FCC TEST REPORT

FCC ID : **WZR-FINDER**

Applicant : **Smart Concepts LTD**
Address : Room 1202, Building 1, Lane 135, Daji Road, Huangpu District, 200011, Shanghai, China

Equipment Under Test (EUT) :

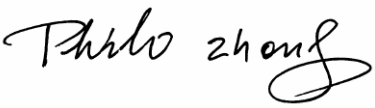
Product description : Light sensor multiply objects finder

Model No. : 1 transmitter to 1 receiver

Standards : FCC 15 Subpart C Paragraph 15.231(e)

Date of Test : Dec.25,2008

Test Engineer :**Olic huang**

Reviewed By : 

PERPARED BY:
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2 Contents

3 Test Summary

Test items	Test Requirement	Test Method	Class / Severity	Result
Periodic operation	FCC PART 15: 2007	ANSI C63.4: 2003	**Note**	PASS
Band Edge	FCC PART 15: 2007	ANSI C63.4: 2003	**Note**	PASS
Radiated Emission (30MHz to 5GHz)	FCC PART 15: 2007	ANSI C63.4: 2003	N/A	PASS
Conducted Emission (150KHz to 30MHz)	FCC PART 15: 2007	ANSI C63.4: 2003	N/A	N/A

Note: denote that for more details, please refer to the section Periodic operation and Band Edge.

4 General Information

4.1 Client Information

Applicant:	Smart Concepts LTD
Address:	Room 1202, Building 1, Lane 135, Daji Road, Huangpu District, 200011, Shanghai, China
Manufacturer:	SHEN ZHEN C&D ELECTRONICS CO.,LTD
Address:	Building 2, Xia You Song Mountaintop Industrial District, You Song Village,LongHua Town, ShenZhen.china

4.2 General Description of E.U.T.

Product description:	Light sensor multiply objects finder
Model No.:	1 transmitter to 1 receiver

4.3 Details of E.U.T.

Power Supply:	Battery DC 6.0V
Modulation :	ASK

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 Light sensor multiply objects finder. The standards used were FCC 15 Paragraph 15.231(e), Paragraph 15.205, 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:

- **IC – Registration No.:IC7760**

  Waltek Services(Shenzhen) Co., Ltd. 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.

- **FCC – Registration No.: 880581**

  Waltek Services(Shenzhen) Co., Ltd. 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. compliance

4.7 Test Location

All Emissions testswere performed at:-

Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building,West Baima Rd., Songgang Street, Baoan District, Shenzhen518105, China.

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	MY45114943
Active Loop Antenna	Beijing Dazhi	ZN30900A	ISO 9001	12	Jul -08	-
Trilog Broadband Antenne	SCHWARZBECK MESS-ELEKTROM	VULB9163	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	336
Broad-band Horn Antenna	SCHWARZBECK MESS-ELEKTROM	BBHA 9120 D	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	667
Broadband Preamplifier	SCHWARZBECK MESS-ELEKTROM	BBV 9718	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	9718-148
10m Coaxial Cable with N-male Connectors usable	SCHWARZBECK 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	SCHWARZBECK 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&SCHWARZ	ESPI	ISO9001	12	Jul-08	101155
Two-Line V-Network	ROHDE&SCHWARZ	ENV216	ISO9001 EN/ISO/IEC 17025	12	Jul-08	100115
Absorbing Clamp	ROHDE&SCHWARZ	MDS-21	ISO9001 EN/ISO/IEC 17025	12	Jul-08	100205
10m 50 Ohm Coaxial Cable with N-plug,individual length,usable up to 3(5)GHz, Connectors	SCHWARZBECK MESS-ELEKTROM	AK 9514	EN/ISO/IEC 17025 DIN EN ISO9001	12	Aug-08	-

6 Conducted Emission Test

Product Name:	Light sensor multiply objects finder
Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
Test Date:	……
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

