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TEST REPORT

Report Number: 15090248HKG-001R1

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

All-In-One Compact Wireless Streaming Music System

FCC ID: Q2O-PULSE2

IC: 152B-PULSE2

This report contains the data of WLAN (WiFi) portion only.

This report supersedes previous report with report number 15041613HKG-001 dated
October 15, 2015

Prepared and Checked by:	Approved by:
Signed On File	Digitally signed by Koo Wai Ip Location: Intertek Testing Services Hong Kong Ltd.
Wong Cheuk Ho, Herbert	Koo Wai Ip
Lead Engineer	Assistant Supervisor
	September 22, 2016

GENERAL INFORMATION

Applicant Name:	Lenbrook Industries Limited
Applicant Address:	Room D, 11th Floor, Wing Cheong Commercial Building, 19-25 Jervois Street, Central, Hong Kong.
Contact Person:	Jes Arcenal
Tel:	(852) 2517 8292
Fax:	(852) 2517 4404
e-mail:	Jes_arcenal@nadelectronics.com
FCC Specification Standard:	FCC Part 15, 2014 Edition
IC Specification Standard:	RSS-247 Issue 1, May 2015 RSS-Gen Issue 4, November 2014
FCC ID:	Q2O-PULSE2
IC:	152B-PULSE2
FCC/IC Model(s):	PULSE 2
Type of EUT:	Digital Transmission System Transmitter
Description of EUT:	All-In-One Compact Wireless Streaming Music System
Serial Number:	N/A
Sample Receipt Date:	September 14, 2015
Date of Test:	September 14, 2015 to October 15, 2015
Report Date:	September 22, 2016
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

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EXHIBIT 1
TEST RESULTS SUMMARY & STATEMENT OF COMPLIANCE

1.0 Test Results Summary & Statement of Compliance

1.1 Summary of Test Results

Test Items	FCC Part 15 Section	RSS-247/ RSS-Gen# Section	Results	Details see section
Antenna Requirement	15.203	8.3#	Pass	2.1
Max. Conducted Output Power (peak)	15.247(b)(3)&(4)	5.4(4)	Pass	4.1
Min. 6dB RF Bandwidth	15.247(a)(2)	5.2(1)	Pass	4.2
Max. Power Density	15.247(e)	5.2(2)	Pass	4.3
Out of Band Antenna Conducted Emission	15.247(d)	5.5	Pass	4.4
Radiated Emission in Restricted Bands and Spurious Emissions	15.247(d), 15.209 & 15.109	8.9#,8.10#	Pass	4.6
AC Power Line Conducted Emission	15.207 & 15.107	8.8#	Pass	4.7

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 standard:

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

EXHIBIT 2
GENERAL DESCRIPTION

2.0 **General Description**

2.1 Product Description

The Equipment-Under-Test (EUT) PULSE 2 is an All-In-One Compact Wireless Streaming Music System. The EUT contains both WLAN (WiFi) and Bluetooth modules. The Bluetooth module has Bluetooth 4.0 BLE and Bluetooth 3.0 features. The EUT can accept analog audio signal, digital audio signal and wireless audio signal via Bluetooth devices. An iOS/Android apps Bluesound installed in Smartphone can act as the remote control of the EUT. The EUT has internal power amplifiers and loudspeaker. It is powered by 100-240VAC.

For the WLAN (WiFi) module:
For 802.11b mode, it operates at frequency range of 2412.000MHz to 2462.000MHz with 11 channels. It transmits via direct-sequence spread spectrum (DSSS) modulation. Maximum bit rate can be up to 11Mbps. For 802.11g mode, it operates at frequency range of 2412.000MHz to 2462.000MHz with 11 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation. Maximum bit rate can be up to 54Mbps. For 802.11n (HT20 with 20MHz bandwidth) mode, it operates at frequency range of 2412.000MHz to 2462.000MHz with 11 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation (mcs0 to mcs7). Maximum bit rate can support up to 65Mbps. For 802.11n (HT40 with 40MHz bandwidth) mode, it operates at frequency range of 2422.000MHz to 2452.000MHz with 9 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation (mcs0 to mcs7). Maximum bit rate can support up to 130Mbps.

For Bluetooth module:
For Bluetooth 4.0 BLE mode, it occupies a frequency range from 2402MHz to 2480MHz (40 channels with channel spacing of 2MHz). It transmits via GFSK modulation.

For Bluetooth 3.0 mode, it occupies a frequency range from 2402MHz to 2480MHz (79 channels with channel spacing of 1MHz). It transmits via GFSK modulation.

The antenna(s) used in the EUT is internal, integral.

The circuit description is saved with filename: descri.pdf.

2.2 Test Methodology

Both AC power line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Preliminary radiated scans and all radiated measurements were performed in radiated emission 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 KDB Publication No.558074 D01 v03r05 (08-April-2016). All other measurements were made in accordance with the procedures in 47 CFR Part 2 and RSS-Gen Issue 4 (2014).

2.3 Test Facility

The radiated emission test site, AC conducted 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 (WiFi portion only).

EXHIBIT 3
SYSTEM TEST CONFIGURATION

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 which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz.. If the base unit attached to peripherals, they were connected and operational (as typical as possible).

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.

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.

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 4.2.3.

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 4.6.3. With the resolution bandwidth 1MHz and spectrum analyzer IF bandwidth 3dB, the pulse desensitization factor was 0dB.

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 power cord connected to one LISN (Line impedance stabilization network), which provided 50ohm coupling impedance for measuring instrument. Meanwhile, the peripheral or support equipment power cords connected to a separate LISN. The ac powers for all LISNs were obtained from the same power source. 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. Power cords of non-EUT equipment (peripherals) were not bundled. AC power cords of peripheral equipments draped over the rear edge of the table, and routed them down onto the floor of the ac power line conducted emission test site to the second LISN.

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

Different data rates have been tested. Worst case is reported only.

All relevant operation modes have been tested, and the worst case data is included in this report.

All data rates were tested under normal mode of WiFi. Only the worst-case data is shown in the report for DSSS and OFDM

For simultaneous transmission, both WiFi and Bluetooth portions are also switched on when taking radiated emission for determining worst-case spurious emission.

3.2 EUT Exercising Software

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

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)
(2) 1 X audio cable of 2m in length (with termination)
(3) 1 X LAN cable of 2m in length (with termination)
(4) 1 X 4GB USB flash drive
(Supplied by Intertek)

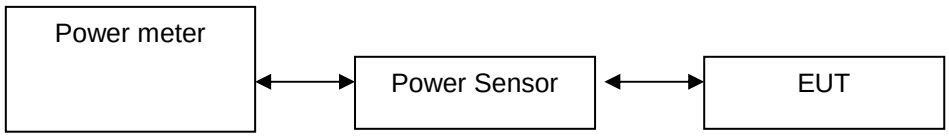
3.4 Measurement Uncertainty

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 ± 5.3dB and ±0.99dB respectively. The value of the Measurement uncertainty for conducted emission test is ±4.2dB.

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.

EXHIBIT 4
TEST RESULTS

4.0 **Test Results**



4.1 Maximum Conducted (peak) Output Power at Antenna Terminals

The antenna port of the EUT was connected to the input of a power meter.

☒ 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 the obtain power at the EUT antenna terminals. The measurement procedure 9.1.2 was used.

☐ The EUT should be configured to transmit continuously (at a minimum duty cycle of 98%) at full power over the measurement duration. The measurement procedure AVG1 was used.

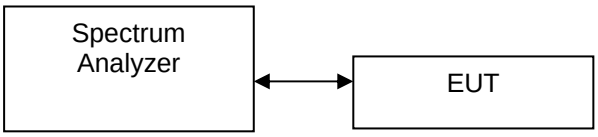
IEEE 802.11b (DSSS, 1 Mbps) Antenna Gain = 2 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	11.44	13.93
Middle Channel: 2437	12.86	19.32
High Channel: 2462	12.28	16.90

IEEE 802.11g (OFDM, 6 Mbps) Antenna Gain = 2 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	11.12	12.94
Middle Channel: 2437	11.88	15.42
High Channel: 2462	11.56	14.32

IEEE 802.11n (HT20, MCS0) Antenna Gain = 2 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	8.04	6.37
Middle Channel: 2437	9.56	9.04
High Channel: 2462	9.28	8.47

RF Conduct measurement Test Setup

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



4.1 Maximum Conducted (Average) output Power at Antenna Terminals

Occupied Bandwidth

IEEE 802.11n (HT40, mcs0)	
Frequency (MHz)	Occupied Bandwidth (kHz)
Low Channel: 2422	41600
Middle Channel: 2437	40640
High Channel: 2452	41080

Maximum Conducted (Avarage) Output Power at Antenna Terminals

The antenna port of the EUT was connected to the input of a spectrum analyzer.

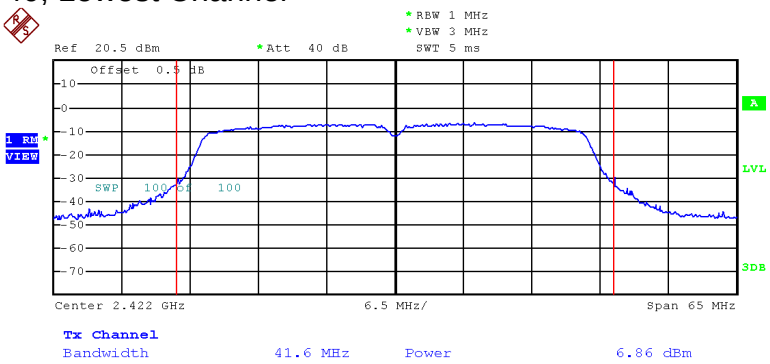
☒ External attenuation and cable loss were compensated for using the OFFSET function of the analyser. The measurement procedure 9.2.2.2 was used.

☐ The EUT should be configured to transmit continuously (at a minimum duty cycle of 98%) at full power over the measurement duration. The measurement procedure AVG1 was used.

IEEE 802.11n (HT40, mcs0) Antenna Gain = 2 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2422	6.86	4.85
Middle Channel: 2437	6.96	4.97
High Channel: 2452	6.38	4.35

Plots of maximum output power

802.11n HT40, Lowest Channel



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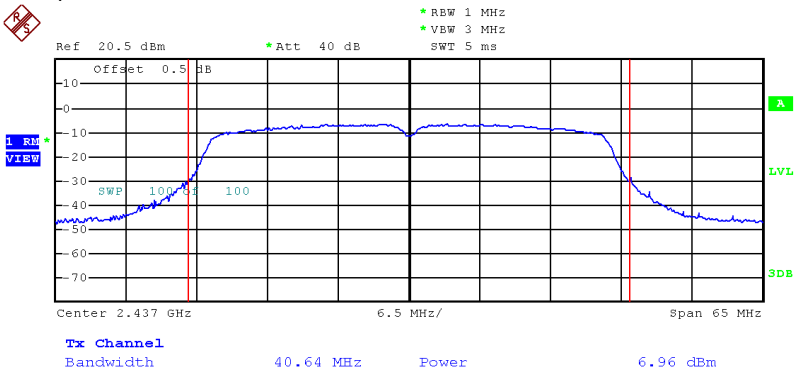
802.11n HT40, Middle Channel



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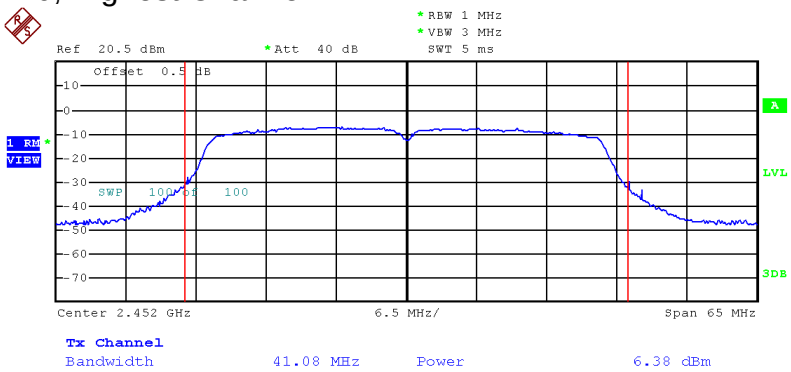
Plots of maximum output power

802.11n HT40, Highest Channel



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4.1 Maximum Conducted Output Power at Antenna Terminals – Cont'd

Cable loss : 0.5 dB External Attenuation : 0 dB

IEEE 802.11b (DSSS, 1 Mbps)
max. conducted (peak) output level = 12.86 dBm

IEEE 802.11g (OFDM, 6 Mbps)
max. conducted (peak) output level = 11.88 dBm

IEEE 802.11n (HT20, mcs0)
max. conducted (peak) output level = 9.56 dBm

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

IEEE 802.11n ((HT40, mcs0)
max. conducted (Average) output level = 6.96 dBm

Limits:
☒ 1W (30dBm) for antennas with gains of 6dBi or less

☐ ___W (___dBm) for antennas with gains more than 6dBi

4.2 Minimum 6dB RF Bandwidth

The antenna port of the EUT was connected to the input of a spectrum analyzer. The EBW measurement procedure was used. A PEAK output reading was taken, a DISPLAY line was drawn 6dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

IEEE 802.11b (DSSS, 1 Mbps)	
Frequency (MHz)	6dB Bandwidth (kHz)
Low Channel: 2412	10240
Middle Channel: 2442	10160
High Channel: 2462	10200

IEEE 802.11g (OFDM, 6 Mbps)	
Frequency (MHz)	6dB Bandwidth (kHz)
Low Channel: 2412	17760
Middle Channel: 2442	17640
High Channel: 2462	17760

IEEE 802.11n (HT20, MCS0)	
Frequency (MHz)	6dB Bandwidth (kHz)
Low Channel: 2412	17760
Middle Channel: 2442	17720
High Channel: 2462	17850

Limits:
6 dB bandwidth shall be at least 500kHz

4.2 Minimum 6dB RF Bandwidth – cont'd

The antenna port of the EUT was connected to the input of a spectrum analyzer. The EBW measurement procedure was used. A PEAK output reading was taken, a DISPLAY line was drawn 6dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

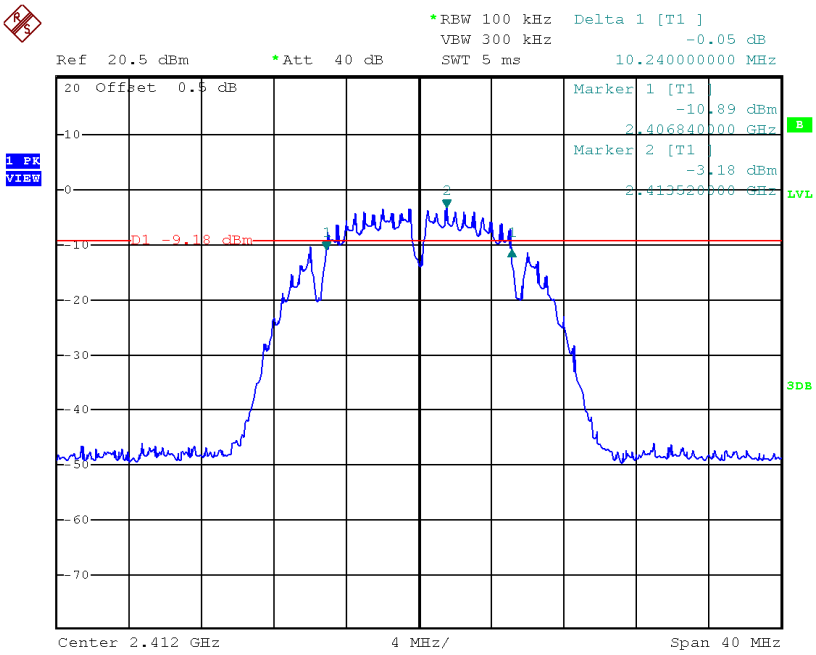
IEEE 802.11n (HT40, MCS0)	
Frequency (MHz)	6dB Bandwidth (kHz)
Low Channel: 2422	35360
Middle Channel: 2442	35440
High Channel: 2452	35500

Limits
6 dB bandwidth shall be at least 500kHz

The plots of 6dB RF bandwidth and occupied bandwidth are saved as below.

