

*FCC PART 15, SUBPART B and C
TEST REPORT**for***SMART CONTROLLER
TRANSMITTER****MODEL: SC-02**

Prepared for

HOME COMFORT ZONES, INC.
8239 S.W. CIRRUS DRIVE
BEAVERTON, OREGON 97008-5995Prepared by: 

KYLE FUJIMOTO

Approved by: 

MICHAEL CHRISTENSEN

COMPATIBLE ELECTRONICS INC.
114 OLINDA DRIVE
BREA, CALIFORNIA 92823
(714) 579-0500

DATE: MARCH 18, 2004

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	14	2	2	2	12	8	40

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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP, NIST or any other agency of the U.S. Government.

Device Tested: Smart Controller Transmitter
Model: SC-02
S/N: N/A

Product Description: See Expository Statement

Modifications: The EUT was modified in order to meet the specifications. Please see the list located in Appendix B.

Manufacturer: Home Comfort Zones, Inc.
8239 S.W. Cirrus Drive
Beaverton, Oregon 97008-5995

Test Date: February 27, 2004

Test Specifications: EMI requirements
CFR Title 47, Part 15 Subpart B; and Subpart C, Sections 15.205, 15.209 and 15.231(e)

Test Procedure: ANSI C63.4: 2001

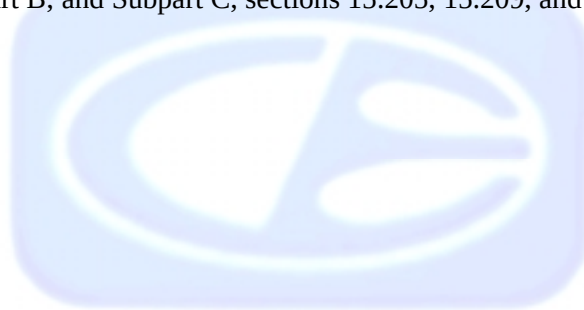
Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz - 30 MHz	This test was not performed because the EUT operates on battery power only and cannot be plugged into the AC public mains.
2	Radiated RF Emissions, 10 kHz - 4200 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.231(e).

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Smart Controller Transmitter Model: SC-02. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 2001. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the **Class B** specification limits defined by CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.231(e).



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Home Comfort Zones, Inc.

Harold G. Alles President

Compatible Electronics, Inc.

Kyle Fujimoto Test Engineer
Michael Christensen Sr. Test Engineer

2.4 Date Test Sample was Received

The test sample was received on February 27, 2004.

2.5 Disposition of the Test Sample

The sample has not yet been returned to Home Comfort Zones, Inc. as of March 18, 2004.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 2001	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description Of Test Configuration - EMI

Setup and operation of the equipment under test.

Specifics of the EUT and Peripherals Tested

The Smart Controller Transmitter Model: SC-02 (EUT) was tested as a stand alone device. The EUT was tested while it was continuously transmitting. The antenna is soldered onto the PCB inside the EUT.

The final radiated data was taken in the mode above. Please see Appendix E for the data sheets.

4.1.1 Cable Construction and Termination

The EUT has no external cables.



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT**5.1 EUT and Accessory List**

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
SMART CONTROLLER TRANSMITTER (EUT)	HOME COMFORT ZONES, Inc.	SC-02	N/A	RU7-HCZ-SC-02

5.2 EMI Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
Radiate Emissions Data Capture Program	Compatible Electronics	2.0	N/A	N/A	N/A
Spectrum Analyzer – Main Section	Hewlett Packard	8566B	3638A08768	June 25, 2003	1 Year
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	3701A22262	June 25, 2003	1 Year
Quasi-Peak Adapter	Hewlett Packard	85650A	2811A01363	June 24, 2003	1 Year
EMI Receiver	Rhode & Schwarz	ESIB40	100172	July 22, 2003	1 Year
Preamplifier	Com-Power	PA-102	1017	January 6, 2004	1 Year
Biconical Antenna	Com Power	AB-100	1548	October 8, 2003	1 Year
Log Periodic Antenna	Com Power	AL-100	16089	October 8, 2003	1 Year
Antenna Mast	Com-Power	AM-100	N/A	N/A	N/A
Turntable	Com-Power	TT-100	N/A	N/A	N/A
Computer	Hewlett Packard	4530	US91912319	N/A	N/A
Monitor	Hewlett Packard	D5258A	TW74500641	N/A	N/A
Loop Antenna	Com-Power	AL-130	25310	June 4, 2003	1 Year
Horn Antenna	Antenna Research	DRG-118/A	1053	January 16, 2004	1 Year
Microwave Preamplifier	Com-Power	PA-122	25195	August 19, 2003	1 Year

