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TEST REPORT

Report Number: 20031489HKG-002

Application for Original Grant of 47 CFR Part 15 Certification

FCC ID: 2AV9NEMBODIEDMOXIEA

Prepared and Checked by:	Approved by:
Signed On File Chan Hin Man, Oscar Assistant Engineer	Digitally signed by Tim Lee Location: Intertek Testing Services Hong Kong Ltd. Lee Shui Tim, Tim Assistant Supervisor Date: July 13 ,2020

TEST REPORT

GENERAL INFORMATION

Applicant Name:	Embodied, Inc.
Applicant Address:	385 E Colorado Blvd Ste 110 Pasadena California 91101 United States
FCC Specification Standard:	FCC Part 15, October 1, 2018 Edition
FCC ID:	2AV9NEMBODIEDMOXIEA
FCC Model(s):	101300
Type of EUT:	Spread Spectrum Transmitter
Description of EUT:	Embodied Moxie
Serial Number:	N/A
Sample Receipt Date:	May 01, 2020
Date of Test:	May 01, 2020 to June 23, 2020
Report Date:	July 13, 2020
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as after modification complied with the 47 CFR Part 15 Certification.

TEST REPORT

TABLE OF CONTENTS

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 (Peak)	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, 2018 Edition

2.0 GENERAL DESCRIPTION

2.1 Product Description

This device is a robot with Wifi function. The Bluetooth function of this device had been disabled.

The tested model is 101300.

For 802.11b mode, it operates at frequency range of 2412MHz to 2462MHz 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 2412MHz to 2462MHz with 11 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation. Maximum bit rate can be up to 54Mbps. For 802.11n (HT20 with 20MHz bandwidth) mode, it operates at frequency range of 2412MHz to 2462MHz with 11 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation (mcs0 to mcs7). Maximum bit rate can support up to 65Mbps.

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

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

2.2 Test Methodology

Both AC power line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Preliminary radiated scans and all radiated measurements were performed in radiated emission test sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. Antenna port conducted measurements were performed according to ANSI C63.10 (2013) and KDB Publication No.558074 D01 v05r02 (04-February-2019). 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 SAR, China. This test facility and site measurement data have been fully placed on file with the FCC.

2.4 Related Submittal(s) Grants

This is a single application for certification of a transceiver (WiFi portion).

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 is power by a 10.8VDC Li-PO battery / 120VAC (Adaptor model: AD0651-1404000D).

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.

TEST REPORT

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.

All setting of data rate for 802.11b/g/n(HT20) of WiFi mode had been considered, and worst case test data are shown on this test report.

3.2 EUT Exercising Software

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

3.3 Details of EUT and Description of Accessories

Details of EUT:

(1) The EUT is powered by 10.8VDC and / or 120VAC

Description of Accessories:

An AC adaptor (provided with the unit) was used to power the device. Their description is listed below.

(1) An AC adaptor (AC Input: 100-240V 50/60Hz / Output: 14VDC 4000A, Model: AD0651-1404000D)
(Provided by Client)

3.4 Measurement Uncertainty

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

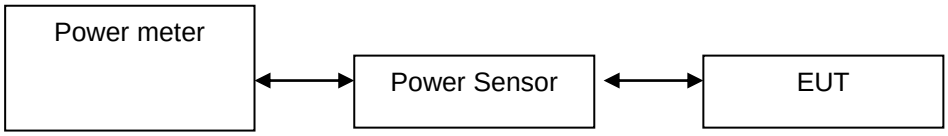
Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

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 the obtain power at the EUT antenna terminals. The measurement procedure 11.9.1.3 ANSI63.10 was used.

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

IEEE 802.11b (DSSS, 1 Mbps) Antenna Gain = 2.28 dBi

Frequency (MHz)		Output in dBm	Output in mWatt
Low Channel:	2412	16.4	43.7
Middle Channel:	2437	16.9	49.0
High Channel:	2462	17.1	51.3

IEEE 802.11g (OFDM, 6 Mbps) Antenna Gain = 2.28dBi

Frequency (MHz)		Output in dBm	Output in mWatt
Low Channel:	2412	19.0	79.4
Middle Channel:	2437	19.5	89.1
High Channel:	2462	19.9	97.7

IEEE 802.11n (20MHz) (OFDM, MCS0) Antenna Gain = 2.28dBi

Frequency (MHz)		Output in dBm	Output in mWatt
Low Channel:	2412	19.1	81.3
Middle Channel:	2437	19.8	95.5
High Channel:	2462	19.9	97.7

TEST REPORT

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

Cable loss : 0.5 dB External Attenuation : 2 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 = 17.1 dBm

IEEE 802.11g (OFDM, 9 Mbps)
max. conducted (peak) output level = 19.9 dBm

IEEE 802.11n (20MHz) (OFDM, MCS0)
max. conducted (peak) output level = 19.9 dBm

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

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

4.2 Minimum 6dB RF Bandwidth

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

IEEE 802.11b (DSSS, 1 Mbps)

	Frequency (MHz)	6dB Bandwidth (MHz)
Low Channel:	2412	8.16
Middle Channel:	2437	8.16
High Channel:	2462	8.16

IEEE 802.11g (OFDM, 6 Mbps)

	Frequency (MHz)	6dB Bandwidth (MHz)
Low Channel:	2412	15.48
Middle Channel:	2437	15.66
High Channel:	2462	15.6

IEEE 802.11n (20MHz) (OFDM, MCS0)

	Frequency (MHz)	6dB Bandwidth (MHz)
Low Channel:	2412	16.68
Middle Channel:	2437	16.2
High Channel:	2462	16.26

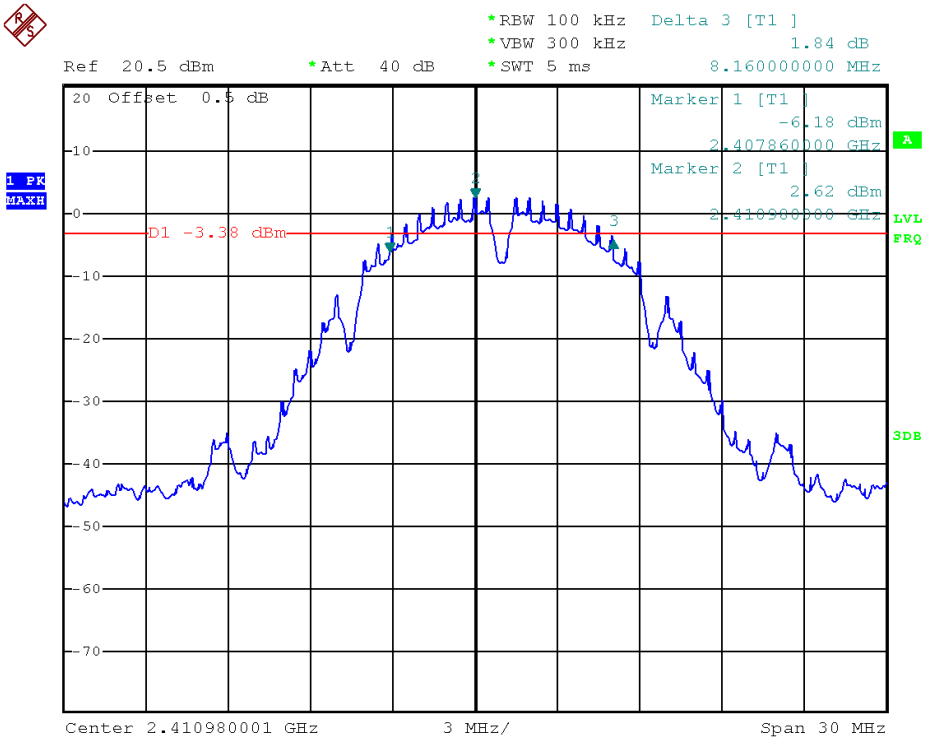
Limits
6 dB bandwidth shall be at least 500kHz

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

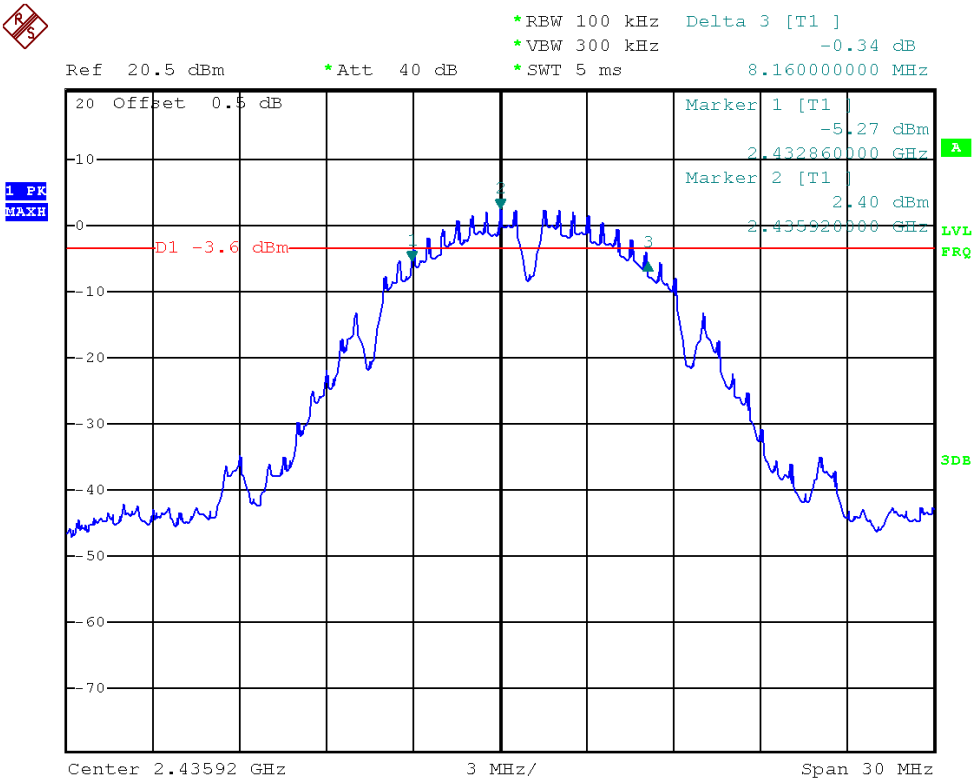
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