Plots of 6dB RF bandwidth

802.11b, Lowest Channel



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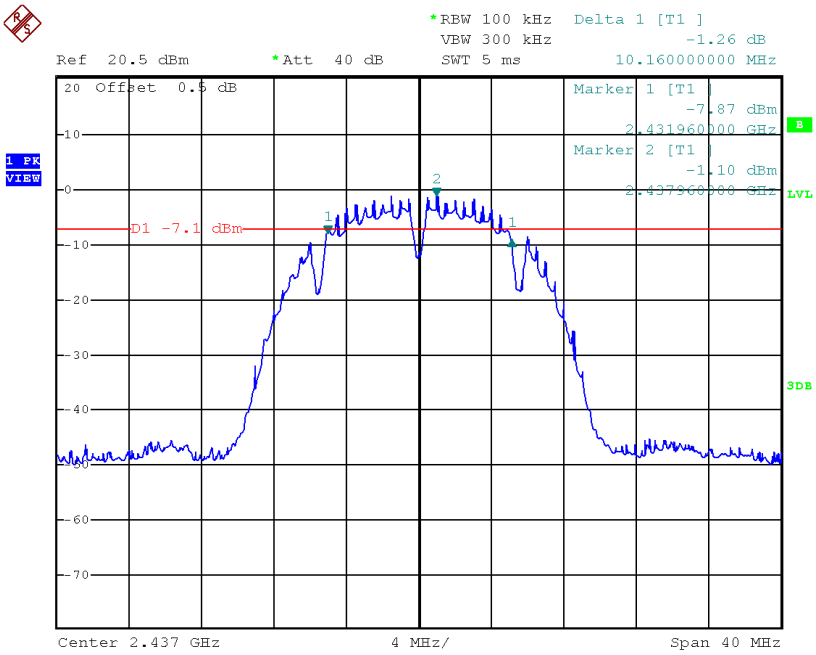
802.11b, Middle Channel



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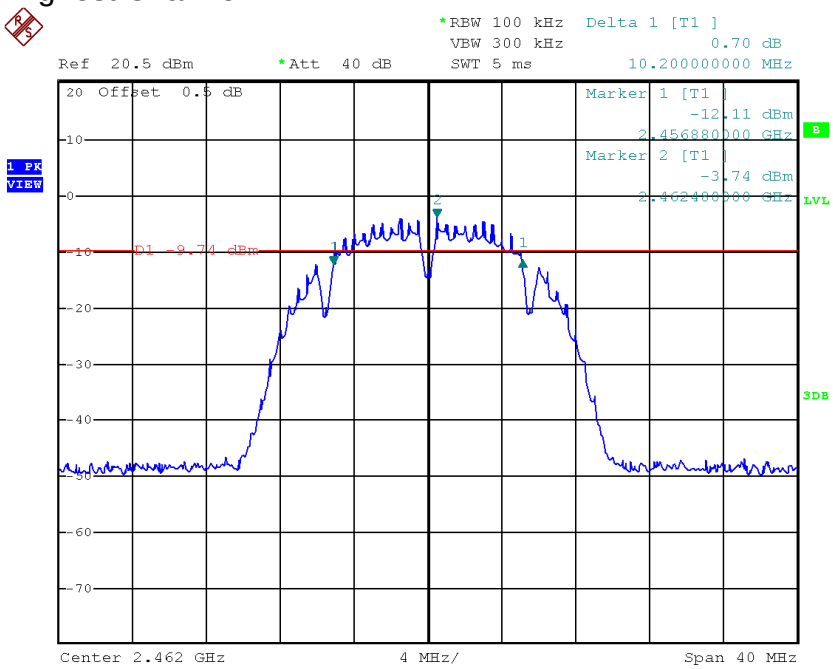
Plots of 6dB RF bandwidth

802.11b, Highest Channel



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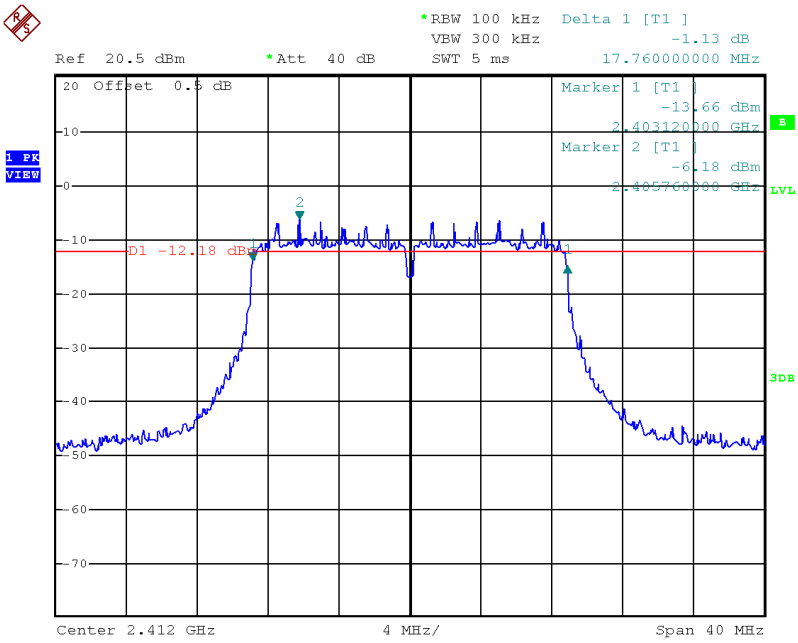
Plots of 6dB RF bandwidth

802.11g, Lowest Channel



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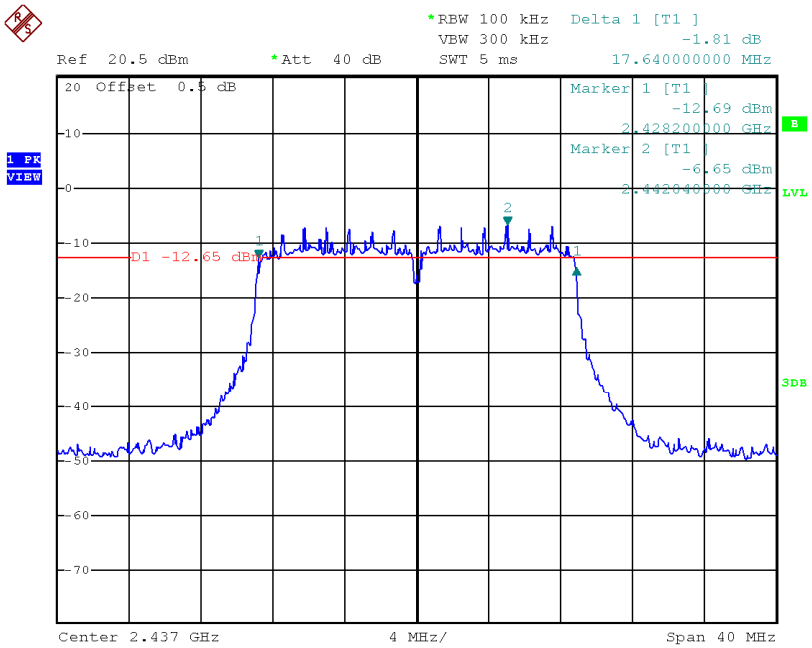
802.11g, Middle Channel



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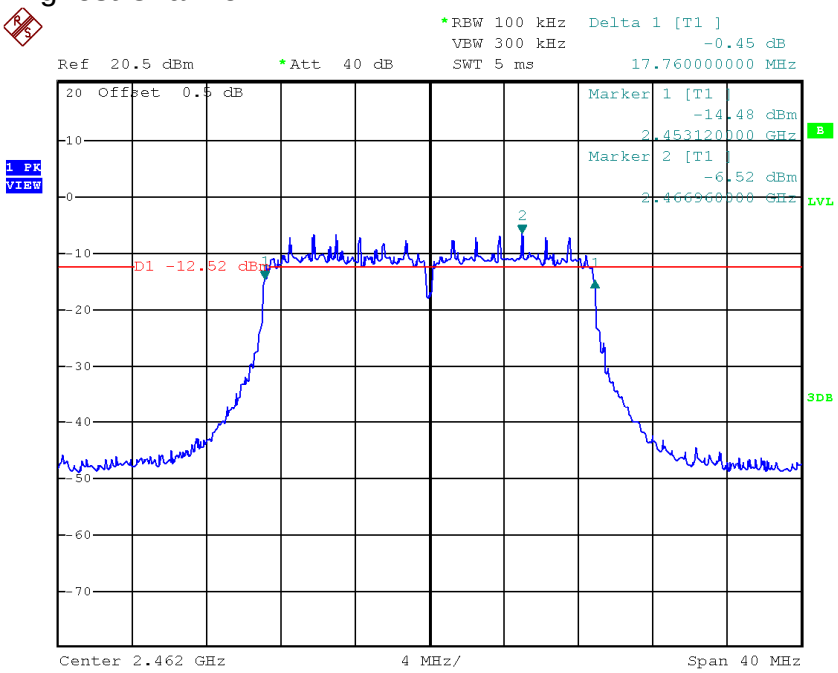
Plots of 6dB RF bandwidth

802.11g, Highest Channel



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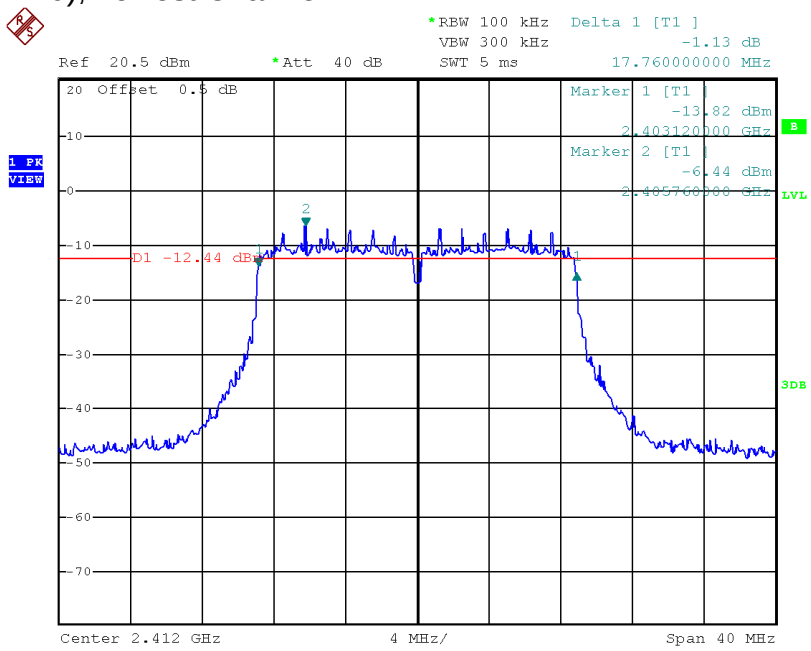
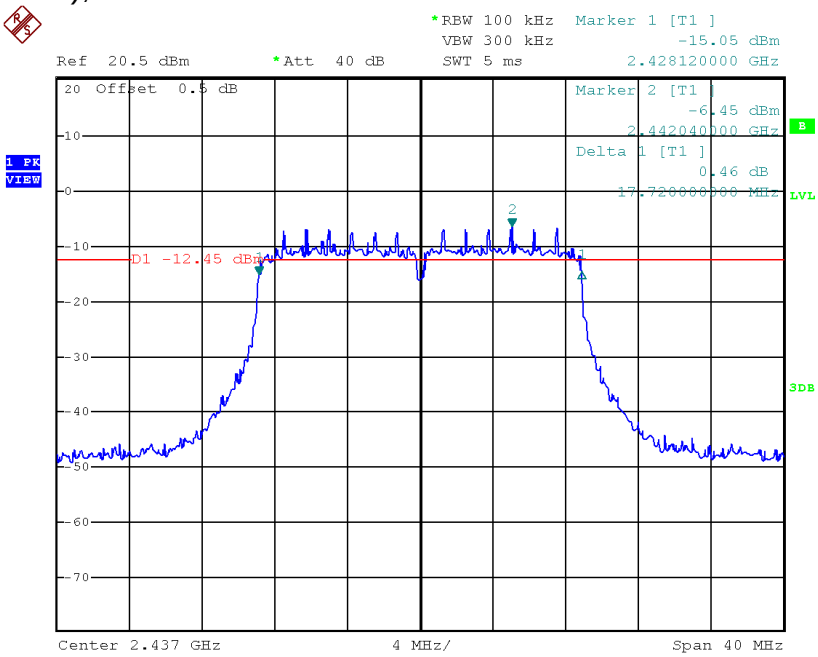
Plots of 6dB RF bandwidth

802.11n(HT20), Lowest Channel



Date: 24.SEP.2015 17:44:32

802.11n(HT20), Middle Channel



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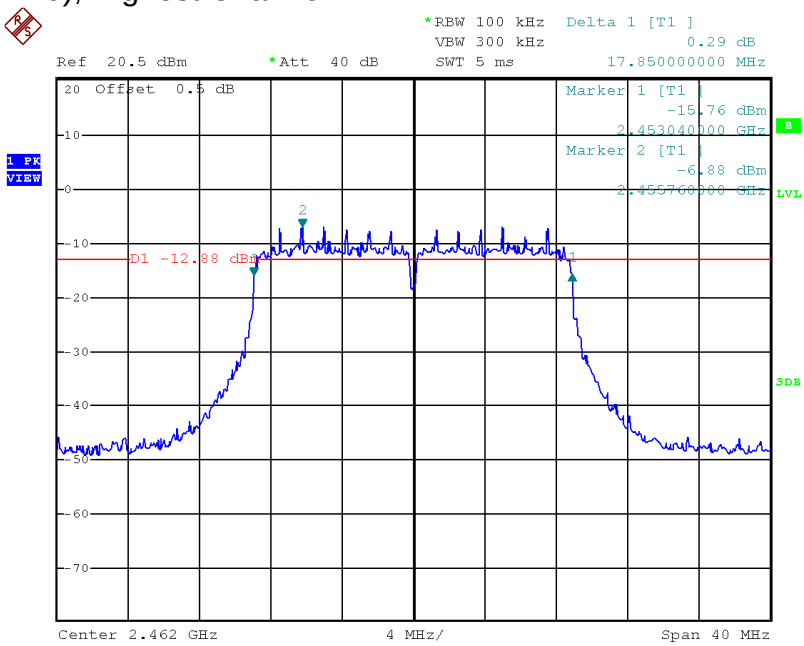
Plots of 6dB RF bandwidth

802.11n(HT20), Highest Channel



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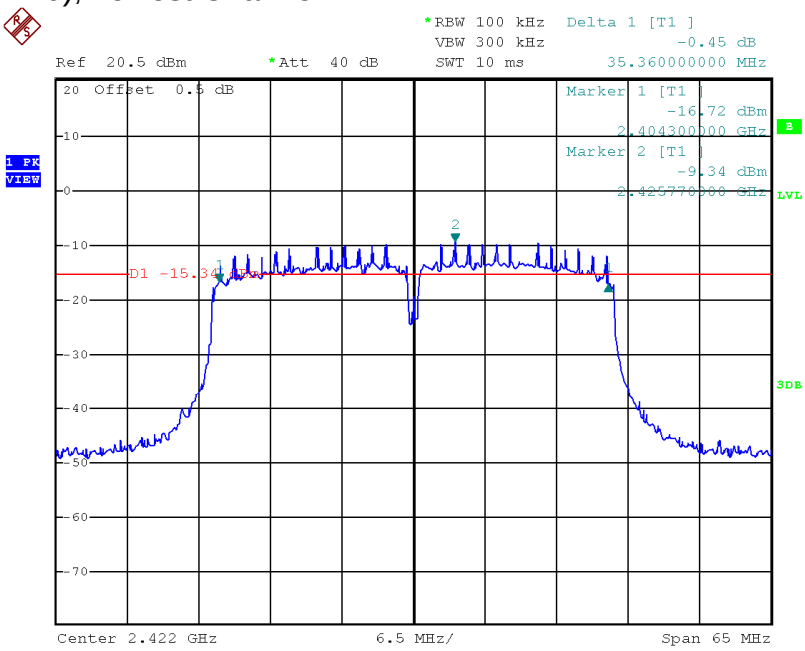
Plots of 6dB RF bandwidth

