TEST REPORT

Report No.: HK12061673-1

Lenbrook Industries Limited

Application
For
Certification
(Original Grant)
(FCC ID: Q2O-N100WSMP)
(IC: 152B-N100WSMP)

Transceiver

Prepared and Checked by:

Signed On File
Wong Cheuk Ho, Herbert
Engineer

Approved by:

Digitally signed by Kenneth Wong
Location: Intertek Testing Services Hong Kong Ltd.

Wong Kwok Yeung, Kenneth
Lead Engineer
Date: October 22, 2012

GENERAL INFORMATION

Lenbrook Industries Limited
BRAND NAME: Bluesound, MODEL: NODE N100

FCC ID: Q2O-N100WSMP
IC: 152B-N100WSMP

Grantee:	Lenbrook Industries Limited
Grantee Address:	Room D, 11th Floor, Wing Cheong Commercial Building, 19-25 Jervois Street, Central, Hong Kong.
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Manufacturer:	Dongguan Kwan Hong Electronics Co., Ltd.
Manufacturer Address:	KwanHong Building, Xiao Bian 2nd Industrial Zone, ChangAn, DongGuan, China.
Brand Name:	Bluesound
Model:	NODE N100
Type of EUT:	Transceiver
Description of EUT:	Wireless Streaming Music Player
Serial Number:	N/A
FCC ID / IC:	Q2O-N100WSMP / 152B-N100WSMP
Date of Sample Submitted:	June 29, 2012
Date of Test:	August 24, 2012
Report No.:	HK12061673-1
Report Date:	October 22, 2012
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

SUMMARY OF TEST RESULT

Lenbrook Industries Limited
BRAND NAME: Bluesound, MODEL: NODE N100

FCC ID: Q2O-N100WSMP
IC: 152B-N100WSMP

TEST SPECIFICATION	REFERENCE	RESULTS
Maximum Peak Output Power	15.247(b), (c) / RSS-210 A8.4	N/A
Hopping Channel Carrier Frequencies Separation	15.247(e) / RSS-210 A8.1	N/A
20dB Bandwidth of the Hopping Channel	15.247(a) / RSS-210 A8.1	N/A
Number of Hopping Frequencies	15.247(e) / RSS-210 A8.1	N/A
Average Time of Occupancy of Hopping Frequency	15.247(e) / RSS-210 A8.1	N/A
Antenna Conducted Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
Radiated Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
RF Exposure Compliance	15.247(i) / RSS-Gen 5.6	N/A
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 7.2.4	Pass
Transmitter Field Strength	15.227 / RSS-310 3.8	N/A
Transmitter Field Strength	15.229 / RSS-210 A2.7	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(a) / RSS-210 A1.1.1	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(e) / RSS-210 A1.1.5	N/A
Transmitter Field Strength and Bandwidth Requirement	15.239 / RSS-210 A2.8	N/A
Transmitter Field Strength and Bandwidth Requirement	15.249 / RSS-210 A2.9	Pass
Transmitter Field Strength and Bandwidth Requirement	15.235 / RSS-310 3.9	N/A
Receiver / Digital Device Radiated Emissions	15.109 / RSS-210 2.5	N/A
Digital Device Conducted Emissions	15.107 / ICES-003	N/A

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the pervisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

Table of Contents

1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a Wireless Streaming Music Player equipped with a 2.4GHz WiFi transceiver which is operating in the frequency range between 2412MHz and 2462MHz (11 channels with 5 MHz channel spacing).

The EUT can accept digitized audio signal from LAN network, USB flash and wireless WiFi. The line-level analog audio signal can be obtained at the RCA output socket, while an optical digital audio output (TOSLINK) is also provided.

In 802.11b mode, the EUT employs Direct-Sequence Spread Spectrum (DSSS) modulation with maximum bit rate 11Mbps.

In 802.11g mode, the EUT employs Orthogonal Frequency Division Multiplexing (OFDM) modulation with maximum bit rate 54Mbps.

In 802.11n mode, the EUT employs modulation type according to MCSn (Modulation and Coding Scheme) setting where n is 0 to 7, with maximum bit rate 65Mbps at n=7. The EUT can only support 20MHz bandwidth modulation in 802.11n.

The RF output power is fixed at +10dBm during test for all types of modulation.

The EUT can be powered by 100-240VAC (universal input).

Antenna Type : Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been placed on file with the FCC and IC.

2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2009).

The device was powered by 120VAC.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

All configuration and setting of data rate for each 802.11b/802.11g/802.11n mode have been considered and worst case test data are shown on this test report.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Equipment Modification

Any modifications installed previous to testing by Lenbrook Industries Limited will be incorporated in each production model sold/leased in the United States and Canada.

