



# **FCC ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT CERTIFICATION TO FCC PART 15 REQUIREMENTS**

For

**INTENTIONAL RADIATOR**

of

**Car Alarm Transceiver**

**FCC ID Number : GOH-2WAIVU**

**Trade Name : CODE SYSTEMS, INC.**

**Model Number : T-RX2WA**

**Agency Series : N/A**

**Report Number : 50810203-RP1**

**Date : September 26, 2005**

Issued to

**CODE SYSTEM, INC.**

**525 Minnesota Drive Troy, Michigan 48083**

Issued by

**Compliance Certification Services Inc.**

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## 1. VERIFICATION OF COMPLIANCE

COMPANY NAME : CODE SYSTEMS, INC.  
525 Minnesota Drive Troy, Michigan 48083

CONTACT PERSON : MR. SHANE WILSON (RETAIL PROGRAM MANAGER)

TELEPHONE NO. : 1-248-583-9620

EUT DESCRIPTION : Car Alarm Transceiver

MODEL NAME/NUMBER : T-RX2WA

FCC ID : GOH-2WAIVU

DATE TESTED : August 17, 2005 ~ August 22, 2005

REPORT NUMBER : 50810203-RP1

TYPE OF EQUIPMENT	SECURITY EQUIPMENT (INTENTIONAL RADIATOR)
EQUIPMENT TYPE	433.92 MHz Car Alarm Transceiver
MEASUREMENT PROCEDURE	ANSI 63.4 / 2003
LIMIT TYPE	CERTIFICATION
FCC RULE	CFR 47, PART 15

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements set forth in the FCC CFR 47, PART 15. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties. **Warning:** This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services Inc. will constitute fraud and shall nullify the document.

*Approved by:*

*Reviewed by:*

David Wang  
Manager of Hsintien Laboratory  
Compliance Certification Services Inc.

Vince Chiang  
Assistant Manager of Hsintien Laboratory  
Compliance Certification Services Inc.



## 2. PRODUCT DESCRIPTION

Fundamental Frequency	<b>433.92 MHz</b>
Power Source	<b>12VDC</b>
Transmitting Time	<b>Periodic <math>\leq 5</math> seconds</b>
Associated Transceiver	<b>FCC ID: GOH-2WALED</b>

## 3. TEST FACILITY

The open area test sites and conducted measurement facilities used to collect the radiated data are located at No. 165, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

## 4. MEASUREMENT STANDARDS

The site is constructed and calibrated in conformance with the requirements of ANSI C63.4/2003.

## 5. TEST METHODOLOGY

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 tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. (CFR 47 Section 15.33)



## 6. MEASUREMENT EQUIPMENT USED

Open Area Test Site # K				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SITE NSA	CCS	K Site	N/A	09/04/2005
MEASURE RECEIVER	R&S	ESVS30	828488/004	09/24/2005
SPECTRUM ANALYZER	ADVANTEST	R3132	120900029	No Calibration Required
ANTENNA	SCHAFFNER	CBL 6112B	2846	05/27/2006
PRE-AMPLIFIER	SCHAFFNER	CPA9231A	3639	10/08/2005
CABLE	SUHNER	RG 214	N-TYPE #K2	02/18/2006
THERMO-HYGRO METER	TFA	N/A	NO.4	02/17/2006
EMC ANALYZER (100Hz-22GHz)	HP	8566B	2937A06102	06/30/2006
ANTENNA (1-18GHz)	EMCO	3115	5761	01/17/2006
AMPLIFIER (1-18GHz)	HP	8449B	3008A01266	02/16/2006
CABLE (1-18GHz)	JYEBAO	LL142	SMA#RS1&2	02/16/2006
CABLE (1-18GHz)	JYEBAO	LL142	SMA#C1	04/28/2006

*Remark: Each piece of equipment is scheduled for calibration once a year.*

## 7. POWERLINE RFI LIMIT

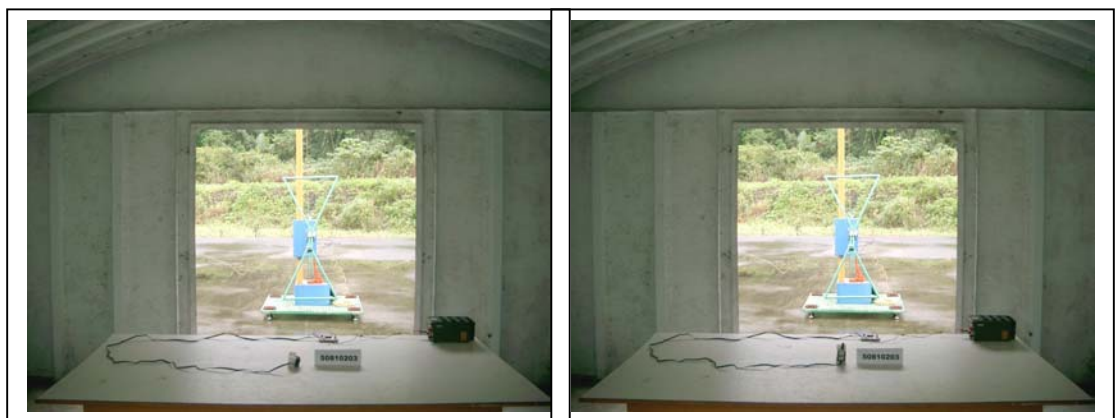
CONNECTED TO AC POWER LINE	SECTION 15.207
CARRIER CURRENT SYSTEM IN THE FREQUENCY RANGE OF 450 KHz TO 30 MHz	SECTION 15.205 AND SECTION 15.209, 15.221, 15.223, 15.225 OR 15.227, AS APPROPRIATE.
BATTERY POWER	NO REQUIRED.

