

TEST REPORT

Report Number: 17071015HKG-001

Application For Original Grant of 47 CFR Part 15 Certification

Single New of RSS-247 Issue 2 Equipment

(DSSS/OFDM modulation)

Ultimate Justice League RC Batmobile

FCC ID: PIYFKM40-17A5W

IC: 4390C-FKM4017A5W

PREPARED AND CHECKED BY:

APPROVED BY:

Signed On File
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Engineer

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Senior Lead Engineer
Date: July 24, 2017

TEST REPORT

GENERAL INFORMATION

| | |
|------------------------------------|--|
| Applicant Name: | Mattel Asia Pacific Sourcing Ltd. |
| Applicant Address: | 13/F., South Tower, World Finance Centre, Harbour City, Tsim Sha Tsui, Kowloon, Hong Kong. |
| Buyer: | Mattel |
| FCC Specification Standard: | FCC Part 15, October 1, 2015 Edition |
| FCC ID: | PIYFKM40-17A5W |
| FCC Model(s): | FKM40 |
| IC Specification Standard: | RSS-247 Issue 2, February 2017 RSS-Gen Issue 4, November 2014 |
| IC: | 4390C-FKM4017A5W |
| PMN: | Ultimate Justice League Batmobile |
| HVIN: | FKM40 |
| Type of EUT: | Spread Spectrum Transmitter |
| Description of EUT: | Ultimate Justice League RC Batmobile |
| Serial Number: | N/A |
| Sample Receipt Date: | July 14, 2017 |
| Date of Test: | July 14, 2017 to July 21, 2017 |
| Report Date: | July 24, 2017 |
| 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 | 7.1.2# | 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 (average) | 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 | 5.5 | Pass | 4.6 |

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, 2015 Edition
RSS-247 Issue 2, February 2017
RSS-Gen Issue 4, November 2014

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EXHIBIT 2 GENERAL DESCRIPTION

2.0 GENERAL DESCRIPTION

2.1 Product Description

The Equipment Under Test (EUT) is a portable 2.4GHz WiFi RC Car operated at 2412-2462MHz with 5MHz Channel Spacing. The EUT is powered by 1 X 9.9V rechargeable battery. After switch on the EUT and paired with Phone Device with Phone Application, the EUT can be controlled to move forward, backward, turning left/right direction by the controller. The camera on EUT can be displayed on Phone Application.

The Equipment Under Test (EUT) operates at frequency range of 2412MHz to 2462MHz with 11 channels.

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 11 Mbps.

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 (20MHz) 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 MCS7Mbps.

The EUT is power by 1 X 9.9V rechargeable battery.

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

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

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2.2 Test Methodology

Radiated and conducted 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. KDB558074 D01 v04 (05-April-2017). 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 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 Industry Canada No.: 2042V-1.

2.4 Related Submittal(s) Grants

This is a single application for certification of a transceiver (DSSS/OFDM portion)

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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 1 X 9.9V rechargeable battery.

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.

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3.1 Justification – Cont'd

Detector function for radiated emissions was in peak mode. Average readings, when required, were taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 4.8.3.

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

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

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

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:

N/A

Description of Accessories:

There are no accessories for compliance of this product.

3.4 Measurement Uncertainty

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

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

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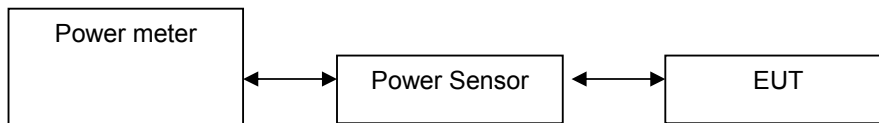
EXHIBIT 4 TEST RESULTS

4.0 TEST RESULTS

4.1 Maximum Conducted (peak) Output Power at Antenna Terminals

RF Conduct Measurement Test Setup

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



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

- ☒ The antenna power of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals. The measurement procedure [PK29.1.2 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, 11 Mbps) Antenna Gain = 0 dBi

| Frequency (MHz) | Output in dBm | Output in mWatt |
|----------------------|---------------|-----------------|
| Low Channel: 2412 | 18.45 | 69.98 |
| Middle Channel: 2437 | 18.10 | 64.57 |
| High Channel: 2462 | 18.96 | 78.70 |

IEEE 802.11g (OFDM, 54 Mbps) Antenna Gain = 0 dBi

| Frequency (MHz) | Output in dBm | Output in mWatt |
|----------------------|---------------|-----------------|
| Low Channel: 2412 | 22.12 | 162.93 |
| Middle Channel: 2437 | 21.96 | 157.04 |
| High Channel: 2462 | 22.29 | 169.43 |

IEEE 802.11n (20MHz) (OFDM, MCS7) Antenna Gain = 0 dBi

| Frequency (MHz) | Output in dBm | Output in mWatt |
|----------------------|---------------|-----------------|
| Low Channel: 2412 | 20.25 | 105.93 |
| Middle Channel: 2437 | 21.18 | 131.22 |
| High Channel: 2462 | 21.72 | 148.59 |

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

Cable loss : 0.5 dB External Attenuation : 0 dB

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

IEEE 802.11b (DSSS, 11 Mbps)

max. conducted (peak) output level = 18.96dBm

IEEE 802.11g (OFDM, 54 Mbps)

max. conducted (peak) output level = 22.29dBm

IEEE 802.11n (20MHz) (OFDM, MCS7 Mbps)

max. conducted (peak) output level = 21.72dBm

Limits:

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

☐ ___ W (___ dBm) for antennas with gains more than 6dBi

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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, 11 Mbps)

| Frequency (MHz) | 6dB Bandwidth (MHz) |
|----------------------|---------------------|
| Low Channel: 2412 | 9.20 |
| Middle Channel: 2437 | 9.20 |
| High Channel: 2462 | 9.44 |

IEEE 802.11g (OFDM, 54 Mbps)

| Frequency (MHz) | 6dB Bandwidth (MHz) |
|----------------------|---------------------|
| Low Channel: 2412 | 16.64 |
| Middle Channel: 2437 | 16.52 |
| High Channel: 2462 | 16.64 |

IEEE 802.11n (20MHz) (OFDM, MCS7 Mbps)

| Frequency (MHz) | 6dB Bandwidth (MHz) |
|----------------------|---------------------|
| Low Channel: 2412 | 17.92 |
| Middle Channel: 2437 | 17.80 |
| High Channel: 2462 | 17.84 |

Limits

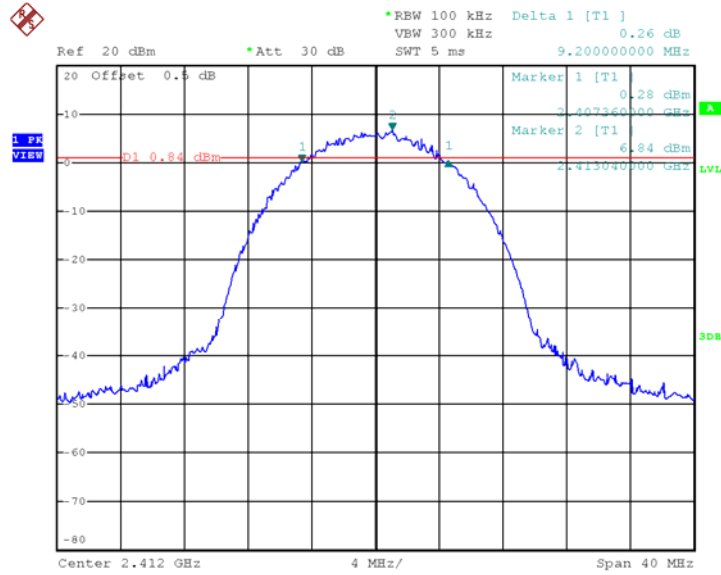
6 dB bandwidth shall be at least 500kHz

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

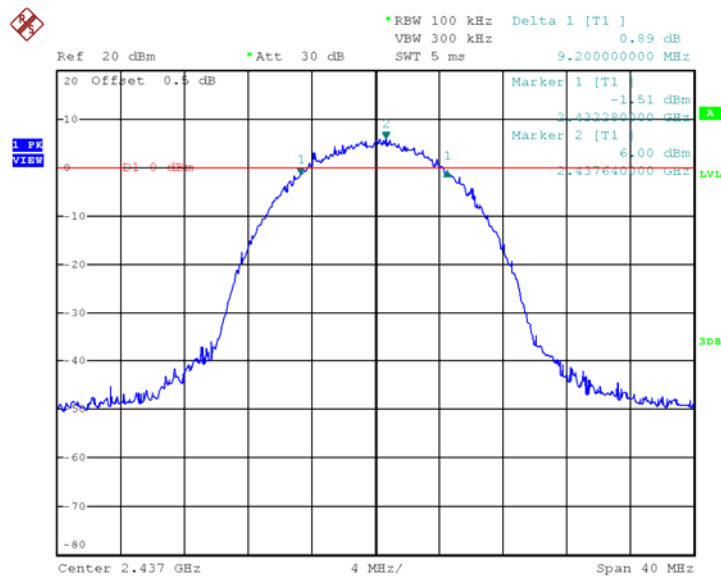
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

