

APPLICATION FOR CERTIFICATION

On Behalf of

Sonos, Inc

Controller

Model No. : CR100

Contains TX module : FCC ID: SBVCR002

Prepared for : Sonos, Inc
223 E. De La Guerra St. Santa Barbara,
CA 93101, USA

Prepared by : Audix Corporation
Technical Division EMC Department
No. 53-11, Tin-Fu Tsun, Lin-Kou,
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Date of Report : May 24, 2006

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TEST REPORT CERTIFICATION

Applicant : Sonos, Inc
 Manufacturer : Inventec Electronics (M) Sdn. Bhd.
 EUT Description : Controller
 Contains TX module : FCC ID: SBVCR002
 (A) MODEL NO. : CR100
 (B) SERIAL NO. : N/A
 (C) BRAND : SONOS
 (D) POWER SUPPLY : DC IN 6V or Battery
 (E) TEST VOLTAGE : AC 120V/60Hz (via Power Supply)

Measurement Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART C, FEBRUARY 2006
AND ANSI C63.4/2003

(FCC CFR 47 Part 15C, §15.205, §15.209 and §15.247)

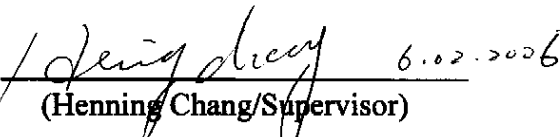
The device described above was tested by AUDIX COPORATION to determine the maximum emission levels emanating from the device. The maximum emission levels were compared to the FCC Part 15 subpart C limits.


The measurement results are contained in this test report and AUDIX CORPORATION is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the FCC official limits.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX CORPORATION.

Date of Test: May 19, 2006

Prepared by: 
(Julie Hsu/Assistant Administrator)

Test Engineer: 
(Henning Chang/Supervisor)

Approved & Authorized Signer: 
(Ben Cheng/Section Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Description	:	Controller This devices is a controller for digital music system (Zone Player, ZP100).
Model Number	:	CR100
Contains TX module	:	FCC ID: SBVCR002
Brand Name	:	SONOS
Applicant	:	Sonos, Inc 506 Chapala Street, Santa Barbara, CA93101, USA
Manufacturer	:	Inventec Electronics (M) Sdn. Bhd. Plot 102, Bayan Lepas Industrial Estate, 11900 Bayan Lepas, Penang, Malaysia.
High Frequency of Used	:	5.0MHz 、 10.0MHz 、 20.0MHz 、 33.0MHz 、 32.768kHz
Li-Polymer Battery (Rechargeable)	:	PL-0548135 >3000mAh
Wireless LAN Card (RF Module)	:	HON HAI PRECISION IND. CO., LTD. M/N AR5BMB5, P/N T60N874.06 IEEE 802.11g
I.T.E. Power Supply	:	UNIFIUE, M/N UIA324-06 S/N 410-0215062 BSMI ID. D53003 I/O: AC 100-240V, 50/60Hz, 0.6A O/P: DC 6V, 3.8A Cable: Shielded, Undetachable, 1.85m Bonded a ferrite core
AC Power Cord (2Pin)	:	Non-Shielded, Detachable, 1.85m
Date of Receipt of Sample	:	May 17, 2006
Date of Test	:	May 19, 2006

Remark :

The FCC reports to refer to the WiFi card as Sonos WiFi card FCC ID SBVCR002.

1.2. Description of Test Facility

Name of Firm : **Audix Corporation**
Technical Division EMC Department
 No. 53-11, Tin-Fu Tsun, Lin-Kou Hsiang,
 Taipei County 24443, Taiwan, R.O.C.

Test Location & Facility (AC) : **Semi-Anechoic Chamber**
 No. 53-11, Tin-Fu Tsun, Lin-Kou Hsiang,
 Taipei County 24443, Taiwan, R.O.C.
 May. 16, 2003 File on
 Federal Communication Commission
 Registration Number: 90 93

NVLAP Lab. Code : 200077-0
 (NVLAP is a NATA accredited body under Mutual Recognition Agreement)

1.3. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Radiation Test (Distance: 3m)	30MHz~300MHz	±2.91dB
	300MHz~1000MHz	±2.94dB
	Above 1GHz	± 5.02dB

Remark : Uncertainty = $ku_c(y)$

2. RADIATED EMISSION MEASUREMENT

2.1. Test Equipment

The following test equipment was used during the radiated emission measurement:

2.1.1. For Frequency 30MHz~1000MHz (at Semi-Anechoic Chamber)

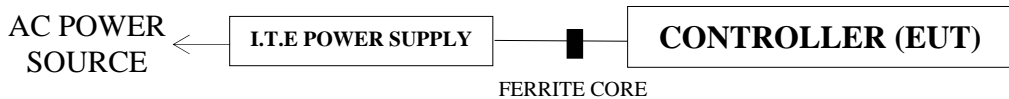
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	HP	8593EM	3826A00248	Sep.26, 05'	Sep.25, 06'
2.	Test Receiver	Rohde & Schwarz	ESCS 30	100265	Sep.27, 05'	Sep.26, 06'
3.	Pre-Amplifier	HP	8447D	2944A06305	Mar.09, 06'	Mar.08, 07'
4.	Broadband Antenna	CHASE	VBA6106A	1264	Nov.11, 05'	Nov.10, 06'
5.	Broadband Antenna	Schwarzbeck	UHALP 9108-A	0139	Apr.19, 06'	Apr.18, 07'

2.1.2. For Frequency Above 1GHz (at Semi-Anechoic Chamber)

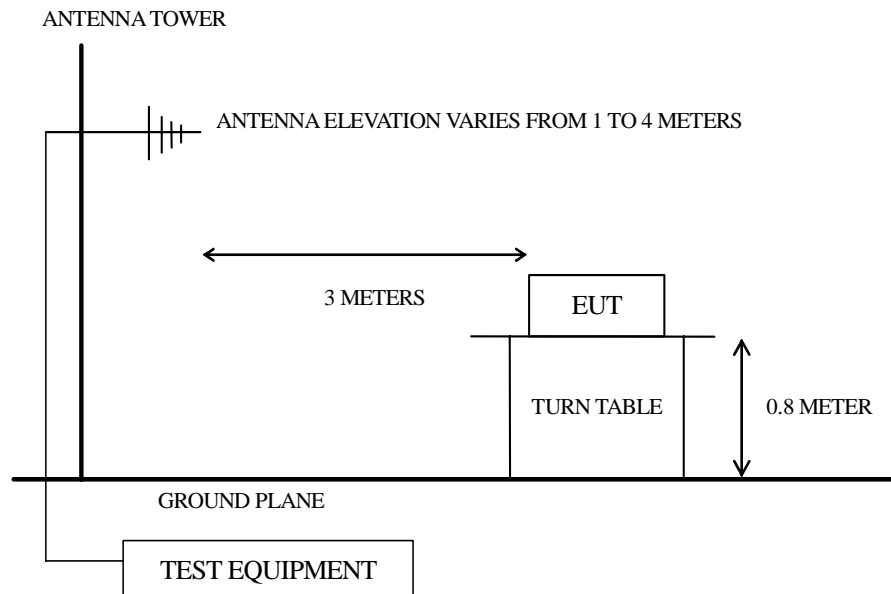
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	HP	8593EM	3826A00248	Sep.26, 05'	Sep.25, 06'
2.	Pre-Amplifier	HP	8449B	3008A00529	Jul.05, 05'	Jul.04, 06'
3.	Horn Antenna	EMCO	3115	9609-4927	Jul.08, 05'	Jul.07, 06'

2.2. Test Setup

2.2.1. Block Diagram of connection between EUT and simulators



2.2.2. Semi-Anechoic Chamber (3m) Setup Diagram



2.3. Radiated Emission Limits (§15.209)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS	
		$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Above 1000	3	74.0 $\text{dB}\mu\text{V/m}$ (Peak) 54.0 $\text{dB}\mu\text{V/m}$ (Average)	

- Remark :
- (1) Emission level ($\text{dB}\mu\text{V/m}$) = 20 log Emission level ($\mu\text{V/m}$)
 - (2) The tighter limit applies at the edge between two frequency bands.
 - (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

2.4. Operating Condition of EUT

- 2.4.1. Setup the EUT and simulator as shown on 2.2.
- 2.4.2. Turn on the power of all equipment.
- 2.4.3. Run telnet on Notebook to run test software scripts on controller to execute the Wi-Fi Card, Normal application software was running simultaneously.

2.5. Test Procedure

The EUT and its simulators were placed on a turn table which was 0.8 meter above ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set 3 meters away from the receiving antenna which was mounted on a antenna tower. The antenna moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna such as calibrated biconical and log- periodical antenna or horn antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to FCC ANSI C63.4-2003 regulation.

The bandwidth of the R&S Test Receiver ESCS30 was set at 120kHz. (For 30MHz to 1000MHz)

The resolution bandwidth and video bandwidth of test spectrum analyzer is 1MHz for peak detection (PK) at frequency above 1GHz.

The resolution bandwidth of test spectrum analyzer is 1MHz and the video bandwidth is 10Hz for average detection (AV) at frequency above 1GHz.

The frequency range from 30MHz to 25GHz (Up to 10th harmonics from fundamental frequency) was checked.

2.6. Radiated Emission Measurement Results

PASSED. All the emissions not reported below are too low against the official limits.

