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TEST REPORT

Report No.: 22080534HKG-002

Qmax Systems India Private Limited

Application For Original Grant of 47 CFR Part 15 Certification

FCC ID: 2APD6TEKCCD002

OBD Diagnostics Device

Transceiver – 2.4GHz WiFi

This report contains the data of 2.4GHz WiFi portion only.

Prepared and Checked by:	**Approved by:**
Signed on File Wong Cheuk Ho, Herbert Lead Engineer	Digitally signed by Kenneth Wong Location: Intertek Testing Services Hong Kong Limited Wong Kwok Yeung, Kenneth Assistant Supervisor Date: April 13, 2023

TEST REPORT

GENERAL INFORMATION

Grantee:	Qmax Systems India Private Limited
Grantee Address:	795, Trunk Road, Poonamallee, Chennai, India.
FCC Specification Standard:	FCC Part 15, October 1, 2021 Edition
FCC ID:	2APD6TEKCCD002
FCC Model(s):	CCD-V1
Type of EUT:	Spread Spectrum Transmitter
Description of EUT:	OBD Diagnostics Device
Serial Number:	N/A
Sample Receipt Date:	June 29, 2022
Date of Test:	June 29, 2022 to November 03, 2022
Report Date:	April 13, 2023
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 Certification.

TEST REPORT

TABLE OF CONTENTS

TEST REPORT

EXHIBIT 1 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 standards:

FCC Part 15, October 1, 2021 Edition

TEST REPORT

EXHIBIT 2 GENERAL DESCRIPTION

2.1 Product Description

The Equipment Under Test (EUT) that is an On-Board Diagnostic system for Vehicle which enabled with IOT tracking and cloud connectivity via Bluetooth, BLE, 2.4GHz, 5GHz WiFi RF & LTE technology. The EUT is powered by vehicle's OBD port and/or 3.7VDC internal rechargeable battery. The EUT can support Bluetooth (FHSS) mode, Bluetooth 5.0 BLE mode, 2.4GHz WiFi mode and 5.1GHz & 5.8GHz WiFi mode.

For IEEE 802.11b mode, it operates at frequency range of 2412.000MHz to 2462.000MHz with 11 channels. It transmits via Direct-sequence spread spectrum (DSSS) modulation. Maximum bit rate can be up to 11Mbps.

For IEEE 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 IEEE 802.11n (with 20MHz bandwidth) mode, it operates at frequency range of 2412.000MHz to 2462.000MHz with 11 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation. Maximum bit rate can support up to 65Mbps.

For IEEE 802.11n (with 40MHz bandwidth) mode, it operates at frequency range of 2422.000MHz to 2452.000MHz with 9 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation. Maximum bit rate can support up to 150Mbps.

This report contains the data of 2.4GHz WiFi portion only.

The antenna(s) used in the EUT is integral, and the test sample is a prototype.

Antenna Information:

- PCB Antenna, Internal, Integral
- WLAN 802.11 a/b/g/n/ac and Bluetooth BLE
- For operating frequency of 2.4GHz WiFi / Bluetooth / BLE, antenna has maximum gain of 3.0 dBi

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

TEST REPORT

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 (April 02, 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 (2.4GHz WiFi portion).

TEST REPORT

EXHIBIT 3 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 device was powered by vehicle's OBD port or 3.7V internal rechargeable battery and/or AC/DC USB adaptor Input: 100-240VAC 50/60Hz 0.5A; Output: 5.0VDC 2100mA.

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.

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

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

3.2 EUT Exercising Software

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

TEST REPORT

3.3 Details of EUT and Description of Accessories

Details of EUT:

The device was powered by vehicle's OBD port or 3.7V internal rechargeable battery and/or AC/DC USB adaptor Input: 100-240VAC 50/60Hz 0.5A; Output: 5.0VDC 2100mA.

Description of Accessories:

(1) 1 X AC/DC USB adaptor (Input: 100-240VAC 50/60Hz 0.5A; Output: 5.0VDC 2100mA)
(2) 1 X USB Type C cable with length of 0.42 meter long
(3) 1 X OBD Emulator

All accessories are provided by Applicant.

3.4 Measurement Uncertainty

Decision Rule for compliance: For FCC/IC standard, the measured value must be within the limits of applicable standard without accounting for the measurement uncertainty. For EN/IEC/HKTA/HKTC standard, conformity rules will be used as per standard directly excepted EN/IEC 61000-3-2, EN/IEC 61000-3-3, HKTA1004, HKCA1008, HKTA1019, HKTA1020, HKTA1041 and HKTA1044. For these excepted or not mentioned standards, Cl 4.2.2 of ILAC-G8:09/2019 decision rules will be reference and guard band will be equal to our measurement uncertainty with 95% confidence level (k=2). In case, the measured value is within guard band region, undetermined decision will be used. The values of the Measurement uncertainty for radiated emission test, AC line conducted emission test and RF conducted test, frequency stability and timing jitter are ± 5.3dB, ± 4.2dB, ±1dB, ±23Hz, 0.1µs respectively.

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.

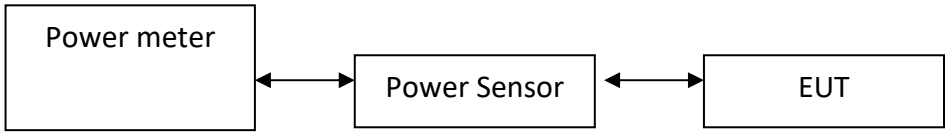
TEST REPORT

EXHIBIT 4 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 9.1.2 was used.

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

IEEE 802.11b (DSSS, 1 Mbps) Antenna Gain = 3 dBi

Frequency (MHz)		Output in dBm	Output in mWatt
Low Channel:	2412	9.6	9.1
Middle Channel:	2437	9.9	9.8
High Channel:	2462	9.5	8.9

IEEE 802.11g (OFDM, 6 Mbps) Antenna Gain = 3 dBi

Frequency (MHz)		Output in dBm	Output in mWatt
Low Channel:	2412	9.2	8.3
Middle Channel:	2437	9.3	8.5
High Channel:	2462	9.4	8.7

IEEE 802.11n (20MHz) (OFDM, MCS0) Antenna Gain = 3 dBi

Frequency (MHz)		Output in dBm	Output in mWatt
Low Channel:	2412	8.9	7.8
Middle Channel:	2437	9.0	7.9
High Channel:	2462	9.1	8.1

IEEE 802.11n (40MHz) (OFDM, MCS0) Antenna Gain = 3 dBi

Frequency (MHz)		Output in dBm	Output in mWatt
Low Channel:	2422	9.0	7.9
Middle Channel:	2437	9.3	8.5
High Channel:	2452	8.9	7.8

TEST REPORT

4.1 Maximum Conducted (Peak) Output Power at Antenna Terminals (Cont'd)

Cable loss: 0.5dB External Attenuation: 0dB

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

IEEE 802.11b (DSSS, 1 Mbps)
Max. Conducted (Peak) Output Level = 9.9dBm

IEEE 802.11g (OFDM, 9 Mbps)
Max. Conducted (Peak) Output Level = 9.4dBm

IEEE 802.11n (20MHz) (OFDM, MCS0)
Max. Conducted (Peak) Output Level = 9.1dBm

IEEE 802.11n (40MHz) (OFDM, MCS0)
Max. Conducted (Peak) Output Level = 9.3dBm

Limits:

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

☐ _____W (_____dBm) for antennas with gains more than 6dBi.

