APPLICATION FOR CERTIFICATION
On Behalf of
WhiteRock Corporation

Radio Frequency Remote Control Thermostat/Transmitter Unit

Model No.：WR-1212

FCC ID：QBU-WR1212

Prepared for : WhiteRock Corporation
12029 Telegraph Rd., Santa Fe Springs,
Ca 90670, USA.

Prepared by : Taiwan Tokin EMC Eng. Corp.
No. 53-11, Tin-Fu Tsun, Lin-Kou,
Taipei Hsien, Taiwan, R.O.C.

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File Number	:	ATM-G91342
Report Number	:	TTEMC-F91068
Date of Test	:	Apr. 29 ~ May 06, 2002
Date of Report	:	May 14, 2002

TABLE OF CONTENTS

TEST REPORT CERTIFICATION

Applicant	:	WhiteRock Corporation
Manufacturer #1	:	Ben Technology Inc.
Manufacturer #2	:	Froward Electronics Co., Ltd.
EUT Description	:	Radio Frequency Remote Control Thermostat/Transmitter Unit
FCC ID	:	QBU-WR1212
		(A) MODEL NO. : WR-1212
		(B) SERIAL NO. : N/A
		(C) POWER SUPPLY : 3Vdc (Battery AA 1.5V x 2)

Measurement Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART C, MAY 2001
AND FCC/OET MP-4

The device described above was tested by TAIWAN TOKIN EMC ENG. CORP. to determine the maximum emission levels emanating from the device. The maximum emission levels were compared to the FCC Part 15 subpart C limits both radiated and conducted emissions.

The measurement results are contained in this test report and TAIWAN TOKIN EMC ENG. CORP. 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 Taiwan Tokin EMC Eng. corp.

Date of Test : Apr. 29 ~ May 06, 2002

Prepared by : Cherry Wang May 27 2002
(Cherry Wang/Assistant Manager)

Test Engineer : Allen Wang May 27 '02
(Allen Wang/Deputy Manager)

Approve & Authorized Signer : Leon Liu May 27 2002
(Leon Liu/Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Description	:	Radio Frequency Remote Control Thermostat/Transmitter Unit
Model Number	:	WR-1212
FCC ID	:	QBU-WR1212
Applicant	:	WhiteRock Corporation 12029 Telegraph Rd., Santa Fe Springs, Ca 90670, USA.
Manufacturer #1	:	Ben Technology Inc. 7F-2, Chung Hsin Rd., Sec. 2, Hsin-Tien City, Taipei Hsien, Taiwan, R.O.C.
Manufacturer #2	:	Froward Electronics Co., Ltd. 393, Chung Cheng Rd., Sec. 1, Sanhsia Town, Taipei Hsien, Taiwan 237.
Fundamental Frequency	:	433.92MHz
Power Supply	:	3Vdc (Battery AA 1.5V x 2)
Date of Receipt of Sample	:	Apr. 04, 2002
Date of Test	:	Apr. 29 ~ May 06, 2002

Radio Frequency Control Thermostat/Receiver Unit
Model Number: WR-1212
FCC by DoC

Remark:
The EUT is a Wireless Radio-Frequency Remote Control Thermostat's Transmitter Unit, which is for HV/AC Central Air System or Heat Pump System.

The operation of this device is automatic transmitter, data transmission period is 0.7sec in every 2 minutes. (The measured graph is attached in Appendix)

Antenna requirement: This EUT's transmitter antenna is design in soldered to a printed circuit board, comply with §15.203 and inform to user that any change and modify is prohibited.

1.2. Description of Test Facility

Semi-Anechoic Chamber Description	:	May 16, 2000 Re-file on Federal Communication Commission Registration Number: 90993
Name of Firm	:	Taiwan Tokin EMC Eng. Corp.
Site Location #1	:	No. 53-11, Tin-Fu Tsun, Lin-Kou, Taipei Hsien, Taiwan, R.O.C.
Site Location #2	:	No. 67-4, Tin-Fu Tsun, Lin-Kou, Taipei Hsien, Taiwan, R.O.C.
NVLAP Lab Code	:	200077-0

1.3. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Conduction Test	150KHz~30MHz	±2.66dB
Radiation Test (Distance: 3m)	30MHz~300MHz	+4.26dB / –4.22dB
	300MHz~1000MHz	+5.28dB / –4.0dB