802.11b, Lowest Channel



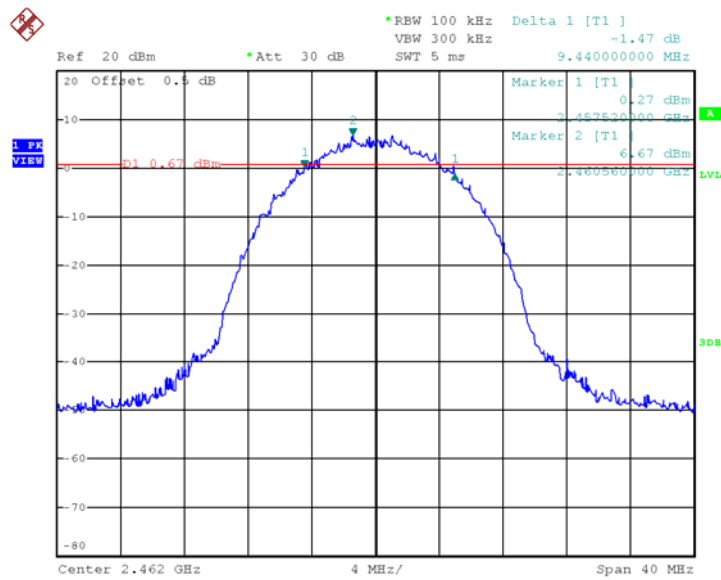
802.11b, Middle Channel



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

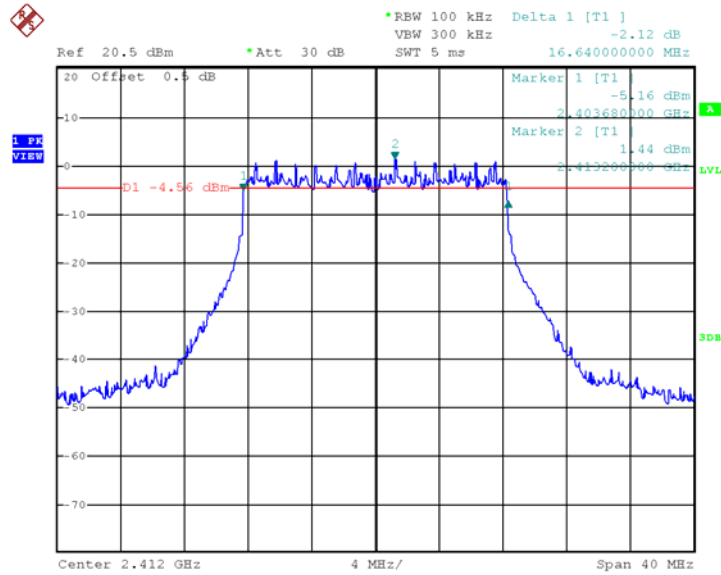
802.11b, Highest Channel



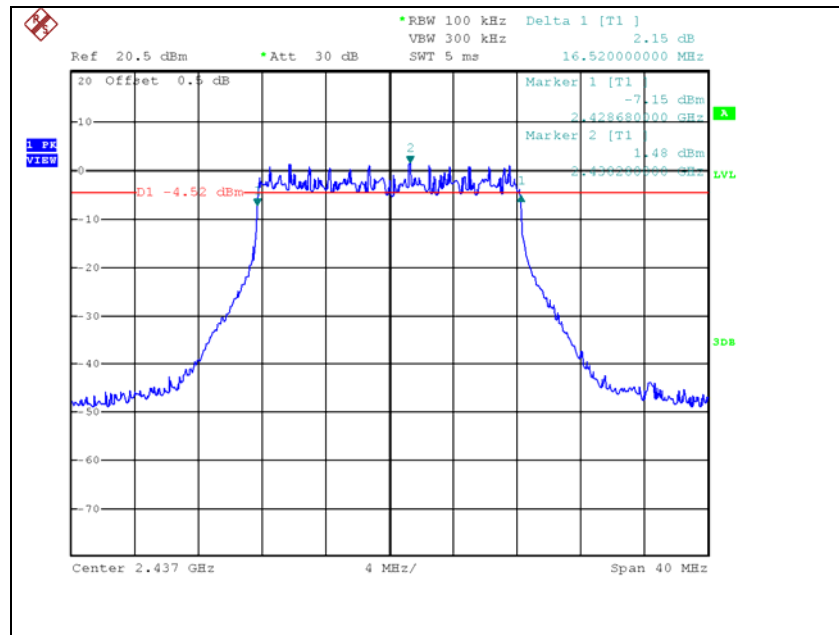
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

802.11g, Lowest Channel



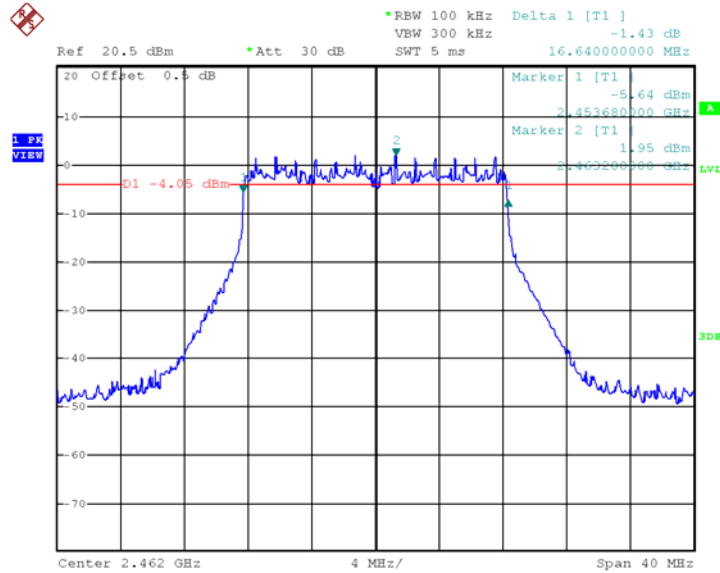
802.11g, Middle Channel



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

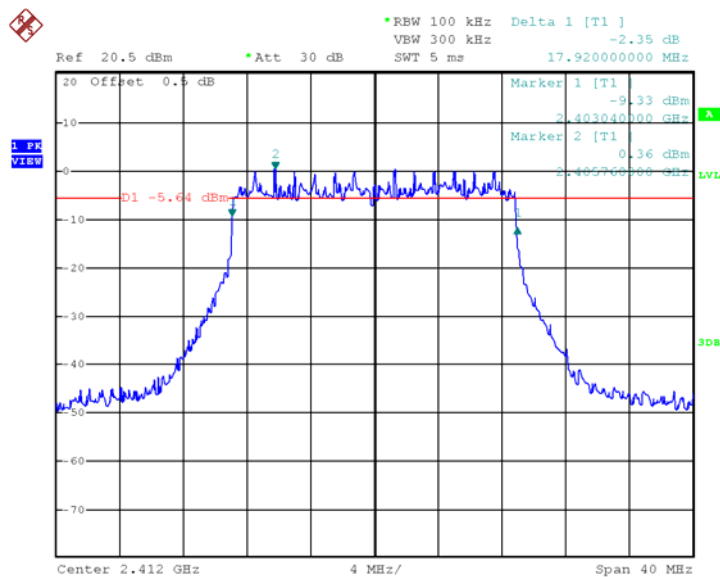
802.11g, Highest Channel



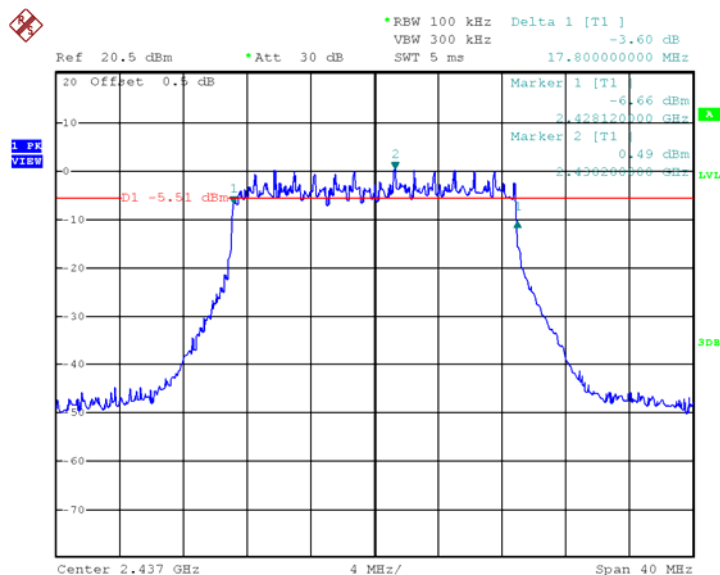
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

802.11n (20MHz), Lowest Channel



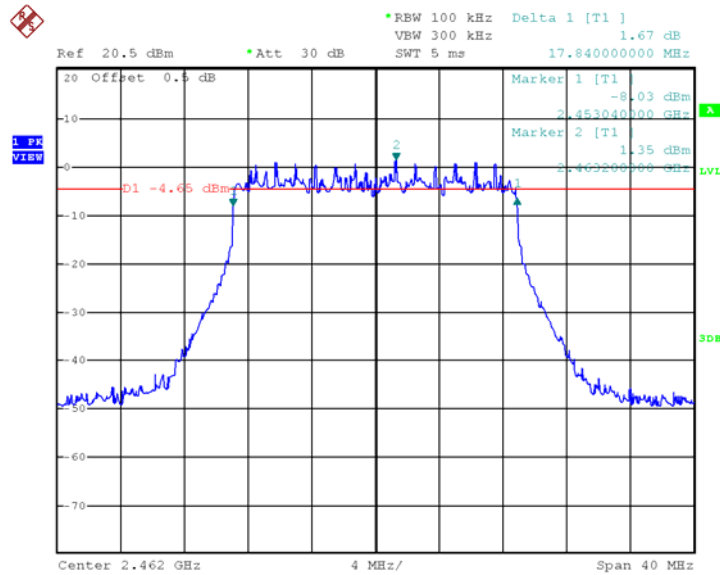
802.11n (20MHz), Middle Channel



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PLOTS OF 6dB RF BANDWIDTH

802.11n (20MHz), 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 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, 11 Mbps)

| Frequency (MHz) | PSD in 100kHz (dBm) |
|----------------------|---------------------|
| Low Channel: 2412 | 6.35 |
| Middle Channel: 2437 | 6.26 |
| High Channel: 2462 | 6.69 |

IEEE 802.11g (OFDM, 54 Mbps)

| Frequency (MHz) | PSD in 100kHz (dBm) |
|----------------------|---------------------|
| Low Channel: 2412 | 1.84 |
| Middle Channel: 2437 | 1.25 |
| High Channel: 2462 | 2.30 |

IEEE 802.11n (20MHz) (OFDM, MCS7)

| Frequency (MHz) | PSD in 100kHz (dBm) |
|----------------------|---------------------|
| Low Channel: 2412 | 0.61 |
| Middle Channel: 2437 | 0.38 |
| High Channel: 2462 | 1.26 |

Cable Loss: 0.5 dB

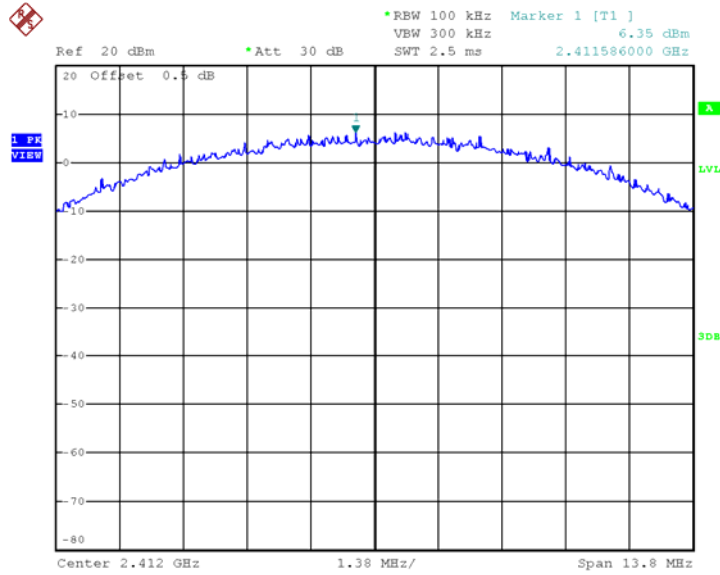
Limit:
8dBm

The plots of power spectral density are as below.

