FCC TEST REPORT

REPORT NO.: RF961017L03

MODEL NO.: CS8131

RECEIVED: Oct. 17, 2007

TESTED: Oct. 19, 2007

ISSUED: Oct. 23, 2007

APPLICANT: In-Tech Electronics Ltd.

ADDRESS: Unit A, 13/F, Wing Tai Centre, 12 Hing Yip Street , Kwun Tong, Kowloon , Hong Kong.

ISSUED BY: Advance Data Technology Corporation

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang 244, Taipei Hsien, Taiwan, R.O.C.

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:	Bluetooth Headset
MODEL:	CS8131
BRAND:	Abe
APPLICANT:	In-Tech Electronics Ltd.
TESTED:	Oct. 19, 2007
TEST SAMPLE:	ENGINEERING SAMPLE
STANDARDS:	**FCC Part 15, Subpart C (Section 15.247)** ANSI C63.4-2003

The above equipment (model: CS8131) have been tested by **Advance Data Technology Corporation**, 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 : Ivy Lin , **DATE:** Oct. 23, 2007
Ivy Lin / Specialist

TECHNICAL ACCEPTANCE : Long Chen , **DATE:** Oct. 23, 2007
Responsible for RF
Long Chen / Senior Engineer

APPROVED BY : Gary Chang , **DATE:** Oct. 23, 2007
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	NA	Power supply is 3.7Vdc from battery
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)	1. Hopping Channel Separation Spec. : Min. 25 kHz or 20 dB bandwidth, whichever is greater 2. 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. 30dBm	PASS	Meet the requirement of limit.
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -3.91dB at 37.68 MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.

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	9kHz ~ 30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	3.19 dB
	200MHz ~1000MHz	3.21 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

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

PRODUCT	Bluetooth Headset
MODEL NO.	CS8131
FCC ID	NV6-CS8131
POWER SUPPLY	3.7Vdc from Li-ion battery 5.0Vdc from adapter (for charging use)
MODULATION TYPE	GFSK
MODULATION TYPE	FHSS
TRANSFER RATE	723.2kbps
FREQUENCY RANGE	2400 ~ 2482.5 MHz
NUMBER OF CHANNEL	79
OUTPUT POWER	1.211mW
ANTENNA TYPE	PCB micro strip antenna with 0dBi gain
DATA CABLE	NA
I/O PORTS	NA
ACCESSORY DEVICES	Adapter, battery

NOTE:

1. The EUT has no communication function when charging.
2. The EUT was powered by the following adapter and battery:

Adapter	
Brand:	SIL
Model:	SSA-5W-05 US 050050C
I/P:	100-240Vac, 50-60Hz, 0.2A
O/P:	5Vdc, 500mA
Power Line:	1.5m non-shielded cable without core
Li-ion battery	
Rating:	3.7Vdc, 80mAh

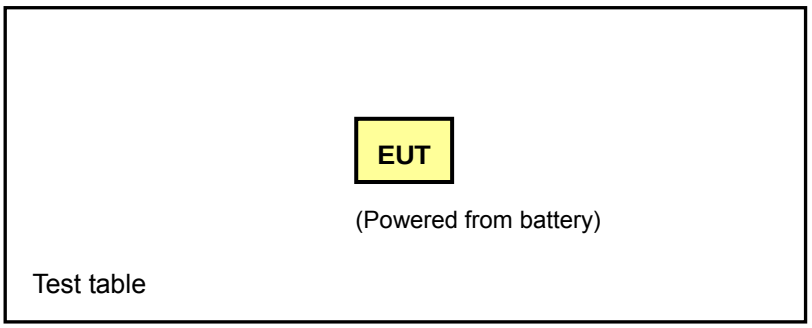
3. Bluetooth technology is used in this EUT.
4. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

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	2431	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 CONFIGURE MODE	Applicable to				Description
	PLC	RE<1G	RE≥1G	APCM	
-	Note	√	√	√	-

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

APCM: Antenna Port Conducted Measurement

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery.

RADIATED EMISSION TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet types and XYZ Axis.

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE	AXIS
-	0 to 78	78	FHSS	GFSK	DH5	Z

RADIATED EMISSION TEST (ABOVE 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet types and XYZ Axis.

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE	AXIS
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5	Z

BANDEDGE MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet types and XYZ Axis.

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE	AXIS
-	0 to 78	0, 78	FHSS	GFSK	DH5	Z

ANTENNA PORT CONDUCTED MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5

3.2.3 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.

3.2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

NA

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 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.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESI7	838496/016	Dec. 29, 2007
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Dec. 01, 2007
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Jan. 04, 2008
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-405	Dec. 18, 2007
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 16, 2008
Preamplifier Agilent	8449B	3008A1960	Oct. 30, 2007
Preamplifier Agilent	8447D	2944A10631	Oct. 30, 2007
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	230128/4	Nov. 14, 2007
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	233233/4	Nov. 14, 2007
Software ADT.	ADT_Radiated_V7.6	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA
Turn Table ADT.	TT100.	TT93021704	NA
Turn Table Controller ADT.	SC100.	SC93021704	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 4.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The IC Site Registration No. is IC3789B-4.

4.2.3 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.

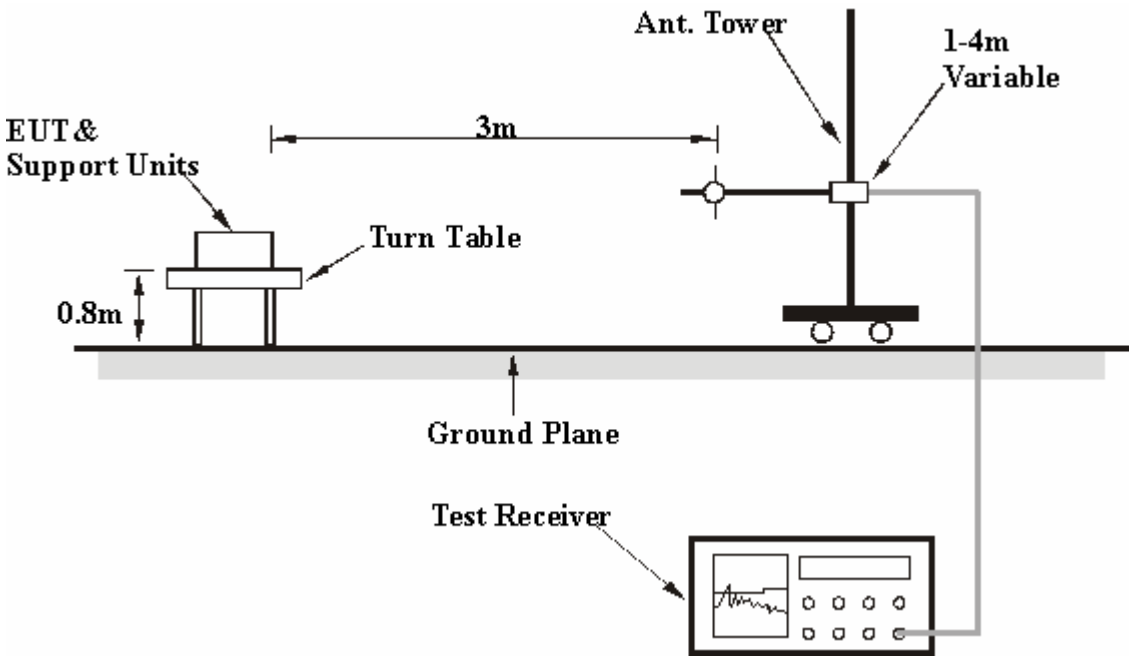
NOTE:

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.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP



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

4.2.6 EUT OPERATING CONDITIONS

a. Placed the EUT on a testing table.

