

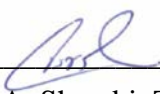
**DATE: 06 October 2011**

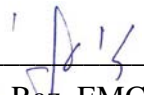
**I.T.L. (PRODUCT TESTING) LTD.**  
**FCC Radio Test Report**  
**for**  
**Mobix Wireless Solutions Ltd.**

**Equipment under test:**

**nDnet Concentrator**  
**C3000**

Written by:   
D. Shidlow, Documentation

Approved by:   
A. Sharabi, Test Engineer

Approved by:   
I. Raz, EMC Laboratory Manager

This report must not be reproduced, except in full, without the written permission of I.T.L. (Product Testing) Ltd.

This report relates only to items tested.

## Measurement/Technical Report for Mobix Wireless Solutions Ltd.

Equipment under test:  
**nDnet Concentrator**

**FCC ID:Z2K3000**

This report concerns:                      Original Grant:                      x  
Class I change:  
Class II change:

47CFR15 Section 15.249

Measurement procedure used is ANSI C63.4-2003.

Application for Certification  
prepared by:  
Ishaiahou Raz  
ITL (Product Testing) Ltd.  
Kfar Bin Nun  
D.N. Shimshon 99780  
Israel  
Tel: +972-8-918-6117  
Fax: +972-8-915-3101  
Email: sraz@itl.co.il

Applicant for this device:  
(different from "prepared by")  
Ofir Applebaum  
Mobix Wireless Solutions Ltd.  
4 Hatnufa St.  
Petach Tikva 4951  
Israel  
Tel: 972-73-222-5200  
Fax: 972-73-222-5256  
Email: ofir@mobix.com

# TABLE OF CONTENTS

<b>1.</b>	<b>GENERAL INFORMATION</b>	<b>4</b>
1.1	Administrative Information	4
1.2	List of Accreditations	5
1.3	Product Description	6
1.4	Test Methodology	6
1.5	Test Facility	6
1.6	Measurement Uncertainty	6
<b>2.</b>	<b>SYSTEM TEST CONFIGURATION</b>	<b>7</b>
2.1	Justification	7
2.2	EUT Exercise Software	7
2.3	Special Accessories	7
2.4	Equipment Modifications	7
2.5	Configuration of Tested System	7
<b>3.</b>	<b>CONDUCTED AND RADIATED MEASUREMENTS TEST SETUP PHOTOS</b>	<b>8</b>
<b>4.</b>	<b>CONDUCTED EMISSION</b>	<b>9</b>
4.1	Test Specification	9
4.2	Test Procedure	9
4.3	Test Results	9
4.4	Test Instrumentation Used, Conducted Measurement	14
<b>5.</b>	<b>AVERAGE FACTOR CALCULATION</b>	<b>15</b>
5.1	Test Instrumentation Used	16
<b>6.</b>	<b>FIELD STRENGTH OF FUNDAMENTAL</b>	<b>17</b>
6.1	Test Specification	17
6.2	Test Procedure	17
6.3	Test Results	17
6.4	Test Instrumentation Used, Field Strength of Fundamental	21
<b>7.</b>	<b>SPURIOUS RADIATED EMISSION 9 KHZ - 30 MHZ</b>	<b>22</b>
7.1	Test Specification	22
7.2	Test Procedure	22
7.3	Test results	22
7.4	Test Instrumentation Used, Radiated Measurements 9 kHz – 30 MHz	23
7.5	Field Strength Calculation	23
<b>8.</b>	<b>SPURIOUS RADIATED EMISSION 30 MHZ- 10 GHZ</b>	<b>24</b>
8.1	Test Specification	24
8.2	Test Procedure	24
8.3	Test Results	24
8.4	Test Instrumentation Used, Radiated Measurements 30 MHz – 10 GHz	26
8.5	Field Strength Calculation	26
<b>9.</b>	<b>BAND EDGE ATTENUATION</b>	<b>27</b>
9.1	Test Specification	27
9.2	Test Procedure	27
9.3	Test Results	27
9.4	Test Instrumentation Used, Band Edge Attenuation	31
<b>10.</b>	<b>APPENDIX A - CORRECTION FACTORS</b>	<b>32</b>
10.1	Correction factors for CABLE	32
10.2	Correction factors for CABLE	33
10.3	Correction factors for CABLE	34
10.4	Correction factors for LOG PERIODIC ANTENNA	35
10.5	Correction factors for LOG PERIODIC ANTENNA	36
10.6	Correction factors for BICONICAL ANTENNA	37
10.7	Correction factors for ACTIVE LOOP ANTENNA	38

