

FCC TEST REPORT

FCC ID : NDZDW200C

Applicant : Precision Enterprise Ltd

Address of Applicant : Unit 2504, 25/F, Nanyang Plaza ,No. 57, Hung To Road
Kwun Tong, Kowloon Hongkong

Equipment Under Test (EUT) :

Product description : 2.4GHz Wireless Digital Transmitter

Model No. : DW200C

Standards : FCC 15 Paragraph 15.247

Date of Test : Dec. 25 to Dec 26, 2008

Test Engineer : Maikou.zhang

Reviewed By : 

PERPARED BY:

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3 Test Summary

Test Items	Test Requirement	Test Method	Limit / Severity	Result
Maximum peak output power	FCC Part 15:2007	ANSI C63.4: 2003	30dBm	PASS
Restricted Band	FCC Part 15:2007	ANSI C63.4: 2003	Note	PASS
Dwell time	FCC Part 15:2007	ANSI C63.4: 2003	Maximum:0.4 s	PASS
Channel separation	FCC Part 15:2007	ANSI C63.4: 2003	Channel separation at least 1MHz	PASS
Hopping channel No.	FCC Part 15:2007	ANSI C63.4: 2003	at least 15channels	PASS
20-dB Bandwidth	FCC Part 15:2007	ANSI C63.4: 2003	Note	PASS
RF Exposure Test	FCC Part 15:2007	ANSI C63.4: 2003	Note	PASS
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	FCC Part 15:2007	ANSI C63.4: 2003	N/A	PASS
Radiation Emission, 30MHz to 25GHz	FCC Part 15:2007	ANSI C63.4: 2003	N/A	PASS

Note : denote that for more details of the EUT , please refer to the relating test items as below .

Remark : the methods of measurement in all the test items were according to the FCC Public Notice DA 00-705 .

4 General Information

4.1 Client Information

Applicant:	Protronic Electronics LTD
Address of Applicant:	Unit 2504, 25/F, Nanyang Plaza ,No. 57, Hung To Road Kwun Tong, Kowloon Hongkong
Manufacturer:	DongGuan Protronics Electrconics LTD
Address of Manufacturer:	Protronic Industrial Park, Xiangxi Village ,Shipai Town, Dongguan,Guangdong, China

4.2 General Description of E.U.T.

Product description:	2.4GHz Wireless Digital Transmitter
Model No.:	DW200C

4.3 Details of E.U.T.

Power Supply:	Adapter Input: 100-240V~ 50/60Hz 0.15A Adapter Output: DC5.0V 0.8A
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4.4 Description of Support Units

The EUT has been tested as an independent unit.

4.5 Standards Applicable for Testing

The customer requested FCC tests for a 2.4GHz Wireless Digital Transmitter. The standards used were FCC 15 Paragraph 15.247, Paragraph 15.205, Paragraph 15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, June 24, 2008.

- **IC – Registration No.: IC 7760**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration IC7760, July 24, 2008.

4.7 Test Location

All Emissions tests were performed at:-

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen 518105, Guangdong, China.

Remark : All the test results of the peripherals were conformed to the FCC Verification requirements.

5 Equipment Used during Test

Equipment	Brand Name	Model	Related standards	Cal.Intal Months	Last Cal. Date	Serial No
3m Semi-anechoic chamber						
EMC Analyzer	Agilent	E7405A	ISO9001:2000	12	Aug-08	MY4511494 3
Trilog Broadband Antenne 30-3000 MHz	SCHWARZB ECK MESS- ELEKTROM	VULB9163	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	336
Broad-band Horn Antenna	SCHWARZB ECK MESS- ELEKTROM	BBHA 9120 D	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	667
Broadband Preamplifier	SCHWARZB ECK MESS- ELEKTROM	BBV 9718	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	9718-148
10m Coaxial Cable with N-male Connectors usable	SCHWARZB ECK MESS- ELEKTROM	AK 9515 H	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	-
10m 50 Ohm Coaxial Cable with N- plug,individual length,usable up to 3(5)GHz, Connectors	SCHWARZB ECK MESS- ELEKTROM	AK 9513	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	-
Positioning Controller	C&C LAB	CC-C-IF	ISO9001	12	Aug-08	MF7802108
Color Monitor	SUNSPO	SP-14C	ISO9001	12	Aug-08	-
EMI Shielded Room						
Test Receiver	ROHDE&SC HWARZ	ESPI	ISO9001	12	Aug-08	101155
Two-Line V-Network	ROHDE&SC HWARZ	ENV216	ISO9001 EN/ISO/IEC 17025	12	Aug-08	100115
Absorbing Clamp	ROHDE&SC HWARZ	MDS-21	ISO9001 EN/ISO/IEC 17025	12	Aug-08	100205
10m 50 Ohm Coaxial Cable with N- plug,individual length,usable up to 3(5)GHz, Connectors	SCHWARZB ECK MESS- ELEKTROM	AK 9514	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	-

6 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
Test Date:	Dec 25,2008
Frequency Range:	150kHz to 30MHz
Class:	Class B
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

6.1 Test Equipment

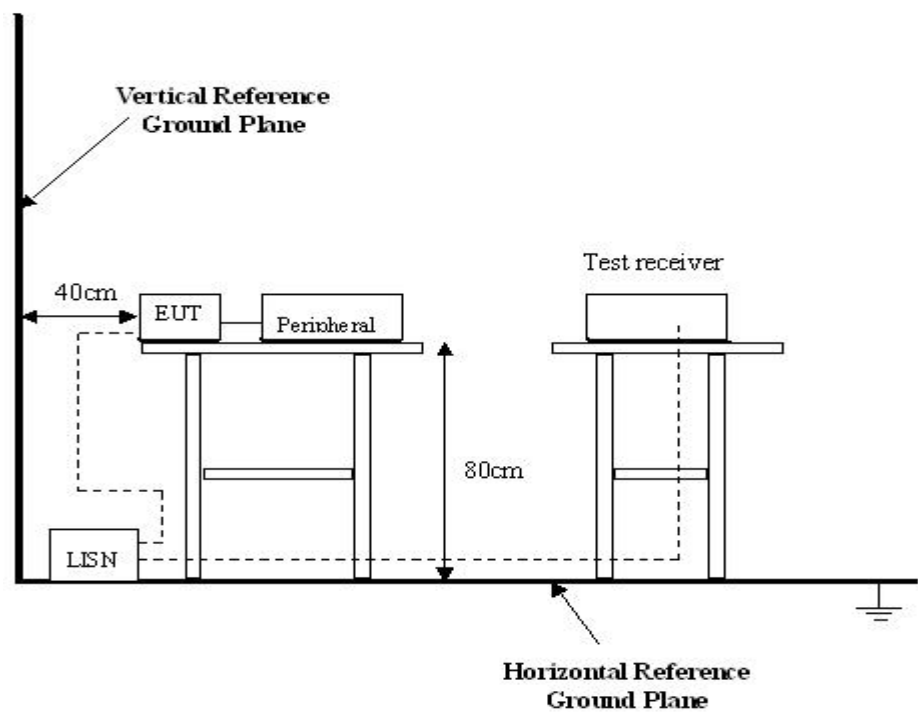
Please refer to Section 5 this report.

6.2 Test Procedure

1. The EUT was connected with signal generator and placed on a table.
2. The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.
3. The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.3Conducted Test Setup

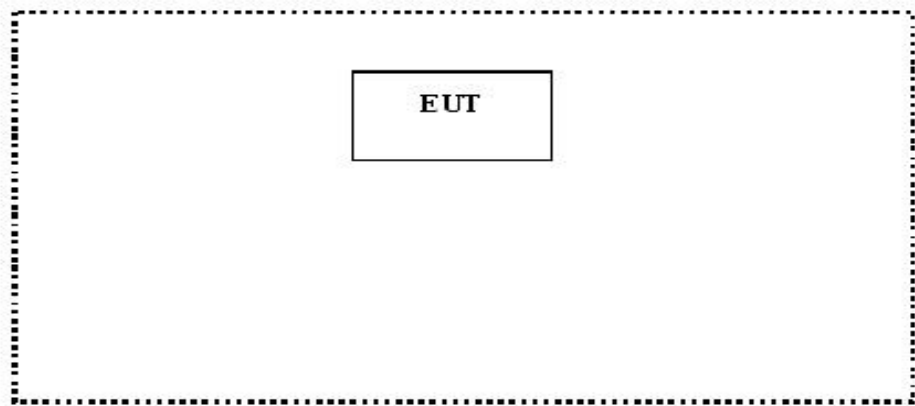
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



6.4EUT Operating Condition

Operating condition is according to ANSI C63.4:2003.

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



6.5 Conducted Emission Limits

66-56 dB μ V between 0.15MHz & 0.5MHz

56 dB μ V between 0.5MHz & 5MHz

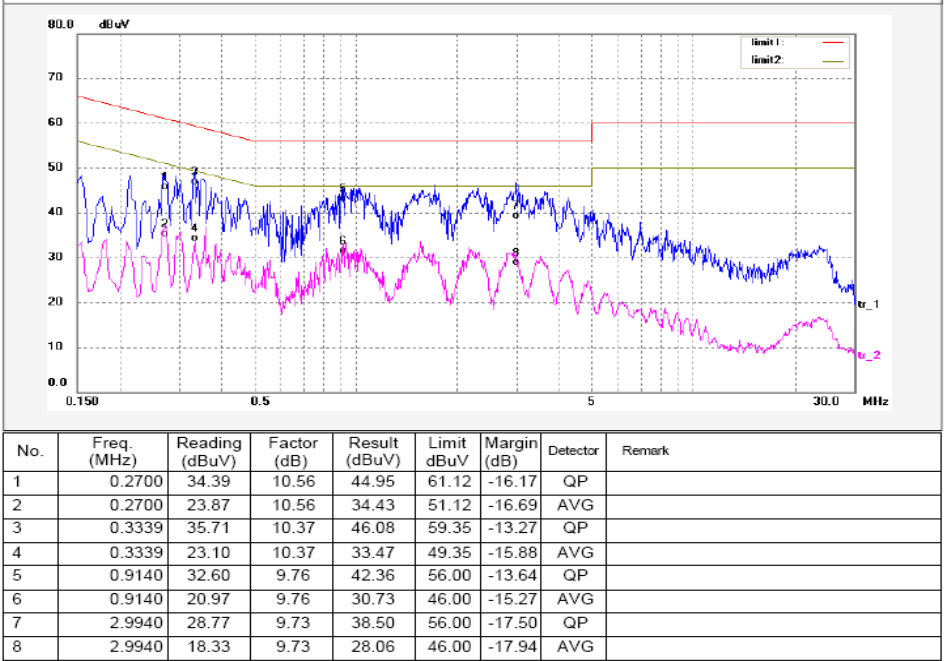
60 dB μ V between 5MHz & 30MHz

Note: In the above limits, the tighter limit applies at the band edges.