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

4.2.7 TEST RESULTS

RADIATED BELOW 1GHz TEST:

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	**FREQUENCY RANGE**	Below 1000MHz
MODULATION TYPE	GFSK	**DETECTOR FUNCTION**	Quasi-Peak
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**ENVIRONMENTAL CONDITIONS**	25deg. C, 65%RH, 991hPa
TESTED BY	Kevin Liang		

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	57.12	22.87 QP	40.00	-17.13	2.00 H	310	8.86	14.00
2	74.62	24.87 QP	40.00	-15.13	2.00 H	202	13.19	11.68
3	140.72	21.01 QP	43.50	-22.49	2.00 H	100	7.48	13.53
4	486.81	24.87 QP	46.00	-21.13	2.00 H	121	4.77	20.10
5	661.79	31.13 QP	46.00	-14.87	1.50 H	337	6.64	24.50
6	809.56	34.37 QP	46.00	-11.63	1.00 H	217	7.80	26.57

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	**37.68**	**36.09 QP**	**40.00**	**-3.91**	**1.00 V**	**16**	**23.55**	**12.54**
2	59.06	31.87 QP	40.00	-8.13	1.50 V	346	17.95	13.92
3	101.84	21.84 QP	43.50	-21.66	2.00 V	61	11.55	10.29
4	514.03	24.03 QP	46.00	-21.97	1.00 V	106	3.15	20.89
5	646.24	31.02 QP	46.00	-14.98	1.50 V	154	6.84	24.18
6	817.34	34.86 QP	46.00	-11.14	1.50 V	52	8.18	26.68

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.

RADIATED ABOVE 1GHz TEST:

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 991hPa
TESTED BY	Kevin Liang		

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	43.30 PK	74.00	-30.70	1.06 H	31	11.07	32.23
2	2390.00	33.80 AV	54.00	-20.20	1.06 H	31	1.57	32.23
3	*2402.00	83.61 PK			1.06 H	31	51.33	32.28
4	*2402.00	53.51 AV			1.06 H	31	21.23	32.28
5	4804.00	53.67 PK	74.00	-20.33	1.87 H	191	15.26	38.41
6	4804.00	23.57 AV	54.00	-30.43	1.87 H	191	-14.84	38.41
7	7206.00	54.17 PK	74.00	-19.83	1.10 H	190	9.46	44.71
8	7206.00	24.07 AV	54.00	-29.93	1.10 H	190	-20.64	44.71

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	1602.00	40.51 PK	74.00	-33.49	1.04 V	4	10.52	29.98
2	1602.00	30.05 AV	54.00	-23.95	1.04 V	4	0.06	29.98
3	2390.00	41.86 PK	74.00	-32.14	1.49 V	344	9.63	32.23
4	2390.00	32.36 AV	54.00	-21.64	1.49 V	344	0.13	32.23
5	*2402.00	95.47 PK			1.49 V	345	63.19	32.28
6	*2402.00	65.37 AV			1.49 V	345	33.09	32.28
7	4804.00	54.58 PK	74.00	-19.42	1.29 V	200	16.17	38.41
8	4804.00	24.48 AV	54.00	-29.52	1.29 V	200	-13.93	38.41
9	7206.00	55.87 PK	74.00	-18.13	1.89 V	251	11.16	44.71
10	7206.00	25.77 AV	54.00	-28.23	1.89 V	251	-18.94	44.71

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. Margin value = Emission level - Limit value
4. " * " : Fundamental Frequency.
5. The other emission levels were very low against the limit
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 correction factor be equal to: 20log(3.125/100)= -30.10 dB
7. Average value = peak reading + 20log(duty cycle)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 991hPa
TESTED BY	Kevin Liang		

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	84.14 PK			1.04 H	40	51.71	32.43
2	*2441.00	54.04 AV			1.04 H	40	21.61	32.43
3	4882.00	51.65 PK	74.00	-22.35	1.12 H	55	12.92	38.73
4	4882.00	21.55 AV	54.00	-32.45	1.12 H	55	-17.18	38.73
5	7323.00	52.78 PK	74.00	-21.22	1.29 H	220	7.78	45.00
6	7323.00	22.68 AV	54.00	-31.32	1.29 H	220	-22.32	45.00

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	95.14 PK			1.45 V	339	62.71	32.43
2	*2441.00	65.04 AV			1.45 V	339	32.61	32.43
3	4882.00	52.09 PK	74.00	-21.91	1.49 V	357	13.36	38.73
4	4882.00	21.99 AV	54.00	-32.01	1.49 V	357	-16.74	38.73
5	7323.00	54.91 PK	74.00	-19.09	1.86 V	304	9.91	45.00
6	7323.00	24.81 AV	54.00	-29.19	1.86 V	304	-20.19	45.00

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. Margin value = Emission level - Limit value
4. " * " : Fundamental Frequency.
5. The other emission levels were very low against the limit
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 correction factor be equal to: 20log(3.125/100)= -30.10 dB
7. Average value = peak reading + 20log(duty cycle)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	GFSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 991hPa
TESTED BY	Kevin Liang		

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	83.35 PK			1.25 H	51	50.78	32.57
2	*2480.00	53.25 AV			1.25 H	51	20.68	32.57
3	2483.50	38.04 PK	74.00	-35.96	1.25 H	51	5.45	32.59
4	2483.50	28.54 AV	54.00	-25.46	1.25 H	51	-4.05	32.59
5	4960.00	50.37 PK	74.00	-23.63	1.20 H	227	11.46	38.91
6	4960.00	20.27 AV	54.00	-33.73	1.20 H	227	-18.64	38.91
7	7440.00	54.39 PK	74.00	-19.61	1.19 H	254	9.11	45.28
8	7440.00	24.29 AV	54.00	-29.71	1.19 H	254	-20.99	45.28

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	96.14 PK			1.16 V	340	63.57	32.57
2	*2480.00	66.04 AV			1.16 V	340	33.47	32.57
3	2483.50	48.94 PK	74.00	-25.06	1.16 V	340	16.35	32.59
4	2483.50	39.44 AV	54.00	-14.56	1.16 V	340	6.85	32.59
5	4960.00	53.86 PK	74.00	-20.14	1.06 V	174	14.95	38.91
6	4960.00	23.76 AV	54.00	-30.24	1.06 V	174	-15.15	38.91
7	7440.00	54.26 PK	74.00	-19.74	1.62 V	324	8.98	45.28
8	7440.00	24.16 AV	54.00	-29.84	1.62 V	324	-21.12	45.28

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. Margin value = Emission level - Limit value
4. " * " : Fundamental Frequency.
5. The other emission levels were very low against the limit
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 correction factor be equal to: 20log(3.125/100)= -30.10 dB
7. Average value = peak reading + 20log(duty cycle)

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.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP40	100040	Jun. 28, 2008

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.

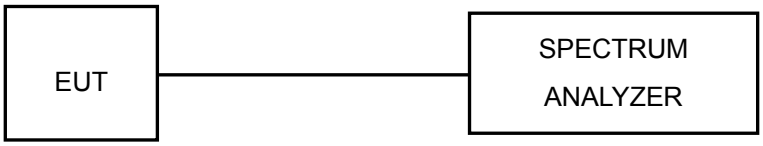
d. Set the SA on View mode and then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were complete.

