SMITH ELECTRONICS, INC.
ELECTROMAGNETIC COMPATIBILITY LABORATORIES

RADIO-FREQUENCY EMISSIONS TEST REPORT

FOR

CLEVELAND MEDICAL DEVICES, INC.

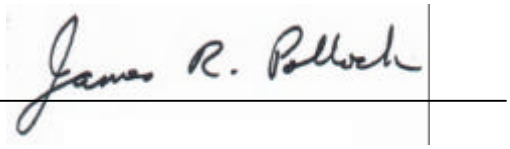
Base Model #502-0051
also known as:

RatPaak
Crystal Monitor Jr.
BioRadio Jr.
Cardiac Patch

FCC ID: N9Y0051

April 23, 2004
Revised October 12, 2004

Prepared by:



Prepared for:

Cleveland Medical Devices, Inc.
4415 Euclid Ave., 4th Floor
Cleveland, OH 44103

Smith Electronics, Inc.
8200 Snowville Road
Brecksville, OH 44141
Phone: (440) 526-4386
Fax: (440) 526-9205

TABLE OF CONTENTS

CERTIFICATE OF COMPLIANCE

1.	Manufacturer:	Cleveland Medical Devices, Inc. 4415 Euclid Ave., 4th Floor Cleveland, OH 44103
2.	Contact:	Hani Kayyali Cleveland Medical Devices, Inc. 216/791-6720
3.	Regulation:	CFR47 – Part 15 15.249
4.	Measurement Method:	ANSI C63.4-1992
5.	EUT:	Base Model #502-0051, Transmitter aka RatPaak, Crystal Monitor Jr., BioRadio Jr., Cardiac Patch FCC ID: N9Y0051
6.	Type:	Biomedical Transmitter
7.	Tuned Frequency	905.1648 MHz – 924.7488 MHz
8.	Test Dates:	April 12, 20 & 21, 2004
9.	Test Location	Smith Electronics, Inc. Test Lab and Open Field Site 8200 Snowville Rd. Brecksville, OH

10. Statement of Compliance:

I hereby certify that measurements of radio frequency emissions from the Cleveland Medical Devices Base Model #502-0051 transmitter were performed by me on April 12, 20 & 21, 2004, and that the results of the measurements confirmed that the units tested are capable of compliance with the above regulation.

April 23. 2004
Date

James R. Pollock, President
Smith Electronics, Inc.

RADIO FREQUENCY EMISSION MEASUREMENTS

OBJECTIVE:

The transmitter emissions were measured in order to show that the emissions from the transmitter were within the requirements of FCC Part 15.249 for equipment of this type.

SUMMARY

The Cleveland Medical Devices, Base Model #502-0051 transmitter has been shown to be capable of complying with those requirements of the Federal Communications Commission for a certified intentional radiator under Part 15.249.

The measured value closest to the appropriate limit was found at the 2nd harmonic of the highest frequency tested. The margin was 1.8 dB below the limit as seen in Table 3.

The transmitter has also been examined as a digital device, and, as no emissions other than the transmitted signal were observed, the device does meet the requirements of a Class A digital device under 15.107 and 15.109.

TEST INFORMATION

EQUIPMENT UNDER TEST	Base Model #502-0051 Transmitter, aka RatPaak, Crystal Monitor Jr., BioRadio, Jr. and Cardiac Patch
MANUFACTURER	Cleveland Medical Devices, Inc. 4415 Euclid Ave., 4th Floor Cleveland, OH 44103
TEST DATES	April 12, 20 & 21, 2004
TEST LABORATORY	Smith Electronics, Inc. 8200 Snowville Rd. Brecksville, OH 44141 (440)526-4386
MEASUREMENT EQUIPMENT	Hewlett-Packard Spectrum Analyzer 8568B with: 85650A RF Section S/N 2216A02120 85662A Display Section S/N 2152A03686 85650A Quasi-Peak Adaptor S/N 2043A00350 Calibrated 6/03 Hewlett Packard Spectrum Analyzer Model 8593EM S/N 3536A00147 Calibrated ¼
ANTENNAS	EMCO Biconical Model 3104 Frequency Range 20 – 200 MHz EMCO Log-Periodic Model 3146 Frequency Range 200 – 1000 MHz Stoddart Tuned Dipole Model 91598-2 Frequency Range 400 – 1000 MHz EMCO Double Ridged Guide Horn Model 3115 Frequency Range 1 – 18 GHz
MISCELLANEOUS	Hewlett-Packard Preamplifier Model 8447D S/N 1937A03103 12.2 m RG-214/U coaxial cable 0.6 m RG-214/U coaxial cable

TEST REPORT

INTRODUCTION

The Base Model #502-0051 transmitter, manufactured by Cleveland Medical Devices, (CMD) is part of a system specifically designed for the transmissions of data from external sensors. The subject data is frequency modulated onto the transmitted signal, picked up by the companion receiver and transferred to the receiver's host computer for later analysis.