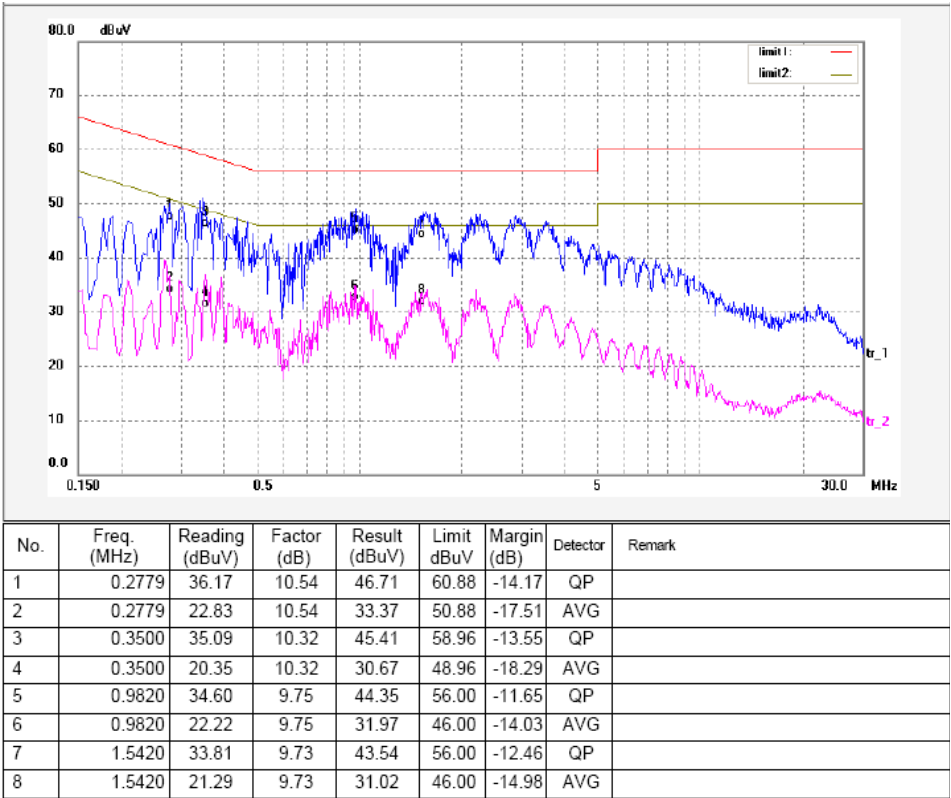
6.6 Conducted Emission Test Data

The EUT was placed on the test table and kept working mode.

L:



N:



7 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2003
Test Date:	Dec. 25, 2008
Frequency Range:	30MHz to 25GHz
Measurement Distance:	3m
Detector:	Peak for pre-scan (120kHz resolution bandwidth) Quasi-Peak if maximised peak within 6dB of limit

7.1 Test Equipment

Please refer to Section 5 this report.

7.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

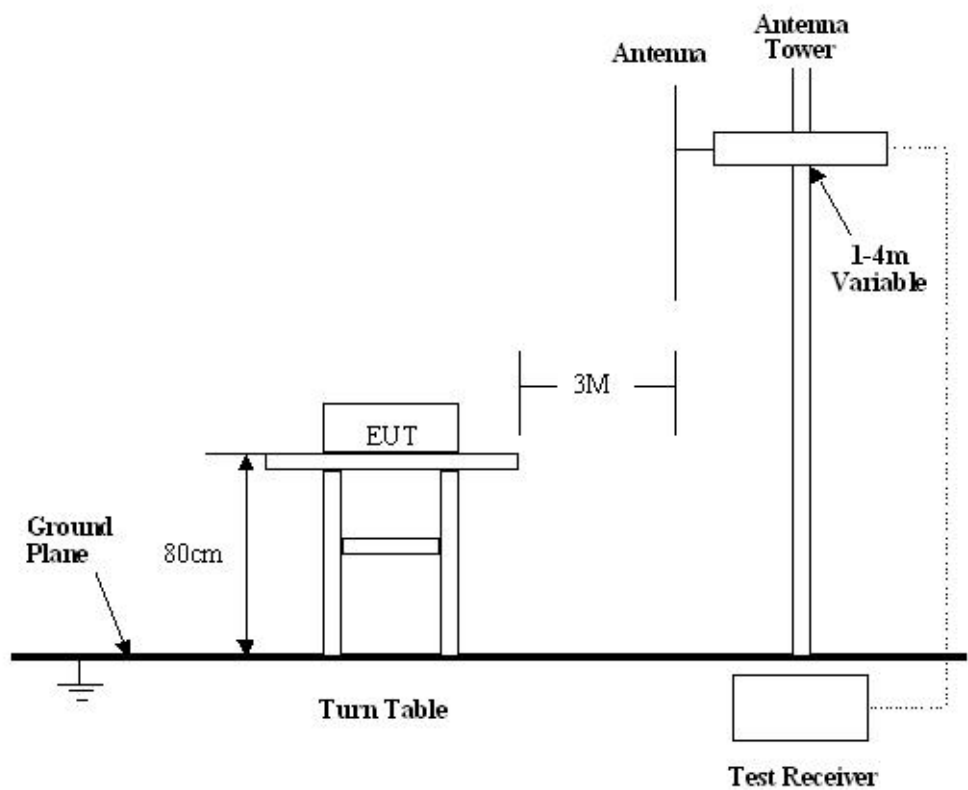
Based on ANSI C63.4:2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at WALTEK SERVICES EMC Lab is +2.9 dB.

7.3 Test Procedure

1. The EUT was connected to the AC power in the equipment under test for radiated emissions test.
2. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
3. All data was recorded in the peak and average detection mode.
4. The EUT was under working mode during the final qualification test and the configuration was used to represent the worst case results.

7.4Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.209 limits and Paragraph 15.247 limits.



7.5Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.247 Rules, the system was tested to 25000 MHz. Below 1GHz

Start Frequency	30 MHz
Stop Frequency	1000 MHz
Sweep Speed	Auto
IF Bandwidth.....	120 kHz
Video Bandwidth.....	100KHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode.....	Normal
Resolution Bandwidth	100KHz

Above 1GHz

Start Frequency	1000 MHz
Stop Frequency	25000MHz
Sweep Speed	Auto
IF Bandwidth.....	120 kHz
Video Bandwidth	1MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode.....	Normal
Resolution Bandwidth	1MHz

7.6Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor – Amplifier Gain

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

7.7 Summary of Test Results

According to the data in section 7.11, the EUT complied with the FCC Part15 Paragraph 15.247 standards.

7.8 EUT Operating Condition

The same as section 6.4 of this report.

Let the EUT work in test mode and test it.

7.9 Radiated Emissions Limit on Paragraph 15.209

Frequency(MHZ)	Distance(m)	Field strength(dBuV/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:**
- (1) $RF\ Voltage(dBuV) = 20 \log RF\ Voltage(uV)$
 - (2) In the Above Table, the tighter limit applies at the band edges.
 - (3) Distance refers to the distance in meters between the measuring instrument antenna.
 - (4) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
 - (5) Above 1GHz, make a Peak and average measurements for all emissions, Limit for peak is 74dBuV/m, According to Part 15.35(b) and average is 54BuV/m.

7.10 Radiated Emissions Test Result

Formula of conversion factors: the field strength at 3m was established by adding
The meter reading of the spectrum analyzer (which is set to read in units of dBuV/m)
To the antenna correction factor supplied by the antenna manufacturer. The antenna
Correction factors are stated in terms of dB. The gain of the pressletor was accounted
For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33 20dBuV+10.36dB=30.36dBuV/m @3m

7.11 Radiated Emission Data

A. Test Item: Radiated Emission Data
Test Voltage: Adapter input 5.0V
Test Mode: TX On
Temperature: 24 °C
Humidity: 52%RH
Test Result: PASS

Remarks: 30-1000MHz radiation test no significant emissions above the equipment noise floor
were detected.

And the below is the Fundamental and Harmonic .

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2402.00	AV	Vertical	97.22		(Fund.)	1.2	0
4804.00	AV	Vertical	38.00	54.00	16.00	1.2	0
7206.00	AV	Vertical	33.01	54.00	20.99	1.8	60
9608.00	AV	Vertical	31.21	54.00	22.79	1.5	120
12010.00	AV	Vertical	31.12	54.00	22.88	1.5	150
14412.00	AV	Vertical	30.24	54.00	23.76	1.2	90
16814.00	AV	Vertical	30.28	54.00	23.72	1.8	0
19216.00	AV	Vertical	29.99	54.00	24.01	1.8	120
21618.00	AV	Vertical	30.59	54.00	23.41	1.5	100
24020.00	AV	Vertical	29.89	54.00	24.11	1.2	135

