

## TEST REPORT

**Report No.: HK12090489-1**

**Lenbrook Industries Limited**

Application  
For  
Certification  
(Original Grant)  
**(FCC ID: Q20-N150AWSMP)**  
**(IC: 152B-N150AWSMP)**

Transceiver

Prepared and Checked by:

Approved by:

Signed On File  
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Engineer

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Wong Kwok Yeung, Kenneth  
Lead Engineer  
Date: December 24, 2012

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## INTERTEK TESTING SERVICES

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### GENERAL INFORMATION

**Lenbrook Industries Limited**  
**BRAND NAME: Bluesound, MODEL: POWERNODE N150**

**FCC ID: Q2O-N150AWSMP**  
**IC: 152B-N150AWSMP**

Grantee:	Lenbrook Industries Limited
Grantee Address:	Room D, 11 <sup>th</sup> Floor, Wing Cheong Commercial Building, 19-25 Jervois Street, Central, Hong Kong.
Contact Person:	Jes Arcenal
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Manufacturer:	Dongguan Kwan Hong Electronics Co., Ltd.
Manufacturer Address:	KwanHong Building, Xiao Bian 2 <sup>nd</sup> Industrial Zone, ChangAn, DongGuan, China.
Brand Name:	Bluesound
Model:	POWERNODE N150
Type of EUT:	Transceiver
Description of EUT:	Amplified Wireless Streaming Music Player
Serial Number:	N/A
FCC ID / IC:	Q2O-N150AWSMP / 152B-N150AWSMP
Date of Sample Submitted:	September 17, 2012
Date of Test:	October 10, 2012
Report No.:	HK12090489-1
Report Date:	December 24, 2012
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

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### SUMMARY OF TEST RESULT

**Lenbrook Industries Limited**  
**BRAND NAME: Bluesound, MODEL: POWERNODE N150**

**FCC ID: Q2O-N150AWSMP**  
**IC: 152B-N150AWSMP**

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 provisions 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 expected variations in temperature and supply voltage were considered.

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### 1.0 General Description

#### 1.1 Product Description

The Equipment Under Test (EUT) is a Amplified Wireless Streaming Music Player, equipped with a 2.4GHz WiFi transceiver (SG901) 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 EUT has built-in stereo 40WX2 digital power amplifier which can drive loudspeaker connected to it, while a line level subwoofer output 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 mode.

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

The mini-USB port is for factory maintenance only and not accessible by end-user.

The EUT is powered by 100-240VAC (universal input with earth pin).

Antenna Type : Internal, Integral

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

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### 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.

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### 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 47kohm 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. Stereo 8 ohm Speaker with 2.0m speaker cable  
(Provided by Intertek)
5. Software: Syslinux 4.02, ETF GUI  
(Provided by Applicant)

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### 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 dB $\mu$ V/m
- RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V
- 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 dB $\mu$ V/m
- RR = RA - AG - AV in dB $\mu$ V
- LF = CF + AF in dB

Assume a receiver reading of 52.0 dB $\mu$ V 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 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

RA = 52.0 dB $\mu$ V/m	
AF = 7.4 dB	RR = 18.0 dB $\mu$ V
CF = 1.6 dB	LF = 9.0 dB
AG = 29.0 dB	
AV = 5.0 dB	
FS = RR + LF	
FS = 18 + 9 = 27 dB $\mu$ V/m	

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(27 \text{ dB}\mu\text{V/m})/20] = 22.4 \mu\text{V/m}$$



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### 3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 14472.000 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 8.4 dB

### 3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 19.406 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 3.2 dB

## INTERTEK TESTING SERVICES

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Applicant: Lenbrook Industries Limited

Date of Test: October 10, 2012

Model: POWERNODE N150

Worst-Case Operating Mode: Transmitting (802.11b DSSS, 11Mbps)

Table 1

### Radiated Emissions Pursuant to FCC Part 15 Section 15.249 Requirement

#### Lowest Channel

Polarization	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	74.0	33	29.4	70.4	94.0	-23.6
V	4824.000	43.5	33	34.9	45.4	54.0	-8.6
H	7236.000	38.5	33	37.9	43.4	54.0	-10.6
H	9648.000	35.0	33	40.4	42.4	54.0	-11.6
H	12060.000	37.9	33	40.5	45.4	54.0	-8.6
H	14472.000	38.6	33	40.0	45.6	54.0	-8.4

Polarization	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	104.2	33	29.4	100.6	114.0	-13.4
V	4824.000	53.5	33	34.9	55.4	74.0	-18.6
H	7236.000	48.7	33	37.9	53.6	74.0	-20.4
H	9648.000	43.4	33	40.4	50.8	74.0	-23.2
H	12060.000	42.9	33	40.5	50.4	74.0	-23.6
H	14472.000	43.2	33	40.0	50.2	74.0	-23.8

- 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.

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## INTERTEK TESTING SERVICES

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Applicant: Lenbrook Industries Limited

Date of Test: October 10, 2012

Model: POWERNODE N150

Worst-Case Operating Mode: Transmitting (802.11b DSSS, 11Mbps)

Table 2

### Radiated Emissions Pursuant to FCC Part 15 Section 15.249 Requirement

#### Middle Channel

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2437.000	74.4	33	29.4	70.8	94.0	-23.2
V	4874.000	43.3	33	34.9	45.2	54.0	-8.8
H	7311.000	38.7	33	37.9	43.6	54.0	-10.4
H	9748.000	34.8	33	40.4	42.2	54.0	-11.8
H	12185.000	37.8	33	40.5	45.3	54.0	-8.7
H	14622.000	39.7	33	38.4	45.1	54.0	-8.9

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2437.000	104.9	33	29.4	101.3	114.0	-12.7
V	4874.000	54.5	33	34.9	56.4	74.0	-17.6
H	7311.000	48.5	33	37.9	53.4	74.0	-20.6
H	9748.000	43.2	33	40.4	50.6	74.0	-23.4
H	12185.000	42.9	33	40.5	50.4	74.0	-23.6
H	14622.000	44.6	33	38.4	50.0	74.0	-24.0

- 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.

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## INTERTEK TESTING SERVICES

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Applicant: Lenbrook Industries Limited  
Model: POWERNODE N150

Date of Test: October 10, 2012

Worst-Case Operating Mode: Transmitting (802.11b DSSS, 11Mbps)

Table 3

### Radiated Emissions Pursuant to FCC Part 15 Section 15.249 Requirement

#### Highest Channel

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2462.000	75.0	33	29.4	71.4	94.0	-22.6
V	4924.000	43.4	33	34.9	45.3	54.0	-8.7
H	7386.000	38.5	33	37.9	43.4	54.0	-10.6
H	9848.000	35.7	33	40.4	43.1	54.0	-10.9
H	12310.000	37.7	33	40.5	45.2	54.0	-8.8
H	14772.000	39.6	33	38.4	45.0	54.0	-9.0

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2462.000	106.1	33	29.4	102.5	114.0	-11.5
V	4924.000	55.5	33	34.9	57.4	74.0	-16.6
H	7386.000	48.7	33	37.9	53.6	74.0	-20.4
H	9848.000	43.4	33	40.4	50.8	74.0	-23.2
H	12310.000	42.9	33	40.5	50.4	74.0	-23.6
H	14772.000	44.6	33	38.4	50.0	74.0	-24.0

- 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.

## INTERTEK TESTING SERVICES

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Applicant: Lenbrook Industries Limited

Date of Test: October 10, 2012

Model: POWERNODE N150

Worst-Case Operating Mode: Transmitting (802.11g OFDM, 54Mbps)

Table 4

### Radiated Emissions Pursuant to FCC Part 15 Section 15.249 Requirement

#### Lowest Channel

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2412.000	73.8	33	29.4	70.2	94.0	-23.8
V	4824.000	40.5	33	34.9	42.4	54.0	-11.6
H	7236.000	36.0	33	37.9	40.9	54.0	-13.1
H	9648.000	33.2	33	40.4	40.6	54.0	-13.4
H	12060.000	35.7	33	40.5	43.2	54.0	-10.8
H	14472.000	36.1	33	40.0	43.1	54.0	-10.9

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2412.000	103.8	33	29.4	100.2	114.0	-13.8
V	4824.000	54.5	33	34.9	56.4	74.0	-17.6
H	7236.000	48.5	33	37.9	53.4	74.0	-20.6
H	9648.000	43.2	33	40.4	50.6	74.0	-23.4
H	12060.000	42.9	33	40.5	50.4	74.0	-23.6
H	14472.000	43.2	33	40.0	50.2	74.0	-23.8

- 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.

## INTERTEK TESTING SERVICES

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Applicant: Lenbrook Industries Limited

Date of Test: October 10, 2012

Model: POWERNODE N150

Worst-Case Operating Mode: Transmitting (802.11g OFDM, 54Mbps)

Table 5

### Radiated Emissions Pursuant to FCC Part 15 Section 15.249 Requirement

#### Middle Channel

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2437.000	74.0	33	29.4	70.4	94.0	-23.6
V	4874.000	41.2	33	34.9	43.1	54.0	-10.9
H	7311.000	36.7	33	37.9	41.6	54.0	-12.4
H	9748.000	33.5	33	40.4	40.9	54.0	-13.1
H	12185.000	37.9	33	40.5	45.4	54.0	-8.6
H	14622.000	39.2	33	38.4	44.6	54.0	-9.4

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2437.000	104.0	33	29.4	100.4	114.0	-13.6
V	4874.000	54.9	33	34.9	56.8	74.0	-17.2
H	7311.000	48.1	33	37.9	53.0	74.0	-21.0
H	9748.000	43.4	33	40.4	50.8	74.0	-23.2
H	12185.000	43.1	33	40.5	50.6	74.0	-23.4
H	14622.000	44.8	33	38.4	50.2	74.0	-23.8

- 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.

## INTERTEK TESTING SERVICES

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Applicant: Lenbrook Industries Limited

Date of Test: October 10, 2012

Model: POWERNODE N150

Worst-Case Operating Mode: Transmitting (802.11g OFDM, 54Mbps)

Table 6

### Radiated Emissions Pursuant to FCC Part 15 Section 15.249 Requirement

#### Highest Channel

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2462.000	74.2	33	29.4	70.6	94.0	-23.4
V	4924.000	41.3	33	34.9	43.2	54.0	-10.8
H	7386.000	36.6	33	37.9	41.5	54.0	-12.5
H	9848.000	33.4	33	40.4	40.8	54.0	-13.2
H	12310.000	37.7	33	40.5	45.2	54.0	-8.8
H	14772.000	39.2	33	38.4	44.6	54.0	-9.4

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2462.000	105.1	33	29.4	101.5	114.0	-12.5
V	4924.000	55.6	33	34.9	57.5	74.0	-16.5
H	7386.000	48.2	33	37.9	53.1	74.0	-20.9
H	9848.000	43.4	33	40.4	50.8	74.0	-23.2
H	12310.000	42.9	33	40.5	50.4	74.0	-23.6
H	14772.000	44.9	33	38.4	50.3	74.0	-23.7

- 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.

## INTERTEK TESTING SERVICES

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Applicant: Lenbrook Industries Limited

Date of Test: October 10, 2012

Model: POWERNODE N150

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

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2412.000	68.4	33	29.4	64.8	94.0	-29.2
V	4824.000	40.5	33	34.9	42.4	54.0	-11.6
H	7236.000	37.3	33	37.9	42.2	54.0	-11.8
H	9648.000	33.4	33	40.4	40.8	54.0	-13.2
H	12060.000	35.8	33	40.5	43.3	54.0	-10.7
H	14472.000	36.2	33	40.0	43.2	54.0	-10.8

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2412.000	102.2	33	29.4	98.6	114.0	-15.4
V	4824.000	54.5	33	34.9	56.4	74.0	-17.6
H	7236.000	48.3	33	37.9	53.2	74.0	-20.8
H	9648.000	43.4	33	40.4	50.8	74.0	-23.2
H	12060.000	42.9	33	40.5	50.4	74.0	-23.6
H	14472.000	43.2	33	40.0	50.2	74.0	-23.8

- 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.



## INTERTEK TESTING SERVICES

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Applicant: Lenbrook Industries Limited

Date of Test: October 10, 2012

Model: POWERNODE N150

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

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2437.000	68.5	33	29.4	64.9	94.0	-29.1
V	4874.000	40.9	33	34.9	42.8	54.0	-11.2
H	7311.000	39.5	33	37.9	44.4	54.0	-9.6
H	9748.000	36.2	33	40.4	43.6	54.0	-10.4
H	12185.000	36.7	33	40.5	44.2	54.0	-9.8
H	14622.000	37.4	33	38.4	42.8	54.0	-11.2

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2437.000	102.8	33	29.4	99.2	114.0	-14.8
V	4874.000	54.4	33	34.9	56.3	74.0	-17.7
H	7311.000	48.5	33	37.9	53.4	74.0	-20.6
H	9748.000	43.2	33	40.4	50.6	74.0	-23.4
H	12185.000	42.9	33	40.5	50.4	74.0	-23.6
H	14622.000	44.6	33	38.4	50.0	74.0	-24.0

- 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.

## INTERTEK TESTING SERVICES

Applicant: Lenbrook Industries Limited  
 Model: POWERNODE N150

Date of Test: October 10, 2012

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

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2462.000	72.0	33	29.4	68.4	94.0	-25.6
V	4924.000	40.5	33	34.9	42.4	54.0	-11.6
H	7386.000	39.5	33	37.9	44.4	54.0	-9.6
H	9848.000	37.2	33	40.4	44.6	54.0	-9.4
H	12310.000	36.9	33	40.5	44.4	54.0	-9.6
H	14772.000	37.2	33	38.4	42.6	54.0	-11.4

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	2462.000	104.4	33	29.4	100.8	114.0	-13.2
V	4924.000	54.3	33	34.9	56.2	74.0	-17.8
H	7386.000	48.4	33	37.9	53.3	74.0	-20.7
H	9848.000	43.2	33	40.4	50.6	74.0	-23.4
H	12310.000	42.7	33	40.5	50.2	74.0	-23.8
H	14772.000	45.0	33	38.4	50.4	74.0	-23.6

- 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.

## INTERTEK TESTING SERVICES

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### 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.

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## INTERTEK TESTING SERVICES

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### 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).

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## INTERTEK TESTING SERVICES

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### 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

=100.6 dB $\mu$ V/m - 40.4 dB

=60.2 dB $\mu$ V/m

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

=70.4 dB $\mu$ V/m - 40.4 dB

=30.0 dB $\mu$ V/m

Upper bandedge

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

=102.5 dB $\mu$ V/m - 47.8 dB

=54.7 dB $\mu$ V/m

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

=71.4 dB $\mu$ V/m - 47.8 dB

=23.6 dB $\mu$ V/m

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

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## INTERTEK TESTING SERVICES

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### 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

=100.2 dB $\mu$ V/m - 37.3 dB

=62.9 dB $\mu$ V/m

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

=70.2 dB $\mu$ V/m - 37.3 dB

=32.9 dB $\mu$ V/m

Upper bandedge

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

=101.5 dB $\mu$ V/m - 43.1 dB

=58.4 dB $\mu$ V/m

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

=70.6 dB $\mu$ V/m - 43.1 dB

=27.5 dB $\mu$ V/m

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

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## INTERTEK TESTING SERVICES

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### 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

=98.6 dB $\mu$ V/m - 38.9 dB

=59.7 dB $\mu$ V/m

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

=64.8 dB $\mu$ V/m - 38.9 dB

=25.9 dB $\mu$ V/m

Upper bandedge

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

=100.8 dB $\mu$ V/m - 45.3 dB

=55.5 dB $\mu$ V/m

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

=68.4 dB $\mu$ V/m - 45.3 dB

=23.1 dB $\mu$ V/m

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

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## INTERTEK TESTING SERVICES

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### 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.



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## INTERTEK TESTING SERVICES

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### 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.

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## INTERTEK TESTING SERVICES

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### 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-2253	EW-1015
Manufacturer	R&S	EMCO
Model No.	FSP40	3115
Calibration Date	Jan. 12, 2012	Aug. 24, 2011
Calibration Due Date	Jan. 12, 2013	Feb. 24, 2013

#### 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