4.3.4 DEVIATION FROM TEST STANDARD

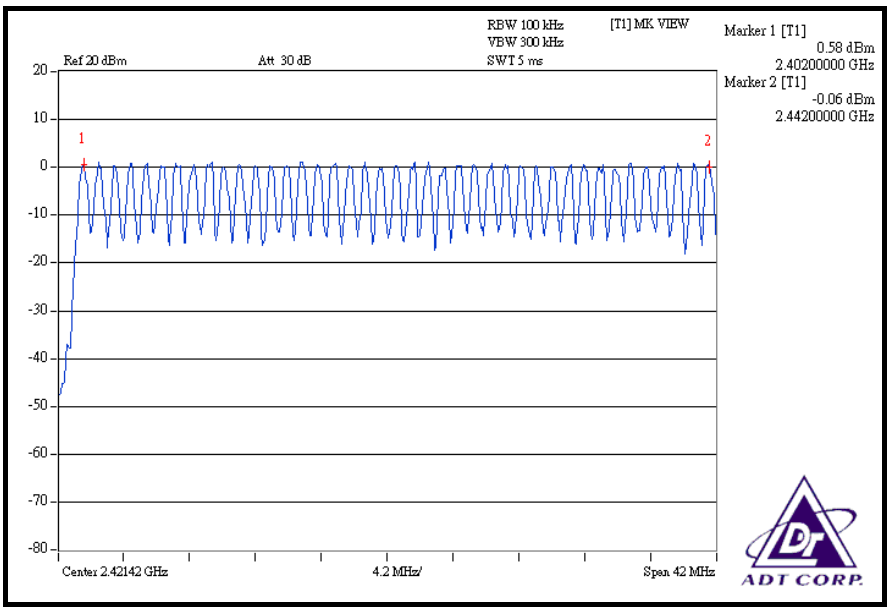
No deviation.

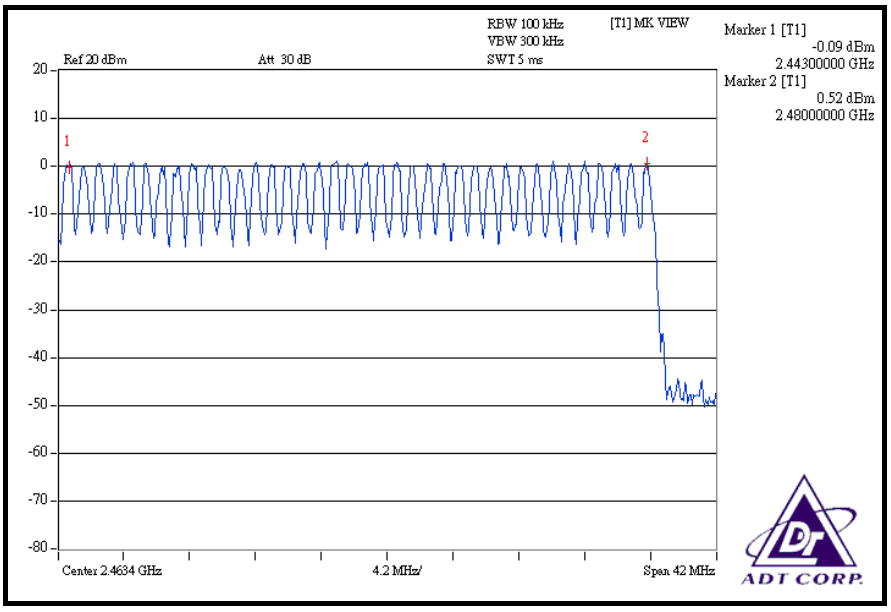
4.3.5 TEST SETUP



4.3.6 TEST RESULTS

There are 79 hopping frequencies in the hopping mode. Please refer to next page 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
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
0.58 dBm
2.40200000 GHz
Marker 2 [T1]
-0.06 dBm
2.44200000 GHz
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz
ADT CORP.


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
-0.09 dBm
2.44300000 GHz
Marker 2 [T1]
0.52 dBm
2.48000000 GHz
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz
ADT CORP.

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.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP40	100040	Jun. 28, 2008

NOTES: 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

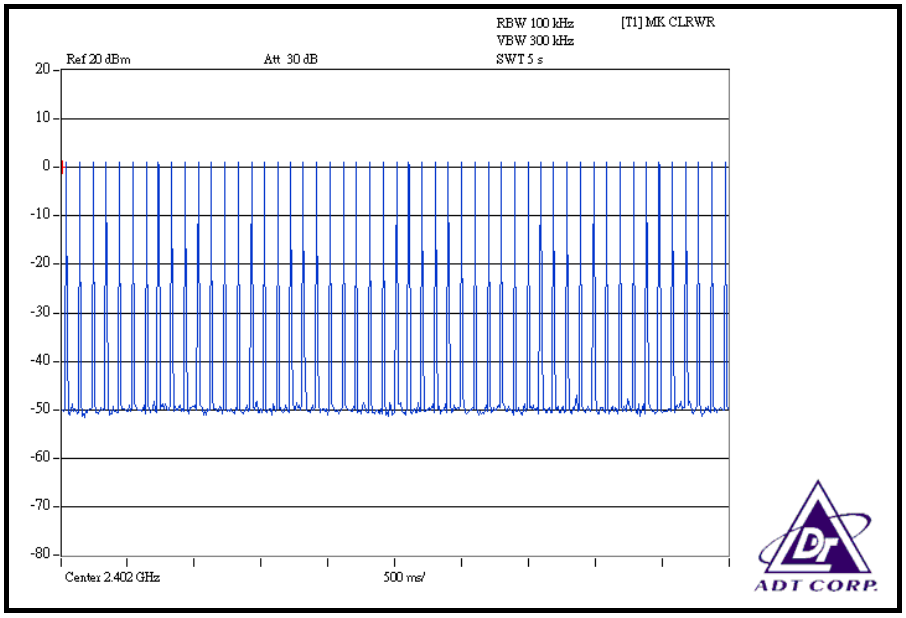
Same as 4.3.5

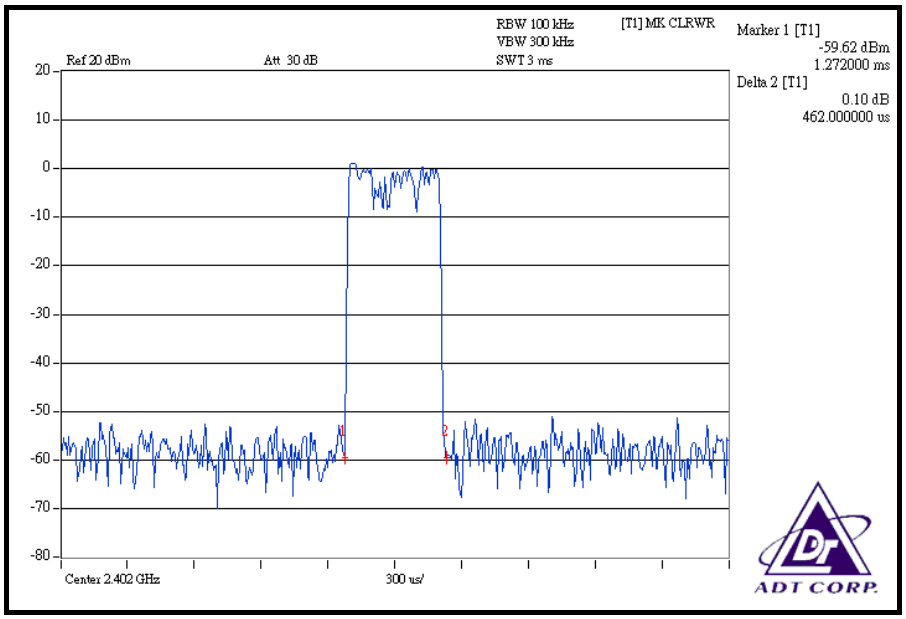
4.4.6 TEST RESULTS

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	148.912	400
DH3	25 (times / 5 sec) *6.32=158.00 times	1.716	271.128	400
DH5	17 (times / 5 sec) *6.32=107.44 times	2.970	319.097	400

