FCC ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT CERTIFICATION TO FCC PART 15 REQUIREMENTS

Date of Issue: April 17, 2006

For

### INTENTIONAL RADIATOR

of

#### Car Alarm Transceiver

FCC ID Number: GOH-2WALED1

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

**Model Number**: 2WABTN

**Agency Series** : N/A

**Report Number** : 60407202-RP1 **Date** : April 17, 2006

Issued to

**CODE SYSTEMS, INC.** 

525 Minnesota Drive Troy, Michigan 48083, USA





Compliance Certification Services Inc. Hsintien Lab.

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# TABLE OF CONTENTS

1.	VERIFICATION OF COMPLIANCE	3
2.	PRODUCT DESCRIPTION	4
3.	TEST FACILITY	4
4.	MEASUREMENT STANDARDS	4
5.	TEST METHODLOGY	4
6.	MEASUREMENT EQUIPMENT USED	5
	POWERLINE RFI LIMIT	
8.	RADIATED EMISSION LIMITS	6
9.	SYSTEM TEST CONFIGURATION	6
10.	TEST PROCEDURE	8
11.	EQUIPMENT MODIFICATIONS	9
12.	TEST RESULT	10
12.	1. MAXIMUM MODULATION PERCENTAGE (M%)	10
12.	2. THE EMISSIONS BANDWIDTH	10
A D	PENDIX I TEST DATA	11

### 1. VERIFICATION OF COMPLIANCE

COMPANY NAME : CODE SYSTEMS, INC.

525 Minnesota Drive Troy, Michigan 48083,

Date of Issue: April 17, 2006

**USA** 

CONTACT PERSON : MR. SHANE WILSON

(RETAIL PROGRAM MANAGER)

TELEPHONE NO. : 1-248-583-9620

EUT DESCRIPTION : Car Alarm Transceiver

MODEL NAME/NUMBER: 2WABTN

FCC ID : GOH-2WALED1

DATE TESTED : April 9, 2006 ~ April 12, 2006

REPORT NUMBER : 60407202-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	433.92 MHz
Power Source	3VDC
Transmitting Time	Periodic ≤ 5 seconds
Associated Transceiver	FCC ID: GOH-2WAIVU

### 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 # J							
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due			
SITE NSA	CCS	J Site	N/A	10/15/2006			
MEASURE RECEIVER	SCHAFFNER	SCR3501	330	06/13/2006			
SPECTRUM ANALYZER	ADVANTEST	R3132	120900003	No Calibration Required			
ANTENNA	SCHAFFNER	CBL 6112B	2800	09/24/2006			
PRE- AMPLIFIER	SCHAFFNER	CPA9231A	3629	10/08/2006			
CABLE	BELDEN	9913	N-TYPE #J2	02/17/2007			
ATTENUATOR	MCL	UNAT-6	AT06-8	12/02/2006			
THERMO- HYGRO METER	TFA	N/A	NO.3	11/02/2006			
EMC ANALYZER (100Hz-22GHz)	HP	8566B	2937A06102	06/30/2006			
ANTENNA (1-18GHz)	EMCO	3115	00022256	01/12/2007			
AMPLIFIER (1-18GHz)	HP	8449B	3008A01266	02/06/2007			
CABLE (1-18GHz)	JYEBAO	LL142	SMA#RS1	02/06/2007			
CABLE (1-18GHz)	HUBER +SUHNER	SUCOFLEX 104	SMA#RS3	02/06/2007			
CABLE (1-18GHz)	JYEBAO	LL142	SMA#C1	02/06/2007			

