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HOKLAS 005 TEST

TEST REPORT

Report Number: 15070911HKG-001

Application
for
Original Grant of 47 CFR Part 15 Certification

Learning App TV Console

FCC ID: G2R-1836

Prepared and Checked by:

Wong Kwok Yeung, Kenneth
Lead Engineer

Approved by:

Chan Chi Hung, Terry
Senior Supervisor
August 11, 2015

GENERAL INFORMATION

Applicant Name:	VTech Electronics Limited
Applicant Address:	23/F., Tai Ping Industrial Center, Block 1, 57 Ting Kok Road, Tai Po, N.T., Hong Kong
FCC Specification Standard:	FCC Part 15, October 1, 2013 Edition
FCC ID:	G2R-1836
FCC Model(s):	1836
Type of EUT:	Digital Transmission System
Description of EUT:	Learning App TV Console
Serial Number:	N/A
Sample Receipt Date:	July 17, 2015
Date of Test:	July 28, 2015 to August 10, 2015
Report Date:	August 11, 2015
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

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2/F., Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong.
Tel: (852) 2173 8888 Fax: (852) 2785 5487 Website: www.hk.intertek-etlsemko.com

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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	Results	Details see section
Antenna Requirement	15.203	Pass	2.1
Max. Conducted Output Power (average)	15.247(b)(3)&(4)	Pass	4.1
Min. 6dB RF Bandwidth	15.247(a)(2)	Pass	4.2
Max. Power Density (average)	15.247(e)	Pass	4.3
Out of Band Antenna Conducted Emission	15.247(d)	Pass	4.4
Radiated Emission in Restricted Bands and Spurious Emissions	15.247(d), 15.209 & 15.109	Pass	4.6
AC Power Line Conducted Emission	15.207 & 15.107	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, October 1, 2014 Edition

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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) 1836 is a Learning App TV Console for children with WiFi connection and 2.4GHz wireless control features – Base Unit.

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 (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. Maximum bit rate can support up to 72.2Mbps.

For wireless control, it operates in the frequency range from 2412MHz to 2475MHz. It receives control signal from Remote Controller 2910.

The EUT is power by an adaptor 120VAC 150mA to 5VDC 1000mA.

The antenna(s) used in the EUT are PCB type antenna.

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

2.2 Test Methodology

Radiated emission measurements was performed according to the procedures in ANSI C63.10 (2009). 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 (2009). All other measurements were made in accordance with the procedures in 47 CFR Part 2.

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.

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2.4 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

The Certification procedure of transceiver for this transceiver (with FCC ID: G2R-2190) is being processed as the same time of this application.

The Declaration of the Conformity procedure of PC Connectivity for this transceiver (with FCC ID: G2R-1836) is being processed as the same time of this application.

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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 60Hz, 150mA, Output: 5VDC 1000mA, Model: SJB0501000VU, Brand: vtech and/or new backup battery: 3V Lithium Battery CR2032 x 1.

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 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. Digital circuitries used to control additional functions other than the operation of the transmitter are subject to FCC Part 15 Section 15.109 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 4.2.3.

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

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.

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3.3 Details of EUT and Description of Accessories

Details of EUT:

An AC adaptor and/or backup battery (provided with the unit) were used to power the device. Their description are listed below.

(1) 120VAC 60Hz, 150mA, Output: 5VDC 1000mA, Model: SJB0501000VU, Brand: vtech. (Provided by Applicant)
(2) backup battery: 3V Lithium Battery CR2032 x 1 (Provided by Applicant)

Description of Accessories:

(1) 8GB Micro SD Card (Provided by Applicant)
(2) Cartridge (Provided by Applicant)
(3) Micro-USB mouse with 1.0m long cable (Provided by Intertek)
(4) HDMI cable of 1.5m(L) with ferrite core (Provided by Applicant)
(5) Mic of 0.9m(L) long (Provided by Applicant)
(6) LCD TV Brand: SONY model: KDL-32W650A (Provided by Intertek)

3.4 Measurement Uncertainty

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

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**

4.1 Maximum Conducted (average) Output Power at Antenna Terminals
The antenna port of the EUT was connected to the input of a power meter.

☒ External attenuation and cable loss were compensated for using the OFFSET function of the analyser. 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 = 0 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	17.78	59.98
Middle Channel: 2437	17.87	61.24
High Channel: 2462	17.14	51.76

IEEE 802.11g (OFDM, 24Mbps) Antenna Gain = 0 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	22.81	190.99
Middle Channel: 2437	22.65	184.08
High Channel: 2462	22.42	174.58

IEEE 802.11n (20MHz) (OFDM, MCS6) Antenna Gain = 0 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	23.25	211.35
Middle Channel: 2437	23.22	209.89
High Channel: 2462	22.92	195.88

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

The antenna port of the EUT was connected to the input of a power meter. The measurement procedure 9.1.2 was used.

Cable loss : 0.6 dB External Attenuation : 20 dB

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

IEEE 802.11b (DSSS, 1 Mbps)
max. conducted (peak) output level = 17.87 dBm

IEEE 802.11g (OFDM, 24 Mbps)
max. conducted (peak) output level = 22.81 dBm

IEEE 802.11n (20MHz) (OFDM, MCS6)
max. conducted (peak) output level = 23.25 dBm

Limits:
☒ 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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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 (MHz)
Low Channel: 2412	10.16
Middle Channel: 2437	10.16
High Channel: 2462	10.16

IEEE 802.11g (OFDM, 24 Mbps)	
Frequency (MHz)	6dB Bandwidth (MHz)
Low Channel: 2412	16.64
Middle Channel: 2437	16.68
High Channel: 2462	16.64

IEEE 802.11n (20MHz) (OFDM, MCS6)	
Frequency (MHz)	6dB Bandwidth (MHz)
Low Channel: 2412	17.80
Middle Channel: 2437	17.88
High Channel: 2462	17.84

Limits
6 dB bandwidth shall be at least 500kHz

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

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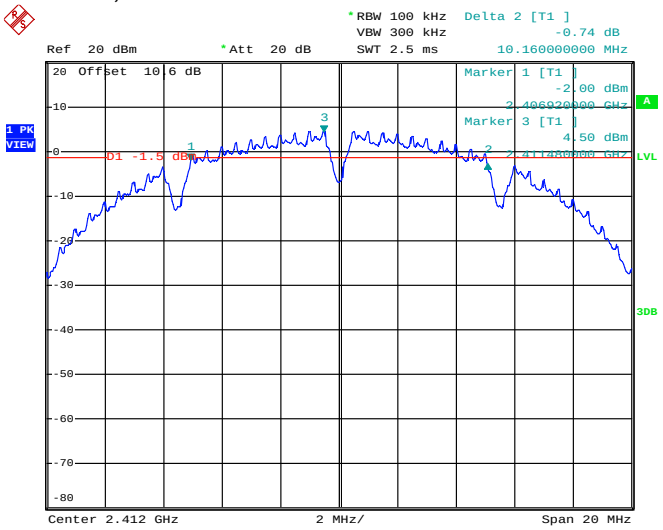
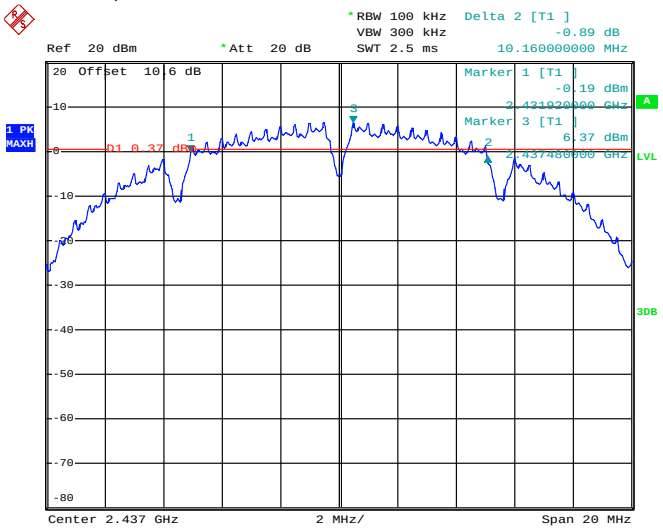
Plots of 6dB RF bandwidth