Test Date : May 19, 2006 Temperature : 23°C Humidity : 43%

The EUT was tested with the following test modes in frequency range of 30MHz ~ 1000MHz and all the test results are listed in section 2.6.1.

No.	Test Mode	Test Frequency	Reference Test Data No.			
			Horizontal		Vertical	
1.	Transmitting	2412MHz (CH1)	# 8	# 9	# 7	# 10
2.		2437MHz (CH6)	# 5	# 8	# 6	# 7
3.		2462MHz (CH11)	# 6	# 7	# 5	# 8
4.	Receiving	---	# 5	# 8	# 6	# 7

The EUT was tested with the following test modes in frequency range above 1GHz and all the test results are listed in section 2.6.2.

No.	Test Mode	Test Frequency
1.	Transmitting	2412MHz (CH1)
2.		2437MHz (CH6)
3.		2462MHz (CH11)

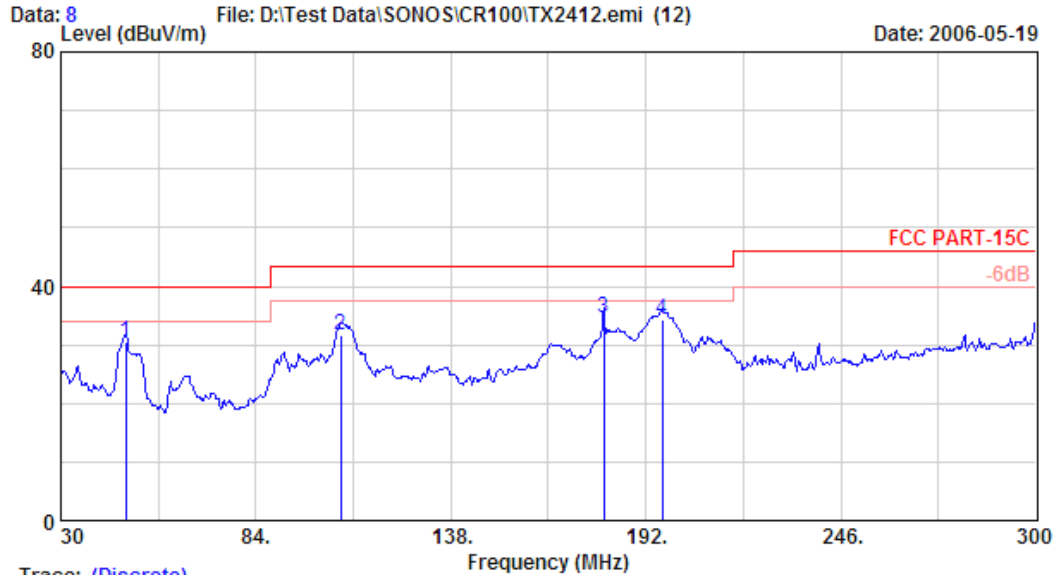
The EUT was tested in restricted bands and all the test results are listed in section 2.6.3. [The restricted bands defined in part 15.205(a)]

No.	Test Mode	Test Frequency	Reference Test Data No.			
			Horizontal		Vertical	
1.	Out of Band	2412MHz	Peak	# 2	Peak	# 1
			Average	# 3	Average	# 4
		2462MHz	Peak	# 8	Peak	# 7
			Average	# 5	Average	# 6

2.6.1. Frequency Range: 30MHz~1000MHz



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Trace: (Discrete)

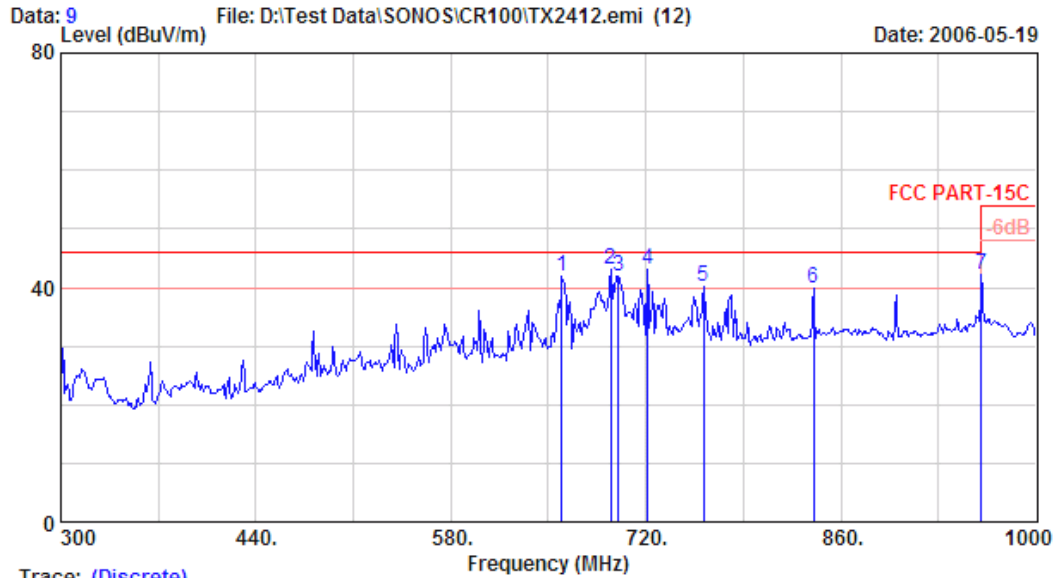
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Dis. / Ant. : 3m VBA6106A	Ant. pol. : HORIZONTAL
Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23*C/43%	Engineer : Alvin YAng
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2412MHz	

	Ant. Factor (dB/m)	Cable Loss (dB)	Emission Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	17.15	1.40	11.94	30.49	40.00	9.51	
2	17.87	2.20	11.50	31.57	43.50	11.93	
3	21.31	2.90	10.36	34.57	43.50	8.93	
4	21.92	3.00	9.35	34.28	43.50	9.22	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



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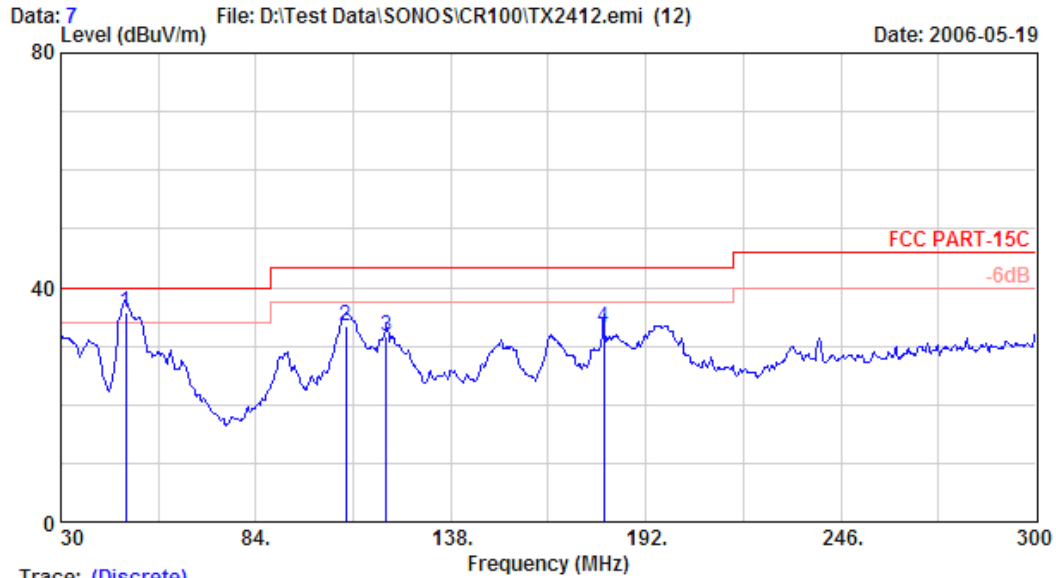
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Dis. / Ant.	: 3m UHALP9108-A(0139)	Ant. pol.	: HORIZONTAL
Limit	: FCC PART-15C		
Env. / Ins.	: 8593EM 23°C/43%	Engineer	: Alvin YAng
EUT	: Controller M/N:CR100		
Power Rating	: 120Vac/60Hz		
Test Mode	: TX2412MHz		

	Ant. Factor	Cable Loss	Emission		Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	Reading (dBµV)	Level (dBµV/m)	(dBµV/m)	(dB)	
1	22.30	6.40	13.25	41.94	46.00	4.06	
2	23.26	6.40	13.40	43.06	46.00	2.94	
3	23.46	6.50	11.96	41.92	46.00	4.08	
4	22.21	6.50	14.22	42.93	46.00	3.07	
5	23.68	6.70	9.78	40.16	46.00	5.84	
6	25.04	7.10	7.62	39.76	46.00	6.24	
7	26.46	7.60	8.00	42.06	54.00	11.94	