802.11b, Lowest Channel



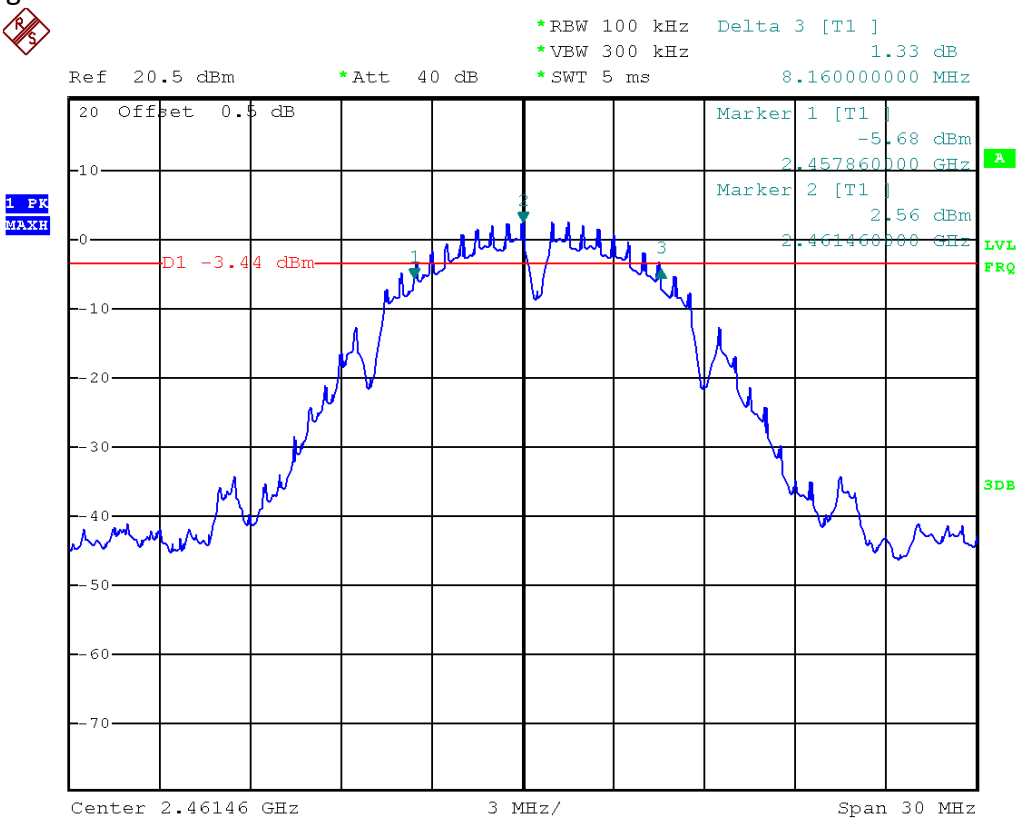
802.11b, Middle Channel



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

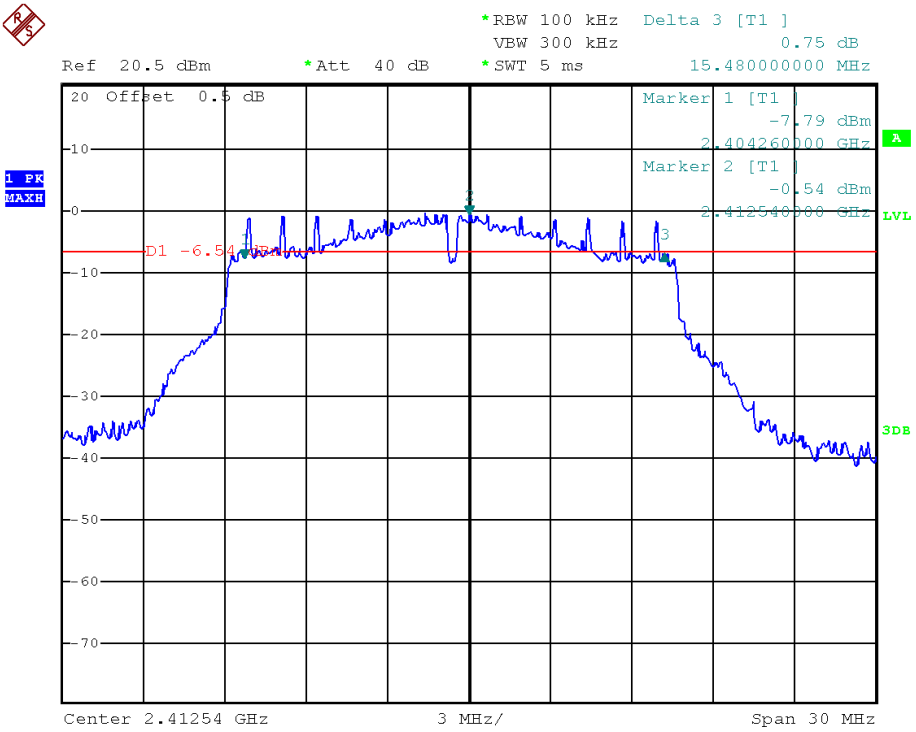
802.11b, Highest Channel



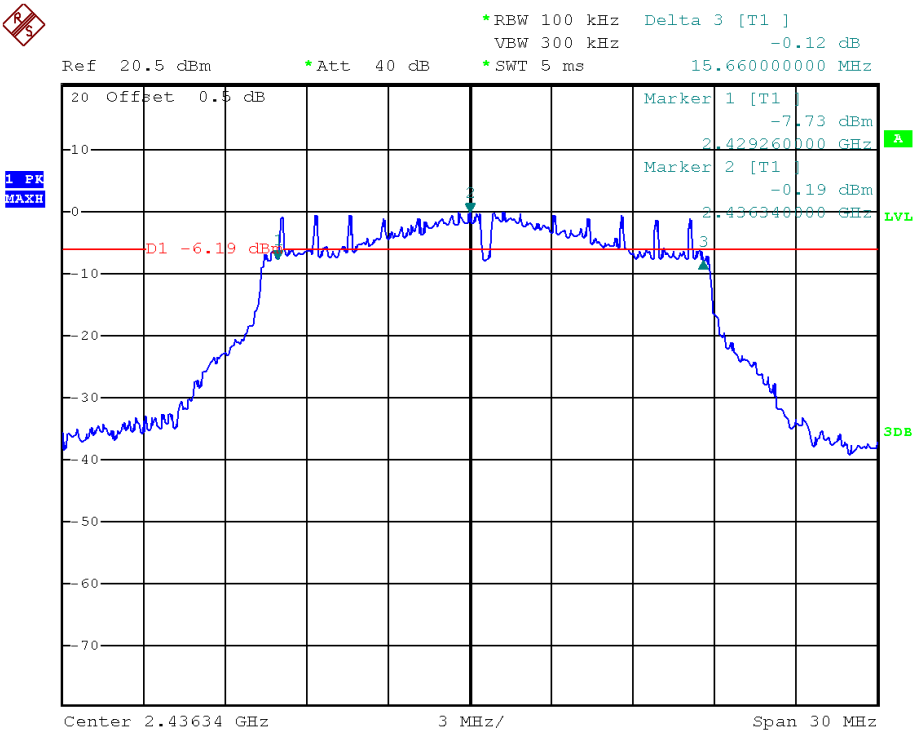
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

802.11g, Lowest Channel



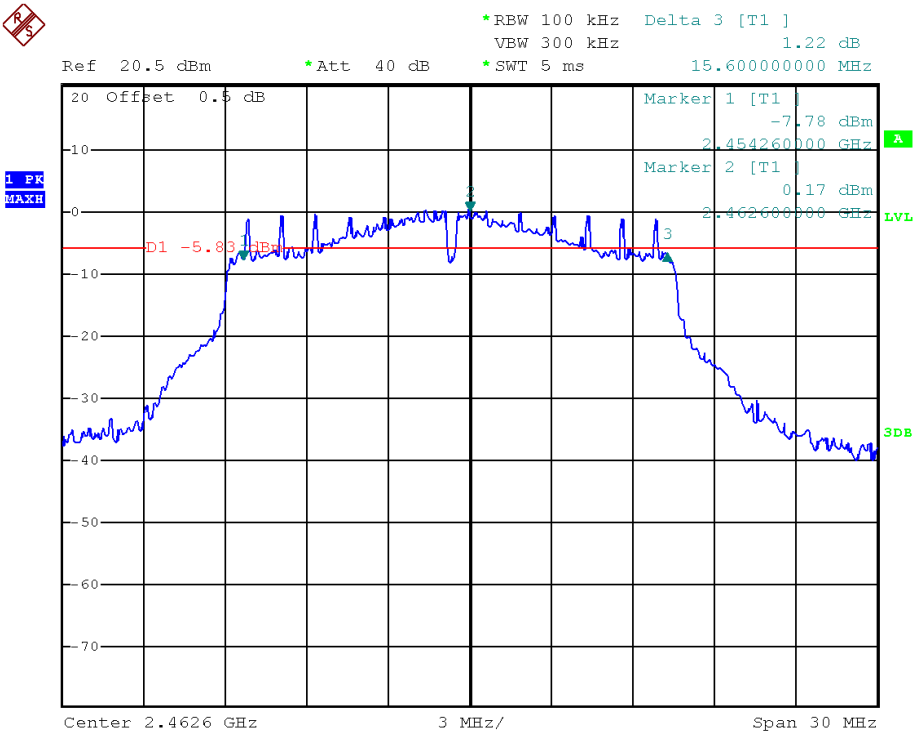
802.11g, Middle Channel



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

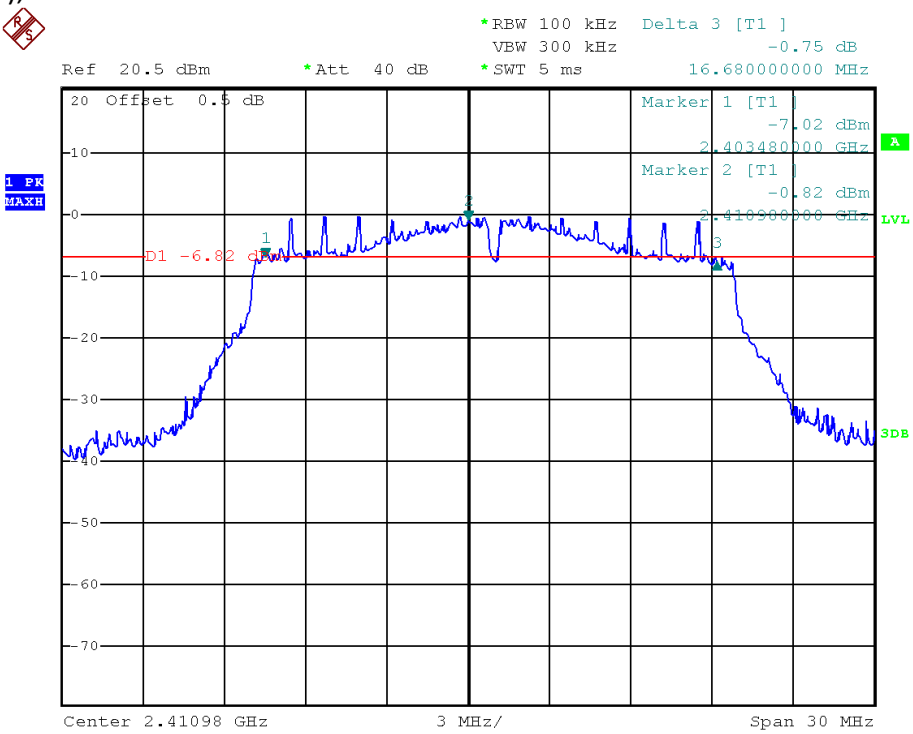
802.11g, Highest Channel



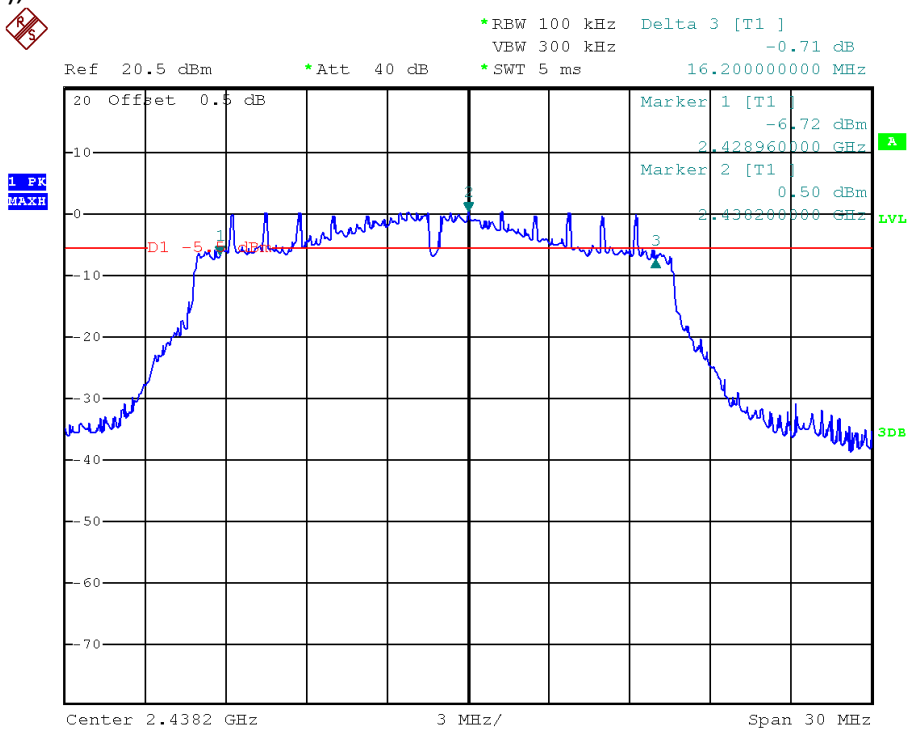
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

802.11n (20MHz), Lowest Channel



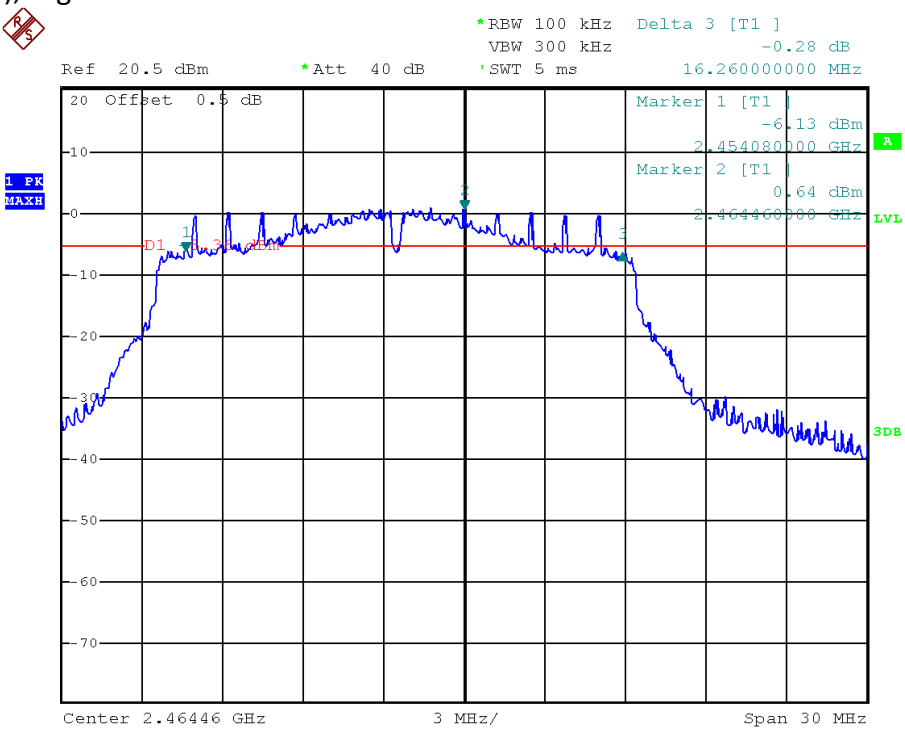
802.11n (20MHz), Middle Channel



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

802.11n (20MHz), Highest Channel



4.3 Maximum Power Spectral Density

Antenna output of the EUT was coupled directly to spectrum analyzer. The measurement procedure 11.10 of ANSI 63.10 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, 1 Mbps)

Frequency (MHz)		PSD in 100kHz (dBm)
Low Channel:	2412	2.22
Middle Channel:	2437	2.18
High Channel:	2462	2.62

IEEE 802.11g (OFDM, 6 Mbps)

Frequency (MHz)		PSD in 100kHz (dBm)
Low Channel:	2412	-0.52
Middle Channel:	2437	-0.07
High Channel:	2462	0.7

IEEE 802.11n (20MHz) (OFDM, MCS0)

Frequency (MHz)		PSD in 100kHz (dBm)
Low Channel:	2412	-0.33
Middle Channel:	2437	0.14
High Channel:	2462	0.77