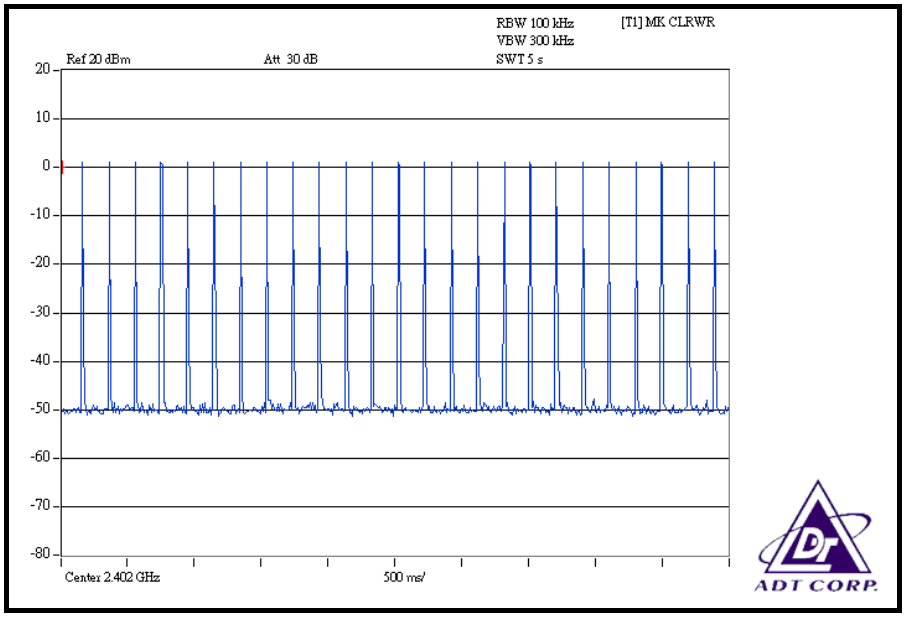
NOTE: Test plots of the transmitting time slot are shown on next 3 pages.

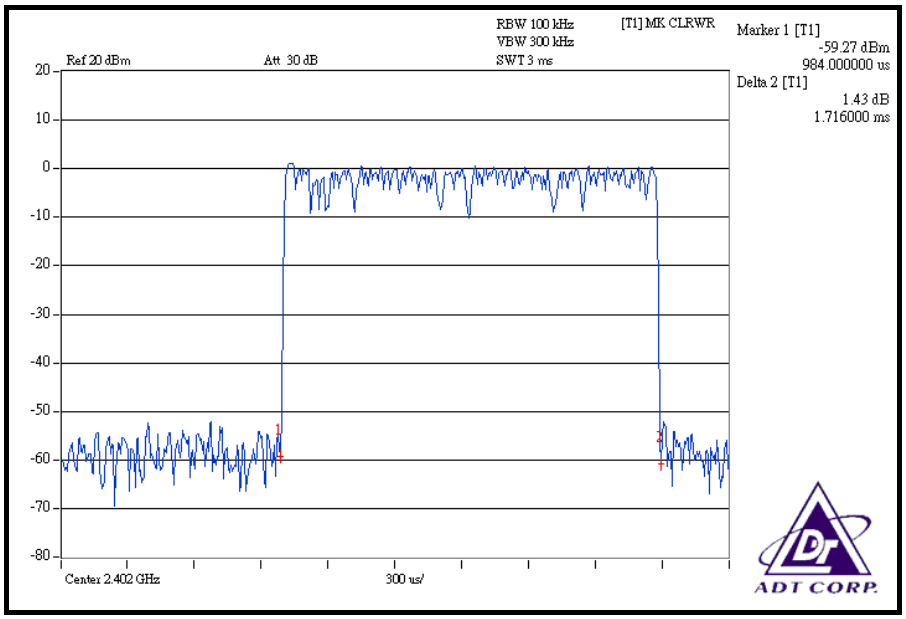
DH1


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.402 GHz
500 ms/
ADT CORP.

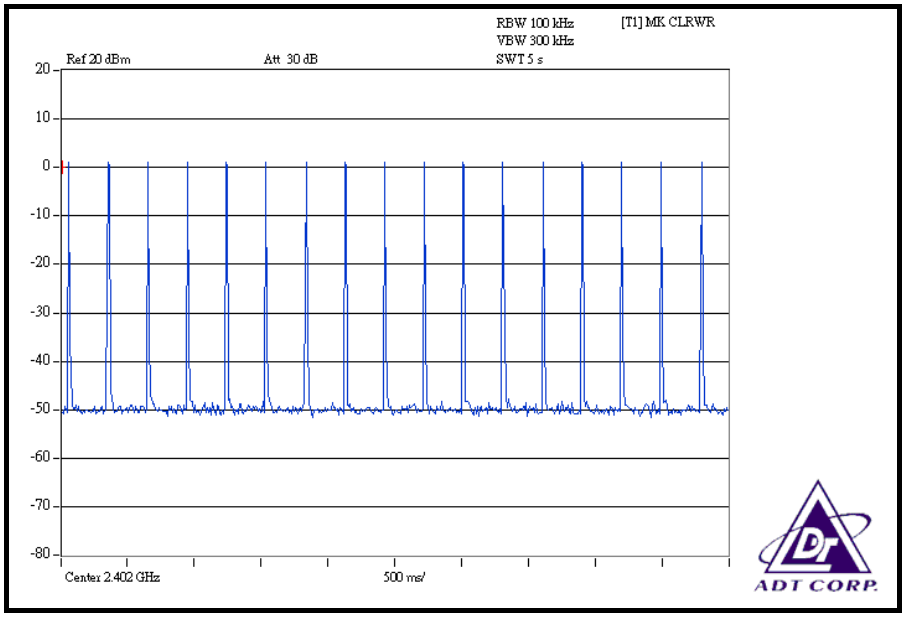

RBW 100 kHz
VBW 300 kHz
SWT 3 ms
[T1] MK CLRWR
Marker 1 [T1]
-59.62 dBm
1.272000 ms
Delta 2 [T1]
0.10 dB
462.000000 us
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.402 GHz
300 us/
ADT CORP.

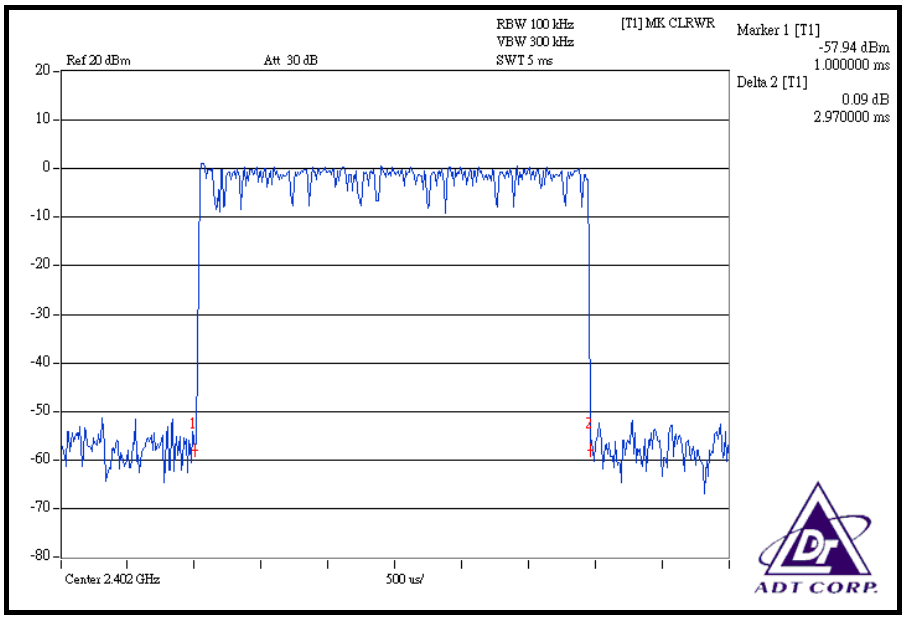
DH3


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.402 GHz
500 ms/
ADT CORP.


RBW 100 kHz
VBW 300 kHz
SWT 3 ms
[T1] MK CLRWR
Marker 1 [T1]
-59.27 dBm
984.000000 us
Delta 2 [T1]
1.43 dB
1.716000 ms
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.402 GHz
300 us/
ADT CORP.