The Base Model #502-0051, is an intentional radiator under Part 15.249. Its transmission frequency can be factory programmed in 256 steps between 905.1648 MHz and 924.7488 MHz. This report indicates that the emissions of the transmitter are within the limits set by 15.249.

The Base Model #502-0051 is also a digital device that, although it would appear to be exempt as a medical device under 15.103(e), has been examined to verify compliance to 15.109 as a Class A digital device.

RADIATED EMISSIONS

Field strength measurements were performed on three samples of the transmitter to assure that the radiated emissions were capable of compliance with the requirements of 15.249.

Measurement of the fundamental frequency was performed on the Smith Electronics, Inc., 3 meter open field test site located at 8200 Snowville Road, Brecksville, OH using the procedures of ANSI C63.4-1992. Site attenuation data pertinent to this site is on file with the FCC. A tuned dipole antenna was used with a spectrum analyzer using peak detection.

The harmonic frequencies were measured in an area of the facility free of reflecting surfaces at a test distance of either 1 meter or 0.5 meters. A double ridged wave guide antenna and a spectrum analyzer with average detection was used for these measurements.

Measurements were made on the transmitter with with the input plug terminals shorted.

Measurements were made at three frequencies; one at the low end of the tuning range, one at the high end and one in the middle of the range. Tests on the transmitter were performed with the transmitter in three orthogonal orientations. Results of the measurements are found in Tables 1 through 3.

Each of the three tables contains the measured data from one of the test frequencies. To save space in the tables, fundamental frequency was rounded to the nearest MHz and the indicated harmonics are the multiples of the rounded value. Table 4 lists each of the actual test frequencies and the nominal frequency used to designate that frequency.

CONCLUSIONS

Based upon the measurements made and reported herein, the Cleveland Medical Devices, Inc. modified Base Model #502-0051 transmitter is found to be capable of complying with the requirements of Part 15.249 of the FCC Rules and Regulations when operated in a manner consistent with its intended use and purpose.

METHOD OF CALCULATION

Signal strength readings were made in units of dBuV from the spectrum analyzer. To these values an antenna factor in dB and a coax loss factor in dB were added to arrive at a field strength in dBuV/m at the measurement distance. This value is converted to field strength in uV/m and compared to the limit corrected for distance. An inverse distance correction factor was used to convert limit values from one distance to another.

SAMPLE CALCULATION

From Table 1 at 1810 MHz, a measured value of 31.8 dBuV is added to the antenna factor (27.3 dB) and coax factor (0.4 dB) to arrive at a field strength of 59.5 dBuV/m.

$$31.8 + 27.3 + 0.4 = 59.5 \text{ dBuV/m}$$

To convert dBuV/m to uV/m use the following equation:

$$\text{uV/m} = 10^{(59.5/20)} = 944 \text{ uV/m at 1 meter}$$

As the test limit at this frequency is 500 uV/m at 3 meters, the field strength could be divided by three to adjust for the distance. Conversely, the limit can be multiplied by three for the adjustment. For the purposes of this report, the limit values have been multiplied to account for the different distances. For the 1 meter measurement distance, the limit was multiplied by three. For the 0.5 meter distance, the limit was multiplied by six to adjust to the equivalent 3 meter distance.

TABLE 1

FUNDAMENTAL AND SPURIOUS EMISSIONS
BASE MODEL #502-0051 TRANSMITTER
TUNED TO 905.1648 MHz

Nom. Freq. (MHz)*	Value (dBuV) @ Dist.	AF (dB)	CL (dB)	Field Strength (dBuV/m)	Field Strength (uV/m)	Limit (uV/m)	dB / Limit
905	54.8 @3m	29.1	1.7	85.6	19,055	50,000	-8.4
1810	31.8 @1m	27.3	0.4	59.5	944	1,500	-4.0
2715	20.7 @1m	30.0	0.6	51.3	367	1,500	-12.2
3620	≤20.4 @1m	32.4	0.7	53.5	473	1,500	-10.0
4525	≤20.0 @1m	32.8	0.8	53.6	479	1,500	-9.9
5430	≤19.8 @1m	35.9	0.9	56.6	676	1,500	-6.9
6335	≤19.8 @1m	35.6	1.0	56.4	661	1,500	-7.1
7240	≤27.9 @0.5m	37.1	1.1	66.1	2,018	3,000	-3.4
8145	≤28.0 @0.5m	37.9	1.2	67.1	2,664	3,000	-2.4
9050	≤27.3 @0.5m	38.1	1.3	66.7	2,163	3,000	-2.8

* = Nominal Frequency: For actual frequency see Table 4.
AF = Antenna Factor
CL = Coax Loss Factor

Frequencies below 1 MHz were made with a peak detector with a 120 kHz bandwidth. Above 1000 MHz, average detection was used with a 1 MHz resolution bandwidth.and a 10 kHz video bandwidth to reduce the instrument noise level. The reduced video bandwidth has no effect on the FM signal other than to reduce the noise.