802.11b, Lowest Channel



Date: 23.JUL.2015 10:30:39

802.11b, Middle Channel



Date: 25.JUL.2015 08:57:10

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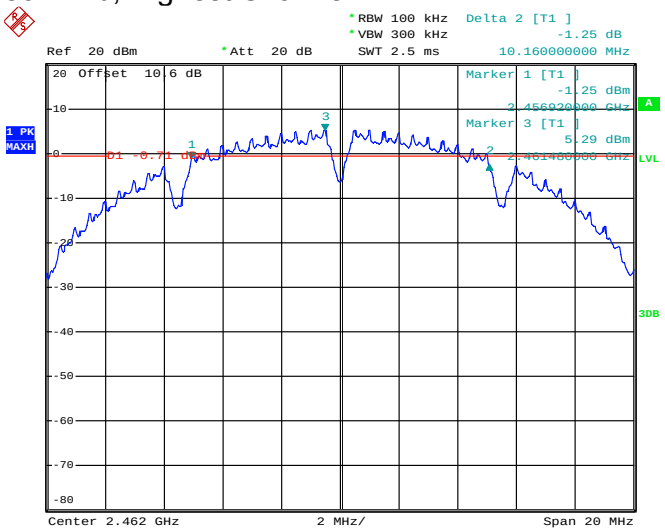
Plots of 6dB RF bandwidth

802.11b, Highest Channel



Date: 4.AUG.2015 09:37:33

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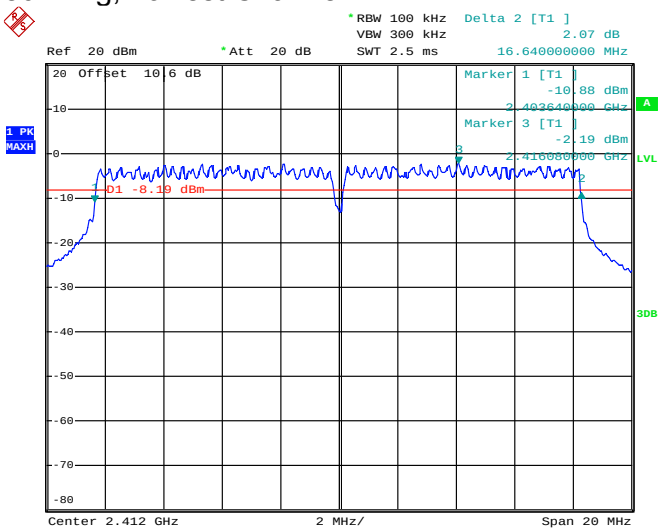
Plots of 6dB RF bandwidth

802.11g, Lowest Channel



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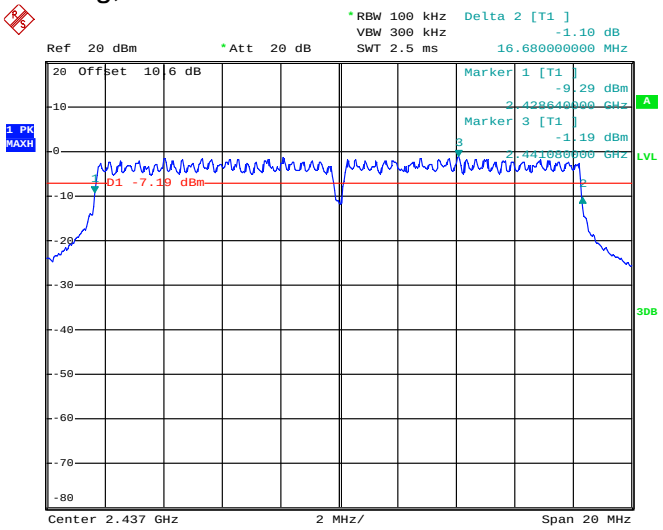
802.11g, Middle Channel



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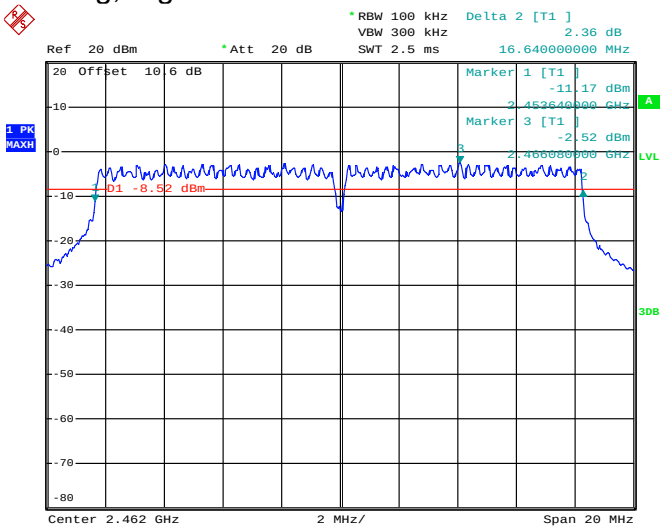
Plots of 6dB RF bandwidth

802.11g, Highest Channel



Date: 25.JUL.2015 10:16:03

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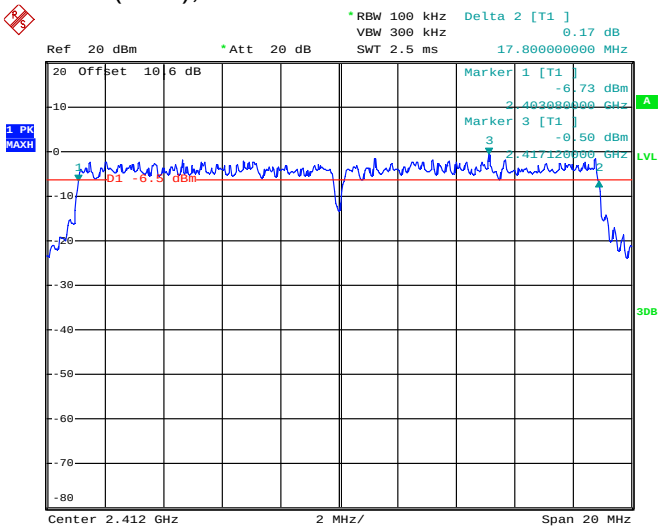
Plots of 6dB RF bandwidth

802.11n(20M), Lowest Channel



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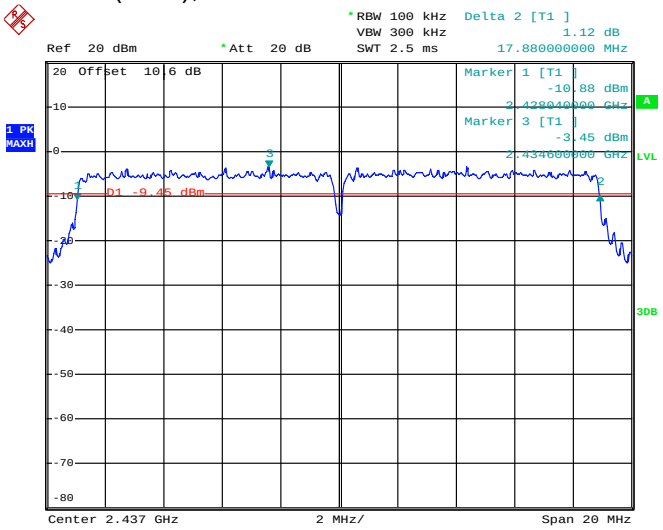
802.11n(20M), Middle Channel



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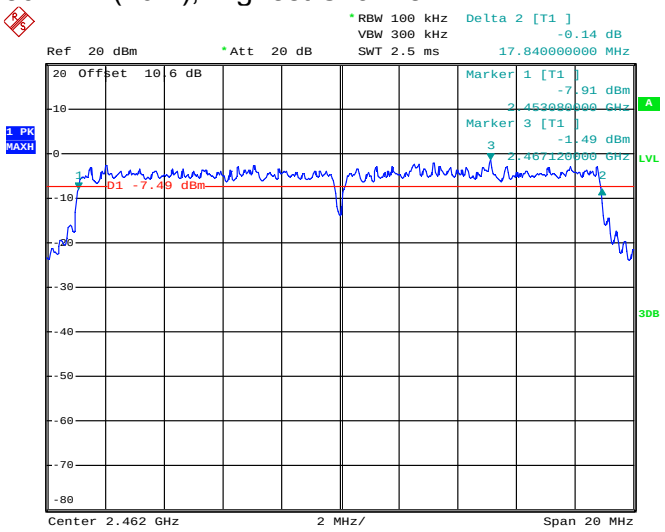
Plots of 6dB RF bandwidth

802.11n(20M), Highest Channel



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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	4.25
Middle Channel: 2437	4.31
High Channel: 2462	3.87

IEEE 802.11g (OFDM, 24 Mbps)	
Frequency (MHz)	PSD in 100kHz (dBm)
Low Channel: 2412	-2.22
Middle Channel: 2437	-1.96
High Channel: 2462	-2.34

IEEE 802.11n (20MHz) (OFDM, MCS6)	
Frequency (MHz)	PSD in 100kHz (dBm)
Low Channel: 2412	-0.88
Middle Channel: 2437	-1.28
High Channel: 2462	-1.09

Cable Loss: 0.6 dB

Limit:
8dBm

The plots of n power spectral density are as below.

