Engineering and Testing for EMC and Safety Compliance

FCC CERTIFICATION TEST REPORT

VHF FM HANDHELD TRANCEIVER

MODEL: DR-235TMkIII
FCC ID: PH3DR-235TMK3
IC: 3070C-DR235MK3

Alinco Incorporated
Electronics Division
Shin-Dai Building 9F
2-6, 1-Chome, Dojimahama, Kita-ku
Osaka 530-0004 Japan

November 10, 2006

Standards Referenced for this Report	
Part 2: 2006	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 15.121: 2006	Radio Frequency Devices; Scanning Receivers and Frequency Converters Used with Scanning Receivers
ANSI C63.4-2004	Standard Format Measurement/Technical Report Personal Computer and Peripherals
RSS-215; Issue 1 (Provisional)	Analogue Scanner Receivers

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
216-279.995	N/A	N/A	N/A

REPORT PREPARED BY:

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1 General Information

The following application for FCC Certification of an analog scanning receiver is prepared on behalf of Alinco Incorporated; Electronics Division, in accordance with FCC Rules and Regulations Parts 2 and 15 and Industry Canada RSS-215. The Equipment Under Test (EUT) is Model DR-235TMkIII, FCC ID: PH3DR-235TMK3, IC: 3070C-DR235MK3. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 2004. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instrument. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

1.1 Modifications

No modifications were made during testing.

1.2 Related Submittal(s)/Grant(s)

This is an original certification submission.

1.3 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4 2004. Radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report, submitted to, and approved by the Federal Communications Commission; to perform AC line conducted and radiated emissions testing (ANSI C63.4 2004).

2 System Test Configuration

2.1 Justification

To complete the test configuration required by the FCC, the receiver was connected to an external antenna, which receives a signal from a signal generator output. With the antenna installed, the receiver indicator was used to determine optimal reception. The EUT's intermediate frequencies (IF), local oscillators (LO), crystal oscillators and harmonics of each were investigated. Conducted emissions were measured from the AC port of the charger. All modes were investigated and tested, including standby mode and scanning mode. The final radiated data was taken with the EUT locked to a set frequency.

2.2 Exercising the EUT

The DR-235TMkIII is a receiver designed to function at the following frequency range: 216–279.995 MHz. The following frequencies were tested: 216 MHz, 248 MHz and 279.995 MHz. In order to activate the receiver circuitry, a signal was transmitted from a signal generator. This allowed the EUT to function in its typical state throughout the course of all testing.

2.3 Test System Details

The test sample was received on November 3, 2006. 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 Bar Code
VHF FM Transceiver	Alinco	DR-235TMkIII	M000490	PH3DR-235TMK3	N/A	17610
Handset	Alinco	EMS-57	M0055663	N/A	0.8 m unshielded I/O	17612