## 8. RADIATED EMISSION LIMITS

GENERAL REQUIREMENTS	SECTION 15.209
RESTRICTED BANDS OF OPERATION	SECTION 15.205
PERIODIC OPERATION IN THE BAND 40.66 -40.70 MHz AND ABOVE 70 MHz.	SECTION 15.231
RECEIVER MODE	SECTION 15.109

## 9. SYSTEM TEST CONFIGURATION

Use a block of foam and combined it with EUT wrapping rubber band around it. This way it can test X, Y and Z axis. To activate continuous transmitting & receiving, place a small plastic block between rubber band and EUT push button.



**Radiated Open Site Test Set-up**

### Radiated Open Site Test Set-Up (Receiver Mode)

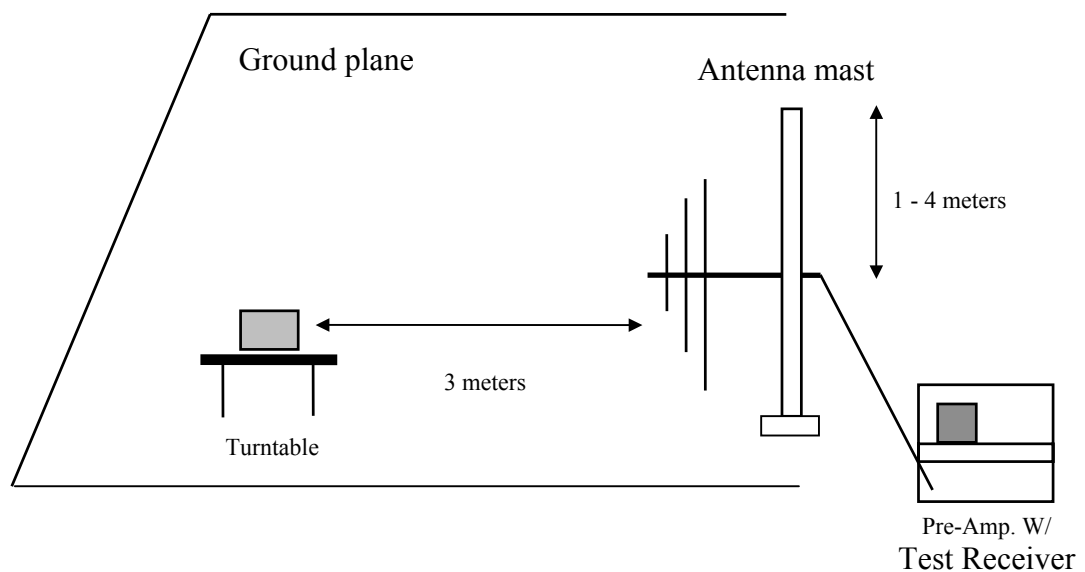




## 10. TEST PROCEDURE

### Radiated Emissions, 15.231(4)(b)

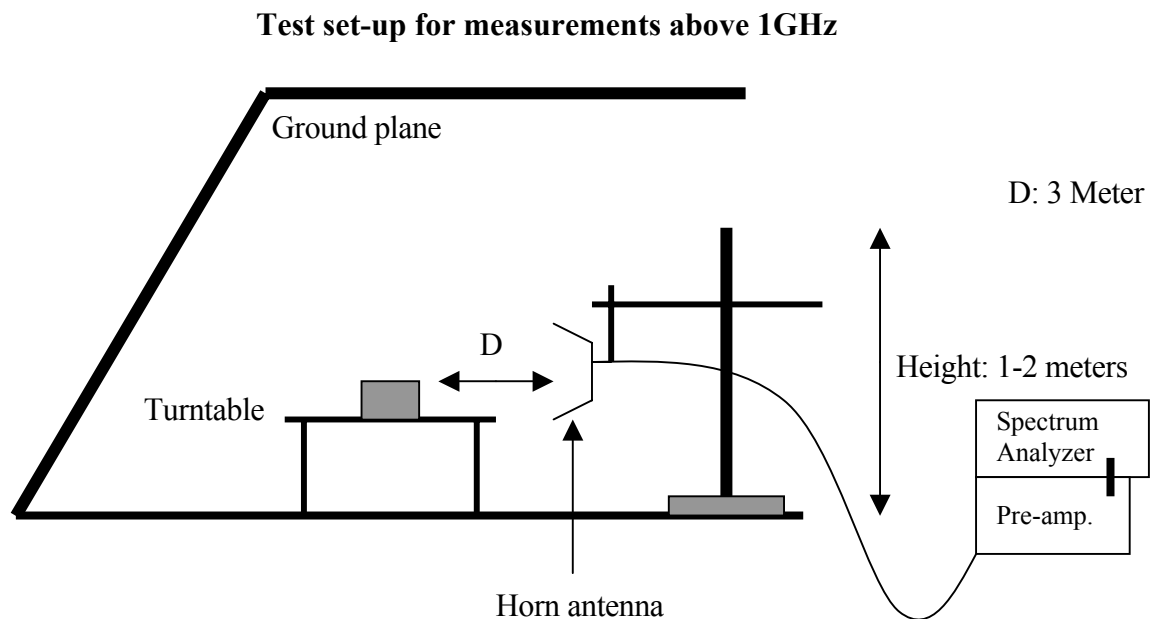
#### Test Set-up for frequency range 30 – 1000 MHz



