1.0 General Description

1.1 Product Description

The Sentrol Model 4004 Four Button Wireless Key is designed to be used with Sentrol's 4000 Wireless System. The 4004 Wireless Key is provided with an encrypted "anti-cloning code. This "anti-cloning" code will prevent a person from remotely capturing transmissions and then later using them to control or tamper with the system.

The 4004 is provided with a replaceable 3 volt Dracell CR2032 lithium battery. The Model 4004 Wireless Key contains four buttons marked A, B, C and Off. Depending upon the "Key Function Options" selected during the programming of the ZX200/ZX400 control and RF Gateway Receiver, the A, B, and C buttons can function as Arming (Away, Stay, Night), Panic, Aux/Medical and other secondary functions. The Off button will always be a disarm function.

The Model 4004 is a single address device and is programmed as a USER and not as a POINT (zone), therefore you do not lose one or more points(zones) when using the Model 4004 with your system. You can also set the "Authority Level" and "Operate Area" of the USER code which restricts the functions and area of this USER as described in the ZX200/ZX400 Programming Guides

1.2 Related Submittals / Grants

There is a related submittal for this application. A related filing has been made for the receiver associated with this transmitter. The receiver FCC ID is A794720.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. For each scan, the procedure for maximizing emissions described in Section 8.3 of this report were followed. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The North site is located at 4317-A Park Drive in Norcross, Georgia. The site consists of a wooden enclosed structure with a steel ground plane. The site meets the characteristics of ANSI C63.4:1992 and is on file with the FCC. Please reference the site filing number: 3140/SIT 1300F2, dated April 26, 1996. For measurements a remotely controlled flush mount metal top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan from one to four meter height. The site enclosure is constructed of non conductive materials.

1.5 Test Equipment List

The following test equipment was used during testing:

Type	Manufacturer	Model Number	Serial Number
EMI Receiver	Hewlett Packard	8546A	3410A00173
Spectrum Analyzer	Hewlett Packard	HP8595E	3249A00243
Spectrum Analyzer	Hewlett Packard	HP8566	2134A01032
Preamplifier	Compliance Design	P950	EMC-0001
Preamplifier	Compliance Design	P950	EMC-0002
Preamplifier	Compliance Design	P1000	EMI-P10GHz
Preamplifier	Hewlett Packard	HP8447D	2237109
Horn Antenna	EMCO	3115	9208-3919
Horn Antenna	EMCO	3116	9310-2222
Loop Antenna	EMCO	6507	9204-1283
Tuned Dipole Ant.	Compliance Design	Roberts A100	423
Tuned Dipole Ant.	Compliance Design	Roberts A100	727
Biconical Antennas	Compliance Design	B1000	367, 406, 434
Biconical Antennas	Compliance Design	B1000	685, 454, 725
Biconical Antennas	Compliance Design	B1000	525, 536, 511
Antenna Mast	Compliance Design	M100	Mast 01
Antenna Mast	Compliance Design	M100	Mast 02

EXHIBIT 2

SYSTEM TEST CONFIGURATION

2.0 System Test Configuration

2.1 Justification

The transmitter was configured for testing in a typical fashion. During testing, the device was mounted to a cardboard box, which enabled the engineer to maximize emissions through placement in its three orthogonal axes.

The device was powered from one new, fully charged Duracell CR2032 3V battery.

2.2 EUT Exercising Software

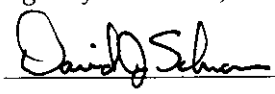
There was no special software to exercise the device. Once activated, the unit transmits the typical signal. For simplicity of testing, the unit was wired to transmit continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

Confirmed by:

David J. Schramm
EMI Technical Supervisor
Intertek Testing Services
Agent for Sentrol, Inc.



Signature

3 September 98

Date

2.4 Equipment Modification

Any modifications installed previous to testing by Sentrol, Inc. will be incorporated in each production model sold/leased in the United States.

No Modifications were installed by Intertek Testing Services

Confirmed by:

David J. Schramm
EMI Technical Supervisor
Intertek Testing Services
Agent for Sentrol, Inc.