TEST REPORT

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	8.60
Middle Channel:	2437	8.10
High Channel:	2462	8.40

IEEE 802.11g (OFDM, 6 Mbps)

Frequency (MHz)		6dB Bandwidth (MHz)
Low Channel:	2412	15.90
Middle Channel:	2437	15.70
High Channel:	2462	15.80

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

Frequency (MHz)		6dB Bandwidth (MHz)
Low Channel:	2412	15.20
Middle Channel:	2437	17.40
High Channel:	2462	15.90

IEEE 802.11n (40MHz) (OFDM, MCS0)

Frequency (MHz)		6dB Bandwidth (MHz)
Low Channel:	2422	36.20
Middle Channel:	2437	35.40
High Channel:	2462	36.00

Limits:

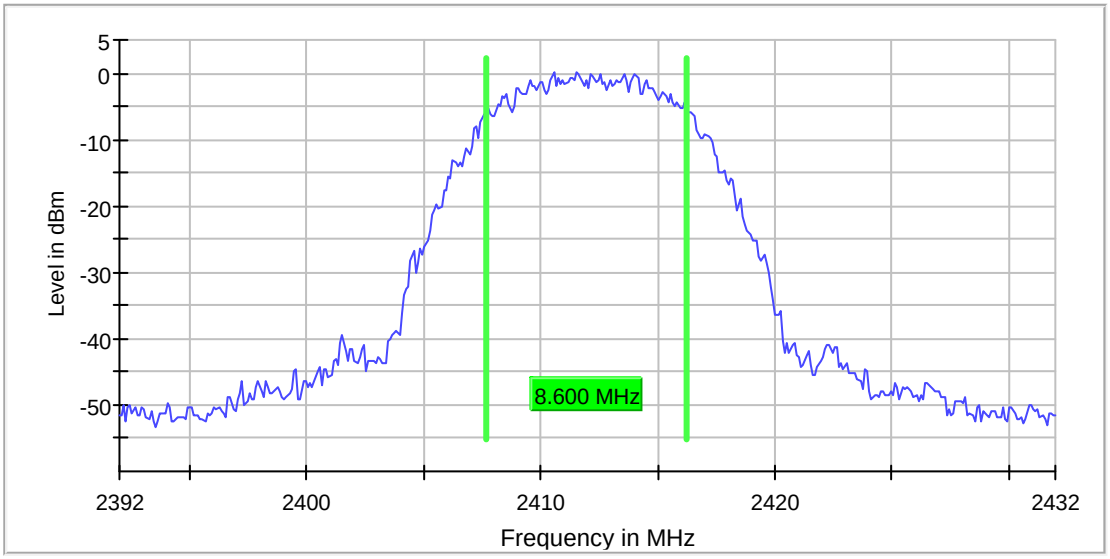
6dB bandwidth shall be at least 500kHz.

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

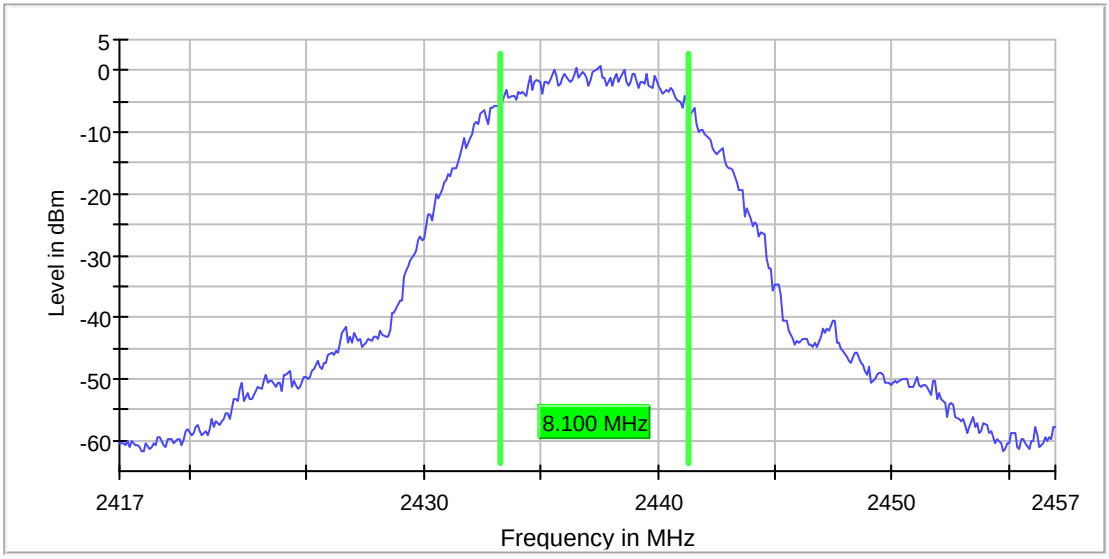
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