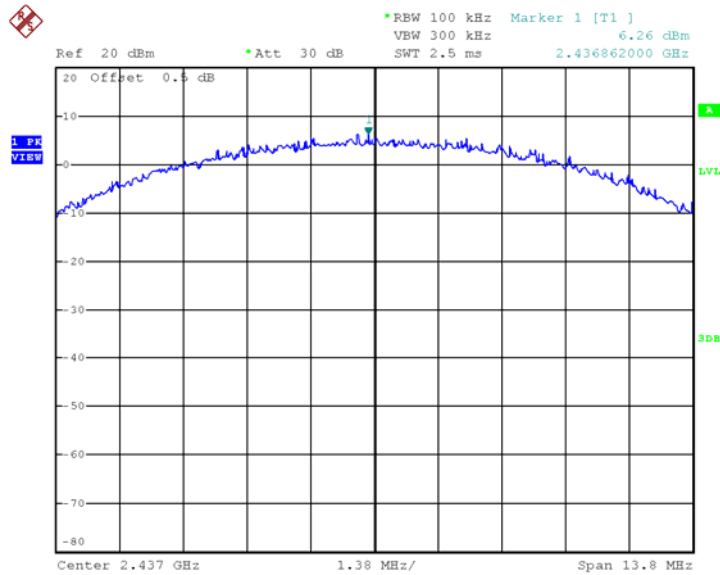
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

802.11b, Lowest channel



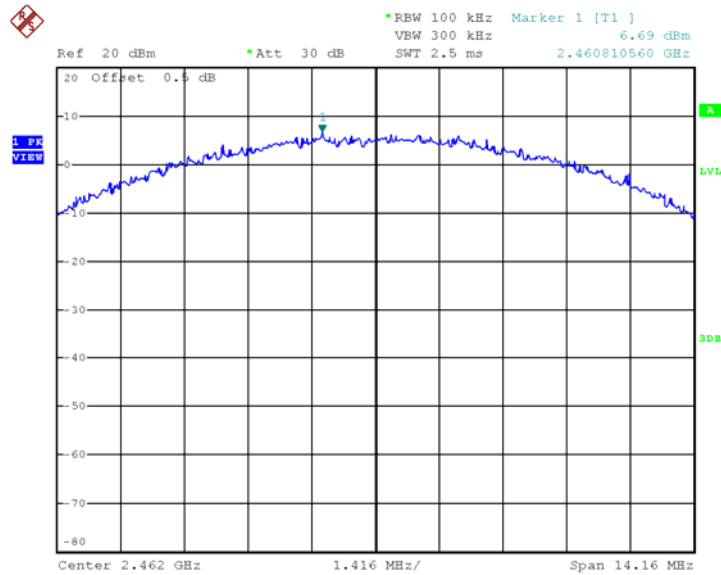
802.11b, Middle channel



TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

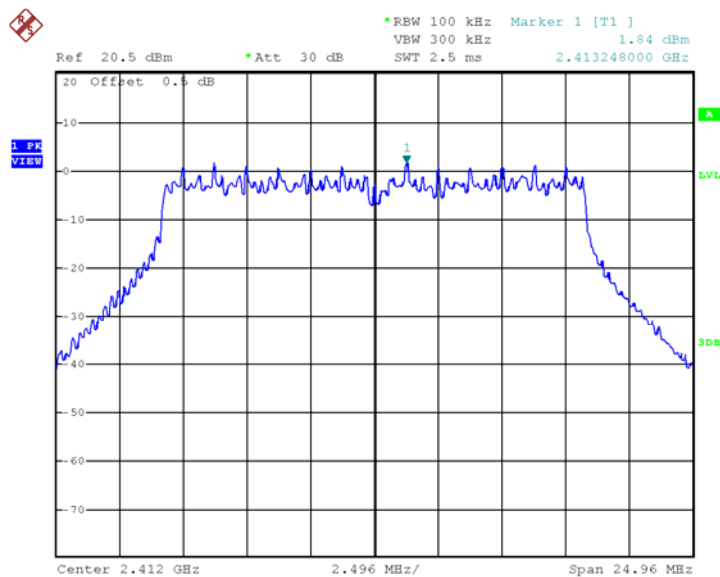
802.11b, Highest channel



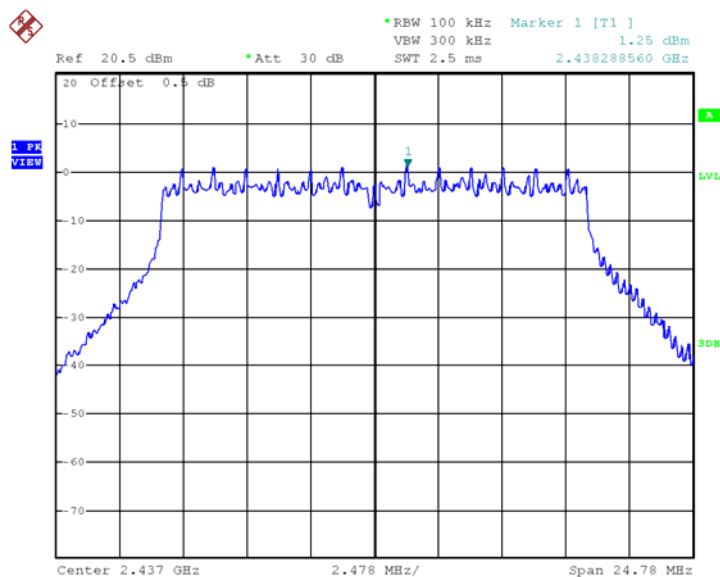
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

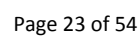
802.11g, Lowest channel



802.11g, Middle channel



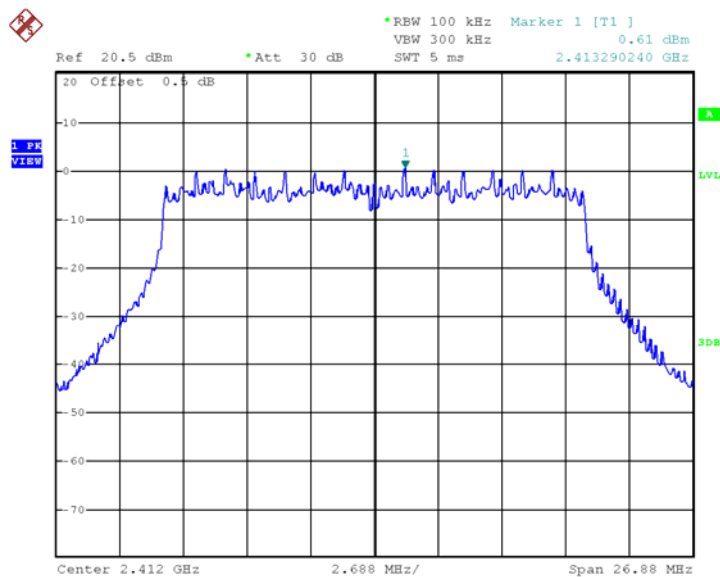
802.11g, Highest channel



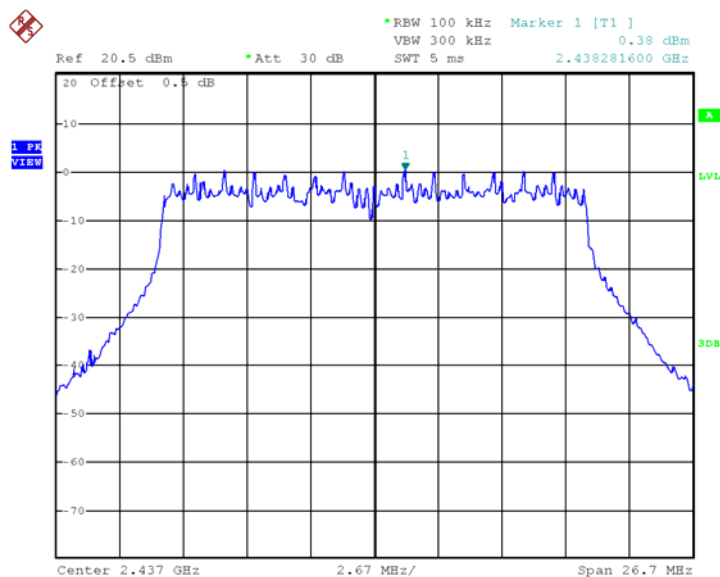
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

802.11n (20MHz), Lowest channel



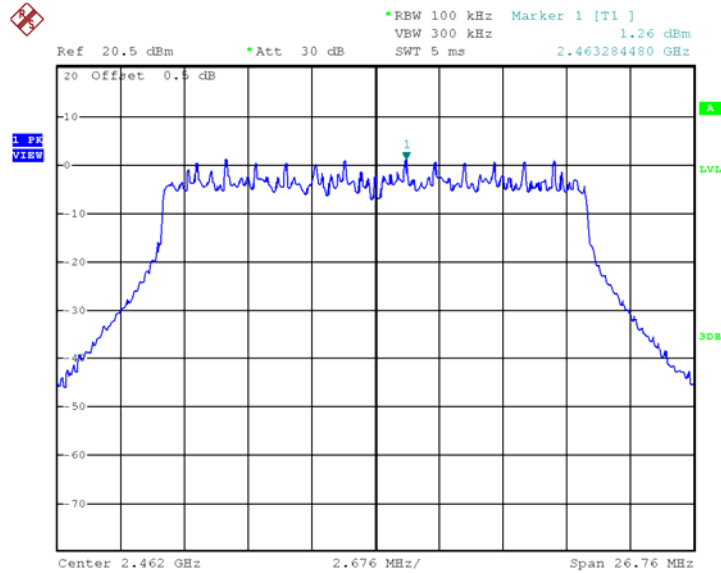
802.11n (20MHz), Middle channel



TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

802.11n (20MHz), Highest channel



TEST REPORT

4.4 Out of Band Conducted Emissions

For 802.11b/g/n20, 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 802.11b/g/n20.