2.4 Configuration of Tested System

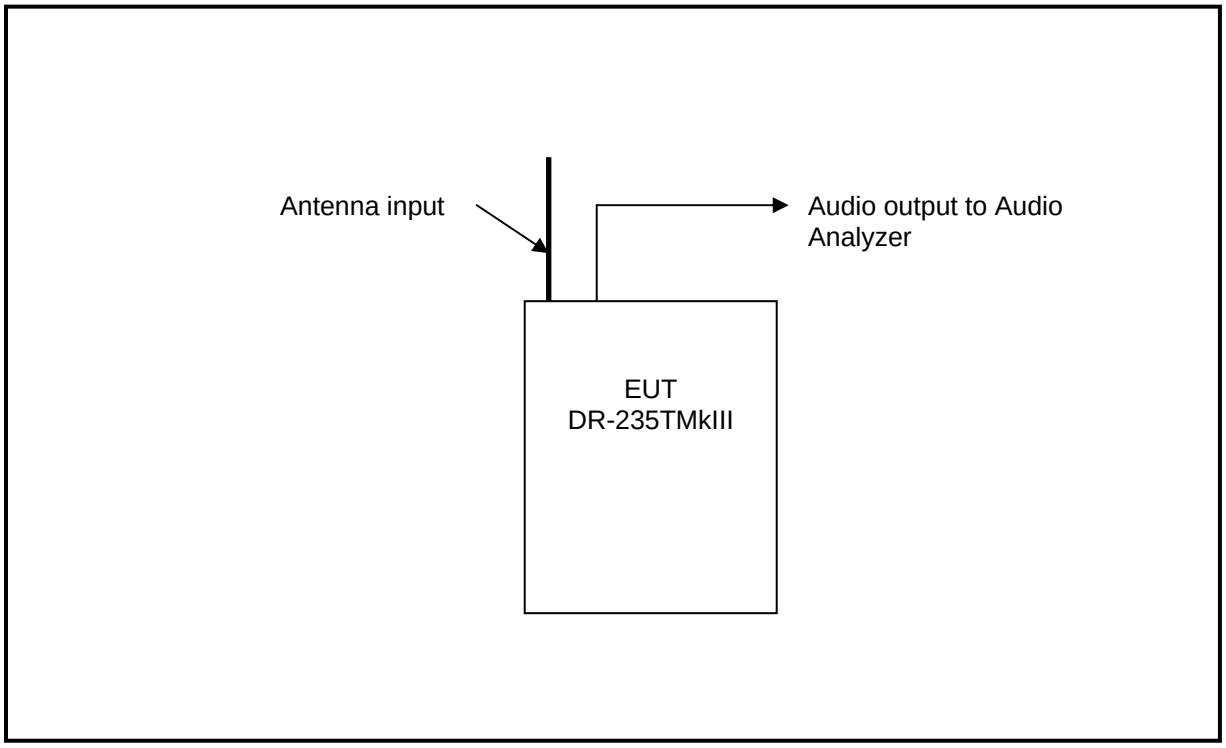


Figure 1: Test System Configuration

3 AC Conducted Emissions - FCC Rules and Regulations Part 15 §15.107(b): Conducted Limits

The EUT is 13.2 VDC battery powered, therefore no AC conducted emissions are required.

4 Radiated Emissions – FCC Rules and Regulations Part 15 §15.109(a): Radiated Emissions Limits; RSS-215 Section 7 - Receiver Spurious Emissions

4.1 Test Methodology for Radiated Emissions Measurements

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one meter and three meter distances, in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction, and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three meter, open-field test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane. The spectrum was examined from 30 MHz to 1000 MHz using a spectrum analyzer, a quasi-peak adapter, and EMCO log periodic and biconical antenna. In order to gain sensitivity, a preamplifier was connected in series between the antenna and the input of the spectrum analyzer.

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 spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. No video filter less than 10 times the resolution bandwidth was used. The second harmonic of the highest LO was tested. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech Quality Manual, Section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

4.2 Radiated Emissions Data

Table 4-1: Radiated Emissions – Mode RX

Temperature: 67°F Humidity: 49%									
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
71.900	Qp	V	0	1.0	40.2	-23.6	16.6	40.0	-23.4
248.144	Qp	H	180	2.5	43.0	-14.8	28.2	46.0	-17.8
370.303	Qp	H	90	1.0	42.0	-11.4	30.6	46.0	-15.4
434.286	Qp	H	90	1.0	35.1	-8.9	26.2	46.0	-19.8
496.297	Qp	H	180	1.0	28.3	-8.0	20.3	46.0	-25.7
555.450	Qp	H	90	1.0	27.5	-6.3	21.2	46.0	-24.8
740.602	Qp	H	0	1.0	32.3	-4.0	28.3	46.0	-17.7
744.449	Qp	H	180	1.0	32.3	-4.0	28.3	46.0	-17.7
1240.750	Av	H	90	1.0	30.5	3.9	34.4	54.0	-19.6
1296.057	Av	H	90	1.0	36.7	4.7	41.4	54.0	-12.6
1302.894	Av	H	90	1.0	37.8	4.7	42.5	54.0	-11.5

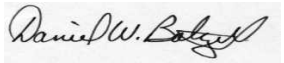
Notes: All readings are quasi-peak, unless stated otherwise.
A low, middle, and high channel was checked for every frequency band.
Limit/Distance: FCC B/3M

Table 4-2: Equipment Used for Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	9/13/07
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz-22 GHz)	3138A07771	9/13/07
901053	Schaffner &Chase	CBL6112B	Bilog Antenna (20 MHz-2 GHz)	2648	9/20/06
900905	Rhein Tech Labs	PR-1040	OATS 1 Preamplifier 40dB (30 MHz–2 GHz)	1006	3/15/07
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	9/13/07

*The preamplifier's gain is included in the site correction factor.

Test Personnel:

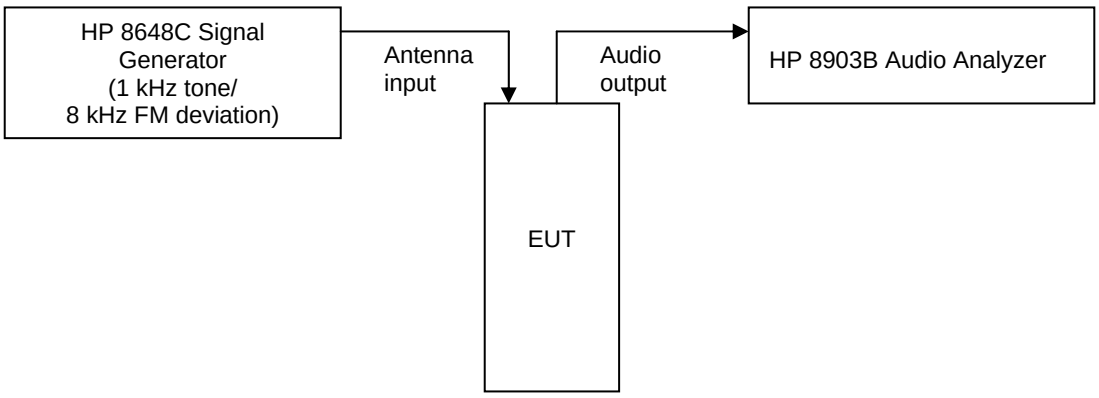
Signature:  Date: November 9, 2006 Typed Name: Daniel Baltzell

5 FCC Rules and Regulations Part 15 §15.121(b) - 38 dB Rejection Test

A signal generator was connected to the receiver under test, and the output of the receiver was connected to an audio analyzer.