**Fig. 1**

1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 3-meters from the EUT.
2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205. The EUT was moved throughout the XY, XZ, and YZ planes to maximize emissions received by the search antenna.
3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.





**Fig. 2**

1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 1-meters from the EUT. The EUT antenna was mounted vertically as per normal installation.
2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205. The EUT was moved throughout the XY, XZ, and YZ planes to maximize emissions received by the search antenna.
3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

## 11. Equipment Modifications

To achieve compliance to FCC Section 15.231 technical limits, the following change(s) were made during compliance testing:

**NONE**

**12. TEST RESULT**

<b>Powerline RFI Class B</b>	<b>Eut</b>	<b>Radiated Emission Limits</b>	<b>Eut</b>
SECTION 15.207		SECTION 15.209	X
SECTION 15.205, 15.209, 15.221, 15.223, x 15.225 OR 15.227		SECTION 15.205	X
BATTERY POWER	X	SECTION 15.231 (b)	X
		SECTION 15.231 (e)	
		SECTION 15.109	X

**12.1 Maximum Modulation Percentage (M%)**

CALCULATION:

Average Reading = Peak Reading (dBuV/m)+ 20log (Duty Cycle)

In order to determine possible Maximum Modulation percentage, alternations are made to the EUT. We measured:

	<b>Tp (ms)</b>	<b>Ton (ms)</b>	<b>M% = (Ton/Tp)* 100%</b>	<b>C.F. = 20*log(M%)</b>
<b>Button#1</b>	74.10	(19*0.84)+(40*0.26) = 26.36	35.57	-8.9783 dB

