Measurement Report

FCC ID:F2QBTCOMBOLYM7

This report concerns (check one) : ■ Original Grant ☐ Class II Change

Issued Date	:	Nov. 25, 2003
Project No.	:	03E0568
Equipment	:	Bluetooth Mouse
Model No.	:	Gemini M2 Mouse
Applicant	:	Itron Technology Inc. 9F, #75, Sec 1, Hsin Tai Wu Rd., Hsichih, Taipei, Taiwan, R.O.C.

Tested by :
Neutron Engineering Inc. EMC Laboratory
Data of Test :
Oct. 22, 2003 ~ Nov. 10, 2003

Testing Engineer : Alan Liu (Alan Liu)

Technical Manager : (Andy Chiu)

Authorized Signatory : (George Yao)

NEUTRON ENGINEERING INC.

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CNLA 0659 ILAC MRA

NVLAP Lab Code: 200145-0

Declaration

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Assessment Authorities

NVLAP Lab Code: 200145-0

CNLA 0659 ILAC MRA

Test Standard/Scope/Item Acceptance

FCC Part 15 Subpart B
IEC/CISPR22
AS/NZS 3548
CNS 13438

FCC Part 15 Subpart B
CISPR 22/EN 55022
AS/NZS 3548
VCCI -Technical Requirement
CNS 13438
SS IEC/CISPR 22
IEC/EN 61000-3-2 IEC/EN 61000-4-5
IEC/EN 61000-3-3 IEC/EN 61000-4-6
IEC/EN 61000-4-2 IEC/EN 61000-4-8
IEC/EN 61000-4-3 IEC/EN 61000-4-11
IEC/EN 61000-4-4

Table of Contents Page

Table of Contents **Page**

1. General Information

1.1 Applicant

Name Itron Technology Inc.
Address 9F, #75, Sec 1, Hsin Tai Wu Rd., Hsichih, Taipei, Taiwan, R.O.C.

1.2 Manufacturer

Name N/A
Address N/A

1.3 Equipment Under Tested

Name: Bluetooth Mouse
Trade Name: itron
Model No.: Gemini M2 Mouse

1.4 OEM Brand/Model (if applicable)

OEM Brand(s)/Model(s) except the basic model in sub-clause 1.3 is(are) the follows:
OEM Brand: N/A
Model No.: N/A

1.5 Product Descriptions(Application/Features/Specification)

The EUT is a Bluetooth Mouse. A major technical descriptions of EUT is described as following:

A .Operation Frequency	2402-2480 MHz
B. Modulation Type	FHSS
C. Bit Rate of Transmitter	1 Mb/s
D. Channel Spacing	1MHz
E. Antenna Designation	Integral Antenna
G. Number Of Channel	79 Channel
H. Channel List	Please refer to the next page

Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	30	2432	60	2462
01	2403	31	2433	61	2463
02	2404	32	2434	62	2464
03	2405	33	2435	63	2465
04	2406	34	2436	64	2466
05	2407	35	2437	65	2467
06	2408	36	2438	66	2468
07	2409	37	2439	67	2469
08	2410	38	2440	68	2470
09	2411	39	2441	69	2471
10	2412	40	2442	70	2472
11	2413	41	2443	71	2473
12	2414	42	2444	72	2474
13	2415	43	2445	73	2475
14	2416	44	2446	74	2476
15	2417	45	2447	75	2477
16	2418	46	2448	76	2478
17	2419	47	2449	77	2479
18	2420	48	2450	78	2480
19	2421	49	2451		
20	2422	50	2452		
21	2423	51	2453		
22	2424	52	2454		
23	2425	53	2455		
24	2426	54	2456		
25	2427	55	2457		
26	2428	56	2458		
27	2429	57	2459		
28	2430	58	2460		
29	2431	59	2461		

1.6 Connecting I/O Port(s)

Please refer to the User's Manual.

1.7 Power Supplied

Power Source: Battery or PC supplied
Power Cord: N/A
Power Rating: 2.7~3.3V; 2xAA Alkaline battery cells

1.8 Products Covered (if applicable)

The sample tested including the following sub-system/module/accessory :

Sub-system/ Module/ Accessory	Model/Type No.	Int. Inst./ Ext. Cont.
N/A	N/A	N/A

1.9 Model Difference (Series, Versions, if any)

Except the basic model no. (model designation of the sample tested in this test report), additional model no. covered is(are) :

N/A

1.10 EUT Modifications (if applicable)

No any modification required for the EUT to comply with the standards.