Remark：Uncertainty = Kμc(y)

2. POWERLINE CONDUCTED TEST

【This EUT input voltage is DC power operated, so no conductive emissions were performed according to FCC Part 15 C section § 15.207】

3. RADIATED EMISSION TEST

3.1. Test Equipment

The following test equipment are used during the radiated emission tests：

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

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8593EM	3826A00248	Sep. 04, 01’	1 Year
2.	Test Receiver	Rohde&Schwarz	ESVP	893202/001	Jun.10, 01’	1 Year
3.	Pre-Amplifier	HP	8447D	2944A06305	Mar.05, 02’	1 Year
4.	Broadband Antenna	Schwarzbeck	BBA 9106	A3L	Jan. 08, 02‘	1 Year
5.	Broadband Antenna	Schwarzbeck	UHALP9108-A	0139	Jan. 08, 02‘	1 Year

3.1.2. For 1GHz~4GHz frequency (at Semi-Anechoic Chamber)

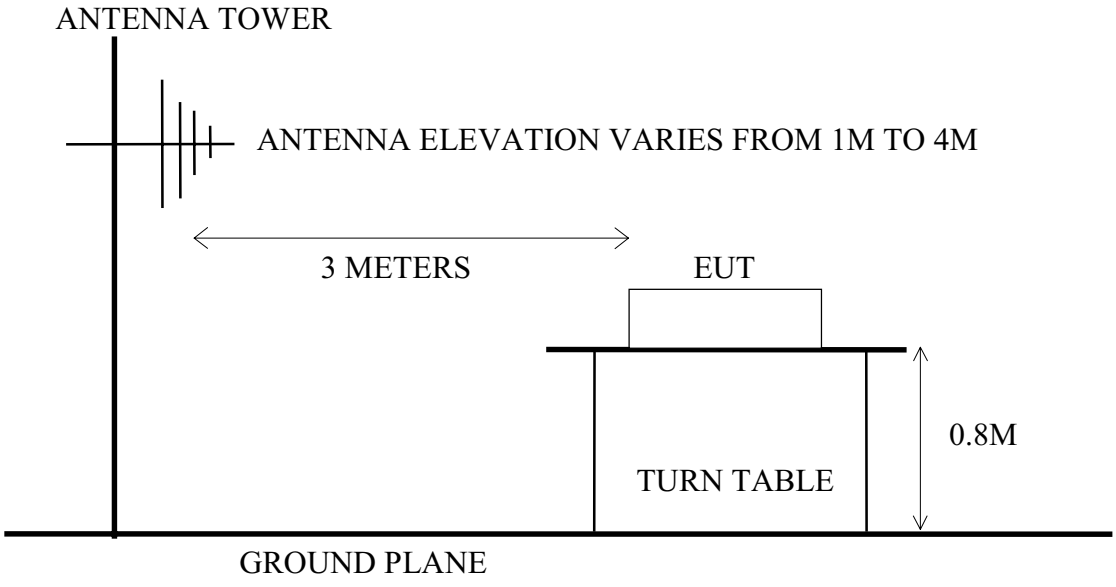
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8593EM	3826A00248	Sep.04, 01’	1 Year
2.	Amplifier	HP	8449B	3008A00529	Jan.05, 02’	1 Year
3.	Horn Antenna	EMCO	3115	9112-3775	Apr.16, 02’	1 Year

3.2. Test Setup

3.2.1. Block Diagram of connection between EUT and simulators

RADIO FREQUENCY CONTROL THERMOSTAT/TRANSMITTER (EUT)

3.2.2. Open Field Test Site (3M) Setup Diagram



3.3. Radiation Limit (§15.231 (e))

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS	
		μV/m	dBμV/m
Fundamental Freq.	3	4399.18	72.8 (Quasi-Peak)
Spurious Emission	3	439.9	52.8 (Quasi-Peak)
Above 1GHz *(3)	3	---	72.8 (Peak)

Remark: (1) Emission level (dBμV/m) = 20 log Emission level (μV/m)
(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
(3) The over 1GHz limits, FCC limit is used based on CFR 47 Part 15.35. and 15.205(b).

3.4. EUT's Configuration during Compliance Measurement

The following equipment were installed on radiated measurement to meet the commission requirement and operating in a manner which tended to maximize its emission characteristics in a normal application.

