Applicant (SZH001):	I-STAR ENTERPRISE (HONG KONG) LIMITED 12/F, A T TOWER 180 ELECTRONIC ROAD NORTH POINT, HONG KONG
Manufacturer:	SHENZHEN HAIS ELECTRONIC CO., LTD 14BUILDING, CHEN TIAN INDUSTRIAL ZONE, BAOMIN 2/R, BAO'AN, SHENZHEN, CHINA
Description of Samples:	Product: 2.4G wireless Nunchuck Brand Name: N/A Model Number: 4384376N-A FCC ID: Y5L4384376N-A
Date Samples Received:	2010-11-23
Date Tested:	2010-11-30
Investigation Requested:	Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2009 and ANSI C63.4:2009 for FCC Certification.
Conclusions:	The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.
Remarks:	---

Dr. LEE Kam Chuen
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.

CONTENT:

1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
10 Dai Wang Street, Taipo Industrial Estate
New Territories, Hong Kong

1.2 Equipment Under Test [EUT]
Description of Sample

Product:	2.4G wireless Nunchuck
Manufacturer:	SHENZHEN HAIS ELECTRONIC CO., LTD 14 BUILDING, CHEN TIAN INDUSTRIAL ZONE, BAOMIN 2/R, BAO'AN, SHENZHEN, CHINA
Brand Name:	N/A
Model Number:	4384376N-A
Input Voltage:	3Vd.c. ("AAA" size battery×2)

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is an I-STAR ENTERPRISE (HONG KONG) LIMITED, it is game controller, modulation by IC; and type is frequency hopping speed spectrum Modulation.

1.3 Date of Order

2010-11-23

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2010-11-30

1.6 Country of Origin

China

2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2009 Regulations and ANSI C63.4:2009 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION
Results Summary

Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Fail	N/A
Output Power of Fundamental Emissions	FCC 47CFR 15.247(b)(1)	ANSI C63.4:2009	N/A	☒	☐	☐
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.4:2009	N/A	☒	☐	☐
Number of Operating Channel	FCC 47CFR 15.247(a)(2)(b)(1)	N/A	N/A	☒	☐	☐
Channel Separation	FCC 47CFR 15.247(a)(1)	N/A	N/A	☒	☐	☐
Pseudorandom Hopping Algorithm	FCC 47CFR 15.247(a)(1)	N/A	N/A	☒	☐	☐
Time of Occupancy	FCC 47CFR 15.247(a)(1)(iii)	N/A	N/A	☒	☐	☐
Bandwidth	FCC 47CFR 15.247(a)(2)	N/A	N/A	☒	☐	☐
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	☒	☐	☐

Note: N/A - Not Applicable

3.0 Test Results

3.1 Emission

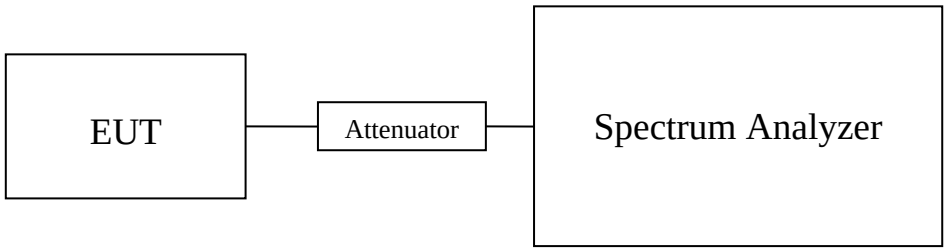
3.1.1 Maximum Peak Output Power

Test Requirement:	FCC 47CFR 15.247(b)(1)
Test Method:	N/A
Test Date:	2010-11-30
Mode of Operation:	Tx mode

Test Method:

The RF output of the EUT was connected to the spectrum analyzer. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in dBm.

Test Setup:



Limits for Peak Output Power of Fundamental & Harmonics Emissions [FCC 47CFR 15.247]:

The maximum peak output power shall not exceeded the following limits: For frequency hopping systems employing at least 75 hopping channels: 1 Watt For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt

Results of Tx Mode (2402.0 MHz to 2480.0MHz) : Pass (TX Unit)
Maximum conducted output power

Transmitter Frequency (MHz)	Maximum conducted output power (mW)
2402	0.3

Transmitter Frequency (MHz)	Maximum conducted output power (mW)
2441	0.2

Transmitter Frequency (MHz)	Maximum conducted output power (mW)
2480	0.2

Calculated measurement uncertainty : 30MHz to 1GHz 1.7dB
1GHz to 18GHz 1.7dB

3.1.2 Radiated Emissions

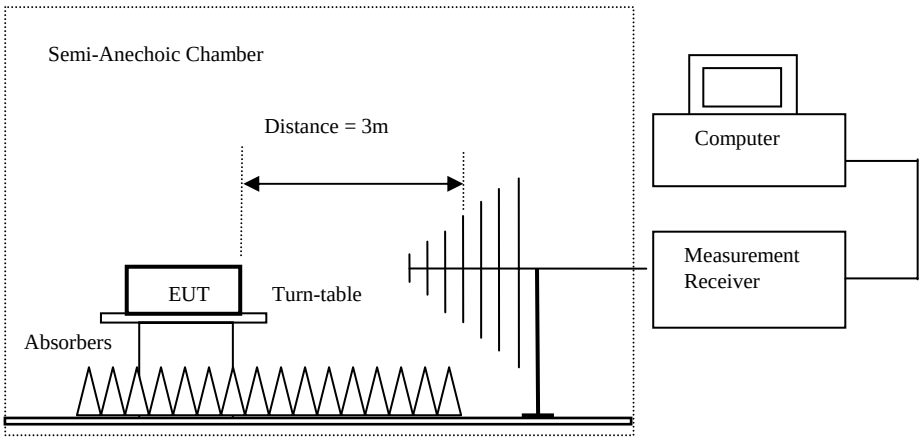
Test Requirement:	FCC 47CFR 15.209
Test Method:	ANSI C63.4:2009
Test Date:	2010-11-30
Mode of Operation:	Tx mode

Test Method:

The sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

* Semi-anechoic chamber located on the G/F of "The Hong Kong Standards and Testing Centre Ltd." with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

Test Setup:



Absorbers placed on top of the ground plane are for measurements above 1000MHz only.

Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of Tx Mode(2402MHz): Pass

Field Strength of Harmonic Emissions PeakValue						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
4804.0	2.3	41.9	44.2	74.0	-29.8	Horizontal
4804.0	2.0	41.9	43.9	74.0	-30.1	Vertical
7206.00	1.6	47.8	49.4	74.0	-24.6	Horizontal
7206.00	1.1	47.8	48.9	74.0	-25.1	Vertical

Field Strength of Harmonic Emissions AverageValue						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
4804.0	-17.7	41.9	24.2	54.0	-29.8	Horizontal
4804.0	-18.0	41.9	23.9	54.0	-30.1	Vertical
7206.00	-18.4	47.8	29.4	54.0	-24.6	Horizontal
7206.00	-18.9	47.8	28.9	54.0	-25.1	Vertical

Remarks:

* Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.1dB
1GHz to 18GHz 5.1dB

Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of Tx Mode(2441MHz): Pass

Field Strength of Harmonic Emissions PeakValue						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
4882.0	2.7	42.0	44.7	74.0	-29.3	Horizontal
4882.0	2.5	42.0	44.5	74.0	-29.5	Vertical
7323.0	1.8	48.0	49.8	74.0	-24.2	Horizontal
7323.0	1.4	48.0	49.4	74.0	-24.6	Vertical

Field Strength of Harmonic Emissions AverageValue						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
4882.0	-17.3	42.0	24.7	54.0	-29.3	Horizontal
4882.0	-17.5	42.0	24.5	54.0	-29.5	Vertical
7323.0	-18.2	48.0	29.8	54.0	-24.2	Horizontal
7323.0	-18.6	48.0	29.4	54.0	-24.6	Vertical

Remarks:

* Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.1dB
1GHz to 18GHz 5.1dB

Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of Tx Mode(2480MHz): Pass

Field Strength of Harmonic Emissions PeakValue						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
4960.0	2.2	42.0	44.2	74.0	-29.8	Horizontal
4960.0	1.7	42.0	43.7	74.0	-30.3	Vertical
7440.00	1.3	48.2	49.5	74.0	-24.5	Horizontal
7440.00	1.0	48.2	49.2	74.0	-24.8	Vertical

Field Strength of Harmonic Emissions AverageValue						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
4960.0	-17.8	42.0	24.2	54.0	-29.8	Horizontal
4960.0	-18.3	42.0	23.7	54.0	-30.3	Vertical
7440.00	-18.7	48.2	29.5	54.0	-24.5	Horizontal
7440.00	-19.0	48.2	29.2	54.0	-24.8	Vertical

Remarks:

* Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.1dB
1GHz to 18GHz 5.1dB

Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of Communication Mode: Pass

Field Strength of Fundamental Emissions Quasi-Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
58.7	27.4	7.2	34.6	40.0	-5.4	Vertical
198.2	23.2	10.8	34.0	43.5	-9.5	Vertical
324.0	19.7	15.2	34.9	46.0	-11.1	Horizontal

Remarks:

* Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.1dB
1GHz to 18GHz 5.1dB

3.1.3 Frequency Range Measurement

Test Requirement:	FCC 47CFR 15.247(a)(1)
Test Method:	ANSI C63.4:2009
Test Date:	2010-11-29
Mode of Operation:	Tx Mode

Test Method:

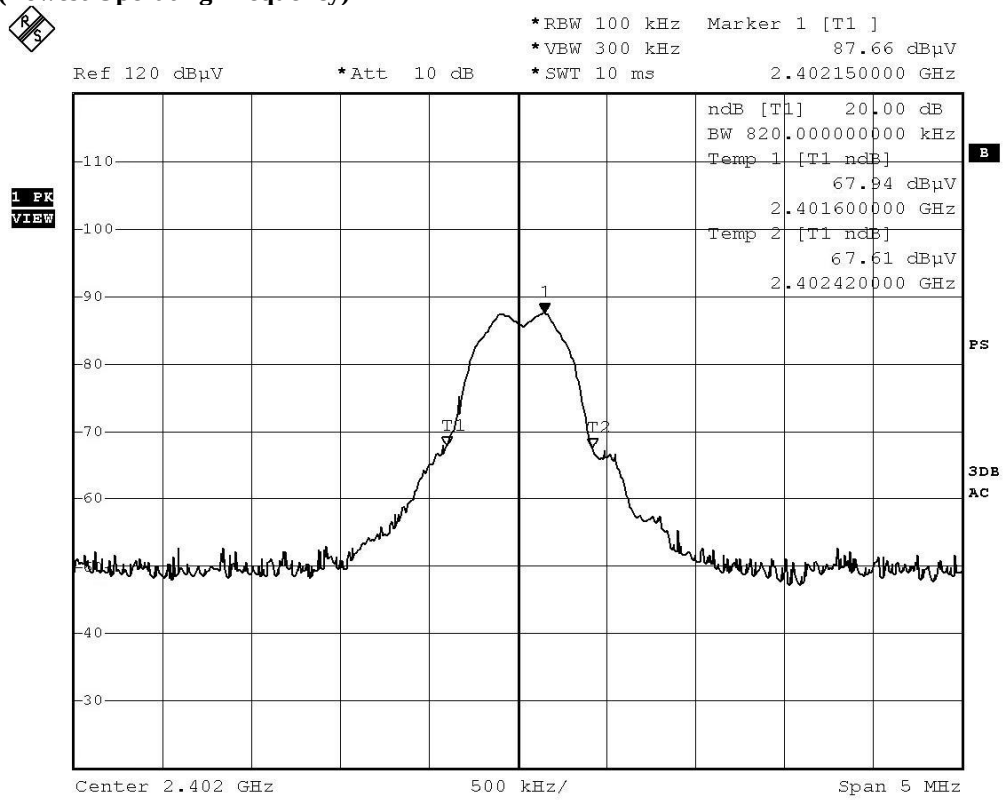
The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