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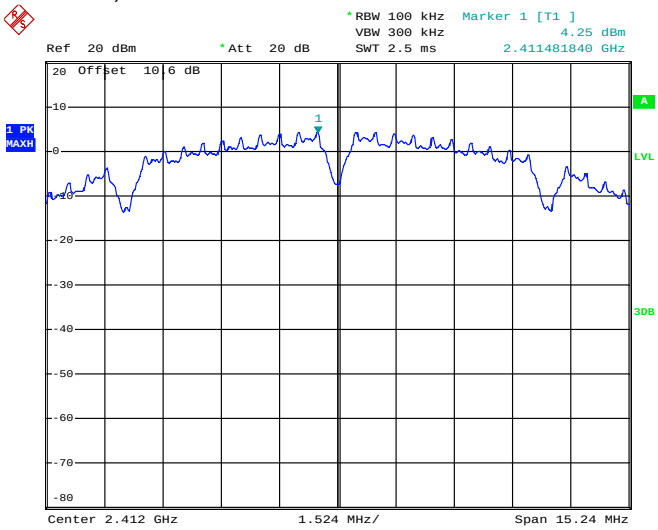
Plots of power spectral density

802.11b, Lowest channel



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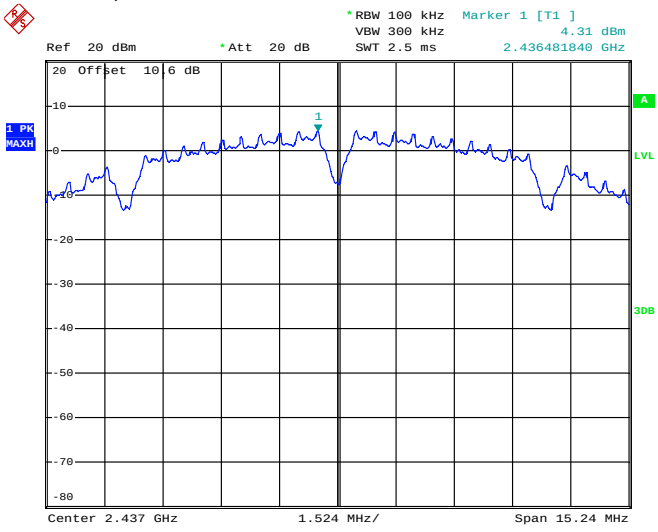
802.11b, Middle channel



Date: 27.JUL.2015 10:57:03

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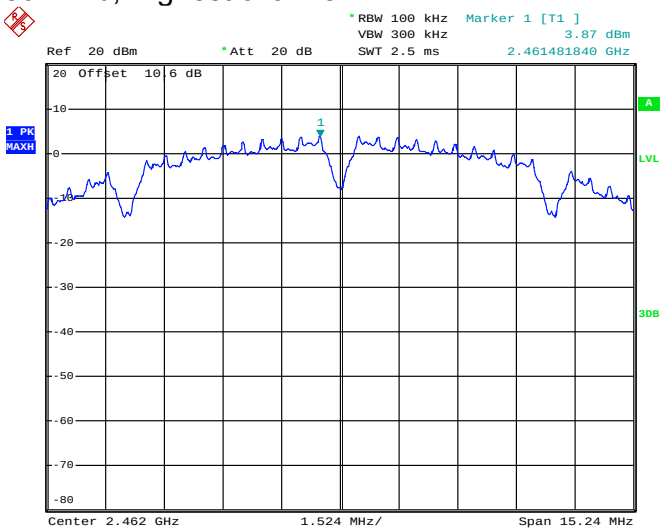
Plots of power spectral density

802.11b, Highest channel



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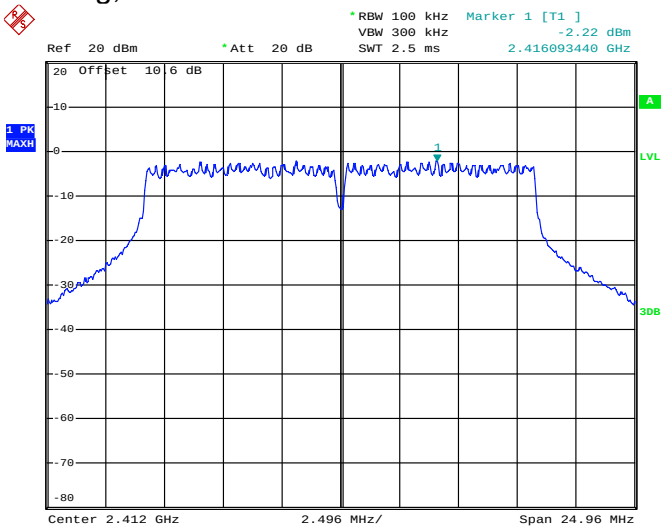
Plots of power spectral density

802.11g, Lowest channel



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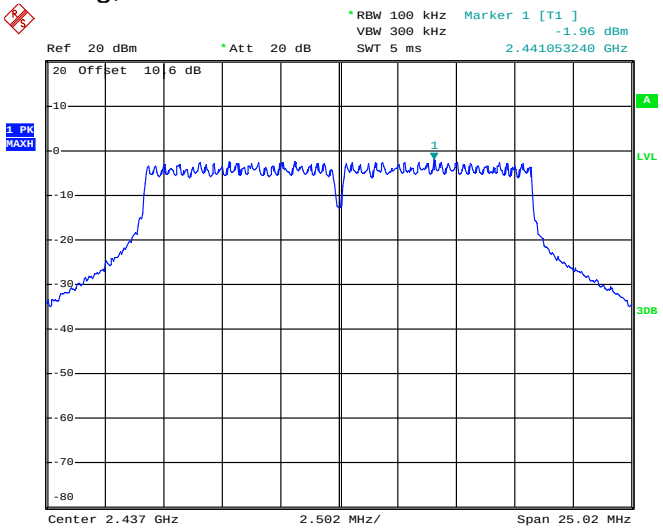
802.11g, Middle channel



Date: 27.JUL.2015 11:30:00

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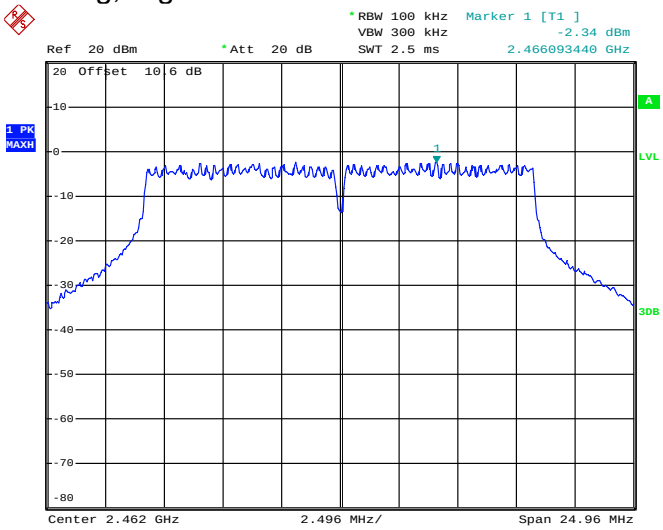
Plots of power spectral density

802.11g, Highest channel



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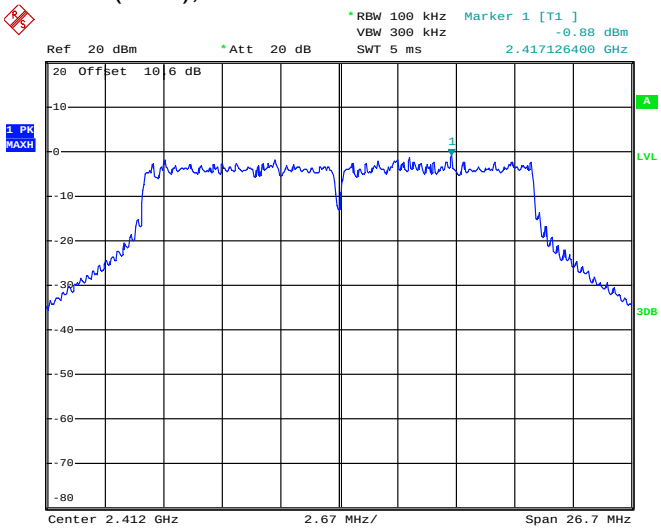
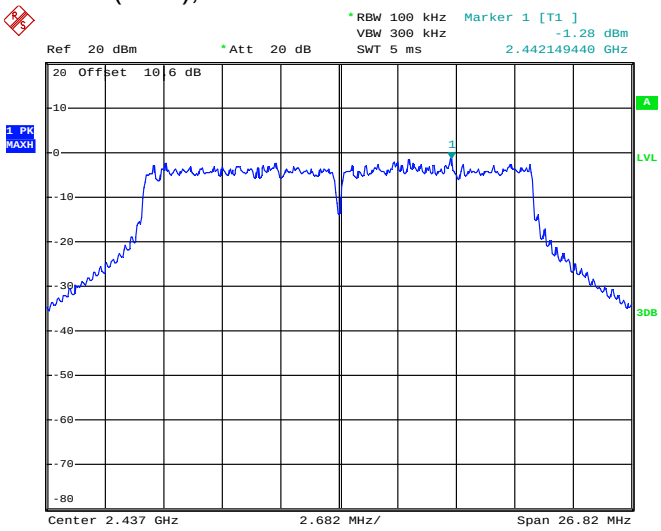
Plots of power spectral density