## 1. General Information

### 1.1 Administrative Information

Manufacturer:	Mobix Wireless Solutions Ltd.
Manufacturer's Address:	4 Hatnufa St., Petah-Tikva, 49510 Israel Tel:972 73-222-5200 Fax:972 73-222-5256
Manufacturer's Representative:	Ofir Appelbaum
Equipment Under Test (E.U.T):	nDnet Concentrator
Equipment Model No.:	C3000
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	13.04.11
Start of Test:	13.04.11
End of Test:	14.04.11
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15, Subpart C, Section 15.249

## **1.2 List of Accreditations**

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

### **1.3 Product Description**

The n-DNet™ Concentrator is a key component in managing segments of the Mobix patented n-Dimensional Network. On one end, the Concentrator controls communications with a cluster of up to 1000 meters and on the other end it connects to the MDM Server. The Concentrator communicates with the meters over the simultaneous RF and PLC n-Dimensional mesh network. Mobix advanced n-DNet™ technology provides unprecedented advantages in data availability, solution topology and price/performance.

### **1.4 Test Methodology**

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

### **1.5 Test Facility**

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing September 3, 2009).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

### **1.6 Measurement Uncertainty**

#### **Conducted Emission**

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) 0.15 – 30 MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 3.44 dB

#### **Radiated Emission**

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB

## 2. System Test Configuration

### 2.1 *Justification*

The E.U.T. was tested in normal operation mode set to transmit in frequency of 915 MHz.

### 2.2 *EUT Exercise Software*

The E.U.T. was operated with normal operation software version 1.915.t.

### 2.3 *Special Accessories*

No special accessories were needed to achieve compliance.

### 2.4 *Equipment Modifications*

No special modifications were needed to achieve compliance.

### 2.5 *Configuration of Tested System*

The configuration of the tested system is described below.



**Figure 1. Configuration of Tested System**

### 3. Conducted and Radiated Measurements Test Setup Photos



**Figure 2. Conducted Emission Test**



**Figure 3. Radiated Emission Test**



## 4. Conducted Emission

### 4.1 Test Specification

F.C.C., Part 15, Subpart C

### 4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50  $\mu$ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

### 4.3 Test Results

JUDGEMENT: Passed by 4.8dB

The margin between the emission levels and the specification limit is, in the worst case, 4.8 dB for the phase line at 11.06 MHz and 16.7 dB at 4.06 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 4* to *Figure 7*.

TEST PERSONNEL:

Tester Signature: \_\_\_\_\_

Date: 02.10.11

Typed/Printed Name: A. Sharabi

## Conducted Emission

E.U.T Description    nDnet Concentrator  
Type                    C3000  
Serial Number:        Not Designated

Specification:    F.C.C., Part 15, Subpart C  
Lead:              Phase  
Detectors:        Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.204934	52.1	47.5	-16.0	37.2	-16.2	0.0
2	0.438691	48.5	45.8	-11.4	36.8	-10.3	0.0
3	3.751044	42.0	37.7	-18.3	29.9	-16.1	0.0
4	8.501745	33.9	29.6	-30.4	21.4	-28.6	0.0
5	11.060667	45.6	45.2	-14.8	45.2	-4.8	0.0
6	22.123711	32.7	30.3	-29.7	26.8	-23.2	0.0

