Engineering and Testing for EMC and Safety Compliance

CLASS II PERMISSIVE CHANGE
FCC PART 90 & INDUSTRY CANADA RSS-119

Test Lab:		Applicant:	
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FCC ID:	ATH2425110	**GRANTEE FRN NUMBER:**	0004-2015-21
PLATFORM:	N/A	**RTL WORK ORDER NUMBER:**	2002213
MODEL(S):	242-5110 / 242-5111	**RTL QUOTE NUMBER:**	QRTL02-655
DATE OF TEST REPORT:	January 9, 2003		

American National Standard Institute:	ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1
FCC Classification:	TBF – Licensed Broadcast Transmitter Held to Face
FCC Rule Part(s):	Part 90: Private Land Mobile Radio Services
Industry Canada Standard:	RSS-119: Land Mobile and Fixed Radio Transmitters and Receivers, 27.41MHz to 960MHz
Digital Interface Information	Digital Interface was found to be compliant
Receiver Information	Receiver was found to be compliant

Frequency Range (MHz)	Power (W)	Frequency Tolerance	Emission Designator
136-174	5.8	2.5 ppm	11K0F3E
136-174	5.8	2.5 ppm	16K0F3E
136-174	1.2	2.5 ppm	11K0F3E
136-174	1.2	2.5 ppm	16K0F3E
136-174	5.8	2.5 ppm	8K10F1E
136-174	1.2	2.5 ppm	8K10F1E

TABLE OF CONTENTS

1 GENERAL INFORMATION 3
1.1 SCOPE 3
1.2 TEST FACILITY 3
1.3 RELATED SUBMITTAL(S)/GRANT(S) 3
1.4 DESCRIPTION OF CHANGE IN DEVICE 3
2 EQUIPMENT INFORMATION 4
2.1 JUSTIFICATION 4
2.2 EXERCISING THE EUT 4
2.3 TEST SYSTEM DETAILS 4
2.4 CONFIGURATION OF TESTED SYSTEM 4
3 FCC PART 2 §2.1053 (A): FIELD STRENGTH OF SPURIOUS RADIATION 5
3.1 FIELD STRENGTH OF SPURIOUS RADIATION TEST PROCEDURE 5
3.2 SAMPLE CALCULATION OF SPURIOUS RADIATION 5
3.3 FIELD STRENGTH OF SPURIOUS RADIATION TEST DATA 6
3.4 FIELD STRENGTH OF SPURIOUS RADIATION TEST EQUIPMENT 6
4 FCC PART 2 §2.1046 (A): RF POWER OUTPUT: RADIATED 7
4.1 RF POWER OUTPUT: RADIATED TEST PROCEDURE 7
4.2 RF POWER OUTPUT: §2.1046 RADIATED TEST DATA 7
4.3 TEST EQUIPMENT 8
5 FCC PART 2 §2.1046 (A): RF POWER OUTPUT: CONDUCTED 9
5.1 RF POWER OUTPUT: CONDUCTED TEST PROCEDURE 9
5.2 RF POWER OUTPUT: CONDUCTED TEST DATA 9
5.3 TEST EQUIPMENT 9
6 CONCLUSION 10

TABLE INDEX

TABLE 2-1: EQUIPMENT UNDER TEST (EUT) 4
TABLE 3-1: FIELD STRENGTH OF SPURIOUS RADIATION – CHANNEL 5 (155.0 MHZ) 6
TABLE 3-2: SPURIOUS RADIATION TEST EQUIPMENT 6
TABLE 4-1: CARRIER OUTPUT POWER (RADIATED) 7
TABLE 4-2: RADIATED POWER OUTPUT TEST EQUIPMENT 8
TABLE 5-1: CARRIER OUTPUT POWER (UNMODULATED) 9
TABLE 5-2: RATED POWER: 9
TABLE 5-3: TEST EQUIPMENT 9
TABLE 6-1: RADIATED EMISSIONS (RECEIVER/DIGITAL) 14
TABLE 6-2: CONDUCTED EMISSIONS NEUTRAL SIDE – TX 155 MHZ 15
TABLE 6-3: CONDUCTED EMISSIONS HOT SIDE – TX 155 MHZ 15