**12.2 The Emissions Bandwidth**

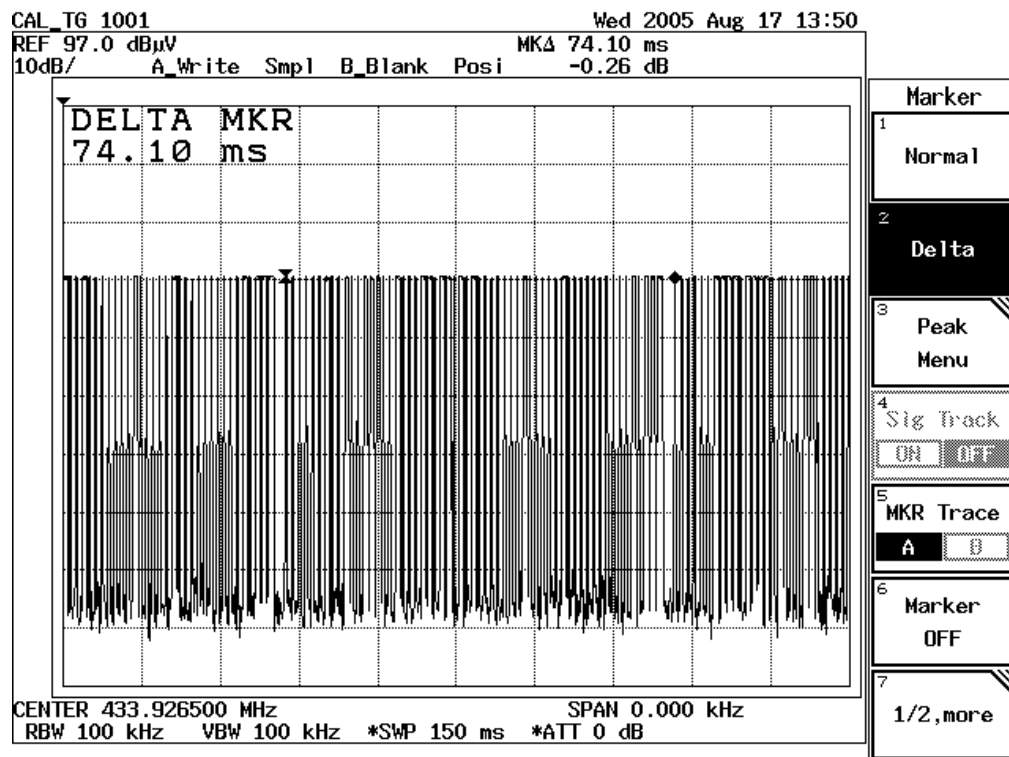
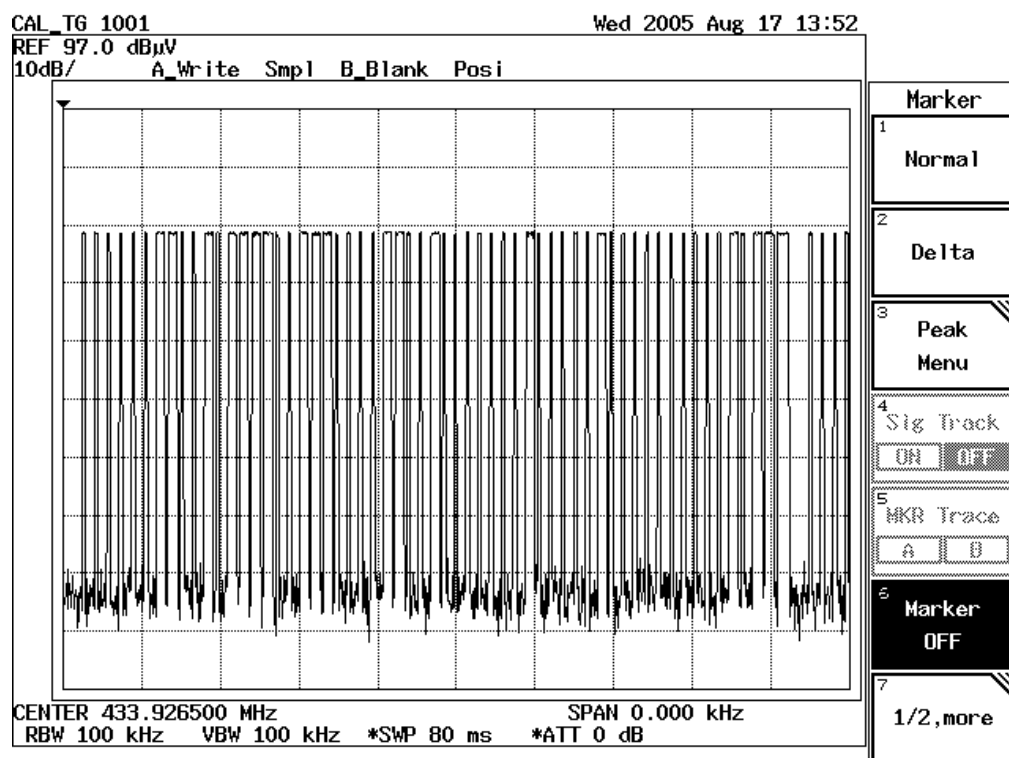
The bandwidth of the emissions were investigated per 15.231(c)

<b>Frequency (MHz)</b>	<b>Botton#1 BW (kHz)</b>	<b>Limit (MHz)</b>	<b>Result</b>
433.92	666.00	1.0848	PASS