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

# **SUPPORT EQUIPMENT:**

No.	Device Type	Model	Brand
1.	DC Power Supply	PS140YA	DAIWA
2.	Tool	N/A	N/A

## 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

Date of Issue: April 17, 2006

### 9. SYSTEM TEST CONFIGURATION

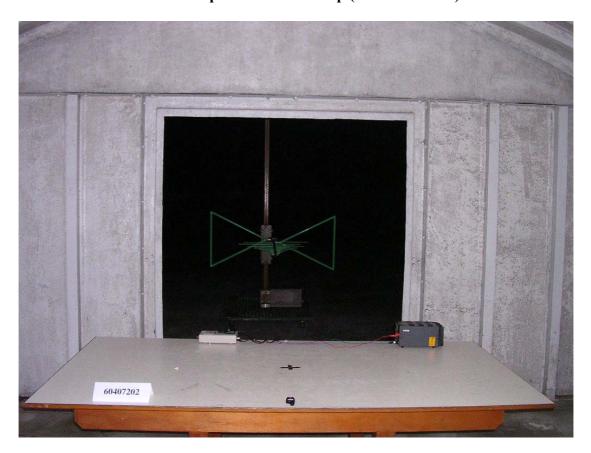
Use a block of foam and combined it with EUT wrapping rubber band around it. This way it can test X, Y and Z axis. To activate continuous transmitting & receiving, place a small plastic block between rubber band and EUT push button.





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

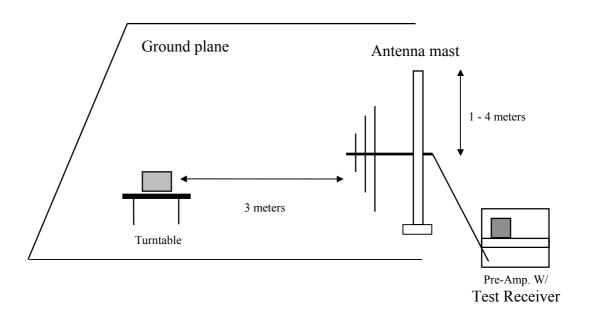


Fig. 1

- 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.

Date of Issue: April 17, 2006

# Test set-up for measurements above 1GHz

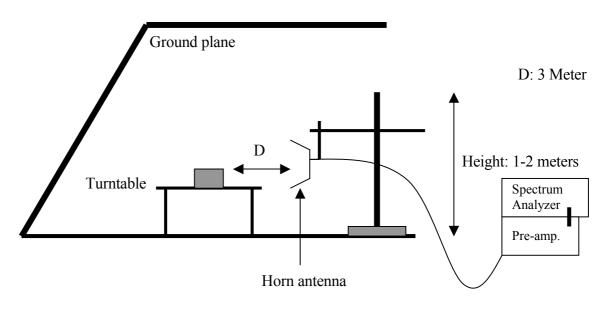


Fig. 2

- 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

Powerline RFI Class B	Eut	Radiated Emission Limits	Eut
SECTION 15.207		SECTION 15.209	X
SECTION 15.205, 15.209,		SECTION 15.205	X
15.221, 15.223, x 15.225 OR			
15.227			
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:

Tp (ms)	Ton (ms)	M% = (Ton/Tp)* 100%	C.F. = 20*log(M%)	
100	(7*1.22)+(46*0.56) = 34.30	34.30	-9.2941 dB	

**Remark:** Tp>100ms. Use 100 ms for calcuation.

## 12.2 The Emissions Bandwidth

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

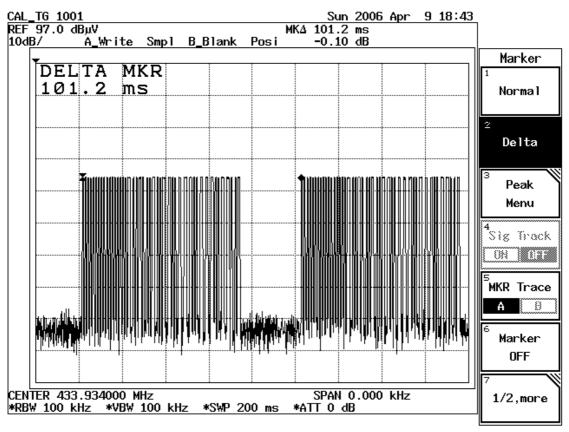
Frequency	BW	Limit	Result
(MHz)	(kHz)	(MHz)	
433.92	573.00	1.0848	PASS