1.11 Electric Block Diagram

Please refer to the Attachment – **A.**

1.12 Photos of EUT

Please refer to the Attachment – **D.**

2. RFI Emissions Measurement

2.1Test Facility

The test facilities used to collect the test data in this report located at No.132-1, Lane 329, Sec. 2, Palain Road, Shijr City, Taipei, Taiwan.

2.2 Standard Compliance

The test data contained in this report relate only to the item(s) listed below :

FCC Part15, Subpart C (15.249) / ANCI C63.4 : 1992

2.3 Test Conditions and Channel

Test Mode	EUT Channel	Test Frequency(MHz)
1	CH 0	2402
2	CH 39	2441
3	CH 78	2480

Note:

(1)The measurements are performed at the highest, middle and lowest available channels with the modulation enabled.

2.4 Test Methodolog

Only radiated testing was performed during the max. EMI emission evaluation. Conducted testing excepted because of the EUT is a battery operating device and no any other cable connection to PC device.

Test procedures according to the technical standards : (Antenna to EUT distance is 3 m)

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.207	Conducted Emission	Class B	0.15-30	PASS
15.247 (a)(1)	Hopping Channel Carrier Frequency Separated	>= 25KHz or the 20dB bandwidth of the hopping channel	2400-2483.5	PASS
15.247 (a)(1)(ii)	Number of Hopping Channel		2400-2483.5	PASS
15.247 (a)(1)(ii)	Average Time of Occupancy	< = 0.4 sec (a 30 second period)	2400-2483.5	PASS
15.247 (a)(1)(ii)	Bandwidth	<= 1MHz (20dB bandwidth)	2400-2483.5	PASS
15.247 (b)(1)	Peak Output Power	1 watt or 30dBm (at least 75 hopping channel)	2400-2483.5	PASS
15.247 (c)	Antenna conducted Spurious Emission	20dB less than the peak value of fundamental frequency	30-25000	PASS
15.247 (c)	Radiated Spurious Emission	15.209(a)	30-25000	PASS

2.5 Deviations from Standard Test Method

N/A

2.6 Sample(s) Tested

The representative sample tested in this reports is(are): Gemini M2 Mouse

Test results in this test report relate only to the sample(s) tested.

The EUT has been tested according to the following environmental condition:

Input Power	110 Vac / 60Hz
Temperature	24 ℃
Relative Humidity	65 %

2.7 Measurement Instruments

Valid measurement instruments used in this report refer to **Table-1** enclosed.

2.8 Measurement Uncertainty

The reported uncertainty of measurement **y ± U，** where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2，** providing a level of confidence of approximately **95** %。

A. Conducted Measurement :5.05dB

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U，(dB)	NOTE
OS-01	ANSI	30MHz ~ 200MHz	H	4.59	
		30MHz ~ 200MHz	V	4.80	
		200MHz ~ 1,000MHz	H	4.47	
		200MHz ~ 1,000MHz	V	5.03	

2.9 Tested System Set-Up/Configuration Details

The system was configured for testing in a typical fashion (as a user would normally use) or in-accordance with the operating configuration specified in the user's manual. A Block Diagram(please refer to the Diagram - 1) and Photos(please refer to the attachment - **B**) showing the set-up/configuration of system tested. In addition, **Table-2** and **Table-3** provide a detail of all equipment items and cables information used in the system tested.