APPENDIX INDEX

APPENDIX A: DESCRIPTION OF CHANGE 11
APPENDIX B: ANTENNA SPECIFICATIONS 12
APPENDIX C: USER MANUAL 13
APPENDIX D: ADDITIONAL INFORMATION FOR INDUSTRY CANADA RSS-119 14
APPENDIX E: RF EXPOSURE INFORMATION 16

1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 90 Part 90: Private Land Mobile Radio Services
All measurements contained in this application were conducted in accordance with the FCC Rules and Regulations CFR47 and ANSI/TIA/EIA603-1992/-1-1998 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

1.2 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

1.3 RELATED SUBMITTAL(S)/GRANT(S)

This is a permissive change request for the original Application for Certification for FCCID: ATH2425110, granted on 01/16/2002.

1.4 DESCRIPTION OF CHANGE IN DEVICE

This permissive change request is being made due to the addition of a new, optional antenna to the approved accessory list. The nominal gain of the antenna is 0 dB (2.15 dBi) with respect to a dipole. No change to the modulation circuitry has been made.

2 EQUIPMENT INFORMATION

2.1 JUSTIFICATION

The power was measured as a conducted measurement with a power meter and reflects the worst case data.

2.2 EXERCISING THE EUT

The Model 242-5110 / 242-5111 is a PTT transmitter, which transmits at a frequency within the range 136 - 174 MHz. The following frequencies were tested: 136, 155, and 174 MHz, in three orthogonal planes, with the receiving antenna in both horizontal and vertical polarities, from 1 meter to 4 meters in height; the worst case data is presented.

2.3 TEST SYSTEM DETAILS

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

TABLE 2-1: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BARCODE
ANTENNA	EF JOHNSON	8" WHIP	N/A	N/A	N/A	014867
BATTERY	EF JOHNSON	587-5100-360	N/A	N/A	N/A	014866
PORTABLE RADIO	EF JOHNSON	242-5112-210-BA	51120A472A14212	ATH2425110	N/A	014865
BATTERY	EF JOHNSON	H8295	N/A	N/A	N/A	014864
BATTERY	EF JOHNSON	H8294	N/A	N/A	N/A	014863
BATTERY	EF JOHNSON	587-5100-360	N/A	N/A	N/A	014862
EAR PIECE	EF JOHNSON	EAR PIECE	N/A	N/A	N/A	014861
HEADSET	EF JOHNSON	HEADSET	N/A	N/A	N/A	014860
CHARGER	EF JOHNSON	AA16740	1123327073	N/A	N/A	014859
MICROPHONE	EF JOHNSON	589-0015-057	0230	N/A	N/A	014858
MIC ADAPTER	EF JOHNSON	589-5100-051	0234	N/A	N/A	014857

2.4 CONFIGURATION OF TESTED SYSTEM

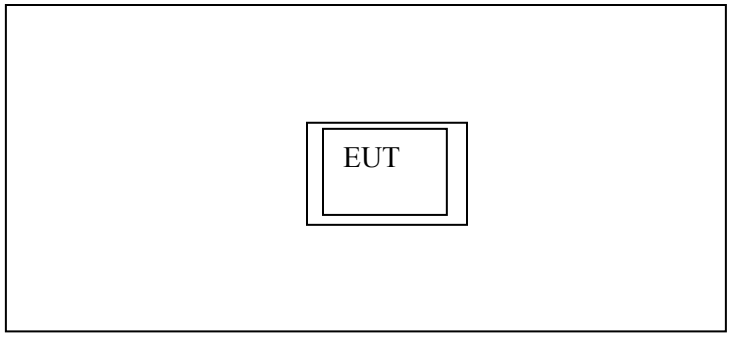

FIGURE 1: CONFIGURATION OF TESTED SYSTEM

3 FCC PART 2 §2.1053 (A): FIELD STRENGTH OF SPURIOUS RADIATION

3.1 FIELD STRENGTH OF SPURIOUS RADIATION TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.12

The transmitter is set to transmit mode and modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1000 Hz.