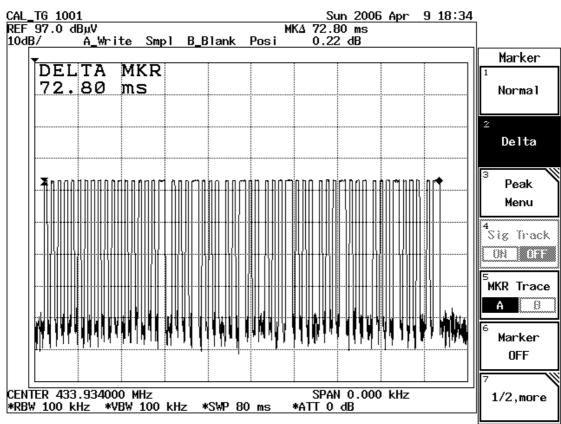
# **APPENDIX I**

**TEST DATA** 

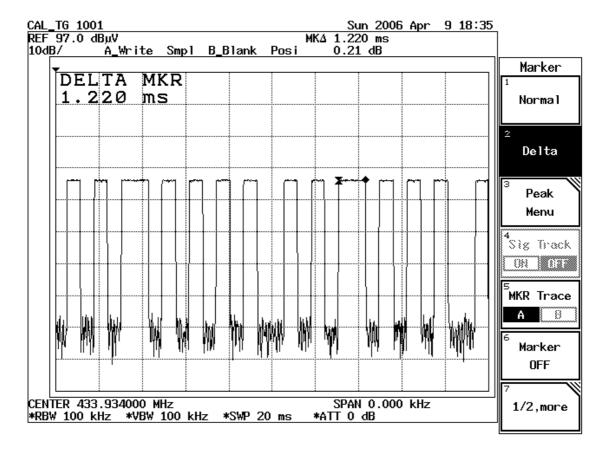
# **Test Plot:** Maximum Modulation Percentage (M%)

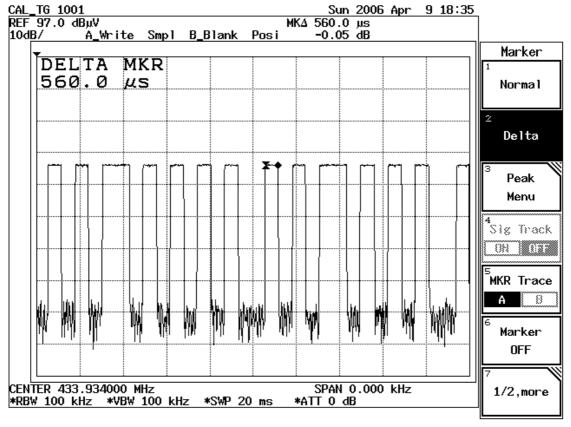
# <u>Tp</u>



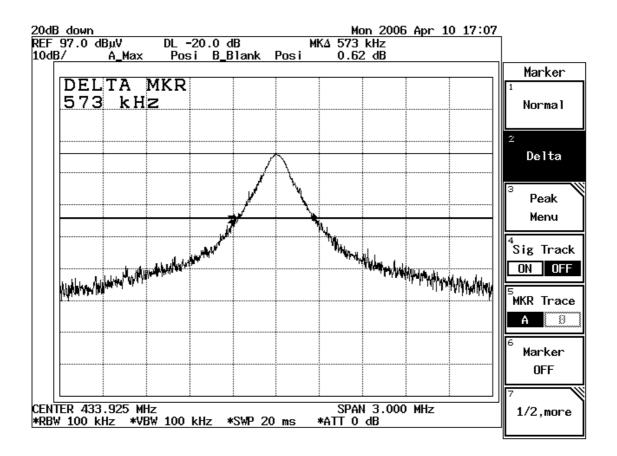


**Ton** 





# **Test Plot:** The Emissions Bandwidth



FCC ID: GOH-2WALED1 Date of Issue: April 17, 2006

# **TEST RESULTS**

## **Below 1 GHz**

Operation Mode: TX Mode / Button#1 Test Date: April 11, 2006

**Temperature:** 28°C **Humidity:** 46 % RH

**Tested by:** Kevin Chang

Freq.	Pk Rdg	Av Rdg	Factor	Level	Limit	Margin	Pol
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(H/V)
433.93	54.53	45.24	-1.80	43.44	80.82	-37.38	$3mV_X$
867.85	27.58	18.29	4.67	22.96	60.82	-37.86	$3mV_X$
433.94	59.24	49.95	-1.80	48.15	80.82	-32.67	$3mV_Y$
867.84	28.50	19.21	4.67	23.88	60.82	-36.94	$3mV_Y$
433.93	65.70	56.41	-1.80	54.61	80.82	-26.21	$3mV_Z$
867.85	27.89	18.60	4.67	23.27	60.82	-37.55	$3mV_Z$
433.93	62.46	53.17	-1.80	51.37	80.82	-29.45	3mH_X
867.85	28.80	19.51	4.67	24.18	60.82	-36.64	3mH_X
433.93	63.56	54.27	-1.80	52.47	80.82	-28.35	3mH_Y
867.84	27.24	17.95	4.67	22.62	60.82	-38.20	3mH_Y
433.94	56.04	46.75	-1.80	44.95	80.82	-35.87	$3mH_Z$
867.85	26.55	17.26	4.67	21.93	60.82	-38.89	$3mH_Z$

