Report No: GZ10071268-1

TEST REPORT

(Application for Certification)

Applicant Name & Address	:	First Audio Manufacturing (HK) Ltd. 3/F., Block A, Wing Kut Industrial Bldg., 608 Castle Peak Road, Kowloon, HK
Manufacturing Site	:	First Audio Manufacturing (Guangzhou) Ltd Tanbu Fidek Industrial Zone, Huadu District, Guangzhou City, China

Sample Description

Product	:	Transmitter
FCC ID	:	W9Q-42138T
Model No.	:	42138T
Electrical Rating	:	DC 3.3V(Power by iPod)
Frequency	:	2.4GHz Transmitter

Date Received	:	20 August 2010
Date Test Conducted	:	01 September 2010 – 08 September 2010
Test standards	:	**FCC Part 15.249: 2009**
Test Result	:	Pass
Conclusion	:	The submitted samples complied with the above rules/standards.
Remark	:	None.

**********End of Page**********

Prepared and Checked By:

Fvan Tu

Fvan Tu
Engineer
Intertek Guangzhou

Approved By:

Carrie Chen ***Signature***

Carrie Chen
Sr. Project Engineer
Intertek Guangzhou
23 November 2010 Date

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CONTENT

1. General Description

1.1 Product Description

The Equipment Under Test (EUT) is a transmitter, model: 42138T. It is powered by an iPod (DC 3.3V). The main function of EUT is working as a transmitter when playing a music or video with iPod or iPhone.

Antenna Type: internal, wire antenna.

For electronic filing, the brief circuit description is saved with filename: Technical Description. pdf.

1.2 Related Submittal (s) / Grants

A 2.4GHz receiver is exempted from the technical requirement. Only the digital part of the speaker (Main Unit) is subject to Verification.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). Radiated emission measurement was performed in semi-anechoic chamber room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

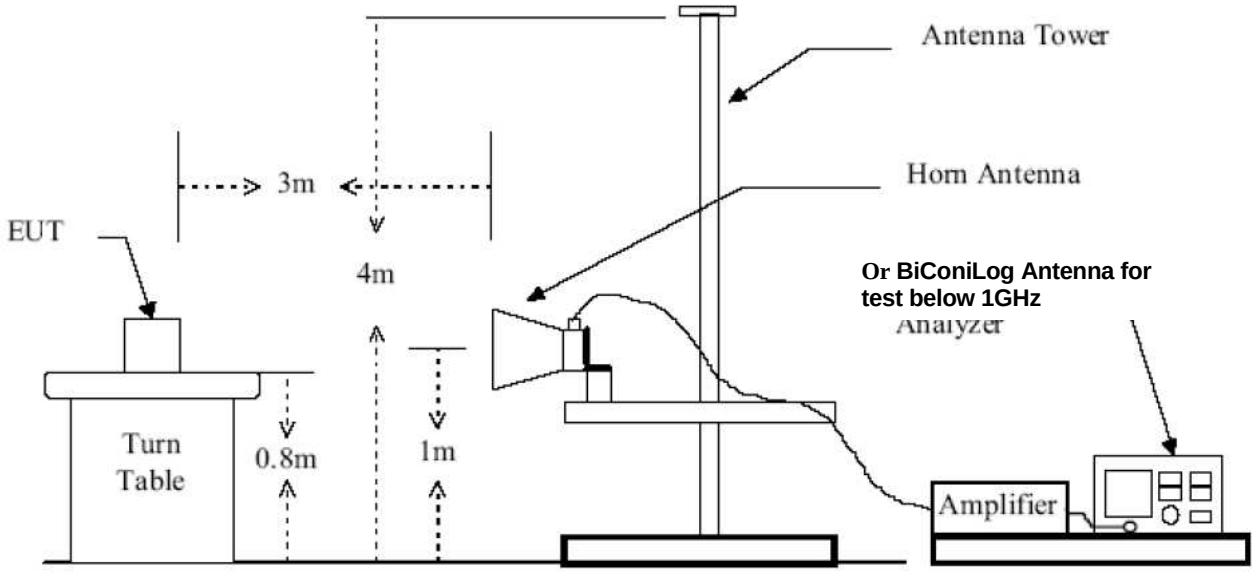
1.4 Test Facility

The Semi-Anechoic chamber and shield room used to collect the radiated data is Interterk Testing Services Shenzhen Ltd. Kejiyuan Branch and located at 6F, Block D, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC.

Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	00066460	25-Nov-09	25-May-11
SZ185-01	EMI Receiver	R&S	ESCI	100547	18-May-10	18-May-11
SZ061-08	Horn Antenna	ETS	3115	00092346	17-Jul-10	17-Jan-12
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	19-Mar-10	19-Mar-11
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	18-Mar-10	18-Mar-11
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	31-Oct-09	31-Oct-10
SZ062-02	RF Cable	RADIALL	RG 213U	--	26-Apr-10	26-Apr-11
SZ062-06	RF Cable	RADIALL	0.04-26.5GHz	--	17-Aug-10	17-Aug-11

Test setup figure



Test setup figure

1.5 Measurement Uncertainty

Uncertainty: 4.8 dB in the frequency range of 30MHz-26.5GHz at a level of confidence of 95%.
When determining the test conclusion, the Measurement Uncertainty of test has been considered.

2. System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

The EUT was powered with iPod (DC3.3V) in the testing.

Type of modulation: FSK modulation, and only the worst data was reported in this report.

For maximizing emissions, the unit was placed in the center of the turntable, and the turntable was rotated through 360°, the antenna hei ght was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Chapter 3.

2.2 EUT Exercising Software

There was no special software to exercise the device.

2.3 Special Accessories

No special accessories used.

2.4 Equipment Modification

Any modifications installed previous to testing by First Audio Manufacturing (HK) Ltd. will be incorporated in each production model sold/leased in the United States. No modifications were installed by Intertek Testing Services Shenzhen Ltd. Guangzhou Branch.

2.5 Support Equipment List and Description

The iPod(model:A1367) provided by Client.

3. Summary of Test Results

FCC Rules	Description of Test	Result
15.203	Antenna Requirement	Pass
15.207	Disturbance Voltage at the Mains Terminals	N/A
15.249	Radiated Emission	Pass
15.249	Band Edges Measurement	Pass
15.215	Bandwidth plot	Pass

Remark: 1. The symbol “N/A” in above table means Not Applicable.
2. When determining the test results, measurement uncertainty of tests has been considered.

3.1 Antenna Requirement

The EUT Antenna Type: internal, wire antenna.

3.2 Conducted Emission

The EUT is battery operating device, the conducted emission is unnecessary.

3.3 Radiated Emission

Data is included worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.3.1 Radiated Emission Limits

According to FCC 15.249, operating within the bands 2400-2483.5 MHz, the field strength of emissions from intentional radiators operated within this frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
2400 - 2483.5	50	500

3.3.2 Test Setup and Procedures

Reference 1.4

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under Part 15, Subpart C rules. The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003.
The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.
Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 3.4.5
The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line

conducted emissions, the range scanned is 150 kHz to 30 MHz.

The EUT is warmed up for 15 minutes prior to the test.
AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 3.6). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.
Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

3.3.3 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

Where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

Assume a receiver reading of 62.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB

AV = -10 dB

FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 dBµV/m

Level in µV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/m

3.3.4 Radiated Emission Test Data

Date of test: 01 September, 2010
Worst case operating mode: EUT on Transmitting

Table 2-1

Radiated Emissions
Pursuant to FCC 15.249: Emissions Requirement

(2404MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2404.000	104.9	36.7	28.5	96.7	114.0	-17.3
Vertical	2404.000	108.4	36.7	28.5	100.2	114.0	-13.8
Vertical	4808.000	66.5	36.1	33.1	63.5	74.0	-10.5
Vertical	7212.000	54.0	36.2	37.8	55.6	74.0	-18.4
Vertical	9616.000	59.6	36.3	38.6	61.9	74.0	-12.1
Vertical	12020.000	58.2	35.6	39.5	62.1	74.0	-11.9

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2404.000	104.9	36.7	28.5	16.4	80.3	94.0	-13.7
Vertical	2404.000	108.4	36.7	28.5	16.4	83.8	94.0	-10.2
Vertical	4808.000	66.5	36.1	33.1	16.4	47.1	54.0	-6.9
Vertical	7212.000	54.0	36.2	37.8	16.4	39.2	54.0	-14.8
Vertical	9616.000	59.6	36.3	38.6	16.4	45.5	54.0	-8.5
Vertical	12020.000	58.2	35.6	39.5	16.4	45.7	54.0	-8.3