3.4.1. Radio Frequency Remote Control Thermostat/Transmitter Unit (EUT)

Model Number	:	WR-1212
Serial Number	:	N/A
FCC ID	:	QBU-WR1212
Manufacturer	:	Ben Technology Inc.
Fundamental Frequency	:	433.92MHz
Power Supply	:	Battery AA 1.5V x 2

3.5. Operating Condition of EUT

3.5.1. Setup the EUT and simulator as shown on 3.2.

3.5.2. Turned on the power of all equipment.

3.5.3. The EUT (Radio Frequency Remote Control Thermostat/Transmitter Unit) was emitted the fundamental frequency with data code.

3.5.4. The EUT was at worked during all testing.

3.5.5. Repeated the above procedures from 3.5.3 to 3.5.4.

3.6. Test Procedure

The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. For 30MHz to 4GHz frequency range, 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 for 30MHz to 4GHz frequency range 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/OET MP-4 regulation.

The bandwidth of test receiver was set at 120KHz and resolution bandwidth of spectrum analyzer was set at 1MHz.

EUT with the following test modes were done during radiated measurement and all the test results are listed in section 3.7.

No.	Test Modes
1.	EUT on Lie
2.	EUT on Side
3.	EUT on Stand

➢ Radiated Emission Noise Measurement Results (Supplement Data)

Date of Test： June 05, 2002 Temperature： 23℃

EUT： Radio Frequency Remote Control Thermostat/Transmitter Unit Humidity： 58%

Test Mode： EUT on Lie

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBμV	Emission Level Horizontal dBμV/m	Limits dBμV/m	Margin dB
Fundamental Freq.					(Quasi-Peak)	
433.900	17.20	5.30	26.80	49.30	72.80	23.50
Spurious Freq. / Harmonic Freq.					(Quasi-Peak)	
867.800	22.57	7.20	5.28	35.05	52.80	17.75
Spurious Freq. / Harmonic Freq.					(Peak)	
1301.700	25.33	4.84	<0	<30.17	74.00	43.83
1735.600	26.62	7.07	<0	<33.69	74.00	40.31
2169.500	28.16	6.07	<0	<34.23	74.00	39.77
2603.400	29.26	6.64	<0	<35.90	74.00	38.10
3037.300	30.88	7.26	<0	<38.14	74.00	35.86
3471.200	31.67	7.72	<0	<39.39	74.00	34.61
3905.100	32.69	8.39	<0	<41.08	74.00	32.92
4339.000	32.83	8.62	<0	<41.45	74.00	32.55

Remark ： 1. The readings are Quasi-Peak values below 1000MHz; the readings are Peak values above 1GHz.
2. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
3. Measurement was up to 10th harmonic (~4GHz), but the emissions level were too low against the official limit and not report.

Date of Test： June 05, 2002 Temperature： 23℃

EUT： Radio Frequency Remote Control Thermostat/Transmitter Unit Humidity： 58%

Test Mode： EUT on Lie

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBμV	Emission Level Vertical dBμV/m	Limits dBμV/m	Margin dB
Fundamental Freq.					(Quasi-Peak)	
433.900	16.60	5.30	29.30	51.20	72.80	21.60
Spurious Freq. / Harmonic Freq.					(Quasi-Peak)	
867.800	21.70	7.20	-1.72	27.18	52.80	25.62
Spurious Freq. / Harmonic Freq.					(Peak)	
1301.700	25.33	4.84	<0	<30.17	74.00	43.83
1735.600	26.62	7.07	<0	<33.69	74.00	40.31
2169.500	28.16	6.07	<0	<34.23	74.00	39.77
2603.400	29.26	6.64	<0	<35.90	74.00	38.10
3037.300	30.88	7.26	<0	<38.14	74.00	35.86
3471.200	31.67	7.72	<0	<39.39	74.00	34.61
3905.100	32.69	8.39	<0	<41.08	74.00	32.92
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Date of Test： June 05, 2002 Temperature： 23℃