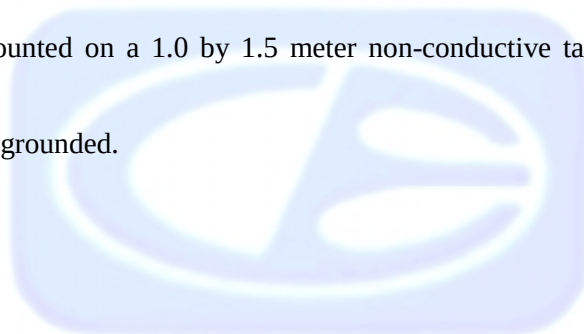
6. TEST SITE DESCRIPTION**6.1 Test Facility Description**

Please refer to section 2.1 and 7.1 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.



7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

7.1 Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer was used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com-Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, and the Com-Power Microwave Preamplifier Model: PA-122 was used for frequencies from 1 GHz to 18 GHz. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 4.2 GHz	1 MHz	Horn Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 2001. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results. The loop antenna was also rotated in the horizontal and vertical axis in order to ensure accurate results.

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data. The final qualification data sheets are located in Appendix E.

8. CONCLUSIONS

The Smart Controller Transmitter Model: SC-02 meets all of the **Class B** specification limits defined in CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.231(e).



APPENDIX A***LABORATORY RECOGNITIONS***

LABORATORY RECOGNITIONS

Compatible Electronics has the following agency accreditations:

National Voluntary Laboratory Accreditation Program - Lab Code: 200528-0

Voluntary Control Council for Interference - Registration Numbers: R-983, C-1026, R-984 and C-1027

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

Conformity Assessment Body for the EMC Directive Under the US/EU MRA Appointed by NIST

Compatible Electronics is recognized or on file with the following agencies:

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)

APPENDIX B***MODIFICATIONS TO THE EUT***

MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC 15.231(e) or FCC Class B specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

Modifications:

1. Reduce the number of coils of the antenna from seven to three
2. Change R7 from 100 ohms to 180 ohms



APPENDIX C

***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Smart Controller Transmitter
Model: SC-02
S/N: N/A

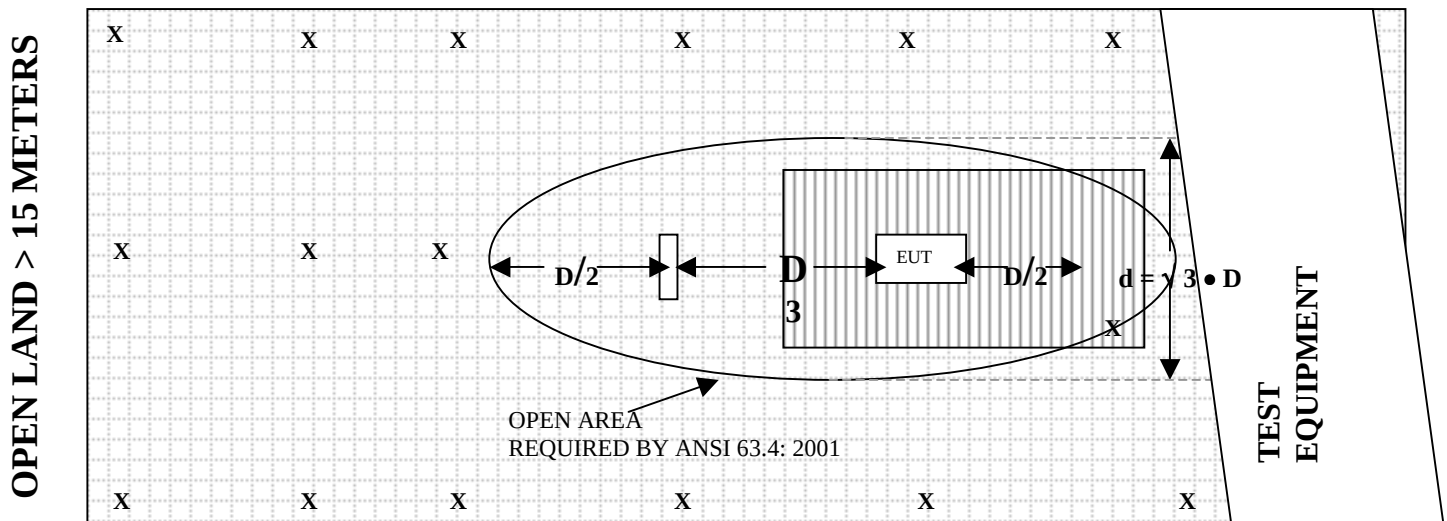
There are no additional models covered under this report.