IEEE 802.11b, Lowest Channel



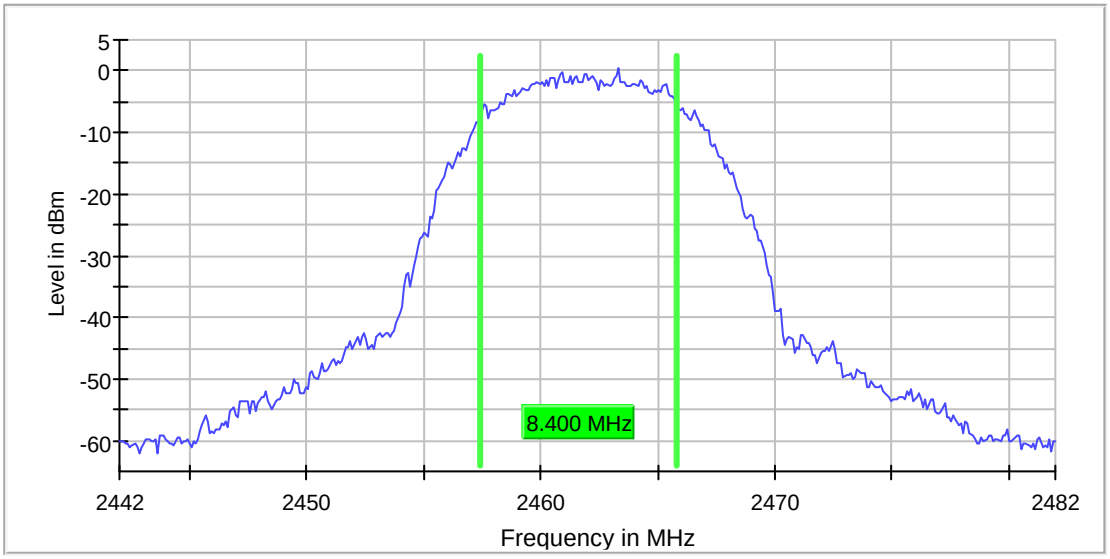
IEEE 802.11b, Middle Channel



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

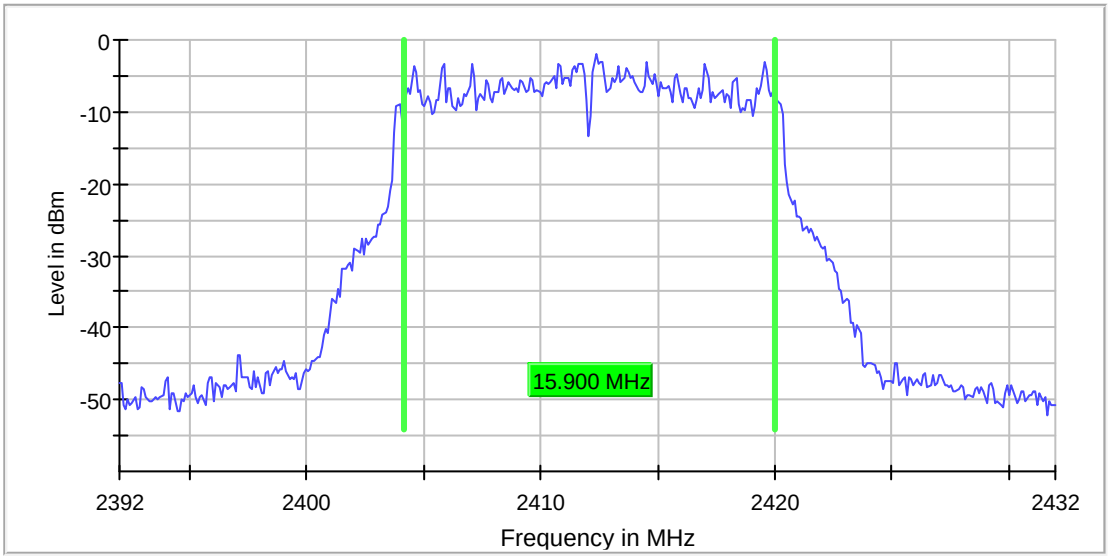
IEEE 802.11b, Highest Channel



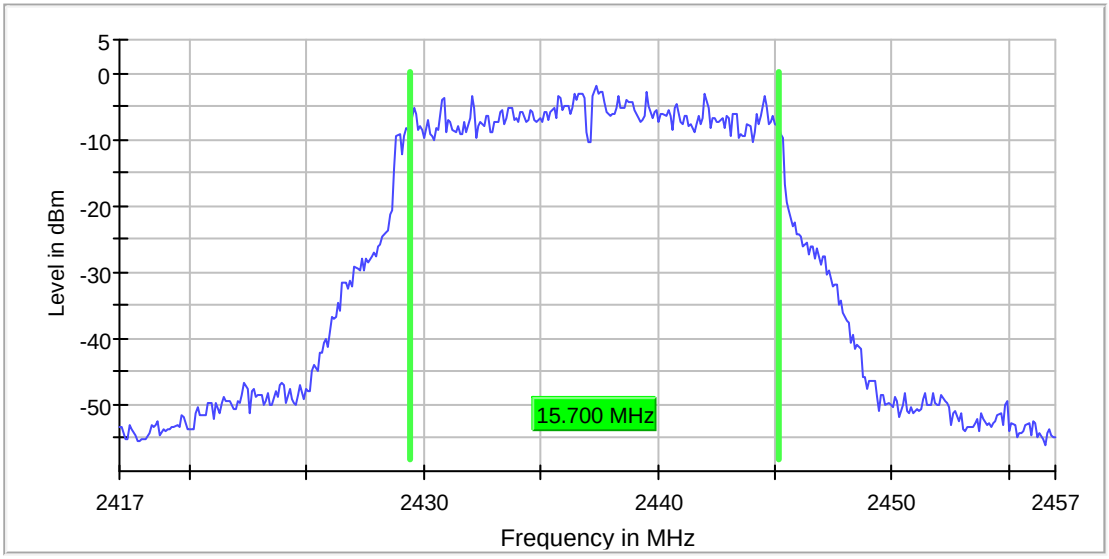
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