**Figure 4. Detectors: Peak, Quasi-peak, Average**

*Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*

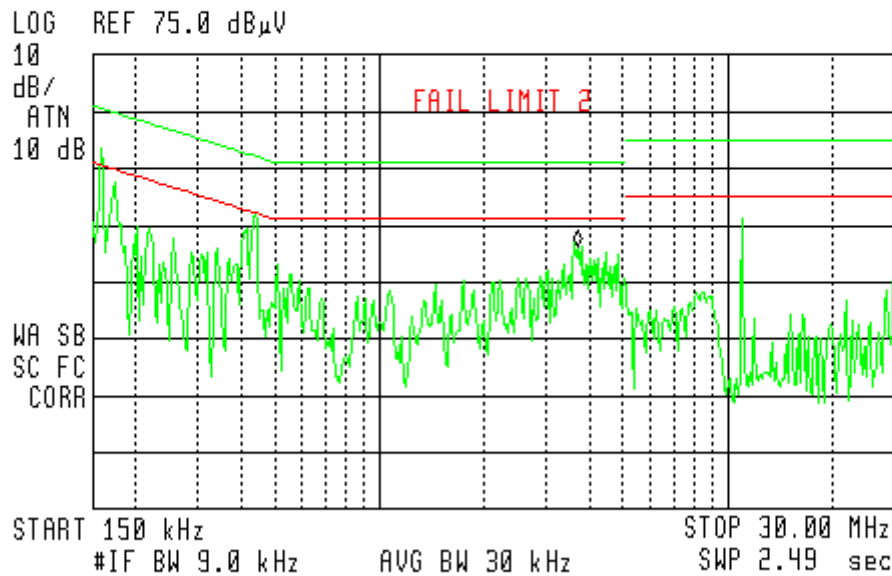
## Conducted Emission

E.U.T Description    nDnet Concentrator  
Type                    C3000  
Serial Number:        Not Designated

Specification:    F.C.C., Part 15, Subpart C  
Lead:              Phase  
Detectors:        Peak, Quasi-peak, Average



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 3.66 MHz  
41.18 dBμV



**Figure 5. Detectors: Peak, Quasi-peak, Average**

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.

## Conducted Emission

E.U.T Description      nDnet Concentrator  
Type                      C3000  
Serial Number:          Not Designated

Specification:    F.C.C., Part 15, Subpart C  
Lead:              Neutral  
Detectors:        Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.217012	51.0	45.4	-17.6	31.5	-21.5	0.0
2	0.568882	36.4	33.4	-22.6	25.1	-20.9	0.0
3	1.442669	35.2	31.2	-24.8	22.3	-23.7	0.0
4	4.063156	41.6	37.3	-18.6	29.3	-16.7	0.0
5	8.674081	35.2	30.1	-29.9	22.3	-27.7	0.0
6	16.498817	29.7	28.4	-31.6	27.5	-22.5	0.0

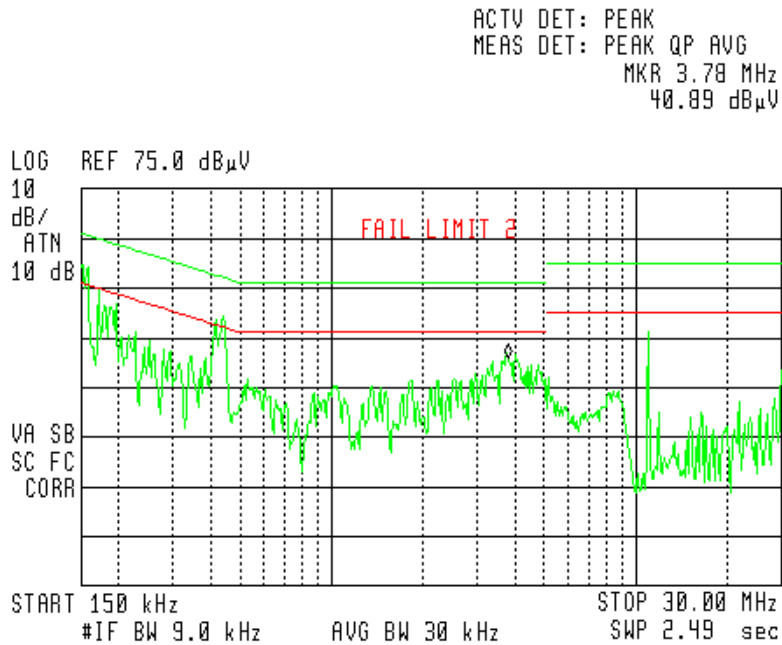
**Figure 6. Detectors: Peak, Quasi-peak, AVERAGE .**

*Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*

## Conducted Emission

E.U.T Description      nDnet Concentrator  
Type                      C3000  
Serial Number:        Not Designated

Specification:    F.C.C., Part 15, Subpart C  
Lead:              Neutral  
Detectors:        Peak, Quasi-peak, Average



**Figure 7. Detectors: Peak, Quasi-peak, AVERAGE .**

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.

#### **4.4 Test Instrumentation Used, Conducted Measurement**

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Last Calibration Date</b>	<b>Period</b>
LISN	Fischer	FCC-LISN-2A	127	March 3, 2011	1 Year
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 Year
RF Filter Section	HP	85420E	3705A00248	November 24, 2010	1 Year
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

## 5. Average Factor Calculation

1. Burst duration = 64msec
2. Time between bursts = 10sec > 100msec
3. Average Factor =  $20 \log \left[ \frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100\text{msec}} \times \text{Num of burst within 100msec} \right]$

$$\text{Average Factor} = 20 \log \left[ \frac{64}{100} \times 1 \right] = -3.87 \text{ dB}$$

NOTE – [Pulse duration /Pulse period] considered 1 as worst case since unit operates with FSK Modulation

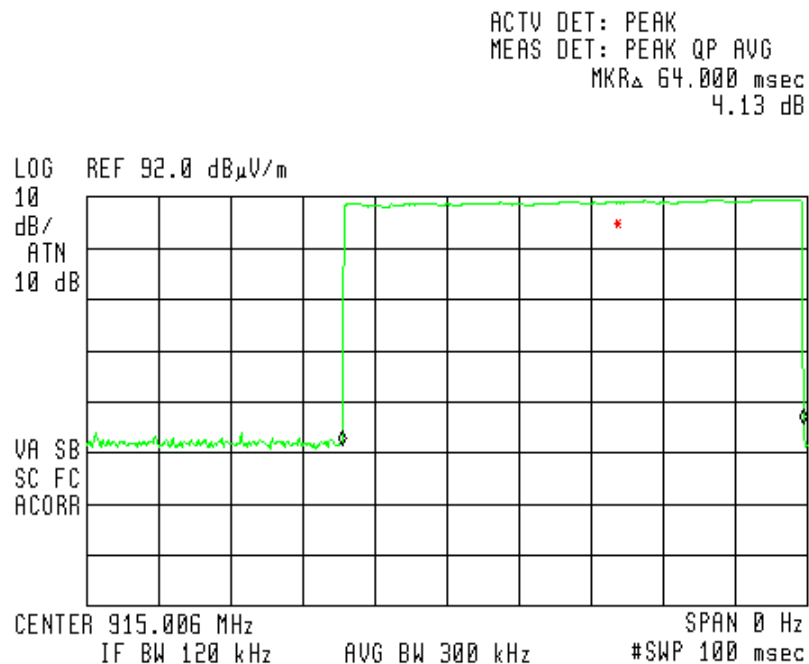


Figure 8. Burst duration within 100msec

## 5.1 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 Year
RF Filter Section	HP	85420E	3705A00248	November 24, 2010	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A



## 6. Field Strength of Fundamental

### 6.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.249(a)

### 6.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3. The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.

The EMI receiver was set to the E.U.T. Fundamental Frequency (915.0 MHz) and Peak Detection. The turntable and antenna mast were adjusted for maximum level reading on the EMI receiver. The measurement was performed for vertical and horizontal polarizations of the test antenna.