APPENDIX D***DIAGRAMS, CHARTS, AND PHOTOS***

FIGURE 1: PLOT MAP AND LAYOUT OF RADIATED SITE

OPEN LAND > 15 METERS



OPEN LAND > 15 METERS

X	= GROUND RODS		= GROUND SCREEN
D	= TEST DISTANCE (meters)		= WOOD COVER

COM-POWER AB-100

BICONICAL ANTENNA

S/N: 1548

CALIBRATION DATE: OCTOBER 8, 2003

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	13.1	120	9.9
35	12.9	125	11.4
40	14.6	140	12.0
45	12.8	150	13.0
50	12.9	160	13.9
60	9.3	175	14.2
70	8.2	180	14.3
80	8.0	200	14.9
90	8.1	250	16.6
100	8.8	300	19.7

COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 16089

CALIBRATION DATE: OCTOBER 8, 2003

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	12.8	700	20.0
400	14.4	800	21.2
500	16.0	900	20.8
600	17.7	1000	21.7

COM-POWER PA-102**PREAMPLIFIER**

S/N: 1017

CALIBRATION DATE: JANUARY 6, 2004

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	37.8	300	37.6
40	37.5	350	37.5
50	37.7	400	37.5
60	37.5	450	37.0
70	37.5	500	37.1
80	37.5	550	37.3
90	37.5	600	37.1
100	37.5	650	37.4
125	37.8	700	37.1
150	37.5	750	37.1
175	37.5	800	36.8
200	37.6	850	36.2
225	37.6	900	36.7
250	37.5	950	36.2
275	37.6	1000	35.3

COM-POWER PA-122**MICROWAVE PREAMPLIFIER**

S/N: 25195

CALIBRATION DATE: AUGUST 19, 2003

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	30.8	6.0	33.3
1.1	30.9	6.5	32.7
1.2	30.9	7.0	31.8
1.3	30.4	7.5	31.6
1.4	30.7	8.0	30.3
1.5	31.0	8.5	29.0
1.6	31.2	9.0	29.0
1.7	30.3	9.5	29.5
1.8	28.9	10.0	30.9
1.9	31.2	11.0	30.2
2.0	30.9	12.0	28.7
2.5	30.4	13.0	30.3
3.0	31.7	14.0	28.7
3.5	32.6	15.0	29.5
4.0	32.6	16.0	31.1
4.5	32.2	17.0	30.1
5.0	31.1	18.0	28.6
5.5	30.6		

ANTENNA RESEARCH DRG-118/A**HORN ANTENNA**

S/N: 1053

CALIBRATION DATE: JANUARY 16, 2004

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	24.4	10.0	38.7
1.5	25.2	10.5	39.0
2.0	28.2	11.0	38.9
2.5	28.5	11.5	41.3
3.0	30.1	12.0	40.5
3.5	31.0	12.5	40.0
4.0	31.2	13.0	40.2
4.5	31.9	13.5	40.5
5.0	33.2	14.0	41.6
5.5	33.7	14.5	44.8
6.0	34.3	15.0	41.4
6.5	35.0	15.5	39.2
7.0	36.7	16.0	39.4
7.5	37.3	16.5	40.9
8.0	37.1	17.0	42.6
8.5	37.3	17.5	45.1
9.0	37.7	18.0	41.7
9.5	38.6		

COM-POWER AL-130**LOOP ANTENNA**

S/N: 25310

CALIBRATION DATE: JUNE 4, 2003

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-41.2	10.3
0.01	-41.3	10.2
0.02	-42.3	9.2
0.05	-42.5	9.0
0.07	-42.3	9.2
0.1	-42.5	9.0
0.2	-44.6	6.9
0.3	-42.1	9.4
0.5	-42.4	9.1
0.7	-42.1	9.4
1	-41.5	10.0
2	-41.0	10.5
3	-41.3	10.2
4	-41.3	10.2
5	-40.9	10.6
10	-41.6	9.9
15	-42.1	9.4
20	-42.2	9.3
25	-42.7	8.8
30	-44.3	7.2