Table -1 Measurement Instruments List

Item	Instruments	Mfr/Brand	Model/Type No.	Serial No.	Calibrated Date	Next Cali. Date	Note
1	Spectrum	HP	85662B	2648A13616	2003/10/20	2004/04/19	✓
2	Spectrum	HP	85680B	2634A03025	2003/10/20	2004/04/19	✓
3	Quasi-Peak	HP	85650A	2521A00844	2003/10/20	2004/04/19	✓
4	Pre-Selector	HP	85685A	2648A00417	2003/10/20	2004/04/19	✓
5	Test Receiver	R&S	ESAI	844348/008	2002/11/21	2003/11/20	
6	Test Receiver	R&S	ESMI	843977/005	2002/11/21	2003/11/20	
7	Pre-Amplifier	R&S	ESMI-Z7	1045.5020.9801 (612.278 014 00)	2003/05/19	2004/05/18	
8	Spectrum Analyzer	Advantest	R3261C	81720298	2003/08/13	2004/08/12	✓
9	Spectrum Analyzer	HP	8591EM	3536A00687	2003/04/25	2004/04/24	
10	LOGBICON Ant	MESS-ELEKTRONIK	VULB 9160	3058	2002/10/23	2003/10/22	
11	LOGBICON Ant	MESS-ELEKTRONIK	VULB 9160	3060	2003/10/21	2004/10/20	✓
12	LogBicon Ant	MESS-ELEKTRONIK	VULB 9161	4022	2002/07/25	2003/07/24	
13	Short Dipole Ant.	Schwarzbeck	VHAA9110	147	2003/01/03	2004/01/02	
14	Precision Dipole Ant.	Schwarzbeck	VHAP/UHAP	986 987 969 970	2002/01/04	2004/01/03	
15	Horn Ant	EMCO	3115	9605-4803	2003/05/23	2004/05/22	
16	Horn Ant	Schwarzbeck	BBHA 9120 D	9120D-325	2002/10/21	2003/10/20	✓
17	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2002/10/21	2003/10/20	
18	LISN	EMCO	Feb-25	9605-2539	2003/06/10	2004/06/09	✓
19	LISN	Rolf Heine	NNB-2/16Z	98083	2002/11/01	2003/10/31	✓
20	LISN	Rolf Heine	NNB-2/16Z	98053	2002/11/15	2003/11/14	
21	Sound Level Meter	QUEST	210	DCA100012	2002/08/28	2003/08/27	
22	EMI Receiver	MEB	SMV4.1	130	2002/12/06	2003/12/05	✓
23	RF Switch	Anritsu	MP59B	M65982	2001/12/09	2003/12/08	✓
24	Pulse Limiter	Electro-Metrics	EM-7600	112644	2002/12/09	2003/12/08	✓
25	ATTENUATOR (11dB)	HP	8494B	3308A38680	2003/05/08	2004/05/07	
26	ATTENUATOR (70dB)	HP	8495B	3308A20487	2003/05/08	2004/05/07	
27	50ÙTerminator	N/A	N/A	N/A	2003/05/09	2004/05/08	✓
28	Pre-Amplifier	Anritsu	MH648A	M09961	2002/12/09	2003/12/08	✓
29	Microwave Pre_amplifier	Agilent	8449B	3008A01714	2003/03/10	2004/03/09	✓
30	LISN For Car Testing	Rolf Heine	LN-KFZ-200	02/10000	2003/01/27	2004/01/26	
31	Signal Generator	HP	8648A	3426A01034	2002/10/11	2004/10/08	
32	Signal Generator	R&S	SMT06	832080/007	2003/04/07	2004/04/06	
33	AUDIO Generator	GW	GAG-810	7650777	2002/12/09	2003/12/08	
34	Test Cable	N/A	10M_OS02	N/A	2002/12/10	2003/12/09	✓
35	Test Cable	N/A	OS02-1/-2/-3	N/A	2002/12/10	2003/12/09	✓
36	Test Cable	N/A	C01	N/A	2002/12/10	2003/12/09	✓
37	Microflex Cable	United Microwave	57793	1m	2003/04/07	2004/04/06	✓
38	Microflex Cable	United Microwave	57793	3m	2003/04/07	2004/04/06	
39	Microflex Cable	United Microwave	A30A30-5006	4M	2003/04/07	2004/04/06	✓
40	Microflex Cable	United Microwave	A30A30-5006	10M	2003/04/07	2004/04/06	
41	Antenna Mast	Chance Most	CMTB-1.5	N/A	N/A	N/A	✓
42	Turn Table	Chance Most	CMTB-1.5	N/A	N/A	N/A	✓

Remark :

(1)" ✓" indicates the instrument used in Test Report.

(2)" N/A" denotes No Model No. / Serial No. and No Calibration specified.

Diagram - 1
Block diagram showing the configuration of system tested

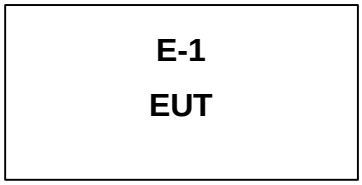


Table - 2 Equipments Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	Bluetooth Mouse	itron	Gemini M2 Mouse	F2QBTCOMBOLYM7		EUT

Note:

(1) Unless otherwise denoted as EUT in『Remark』column , device(s) used in tested system is a support equipment.
(2) Unless otherwise marked as ※ in『Remark』column, Neutron consigns the support equipment to the tested system.
(3) The support equipment was authorized by Declaration of Confirmation.

Table - 3 Information of Interface Cable

Item	Shielded Type	Ferrite Core	Length	Note
	N/A	N/A	N/A	

Note:

(1) Unless otherwise marked as ※ in『Remark』column, Neutron consigns the support equipment to the tested system.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.10 Max.(Worst Case) RF Emission Evaluation

(a) Only radiated testing was performed during the max. EMI emission evaluation. Conducted testing excepted because of the EUT is a battery operating device and no any other cable connection to PC device.
(b) The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit & receive during test. This operating condition was tested and used to collect the included data.
(c) To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of this EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.
These operation modes were used for final testing and collecting test data included in this report.