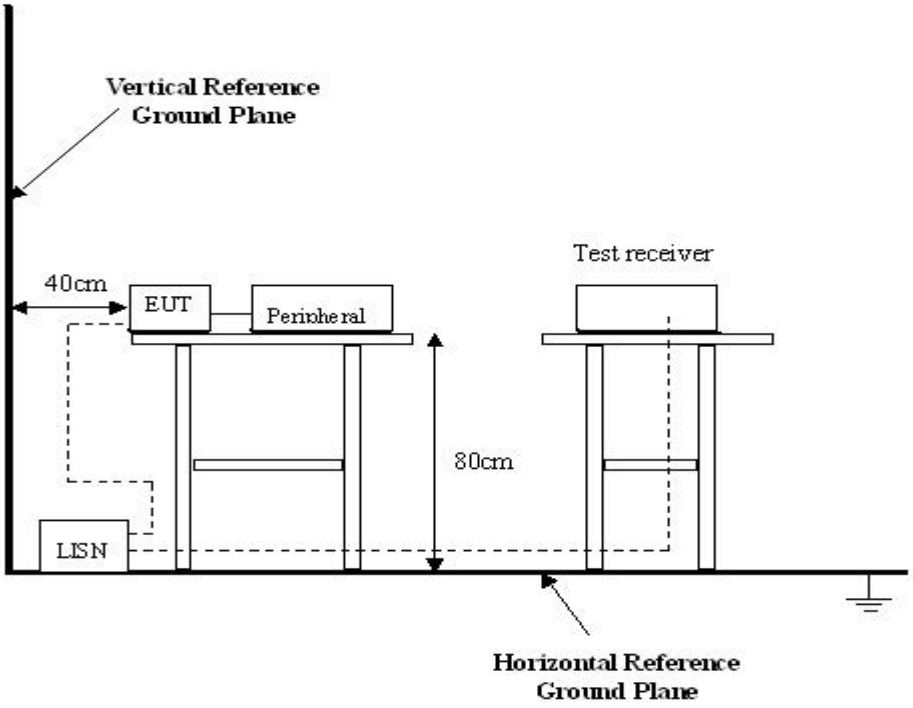
Please refer to Section 5 this report.

6.2 Test Procedure

1. The EUT was tested according to ANSI C63.4: 2003. The frequency spectrum from 150kHz to 30MHz was investigated.
2. 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.

6.3 Conducted Test Setup

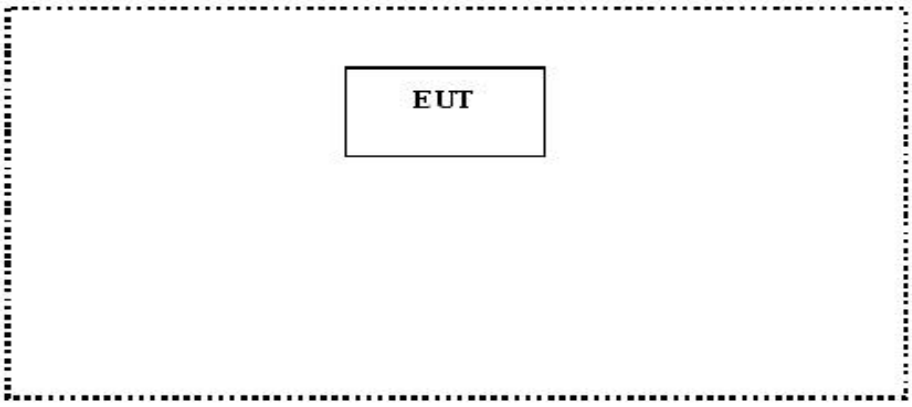
The conducted emission tests were performed using the setup accordance with the ANSI C63.4: 2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



6.4 EUT 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 dBμV between 0.15MHz & 0.5MHz
56 dBμV between 0.5MHz & 5MHz
60 dBμV between 5MHz & 30MHz

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

6.6 Conducted Emission Test Data

Owing to the DC operation of EUT, this test is not performed.

7 Radiation Emission Test

Product Name:	Light sensor multiply objects finder
Test Requirement:	FCC Part15 Paragraph 15.231(e)
Test Method:	Based on FCC Part15 Paragraph 15.33
Test Date:	Dec.25,2008
Frequency Range:	30MHz to 5GHz
Measurement Distance:	3m

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.

