

MEASUREMENT/TECHNICAL REPORT

Current Works, Inc. Model SideKeys

FCC ID: LYN20TX

APPLICATION FOR CERTIFICATION

**RF Emission Measurements Performed For Determination of
Compliance with the US Code of Federal Regulations**

Title 47, Chapter I, FCC Part 15 Subpart B

As Required for Certification for Intentional Radiators

Radiometrics Midwest Corporation Test Document RP-3806A

Issue Date: August 14, 1998

This report concerns: Original grant

Equipment type: Transmitter

Transition Rules per 15.37 are not requested.

Tests Performed For

Current Works, Inc.
1000 N. Rand Rd, Bldg 115
Wauconda, Illinois 60084

Test Facility

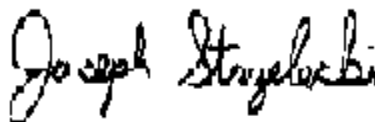
Radiometrics Midwest Corporation
12 East Devonwood
Romeoville, IL 60446
Phone: (815) 293-0772
FAX: (815) 293-0820
radiomet@ix.netcom.com

Test Report Written By



Charles Grimes
EMC Engineer

Test Report Approved By



Joseph Strzelecki
Senior EMC Engineer
NARTE EMC-000877-NE

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1.0 General Information

1.1 Product Description

The Model SideKeys (referred to as the EUT in this report) is a 418 MHz transmitter. The EUT is manufactured by Current Works, Inc.

The EUT is a wireless transmitter of nine keys. The handheld keypad sends an RF signal to a matched receiver connected to the CPU of a personal computer. The receiver is connected to the computer between the computer's normal keyboard and its CPU. The computer's normal keyboard and mouse remain connected, active, and usable. There may be several remote SideKeys keypads matched to the same receiver, allowing several users to access one computer

Each of the SideKeys transmitting keypads has nine individual switches. When a switch is pressed, the transmitter sends a fixed Wireless 418 MHz Modulated Radio Frequency signal to the matching receiver. This fixed signal indicates which transmitter is being used and on which one the individual switches was pressed. The signals sent are a finite number of predetermined codes, as in a remote control security device. These codes are sent one at time for a single, predetermined meaning, not strung together in different orders to get different meanings. They do not send data to the receiver. The receiver converts this fixed signal into the prescribed scan code signal and sends it on to the computer's CPU to enter the desired keystroke. The SideKeys transmitting keypads are matched to the receiver and the individual keys are defined in the receiver by following the three simple steps described on the receiver.

1.2 Related Submittals

The associated receiver is operated under Part 15 Subpart B. It is subject to the FCC requirements pursuant to the Certification equipment authorization under Part 15 Subpart C, and is being submitted as FCC ID: LYN48RX.

1.4 Tested System Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system which have grants, are:

Model Number Serial Number	FCC ID	Manufacturer & Description	Cable Descriptions
M/N: SideKeys (EUT) S/N:	LYN20TX	Current Works, Inc. 418 MHz transmitter	none

1.5 Test Methodology

The test procedures used are in accordance with the ANSI document C63.4-1992, (July 17, 1992) "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

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1.6 Test Facility

The open area test site used to collect the radiated data is located on 8625 Helmar Road in Newark, Illinois. The open field test site has a metal ground screen. Details of the site characteristics are on file with the FCC. Conducted emission measurements were not performed on the EUT, as it was battery powered. Preliminary radiated emission scans were performed in shielded enclosure "B" at Radiometrics' Romeoville, Illinois EMI test lab. These sites have been fully described in a report and accepted by the FCC in a letter dated October 1, 1996 (31040/SIT 1300F2).

1.7 Test Equipment

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. Below 1 GHz, when a radiated emission is detected approaching the specification limit, the measurement of the emission is repeated using a tuned dipole antenna with a Roberts Balun.