### 6.3 Test Results

JUDGEMENT: Passed by 6.10 dB

The EUT met the FCC Part 15, Subpart C, Section 15.249(a) specification requirements.

See additional details in *Figure 9* to *Figure 11*.

TEST PERSONNEL:

Tester Signature: 

Date: 02.10.011

Typed/Printed Name: A. Sharabi

## Field Strength of Fundamental

E.U.T Description    nDnet Concentrator  
Model Number        C3000  
Serial Number:        Not Designated

Specification: F.C.C., Part 15, Subpart C 15.249(a)

Antenna Polarization: Horizontal/Vertical

Test Distance: 3 meters

Detector: Peak

Freq. (MHz)	Pol. V/H	Peak Reading (dBμV/m)	Average Result (dBμV/m)	Specification (dBμV/m)	Margin (dB)
915.0	H	89.77	85.9	93.98	-8.08
915.0	V	91.75	87.88	93.98	-6.10

**Figure 9. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL/VERTICAL. Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Reading” includes “Correction Factors.

“Correction Factors” = Antenna Correction Factor + Cable Loss.

“Average Result” = Peak Reading + Average Factor

## Field Strength of Fundamental

E.U.T Description    nDnet Concentrator  
Model Number        C3000  
Serial Number:       Not Designated

Specification: F.C.C., Part 15, Subpart C 15.249(a)

Antenna Polarization: Vertical

Test Distance: 3 meters

Detector: Peak



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 914.9550 MHz  
91.75 dB $\mu$ V/m

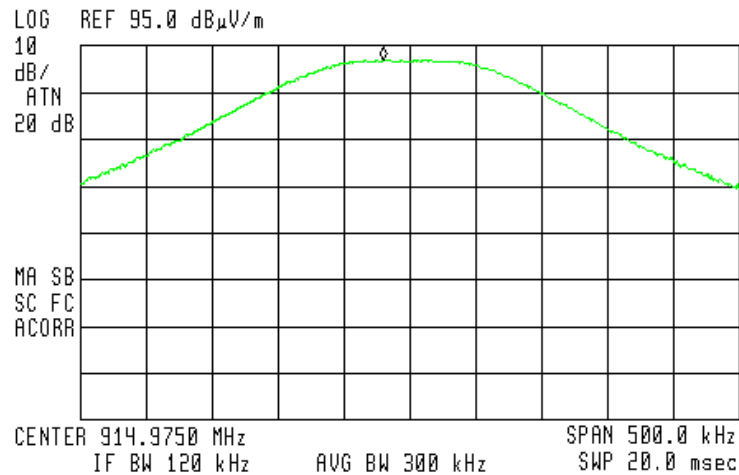


Figure 10. Antenna polarization vertical

## Field Strength of Fundamental

E.U.T Description    nDnet Concentrator  
Model Number        C3000  
Serial Number:       Not Designated

Specification: F.C.C., Part 15, Subpart C 15.249(a)