Cable Loss: 0.5 dB

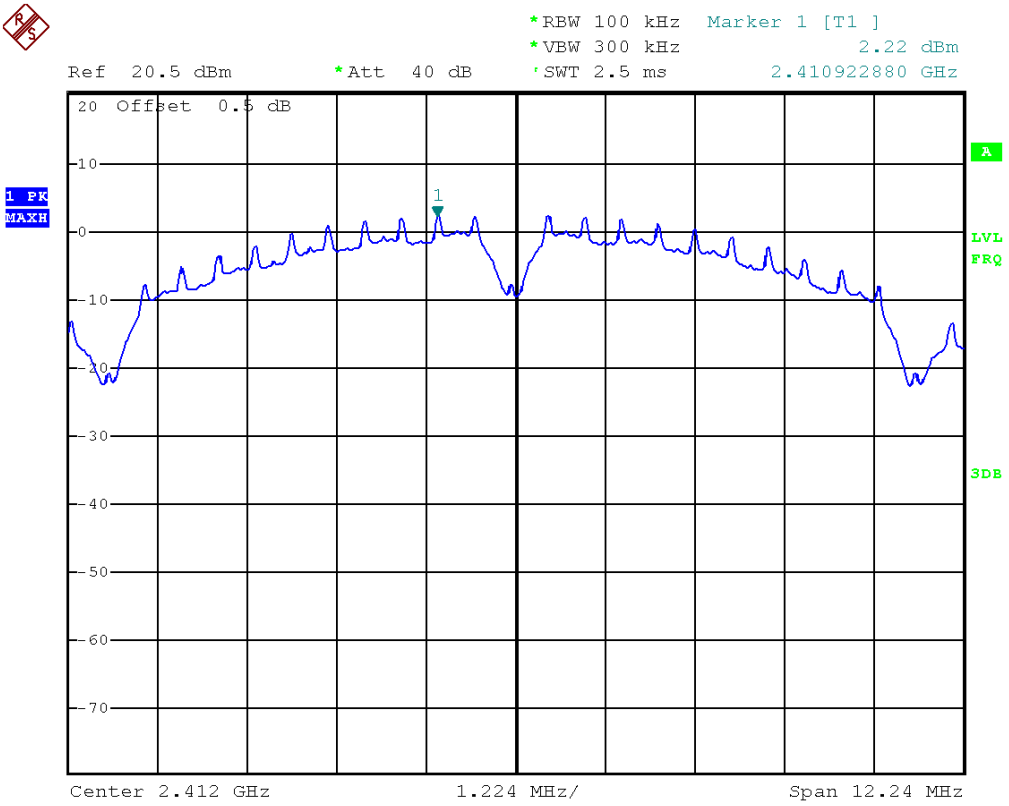
Limit:
8dBm

The plots of power spectral density are as below.

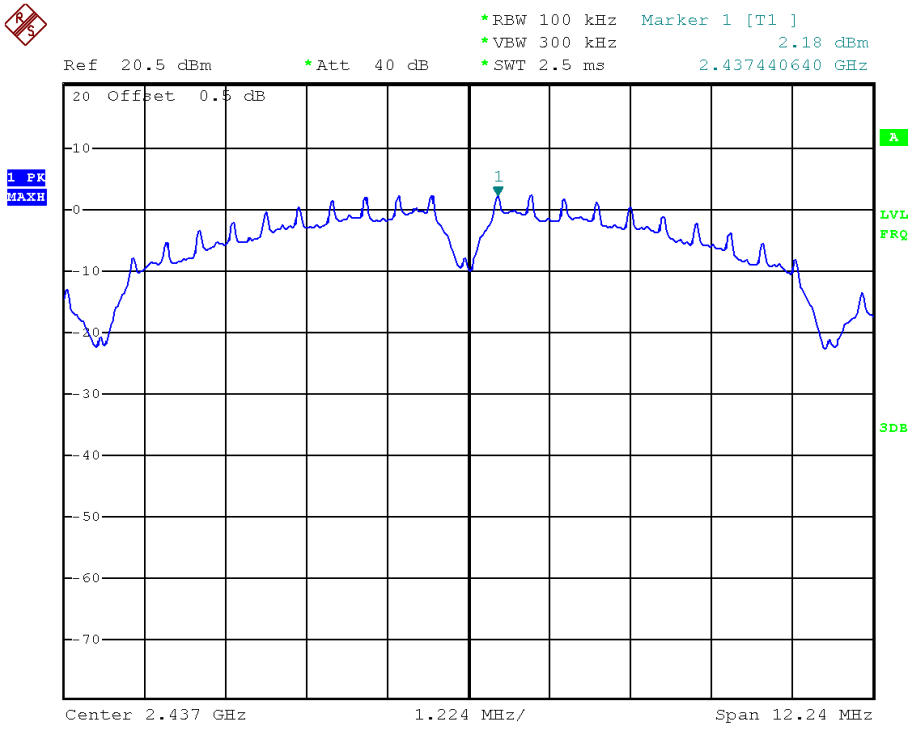
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY (100kHz RBW)

802.11b, Lowest channel



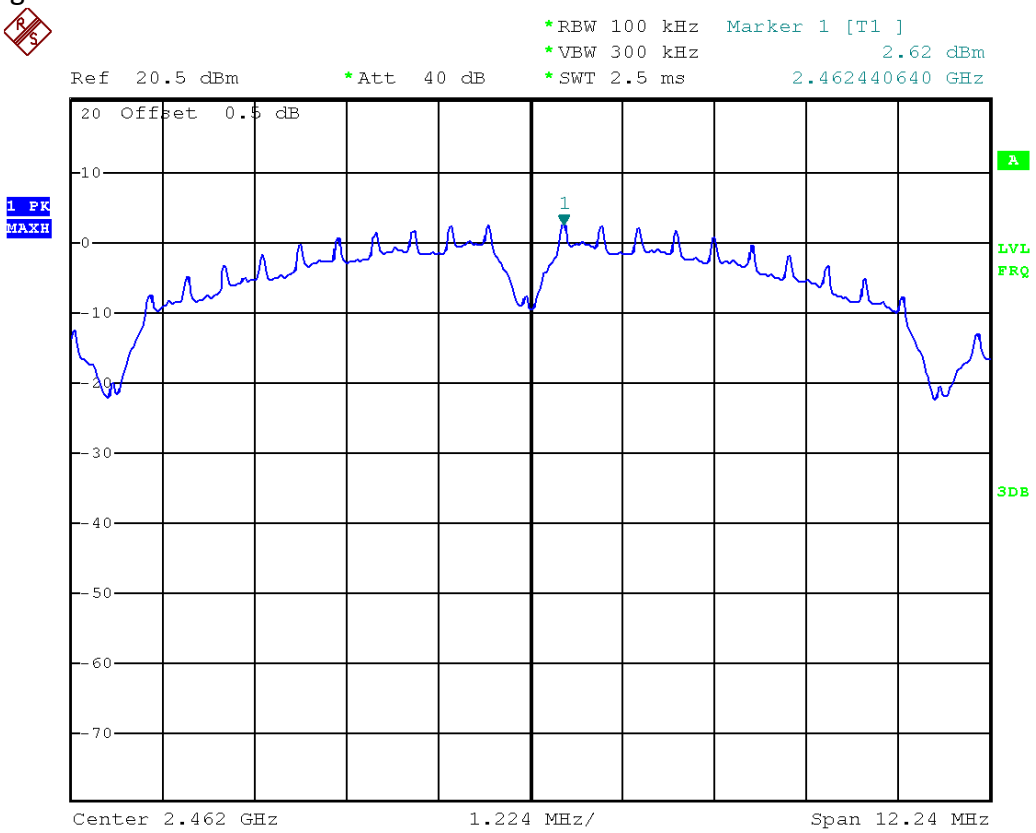
802.11b, Middle channel



TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY (100kHz RBW)

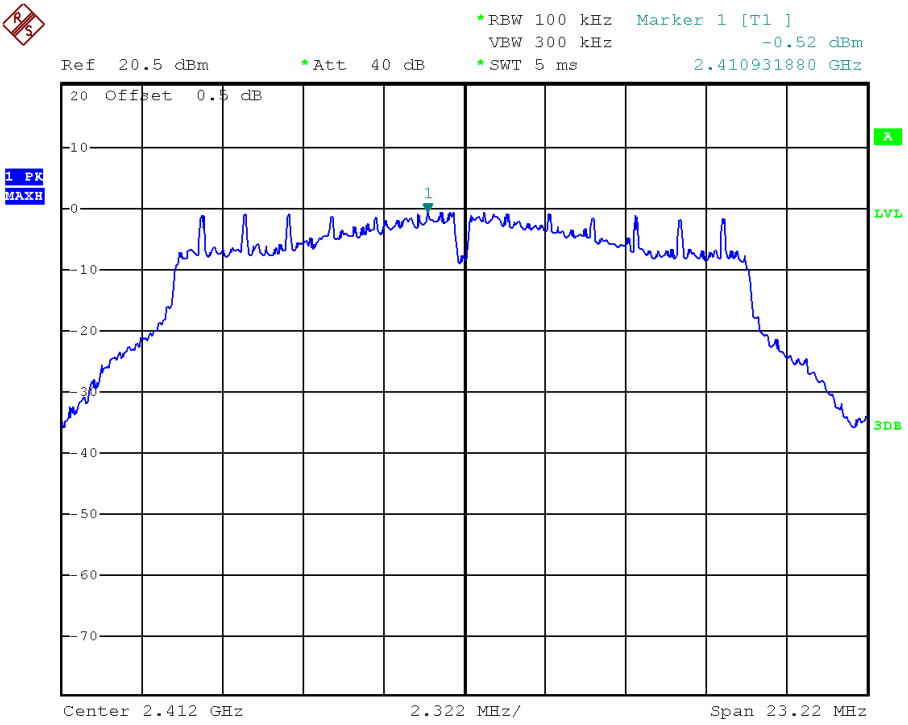
802.11b, Highest channel



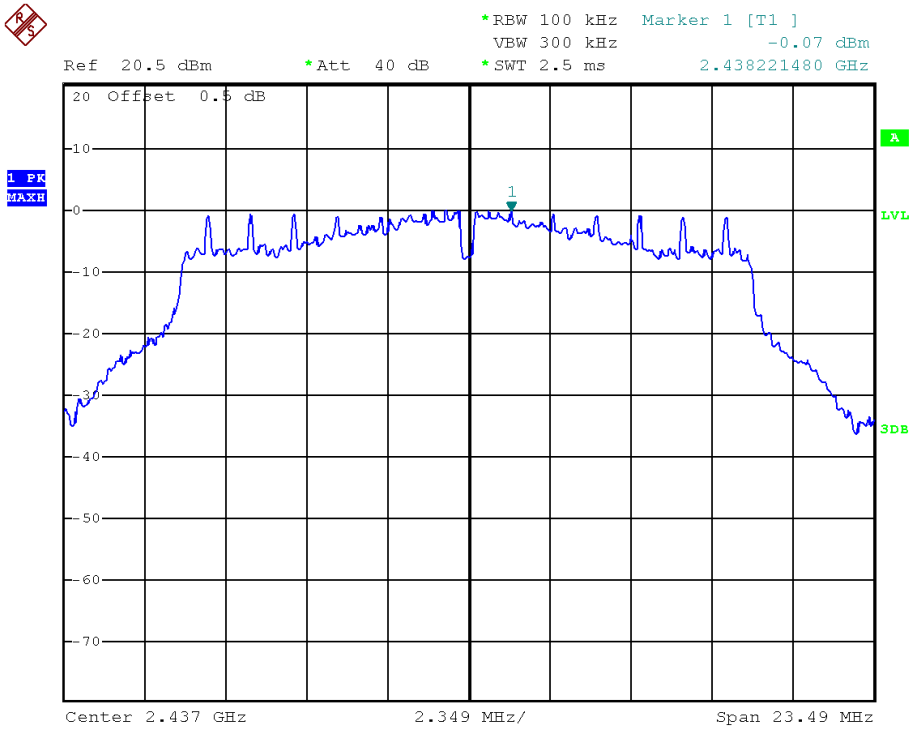
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