The radiated emission measurements were performed with a spectrum analyzer. The bandwidths of the spectrum analyzers are adjusted to the correct bandwidths as specified by the FCC Rules. The bandwidth used from 450 kHz to 30 MHz is 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz a 1 MHz bandwidth is used. In order to increase the sensitivity of the spectrum analyzer, a preamplifier was used. The preamplifiers used had sufficient dynamic range that ensured that an overload condition was not present during the tests.

2.0 System Test Configuration

2.1 Test System and Justification

It is not possible to connect any external wiring to the EUT.

2.2 EUT Test Configuration

The EUT was tested as a stand alone device. The button was taped down for continuous operation for testing.

2.3 Special Accessories

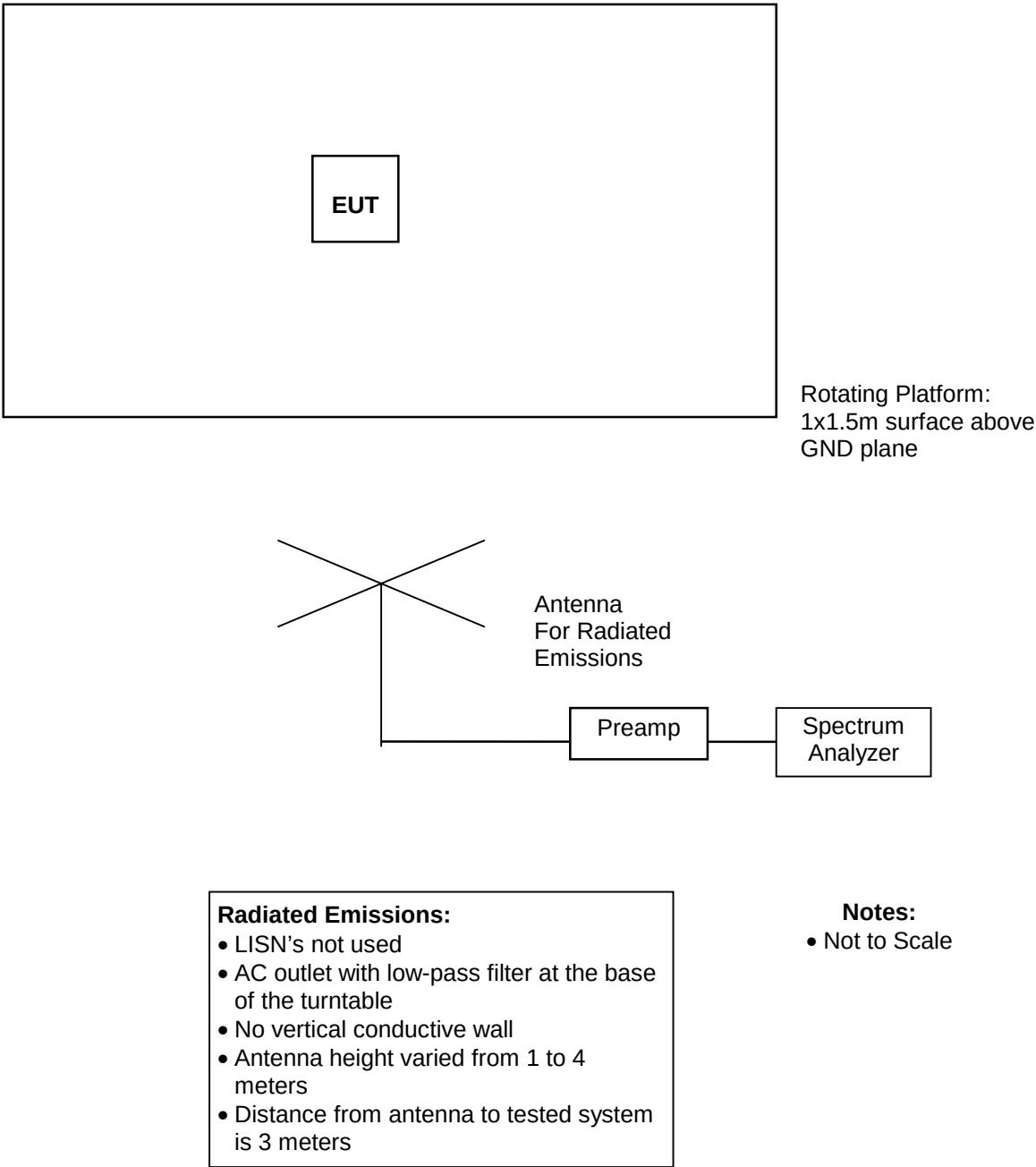
No special accessories were used during the tests in order to achieve compliance.