DH5


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.402 GHz
500 ms/
ADT CORP.


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK CLRWR
Marker 1 [T1]
-57.94 dBm
1.000000 ms
Delta 2 [T1]
0.09 dB
2.970000 ms
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.402 GHz
500 us/
ADT CORP.

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, the 20dB bandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP40	100040	Jun. 28, 2008

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.

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

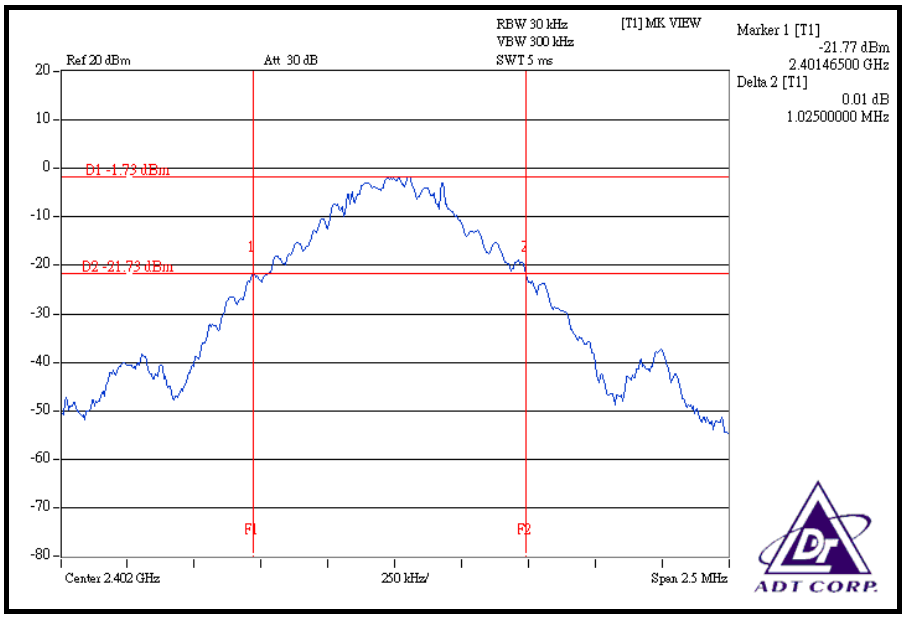
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

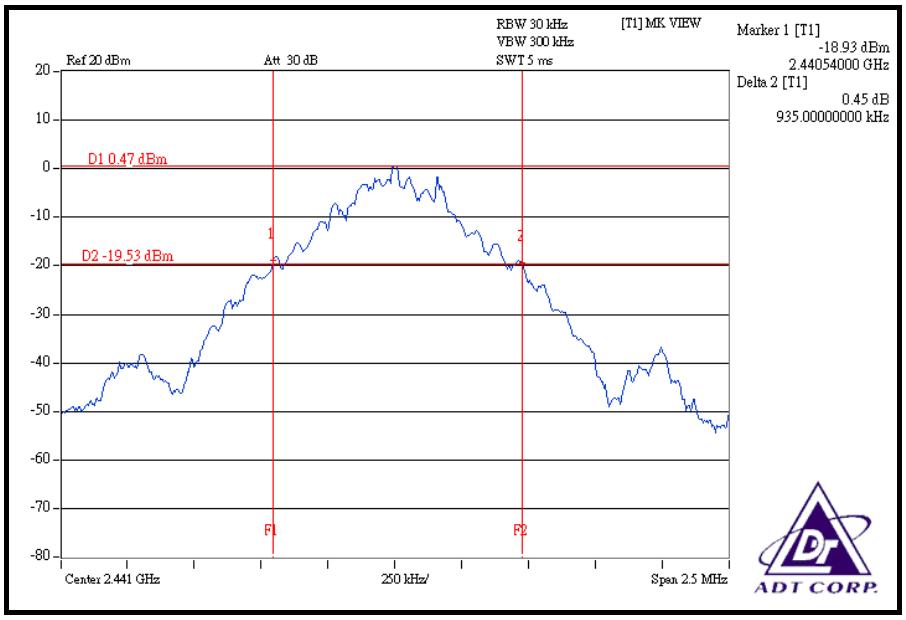
MODULATION TYPE	GFSK	**ENVIRONMENTAL CONDITIONS**	26deg. C, 63%RH, 991hPa
TESTED BY	Long Chen		

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.025
39	2441	0.935
78	2480	0.940

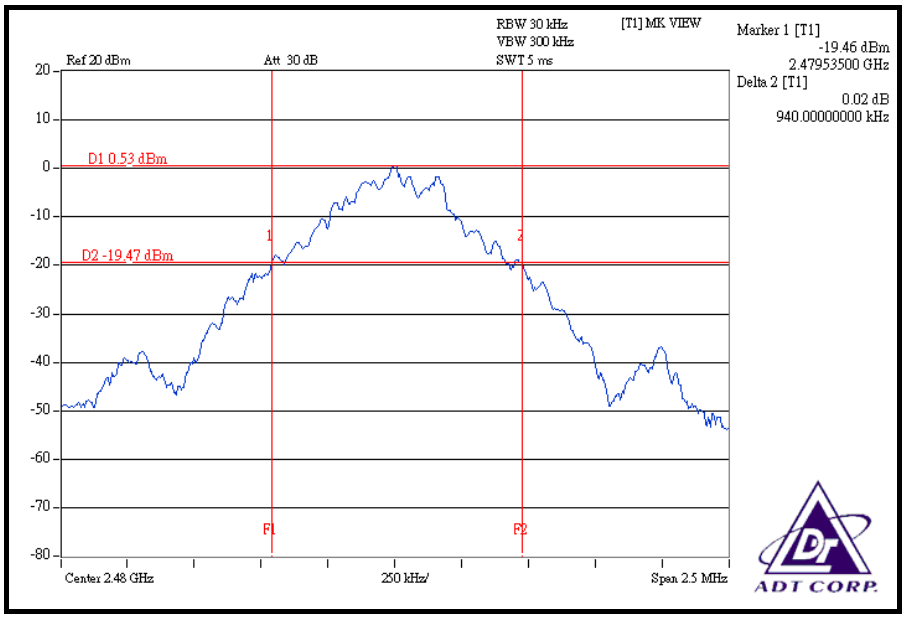
CH 0


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-21.77 dBm
2.40146500 GHz
Delta 2 [T1]
0.01 dB
1.02500000 MHz
Ref 20 dBm
Att 30 dB
D1 -1.73 dBm
D2 -21.73 dBm
Center 2.402 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

CH 39


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-18.93 dBm
2.44054000 GHz
Delta 2 [T1]
0.45 dB
935.00000000 kHz
Ref 20 dBm
Att 30 dB
D1 0.47 dBm
D2 -19.53 dBm
Center 2.441 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

CH 78


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-19.46 dBm
2.47953500 GHz
Delta 2 [T1]
0.02 dB
940.00000000 kHz
Ref 20 dBm
Att 30 dB
D1 0.53 dBm
D2 -19.47 dBm
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

4.6 HOPPING CHANNEL SEPARATION

4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP40	100040	Jun. 28, 2008

NOTES: 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

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.
c. By using the MaxHold function record the separation of two adjacent channels.
d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
e. 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