TABLE 2

FUNDAMENTAL AND SPURIOUS EMISSIONS
BASE MODEL #502-0051 TRANSMITTER
TUNED TO 915.9168 MHz

Nom. Freq. (MHz)*	Value (dBuV) @ Dist.	AF (dB)	CL (dB)	Field Strength (dBuV/m)	Field Strength (uV/m)	Limit (uV/m)	dB / Limit
916	52.8 @3m	29.1	1.7	83.6	15,136	50,000	-10.4
1832	26.6 @1m	27.4	0.4	54.4	525	1,500	-9.1
2748	25.1 @1m	30.1	0.6	55.8	617	1,500	-7.7
3664	≤20.3 @1m	32.5	0.7	53.5	473	1,500	-10.0
4580	≤20.6 @1m	33.0	0.8	54.4	525	1,500	-9.1
5496	≥19.5 @1m	36.1	0.9	56.5	668	1,500	-7.0
6412	≤19.8 @1m	35.5	1.0	56.3	653	1,500	-7.2
7328	≤28.6 @0.5m	37.2	1.1	66.9	2,213	3,000	-2.6
8244	≤28.1 @0.5m	37.9	1.2	67.2	2,291	3,000	-2.3
9160	≤27.1 @0.5m	38.1	1.3	66.5	2,113	3,000	-3.0

* = Nominal Frequency: For actual frequency see Table 4.
AF = Antenna Factor
CL = Coax Loss Factor

Frequencies below 1 MHz were made with a peak detector with a 120 kHz bandwidth. Above 1000 MHz, average detection was used with a 1 MHz resolution bandwidth.and a 10 kHz video bandwidth to reduce the instrument noise level. The reduced video bandwidth has no effect on the FM signal other than to reduce the noise.

TABLE 3

FUNDAMENTAL AND SPURIOUS EMISSIONS
BASE MODEL #502-0051 TRANSMITTER
TUNED TO 923.5968 MHz

Nom. Freq. (MHz)*	Value (dBuV) @ Dist.	AF (dB)	CL (dB)	Field Strength (dBuV/m)	Field Strength (uV/m)	Limit (uV/m)	dB / Limit
924	52.5 @3m	29.1	1.7	83.3	14,622	50,000	-10.7
1848	33.8 @1m	27.5	0.4	61.7	1,216	1,500	-1.8
2772	≤19.8 @1m	30.2	0.6	50.6	339	1,500	-12.9
3696	≤20.0 @1m	32.5	0.7	53.2	457	1,500	-10.3
4620	≤20.6 @1m	33.1	0.8	54.5	531	1,500	-9.0
5544	≥19.7 @1m	36.1	0.9	56.7	684	1,500	-6.8
6468	≤19.8 @1m	35.5	1.0	56.3	653	1,500	-7.2
7392	≤28.2 @0.5m	37.3	1.1	66.7	2,163	3,000	-2.8
8316	≤28.3 @0.5m	38.0	1.2	67.5	2,371	3,000	-2.0
9240	≤27.0 @0.5m	38.1	1.3	66.4	2,089	3,000	-3.1

* = Nominal Frequency: For actual frequency see Table 4.
AF = Antenna Factor
CL = Coax Loss Factor

Frequencies below 1 MHz were made with a peak detector with a 120 kHz bandwidth. Above 1000 MHz, average detection was used with a 1 MHz resolution bandwidth.and a 10 kHz video bandwidth to reduce the instrument noise level. The reduced video bandwidth has no effect on the FM signal other than to reduce the noise.

TABLE 4

NOMINAL FREQUENCY vs. ACTUAL FREQUENCY

LOW RANGE

NOMINAL	ACTUAL
905	905.1648
1810	1810.3296
2715	2715.4944
3620	3620.6592
4525	4525.8240
5430	5430.9888
6335	6336.1536
7240	7241.3184
8145	8146.4832
9050	9051.6480

MID RANGE

916	915.9168
1832	1831.8336
2748	2747.7504
3664	3663.6672
4580	4579.5840
5496	5495.5008
6412	6411.4176
7328	7327.3344
8244	8243.2512
9160	9159.1680

HIGH RANGE

924	923.5968
1848	1847.1936
2772	2770.7904
3696	3694.3872
4620	4617.9840
5544	5541.5808
6468	6465.1776
7392	7388.7744
8316	8312.3712
9240	9235.9680

EUT Close Up

1 Meter Measurements

PICTORIAL 1
Base Model 502-0051
Transmitter
Worst Case Test Setup