Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC AND INDUSTRY CANADA

Test Lab:	Applicant:
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FCC ID:	PH3DR-435TMk2	**GRANTEE FRN:**	0005-1920-83
PLAT FORM:	N/A	**RTL WORK ORDER #:**	2003108
MODEL:	DR-435TMkII	**RTL QUOTE #:**	QRTL03-888
DATE OF TEST REPORT:	June 25, 2003		

American National Standard Institute:	ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1
FCC Classification:	CSR – Scanning Receiver
FCC Rule Part(s):	Part 15.121: Scanning receivers and frequency converters used with scanning receivers
Industry Canada Standard:	RSS-215; Issue 1 (Provisional): Analogue Scanner Receivers
Digital Interface Information	Digital Interface was found to be compliant
Receiver Information	Receiver was found to be compliant

Frequency Range (MHz)	Output Power (W) EIRP	Frequency Tolerance	Emission Designator
350.000 – 511.995	N/A	N/A	N/A

I, 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, Industry Canada RSS-215, ANSI C63.4, ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1.

Signature: _____ Date: June 25, 2003

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

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1 GENERAL INFORMATION

The following application for FCC Type Certification of a Transceiver (Analog Scanner Receiver portion) is prepared on behalf of Alinco Incorporated; Electronics Division, in accordance with Part 2, and Part 15, Subparts A and B of the Federal Communications Commission rules and regulations and Industry Canada RSS-215. The Equipment Under Test (EUT) was Model DR-435TMkII, FCC ID: PH3DR-435TMk2; VHF/UHF FM Handheld Transceiver. The test results reported in this document relate only to this model.

All measurements contained in this application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. 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.

All radiated emissions measurements were performed manually at Rhein Tech Laboratories, Inc. The radiated emissions measurements required by the rules were performed on the three-meter, open field; test range maintained by Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. Complete description and site attenuation measurement data have been placed on file with the Federal Communications Commission. The power line conducted emissions measurements were performed in a shielded enclosure also located at the Herndon, Virginia facility. The FCC accepts Rhein Tech Laboratories, Inc. as a facility available to do measurement work for others on a contractual basis, including AC line conducted and radiated emissions testing (ANSI C63.4 1992).

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 in 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 errors.

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 2000. Radiated testing was performed at an antenna- to-EUT distance of 3 meters.

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), 2nd Local Oscillators (LO), crystal oscillators and harmonics of each were investigated. Conducted emission was 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-435TMkII is a receiver designed to function at the following frequency range: 350.000 MHz – 511.995 MHz. The following channel frequencies were tested: 350.000 MHz, 430.995 MHz, and 511.995 MHz. Each receiver frequency was measured independently. 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 FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system are:

TABLE 1: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
UHF FM TRANSCEIVER	ALINCO	DR-435TMKII	M000401	PH3DR-435TMK2	N/A	15293
MICROPHONE	ALINCO	EMS-57	N/A	N/A	SHIELDED I/O	015924
ANTENNA	ALINCO	WHIP ANTENNA	N/A	N/A	N/A	013435

TABLE 2: EXTERNAL COMPONENTS IN TEST CONFIGURATION

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
SIGNAL GENERATOR	HEWLETT PACKARD	8648C	3537A01741	N/A	SHIELDED POWER	900917
HEADPHONES	KOSS	N/A	N/A	N/A	UNSHIELDED I/O	014975
SPEAKER MICROPHONE	ALINCO	EMS-47	N/A	N/A	SHIELDED I/O	015294

2.4 CONFIGURATION OF TESTED SYSTEM

PHOTOGRAPH 1: CONFIGURATION OF TEST SYSTEM

3 CONDUCTED EMISSIONS

AC conducted emissions is not required since the device under test is not powered from AC mains, but has a 13.8 VDC input requirement.

4 RADIATED 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.

4.2 RADIATED EMISSION DATA

TABLE 3: RADIATED EMISSIONS: (INPUT FREQUENCY: 350.000 MHZ)

Temperature: 63°F Humidity: 82%									
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 (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
33.350	Qp	H	225	1.0	36.4	-14.9	21.5	40.0	-18.5
144.000	Qp	H	45	1.0	35.2	-13.9	21.3	43.5	-22.2
215.767	Qp	H	0	1.0	40.3	-10.2	30.1	43.5	-13.4
380.847	Qp	H	1	1.0	56.5	-13.3	43.2	46.0	-2.8
761.722	Qp	H	145	1.0	34.3	6.2	40.5	46.0	-5.5
1142.583	Av	H	145	1.0	35.8	-0.6	35.2	54.0	-18.8
1523.444	Av	H	225	1.0	31.8	4.1	35.9	54.0	-18.1

1st IF = 30.85 MHz, 2nd IF = 455 KHz, 1st LO = 380.847 MHz, 2nd Harmonic of 1st LO = 761.722 MHz, (Harmonics of 21.250 MHz, 30.395 MHz, 7.9872 MHz, and 3.6864 MHz clock oscillators were investigated)
**All readings are quasi-peak, unless stated otherwise.*

TABLE 4: RADIATED EMISSIONS: (INPUT FREQUENCY: 430.995 MHZ)

Temperature: 63°F Humidity: 82%									
Emission Frequency (MHz)	**Test Detector**	**Antenna Polarity (H/V)**	**Turntable Azimuth (deg)**	**Antenna Height (m)**	**Analyzer Reading (dBµV)**	**Site Correction Factor (dB/m)**	**Emission Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
133.200	Qp	V	225	1.0	34.4	-14.3	20.1	43.5	-23.4
144.400	Qp	V	145	1.0	35.9	-13.8	22.1	43.5	-21.4
245.300	Qp	V	235	1.0	33.7	-8.6	25.1	46.0	-20.9
400.165	Qp	H	180	1.0	47.2	-3.3	43.9	46.0	-2.1
400.700	Qp	V	145	1.0	33.3	-3.2	30.1	46.0	-15.9
800.330	Qp	V	145	1.0	34.2	7.2	41.4	46.0	-4.6
800.500	Qp	V	180	1.0	33.8	7.2	41.0	46.0	-5.0
1200.495	Av	V	0	1.0	33.0	-1.6	31.4	54.0	-22.6
1600.660	Av	V	180	1.0	34.9	3.2	38.1	54.0	-15.9

1st IF = 30.85 MHz, 2nd IF = 455 KHz, 1st LO = 400.165 MHz, 2nd Harmonic of 1st LO = 800.330 MHz, (Harmonics of 21.250 MHz, 30.395 MHz, 7.9872 MHz, and 3.6864 MHz clock oscillators were investigated)
**All readings are quasi-peak, unless stated otherwise.*

TABLE 5: RADIATED EMISSIONS: (INPUT FREQUENCY: 511.995 MHZ)

Temperature: 63°F Humidity: 82%									
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)**
170.000	Qp	H	180	1	37.6	-19.4	18.2	43.5	-25.3
461.900	Qp	H	185	1	35.3	-11.3	24.0	46	-22.0
481.145	Qp	V	180	1	52	-10.9	41.1	46	-4.9
850.000	Qp	H	180	1	40.3	-3.9	36.4	46	-9.6
962.290	Qp	V	145	1	33.7	-2.5	31.2	46	-14.8
1443.435	Av	V	45	1	34.4	3.7	38.1	54	-15.9

1^{st} IF = 30.85 MHz, 2^{nd} IF = 455 KHz, 1^{st} LO = 481.145 MHz, 2^{nd} Harmonic of 1^{st} LO = 962.290 MHz, (Harmonics of 21.250 MHz, 30.395 MHz, 7.9872 MHz, and 3.6864 MHz clock oscillators were investigated)
**All readings are quasi-peak, unless stated otherwise.*

TEST PERSONNEL:

Signature:  Date: June 24, 2003 Typed Name: Franck Schuppius

TABLE 6: EQUIPMENT USED FOR TESTING

Radiated Emissions					
RTL Asset #	**Manufacturer**	**Model**	**Part Type**	**Serial Number**	**Calibration Due Date**
900897	Hewlett Packard	8565A	Spectrum Analyzer (10kHz – 1.5 GHz)	N/A	03/27/04
901053	Schaffner & Chase	CBL6112B	Bilog antenna (20 MHz - 2 GHz)	2648	05/24/04
900905	Rhein Tech Laboratories, Inc.	PR-1040	Pre Amplifier 40dB (10MHz – 2 GHz)	1006	N/A
900917	Hewlett Packard	8648C	Signal generator	3537A01741	N/A

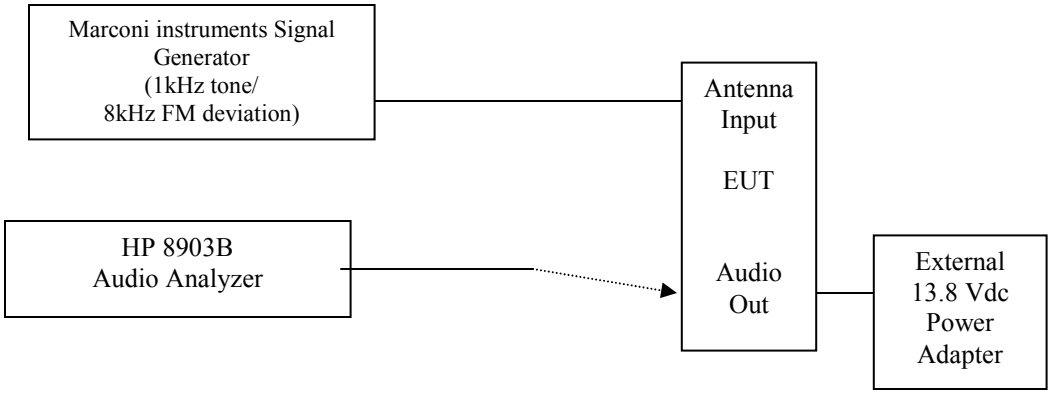
*Note: The preamplifier's gain is included in the site correction factor.

5 38DB 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: mobile = 824.04 MHz - 848.97 MHz; base = 869.04 MHz - 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 and that 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 MHz, 836.50 MHz, and 848.97 MHz for the mobile, and 869.04 MHz, 881.50 MHz, and 893.97 MHz for the base.

The DR-435TMkII unit reference level used was –50.4 dBm from the signal generator. The DR-435TMkII unit was scanned from 350 – 511.995 MHz for all channels (manufacturers spec.). Signals that were noted as responses were checked with the signal generator off. If they were still present, they were determined as ambient signals and removed from the response list. There was no signal available for the 38 dB rejection test requirements.

5.1 38DB REJECTION TEST DATA FOR BASE BAND (869.040-893.970 MHZ)

TABLE 7: 38DB REJECTION (FREQUENCY INJECTED: 869.040 MHZ) (CELLULAR BAND)

Frequency Injected: 869.040 MHz		**Temperature: 74°F; Humidity: 45%**		
Frequency Detected (MHz)	**Level 12dB SINAD at 869.040 MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

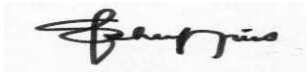
TABLE 8: 38DB REJECTION (FREQUENCY INJECTED: 881.500 MHZ) (CELLULAR BAND)

Frequency Injected: 881.500 MHz		**Temperature: 74°F; Humidity: 45%**		
Frequency Detected (MHz)	**Level 12dB SINAD at 881.500 MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

TABLE 9: 38DB REJECTION (FREQUENCY INJECTED: 893.970 MHZ) (CELLULAR BAND)

Frequency Injected: 893.970 MHz		**Temperature: 74°F; Humidity: 45%**		
Frequency Detected (MHz)	**Level 12dB SINAD at 893.970 MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

TEST PERSONNEL:

Signature:  Date: June 26, 2003 Typed Name: Franck Schuppius

5.2 38DB REJECTION TEST DATA FOR MOBILE BAND (824.040-848.970 MHZ)

TABLE 10: 38DB REJECTION (FREQUENCY INJECTED: 824.040 MHZ) (MOBILE BAND)

Frequency Injected: 824.040 MHz		Temperature: 74°F; Humidity: 45%		
Frequency Detected (MHz)	**Level 12dB SINAD at 824.040 MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

TABLE 11: 38DB REJECTION (FREQUENCY INJECTED: 836.500 MHZ) (MOBILE BAND)

Frequency Injected: 836.500 MHz		Temperature: 74°F; Humidity: 45%		
Frequency Detected (MHz)	**Level 12dB SINAD at 836.500 MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

TABLE 12: 38DB REJECTION (FREQUENCY INJECTED: 848.970 MHZ) (MOBILE BAND)

Frequency Injected: 848.970 MHz		Temperature: 74°F; Humidity: 45%		
Frequency Detected (MHz)	**Level 12dB SINAD at 848.970 MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

TEST PERSONNEL:

Signature:  Date: June 26, 2003 Typed Name: Franck Schuppius

6 CONCLUSION

The data in this measurement report shows that the Alinco Incorporated Model DR-435TMkII, FCC ID: PH3DR-435TMk2, VHF/UHF FM Handheld Transceiver, complies with all the requirements of Parts 2 and 15.121 of the FCC Rules and Industry Canada RSS-215, Issue 1.