The measurement procedures under sections 11 of KDB558074 D01 v04 (05-April-2017) were used.

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

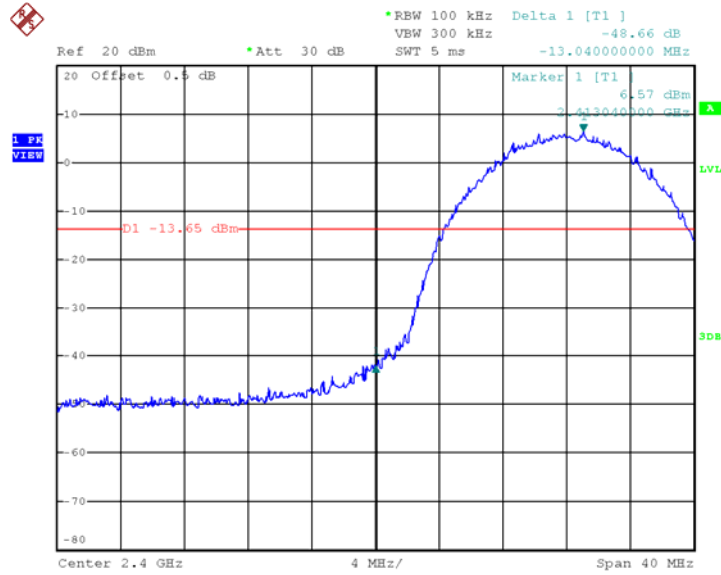
Limits:

All spurious emission and up to the tenth harmonic was measured and they were found to be at least for 802.11b,g below the maximum measured in-band peak PSD level.

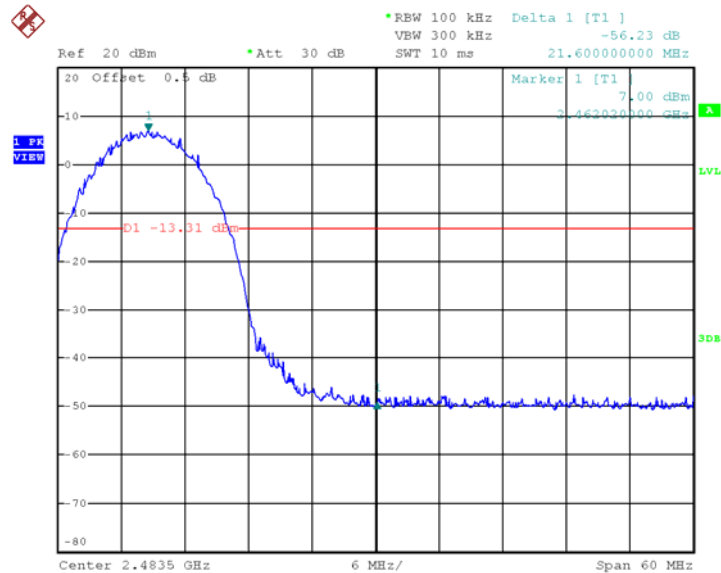
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11b, Lowest Channel



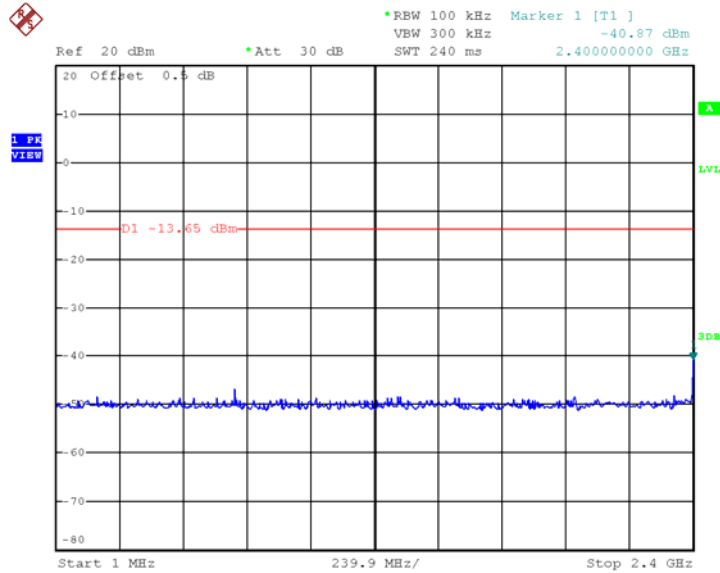
802.11b, Highest Channel



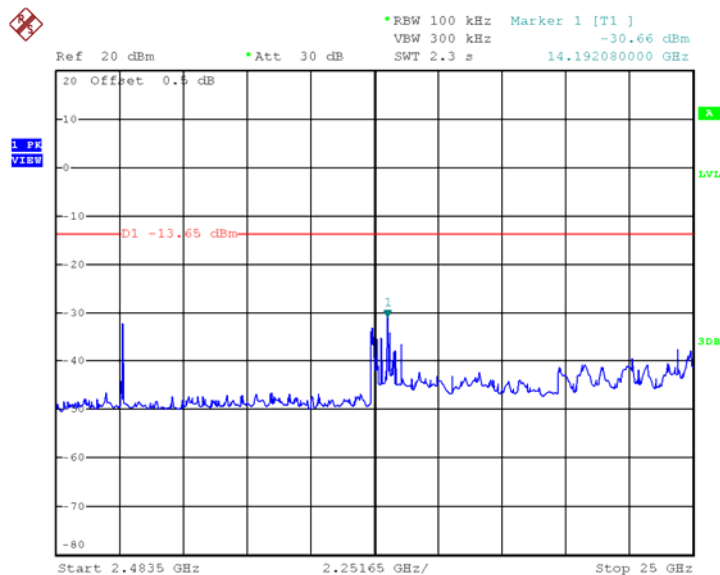
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11b, Lowest Channel, Plot A



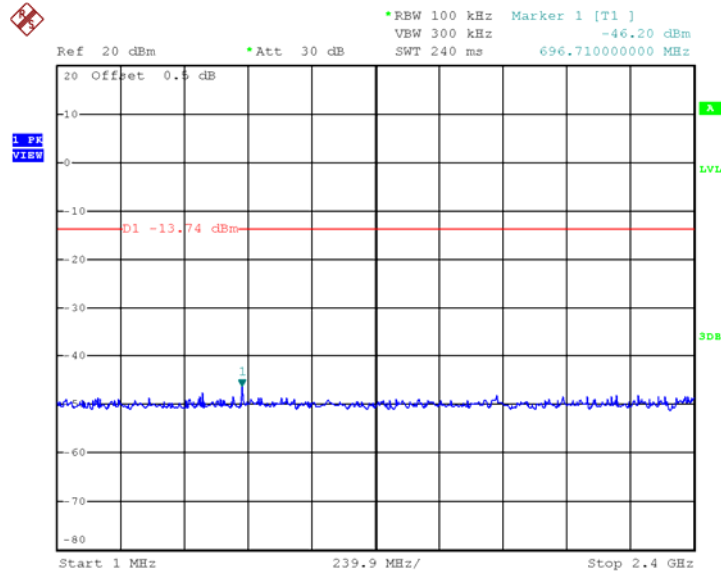
802.11b, Lowest Channel, Plot B



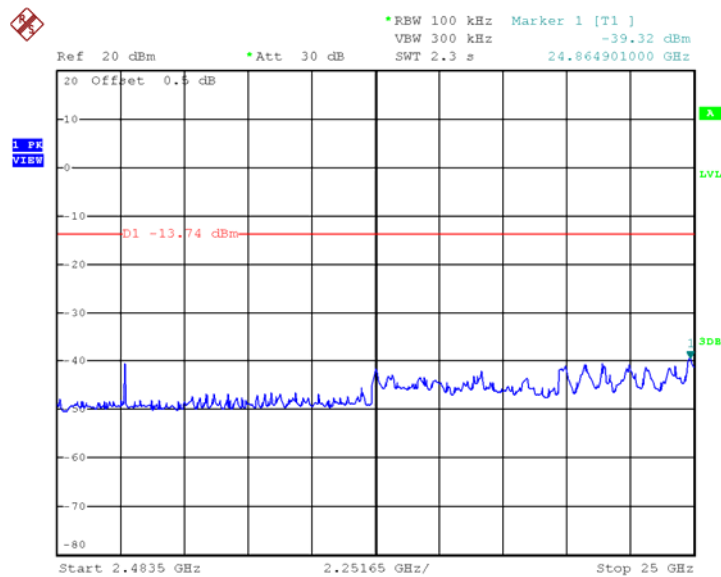
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11b, Middle Channel, Plot A



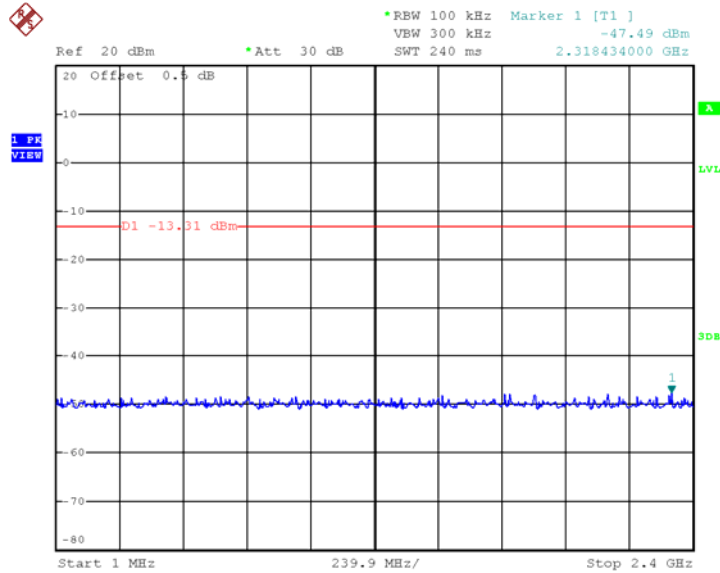
802.11b, Middle Channel, Plot B



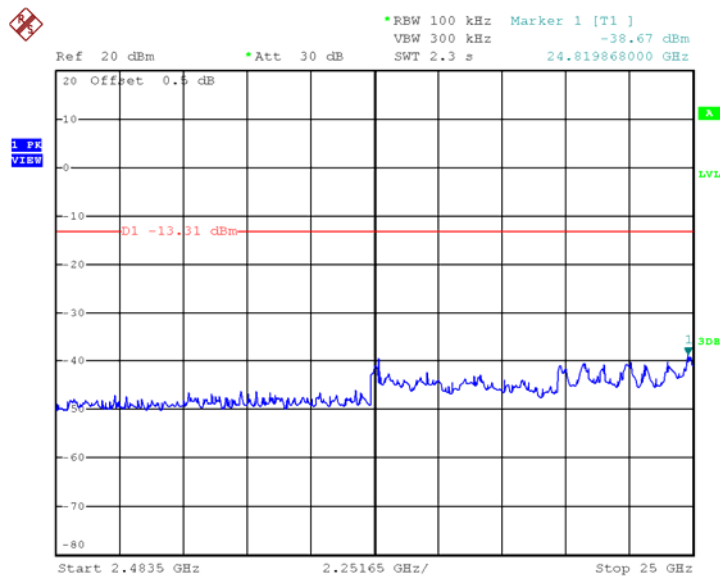
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11b, Highest Channel, Plot A