2402.00	AV	Horizontal	97.16		(Fund.)	1.4	0
4804.00	AV	Horizontal	40.25	54.00	13.75	1.6	0
7206.00	AV	Horizontal	34.02	54.00	19.98	1.8	60
9608.00	AV	Horizontal	32.03	54.00	21.97	1.0	40
12010.00	AV	Horizontal	34.21	54.00	19.79	1.8	135
14412.00	AV	Horizontal	30.36	54.00	23.64	1.0	60
16814.00	AV	Horizontal	30.74	54.00	23.26	1.8	0
19216.00	AV	Horizontal	31.22	54.00	22.78	1.5	90
21618.00	AV	Horizontal	31.53	54.00	22.47	1.5	60
24020.00	AV	Horizontal	32.75	54.00	21.25	1.0	0
2402.00	PK	Vertical	99.96		(Fund.)	1.2	0
4804.00	PK	Vertical	46.00	74.00	28.00	1.1	10
7206.00	PK	Vertical	38.01	74.00	35.99	1.4	120
9608.00	PK	Vertical	37.42	74.00	36.58	1.7	120
12010.00	PK	Vertical	35.63	74.00	38.37	1.0	180
14412.00	PK	Vertical	36.22	74.00	37.78	1.5	0
16814.00	PK	Vertical	35.89	74.00	38.11	1.0	120
19216.00	PK	Vertical	38.67	74.00	35.33	1.8	0
21618.00	PK	Vertical	38.78	74.00	35.22	1.5	0
24020.00	PK	Vertical	33.02	74.00	40.98	1.2	50
2402.00	PK	Horizontal	98.36		(Fund.)	1.3	0
4804.00	PK	Horizontal	41.26	74.00	32.74	1.2	40
7206.00	PK	Horizontal	36.25	74.00	33.75	1.5	100
9608.00	PK	Horizontal	37.33	74.00	36.67	1.0	90
12010.00	PK	Horizontal	33.19	74.00	40.81	1.0	60
14412.00	PK	Horizontal	33.62	74.00	40.38	1.5	60
16814.00	PK	Horizontal	30.73	74.00	43.27	1.8	110
19216.00	PK	Horizontal	33.57	74.00	40.43	1.8	180
21618.00	PK	Horizontal	34.00	74.00	40.00	1.8	0
24020.00	PK	Horizontal	35.81	74.00	38.19	1.0	20
Middle frequency							
2440.00	AV	Vertical	98.23		(Fund.)	1.5	0
4882.00	AV	Vertical	38.54	54.00	15.46	1.2	90
7323.00	AV	Vertical	33.58	54.00	20.42	1.0	45

9764.00	AV	Vertical	30.33	54.00	22.67	1.0	100
12205.00	AV	Vertical	30.87	54.00	22.13	1.8	180
14646.00	AV	Vertical	31.02	54.00	22.98	1.0	0
17087.00	AV	Vertical	30.26	54.00	23.74	1.6	100
19528.00	AV	Vertical	30.17	54.00	23.83	1.2	0
21969.00	AV	Vertical	33.65	54.00	20.35	1.5	90
24400.00	AV	Vertical	32.02	54.00	21.98	1.5	20
2440.00	AV	Horizontal	91.02		(Fund.)	1.1	0
4882.00	AV	Horizontal	35.69	54.00	28.31	1.3	80
7323.00	AV	Horizontal	30.33	54.00	23.67	1.8	90
9764.00	AV	Horizontal	30.25	54.00	23.75	1.0	100
12205.00	AV	Horizontal	31.45	54.00	22.55	1.8	120
14646.00	AV	Horizontal	30.67	54.00	23.33	1.6	90
17087.00	AV	Horizontal	30.24	54.00	23.76	1.5	45
19528.00	AV	Horizontal	31.86	54.00	22.14	1.8	180
21969.00	AV	Horizontal	30.59	54.00	23.41	1.6	120
24400.00	AV	Horizontal	29.03	54.00	27.97	1.2	150
2440.00	PK	Vertical	99.52		(Fund.)	1.0	0
4882.00	PK	Vertical	41.25	74.00	32.75	1.3	10
7323.00	PK	Vertical	38.25	74.00	35.75	1.2	180
9764.00	PK	Vertical	38.94	74.00	35.06	1.6	100
12205.00	PK	Vertical	37.87	74.00	36.13	1.5	120
14646.00	PK	Vertical	38.36	74.00	35.64	1.8	90
17087.00	PK	Vertical	39.47	74.00	34.53	1.0	180
19528.00	PK	Vertical	34.56	74.00	39.44	1.0	150
21969.00	PK	Vertical	40.22	74.00	33.78	1.6	45
24400.00	PK	Vertical	32.12	74.00	41.88	1.2	45
2440.00	PK	Horizontal	96.35		(Fund.)	1.0	120
4882.00	PK	Horizontal	41.58	74.00	32.42	1.1	25
7323.00	PK	Horizontal	41.51	74.00	32.49	1.5	60
9764.00	PK	Horizontal	40.14	74.00	33.86	1.5	90
12205.00	PK	Horizontal	39.36	74.00	34.64	1.6	100
14646.00	PK	Horizontal	38.74	74.00	35.26	1.0	120
17087.00	PK	Horizontal	35.69	74.00	28.31	1.4	10

19528.00	PK	Horizontal	38.86	74.00	35.14	1.5	120
21969.00	PK	Horizontal	40.22	74.00	33.78	1.5	100
24400.00	PK	Horizontal	35.62	74.00	38.38	1.8	60
High frequency							
2480.00	AV	Vertical	98.65		(Fund.)	1.0	0
4960.00	AV	Vertical	35.78	54.00	18.22	1.2	100
7440.00	AV	Vertical	32.25	54.00	21.75	1.5	100
9920.00	AV	Vertical	30.26	54.00	23.74	1.6	90
12400.00	AV	Vertical	30.55	54.00	23.45	1.8	45
14880.00	AV	Vertical	30.34	54.00	23.66	1.5	100
17360.00	AV	Vertical	30.62	54.00	23.38	1.6	120
19840.00	AV	Vertical	30.13	54.00	23.87	1.8	90
22320.00	AV	Vertical	30.27	54.00	23.73	1.5	90
24800.00	AV	Vertical	28.25	54.00	25.75	1.5	90
2480.00	AV	Horizontal	98.26		(Fund.)	1.0	0
4960.00	AV	Horizontal	35.23	54.00	18.77	1.2	20
7440.00	AV	Horizontal	30.35	54.00	23.65	1.5	90
9920.00	AV	Horizontal	31.47	54.00	22.53	1.0	60
12400.00	AV	Horizontal	31.89	54.00	22.11	1.6	90
14880.00	AV	Horizontal	32.42	54.00	21.58	1.0	100
17360.00	AV	Horizontal	31.17	54.00	22.83	1.8	120
19840.00	AV	Horizontal	32.55	54.00	21.45	1.5	120
22320.00	AV	Horizontal	32.86	54.00	21.14	1.0	100
24800.00	AV	Horizontal	33.25	54.00	20.75	1.6	60
2480.00	PK	Vertical	99.01		(Fund.)	1.0	0
4960.00	PK	Vertical	41.25	74.00	32.75	1.2	0
7440.00	PK	Vertical	36.83	74.00	37.17	1.5	10
9920.00	PK	Vertical	35.35	74.00	38.65	1.8	20
12400.00	PK	Vertical	35.56	74.00	38.44	1.0	58
14880.00	PK	Vertical	36.20	74.00	37.80	1.5	90
17360.00	PK	Vertical	36.87	74.00	37.13	1.8	45
19840.00	PK	Vertical	36.26	74.00	37.74	1.5	100
22320.00	PK	Vertical	36.25	74.00	37.75	1.5	0
24800.00	PK	Vertical	33.69	74.00	40.31	15	50

2480.00	PK	Vertical	100.54		(Fund.)	1.0	90
4960.00	PK	Vertical	40.25	74.00	33.75	1.1	0
7440.00	PK	Vertical	38.64	74.00	35.36	1.5	90
9920.00	PK	Vertical	35.30	74.00	38.70	1.6	50
12400.00	PK	Vertical	35.52	74.00	38.48	1.6	45
14880.00	PK	Vertical	35.26	74.00	38.74	1.5	60
17360.00	PK	Vertical	36.41	74.00	37.59	1.8	10
19840.00	PK	Vertical	39.25	74.00	34.75	1.8	150
22320.00	PK	Vertical	31.11	74.00	42.89	1.0	0
24800.00	PK	Vertical	29.85	74.00	44.15	1.0	0

8 Maximum Peak Output Power

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2003
Test Date:	Dec. 26, 2008
Test mode:	Compliance test in the worse case: Tx Lower/Tx Middle/Tx Upper
Requirements:	Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 1W(30dBm)

Test procedure:

The following test procedure as below:

The transmitter output (antenna port) was connected to the spectrum analyzer.EUT and its simulators are placed on a table, let EUT working in test mode,then test it.

The bandwidth of the fundamental frequency was measured with the spectrum analyser using 100kHz RBW and 100kHz VBW.

Test Result: The unit does meet the FCC requirements.

Test Channel	Fundamental Frequency(MHz)	Output Power (mW)	Limit (W)	Power output level
Lower	2402	0.138	1	conducted
Middle	2440	0.234	1	conducted
Upper	2480	0.263	1	conducted

9 Hopping Channel Number

Test Requirement: FCC Part15 C

Test Method: Based on FCC Part15 Paragraph 15.247

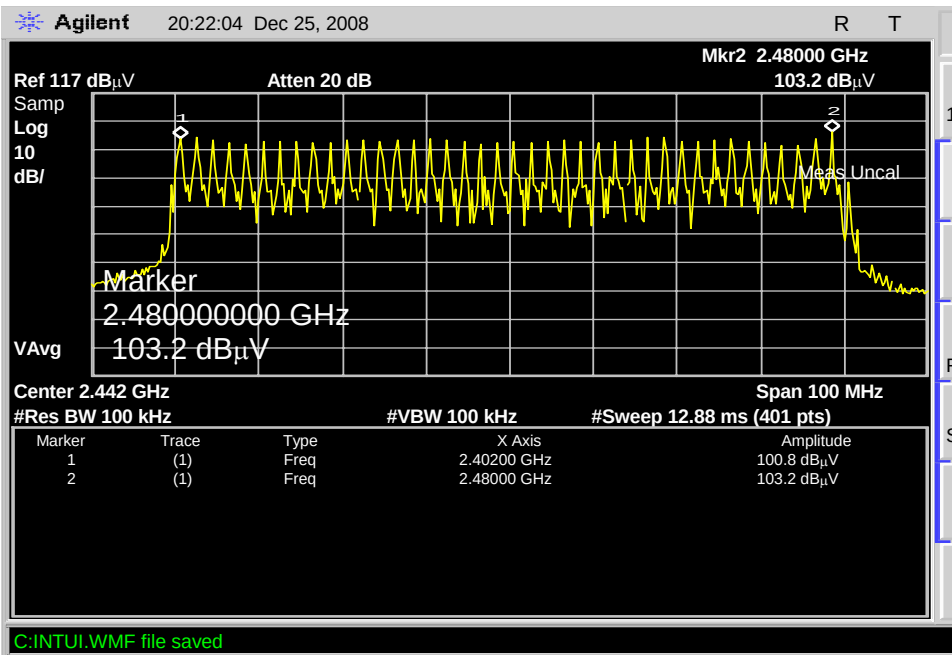
Test Date: Dec. 25, 2008

Test mode: The EUT work in test mode(Tx) and test it

Requirements: Regulation 15.247(b) For frequency hopping systems operating In the 2400-2483.5MHz band employing at least 15 hopping channels.