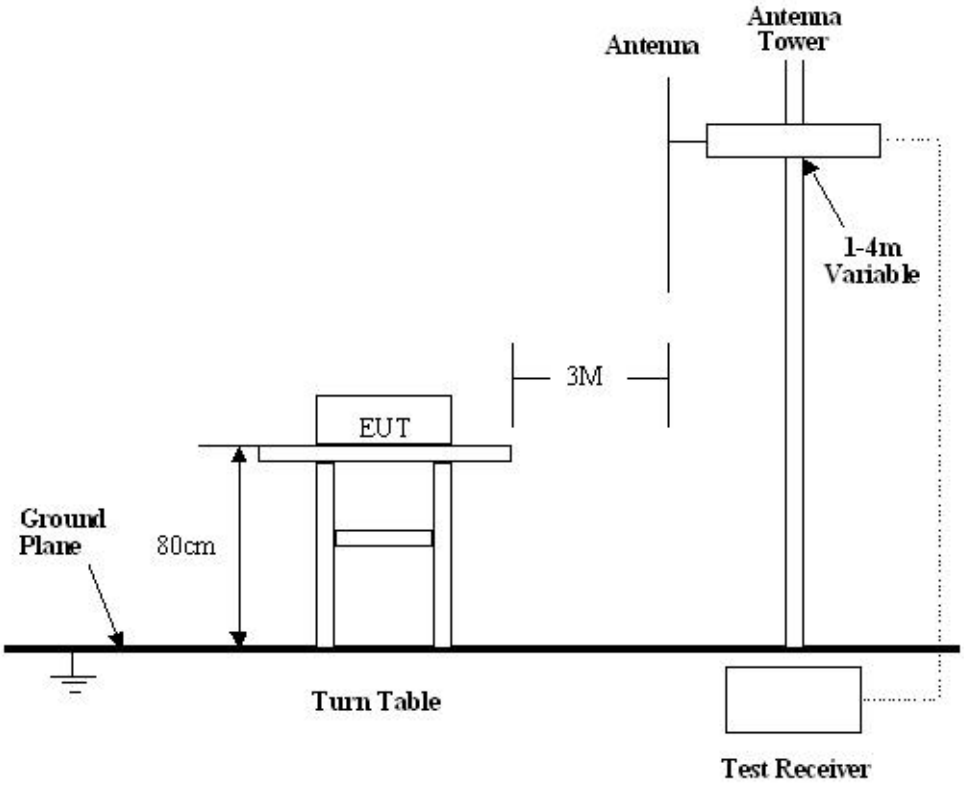
Based on ANSI C63.4: 2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is +2.9 dB.

7.3 Test Procedure

1. New battery were installed in the equipment under test for radiated emissions test.
2. This is a handhold device,The radiation emission should be tested under 3-axes position(lying,side and stand),After pre-test,It was found that the worse radiation emission was get at the lying position.
3. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
4. All data was recorded in the peak and average detection mode.
5. The EUT was under working mode during the final qualification test and the configuration was used to represent the worst case results.

7.4 Radiated 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 15.231(e), Paragraph 15.209 limits.



7.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.231(e) Rules, the system was tested to 5000 MHz.

Below 1GHz

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

Above 1GHz

Start Frequency 1GHz
Stop Frequency 5GHz
Sweep Speed Auto
IF Bandwidth .....120 kHz
Video Bandwidth.....1 MHz
Quasi-Peak Adapter Bandwidth .....120 kHz
Quasi-Peak Adapter Mode.....Normal
Resolution Bandwidth 1MHz

7.6 Corrected 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 7.10, the EUT complied with the FCC Part15 Paragraph 15.231(e) standards.

7.8 EUT Operating Condition

Same as section 6.4 of this report.

7.9 Radiated Emissions Limit

Field strength of Fundamental frequency (MHz) (microvolts/meter)	Field strength of fundamental (microvolts/meter)	spurious emissions
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1500	50 to 150
174-260	1500	150
260-470	1500 to 5000	150 to 500
Above 470	5000	500

7.10 Radiated Emissions Test Result

Formula of conversion factors:the field strength at 3m was egtablished by adding
The meter reading of the spectrum analyer (which is set to read in units of dBuV)
To the antenna correction factor supplied by the antenna manufacturer. The antenna
Correction factors are stared 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

7.10.1 Radiated Emission Test Data

Test Item:	Radiated Emission Test Data
Test Voltage:	DC 6.0V
Test Mode:	TX On
Temperature:	24 °C
Humidity:	52%RH
Test Result:	PASS

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
433.92	AV	Vertical	55.31	72.87	17.56	1.0	0
433.92	AV	Horizontal	63.85	72.87	9.02	1.0	45
867.84	AV	Vertical	40.69	52.87	12.18	1.0	60
1301.76	AV	Vertical	35.70	54.00	18.30	1.0	100
1735.58	AV	Vertical	34.12	54.00	19.88	1.5	100
2169.60	AV	Vertical	32.44	54.00	21.56	1.5	110
2603.52	AV	Vertical	30.44	54.00	23.56	1.0	90
3037.44	AV	Vertical	29.75	54.00	24.25	1.4	90
3471.36	AV	Vertical	29.44	54.00	24.56	1.6	90
3905.28	AV	Vertical	28.39	54.00	25.61	1.5	60
4339.20	AV	Vertical	27.44	54.00	26.56	1.0	60
867.831	AV	Horizontal	39.26	52.87	13.61	1.5	90
1301.76	AV	Horizontal	37.98	54.00	16.02	1.0	60
1735.58	AV	Horizontal	36.44	54.00	17.56	1.5	45
2169.60	AV	Horizontal	35.64	54.00	18.36	1.5	100
2603.52	AV	Horizontal	33.44	54.00	20.56	1.1	80
3037.44	AV	Horizontal	32.44	54.00	21.56	1.5	120
3471.36	AV	Horizontal	26.44	54.00	27.56	1.5	120
3905.28	AV	Horizontal	24.56	54.00	29.44	1.1	100
4339.20	AV	Horizontal	23.44	54.00	30.56	1.1	20

Where F is the frequency in MHz,The formulas for calculating the maximum permitted fundamental field strengths are as follows:

(1). For the band 130-174MHz,uV/m at 3 meters=22.72727(F)-2454.545;

(2). For the band 260-470MHz,uV/m at 3 meters=16.6667(F)-2833.3333.