EUT： Radio Frequency Remote Control Thermostat/Transmitter Unit Humidity： 58%

Test Mode： EUT on Side

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBμV	Emission Level Horizontal dBμV/m	Limits dBμV/m	Margin dB
Fundamental Freq.					(Quasi-Peak)	
433.900	17.20	5.30	37.21	59.71	72.80	13.09
Spurious Freq. / Harmonic Freq.					(Quasi-Peak)	
867.800	22.57	7.20	-1.58	28.19	52.80	24.61
Spurious Freq. / Harmonic Freq.					(Peak)	
1301.700	25.33	4.84	<0	<30.17	74.00	43.83
1735.600	26.62	7.07	<0	<33.69	74.00	40.31
2169.500	28.16	6.07	<0	<34.23	74.00	39.77
2603.400	29.26	6.64	<0	<35.90	74.00	38.10
3037.300	30.88	7.26	<0	<38.14	74.00	35.86
3471.200	31.67	7.72	<0	<39.39	74.00	34.61
3905.100	32.69	8.39	<0	<41.08	74.00	32.92
4339.000	32.83	8.62	<0	<41.45	74.00	32.55

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Date of Test： June 05, 2002 Temperature： 23℃

EUT： Radio Frequency Remote Control Thermostat/Transmitter Unit Humidity： 58%

Test Mode： EUT on Side

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBμV	Emission Level Vertical dBμV/m	Limits dBμV/m	Margin dB
Fundamental Freq.					(Quasi-Peak)	
433.900	16.60	5.30	22.00	43.90	72.80	28.90
Spurious Freq. / Harmonic Freq.					(Quasi-Peak)	
867.800	21.70	7.20	-0.96	27.94	52.80	24.86
Spurious Freq. / Harmonic Freq.					(Peak)	
1301.700	25.33	4.84	<0	<30.17	74.00	43.83
1735.600	26.62	7.07	<0	<33.69	74.00	40.31
2169.500	28.16	6.07	<0	<34.23	74.00	39.77
2603.400	29.26	6.64	<0	<35.90	74.00	38.10
3037.300	30.88	7.26	<0	<38.14	74.00	35.86
3471.200	31.67	7.72	<0	<39.39	74.00	34.61
3905.100	32.69	8.39	<0	<41.08	74.00	32.92
4339.000	32.83	8.62	<0	<41.45	74.00	32.55

Remark ： 1. The readings are Quasi-Peak values below 1000MHz; the readings are Peak values above 1GHz.
2. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
3. Measurement was up to 10th harmonic (~4GHz), but the emissions level were too low against the official limit and not report.

Date of Test： June 05, 2002 Temperature： 23℃

EUT： Radio Frequency Remote Control Thermostat/Transmitter Unit Humidity： 58%

Test Mode： EUT on Stand

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBμV	Emission Level Horizontal dBμV/m	Limits dBμV/m	Margin dB
Fundamental Freq.					(Quasi-Peak)	
433.900	17.20	5.30	32.16	54.66	72.80	18.14
Spurious Freq. / Harmonic Freq.					(Quasi-Peak)	
867.800	22.57	7.20	2.03	31.80	52.80	21.00
Spurious Freq. / Harmonic Freq.					(Peak)	
1301.700	25.33	4.84	<0	<30.17	74.00	43.83
1735.600	26.62	7.07	<0	<33.69	74.00	40.31
2169.500	28.16	6.07	<0	<34.23	74.00	39.77
2603.400	29.26	6.64	<0	<35.90	74.00	38.10
3037.300	30.88	7.26	<0	<38.14	74.00	35.86
3471.200	31.67	7.72	<0	<39.39	74.00	34.61
3905.100	32.69	8.39	<0	<41.08	74.00	32.92
4339.000	32.83	8.62	<0	<41.45	74.00	32.55

Remark ： 1. The readings are Quasi-Peak values below 1000MHz; the readings are Peak values above 1GHz.
2. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
3. Measurement was up to 10th harmonic (~4GHz), but the emissions level were too low against the official limit and not report.