Antenna Polarization: Horizontal

Test Distance: 3 meters

Detector: Peak

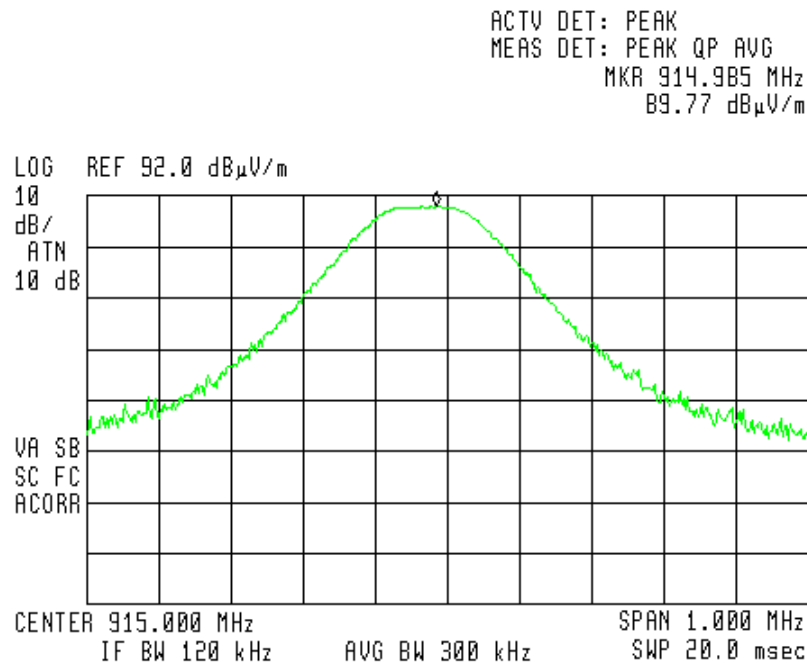


Figure 11. Antenna polarization horizontal

#### 6.4 *Test Instrumentation Used, Field Strength of Fundamental*

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A

## 7. Spurious Radiated Emission 9 kHz - 30 MHz

### 7.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.249(b)

### 7.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 1.

The frequency range 9kHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30 MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

The E.U.T. was operated in continuous transmission to enable better detection of signals.

### 7.3 Test results

JUDGEMENT: Passed

No signals were detected in the frequency range of 9 kHz – 30 MHz.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 15.249 specification.

TEST PERSONNEL:

Tester Signature: 

Date: 02.10.11

Typed/Printed Name: A. Sharabi

#### 7.4 *Test Instrumentation Used, Radiated Measurements* 9 kHz – 30 MHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 year
RF Section	HP	85420E	3705A00248	November 24, 2010	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2010	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

#### 7.5 *Field Strength Calculation*

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dB $\mu$ V/m]  
 RA: Receiver Amplitude [dB $\mu$ V]  
 AF: Receiving Antenna Correction Factor [dB/m]  
 CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dB $\mu$ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB $\mu$ V

No external pre-amplifiers are used.

## 8. Spurious Radiated Emission 30 MHz- 10 GHz

### 8.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.249(b)

### 8.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 1.

The emission levels were compared to the requirement of Section 15.249.

In the frequency range 30 MHz - 2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 2.9 - 10 GHz, a spectrum analyzer including a low noise amplifier was used. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz. During average measurements, the I.F. bandwidth was 1 MHz and video bandwidth was 100 Hz.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.).

The test distance was 3 meters.

### 8.3 Test Results

JUDGEMENT: Passed by 7.76 dB

The margin between the emission level and the specification limit is 7.76 B in the worst case at the frequency of 1829.00 MHz, vertical polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C Section 15.249, specification.

TEST PERSONNEL:

Tester Signature: 

Date: 02.10.11

Typed/Printed Name: A. Sharabi



## Spurious Radiated Emission 30 MHz- 10 GHz

E.U.T Description    nDnet Concentrator  
Type                      C3000  
Serial Number:        Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical    Frequency range: 30 MHz to 10.0 GHz  
Test Distance: 3 meters                            Detector: Peak  
Operation Frequency: 915.0 MHz

<b>Freq.</b> (MHz)	<b>Pol.</b> V/H	<b>Peak Reading</b> (dB $\mu$ V/m)	<b>Average Results</b> (dB $\mu$ V/m)	<b>Average Specification</b> (dB $\mu$ V/m)	<b>Margin</b> (dB)
1829.00	V	49.9	46.03	53.79	-7.76
1829.00	H	45.4	41.53	53.79	-12.26