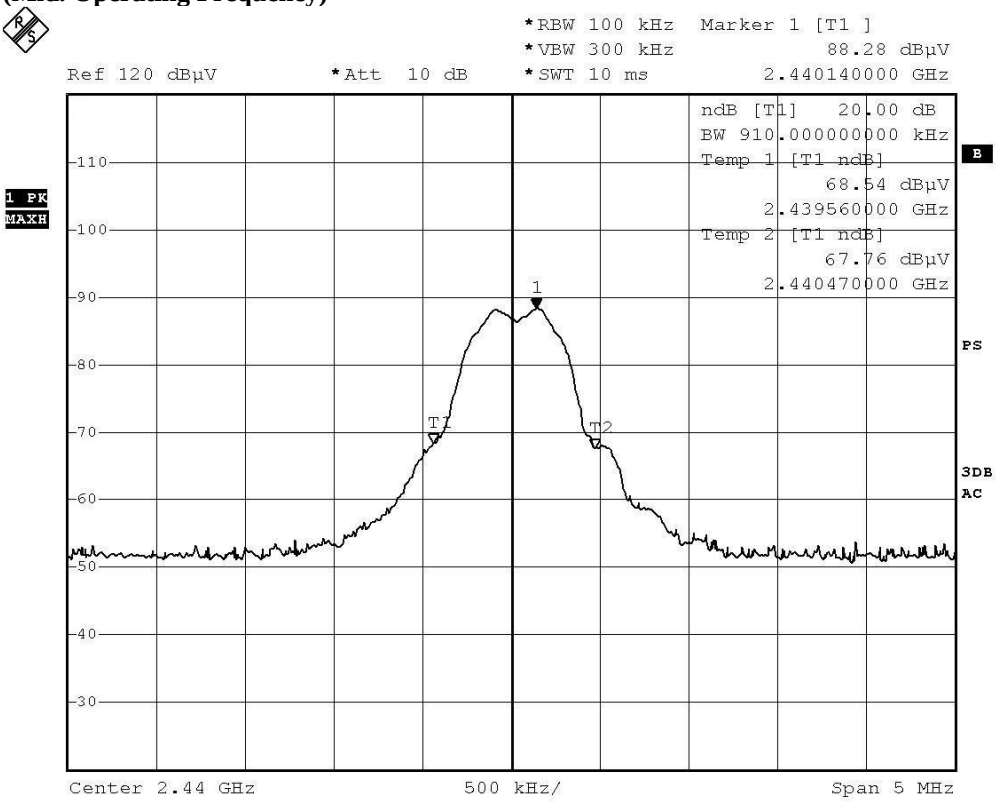
Frequency Range	20dB Bandwidth	FCC Limits
[MHz]	[kHz]	[MHz]
2402.15	820.0	Within 2400-2483.5

(Lowest Operating Frequency)



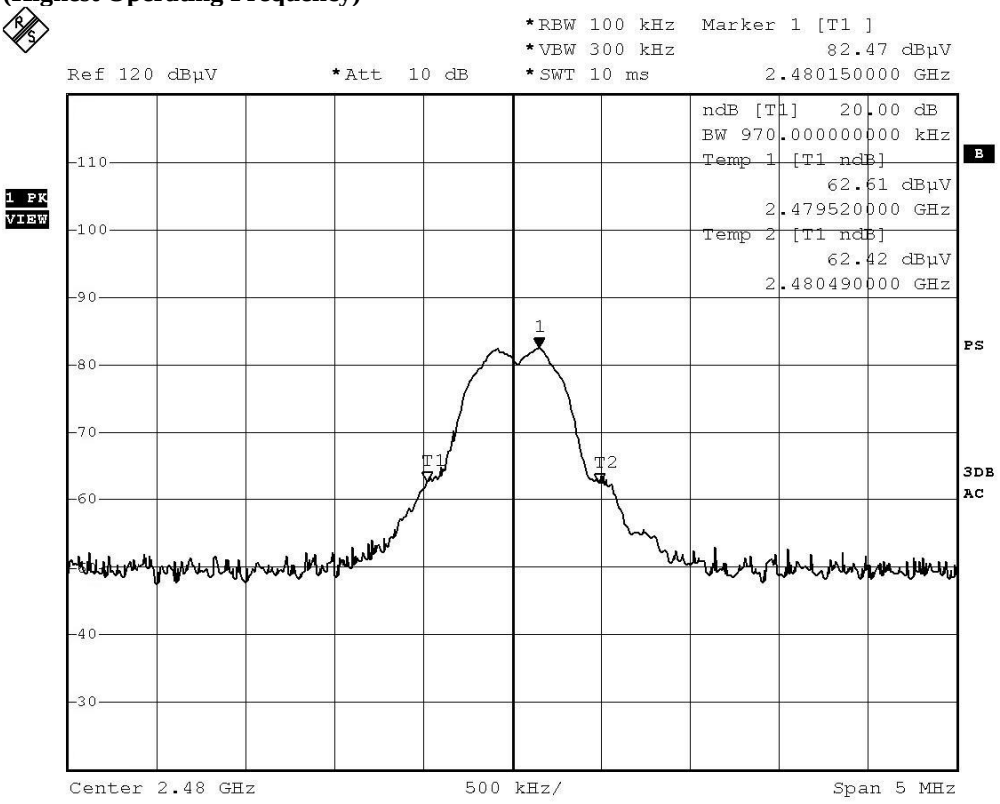
Frequency Range	20dB Bandwidth	FCC Limits
[MHz]	[kHz]	[MHz]
2440.14	910.0	Within 2400-2483.5

(Mid. Operating Frequency)



Frequency Range	20dB Bandwidth	FCC Limits
[MHz]	[kHz]	[MHz]
2480.15	970.0	Within 2400-2483.5

(Highest Operating Frequency)