David J Schramm _____ Signature

3 September 98 _____ Date

2.5 Support Equipment List and Description

The information for all equipment, plus descriptions of all cables used in the tested system are:

None

Cables:

None

2.6 Test Configuration Block Diagram

Figure 2.6 Configuration of Tested System

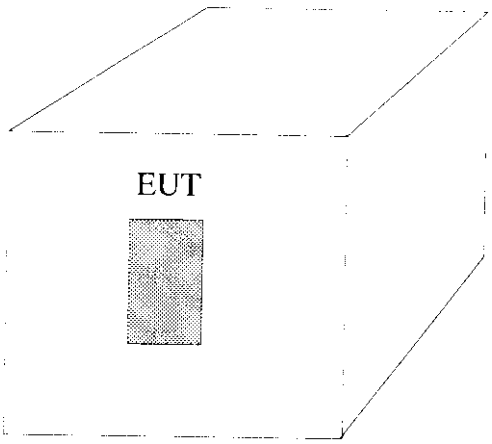


EXHIBIT 3

EMISSION RESULTS

3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF
where FS = Field Strength in dBμV/m
RR = RA - AG in dBμV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
FS = RR + LF
FS = 23 + 9 = 32 dBμV/m

RR = 23.0 dBμV
LF = 9.0 dB

Level in μV/m = Common Antilogarithm [(32 dBμ/V/m)/20] = 39.8 μV/m

3.3 Radiated Emission Test Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 9.0 dB

*Readings under 1GHz are Peak
Readings over 1GHz are Average

Test Personnel: _____

Gregory A. Thompson, Project Engineer

Date: 8-28-98

Radiated Emissions / Interference
Table: 1

Company: Sentrol Moose
Model: 4004

Notes: Initial Results

Date: 08/21/98
Tested by: Greg A. Thompson
Test Distance: 3
Job Number: J98-19047

Standard: FCC Part 15 Spurious Emissions
Class B

Antenna Polarity	Frequency MHz	Amplitude dB(uV)	Antenna Factor dB(1/m)	Pre-amp Cable dB	Average Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB
y	418.000	67.0	16.7	11.0	18.0	54.7	80.3	-25.6
x	836.000	51.3	21.0	8.9	18.0	45.4	60.3	-14.9
x	1254.000	69.7	26.3	26.7	18.0	51.3	60.3	-9.0
x	1672.000	54.6	27.5	26.1	18.0	38.0	54.0	-16.0
x	2090.000	54.5	29.0	25.5	18.0	40.0	60.3	-20.3
x	2508.000	44.5	30.5	25.1	18.0	31.9	60.3	-28.4
x	2926.000	37.7	31.5	24.3	18.0	26.9	60.3	-33.4
y	3344.000	38.8	32.4	23.2	18.0	30.0	60.3	-30.3
y	3762.000	39.2	33.4	22.9	18.0	31.7	54.0	-22.3
x	4180.000	35.4	34.1	22.6	18.0	28.9	54.0	-25.1

Average Factor Based on 12.5ms on time in a period of 100ms

3.4 Line Conducted Configuration Photograph

Worst Case Line Conducted Emissions

Front View

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3.4 Line Conducted Configuration Photograph (cont.)

Worst Case Line Conducted Emissions

Rear View

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3.5 Line Conducted Emission Test Data

Note: Line Conducted Emission testing was not required for this device since it is battery powered and does not connect to the AC Mains.

Test Personnel: _____

Gregory A. Thompson, Project Engineer

Date: 8-28-98

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

4.0 Equipment Photographs

Photographs of the tested EUT are attached.

Photograph 4.1: Overview - Top
Photograph 4.2: Overview - Printed Circuit Board - Bottom
Photograph 4.3: Printed Circuit Board - Top
Photograph 4.4: Inside Cover

TXCC-A1YUS-A PCB ASSEMBLY

DESCRIPTION	QUANTITY	NOTE
XTAL 13.0625MHZ 3X8MM	1	X2
POSITIVE BATTERY CONTACT	1	
LITHIUM BATTERY 3V UL LISTED	1	BAT1
PCB PC1413-3	1	PCB1
CHIP C. 100P 50V 5% 0805 NP0	4	C1 C2 C11 C13
CHIP C. 1000PF +/-10% 50V 0805	6	C3 C20 C21 C28 C29 C30
CHIP C.4700PF 50V+/-10% 0805	1	C27
CHIP C. 0.047UF 10% 25V 0805 X7R	1	C14
CHIP C. 47P 50V 5% 0805 NP0	1	C12
CHIP R. 1K 1/10W TAPE IN REEL	4	R4 R7 R11 R35
CHIP R. 100K 1/10W TAPE IN REEL	5	R5 R8 R13 R16 R21
CHIP R. 150K 1/10W TAPE IN REEL	1	R31
CHIP RESISTOR 2K 1/10W TAPE IN REEL	2	R6 R10
CHIP RES. 2.2K +/-5% 1/10W	1	R3
CHIP R. 22K 1/10W TAPE IN REEL	1	R19
CHIP R.33K 1/10W TAPE IN REEL	1	R37
CHIP RES. 39K +/-5% 1/10W	2	R36 R39
CHIP R. 4.7K 1/10W TAPE IN REEL	2	R33 R34
CHIP R. 47 0.1W 5% REEL TYPE	1	R45
CHIP R.560 1/10W TAPE IN REEL	1	R1
CHIP R.6.8K 1/10W TAPE IN REEL	1	R38
CHIP RE. 8.2K 1/10W TAPE IN BOX	1	R12