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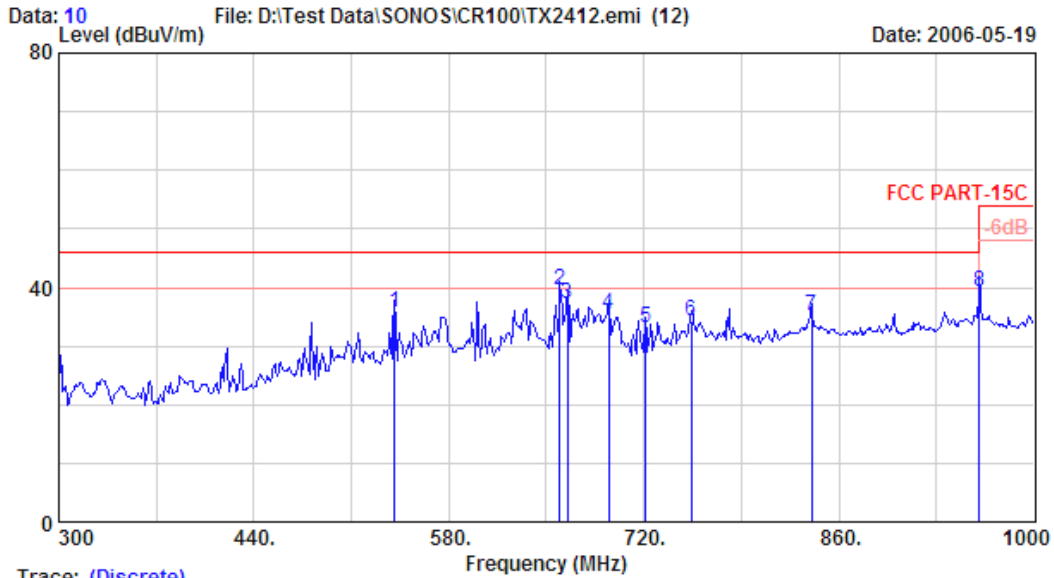
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Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin YAng
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2412MHz	

	Ant. Factor	Cable Loss	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dBµV)	(dBµV/m)	(dBµV/m)	(dB)	
1	48.090	16.36	1.40	17.96	35.72	40.00	4.28
2	108.840	17.90	2.20	13.43	33.53	43.50	9.97
3	120.180	17.58	2.30	11.70	31.59	43.50	11.92
4	180.390	21.28	2.90	8.96	33.14	43.50	10.36

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
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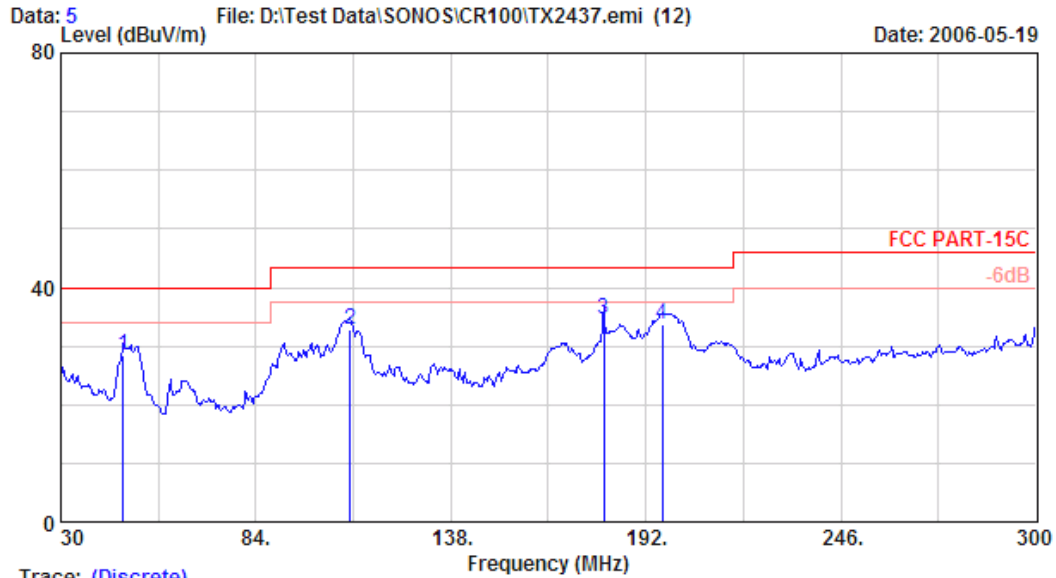
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Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin YAng
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2412MHz	

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	540.800	20.43	7.01	8.24	35.67	46.00	10.33	
2	659.800	21.96	6.40	11.21	39.57	46.00	6.43	
3	665.400	22.42	6.40	8.34	37.16	46.00	8.84	
4	694.800	23.09	6.40	6.07	35.56	46.00	10.44	
5	721.400	22.11	6.50	4.52	33.13	46.00	12.87	
6	754.300	24.69	6.70	2.84	34.23	46.00	11.77	
7	840.400	26.62	7.10	1.45	35.17	46.00	10.83	
8	960.800	27.14	7.60	4.53	39.26	54.00	14.74	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
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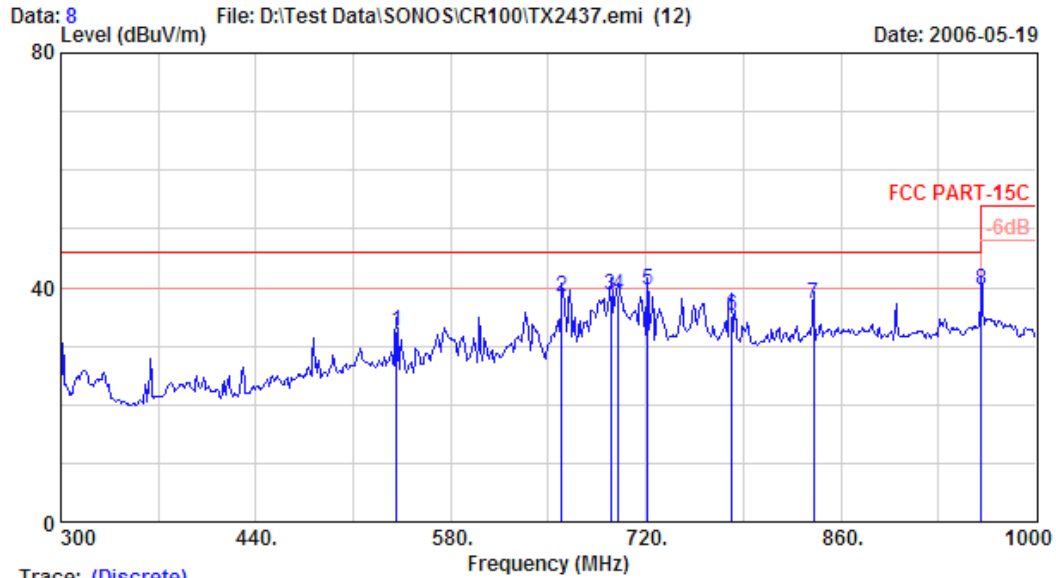
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Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2437MHz	

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	47.280	17.64	1.40	9.50	28.54	40.00	11.46	
2	110.190	18.17	2.20	12.32	32.69	43.50	10.81	
3	180.390	21.31	2.90	10.47	34.69	43.50	8.81	
4	196.590	21.92	3.00	8.72	33.64	43.50	9.86	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
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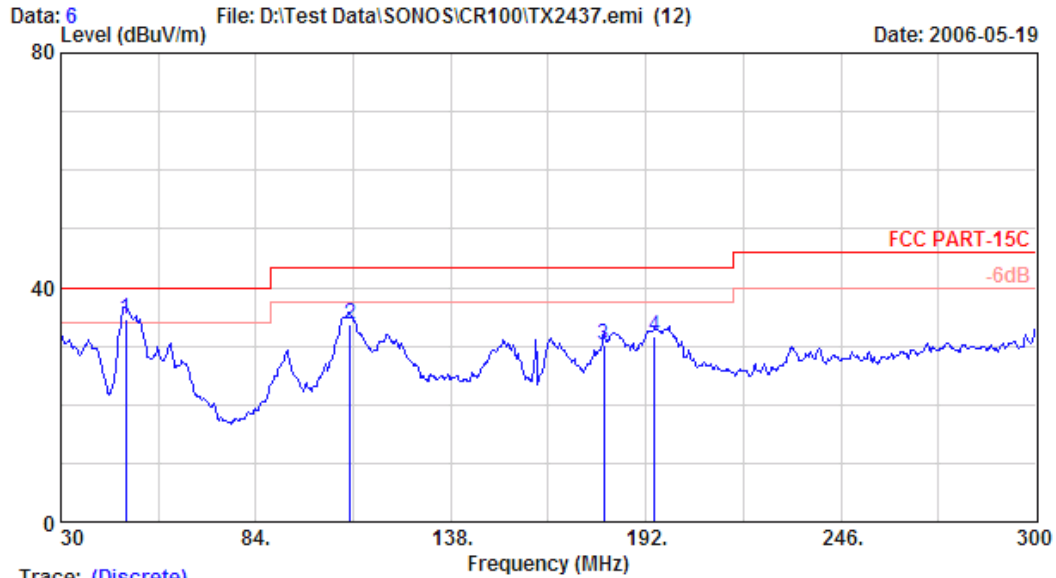
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Dis. / Ant. : 3m UHALP9108-A(0139)	Ant. pol. : HORIZONTAL
Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2437MHz	