3.2 SAMPLE CALCULATION OF SPURIOUS RADIATION

The signal generator level from the substitution measurement is corrected by subtracting the cable loss from the signal generator to the transmitting antenna, and further corrected by adding the transmitting antenna gain (corrected to a half wave dipole, i.e. dBd). This corrected level is then subtracted from the carrier value (dbm), resulting in a dBc level. The final margin is arrived at by subtracting this corrected value from the limit. For instance in the following table:

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)*	Antenna Factor (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
272.0	-74.4	0.4	-0.6	113.0	-55.4

-74.4 dBm
-1.0 dB (-0.4 dB cable loss – (1.6 dBi –2.15)corrected antenna gain)
-75.4 dBm

37.62 dBm (conducted power measurement) - (-75.4 dBm) = 113.0 dBc

57.62 (limit=50+10LogP) – 113.0 (dBc) = -55.4 (dB)

3.3 FIELD STRENGTH OF SPURIOUS RADIATION TEST DATA

The worst-case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

TABLE 3-1: FIELD STRENGTH OF SPURIOUS RADIATION – CHANNEL 5 (155.0 MHZ)
5.8 W; 12.5 Channel bandwidth; Mask D (Substitution Method) (Limit 57.6 dBc)

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss (dB)*	Antenna Factor (dBd)	Corrected Signal Generator Level (dBc)	Limit (dBc)	Margin (dB)
310.0	45.6	-79.3	0.4	-0.6	117.9	57.6	-60.3
465.0	59.5	-59.3	0.7	-0.6	98.2	57.6	-40.6
620.0	31.6	-85.8	0.8	-1.2	125.4	57.6	-67.8
775.0	33.2	-83.5	1.0	-1.3	123.4	57.6	-65.8
930.0	26.5	-87.0	1.2	-1.3	127.1	57.6	-69.5
1085.0	26.4	-80.9	1.3	2.8	117.0	57.6	-59.4
1240.0	26.5	-76.9	1.1	4.3	111.3	57.6	-53.7
1395.0	26.6	-77.2	1.1	5.8	110.1	57.6	-52.5
1550.0	26.9	-75.1	1.1	6.9	106.9	57.6	-49.3

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna and difference in gain (ref. To a 1/2 wave dipole)

TEST PERSONNEL:

DANIEL BALTZELL — TEST TECHNICIAN/ENGINEER
SIGNATURE
January 9, 2003 — DATE OF TEST

3.4 FIELD STRENGTH OF SPURIOUS RADIATION TEST EQUIPMENT

TABLE 3-2: SPURIOUS RADIATION TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900791	Schaffner@Chase	CBL6112	Antenna (25MHz – 2GHz)	2099	08/23/2003
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1-26.5 GHz)	3008A00505	N/A
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	06/07/03
900928	Hewlett Packard	83752A	Synthesized Sweeper (0.01 to 20 GHz)	3610A00866	05/11/03

4 FCC PART 2 §2.1046 (A): RF POWER OUTPUT: RADIATED

4.1 RF POWER OUTPUT: RADIATED TEST PROCEDURE

Substitution Method:

The EUT was setup at an antenna-to-EUT distance of 3 meters on an open area test site. The EUT was placed on a nonconductive turntable 1.0 meter above the ground plane. The physical arrangement of the EUT was varied through three orthogonal planes in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The worst-case, maximum radiated emission was recorded and used as reference for the measurement. The EUT was then replaced by a ½ wave dipole antenna and polarized in accordance with the EUT's antenna polarization. The ½ wave dipole antenna was connected to a RF signal generator with a coaxial cable. The search antenna height, and search antenna polarity was set to levels that produced the maximum reading obtained. The signal generator was adjusted to a level that produced that maximum radiated emission level. The signal generator level was recorded and corrected by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal ½ wave dipole antenna. The signal generator corrected level is the ERP level.