FRONT VIEW

HOME COMFORT ZONES, INC.
SMART CONTROLLER TRANSMITTER
MODEL: SC-02

FCC SUBPART C - RADIATED EMISSIONS – 02-27-04

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



REAR VIEW

HOME COMFORT ZONES, INC.
SMART CONTROLLER TRANSMITTER
MODEL: SC-02

FCC SUBPART C - RADIATED EMISSIONS – 02-27-04

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



FRONT VIEW

HOME COMFORT ZONES, INC.
SMART CONTROLLER TRANSMITTER
MODEL: SC-02

FCC SUBPART B - RADIATED EMISSIONS – 02-27-04

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
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REAR VIEW

HOME COMFORT ZONES, INC.
SMART CONTROLLER TRANSMITTER
MODEL: SC-02

FCC SUBPART B - RADIATED EMISSIONS – 02-27-04

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Brea Division
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20621 Pascal Way
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(949) 587-0400

APPENDIX E

DATA SHEETS

RADIATED EMISSIONS

DATA SHEETS

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	Home Comfort Zones, Inc.	DATE	2/27/04
EUT	Smart Controller Transmitter	DUTY CYCLE	67.3344 %
MODEL	SC-02	PEAK TO AVG	-3.43526011 dB
S/N	N/A	TEST DIST.	3 Meters
TEST ENGINEER	Kyle Fujimoto	LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
418.0000	58.8	55.4 A	H	1.8	90	Y		14.7	2.1	0.0	0.0	0.0	72.2	-0.1	72.3	
418.0000	52.1	48.7 A	V	1.8	90	Y		14.7	2.1	0.0	0.0	0.0	65.5	-6.8	72.3	
836.0000	51.9	48.5 A	H	1.8	90	Y		21.1	3.0	36.4	0.0	0.0	36.2	-16.1	52.3	
836.0000	43.4	40.0 A	V	1.8	90	Y		21.1	3.0	36.4	0.0	0.0	27.6	-24.7	52.3	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

FCC 15.231

Home Comfort Zones, Inc.
 Smart Controller Transmitter
 Model: SC-02
 Duty Cycle: 67.3344%
 Average to Peak Drop: 3.43526 dB

Date: 2/27/04
 Lab: B
 Tested By: Kyle Fujimoto

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
1254	38	V	72.3	-34.3	Peak	2	225	
1254	34.56	V	52.3	-17.74	Avg	2	225	
1672	41.92	V	74	-32.08	Peak	2	225	
1672	38.48	V	54	-15.52	Avg	2	225	
2090	44.72	V	72.3	-27.58	Peak	2	225	
2090	41.28	V	52.3	-11.02	Avg	2	225	
2508	44.47	V	72.3	-27.83	Peak	2	225	
2508	41.03	V	52.3	-11.27	Avg	2	225	
2926		V	72.3	-72.3	Peak			No Emissions
2926		V	52.3	-52.3	Avg			Detected
3344		V	72.3	-72.3	Peak			No Emissions
3344		V	52.3	-52.3	Avg			Detected
3762	48.34	V	74	-25.66	Peak	1.5	0	
3762	44.9	V	54	-9.1	Avg	1.5	0	
4180		V	74	-74	Peak			No Emissions
4180		V	54	-54	Avg			Detected

FCC 15.231

Home Comfort Zones, Inc.
 Smart Controller Transmitter
 Model: SC-02

Date: 2/27/04

Lab: B

Tested By: Kyle Fujimoto

Duty Cycle: 67.3344%

Average to Peak Drop: 3.43526 dB

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
1254	40	H	72.3	-32.3	Peak	2	135	
1254	36.56	H	52.3	-15.74	Avg	2	135	
1672	40.34	H	74	-33.66	Peak	2	135	
1672	36.9	H	54	-17.1	Avg	2	135	
2090	44.4	H	72.3	-27.9	Peak	2	135	
2090	30.66	H	52.3	-21.64	Avg	2	135	
2508	44.53	H	72.3	-27.77	Peak	2	180	
2508	30.06	H	52.3	-22.24	Avg	2	180	
2926		H	72.3	-72.3	Peak			No Emissions
2926		H	52.3	-52.3	Avg			Detected
3344		H	72.3	-72.3	Peak			No Emissions
3344		H	52.3	-52.3	Avg			Detected
3762		H	74	-74	Peak			No Emissions
3762		H	54	-54	Avg			Detected
4180		H	74	-74	Peak			No Emissions
4180		H	54	-54	Avg			Detected