CHIP DIODE RLS4148 MLL-34	1	D2
VARI CAP DIODE BB721	1	D3
CHIP LED RED 0805	1	LED1
I.C. MC13176 SOIC-16	1	U5
IC PIC16LC54-04/SO	1	U1
VOLTAGE REGULATOR 2.1V SOT-23	1	U2
VOLTAGE DETECTOR 2.3V SOT-23	1	U4
TRANSISTOR MMBTJ906 SOT-23	3	Q1 Q2 Q3
AIR COIL B09T (35.5NH +/-5%)	2	L1 L2
SMD RESONATOR 1MHZ 0.5%	1	X1

EXHIBIT 8

MISCELLANEOUS INFORMATION

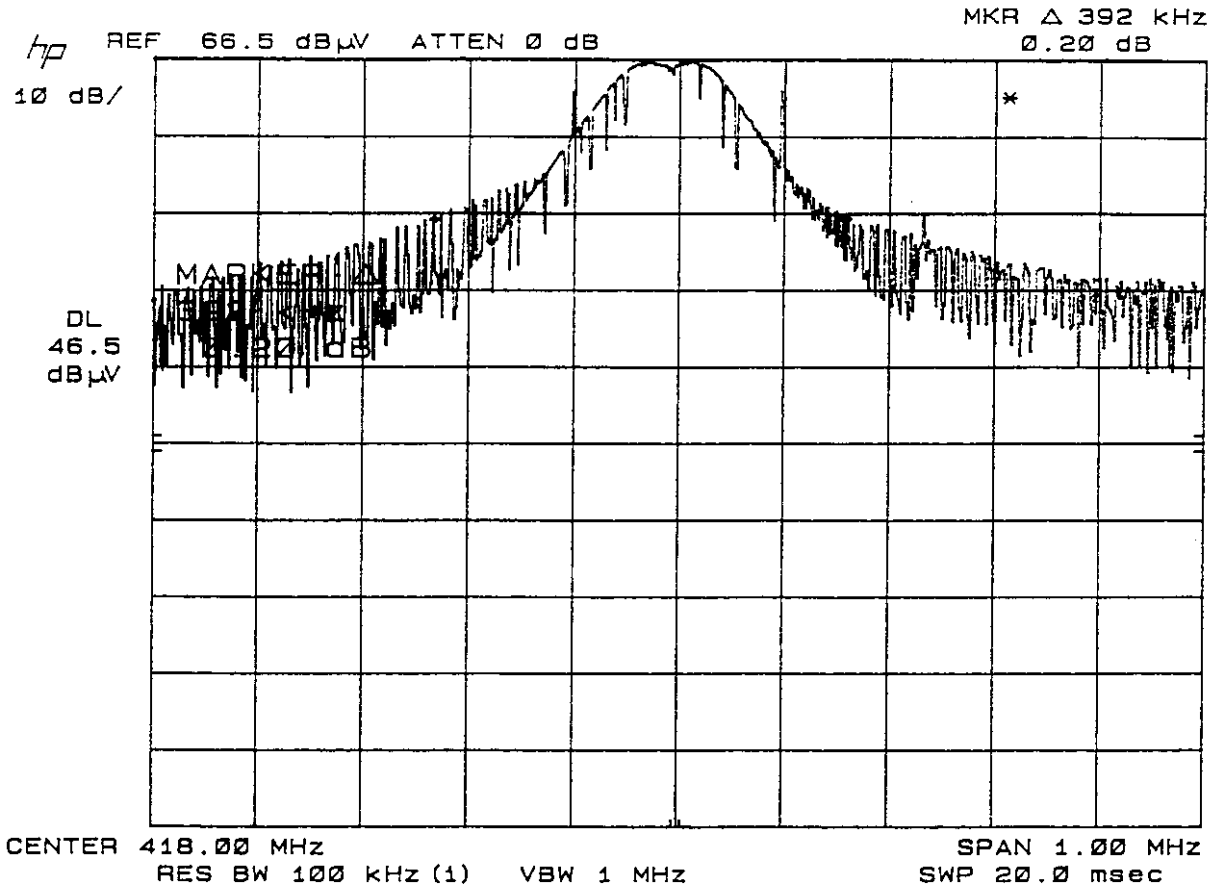
8.0 Miscellaneous Information

This miscellaneous information includes details of the measured bandwidth, the test procedure and calculation of factors such as pulse desensitization and averaging factor.