802.11n(20M), Lowest channel



Date: 27.JUL.2015 11:37:06

802.11n(20M), Middle channel



Date: 27.JUL.2015 11:38:54

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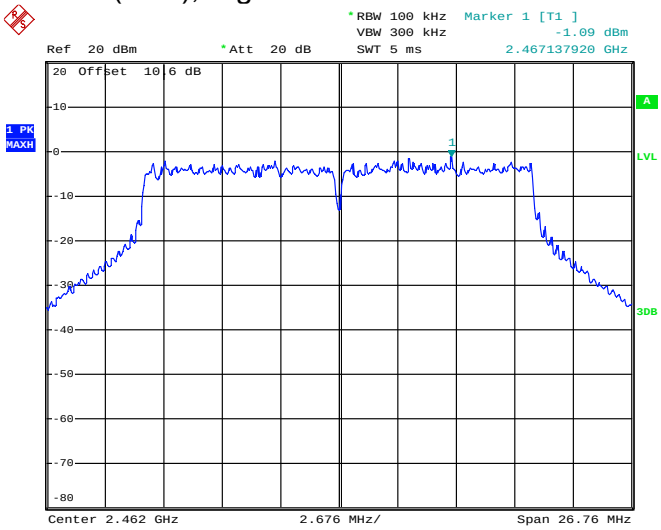
Plots of power spectral density

802.11n(20M), Highest channel



Date: 27.JUL.2015 11:40:26

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4.4 Out of Band Conducted Emissions

The maximum conducted (peak) output power was used to demonstrate compliance as described in 9.1.2. 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.

The measurement procedures under sections 11 of KDB558074 D01 v03r03 (09-June-2015) were used.

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

Limits:
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.

The plots of reference level measurement can be found on the section of PSD, and out of band conducted emissions are as below.

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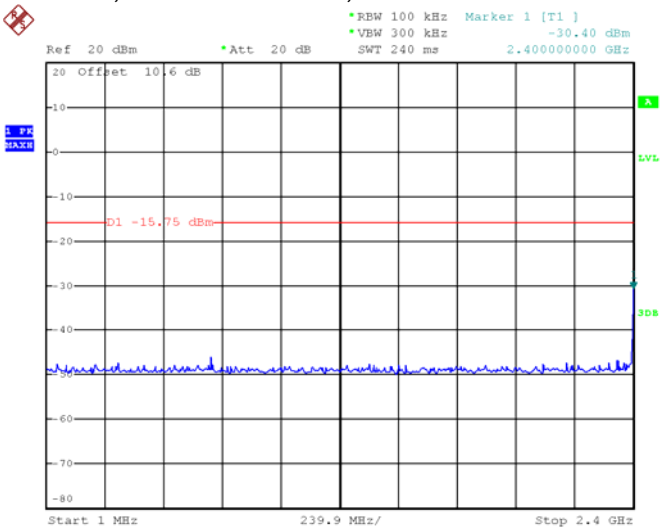
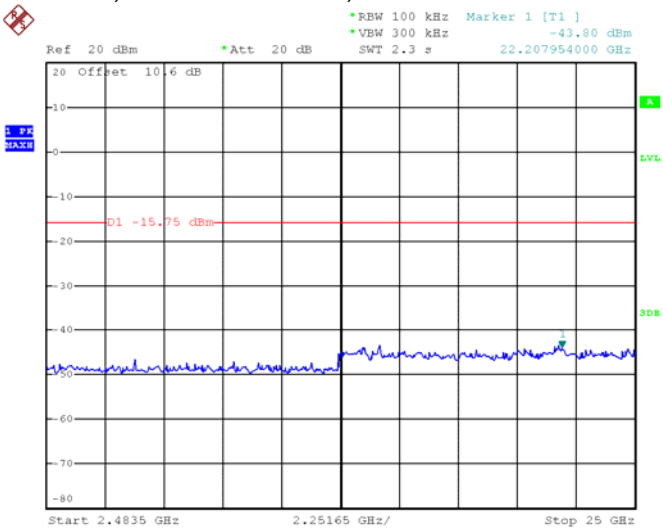
Plots of out of band conducted emissions

802.11b, Lowest Channel, Plot A



Date: 30.JUL.2015 20:37:51

802.11b, Lowest Channel, Plot B



Date: 30.JUL.2015 20:40:15

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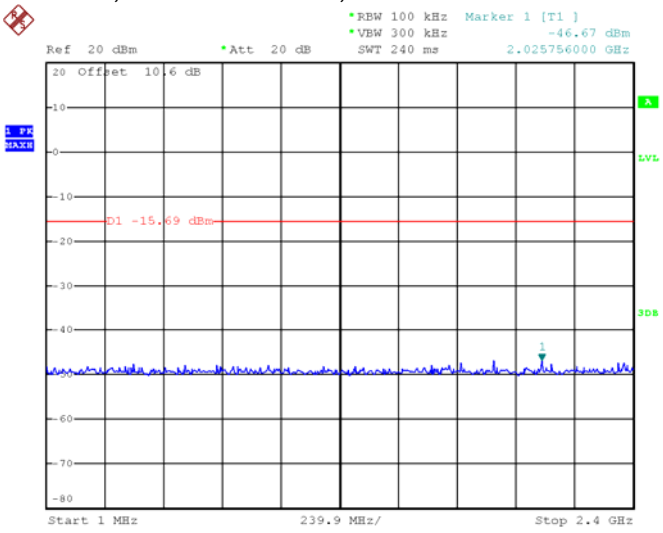
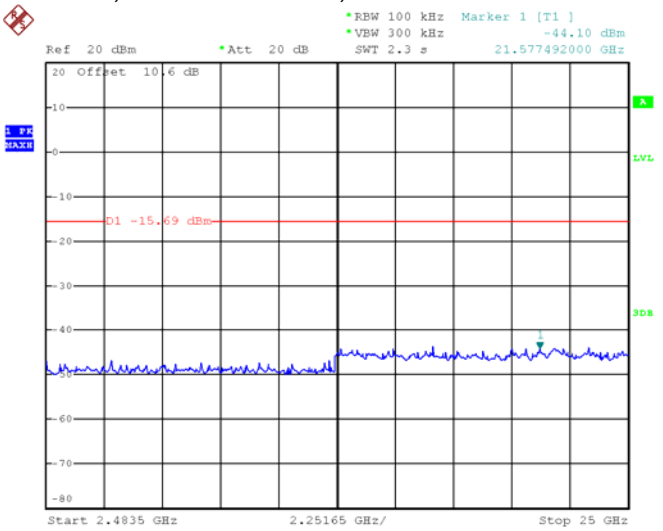
Plots of out of band conducted emissions