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	540.800	19.25	7.01	6.31	32.57	46.00	13.43	
2	659.800	22.30	6.40	9.73	38.42	46.00	7.58	
3	694.800	23.26	6.40	9.05	38.71	46.00	7.29	
4	700.400	23.46	6.50	8.78	38.74	46.00	7.26	
5	721.400	22.21	6.50	10.76	39.47	46.00	6.53	
6	781.600	24.03	6.90	4.34	35.27	46.00	10.73	
7	840.400	25.04	7.10	5.10	37.25	46.00	8.75	
8	960.800	26.46	7.60	5.37	39.43	54.00	14.57	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
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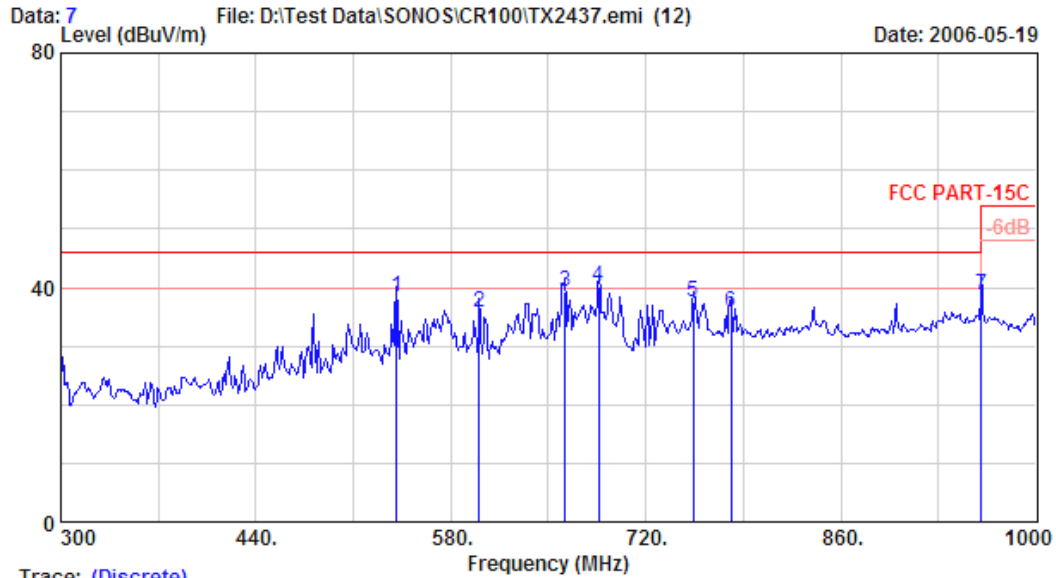
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Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2437MHz	

	Ant. Factor	Cable Loss	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dBµV)	(dBµV/m)	(dBµV/m)	(dB)	
1	48.090	16.36	1.40	16.80	34.56	40.00	5.44
2	110.190	17.97	2.20	13.51	33.68	43.50	9.82
3	180.390	21.28	2.90	6.08	30.26	43.50	13.24
4	194.430	22.34	3.00	6.33	31.67	43.50	11.83

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
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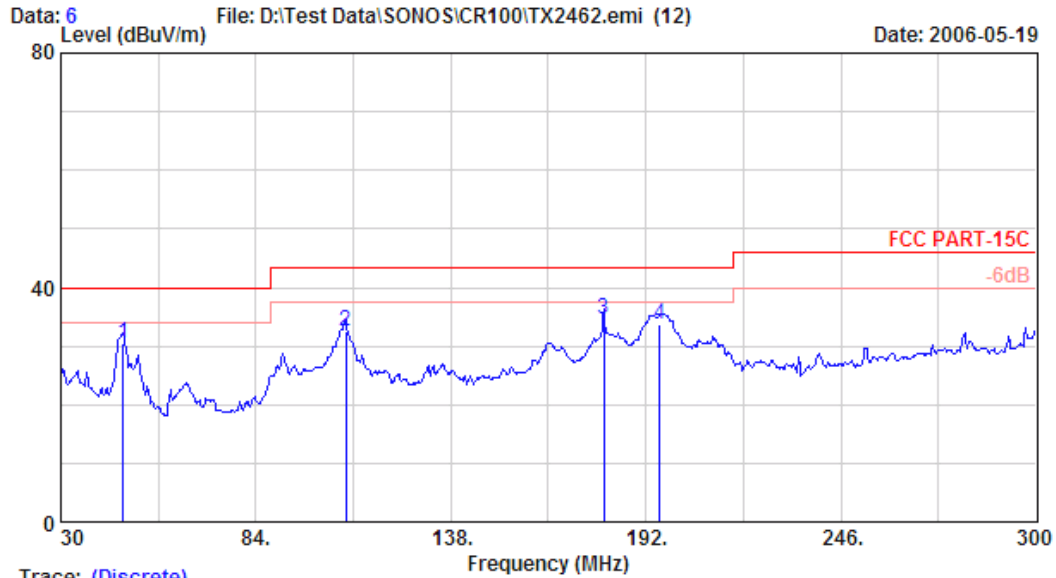
Site no.	: A/C Chamber	Data no.	: 7
Dis. / Ant.	: 3m UHALP9108-A(0139)	Ant. pol.	: VERTICAL
Limit	: FCC PART-15C		
Env. / Ins.	: 8593EM 23*C/43%	Engineer	: Alvin Yang
EUT	: Controller M/N:CR100		
Power Rating	: 120Vac/60Hz		
Test Mode	: TX2437MHz		

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	540.800	20.43	7.01	10.82	38.25	46.00	7.75	
2	600.300	21.65	6.30	7.73	35.68	46.00	10.32	
3	661.900	22.12	6.40	10.82	39.34	46.00	6.66	
4	686.400	23.55	6.50	10.11	40.16	46.00	5.84	
5	754.300	24.69	6.70	6.12	37.51	46.00	8.49	
6	780.900	25.36	6.80	3.53	35.69	46.00	10.31	
7	960.800	27.14	7.60	3.84	38.58	54.00	15.42	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



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Trace: (Discrete)

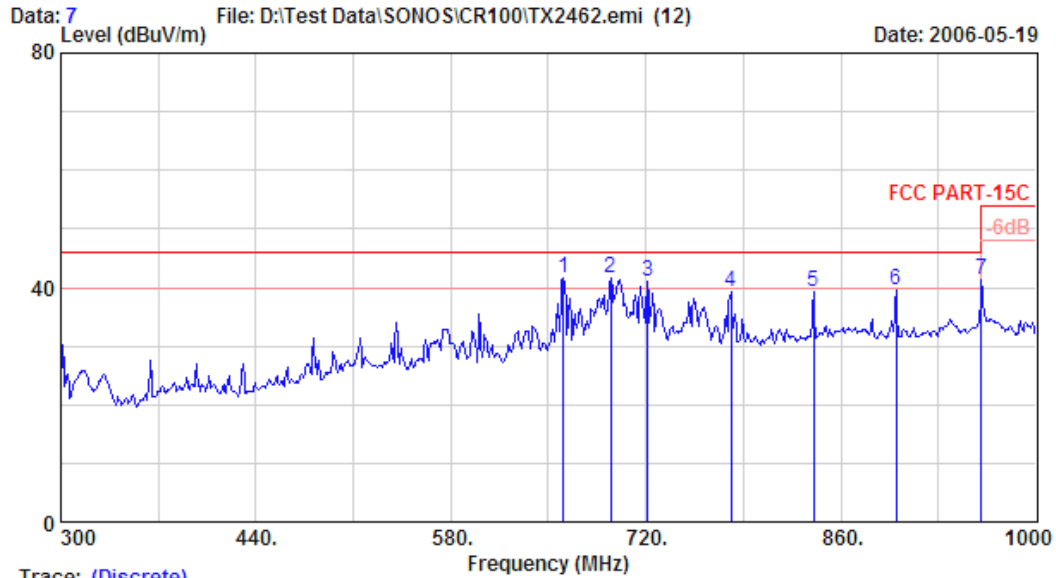
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Dis. / Ant. : 3m VBA6106A	Ant. pol. : HORIZONTAL
Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2462MHz	

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	47.280	17.64	1.40	11.52	30.56	40.00	9.44	
2	108.840	18.06	2.20	12.32	32.58	43.50	10.92	
3	180.390	21.31	2.90	10.41	34.62	43.50	8.88	
4	195.780	21.85	3.00	9.00	33.85	43.50	9.65	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



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Trace: (Discrete)

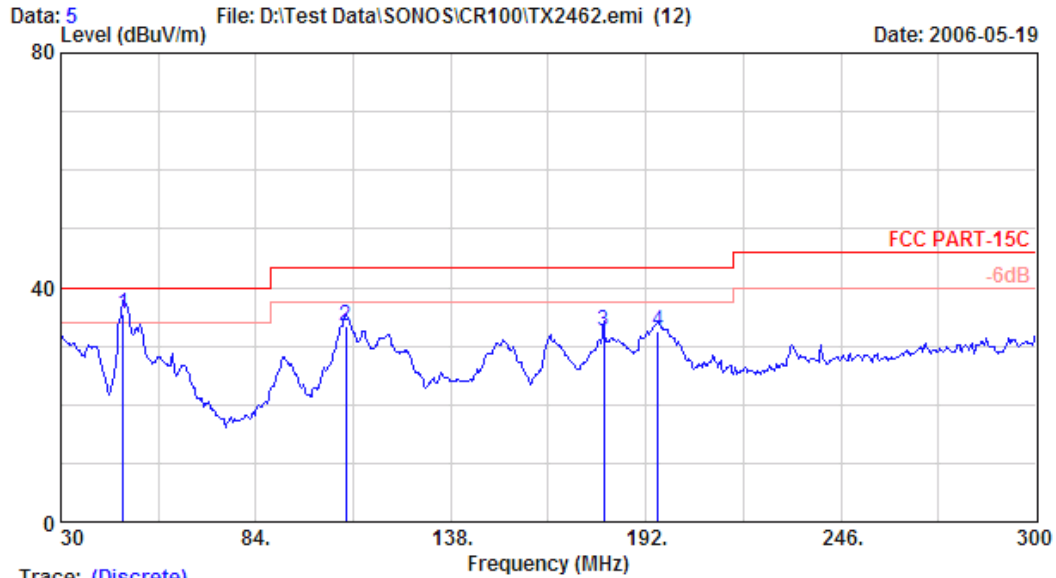
Site no. : A/C Chamber	Data no. : 7
Dis. / Ant. : 3m UHALP9108-A(0139)	Ant. pol. : HORIZONTAL
Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23*C/43%	Engineer : Alvin Yang
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2462MHz	