802.11n(HT40), Lowest Channel



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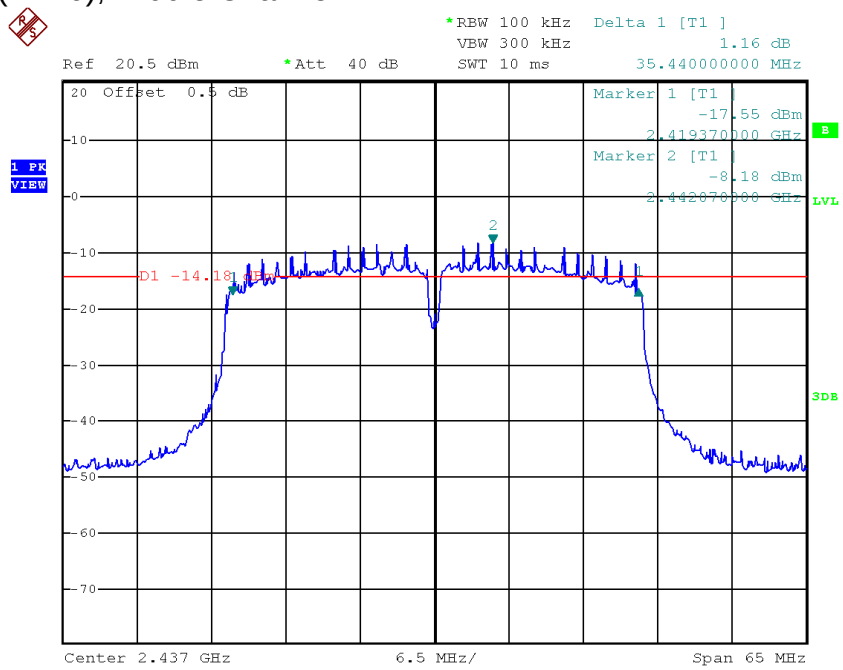
802.11n(HT40), Middle Channel



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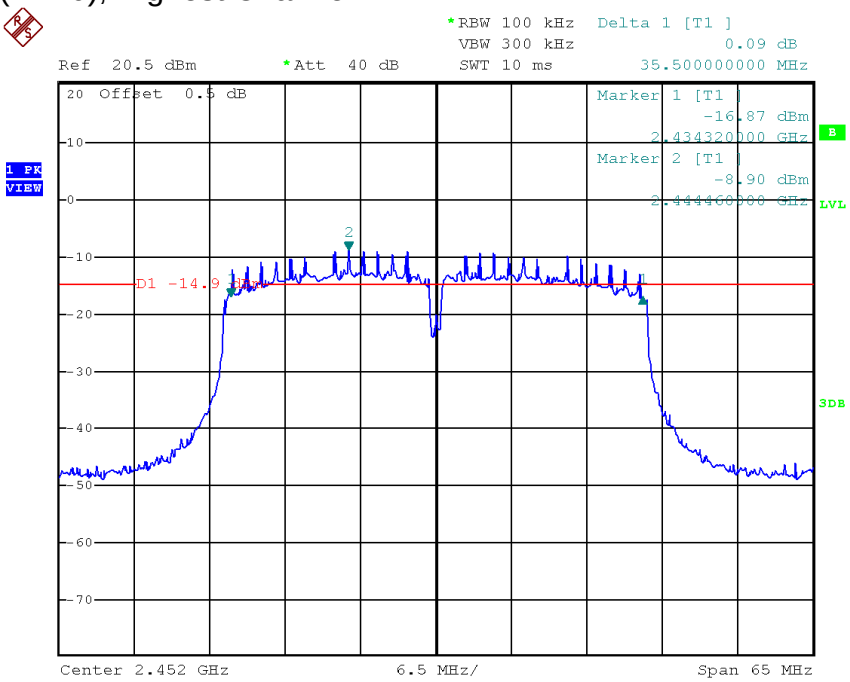
Plots of 6dB RF bandwidth

802.11n(HT40), Highest Channel



Date: 24.SEP.2015 18:04:58

4.3 Maximum Power Spectral Density

Antenna output of the EUT was coupled directly to spectrum analyzer. The measurement procedure 10.2 PKPSD-1 was used. If an external attenuator and/or cable was used, these losses are compensated for using the OFFSET function of the analyser.

IEEE 802.11b (DSSS, 1 Mbps)	
Frequency (MHz)	PSD in 100kHz (dBm)
Low Channel: 2412	-3.12
Middle Channel: 2442	-3.52
High Channel: 2462	-3.68

IEEE 802.11g (OFDM, 6 Mbps)	
Frequency (MHz)	PSD in 100kHz (dBm)
Low Channel: 2412	-6.06
Middle Channel: 2442	-6.32
High Channel: 2462	-6.65

IEEE 802.11n (HT20, MCS0)	
Frequency (MHz)	PSD in 100kHz (dBm)
Low Channel: 2412	-6.36
Middle Channel: 2442	-6.58
High Channel: 2462	-6.35

Cable Loss: 0.5 dB

Limit:
8dBm

4.3 Maximum Power Spectral Density – cont'd

Antenna output of the EUT was coupled directly to spectrum analyzer. The measurement procedure 10.3 AVGPSD-1 was used. If an external attenuator and/or cable was used, these losses are compensated for using the OFFSET function of the analyser.

IEEE 802.11n (HT40, MCS0)	
Frequency (MHz)	PSD in 100kHz (dBm)
Low Channel: 2422	-12.46
Middle Channel: 2442	-12.34
High Channel: 2452	-12.46

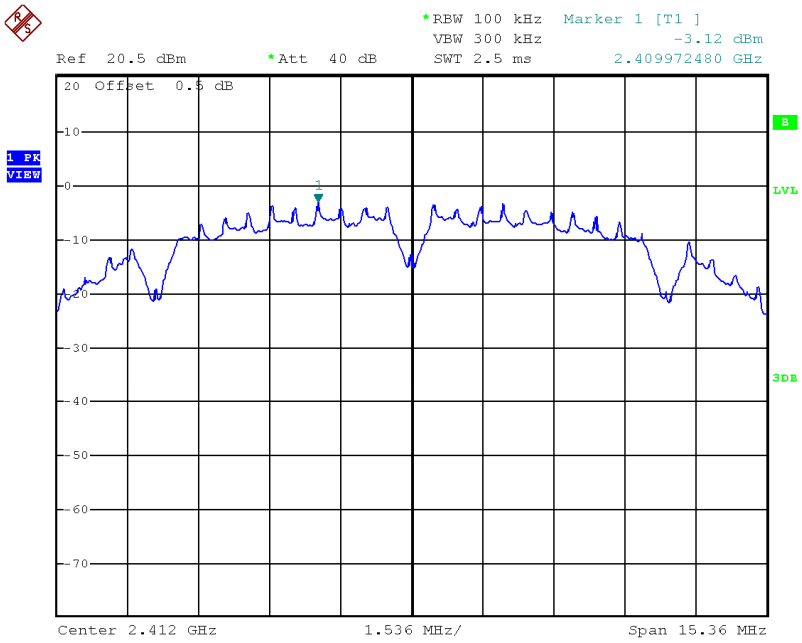
Cable Loss: 0.5 dB

Limit:
8dBm

The plots of power spectral density are as below.

Plots of power spectral density

802.11b, Lowest channel



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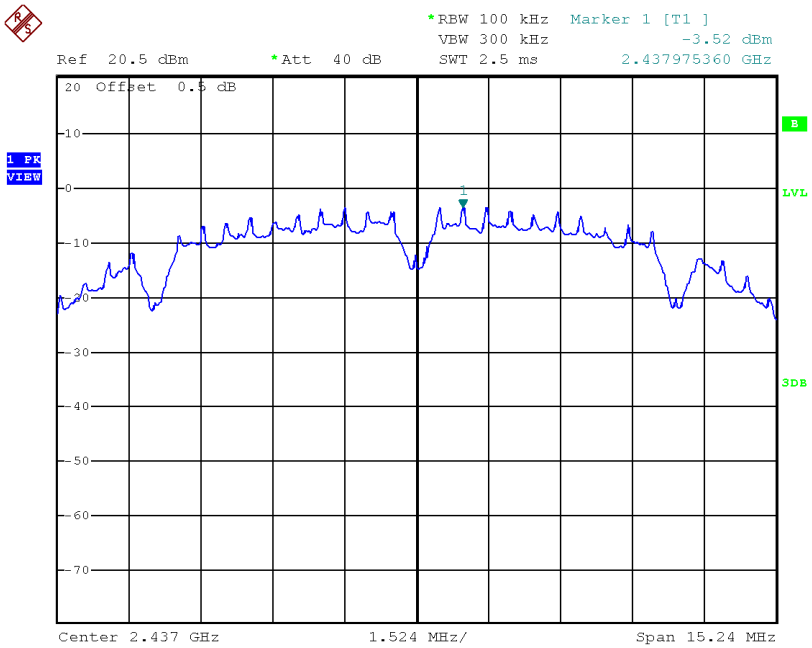
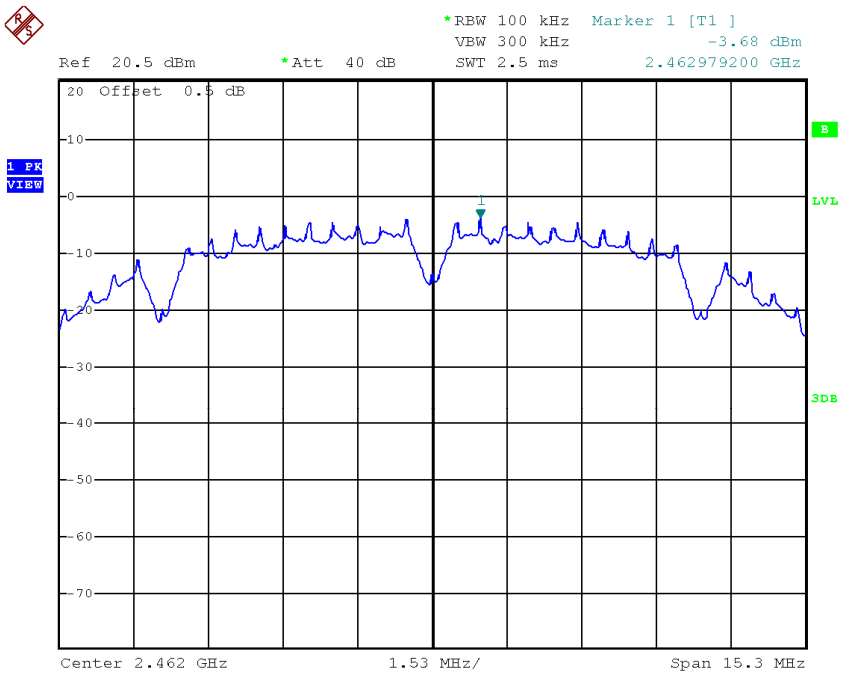
802.11b, Middle channel



Date: 24.SEP.2015 18:32:47

Plots of power spectral density

802.11b, Highest channel



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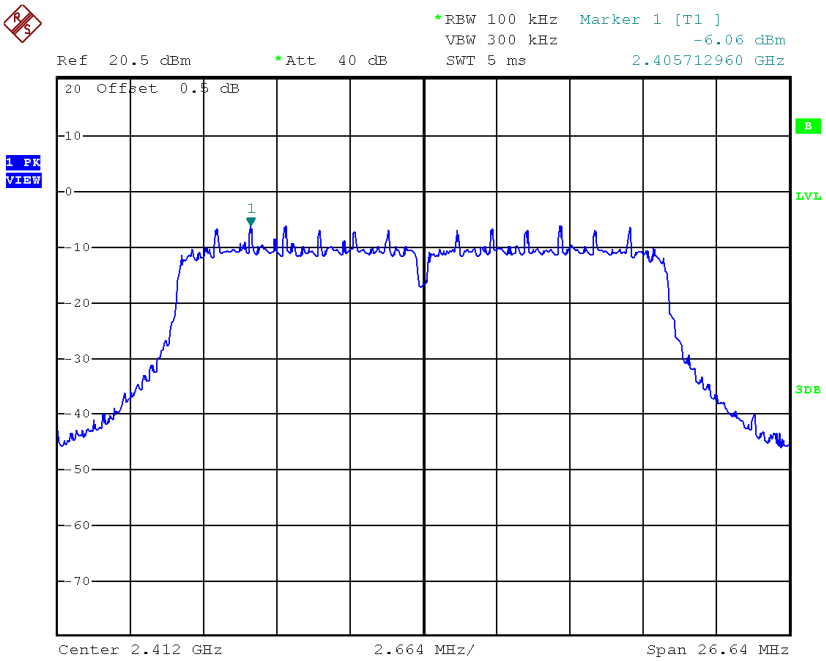
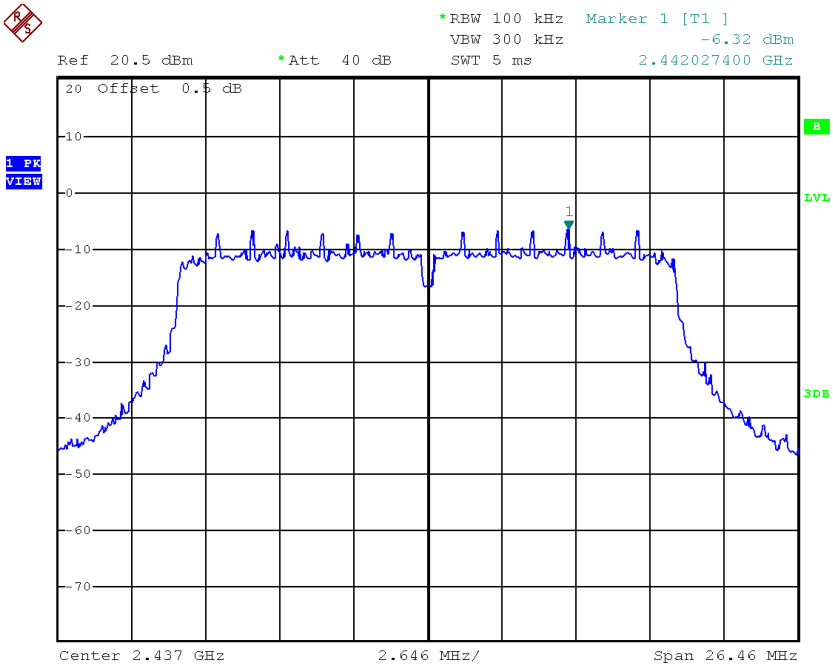
Plots of power spectral density