802.11g, Lowest channel



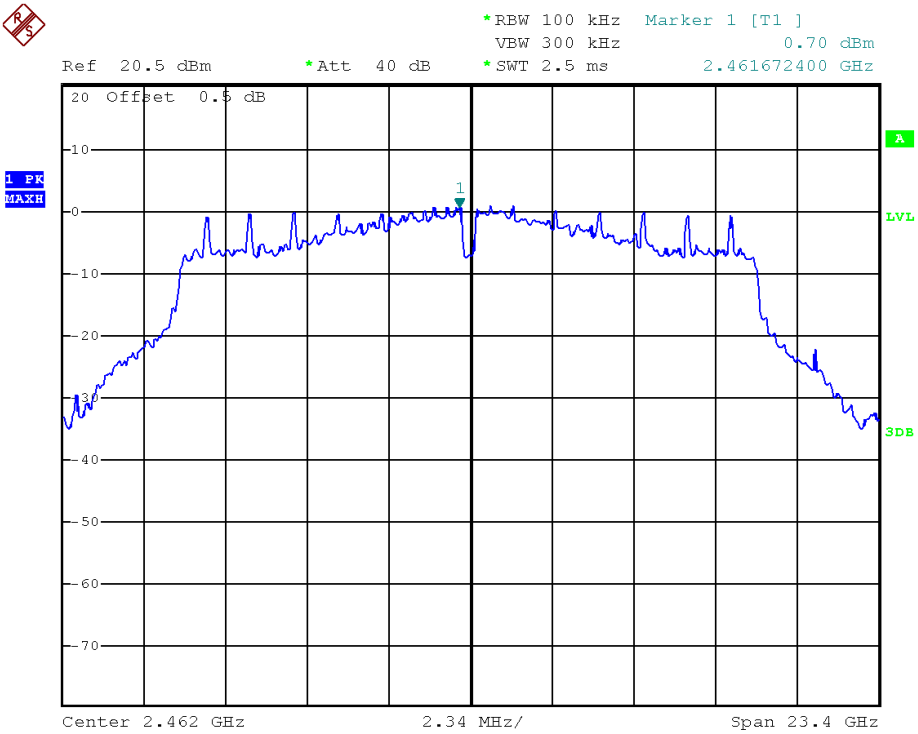
802.11g, Middle channel



TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

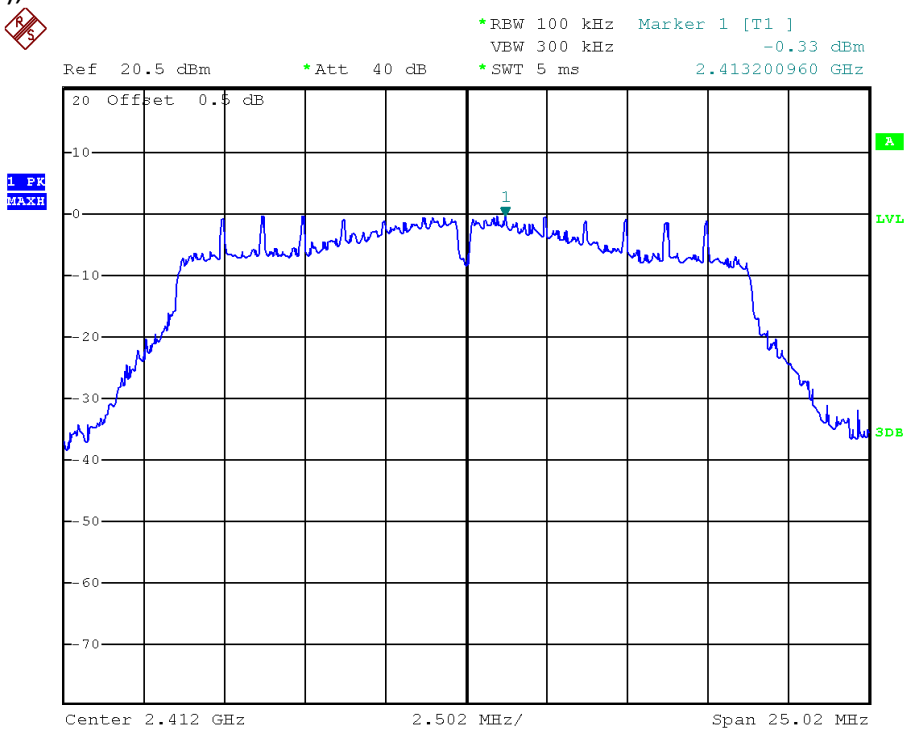
802.11g, Highest channel



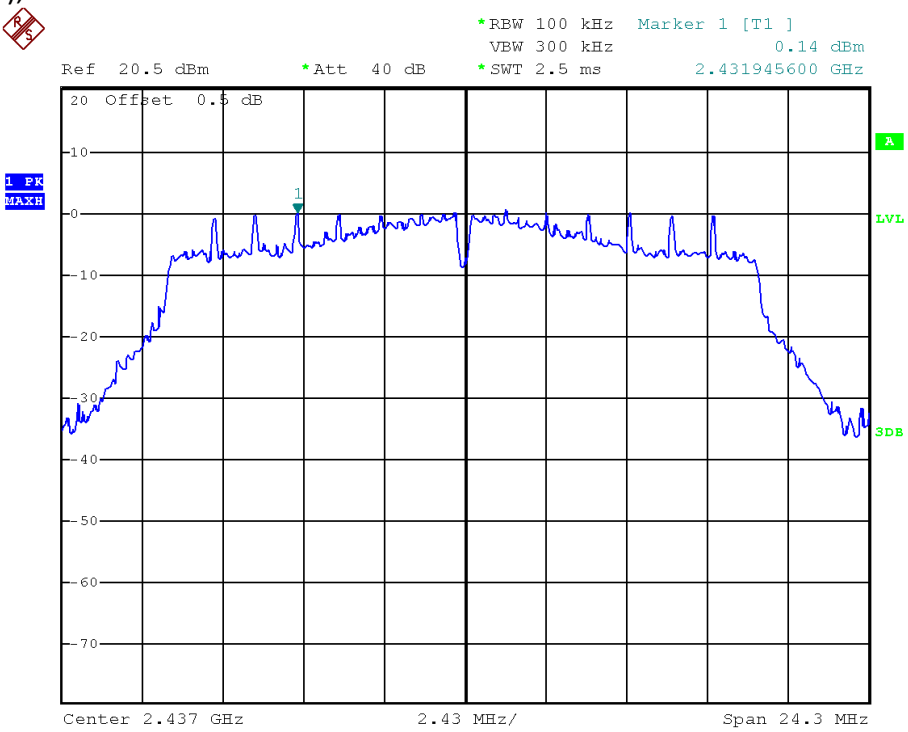
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

802.11n (20MHz), Lowest channel



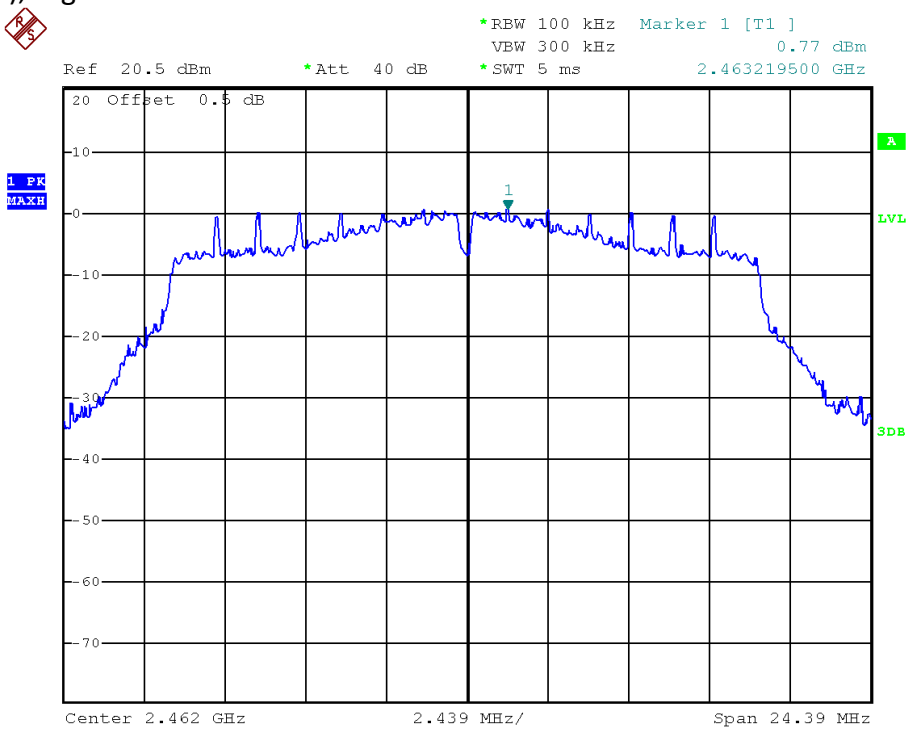
802.11n (20MHz), Middle channel



TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

802.11n (20MHz), Highest channel



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 KDB Publication No.558074 D01 v05r02 (02-April-2019) were used.

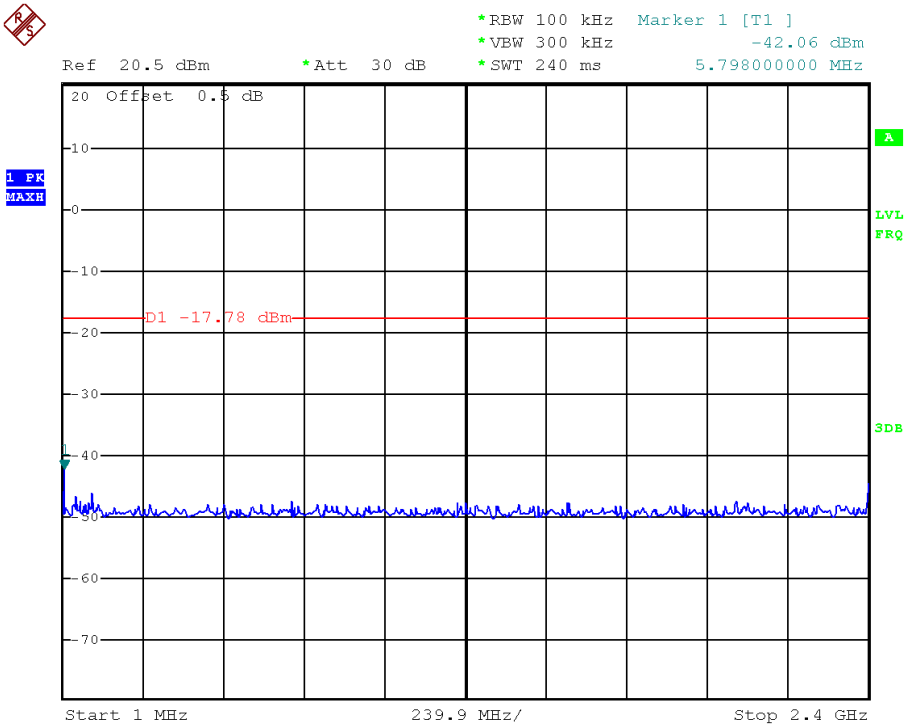
Furthermore, delta measurement technique for measuring bandedge emissions was incorporated in the test of the edge at 2483.5MHz.

Limits:
All spurious emission and up to the tenth harmonic were measured and they were found to be at least 20dB for 802.11b/g/n20 below the maximum measured in-band peak PSD level.

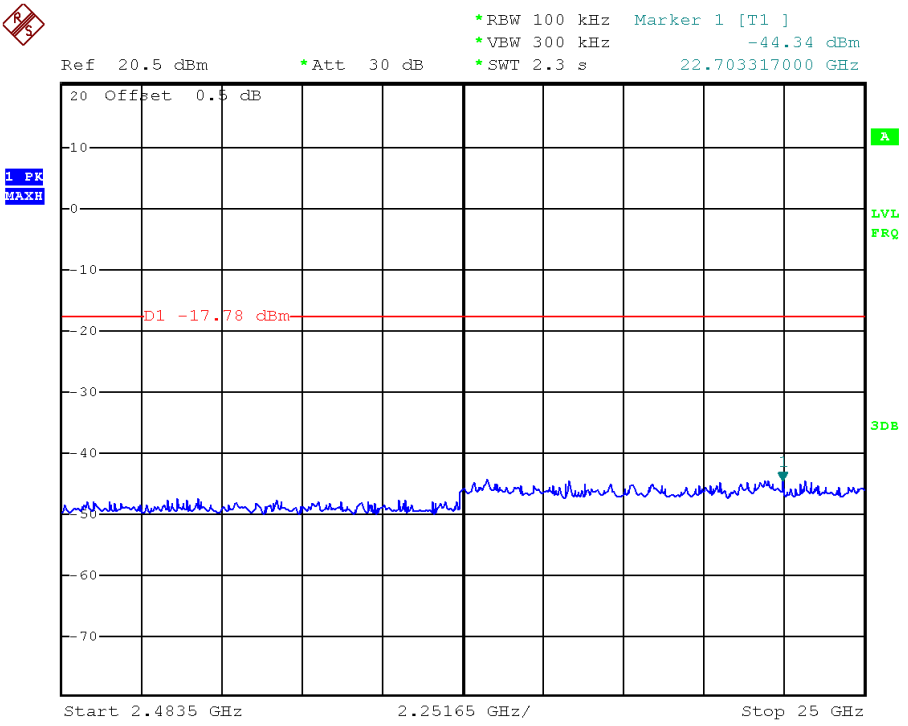
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11b, Lowest Channel, Plot A