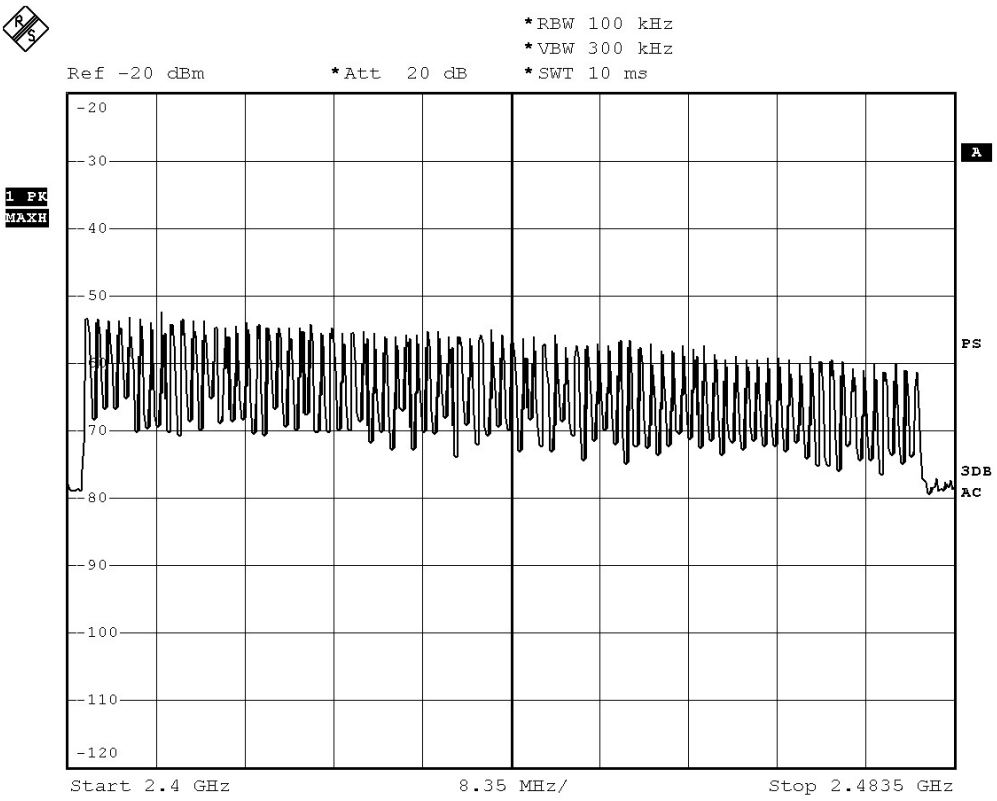
Channel Centre Frequency

Requirements:
Frequency hopping system in the 2400-2483.5MHz band shall use at least 15 non-overlapping channels.

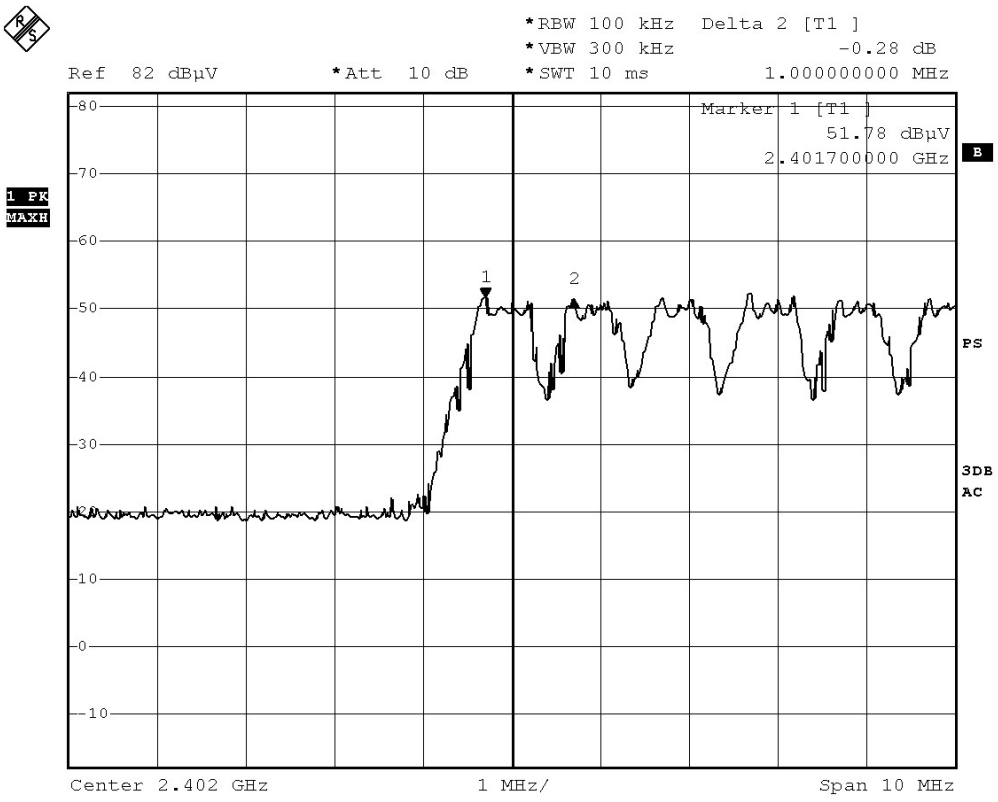
Item	Frequency (MHz)	Item	Frequency (MHz)	Item	Frequency (MHz)
1	2402	31	2432	61	2462
2	2403	32	2433	62	2463
3	2404	33	2434	63	2464
4	2405	34	2435	64	2465
5	2406	35	2436	65	2466
6	2407	36	2437	66	2467
7	2408	37	2438	67	2468
8	2409	38	2439	68	2469
9	2410	39	2440	69	2470
10	2411	40	2441	70	2471
11	2412	41	2442	71	2472
12	2413	42	2443	72	2473
13	2414	43	2444	73	2474
14	2415	44	2445	74	2475
15	2416	45	2446	75	2476
16	2417	46	2447	76	2477
17	2418	47	2448	77	2478
18	2419	48	2449	78	2479
19	2420	49	2450	79	2480
20	2421	50	2451		
21	2422	51	2452		
22	2423	52	2453		
23	2424	53	2454		
24	2425	54	2455		
25	2426	55	2456		
26	2427	56	2457		
27	2428	57	2458		
28	2429	58	2459		
29	2430	59	2460		

30	2431	60	2461

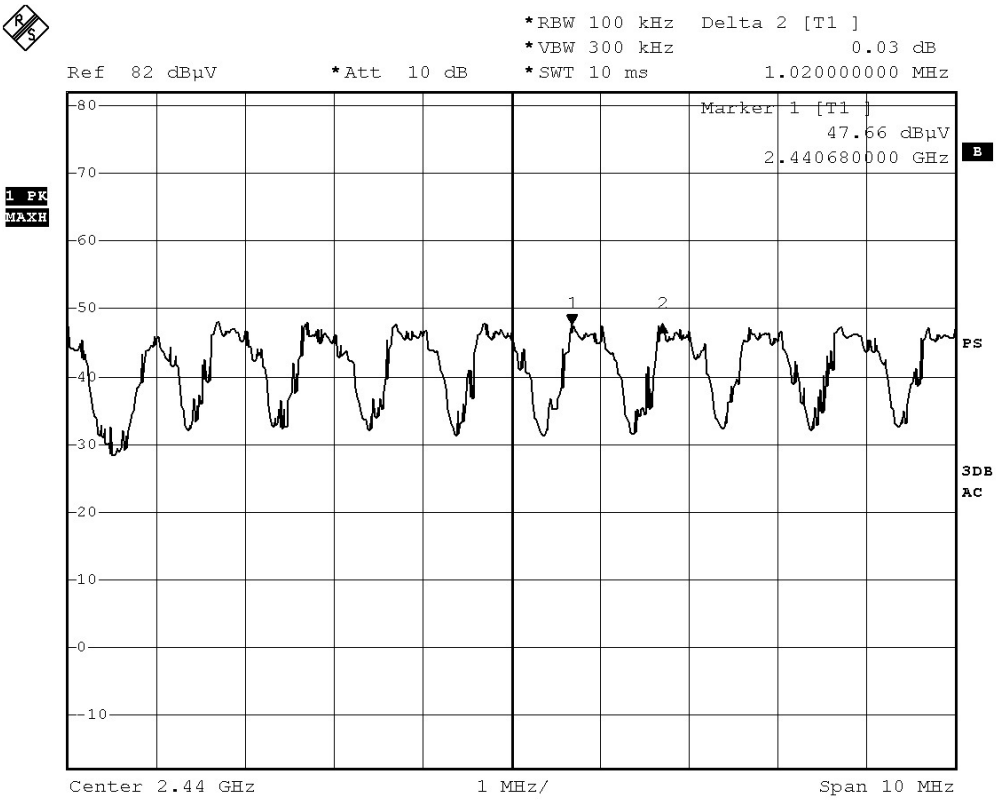
Number of Hopping frequencies = 79 Channels