Factor = Antenna Factor + Cable Loss - Pre Amplifier

Av Rdg = Pk Rdg - 9.2941dB

### 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.

Operation Mode: TX Mode / Button#2 Test Date: April 11, 2006

Date of Issue: April 17, 2006

**Temperature:** 28°C **Humidity:** 46 % RH

**Tested by:** Kevin Chang

Freq.	Pk Rdg	Av Rdg	Factor	Level	Limit	Margin	Pol
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(H/V)
433.93	53.52	44.23	-1.80	42.43	80.82	-38.39	$3mV_X$
867.85	28.51	19.22	4.67	23.89	60.82	-36.93	$3 \mathrm{mV}_{\mathrm{X}}$
433.93	60.23	50.94	-1.80	49.14	80.82	-31.68	$3mV_Y$
867.85	28.80	19.51	4.67	24.18	60.82	-36.64	$3mV_Y$
433.93	64.18	54.89	-1.80	53.09	80.82	-27.73	$3mV_Z$
867.84	30.03	20.74	4.67	25.41	60.82	-35.41	$3mV_Z$
433.94	62.57	53.28	-1.80	51.48	80.82	-29.34	$3mH_X$
867.85	26.41	17.12	4.67	21.79	60.82	-39.03	$3mH_X$
433.94	64.05	54.76	-1.80	52.96	80.82	-27.86	$3mH_Y$
867.85	27.14	17.85	4.67	22.52	60.82	-38.30	$3mH_Y$
433.92	51.71	42.42	-1.80	40.62	80.82	-40.20	3mH_Z
867.84	28.12	18.83	4.67	23.50	60.82	-37.32	3mH_Z

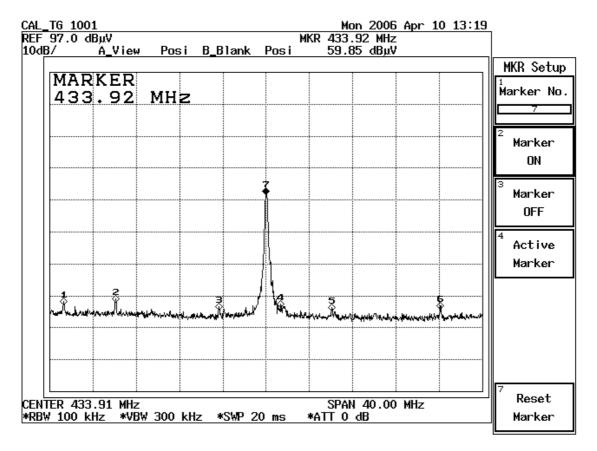
Factor = Antenna Factor + Cable Loss - Pre Amplifier

Av Rdg = Pk Rdg - 9.2941dB

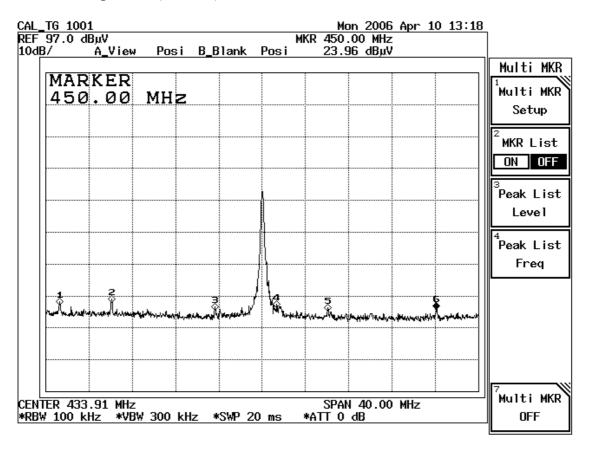
### Notes:

- 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.