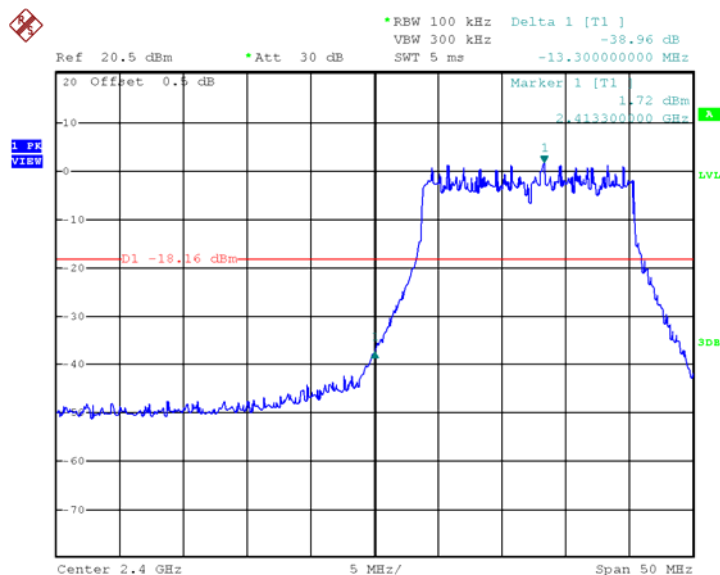
802.11b, Highest Channel, Plot B



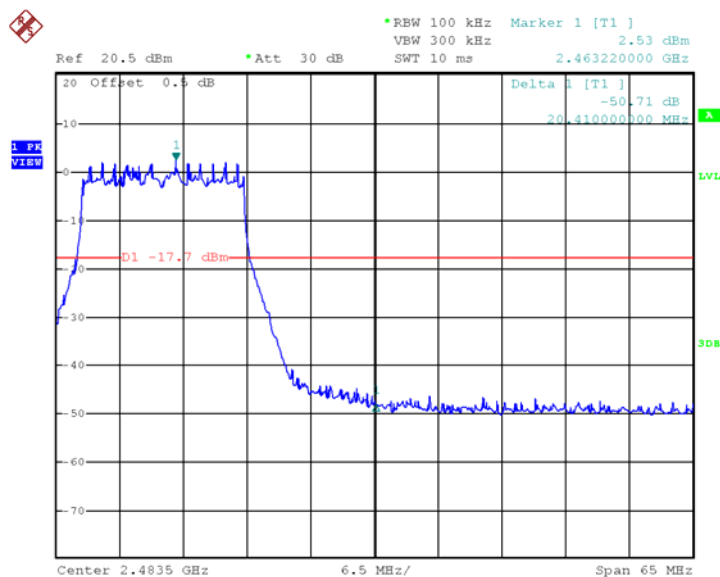
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11g, Lowest Channel



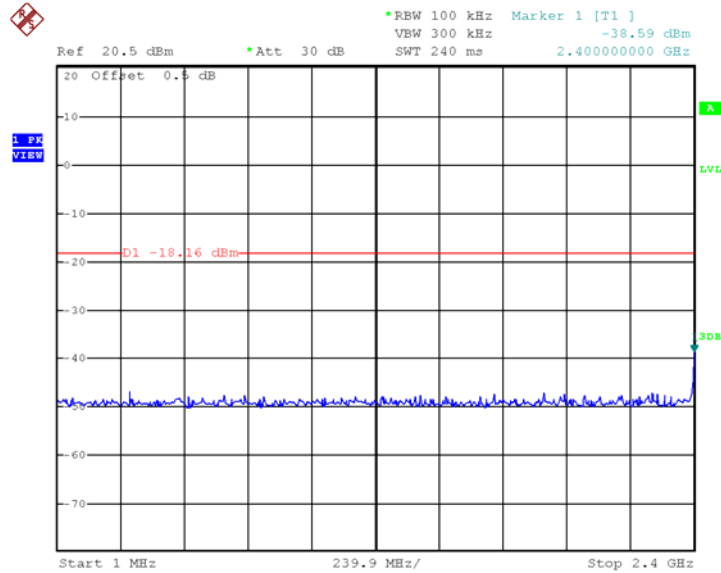
802.11g, Highest Channel



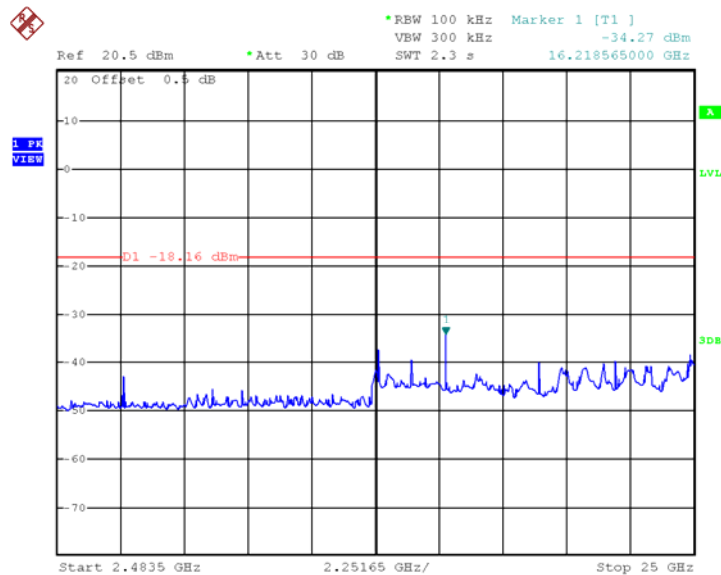
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11g, Lowest Channel, Plot A



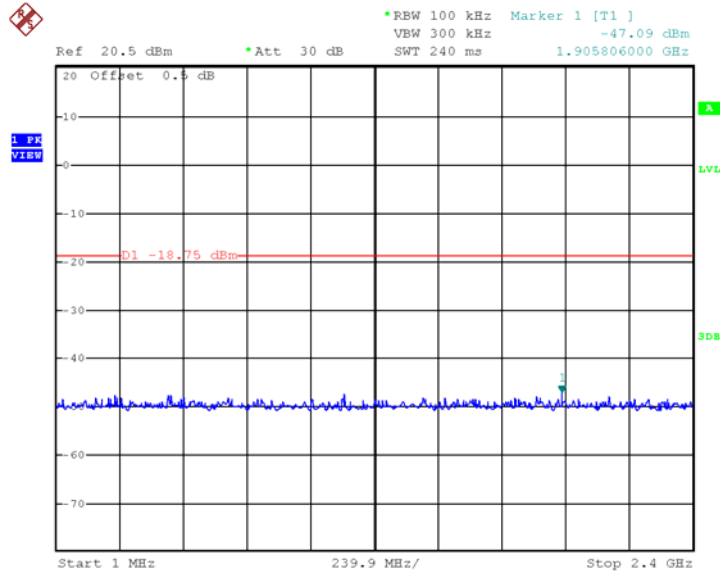
802.11g, Lowest Channel, Plot B



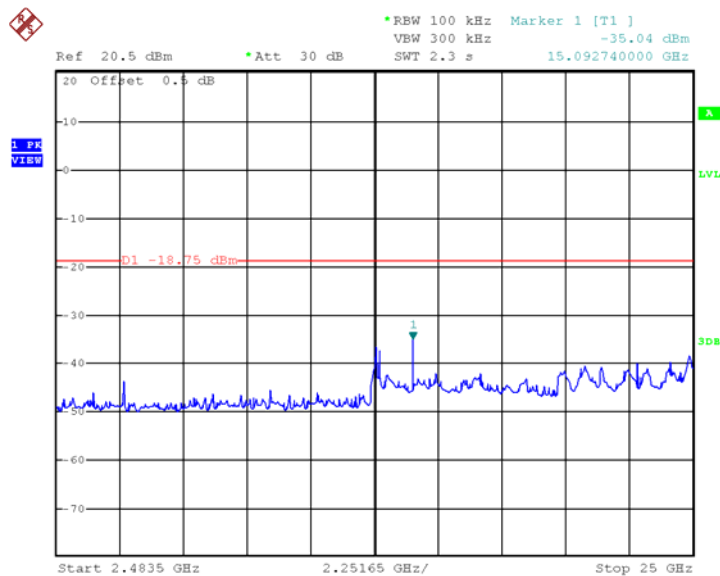
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11g, Middle Channel, Plot A