Date of Test： June 05, 2002 Temperature： 23℃

EUT： Radio Frequency Remote Control Thermostat/Transmitter Unit Humidity： 58%

Test Mode： EUT on Stand

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBμV	Emission Level Vertical dBμV/m	Limits dBμV/m	Margin dB
Fundamental Freq.					(Quasi-Peak)	
433.900	16.60	5.30	42.81	64.71	72.80	8.09
Spurious Freq. / Harmonic Freq.					(Quasi-Peak)	
867.800	21.70	7.20	-1.83	27.07	52.80	25.73
Spurious Freq. / Harmonic Freq.					(Peak)	
1301.700	25.33	4.84	<0	<30.17	74.00	43.83
1735.600	26.62	7.07	<0	<33.69	74.00	40.31
2169.500	28.16	6.07	<0	<34.23	74.00	39.77
2603.400	29.26	6.64	<0	<35.90	74.00	38.10
3037.300	30.88	7.26	<0	<38.14	74.00	35.86
3471.200	31.67	7.72	<0	<39.39	74.00	34.61
3905.100	32.69	8.39	<0	<41.08	74.00	32.92
4339.000	32.83	8.62	<0	<41.45	74.00	32.55

Remark ： 1. The readings are Quasi-Peak values below 1000MHz; the readings are Peak values above 1GHz.
2. Emission Level = Antenna Factor + Cable Loss + Meter Reading.
3. Measurement was up to 10th harmonic (~4GHz), but the emissions level were too low against the official limit and not report.

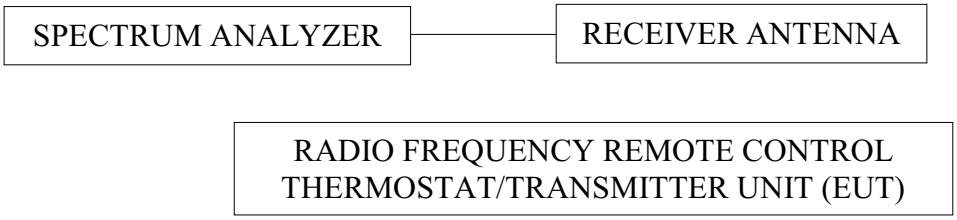
4. EMISSION BANDWIDTH TEST

4.1. Test Equipment

The following test equipment were used during the Emission Bandwidth Test：

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8593EM	3826A00248	Sep. 04, 01’	1 Year

4.2. Block Diagram of Test Setup



4.3. Specification Limits (§15.231-(c))

The bandwidth of emission shall be no wider than 0.25% of the center frequency for device operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

4.4. EUT’s Configuration during Compliance Measurement

The configuration of EUT were same as section 3.4.

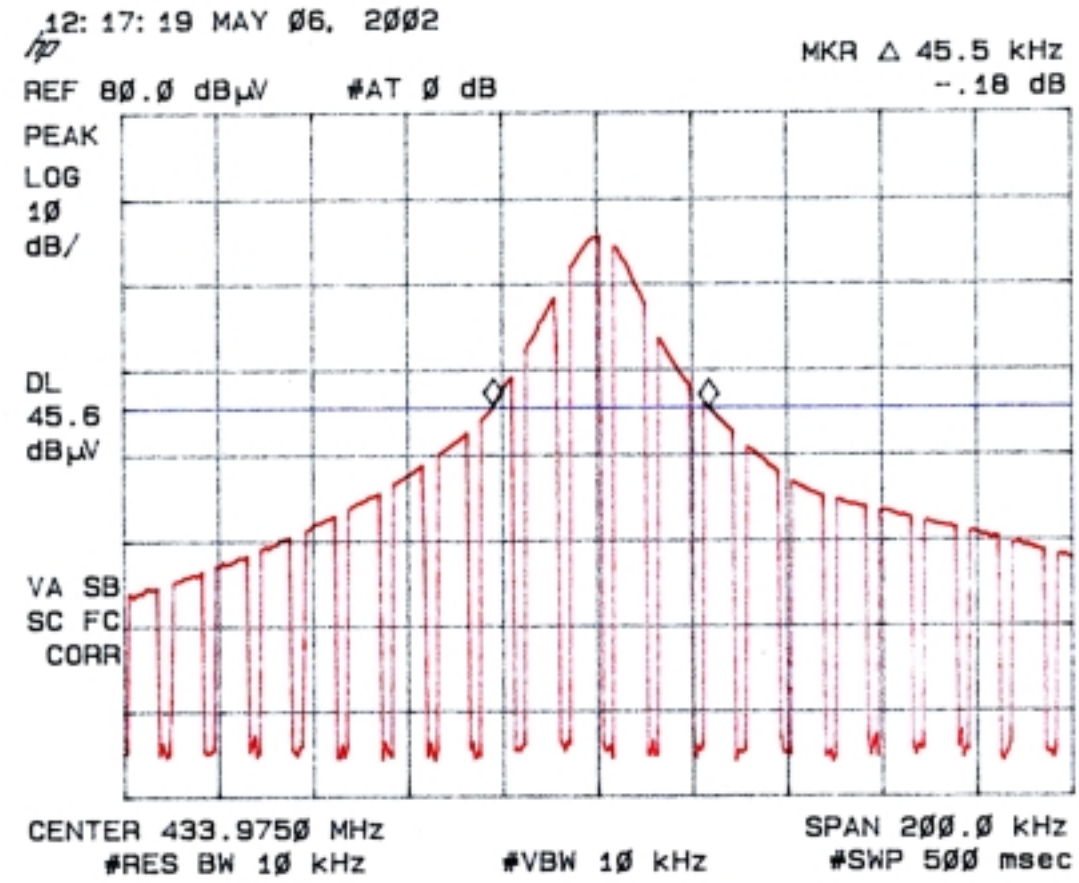
4.5. Emission Bandwidth Measurement Results