Test result: The total number of channels would be 40 channels.
The unit does meet the FCC requirements.

Please refer the graph as below:



10 Frequency Separated

The requirements in this clause are only applicable to equipment using frequency hopping spread spectrum (FHSS) modulation.

Channel Separated

Definition: A hopping channel is any of the centre frequencies defined within the hopping sequence of a FHSS system.

Limit: Non-adaptive frequency hopping system shall make use of non-overlapping channels separated by the channel bandwidth as measured at 20dB below peak power.

The hopping channels defined within a hopping sequence shall be at least 1MHz apart(channel separation)

Operating Environment:

Temperature: 22.0 °C
Humidity: 55 % RH
Barometric Pressure: 1012 mbar

EUT Operation Condition:

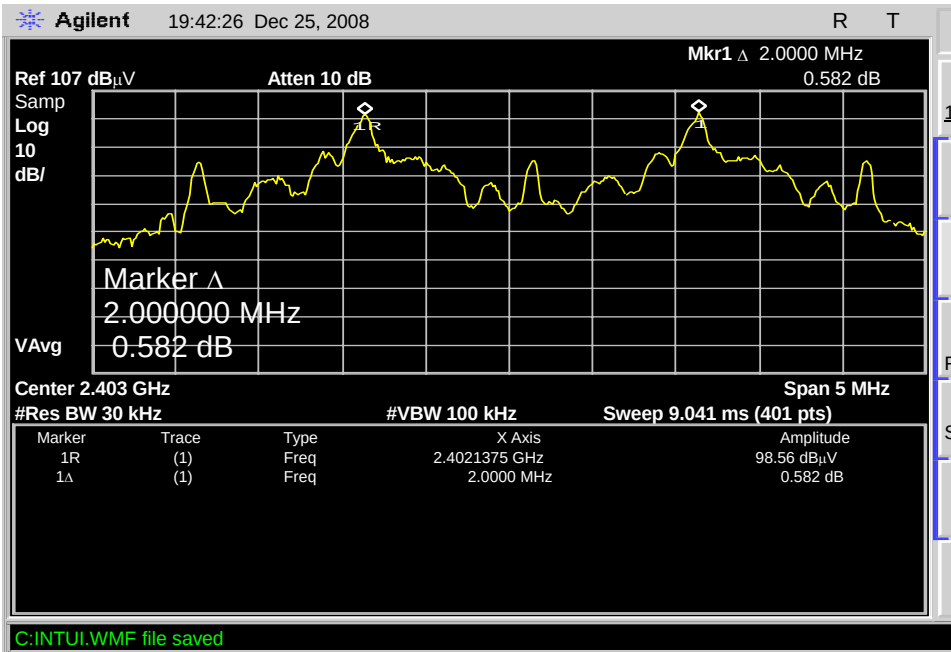
The EUT was programmed to be in continuously transmitting mode.

Test Result: PASS

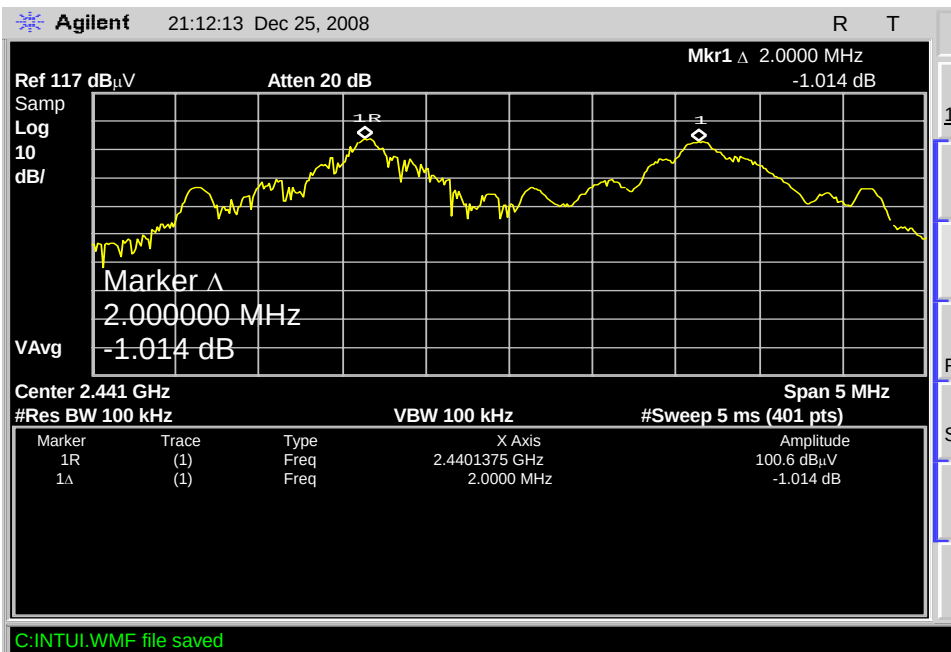
Test Channel	Channel Separation	PASS/FAIL
Lower Channels	2MHz	Pass
Middle Channels	2MHz	Pass
Upper Channels	2MHz	Pass

Please refer to the below photos for more details

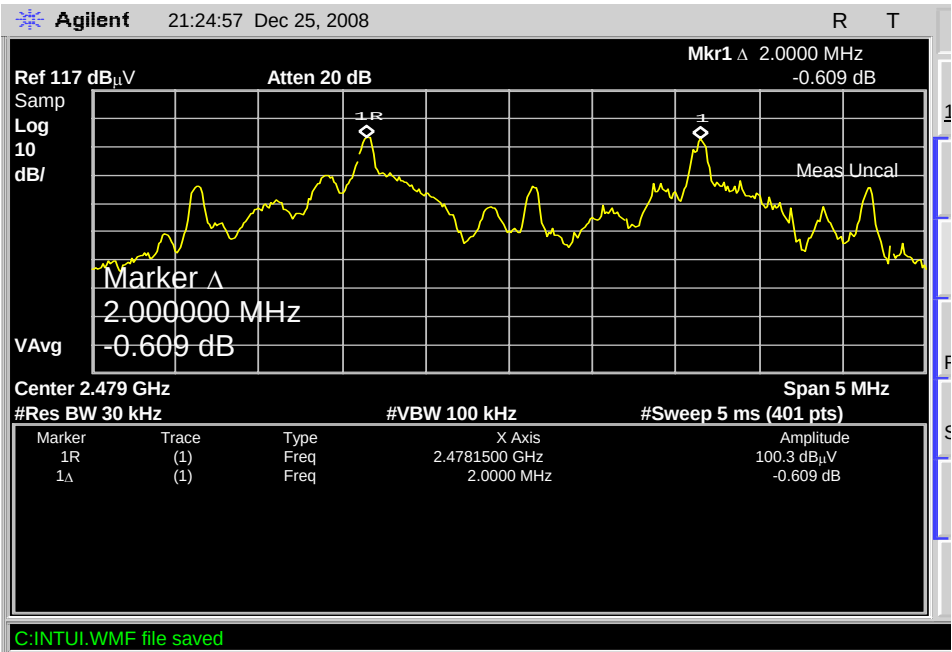
Lower Channel



Middle Channel



Upper Channel



11 Dwell time

Definition:

The dwell time is the time spent at a particular frequency during any single hop.

Limit: the maximum dwell time shall be less than 0.4s.

Operating Environment:

Temperature: 22.0 °C

Humidity: 55 % RH

Barometric Pressure: 1012 mbar

EUT Operation Condition:

The EUT was programmed to be in continuously transmitting mode.

Test Procedure

The EUT output antenna port was connected to the spectrum analyzer. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz, and the frequency span to zero span, measure the maximum time duration of one single pulse. So, the Dwell Time can be calculated as follows:

$$T = \text{Ton-time} * \text{Ntimes} / 1\text{S} * 0.4 * 40 \leq 0.4\text{S}.$$

Ton-time: one pulse of the hopping time.

Ntimes: the number of hopping in one second

Test Result: PASS

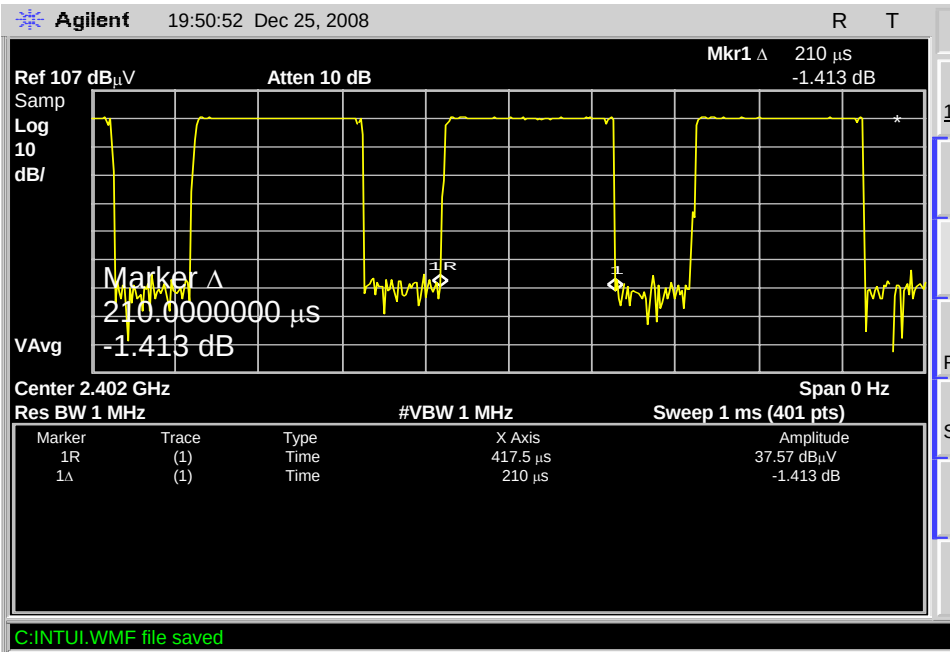
Please refer to the below photos for more details.