Sample calculation of limit @ 433.92MHz

16.6667 (433.92)- 2833.333=4893.68V/m

20log(4893.68)=72.8664 dBuV/m limit @ 433.92MHz

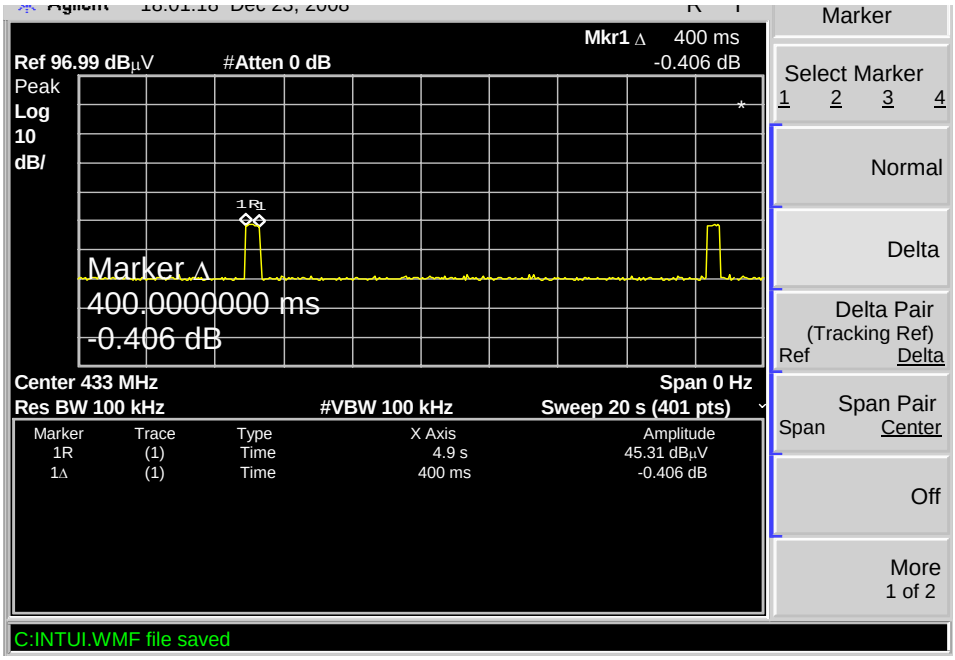
And the maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

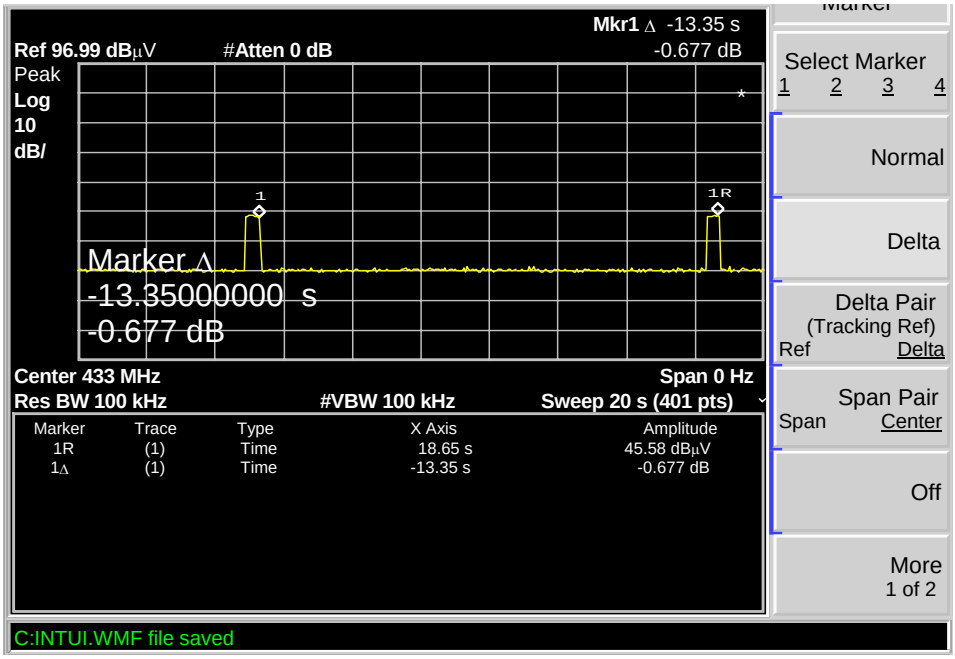
8 Antenna Requirement.