2.11 EUT Operation

The EUT exercise program used during radiated and/or conducted emission measurement was designed to exercise the various system components in a manner similar to a typical use.
The measurements are performed at the highest (CH0), middle (CH39), lowest (CH78) available channels with the hopping function disabled. Unless otherwise specified the above condition, the test was performed while EUT had its hopping function enabled.

3. Justification

3.1 Limitations

3.1.1 Power Line Conducted Emission

Measurement Frequency Range (MHz)	Mains Terminal Class A Limits (dBuV)		Mains Terminals Class B Limits (dBuV)		Note CISPR FCC Std.
	QP Mode	AV Mode	QP Mode	AV Mode	
0.15 - 0.50	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 - 5.00	73.00	60.00	56.00	46.00	CISPR
5.00 - 30.0	73.00	60.00	60.00	50.00	CISPR
0.45-1.705	60.00	N/A	48.00	N/A	FCC
1.705-30.0	69.50	N/A	48.00	N/A	FCC

Notes:

(1). The tighter limit applies at the band edges.

(2). The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

3.1.2 Radiated Emission Limits (Frequency Range 30MHz-1000MHz)

Measurement Frequency Range (MHz)	Quasi-Peak Mode Class A Limits (dBuV/m)		Quasi-Peak Mode Class B Limits (dBuV/m)		Note CISPR FCC Std.
	10m	30m	10m	3m	
30.00 -230.00	40.00	30.00	30.00	40.00	CISPR
230.0 -1000.0	47.00	37.00	37.00	47.00	CISPR
30.00 - 88.00	39.00	N/A	30.00	40.00	FCC
88.00 - 216.0	43.50	N/A	33.50	43.50	FCC
216.0 -960.0	46.00	N/A	36.00	46.00	FCC
above 960.0	49.50	N/A	46.00	54.00	FCC

Notes:

(1). The tighter limit applies at the band edges.

(2). Emission level (dBuV/m)=20log Emission level (uV/m).

(3). A measuring distance 0f 10m is a primary used. However, either 3m or 10m (instead of 10m) distance my be allowed. If the distance is 3m, add 10dB to the QP-limit above. If the distance is 10m, subtract 10dB from the QP-limit above.

3.2 Measurement Justification

3.2.1 Conducted Emission

The EUT is a placed on as table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-1992. Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** were made with a **Spectrum Analyzer** using **CISPR Quasi-Peak detector mode**.

The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and these signals are then Quasi Peak detector mode and/or Average detector mode re-measured.

Data of **Table - 4**. lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP or AV in column of " Remark ".

If the Peak Mode measured value lower than both QP Mode and AV Mode Limit, EUT shall be deemed to compliance with both QP & AV Limits and then no additional QP Mode or AV Mode measurement performed.

If additional QP or AV Mode measurement needed, and if the QP Mode measured value compliance with the QP Mode Limit and lower than AV Mode Limit, the EUT shall be deemed to meet both QP & AV Limits and then only QP Mode was measured, but AV Mode was not performed。

3.2.2 Radiated Emission

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.

The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak, Peak or Average detector mode re-measured.

Data of **Table – 5** lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP or AV in column of " Remark ".

If the Peak Mode measured value compliance with and lower than Quasi Peak or Average Mode Limit, the EUT shall be deemed to meet QP/AV Limits and then no additional QP/AV Mode measurement performed.

3.2.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as **FS = RA + AF + CL - AG**

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor (1)
CL = Cable Attenuation Factor(Cable Loss) (1)
AG = Amplifier Gain (1)

Remark :

(1) The Correction Factor = AF + CL - AG, as shown in the data tables' Correction Factor column.

