Engineering and Testing for EMC and Safety Compliance

Certification Application Test Report

MODEL: DJ-X30T (US Version)
DJ-X30K (Canadian Version)

FCC ID: PH3DJ-X30T
IC: 3070C-DJX30K

Alinco Incorporated
Electronics Division
Shin-Dai Building 9F
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December 28, 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 C63.4-2003	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
0.100-1299.995	N/A	N/A	N/A

Report Prepared By:

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Rhein Tech Laboratories, Inc.

Document Number: 2006207

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.

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1 General Information

The following application for 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 DJ-X30T/DJ-X30K, FCC ID: PH3DJ-X30T, IC: 3070C-DJX30K respectively. The DJ-X30T is the US version and does not receive in the Cellular Radiotelephone Service frequency bands. The DJ-X30K is the Canadian version. 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, 2003. 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 application.

1.3 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4 2003. 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 2003).

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 DJ-X30T/DJ-X30K is a receiver designed to function at the following frequency range: 0.100-1299.995 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 December 11, 2006. The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are shown in the table that follows.

Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
UHF FM Mobile Receiver	Alinco	DJ-X30T/ DJ-X30K	M000496	PH3DJ-X30T	N/A	17701
Antenna	Alinco	N/A	N/A	N/A	N/A	17670
Ear Bud/Remote Controller	Alinco	EDS-12	N/A	N/A	Unshielded I/O	17671

2.4 Configuration of Tested System

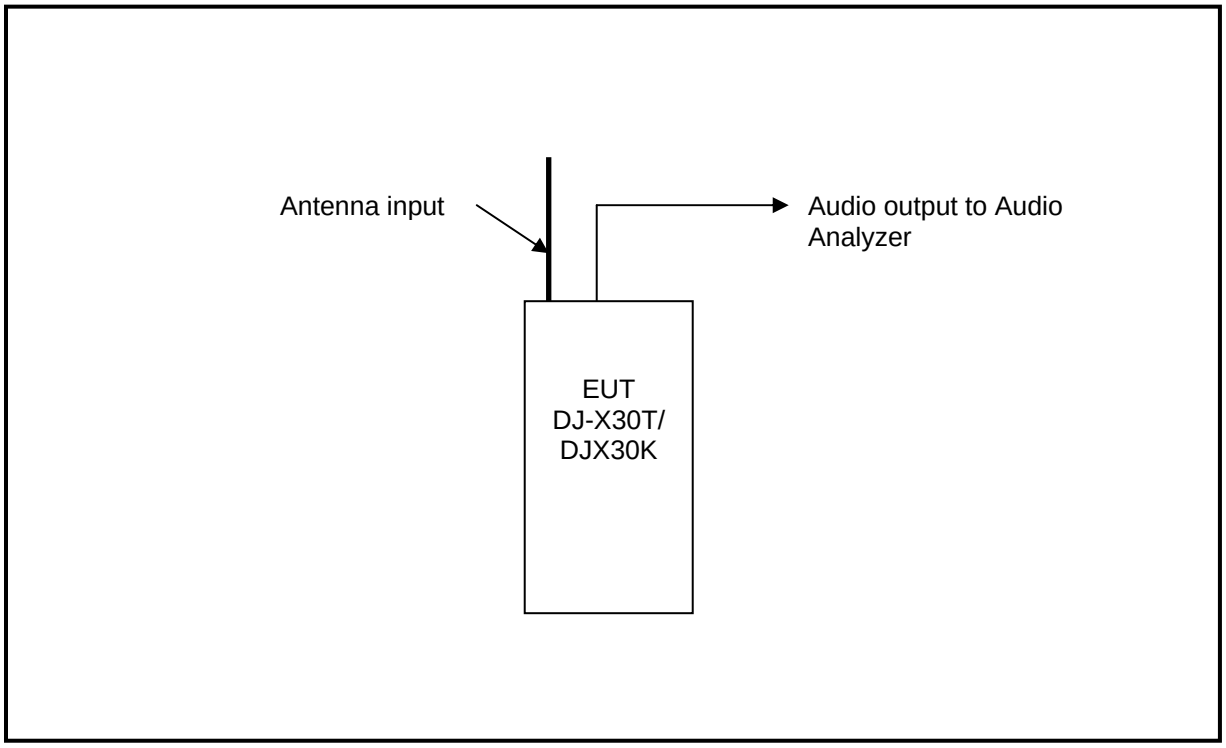


Figure 2-1: Test System Configuration

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

3.1 Site and Test Description

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50-ohm/50 microhenry Line Impedance Stabilization Network (LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 100 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable).

The analyzer's 6 dB bandwidth was set to 9 kHz. Video filter less than 10 times the resolution bandwidth is not used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded.