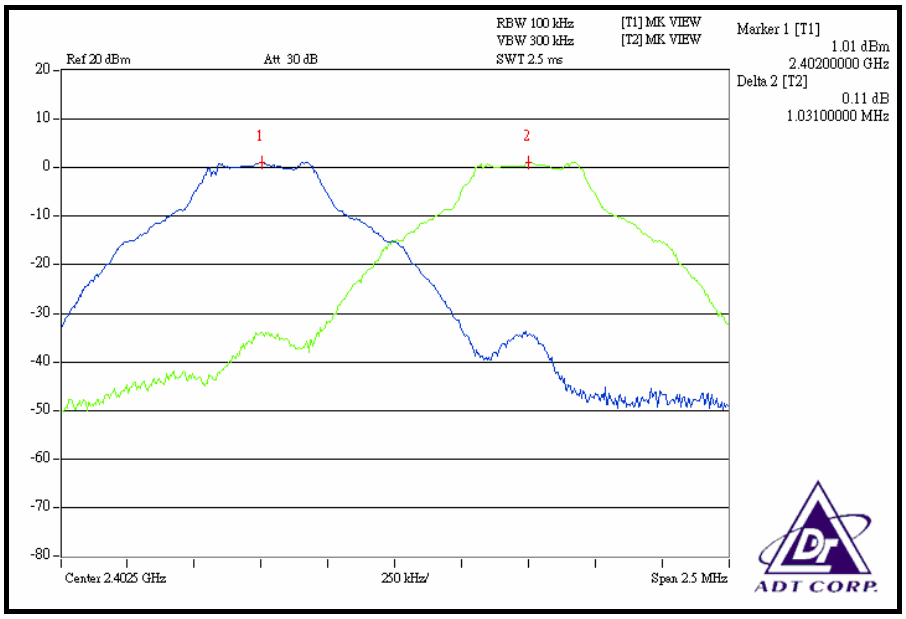
4.6.6 TEST RESULTS

MODULATION TYPE	GFSK	ENVIRONMENTAL CONDITIONS	26deg. C, 63%RH, 991hPa
TESTED BY	Long Chen		

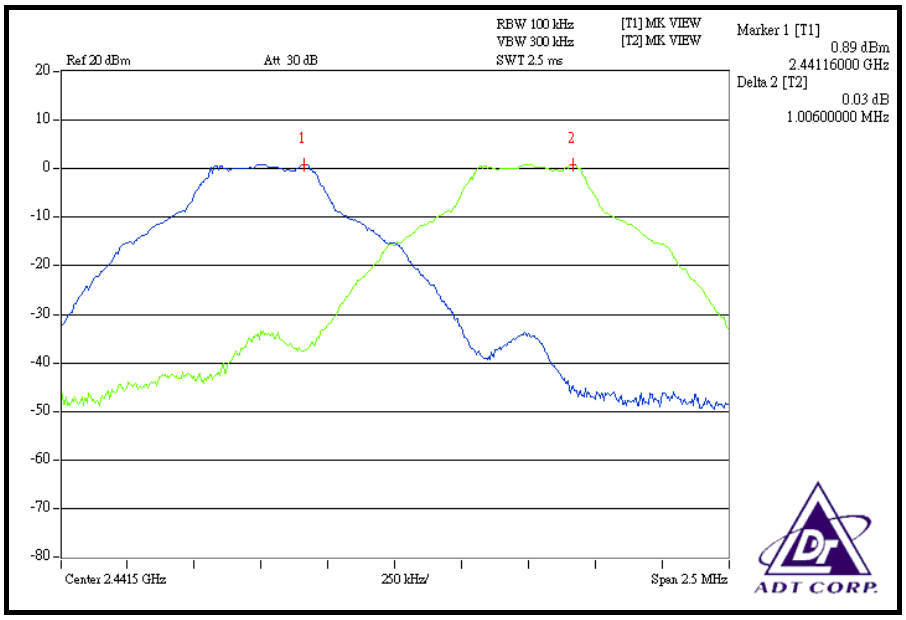
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	PASS / FAIL
0	2402	1.031	1.025	PASS
39	2441	1.006	0.935	PASS
78	2480	1.000	0.940	PASS

NOTE: The minimum limit is 20dB bandwidth. Test results please refer to next two pages.

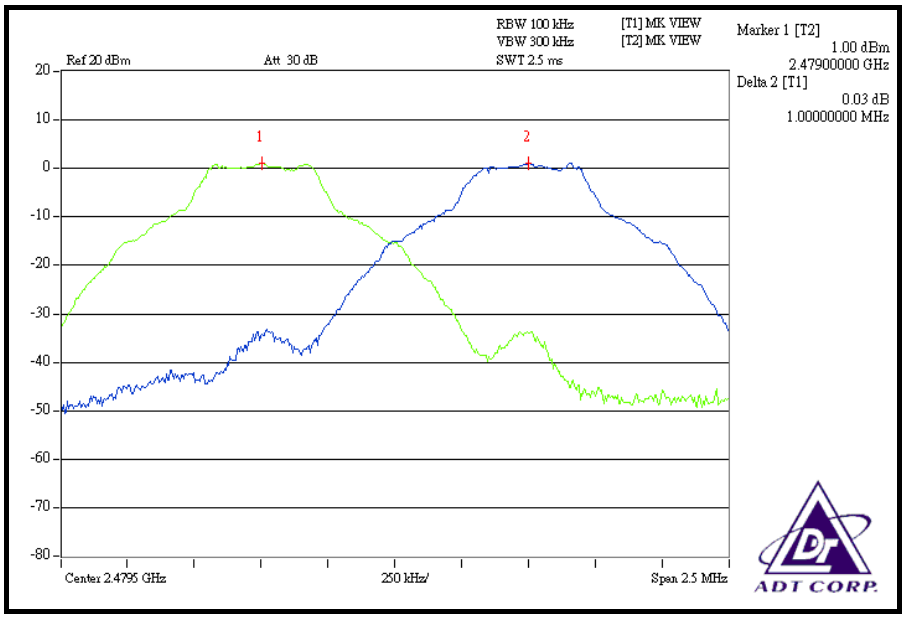
CH 0


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
[T1] MK VIEW
[T2] MK VIEW
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
1.01 dBm
2.40200000 GHz
Delta 2 [T2]
0.11 dB
1.03100000 MHz
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.4025 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

CH 39


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
[T1] MK VIEW
[T2] MK VIEW
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
0.89 dBm
2.44116000 GHz
Delta 2 [T2]
0.03 dB
1.00600000 MHz
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

CH 78


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
[T1] MK VIEW
[T2] MK VIEW
Marker 1 [T2]
1.00 dBm
2.47900000 GHz
Delta 2 [T1]
0.03 dB
1.00000000 MHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
2
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz
ADT CORP.

4.7 MAXIMUM PEAK OUTPUT POWER

4.7.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

4.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP40	100040	Jun. 28, 2008

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

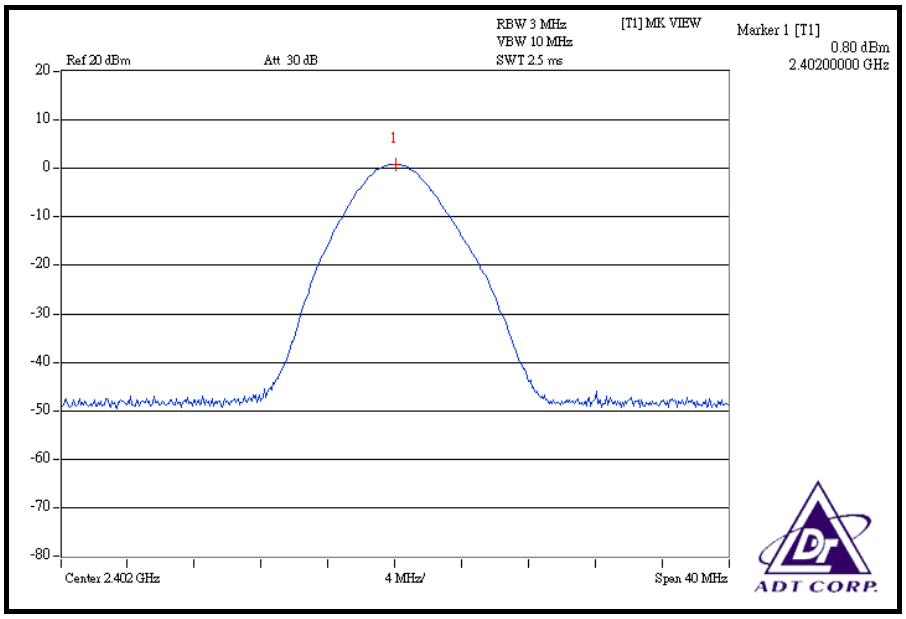
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 TEST RESULTS