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product has a permanent antenna, fulfill the requirement of this section

9 Periodic Operation

Refer to the plot (as below),We find each the duration transmission for the device is about 0.400seconds and silent period between transmissions is about 13.35seconds, greater than 10seconds,This device does meet the FCC requirement.





Note:

The duty cycle was determined by the following equation:

To calculate the actual field intensity,The duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion

The EUT is auto. operation for transmitter，it is declared by the manufacturer as a duty cycle ratio of less than 100%.

The EUT ‘s work time : T_{on} =1.18*9+0.4*16=17.02ms

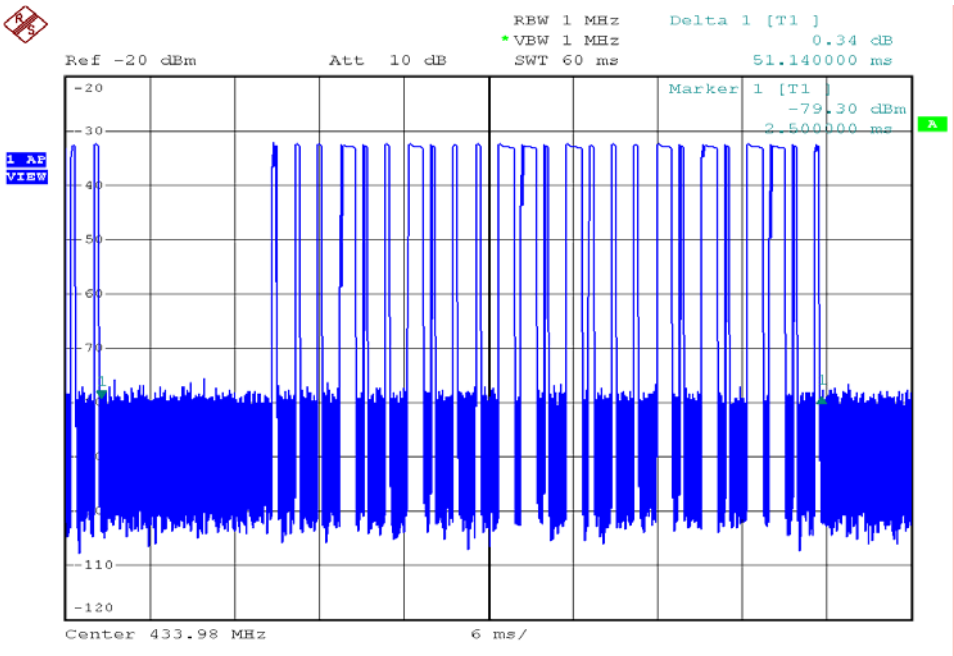
The EUT’s work period :$T=T_{ON}+T_{OFF}$=51.14ms

The EUT’s duty cycle : $D = T_{on} /T$ = 17.02/51.14*100% =33.28%

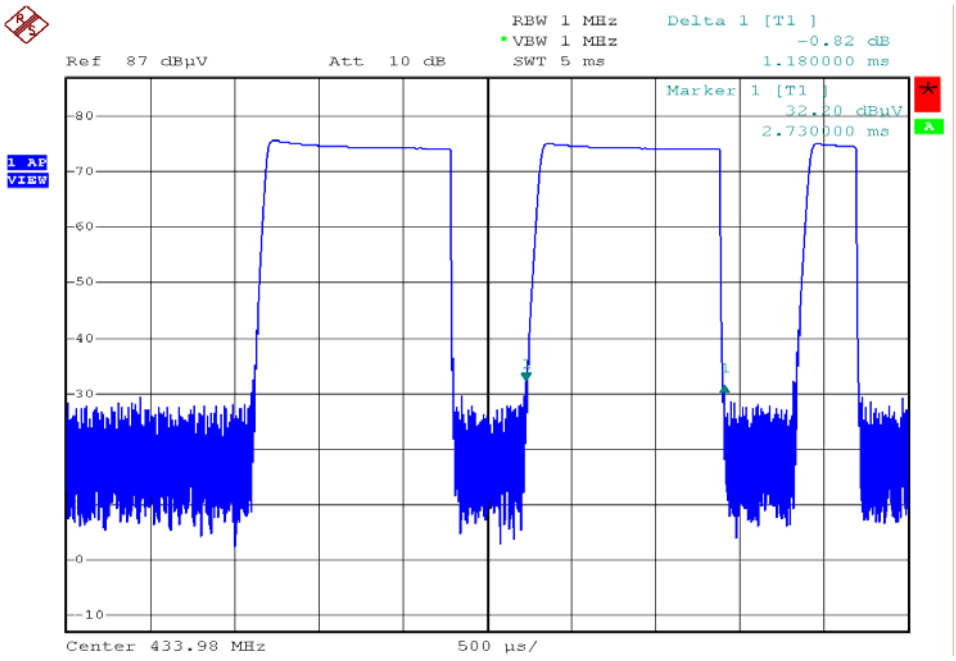
Duty Cycle Correction Factor(dB)=20 * Log10(Duty Cycle(%))=20* Log1033.28% =9.56