IEEE 802.11g, Lowest Channel



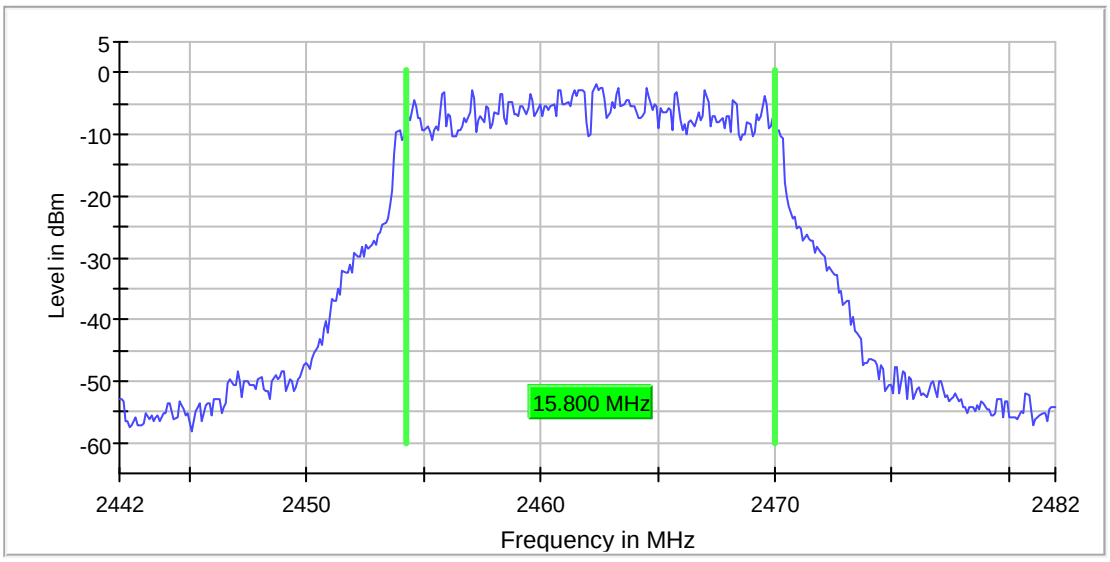
IEEE 802.11g, Middle Channel



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

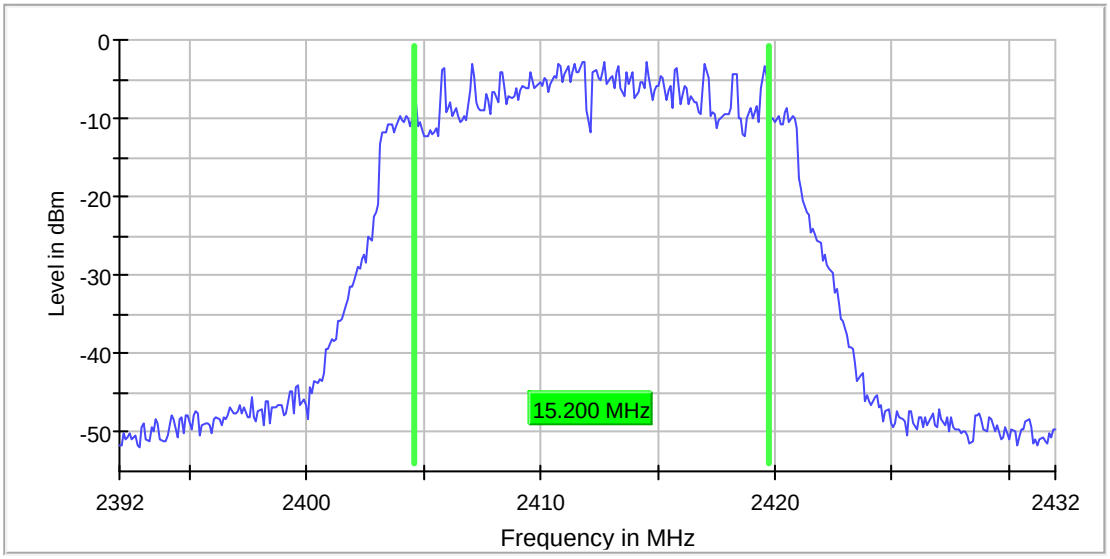
IEEE 802.11g, Highest Channel



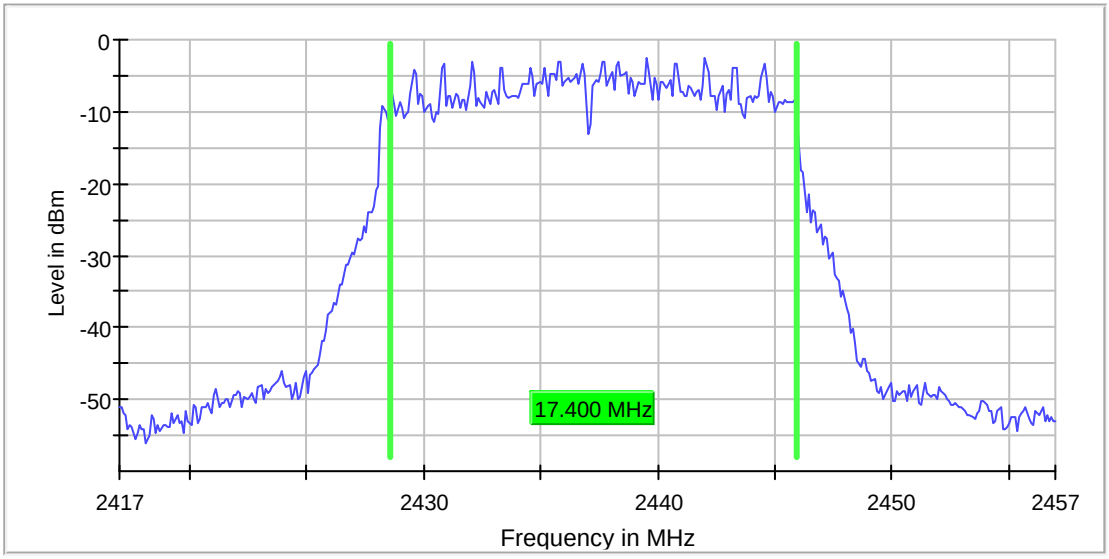
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