Channel 2402MHz

Dwell time of each occupation in this channel as follows:
 $0.000210 \times 80 / 1S \times 0.4 \times 40 = 0.2688 < 0.4S$

Test Result: PASS

The Results are not be greater than 0.4 seconds.

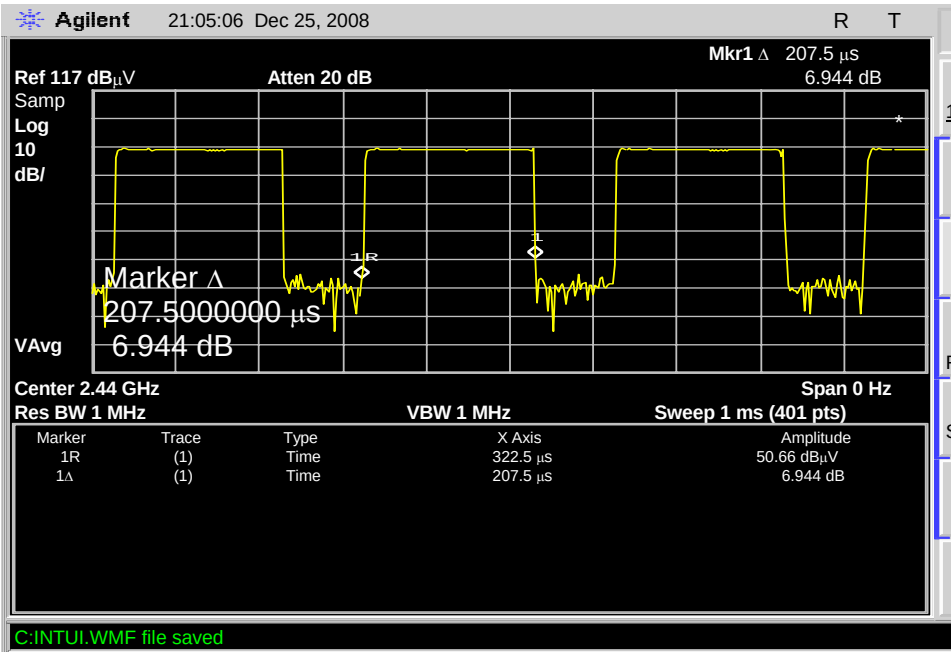


Channel 2440MHz

Dwell time of each occupation in this channel as follows:
 $0.0002075 \times 80 / 15 \times 0.4 \times 40 = 0.2656 < 0.4S$

Test Result: PASS

The Results are not be greater than 0.4 seconds.

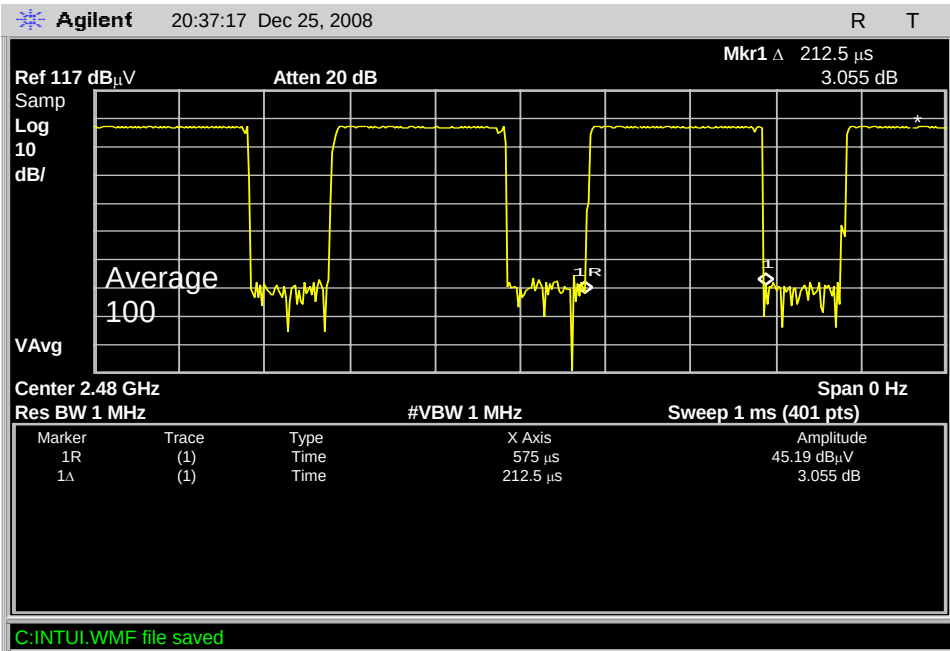


Channel 2480MHz

Dwell time of each occupation in this channel as follows:
 $0.0002125 \times 80 / 1S \times 0.4 \times 40 = 0.2720 < 0.4S$

Test Result: PASS

The Results are not be greater than 0.4 seconds.



12 20-dB Bandwidth

Test Requirement: FCC Part15 C
Test Method: Based on FCC Part15 Paragraph 15.247
Test Date: Dec. 25, 2008
Test mode: The EUT work in test mode(Tx) and test it

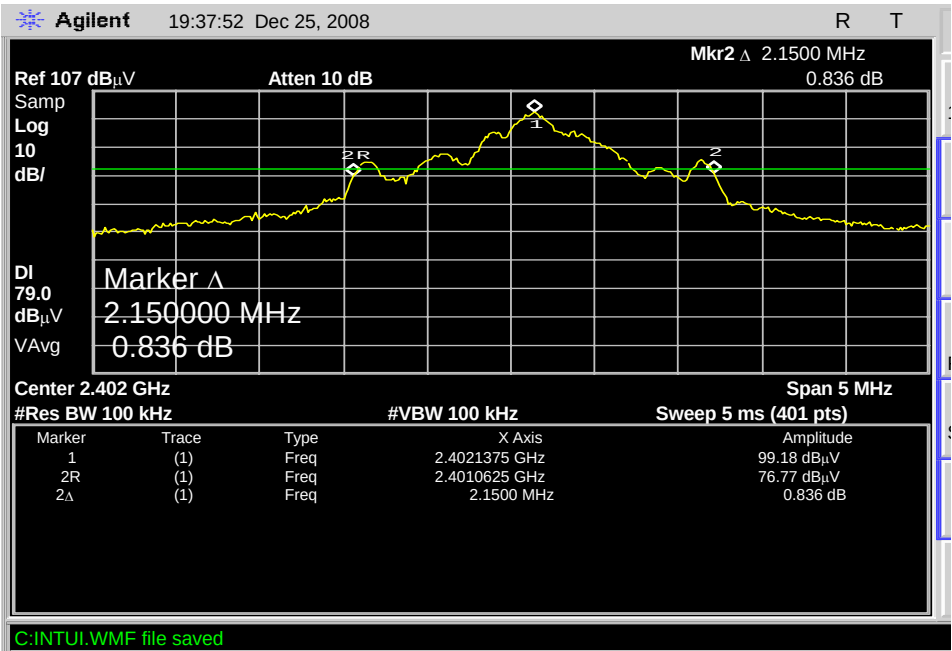
Test Procedure

- 1. The transmitter output (antenna port) was connected to the spectrum analyzer.
- 2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 100KHz RBW and 100KHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

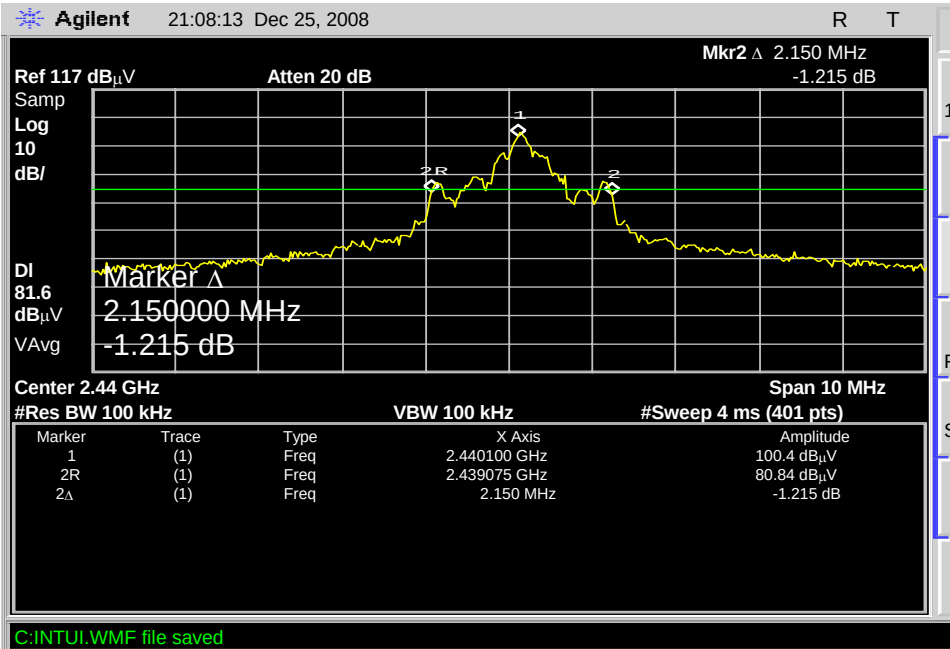
Test Result

Please refer the graph as below:

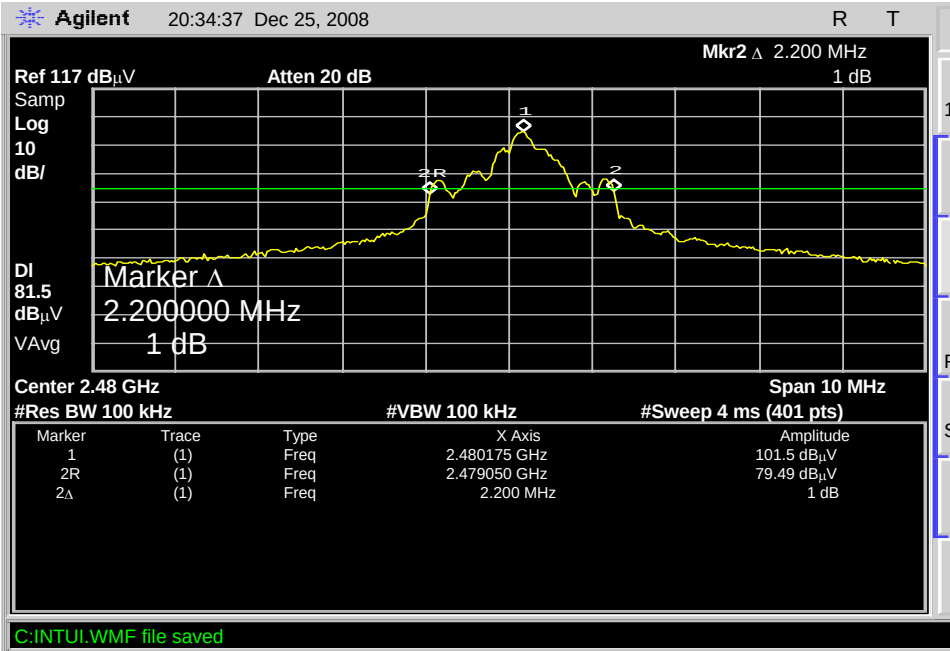
Lower Channel 2402MHz



Middle Channel 2440MHz



Upper Channel 2480MHz



13 Radiated spurious emissions into adjacent restricted band

Test Requirement: FCC Part15 Paragraph 15.205
Test Method: Based on FCC Part 15 Paragraph 15.247
Test Date: Dec. 25, 2008
Requirements: The EUT work in test mode(Tx) and test it