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

2.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

1. 1X Audio Cable with 2.0m long and connected with 47kΩ terminator (Provided by Intertek)
2. 1X Ethernet Cable with 2.0m long (Provided by Applicant)
3. 1X USB mass storage Drive (Model: DT100/4GB Kingston) (Provided by Intertek)
4. Software: Syslinux 4.02, ETF GUI (Provided by Applicant)

3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG - AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

RR = 18.0 dBµV
LF = 9.0 dB

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 2483.500 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 3.4 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 23.132 MHz

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 4.7 dB

Applicant: Lenbrook Industries Limited Date of Test: August 24, 2012
Model: NODE N100
Worst-Case Operating Mode: Transmitting (802.11b DSSS, 11Mbps)

Table 1

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2412.000	88.6	33	29.4	85.0	94.0	-9.0
V	4824.000	43.7	33	34.9	45.6	54.0	-8.4
V	7236.000	35.5	33	37.9	40.4	54.0	-13.6
V	9648.000	35.7	33	40.4	43.1	54.0	-10.9
V	12060.000	38.5	33	40.5	46.0	54.0	-8.0
V	14472.000	40.1	33	40.0	47.1	54.0	-6.9

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2412.000	108.6	33	29.4	105.0	114.0	-9.0
V	4824.000	59.1	33	34.9	61.0	74.0	-13.0
V	7236.000	43.5	33	37.9	48.4	74.0	-25.6
V	9648.000	42.0	33	40.4	49.4	74.0	-24.6
V	12060.000	42.5	33	40.5	50.0	74.0	-24.0
V	14472.000	44.1	33	40.0	51.1	74.0	-22.9

NOTES: 1. Average Detector and Peak Detector are used for emission measurement.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Lenbrook Industries Limited Date of Test: August 24, 2012
Model: NODE N100
Worst-Case Operating Mode: Transmitting (802.11b DSSS, 11Mbps)

Table 2

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2437.000	88.9	33	29.4	85.3	94.0	-8.7
V	4874.000	45.7	33	34.9	47.6	54.0	-6.4
V	7311.000	35.9	33	37.9	40.8	54.0	-13.2
V	9748.000	35.7	33	40.4	43.1	54.0	-10.9
V	12185.000	38.3	33	40.5	45.8	54.0	-8.2
V	14622.000	41.8	33	38.4	47.2	54.0	-6.8

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2437.000	109.1	33	29.4	105.5	114.0	-8.5
V	4874.000	60.3	33	34.9	62.2	74.0	-11.8
V	7311.000	43.7	33	37.9	48.6	74.0	-25.4
V	9748.000	42.1	33	40.4	49.5	74.0	-24.5
V	12185.000	42.9	33	40.5	50.4	74.0	-23.6
V	14622.000	46.2	33	38.4	51.6	74.0	-22.4

NOTES: 1. Average Detector and Peak Detector are used for emission measurement.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Lenbrook Industries Limited Date of Test: August 24, 2012
Model: NODE N100
Worst-Case Operating Mode: Transmitting (802.11b DSSS, 11Mbps)

Table 3

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2462.000	91.7	33	29.4	88.1	94.0	-5.9
V	4924.000	46.6	33	34.9	48.5	54.0	-5.5
V	7386.000	35.3	33	37.9	40.2	54.0	-13.8
V	9848.000	36.2	33	40.4	43.6	54.0	-10.4
V	12310.000	37.5	33	40.5	45.0	54.0	-9.0
V	14772.000	41.9	33	38.4	47.3	54.0	-6.7

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2462.000	111.6	33	29.4	108.0	114.0	-6.0
V	4924.000	61.9	33	34.9	63.8	74.0	-10.2
V	7386.000	43.5	33	37.9	48.4	74.0	-25.6
V	9848.000	41.9	33	40.4	49.3	74.0	-24.7
V	12310.000	43.1	33	40.5	50.6	74.0	-23.4
V	14772.000	52.4	33	38.4	57.8	74.0	-16.2

NOTES: 1. Average Detector and Peak Detector are used for emission measurement.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Lenbrook Industries Limited Date of Test: August 24, 2012
Model: NODE N100
Worst-Case Operating Mode: Transmitting (802.11g OFDM, 54Mbps)

Table 4

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2412.000	66.9	33	29.4	63.3	94.0	-30.7
V	4824.000	35.2	33	34.9	37.1	54.0	-16.9
V	7236.000	35.1	33	37.9	40.0	54.0	-14.0
V	9648.000	35.4	33	40.4	42.8	54.0	-11.2
V	12060.000	38.3	33	40.5	45.8	54.0	-8.2
V	14472.000	39.9	33	40.0	46.9	54.0	-7.1

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2412.000	104.6	33	29.4	101.0	114.0	-13.0
V	4824.000	48.1	33	34.9	50.0	74.0	-24.0
V	7236.000	45.1	33	37.9	50.0	74.0	-24.0
V	9648.000	43.2	33	40.4	50.6	74.0	-23.4
V	12060.000	42.9	33	40.5	50.4	74.0	-23.6
V	14472.000	44.1	33	40.0	51.1	74.0	-22.9

NOTES: 1. Average Detector and Peak Detector are used for emission measurement.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Lenbrook Industries Limited Date of Test: August 24, 2012
Model: NODE N100
Worst-Case Operating Mode: Transmitting (802.11g OFDM, 54Mbps)

Table 5

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2437.000	66.6	33	29.4	63.0	94.0	-31.0
V	4874.000	35.7	33	34.9	37.6	54.0	-16.4
V	7311.000	35.4	33	37.9	40.3	54.0	-13.7
V	9748.000	35.5	33	40.4	42.9	54.0	-11.1
V	12185.000	38.5	33	40.5	46.0	54.0	-8.0
V	14622.000	41.7	33	38.4	47.1	54.0	-6.9

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2437.000	106.3	33	29.4	102.7	114.0	-11.3
V	4874.000	49.7	33	34.9	51.6	74.0	-22.4
V	7311.000	45.7	33	37.9	50.6	74.0	-23.4
V	9748.000	42.7	33	40.4	50.1	74.0	-23.9
V	12185.000	43.1	33	40.5	50.6	74.0	-23.4
V	14622.000	45.7	33	38.4	51.1	74.0	-22.9

NOTES: 1. Average Detector and Peak Detector are used for emission measurement.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Lenbrook Industries Limited Date of Test: August 24, 2012
Model: NODE N100
Worst-Case Operating Mode: Transmitting (802.11g OFDM, 54Mbps)

Table 6

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2462.000	68.9	33	29.4	65.3	94.0	-28.7
V	4924.000	36.6	33	34.9	38.5	54.0	-15.5
V	7386.000	35.7	33	37.9	40.6	54.0	-13.4
V	9848.000	35.2	33	40.4	42.6	54.0	-11.4
V	12310.000	38.3	33	40.5	45.8	54.0	-8.2
V	14772.000	41.5	33	38.4	46.9	54.0	-7.1

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2462.000	107.6	33	29.4	104.0	114.0	-10.0
V	4924.000	51.6	33	34.9	53.5	74.0	-20.5
V	7386.000	46.2	33	37.9	51.1	74.0	-22.9
V	9848.000	43.2	33	40.4	50.6	74.0	-23.4
V	12310.000	42.7	33	40.5	50.2	74.0	-23.8
V	14772.000	46.4	33	38.4	51.8	74.0	-22.2

NOTES: 1. Average Detector and Peak Detector are used for emission measurement.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Lenbrook Industries Limited Date of Test: August 24, 2012
Model: NODE N100
Worst-Case Operating Mode: Transmitting (802.11n OFDM, 65Mbps, 20MHz Bandwidth)

Table 7

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2412.000	68.6	33	29.4	65.0	94.0	-29.0
V	4824.000	33.1	33	34.9	35.0	54.0	-19.0
V	7236.000	33.6	33	37.9	38.5	54.0	-15.5
V	9648.000	35.1	33	40.4	42.5	54.0	-11.5
V	12060.000	36.6	33	40.5	44.1	54.0	-9.9
V	14472.000	39.6	33	40.0	46.6	54.0	-7.4

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2412.000	101.2	33	29.4	97.6	114.0	-16.4
V	4824.000	46.7	33	34.9	48.6	74.0	-25.4
V	7236.000	41.2	33	37.9	46.1	74.0	-27.9
V	9648.000	42.1	33	40.4	49.5	74.0	-24.5
V	12060.000	43.1	33	40.5	50.6	74.0	-23.4
V	14472.000	44.1	33	40.0	51.1	74.0	-22.9

NOTES: 1. Average Detector and Peak Detector are used for emission measurement.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Lenbrook Industries Limited Date of Test: August 24, 2012
Model: NODE N100
Worst-Case Operating Mode: Transmitting (802.11n OFDM, 65Mbps, 20MHz Bandwidth)

Table 8

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2437.000	72.9	33	29.4	69.3	94.0	-24.7
V	4874.000	33.5	33	34.9	35.4	54.0	-18.6
V	7311.000	34.1	33	37.9	39.0	54.0	-15.0
V	9748.000	34.7	33	40.4	42.1	54.0	-11.9
V	12185.000	36.9	33	40.5	44.4	54.0	-9.6
V	14622.000	40.6	33	38.4	46.0	54.0	-8.0

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2437.000	103.6	33	29.4	100.0	114.0	-14.0
V	4874.000	47.1	33	34.9	49.0	74.0	-25.0
V	7311.000	41.1	33	37.9	46.0	74.0	-28.0
V	9748.000	42.2	33	40.4	49.6	74.0	-24.4
V	12185.000	42.6	33	40.5	50.1	74.0	-23.9
V	14622.000	45.6	33	38.4	51.0	74.0	-23.0

NOTES: 1. Average Detector and Peak Detector are used for emission measurement.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Lenbrook Industries Limited Date of Test: August 24, 2012
Model: NODE N100
Worst-Case Operating Mode: Transmitting (802.11n OFDM, 65Mbps, 20MHz Bandwidth)

Table 9

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2462.000	73.6	33	29.4	70.0	94.0	-24.0
V	4924.000	34.6	33	34.9	36.5	54.0	-17.5
V	7386.000	33.1	33	37.9	38.0	54.0	-16.0
V	9848.000	34.6	33	40.4	42.0	54.0	-12.0
V	12310.000	37.1	33	40.5	44.6	54.0	-9.4
V	14772.000	41.1	33	38.4	46.5	54.0	-7.5

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2462.000	105.6	33	29.4	102.0	114.0	-12.0
V	4924.000	48.1	33	34.9	50.0	74.0	-24.0
V	7386.000	41.1	33	37.9	46.0	74.0	-28.0
V	9848.000	37.2	33	40.4	44.6	74.0	-29.4
V	12310.000	42.5	33	40.5	50.0	74.0	-24.0
V	14772.000	45.7	33	38.4	51.1	74.0	-22.9

NOTES: 1. Average Detector and Peak Detector are used for emission measurement.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

4.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 Product Labelling

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 Technical Specifications

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States and Canada.

8.0 Miscellaneous Information

The miscellaneous information includes details of the test procedure.

8.1 Measured Bandwidth

From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.4 (2009) for frequency being measured.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209, whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

Peak Measurement (802.11b DSSS, 11Mbps)

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=105.0 dBµV/m - 41.1 dB
=63.9 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=85.0 dBµV/m - 41.1 dB
=43.9 dBµV/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=108.0 dBµV/m - 55.2 dB
=52.8 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=88.1 dBµV/m - 55.2 dB
=32.9 dBµV/m

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/m (Average Limit).

Peak Measurement (802.11g OFDM, 54Mbps)

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=101.0 dBµV/m - 35.3 dB
=65.7 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=63.3 dBµV/m - 35.3 dB
=28.0 dBµV/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=104.0 dBµV/m - 33.4 dB
=70.6 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=65.3 dBµV/m - 33.4 dB
=31.9 dBµV/m

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/m (Average Limit).

Peak Measurement (802.11n OFDM, 65Mbps, 20MHz Bandwidth)

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=97.6 dBµV/m - 35.0 dB
=62.6 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=65.0 dBµV/m - 35.0 dB
=30.0 dBµV/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=102.0 dBµV/m - 38.0 dB
=64.0 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=70.0 dBµV/m - 38.0 dB
=32.0 dBµV/m

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/m (Average Limit).

8.2 Discussion Pulse Desensitivity

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

8.3 Calculation of Average Factor

The average factor is not applicable for this device as the transmitted signal is a continuously signal.

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 (2009). A typical or an unmodulated CW signal at the operating frequency of the EUT has been supplied to the EUT for all measurements. Such a signal is supplied by a signal generator and an antenna in close proximity to the EUT. The signal level is sufficient to stabilize the local oscillator of the EUT.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 (2009).

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

9.0 Confidentiality Request

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: request.pdf.

10.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-2500	EW-2512	EW-0446
Manufacturer	R&S	EMCO	EMCO
Model No.	ESCI	3104C	3146
Calibration Date	Feb. 24, 2012	Nov. 15, 2011	Oct. 31, 2011
Calibration Due Date	Feb. 24, 2013	May 15, 2013	Apr. 30, 2013

Equipment	Spectrum Analyzer	Double Ridged Guide Antenna
Registration No.	EW-1792	EW-1133
Manufacturer	R&S	EMCO
Model No.	FSP40	3115
Calibration Date	Sep. 28, 2011	Mar. 02, 2011
Calibration Due Date	Sep. 28, 2012	Sep. 02, 2012

2) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN
Registration No.	EW-2500	EW-2041
Manufacturer	R&S	KYORITSU
Model No.	ESCI	KNW-403D
Calibration Date	Feb. 24, 2012	Jan. 05, 2012
Calibration Due Date	Feb. 24, 2013	Dec. 31, 2012

3) Bandedge Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2466
Manufacturer	R&S
Model No.	FSP30
Calibration Date	Jul. 06, 2012
Calibration Due Date	Jul. 06, 2013