An FM signal was applied to the receiver antenna input with a 1 kHz tone modulated at 8 kHz deviation, and adjusted with the audio analyzer to produce a 12 dB SINAD. This was done across the receiver bands to determine a reference level. The reference level used was that with the highest sensitivity in all of the bands.

The output of the signal generator was then adjusted to a level 40 dB above the reference level established and set to a low, medium, and high frequency in both the mobile and base cellular bands: the mobile band being 824.04-848.97 MHz, and the base band being 869.04-893.97 MHz. The squelch of the receiver was then set to a minimum threshold level, and scanning begun from the lowest to the highest channel. Whenever the receiver stopped and "un-squelched", that frequency was noted as a response. After all the frequencies of responses were noted, the signal generator was set to measure the sensitivity at each of these response frequencies. This measurement was the reference sensitivity for the particular received frequency measured. The audio analyzer measurement was used to measure the 12 dB SINAD, which is the spurious value. The difference between the reference sensitivity and the spurious value is the rejection ratio and must be at least 38 dB.



Frequencies used on the signal generator were 824.04, 836.50, and 848.97 MHz for the mobile band, and 869.04, 881.50, and 893.97 MHz for the base band.

The DR-235TMkIII unit reference level used was –70 dBm from the signal generator. The DR-235TMkIII unit was scanned on all specified operating frequency ranges (per manufacturer's specifications). Signals that were noted as responses were checked with the signal generator off. If they were still present, they were determined to be ambient signals and removed from the response list.

No signals were detected for the 38 dB rejection test requirements.

5.1 38 dB Rejection Test Data for Base Band (869.040-893.970 MHz)

Table 5-1: 38 dB Rejection {Frequency Injected: 869.040 MHz} (Cellular Band)

Frequency Injected: 869.040 MHz		Temperature: 72°F; Humidity: 45%		
Frequency Detected (MHz)	Level 12 dB SINAD at 869.040 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

Table 5-2: 38 dB Rejection {Frequency Injected: 881.500 MHz} (Cellular Band)

Frequency Injected: 881.500 MHz		Temperature: 72°F; Humidity: 45%%		
Frequency Detected (MHz)	Level 12 dB SINAD at 881.500 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

Table 5-3: 38 dB Rejection {Frequency Injected: 893.970 MHz} (Cellular Band)

Frequency Injected: 893.970 MHz		Temperature: 72°F; Humidity: 45%		
Frequency Detected (MHz)	Level 12 dB SINAD at 893.970 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

5.2 38dB Rejection Test Data for Mobile Band (824.040-848.970 MHz)

Table 5-4: 38 dB Rejection {Frequency Injected: 824.040 MHz} (Mobile Band)

Frequency Injected: 824.040 MHz		Temperature: 72°F; Humidity: 45%		
Frequency Detected (MHz)	Level 12 dB SINAD at 824.040 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

Table 5-5: 38 dB Rejection {Frequency Injected: 836.500 MHz} (Mobile Band)

Frequency Injected: 836.505 MHz		Temperature: 72°F; Humidity: 45%		
Frequency Detected (MHz)	Level 12 dB SINAD at 836.500 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

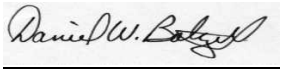
Table 5-6: 38 dB Rejection {Frequency Injected: 848.970 MHz} (Mobile Band)

Frequency Injected: 848.970 MHz		Temperature: 72°F; Humidity: 45%		
Frequency Detected (MHz)	Level 12 dB SINAD at 848.970 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

Table 5-7: Equipment Used for Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900917	Hewlett Packard	8648B	Signal Generator	3537A01741	8/29/07
901067	Hewlett Packard	HP8903B	Audio Analyzer	2450A00135	7/21/07

Test Personnel:

Signature:  Date: November 6, 2006 Typed Name: Daniel Baltzell

6 Conclusion

The data in this measurement report shows that the Alinco Incorporated Model DR-235TMkIII, FCC ID: **PH3DR-235TMK3**, **IC: 3070C-DR235MK3**, complies with all applicable requirements of Parts 2 and 15.121 of the FCC Rules and Industry Canada RSS-215, Issue 1.