IEEE 802.11n (20MHz), Lowest Channel



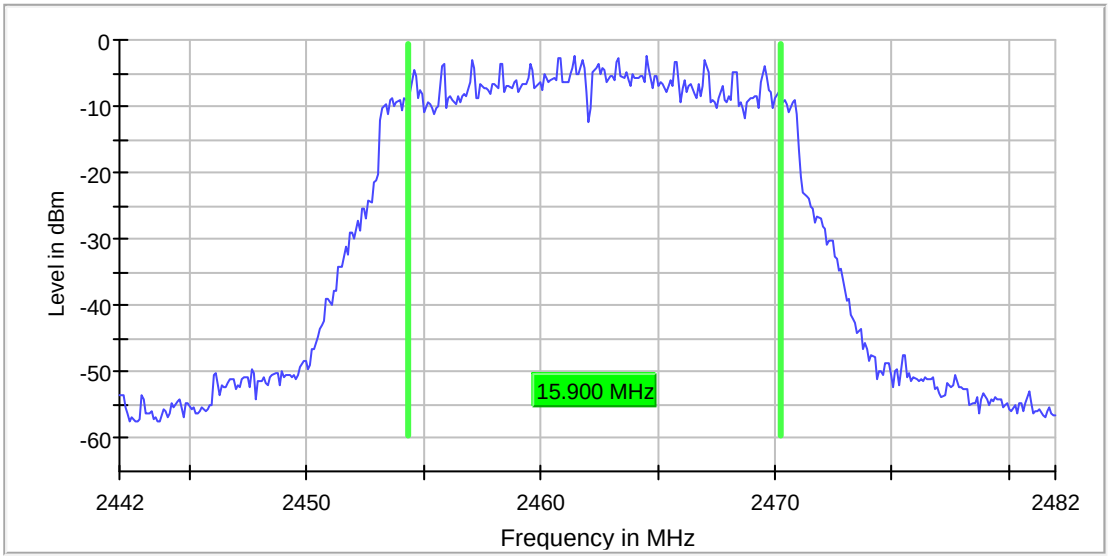
IEEE 802.11n (20MHz), Middle Channel



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

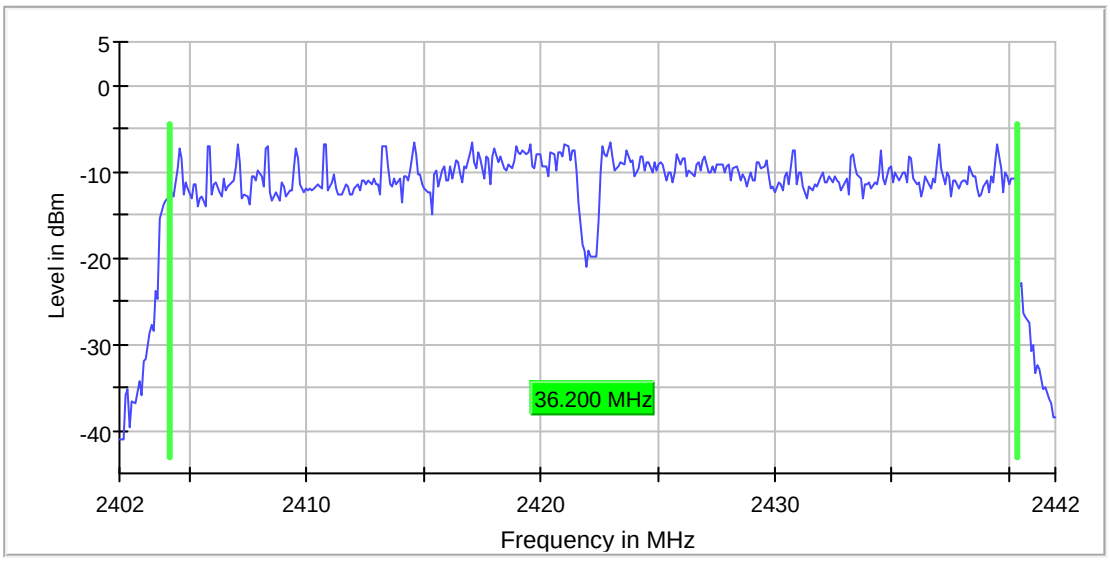
IEEE 802.11n (20MHz), Highest Channel



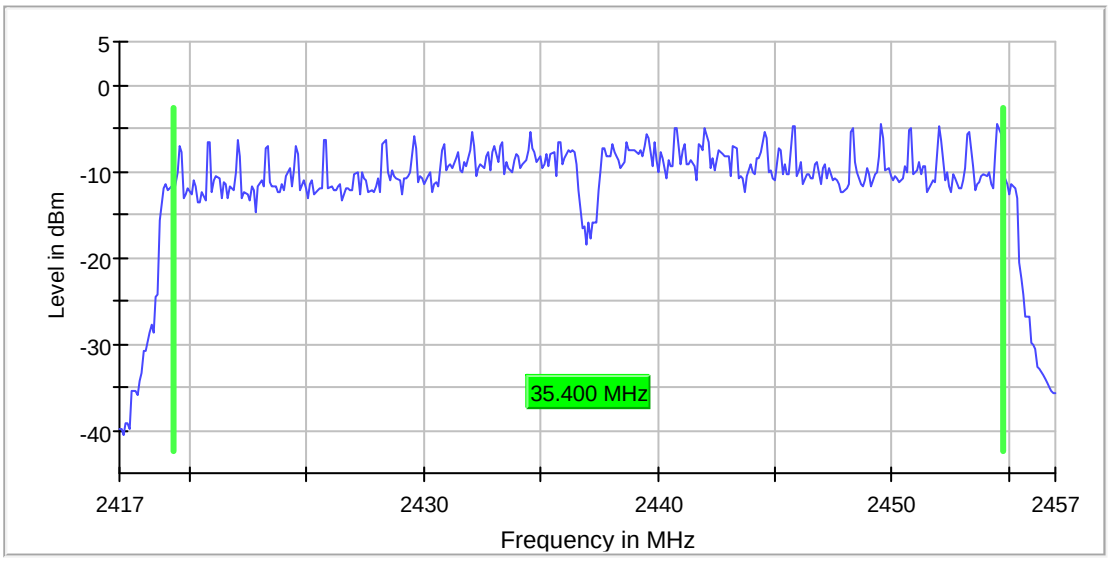
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

IEEE 802.11n (40MHz), Lowest Channel



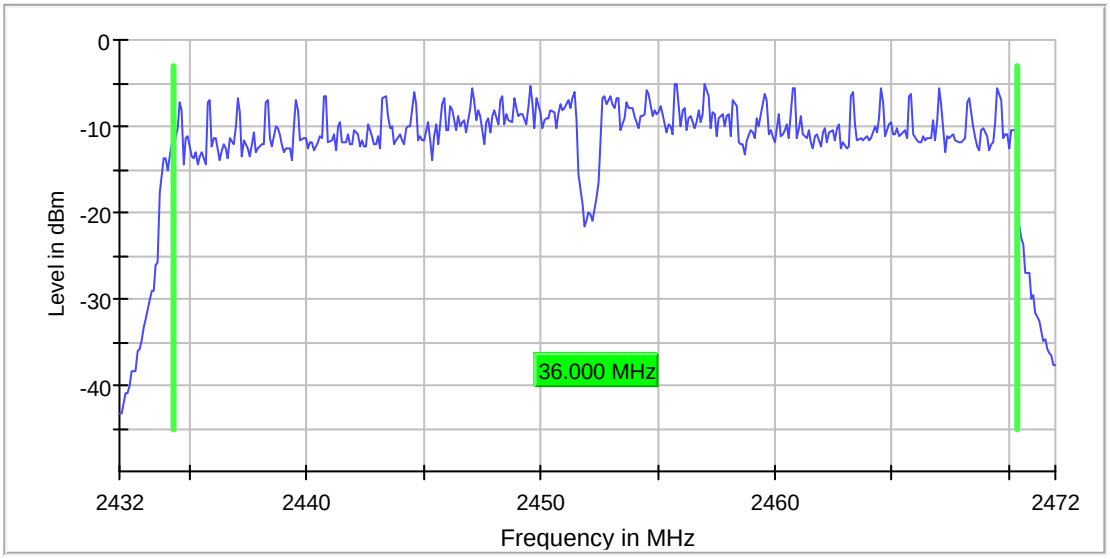
IEEE 802.11n (40MHz), Middle Channel



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

IEEE 802.11n (40MHz), Highest Channel



TEST REPORT

4.3 Minimum 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, 1 Mbps)

Frequency (MHz)		PSD in 100kHz (dBm)
Low Channel:	2412	0.06
Middle Channel:	2437	0.26
High Channel:	2462	1.39