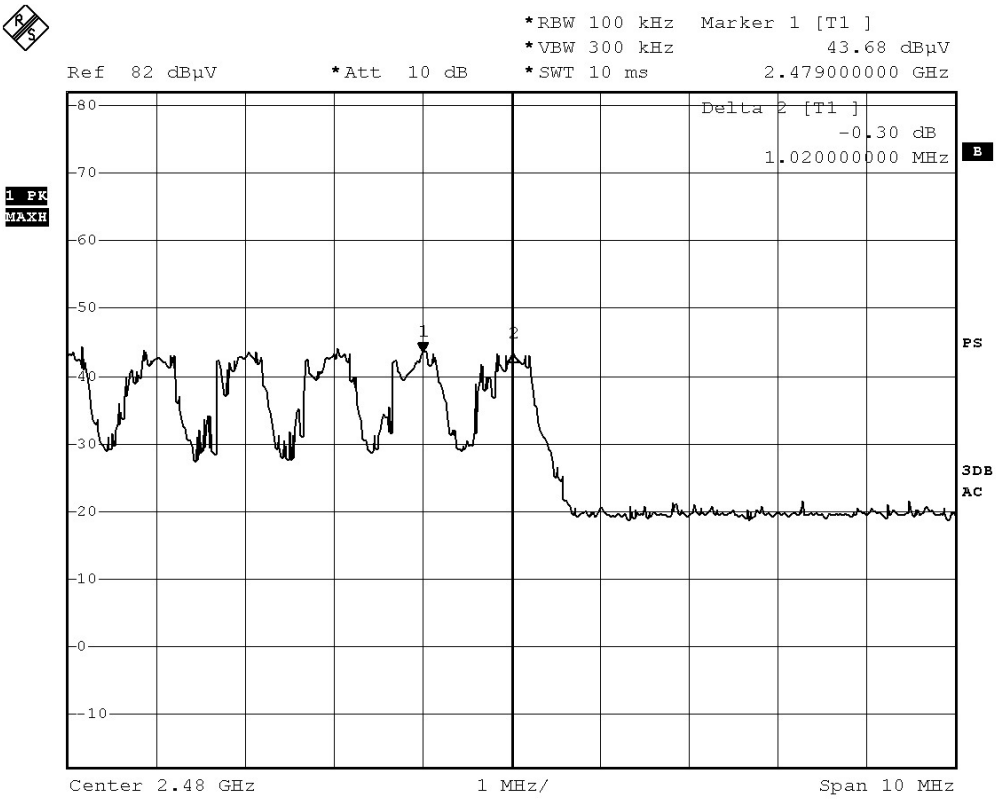
Lowest Frequency Separation（1000.0KHz）



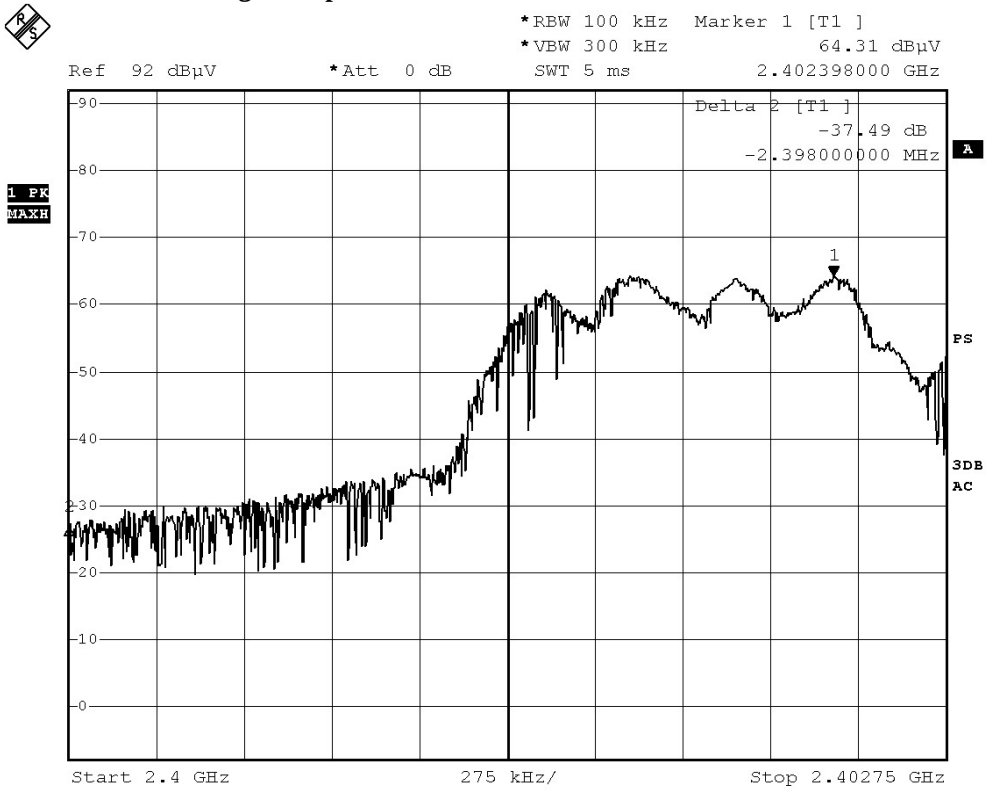
Mid Frequency Separation（1020.0KHz）



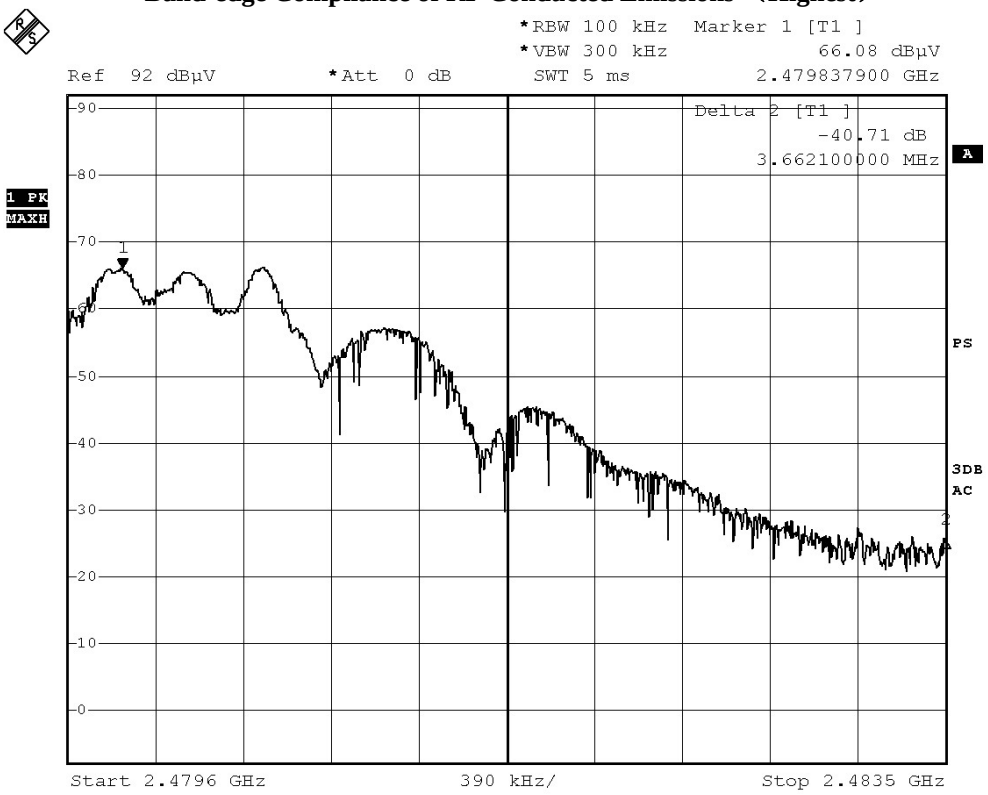
Highest Frequency Separation（1020.0KHz）



Band-edge Compliance of RF Conducted Emissions （Lowest）



Band-edge Compliance of RF Conducted Emissions （Highest）



Antenna Requirement

Test Requirements: § 15.203

Test Specification:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Test Results:

The EUT has 1 Antenna which is permanently attached to the main unit and attached on PCB board, the antenna gain = 0dBi. All component install on inside of EUT. User unable to remove or changed the Antenna.

Pseudorandom Hopping Algorithm

Requirements:

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

Pseudorandom Frequency Hopping

The embedded FHSS engine uses 79 hopping frequencies. Each channel frequency is selected from a pseudorandom ordered list of hopping frequencies, from 2402.0MHz to 2480.0MHz with separating in 996.0 kHz apart from each of the channels. A single data frame is transmitted on each frequency location before skipping to the next hopping frequency in the list. Each channel is occupied 8 milliseconds.

Typically, the initiation of an FHSS communication is as follows

1. The initiating party sends a request via a predefined frequency or control channel.
2. The receiving party sends a number, known as a seed back to the initiating party.
3. The initiating party sends a synchronization signal acknowledging to the receiving party as it has successfully established a transmission link.
4. The communication begins, and both the receiving and the sending party change their frequencies along an unpredictable hopping sequence with pseudorandom properties.

System Receiver Input Bandwidth

The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1005. 0 kHz. The receiver bandwidth was verified during RF hopping to the relative channel.

Receiver Hopping Capability

The associated receiver has the ability to shift frequencies in synchronization with the transmitted signals, with they start connect with a same channel and then hop to next channel with a same formula among each other.

Occupancy Time

Requirements:

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 channel employed.
No requirements for Digital Transmission System.

Measurement Data: Number of RF channel: 79
Observed duration of occupancy: 0.4x75=31.6s
Period observed: 2s
Duration of a burst: 340μs

Time of occupancy: ((8x0.00034)/2s x 31.6 = 0.043
See fig. A and B.

Remark: The Occupancy Time of the Lowest, Middle and Highest operating frequency has been examined and the worst case test result is recorded in this test report.