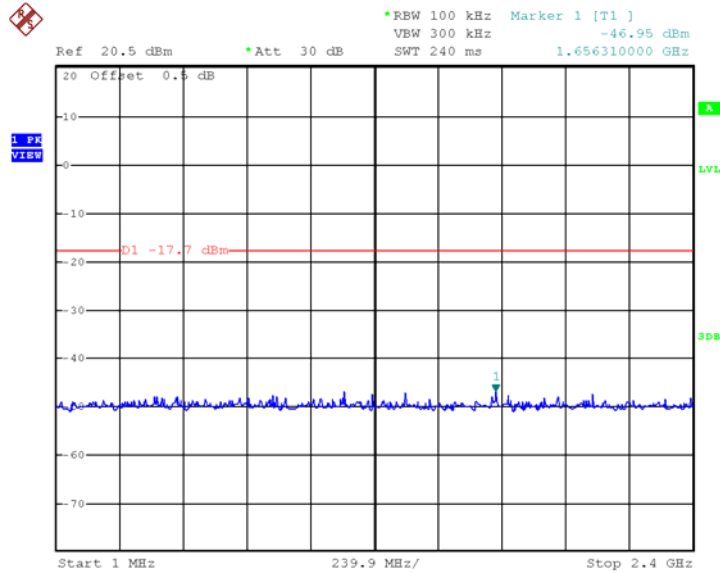
802.11g, Middle Channel, Plot B



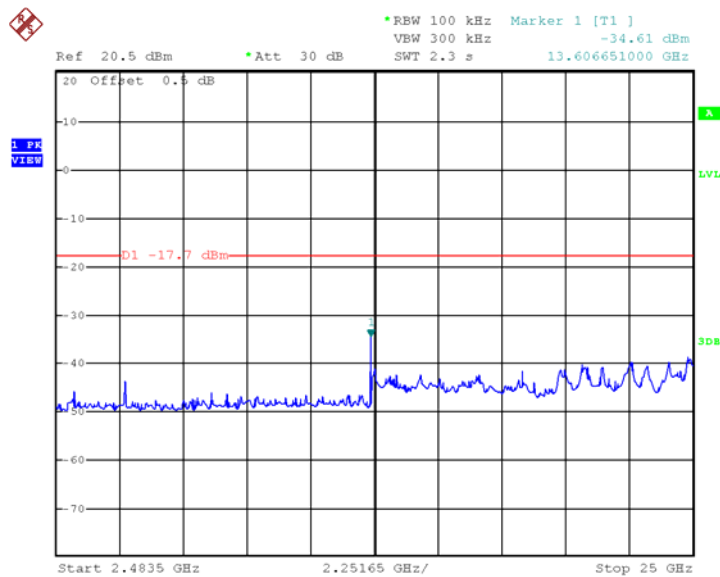
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11g, Highest Channel, Plot A



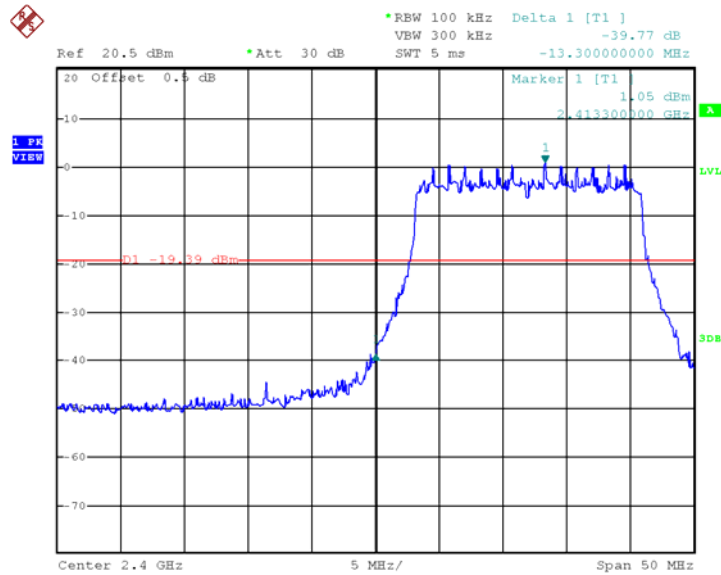
802.11g, Highest Channel, Plot B



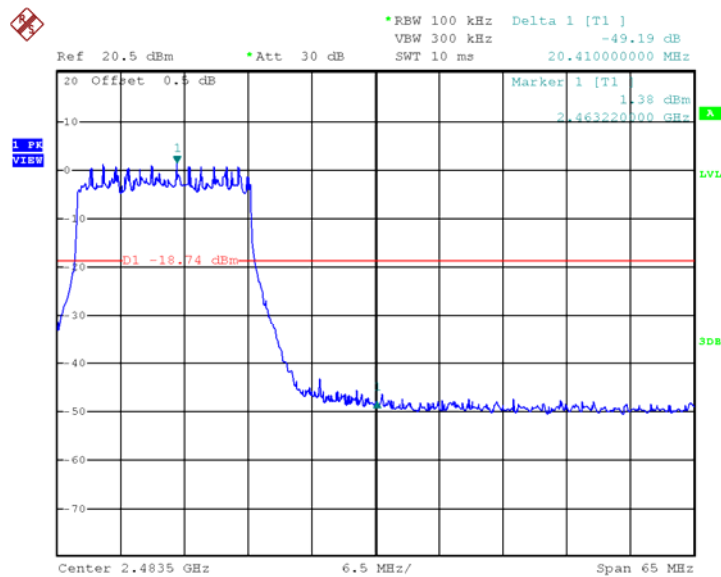
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11n (20MHz), Lowest Channel



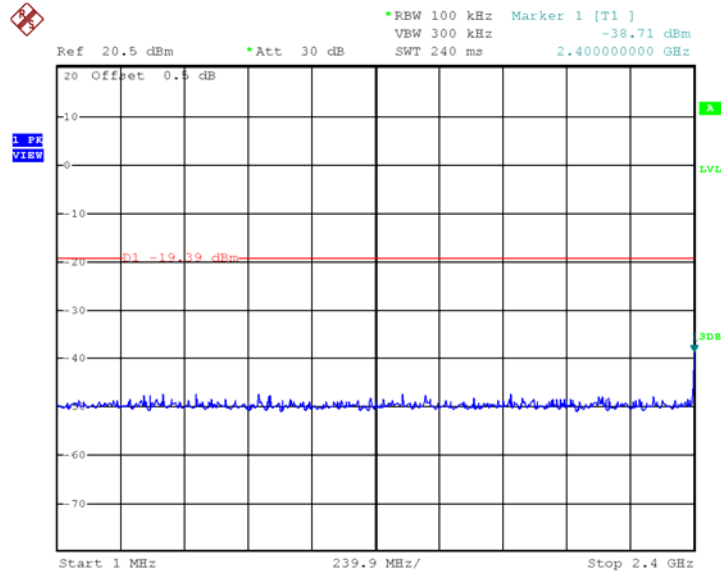
802.11n (20MHz), Highest Channel



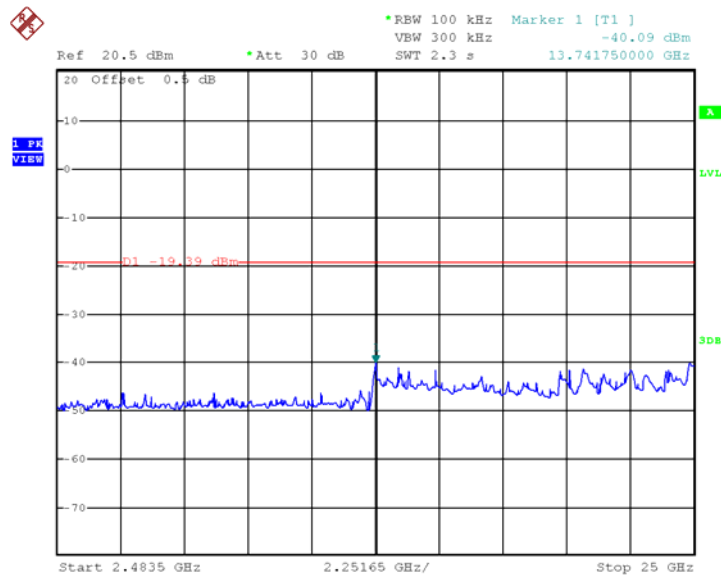
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

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



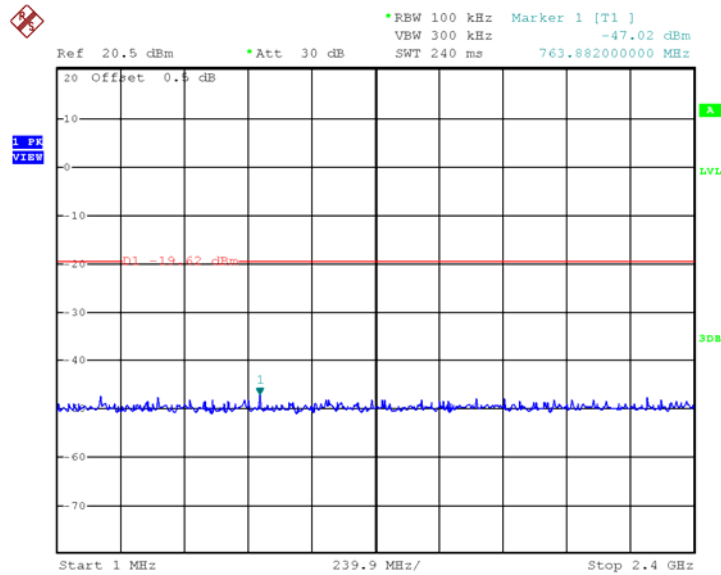
802.11n (20MHz), Lowest Channel, Plot B



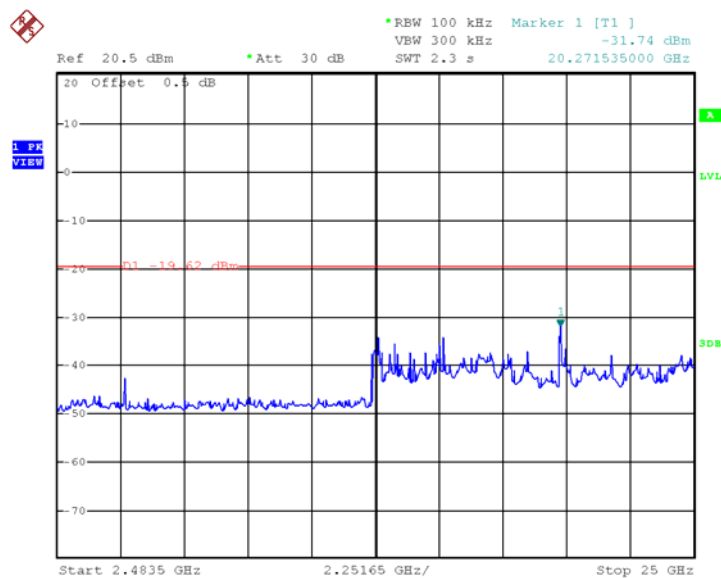
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