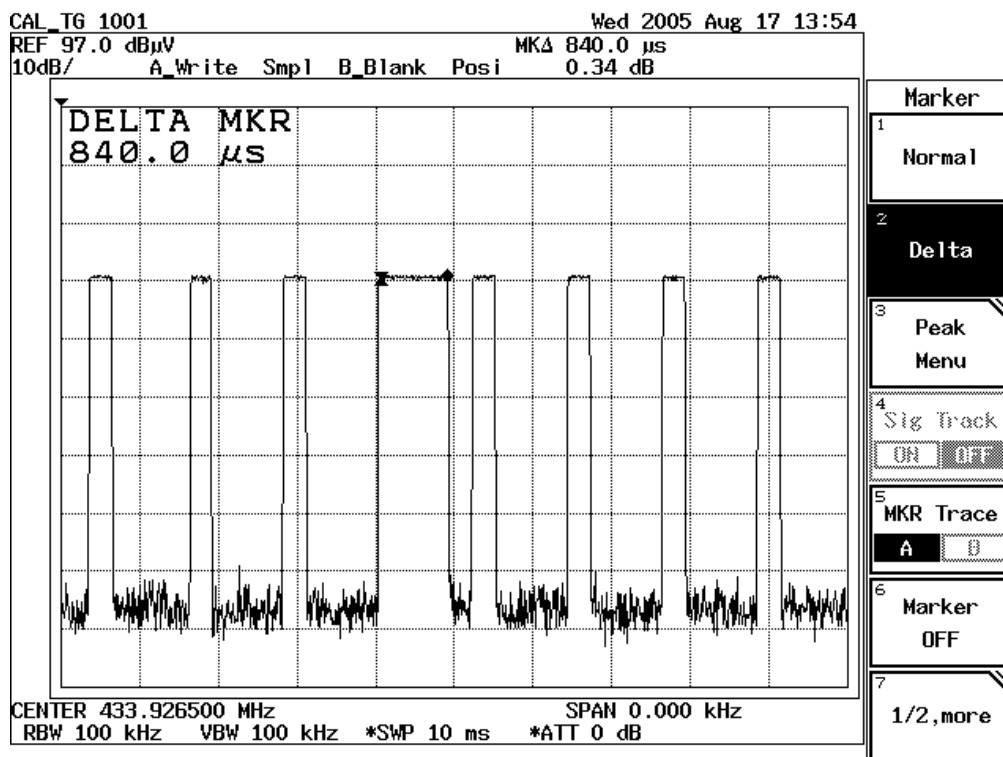
## **APPENDIX I**

### **TEST DATA**

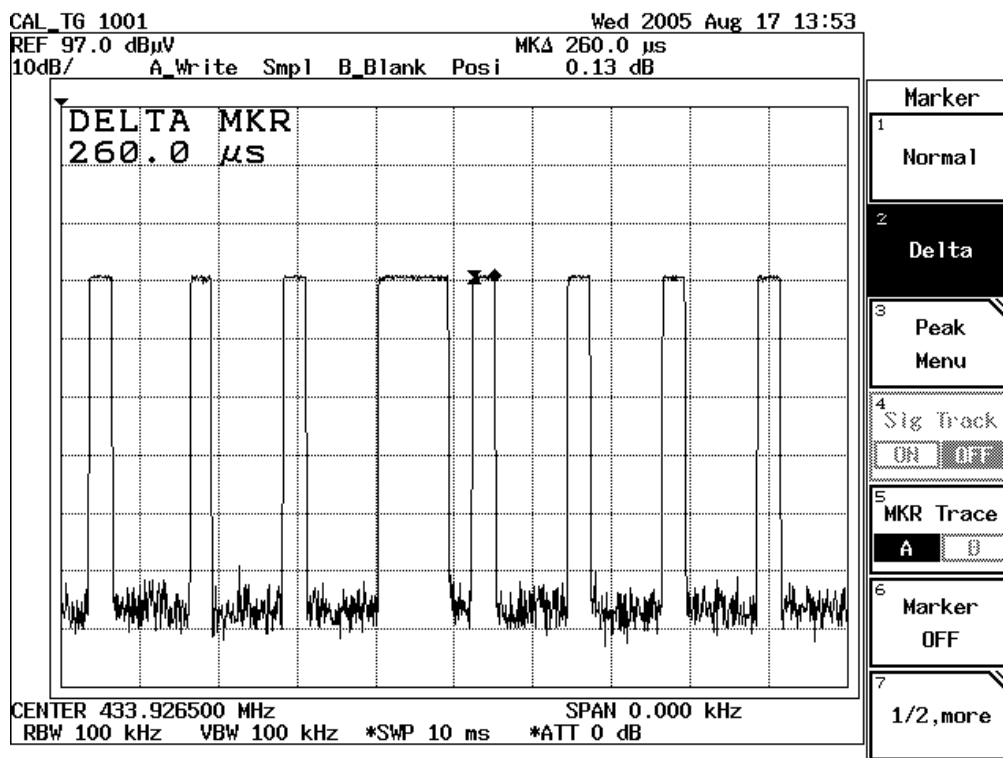
**Test Plot: Maximum Modulation Percentage (M%)****Tp****Button#1****Channel Number****Button#1**