802.11b, Middle Channel, Plot A



Date: 30.JUL.2015 20:43:02

802.11b, Middle Channel, Plot B



Date: 30.JUL.2015 20:44:44

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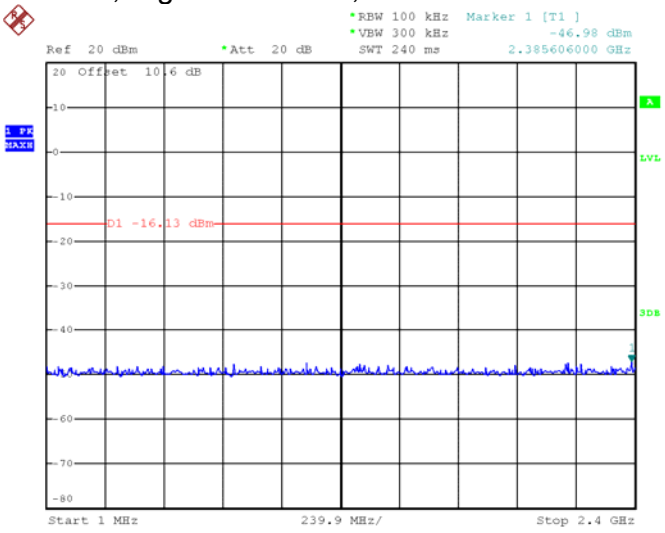
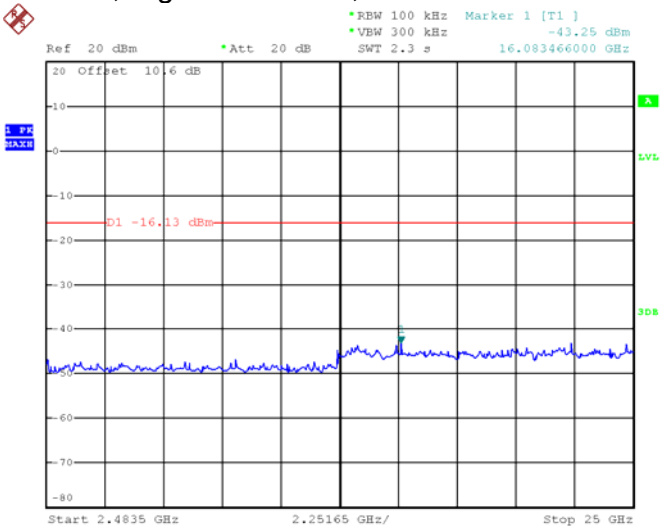
Plots of out of band conducted emissions

802.11b, Highest Channel, Plot A



Date: 30.JUL.2015 20:46:55

802.11b, Highest Channel, Plot B



Date: 30.JUL.2015 20:48:59

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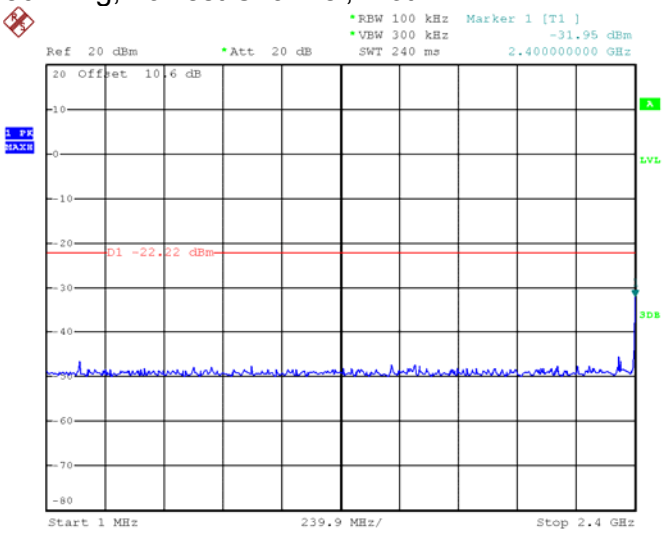
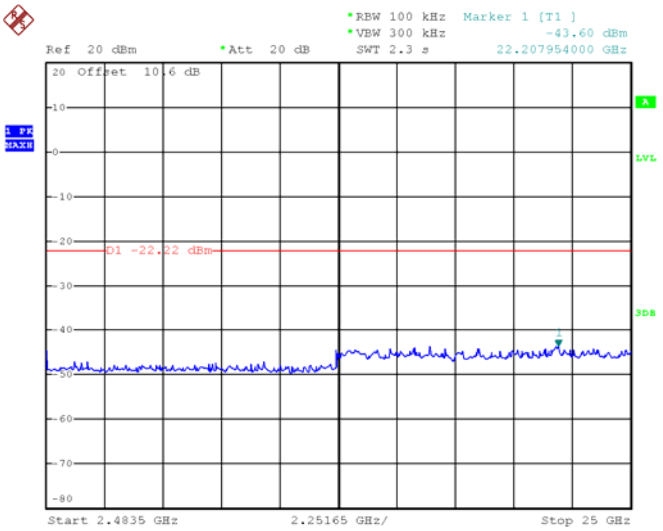
Plots of out of band conducted emissions

802.11g, Lowest Channel, Plot A



Date: 30.JUL.2015 20:53:37

802.11g, Lowest Channel, Plot B



Date: 30.JUL.2015 20:56:02

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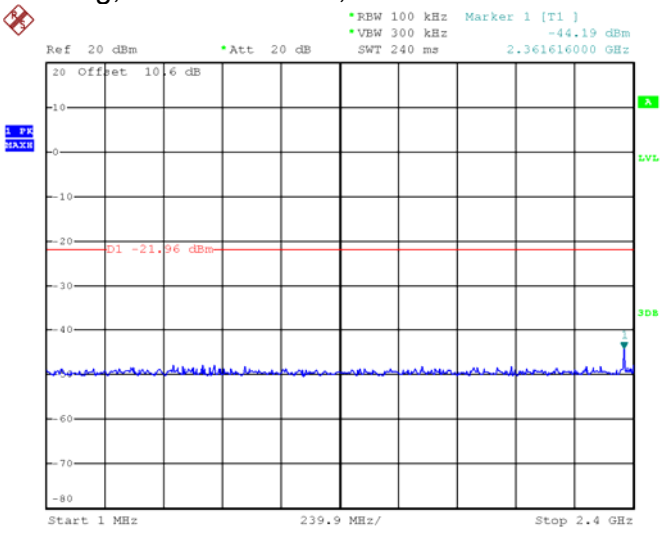
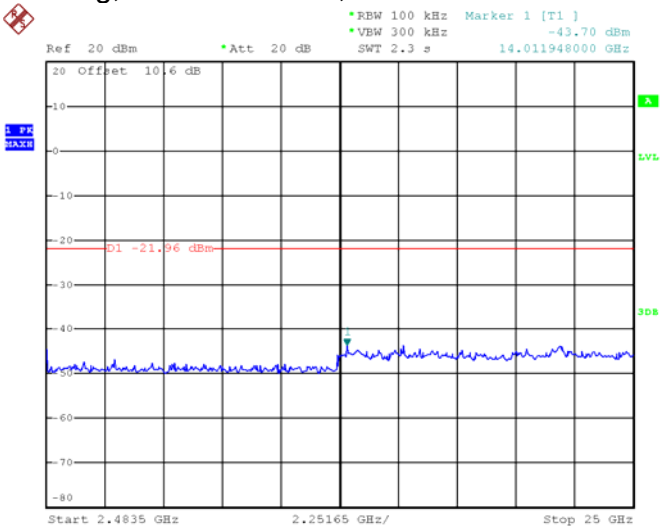
Plots of out of band conducted emissions

802.11g, Middle Channel, Plot A



Date: 30.JUL.2015 20:57:59

802.11g, Middle Channel, Plot B



Date: 30.JUL.2015 20:59:31

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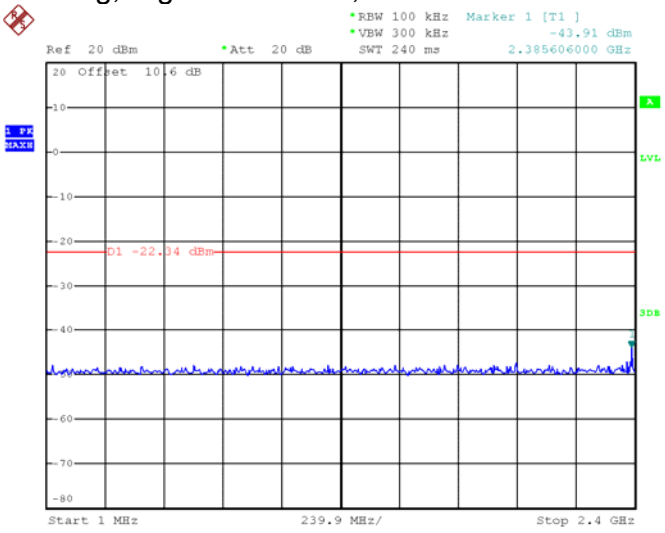
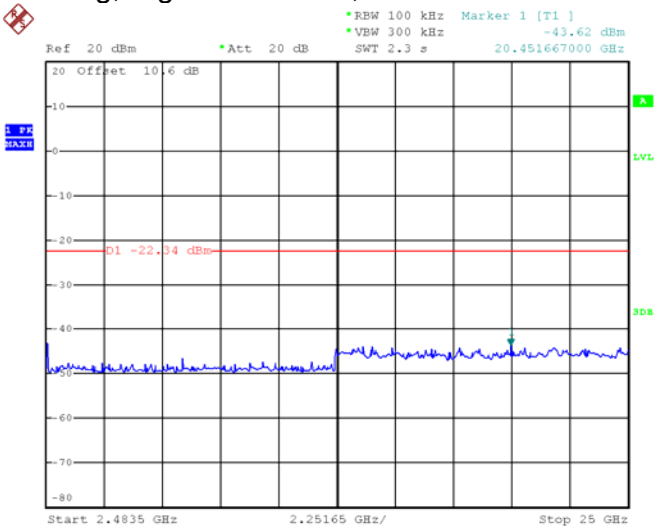
Plots of out of band conducted emissions