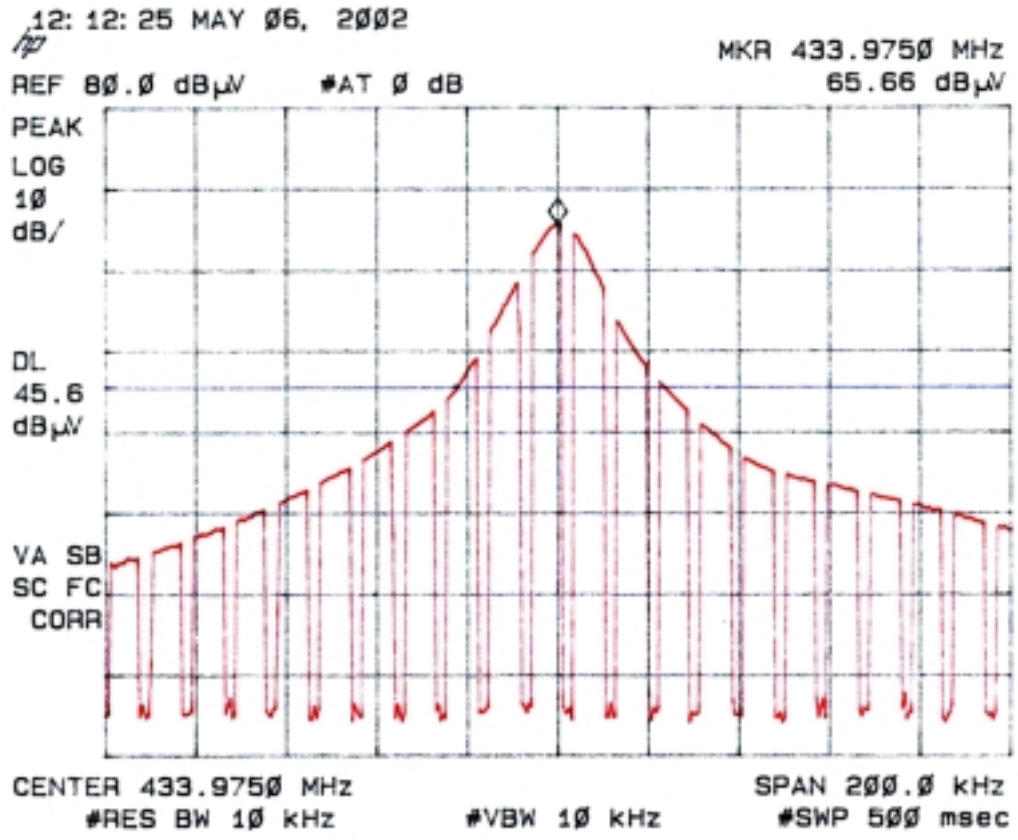
Fundamental Frequency: 433.92MHz

Date of Test: May 06, 2002

No.	Center Frequency	**Bandwidth**	**Tolerance (%)**
1.	433.9750MHz	**45.5kHz**	**0.0104%**

The bandwidth test graphs are attached in next page.