8.1 Measured Bandwidth

The plot on the following page shows the fundamental emission when modulated with a worst-case bit sequence. From the plot, the bandwidth is observed to be **392 kHz,** at 20 dBc. The bandwidth limit is **1,045 kHz**. The unit meets the FCC Part 15 bandwidth requirements.

Figure 8.1 Bandwidth Plot



8.2 Calculation of Average Factor

Example of Average Factor

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with FCC Part 15 specifies measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

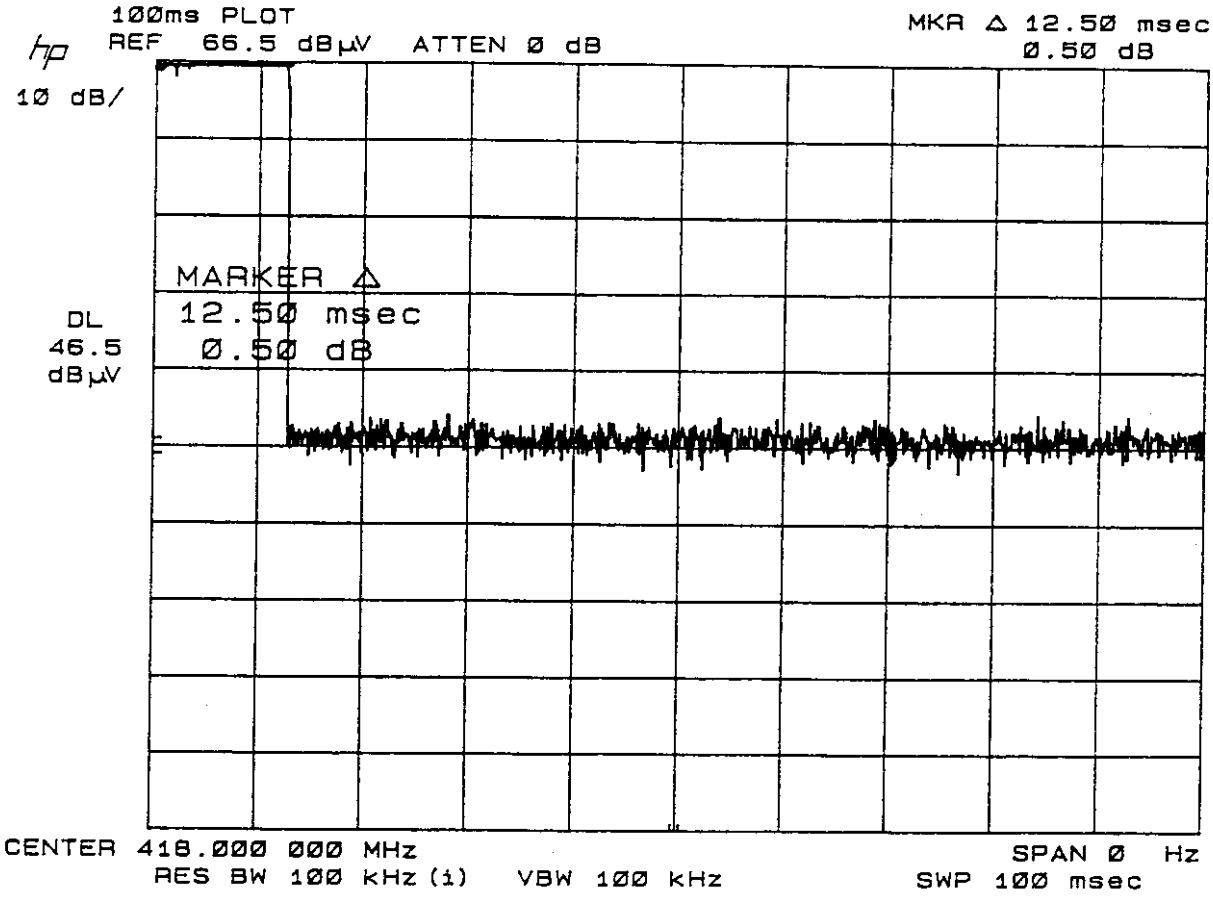
The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero span (receiver mode) and linear mode at maximum bandwidth (3 MHZ at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

During testing, a worst-case duty cycle of 12.5 msec. was observed. A plot of the worst-case duty cycle as observed during testing is included on the following page.