2.4 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

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Figure 2.1 Configuration of Tested System



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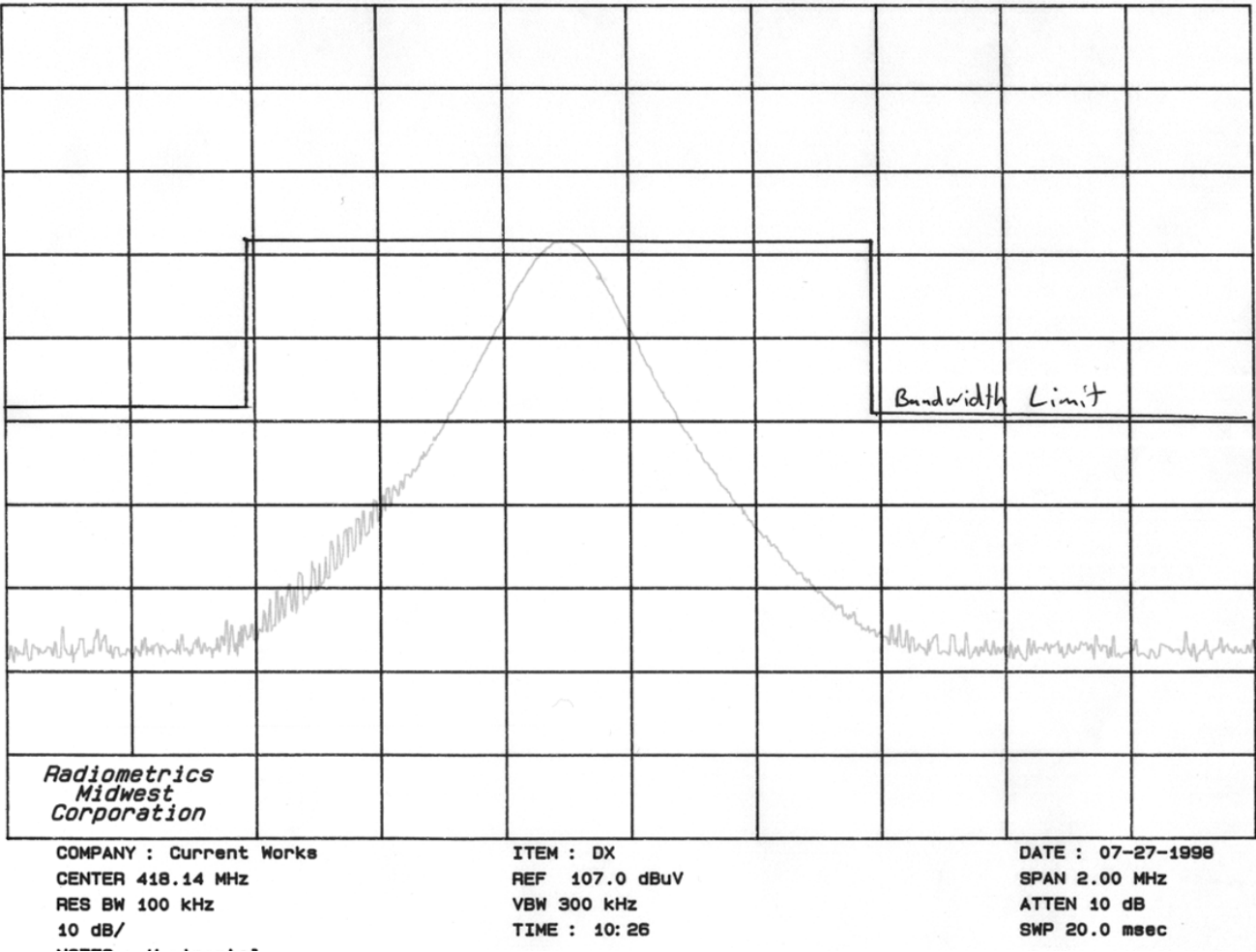
3.0 Occupied Bandwidth Data