802.11g, Highest Channel, Plot A



Date: 30.JUL.2015 21:02:43

802.11g, Highest Channel, Plot B



Date: 30.JUL.2015 21:04:51

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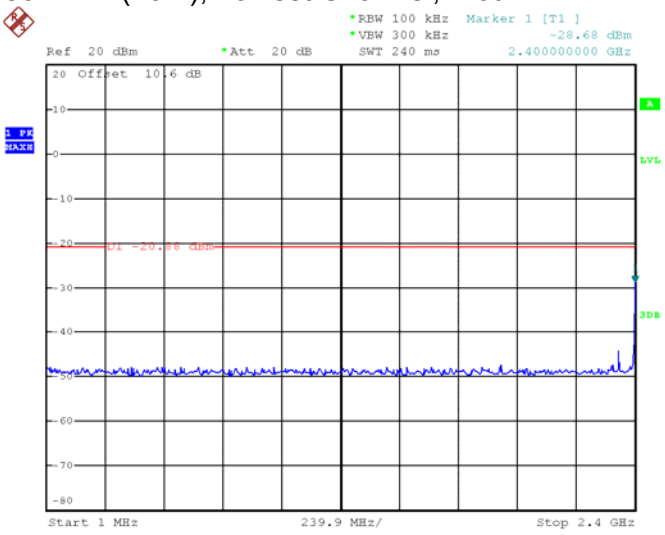
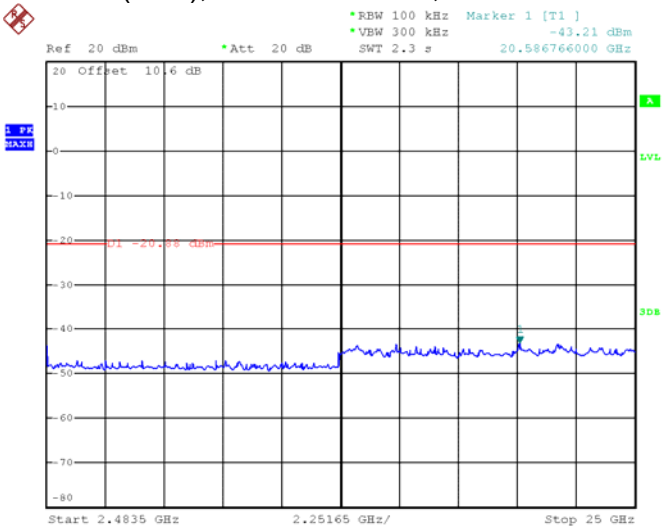
Plots of out of band conducted emissions

802.11n (20m), Lowest Channel, Plot A



Date: 30.JUL.2015 21:10:47

802.11n (20m), Lowest Channel, Plot B



Date: 30.JUL.2015 21:15:39

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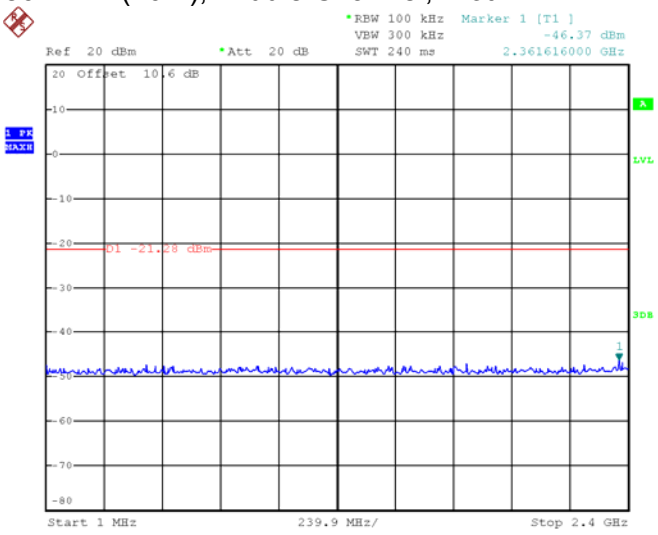
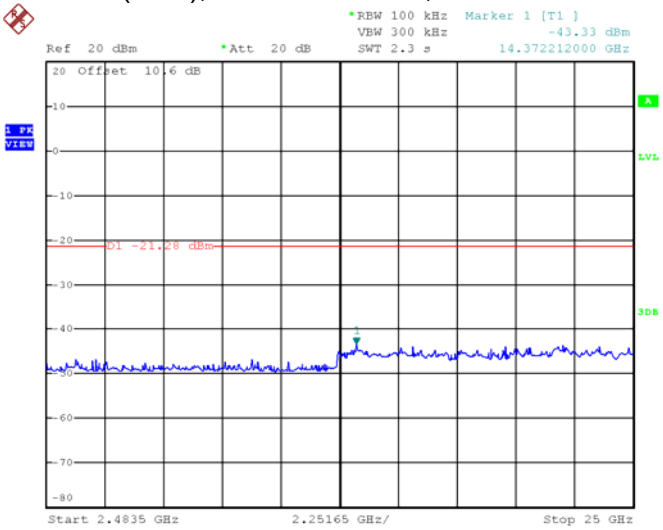
Plots of out of band conducted emissions

802.11n (20m), Middle Channel, Plot A



Date: 4.AUG.2015 19:34:32

802.11n (20m), Middle Channel, Plot B



Date: 4.AUG.2015 19:37:13

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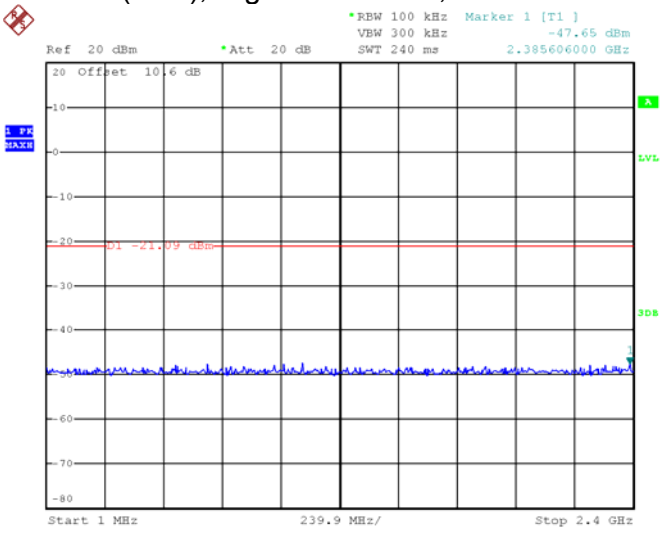
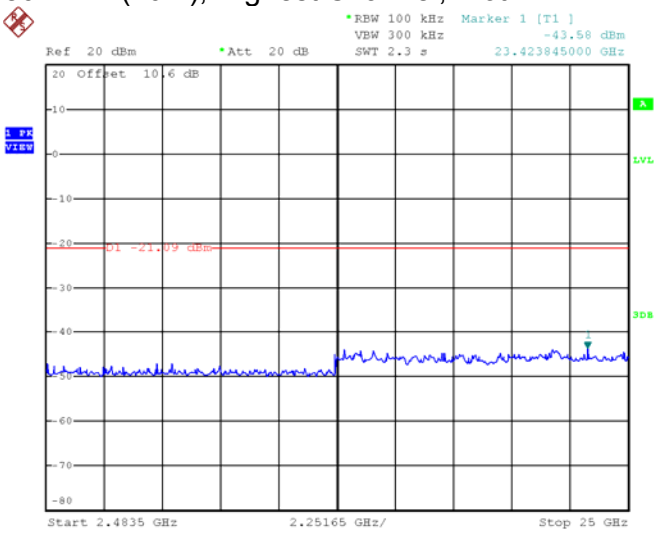
Plots of out of band conducted emissions

802.11n (20m), Highest Channel, Plot A



Date: 4.AUG.2015 19:42:10

802.11n (20m), Highest Channel, Plot B



Date: 4.AUG.2015 19:43:50

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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

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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

817.663 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 1-10 list the significant emission frequencies, the limit and the margin of compliance.