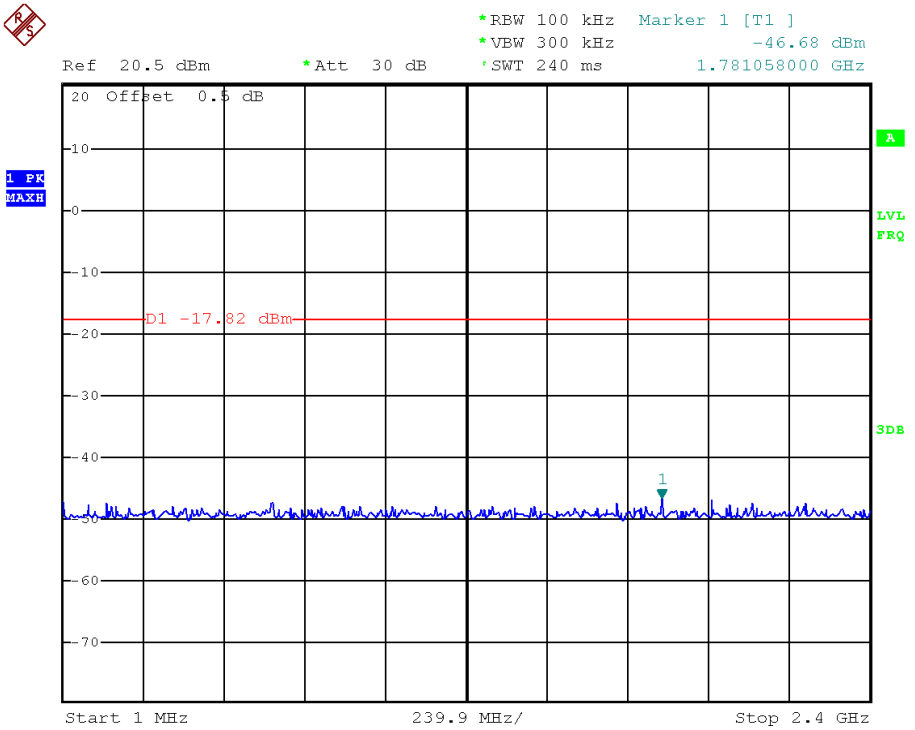
802.11b, Lowest Channel, Plot B



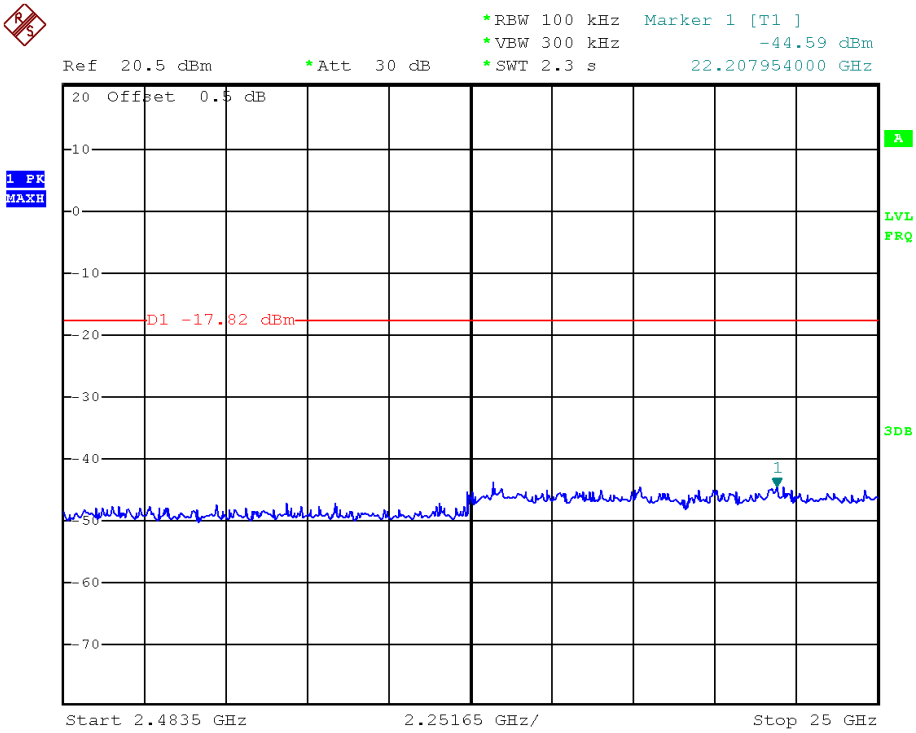
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11b, Middle Channel, Plot A

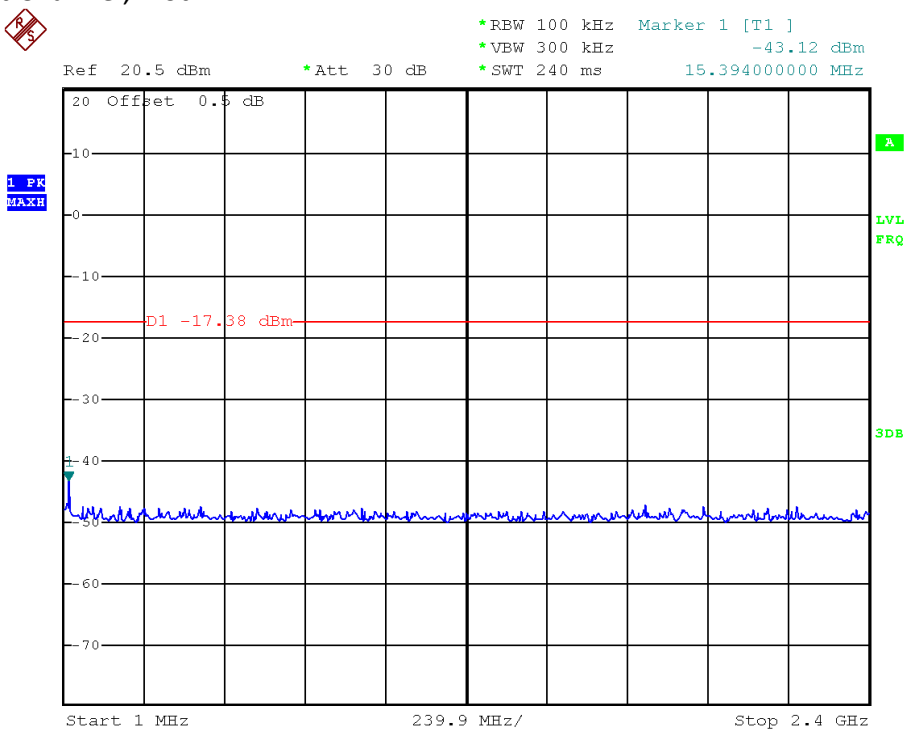


802.11b, Middle Channel, Plot B

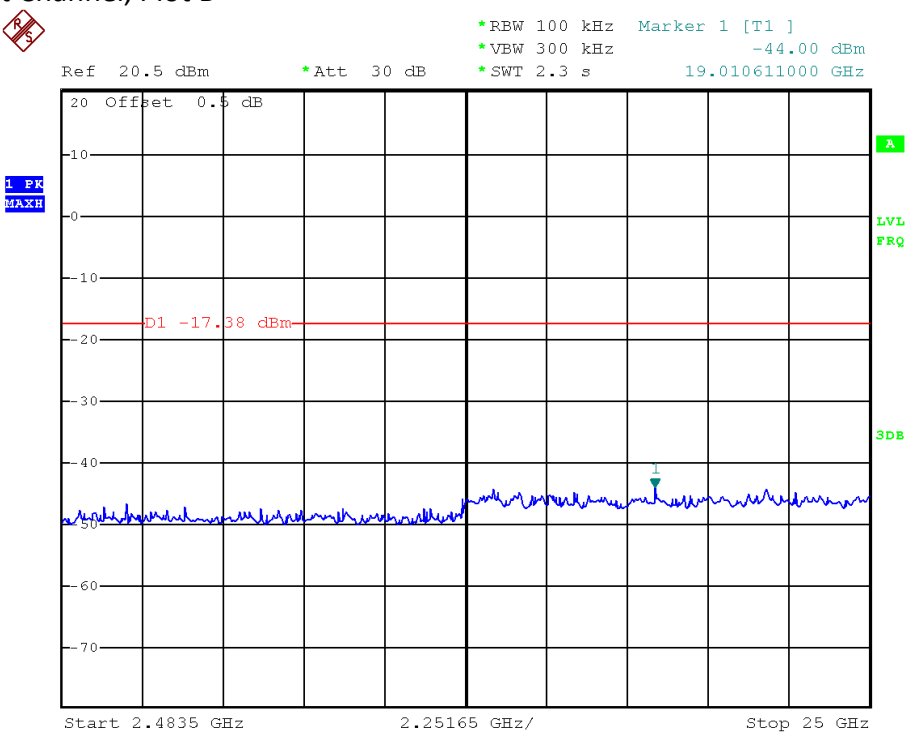


PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11b, Highest Channel, Plot A



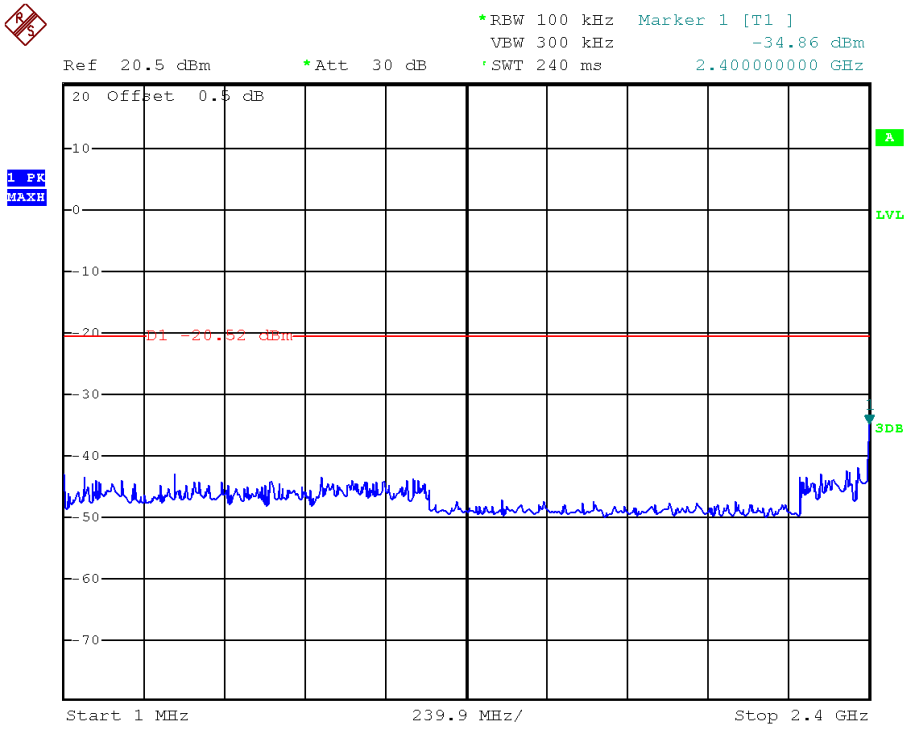
802.11b, Highest Channel, Plot B



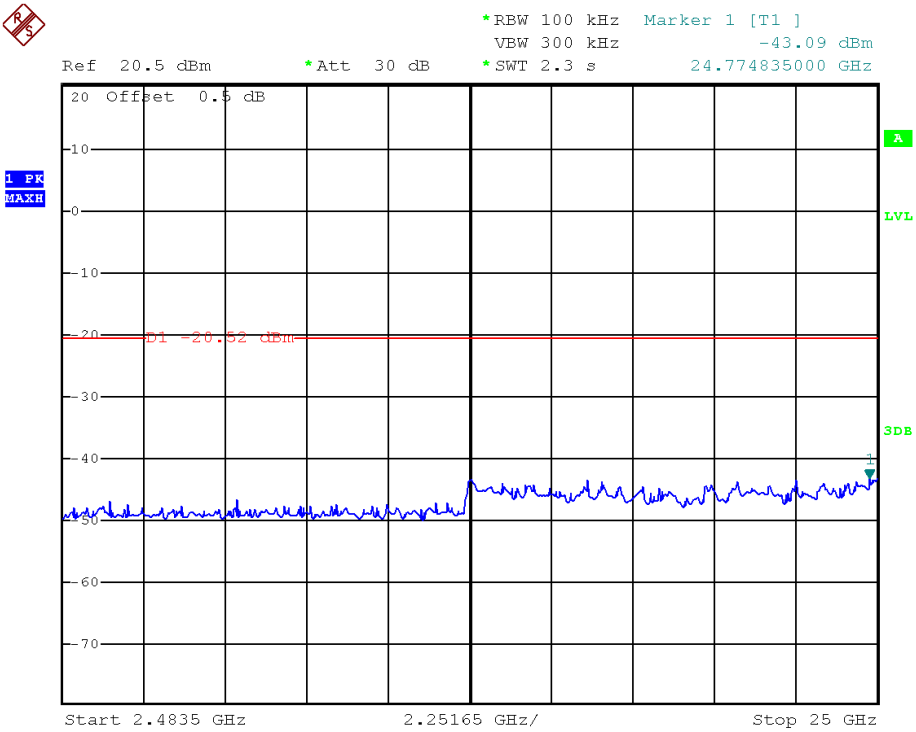
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11g, Lowest Channel, Plot A



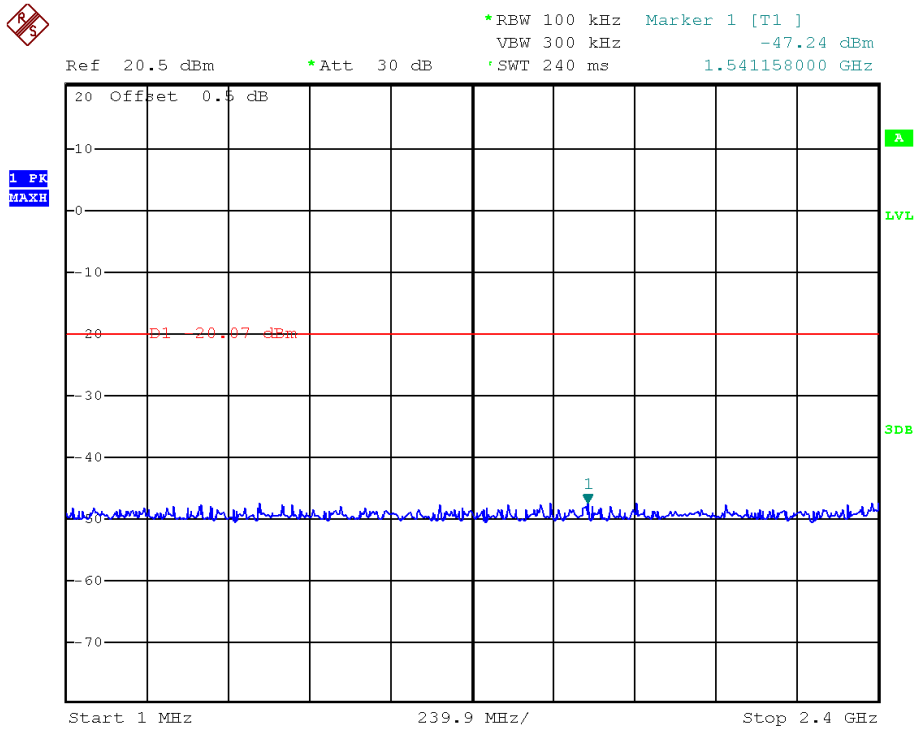
802.11g, Lowest Channel, Plot B



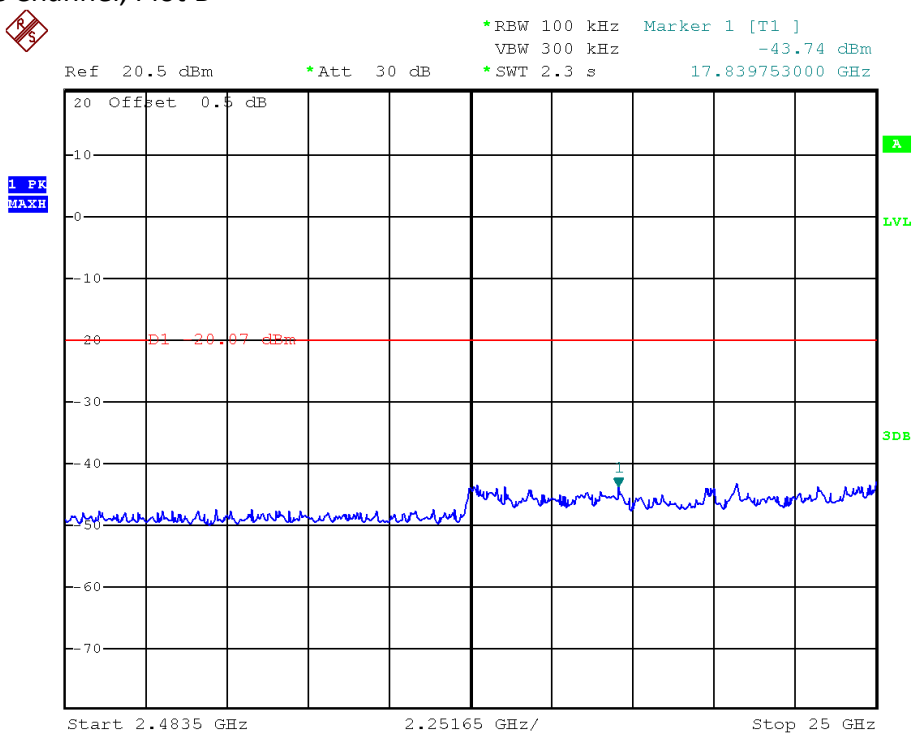
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11g, Middle Channel, Plot A