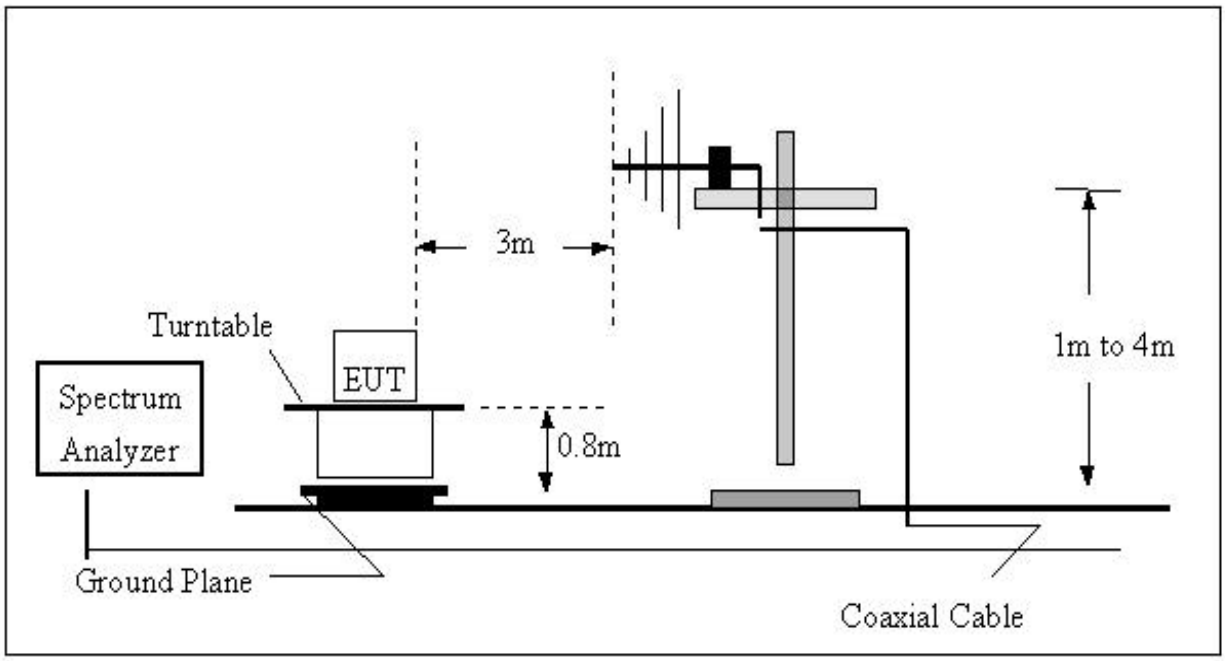
3.3 Measurement Data

Table - 4. Conducted Emission Data (0.15-30MHz) – Not Applicable

Table - 5. Radiated Emission Data (30-1000MHz)

Radiated Emission Data (above 1000MHz)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz

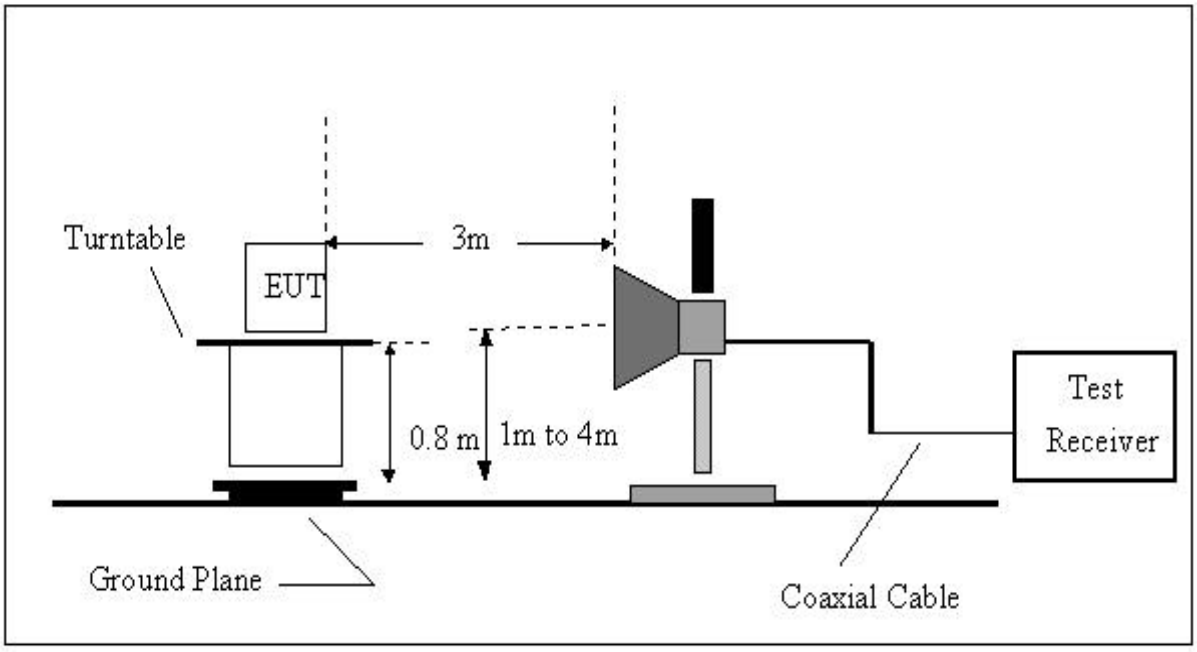


Table 5 Radiated Emission Data (30-1000MHz)

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)

The following table lists worst case data from TX / RX with various bitrates on various channels.

