

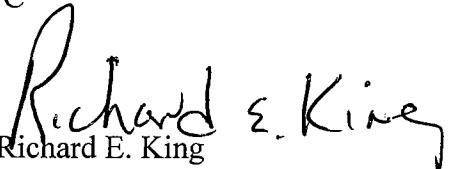


Measurement of RF Interference from a Model  
Motorola Canopy Transciever (UNII) Band  
using the Radiall /Larson Model R380.600.200  
Omni-directional Antenna

For : Cascade Networks, Inc.  
Longview WA

P.O. No. :  
Date Received : June 27, 2003  
Date Tested : June 30 through July 5, 2003  
Test Personnel: Richard E. King  
Specification : FCC "Code of Federal Regulations" Title 47  
Part 15.407, Subpart C

Test Report By

:   
Richard E. King

Witnessed by

: Brian Magnuson  
Cascade Networks, Inc.

Approved By

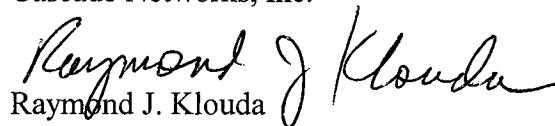
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TABLE OF CONTENTS

PARAGRAPH	DESCRIPTION OF CONTENTS	PAGE NO.
1.0 INTRODUCTION.....		4
1.1 Description of Test Item.....		4
1.2 Purpose .....		4
1.3 Deviations, Additions and Exclusions.....		4
1.4 Applicable Documents.....		4
1.5 Subcontractor Identification.....		4
1.6 Laboratory Conditions .....		4
2.0 TEST ITEM SETUP AND OPERATION.....		4
2.1 Power Input.....		5
2.2 Grounding.....		5
2.3 Peripheral Equipment.....		5
2.4 Interconnect Cables.....		5
2.5 Operational Mode .....		5
3.0 TEST EQUIPMENT .....		5
3.1 Test Equipment List.....		5
3.2 Calibration Traceability .....		5
4.0 REQUIREMENTS, PROCEDURES AND RESULTS .....		5
4.1 Powerline Conducted Emissions.....		5
4.1.1 Requirements .....		5
4.2 Radiated Measurements .....		5
4.2.1 Requirements .....		5
4.2.2 Procedures .....		5
4.2.3 Results .....		6
5.0 CONCLUSIONS.....		6
6.0 CERTIFICATION.....		6
7.0 ENDORSEMENT DISCLAIMER .....		6
TABLE I - EQUIPMENT LIST .....		8

## Measurement of RF Emissions from a Motorola Canopy Transciever

### **1.0 INTRODUCTION:**

**1.1 Description of Test Item** - This document presents the results of tests performed to determine if the Motorola Canopy Transceiver (UNII Band) meets the FCC requirements when using a Radiall /Larson model R380.600.200 omni-directional antenna. The test item was designed to transmit in the 5.250MHz to 5.350MHz band. The tests were performed for Cascade Networks Inc, of Longview, Washington.

**1.2 Purpose** - The test series was performed to determine if the test item meets the requirements of the radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections for Intentional Radiators. Testing was performed in accordance with ANSI C63.4-2001.

**1.3 Deviations, Additions and Exclusions** - There were no deviations, additions to, or exclusions from the test specification during this test series.

**1.4 Applicable Documents** - The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, dated 1 October 2002
- ANSI C63.4-2001, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

**1.5 Subcontractor Identification** - This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP Lab Code: 100278-0.

**1.6 Laboratory Conditions** The temperature at the time of the test was 23°C and the relative humidity was 50%.

### **2.0 TEST ITEM SETUP AND OPERATION:**

The test item is a Motorola Canopy Transciever. A block diagram of the test item setup is shown as Figure 1.