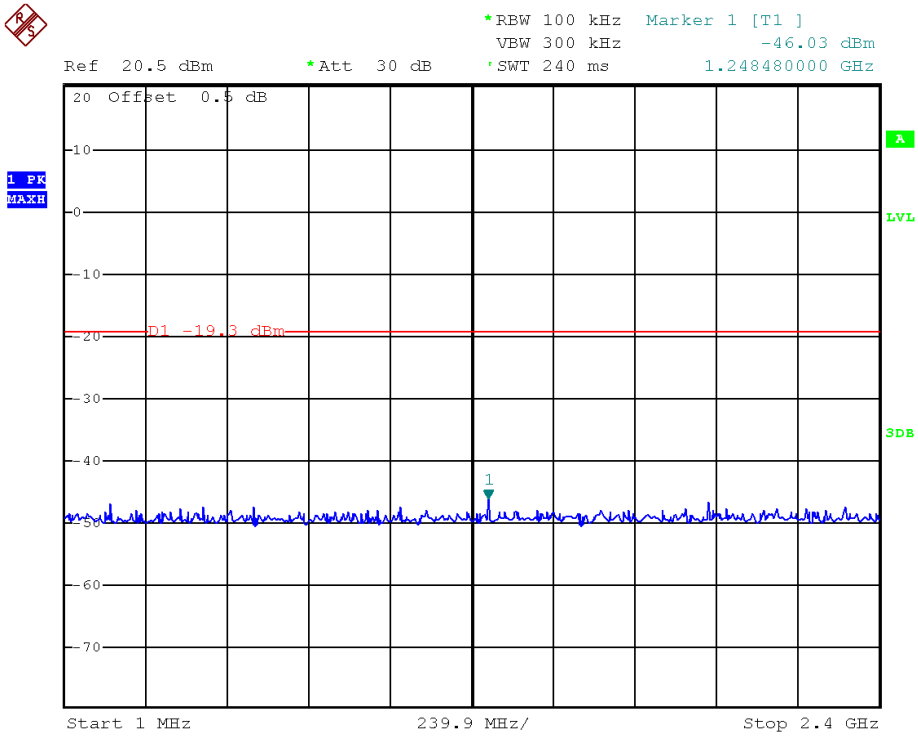
802.11g, Middle Channel, Plot B



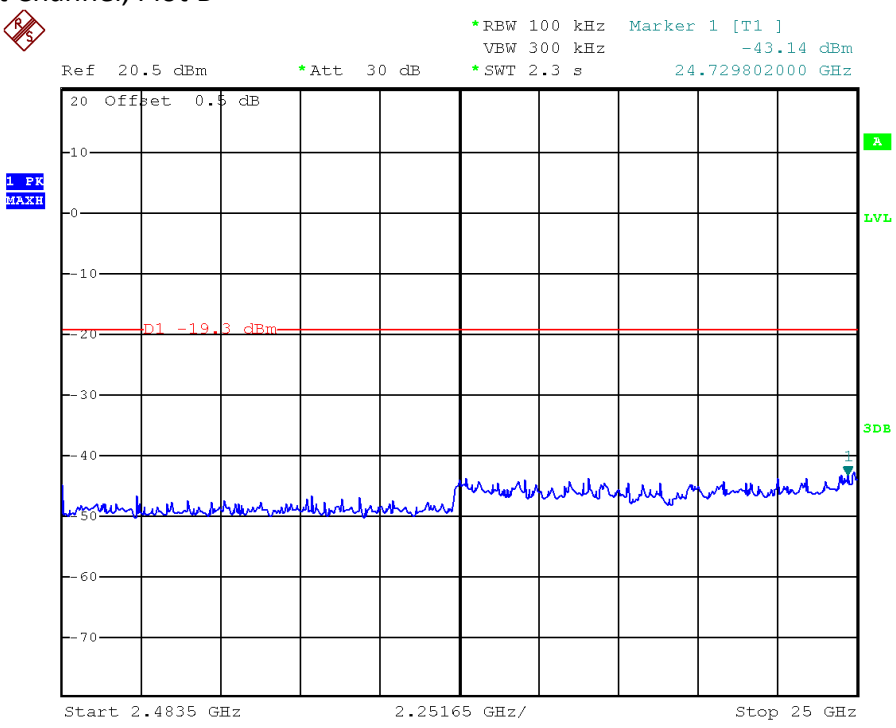
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

802.11g, Highest Channel, Plot A



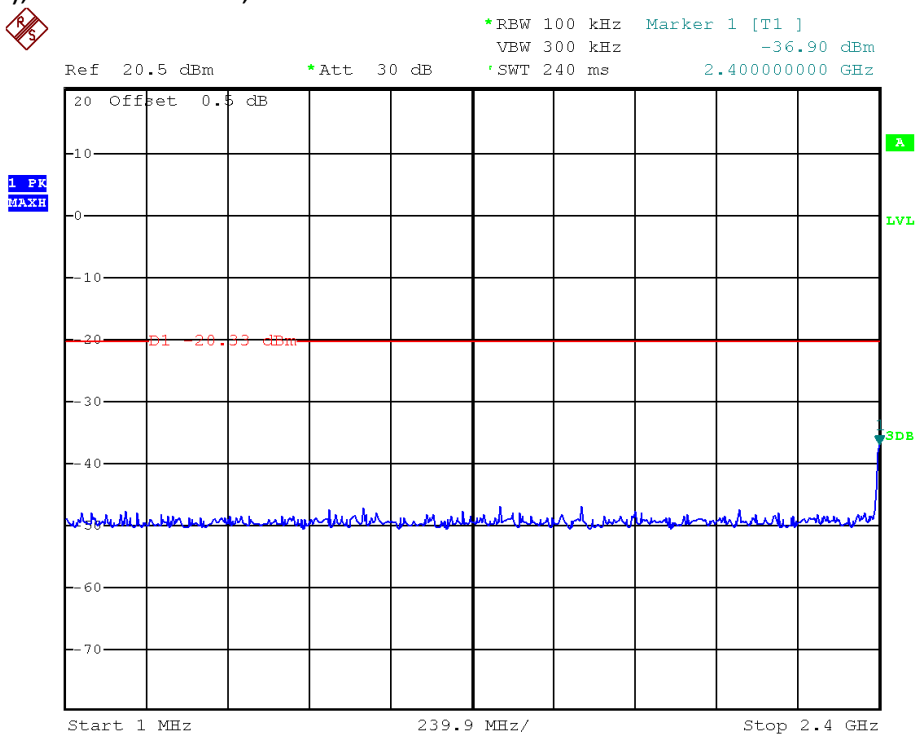
802.11g, Highest Channel, Plot B



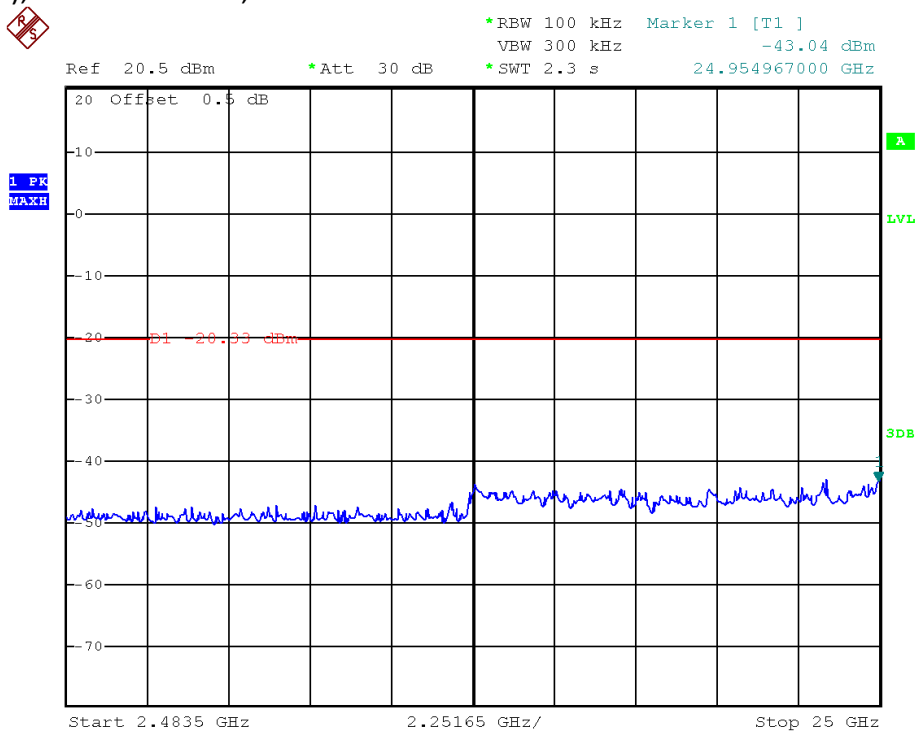
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

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



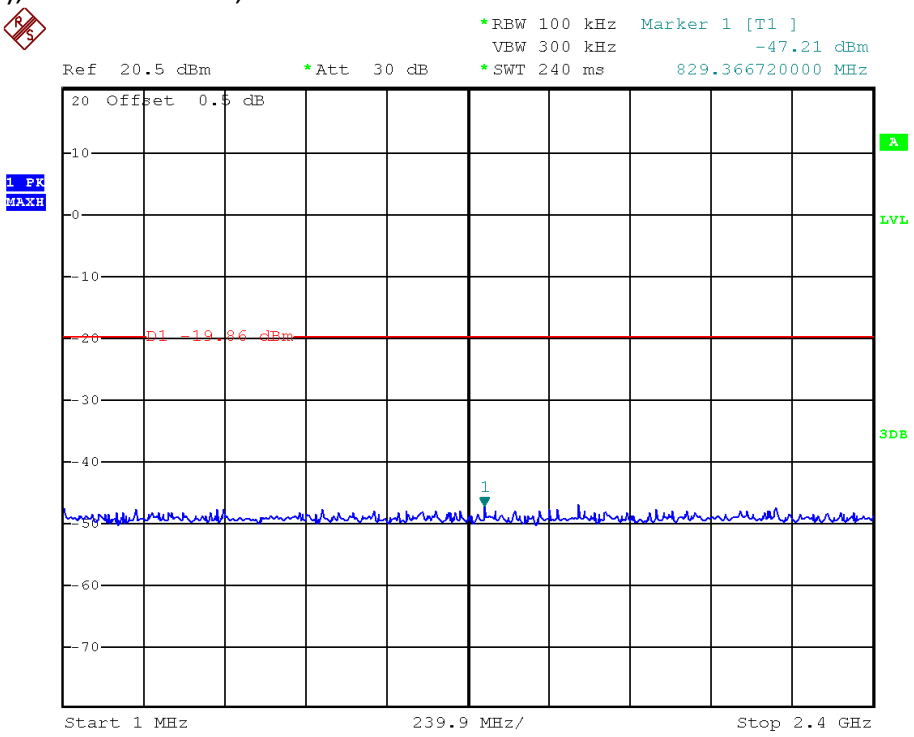
802.11n (20MHz), Lowest Channel, Plot B



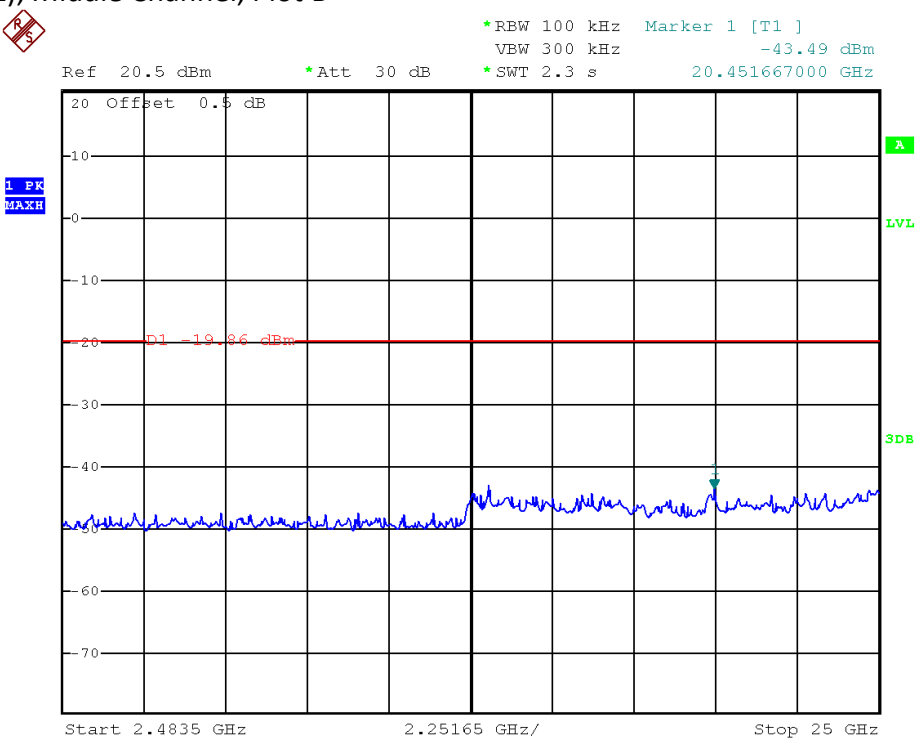
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

