

**TEST REPORT****Report Number: 15120538HKG-005**

Application  
for  
Original Grant of 47 CFR Part 15 Certification  
RSS-247 Issue 1 Equipment Certification

Wireless Subwoofer

FCC ID: 2AA9N-GRSUB

IC: 11506A-GRSUB

Prepared and Checked by:

***Signed on File***

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Approved by:

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Feb 18, 2016

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## GENERAL INFORMATION

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<b>Applicant Address:</b>	9741 54 Ave NW , Edmonton, Alberta T6E 5J4, Canada
<b>Contact Person:</b>	Jim Qualie
<b>FCC Specification Standard:</b>	FCC Part 15, 2014 Edition
<b>IC Specification Standard:</b>	RSS-247 Issue 1, May 2015 RSS-Gen Issue 4, November 2014
<b>FCC ID:</b>	2AA9N-GRSUB
<b>IC:</b>	11506A-GRSUB
<b>FCC Model(s):</b>	GoRave SOULSHAKER
<b>IC HVIN:</b>	GoRave SOULSHAKER
<b>IC PMN:</b>	GoRave SOULSHAKER
<b>Type of EUT:</b>	2.4GHz Frequency Hopping Spread Spectrum Transmitter
<b>Description of EUT:</b>	Wireless Subwoofer
<b>Serial Number:</b>	N/A
<b>Sample Receipt Date:</b>	Dec 29, 2015
<b>Date of Test:</b>	Dec 29, 2015 to Feb 18, 2016
<b>Report Date:</b>	Feb 18, 2016
<b>Environmental Conditions:</b>	Temperature: +10 to 40°C Humidity: 10 to 90%

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### **EXHIBIT 1**

### **TEST RESULTS SUMMARY & STATEMENT OF COMPLIANCE**

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## 1.0 Test Results Summary & Statement of Compliance

### 1.1 Summary of Test Results

Test Items	FCC Part 15 Section	RSS-247/ RSS-Gen <sup>#</sup> Section	Results	Details see section
Antenna Requirement	15.203	7.1.2 <sup>#</sup>	Pass	2.1
Max. Conducted Output Power	15.247(b)(1)	5.1(2)	Pass	4.1
Max. 20dB RF Bandwidth	15.247(a)(1)(iii)	5.1(1)	Pass	4.2
Min. No. of Hopping Frequencies	15.247(a)(1)(iii)	5.1(3)	Pass	4.3
Min. Hopping Channel Carrier Frequency Separation	15.247(a)(1)	5.1	Pass	4.4
Average Time of Occupancy	15.247(a)(1)(iii)	5.1(3)	Pass	4.5
Out of Band Antenna Conducted Emission	15.247(d)	5.5	Pass	4.6
Radiated Emission in Restricted Bands and Spurious Emissions	15.247(d) & 15.109	5.4	Pass	4.8
AC Power Line Conducted Emission	15.207 & 15.107	7.2.4 <sup>#</sup>	Pass	4.9

Note: Pursuant to FCC Part 15 Section 15.215(c), the 20dB 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.

### 1.2 Statement of Compliance

The equipment under test is found to be complying with the following standards:

FCC Part 15, 2014 Edition  
RSS-247 Issue 1, May 2015  
RSS-Gen Issue 4, November 2014

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### **EXHIBIT 2**

### **GENERAL DESCRIPTION**

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## 2.0 General Description

### 2.1 Product Description

The Equipment Under Test (EUT) is a Wireless Subwoofer which equipped a 2.4GHz Frequency Hopping Spread Spectrum Transceiver. It operates at frequency range of 2403.585MHz to 2477.313MHz. There are total 15 channels. During normal operation, the EUT is paired with another 2.4GHz transceiver Model: PL5561-S (FCC ID: OP5PL5568 / IC:3534A-PL5568) that is connecting to PC or notebook computer. The EUT accept audio signal via the 2.4GHz radio link. The audio signal is amplified and driving internal loudspeaker. It is powered by 100-240VAC.

The antenna used in the EUT is integral, integrated.

The circuit description and frequency hopping algorithm are saved with filename: descri.pdf.

### 2.2 Test Methodology

Radiated emission measurements was performed according to the procedures in ANSI C63.10 (2013). Preliminary radiated scans and all radiated measurements were performed in Open Area Test Sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. Antenna port conducted measurements were performed according to ANSI C63.10 (2013) and FCC Public Notice DA 00-705 (30-Mar-2000). All other measurements were made in accordance with the procedures in RSS-Gen Issue 4 (2014).

### 2.3 Test Facility

The radiated emission test site and antenna port conducted measurement facility used to collect the radiated data and conductive data are at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC and the Industry Canada.

### 2.4 Related Submittal(s) Grants

This is a single application for certification of a transceiver. In normal operation, this transceiver is working with another transceiver which had been already granted with FCC ID: OP5PL5568 / IC:3534A-PL5568

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**EXHIBIT 3**  
**SYSTEM TEST CONFIGURATION**

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### 3.0 System Test Configuration

#### 3.1 Justification

For radiated emissions testing, the equipment under test (EUT) was setup to transmit / receive continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables (if any) were manipulated to produce worst case emissions.

The EUT was powered by 120VAC.

For the measurements, the EUT was attached to a plastic stand if necessary and placed on the wooden turntable. If the base unit attached to peripherals, they were connected and operational (as typical as possible). The parent unit was remotely located as far from the antenna and the base as possible to ensure full power transmission from the baby unit. Else, the base was wired to transmit full power with modulation.

The signal was maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization were varied during the search for maximum signal level. The antenna height was varied from 1 to 4 meters. Radiated emissions were taken at three meters unless the signal level was too low for measurement at that distance. If necessary, a pre-amplifier was used and/or the test was conducted at a closer distance.

For any intentional radiator powered by AC power line, measurements of the radiated signal level of the fundamental frequency component of the emission was performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

For transmitter radiated measurement, the spectrum analyzer resolution bandwidth was 100 kHz for frequencies below 1000 MHz. The resolution bandwidth was 1 MHz for frequencies above 1000 MHz.

Radiated emission measurement for transmitter were performed 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 to 40 GHz, whichever is lower.

Emission that are directly caused by digital circuits in the transmit path and transmitter portion were measured, and the limit are according to FCC Part 15 Section 15.209/ RSS-247 2.5. Digital circuitries used to control additional functions other than the operation of the transmitter are subject to FCC Part 15 Section 15.109/ RSS-247 Section 5.5 Limits.

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### 3.1 Justification - Cont'd

Detector function for radiated emissions was in peak mode. Average readings, when required, were 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 section 4.8.3.

Determination of pulse desensitization was made according to *Hewlett Packard Application Note 150-2, Spectrum Analysis... Pulsed RF*. The effective period (Teff) was referred to Exhibit 4.8.3. With the resolution bandwidth 1MHz and spectrum analyzer IF bandwidth 3dB, the pulse desensitization factor was 0dB.

For AC line conducted emission test, the EUT along with its peripherals were placed on a 1.0m(W)x1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50ohm coupling impedance for measuring instrument. The LISN housing, measuring instrument case, reference ground plane, and vertical ground plane were bounded together. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were manipulated to find the maximum emission.

### 3.2 EUT Exercising Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

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### 3.3 Details of EUT and Description of Accessories

Details of EUT:

- (1) The EUT is powered by 120VAC

Description of Accessories:

- (1) 1 X power cable of 1.8m in length  
(Supplied by Applicant)

### 3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test at a level of confidence of 95% has been considered. The values of the Measurement uncertainty for radiated emission test and RF conducted measurement test are  $\pm 5.3\text{dB}$  and  $\pm 0.99\text{dB}$  respectively. The value of the Measurement uncertainty for conducted emission test is  $\pm 4.2\text{dB}$ .

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

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### **EXHIBIT 4**

### **TEST RESULTS**

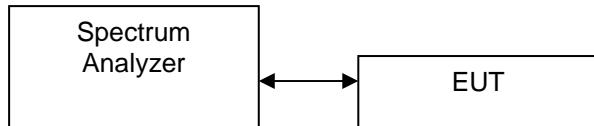
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## 4.0 Test Results

### RF Conduct measurement Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



#### 4.1 Maximum Conducted (peak) Output Power at Antenna Terminals

- The antenna power of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.
- The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for RBW>20dB bandwidth and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyser.

Antenna Gain = 2dBi		
Frequency (MHz)	Output in dBm	Output in mW
Low Channel: 2403.585	9.90	9.77
Middle Channel: 2438.913	10.42	11.02
High Channel: 2477.313	8.28	6.73

Cable loss: 0.5 dB External Attenuation : 0 dB

Cable loss, external attenuation:  included in OFFSET function  
 added to SA raw reading

dBm max. output level = 10.42 dBm (11.02mW)

Limits:

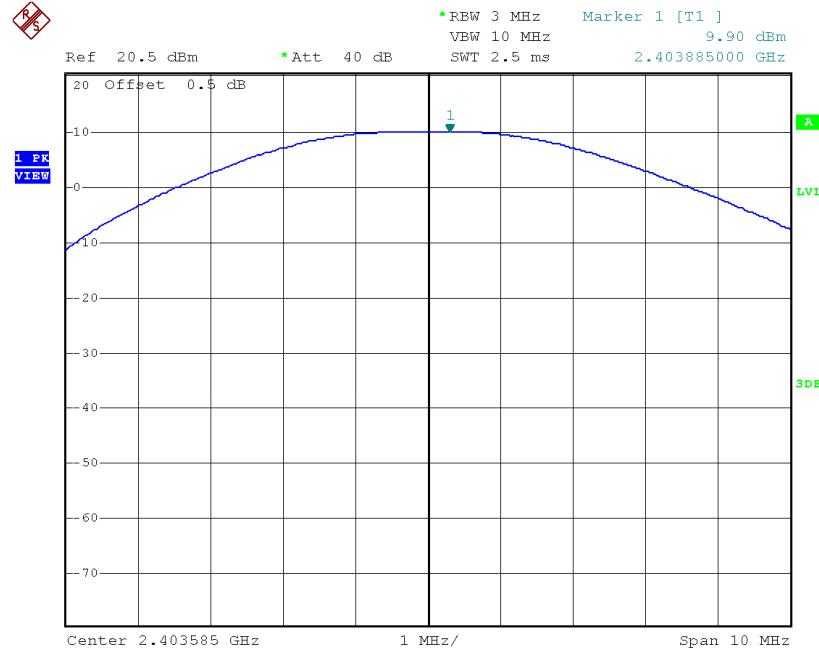
- 0.125W (21dBm) for antennas with gains of 6dBi or less
- 0.25W (24dBm) for antennas with gains of 6dBi or less
- 1W (30dBm) for antennas with gains of 6dBi or less
- \_\_\_\_W (\_\_\_\_dBm) for antennas with gains more than 6dBi

The plots of conducted output power are saved as below.