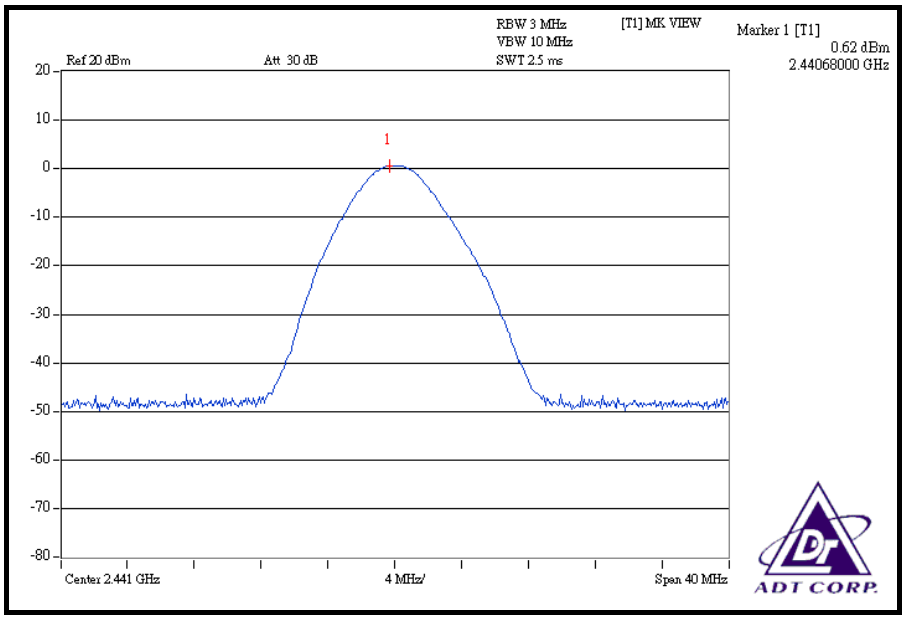
MODULATION TYPE	GFSK	ENVIRONMENTAL CONDITIONS	26deg. C, 63%RH, 991hPa
TESTED BY	Long Chen		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
0	2402	1.202	0.80	30	PASS
39	2441	1.153	0.62	30	PASS
78	2480	1.211	0.83	30	PASS

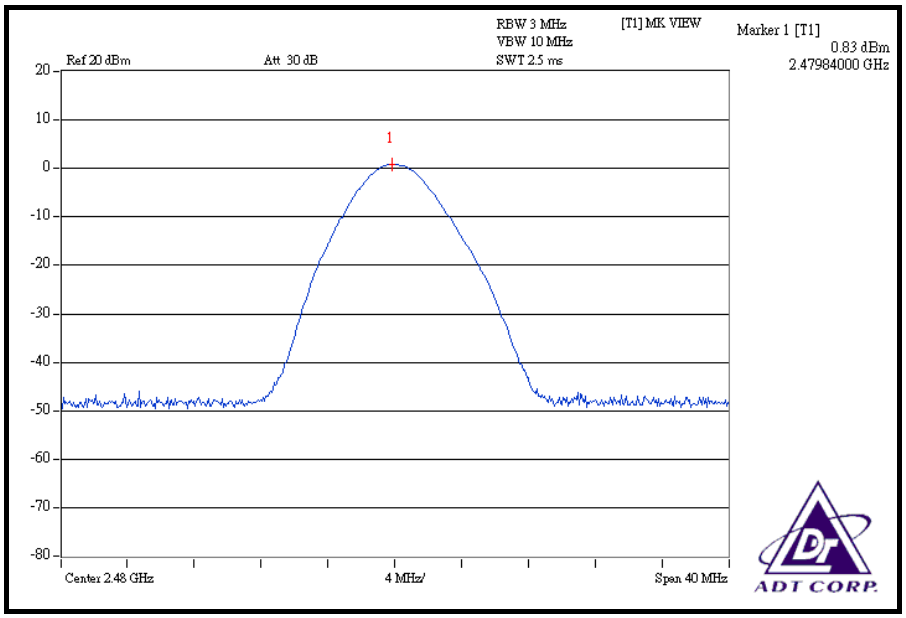
CH 0


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
0.80 dBm
2.40200000 GHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Center 2.402 GHz
4 MHz/
Span 40 MHz
ADT CORP.

CH 39


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
0.62 dBm
2.44068000 GHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Center 2.441 GHz
4 MHz/
Span 40 MHz
ADT CORP.

CH 78


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MK VIEW
Marker 1 [T1]
0.83 dBm
2.47984000 GHz
Ref 20 dBm
Att 30 dB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
Center 2.48 GHz
4 MHz/
Span 40 MHz
ADT CORP.

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.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP40	100040	Jun. 28, 2008

NOTES: 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 and 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 and highest channel frequencies individually.

4.8.6 TEST RESULTS

The spectrum plots are attached on the following 4 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).

NOTE 1:
The band edge emission plot on the next page shows 48.64dBc between carrier maximum power and local maximum emission in restrict band (2.35640GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.2.7 is 95.47dBuV/m (Peak), so the maximum field strength in restrict band is 95.47 – 48.64 = 46.83dBuV/m, which is under 74 dBuV/m limit.

Average value = 46.83 – 30.10 = 16.73dBuV/m, which is under 54dBuV/m limit.

*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)= -30.10 dB.

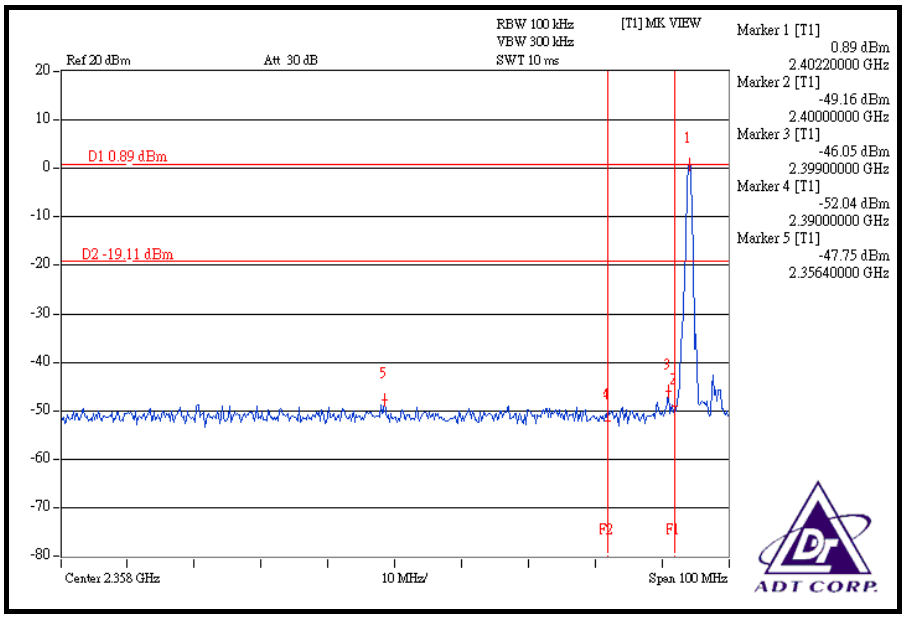
Average value = peak reading – 30.10.