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



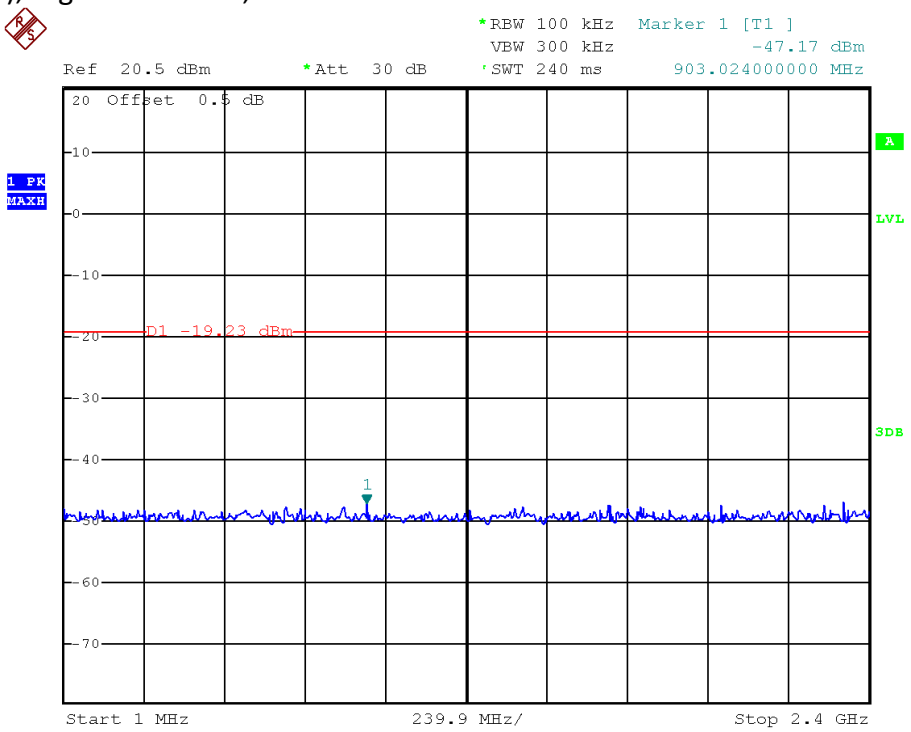
802.11n (20MHz), Middle Channel, Plot B



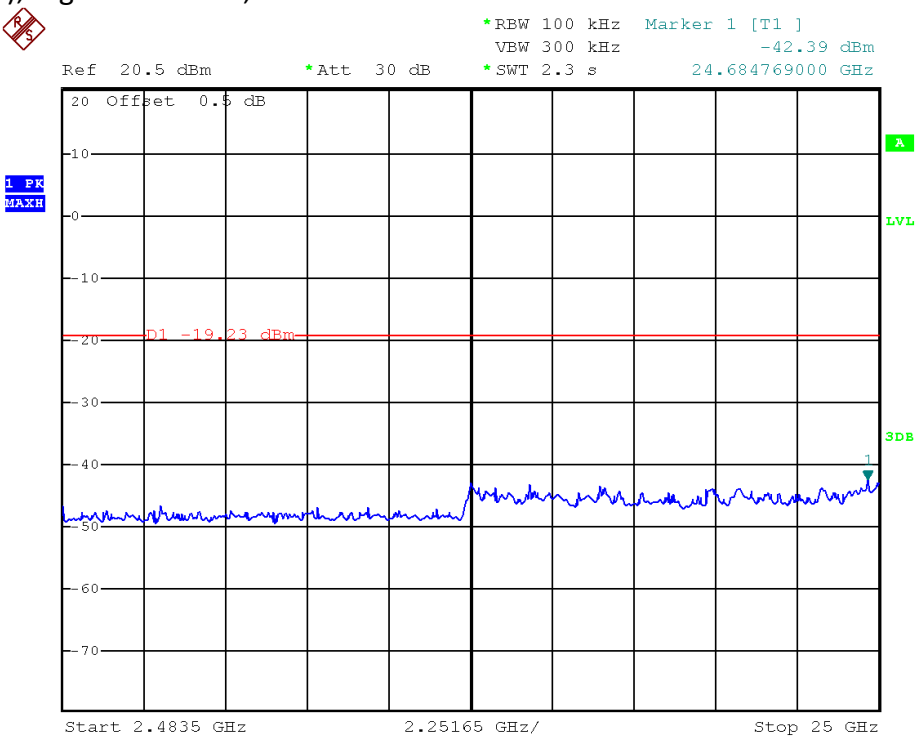
TEST REPORT

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 dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

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

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

Example
Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29.0 dB is subtracted. The pulse desensitization factor of the spectrum analyzer is 0.0 dB, and the resultant average factor is -10.0 dB. The net field strength for comparison to the appropriate emission limit is 32.0 dBμV/m. This value in dBμV/m is converted to its corresponding level in μV/m.

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

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

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

4.6 Transmitter Radiated Emissions in Restricted Bands and Spurious Emissions

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

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

4.6.1 Radiated Emission Configuration Photograph

Worst Case Restricted Band Radiated Emission
at

2483.5 MHz

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

4.6.2 Radiated Emission Data

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

Judgement -

Passed by 1.2 dB margin

TEST REPORT

RADIATED EMISSION DATA

Mode: TX-Channel 01

Table 1
IEEE 802.11b (DSSS, 1 Mbps)

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	***2390.000***	***41.9***	***33***	***29.4***	***38.3***	***54.0***	***-15.8***
V	***4824.000***	***35.4***	***33***	***34.9***	***37.3***	***54.0***	***-16.7***
H	***12060.000***	***31.3***	***33***	***40.5***	***38.8***	***54.0***	***-15.2***

Polari-zation	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	***2390.000***	***54.9***	***33***	***29.4***	***51.3***	***74.0***	***-22.7***
V	***4824.000***	***39.0***	***33***	***34.9***	***40.9***	***74.0***	***-33.1***
H	***12060.000***	***42.7***	***33***	***40.5***	***50.2***	***74.0***	***-23.8***

NOTES:
1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters.
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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: TX-Channel 06

Table 2
IEEE 802.11b (DSSS, 1 Mbps)

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	***4874.000***	***36.1***	***33***	***34.9***	***38.0***	***54.0***	***-16.1***
V	***7311.000***	***38.4***	***33***	***37.9***	***43.3***	***54.0***	***-10.8***
H	***12185.000***	***31.6***	***33***	***40.5***	***39.1***	***54.0***	***-14.9***

Polari-zation	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	***4874.000***	***65.3***	***33***	***34.9***	***67.2***	***74.0***	***-6.8***
V	***7311.000***	***46.5***	***33***	***37.9***	***51.4***	***74.0***	***-22.6***
H	***12185.000***	***42.9***	***33***	***40.5***	***50.4***	***74.0***	***-23.6***

NOTES:
1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters.
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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: TX-Channel 11

Table 3
IEEE 802.11b (DSSS, 1 Mbps)

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	***2483.500***	***56.4***	***33***	***29.4***	***52.8***	***54.0***	***-1.2***
V	***4924.000***	***35.3***	***33***	***34.9***	***37.2***	***54.0***	***-16.8***
V	***7386.000***	***41.4***	***33***	***37.9***	***46.3***	***54.0***	***-7.7***
H	***12310.000***	***31.7***	***33***	***40.5***	***39.2***	***54.0***	***-14.8***

Polari-zation	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	***2483.500***	***56.4***	***33***	***29.4***	***52.8***	***74.0***	***-21.2***
V	***4924.000***	***43.2***	***33***	***34.9***	***45.1***	***74.0***	***-28.9***
V	***7386.000***	***44.8***	***33***	***37.9***	***49.7***	***74.0***	***-24.3***
H	***12310.000***	***43.0***	***33***	***40.5***	***50.5***	***74.0***	***-23.5***

NOTES:
1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters.
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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: TX-Channel 01

Table 4
IEEE 802.11g (OFDM, 6 Mbps)

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	***2390.000***	***42.8***	***33***	***29.4***	***39.2***	***54.0***	***-14.8***
V	***4824.000***	***34.3***	***33***	***34.9***	***36.2***	***54.0***	***-17.8***
H	***12060.000***	***31.9***	***33***	***40.5***	***39.4***	***54.0***	***-14.6***

Polari-zation	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	***2390.000***	***56.9***	***33***	***29.4***	***53.3***	***74.0***	***-20.7***
V	***4824.000***	***40.3***	***33***	***34.9***	***42.2***	***74.0***	***-31.8***
H	***12060.000***	***43.3***	***33***	***40.5***	***50.8***	***74.0***	***-23.2***

NOTES:
1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters.
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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: TX-Channel 06

Table 5
IEEE 802.11g (OFDM, 6 Mbps)

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	***4874.000***	***37.2***	***33***	***34.9***	***39.1***	***54.0***	***-15.0***
V	***7311.000***	***30.8***	***33***	***37.9***	***35.7***	***54.0***	***-18.3***
H	***12185.000***	***31.9***	***33***	***40.5***	***39.4***	***54.0***	***-14.6***

Polari-zation	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	***4874.000***	***66.3***	***33***	***34.9***	***68.2***	***74.0***	***-5.8***
V	***7311.000***	***45.7***	***33***	***37.9***	***50.6***	***74.0***	***-23.4***
H	***12185.000***	***43.1***	***33***	***40.5***	***50.6***	***74.0***	***-23.4***

NOTES:
1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters.
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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: TX-Channel 11

Table 6
IEEE 802.11g (OFDM, 6 Mbps)

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	***2483.500***	***41.6***	***33***	***29.4***	***38.0***	***54.0***	***-16.0***
V	***4924.000***	***37.2***	***33***	***34.9***	***39.1***	***54.0***	***-14.9***
V	***7386.000***	***34.2***	***33***	***37.9***	***39.1***	***54.0***	***-14.9***
H	***12310.000***	***31.1***	***33***	***40.5***	***38.6***	***54.0***	***-15.4***

Polari-zation	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	***2483.500***	***54.7***	***33***	***29.4***	***51.1***	***74.0***	***-23.0***
V	***4924.000***	***48.9***	***33***	***34.9***	***50.8***	***74.0***	***-23.2***
V	***7386.000***	***49.4***	***33***	***37.9***	***54.3***	***74.0***	***-19.7***
H	***12310.000***	***42.9***	***33***	***40.5***	***50.4***	***74.0***	***-23.6***

NOTES:
1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters.
4. Negative value in the margin column shows emission below limit.
7. Horn antenna is used for the emission over 1000MHz.
8. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: TX-Channel 01

Table 7
IEEE 802.11n (20MHz) (OFDM, MCS0)

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	***2390.000***	***48.4***	***33***	***29.4***	***44.8***	***54.0***	***-9.2***
V	***4824.000***	***36.9***	***33***	***34.9***	***38.8***	***54.0***	***-15.2***
V	***7236.000***	***34.5***	***33***	***37.9***	***39.4***	***54.0***	***-14.6***

Polari-zation	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	***2390.000***	***56.9***	***33***	***29.4***	***53.3***	***74.0***	***-20.8***
V	***4824.000***	***41.7***	***33***	***34.9***	***43.6***	***74.0***	***-30.4***
H	***12060.000***	***42.9***	***33***	***40.5***	***50.4***	***74.0***	***-23.6***

NOTES:

1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters.
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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: TX-Channel 06

Table 8
IEEE 802.11n (20MHz) (OFDM, MCS0)

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	***4874.000***	***36.1***	***33***	***34.9***	***38.0***	***54.0***	***-16.0***
V	***7311.000***	***33.3***	***33***	***37.9***	***38.2***	***54.0***	***-15.8***
V	***12185.000***	***37.3***	***33***	***40.5***	***44.8***	***54.0***	***-9.2***

Polari-zation	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	***4874.000***	***65.2***	***33***	***34.9***	***67.1***	***74.0***	***-6.9***
V	***7311.000***	***48.8***	***33***	***37.9***	***53.7***	***74.0***	***-20.3***
H	***12185.000***	***43.1***	***33***	***40.5***	***50.6***	***74.0***	***-23.4***

NOTES:
1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters.
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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: TX-Channel 11

Table 9
IEEE 802.11n (20MHz) (OFDM, MCS0)