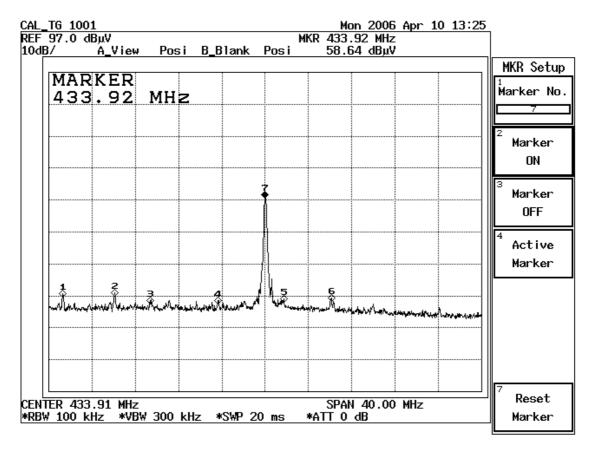
# Number seven: Another transmitter trigger signal (Vertical)



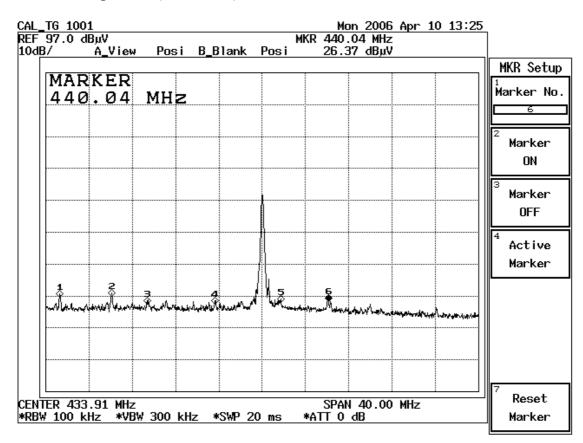
# **Receiver mode spurious (Vertical)**



# Number seven: Another transmitter trigger signal (Horizontal)



# **Receiver mode spurious (Horizontal)**



**Operation Mode:** RX Mode **Test Date:** April 11, 2006

**Temperature:** 28°C **Humidity:** 46 % RH

**Tested by:** Kevin Chang

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)
433.910	V	Peak	59.85				
415.235	V	Peak	25.47	-2.18	23.29	46.00	-22.71
420.035	V	Peak	26.54	-2.08	24.46	46.00	-21.54
429.515	V	Peak	23.57	-1.89	21.68	46.00	-24.32
435.275	V	Peak	24.88	-1.77	23.11	46.00	-22.89
439.995	V	Peak	24.50	-1.68	22.82	46.00	-23.18
449.995	V	Peak	24.04	-1.48	22.56	46.00	-23.44
433.910	Н	Peak	58.64				
415.235	Н	Peak	27.65	-2.18	25.47	46.00	-20.53
420.035	Н	Peak	27.88	-2.08	25.80	46.00	-20.20
423.315	Н	Peak	25.47	-2.01	23.46	46.00	-22.54
429.555	Н	Peak	25.46	-1.89	23.57	46.00	-22.43
435.635	Н	Peak	26.17	-1.77	24.40	46.00	-21.60
440.035	Н	Peak	26.47	-1.68	24.79	46.00	-21.21

### 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.

Date of Issue: April 17, 2006

# Above 1 GHz

**Operation Mode:** TX Mode / Button#1 Test Date: April 12, 2006

28°C **Humidity:** 46 % RH **Temperature:** 

**Tested by:** Kevin Chang

Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol (H/V)
1839.00	46.70	37.41	-7.61	29.80	60.82	-31.02	3mV
1994.50	46.50	46.50	-6.71	30.50	60.82	-30.32	3mV
2132.50	48.00	48.00	-6.20	32.51	60.82	-28.31	3mV
1840.00	46.90	46.90	-7.61	30.00	60.82	-30.82	3mH
1922.50	46.90	46.90	-7.12	30.49	60.82	-30.33	3mH
2096.50	47.90	47.90	-6.33	32.28	60.82	-28.54	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 9.2941dB) 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:** April 11, 2006

28°C **Humidity:** 46 % RH **Temperature:** 

**Tested by:** Kevin Chang

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Peak	AV	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					-		-			
* No Any	* 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 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = Auto.