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

Date of test: 01 September, 2010
Worst case operating mode: EUT on Transmitting

Table 2-2

Radiated Emissions
Pursuant to FCC 15.249: Emissions Requirement

(2440MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2440.000	102.7	36.7	28.5	94.5	114.0	-19.5
Vertical	2440.000	109.1	36.7	28.5	100.9	114.0	-13.1
Vertical	4880.000	63.4	36.1	33.3	60.6	74.0	-13.4
Vertical	7320.000	54.2	36.3	37.9	55.8	74.0	-18.2
Vertical	9760.000	59.5	36.3	38.7	61.9	74.0	-12.1
Vertical	12200.000	58.1	35.6	39.5	62.0	74.0	-12.0

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2440.000	102.7	36.7	28.5	16.4	78.1	94.0	-15.9
Vertical	2440.000	109.1	36.7	28.5	16.4	84.5	94.0	-9.5
Vertical	4880.000	63.4	36.1	33.3	16.4	44.2	54.0	-9.8
Vertical	7320.000	54.2	36.3	37.9	16.4	39.4	54.0	-14.6
Vertical	9760.000	59.5	36.3	38.7	16.4	45.5	54.0	-8.5
Vertical	12200.000	58.1	35.6	39.5	16.4	45.6	54.0	-8.4

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

Date of test: 01 September, 2010
Worst case operating mode: EUT on Transmitting

Table 2-3

Radiated Emissions
Pursuant to FCC 15.249: Emissions Requirement

(2478MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2478.000	101.9	36.7	28.5	93.7	114.0	-20.3
Vertical	2478.000	108.5	36.7	28.5	100.3	114.0	-13.7
Vertical	4956.000	59.8	36.1	33.1	56.8	74.0	-17.2
Vertical	7434.000	54.0	36.3	37.9	55.6	74.0	-18.4
Vertical	9912.000	55.5	36.3	38.7	57.9	74.0	-16.1
Vertical	12390.000	56.8	35.6	39.5	60.7	74.0	-13.3

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2478.000	101.9	36.7	28.5	16.4	77.3	94.0	-16.7
Vertical	2478.000	108.5	36.7	28.5	16.4	83.9	94.0	-10.1
Vertical	4956.000	59.8	36.1	33.1	16.4	40.4	54.0	-13.6
Vertical	7434.000	54.0	36.3	37.9	16.4	39.2	54.0	-14.8
Vertical	9912.000	55.5	36.3	38.7	16.4	41.5	54.0	-12.5
Vertical	12390.000	56.8	35.6	39.5	16.4	44.3	54.0	-9.7

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

3.3.5 Test Result

The data on the above test result table lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

According 15.249, the worst case radiated emission at 4808.000 MHz
Judgement: Passed by 6.9 dB

3.4 Band Edges Measurement

3.4.1 Limited of the band edges measurement

Sec15.249:
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

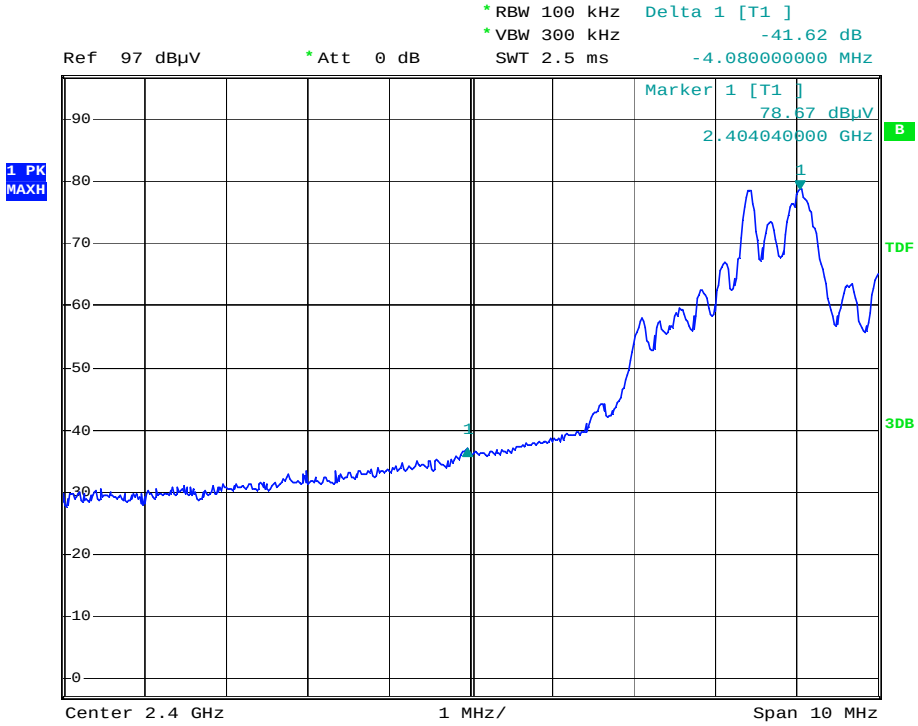
(e) As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