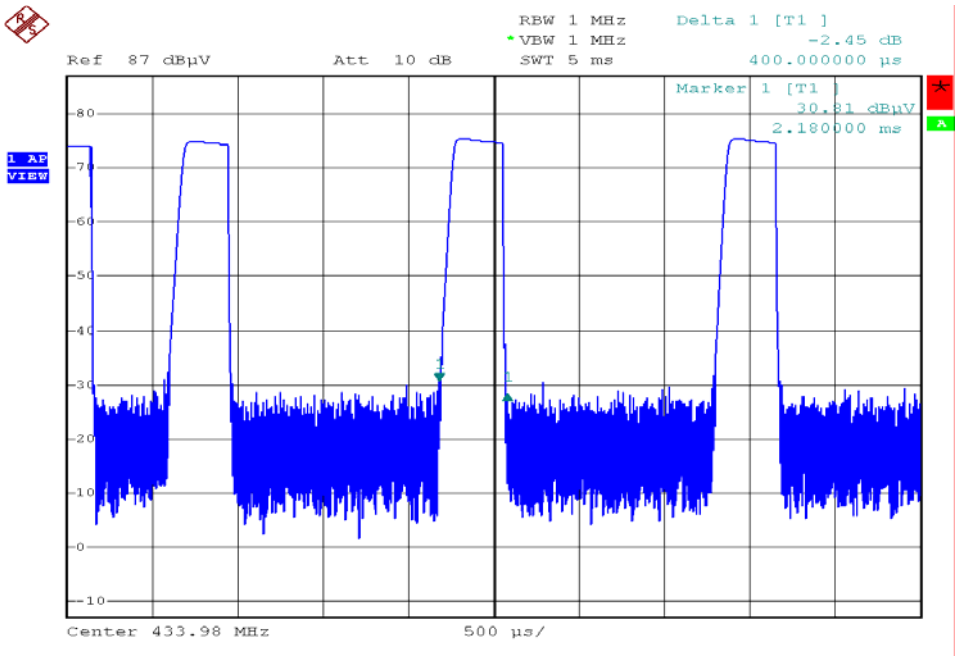
Plot(s) is presented hereinafter as reference:

The EUT’s work period：



The EUT‘s work time :





10 Band Edge

Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.231
Test Date:	Dec.25,2008
Test mode:	TX On
Temperature:	24 °C
Humidity:	52%RH

10.1 Test Procedure

1. 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.
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.

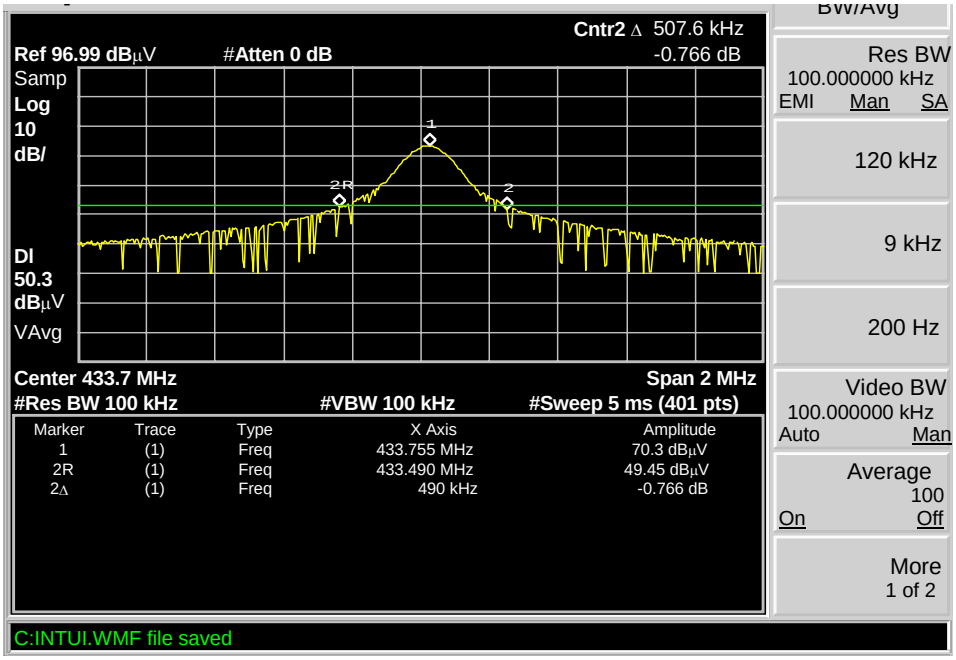
10.2 Band Edge

Requirements: The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Frequency (MHz)	Bandwidth Emission (KHz)	Limit (KHz)	Result
433.92	490	1084.8	Pass

