# RadioShack Corporation

Application
For
Permissive Change
**(FCC ID: AAO4300940T)**

418MHz Wireless Caller ID Base Transmitter

WO# 0008404
WL/at
August 11, 2000

- The test results reported in this report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
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FCC ID : AAO4300940T

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# MEASUREMENT/TECHNICAL REPORT

## RadioShack Corporation - MODEL: RadioShack 43-940
## FCC ID: AAO4300940T

## August 11, 2000

This report concerns (check one:) Original Grant____ Class II Change__X___

Equipment Type: Low Power Transmitter (example: computer, printer, modem, etc.)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes___
No_X_

If yes, defer until: _____
date

Company Name agrees to notify the Commission by: _____
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes_____
No_X_

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-1-98 Edition] provision.

Report prepared by:

Wilson Loke
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| Exhibit type | File Description | filename |
|---|---|---|
| Cover Letter | Letter of Agency | letter.pdf |
| Test Report | Test Report | report.doc |
| Cover Letter | Original grant | original.pdf |
| Test Setup Photo | Radiated Emission | radiated1.jpg, radiated2.jpg |
| Test Setup Photo | Conducted Emission | conduct1.jpg to conduct3.jpg |
| Test Report | Conducted Emission Test Result | conduct.pdf |
| Test Report | Bandwidth Plot | bw.pdf |
| External Photo | External Photo | ophoto1.jpg, ophoto2.jpg |
| Internal Photo | Internal Photo | iphoto1.jpg to iphoto3.jpg |
| Block Diagram | Block Diagram | block.pdf |
| Schematics | Circuit Diagram | circuit.pdf |
| ID Label/Location | Label Artwork and Location | label.pdf |
| User Manual | User Manual | manual.pdf |
| Test Report | Average Factor | af.pdf |
| Operation Description | Data Protocol Description | datap.pdf |

# EXHIBIT 1

# GENERAL DESCRIPTION

## 1.0 General Description

### 1.1 Product Description

Model RadioShack 43-940 is a Wireless Caller ID System. It includes Base Transmitter and LCD Display receiver. This is an application for certification of the transmitter. It receives standard Bellcore Type I Caller ID data (FSK) and transmit this signal with carrier frequency of 418MHz to its standalone receiver. The Wireless Caller ID is equipped with RJ11C connectors and the circuit wiring is consistent under the requirement of Part 68.

The original grant is saved with filename: original.pdf

### 1.2 Purpose of Application

The purpose of application is to the increase data length from 0.4 second to 0.5 second for improving performance and the silent period between transmissions is also changed from 12.5 seconds to 15.3 seconds for ensuring the compliance of 15.231(e). These changes are in software of EUT only. No hardware or circuit modification has been made.

1.3 Related Submittal(s) Grants

This is a single application for certification of a transmitter. The FCC ID of the receiver associated with this transmitter is AAO4300940R.

1.4 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. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section"** of this Application.

1.5 Test Facility

The open area test site and conducted measurement facility used to collect the emission data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC.

# EXHIBIT 2

# SYSTEM TEST CONFIGURATION

## 2.0 System Test Configuration

### 2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (1992.)

The EUT was powered from AC/DC Adaptor.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it).

For simplicity of testing, the unit was wired to transmit continuously.

### 2.2 EUT Exercising Software

There was no special software to exercise the device. Once the button is depressed, 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.

2.4 Equipment Modification

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

No modifications were installed by Intertek Testing Services.

2.5 Support Equipment List and Description

This product was tested in a standalone configuration.

All the items listed under section 2.0 of this report are

*Confirmed by:*

*Wilson Loke*
*Manager*
*Intertek Testing Services*
*Agent for RadioShack Corporation*

_____Signature

_August 17, 2000_____Date

# EXHIBIT 3

# EMISSION RESULTS

## 3.0 Emission Results

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

## 3.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

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
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

3.1 Field Strength Calculation (cont'd)

Example

Assume a receiver reading of 62.0 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. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB

AV = -10 dB

FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 dBμV/m

Level in mV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

## 3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission

418.099 MHz

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated1.jpg and radiated2.jpg

3.3 Radiated Emission 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 1.4 dB

***TEST PERSONNEL:***

_____
*Signature*

Yvonne Leung, Engineer
*Typed/Printed Name*

August 11, 2000
*Date*

Company: RadioShack Corporation
Model: RadioShack 43-940

Date of Test: February 25, 2000

Table 1

**Radiated Emissions**

| Polarity | Frequency (MHz) | Reading (dBµV) | Antenna Factor (dB) | Pre-Amp Gain (dB) | Average Factor (-dB) | Net at 3m (dBµV/m) | Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| V | 418.099 | 77.0 | 15.9 | 16 | 6 | 70.9 | 72.3 | -1.4 |
| H | 836.171 | 45.0 | 21.8 | 16 | 6 | 44.8 | 52.3 | -7.5 |
| H | 1254.269 | 57.7 | 25.5 | 34 | 6 | 43.2 | 52.3 | -9.1 |
| H | *1672.362 | 57.1 | 26.5 | 34 | 6 | 43.6 | 52.3 | -8.7 |
| H | 2090.476 | 56.4 | 29.1 | 34 | 6 | 45.5 | 52.3 | -6.8 |
| H | 2508.543 | 43.8 | 29.1 | 34 | 6 | 32.9 | 52.3 | -19.4 |
| H | 2926.642 | 42.8 | 29.1 | 34 | 6 | 31.9 | 52.3 | -20.4 |

Notes:

1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3 meter distance were measured at 0.3 meter and an inverse proportional extrapolation was performed to compare the signal level to the 3 meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3 meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna and average detector are used for the emission over 1000MHz.

*Emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: Yvonne Leung

## 3.4 Line Conducted Configuration Photograph

Worst Case Line-Conducted Configuration

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conduct1.jpg to conduct3.jpg

Company: RadioShack Corporation
Model: RadioShack 43-940

Date of Test: February 25, 2000

**Conducted Emissions**
**Section 15.107 Requirements**

For electronic filing, the conducted emission test result is saved with filename: conduct.pdf

3.5 Line Conducted Emission 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 more than 20 dB

***TEST PERSONNEL:***

_____
*Signature*

Yvonne Leung, Engineer
*Typed/Printed Name*

August 11, 2000
*Date*

# EXHIBIT 4

# EQUIPMENT PHOTOGRAPHS

## 4.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: ophoto1.jpg to ophoto2.jpg and iphoto1.jpg to iphoto3.jpg

# EXHIBIT 5

# PRODUCT LABELLING

## 5.0 Product Labelling

For electronic filing, the FCC ID label artwork and the label location are saved with filename: label.pdf

# EXHIBIT 6

# TECHNICAL SPECIFICATIONS

## 6.0 Technical Specifications

For electronic filing, the block diagram and schematics are saved with filename: block.pdf and circuit.pdf respectively.

# EXHIBIT 7

# INSTRUCTION MANUAL

## 7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf

This manual will be provided to the end-user with each unit sold/leased in the United States.

Please note that the required FCC Information to the User can be found on Page 7 and Page 18 of this manual.

# 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 saved in bw.pdf shows the fundamental emission when modulated. From the plot, the bandwidth is observed to be 61kHz, at 20 dBc. The bandwidth limit is 1045kHz. The unit meets the FCC bandwidth requirements.

Figure 8.1 Bandwidth

## 8.2 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

Pulse desensitivity was not applicable for this device. The effective period ($T_{eff}$) was approximately 0.63ms for a digital "1" bit, as shown in the plots of Exhibit 8.3. With a resolution bandwidth (3 dB) of 100 kHz, the pulse desensitivity factor was 0 dB.

## 8.3 Calculation of Average Factor

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with the FCC rules specify 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 scan (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.

A plot of the worst-case duty cycle as detected in this manner and the description of data protocol are saved with filename: af.pdf and datap.pdf

Duty Cycle = 0.5 or 50%

Therefore, the averaging factor is found by $20 \log_{10} 0.5 = -6$dB

## 8.4 Emissions Test Procedures

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

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 1992.

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 ground plane. 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 axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

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.

8.4 Emissions Test Procedures (cont'd)

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.

Conducted measurements are made as described in ANSI C63.4 - 1992.

The IF 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. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). 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 are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.