Fig. A Time between RF Burst

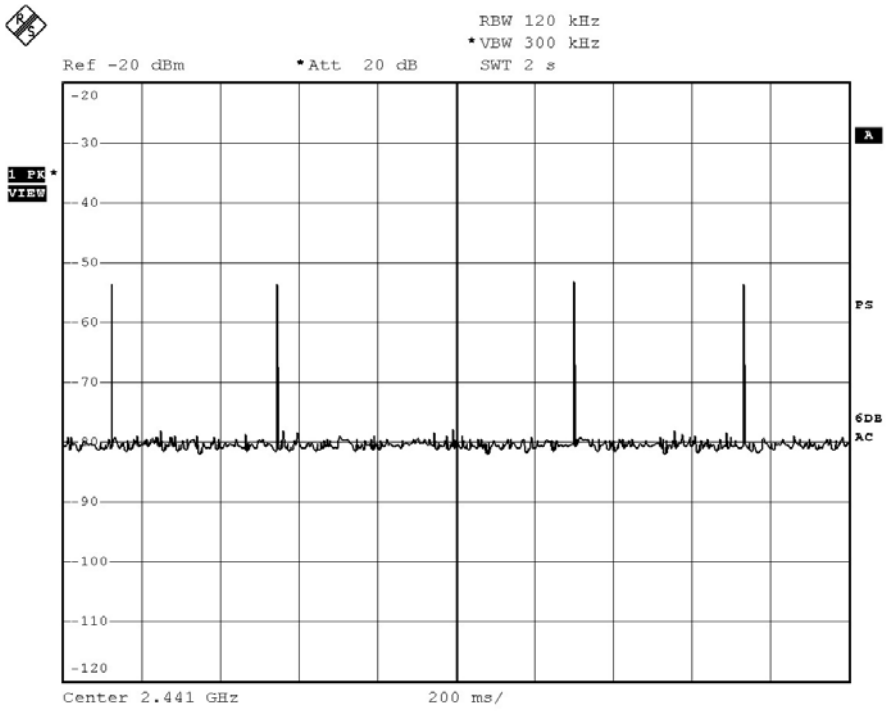
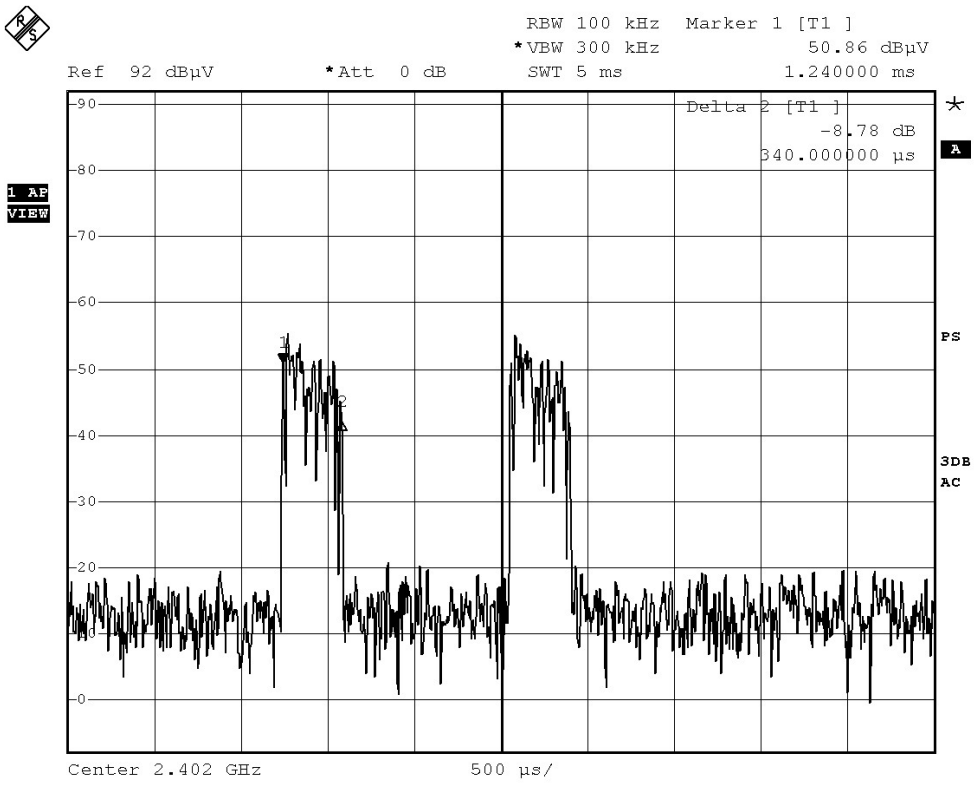


Fig B . RF Burst



RF Exposure

Test Requirement:	FCC 47CFR 15.247(b)(5)
Test Date:	2010-12-02
Mode of Operation:	Tx mode

Test Method:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

Test Results:

The EUT complied with the requirement(s) of this section.
EUT meets the requirements of these sections as proven through MPE calculation
The MPE calculation for EUT @ 20cm
Based on the highest P = 10 mW

Pd = PG/ 4pi*R^2 = (0.3 x 1.0)/12.566* $(20)^2$
= (0.3)/12.56637x 400= 17.0 / 5026.55
= 0.00006 mW/cm^2

where:
*Pd = power density in mW/cm2
* G = Antenna numeric gain (1.0); Log G = g/10 (g = 0).
* P = Conducted RF power to antenna (0.3 mW).
* R = Minimum allowable distance.(20 cm)

*The power density Pd = 0.00006 mW/cm^2 is less than 1 mW/cm^2 (listed MPE limit)
*The SAR evaluation is not needed (this is a desk top device, R> 20 cm)
* The EUT(antenna) must be 0.2 meters away from the General Population.

Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM020	HORN ANTENNA	EMCO	3115	4032	2009/09/11	2011/09/11
EM215	MULTIDEVICE CONTROLER	EMCO	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-Linggren	FACT-3	--	2010/10/25	2011/11/25
EM174	BICONILOG ANTENNA	EMCO	3142B	1671	2010/02/09	2012/02/09
EM194	BICONILOG ANTENNA	EMCO	3142B	1795	2010/10/06	2012/10/06
EM219	BICONILOG ANTENNA	EMCO	3142C	00029071	2009/01/06	2011/01/06
EM229	EMI Test Receiver	R&S	ESIB40	100248	2010/11/02	2011/11/02
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2010/07/01	2011/07/01
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2009/07/26	2011/07/26

Remarks:-

CM Corrective Maintenance
N/A Not Applicable or Not Available
TBD To Be Determined