Conducted measurements at telecommunications ports (if applicable) were performed per EN55022: 1998. The limits for Class A and Class B are contained therein.

3.2 Test Limits

Class A Line-Conducted Emissions		
	Limit (dBµV)	
Frequency (MHz)	Quasi-Peak	Average
0.15 to 0.50	79	66
0.50 to 30.0	73	60

Class B Line-Conducted Emissions		
	Limit (dBµV)	
Frequency (MHz)	Quasi-Peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5.00	56	46
5.00 to 30.00	60	50

3.3 Conducted Emissions Test Data

Table 3-1: Conducted Emissions Test Data – Mode RX, Neutral Side Line 1 – EDC-154 Charger

Temperature: 74°F Humidity: 42%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.181	Pk	42.6	0.2	42.8	64.4	-21.6	54.4	-11.6	Pass
0.301	Pk	48.0	0.3	48.3	60.2	-11.9	50.2	-1.9	Pass
0.363	Pk	43.3	0.2	43.5	58.7	-15.2	48.7	-5.2	Pass
2.270	Pk	40.0	0.8	40.8	56.0	-15.2	46.0	-5.2	Pass
5.110	Pk	42.4	1.2	43.6	60.0	-16.4	50.0	-6.4	Pass
9.610	Pk	26.2	1.6	27.8	60.0	-32.2	50.0	-22.2	Pass

Table 3-2: Conducted Emissions Test Data – Mode RX, Hot Side Line 2- EDC-154 Charger

Temperature: 74°F Humidity: 42%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.302	Pk	45.4	0.3	45.7	60.2	-14.5	50.2	-4.5	Pass
0.363	Pk	43.4	0.2	43.6	58.7	-15.1	48.7	-5.1	Pass
0.422	Pk	39.8	0.3	40.1	57.4	-17.3	47.4	-7.3	Pass
0.800	Pk	43.0	0.3	43.3	56.0	-12.7	46.0	-2.7	Pass
5.070	Pk	39.9	1.2	41.1	60.0	-18.9	50.0	-8.9	Pass
8.760	Pk	23.1	1.5	24.6	60.0	-35.4	50.0	-25.4	Pass

Table 3-3: Conducted Emissions Test Data – Mode RX, Neutral Side Line 1 – EDC-139 Charger

Temperature: 74°F Humidity: 42%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.301	Pk	44.4	0.3	44.7	60.2	-15.5	50.2	-5.5	Pass
0.362	Pk	44.8	0.2	45.0	58.7	-13.7	48.7	-3.7	Pass
0.422	Pk	40.3	0.3	40.6	57.4	-16.8	47.4	-6.8	Pass
0.723	Av	37.5	0.4	37.9	56.0	-18.1	46.0	-8.1	Pass
0.723	Qp	45.1	0.4	45.5	56.0	-10.5	46.0	-0.5	Pass
5.520	Pk	42.7	1.3	44.0	60.0	-16.0	50.0	-6.0	Pass
8.100	Pk	28.6	1.5	30.1	60.0	-29.9	50.0	-19.9	Pass

Table 3-4: Conducted Emissions Test Data – Mode RX, Hot Side Line 2- EDC-139 Charger

Temperature: 74°F Humidity: 42%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail
0.300	Pk	45.5	0.3	45.8	60.2	-14.4	50.2	-4.4	Pass
0.362	Pk	43.5	0.2	43.7	58.7	-15.0	48.7	-5.0	Pass
0.423	Pk	39.9	0.3	40.2	57.4	-17.2	47.4	-7.2	Pass
0.724	Av	31.7	0.4	32.1	56.0	-23.9	46.0	-13.9	Pass
0.724	Qp	44.5	0.4	44.9	56.0	-11.1	46.0	-1.1	Pass
1.680	Pk	43.4	0.6	44.0	56.0	-12.0	46.0	-2.0	Pass
5.190	Pk	40.0	1.2	41.2	60.0	-18.8	50.0	-8.8	Pass
7.900	Pk	22.9	1.5	24.4	60.0	-35.6	50.0	-25.6	Pass

Table 3-5: Equipment Used for Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	9/13/07
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
901083	AFJ International	LS16	16A LISN (110 V)	16010020080	3/28/08

Test Personnel:

Typed Name: Daniel Baltzell Signature:  Date: December 19, 2006

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 Test Data

Table 4-1: Radiated Emissions – Mode RX

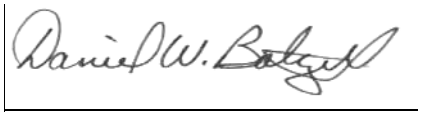
Temperature: 46°F Humidity: 56%									
Emission Frequency (MHz)	**Test Detector**	**Antenna Polarity (H/V)**	**Turntable Azimuth (deg)**	**Antenna Height (m)**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB/m)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**
132.630	Qp	V	0	1.0	40.0	-16.8	23.2	43.5	-20.3
233.239	Qp	H	0	1.2	60.7	-16.2	44.5	46.0	-1.5
233.239	Qp	V	0	1.0	52.0	-16.2	35.8	46.0	-10.2
287.250	Qp	V	0	1.0	32.3	-13.7	18.6	46.0	-27.4
343.841	Qp	H	180	1.0	48.8	-11.9	36.9	46.0	-9.1
343.841	Qp	V	0	1.5	47.4	-11.9	35.5	46.0	-10.5
687.750	Qp	H	0	2.0	34.7	-4.8	29.9	46.0	-16.1
687.750	Qp	V	0	1.0	23.8	-4.8	19.0	46.0	-27.0
699.719	Qp	H	0	1.8	38.7	-4.9	33.8	46.0	-12.2
699.719	Qp	V	180	1.5	37.6	-4.9	32.7	46.0	-13.3
1166.250	Av	H	0	1.0	28.5	2.4	30.9	54.0	-23.1

Notes: All readings are quasi-peak, unless stated otherwise.
Limit/Distance: FCC B/3M

Table 4-2: Equipment Used for Testing

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900897	Hewlett Packard	8567A	Spectrum Analyzer (10KHz-1.5GHz)	2727A00535	3/3/2007
901053	Schaffner &Chase	CBL6112B	Bilog Antenna (20 MHz - 2 GHz)	2648	9/20/07
901281	Rhein Tech Laboratories, Inc.	PR-1040	Pre Amplifier 40 dB (10 MHz – 2 GHz)	N/A	9/8/07
900901	Hewlett Packard	85650A	Quasi-Peak Adapter	2727A00535	3/3/2007

Test Personnel:

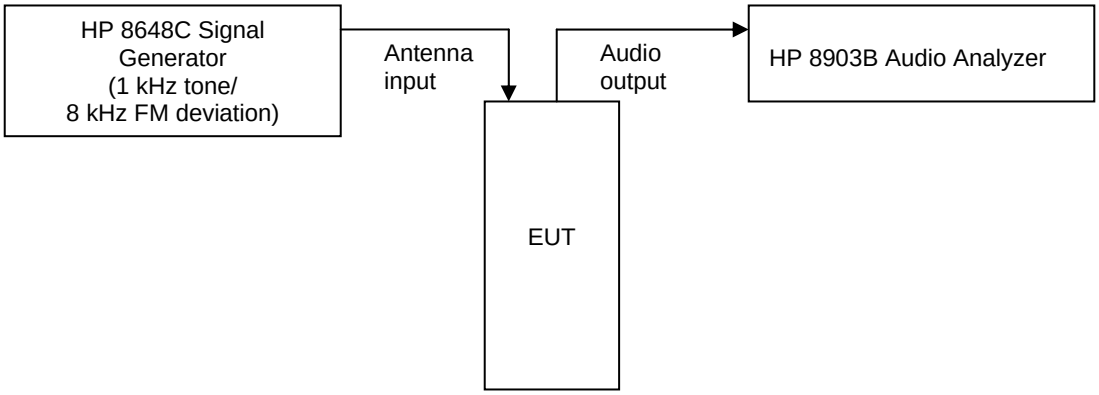
Typed Name: Daniel Baltzell Signature:  Date: December 19, 2006

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 MHz - 848.97 MHz, and the base band being 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, 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 DJ-X30T/DJ-X30K unit reference level used was –63.7 dBm from the signal generator. The DJ-X30T/DJ-X30K 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.

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: 74°F; Humidity: 46%		
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: 74°F; Humidity: 46%		
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: 74°F; Humidity: 46%		
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: 74°F; Humidity: 46%		
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: 74°F; Humidity: 46%		
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

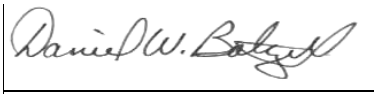
Table 5-6: 38 dB Rejection {Frequency Injected: 848.970 MHz} (Mobile Band)

Frequency Injected: 848.970 MHz		Temperature: 74°F; Humidity: 46%		
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:

Typed Name: Daniel Baltzell Signature:  Date: December 17 , 2006

6 Conclusion

The data in this measurement report shows that the Alinco Incorporated Model DJ-X30T/DJ-X30K, FCC ID: **PH3DJ-X30T**, IC: 3070C-DJX30K, complies with all applicable requirements of Parts 2 and 15.121 of the FCC Rules and Industry Canada RSS-215, Issue 1.