3.4.2 Test Setup

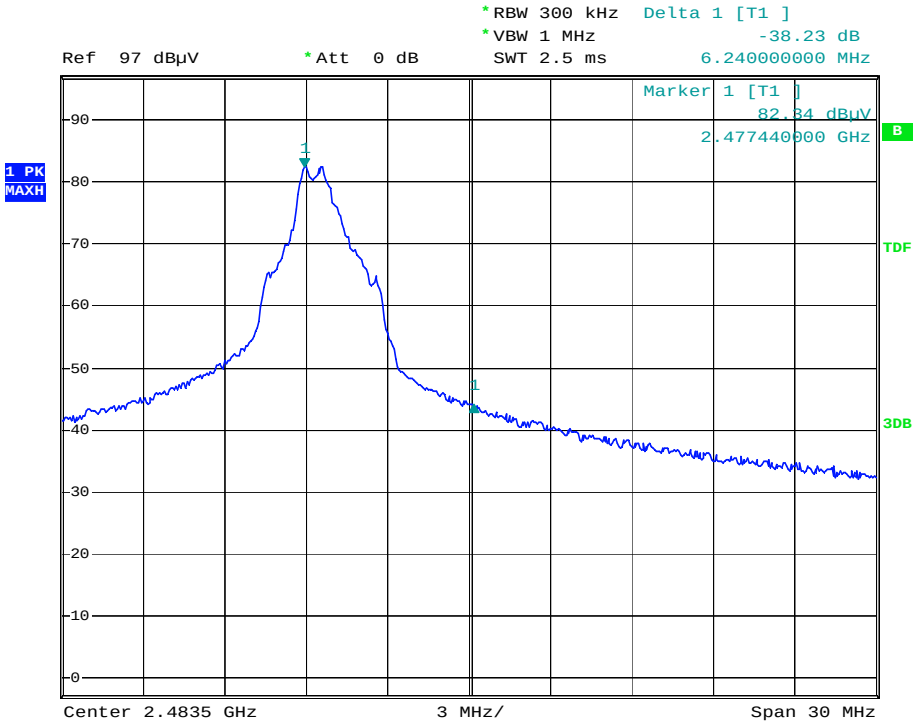
Refer to 1.4

3.4.3 Test Plot

Frequency Bands
Operating mode: Transmitting
Low Channel (2404MHz)



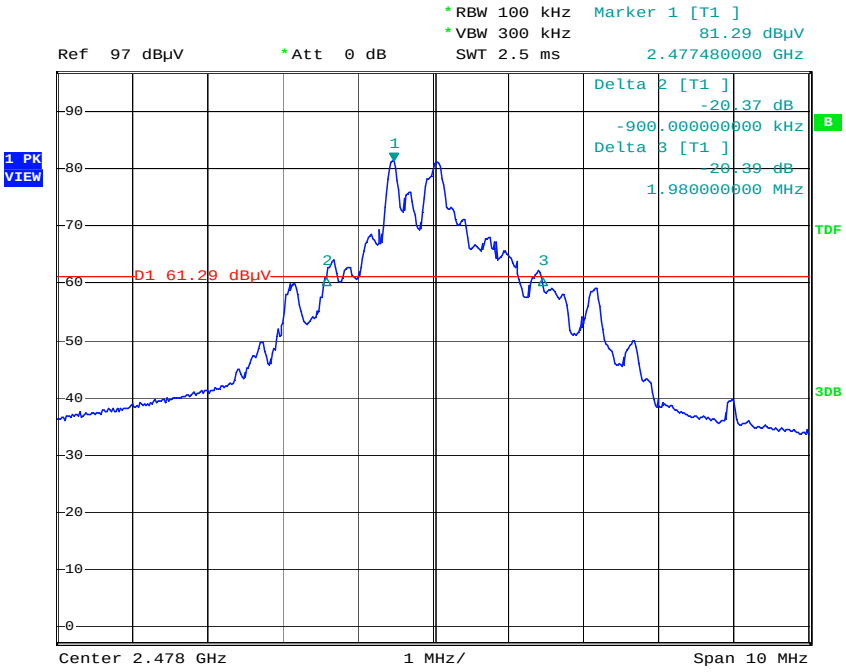
High Channel (2478MHz)