Worst-case "ON" time per 100 msec interval (or repetition cycle) = 12.5 msec (See average plot).

Therefore, the averaging factor is found by 20 $\log_{10}$ (12.5/100) = **-18.0 dB**.

Figure 8.2 Average Plot



8.3 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under FCC Part 15 rules.

The transmitting equipment under test (EUT) is attached to a cardboard box and placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the groundplane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The cardboard box is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode or average mode (see attached data table). If peak measurements are taken for comparison with the average limit, they are corrected by measuring the duty cycle of the equipment under test and subtracting the corresponding average factor in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.2.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 450 KHz to 30 MHZ.

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Measurements were made as described in ANSI C63.4: 1992.

The resolution bandwidth used for measurement of radiated signal strength was 100 KHz or greater below 1000 MHZ. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHZ, a resolution bandwidth of 1 MHZ is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals may be acquired at a distance of one meter or less. All measurements are taken at three meters unless otherwise noted on the data tables.

8.4 Operating Characteristics and Holdover Time

This device is designed for momentary operation and is described in Section 15.231 of the FCC Rules. This device can only be activated manually.

Holdover time after manual activation is 2.46 seconds(see manual plot). §15.231(a)(1)

Periodic supervisory transmissions are not employed by this device.

Figure 8.4a Manual Activation Plot

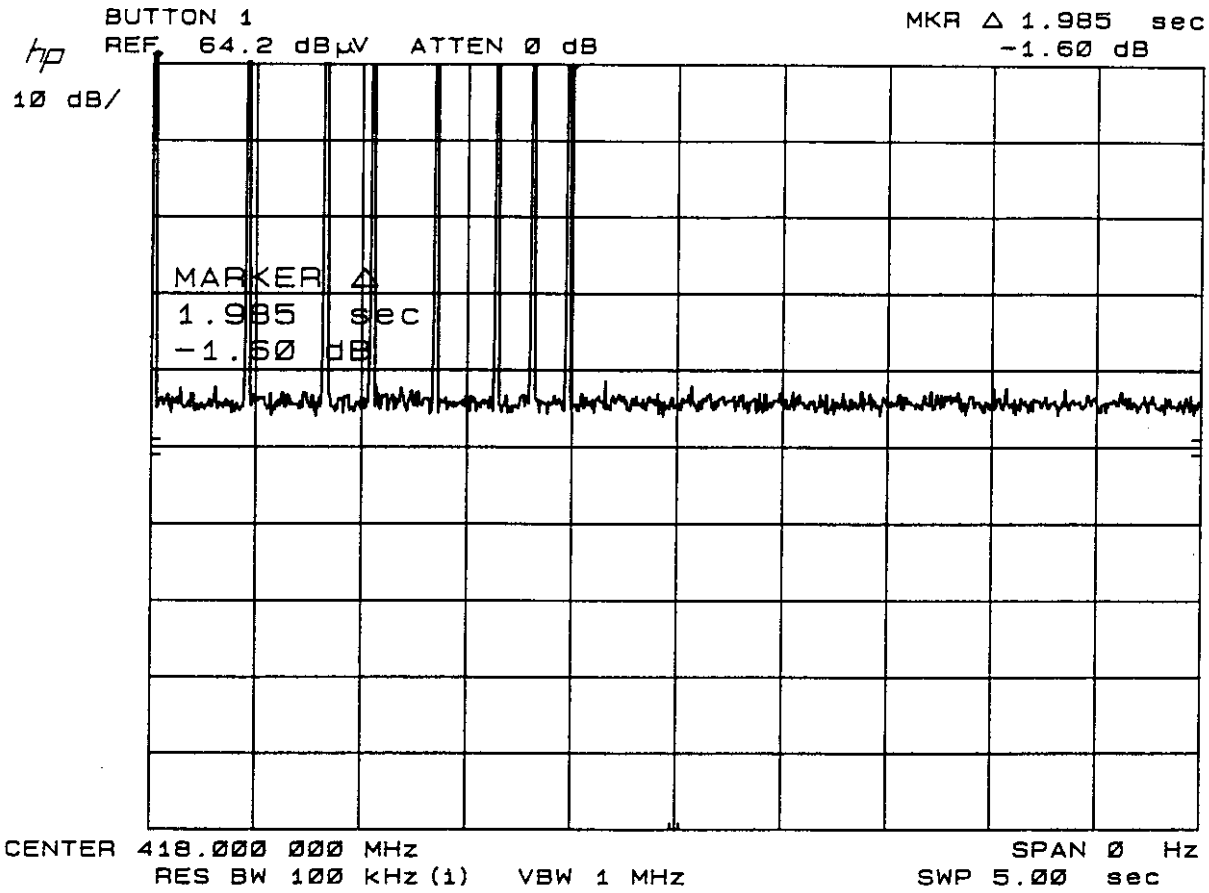


Figure 8.4b Manual Activation Plot

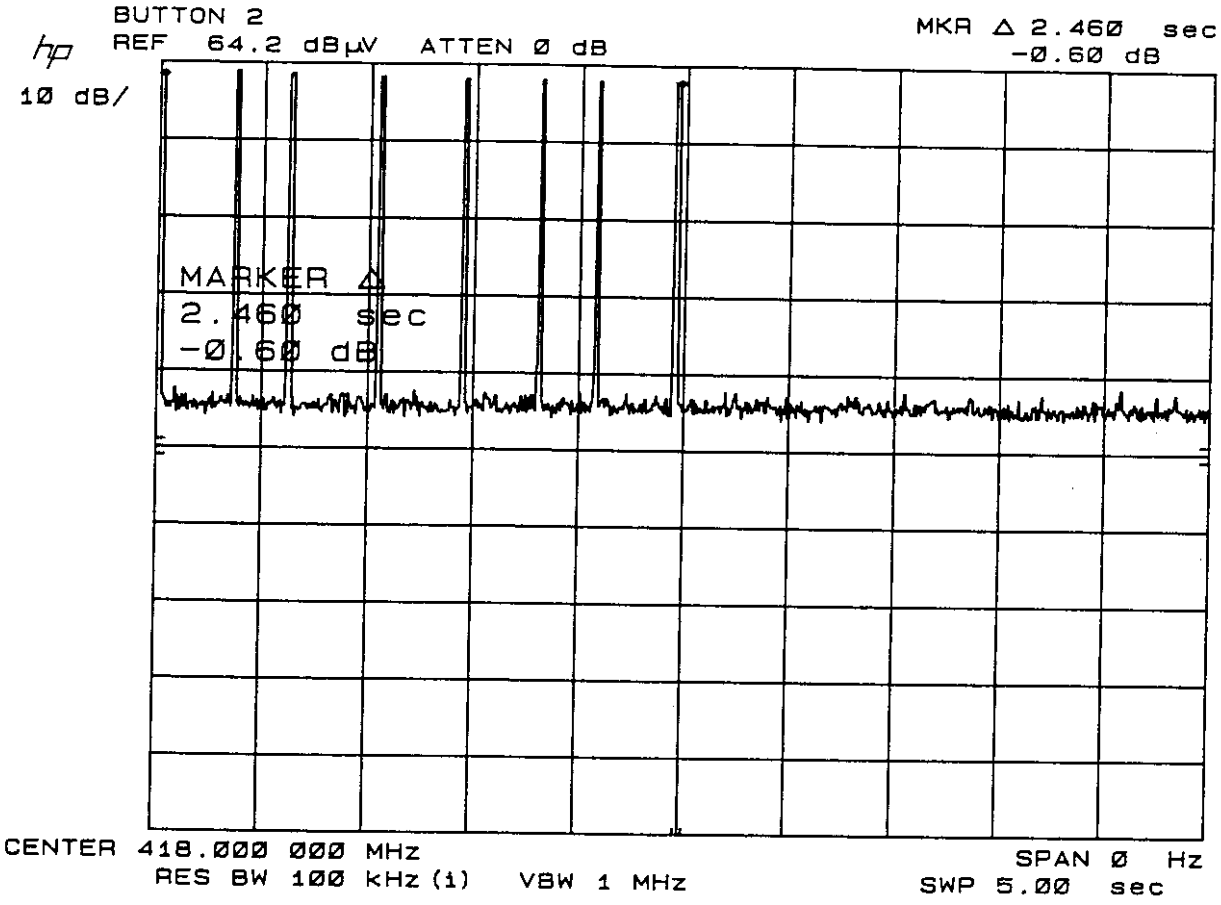


Figure 8.4c Manual Activation Plot