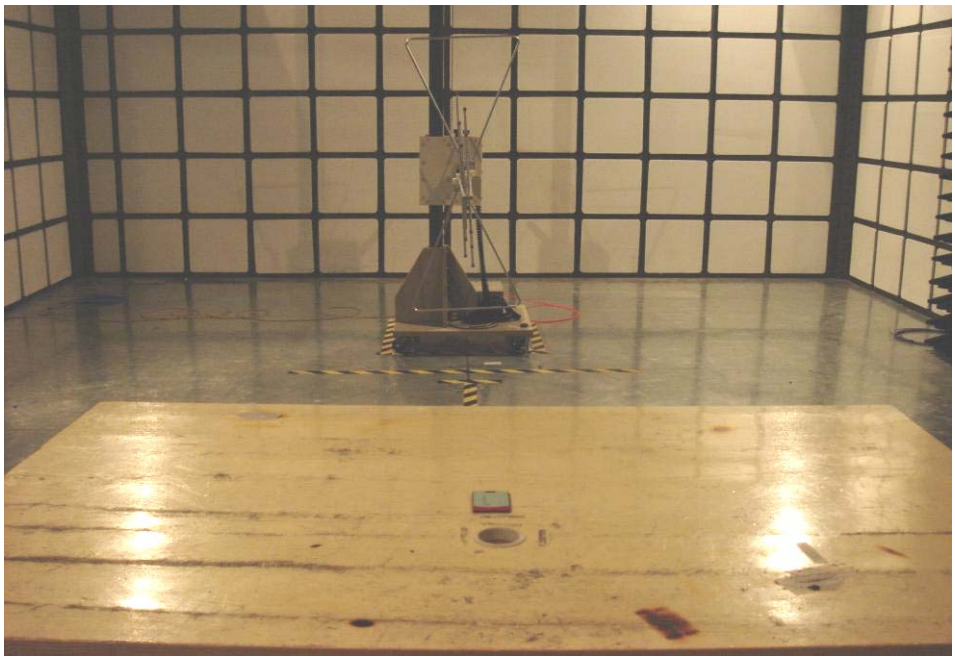
10.3 Band Edge Test Result

433.92MHz TX

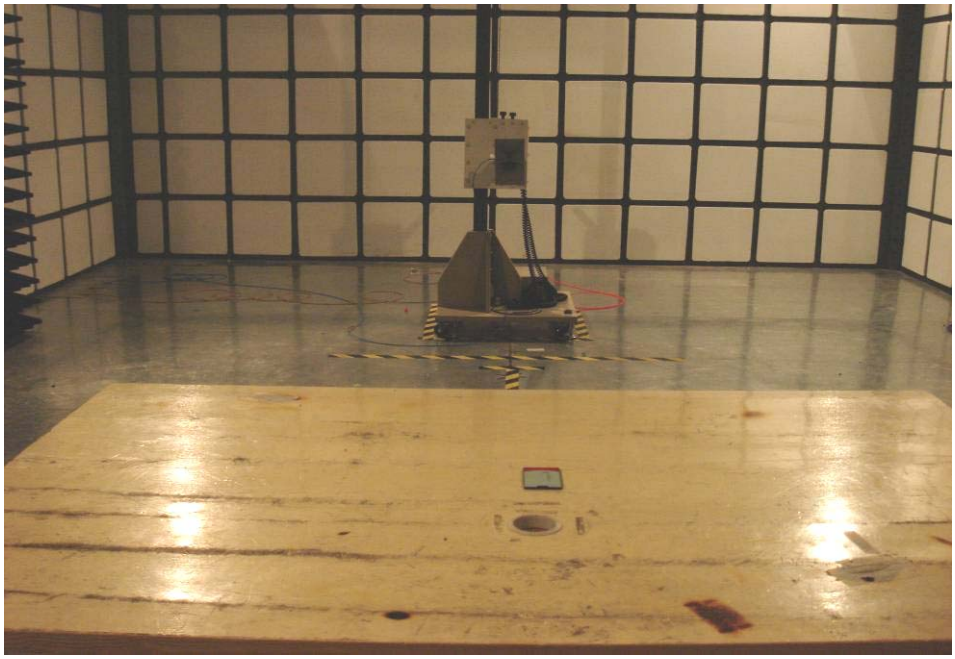


11 Photographs of Testing

11.1 Radiation Emission Test View For 30MHz-1000MHz



11.2 Radiation Emission Test View For 1GHz-5GHz

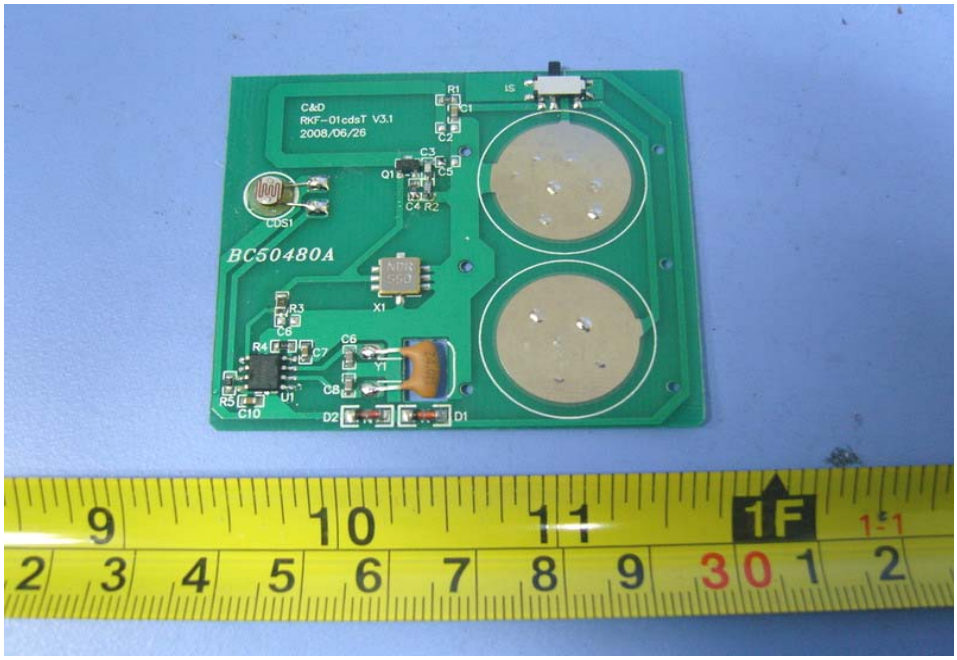