Freq. (MHz)	Ant. H/V	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Safe Margins (dBuV/m)	Note
79.100	V	47.77	- 15.98	31.79	40.00	- 8.21	
120.300	V	43.72	- 11.76	31.96	43.50	- 11.54	
143.900	H	44.12	- 10.35	33.77	43.50	- 9.73	
157.500	H	45.00	- 10.08	34.92	43.50	- 8.58	
159.200	V	41.71	- 10.16	31.55	43.50	- 11.95	
187.600	H	47.47	- 12.76	34.71	43.50	- 8.79	
221.700	V	48.17	- 13.11	35.06	46.00	- 10.94	
265.100	V	43.82	- 11.48	32.34	46.00	- 13.66	
334.900	V	41.12	- 9.35	31.77	46.00	- 14.23	
419.400	H	42.47	- 7.48	34.99	46.00	- 11.01	
433.100	H	40.40	- 7.22	33.18	46.00	- 12.82	
632.000	H	38.32	- 2.95	35.37	46.00	- 10.63	

Remark：

(1) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms

(2) All readings are Peak unless otherwise stated QP in column of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 25MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; " H" denotes spurious frequency. "E" denotes band edge frequency.

(4) Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode or QP detector mode of the emission 。

(5) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Table 5 Radiated Emission Data (above 1000MHz)

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)

The following table lists worst case data from TX / RX with various orthogonal planes on the EUT antenna.

CH0(2402MHz)

Freq. (MHz)	Ant.Pol. (H/V)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CF CF(dB)	Peak Act. (dBuV/m)	AV Act. (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	NOTE
4804.0	V	48.99	-	-11.72	37.27	-	74.00	54.00	X/H
7206.0	V	48.33	-	-6.71	41.62	-	74.00	54.00	X/H
9608.0	V	43.58	-	-5.32	38.26	-	74.00	54.00	X/H
12010.0	V	44.62	-	-4.54	40.08	-	74.00	54.00	X/H
14412.0	V	41.75	-	-2.08	39.67	-	74.00	54.00	X/H
16814.0	V	46.75	-	-3.9	42.86	-	74.00	54.00	X/H
4804.0	H	46.53	-	-11.72	34.81	-	74.00	54.00	X/H
7206.0	H	46.07	-	-6.71	39.36	-	74.00	54.00	X/H
9608.0	H	43.89	-	-5.32	38.57	-	74.00	54.00	X/H
12010.0	H	45.21	-	-4.54	40.67	-	74.00	54.00	X/H
14412.0	H	41.88	-	-2.08	39.80	-	74.00	54.00	X/H
16814.0	H	46.04	-	-3.89	42.15	-	74.00	54.00	X/H

Remark：

(1) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms

(2) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; " H" denotes spurious frequency. "E" denotes band edge frequency.

(4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

(5) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(This judgment method include the Band Edge Requirement.)

(6) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(7) EUT Orthogonal Axes：
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

Table 5 Radiated Emission Data (above 1000MHz)

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)

The following table lists worst case data from TX / RX with various orthogonal planes on the EUT antenna.

CH39(2441MHz)

Freq. (MHz)	Ant.Pol. (H/V)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CF CF(dB)	Peak Act. (dBuV/m)	AV Act. (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	NOTE
4882.0	V	48.20	-	-11.7	36.50	-	74.00	54.00	X/H
7323.0	V	49.19	-	-6.53	42.66	-	74.00	54.00	X/H
9764.0	V	43.86	-	-5.14	38.72	-	74.00	54.00	X/H
2205.0	V	43.99	-	-4.59	39.40	-	74.00	54.00	X/H
14646.0	V	43.73	-	-2.71	41.02	-	74.00	54.00	X/H
17087.0	V	45.99	-	-2.8	43.17	-	74.00	54.00	X/H
4882.0	H	47.80	-	-11.7	36.10	-	74.00	54.00	X/H
7323.0	H	46.70	-	-6.53	40.17	-	74.00	54.00	X/H
9764.0	H	44.24	-	-5.14	39.10	-	74.00	54.00	X/H
2205.0	H	44.14	-	-4.59	39.55	-	74.00	54.00	X/H
14646.0	H	43.02	-	-2.71	40.31	-	74.00	54.00	X/H
17087.0	H	46.15	-	-2.82	43.33	-	74.00	54.00	X/H

Remark：

(1) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms

(2) All readings are Peak unless otherwise stated QP in column of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; " H" denotes spurious frequency. "E" denotes band edge frequency.