802.11g, Lowest channel



Date: 24.SEP.2015 18:37:43

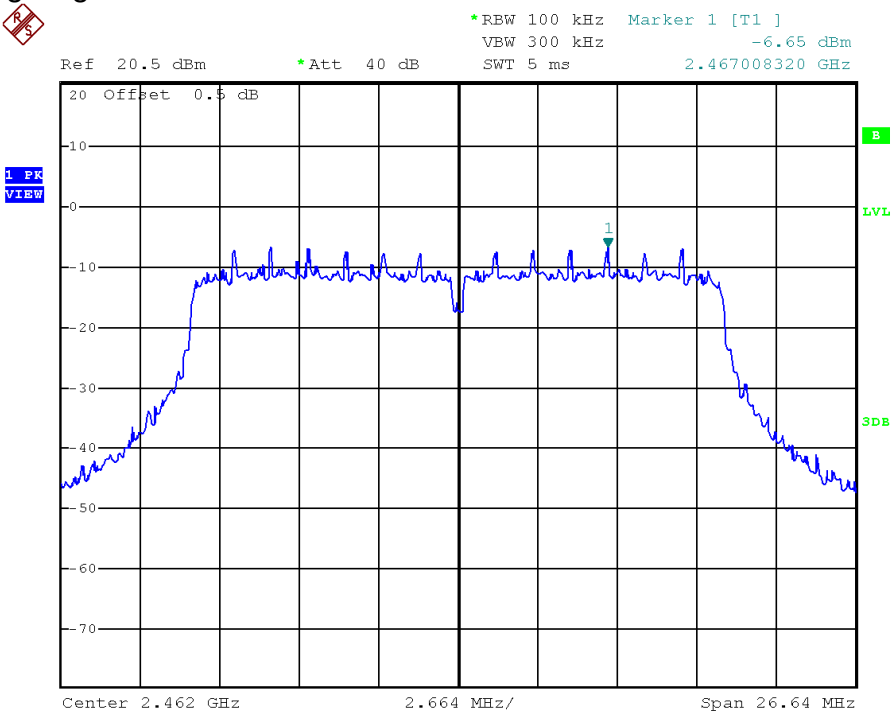
802.11g, Middle channel



Date: 24.SEP.2015 18:43:23

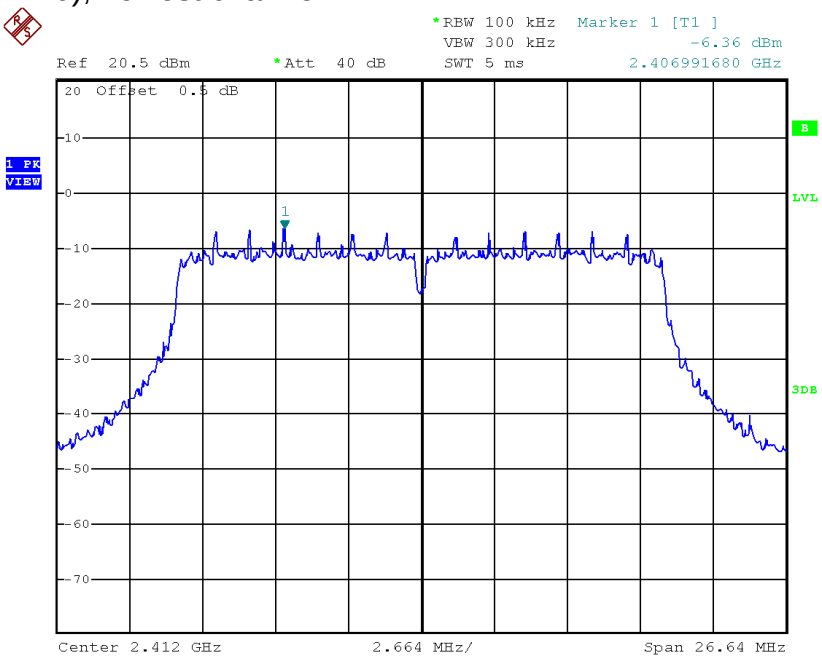
Plots of power spectral density

802.11g, Highest channel



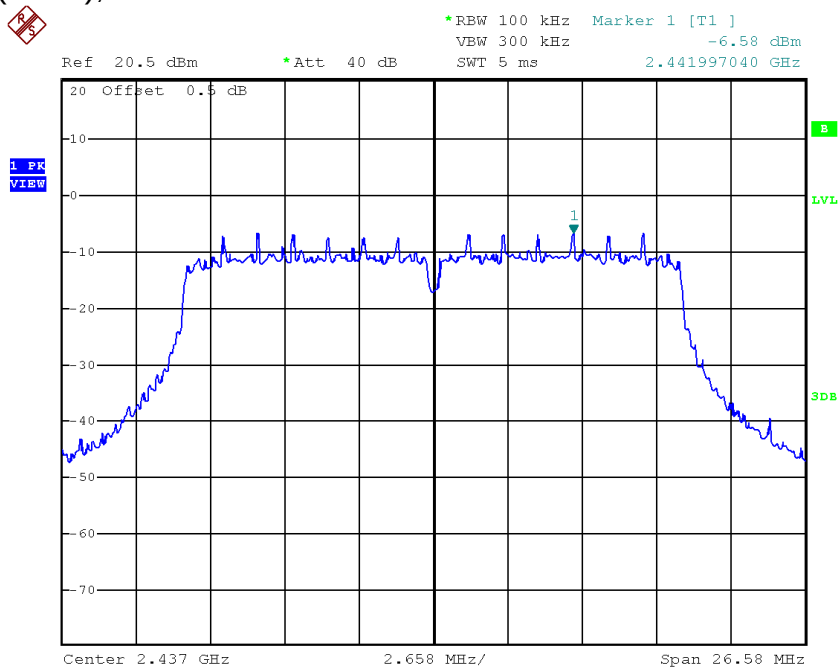
Plots of power spectral density

802.11n(HT20), Lowest channel



Date: 24.SEP.2015 18:39:33

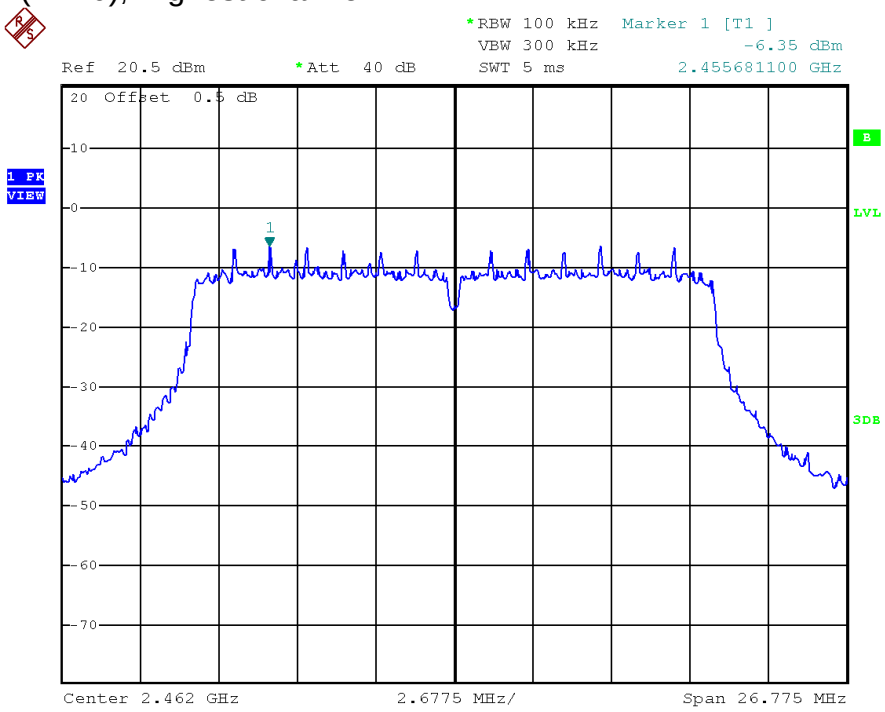
802.11n(HT20), Middle channel



Date: 24.SEP.2015 18:44:17

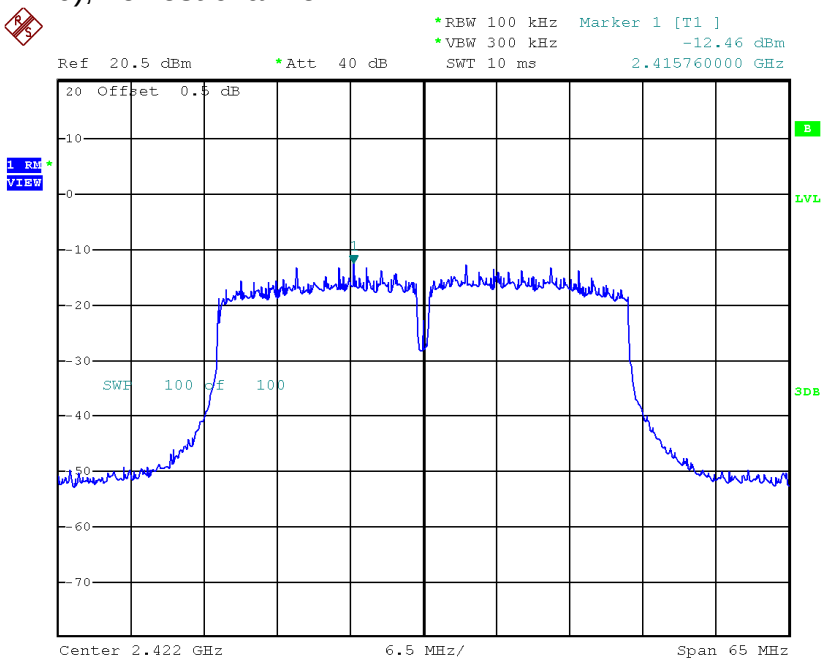
Plots of power spectral density

802.11n(HT20), Highest channel



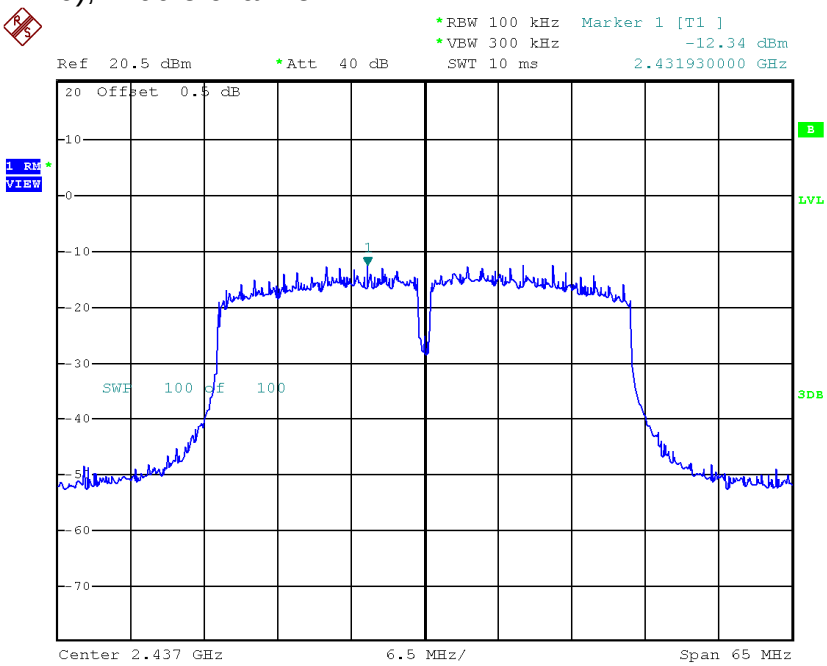
Plots of power spectral density

802.11n(HT40), Lowest channel



Date: 24.SEP.2015 18:53:47

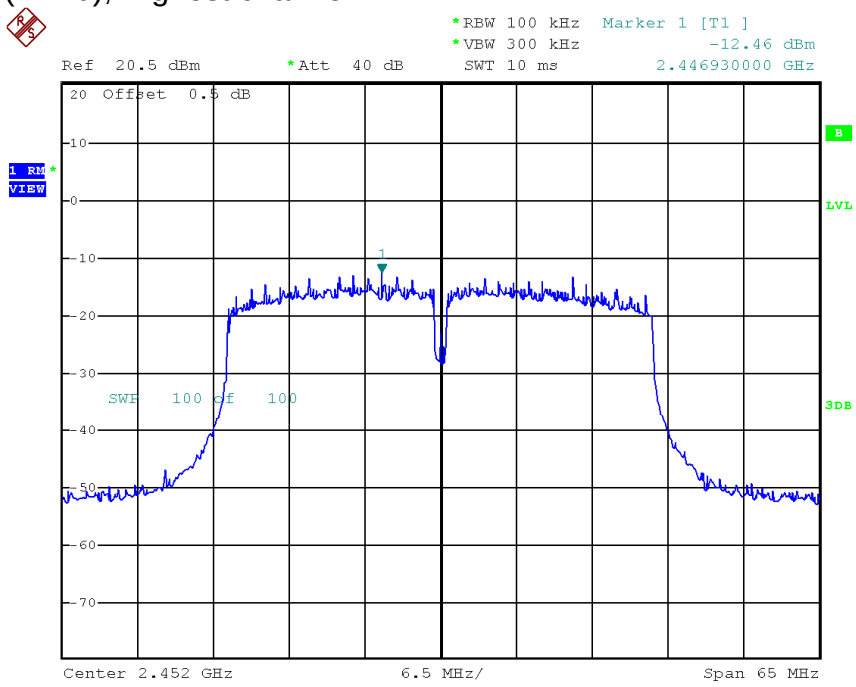
802.11n(HT40), Middle channel



Date: 24.SEP.2015 18:55:23

Plots of power spectral density

802.11n(HT40), Highest channel



Date: 24.SEP.2015 18:56:26

4.4 Out of Band Conducted Emissions

For 802.11b/g/n (HT20):
The maximum conducted (peak) output power was used to demonstrate compliance as described in 9.1. Then the display line (in red) shown in the following plots denotes the limit at 20dB below maximum measured in-band peak PSD level in 100 KHz bandwidth.

For 802.11n (HT40):
The maximum conducted (average) output power was used to demonstrate compliance as described in 9.2. Then the display line (in red) shown in the following plots denotes the limit at 30dB below maximum measured in-band peak PSD level in 100 KHz bandwidth.

The measurement procedures under sections 11 of KDB558074 D01 v03r05 (08-April-2016) were used.

Furthermore, delta measurement technique for measuring bandedge emissions was incorporated in the test of the edge at 2483.5MHz.

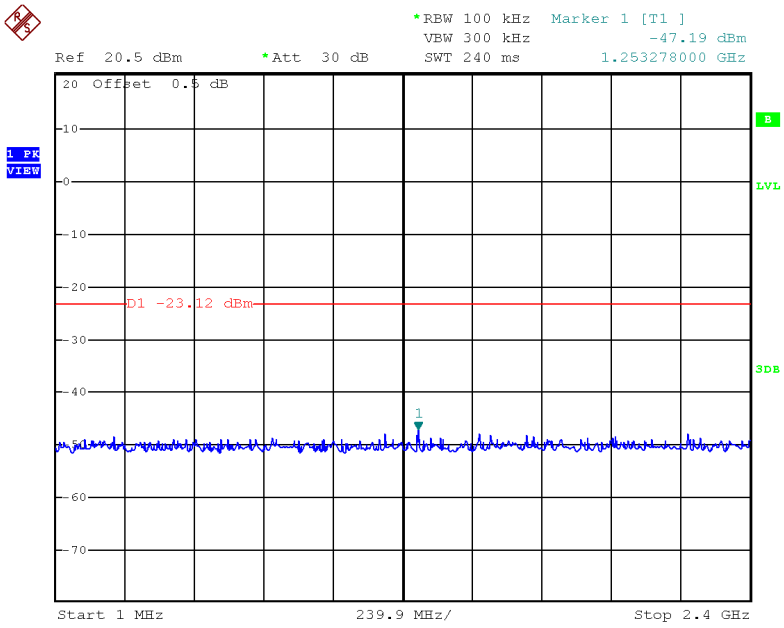
Limits:
For 802.11 b/g/n (HT20)
All spurious emission and up to the tenth harmonic was measured and they were found to be at least 20 dB below the maximum measured in-band peak PSD level.

For 802.11n HT40:
All spurious emission and up to the tenth harmonic was measured and they were found to be at least 30 dB below the maximum measured in-band peak PSD level.

The plots of out of band conducted emissions are as below.