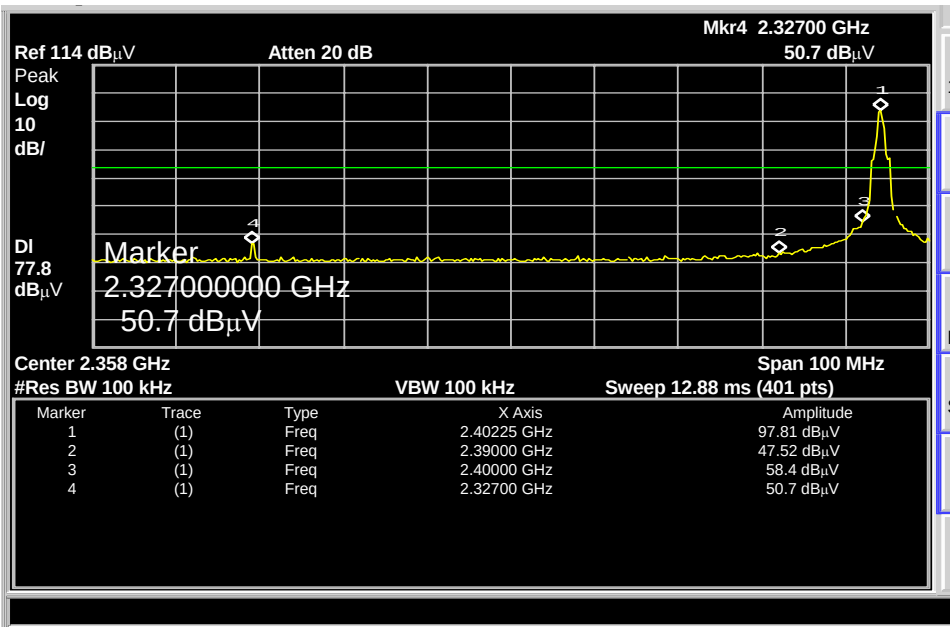
Requiments:

emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions,The provisions in section 15.35apply to these measurements.

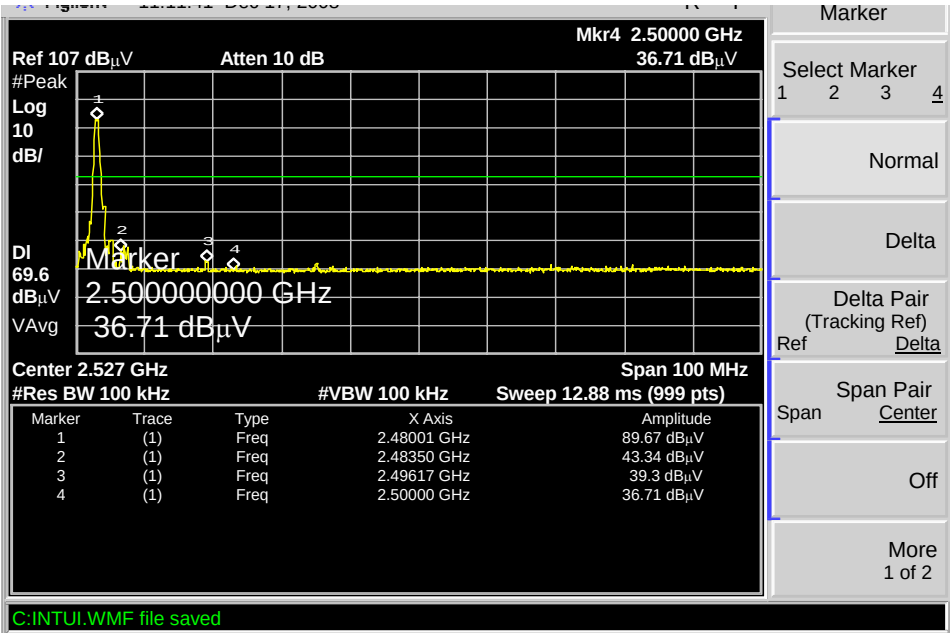
Test procedure:

An in band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4-2003 and FCC Rules.The procedure was repeated with an average detector and a plot made.The calculated field strength in the adjacent restricted band is presented below.

Lower bandedge/ restricted band (peak value)



Upper bandedge/ restricted band (peak value)



14 RF Exposure Test

Test Requirement:	FCC Part 2 Subpart J
Test Method:	Based on FCC Part 15 Paragraph 15.247
Test Date:	Dec. 25, 2008
Requirements:	The EUT work in test mode(Tx) and test it

Requiments:

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 limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

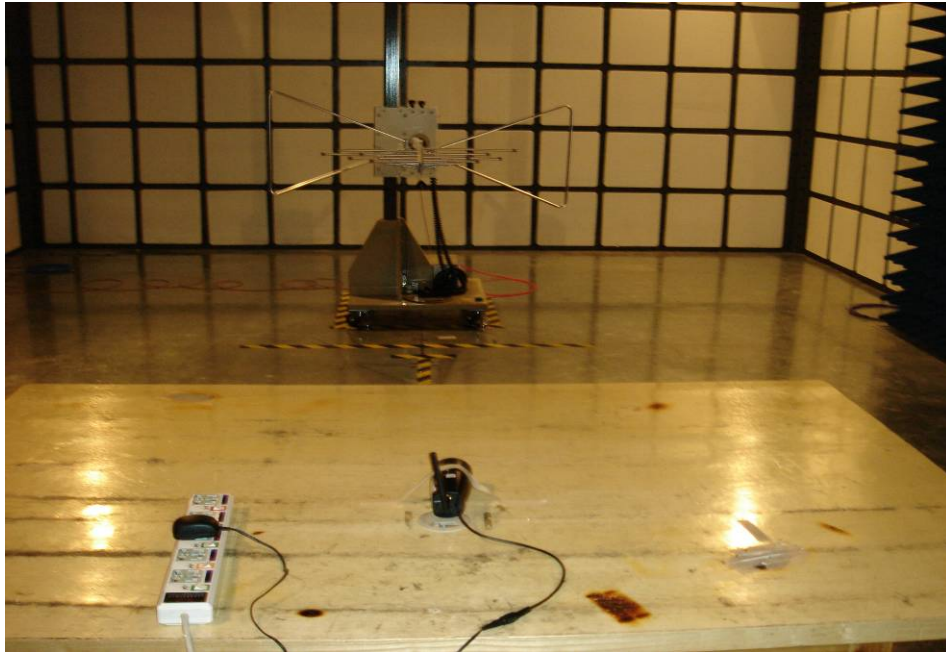
$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

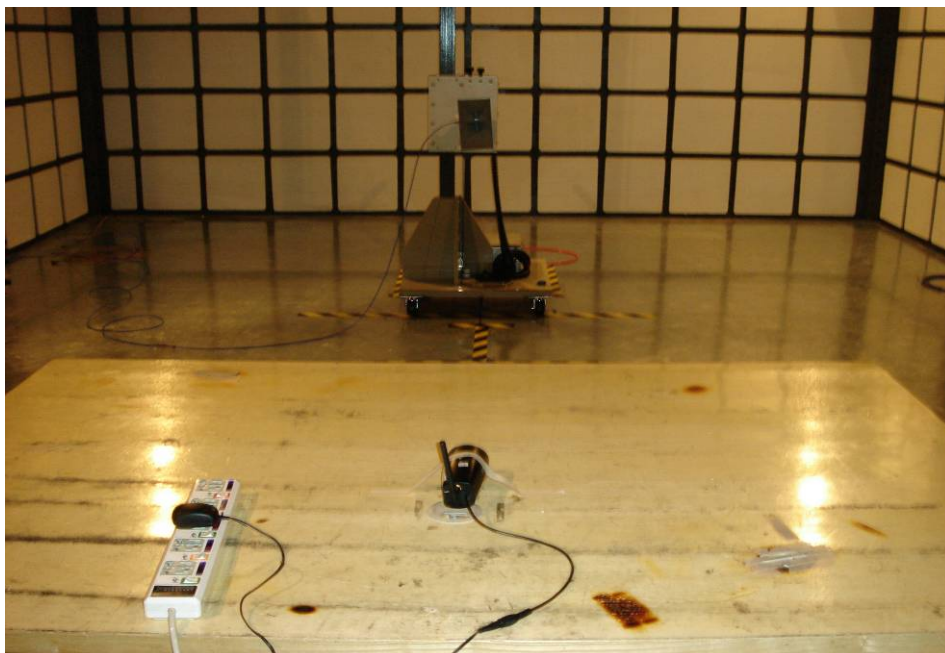
Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
-2.59	0.551	-8.59	0.138	0.151269	1	Complies
-2.59	0.551	-6.30	0.234	0.256464	1	Complies
-2.59	0.551	-5.80	0.263	0.288248	1	Complies