**2.1 Power Input** - The test item was powered with 24VDC from a Motorola model AEC-T4824 Class 2 transformer.

**2.2 Grounding** - Since the test item was powered with two wires, it was ungrounded during the tests.

**2.3 Peripheral Equipment** - The test item was submitted with a Panasonic ToughBook laptop.

**2.4 Interconnect Cables** - The test item was connected to the laptop via a 45 foot long CAT 5 ethernet cable.

**2.5 Operational Mode** - For all tests the test item and all peripheral equipment were placed on a 80cm high non-conductive stand. The test item and all peripheral equipment were energized.

For all tests, the test item was set to transmit continuously. The tests were performed with the test item transmitting at 5275MHz, 5300MHz and 5325MHz.

### **3.0 TEST EQUIPMENT:**

**3.1 Test Equipment List** - A list of the test equipment used can be found on Table I. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

**3.2 Calibration Traceability** Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

### **4.0 REQUIREMENTS, PROCEDURES AND RESULTS:**

#### **4.1 Powerline Conducted Emissions**

**4.1.1 Requirements** – Since conducted emissions test data was obtained by Cascade Networks no conducted emission measurements were taken.

#### **4.2 Radiated Measurements**

**4.2.1 Requirements** - Per section 15.407(b)(2), For transmitters operating in the 5.25 - 5.35GHz range band: all emissions outside of the 5.15-5.25GHz band shall not exceed an EIRP of -27dBm/MHz. Devices operating in the 5.25-5.35GHz band that generate emissions in the 5.15-5.25GHz band must meet all applicable technical requirements for operation in the 5.15-5.25GHz (including indoor use) or alternatively meet an out-of-band emissions EIRP limit of -27dBm/MHz in the 5.15-5.25GHz band.

**4.2.2 Procedures** - Radiated measurements were manually performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering

the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads. The frequency ranges for the harmonics were investigated using an average detector function.

To ensure that maximum emission levels were measured, the following steps were taken:

- 1) Measurements were made using an average detector and a standard gain horn antenna.
- 2) To ensure that maximum or worst case, emission levels were measured, the following steps were taken:
  - (a) The test item was rotated so that all of its sides were exposed to the receiving antenna.
  - (b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
  - (c) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

Photographs of the test item setup with the Omni antenna are presented as Figures 2.

**4.2.3 Results** - The radiated emission levels, with the test item transmitting at 5275.0, 5300.0 and 5325.0MHz, are presented on data pages 10 through 12. As can be seen by the data the test item did meet the emissions limits of 15.407(b)(2).

## **5.0 CONCLUSIONS:**

It was determined that the Cascade Networks, Inc. Motorola Canopy Transciever, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15.407, Subpart C, Section 15.205 et seq. for Intentional Radiators, when tested per ANSI C63.4-2001.

## **6.0 CERTIFICATION:**

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the test item at the test date as operated by Cascade Networks, Inc. personnel. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

## **7.0 ENDORSEMENT DISCLAIMER:**

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.



