

Issuing Laboratory:
Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



TEST REPORT

Report No.: 13061080HKG-002

Oregon Scientific Global Distribution Limited

Application
For
Certification
(Original Grant)
(FCC ID: YPG-011813)

(Bluetooth portion)
Transceiver

Prepared and Checked by:

A handwritten signature in black ink.

Wong Kwok Yeung, Kenneth
Lead Engineer

Approved by:

A handwritten signature in black ink.

Chan Chi Hung, Terry
Supervisor
Date: August 23, 2013

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**GENERAL INFORMATION**

Oregon Scientific Global Distribution Limited
BRAND NAME: Oregon Scientific, MODEL: OP0118-13

FCC ID: YPG-011813

Grantee:	Oregon Scientific Global Distribution Limited
Grantee Address:	Block C, 9/F., Kaiser Estate, Phase 1, 41 Man Yue Street, Hung Hom, Kowloon, Hong Kong.
Contact Person:	Amy Liang
Tel:	N/A
Fax:	N/A
e-mail:	yqliang@idthk.com
Manufacturer:	Oregon Scientific Global Distribution Limited
Manufacturer Address:	Block C, 9/F., Kaiser Estate, Phase 1, 41 Man Yue Street, Hung Hom, Kowloon, Hong Kong.
Brand Name:	Oregon Scientific
Model:	OP0118-13
Type of EUT:	Transceiver
Description of EUT:	MEEP!X2
Serial Number:	N/A
FCC ID:	YPG-011813
Date of Sample Submitted:	June 21, 2013
Date of Test:	June 21, 2013 - August 12, 2013
Report No.:	13061080HKG-002
Report Date:	August 23, 2013
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

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**SUMMARY OF TEST RESULT**

Oregon Scientific Global Distribution Limited
BRAND NAME: Oregon Scientific, MODEL: OP0118-13

FCC ID: YPG-011813

TEST SPECIFICATION	REFERENCE	RESULTS
Transmitter Power Line Conducted Emissions	15.207	Pass
Transmitter Field Strength and Bandwidth Requirement	15.249	Pass
Receiver / Digital Device Radiated Emissions	15.109	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2012 Edition

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 tablet, equipped with HDMI, WiFi, Bluetooth 3.0 & 4.0 and SD Interface. The EUT operates in the frequency range from 2412MHz to 2462MHz at 802.11b,g,n HT20 (11 channels with 5MHz spacing) and The EUT operates in the frequency 2402MHz to 2480MHz at Bluetooth 3.0 (79 channels with 1MHz spacing) while 2402MHz to 2480MHz at Bluetooth 4.0 (40 channels with 2MHz spacing). The EUT is powered by an external AC/DC adaptor or USB 5.0VDC or / and 3.7 VDC (1 x 3.7V rechargeable battery). The adaptor accepts 100-120VAC only.

The EUT is using non-adaptive frequency hopping as declared by applicant.

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 (Bluetooth portion).

The Declaration of the Conformity procedure of peripheral (USB portion) for this transceiver is being processed as the same time of this application.

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.

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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 or USB 5.0VDC or 3.7VDC (1 x 3.7V rechargeable battery).

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.

This device contains one WiFi module & one Bluetooth module on it, the simultaneous transmission (WiFi and Bluetooth) has also been considered and tested (all channels combinations had been considered). There are no any other emissions found based on simultaneous transmission.

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 Oregon Scientific Global Distribution Limited will be incorporated in each production model sold/leased in the United States.

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

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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. 1 x 1.5m HDMI cable
2. 1 x 0.2m USB cable
(Provided by Applicant)

3. 1 x 2.0m Microphone
4. 1 x 1.5m earphone
5. 1 x Notebook: Lenovo SL500
6. 1 x HDMI monitor
(Provided by Intertek)

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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 $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in $\text{dB}\mu\text{V}$

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 $\text{dB}\mu\text{V}/\text{m}$

RR = $RA - AG - AV$ in $\text{dB}\mu\text{V}$

LF = $CF + AF$ in dB

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

$$RA = 52.0 \text{ dB}\mu\text{V}/\text{m}$$

$$AF = 7.4 \text{ dB}$$

$$RR = 18.0 \text{ dB}\mu\text{V}$$

$$CF = 1.6 \text{ dB}$$

$$LF = 9.0 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$AV = 5.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 18 + 9 = 27 \text{ dB}\mu\text{V}/\text{m}$$

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

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3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 4804.000 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 7.2 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 0.37005 MHz

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

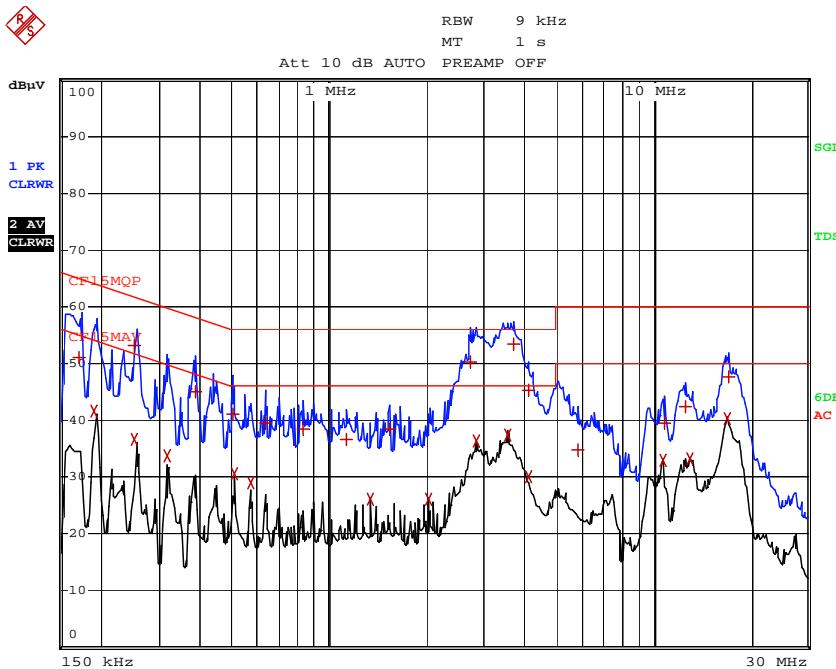
3.5 Conducted Emission Data

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

Judgment: Pass by 2.70 dB

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EDIT PEAK LIST (Final Measurement Results)					
Trace1:	CF15MQP	Trace2:	CF15MAV	Trace3:	---
	TRACE	FREQUENCY	LEVEL dB _μ V	DELTA LIMIT dB	
1	Quasi Peak	172.5 kHz	51.09 N	-13.74	
2	CISPR Average	190.5 kHz	41.71 L1	-12.29	
1	Quasi Peak	253.5 kHz	53.08 L1	-8.55	
2	CISPR Average	253.5 kHz	36.49 L1	-15.15	
2	CISPR Average	316.5 kHz	33.80 L1	-15.99	
1	Quasi Peak	384 kHz	45.01 L1	-13.18	
1	Quasi Peak	505.5 kHz	41.09 L1	-14.90	
2	CISPR Average	510 kHz	30.50 L1	-15.49	
2	CISPR Average	573 kHz	28.95 L1	-17.04	
1	Quasi Peak	636 kHz	39.47 L1	-16.52	
1	Quasi Peak	829.5 kHz	38.41 N	-17.58	
1	Quasi Peak	1.131 MHz	36.49 L1	-19.50	
2	CISPR Average	1.338 MHz	26.15 L1	-19.84	
1	Quasi Peak	1.545 MHz	38.48 N	-17.51	
2	CISPR Average	2.0355 MHz	26.00 L1	-19.99	
1	Quasi Peak	2.733 MHz	50.37 L1	-5.62	
2	CISPR Average	2.8635 MHz	36.40 L1	-9.59	
2	CISPR Average	3.5655 MHz	37.34 L1	-8.65	
1	Quasi Peak	3.7005 MHz	53.29 N	-2.70	
1	Quasi Peak	4.1145 MHz	45.31 L1	-10.68	

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EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CF15MQP			
Trace2:	CF15MAV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dB μ V	DELTA	LIMIT dB
2	CISPR Average 4.1145 MHz	30.03	L1	-15.96
1	Quasi Peak 5.856 MHz	34.83	L1	-25.16
2	CISPR Average 10.689 MHz	32.94	L1	-17.05
1	Quasi Peak 10.815 MHz	39.62	L1	-20.38
1	Quasi Peak 12.534 MHz	42.34	L1	-17.65
2	CISPR Average 12.9165 MHz	33.07	L1	-16.92
2	CISPR Average 16.989 MHz	40.20	L1	-9.79
1	Quasi Peak 17.052 MHz	47.73	L1	-12.26

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Applicant: Oregon Scientific Global Distribution Limited Date of Test: August 12, 2013

Model: OP0118-13

Worst-Case Operating Mode: Bluetooth 3.0

Table 1

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

Lowest Channel

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Average Factor (dB)	Calculated at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
V	2402.000	99.5	33	29.4	95.9	30.1	65.8	94.0	-28.2
H	4804.000	49.8	33	34.9	51.7	30.1	21.6	54.0	-32.4
H	7206.000	45.7	33	37.9	50.6	30.1	20.5	54.0	-33.5
H	9608.000	42.9	33	40.4	50.3	30.1	20.2	54.0	-33.8
H	12020.000	42.4	33	40.5	49.9	30.1	19.8	54.0	-34.2
H	14412.000	42.5	33	40.0	49.5	30.1	19.4	54.0	-34.6

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
H	2402.000	99.5	33	29.4	95.9	114.0	-18.1
H	4804.000	49.8	33	34.9	51.7	74.0	-22.3
H	7206.000	45.7	33	37.9	50.6	74.0	-23.4
H	9608.000	42.9	33	40.4	50.3	74.0	-23.7
H	12020.000	42.4	33	40.5	49.9	74.0	-24.1
H	14412.000	42.5	33	40.0	49.5	74.0	-24.5

NOTES: 1. Peak Detector Data unless otherwise stated.

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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Applicant: Oregon Scientific Global Distribution Limited Date of Test: August 12, 2013

Model: OP0118-13

Worst-Case Operating Mode: Bluetooth 3.0

Table 2

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

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Average Factor (dB)	Calculated at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
V	2441.000	100.1	33	29.4	96.5	30.1	66.4	94.0	-27.6
H	4882.000	49.7	33	34.9	51.6	30.1	21.5	54.0	-32.5
H	7323.000	45.5	33	37.9	50.4	30.1	20.3	54.0	-33.7
H	9764.000	42.8	33	40.4	50.2	30.1	20.1	54.0	-33.9
H	12206.000	42.1	33	40.5	49.6	30.1	19.5	54.0	-34.5
H	14646.000	43.9	33	38.4	49.3	30.1	19.2	54.0	-34.8

Polari-zation	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
V	2441.000	100.1	33	29.4	96.5	114.0	-17.5
H	4882.000	49.7	33	34.9	51.6	74.0	-22.4
H	7323.000	45.5	33	37.9	50.4	74.0	-23.6
H	9764.000	42.8	33	40.4	50.2	74.0	-23.8
H	12206.000	42.1	33	40.5	49.6	74.0	-24.4
H	14646.000	43.9	33	38.4	49.3	74.0	-24.7

NOTES: 1. Peak Detector Data unless otherwise stated.

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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Applicant: Oregon Scientific Global Distribution Limited Date of Test: August 12, 2013

Model: OP0118-13

Worst-Case Operating Mode: Bluetooth 3.0

Table 3

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

Highest Channel

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Average Factor (dB)	Calculated at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
V	2480.000	101.6	33	29.4	98.0	30.1	67.9	94.0	-26.1
H	4960.000	49.9	33	34.9	51.8	30.1	21.7	54.0	-32.3
H	7440.000	45.5	33	37.9	50.4	30.1	20.3	54.0	-33.7
H	9920.000	42.8	33	40.4	50.2	30.1	20.1	54.0	-33.9
H	12400.000	42.0	33	40.5	49.5	30.1	19.4	54.0	-34.6
H	14880.000	43.9	33	38.4	49.3	30.1	19.2	54.0	-34.8

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
V	2480.000	101.6	33	29.4	98.0	114.0	-16.0
H	4960.000	49.9	33	34.9	51.8	74.0	-22.2
H	7440.000	45.5	33	37.9	50.4	74.0	-23.6
H	9920.000	42.8	33	40.4	50.2	74.0	-23.8
H	12400.000	42.0	33	40.5	49.5	74.0	-24.5
H	14880.000	43.9	33	38.4	49.3	74.0	-24.7

NOTES: 1. Peak Detector Data unless otherwise stated.

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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Applicant: Oregon Scientific Global Distribution Limited Date of Test: August 12, 2013

Model: OP0118-13

Worst-Case Operating Mode: Bluetooth 4.0

Table 4

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

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Average Factor (dB)	Calculated at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
V	2402.000	90.1	33	29.4	86.5	0	86.5	94.0	-7.5
H	4804.000	44.9	33	34.9	46.8	0	46.8	54.0	-7.2
H	7206.000	41.3	33	37.9	46.2	0	46.2	54.0	-7.8
H	9608.000	38.5	33	40.4	45.9	0	45.9	54.0	-8.1
H	12010.000	38.1	33	40.5	45.6	0	45.6	54.0	-8.4
H	14412.000	38.2	33	40.0	45.2	0	45.2	54.0	-8.8

Polari-zation	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
V	2402.000	107.4	33	29.4	103.8	114.0	-10.2
H	4804.000	49.8	33	34.9	51.7	74.0	-22.3
H	7206.000	45.6	33	37.9	50.5	74.0	-23.5
H	9608.000	42.8	33	40.4	50.2	74.0	-23.8
H	12010.000	42.6	33	40.5	50.1	74.0	-23.9
H	14412.000	42.3	33	40.0	49.3	74.0	-24.7

NOTES: 1. Average 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.

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation.



Applicant: Oregon Scientific Global Distribution Limited Date of Test: August 12, 2013

Model: OP0118-13

Worst-Case Operating Mode: Bluetooth 4.0

Table 5

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

Middle Channel

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Average Factor (dB)	Calculated at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
V	2442.000	90.0	33	29.4	86.4	0	86.4	94.0	-7.6
H	4884.000	44.6	33	34.9	46.5	0	46.5	54.0	-7.5
H	7326.000	41.4	33	37.9	46.3	0	46.3	54.0	-7.7
H	9768.000	38.5	33	40.4	45.9	0	45.9	54.0	-8.1
H	12210.000	38.1	33	40.5	45.6	0	45.6	54.0	-8.4
H	14652.000	39.8	33	38.4	45.2	0	45.2	54.0	-8.8

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
V	2442.000	106.9	33	29.4	103.3	114.0	-10.7
H	4884.000	49.9	33	34.9	51.8	74.0	-22.2
H	7326.000	45.5	33	37.9	50.4	74.0	-23.6
H	9768.000	42.8	33	40.4	50.2	74.0	-23.8
H	12210.000	42.5	33	40.5	50.0	74.0	-24.0
H	14652.000	43.9	33	38.4	49.3	74.0	-24.7

NOTES: 1. Average 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.

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

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Applicant: Oregon Scientific Global Distribution Limited Date of Test: August 12, 2013

Model: OP0118-13

Worst-Case Operating Mode: Bluetooth 4.0

Table 6

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

Highest Channel

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Average Factor (dB)	Calculated at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
V	2480.000	89.8	33	29.4	86.2	0	86.2	94.0	-7.8
H	4960.000	44.7	33	34.9	46.6	0	46.6	54.0	-7.4
H	7440.000	41.4	33	37.9	46.3	0	46.3	54.0	-7.7
H	9920.000	38.6	33	40.4	46.0	0	46.0	54.0	-8.0
H	12400.000	38.1	33	40.5	45.6	0	45.6	54.0	-8.4
H	14880.000	39.8	33	38.4	45.2	0	45.2	54.0	-8.8

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
V	2480.000	106.8	33	29.4	103.2	114.0	-10.8
H	4960.000	49.7	33	34.9	51.6	74.0	-22.4
H	7440.000	45.7	33	37.9	50.6	74.0	-23.4
H	9920.000	42.8	33	40.4	50.2	74.0	-23.8
H	12400.000	42.4	33	40.5	49.9	74.0	-24.1
H	14880.000	43.9	33	38.4	49.3	74.0	-24.7

NOTES: 1. Average 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.

Issuing Laboratory:
Intertek Testing Services Hong Kong Limited

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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.

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8.0 Miscellaneous Information

The miscellaneous information includes details of the test procedure and measured bandwidth / calculation of factor such as pulse desensitization and averaging factor.

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.

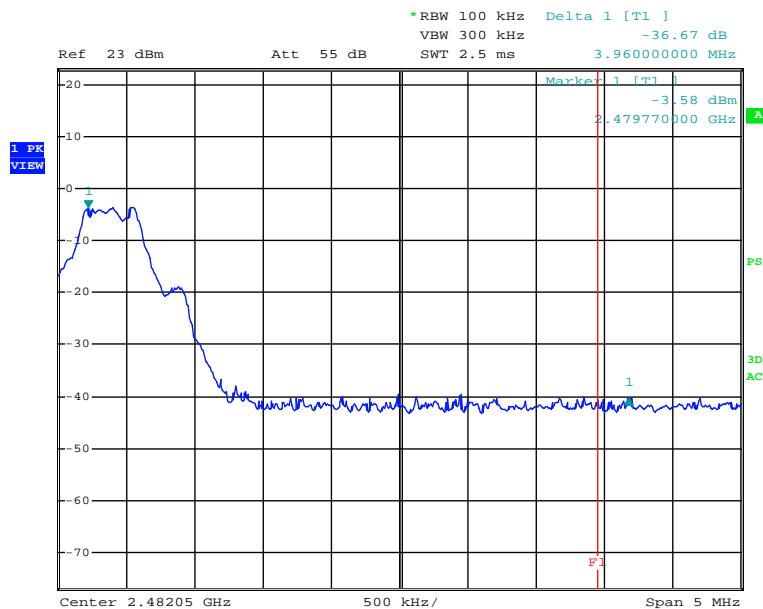
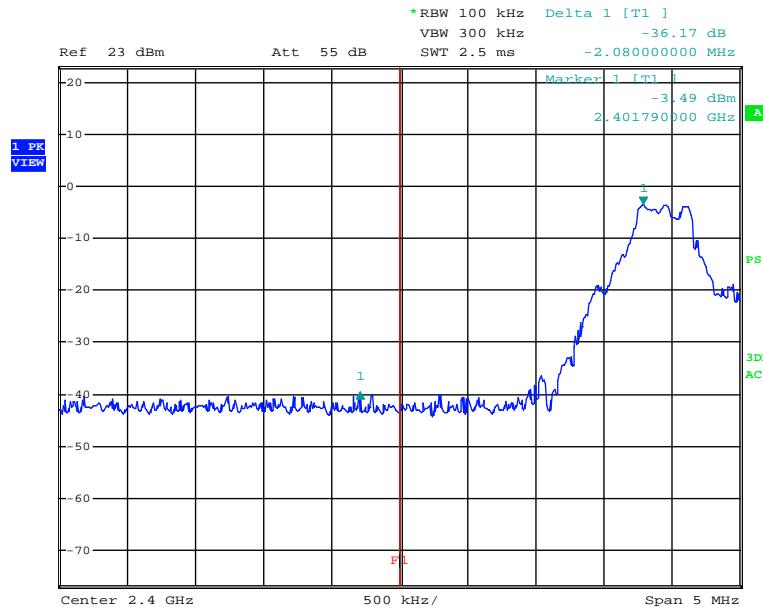
Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209, whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

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Bluetooth 3.0

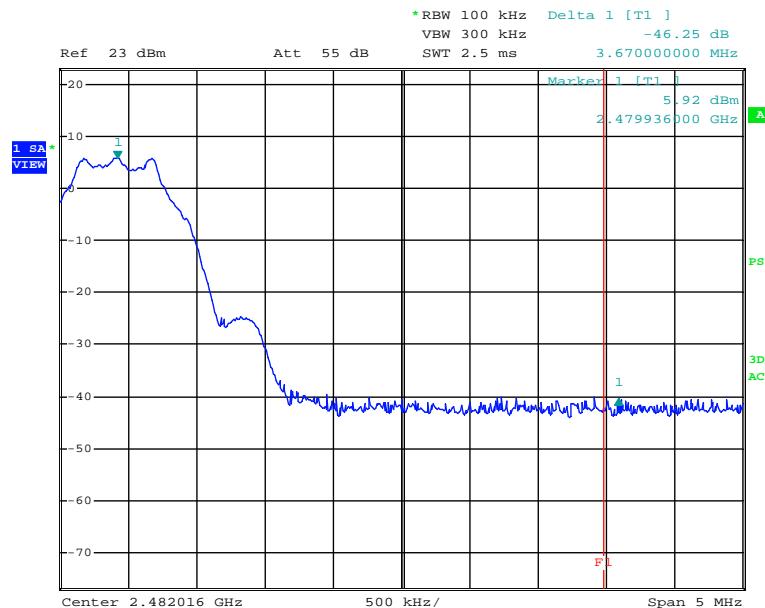
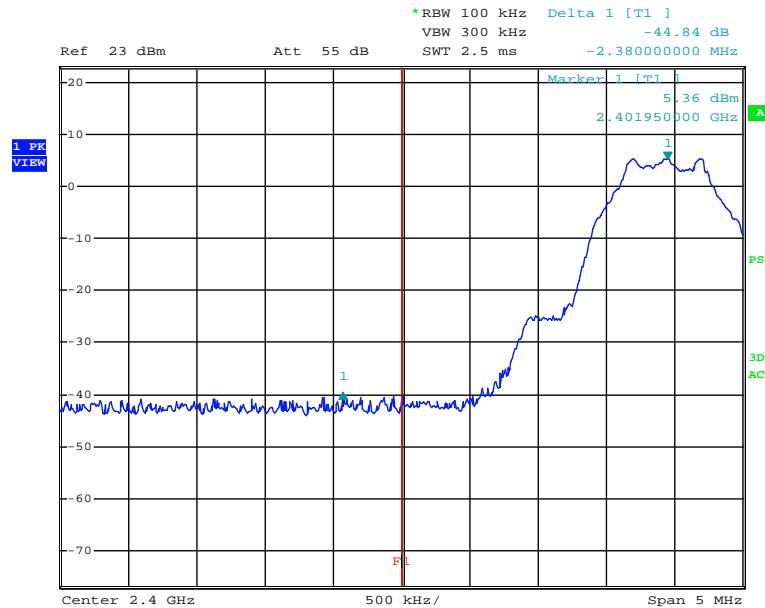


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Bluetooth 4.0



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Peak Measurement (Bluetooth 3.0)

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

$$\begin{aligned} &= 95.9 \text{ dB}\mu\text{V/m} - 36.2 \text{ dB} \\ &= 59.7 \text{ dB}\mu\text{V/m} \end{aligned}$$

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

$$\begin{aligned} &= 65.8 \text{ dB}\mu\text{V/m} - 36.2 \text{ dB} \\ &= 29.6 \text{ dB}\mu\text{V/m} \end{aligned}$$

Upper bandedge

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

$$\begin{aligned} &= 98.0 \text{ dB}\mu\text{V/m} - 36.7 \text{ dB} \\ &= 61.3 \text{ dB}\mu\text{V/m} \end{aligned}$$

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

$$\begin{aligned} &= 67.9 \text{ dB}\mu\text{V/m} - 36.7 \text{ dB} \\ &= 37.8 \text{ dB}\mu\text{V/m} \end{aligned}$$

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

Issuing Laboratory:

Intertek Testing Services Hong Kong Limited

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Peak Measurement (Bluetooth 4.0)

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

$$\begin{aligned} &= 103.8 \text{ dB}\mu\text{V/m} - 44.8 \text{ dB} \\ &= 59.0 \text{ dB}\mu\text{V/m} \end{aligned}$$

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

$$\begin{aligned} &= 86.5 \text{ dB}\mu\text{V/m} - 44.8 \text{ dB} \\ &= 41.7 \text{ dB}\mu\text{V/m} \end{aligned}$$

Upper bandedge

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

$$\begin{aligned} &= 103.2 \text{ dB}\mu\text{V/m} - 46.3 \text{ dB} \\ &= 56.9 \text{ dB}\mu\text{V/m} \end{aligned}$$

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

$$\begin{aligned} &= 86.2 \text{ dB}\mu\text{V/m} - 46.3 \text{ dB} \\ &= 39.9 \text{ dB}\mu\text{V/m} \end{aligned}$$

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

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8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (T_{eff}) is approximately 3.125ms for a digital "1" bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

8.3 Calculation of Average Factor

Based on the Bluetooth Specification Version 3.0, the transmitter ON time for each timeslot of Bluetooth is 625 μ s. DH5 has the maximum duty cycle, which consists of 5 continuous Tx slots and 1 Rx slot. Therefore one hopset take $(5+1) \times 625\mu\text{s} = 3.75\text{ms}$. For one period for a pseudo-random hopping through all 79 RF channels, it takes: $79 \times 3.75\text{ms} = 296.25\text{ms}$.

The dwell time for DH5 is $5 \times 625\mu\text{s} = 3.125\text{ms}$.

Therefore,

$$\begin{aligned}\text{Duty Cycle (DC)} &= \text{Maximum On time in 100ms/100ms} \\ &= 3.125\text{ms}/100\text{ms} \\ &= 0.03125\end{aligned}$$

$$\begin{aligned}\text{Average Factor (AF) of Bluetooth in dB} &= 20 \log_{10} (0.03125) \\ &= -30.1 \text{ dB}\end{aligned}$$

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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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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.

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9.0 Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-2500	EW-0571	EW-1042
Manufacturer	R&S	EMCO	EMCO
Model No.	ESCI	3104C	3148
Calibration Date	Mar. 22, 2013	Apr. 05, 2012	Apr. 25, 2012
Calibration Due Date	Feb. 28, 2014	Oct. 05, 2013	Oct. 25, 2013

Equipment	Spectrum Analyzer	Double Ridged Guide Antenna
Registration No.	EW-2188	EW-1015
Manufacturer	AGILENTTECH	EMCO
Model No.	E4407B	3115
Calibration Date	Nov. 05, 2012	Mar. 05, 2013
Calibration Due Date	Nov. 05, 2013	Sep. 05, 2014

2) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN
Registration No.	EW-2500	EW-2874
Manufacturer	R&S	R&S
Model No.	ESCI	ENV-216
Calibration Date	Mar. 22, 2013	Aug. 15, 2012
Calibration Due Date	Feb. 28, 2014	Aug. 15, 2013

3) Bandedge Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2249
Manufacturer	R&S
Model No.	FSP30
Calibration Date	Oct. 04, 2012
Calibration Due Date	Oct. 04, 2013