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	660.500	22.34	6.40	12.77	41.51	46.00	4.49	
2	694.800	23.26	6.40	11.98	41.64	46.00	4.36	
3	721.400	22.21	6.50	12.20	40.91	46.00	5.09	
4	780.900	24.07	6.80	8.29	39.16	46.00	6.84	
5	840.400	25.04	7.10	7.18	39.32	46.00	6.68	
6	899.900	24.96	7.37	7.28	39.61	46.00	6.39	
7	960.800	26.46	7.60	7.19	41.25	54.00	12.75	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



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Trace: (Discrete)

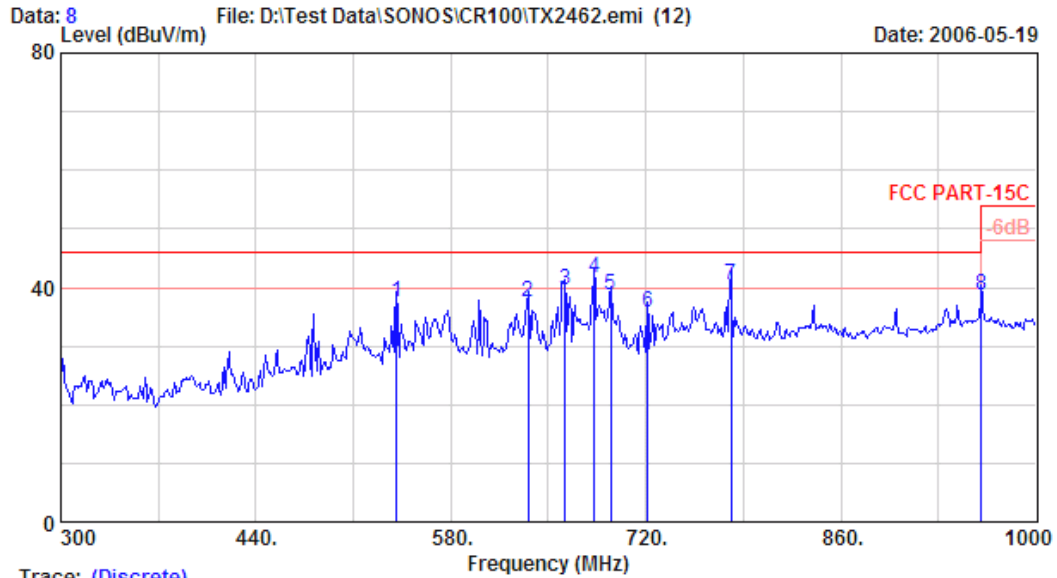
Site no. : A/C Chamber	Data no. : 5
Dis. / Ant. : 3m VBA6106A	Ant. pol. : VERTICAL
Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2462MHz	

	Ant. Factor	Cable Loss	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dBµV)	(dBµV/m)	(dBµV/m)	(dB)	
1	47.280	16.51	1.40	17.56	35.47	40.00	4.53
2	108.840	17.90	2.20	13.43	33.53	43.50	9.97
3	180.390	21.28	2.90	8.36	32.54	43.50	10.96
4	195.240	22.46	3.00	7.12	32.58	43.50	10.92

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



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Trace: (Discrete)

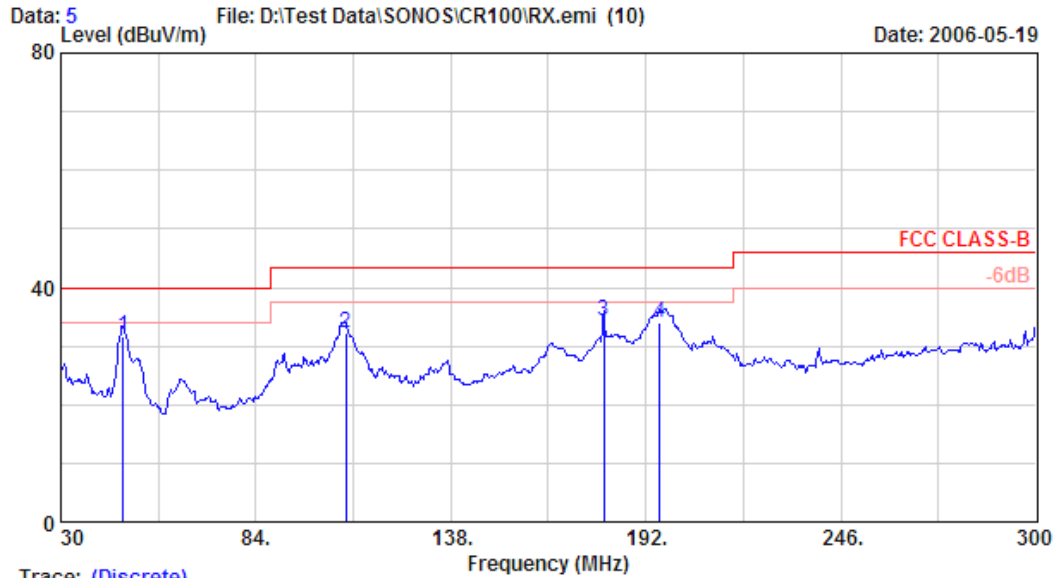
Site no. : A/C Chamber	Data no. : 8
Dis. / Ant. : 3m UHALP9108-A(0139)	Ant. pol. : VERTICAL
Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:CR100	
Power Rating : 120Vac/60Hz	
Test Mode : TX2462MHz	

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	540.800	20.43	7.01	10.13	37.56	46.00	8.44	
2	635.300	21.14	6.30	10.02	37.47	46.00	8.53	
3	661.900	22.12	6.40	10.96	39.48	46.00	6.52	
4	682.900	23.53	6.41	11.63	41.57	46.00	4.43	
5	694.800	23.09	6.40	9.09	38.58	46.00	7.42	
6	721.400	22.11	6.50	7.06	35.67	46.00	10.33	
7	780.900	25.36	6.80	8.29	40.46	46.00	5.54	
8	960.800	27.14	7.60	3.84	38.58	54.00	15.42	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



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Trace: (Discrete)

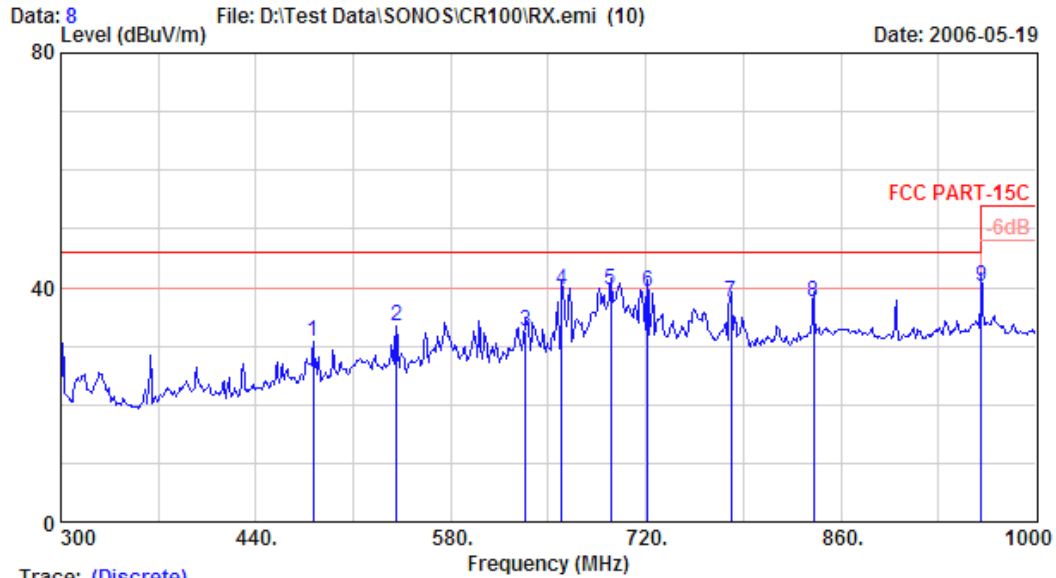
Site no. : A/C Chamber	Data no. : 5
Dis. / Ant. : 3m VBA6106A	Ant. pol. : HORIZONTAL
Limit : FCC CLASS-B	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:ZP100	
Power Rating : 120Vac/60Hz	
Test Mode : RX Mode	

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	47.280	17.64	1.40	12.54	31.58	40.00	8.42	
2	108.840	18.06	2.20	12.12	32.38	43.50	11.12	
3	180.390	21.31	2.90	9.99	34.21	43.50	9.29	
4	195.780	21.85	3.00	9.26	34.11	43.50	9.39	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



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Trace: (Discrete)