Modulation Bandwidth
Operating mode: Transmitting
Low Channel (2404MHz)

Middle Channel (2440MHz)

High Channel (2478MHz)



3.4.4 Test Result

From the plot, the field strength of any emissions outside of the specified frequency band are attenuated to the general radiated emission limits in section 15.209. It fulfil the requirement of 15.249(d).

Peak Measurement

Bandedge compliance is determined by applying marker-delta method, i.e (Bandedge Plot).

(i) Lower channel 2404MHz:

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the bandedge plot

= 100.2dBµv/m – 41.62dB
= 58.58dBµv/m

Average Resultant field strength = Fundamental emissions (peak value) – delta from the bandedge plot

= 83.8dBµv/m – 41.62dB
= 42.18dBµv/m

(ii) Upper channel 2478MHz:

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the bandedge plot

= 100.3dBµv/m – 38.23dB
= 62.07dBµv/m

Average Resultant field strength = Fundamental emissions (peak value) – delta from the bandedge plot

= 83.9dBµv/m – 38.23dB
= 45.67dBµv/m

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74 dBµv/m (Peak Limit) and 54dBµv/m (Average Limit).

3.4.5 Transmitter Duty Cycle Calculation FCC Rule 15.35(b, c)

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

A plot of the worst-case duty cycle as detected in this manner is shown below.

The duty cycle is simply the on-time divided by the period:

The duration of one cycle =598us
Effective period of the cycle = 90.9us

DC =90.9/598=0.15201 or 15.201%

Therefore, the averaging factor is found by 20lg0.15201=-16.4dB

3.5 Bandwidth Plot

Pursuant to FCC part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

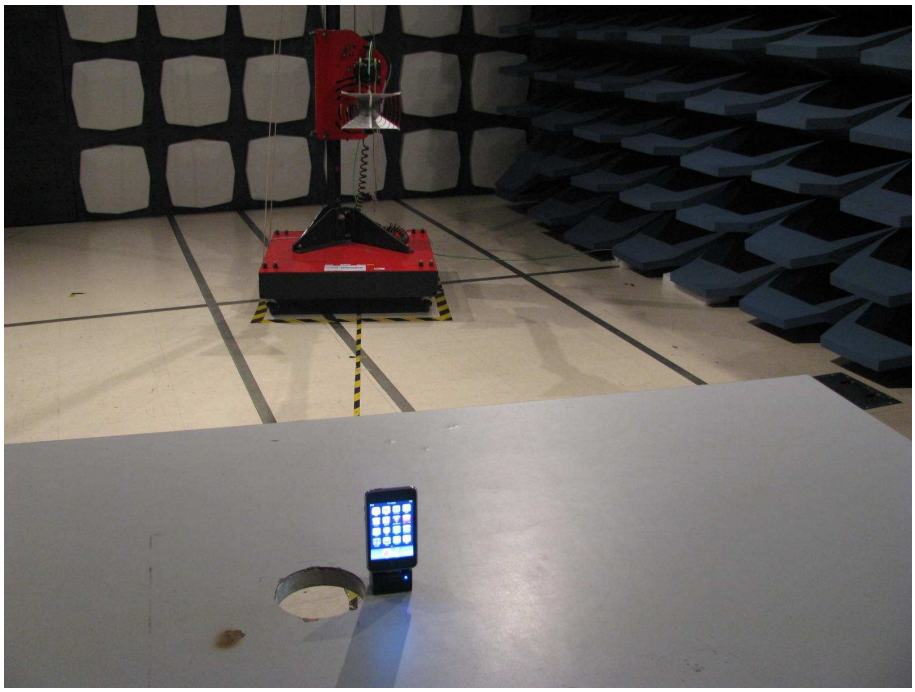
3.6 Discussion of Pulse Desensitization

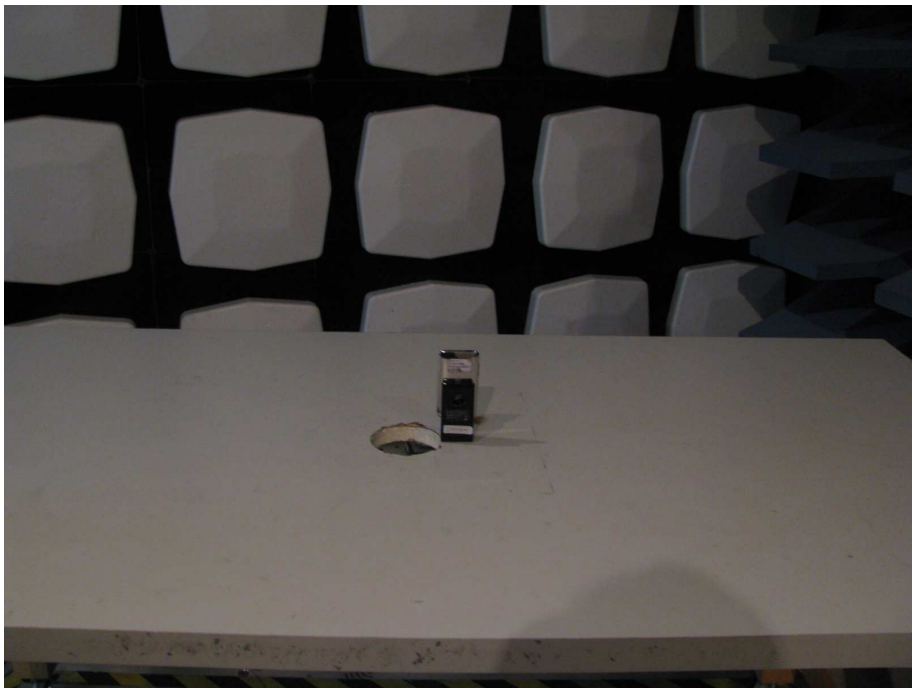
The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF.*

The effective period (T_{eff}) was approximately 90.9 µs, With a resolution bandwidth (3 dB) of 1 MHz, the pulse desensitivity factor was 0dB.