12 Photographs - Constructional Details

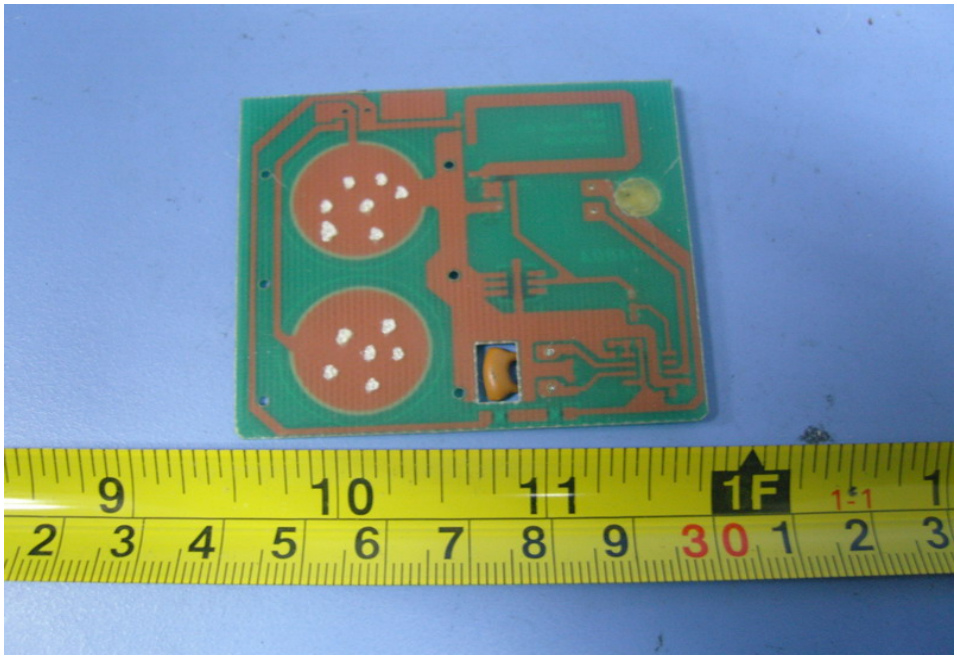
12.1 EUT-Front View for TX

12.2 EUT-Back View for TX

12.3 TX PCB-Front View



12.4 TX PCB-Back View



13 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 Label Location