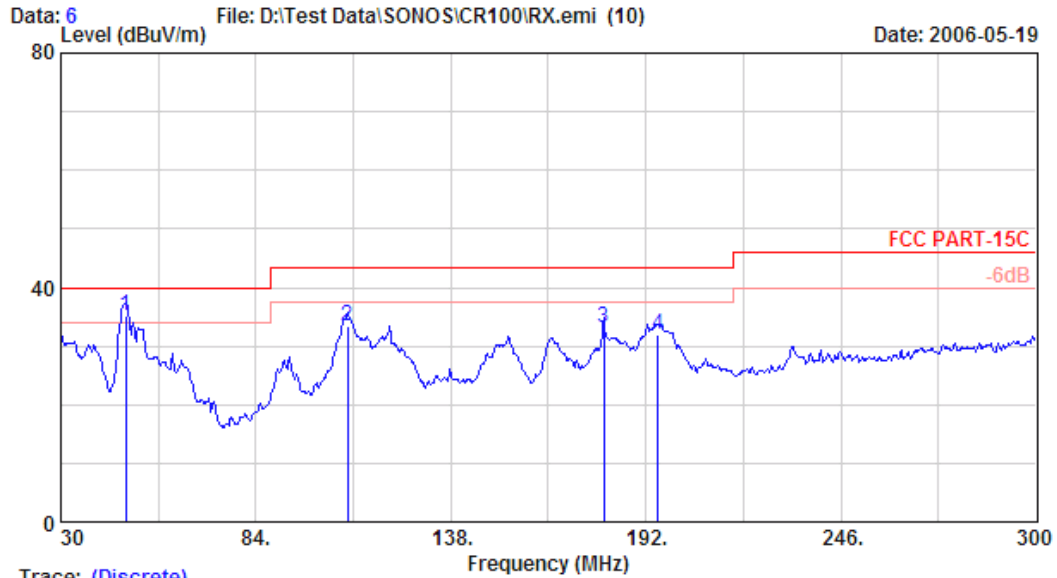
Site no. : A/C Chamber	Data no. : 8
Dis. / Ant. : 3m UHALP9108-A(0139)	Ant. pol. : HORIZONTAL
Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:ZP100	
Power Rating : 120Vac/60Hz	
Test Mode : RX Mode	

	Ant. Factor	Cable Loss	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dBµV)	(dBµV/m)	(dBµV/m)	(dB)	
1	481.300	18.74	6.10	6.01	30.84	46.00	15.16
2	540.800	19.25	7.01	7.10	33.36	46.00	12.64
3	633.900	20.94	6.30	5.34	32.58	46.00	13.42
4	659.800	22.30	6.40	10.89	39.59	46.00	6.41
5	694.800	23.26	6.40	9.93	39.59	46.00	6.41
6	721.400	22.21	6.50	10.46	39.18	46.00	6.82
7	780.900	24.07	6.80	6.65	37.52	46.00	8.48
8	840.400	25.04	7.10	5.44	37.58	46.00	8.42
9	960.800	26.46	7.60	6.21	40.27	54.00	13.73

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



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Trace: (Discrete)

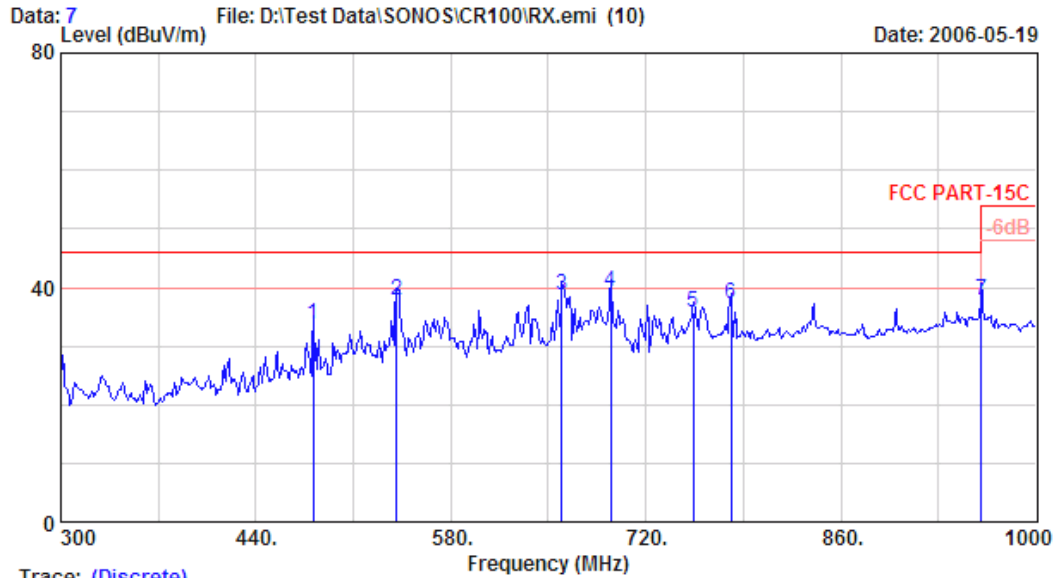
Site no. : A/C Chamber	Data no. : 6
Dis. / Ant. : 3m VBA6106A	Ant. pol. : VERTICAL
Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:ZP100	
Power Rating : 120Vac/60Hz	
Test Mode : RX Mode	

	Ant. Factor	Cable Loss	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dBµV)	(dBµV/m)	(dBµV/m)	(dB)	
1	48.090	16.36	1.40	43.68	35.04	40.00	4.96
2	109.380	17.94	2.20	39.64	33.54	43.50	9.96
3	180.390	21.28	2.90	34.72	33.03	43.50	10.47
4	195.240	22.46	3.00	32.30	31.94	43.50	11.56

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



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Trace: (Discrete)

Site no. : A/C Chamber	Data no. : 7
Dis. / Ant. : 3m UHALP9108-A(0139)	Ant. pol. : VERTICAL
Limit : FCC PART-15C	
Env. / Ins. : 8593EM 23°C/43%	Engineer : Alvin Yang
EUT : Controller M/N:ZP100	
Power Rating : 120Vac/60Hz	
Test Mode : RX Mode	

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBµV)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Remark
1	481.300	18.91	6.10	8.66	33.67	46.00	12.33	
2	540.800	20.43	7.01	10.23	37.67	46.00	8.33	
3	659.800	21.96	6.40	10.31	38.67	46.00	7.33	
4	694.800	23.09	6.40	9.69	39.18	46.00	6.82	
5	754.300	24.69	6.70	4.49	35.88	46.00	10.12	
6	780.900	25.36	6.80	5.00	37.17	46.00	8.83	
7	960.800	27.14	7.60	3.09	37.82	54.00	16.18	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

2.6.2. Frequency Range Above 1GHz

Date of Test : May 19, 2006 Temperature : 23°C

EUT : Controller Humidity : 43%

Test Mode : Transmitting Mode, Frequency: 2412MHz

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBμV	Emission Level Horizontal dBμV/m	Limits dBμV/m	Margin dB
Peak	2212.960	28.25	6.12	13.38	47.75	74.00	26.25
	2241.520	28.31	6.16	11.14	45.61	74.00	28.39
Average	2212.960	28.25	6.12	10.16	44.53	54.00	9.47
	2241.520	28.31	6.16	7.73	42.20	54.00	11.80

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBμV	Emission Level Vertical dBμV/m	Limits dBμV/m	Margin dB
Peak	2212.960	28.25	6.12	14.04	48.41	74.00	25.59
	2241.520	28.31	6.16	11.72	46.19	74.00	27.81
Average	2212.960	28.25	6.12	10.41	44.78	54.00	9.22
	2241.520	28.31	6.16	8.54	43.01	54.00	10.99

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. Measurement was up to 25GHz, but the emission levels were too low against the official limit and not reported.

Date of Test : May 19, 2006 Temperature : 23°C

EUT : Controller Humidity : 43%

Test Mode : Transmitting Mode, Frequency: 2437MHz

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBµV	Emission Level Horizontal dBµV/m	Limits dBµV/m	Margin dB
Peak	2238.160	28.31	6.16	10.77	45.24	74.00	28.76
Average	2238.160	28.31	6.16	8.07	42.54	54.00	11.46

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBµV	Emission Level Vertical dBµV/m	Limits dBµV/m	Margin dB
Peak	1141.120	25.27	4.47	13.56	43.30	74.00	30.70
	1692.160	26.41	6.80	11.48	44.69	74.00	29.31
	2204.560	28.24	6.11	10.15	44.50	74.00	29.50
	2238.160	28.31	6.16	12.14	46.61	74.00	27.39
Average	1141.120	25.27	4.47	10.80	40.54	54.00	13.46
	1692.160	26.41	6.80	8.36	41.57	54.00	12.43
	2204.560	28.24	6.11	7.22	41.57	54.00	12.43
	2238.160	28.31	6.16	9.33	43.80	54.00	10.20

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. Measurement was up to 25GHz, but the emission levels were too low against the official limit and not reported.

Date of Test : May 19, 2006 Temperature : 23°C

EUT : Controller Humidity : 43%

Test Mode : Transmitting Mode, Frequency: 2462MHz

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBµV	Emission Level Horizontal dBµV/m	Limits dBµV/m	Margin dB
Peak	2090.320	27.99	5.97	8.95	42.91	74.00	31.09
	2204.560	28.24	6.11	10.70	45.05	74.00	28.95
	2258.320	28.35	6.17	11.58	46.10	74.00	27.90
Average	2204.560	28.24	6.11	8.32	42.67	54.00	11.33
	2258.320	28.35	6.17	9.06	43.58	54.00	10.42

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBµV	Emission Level Vertical dBµV/m	Limits dBµV/m	Margin dB
Peak	1322.560	25.34	4.90	8.35	38.59	74.00	35.41
	2258.320	28.35	6.17	8.13	42.65	74.00	31.35
Average	1322.560	25.34	4.90	11.67	41.91	54.00	12.09
	2258.320	28.35	6.17	11.33	45.85	54.00	8.15

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. Measurement was up to 25GHz, but the emission levels were too low against the official limit and not reported.