**Figure 12. Spurious Radiated Emission**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Amp” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

“Average Results” = Peak Reading + Average Factor

#### 8.4 Test Instrumentation Used, Radiated Measurements 30 MHz – 10 GHz

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 Year
RF Filter Section	HP	85420E	3705A00248	November 24, 2010	1 Year
Antenna Biconical	ETS	3109	002-3244	August 1, 2010	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2010	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 21, 2011	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

#### 8.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[\text{dB}\mu\text{V/m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

FS: Field Strength [dBμV/m]  
 RA: Receiver Amplitude [dBμV]  
 AF: Receiving Antenna Correction Factor [dB/m]  
 CF: Cable Attenuation Factor [dB]

## 9. Band Edge Attenuation

### 9.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.249(e)

### 9.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3. The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.

The EMI receiver was set to the E.U.T. Fundamental Frequency and Peak Detection. The turntable and antenna mast were adjusted for maximum level reading on the EMI receiver. The measurement was performed for vertical and horizontal polarizations of the test antenna.

### 9.3 Test Results

JUDGEMENT: Passed by 0.01 dB

The EUT met the FCC Part 15, Subpart C, Section 15.249(e) specification requirements.

See additional details in *Figure 13* to *Figure 15*.

TEST PERSONNEL:

Tester Signature: 

Date: 02.10.11

Typed/Printed Name: A. Sharabi

## Band Edge Attenuation

E.U.T Description    nDnet Concentrator  
Model Number        C3000  
Serial Number:       Not Designated

Specification: F.C.C., Part 15, Subpart C 15.249(e)

<b>Freq.</b> (MHz)	<b>Reading</b> (dBc)	<b>Specification</b> (dBc)	<b>Margin</b> (dB)
916.56	50.01	50	-0.01
913.57	50.18	50	-0.18