4.2 RF POWER OUTPUT: §2.1046 RADIATED TEST DATA

The following channels (in MHz) were tested: 136.0; 155.0; 174.0. The worst-case Output Power (highest) levels are shown.

TABLE 4-1: CARRIER OUTPUT POWER (RADIATED)

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss (dB)*	Antenna Factor (dBd)	ERP (dBm)	ERP (W)
136.0	115.4	33.4	0.1	-0.5	32.8	1.892
155.0	118.6	34.8	0.1	-0.2	34.6	2.851
174.0	116.8	30.4	0.1	-0.1	30.3	1.059

*cable loss from transmitting antenna to signal generator
Measurement accuracy is +/- .5 dB

TEST PERSONNEL:

DANIEL BALTZELL		December 30, 2002
TEST ENGINEER	SIGNATURE	DATE OF TEST

4.3 TEST EQUIPMENT

TABLE 4-2: RADIATED POWER OUTPUT TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900772	EMCO	3161-02	Horn Antenna	9804-1044	N/A
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	N/A
900889	Hewlett Packard	85685A	RF Preselector for HP 8566B or 8568B (20Hz-2GHz)	3146A01309	11/21/03
900905	Rhein Tech Labs	PR-1040	Amplifier	900905	N/A
900928	Hewlett Packard	83752A	Synthesized Sweeper 0.01 to 20 GHz	3610A00866	5/11/03
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/16/03
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	4/20/03
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	5/22/03
901235	IW Microwave Products	KPS-1503-360-KPS	High frequency RF cables	36"	N/A
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	w/o top for wireless testing	N/A
900154	Compliance Design Inc.		Roberts Dipole	Adjustable Elements Dipole Antenna (30-1000MHz)	9/16/03

5 FCC PART 2 §2.1046 (A): RF POWER OUTPUT: CONDUCTED

5.1 RF POWER OUTPUT: CONDUCTED TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

5.2 RF POWER OUTPUT: CONDUCTED TEST DATA

The following channels (in MHz) were tested: 136.0; 155.0; 174.0. The worst-case Output Power (highest) levels are shown.

TABLE 5-1: CARRIER OUTPUT POWER (UNMODULATED)

Channel	Frequency (MHz)	Level (dBm)	Level (W)
1	136.0	37.56	5.7
2	155.0	37.63	5.8
3	174.0	37.63	5.8

*Measurement accuracy: +/- 3%

TABLE 5-2: RATED POWER:

Rated Power (W)	
High Power	**Low Power**
5.0	1.0

TEST PERSONNEL:

DANIEL BALTZELL		December 30, 2002
TEST ENGINEER	SIGNATURE	DATE OF TEST

5.3 TEST EQUIPMENT

TABLE 5-3: TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900770	Hewlett Packard	437B	Power Meter	2949A02966	02/16/03
901055	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2545A04102	07/31/03
900769	Hewlett Packard	8481B	Power Sensor	2702A05059	02/09/03

6 CONCLUSION

The data in this measurement report shows that the E.F. Johnson Model 242-5110 / 242-5111, FCC ID: ATH2425110, complies with all the requirements of Parts 2 and 90 of the FCC Rules and Industry Canada RSS-119.

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to, or exclusions from, the FCC Part 2, FCC Part 15, FCC Part 90, ANSI C63.4, ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1 and Industry Canada RSS-119.

Signature:  Date: December 31, 2002

Typed/Printed Name: Desmond A. Fraser Position: President

Signature:  Date: December 31, 2002

Typed/Printed Name: Daniel W. Baltzell Position: EMC Test Engineer