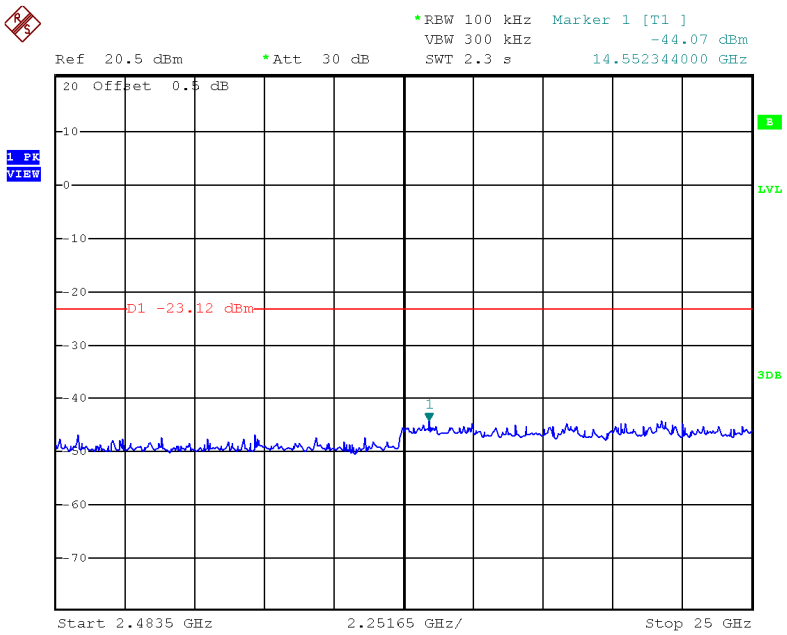
Plots of out of band conducted emissions

802.11b, Lowest Channel, Plot A



Date: 29.SEP.2015 12:20:36

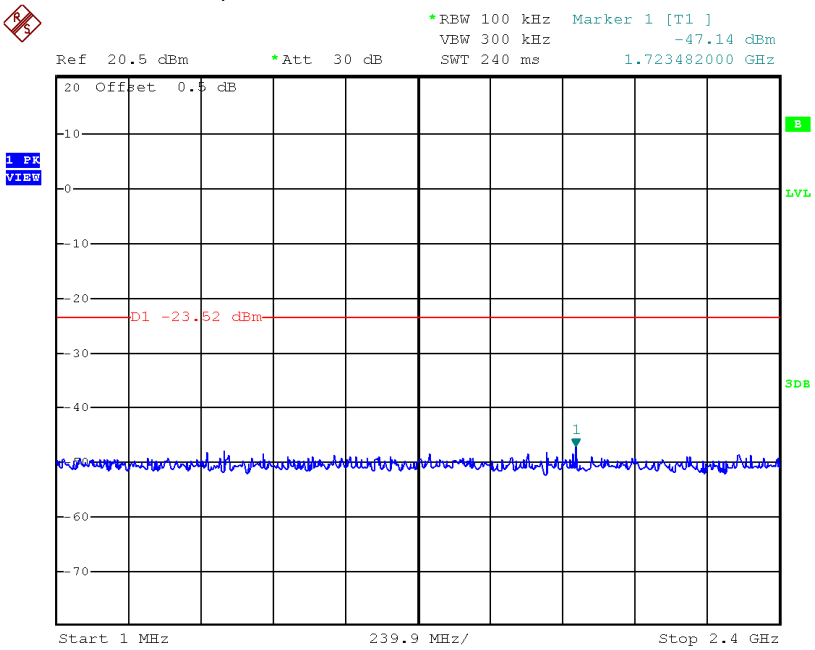
802.11b, Lowest Channel, Plot B



Date: 29.SEP.2015 12:19:53

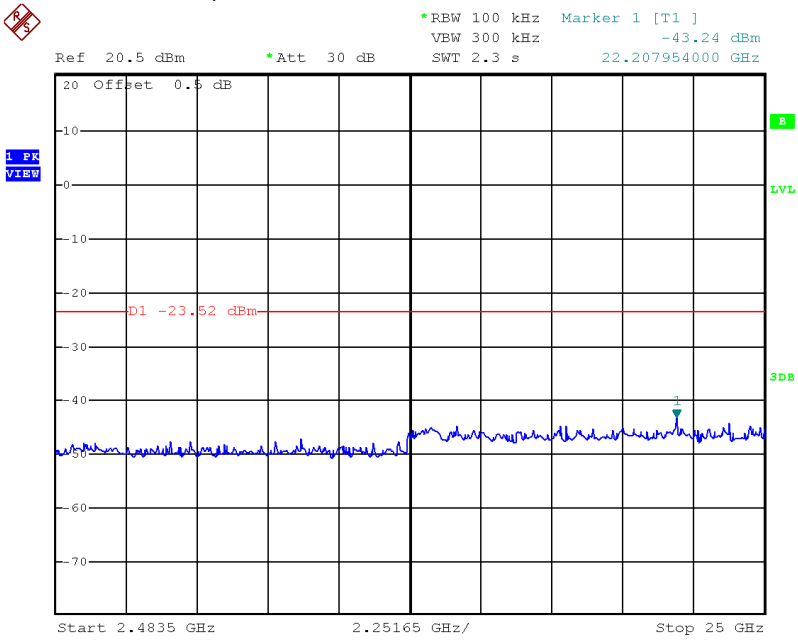
Plots of out of band conducted emissions

802.11b, Middle Channel, Plot A



Date: 29.SEP.2015 12:22:40

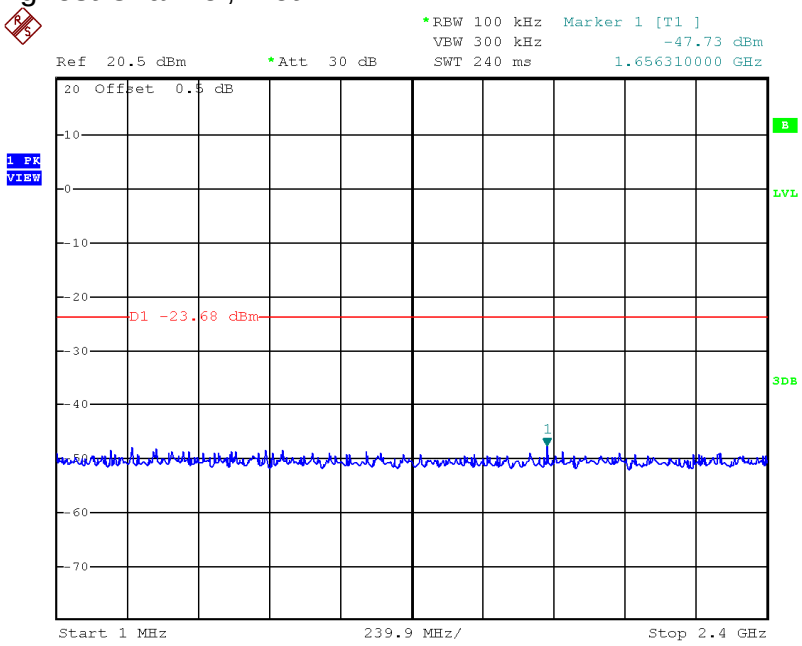
802.11b, Middle Channel, Plot B



Date: 29.SEP.2015 12:23:32

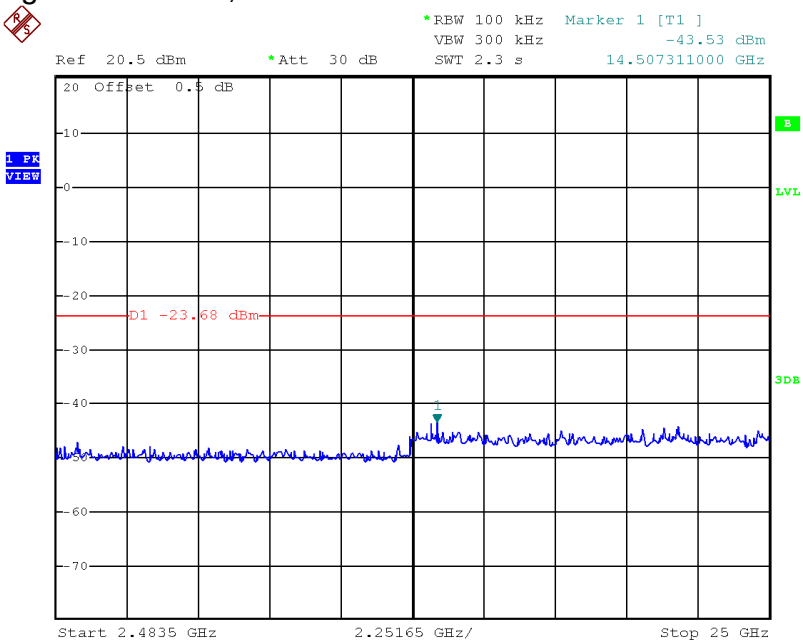
Plots of out of band conducted emissions

802.11b, Highest Channel, Plot A



Date: 29.SEP.2015 12:25:38

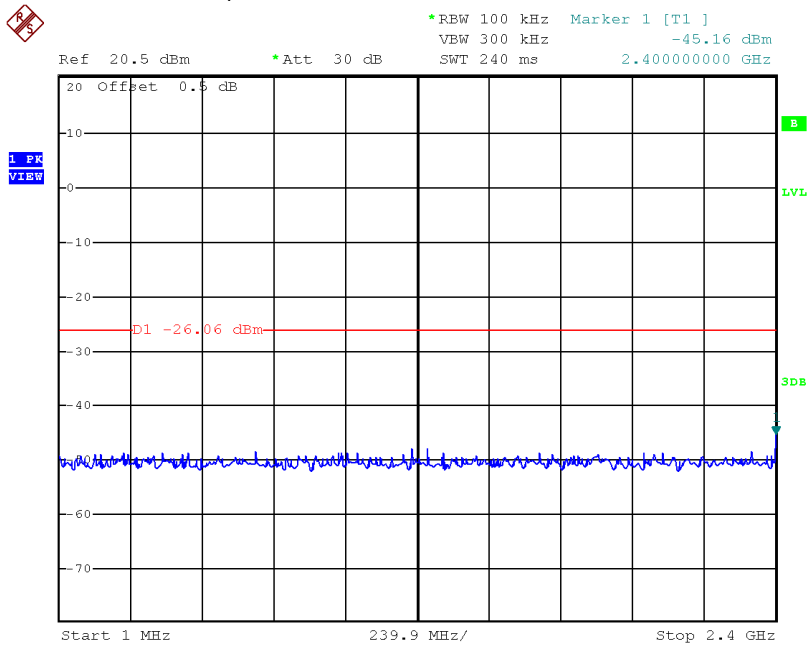
802.11b, Highest Channel, Plot B



Date: 29.SEP.2015 12:25:10

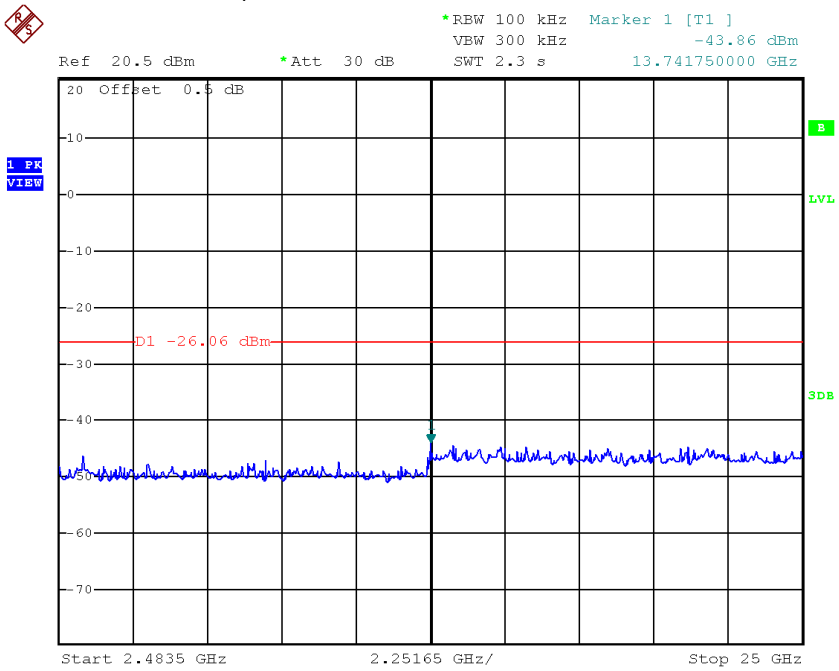
Plots of out of band conducted emissions

802.11g, Lowest Channel, Plot A



Date: 29.SEP.2015 12:28:57

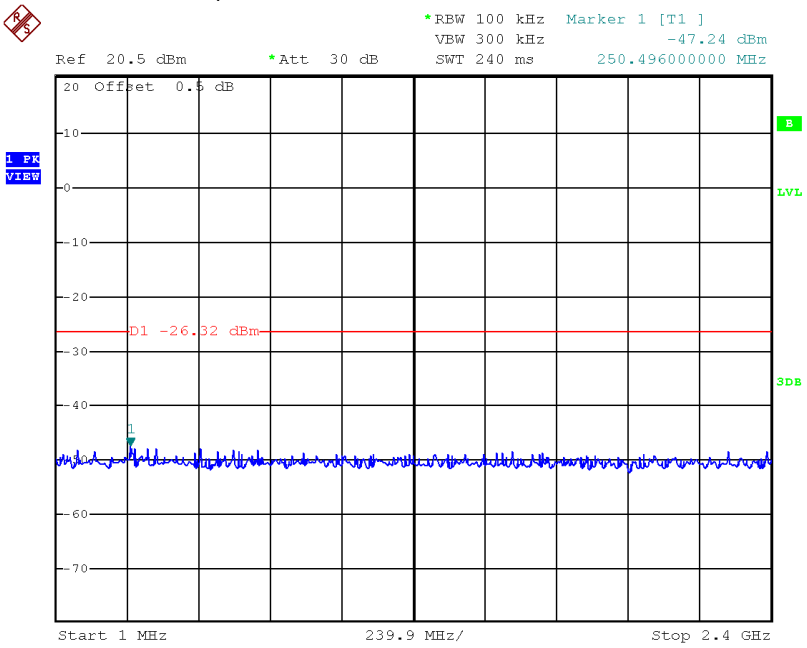
802.11g, Lowest Channel, Plot B



Date: 29.SEP.2015 12:29:51

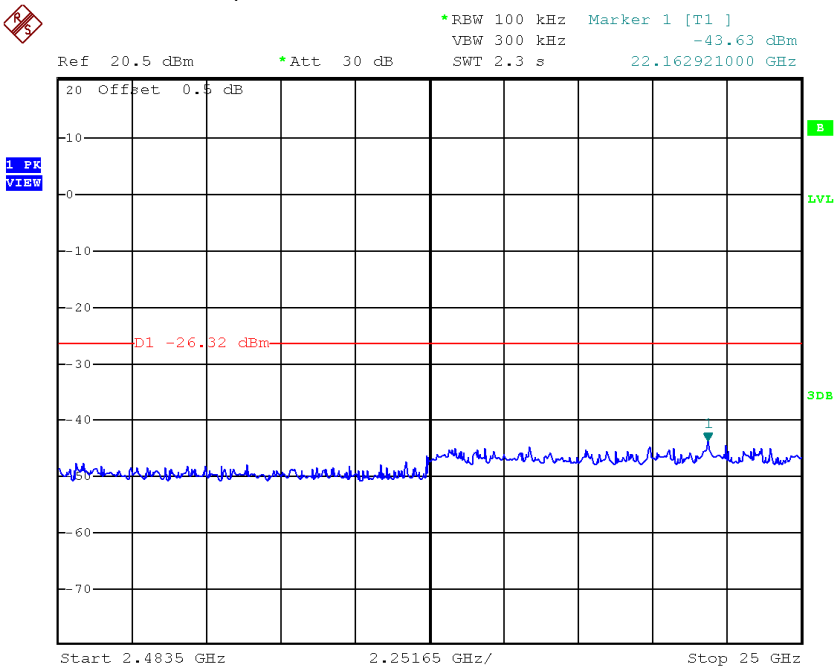
Plots of out of band conducted emissions

802.11g, Middle Channel, Plot A



Date: 29.SEP.2015 12:31:31

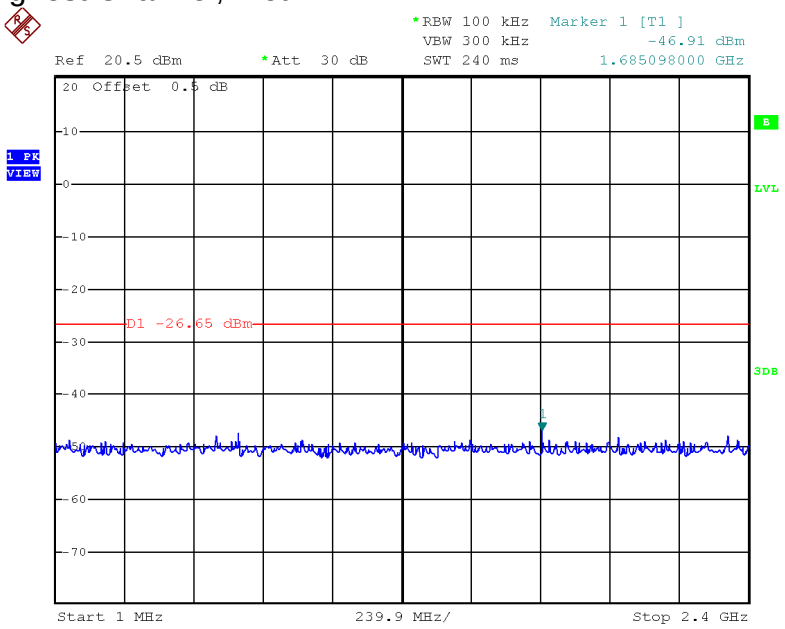
802.11g, Middle Channel, Plot B



Date: 29.SEP.2015 12:31:04

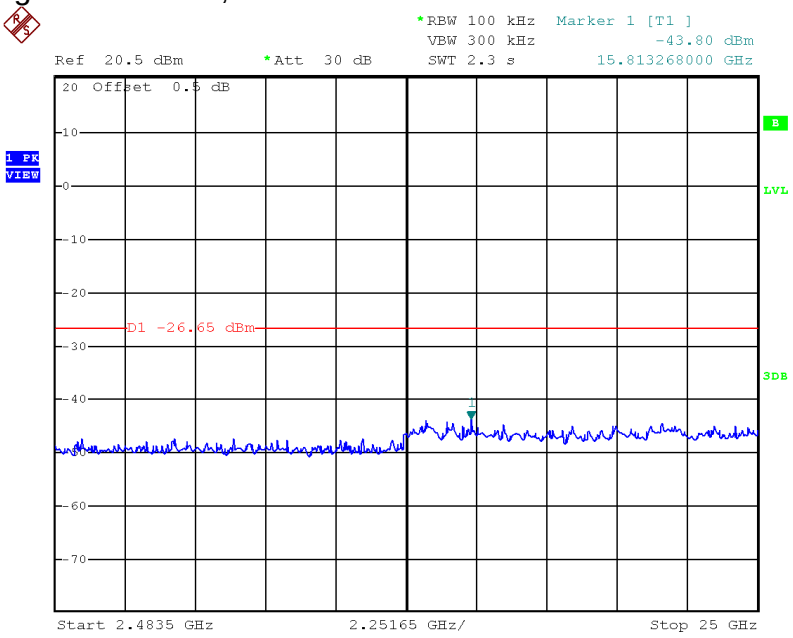
Plots of out of band conducted emissions