15 Photographs of Testing

Radiation Emission Test View For 30MHz-1000MHz



Radiation Emission Test View For 1GHz-25GHz



Conducted Emission Test View for 150KHz-30MHz



16 Photographs - Constructional Details

16.1 EUT - Appearance View



16.2 EUT - Front View



16.3 EUT - Back View



16.4 Adapter - Front View



16.5 Adapter - Back View



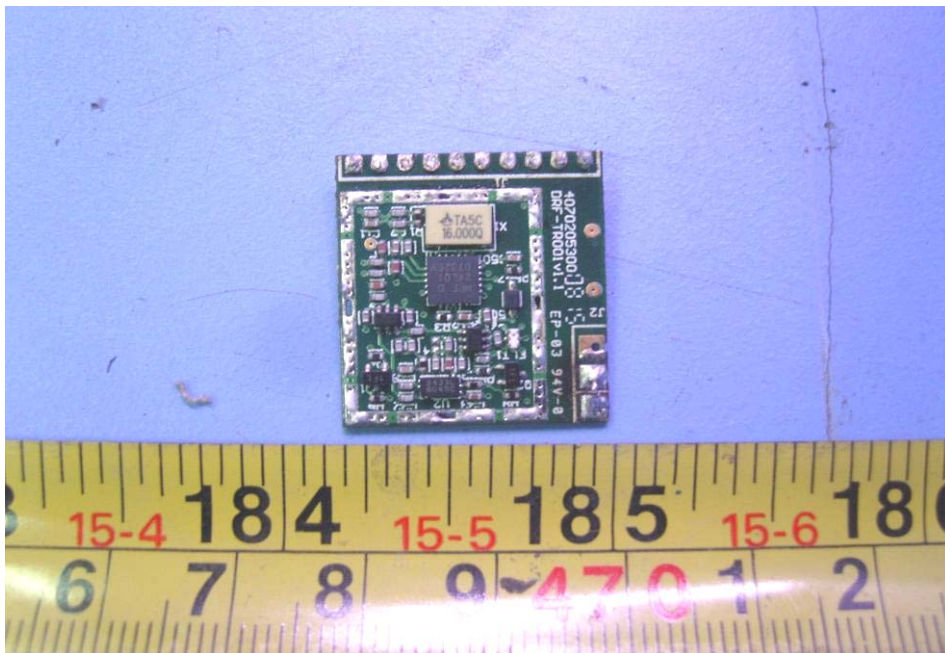
16.6 EUT – Open View



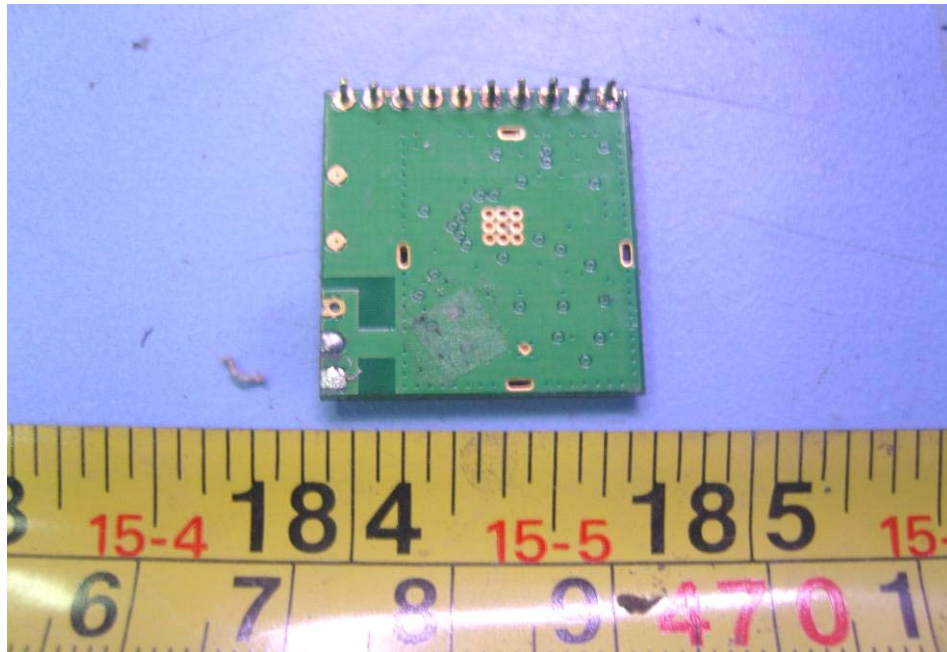
16.7 Adapter – Open View



16.8 PCB 1 - Front View



16.9 PCB1 - Back View



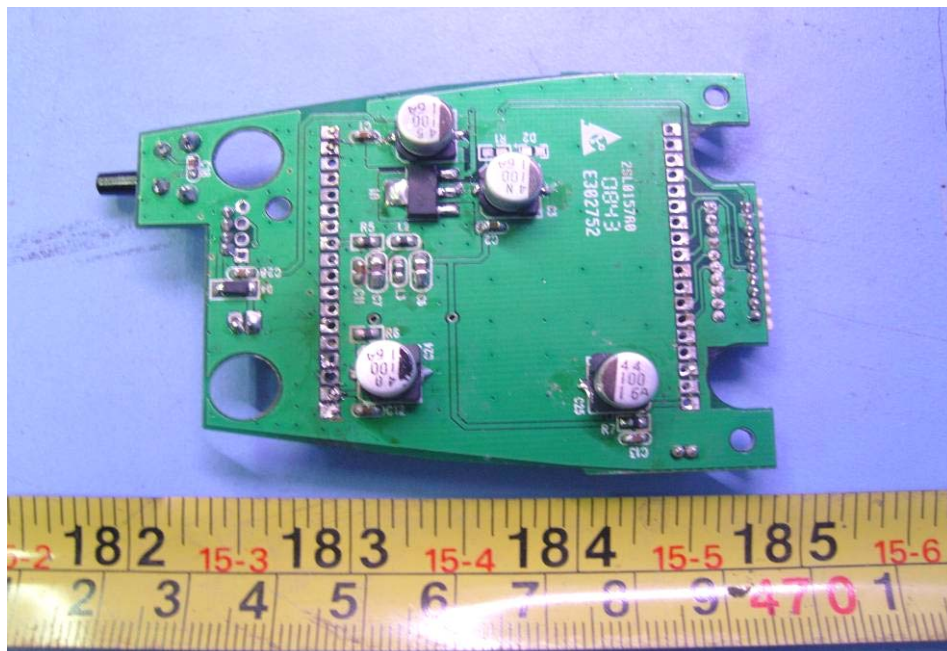
16.10 PCB 2 - Front View