Ton

## Button#1

Ton

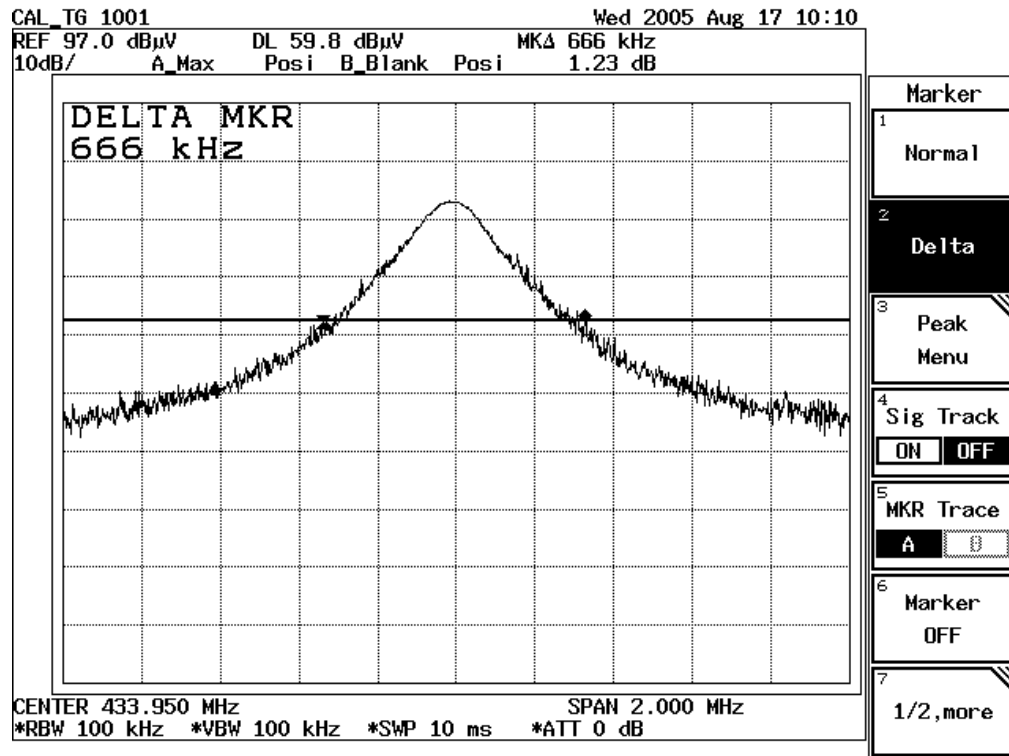
## Button#1





## Test Plot: The Emissions Bandwidth

### Button#1





## TEST RESULTS

### Below 1 GHz

**Operation Mode:** TX Mode / Button#1**Test Date:** August 21, 2005**Temperature:** 28°C**Humidity:** 68 % RH**Tested by:** Jason Lee

Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol (H/V)
433.93	78.93	69.95	-5.87	64.08	80.83	-16.75	3mV_X
867.86	34.34	25.36	1.39	26.75	60.83	-34.08	3mV_X
433.94	76.90	67.92	-5.87	62.05	80.83	-18.78	3mV_Y
867.85	31.51	22.53	1.39	23.92	60.83	-36.91	3mV_Y
433.94	80.94	71.96	-5.87	66.09	80.83	-14.74	3mV_Z
867.88	34.52	25.54	1.39	26.93	60.83	-33.90	3mV_Z
433.93	88.68	79.70	-5.87	73.83	80.83	-7.00	3mH_X
867.86	40.97	31.99	1.39	33.38	60.83	-27.45	3mH_X
433.93	88.42	79.44	-5.87	73.57	80.83	-7.26	3mH_Y
867.86	42.34	33.36	1.39	34.75	60.83	-26.08	3mH_Y
433.94	86.93	77.95	-5.87	72.08	80.83	-8.75	3mH_Z
867.89	41.37	32.39	1.39	33.78	60.83	-27.05	3mH_Z

*Factor = Antenna Factor + Cable Loss - Pre Amplifier**Av Rdg = Pk Rdg -8.9783dB*

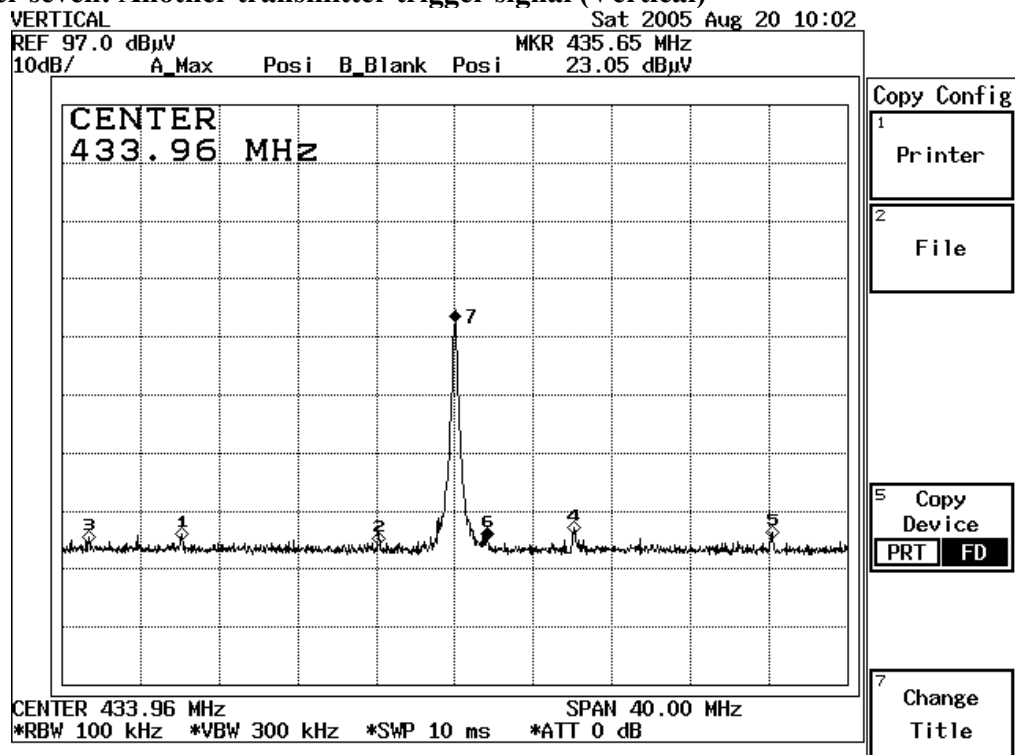
### **Notes:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.