802.11g, Highest Channel, Plot A



Date: 29.SEP.2015 12:32:34

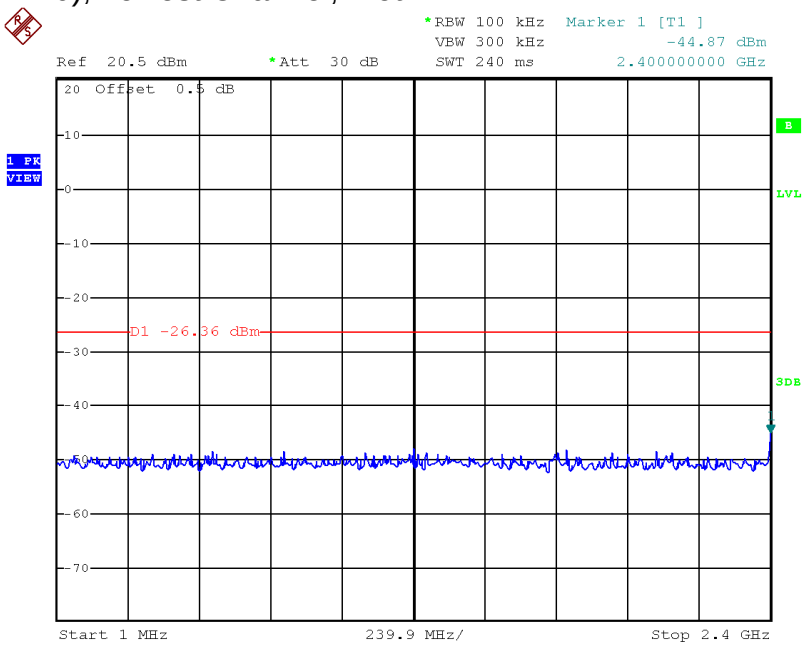
802.11g, Highest Channel, Plot B



Date: 29.SEP.2015 12:33:10

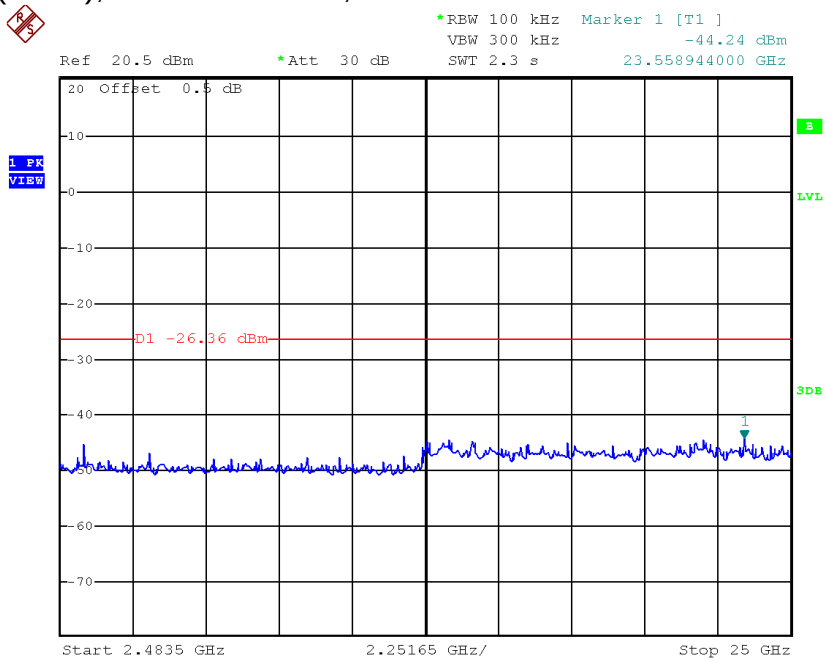
Plots of out of band conducted emissions

802.11n (HT20), Lowest Channel, Plot A



Date: 29.SEP.2015 12:36:01

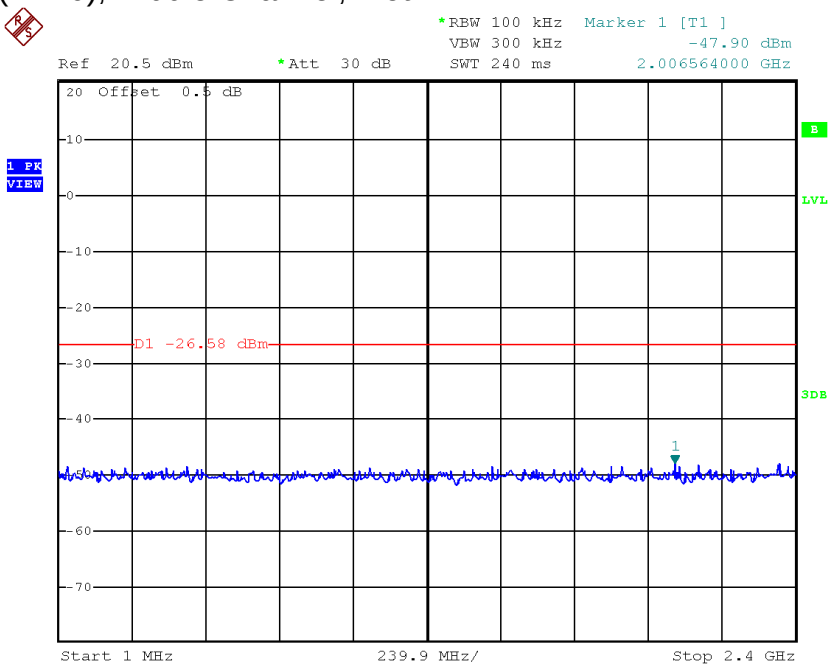
802.11n (HT20), Lowest Channel, Plot B



Date: 29.SEP.2015 12:34:58

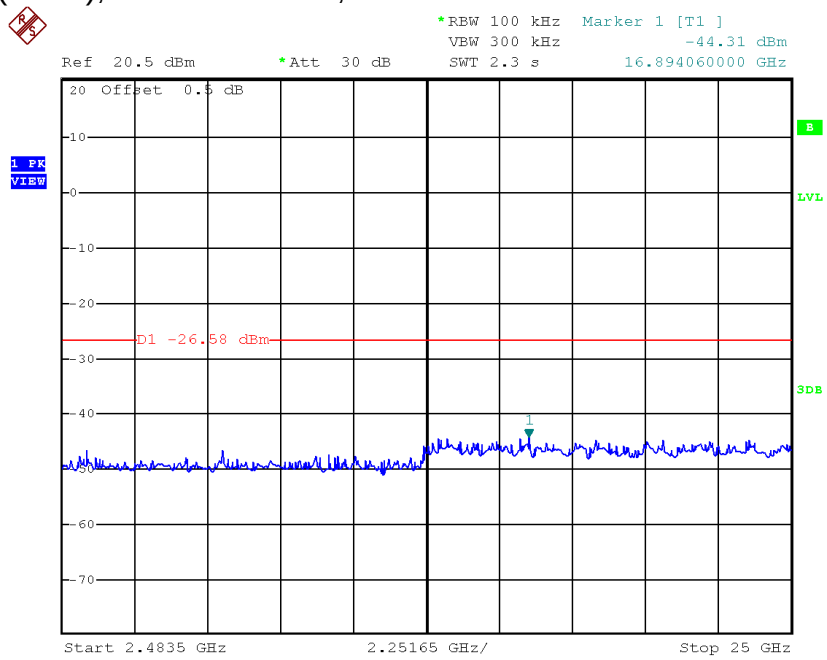
Plots of out of band conducted emissions

802.11n (HT20), Middle Channel, Plot A



Date: 29.SEP.2015 12:36:55

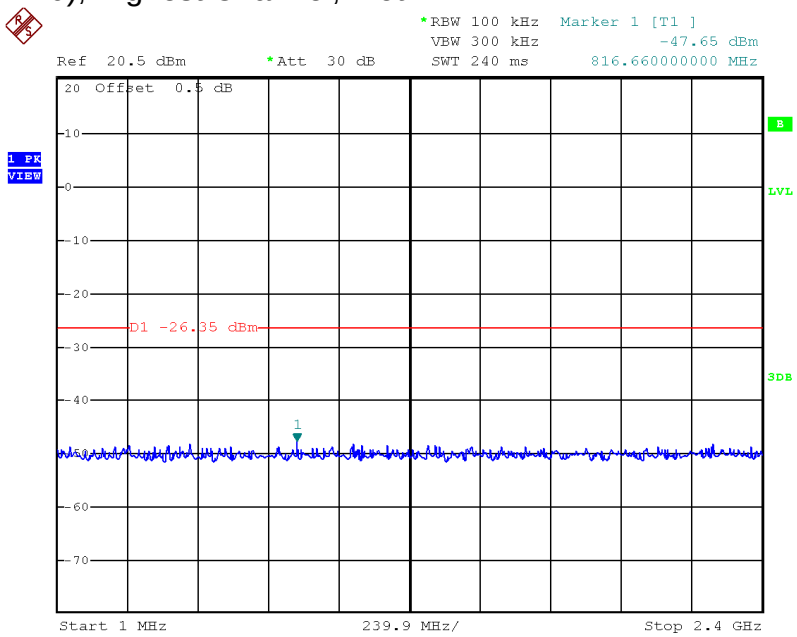
802.11n (HT20), Middle Channel, Plot B



Date: 29.SEP.2015 12:37:35

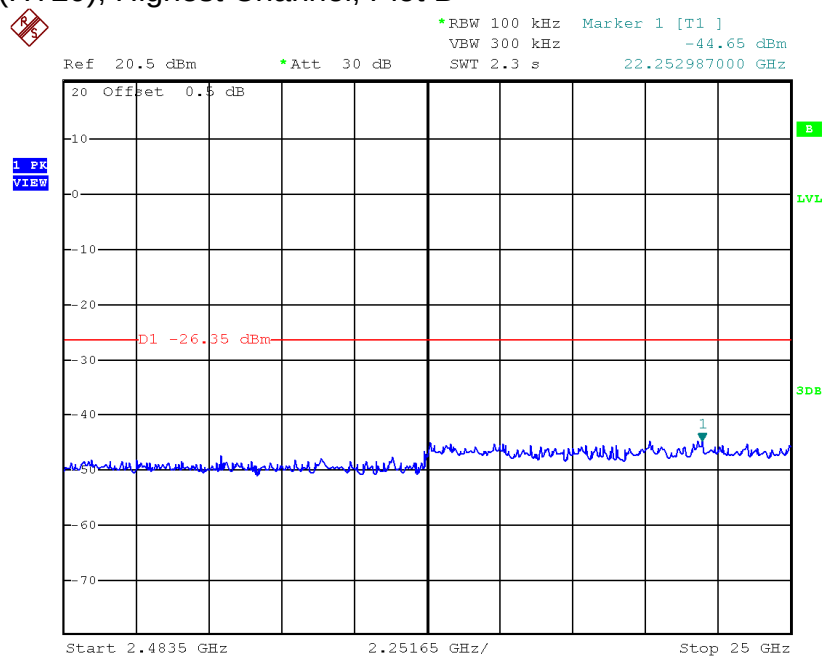
Plots of out of band conducted emissions

802.11n (HT20), Highest Channel, Plot A



Date: 29.SEP.2015 12:39:09

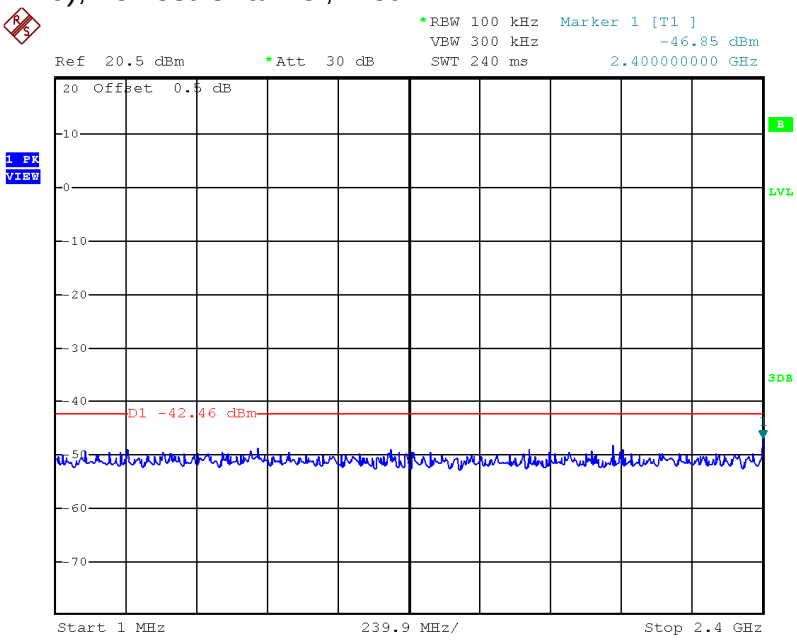
802.11n (HT20), Highest Channel, Plot B



Date: 29.SEP.2015 12:38:35

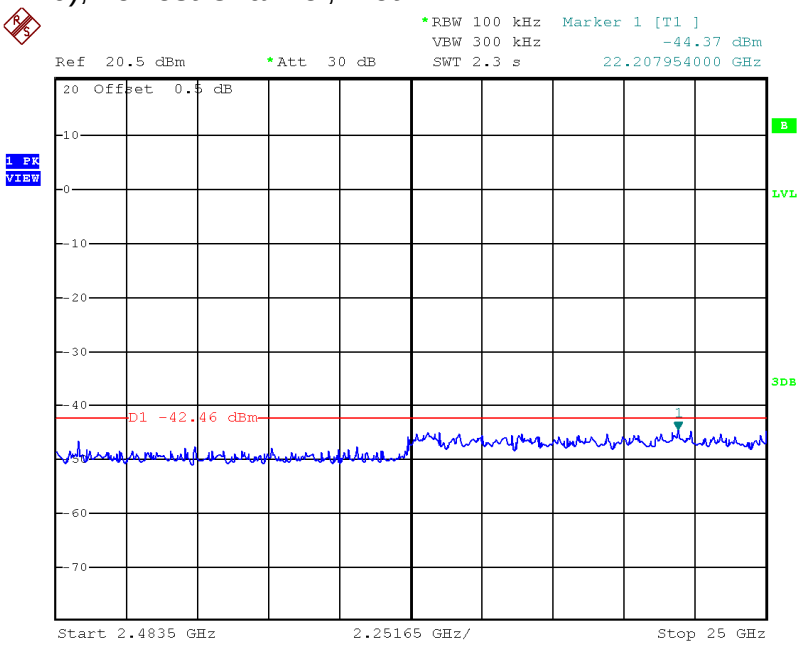
Plots of out of band conducted emissions