IEEE 802.11g (OFDM, 6 Mbps)

Frequency (MHz)		PSD in 100kHz (dBm)
Low Channel:	2412	-2.28
Middle Channel:	2437	-2.20
High Channel:	2462	-1.62

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

Frequency (MHz)		PSD in 100kHz (dBm)
Low Channel:	2412	-1.81
Middle Channel:	2437	-2.51
High Channel:	2462	-2.74

IEEE 802.11n (40MHz) (OFDM, MCS0)

Frequency (MHz)		PSD in 100kHz (dBm)
Low Channel:	2412	-5.34
Middle Channel:	2437	-4.55
High Channel:	2462	-5.05

Cable Loss: 0.5dB

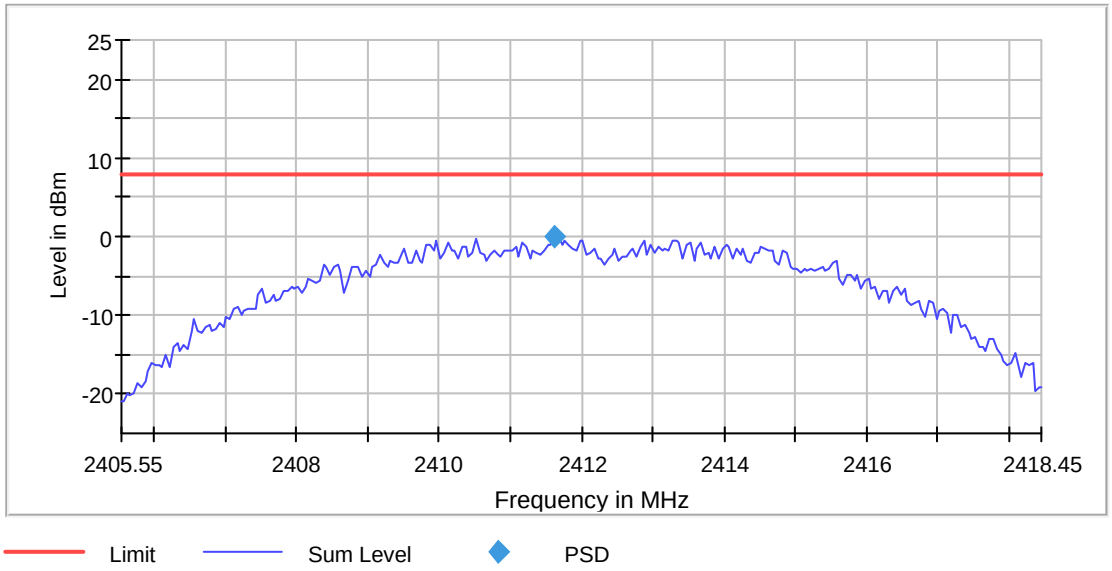
Limit: 8dBm

The plots of power spectral density are as below.

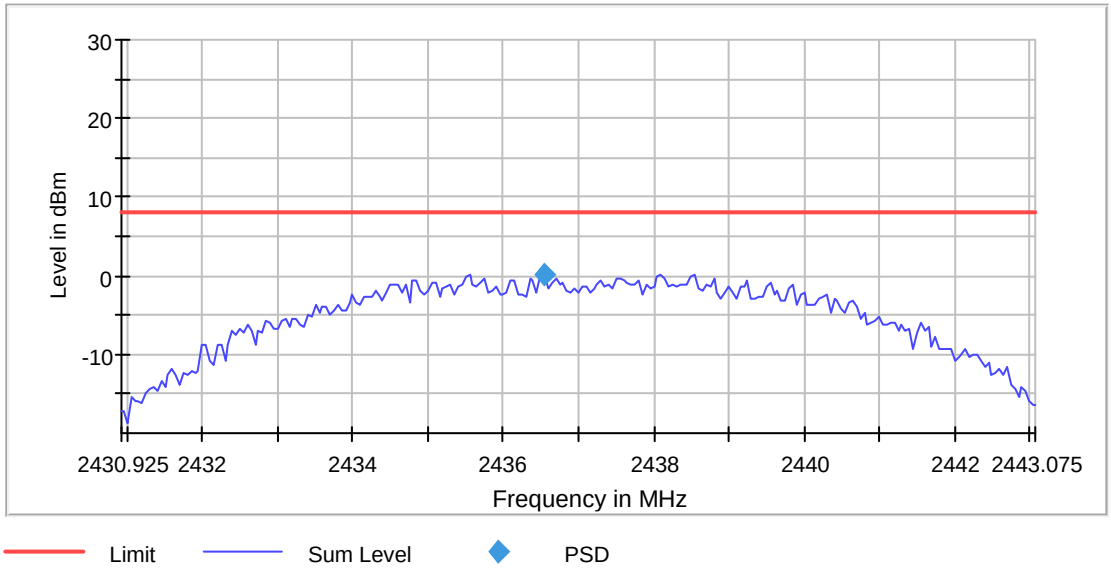
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