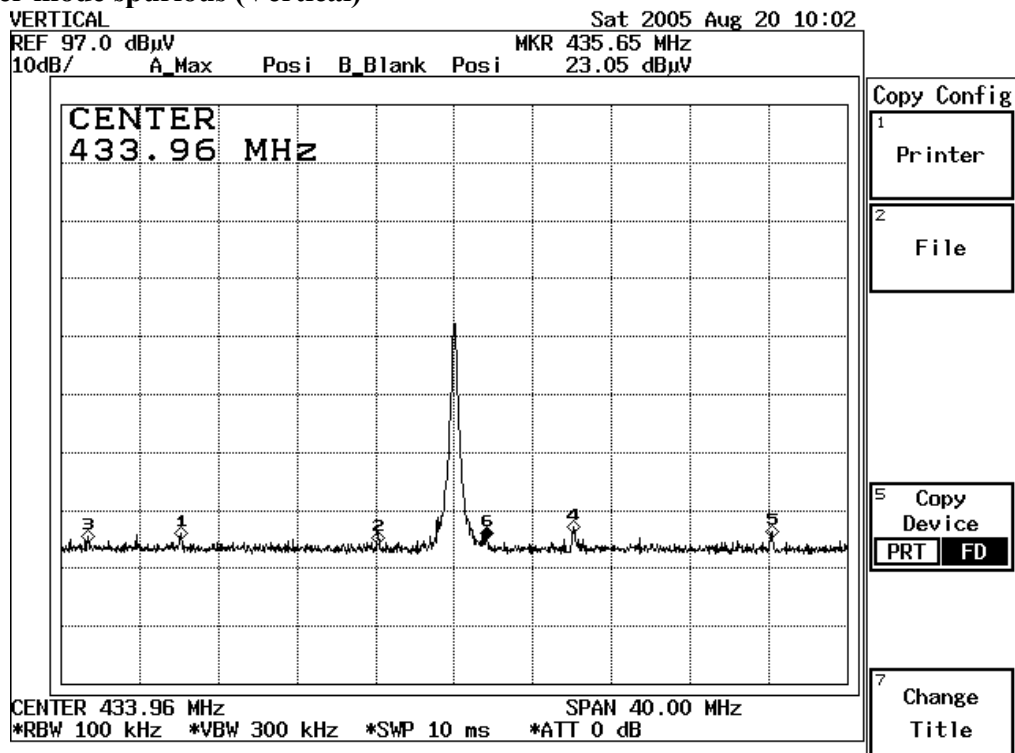


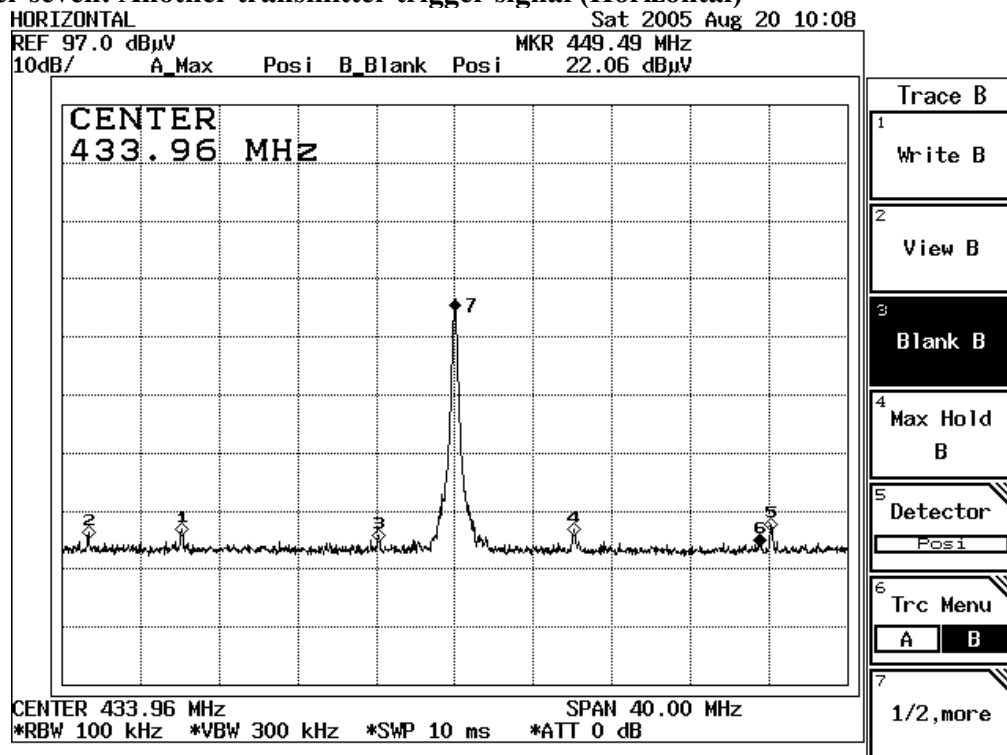
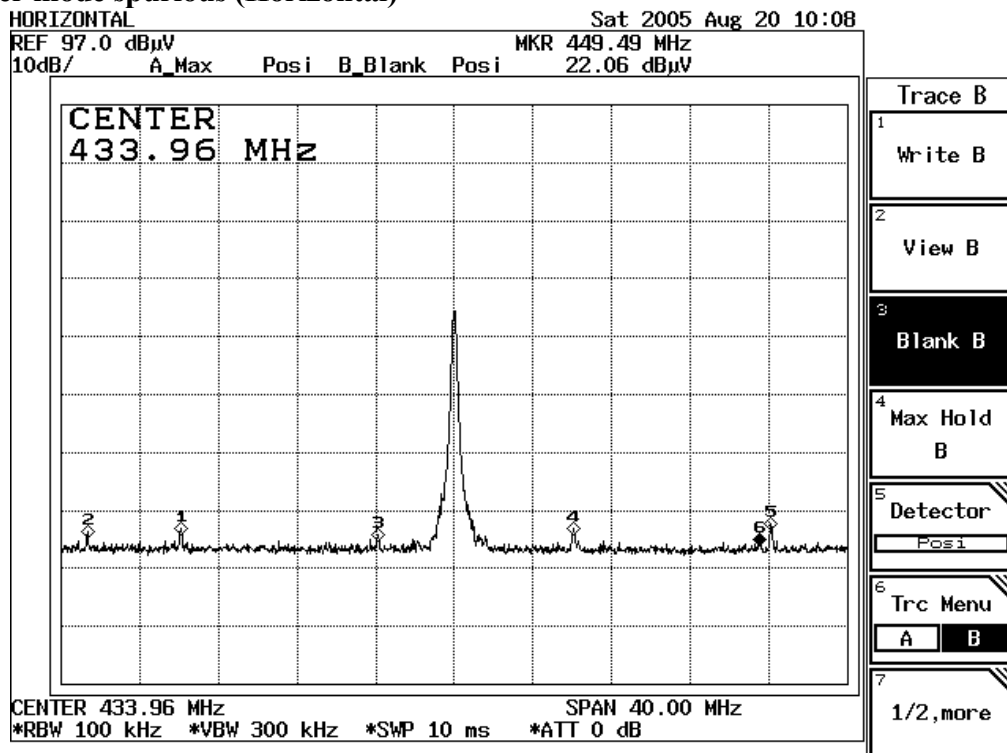