2.6.3. Restricted Bands Measurement Results

Date of Test : May 19, 2006 Temperature : 23°C

EUT : Controller Humidity : 43%

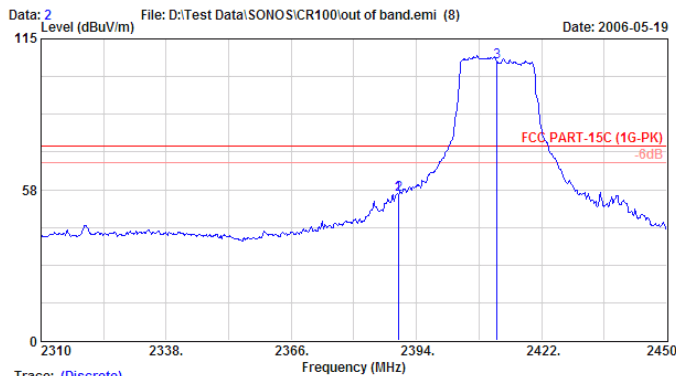
Test Mode : Transmitting Mode, Frequency: 2412MHz

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBμV	Emission Level Horizontal dBμV/m	Limits dBμV/m	Margin dB
Peak *	2389.940	28.59	6.34	20.82	55.75	74.00	18.25
Average *	2319.660	28.46	6.25	-0.45	34.26	54.00	19.74

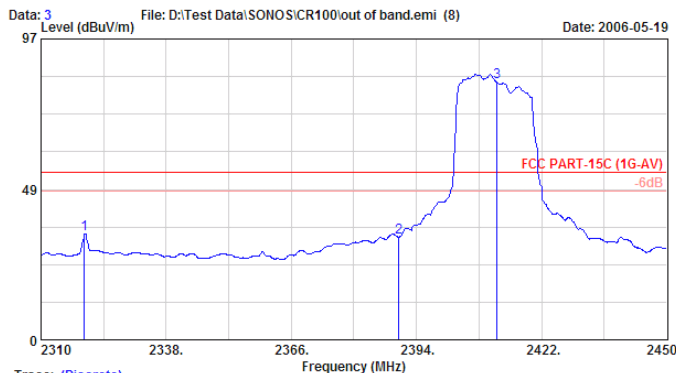
- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. Low frequency section (spurious in the restricted band 2310-2390MHz).
 3. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



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Trace: (Discrete)
 Site no. : A/C Chamber Data no. : 2
 Dis. / Ant. : 3m 3115 Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : 8593EM 23°C/43% Engineer : Alvin Yang
 EUT : Controller M/N:CR100
 Power Rating : 120Vac/60Hz
 Test Mode : TX2412MHz



Trace: (Discrete)
 Site no. : A/C Chamber Data no. : 3
 Dis. / Ant. : 3m 3115 Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-AV)
 Env. / Ins. : 8593EM 23°C/43% Engineer : Alvin Yang
 EUT : Controller M/N:CR100
 Power Rating : 120Vac/60Hz
 Test Mode : TX2412MHz

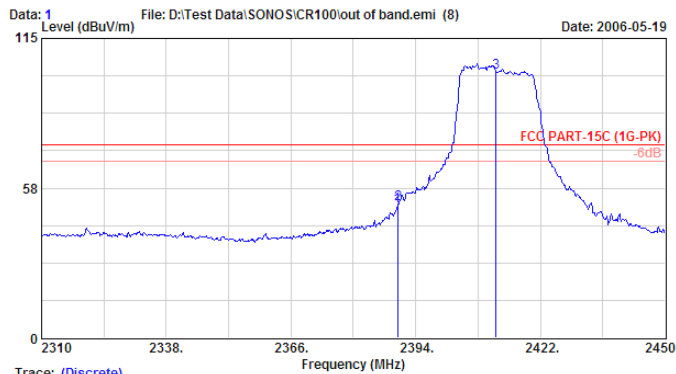
Date of Test : May 19, 2006 Temperature : 23°C
 EUT : Controller Humidity : 43%
 Test Mode : Transmitting Mode, Frequency: 2412MHz

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBμV	Emission Level Vertical dBμV/m	Limits dBμV/m	Margin dB
Peak *	2389.940	28.59	6.34	15.60	50.53	74.00	23.47
Average *	2319.800	28.46	6.25	-4.38	30.33	54.00	23.67

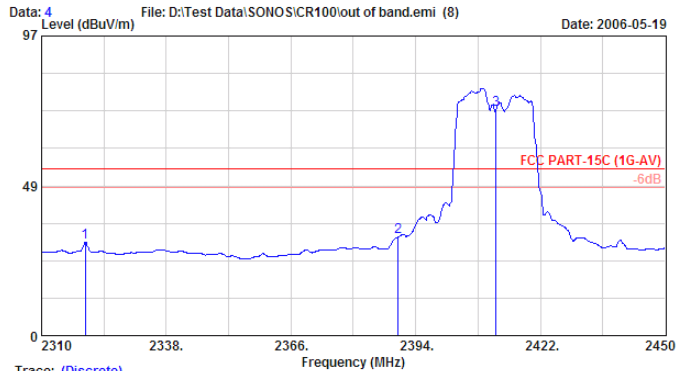
- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. Low frequency section (spurious in the restricted band 2310-2390MHz).
 3. ‘*’ The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



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Trace: (Discrete)
 Site no. : A/C Chamber Data no. : 1
 Dis. / Ant. : 3m 3115 Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : 8593EM 23°C/43% Engineer : Alvin Yang
 EUT : Controller M/N:CR100
 Power Rating : 120Vac/60Hz
 Test Mode : TX2412MHz



Trace: (Discrete)
 Site no. : A/C Chamber Data no. : 4
 Dis. / Ant. : 3m 3115 Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-AV)
 Env. / Ins. : 8593EM 23°C/43% Engineer : Alvin Yang
 EUT : Controller M/N:CR100
 Power Rating : 120Vac/60Hz
 Test Mode : TX2412MHz

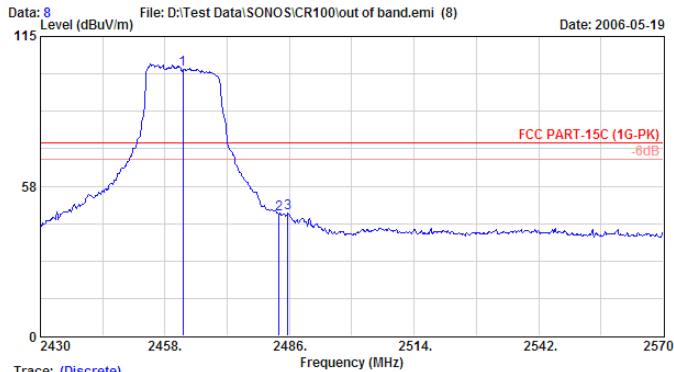
Date of Test : May 19, 2006 Temperature : 23°C
 EUT : Controller Humidity : 43%
 Test Mode : Transmitting Mode, Frequency: 2462MHz

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBμV	Emission Level Horizontal dBμV/m	Limits dBμV/m	Margin dB
Peak *	2483.620	28.77	6.45	11.73	46.95	74.00	27.05
Average *	2483.620	28.77	6.45	-5.06	30.16	54.00	23.84

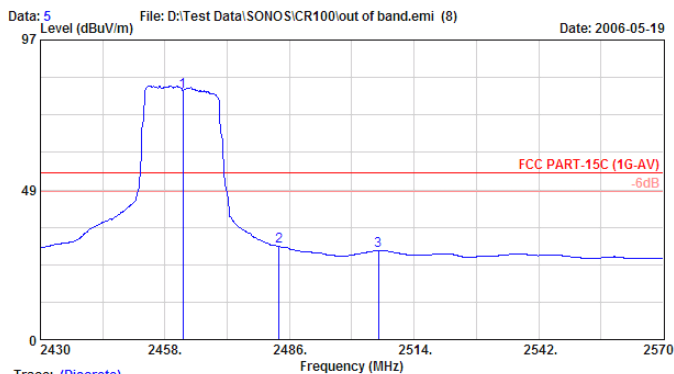
- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. High frequency section (spurious in the restricted band 2483.5-2500MHz).
 3. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



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Trace: (Discrete)
 Site no. : A/C Chamber Data no. : 8
 Dis. / Ant. : 3m 3115 Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : 8593EM 23°C/43% Engineer : Alvin Yang
 EUT : Controller M/N:CR100
 Power Rating : 120Vac/60Hz
 Test Mode : TX2412MHz



Trace: (Discrete)
 Site no. : A/C Chamber Data no. : 5
 Dis. / Ant. : 3m 3115 Ant. pol. : HORIZONTAL
 Limit : FCC PART-15C (1G-AV)
 Env. / Ins. : 8593EM 23°C/43% Engineer : Alvin Yang
 EUT : Controller M/N:CR100
 Power Rating : 120Vac/60Hz
 Test Mode : TX2412MHz