**Figure 13. Band Edge Attenuation**

## Band Edge Attenuation

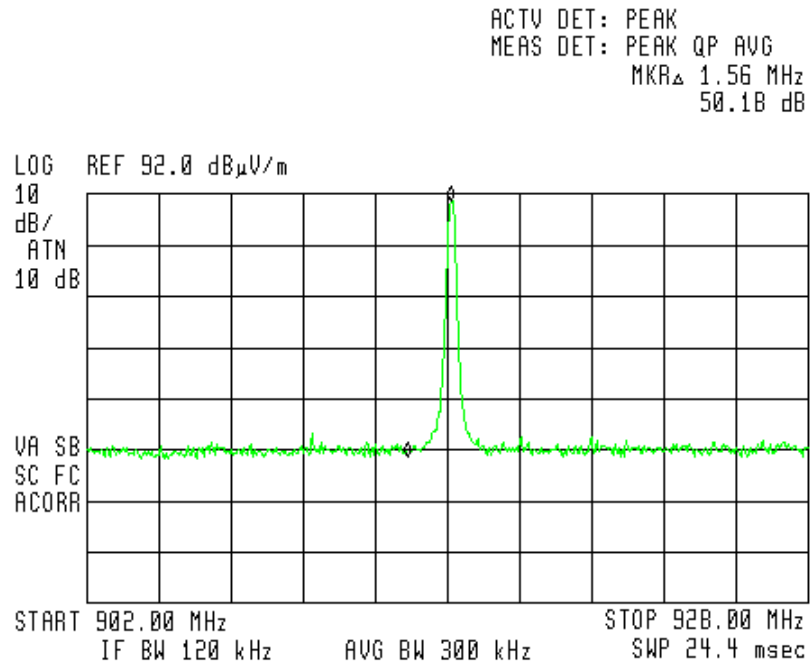


Figure 14. Band Edge Attenuation

## Band Edge Attenuation

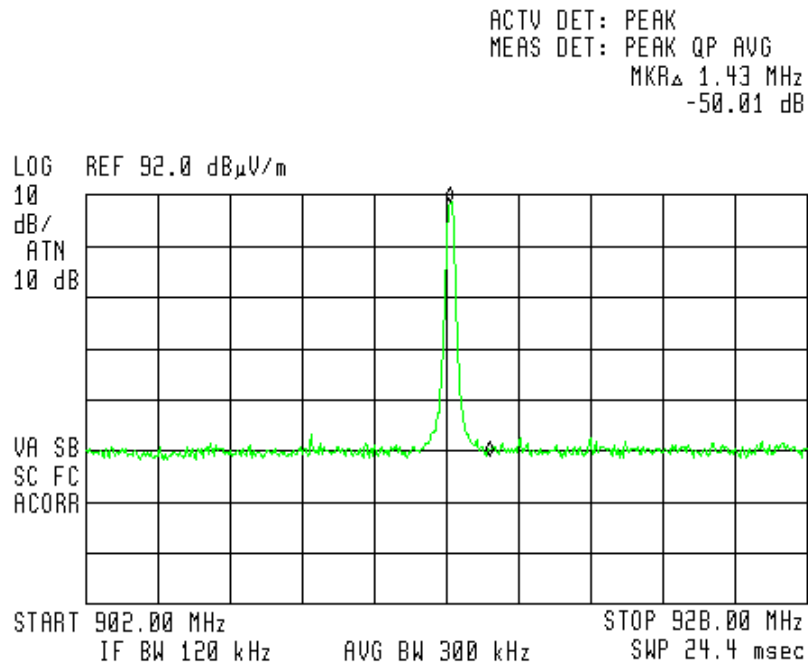


Figure 15. Band Edge Attenuation

#### 9.4 Test Instrumentation Used, Band Edge Attenuation

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	November 24, 2010	1 Year
RF Filter Section	HP	85420E	3705A00248	November 24, 2010	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

## 10. APPENDIX A - CORRECTION FACTORS

### 10.1 Correction factors for CABLE from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

#### NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".



**10.2 Correction factors for CABLE**  
**from EMI receiver**  
**to test antenna**  
**at 3 meter range.**

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

**NOTES:**

- 1. The cable type is RG-8.*
- 2. The overall length of the cable is 10 meters.*

**10.3 Correction factors for CABLE**  
**from spectrum analyzer**  
**to test antenna above 2.9 GHz**

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

**NOTES:**

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.
2. The cable is used for measurements above 2.9 GHz.
3. The overall length of the cable is 10 meters.

## 12.6 Correction factors for LOG PERIODIC ANTENNA

**Type LPD 2010/A  
at 3 and 10 meter ranges.**

### Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

### Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

#### NOTES:

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range,  
and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission  
Test EMI Receiver".

#### 10.4 Correction factors for

#### LOG PERIODIC ANTENNA

**Type SAS-200/511  
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

#### NOTES:

1. Antenna serial number is 253.
2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.
3. The files mentioned above are located on the disk marked "Antenna Factors".

**10.5      Correction factors for *BICONICAL ANTENNA***  
**Type 3109,**  
**at 3 meter range**

<b>FREQUENCY</b>	<b>AFF</b>
<b>(MHz)</b>	<b>(dB/m)</b>
30.0	13.3
40.0	12.7
50.0	11.0
60.0	9.2
70.0	10.0
80.0	7.2
90.0	7.9
100.0	9.4
120.0	11.9
140.0	13.1
160.0	12.3
180.0	12.4
200.0	14.8
250.0	15.3
300.0	17.9

*NOTE:*

*1. Antenna serial number is 002-3244.*

## 10.6 Correction factors for *ACTIVE LOOP ANTENNA*

**Model 6502**

**S/N 9506-2950**

<b>FREQUENCY</b>	<b>Magnetic Antenna Factor</b>	<b>Electric Antenna Factor</b>
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2