### Number seven: Another transmitter trigger signal (Vertical)



### Receiver mode spurious (Vertical)



**Number seven: Another transmitter trigger signal (Horizontal)****Receiver mode spurious (Horizontal)**

**Operation Mode:** RX Mode**Test Date:** August 21, 2005**Temperature:** 28°C**Humidity:** 68 % RH**Tested by:** Jason Lee

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
433.960	V	Peak	63.32	---	---	---	---
415.367	V	Peak	34.26	-6.36	27.90	46.00	-18.10
420.047	V	Peak	32.22	-6.23	25.99	46.00	-20.01
430.047	V	Peak	35.62	-5.97	29.65	46.00	-16.35
435.680	V	Peak	32.69	-5.83	26.86	46.00	-19.14
440.047	V	Peak	33.69	-5.71	27.98	46.00	-18.02
450.087	V	Peak	35.17	-5.45	29.72	46.00	-16.28
433.960	H	Peak	68.53	---	---	---	---
415.360	H	Peak	32.59	-6.36	26.23	46.00	-19.77
420.040	H	Peak	34.03	-6.23	27.80	46.00	-18.20
430.080	H	Peak	33.39	-5.97	27.42	46.00	-18.58
440.040	H	Peak	36.04	-5.71	30.33	46.00	-15.67
449.080	H	Peak	32.13	-5.47	26.66	46.00	-19.34
450.120	H	Peak	33.06	-5.45	27.61	46.00	-18.39

**Notes:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.

**Above 1 GHz****Operation Mode:** TX Mode / Button#1**Test Date:** August 21, 2005**Temperature:** 28°C**Humidity:** 68 % RH**Tested by:** Jason Lee

Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol (H/V)
1300.00	56.80	---	-10.51	46.29	74.00	-27.71	3mV
1300.00	---	---	---	---	---	---	3mV
1735.00	51.10	42.12	-8.37	33.75	60.83	-27.08	3mV
1300.00	57.70	---	-10.51	47.19	74.00	-26.81	3mH
1300.00	---	---	---	---	---	---	3mH
1735.00	54.00	45.02	-8.37	36.65	60.83	-24.18	3mH

*Factor = Antenna Factor + Cable Loss - Pre Amplifier***Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode (RBW=VBW=1MHz) of the emission shown in Rdg column.
4. Average detector mode (RBW=1MHz, VBW=10Hz) for restricted frequency bands.
5. Average measured mode (Pk Rdg -8.9783dB) for not restricted frequency bands.
6. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

**Operation Mode:** RX Mode**Test Date:** August 21, 2005**Temperature:** 28°C**Humidity:** 68% RH**Tested by:** Jason Lee

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
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* No Any Emissions Were Found Within 20dB Below Limits From 1 GHz To 2 GHz.										

**Notes:**

1. Measuring frequencies from 1 GHz to 2 GHz.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = Auto.
5. Spectrum AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto.