Engineering and Testing for EMC and Safety Compliance

APPLICATION FOR FCC CLASS B CERTIFICATION

WIDE BAND COMMUNICATIONS RECEIVER

MODEL: DR-135TMkII
FCC ID: PH3DR-135TMK2

Alinco Incorporated
Electronics Division
Shin-Dai Building 9F
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Osaka 530-0004 Japan

January 31, 2003

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 1999	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 1999	RADIO FREQUENCY DEVICES
ANSI C63.4-1992	STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS
RSS-215; ISSUE 1 (PROVISIONAL)	ANALOGUE SCANNER RECEIVERS

FCC Rules Parts	Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
15.121	118-173.995	N/A	N/A	N/A

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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 Commissions rules and regulations and Industry Canada RSS-215. The Equipment Under Test (EUT) was Model DR-135TMkII, FCC ID: PH3DR-135TMK2, VHF FM Mobile Transceiver. 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, 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. The radiated emissions measurements required by the rules were performed on the three-meter, open field; test range maintained by Rhein Tech Laboratories, 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. A 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.

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 1992. 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 1992).

2 CONFORMANCE STATEMENT

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 1999	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 1999	RADIO FREQUENCY DEVICES
ANSI C63.4-1992	STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS
RSS-215; ISSUE 1 (PROVISIONAL)	ANALOGUE SCANNER RECEIVERS

FCC Rules Parts	Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
15.121	118-173.995 MHz	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 above. Modifications were not made during testing to the equipment in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to or exclusions from the ANSI C63.4 test methodology.

Signature: 

Date: January 31, 2003

Typed/Printed Name: Desmond A. Fraser

Position: President
(NVLAP Signatory)

NVLAP *Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 20061-0.*

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

3 SYSTEM TEST CONFIGURATION

3.1 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 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.

3.2 EXERCISING THE EUT

The DR-135TMkII is a receiver designed to function at the following frequency range: 118 MHz - 173.995 MHz. The following frequencies were tested: 118.000 MHz, 145.000 MHz and 173.995 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.

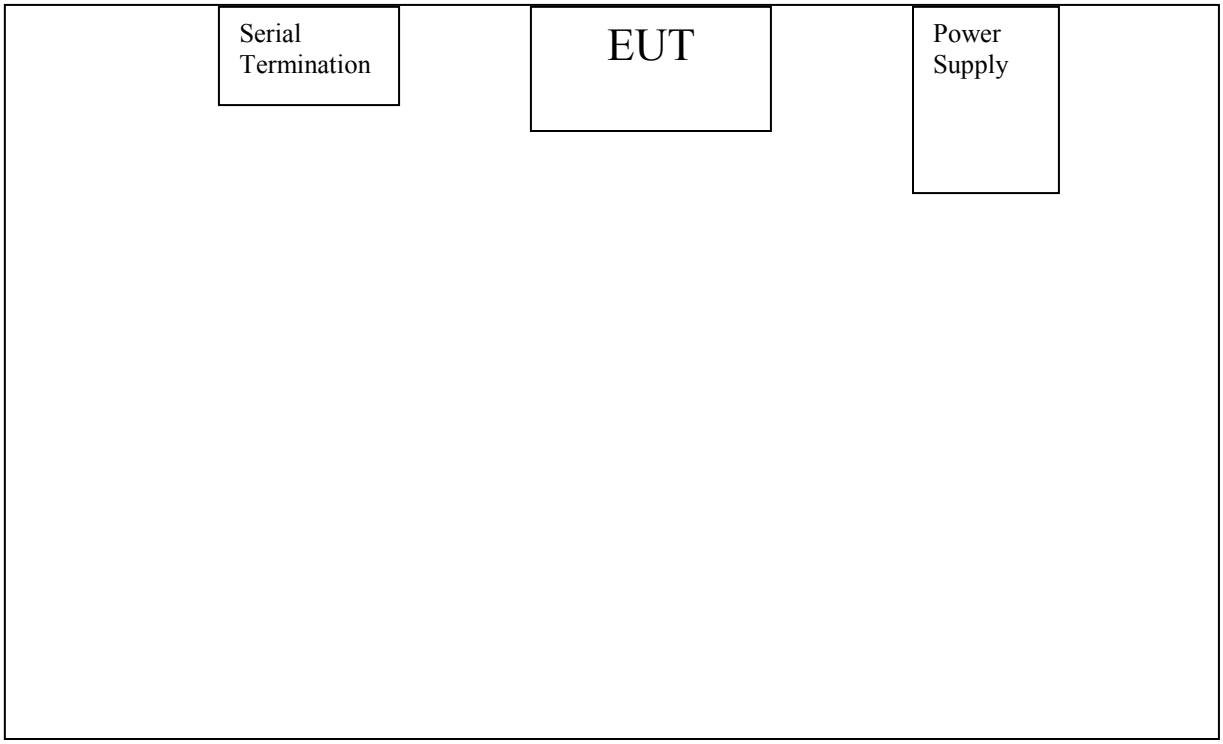
3.3 TEST SYSTEM DETAILS

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
VHF FM MOBILE TRANSCEIVER	ALINCO	DR-135TMKII	M000491	PH3DR-135TMK2	N/A	014873
MICROPHONE	ALINCO	EMS-57	M0004485	N/A	UNSHIELDED I/O	014874

3.4 CONFIGURATION OF TESTED SYSTEM



4 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.

5 RADIATED EMISSIONS

5.1 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 insure 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.

5.2 RADIATED EMISSION DATA

TABLE 2: RADIATED EMISSIONS: (INPUT FREQUENCY: 118 MHZ)

Temperature: 27°F Humidity: 92%									
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)**
139.683	Qp	H	5	2.2	56.7	-17.6	39.1	43.5	-4.4
279.385	Qp	H	250	1.0	47.5	-14.9	32.6	46.0	-13.4
419.087	Qp	H	300	1.0	51.3	-10.8	40.5	46.0	-5.5
558.789	Qp	H	250	1.4	47.5	-8.0	39.5	46.0	-6.5
698.491	Qp	H	200	1.5	37.4	-6.4	31.0	46.0	-15.0
838.193	Qp	H	100	1.0	42.6	-4.3	38.3	46.0	-7.7
977.914	Qp	V	180	1.5	39.0	-3.8	35.2	54.0	-18.8

LO = 139.7 MHz, 1st IF = 21.7 MHz, 2nd IF = 450KHz

TABLE 3: RADIATED EMISSIONS: (INPUT FREQUENCY: 145 MHZ)

Temperature: 27°F Humidity: 92%									
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)**
123.293	Qp	V	75	1.0	43.7	-16.3	27.4	43.5	-16.1
246.586	Qp	V	280	1.0	42.8	-16.8	26.0	46.0	-20.0
369.879	Qp	V	180	1.0	35.2	-12.8	22.4	46.0	-23.6
493.172	Qp	V	130	1.0	37.0	-10.1	26.9	46.0	-19.1
616.502	Qp	H	290	2.0	43.0	-7.4	35.6	46.0	-10.4
739.758	Qp	V	180	1.0	32.5	-6.1	26.4	46.0	-19.6
863.100	Qp	H	190	1.5	37.5	-4.1	33.4	46.0	-12.6
986.399	Qp	H	190	1.2	40.6	-2.6	38.0	54.0	-16.0

LO = 123.3 MHz, 1st IF = 21.7 MHz, 2nd IF = 450KHz

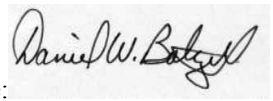
TABLE 4: RADIATED EMISSIONS: (INPUT FREQUENCY: 173.995 MHZ)

Temperature: 27°F Humidity: 92%									
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)**
152.295	Qp	H	265	2.0	49.4	-18.1	31.3	43.5	-12.2
304.590	Qp	H	90	1.0	40.6	-14.8	25.8	46.0	-20.2
456.885	Qp	H	300	1.0	34.0	-10.4	23.6	46.0	-22.4
609.180	Qp	H	180	1.4	34.9	-7.5	27.4	46.0	-18.6
761.475	Qp	H	170	1.4	35.1	-5.7	29.4	46.0	-16.6
913.770	Qp	H	300	1.4	35.8	-4.0	31.8	46.0	-14.2

LO= 152,285 MHz, 1st IF = 21.7 MHz, 2nd IF = 450KHz

**All readings are quasi-peak, unless stated otherwise.*

TEST PERSONNEL:



Signature: _____ Date: January 31, 2003 Typed Name: Daniel W.Baltzell

TABLE 5: EQUIPMENT USED FOR TESTING

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

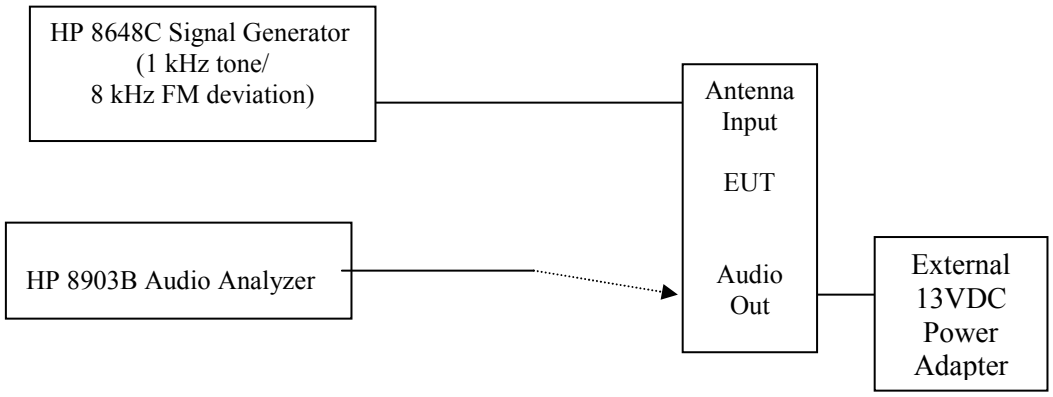
Radiated Emissions					
RTL Asset #	**Manufacturer**	**Model**	**Part Type**	**Serial Number**	**Calibration Date**
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/10/03
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	5/10/03
901053	Schaffner &Chase	CBL6112B	Bilog antenna (20 MHz - 2 GHz)	2648	05/24/03
*900905	Rhein Tech Laboratories, Inc.	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	N/A
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	5/10/03

6 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: 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 began 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, 836.50, 848.97 MHz for the mobile and 869.04, 881.50, 893.97 MHz for the Base.

The DR-135TMkII unit reference level used was –60 dBm from the signal generator. The DR-135TMkII unit was scanned from 118 MHz – 173.995 MHz for all channels (manufacturers specifications.). 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.

6.1 38 DB REJECTION TEST DATA FOR BASE BAND (869.040-893.970 MHZ)

TABLE 6: 38DB REJECTION {FREQUENCY INJECTED: 869.040 MHZ} (CELLULAR BAND)

Frequency Injected: 869.040 MHz		**Temperature: 74°F; Humidity: 33%**		
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

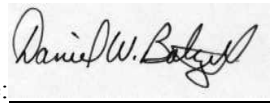
TABLE 7: 38DB REJECTION {FREQUENCY INJECTED: 881.500 MHZ} (CELLULAR BAND)

Frequency Injected: 881.500 MHz		**Temperature: 74°F; Humidity: 33%**		
Frequency Detected (MHz)	**Level 12dB SINAD at 881.50MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

TABLE 8: 38DB REJECTION {FREQUENCY INJECTED: 893.970 MHZ} (CELLULAR BAND)

Frequency Injected: 893.970 MHz		**Temperature: 74°F; Humidity: 33%**		
Frequency Detected (MHz)	**Level 12dB SINAD at 893.970MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

TEST PERSONNEL:



Signature:_____ Date: January 2, 2003 Typed Name: Daniel Baltzell

6.2 38DB REJECTION TEST DATA FOR MOBILE BAND (824.040-848.970 MHZ)

TABLE 9: 38DB REJECTION {FREQUENCY INJECTED: 824.040 MHZ} (MOBILE BAND)

Frequency Injected: 824.040 MHz		**Temperature: 74°F; Humidity: 33%**		
Frequency Detected (MHz)	**Level 12dB SINAD at 824.040MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

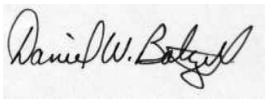
TABLE 10: 38DB REJECTION {FREQUENCY INJECTED: 836.500 MHZ} (MOBILE BAND)

Frequency Injected: 836.505 MHz		**Temperature: 74°F; Humidity: 33%**		
Frequency Detected (MHz)	**Level 12dB SINAD at 836.500MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

TABLE 11: 38DB REJECTION {FREQUENCY INJECTED: 848.970 MHZ} (MOBILE BAND)

Frequency Injected: 848.970 MHz		**Temperature: 74°F; Humidity: 33%**		
Frequency Detected (MHz)	**Level 12dB SINAD at 848.970MHz**	**Level 12dB at frequency detected**	**Rejection**	**Margin**
No Frequencies Detected	N/A	N/A	N/A	N/A

TEST PERSONNEL:



Signature: _____ Date: January 2, 2003 Typed Name: Daniel Baltzell

7 CONCLUSION

The data in this measurement report shows that the Alinco Incorporated Model DR-135TMkII, FCC ID: PH3DR-135TMK2, VHF FM Mobile Transceiver, complies with all the requirements of Parts 2 and 15.121 of the FCC Rules and Industry Canada RSS-215, Issue 1.