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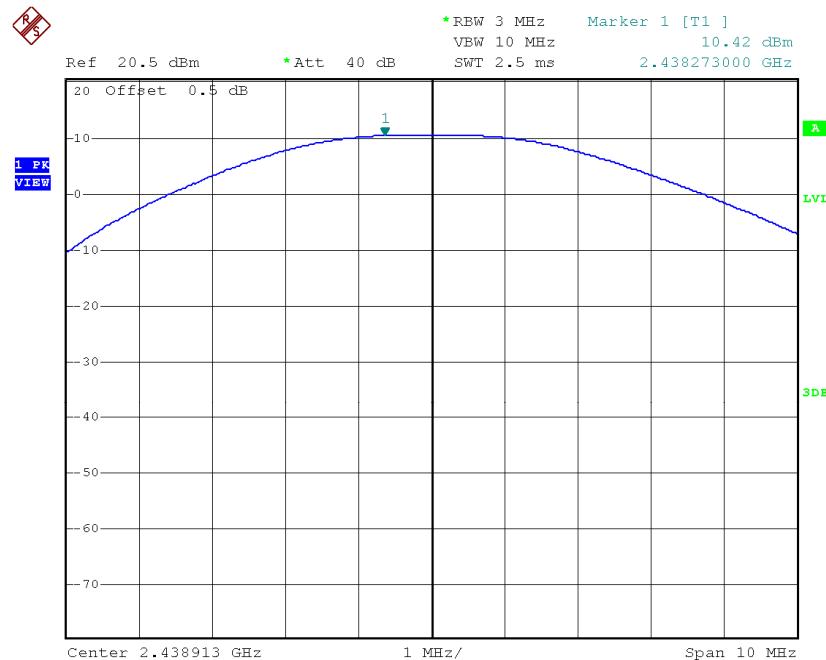
## Plots of conducted output power

### Lowest Channel



Date: 19.JAN.2016 18:16:42

### Middle Channel



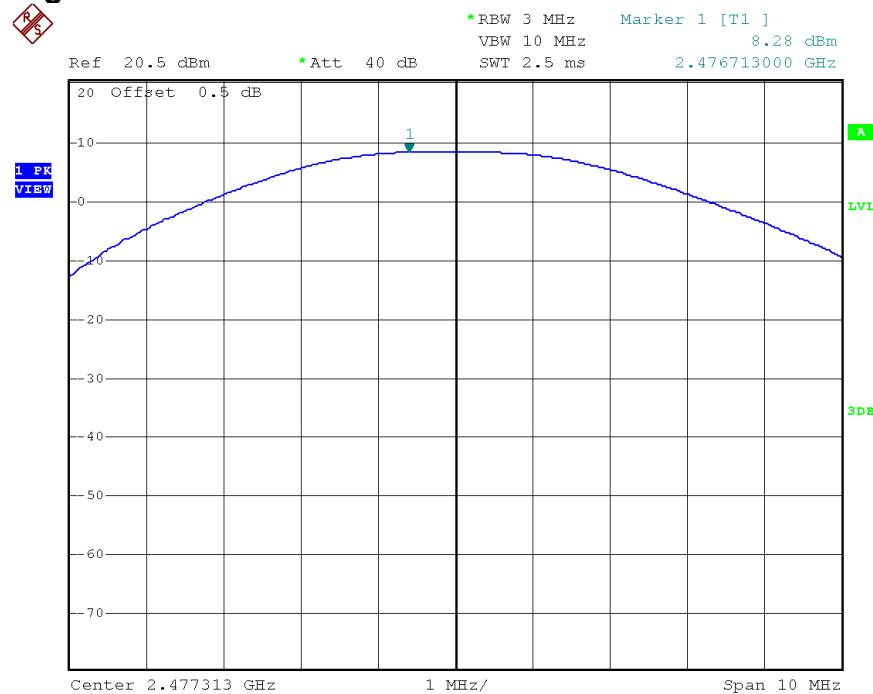
Date: 19.JAN.2016 19:27:43

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## Plots of conducted output power

### Highest Channel



Date: 19.JAN.2016 19:35:44

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### 4.2 Maximum 20 dB RF Bandwidth

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was chosen so that the display was a result of the hopping channel modulation. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level. The 20 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)	20 dB Bandwidth (kHz)
Low Channel: 2403.585	2200
Middle Channel: 2438.913	2260
High Channel: 2477.313	2240

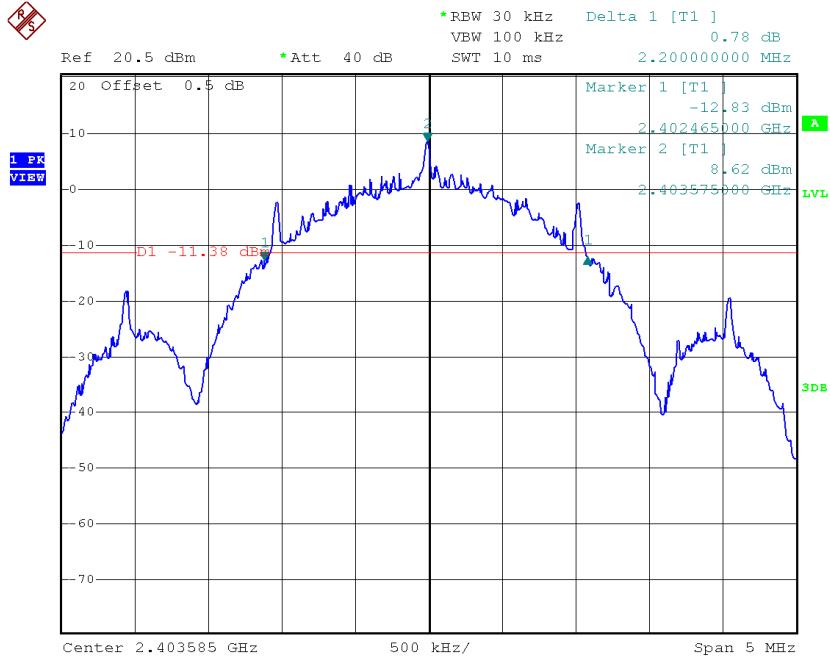
#### Limits

- ≤500kHz for 902-928MHz
- N/A for 2400-2483.5MHz
- ≤1MHz for 5725-5850MHz

The plots of 20dB RF bandwidth and occupied bandwidth are saved as below.

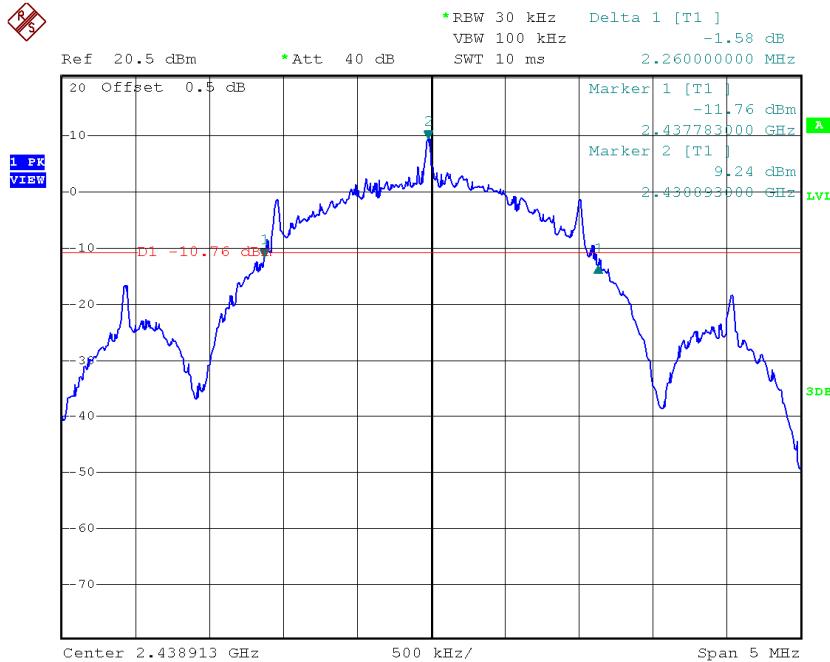
# INTERTEK TESTING SERVICES

## Plots of 20dB RF bandwidth Lowest Channel



Date: 19.JAN.2016 18:40:12

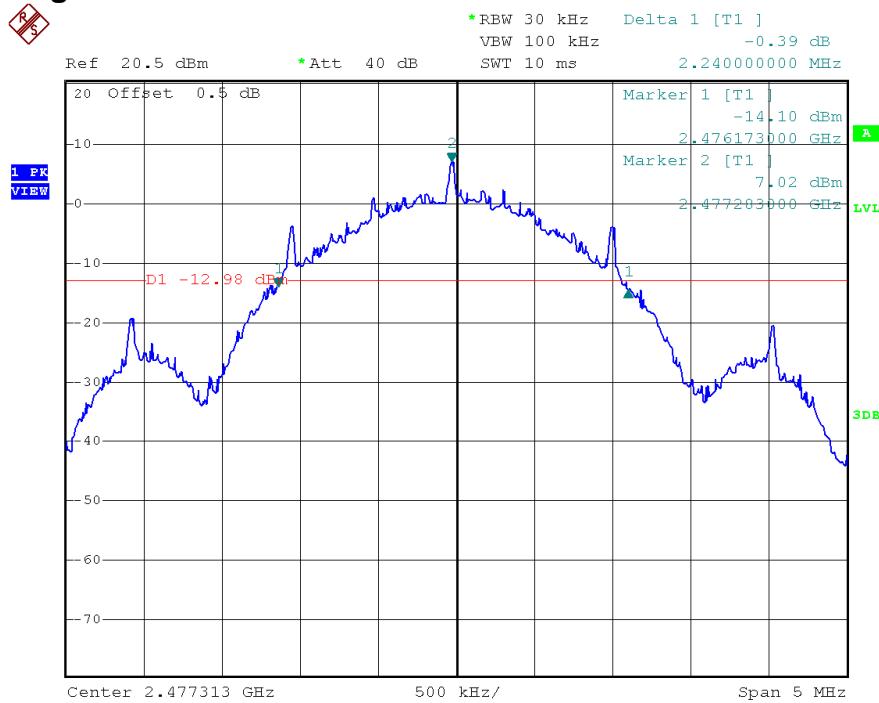
## Middle Channel



Date: 19.JAN.2016 19:21:30

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## Plots of 20dB RF bandwidth Highest Channel



Date: 19.JAN.2016 19:40:05

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### 4.3 Minimum Number of Hopping Frequencies

With the analyzer set to MAX HOLD readings were taken for 2-3 minutes in each band. The channel peaks so recorded were added together, and the total number compared to the minimum number of channels required in the regulation.

No. of hopping channels	15
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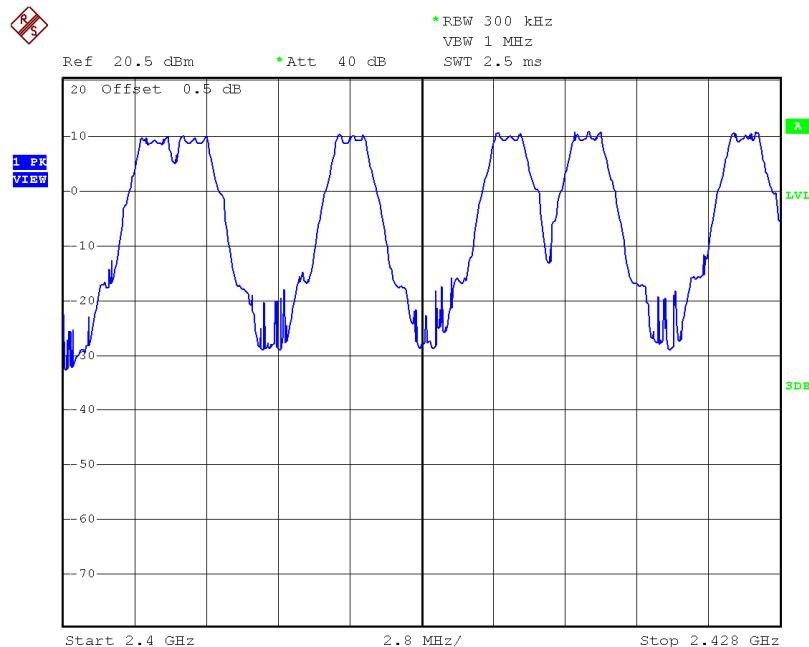
#### Minimum Requirements:

- at least 50 hopping channels for 902MHz-928MHz (20 dB bandwidth of hopping channel  $< 250\text{kHz}$ )
- at least 25 hopping channels for 902MHz-928MHz (20 dB bandwidth of hopping channel  $\geq 250\text{kHz}$ )
- at least 15 hopping channels for 2400MHz-2483.5MHz.
- at least 75 hopping channels for 5725MHz-5850MHz.

The plots of number of hopping frequencies are saved as below.

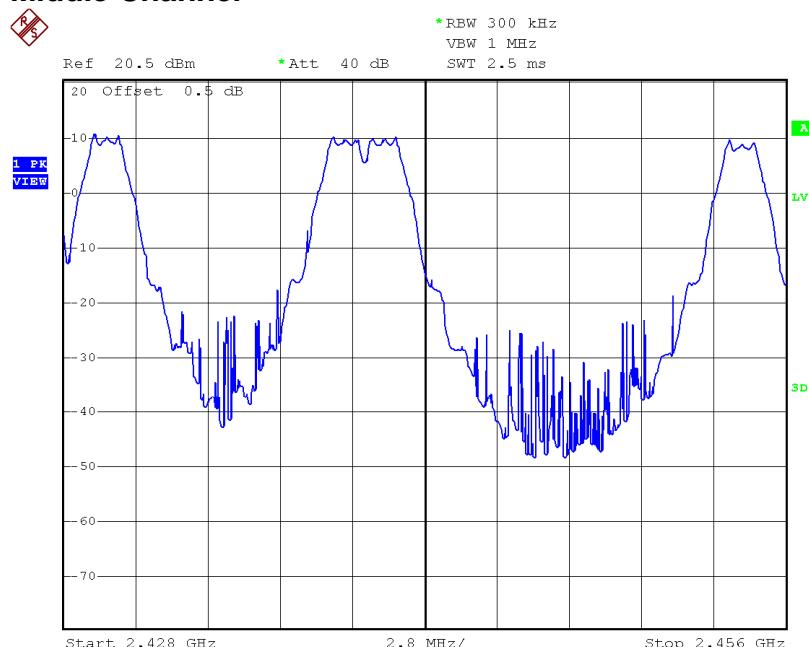
# INTERTEK TESTING SERVICES

## Plots of number of hopping frequencies Lowest Channel



Date: 19.JAN.2016 20:22:44

## Middle Channel

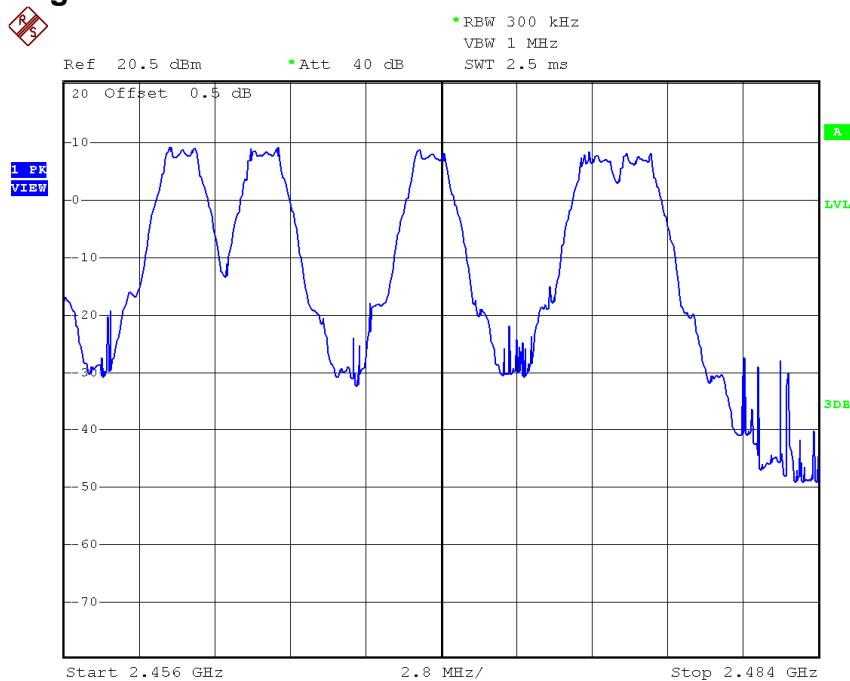


Date: 19.JAN.2016 20:25:57

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## Plots of number of hopping frequencies

### Highest Channel



Date: 19.JAN.2016 20:28:39

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### 4.4 Minimum Hopping Channel Carrier Frequency Separation

Using the DELTA MARKER function of the analyzer, the frequency separation between two adjacent channels was measured and met the requirement.

Channel Separation (Channel <u>1</u> and Channel <u>2</u> )	1538 kHz
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Limits:

The channel separation must be larger than:

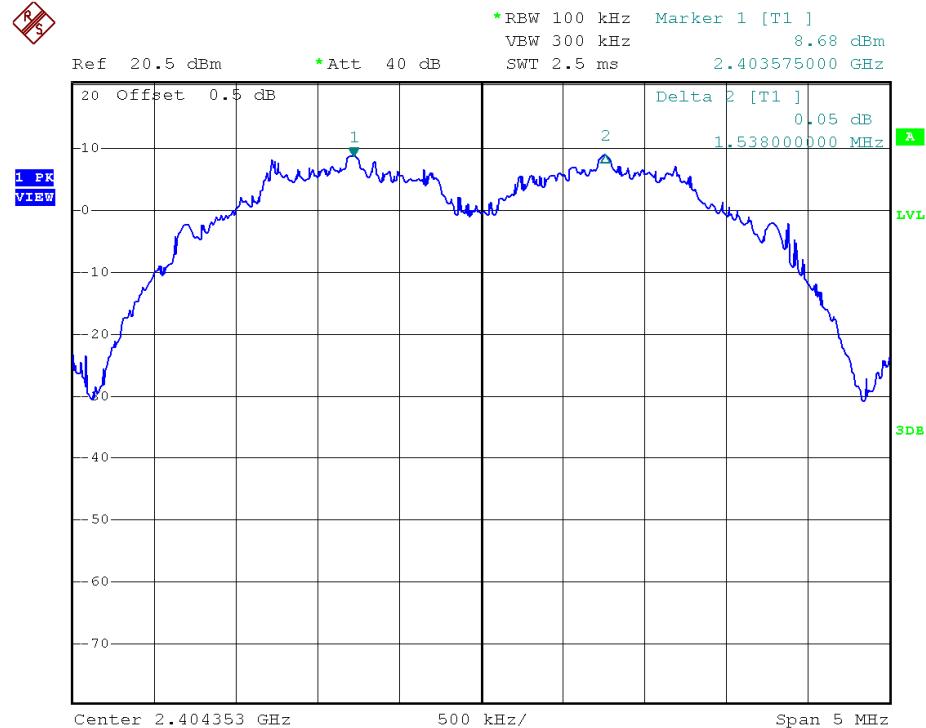
- 25 kHz
- 20 dB bandwidth of hopping channel: \_\_\_\_Hz
- 2/3 of 20dB bandwidth of hopping channel: 1506.667KHz

The plot(s) of hopping channel carrier frequency separation is saved as below.

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## Plots of hopping channel carrier frequency separation

### Between channel 1 and channel 2



Date: 19.JAN.2016 20:39:33

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### 4.5 Average Channel Occupancy Time

The spectrum analyzer center frequency was set to one of the known hopping channels. The SWEEP was set to 10ms, the SPAN was set to ZERO SPAN, and the TRIGGER was set to VIDEO. The time duration of the transmission so captured was measured with the MARKER DELTA function.

The SWEEP was then set to the time required by the regulation (20 seconds for 902-928 MHz devices, if the 20dB bandwidth is less than 250kHz, 10 seconds for 902-928 MHz if the 20dB bandwidth is or greater than 250kHz, “0.4 seconds x Number of hopping channels employed” seconds for 2400-2483.5 MHz, 30 seconds for 5725-5850 MHz). The analyzer was set to SINGLE SWEEP, the total ON time was added and compared against the limit (0.4 seconds).

Average Occupancy Time	
Number of hops in 6s = 72 Single pulse width = 4.42ms Average Occupancy Time = 4.42ms X 72	Average Occupancy Time = 0.31824s

Limits:

Average 0.4 seconds maximum occupancy in:

- 6 seconds (0.4 sec. x 15) for 2400MHz-2483.5MHz
- 20 seconds for 902MHz-928MHz ≥ 50 hopping channels
- 10 seconds for 902MHz-928MHz ≥ 25 hopping channels
- 30 seconds for 5725-5850MHz

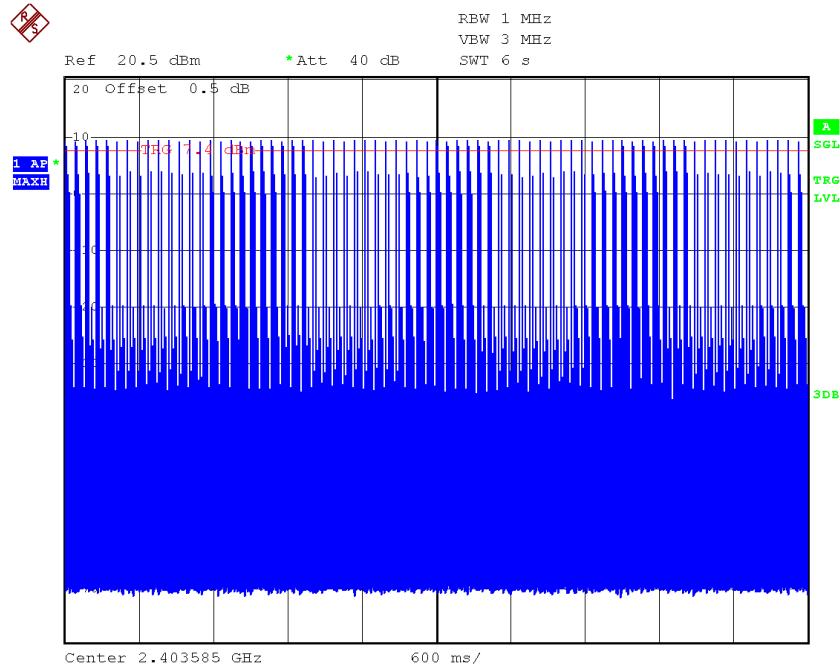
The plots of average channel occupancy time are saved as below.

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## Plots of average channel occupancy time

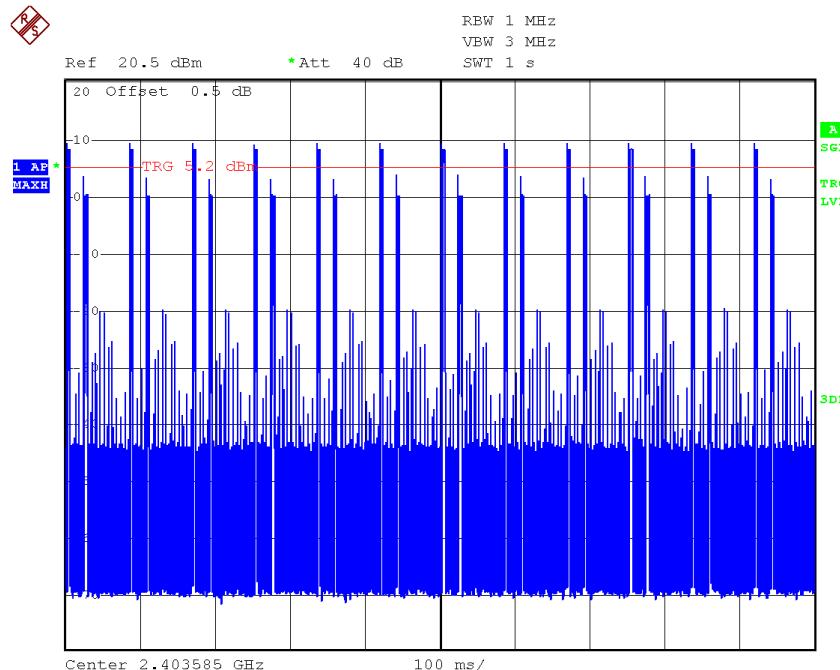
(hopping mode)

### Plot A



Date: 28.JAN.2016 18:19:37

### Plot B



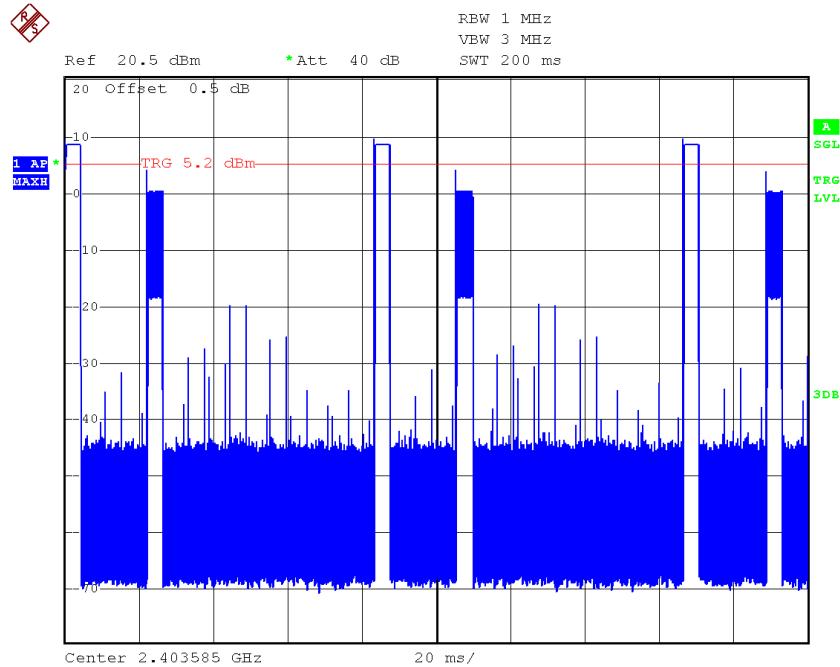
Date: 29.JAN.2016 13:08:24

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## Plots of average channel occupancy time

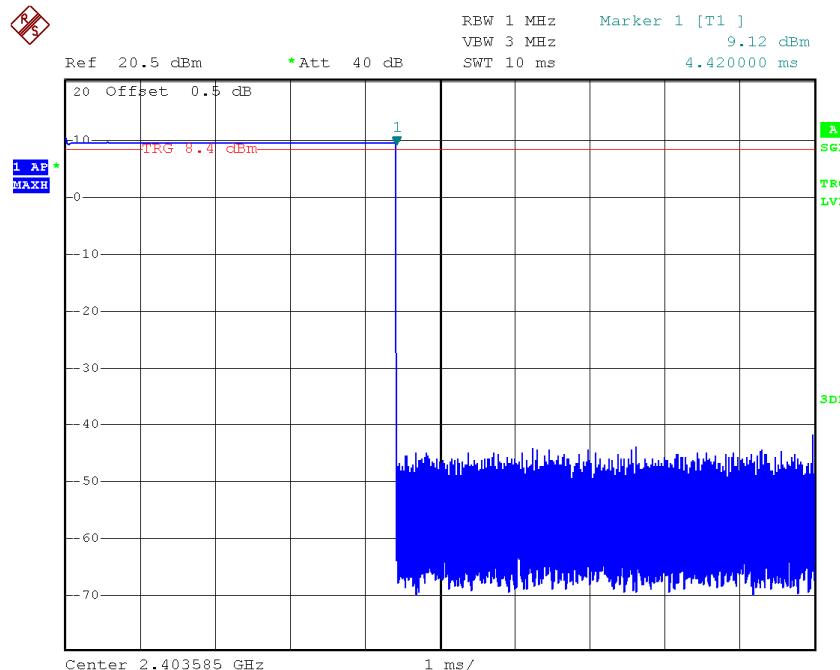
(hopping mode)

### Plot C



Date: 29.JAN.2016 13:01:48

### Plot D



Date: 19.JAN.2016 21:10:48

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### 4.6 Out of Band Conducted Emissions

In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

The plot(s) of bandedge compliance is shown the worst-case which has been already considered between enable and disable the hopping function of the EUT.

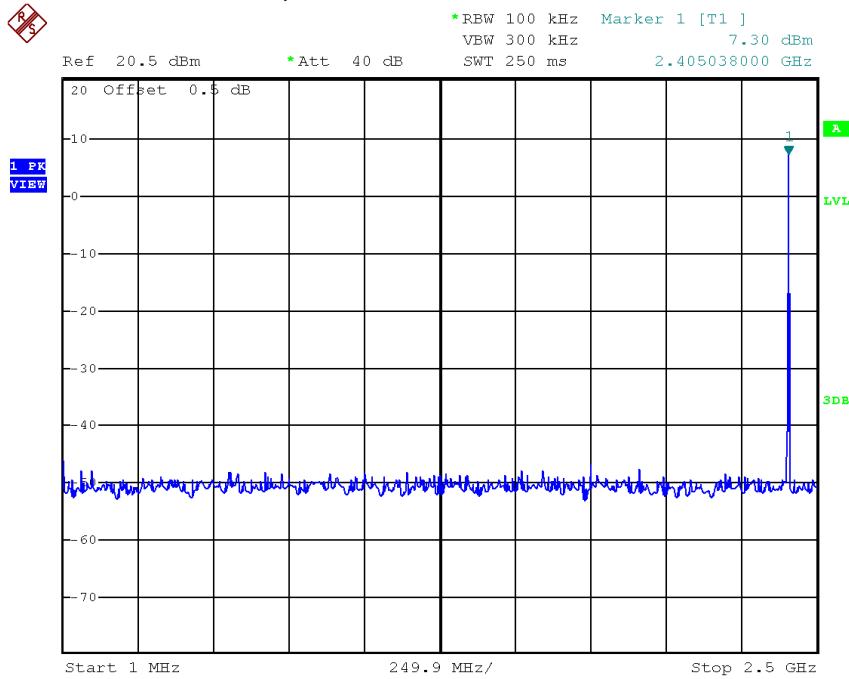
Limits:

All spurious emission and up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

The plots of out of band conducted emissions and bandedge are saved as below.

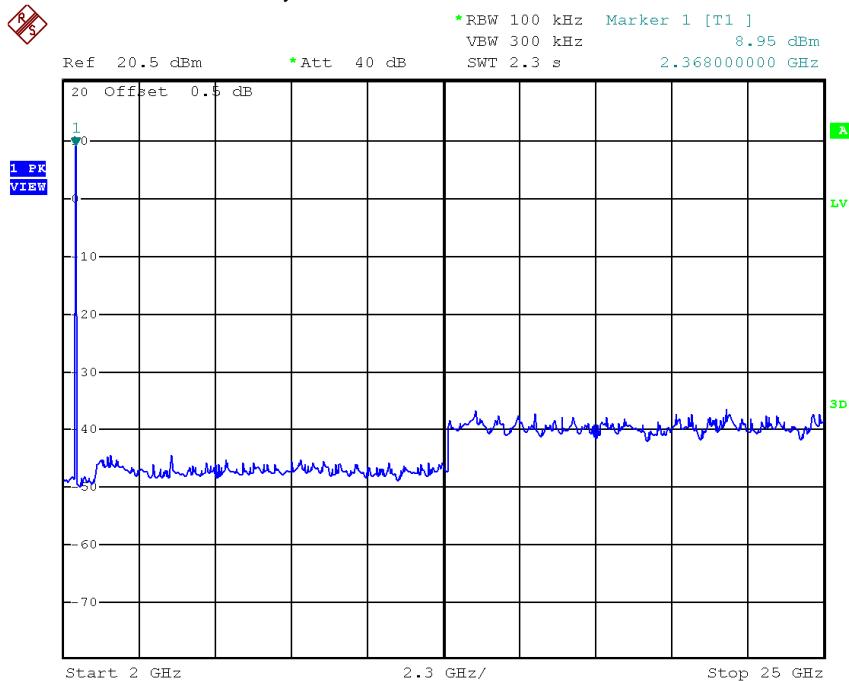
# INTERTEK TESTING SERVICES

## Plots of out of band conducted emissions Lowest channel, Plot 1



Date: 27.JAN.2016 15:17:42

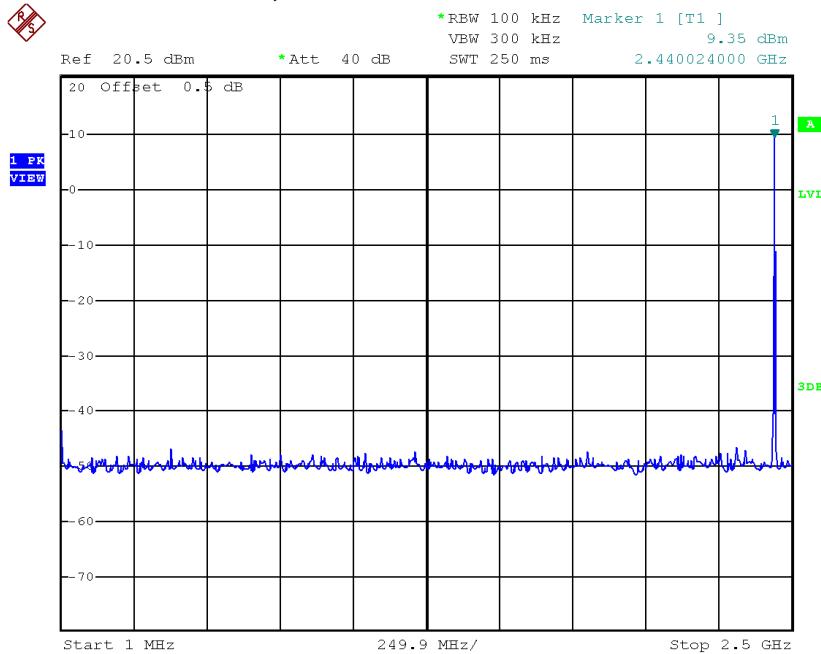
## Lowest channel, Plot 2



Date: 27.JAN.2016 15:13:52

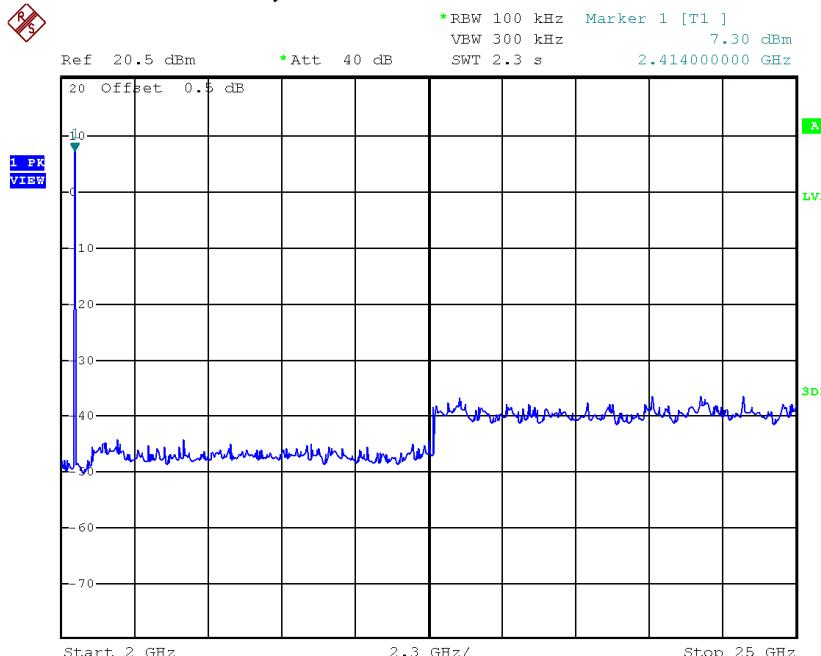
# INTERTEK TESTING SERVICES

## Plots of out of band conducted emissions Middle channel, Plot 1



Date: 27.JAN.2016 15:05:15

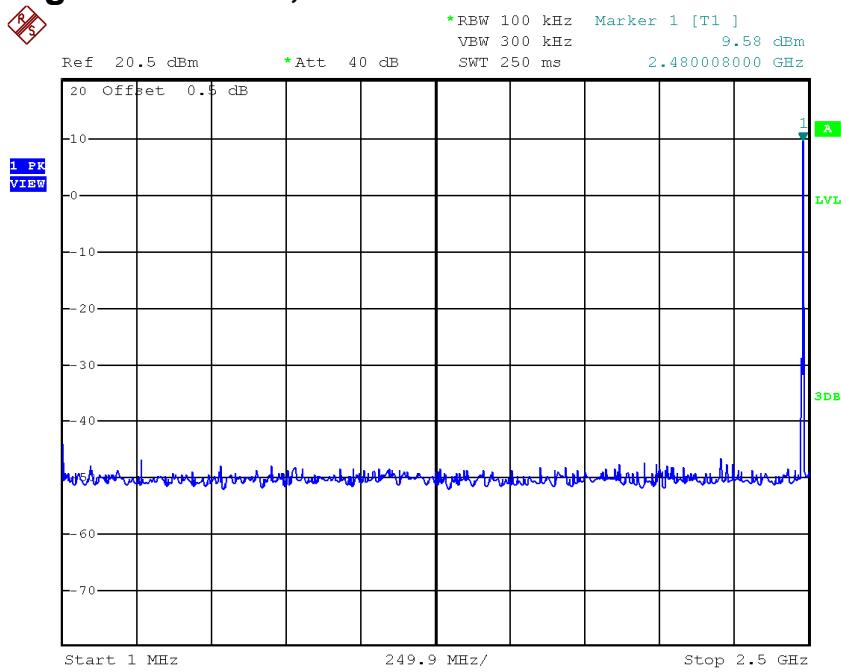
## Middle channel, Plot 2



Date: 27.JAN.2016 15:06:56

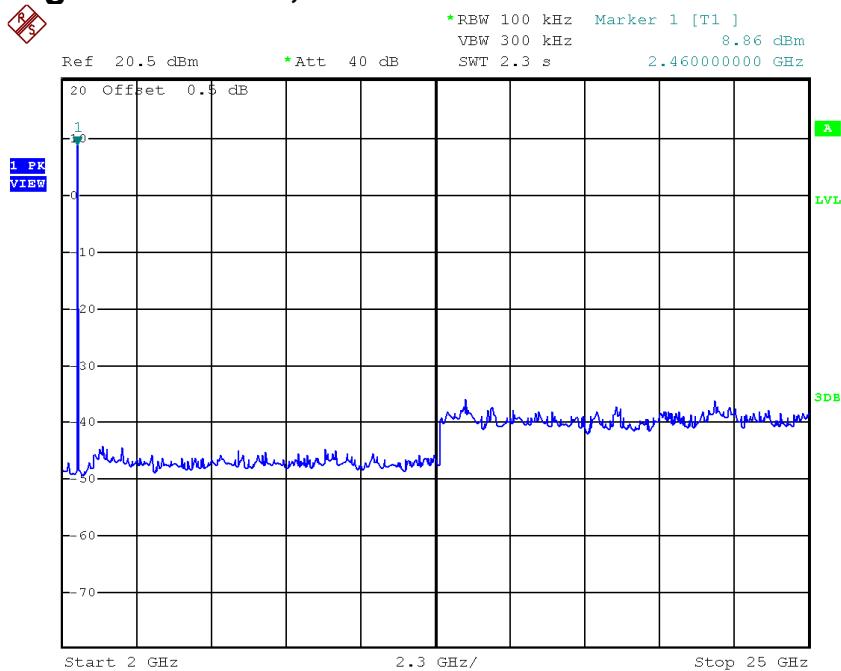
# INTERTEK TESTING SERVICES

## Plots of out of band conducted emissions Highest channel, Plot 1



Date: 27.JAN.2016 15:00:53

## Highest channel, Plot 2

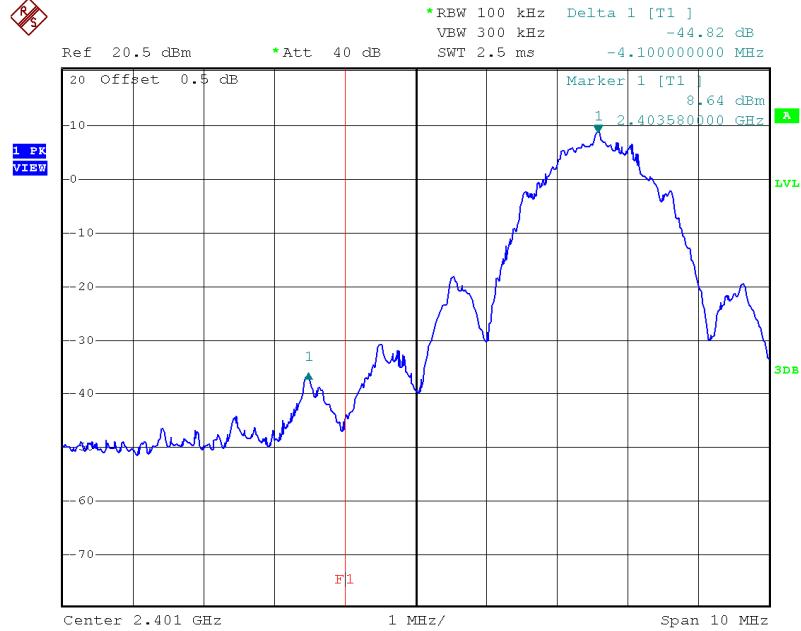


Date: 27.JAN.2016 15:00:04

# INTERTEK TESTING SERVICES

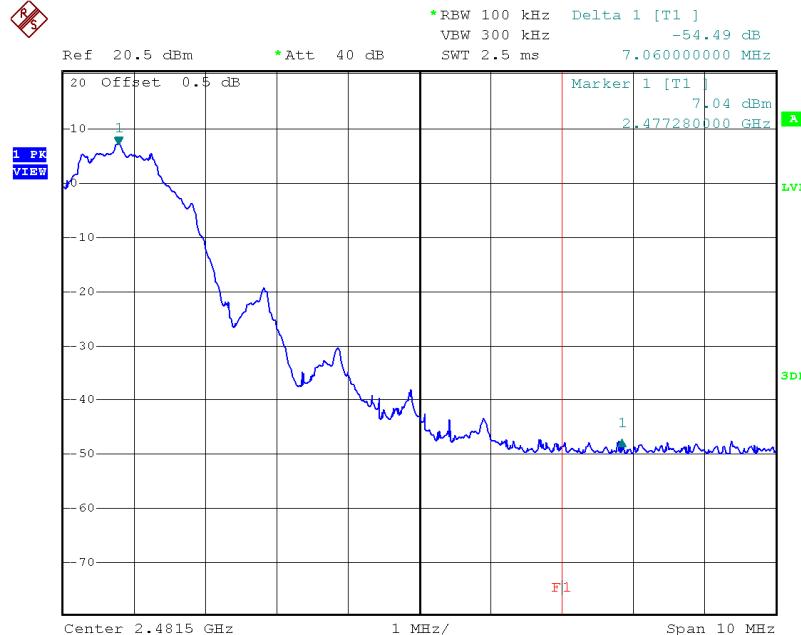
## Plots of bandedge

### Lowest bandedge



Date: 19.JAN.2016 18:50:20

### Highest bandedge



Date: 19.JAN.2016 19:47:18

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### 4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD + AV$$

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

PD = Pulse Desensitization in dB

AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflects the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD + AV$$

#### Example

Assume a receiver reading of 62.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

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

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

$$AG = 29 \text{ dB}$$

$$PD = 0 \text{ dB}$$

$$AV = -10 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

## INTERTEK TESTING SERVICES

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### 4.8 Transmitter Radiated Emissions in Restricted Bands and Spurious Emissions

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.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

## **INTERTEK TESTING SERVICES**

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### **4.8.1 Radiated Emission Configuration Photograph**

Worst Case Restricted Band Radiated Emission  
at  
67.310 MHz

The worst case radiated emission configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

### **4.8.2 Radiated Emission Data**

The data in tables 1-5 list the significant emission frequencies, the limit and the margin of compliance.

Judgement -

Passed by 2.6 dB margin compare with peak limit

# INTERTEK TESTING SERVICES

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Mode: TX-Channel (Lowest)

Table 1

## Radiated Emission Data

Polari-zation	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Average Factor (dB)	Calculated at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	<b>2390.000</b>	<b>60.4</b>	<b>33</b>	<b>29.4</b>	<b>56.8</b>	<b>21</b>	<b>35.8</b>	<b>54.0</b>	<b>-18.2</b>
V	<b>4807.170</b>	<b>56.7</b>	<b>33</b>	<b>34.9</b>	<b>58.6</b>	<b>21</b>	<b>37.6</b>	<b>54.0</b>	<b>-16.4</b>
V	<b>12017.925</b>	<b>57.1</b>	<b>33</b>	<b>40.5</b>	<b>64.6</b>	<b>21</b>	<b>43.6</b>	<b>54.0</b>	<b>-10.4</b>

Polari-zation	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	<b>2390.000</b>	<b>60.4</b>	<b>33</b>	<b>29.4</b>	<b>56.8</b>	<b>74.0</b>	<b>-17.2</b>
V	<b>4807.170</b>	<b>56.7</b>	<b>33</b>	<b>34.9</b>	<b>58.6</b>	<b>74.0</b>	<b>-15.4</b>
V	<b>12017.925</b>	<b>57.1</b>	<b>33</b>	<b>40.5</b>	<b>64.6</b>	<b>74.0</b>	<b>-9.4</b>

NOTES:

1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance 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 radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-247 Section 3.3.
6. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
7. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

# INTERTEK TESTING SERVICES

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Mode: TX-Channel (Middle)

Table 2

## Radiated Emission Data

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Average Factor (dB)	Calculated at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
<b>V</b>	<b>4877.826</b>	<b>54.9</b>	<b>33</b>	<b>34.9</b>	<b>56.8</b>	<b>21</b>	<b>35.8</b>	<b>54.0</b>	<b>-18.2</b>
<b>V</b>	<b>7316.739</b>	<b>56.9</b>	<b>33</b>	<b>37.9</b>	<b>61.8</b>	<b>21</b>	<b>40.8</b>	<b>54.0</b>	<b>-13.2</b>
<b>V</b>	<b>12194.565</b>	<b>56.3</b>	<b>33</b>	<b>40.5</b>	<b>63.8</b>	<b>21</b>	<b>42.8</b>	<b>54.0</b>	<b>-11.2</b>

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)
<b>V</b>	<b>4877.826</b>	<b>54.9</b>	<b>33</b>	<b>34.9</b>	<b>56.8</b>	<b>74.0</b>	<b>-17.2</b>
<b>V</b>	<b>7316.739</b>	<b>56.9</b>	<b>33</b>	<b>37.9</b>	<b>61.8</b>	<b>74.0</b>	<b>-12.2</b>
<b>V</b>	<b>12194.565</b>	<b>56.3</b>	<b>33</b>	<b>40.5</b>	<b>63.8</b>	<b>74.0</b>	<b>-10.2</b>

NOTES: 1. Peak detector is used for the emission measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance 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 radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

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

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-247 Section 3.3.

6. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.

7. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

# INTERTEK TESTING SERVICES

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Mode: TX-Channel (Highest)

Table 3

## Radiated Emission Data

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dB $\mu$ V/m)	Average Factor (dB)	Calculated at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
<b>V</b>	<b>2483.500</b>	<b>61.0</b>	<b>33</b>	<b>29.4</b>	<b>57.4</b>	<b>21</b>	<b>36.4</b>	<b>54.0</b>	<b>-17.6</b>
<b>V</b>	<b>4954.626</b>	<b>54.7</b>	<b>33</b>	<b>34.9</b>	<b>56.6</b>	<b>21</b>	<b>35.6</b>	<b>54.0</b>	<b>-18.4</b>
<b>V</b>	<b>7431.939</b>	<b>57.5</b>	<b>33</b>	<b>37.9</b>	<b>62.4</b>	<b>21</b>	<b>41.4</b>	<b>54.0</b>	<b>-12.6</b>
<b>V</b>	<b>12386.565</b>	<b>55.7</b>	<b>33</b>	<b>40.5</b>	<b>63.2</b>	<b>21</b>	<b>42.2</b>	<b>54.0</b>	<b>-11.8</b>

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)
<b>V</b>	<b>2483.500</b>	<b>61.0</b>	<b>33</b>	<b>29.4</b>	<b>57.4</b>	<b>74.0</b>	<b>-16.6</b>
<b>V</b>	<b>4954.626</b>	<b>54.7</b>	<b>33</b>	<b>34.9</b>	<b>56.6</b>	<b>74.0</b>	<b>-17.4</b>
<b>V</b>	<b>7431.939</b>	<b>57.5</b>	<b>33</b>	<b>37.9</b>	<b>62.4</b>	<b>74.0</b>	<b>-11.6</b>
<b>V</b>	<b>12386.565</b>	<b>55.7</b>	<b>33</b>	<b>40.5</b>	<b>63.2</b>	<b>74.0</b>	<b>-10.8</b>

NOTES: 1. Peak detector is used for the emission measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance 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 radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

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

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-247 Section 3.3.

6. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.

7. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

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Worst Case: EUT Transmitting (Audio playing)

Table 4

### Radiated Emission Data

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	40.320	42.3	16	10.0	36.3	40.0	-3.7
V	54.120	41.8	16	11.0	36.8	40.0	-3.2
V	67.310	45.4	16	8.0	37.4	40.0	-2.6
V	<b>76.030</b>	<b>47.2</b>	<b>16</b>	<b>6.0</b>	<b>37.2</b>	<b>40.0</b>	<b>-2.8</b>
V	96.023	40.3	16	12.0	36.3	43.5	-7.2
V	<b>133.360</b>	<b>38.5</b>	<b>16</b>	<b>14.0</b>	<b>36.5</b>	<b>43.5</b>	<b>-7.0</b>
V	<b>162.290</b>	<b>36.6</b>	<b>16</b>	<b>16.0</b>	<b>36.6</b>	<b>43.5</b>	<b>-6.9</b>
V	<b>171.610</b>	<b>34.0</b>	<b>16</b>	<b>18.0</b>	<b>36.0</b>	<b>43.5</b>	<b>-7.5</b>
V	233.620	32.9	16	19.0	35.9	46.0	-10.1
V	<b>266.852</b>	<b>32.0</b>	<b>16</b>	<b>21.0</b>	<b>37.0</b>	<b>46.0</b>	<b>-9.0</b>
V	<b>334.640</b>	<b>28.8</b>	<b>16</b>	<b>24.0</b>	<b>36.8</b>	<b>46.0</b>	<b>-9.2</b>
V	<b>406.624</b>	<b>28.5</b>	<b>16</b>	<b>24.0</b>	<b>36.5</b>	<b>46.0</b>	<b>-9.5</b>
V	467.993	26.0	16	26.0	36.0	46.0	-10.0
V	663.820	22.8	16	29.0	35.8	46.0	-10.2

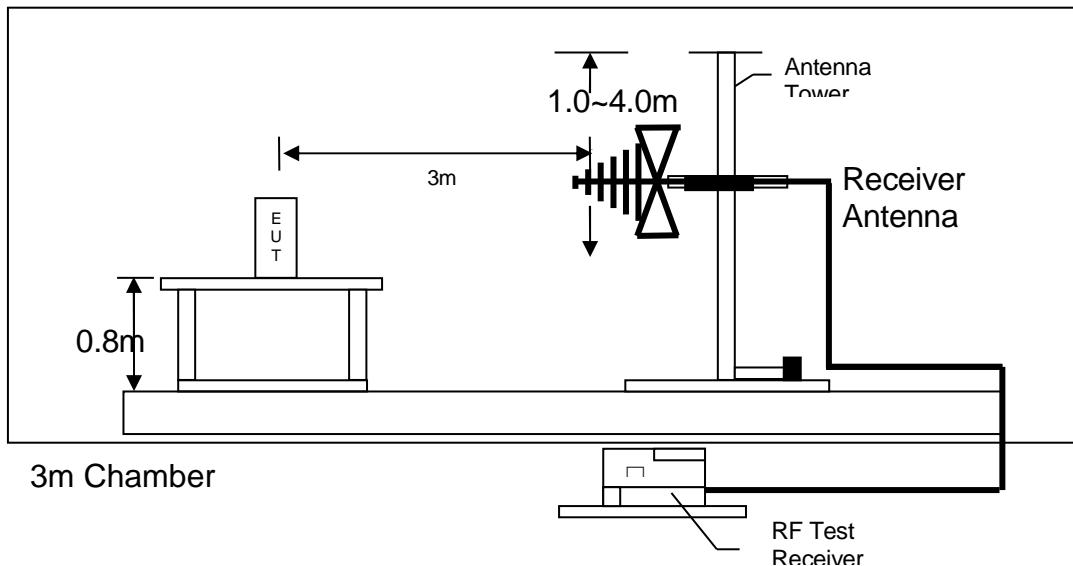
NOTES:

1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance 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 radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-247 Section 3.3.
5. Correction Factor is constituted Cable Loss, Antenna Factor and Amplifier Gain.

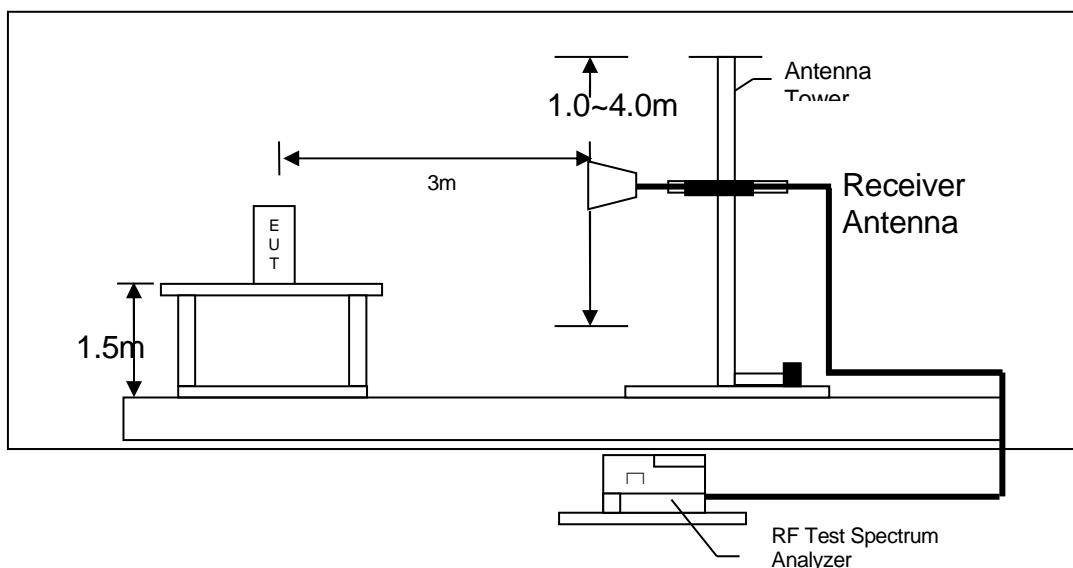
# INTERTEK TESTING SERVICES

## Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions upto 1GHz



Test setup of radiated emissions above 1GHz

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### 4.8.3 Transmitter Duty Cycle Calculation

Duty Cycle (DC) = Maximum On time in 100ms/100ms

Duty Cycle (DC) =  $(2*4.42\text{ms}) / 100\text{ms} = 0.0884$

Average Factor (AF) =  $20 \log(\text{DC})$

=  $20 * \log (0.0884)$

= -21dB

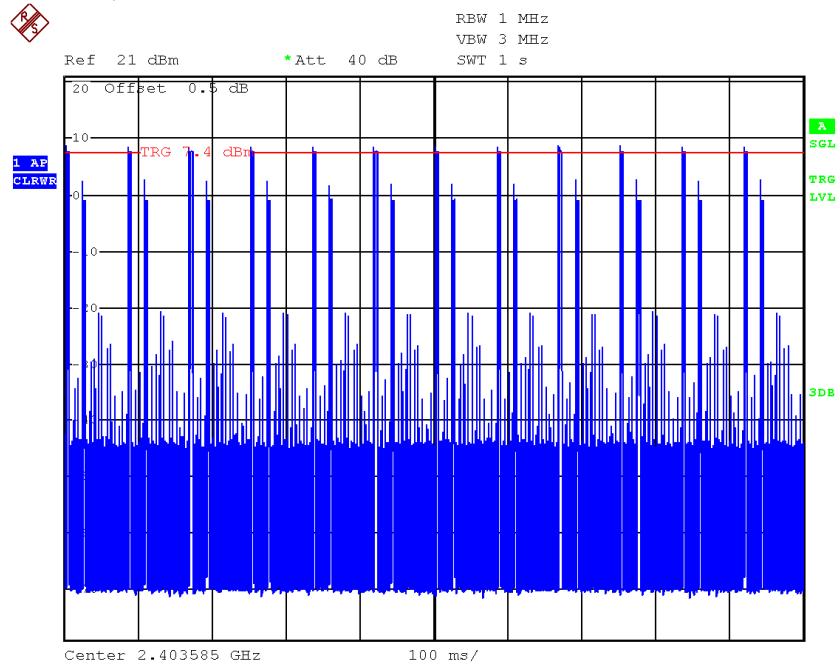
The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SPAN function on the analyzer was set to ZERO. The transmitter ON time was determined from the resultant time-amplitude display.

Please refer to the attached plot(s) for more details.

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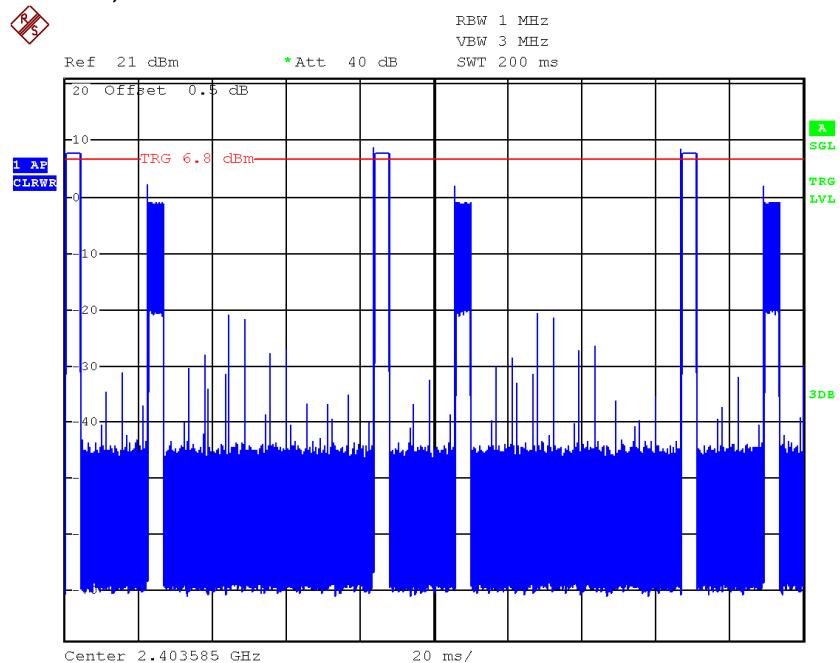
## Plots of transmitter On time

### Plot A, Tx time duration for one second



Date: 23.FEB.2016 10:18:20

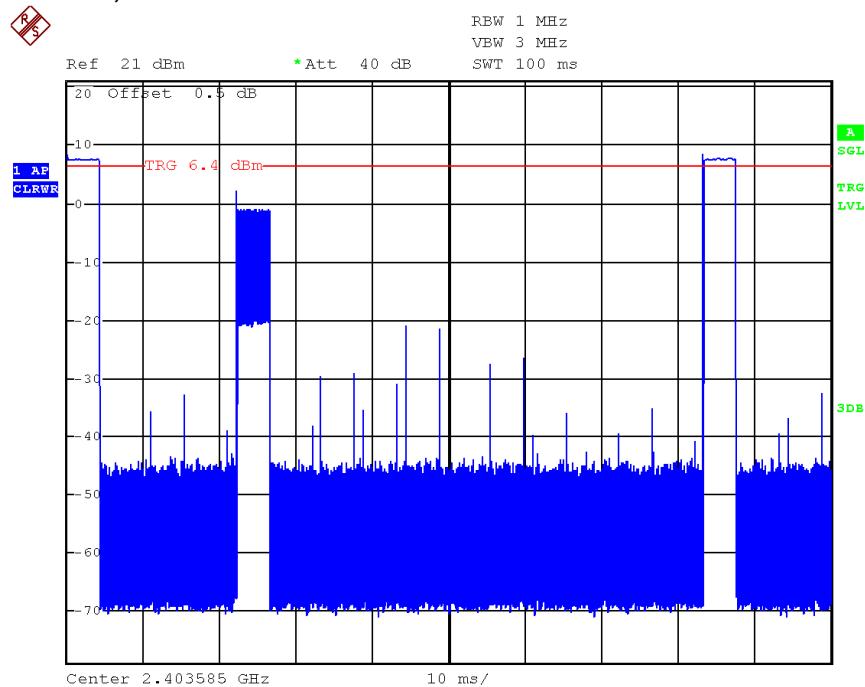
### Plot B, Tx time duration for 200ms



Date: 23.FEB.2016 10:19:46

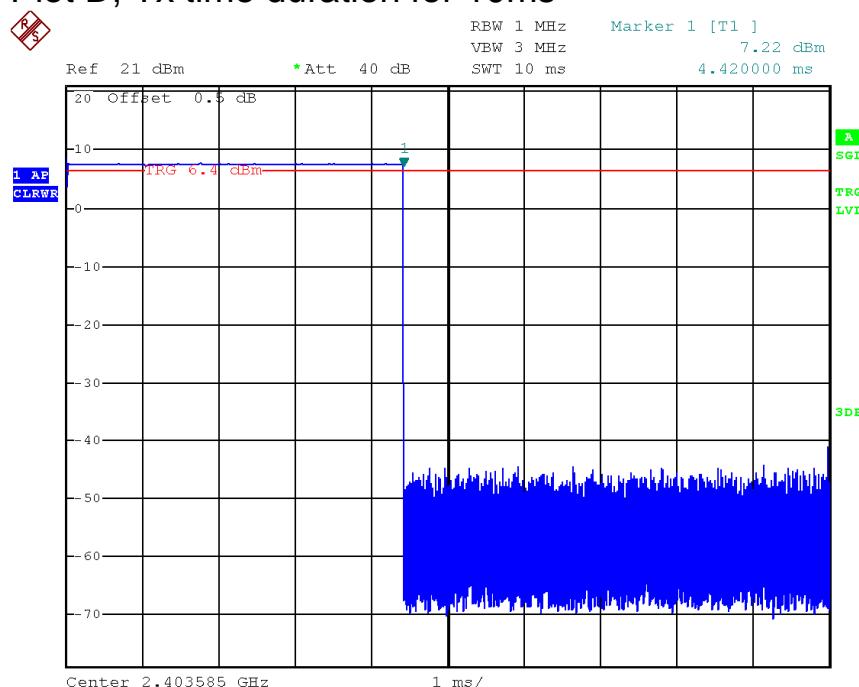
# INTERTEK TESTING SERVICES

## Plots of transmitter On time Plot C, Tx time duration for 100ms



Date: 23.FEB.2016 10:29:29

## Plot D, Tx time duration for 10ms



Date: 23.FEB.2016 10:30:11

## INTERTEK TESTING SERVICES

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### 4.9 AC Power Line Conducted Emission

- Not applicable – EUT is only powered by battery for operation.
- EUT connects to AC power line. Emission Data is listed in following pages.
- Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

#### 4.9.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration  
at

0.398 MHz

The worst case line conducted configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

#### 4.9.2 AC Power Line Conducted Emission Data

The plot(s) and data in the following pages list the significant emission frequencies, the limit and the margin of compliance.

Passed by 2.1 dB margin compare with average limit

# INTERTEK TESTING SERVICES

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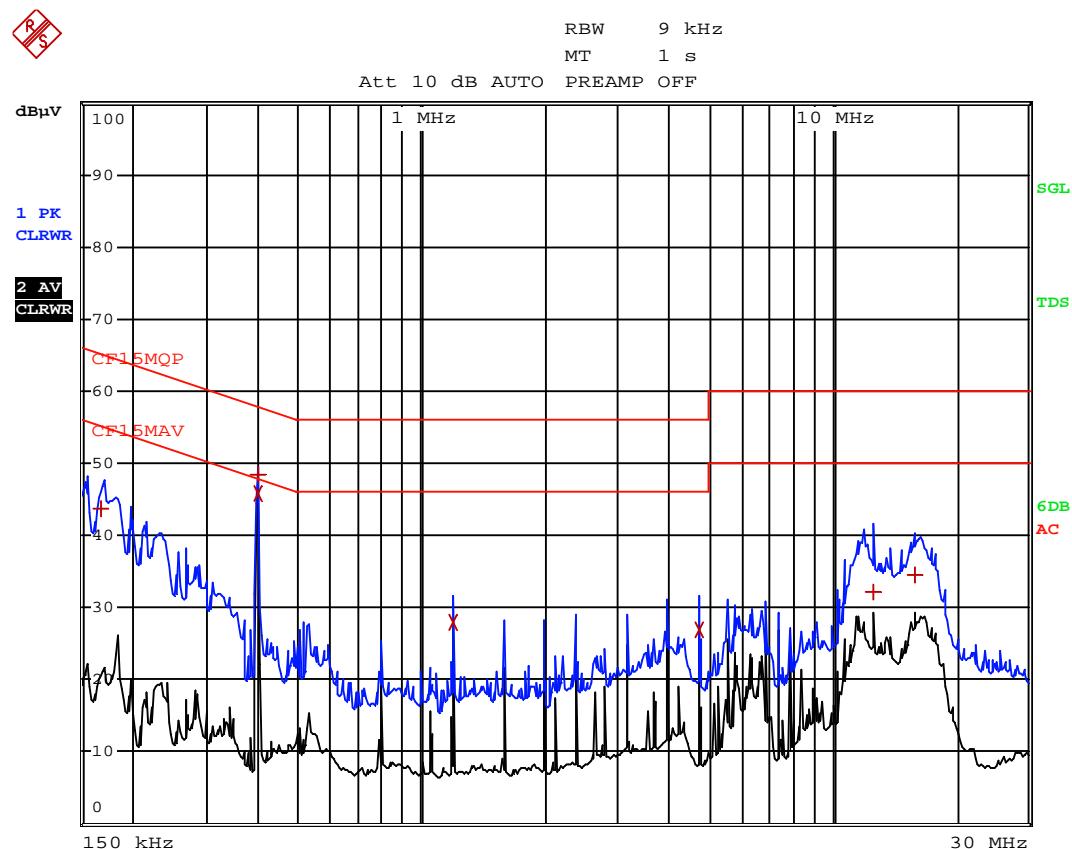
## Worst Case: EUT Transmitting

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CF15MQP			
Trace2:	CF15MAV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dB $\mu$ V	DELTA	LIMIT dB
1 Quasi Peak	168 kHz	43.70	N	-21.35
1 Quasi Peak	397.5 kHz	48.52	L1	-9.38
2 CISPR Average	397.5 kHz	45.83	N	-2.06
2 CISPR Average	1.194 MHz	27.96	L1	-18.03
2 CISPR Average	4.767 MHz	26.86	N	-19.13
1 Quasi Peak	12.543 MHz	32.19	N	-27.80
1 Quasi Peak	15.9 MHz	34.63	N	-25.36

Date: 31.DEC.2015 11:49:36

# INTERTEK TESTING SERVICES

Worst Case: EUT Transmitting

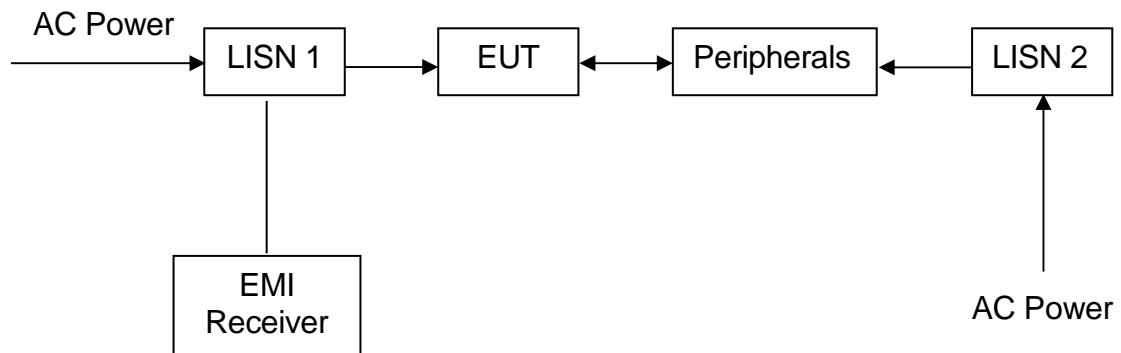


Date: 31.DEC.2015 11:49:50

# INTERTEK TESTING SERVICES

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## Conducted Emission Test Setup



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**INTERTEK TESTING SERVICES**

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**EXHIBIT 5**  
**EQUIPMENT LIST**

# INTERTEK TESTING SERVICES

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## 5.0 Equipment List

### 1) Radiated Emissions Test

Equipment	EMI Test Receiver	BiConiLog Antenna
Registration No.	EW-3095	EW-3061
Manufacturer	R&S	EMCO
Model No.	ESCI	3412E
Calibration Date	Nov. 05, 2015	Jul. 22, 2015
Calibration Due Date	Nov. 05, 2016	Jul. 22, 2016

Equipment	Spectrum Analyzer	Double Ridged Guide Antenna
Registration No.	EW-2253	EW-0194
Manufacturer	R&S	EMCO
Model No.	FSP40	3115
Calibration Date	May 27, 2015	Jan. 29, 2015
Calibration Due Date	May 27, 2016	Jul. 29, 2016

### 2) Bandwidth/Bandedge Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2329
Manufacturer	R&S
Model No.	FSP3
Calibration Date	Jun. 17, 2015
Calibration Due Date	Jun. 17, 2016

### 3) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN	Pulse Limiter
Registration No.	EW-2666	EW-0192	EW-0698
Manufacturer	R&S	R&S	R&S
Model No.	ESCI7	ESH3-Z5	ESH3-Z2
Calibration Date	May 13, 2015	Jun. 18, 2015	Jul. 14, 2015
Calibration Due Date	May 13, 2016	Jun. 18, 2016	Jul. 14, 2016

**END OF TEST REPORT**