The occupied bandwidth of the RF output was measured using an HP8566A spectrum analyzer. The bandwidth was measured using the peak detector function and a narrow resolution bandwidth.

A broadband antenna was used to receive the modulated signal. The spectrum analyzer was set to the "MAX HOLD" mode to record the worst case of the modulation. The spectrum analyzer display was digitized and plotted. A limit was drawn on the plots based on the level of the modulated carrier. The plots of the occupied bandwidth for the EUT are supplied on the following page.

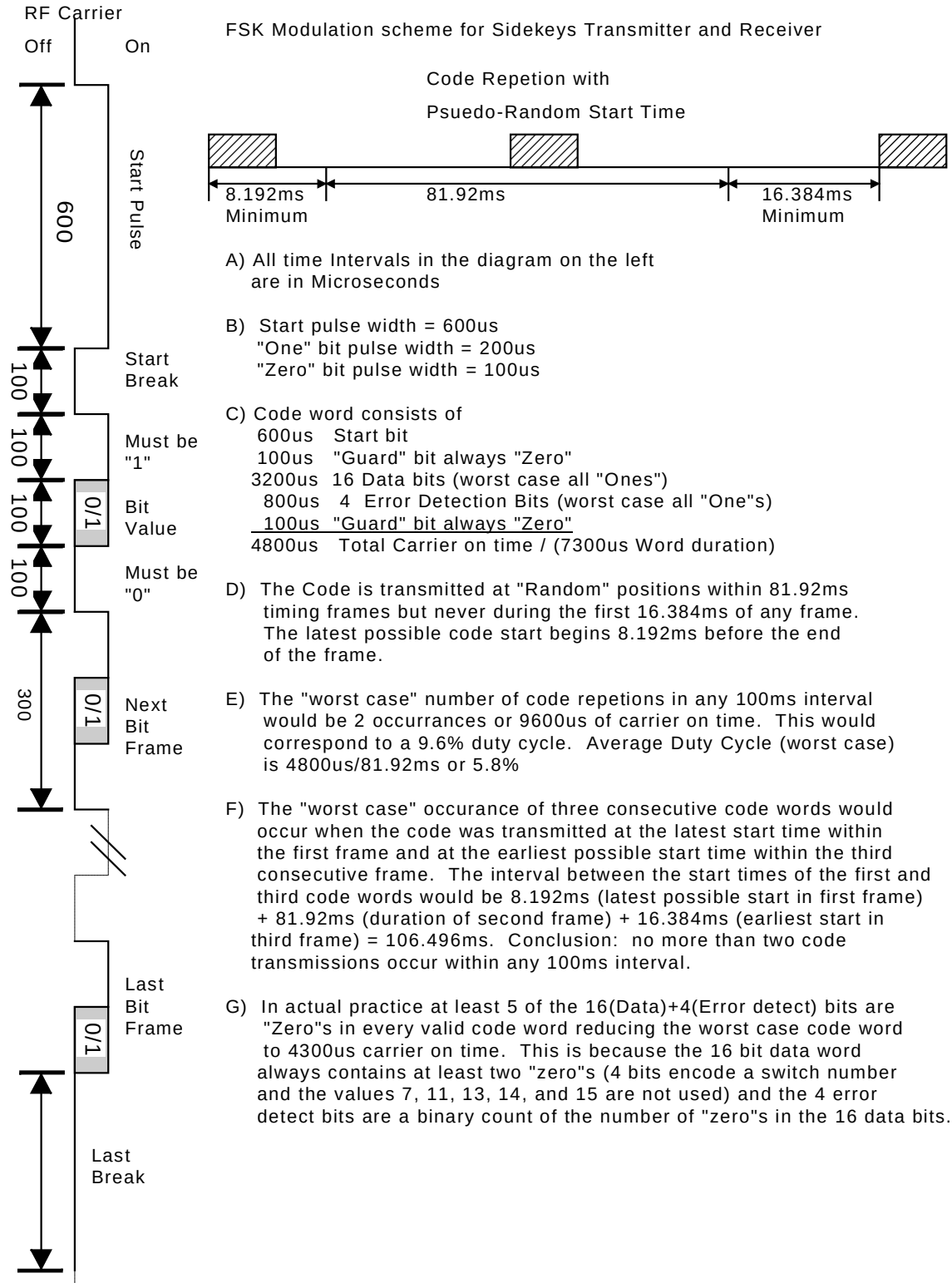
The bandwidth limit is 0.25% of the operating frequency or 1.045 MHz.