(4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

(5) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(6) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(7) EUT Orthogonal Axes：

"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

Table 5 Radiated Emission Data (above 1000MHz)

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)

The following table lists worst case data from TX / RX with various orthogonal planes on the EUT antenna.

CH78(2480MHz)

Freq. (MHz)	Ant.Pol. (H/V)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CF CF(dB)	Peak Act. (dBuV/m)	AV Act. (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	NOTE
4960.0	V	51.66	-	-11.49	40.17	-	74.00	54.00	X/H
7440.0	V	49.34	-	-6.53	42.81	-	74.00	54.00	X/H
9920.0	V	44.70	-	-5.15	39.55	-	74.00	54.00	X/H
12400.0	V	44.11	-	-4.6	39.51	-	74.00	54.00	X/H
14880.0	V	43.17	-	-3.65	39.52	-	74.00	54.00	X/H
17360.0	V	46.02	-	-2.0	44.06	-	74.00	54.00	X/H
4960.0	H	48.30	-	-11.49	36.81	-	74.00	54.00	X/H
7440.0	H	45.71	-	-6.53	39.18	-	74.00	54.00	X/H
9920.0	H	45.69	-	-5.15	40.54	-	74.00	54.00	X/H
12400.0	H	43.78	-	-4.6	39.18	-	74.00	54.00	X/H
14880.0	H	44.06	-	-3.65	40.41	-	74.00	54.00	X/H
17360.0	H	46.93	-	-1.96	44.97	-	74.00	54.00	X/H

Remark：

(1) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms

(2) All readings are Peak unless otherwise stated QP in column of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; " H" denotes spurious frequency. "E" denotes band edge frequency.

(4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

(5) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(This judgment method include the Band Edge Requirement.)

(6) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(7) EUT Orthogonal Axes：
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

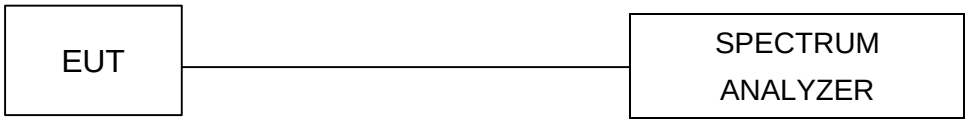
4. Hopping Channel Carrier Frequency Separated

4.1 Applied Standard / limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)	Hopping Channel Carrier Frequency Separated	>= 25KHz or the 20dB bandwidth of the hopping channel	2400-2483.5	PASS

4.2 Test Setup

(1) EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
(2) Spectrum Setting : RBW= 100KHz, VBW=100KHz,Sweep time = 200 ms.



4.3 Test Result

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)
Please refer to the attachment F.

Hopping Channel Carrier Frequency Separated	LIMIT (KHz)
1 MHz	>= 25

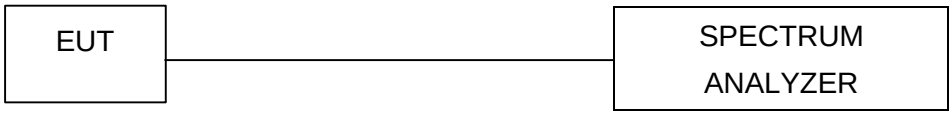
5 Number of Hopping Channel

5.1 Applied Standard / limit

FCC Part15 (15.247) , Subpart C		
Section	Test Item	Frequency Range (MHz)
15.247 (a)(1)(ii)	Number of Hopping Channel	2400-2483.5

5.2 Test Setup

(1) EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
(2) Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.



5.3 Test Result

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)
Please refer to the attachment G.

Number of Hopping Channel	79

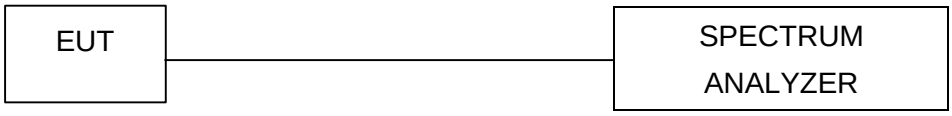
6 Average Time of Occupancy

6.1 Applied Standard / limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(ii)	Average Time of Occupancy	< = 0.4 sec (a 30 second period)	2400-2483.5	PASS

6.2 Test Setup

(1) EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
(2) Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.



6.3 Test Result

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)
Please refer to the attachment H.