Judgement -

Passed by 2.3 dB margin compare with average limit

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Mode: TX-Channel 01

Table 1
IEEE 802.11b (DSSS, 1 Mbps)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - average (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***52.0***	***33***	***29.4***	***48.4***	***54.0***	***-5.6***
V	***4824.000***	***42.9***	***33***	***34.9***	***44.8***	***54.0***	***-9.2***
V	***12060.000***	***38.9***	***33***	***40.5***	***46.4***	***54.0***	***-7.6***
V	***14472.000***	***40.6***	***33***	***40.0***	***47.6***	***54.0***	***-6.4***

Remark: Average measurement method is used according to ANSI C63.10.

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	***2390.000***	***63.5***	***33***	***29.4***	***59.9***	***74.0***	***-14.1***
V	***4824.000***	***54.8***	***33***	***34.9***	***56.7***	***74.0***	***-17.3***
V	***12060.000***	***50.1***	***33***	***40.5***	***57.6***	***74.0***	***-16.4***
V	***14472.000***	***51.3***	***33***	***40.0***	***58.3***	***74.0***	***-15.7***

Remark: Peak detector is used for the emission measurement.

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.
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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Mode: TX-Channel 06

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 - average (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***40.9***	***33***	***34.9***	***42.8***	***54.0***	***-11.2***
V	***7311.000***	***35.8***	***33***	***37.9***	***40.7***	***54.0***	***-13.3***
V	***12185.000***	***39.2***	***33***	***40.5***	***46.7***	***54.0***	***-7.3***
V	14622.000	41.9	33	38.4	47.3	54.0	-6.7

Remark: Average measurement method is used according to ANSI C63.10.

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***	***53.9***	***33***	***34.9***	***55.8***	***74.0***	***-18.2***
V	***7311.000***	***49.4***	***33***	***37.9***	***54.3***	***74.0***	***-19.7***
V	***12185.000***	***50.0***	***33***	***40.5***	***57.5***	***74.0***	***-16.5***
V	14622.000	53.2	33	38.4	58.6	74.0	-15.4

Remark: Peak detector is used for the emission measurement.

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.
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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Mode: TX-Channel 11

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 - average (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***52.8***	***33***	***29.4***	***49.2***	***54.0***	***-4.8***
V	***4924.000***	***40.5***	***33***	***34.9***	***42.4***	***54.0***	***-11.6***
V	***7386.000***	***35.3***	***33***	***37.9***	***40.2***	***54.0***	***-13.8***
V	***12310.000***	***39.1***	***33***	***40.5***	***46.6***	***54.0***	***-7.4***
V	14772.000	42.4	33	38.4	47.8	54.0	-6.2

Remark: Average measurement method is used according to ANSI C63.10.

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***	***63.2***	***33***	***29.4***	***59.6***	***74.0***	***-14.4***
V	***4924.000***	***53.8***	***33***	***34.9***	***55.7***	***74.0***	***-18.3***
V	***7386.000***	***49.8***	***33***	***37.9***	***54.7***	***74.0***	***-19.3***
V	***12310.000***	***49.7***	***33***	***40.5***	***57.2***	***74.0***	***-16.8***
V	14772.000	53.1	33	38.4	58.5	74.0	-15.5

Remark: Peak detector is used for the emission measurement.

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.
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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Mode: TX-Channel 01

Table 4
IEEE 802.11g (OFDM, 24 Mbps)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - average (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***52.5***	***33***	***29.4***	***48.9***	***54.0***	***-5.1***
V	***4824.000***	***42.0***	***33***	***34.9***	***43.9***	***54.0***	***-10.1***
V	***12060.000***	***39.1***	***33***	***40.5***	***46.6***	***54.0***	***-7.4***
V	***14472.000***	***40.5***	***33***	***40.0***	***47.5***	***54.0***	***-6.5***

Remark: Average measurement method is used according to ANSI C63.10

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	***2390.000***	***64.1***	***33***	***29.4***	***60.5***	***74.0***	***-13.5***
V	***4824.000***	***55.5***	***33***	***34.9***	***57.4***	***74.0***	***-16.6***
V	***12060.000***	***50.3***	***33***	***40.5***	***57.8***	***74.0***	***-16.2***
V	***14472.000***	***51.6***	***33***	***40.0***	***58.6***	***74.0***	***-15.4***

Remark: Peak detector is used for the emission measurement.

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.
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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Mode: TX-Channel 06

Table 5
IEEE 802.11g (OFDM, 24 Mbps)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - average (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***40.4***	***33***	***34.9***	***42.3***	***54.0***	***-11.7***
V	***7311.000***	***35.7***	***33***	***37.9***	***40.6***	***54.0***	***-13.4***
V	***12185.000***	***38.9***	***33***	***40.5***	***46.4***	***54.0***	***-7.6***
V	14622.000	42.2	33	38.4	47.6	54.0	-6.4

Remark: Average measurement method is used according to ANSI C63.10.

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***	***54.3***	***33***	***34.9***	***56.2***	***74.0***	***-17.8***
V	***7311.000***	***49.3***	***33***	***37.9***	***54.2***	***74.0***	***-19.8***
V	***12185.000***	***49.9***	***33***	***40.5***	***57.4***	***74.0***	***-16.6***
V	14622.000	53.4	33	38.4	58.8	74.0	-15.2

Remark: Peak detector is used for the emission measurement.

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.
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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Mode: TX-Channel 11

Table 6
IEEE 802.11g (OFDM, 24 Mbps)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - average (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***53.1***	***33***	***29.4***	***49.5***	***54.0***	***-4.5***
V	***4924.000***	***40.4***	***33***	***34.9***	***42.3***	***54.0***	***-11.7***
V	***7386.000***	***35.6***	***33***	***37.9***	***40.5***	***54.0***	***-13.5***
V	***12310.000***	***38.9***	***33***	***40.5***	***46.4***	***54.0***	***-7.6***
V	14772.000	42.2	33	38.4	47.6	54.0	-6.4

Remark: Average measurement method is used according to ANSI C63.10.

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***	***63.5***	***33***	***29.4***	***59.9***	***74.0***	***-14.1***
V	***4924.000***	***54.3***	***33***	***34.9***	***56.2***	***74.0***	***-17.8***
V	***7386.000***	***49.7***	***33***	***37.9***	***54.6***	***74.0***	***-19.4***
V	***12310.000***	***50.0***	***33***	***40.5***	***57.5***	***74.0***	***-16.5***
V	14772.000	53.5	33	38.4	58.9	74.0	-15.1

Remark: Peak detector is used for the emission measurement.

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.
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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Mode: TX-Channel 01

Table 7
IEEE 802.11n (20MHz) (OFDM, MCS6)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - average (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2390.000***	***52.2***	***33***	***29.4***	***48.6***	***54.0***	***-5.4***
V	***4824.000***	***42.2***	***33***	***34.9***	***44.1***	***54.0***	***-9.9***
V	***12060.000***	***39.0***	***33***	***40.5***	***46.5***	***54.0***	***-7.5***
V	***14472.000***	***40.6***	***33***	***40.0***	***47.6***	***54.0***	***-6.4***

Remark: Average measurement method is used according to ANSI C63.10.

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	***2390.000***	***63.7***	***33***	***29.4***	***60.1***	***74.0***	***-13.9***
V	***4824.000***	***55.3***	***33***	***34.9***	***57.2***	***74.0***	***-16.8***
V	***12060.000***	***50.1***	***33***	***40.5***	***57.6***	***74.0***	***-16.4***
V	***14472.000***	***51.7***	***33***	***40.0***	***58.7***	***74.0***	***-15.3***

Remark: Peak detector is used for the emission measurement.

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.
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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Mode: TX-Channel 06

Table 8
IEEE 802.11n (20MHz) (OFDM, MCS6)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - average (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***4874.000***	***41.8***	***33***	***34.9***	***43.7***	***54.0***	***-10.3***
V	***7311.000***	***35.4***	***33***	***37.9***	***40.3***	***54.0***	***-13.7***
V	***12185.000***	***39.0***	***33***	***40.5***	***46.5***	***54.0***	***-7.5***
V	14622.000	41.9	33	38.4	47.3	54.0	-6.7

Remark: Average measurement method is used according to ANSI C63.10.

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***	***54.6***	***33***	***34.9***	***56.5***	***74.0***	***-17.5***
V	***7311.000***	***49.2***	***33***	***37.9***	***54.1***	***74.0***	***-19.9***
V	***12185.000***	***50.1***	***33***	***40.5***	***57.6***	***74.0***	***-16.4***
V	14622.000	53.1	33	38.4	58.5	74.0	-15.5

Remark: Peak detector is used for the emission measurement.