12: 17: 19 MAY Ø6, 2ØØ2
MKR Δ 45.5 kHz
REF 8Ø.Ø dBµV
#AT Ø dB
-.18 dB
PEAK
LOG
1Ø
dB/
DL
45.6
dBµV
VA SB
SC FC
CORR
CENTER 433.975Ø MHz
SPAN 2ØØ.Ø kHz
#RES BW 1Ø kHz
#VBW 1Ø kHz
#SWP 5ØØ msec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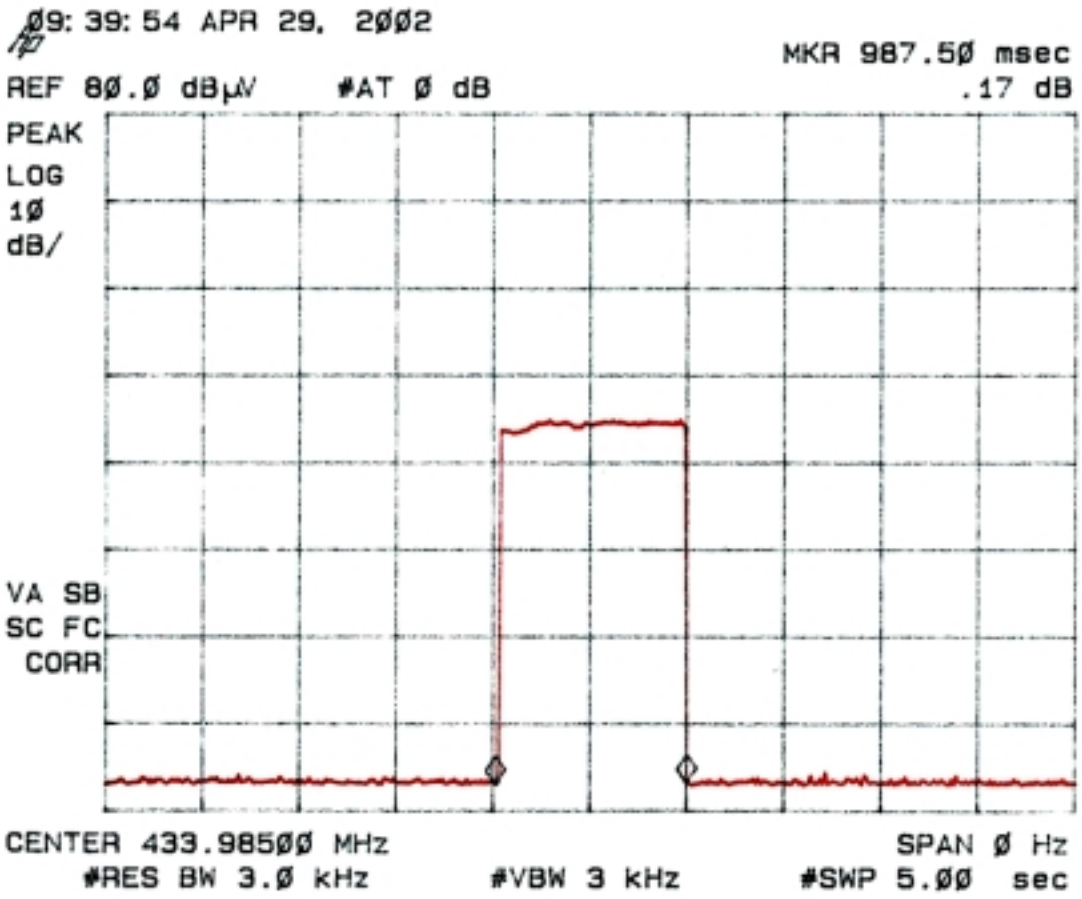
MKR 433.975Ø MHz
REF 8Ø.Ø dBµV
#AT Ø dB
65.66 dBµV
PEAK
LOG
1Ø
dB/
DL
45.6
dBµV
VA SB
SC FC
CORR
CENTER 433.975Ø MHz
SPAN 2ØØ.Ø kHz
#RES BW 1Ø kHz
#VBW 1Ø kHz
#SWP 5ØØ msec

5. DEVIATION TO TEST SPECIFICATIONS

【NONE】

APPENDIX

Graph of Periodic Operated Measurement



『**Remark:** The devices (Radio Frequency Remote Control Thermostat/Transmitter Unit, EUT) operation the duration of each transmission is not greater than one second and the silent period between duration of the transmission but in no case less than 10 seconds, Compliance with §15.231 (e)』