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



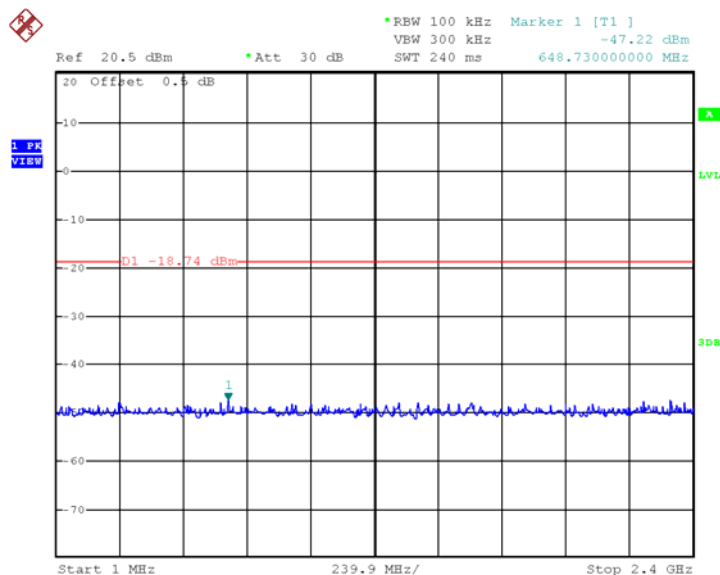
802.11n (20MHz), Middle Channel, Plot B



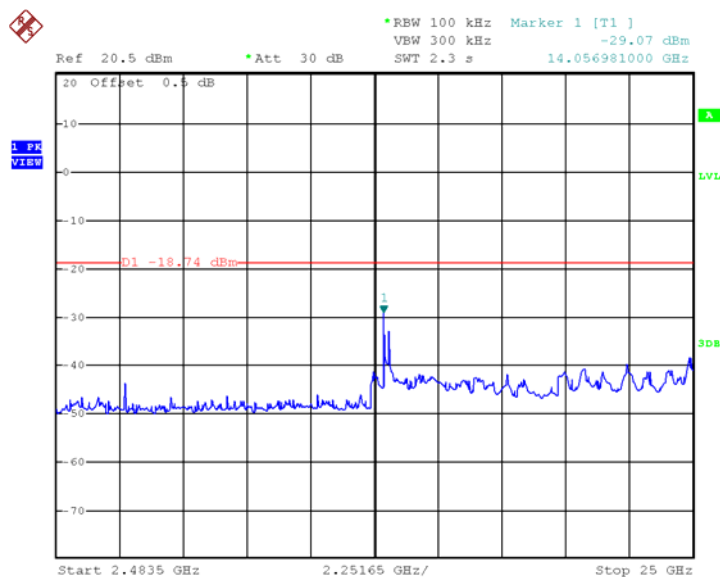
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

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



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



TEST REPORT

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 dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

PD = Pulse Desensitization in dB

AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may 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 dB μ V 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 dB μ V/m. This value in dB μ V/m is converted to its corresponding level in μ V/m.

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

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

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

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

$$PD = 0.0 \text{ dB}$$

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

$$FS = 62.0 + 7.4 + 1.6 - 29.0 + 0.0 + (-10.0) = 32.0 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32.0 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

TEST REPORT

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

4924.000 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 1-7 list the significant emission frequencies, the limit and the margin of compliance.

Judgement -

Passed by 0.9 dB margin

TEST REPORT

RADIATED EMISSION DATA

Mode: TX-Channel 01

Table 1
IEEE 802.11b (DSSS, 11 Mbps)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|-----------------|-------------------------|--------------------|-------------------|---------------------|---------------------------|------------------------------|---------------------|
| <i>H</i> | <i>4824.000</i> | <i>50.3</i> | <i>33</i> | <i>34.9</i> | <i>52.2</i> | <i>54.0</i> | <i>-1.8</i> |
| <i>V</i> | <i>12060.000</i> | <i>33.2</i> | <i>33</i> | <i>40.5</i> | <i>40.7</i> | <i>54.0</i> | <i>-13.3</i> |
| <i>V</i> | <i>14472.000</i> | <i>34.5</i> | <i>33</i> | <i>40.0</i> | <i>41.5</i> | <i>54.0</i> | <i>-12.5</i> |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|-----------------|-------------------------|--------------------|-------------------|---------------------|---------------------------|---------------------------|---------------------|
| <i>H</i> | <i>4824.000</i> | <i>61.7</i> | <i>33</i> | <i>34.9</i> | <i>63.6</i> | <i>74.0</i> | <i>-10.4</i> |
| <i>V</i> | <i>12060.000</i> | <i>43.8</i> | <i>33</i> | <i>40.5</i> | <i>51.3</i> | <i>74.0</i> | <i>-22.7</i> |
| <i>V</i> | <i>14472.000</i> | <i>45.3</i> | <i>33</i> | <i>40.0</i> | <i>52.3</i> | <i>74.0</i> | <i>-21.7</i> |

- NOTES:
1. Peak detector is used for the emission measurement.
 2. Average detector is used for the average data of emission measurement
 3. 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.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: TX-Channel 06

Table 2
IEEE 802.11b (DSSS, 11 Mbps)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|------------------------------|--------------|
| H | 4874.000 | 50.6 | 33 | 34.9 | 52.5 | 54.0 | -1.5 |
| V | 7311.000 | 41.9 | 33 | 37.9 | 46.8 | 54.0 | -7.2 |
| V | 12185.000 | 33.3 | 33 | 40.5 | 40.8 | 54.0 | -13.2 |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|---------------------------|--------------|
| H | 4874.000 | 62.2 | 33 | 34.9 | 64.1 | 74.0 | -9.9 |
| V | 7311.000 | 53.9 | 33 | 37.9 | 58.8 | 74.0 | -15.2 |
| 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. Average detector is used for the average data of emission measurement
 3. 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.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: TX-Channel 11

Table 3
IEEE 802.11b (DSSS, 11 Mbps)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|--------------------|------------------------------|--------------|
| V | 2483.500 | 51.3 | 33 | 29.4 | 47.7 | 54.0 | -6.3 |
| H | 4924.000 | 51.2 | 33 | 34.9 | 53.1 | 54.0 | -0.9 |
| V | 7386.000 | 42.5 | 33 | 37.9 | 47.4 | 54.0 | -6.6 |
| V | 12310.000 | 33.3 | 33 | 40.5 | 40.8 | 54.0 | -13.2 |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|---------------------------|--------------|
| V | 2483.500 | 63.8 | 33 | 29.4 | 60.2 | 74.0 | -13.8 |
| H | 4924.000 | 63.3 | 33 | 34.9 | 65.2 | 74.0 | -8.8 |
| V | 7386.000 | 54.8 | 33 | 37.9 | 59.7 | 74.0 | -14.3 |
| V | 12310.000 | 44.0 | 33 | 40.5 | 51.5 | 74.0 | -22.5 |

- NOTES:
1. Peak detector is used for the emission measurement.
 2. Average detector is used for the average data of emission measurement
 3. 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.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: TX-Channel 01

Table 4
IEEE 802.11g (OFDM, 54 Mbps)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|------------------------------|--------------|
| H | 4824.000 | 40.9 | 33 | 34.9 | 42.8 | 54.0 | -11.2 |
| V | 12060.000 | 33.0 | 33 | 40.5 | 40.5 | 54.0 | -13.5 |
| V | 14472.000 | 34.3 | 33 | 40.0 | 41.3 | 54.0 | -12.7 |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|---------------------------|--------------|
| H | 4824.000 | 56.4 | 33 | 34.9 | 58.3 | 74.0 | -15.7 |
| V | 12060.000 | 43.6 | 33 | 40.5 | 51.1 | 74.0 | -22.9 |
| V | 14472.000 | 45.0 | 33 | 40.0 | 52.0 | 74.0 | -22.0 |

- NOTES:
1. Peak detector is used for the emission measurement.
 2. Average detector is used for the average data of emission measurement
 3. 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.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: TX-Channel 06

Table 5
IEEE 802.11g (OFDM, 54 Mbps)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|------------------------------|--------------|
| H | 4874.000 | 41.4 | 33 | 34.9 | 43.3 | 54.0 | -10.7 |
| V | 7311.000 | 34.8 | 33 | 37.9 | 39.7 | 54.0 | -14.3 |
| V | 12185.000 | 33.1 | 33 | 40.5 | 40.6 | 54.0 | -13.4 |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|---------------------------|--------------|
| H | 4874.000 | 57.0 | 33 | 34.9 | 58.9 | 74.0 | -15.1 |
| V | 7311.000 | 46.3 | 33 | 37.9 | 51.2 | 74.0 | -22.8 |
| V | 12185.000 | 43.8 | 33 | 40.5 | 51.3 | 74.0 | -22.7 |

- NOTES:
1. Peak detector is used for the emission measurement.
 2. Average detector is used for the average data of emission measurement
 3. 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.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: TX-Channel 11

Table 6
IEEE 802.11g (OFDM, 54 Mbps)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|------------------------------|--------------|
| V | 2483.500 | 52.7 | 33 | 29.4 | 49.1 | 54.0 | -4.9 |
| H | 4924.000 | 41.9 | 33 | 34.9 | 43.8 | 54.0 | -10.2 |
| V | 7386.000 | 35.5 | 33 | 37.9 | 40.4 | 54.0 | -13.6 |
| V | 12310.000 | 33.0 | 33 | 40.5 | 40.5 | 54.0 | -13.5 |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|---------------------------|--------------|
| V | 2483.500 | 69.8 | 33 | 29.4 | 66.2 | 74.0 | -7.8 |
| H | 4924.000 | 58.9 | 33 | 34.9 | 60.8 | 74.0 | -13.2 |
| V | 7386.000 | 47.2 | 33 | 37.9 | 52.1 | 74.0 | -21.9 |
| V | 12310.000 | 43.7 | 33 | 40.5 | 51.2 | 74.0 | -22.8 |

- NOTES:
1. Peak detector is used for the emission measurement.
 2. Average detector is used for the average data of emission measurement
 3. 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.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: TX-Channel 01