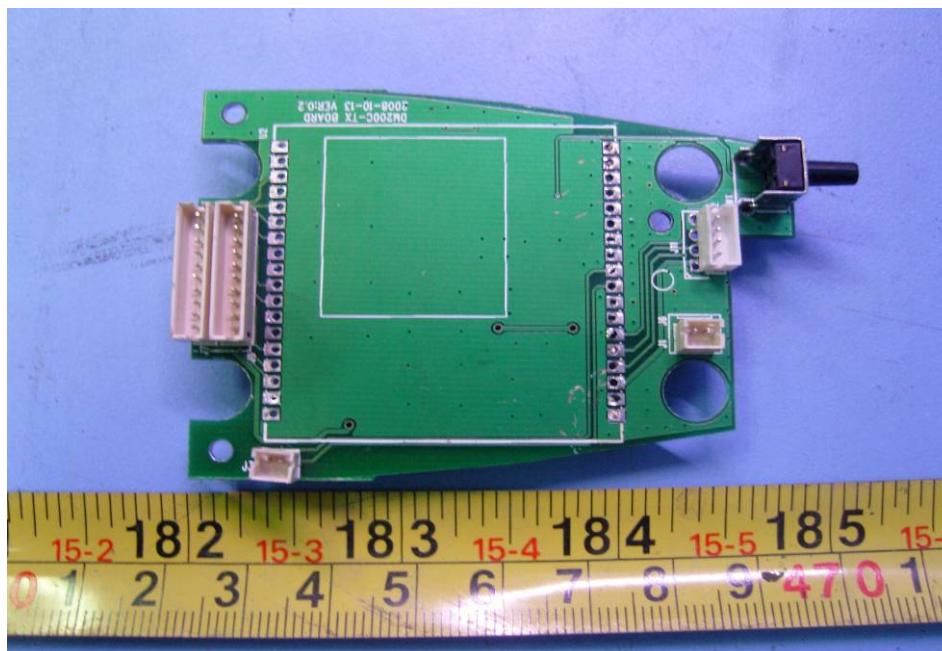
16.11 PCB2 - Back View



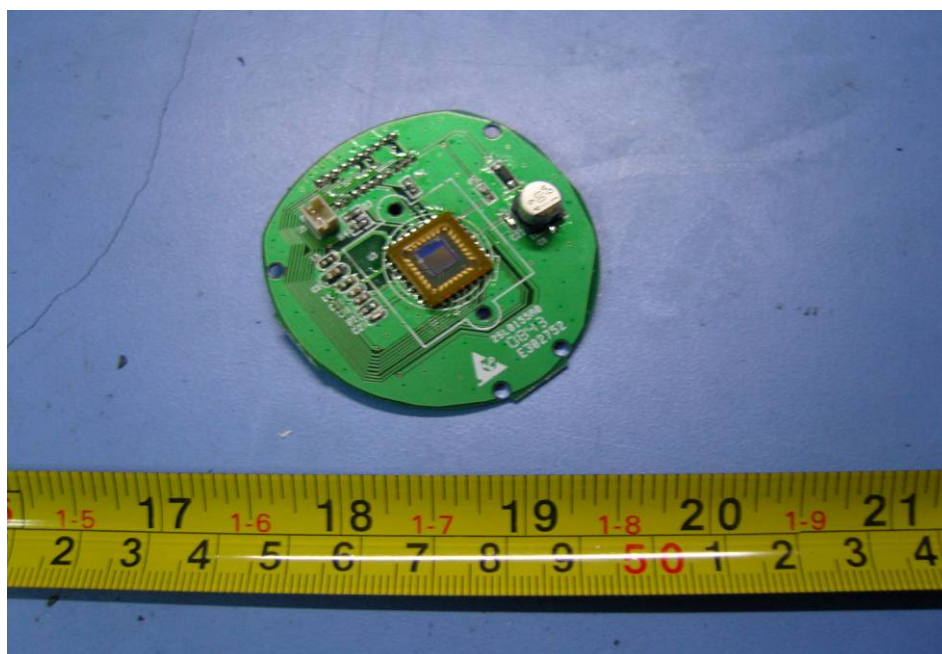
16.12 PCB3 - Front View



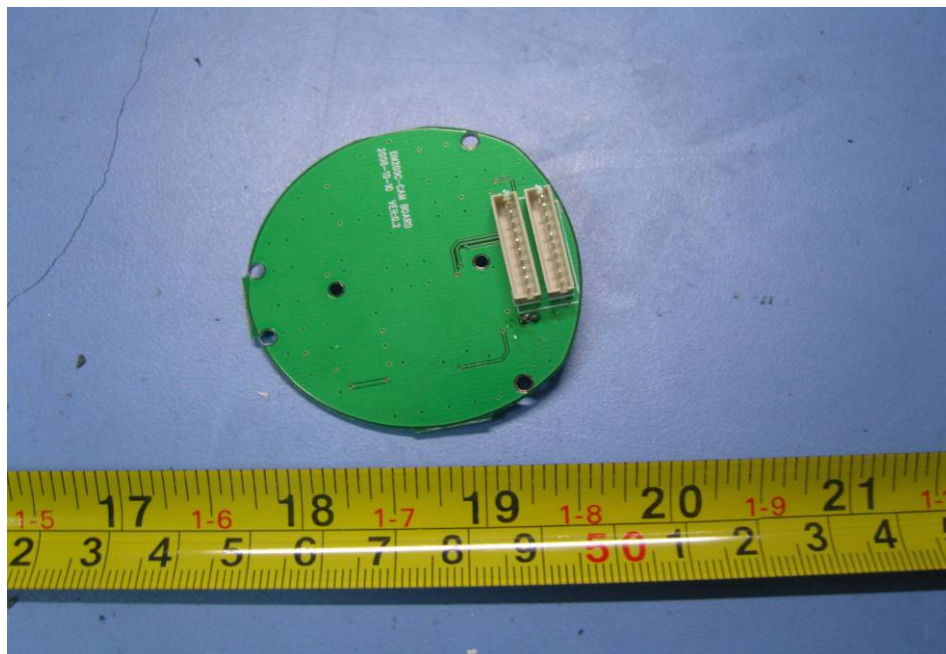
16.13 PCB3 - Back View



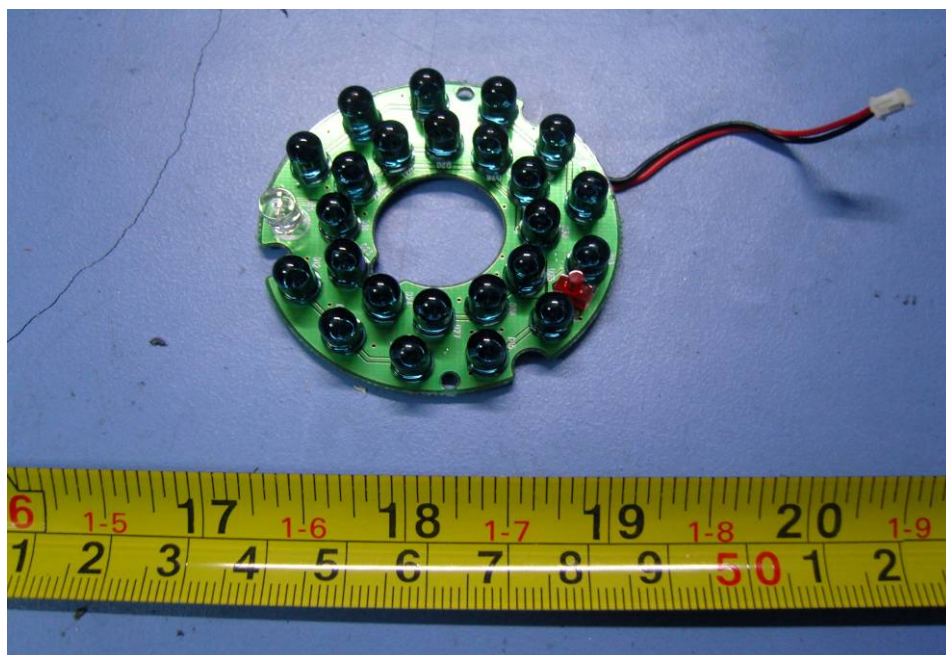
16.14 PCB4- Front View



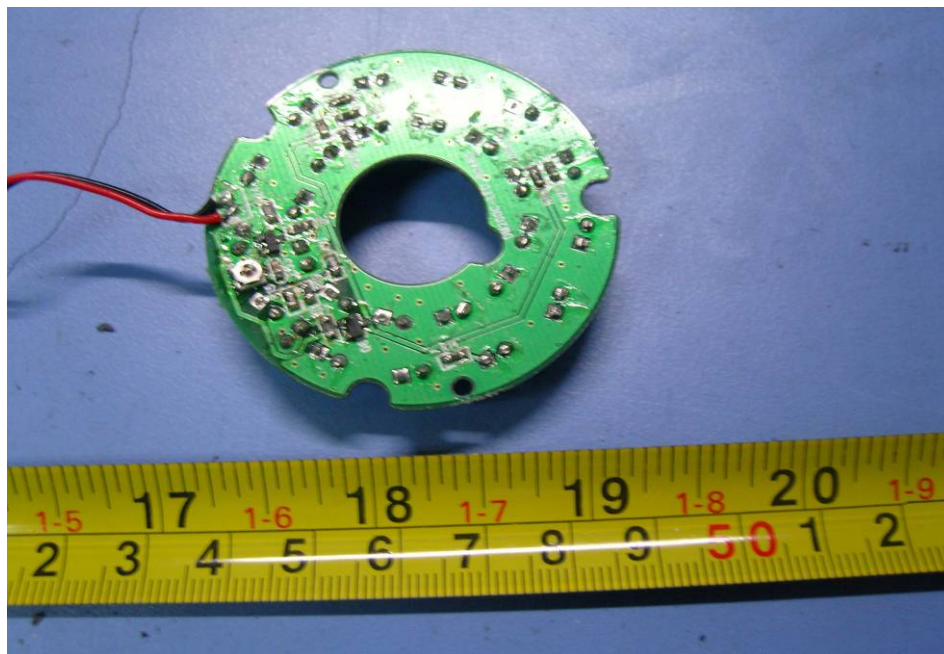
16.15 PCB4 - Back View



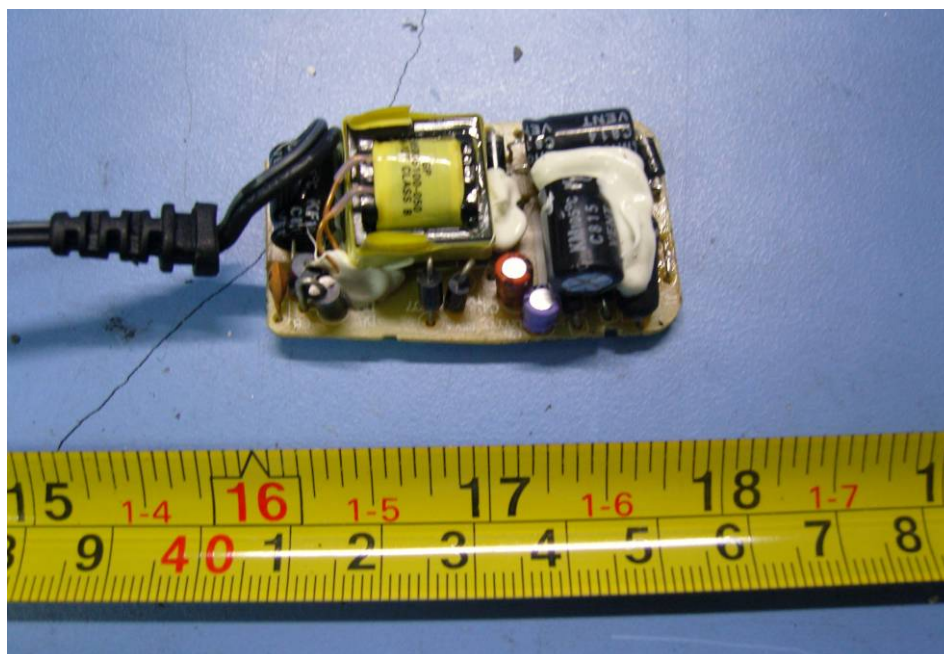
16.16 PCB5 - Front View



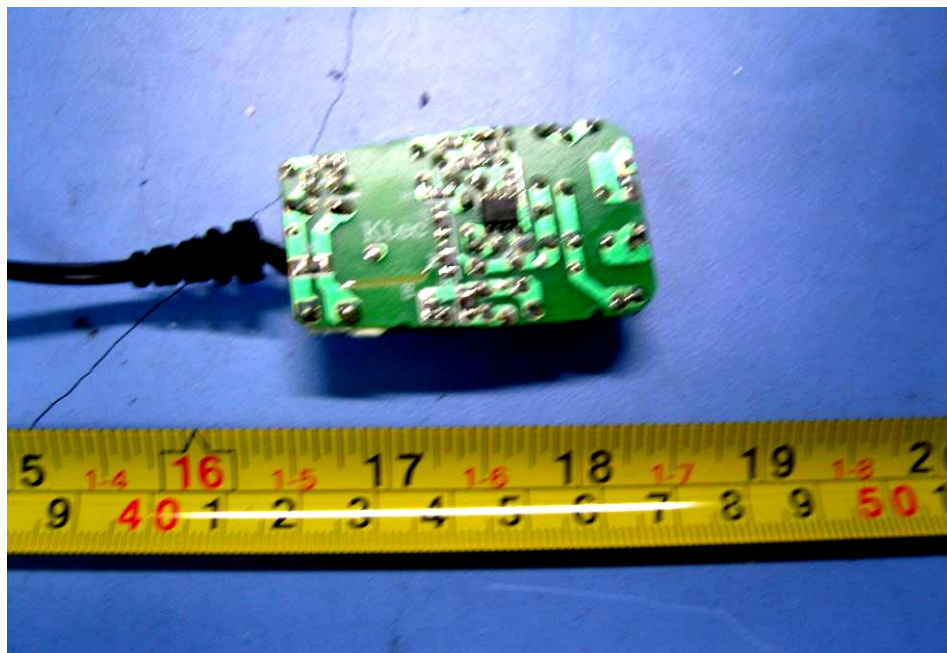
16.17 PCB5- Back View



16.18 Adapter - Front View



16.19 Adapter - Back View



17 FCC ID Label

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT
EUT Bottom View/proposed FCC Mark Location