4. Appendix I – Photos of Test Setup

Radiated Emission



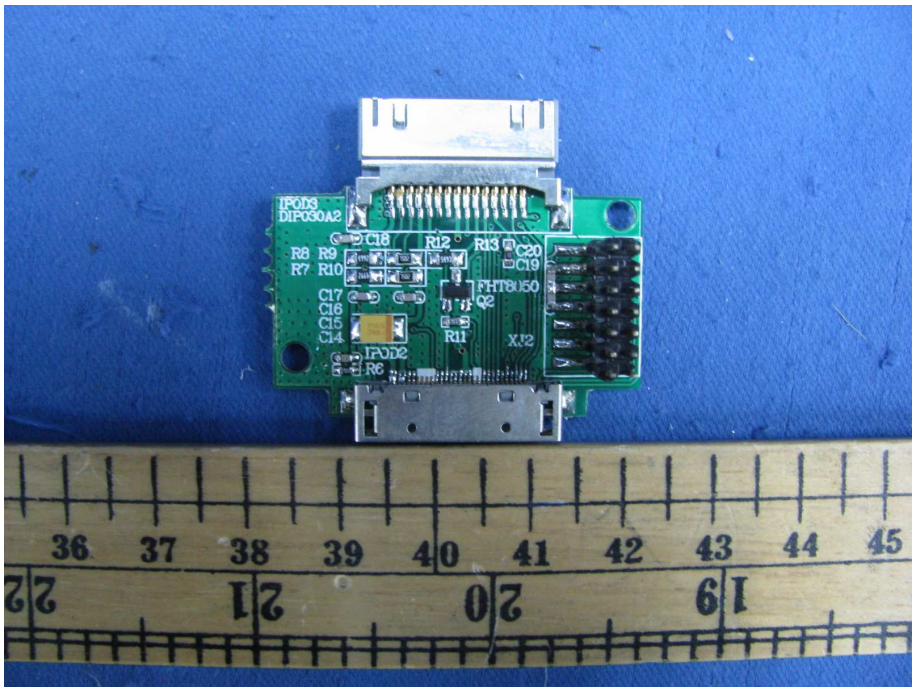


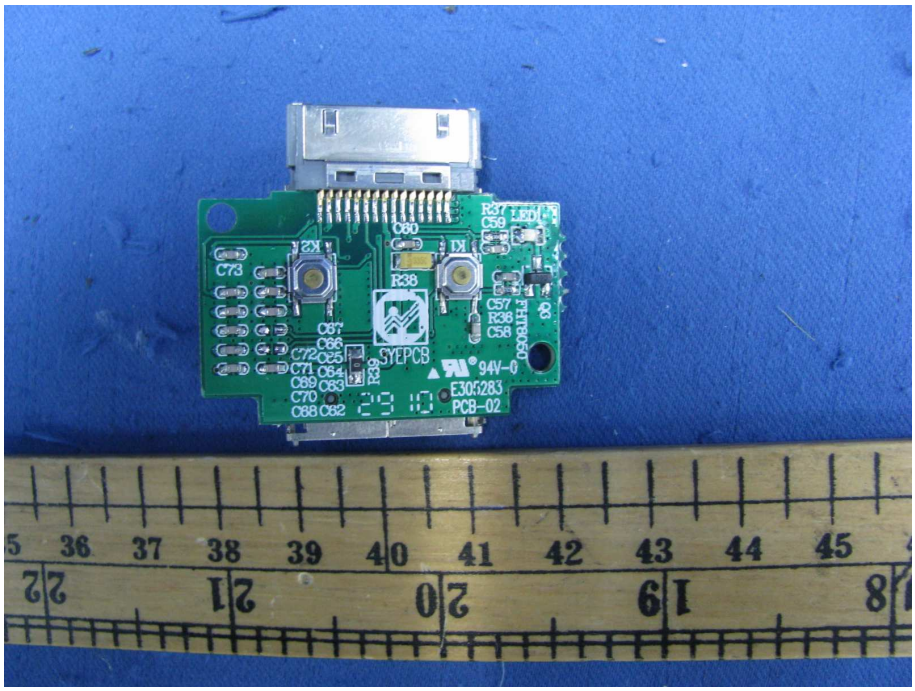
5. Appendix II – Photos of EUT

Over View

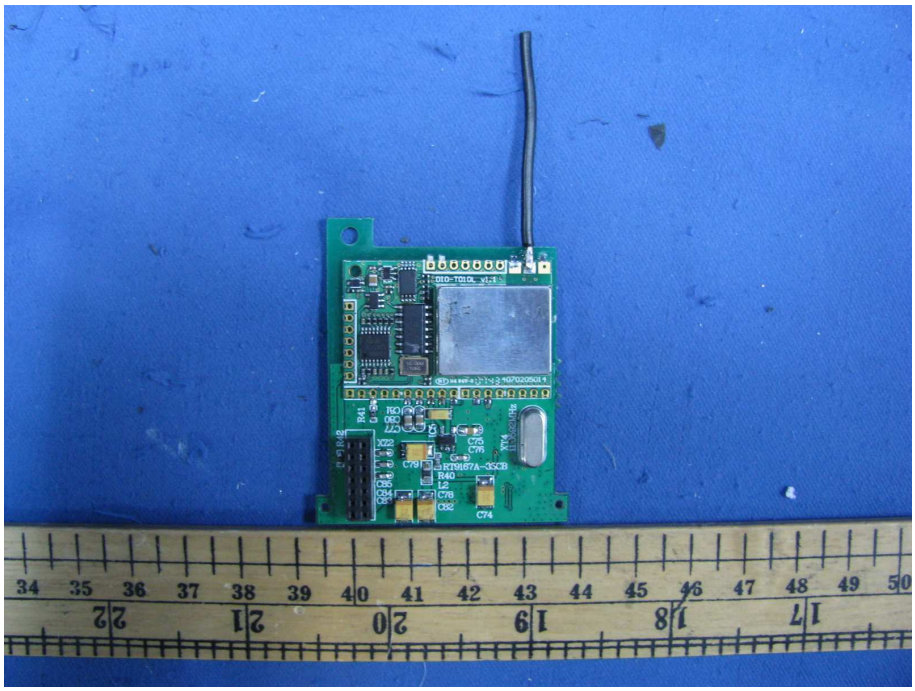
Internal View

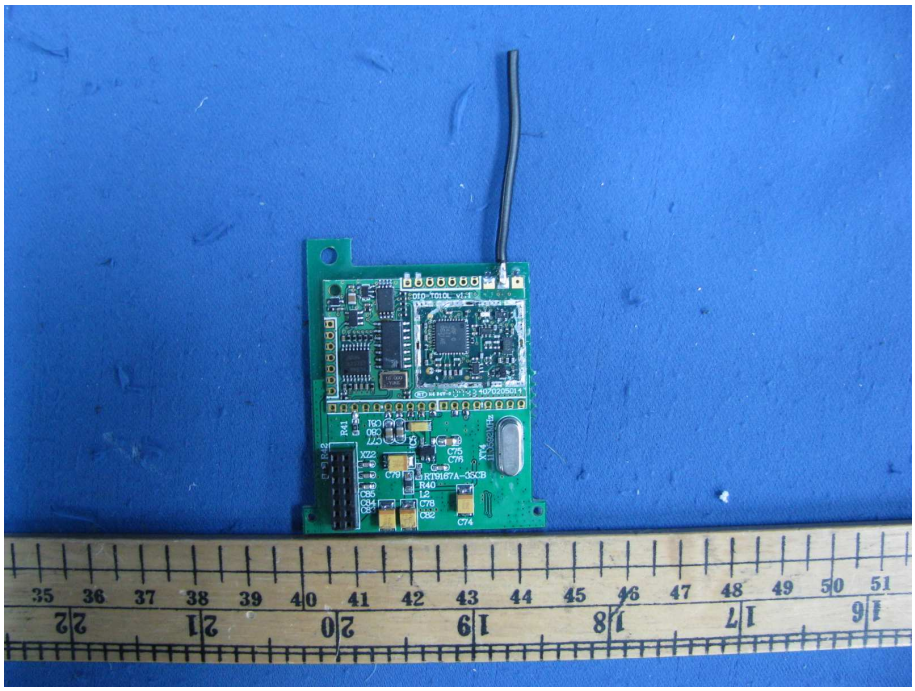
Internal View



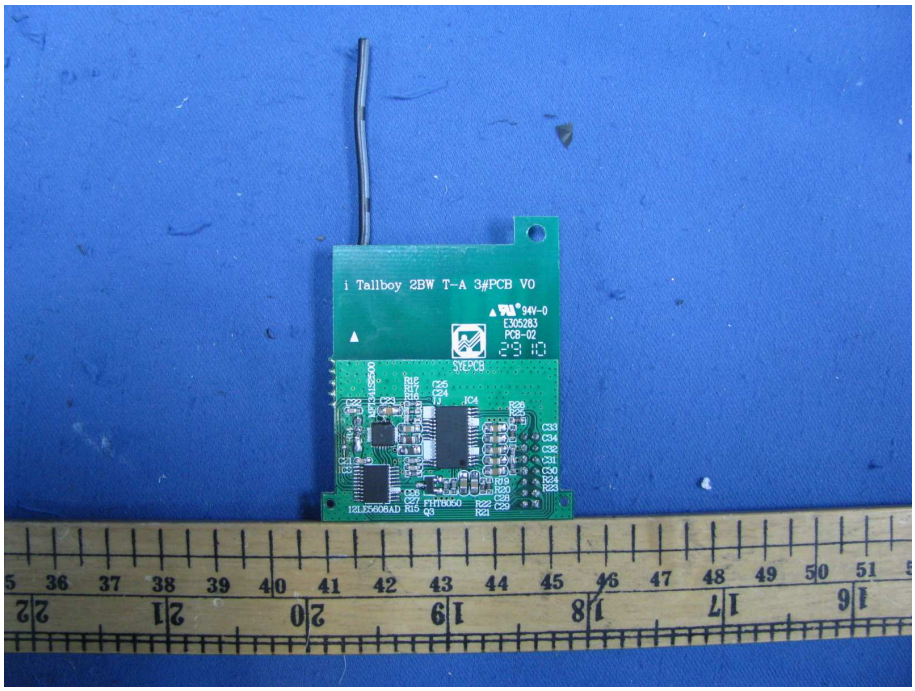


Internal View





Internal View



6. Appendix III - Document List

Exhibit type	File Description	Filename
Test Report	Test Report	Report.pdf
Block Diagram	Block Diagram	Block.pdf
Schematics	Circuit Diagram	Circuit.pdf
Operation Description	Technical Description	Description.pdf
ID Label/Location	Label Artwork and Location	Label.pdf
User Manual	User Manual	Manual.pdf
Cover Letter	Confidentiality Letter	Request.pdf
Cover Letter	Letter of Agency	Agency.pdf
Test setup photos	Test setup photos	Test setup photos.pdf
External photos	External photos	External photos.pdf
Internal photos	Internal photos	Internal photos.pdf
Average factor	Average factor	Average factor.pdf

---------- End of Report ----------