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.
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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Mode: TX-Channel 11

Table 9
IEEE 802.11n (20MHz) (OFDM, MCS6)

Radiated Emission Data

Polari-zation	Frequency	Reading (dBuV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - average (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
V	***2483.500***	***53.3***	***33***	***29.4***	***49.7***	***54.0***	***-4.3***
V	***4924.000***	***42.0***	***33***	***34.9***	***43.9***	***54.0***	***-10.1***
V	***7386.000***	***35.5***	***33***	***37.9***	***40.4***	***54.0***	***-13.6***
V	***12310.000***	***39.1***	***33***	***40.5***	***46.6***	***54.0***	***-7.4***
V	14772.000	42.0	33	38.4	47.4	54.0	-6.6

Remark: Average measurement method is used according to ANSI C63.10.

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***	***63.8***	***33***	***29.4***	***60.2***	***74.0***	***-13.8***
V	***4924.000***	***54.9***	***33***	***34.9***	***56.8***	***74.0***	***-17.2***
V	***7386.000***	***49.6***	***33***	***37.9***	***54.5***	***74.0***	***-19.5***
V	***12310.000***	***50.2***	***33***	***40.5***	***57.7***	***74.0***	***-16.3***
V	14772.000	53.2	33	38.4	58.6	74.0	-15.4

Remark: Peak detector is used for the emission measurement.

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.
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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Mode: (WiFi+Remote RF) On and Play Movie (from SD card)

Table 10

Radiated Emission Data

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	48.715	29.6	16	11.0	24.6	40.0	-15.4
H	72.922	42.9	16	7.0	33.9	40.0	-6.1
H	81.923	30.2	16	7.0	21.2	40.0	-18.8
H	146.368	25.8	16	14.0	23.8	43.5	-19.7
H	184.520	24.2	16	20.0	28.2	43.5	-15.3
H	***251.206***	***29.9***	***16***	***20.0***	***33.9***	***46.0***	***-12.1***
H	296.087	35.9	16	22.0	41.9	46.0	-4.1
H	347.260	33.1	16	24.0	41.1	46.0	-4.9
H	696.046	25.3	16	30.0	39.3	46.0	-6.7
H	744.180	23.0	16	30.0	37.0	46.0	-9.0
H	817.663	28.7	16	31.0	43.7	46.0	-2.3

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.

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4.6.3 Transmitter Duty Cycle Calculation

Not applicable – No average factor is required.

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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

451.5 kHz

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 10.86 dB margin compare with quasi-peak limit

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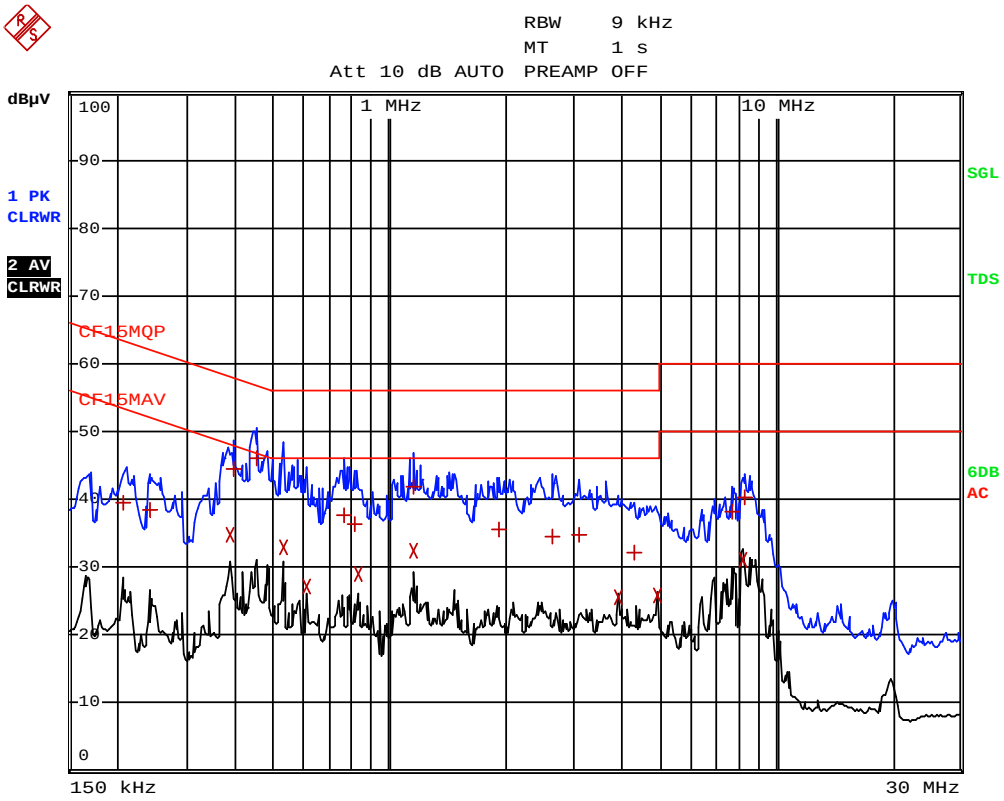
Worst Case: (WiFi+Remote RF) On and Play mic recorded file (from SD card)



Date: 31.JUL.2015 10:32:52

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Worst Case: (WiFi+Remote RF) On and playback mic recorded file (from SD card)

EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	208.5 kHz	39.58	L1	-23.68
1	Quasi Peak	240 kHz	38.53	L1	-23.56
2	CISPR Average	384 kHz	34.67	N	-13.52
1	Quasi Peak	393 kHz	44.61	L1	-13.38
1	Quasi Peak	451.5 kHz	45.98	L1	-10.86
2	CISPR Average	528 kHz	32.85	N	-13.14
2	CISPR Average	609 kHz	27.21	N	-18.78
1	Quasi Peak	766.5 kHz	37.70	L1	-18.29
1	Quasi Peak	811.5 kHz	36.28	L1	-19.71
2	CISPR Average	834 kHz	29.03	N	-16.96
1	Quasi Peak	1.1535 MHz	41.81	L1	-14.18
2	CISPR Average	1.1535 MHz	32.32	N	-13.67
1	Quasi Peak	1.9185 MHz	35.61	L1	-20.38
1	Quasi Peak	2.652 MHz	34.43	L1	-21.56
1	Quasi Peak	3.102 MHz	34.76	L1	-21.23
2	CISPR Average	3.912 MHz	25.51	N	-20.48
1	Quasi Peak	4.326 MHz	32.19	L1	-23.80
2	CISPR Average	4.9695 MHz	25.98	N	-20.01
1	Quasi Peak	7.6965 MHz	38.24	L1	-21.75
2	CISPR Average	8.268 MHz	31.11	N	-18.88

Date: 31.JUL.2015 10:32:13

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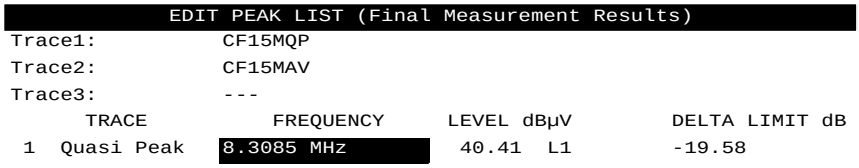
Worst Case: (WiFi+Remote RF) On and playback mic recorded file (from SD card)



Date: 31.JUL.2015 10:32:27

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EXHIBIT 5
EQUIPMENT LIST

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5.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-3095	EW-2512	EW-0447
Manufacturer	R&S	EMCO	EMCO
Model No.	ESCI	3104C	3146
Calibration Date	Oct. 16, 2014	Jan. 22, 2015	Mar. 16, 2015
Calibration Due Date	Oct. 16, 2015	Jul. 22, 2016	Sep. 16, 2016

Equipment	Spectrum Analyzer	Double Ridged Guide Antenna
Registration No.	EW-2466	EW-1133
Manufacturer	R&S	EMCO
Model No.	FSP30	3115
Calibration Date	Sep. 02, 2014	Apr. 30, 2014
Calibration Due Date	Sep. 02, 2015	Oct. 30, 2015

2) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN
Registration No.	EW-2251	EW-2501
Manufacturer	R&S	R&S
Model No.	ESCI	ENV-216
Calibration Date	Dec 4, 2014	Jan 15, 2015
Calibration Due Date	Dec 4, 2015	Jan 15, 2016

3) Conductive Measurement Test

Equipment	RF Power Meter with Power Sensor (N1921A)	Spectrum Analyzer
Registration No.	EW-2270	EW-2253
Manufacturer	AGILENTTECH	R&S
Model No.	N1911A	FSP40
Calibration Date	Jan. 05, 2015	May. 27, 2015
Calibration Due Date	Jan. 05, 2016	May. 27, 2016

END OF TEST REPORT

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