802.11n (HT40), Lowest Channel, Plot A



Date: 29.SEP.2015 12:42:28

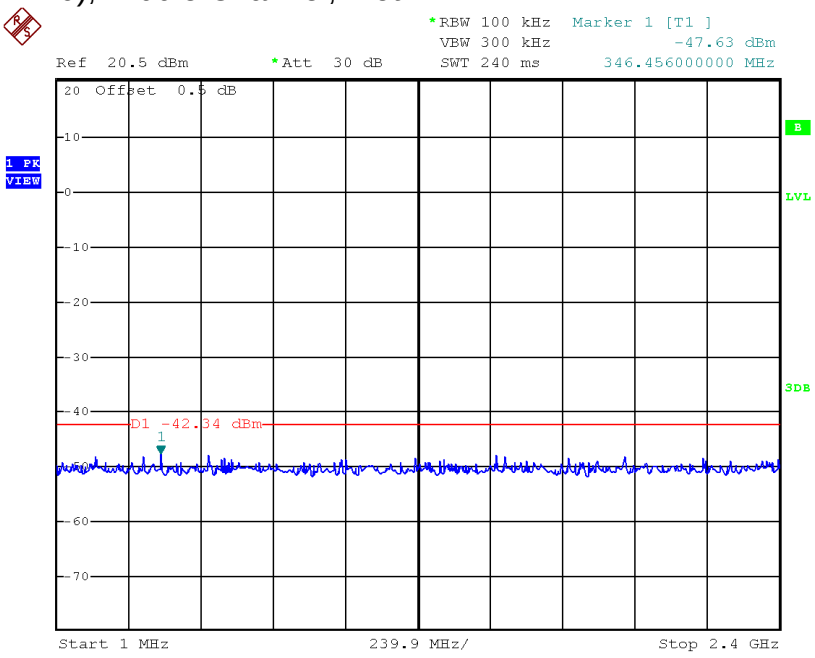
802.11n (HT40), Lowest Channel, Plot B



Date: 29.SEP.2015 12:44:13

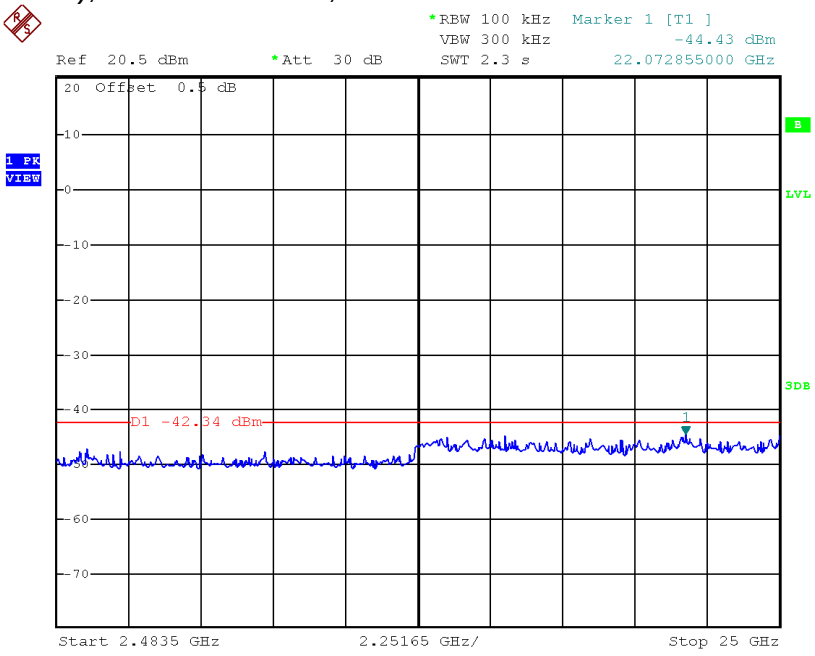
Plots of out of band conducted emissions

802.11n (HT40), Middle Channel, Plot A



Date: 29.SEP.2015 12:46:09

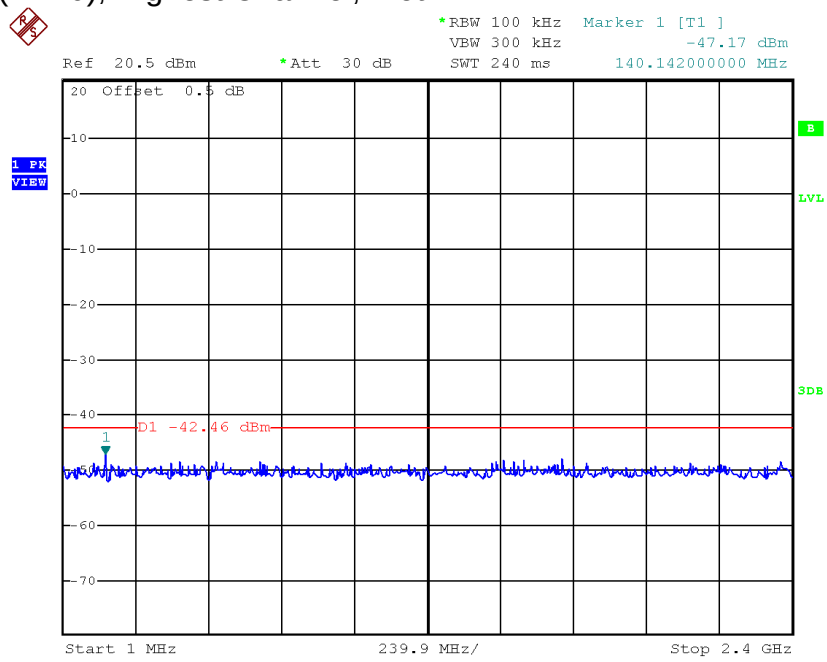
802.11n (HT40), Middle Channel, Plot B



Date: 29.SEP.2015 12:45:32

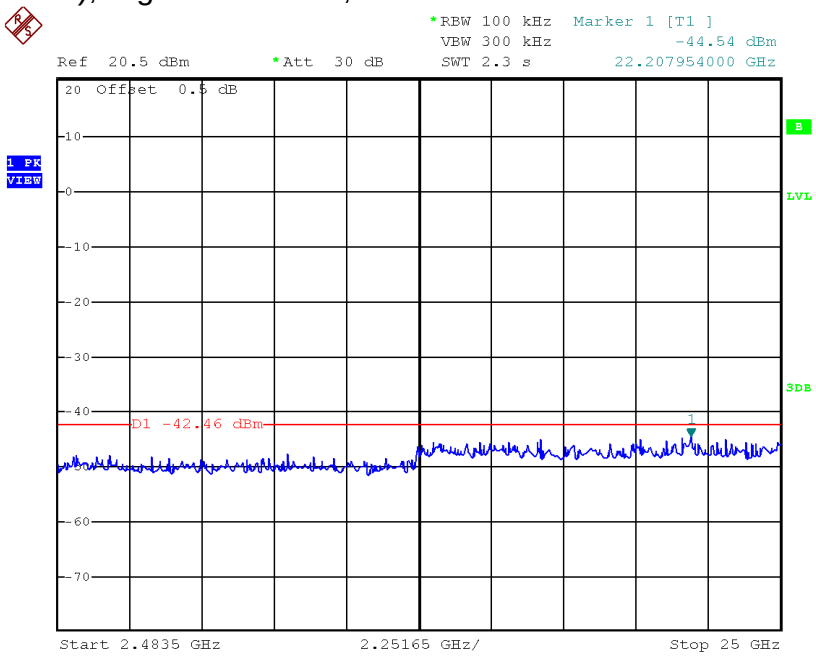
Plots of out of band conducted emissions

802.11n (HT40), Highest Channel, Plot A



Date: 29.SEP.2015 12:47:07

802.11n (HT40), Highest Channel, Plot B



Date: 29.SEP.2015 12:48:27

4.5 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 dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
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 reflect 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 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29.0 dB is subtracted. The pulse desensitization factor of the spectrum analyzer is 0.0 dB, and the resultant average factor is -10.0 dB. The net field strength for comparison to the appropriate emission limit is 32.0 dBμV/m. This value in dBμV/m is converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0.0 dB
AV = -10 dB

FS = 62.0 + 7.4 + 1.6 – 29.0 + 0.0 + (-10.0) = 32.0 dBμV/m

Level in μV/m = Common Antilogarithm [(32.0 dBμV/m)/20] = 39.8 μV/m

4.6 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.

4.6.1 Radiated Emission Configuration Photograph

Worst Case Restricted Band Radiated Emission
at

250.008 MHz

The worst case radiated emission configuration photographs are saved with filename: config photos.pdf

4.6.2 Radiated Emission Data

The data in tables 1-13 list the significant emission frequencies, the limit and the margin of compliance.

Judgement -

Passed by 0.8 dB margin

Mode: TX-Channel 01
Date of Test: OCT 9, 2015

Table 1
IEEE 802.11b (DSSS, 1 Mbps)

Radiated Emission Data

Polari-zation	Frequency (MHz)	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***56.0***	***33***	***29.4***	***52.4***	***54.0***	***-1.6***
V	2400.000	56.4	33	29.4	52.8	54.0	-1.2
V	***4824.000***	***50.5***	***33***	***34.9***	***52.4***	***54.0***	***-1.6***
V	***12060.000***	***43.7***	***33***	***40.5***	***51.2***	***54.0***	***-2.8***

Polari-zation	Frequency (MHz)	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***56.0***	***33***	***29.4***	***52.4***	***74.0***	***-21.6***
V	2400.000	56.4	33	29.4	52.8	74.0	-21.2
V	***4824.000***	***50.5***	***33***	***34.9***	***52.4***	***74.0***	***-21.6***
V	***12060.000***	***43.7***	***33***	***40.5***	***51.2***	***74.0***	***-22.8***

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.

Mode: TX-Channel 06
Date of Test: OCT 9, 2015

Table 2
IEEE 802.11b (DSSS, 1 Mbps)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***50.3***	***33***	***34.9***	***52.2***	***54.0***	***-1.8***
V	***7311.000***	***45.5***	***33***	***37.9***	***50.4***	***54.0***	***-3.6***
V	***12185.000***	***44.1***	***33***	***40.5***	***51.6***	***54.0***	***-2.4***

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***50.3***	***33***	***34.9***	***52.2***	***74.0***	***-21.8***
V	***7311.000***	***45.5***	***33***	***37.9***	***50.4***	***74.0***	***-23.6***
V	***12185.000***	***44.1***	***33***	***40.5***	***51.6***	***74.0***	***-22.4***

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.

Mode: TX-Channel 11
Date of Test: OCT 9, 2015

Table 3
IEEE 802.11b (DSSS, 1 Mbps)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***56.0***	***33***	***29.4***	***52.4***	***54.0***	***-1.6***
V	***4924.000***	***50.3***	***33***	***34.9***	***52.2***	***54.0***	***-1.8***
V	***7386.000***	***45.5***	***33***	***37.9***	***50.4***	***54.0***	***-3.6***
V	***12310.000***	***44.1***	***33***	***40.5***	***51.6***	***54.0***	***-2.4***

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***56.0***	***33***	***29.4***	***52.4***	***74.0***	***-21.6***
V	***4924.000***	***50.3***	***33***	***34.9***	***52.2***	***74.0***	***-21.8***
V	***7386.000***	***45.5***	***33***	***37.9***	***50.4***	***74.0***	***-23.6***
V	***12310.000***	***44.1***	***33***	***40.5***	***51.6***	***74.0***	***-22.4***

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.

Mode: TX-Channel 01
Date of Test: OCT 9, 2015

Table 4
IEEE 802.11g (OFDM, 6 Mbps)

Radiated Emission Data

Polari-zation	Frequency (MHz)	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***56.0***	***33***	***29.4***	***52.4***	***54.0***	***-1.6***
V	2400.000	56.4	33	29.4	52.8	54.0	-1.2
V	***4824.000***	***49.3***	***33***	***34.9***	***51.2***	***54.0***	***-2.8***
V	***12060.000***	***43.7***	***33***	***40.5***	***51.2***	***54.0***	***-2.8***

Polari-zation	Frequency (MHz)	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***56.0***	***33***	***29.4***	***52.4***	***74.0***	***-21.6***
V	2400.000	56.4	33	29.4	52.8	74.0	-21.2
V	***4824.000***	***49.3***	***33***	***34.9***	***51.2***	***74.0***	***-22.8***
V	***12060.000***	***43.7***	***33***	***40.5***	***51.2***	***74.0***	***-22.8***

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.

Mode: TX-Channel 06
Date of Test: OCT 9, 2015

Table 5
IEEE 802.11g (OFDM, 6 Mbps)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***49.3***	***33***	***34.9***	***51.2***	***54.0***	***-2.8***
V	***7311.000***	***45.3***	***33***	***37.9***	***50.2***	***54.0***	***-3.8***
V	***12185.000***	***43.9***	***33***	***40.5***	***51.4***	***54.0***	***-2.6***

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***49.3***	***33***	***34.9***	***51.2***	***74.0***	***-22.8***
V	***7311.000***	***45.3***	***33***	***37.9***	***50.2***	***74.0***	***-23.8***
V	***12185.000***	***43.9***	***33***	***40.5***	***51.4***	***74.0***	***-22.6***

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.

Mode: TX-Channel 11
Date of Test: OCT 9, 2015

Table 6
IEEE 802.11g (OFDM, 6 Mbps)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***56.6***	***33***	***29.4***	***53.0***	***54.0***	***-1.0***
V	***4924.000***	***50.3***	***33***	***34.9***	***52.2***	***54.0***	***-1.8***
V	***7386.000***	***45.3***	***33***	***37.9***	***50.2***	***54.0***	***-3.8***
V	***12310.000***	***43.9***	***33***	***40.5***	***51.4***	***54.0***	***-2.6***

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***56.6***	***33***	***29.4***	***53.0***	***74.0***	***-21.0***
V	***4924.000***	***50.3***	***33***	***34.9***	***52.2***	***74.0***	***-21.8***
V	***7386.000***	***45.3***	***33***	***37.9***	***50.2***	***74.0***	***-23.8***
V	***12310.000***	***43.9***	***33***	***40.5***	***51.4***	***74.0***	***-22.6***

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.

Mode: TX-Channel 01
Date of Test: OCT 9, 2015

Table 7
IEEE 802.11n (HT20, MCS0)

Radiated Emission Data

Polari-zation	Frequency (MHz)	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***55.0***	***33***	***29.4***	***51.4***	***54.0***	***-2.6***
V	2400.000	56.4	33	29.4	52.8	54.0	-1.2
V	***4824.000***	***49.3***	***33***	***34.9***	***51.2***	***54.0***	***-2.8***
V	***12060.000***	***43.9***	***33***	***40.5***	***51.4***	***54.0***	***-2.6***

Polari-zation	Frequency (MHz)	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***55.0***	***33***	***29.4***	***51.4***	***74.0***	***-22.6***
V	2400.000	56.4	33	29.4	52.8	74.0	-21.2
V	***4824.000***	***49.3***	***33***	***34.9***	***51.2***	***74.0***	***-22.8***
V	***12060.000***	***43.9***	***33***	***40.5***	***51.4***	***74.0***	***-22.6***

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.

Mode: TX-Channel 06
Date of Test: OCT 9, 2015

Table 8
IEEE 802.11n (HT20, MCS0)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***49.3***	***33***	***34.9***	***51.2***	***54.0***	***-2.8***
V	***7311.000***	***45.3***	***33***	***37.9***	***50.2***	***54.0***	***-3.8***
V	***12185.000***	***44.1***	***33***	***40.5***	***51.6***	***54.0***	***-2.4***

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***49.3***	***33***	***34.9***	***51.2***	***74.0***	***-22.8***
V	***7311.000***	***45.3***	***33***	***37.9***	***50.2***	***74.0***	***-23.8***
V	***12185.000***	***44.1***	***33***	***40.5***	***51.6***	***74.0***	***-22.4***

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.

Mode: TX-Channel 11
Date of Test: OCT 9, 2015

Table 9
IEEE 802.11n (HT20, MCS0)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***55.6***	***33***	***29.4***	***52.0***	***54.0***	***-2.0***
V	***4924.000***	***49.3***	***33***	***34.9***	***51.2***	***54.0***	***-2.8***
V	***7386.000***	***45.3***	***33***	***37.9***	***50.2***	***54.0***	***-3.8***
V	***12310.000***	***43.9***	***33***	***40.5***	***51.4***	***54.0***	***-2.6***

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***55.6***	***33***	***29.4***	***52.0***	***74.0***	***-22.0***
V	***4924.000***	***49.3***	***33***	***34.9***	***51.2***	***74.0***	***-22.8***
V	***7386.000***	***45.3***	***33***	***37.9***	***50.2***	***74.0***	***-23.8***
V	***12310.000***	***43.9***	***33***	***40.5***	***51.4***	***74.0***	***-22.6***

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.