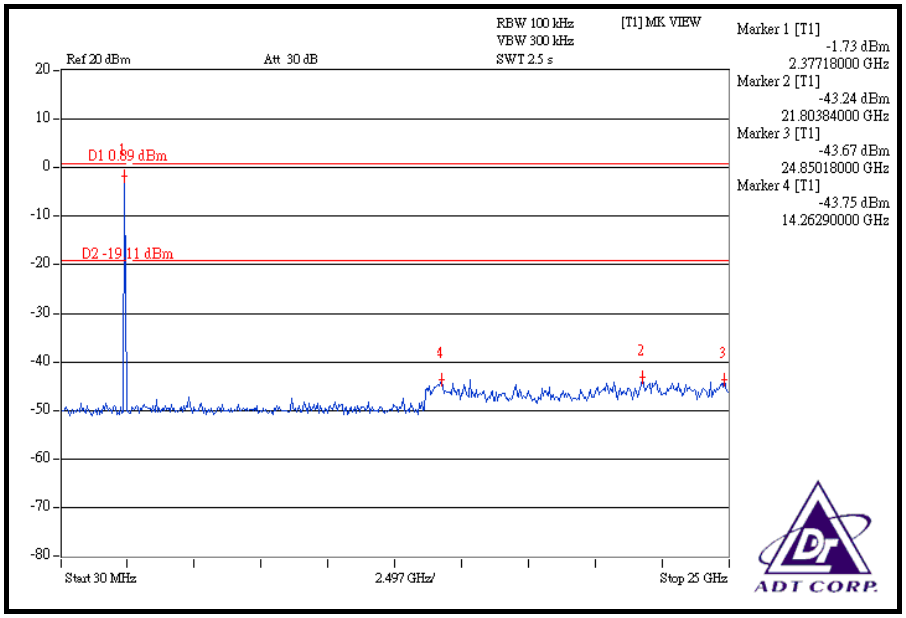
NOTE 2:
The band edge emission plot on the next second page shows 47.34dBc between carrier maximum power and local maximum emission in restrict band (2.48440GHz). The emission of carrier strength list in the test result of channel 78 at the item 4.2.7 is 96.14dBuV/m (Peak), so the maximum field strength in restrict band is 96.14 – 47.34 = 48.8dBuV/m, which is under 74 dBuV/m limit.

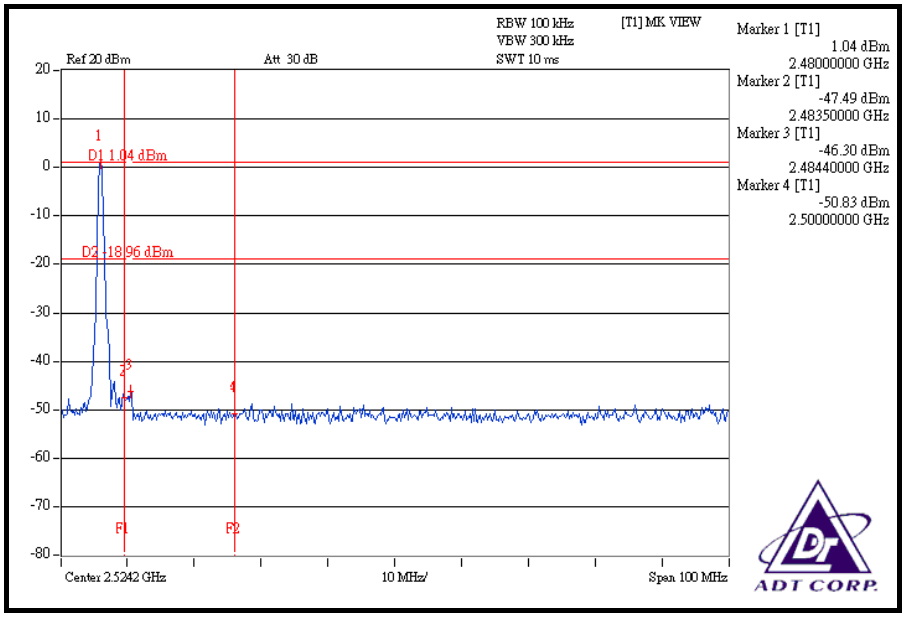
Average value = 48.8 – 30.10 = 18.7dBuV/m, which is under 54dBuV/m limit.

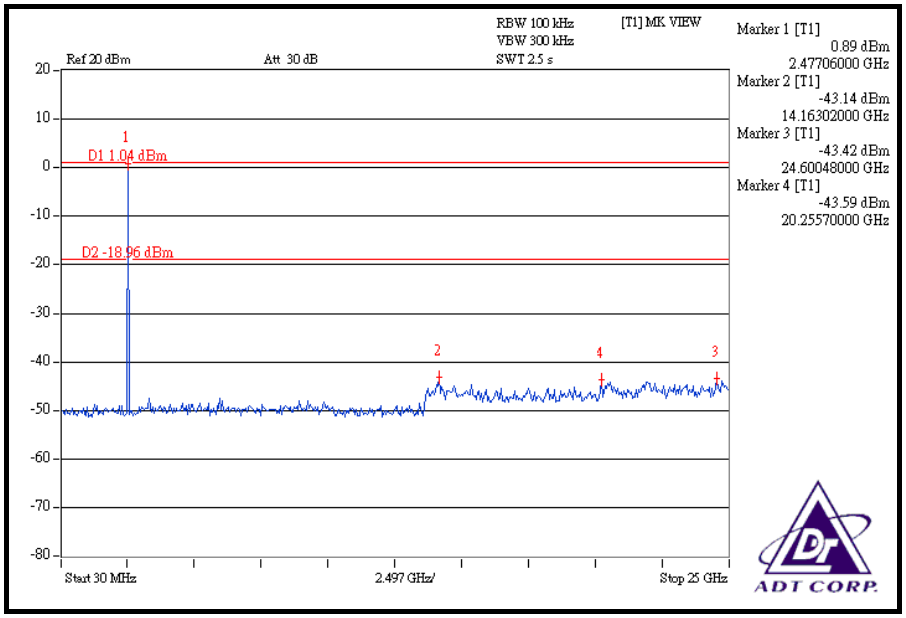
*The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correction factor be equal to: 20log(3.125/100)= -30.10 dB.

Average value = peak reading – 30.10.


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
D1 0.89 dBm
D2 -19.11 dBm
Marker 1 [T1]
0.89 dBm
2.40220000 GHz
Marker 2 [T1]
-49.16 dBm
2.40000000 GHz
Marker 3 [T1]
-46.05 dBm
2.39900000 GHz
Marker 4 [T1]
-52.04 dBm
2.39000000 GHz
Marker 5 [T1]
-47.75 dBm
2.35640000 GHz
F2
F1
Center 2.358 GHz
10 MHz/
Span 100 MHz
ADT CORP.


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
D1 0.89 dBm
D2 -19.11 dBm
Marker 1 [T1]
-1.73 dBm
2.37718000 GHz
Marker 2 [T1]
-43.24 dBm
21.80384000 GHz
Marker 3 [T1]
-43.67 dBm
24.85018000 GHz
Marker 4 [T1]
-43.75 dBm
14.26290000 GHz
Start 30 MHz
2.497 GHz/
Stop 25 GHz
ADT CORP.


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
1.04 dBm
2.48000000 GHz
Marker 2 [T1]
-47.49 dBm
2.48350000 GHz
Marker 3 [T1]
-46.30 dBm
2.48440000 GHz
Marker 4 [T1]
-50.83 dBm
2.50000000 GHz
D1 1.04 dBm
D2 -18.96 dBm
F1
F2
Center 2.5242 GHz
10 MHz/
Span 100 MHz
ADT CORP.


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
0.89 dBm
2.47706000 GHz
Marker 2 [T1]
-43.14 dBm
14.16302000 GHz
Marker 3 [T1]
-43.42 dBm
24.60048000 GHz
Marker 4 [T1]
-43.59 dBm
20.25570000 GHz
D1 1.04 dBm
D2 -18.96 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz
ADT CORP.

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

The antenna used in this product is PCB micro strip antenna without antenna connector. The maximum gain of this antenna is 0dBi.

5. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., 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, UL, A2LA
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: 886-2-26051924

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

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.