The EUT total hops / second (1)	1600 times (Bluetooth Standard)
Total channel (2)	79
each channel hops/second (3)=(1)/(2)	20.25 times
each channel hops in 30 second (4)=30 x(3)	607.5 times
Average time of signal channel occupancy (5)	400ms(see plot below)
Average Time of Occupancy (6)=(4) x (5)	0.26 second
LIMIT(second)	<= 0.4 second

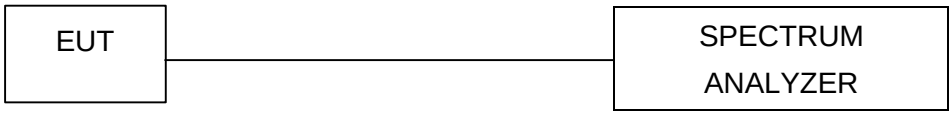
7 Bandwidth

7.1 Applied Standard / limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(ii)	Bandwidth	<= 1MHz (20dB bandwidth)	2400-2483.5	PASS

7.2 Test Setup

(1) EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
(2) Spectrum Setting : RBW= 10KHz, VBW=30KHz, Sweep time = 200 ms.



7.3 Test Result

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)
Please refer to the attachment I.

CH	CH Frequency (MHz)	Bandwidth (KHz)	LIMIT (MHz)
0	2402	883.3	<= 1
39	2441	936.6	<= 1
78	2480	883.3	<= 1

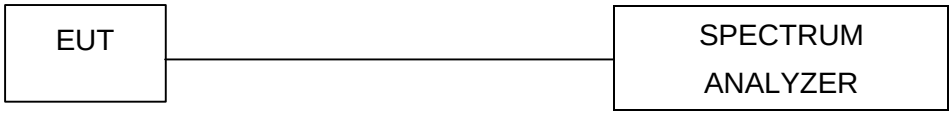
8 Peak Output Power

8.1 Applied Standard / limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(1)	Peak Output Power	1 watt or 30dBm (at least 75 hopping channel)	2400-2483.5	PASS

8.2 Test Setup

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the
block diagram below,
(2) Spectrum Setting : RBW= 3MHz, VBW= 3MHz, Sweep time = 200 ms.



8.3 Test Result

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)
Please refer to the attachment J.

CH	CH Frequency (MHz)	Peak Output Power (dBm)	LIMIT (dBm)	LIMIT (W)
0	2402	0.33	30	1
39	2441	3.43	30	1
78	2480	4.62	30	1

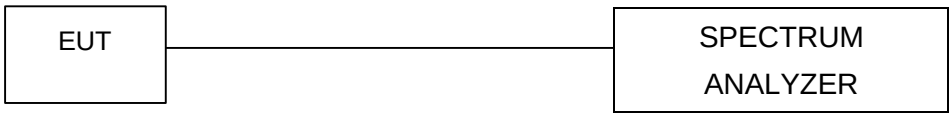
9 Antenna conducted Spurious Emission

9.1 Applied Standard / limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (c)	Antenna conducted Spurious Emission	20dB less than the peak value of fundamental frequency	30-25000	PASS

9.2 Test Setup

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the
block diagram below,
(2) Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.



9.3 Test Result

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)
Please refer to the attachment K.

The max. radio frequency power in any 100kHz bandwidth outside the frequency band		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2484.45	-41.59	2480	4.62
Result			
In any 100kHz bandwidth outside the frequency band, the radio frequency power is at least 20dB below that in the 100kHz bandwidth within the band, that contains the highest lever of the desired power.			

10 Maximum Permissible Exposure (MPE)

10.1 Applied Standard / limit

FCC CFR 47 Section 2.1091		
Frequency Range(MHz)	MPE Limit (mW/cm^2)	Result
1500-100,000	1	PASS

10.2 Test Result

Special Notes：(EUT Operation Mode or Test Configuration Mode, if applicable)

Peak output power (dBm)	Ant Gain (dBi)	EIRP (1)		The maximum power density at 20cm distance : S	LIMIT (mW/cm^2)
		(dBm)	mW		
4.62	3	7.62	5.78	0.0011 << 1	1

NOTE:
(1) EIRP= Peak output power + Ant Gain
(2) S (mW/cm^2) = EIRP / ($4\pi R^2$)

Attachment

Table Contents

Attachment - A.

Electric Block Diagram

Attachment - B.

EUT Modification Description

Attachment - C.

EUT Test Photos

1. Radiated Measurement Photos

Attachment - D.

EUT Photos

1. **Photo # 1 Front View/ Rear View**
2. **Photo # 2 Unit Partially Disassembled**
3. **Photo # 3 Unit Partially Disassembled**
4. **Photo # 4 Unit Partially Disassembled**

Attachment – E.

User' s Manual

Attachment - L.

Laboratory Accreditation Certificate

Attachment - M.

Product Labeling