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	***2483.500***	***42.2***	***33***	***29.4***	***38.6***	***54.0***	***-15.4***
V	***4924.000***	***30.5***	***33***	***34.9***	***32.4***	***54.0***	***-21.6***
V	***7386.000***	***34.4***	***33***	***37.9***	***39.3***	***54.0***	***-14.7***
H	***12310.000***	***37.9***	***33***	***40.5***	***45.4***	***54.0***	***-8.6***

Polari-zation	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	***2483.500***	***71.0***	***33***	***29.4***	***67.4***	***74.0***	***-6.6***
V	***4924.000***	***52.7***	***33***	***34.9***	***54.6***	***74.0***	***-19.4***
V	***7386.000***	***50.2***	***33***	***37.9***	***55.1***	***74.0***	***-18.9***
H	***12310.000***	***46.1***	***33***	***40.5***	***53.6***	***74.0***	***-20.4***

NOTES:

1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters.
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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: Wifi Operating

Table 10

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	***38.540***	***38.5***	***16***	***10.0***	***32.5***	***40.0***	***-7.5***
V	82.010	43.2	16	7.0	34.2	40.0	-5.8
H	***112.056***	***39.5***	***16***	***14.0***	***37.5***	***43.5***	***-6.0***
H	***399.994***	***27.6***	***16***	***25.0***	***36.6***	***46.0***	***-9.4***
H	479.990	30.8	16	26.0	40.8	46.0	-5.2
V	803.508	20.5	16	31.0	35.5	46.0	-10.5

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

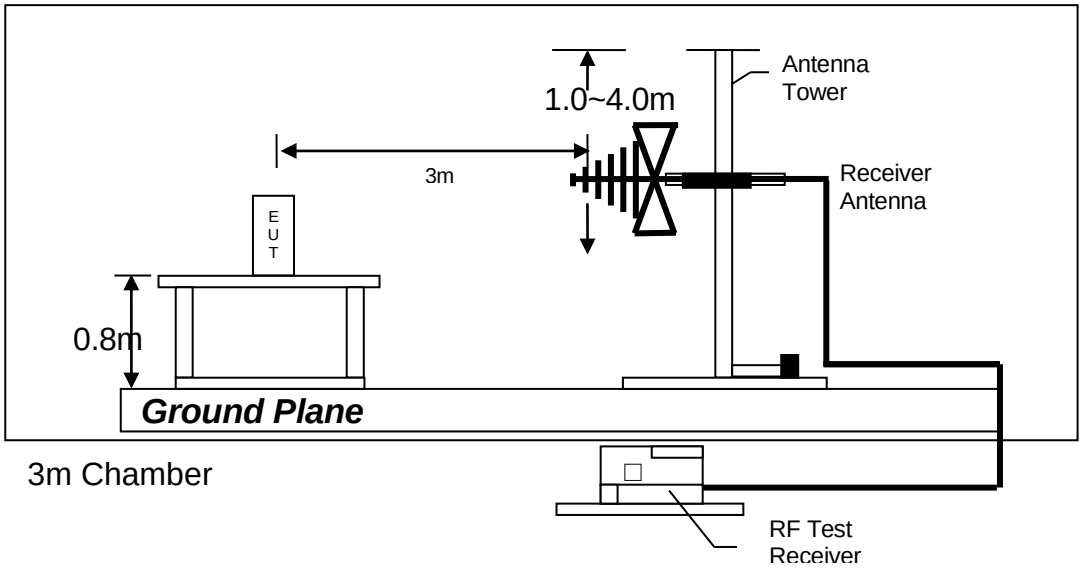
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test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

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

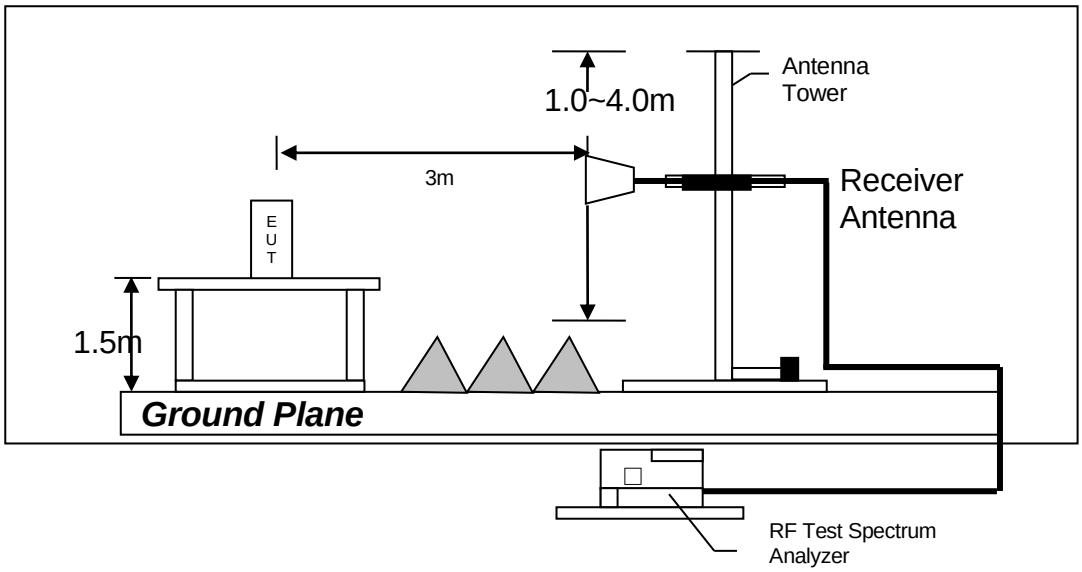
4. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

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

4.6.4 Transmitter Duty Cycle Calculation

Not applicable – No average factor is required.

4.7 AC Power Line Conducted Emission

☐ Not applicable – EUT is only powered by battery for operation.

☒ EUT connects to AC power line. Emission Data is listed in following pages.

☐ Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

4.7.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration
at

27.645 MHz

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

4.7.2 AC Power Line Conducted Emission Data

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

Passed by 13.8 dB margin compare with CISPR Average limit

TEST REPORT

AC POWER LINE CONDUCTED EMISSION

Worst Case: Play + Charging Operating

EDIT PEAK LIST (Final Measurement Results)

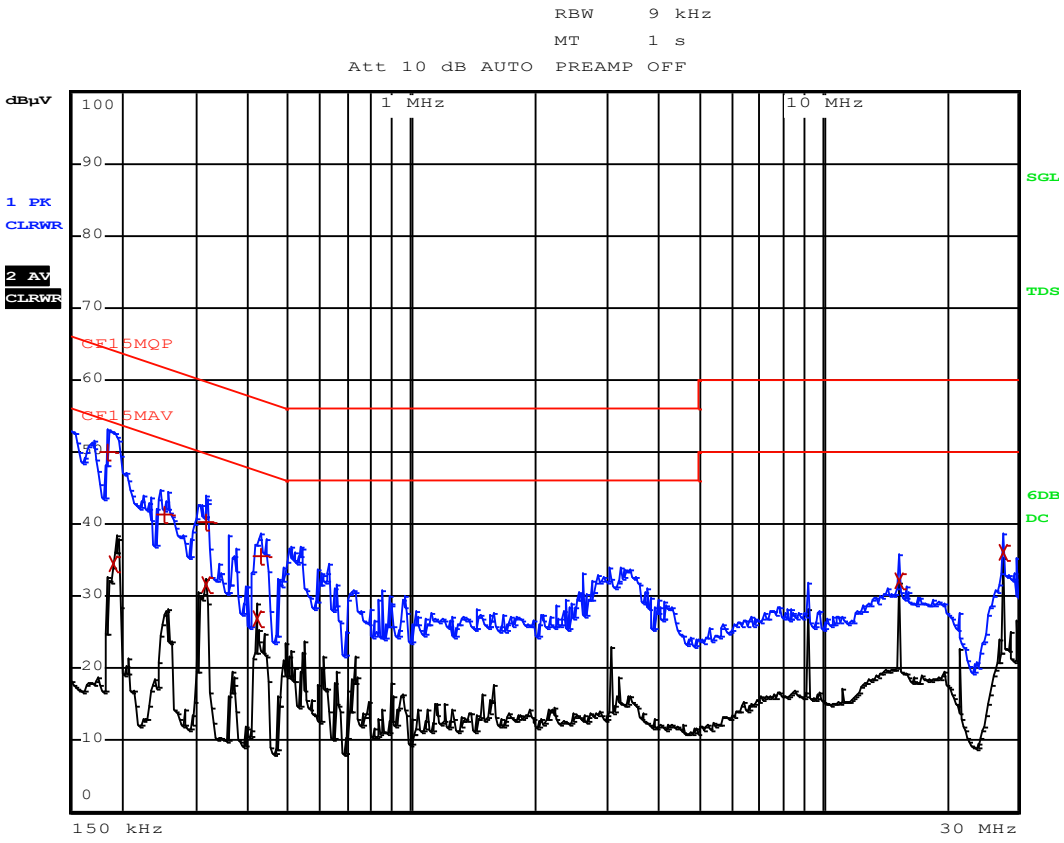
Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	186 kHz	49.88	L1	-14.32
2	CISPR Average	190.5 kHz	34.63	L1	-19.37
1	Quasi Peak	253.5 kHz	41.28	N	-20.35
1	Quasi Peak	316.5 kHz	40.18	L1	-19.60
2	CISPR Average	316.5 kHz	31.71	N	-18.08
2	CISPR Average	420 kHz	26.88	N	-20.56
1	Quasi Peak	429 kHz	35.48	N	-21.78
2	CISPR Average	15.36 MHz	32.14	L1	-17.86
2	CISPR Average	27.645 MHz	36.16	N	-13.83

Date: 3.APR.2020 11:17:11

TEST REPORT

Worst Case: Play + Charging Operating



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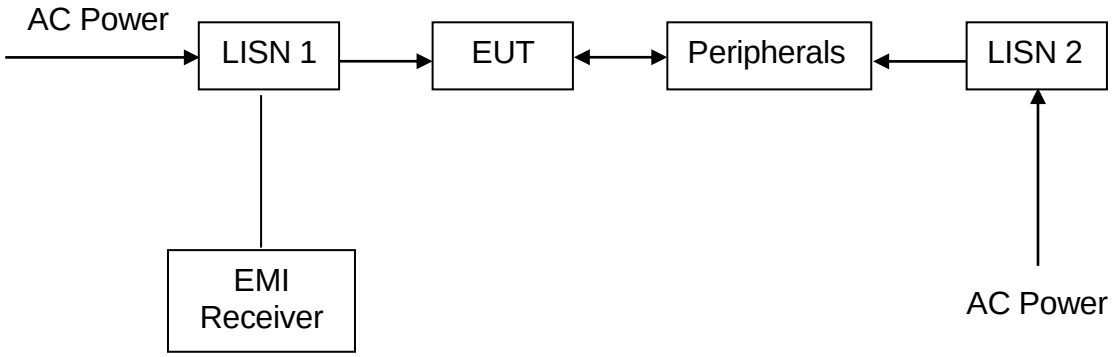
4.7.3 Conducted Emission Test Setup



5.0 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-2253	EW-0571	EW-1042
Manufacturer	R&S	EMCO	EMCO
Model No.	FSP40	3104C	3148
Calibration Date	November 18, 2019	July 23, 2019	May 23, 2019
Calibration Due Date	November 18, 2020	January 23, 2021	November 23, 2020

Equipment	Spectrum Analyzer	RF Pre-Amplifier 3 pcs (9kHz To 40GHz)	Double Ridged Guide Antenna
Registration No.	EW-2253	EW-3006b	EW-3415
Manufacturer	R&S	SCHWARZBECK	EMCO
Model No.	FSP40	BBV 9718	3115
Calibration Date	November 18, 2019	November 25, 2019	June 07, 2019
Calibration Due Date	November 18, 2020	November 25, 2020	December 07, 2020

Equipment	Active Loop H-Field (9kHz To 30MHz)	RF Cable (up to 40GHz) 1.5m length	14m Double Shield RF Cable (20MHz To 6GHz)
Registration No.	EW-2313	EW-3104	EW-2858
Manufacturer	ELECTROMETRI	N/A	RADIALL
Model No.	EM-6876	SMA-M to SMA-M	nm / br5d / sma 14m
Calibration Date	December 17, 2019	August 26, 2019	September 30, 2019
Calibration Due Date	June 17, 2021	August 26, 2020	September 30, 2020

2) Conducted Emissions Test

Equipment	EMI Test Receiver	Artificial Mains Network	RF Cable 80cm (RG142) (9kHz to 30MHz)
Registration No.	EW-2666	EW-3360	EW-2452
Manufacturer	ROHDESCHWARZ	R&S	RADIALL
Model No.	ESCI7	ENV216	bnc m st / 142 / bnc m st 80cm
Calibration Date	August 28, 2019	August 29, 2019	November 14, 2019
Calibration Due Date	August 28, 2020	August 29, 2020	November 14, 2020

3) Conductive Measurement Test

Equipment	Spectrum Analyzer	Digital Power Meter	RF Cable (up to 40GHz) 1.5m length
Registration No.	EW-2253	EW-2620	EW-3104
Manufacturer	R&S	YOKOGAWA	N/A
Model No.	FSP40	WT210	SMA-M to SMA-M
Calibration Date	November 18, 2019	May 28, 2019	August 26, 2019
Calibration Due Date	November 18, 2020	June 25, 2020	August 26, 2020

4) Bandwith/Bandedge Measurement Test

Equipment	Spectrum Analyzer	RF Cable (up to 40GHz) 1.5m length
Registration No.	EW-2253	EW-3104
Manufacturer	R&S	N/A
Model No.	FSP40	SMA-M to SMA-M
Calibration Date	November 18, 2019	August 26, 2019
Calibration Due Date	November 18, 2020	August 26, 2020