IEEE 802.11b, Lowest Channel



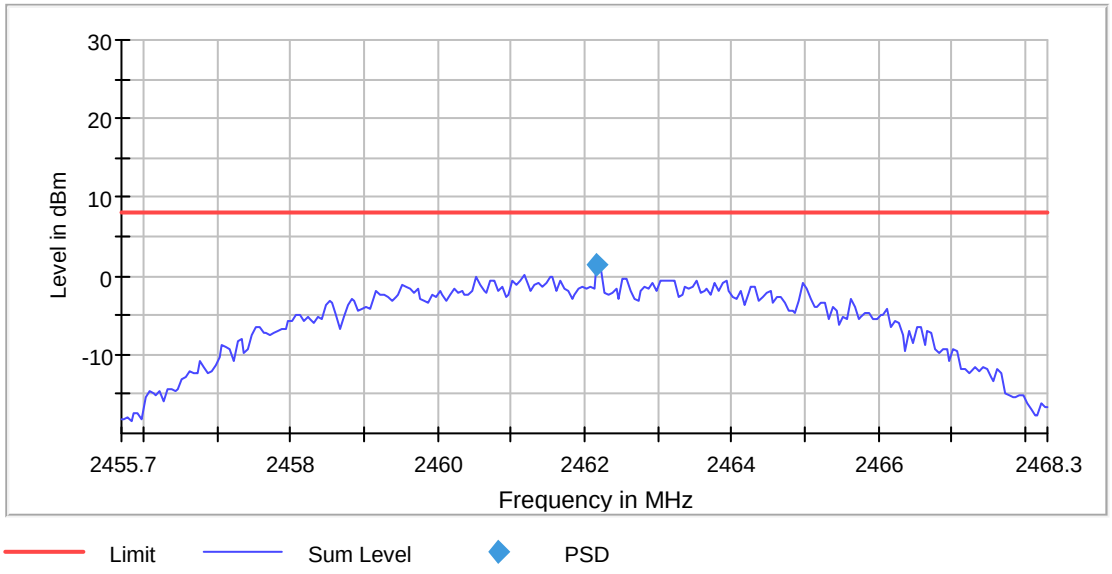
IEEE 802.11b, Middle Channel



TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

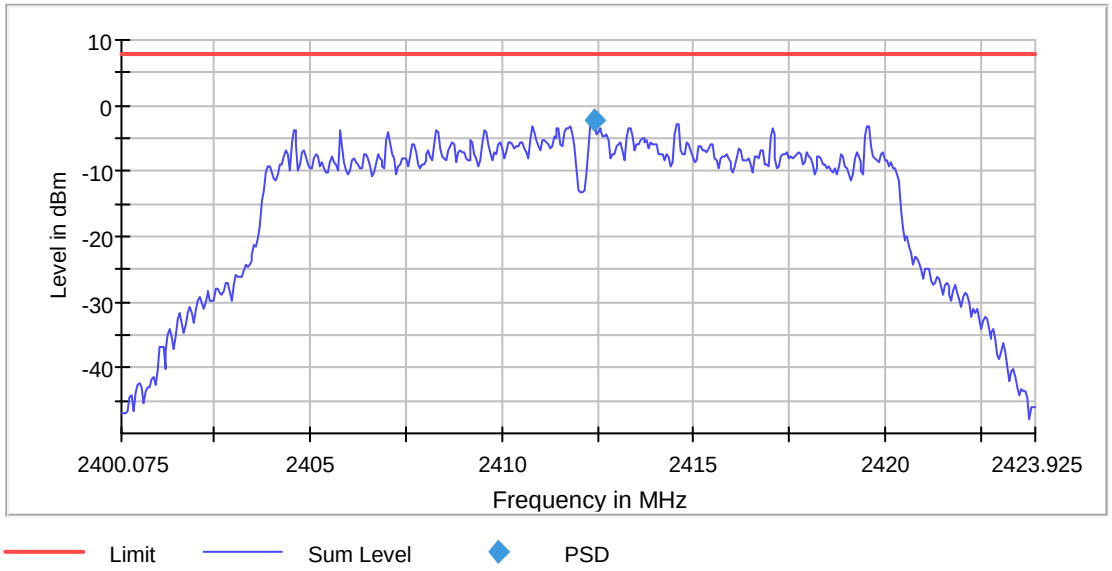
IEEE 802.11b, Highest Channel



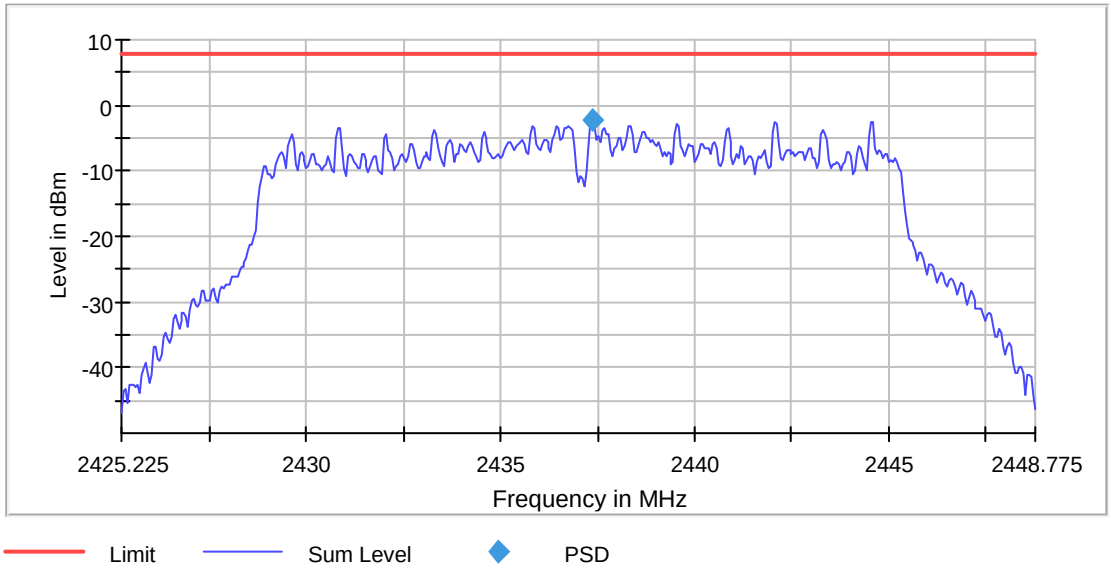
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