TABLE I: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENG. INC.							Page: 1	
Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
<b>Equipment Type: ACCESSORIES, MISCELLANEOUS</b>								
XOAI	WAVE-TO-COAX ADAPTER	HEWLETT PACKARD	R281A	02119	26.5-65GHZ		NOTE 1	
XOB1	ADAPTER	HEWLETT PACKARD	K281C	10422	18-26.5GHZ		NOTE 1	
XZG3	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2421A03059	---		N/A	
<b>Equipment Type: AMPLIFIERS</b>								
APHO	POWER AMPLIFIER	HEWLETT PACKARD	11975A	2304A00322	2-8GHZ		NOTE 1	
APK3	PREAMPLIFIER	AGILENT TECHNOL	8449B	3008A01593	1-26.5GHZ	05/09/03 12		05/09/04
<b>Equipment Type: ANTENNAS</b>								
NHA0	STANDARD GAIN HORN ANTENNA	NARDA	640	---	8.2-12.4GHZ		NOTE 1	
NHE1	STANDARD GAIN HORN ANT. -	NARDA	639	---	12.4-18GHZ		NOTE 1	
NHG0	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ		NOTE 1	
NHG1	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ		NOTE 1	
NHH0	STANDARD GAIN HORN ANTENNA	NARDA	V637	---	26.5-40GHZ		NOTE 1	
NHH1	STANDARD GAIN HORN ANTENNA	NARDA	V637	---	26.5-40GHZ		NOTE 1	
<b>Equipment Type: ATTENUATORS</b>								
TVCO	VARIABLE ATTENUATOR	HEWLETT PACKARD	R382A	1281	26.5-40GHZ	07/29/02 12		07/29/03
TVDO	VARAIBLE ATTENUATOR	HEWLETT PACKARD	K382A	1066	18-26.5GHZ	07/29/02 12		07/29/03
<b>Equipment Type: CONTROLLERS</b>								
CDR2	COMPUTER, LAP-TOP AUTOMOTI	IBM	600M		300MHZ		N/A	
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---		N/A	
<b>Equipment Type: RECEIVERS</b>								
RAC2	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3638A08770	100HZ-22GHZ	02/10/03 12		02/10/04
RACD	RF PRESELECTOR	HEWLETT PACKARD	85685A	3010A01205	20HZ-2GHZ	02/10/03 12		02/10/04
RAE1	SPECTRUM ANALYZER (DCC-CEM	HEWLETT PACKARD	85660A	2209A01336	100HZ-22GHZ	02/06/03 12		02/06/04
RAF4	QUASIPeAK ADAPTER	HEWLETT PACKARD	85650A	2043A00320	0.01-1000MHZ	02/10/03 12		02/10/04
RAH0	FREQUENCY MIXER	HEWLETT PACKARD	11970K	2332A00270	18-26GHZ		N/A	
RAI0	FREQUENCY MIXER	HEWLETT PACKARD	11970A	2332A00292	26-40GHZ	06/02/03	N/A	
<b>Equipment Type: SIGNAL GENERATORS</b>								
GSB0	SWEEP OSCILLATOR	HEWLETT PACKARD	8350B	2309A02104	0.01-40GHZ	06/10/03 12		06/10/04
Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
GSBB	TUNING HEAD	HEWLETT PACKARD	83570A	2412A00512	18-26.5GHZ	06/09/03 12		06/09/04
GSBC	TUNING HEAD	HEWLETT PACKARD	83572B	2429A00203	26.5-40GHZ	06/09/03 12		06/09/04

Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable

Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

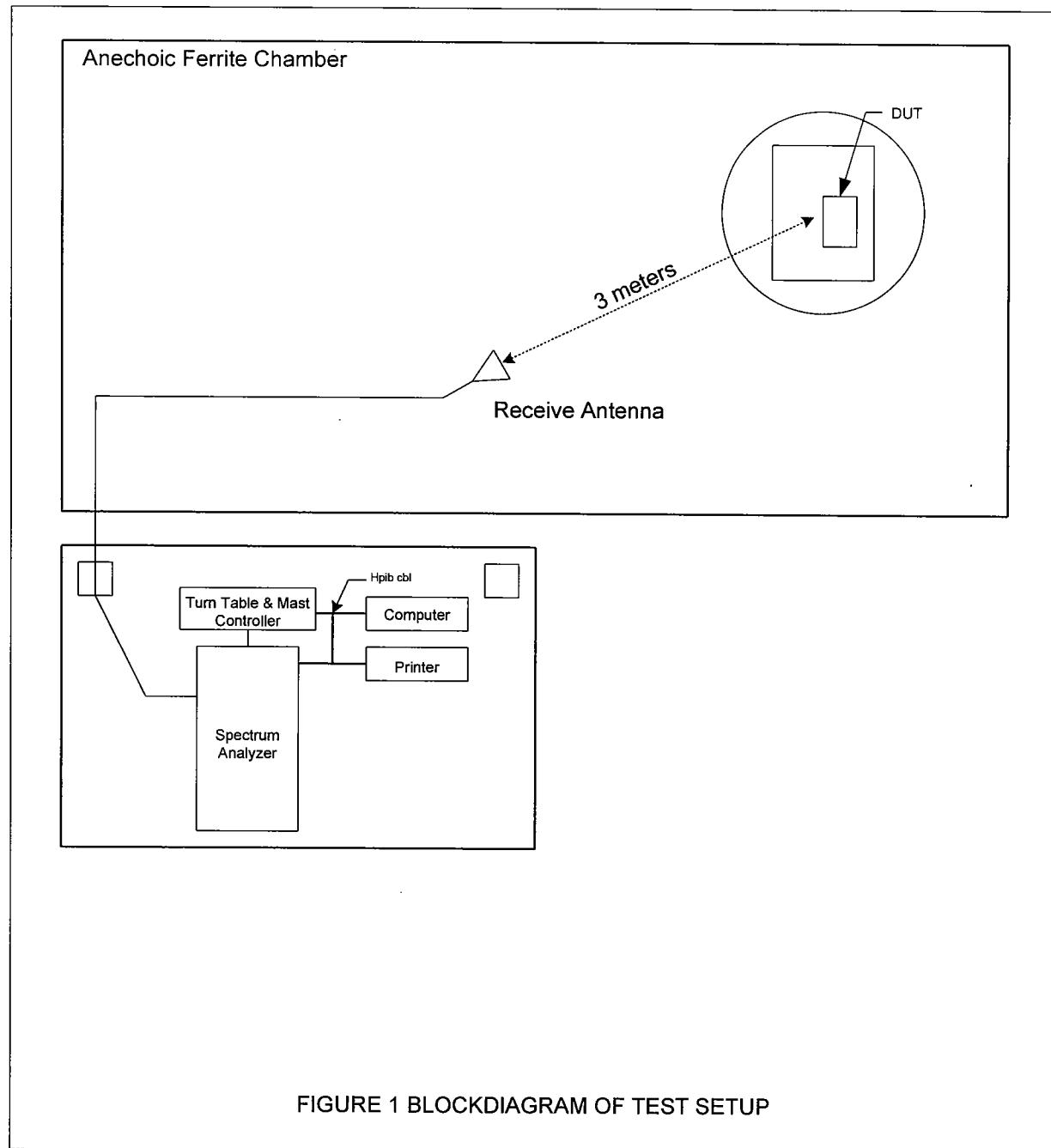


Figure 2



TEST SETUP FOR MEASUREMENT OF RADIATED EMISSIONS WITH THE OMNI ANTENNA

**MANUFACTURER :** Cascade Networks  
**MODEL :** Motorola Canopy Transceiver  
**ANTENNA :** OMNI  
**S/N :** None given  
**SPECIFICATION :** FCC-15C Radiated Emissions  
**DATE :** July 2, 2003  
**NOTES :**

**Low Channel**

FREQ. (MHz)	ANT. POL.	AMB.	RBW/VBW	MTR. READING (dBuV)	MATCHED SIGNAL (dBm)	ANT. GAIN	CABLE LOSS (dB)	EIRP MATCHED (dBm)	LIMIT (dBm)
10550.0	H		1M/10Hz	29.2	-39.2	14.3	-8.3	-33.2	-27
10550.0	V		1M/10Hz	28.2	-41.2	14.3	-8.3	-35.2	-27
15825.0	H		1M/10Hz	31.3	-55.3	12.9	-10.1	-52.5	-27
15825.0	V		1M/10Hz	31.3	-54.9	12.9	-10.1	-52.1	-27
21100.0	H	*	1M/3M	23.9	-53.0	12.0	0.0	-41.0	-27
21100.0	V	*	1M/3M	24.2	-53.0	12.0	0.0	-41.0	-27
26375.0	H	*	1M/3M	21.5	-59.6	14.6	0.0	-45.0	-27
26375.0	V	*	1M/3M	21.4	-61.4	14.6	0.0	-46.8	-27
31650.0	H	*	1M/3M	26.5	-62.3	16.0	0.0	-46.3	-27
31650.0	V	*	1M/3M	25.5	-62.1	16.0	0.0	-46.1	-27