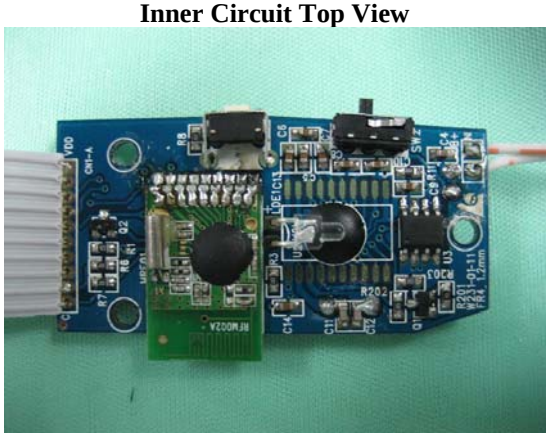
Appendix B

Photographs of EUT

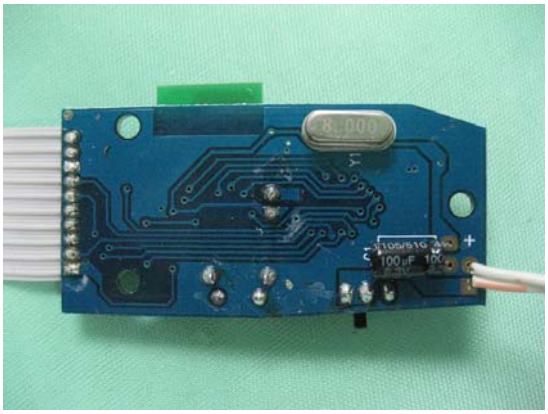
Front View of the product

Rear View of the product

Inner Circuit Top View

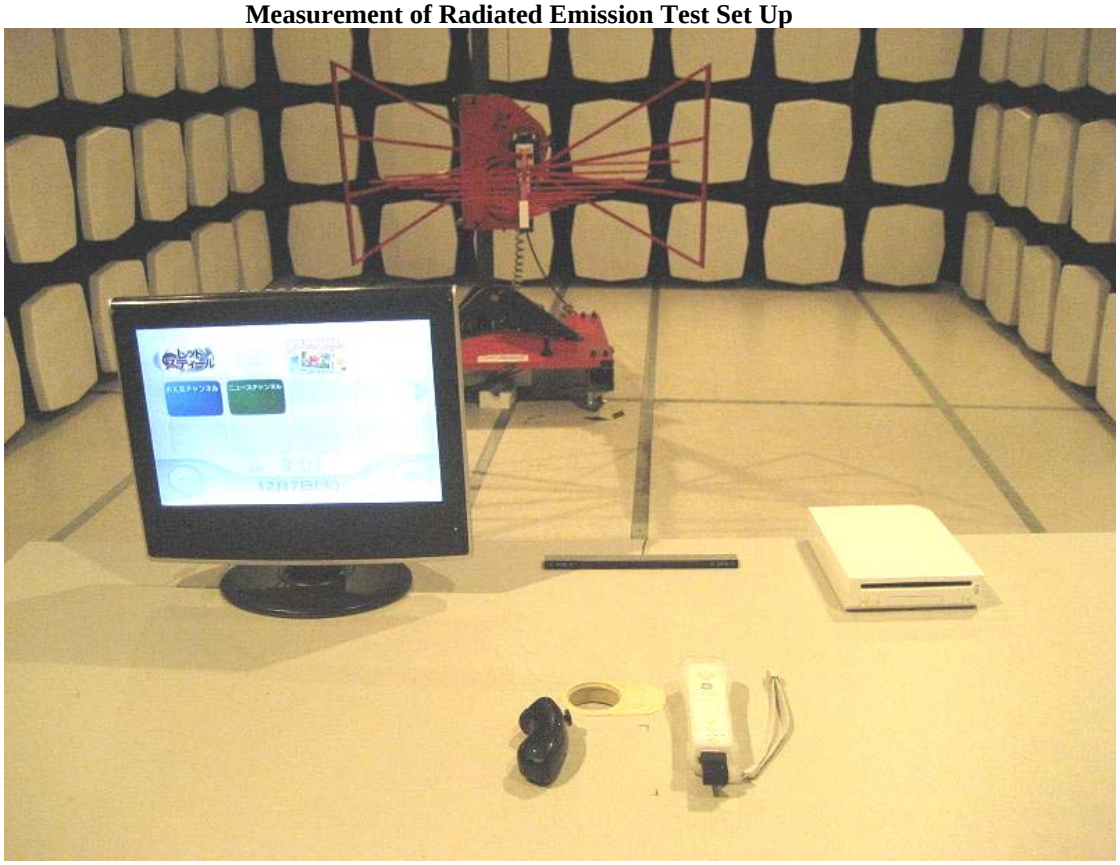


Inner Circuit Bottom View



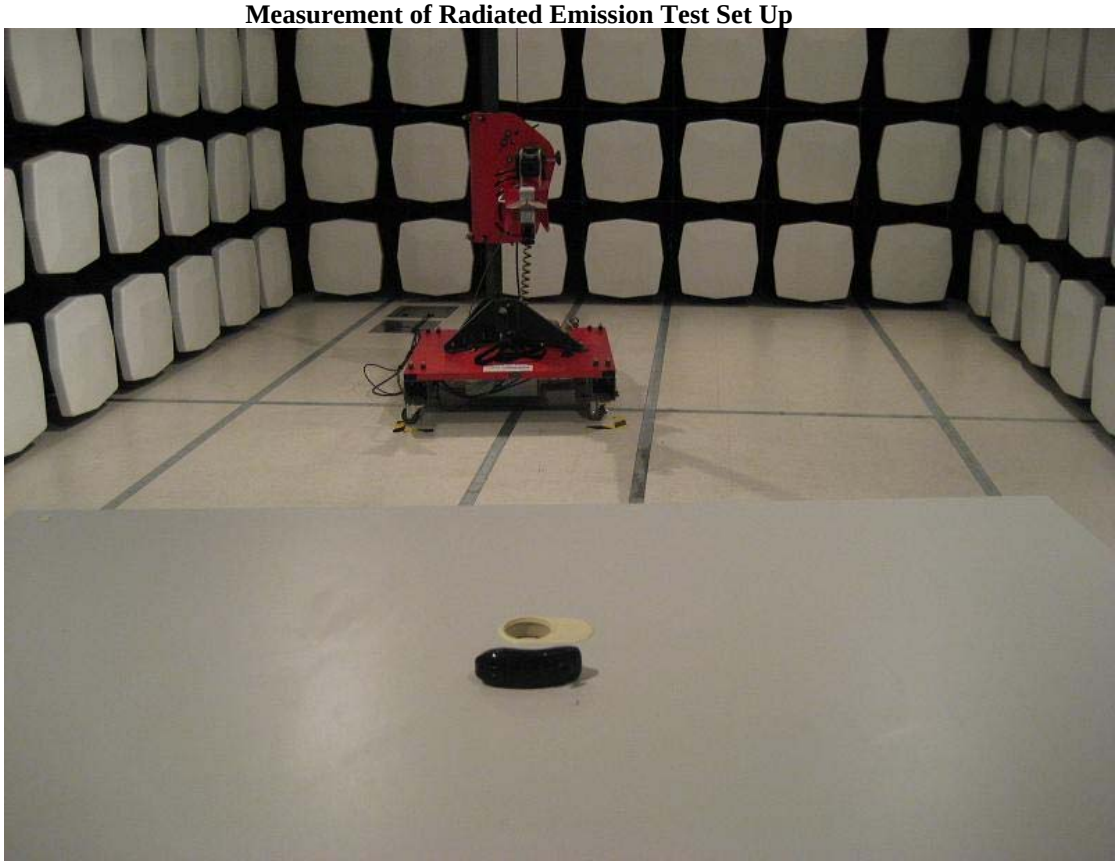
Photographs of EUT

Measurement of Radiated Emission Test Set Up



Photographs of EUT

Measurement of Radiated Emission Test Set Up



******* End of Test Report *******