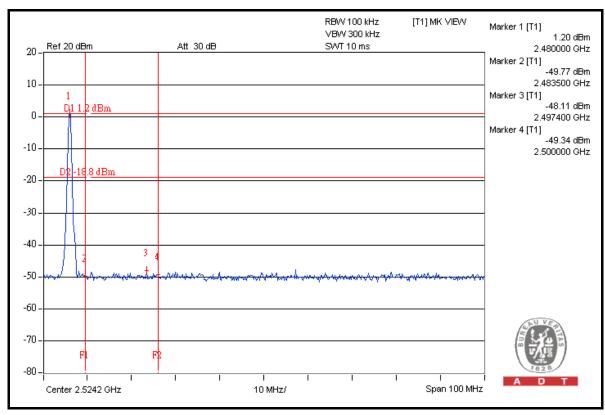
- 1. Delta = Amplitude between the peak of the fundamental and the peak of the band edge emission. Please check following 2 pages.
- 2. Maximum field strength in restrict band (PK value) = Fundamental emission (PK value) Delta.
- 3. Average value = Peak value + 20 Log (duty cycle) = Peak value 30.1dB.
- 4. 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 correction factor be equal to: 20log (3.125/100)= -30.1 dB.

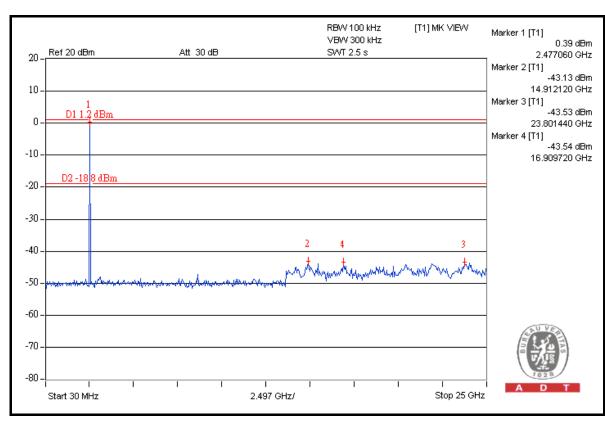














#### **8DPSK MODULATION**

# **RESTRICT BAND (2310 ~ 2390 MHz)**

FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
2402.00 (PK)	96.38	48.37	48.01	74.00
2402.00 (AV)	-	-	17.91	54.00

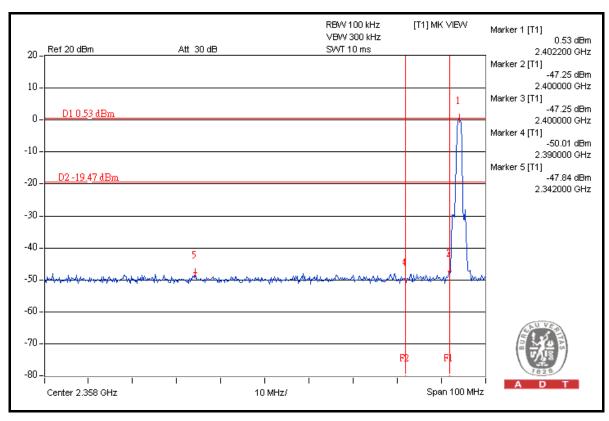
# **RESTRICT BAND (2483.5 ~ 2500 MHz)**

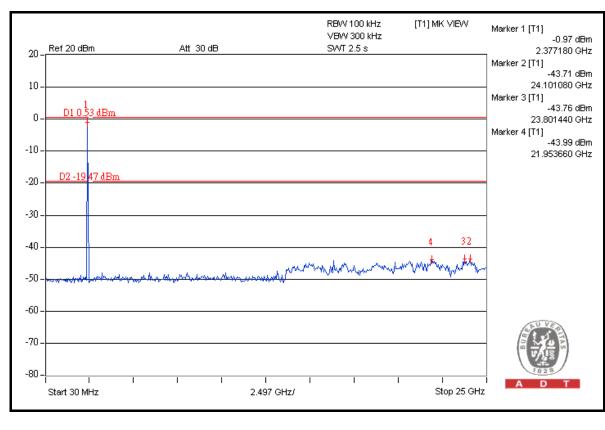
FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
2480.00 (PK)	94.51	47.44	47.07	74.00
2480.00 (AV)	-	-	16.97	54.00

#### NOTE:

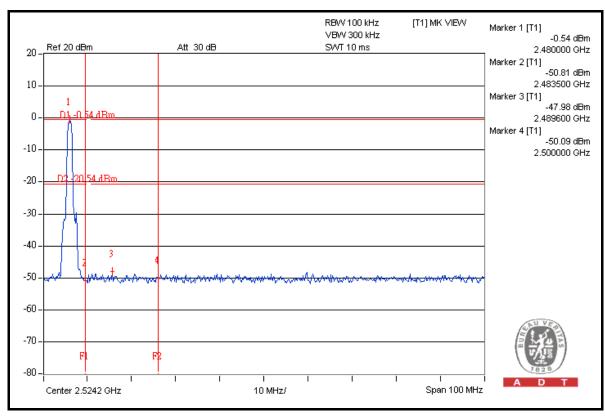
- 1. Delta = Amplitude between the peak of the fundamental and the peak of the band edge emission. Please check following 2 pages.
- 2. Maximum field strength in restrict band (PK value) = Fundamental emission (PK value) Delta.
- 3. Average value = Peak value + 20 Log (duty cycle) = Peak value 30.1dB.
- 4. 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 correction factor be equal to: 20log (3.125/100)= -30.1 dB.

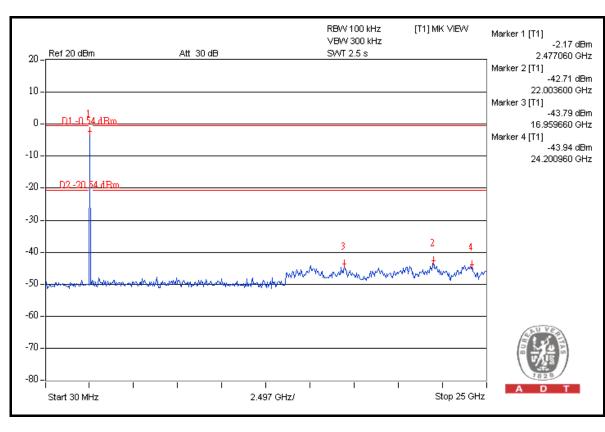














5. PHOTOGRAPHS OF THE TEST CONFIGURATION
Please refer to the attached file (Test Setup Photo).



# 6. 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:

<u>www.adt.com.tw/index.5/phtml</u>. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab: Hsin Chu EMC/RF Lab:

Tel: 886-2-26052180 Tel: 886-3-5935343 Fax: 886-2-26051924 Fax: 886-3-5935342

# Hwa Ya EMC/RF/Safety Telecom Lab:

Tel: 886-3-3183232 Fax: 886-3-3185050

Web Site: www.adt.com.tw

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



# 7. 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 ---