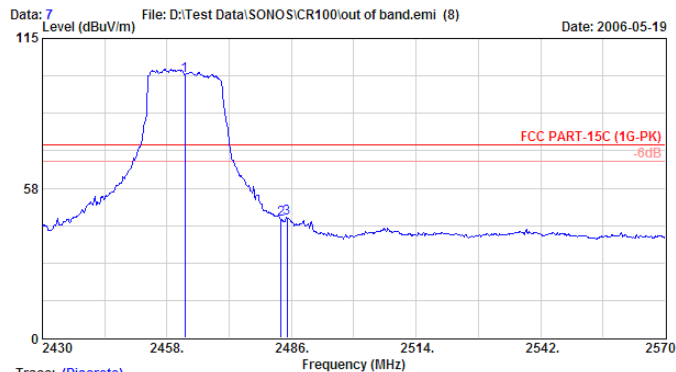
Date of Test : May 19, 2006 Temperature : 23°C
 EUT : Controller Humidity : 43%
 Test Mode : Transmitting Mode, Frequency: 2462MHz

	Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBμV	Emission Level Vertical dBμV/m	Limits dBμV/m	Margin dB
Peak *	2483.620	28.77	6.45	10.35	45.57	74.00	28.43
Average *	2483.620	28.77	6.45	-6.99	28.23	54.00	25.77

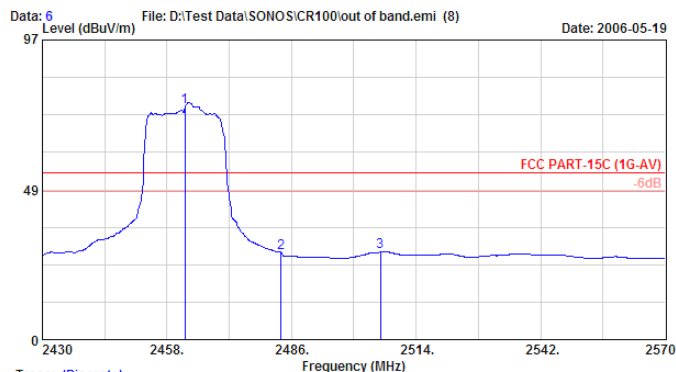
- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
 2. High frequency section (spurious in the restricted band 2483.5-2500MHz).
 3. '*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.



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Trace: (Discrete)
 Site no. : A/C Chamber Data no. : 7
 Dis. / Ant. : 3m 3115 Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-PK)
 Env. / Ins. : 8593EM 23°C/43% Engineer : Alvin Yang
 EUT : Controller M/N:CR100
 Power Rating : 120Vac/60Hz
 Test Mode : TX2412MHz



Trace: (Discrete)
 Site no. : A/C Chamber Data no. : 6
 Dis. / Ant. : 3m 3115 Ant. pol. : VERTICAL
 Limit : FCC PART-15C (1G-AV)
 Env. / Ins. : 8593EM 23°C/43% Engineer : Alvin Yang
 EUT : Controller M/N:CR100
 Power Rating : 120Vac/60Hz
 Test Mode : TX2412MHz

3. DEVIATION TO TEST SPECIFICATIONS

【NONE】

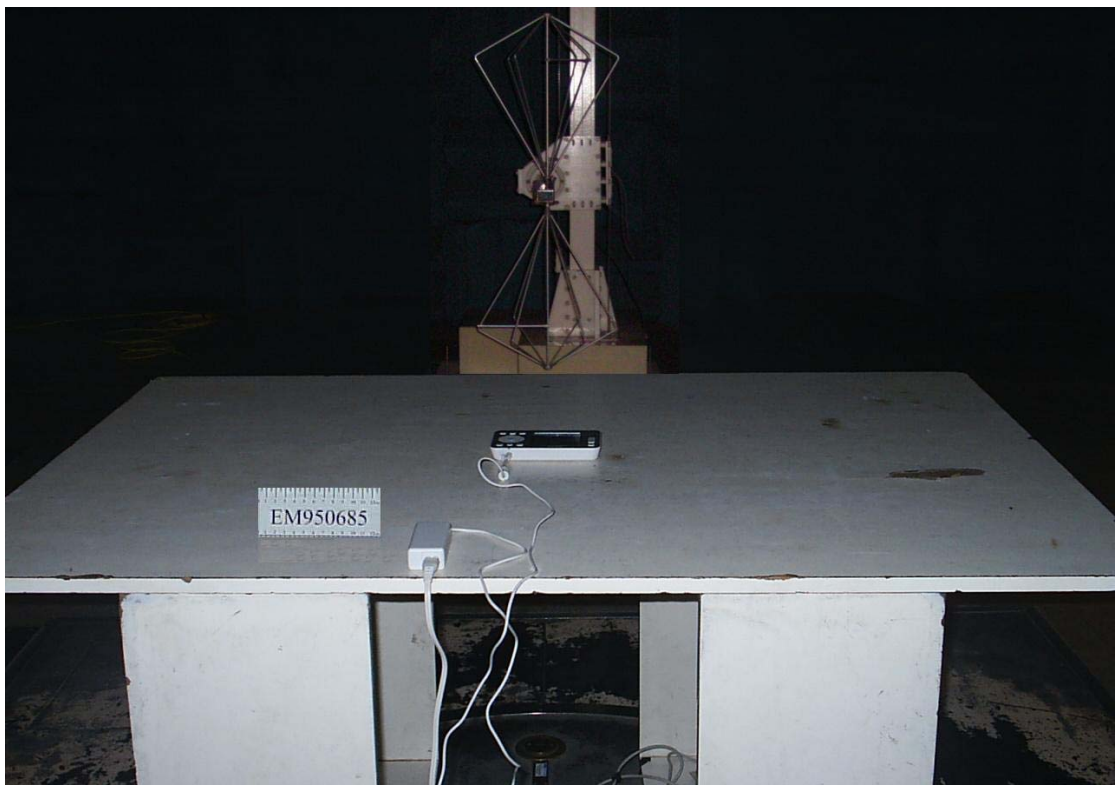
4. PHOTOGRAPHS

4.1. Photos of Radiated Measurement at Semi-Anechoic Chamber

4.1.1. Frequency Range: 30MHz to 1GHz



FRONT VIEW OF RADIATED MEASUREMENT

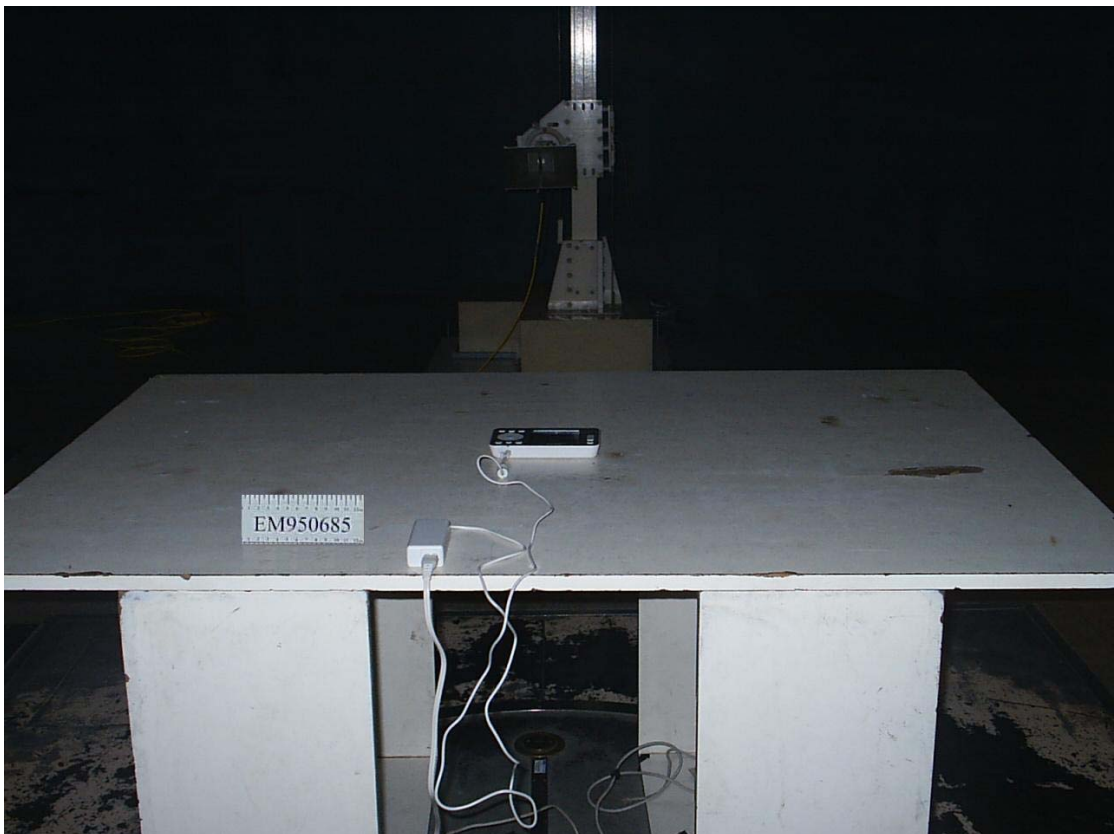


BACK VIEW OF RADIATED MEASUREMENT

4.1.2. Frequency Range: Above 1GHz



FRONT VIEW OF RADIATED MEASUREMENT



BACK VIEW OF RADIATED MEASUREMENT