Table 7
IEEE 802.11n (20MHz) (OFDM, MCS7 Mbps)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|-----------------|-------------------------|--------------------|-------------------|---------------------|---------------------------|------------------------------|---------------------|
| <i>H</i> | <i>4824.000</i> | <i>40.6</i> | <i>33</i> | <i>34.9</i> | <i>42.5</i> | <i>54.0</i> | <i>-11.5</i> |
| <i>V</i> | <i>12060.000</i> | <i>33.4</i> | <i>33</i> | <i>40.5</i> | <i>40.9</i> | <i>54.0</i> | <i>-13.1</i> |
| <i>V</i> | <i>14472.000</i> | <i>34.5</i> | <i>33</i> | <i>40.0</i> | <i>41.5</i> | <i>54.0</i> | <i>-12.5</i> |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|-----------------|-------------------------|--------------------|-------------------|---------------------|---------------------------|---------------------------|---------------------|
| <i>H</i> | <i>4824.000</i> | <i>56.2</i> | <i>33</i> | <i>34.9</i> | <i>58.1</i> | <i>74.0</i> | <i>-15.9</i> |
| <i>V</i> | <i>12060.000</i> | <i>44.2</i> | <i>33</i> | <i>40.5</i> | <i>51.7</i> | <i>74.0</i> | <i>-22.3</i> |
| <i>V</i> | <i>14472.000</i> | <i>45.2</i> | <i>33</i> | <i>40.0</i> | <i>52.2</i> | <i>74.0</i> | <i>-21.8</i> |

- NOTES:
1. Peak detector is used for the emission measurement.
 2. Average detector is used for the average data of emission measurement
 3. 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.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: TX-Channel 06

Table 8
IEEE 802.11n (20MHz) (OFDM, MCS7 Mbps)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|------------------------------|--------------|
| H | 4874.000 | 41.2 | 33 | 34.9 | 43.1 | 54.0 | -10.9 |
| V | 7311.000 | 34.6 | 33 | 37.9 | 39.5 | 54.0 | -14.5 |
| V | 12185.000 | 33.1 | 33 | 40.5 | 40.6 | 54.0 | -13.4 |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|---------------------------|--------------|
| H | 4874.000 | 56.8 | 33 | 34.9 | 58.7 | 74.0 | -15.3 |
| V | 7311.000 | 46.4 | 33 | 37.9 | 51.3 | 74.0 | -22.7 |
| 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. Average detector is used for the average data of emission measurement
 3. 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.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: TX-Channel 11

Table 9
IEEE 802.11n (20MHz) (OFDM, MCS7 Mbps)

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|------------------------------|--------------|
| V | 2483.500 | 52.2 | 33 | 29.4 | 48.6 | 54.0 | -5.4 |
| H | 4924.000 | 41.7 | 33 | 34.9 | 43.6 | 54.0 | -10.4 |
| V | 7386.000 | 35.2 | 33 | 37.9 | 40.1 | 54.0 | -13.9 |
| V | 12310.000 | 33.1 | 33 | 40.5 | 40.6 | 54.0 | -13.4 |

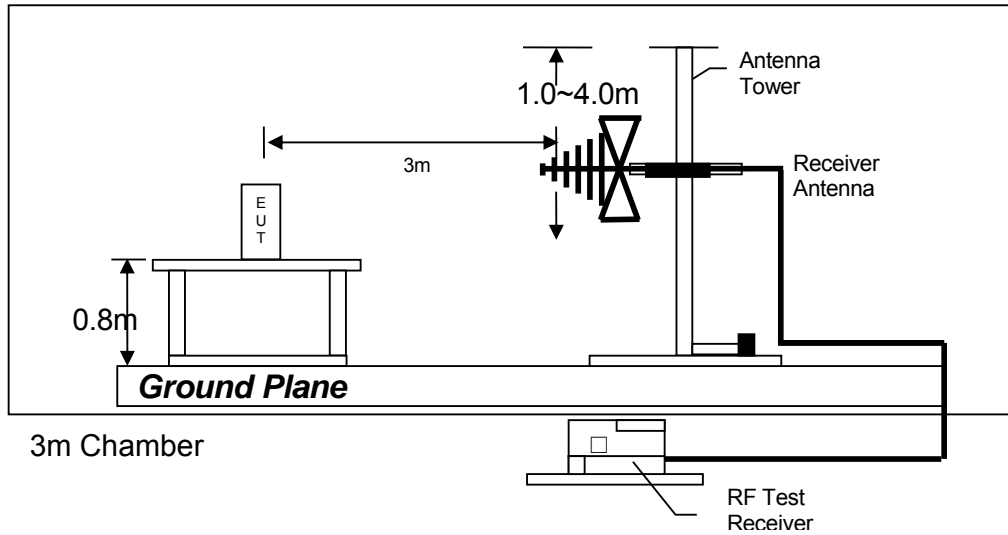
| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|------------------|----------------|-------------------|---------------------|---------------------------|---------------------------|--------------|
| V | 2483.500 | 68.4 | 33 | 29.4 | 64.8 | 74.0 | -9.2 |
| H | 4924.000 | 58.9 | 33 | 34.9 | 60.8 | 74.0 | -13.2 |
| V | 7386.000 | 46.9 | 33 | 37.9 | 51.8 | 74.0 | -22.2 |
| V | 12310.000 | 44.0 | 33 | 40.5 | 51.5 | 74.0 | -22.5 |

- NOTES:
1. Peak detector is used for the emission measurement.
 2. Average detector is used for the average data of emission measurement
 3. 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.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

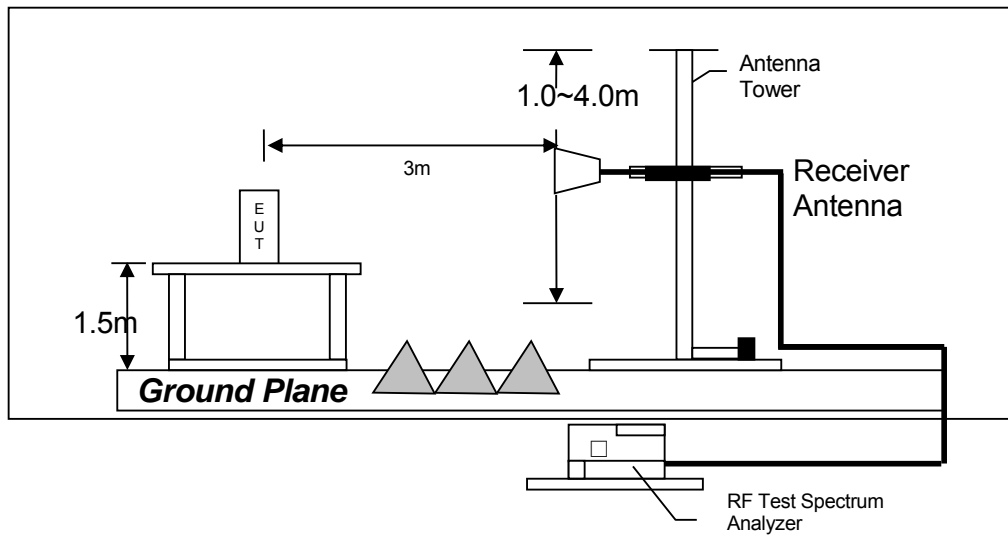
TEST REPORT

4.6.3 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

TEST REPORT

4.6.4 Transmitter Duty Cycle Calculation

Not applicable – No average factor is required.

TEST REPORT

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.

TEST REPORT

EXHIBIT 5 EQUIPMENT LIST

5.0 EQUIPMENT LIST

1) Radiated Emissions Test

| EQUIPMENT | EMI TEST RECEIVER | SPECTRUM ANALYZER | LOG PERIODIC ANTENNA |
|----------------------|-------------------|-------------------|----------------------|
| Registration No. | EW-3156 | EW-2253 | EW-0447 |
| Manufacturer | R&S | R&S | EMCO |
| Model No. | ESR26 | FSP40 | 3146 |
| Calibration Date | Dec. 06, 2016 | Jun. 15, 2016 | May 18, 2016 |
| Calibration Due Date | Dec. 06, 2017 | Jun. 15, 2017 | Nov. 18, 2017 |

| EQUIPMENT | BICONICAL ANTENNA | DOUBLE RIDGED GUIDE ANTENNA | Notch Filter (cutoff frequency 2.4GHz to 2.5GHz) 2 pieces |
|----------------------|-------------------|-----------------------------|---|
| Registration No. | EW-0571 | EW-0194 | EW-2213 |
| Manufacturer | EMCO | EMCO | MICROTRONICS |
| Model No. | 3104C | 3115 | BRM50701-02 |
| Calibration Date | May 18, 2016 | Aug. 10, 2016 | May 26, 2017 |
| Calibration Due Date | Nov. 18, 2017 | Feb. 10, 2018 | May 26, 2018 |

| EQUIPMENT | BROAD-BAND HORN ANTENNA WITH FREQUENCY RANGE 14G - 40GHZ | Solid State Low Noise Preamplifier Assembly (1 - 18)GHz | RF Pre-amplifier 3 pcs (9kHz to 40GHz) |
|----------------------|--|---|--|
| Registration No. | EW-1679 | EW-3229 | EW-3006c |
| Manufacturer | SCHWARZBECK | BONN ELEKTRO | SCHWARZBECK |
| Model No. | BBHA9170 | BLMA 0118-5G | BBV 9718 |
| Calibration Date | Jun. 28, 2016 | Oct. 24, 2016 | 23-Mar-2017 |
| Calibration Due Date | Jun. 28, 2017 | Oct. 24, 2017 | 23-Mar-2018 |

| EQUIPMENT | 12m Double Shield RF Cable | 12 metre RF Cable 40GHz |
|----------------------|----------------------------|----------------------------|
| Registration No. | EW-1852 | EW-2774 |
| Manufacturer | RADIAL | GREATBILLION |
| Model No. | N(m)-RG142 - N(m) | SMA m-m ra 12m 40G outdoor |
| Calibration Date | Nov. 21, 2016 | Nov. 24, 2016 |
| Calibration Due Date | Oct. 13, 2017 | Nov. 24, 2017 |

TEST REPORT

2) Conductive Measurement Test

| Equipment | Spectrum Analyzer | RF Power Meter with Power Sensor (N1921A) |
|----------------------|-------------------|--|
| Registration No. | EW-2466 | EW-2270 |
| Manufacturer | R&S | AGILENTTECH |
| Model No. | FSP30 | N1911A |
| Calibration Date | Oct. 03, 2016 | Jan. 04, 2017 |
| Calibration Due Date | Aug. 20, 2017 | Jan. 04, 2018 |