CHECKED BY: Richard E. King  
 Richard E. King



**MANUFACTURER :** Cascade Networks  
**MODEL :** Motorola Canopy Transceiver  
**ANTENNA :** OMNI  
**S/N :** None given  
**SPECIFICATION :** FCC-15C Radiated Emissions  
**DATE :** July 2, 2003  
**NOTES :**

**Middle Channel**

FREQ. (MHz)	ANT. POL.	AMB.	RBW/VBW	MTR.	MATCHED		CABLE LOSS (dB)	EIRP MATCHED (dBm)	EIRP LIMIT (dBm)
				READING (dBuV)	SIGNAL (dBm)	ANT. GAIN			
10600.0	H		1M/10Hz	27.6	-41.8	14.3	-8.3	-35.8	-27
10600.0	V		1M/10Hz	26.8	-42.0	14.3	-8.3	-36.0	-27
15900.0	H		1M/10Hz	31.3	-54.8	12.9	-10.1	-51.9	-27
15900.0	V	*	1M/10Hz	30.8	-55.1	12.9	-10.1	-52.2	-27
21200.0	H	*	1M/3M	23.7	-55.0	12.0	0.0	-43.0	-27
21200.0	V	*	1M/3M	24.4	-54.8	12.0	0.0	-42.8	-27
26500.0	H	*	1M/3M	26.4	-58.0	14.7	0.0	-43.3	-27
26500.0	V	*	1M/3M	26.2	-59.0	14.7	0.0	-44.3	-27
31800.0	H	*	1M/3M	26.0	-63.3	16.1	0.0	-47.2	-27
31800.0	V	*	1M/3M	25.9	-63.8	16.1	0.0	-47.7	-27

CHECKED BY: Richard E. King  
Richard E. King

**MANUFACTURER :** Cascade Networks  
**MODEL :** Motorola Canopy Transceiver  
**ANTENNA :** OMNI  
**S/N :** None given  
**SPECIFICATION :** FCC-15C Radiated Emissions  
**DATE :** July 2, 2003  
**NOTES :**

**High Channel**

FREQ. (MHz)	ANT. POL.	AMB.	RBW/VBW	MTR.	MATCHED SIGNAL (dBm)	ANT. GAIN	CABLE LOSS (dB)	EIRP MATCHED (dBm)	EIRP LIMIT (dBm)
				READING (dBuV)					
10650.0	H		1M/10Hz	28.6	-41.8	14.4	-8.3	-35.7	-27
10650.0	V	*	1M/10Hz	26.4	-42.0	14.4	-8.3	-35.9	-27
15975.0	H		1M/10Hz	31.4	-54.8	13.0	-10.1	-51.9	-27
15975.0	V		1M/10Hz	31.2	-55.1	13.0	-10.1	-52.2	-27
21300.0	H	*	1M/3M	23.8	-53.4	12.1	0.0	-41.3	-27
21300.0	V	*	1M/3M	23.5	-54.3	12.1	0.0	-42.2	-27
26625.0	H	*	1M/3M	23.9	-61.6	14.7	0.0	-46.9	-27
26625.0	V	*	1M/3M	23.7	-61.3	14.7	0.0	-46.6	-27
31950.0	H	*	1M/3M	26.2	-63.1	16.1	0.0	-47.0	-27
31950.0	V	*	1M/3M	25.7	-64.1	16.1	0.0	-48.0	-27

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