FCC 15.231

Home Comfort Zones, Inc.
Smart Controller Transmitter
Model: SC-02

Date: 2/27/04
Lab: B
Tested By: Kyle Fujimoto

Spurious Emissions from 10 kHz to 4200 MHz Vertical and Horizontal Polarizations

[illegible]

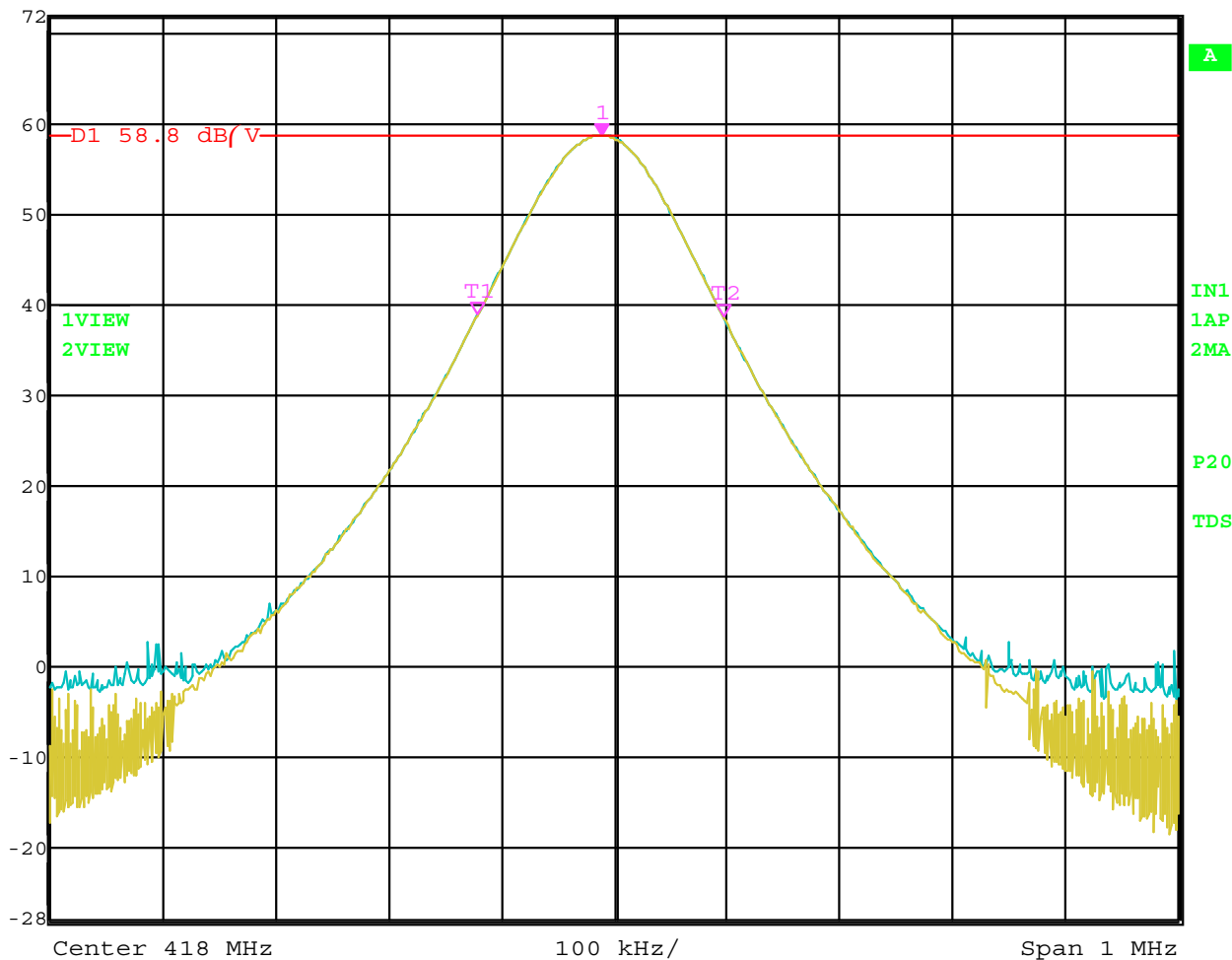


20 dB BANDWIDTH

DATA SHEET



Ref Lvl 72 dB/V
Marker 1 [T2 ndB] 20.00 dB
BW 218.43687375 kHz
RBW 100 kHz
VBW 100 kHz
RF Att 0 dB
SWT 5 ms
Unit dB/V



Date: 27.FEB.2004 16:06:04

20 dB Bandwidth of the Fundamental