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Report No.: GZEM140800417802

Page: 1 of 19

FCC ID: 2AC3GVSMSV5P

## TEST REPORT

Application No.:	GZEM1408004178RF
Applicant:	Guangzhou Waytronic Electronics Co., Ltd.
Manufacturer:	Same as Applicant
Factory:	Same as Applicant
FCC ID:	2AC3GVSMSV5P
Product Name:	Vehicle Warning System V5.10
Product Description:	Radio transmitter with 2.4GHz as carrier
Model No.:	P-Tag
Standards:	CFR 47 PART 15 Subpart C: 2013 section 15.249
Date of Receipt:	2014-08-12
Date of Test:	2014-09-03 to 2014-10-14
Date of Issue:	2015-01-12
Test Result :	Pass*

\* In the configuration tested, the EUT complied with the standards specified above.



The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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## 2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2015-01-12		Original

Authorized for issue by:			
Tested By	 (Jack Liang) /Project Engineer		2014-09-03 to 2014-10-14
Prepared By	 (Millie Li) /Clerk		2014-11-04
Checked By	 (Jerry Chan)/Reviewer		2014-11-24

### 3 Test Summary

Test	Test Requirement	Test method	Result
Field Strength of Fundamental	FCC PART 15 C section 15.249 (a)	ANSI C63.10: Clause 6.6	PASS
Field Strength of Unwanted Emissions	FCC PART 15 C section 15.249 (a) section 15.249 (d)	ANSI C63.10: Clause 6.4, 6.6 and 6.7	PASS
Band Edges	FCC PART 15 C section 15.249 (d)	ANSI C63.10: Clause 6.9.2	PASS
Occupied Bandwidth	FCC PART 15 C section 15.215(c)	ANSI C63.10: Clause 6.9.1	PASS

**Remark:**

EUT: In this whole report EUT means Equipment Under Test.

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radio Frequency.

ANSI C63.10: the detail version is ANSI C63.10:2009 in the whole report.

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## 5 General Information

### 5.1 Client Information

Applicant: Guangzhou Waytronic Electronics Co., Ltd.  
Address of Applicant: 502 Room, West 2nd Building, Tangli Mansion, Tangxia, Tianhe District, Guangzhou Guangdong China  
Manufacturer: Same as Applicant  
Address of Manufacturer: Same as Applicant  
Factory: Same as Applicant  
Address of Factory: Same as Applicant

### 5.2 General Description of E.U.T.

Product Name: Vehicle Warning System V5.10  
Model No.: P-Tag

### 5.3 Details of E.U.T.

Operating Frequency 2427MHz  
Type of Modulation: MSK  
Number of Channels 1  
Channel Separation: /  
Antenna Type External Antenna  
Antenna Gain: 3.0 dBi  
Function: 2.4GHz is used for common channel for data transfer. Transmitter will be hopped at 2427MHz for searching the Receiver. When the receiver is found, this frequency will be fixed and not be changed any more.  
Power Supply: DC 3.7V 1800mAh by internal rechargeable  
Test Voltage DC 3.7V  
Power Cord: N/A

### 5.4 Description of Support Units

The EUT has been tested as an independent unit.

## 5.5 Other Information Requested by the Customer

None.

## 5.6 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.

## 5.7 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory,  
198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District,  
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

## 5.6 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC (Registration No.: 282399)**

SGS-CSTC Standards Technical Services 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 282399, May 31, 2002.

- **Industry Canada (Registration No.: 4620B-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co. Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584, G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01:2006-10 and Rules of procedure IECEE 02:2006-10, and the relevant IECEE CB-Scheme Operational documents.

## 6 Equipment Used during Test

RE in Chamber						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0525	Compact Semi-Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	2013-12-5	2014-12-5
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2014-04-19	2015-04-19
EMC0056	EMI Test Receiver	Rohde & Schwarz	ESCI	100236	2014-03-03	2015-03-03
EMC0528	RI High frequency Cable	SGS	20 m	N/A	2014-05-09	2015-05-09
EMC2025	Trilog Broadband Antenna 30-1000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9160	9160-3372	2014-07-14	2017-07-14
EMC0524	Bi-log Type Antenna	Schaffner -Chase	CBL6112B	2966	2013-08-31	2016-08-31
EMC0519	Bilog Type Antenna	Schaffner -Chase	CBL6143	5070	2014-05-04	2017-05-04
EMC2026	Horn Antenna 1-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	9120D-841	2013-08-31	2016-08-31
EMC0518	Horn Antenna	Rohde & Schwarz	HF906	100096	2012-07-01	2015-07-01
EMC0521	1-26.5 GHz Pre-Amplifier	Agilent	8449B	3008A01649	2014-03-03	2015-03-03
EMC2065	Amplifier	HP	8447F	N/A	2014-08-25	2015-08-25
EMC0075	310N Amplifier	Sonama	310N	272683	2014-03-03	2015-03-03
EMC0523	Active Loop Antenna	EMCO	6502	42963	2014-03-03	2016-03-03
EMC2041	Broad-Band Horn Antenna (14)15-26.5(40)GHz	SCHWARZBECK MESS-ELEKTRONI	BBHA 9170	9170-375	2014-05-26	2017-05-26
EMC2069	2.4GHz filter	Micro-Tronics	BRM 50702	149	2014-04-19	2015-04-19
EMC0530	10m Semi-Anechoic Chamber	ETS	N/A	N/A	2014-05-03	2016-05-03

General used equipment						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0006	DMM	Fluke	73	70681569	2014-09-15	2015-09-15
EMC0007	DMM	Fluke	73	70671122	2014-09-15	2015-09-15

## 7 Test Results

### 7.1 E.U.T. Operation

**Test Voltage:** DC 3.7V  
**Temperature:** 20.0 -25.0 °C  
**Humidity:** 38-50 % RH  
**Atmospheric Pressure:** 1000 -1010 mbar

**Test Frequencies and Frequency Range:** According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

#### Number of fundamental frequencies to be tested in EUT transmit band

Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

#### Frequency range of radiated emission measurements

Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

EUT channels and frequencies list: 2427MHz

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0		27		54	
1		28		55	
2		29		56	
3		30		57	
4		31		58	
5		32		59	
6		33		60	
7		34		61	
8	2427MHz	35		62	
9		36		63	
10		37		64	
11		38		65	
12		39		66	
13		40		67	
14		41		68	
15		42		69	
16		43		70	
17		44		71	
18		45		72	
19		46		73	
20		47		74	
21		48		75	
22		49		76	
23		50		77	
24		51		78	
25		52			
26		53			

## 7.2 Antenna Requirement

### Standard requirement

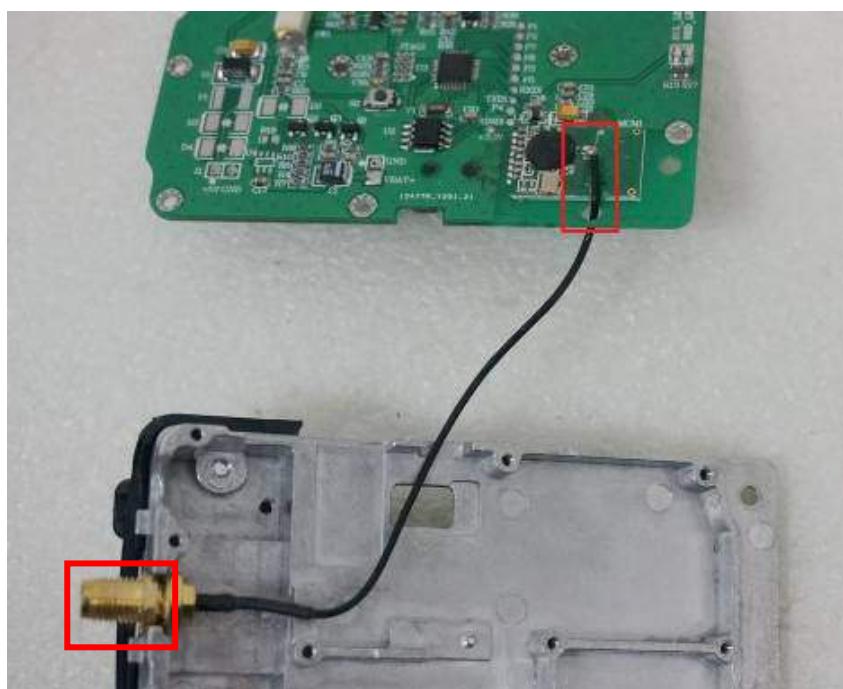
15.203 requirement:

For intentional device. According to 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.

### EUT Antenna

The antenna is a special male head external antenna and no consideration of replacement. When the external antenna is used, the integral antenna cannot work.

The best case gain of the antenna is 3.0 dBi.



**Test result: The unit does meet the FCC requirements.**

### 7.3 Field Strength of Fundamental & Field Strength of Unwanted Emissions & Band Edge

**Test Requirement:** FCC Part15 C section 15.249

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dB $\mu$ V/m @ 3m)	Field Strength of Harmonics (dB $\mu$ V/m @ 3m)
902 to 928	94.0	54.0
2400 to 2483.5	94.0	54.0
5725 to 5875	94.0	54.0
24000 to 24250	108.0	68.0

(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.

**Limits:** The fundamental frequency of the EUT is 2427MHz.

The limit for Average field strength dB $\mu$ V/m for the fundamental frequency = 94.0 dB $\mu$ V/m.

The limit for Peak field strength dB $\mu$ V/m for the fundamental frequency = 114.0 dB $\mu$ V/m.

No fundamental is allowed in the restricted bands.

The limit for average field strength dB $\mu$ V/m for the harmonics = 54.0 dB $\mu$ V/m.

The limit for peak field strength dB $\mu$ V/m for the harmonics = 74.0 dB $\mu$ V/m.

Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or 54.0 dB $\mu$ V/m in 15.209. Here the limit for the other emission is 54.0 dB $\mu$ V/m.

**Test Method:** ANSI C63.10: Clause 6.4, 6.6 and 6.7 for Field Strength of Fundamental & Field Strength of Unwanted Emissions

ANSI C63.10: Clause 6.9.2 for Band Edge

**Status** Pre-test the EUT in continuous transmitting mode with setup as stand-alone in X, Y, Z threes axes, found the worst case is X axes and report the data.

**Measurement Distance:** 3m (Semi-Anechoic Chamber)

**Frequency range** 9 kHz – 25 GHz for transmitting mode.

Test instrumentation resolution bandwidth

9 kHz (9 kHz - 30 MHz), 120 kHz (30 MHz - 1000 MHz), 1 MHz (1000 MHz – 25 GHz)

**Test Procedure:**

## 1) 9 kHz to 30 MHz emissions:

For testing performed with the loop antenna, testing was performed in accordance to ANSI C63.10. The centre of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.

## 2) 30 MHz to 1 GHz emissions:

For testing performed with the bi-log type antenna, testing was performed in accordance to ANSI C63.10. The measurement is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

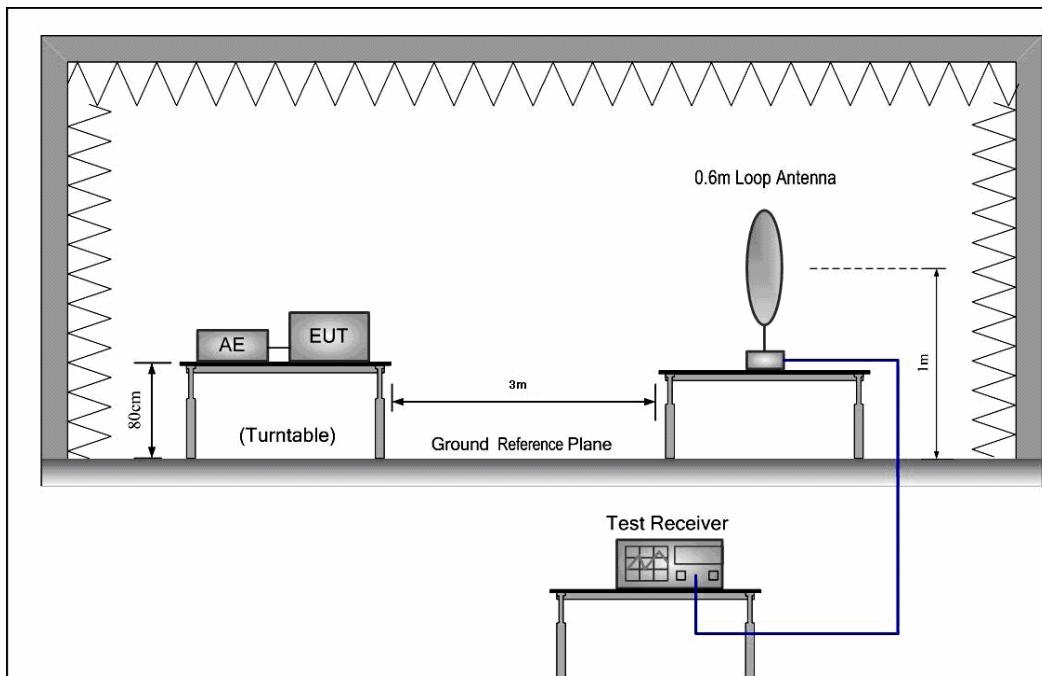
## 3) 1 GHz to 25 GHz emissions:

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2007 was used to perform radiated emission test above 1 GHz.

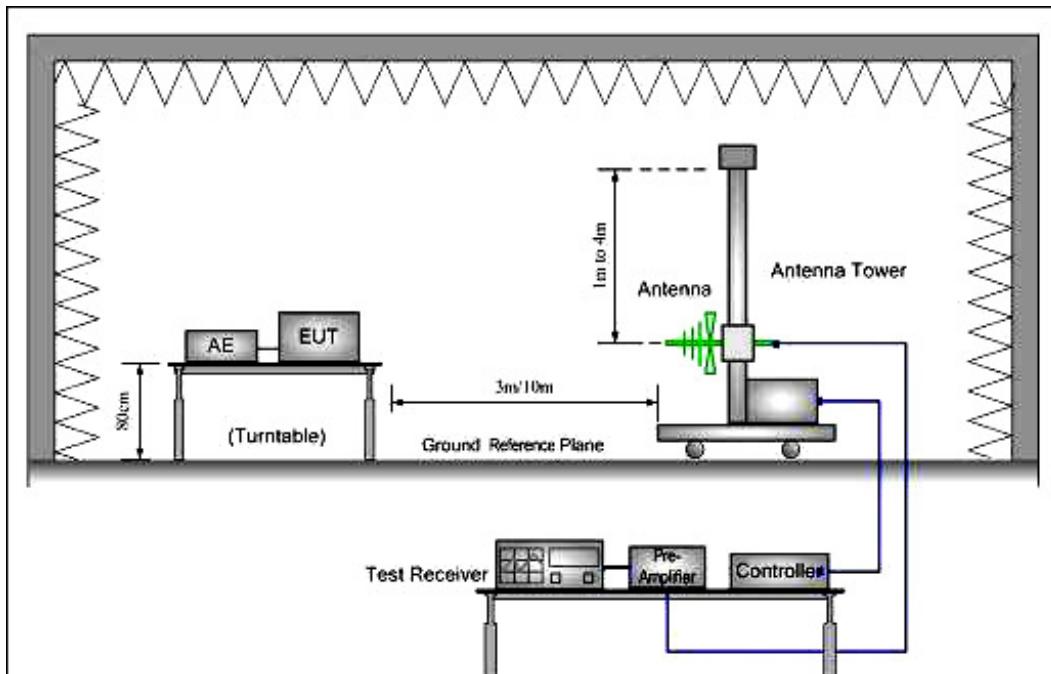
For testing performed with the horn antenna, testing was performed in accordance to ANSI C63.10. The measurement is performed with the EUT rotated 360°, the antenna height scan between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

**Test Configuration:**

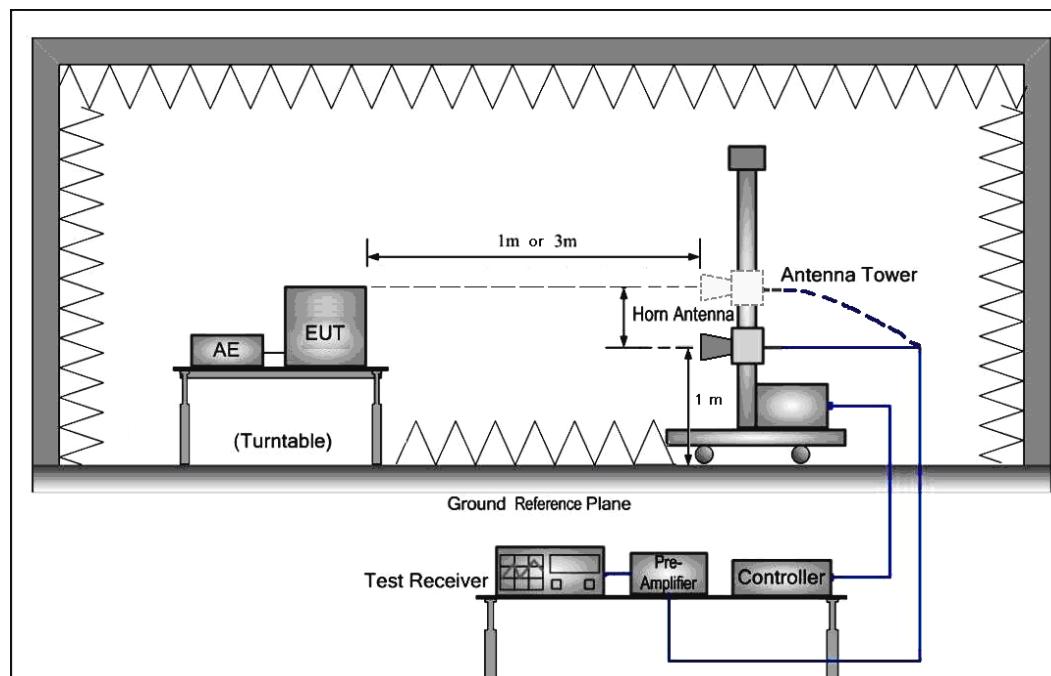
## 1) 9 kHz to 30 MHz emissions:



## 2) 30 MHz to 1 GHz emissions:



## 3) 1 GHz to 25 GHz emissions:



The field strength is calculated by adding the Antenna Factor, Cable Loss & Per-amplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Loss – Preamplifier Factor

**Test at 2427MHz in transmitting status**

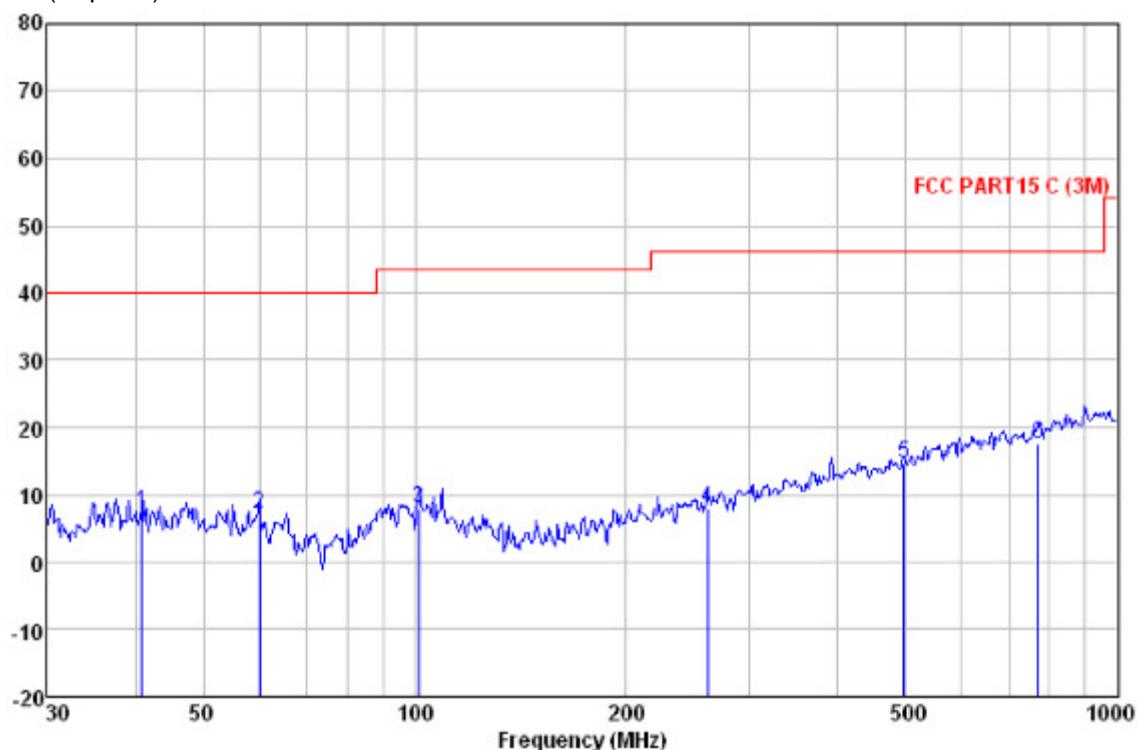
9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

**30 MHz~1 GHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement**

Vertical:

Peak scan

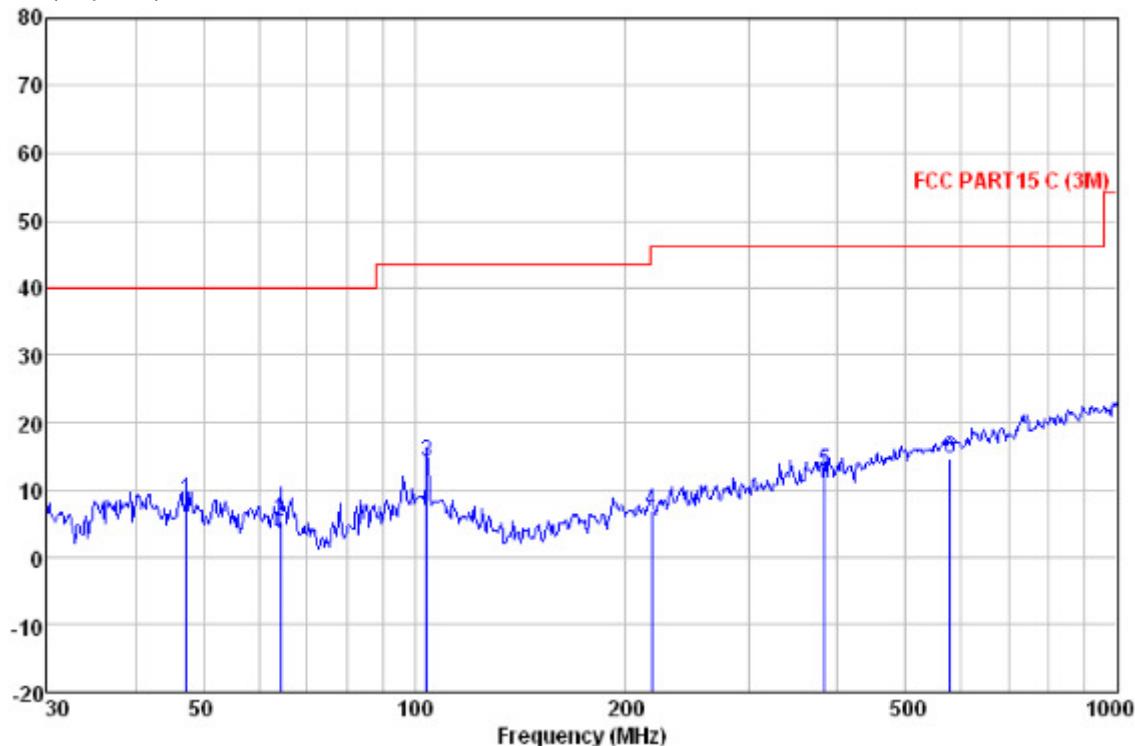
Level (dB $\mu$ V/m)

Quasi-peak measurement

Freq MHz	Read	Antenna Level	Cable Loss	Preamp Factor	Limit Level	Line Level	Over Limit	Over Remark
	dB $\mu$ V	dB/m	dB	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB	
40.845	23.81	13.57	1.01	31.01	7.38	40.00	-32.62	QP
60.069	24.48	12.69	1.10	31.00	7.27	40.00	-32.73	QP
101.289	24.68	13.02	1.40	31.00	8.10	43.50	-35.40	QP
261.058	24.76	12.09	2.26	31.03	8.08	46.00	-37.92	QP
495.934	26.14	16.52	3.09	31.00	14.75	46.00	-31.25	QP
771.449	25.09	19.72	3.75	30.90	17.66	46.00	-28.34	QP

**Horizontal:**

Peak scan

Level (dB $\mu$ V/m)

Quasi-peak measurement

Freq MHz	ReadAntenna Level		Cable Loss		Preamp Factor		Limit Line dB $\mu$ V/m	Over Line dB	Over Limit dB	Remark
	dB $\mu$ V	dB/m	dB	dB	dB $\mu$ V/m					
47.326	25.08	13.41	1.07	31.00	8.56	40.00	-31.44	QP		
64.433	24.32	10.84	1.14	31.00	5.30	40.00	-34.70	QP		
104.170	30.93	12.78	1.41	31.00	14.12	43.50	-29.38	QP		
217.544	24.86	11.10	1.95	31.08	6.83	46.00	-39.17	QP		
383.932	26.32	14.68	2.77	30.91	12.86	46.00	-33.14	QP		
578.670	24.31	18.09	3.19	30.92	14.67	46.00	-31.33	QP		

**1~25 GHz Field Strength of Fundamental & Field Strength of Unwanted Emissions.****Peak & Average Measurement**

<b>Peak Measurement:</b>							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Antenna polarization
2427.000	27.57	6.73	38.25	64.59	60.64	114.00	V
4854.000	31.56	11.21	38.56	43.78	47.99	74.00	V
7281.000	36.49	13.15	38.87	42.48	53.25	74.00	V
9708.000	38.30	15.10	39.73	42.66	56.33	74.00	V
2427.000	27.57	6.73	38.25	46.29	42.34	114.00	H
4854.000	31.56	11.21	38.56	42.10	46.31	74.00	H
7281.000	36.49	13.15	38.87	40.94	51.71	74.00	H
9708.000	38.30	15.10	39.73	42.68	56.35	74.00	H

**Average Measurement:**

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Antenna polarization
2427.000	27.57	6.73	38.25	61.10	57.15	94.00	V
4854.000	31.56	11.21	38.56	40.67	44.88	54.00	V
7281.000	36.49	13.15	38.87	38.13	48.90	54.00	V
9708.000	38.30	15.10	39.73	36.02	49.69	54.00	V
2427.000	27.57	6.73	38.25	42.59	38.64	94.00	H
4854.000	31.56	11.21	38.56	38.38	42.59	54.00	H
7281.000	36.49	13.15	38.87	36.98	47.75	54.00	H
9708.000	38.30	15.10	39.73	36.09	49.76	54.00	H

**Band Edge:**

<b>Peak Measurement:</b>							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Antenna polarization
2400.00	27.58	6.56	49.44	55.73	40.43	74.00	V
2483.50	27.55	6.99	49.42	56.54	41.66	74.00	V
2400.00	27.58	6.56	49.44	55.74	40.44	74.00	H
2483.50	27.55	6.99	49.42	55.72	40.84	74.00	H

**Average Measurement:**

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Antenna polarization
2400.00	27.58	6.56	49.44	47.73	32.43	54.00	V
2483.50	27.55	6.99	49.42	48.17	33.29	54.00	V
2400.00	27.58	6.56	49.44	46.14	30.84	54.00	H
2483.50	27.55	6.99	49.42	47.42	32.54	54.00	H

**Remark:**

- 1). The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
Final Test Level = Receiver Reading + Antenna Factor + Cable Loss - Preamplifier Factor.
- 2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits 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.
- 3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.
- 4). For Radiated Emissions fall in the restricted bands (2400MHz is worse case than 2390MHz and report it as above), which set out in Section 15.205 Restricted bands.  
Also there is not any other emission which falls in restricted bands can be detected and reported.

**Test result: The unit does meet the FCC requirements.**

## 7.4 Occupied Bandwidth

**Test Requirement:** FCC Part 15 C section 15.249

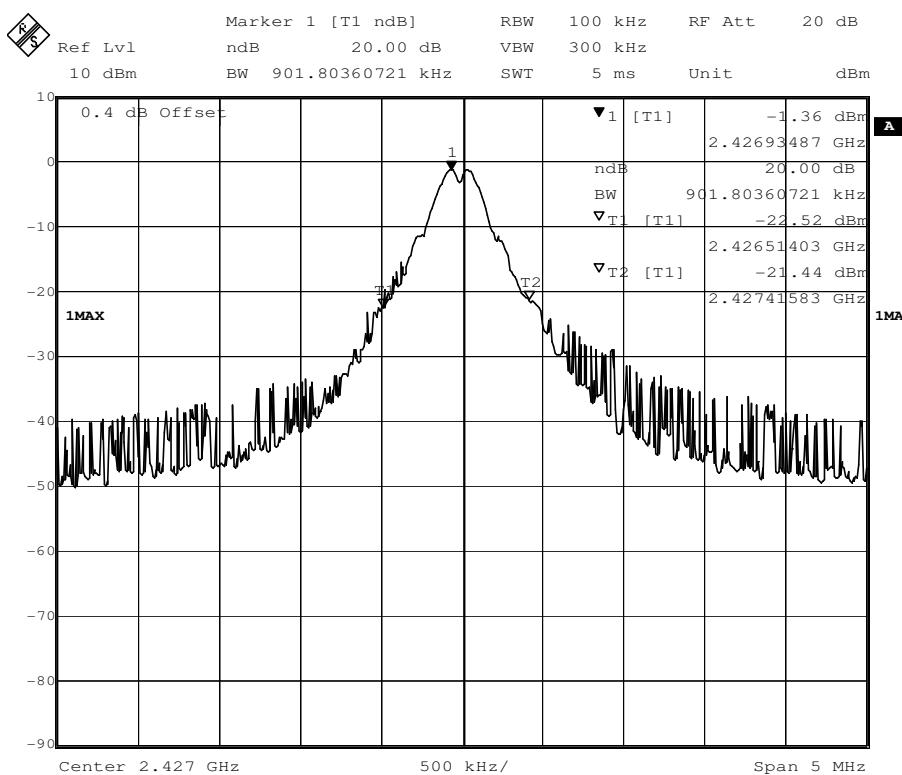
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

**Test Method:** ANSI C63.10: Clause 6.9.1

Operation within the band 2.400 to 2.4835 GHz

**Method of measurement:** A small sample of the transmitter output was fed into the Spectrum Analyzer and the attached plot was taken.

### Test in the frequency 2.427 GHz



**The results:** The unit does meet the FCC requirements.

**--End of the report--**