Mode: TX-Channel 03
Date of Test: OCT 9, 2015

Table 10
IEEE 802.11n (HT40, MCS0)

Radiated Emission Data

Polari-zation	Frequency (MHz)	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***55.6***	***33***	***29.4***	***52.0***	***54.0***	***-2.0***
V	2400.000	55.2	33	29.4	51.6	54.0	-2.4
V	***4844.000***	***49.3***	***33***	***34.9***	***51.2***	***54.0***	***-2.8***
V	***12110.000***	***43.7***	***33***	***40.5***	***51.2***	***54.0***	***-2.8***

Polari-zation	Frequency (MHz)	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***55.6***	***33***	***29.4***	***52.0***	***74.0***	***-22.0***
V	2400.000	55.2	33	29.4	51.6	74.0	-22.4
V	***4844.000***	***49.3***	***33***	***34.9***	***51.2***	***74.0***	***-22.8***
V	***12110.000***	***43.7***	***33***	***40.5***	***51.2***	***74.0***	***-22.8***

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.

Mode: TX-Channel 06
Date of Test: OCT 9, 2015

Table 11
IEEE 802.11n (HT40, MCS0)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***48.9***	***33***	***34.9***	***50.8***	***54.0***	***-3.2***
V	***7311.000***	***45.3***	***33***	***37.9***	***50.2***	***54.0***	***-3.8***
V	***12185.000***	***43.7***	***33***	***40.5***	***51.2***	***54.0***	***-2.8***

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***48.9***	***33***	***34.9***	***50.8***	***74.0***	***-23.2***
V	***7311.000***	***45.3***	***33***	***37.9***	***50.2***	***74.0***	***-23.8***
V	***12185.000***	***43.7***	***33***	***40.5***	***51.2***	***74.0***	***-22.8***

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.

Mode: TX-Channel 09
Date of Test: OCT 9, 2015

Table 12
IEEE 802.11n (HT40, MCS0)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***55.6***	***33***	***29.4***	***52.0***	***54.0***	***-2.0***
V	***4904.000***	***49.3***	***33***	***34.9***	***51.2***	***54.0***	***-2.8***
V	***7356.000***	***45.3***	***33***	***37.9***	***50.2***	***54.0***	***-3.8***
V	***12260.000***	***43.7***	***33***	***40.5***	***51.2***	***54.0***	***-2.8***

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***55.6***	***33***	***29.4***	***52.0***	***74.0***	***-22.0***
V	***4904.000***	***49.3***	***33***	***34.9***	***51.2***	***74.0***	***-22.8***
V	***7356.000***	***45.3***	***33***	***37.9***	***50.2***	***74.0***	***-23.8***
V	***12260.000***	***43.7***	***33***	***40.5***	***51.2***	***74.0***	***-22.8***

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.

Worst Case: EUT Transmitting (WiFi + Bluetooth simultaneously)
Date of Test: OCT 9, 2015

Table 13

Radiated Emission Data

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	150.002	36.0	16	14.0	34.0	43.5	-9.5
V	***160.325***	***34.5***	***16***	***16.0***	***34.5***	***43.5***	***-9.0***
V	175.006	32.0	16	19.0	35.0	43.5	-8.5
V	***187.632***	***35.5***	***16***	***16.0***	***35.5***	***43.5***	***-8.0***
V	***212.356***	***38.0***	***16***	***17.0***	***39.0***	***43.5***	***-4.5***
V	***250.008***	***41.2***	***16***	***20.0***	***45.2***	***46.0***	***-0.8***
V	255.065	34.4	16	21.0	39.4	46.0	-6.6
V	290.154	31.6	16	22.0	37.6	46.0	-8.4
V	375.023	31.4	16	24.0	39.4	46.0	-6.6
V	450.034	27.8	16	26.0	37.8	46.0	-8.2
V	625.045	21.9	16	29.0	34.9	46.0	-11.1
V	750.054	21.0	16	30.0	35.0	46.0	-11.0

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

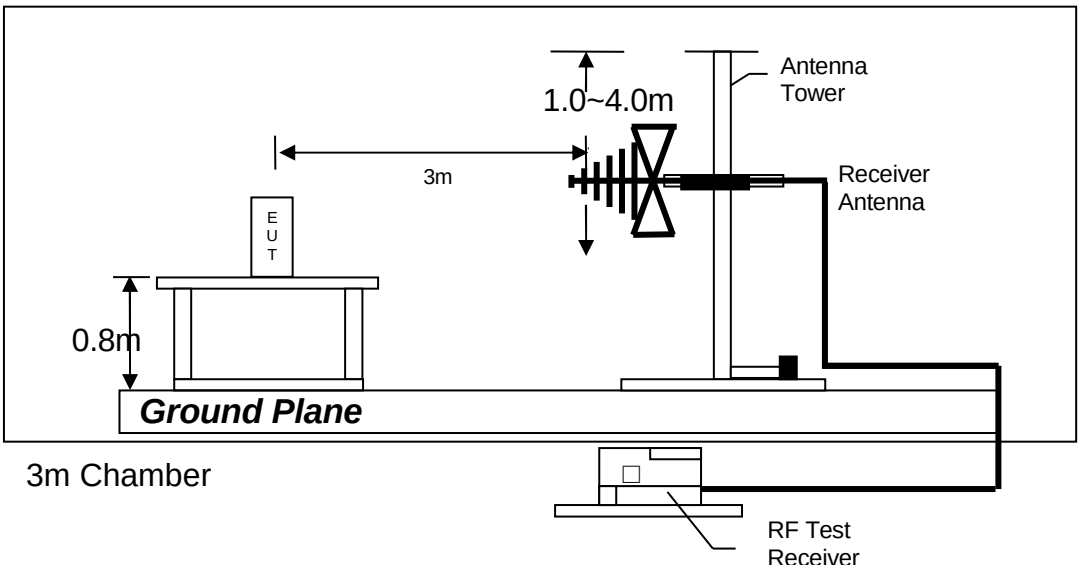
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test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

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

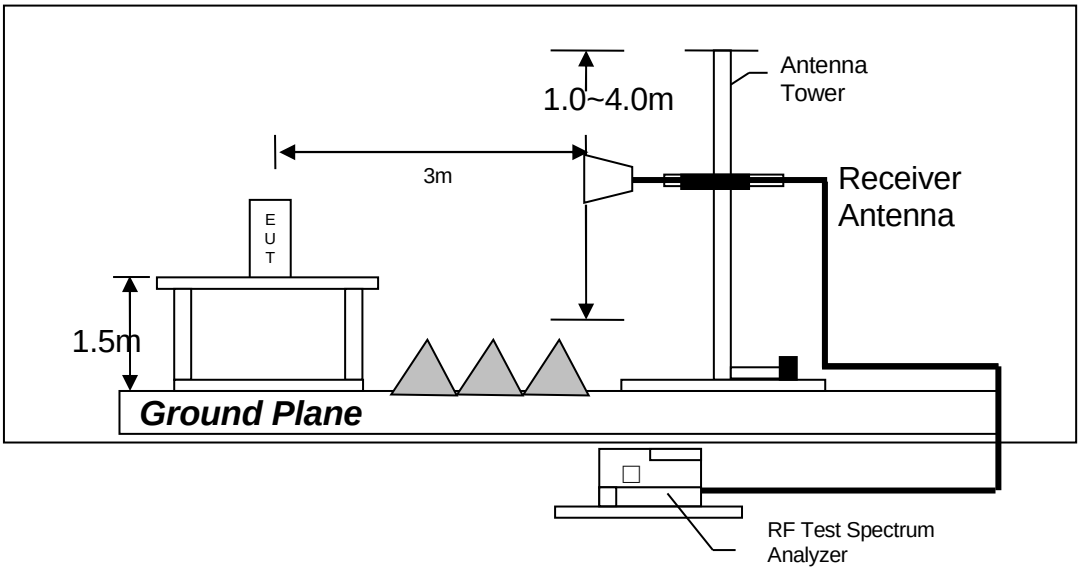
4. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-247 Section 3.3.

Radiated Emission Test Setup

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



Test setup of radiated emissions up to 1GHz



Test setup of radiated emissions above 1GHz

4.6.3 Transmitter Duty Cycle Calculation

Not applicable – No average factor is required.

4.7 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.

4.7.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration
at

0.843 MHz

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

4.7.2 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 8.5 dB margin

Worst Case: EUT Transmitting (WiFi + Bluetooth simultaneously)

EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	150 kHz	56.42	N	-9.57
2	CISPR Average	186 kHz	44.20	L1	-10.00
1	Quasi Peak	213 kHz	45.15	L1	-17.93
2	CISPR Average	226.5 kHz	36.68	L1	-15.88
1	Quasi Peak	370.5 kHz	43.73	L1	-14.75
2	CISPR Average	370.5 kHz	37.76	L1	-10.72
1	Quasi Peak	433.5 kHz	48.66	L1	-8.52
2	CISPR Average	460.5 kHz	35.95	L1	-10.72
1	Quasi Peak	699 kHz	39.84	N	-16.15
2	CISPR Average	780 kHz	31.77	N	-14.22
2	CISPR Average	843 kHz	37.49	N	-8.50
1	Quasi Peak	1.023 MHz	41.99	N	-14.00
1	Quasi Peak	1.0995 MHz	41.41	N	-14.58
2	CISPR Average	1.437 MHz	33.26	N	-12.73
2	CISPR Average	1.797 MHz	35.18	N	-10.81
1	Quasi Peak	1.8015 MHz	45.22	N	-10.77
1	Quasi Peak	2.2965 MHz	45.70	N	-10.29
2	CISPR Average	2.7915 MHz	35.51	N	-10.48
2	CISPR Average	3.0975 MHz	35.58	N	-10.41
1	Quasi Peak	3.372 MHz	44.19	N	-11.81

Date: 15.OCT.2015 13:20:15

Worst Case: EUT Transmitting (WiFi + Bluetooth simultaneously)

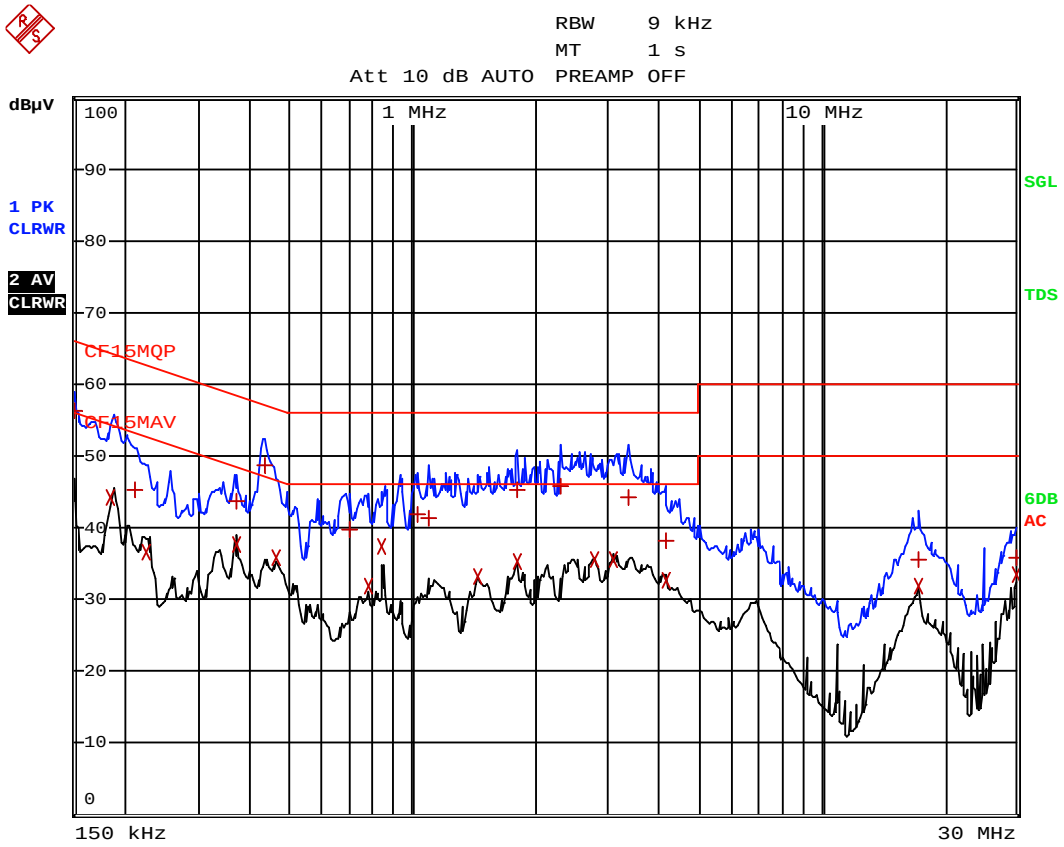
EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	4.146 MHz	32.80	L1	-13.19
1	Quasi Peak	4.191 MHz	38.15	N	-17.84
2	CISPR Average	17.295 MHz	31.98	N	-18.01
1	Quasi Peak	17.34 MHz	35.56	L1	-24.43
1	Quasi Peak	29.949 MHz	35.85	L1	-24.14
2	CISPR Average	29.9535 MHz	33.44	L1	-16.55

Date: 15.OCT.2015 13:21:12

Worst Case: EUT Transmitting (WiFi + Bluetooth simultaneously)



Date: 15.OCT.2015 13:21:34

Conducted Emission Test Setup

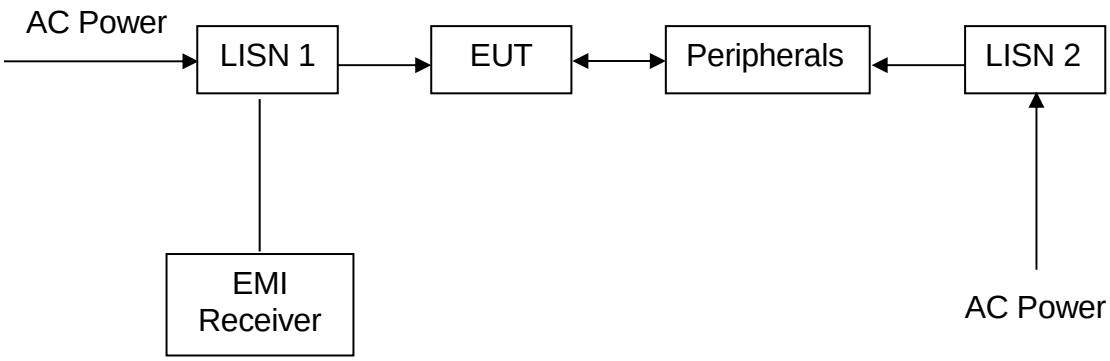


EXHIBIT 5
EQUIPMENT LIST

5.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	Biconical Antenna
Registration No.	EW-3095	EW-2249	EW-2512
Manufacturer	R&S	R&S	EMCO
Model No.	ESCI	FSP30	3104C
Calibration Date	Oct. 16, 2014	Nov. 19, 2014	Jan. 22, 2015
Calibration Due Date	Oct. 16, 2015	Nov. 19, 2015	Jul. 22, 2016

Equipment	Log Periodic Antenna	Pyramidal Horn Antenna	Double Ridged Guide Antenna
Registration No.	EW-0447	EW-0905	EW-1133
Manufacturer	EMCO	EMCO	EMCO
Model No.	3146	3160-09	3115
Calibration Date	Mar. 16, 2015	Jun. 05, 2014	Apr. 30, 2014
Calibration Due Date	Sep. 16, 2016	Dec. 05, 2015	Oct. 30, 2015

2) Conductive Measurement Test

Equipment	RF Power Meter with Power Sensor (N1921A)	Spectrum Analyzer
Registration No.	EW-2270	EW-2249
Manufacturer	AGILENTTECH	R&S
Model No.	N1911A	FSP30
Calibration Date	Jan. 05, 2015	Nov. 19, 2014
Calibration Due Date	Jan. 05, 2016	Nov. 19, 2015

3) 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	Nov. 06, 2014	Dec. 08, 2014
Calibration Due Date	Nov. 06, 2015	Dec. 08, 2015

END OF TEST REPORT