Figure 3.1 Occupied Bandwidth Plot



4.0 Peak to Average Calculations

As required by section 15.35, the Peak to Average correction factor was calculated with the data supplied by the EUT designer.



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5.0 Radiated Emissions Data

The following table lists the highest measured emission frequencies, and measured levels and the Class B limit. A sample calculation is given in paragraph 5.1.

Model : SideKeys
 Test Date : July 27, 1998
 Test Distance : 3 Meters
 Antennas Used : Biconical (30-200 MHz): Log-Periodic (200-1000 MHz)
 : Horn (1000-5000 MHz)
 Notes : A 30 dB preamp and low-loss coax cable was used above 1000 MHz.
 : No preamp below 1000 MHz
 : Peak to Average Factor = 20 dB

Correction Factor = cable loss - preamp - Peak to Average Factor

Freq. MHz	Analyzer Reading dBuV*	Antenna Factor dB	Antenna Polarity/ Type	Correction Factors dB	Field Strength of Signal dBuV/m	Limit Field Strength dBuV/m	Margin Under Limit dB
418.0	75.0	16.8	V/LP	-15.2	-76.6	80.3	3.7
836.0	32.2	22.4	V/LP	-11.7	-42.9	60.3	17.4
1254.0	58.8	25.4	H/LP	-48.2	-36.0	60.3	24.3
1672.0	38.9	26.9	V/LP	-48.0	-17.8	54.0	36.2
418.0	75.2	16.8	V/LP	-15.2	-76.8	80.3	3.5
836.0	32.2	22.4	V/LP	-11.7	-42.9	60.3	17.4
1254.0	56.6	25.4	H/LP	-48.2	-33.8	60.3	26.5
1672.0	40.4	26.9	V/LP	-48.0	-19.3	54.0	34.7

* Peak Detector function

Judgment: Passed by 3.5 dB

No Emissions were detected from 2000 to 5000 MHz within 15 dB of the limits.

Test Personnel: Charles Grimes
EMC Engineer

The peak detector function did not exceed the limits by more than 16.5 dB.

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5.1 Field Strength Calculation

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

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

Assume a receiver reading of 49.5 dBuV is obtained. The Antenna Factor of 8.1 and a Cable Factor of 1.7 is added. The Amplifier Gain of 23.3 dB is subtracted, giving a field strength of 36 dBuV/m. The 36 dBuV/m can be mathematically converted to its corresponding level in uV/m.

$$FS = 49.5 + 8.1 + 1.7 - 23.3 = 36.0 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm} [(36 \text{ dBuV/m})/20] = 63.1 \text{ uV/m}$$