IEEE 802.11g, Lowest Channel



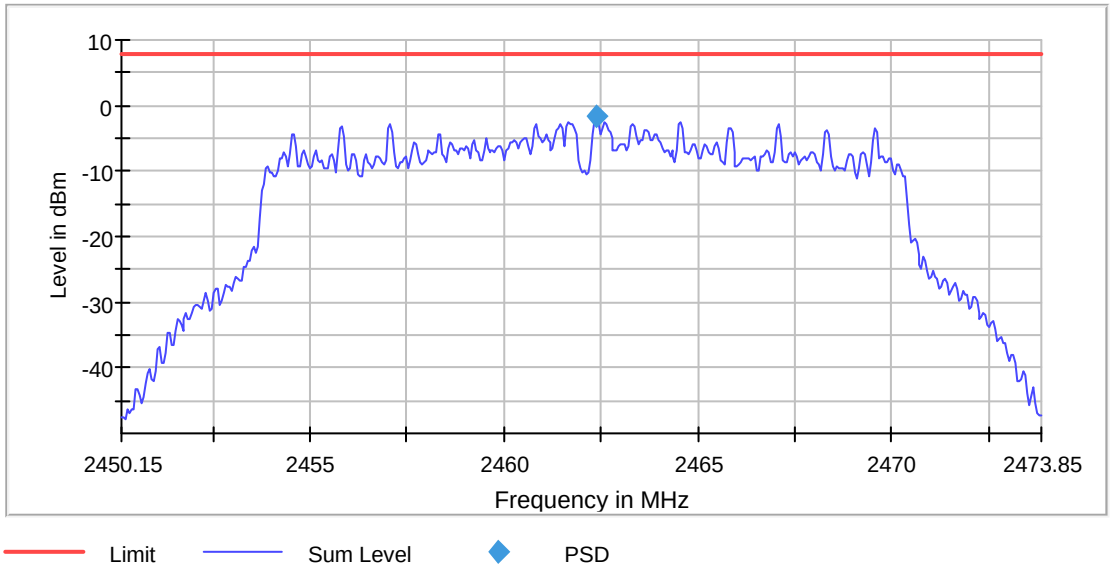
IEEE 802.11g, Middle Channel



TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

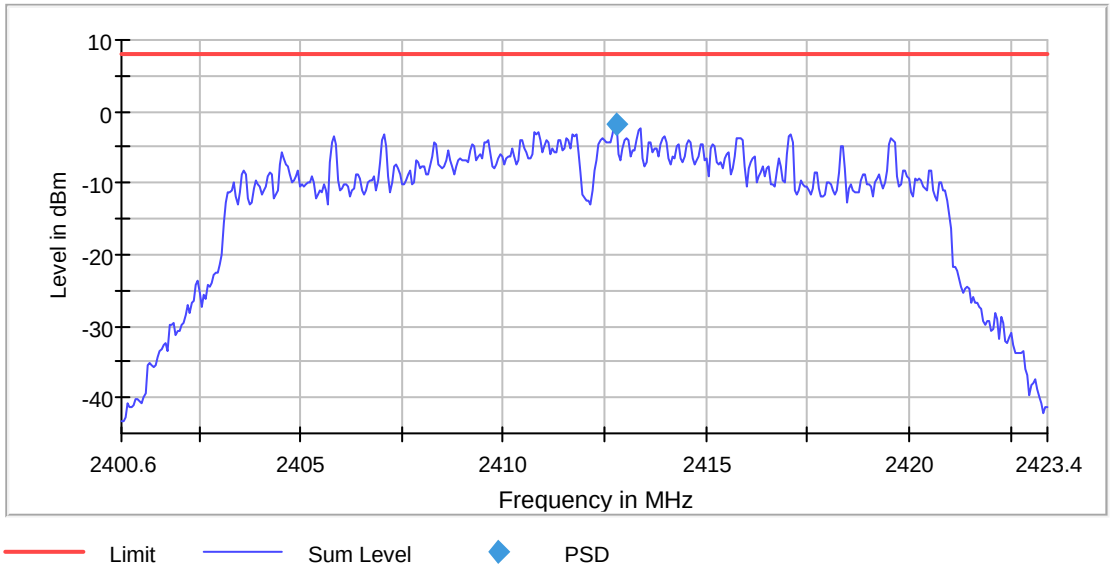
IEEE 802.11g, Highest Channel



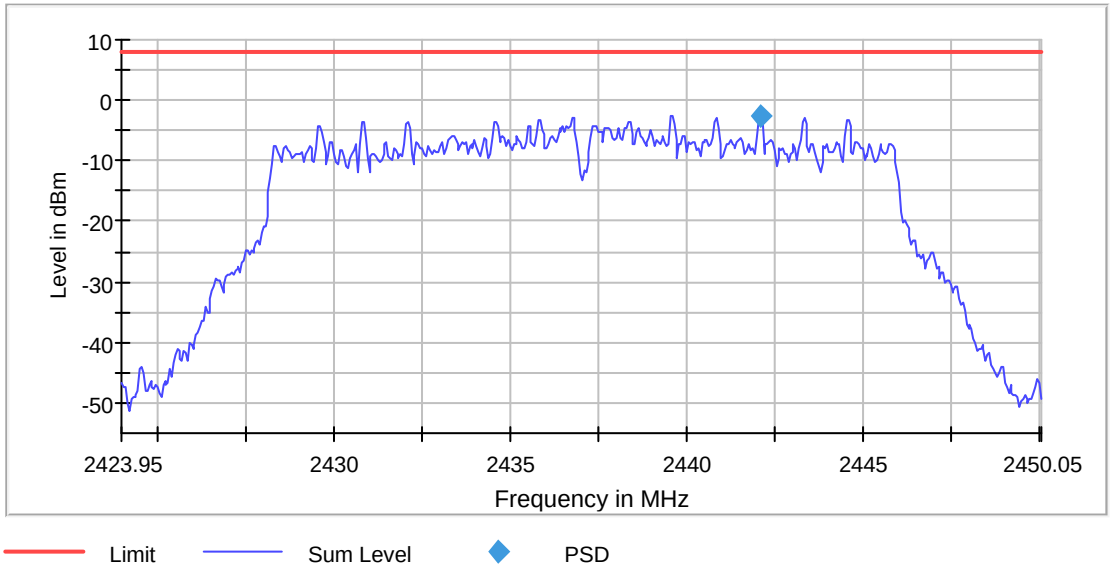
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

IEEE 802.11n (20MHz), Lowest Channel



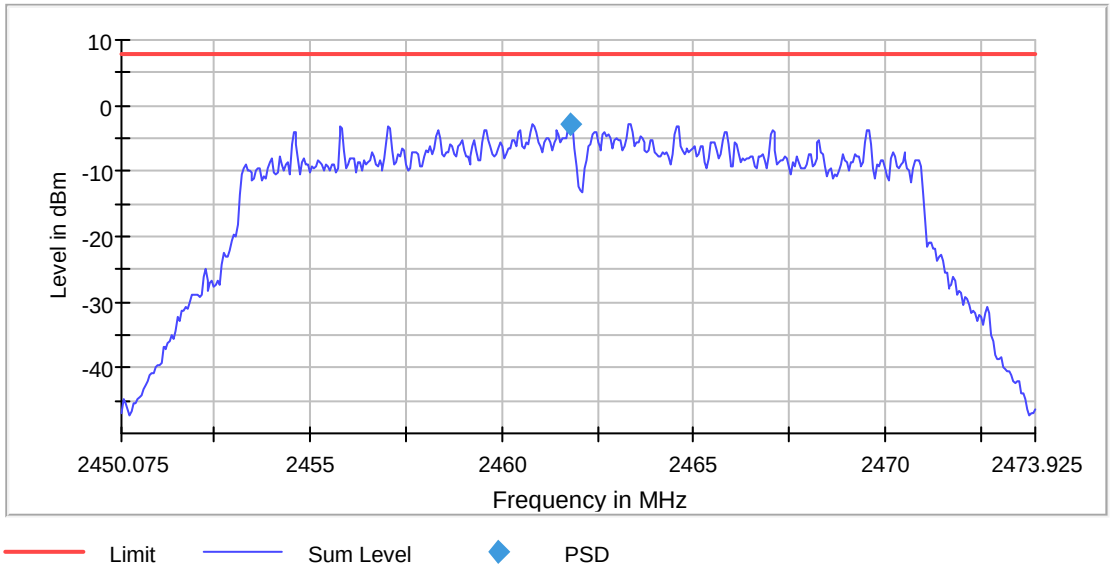
IEEE 802.11n (20MHz), Middle Channel



TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

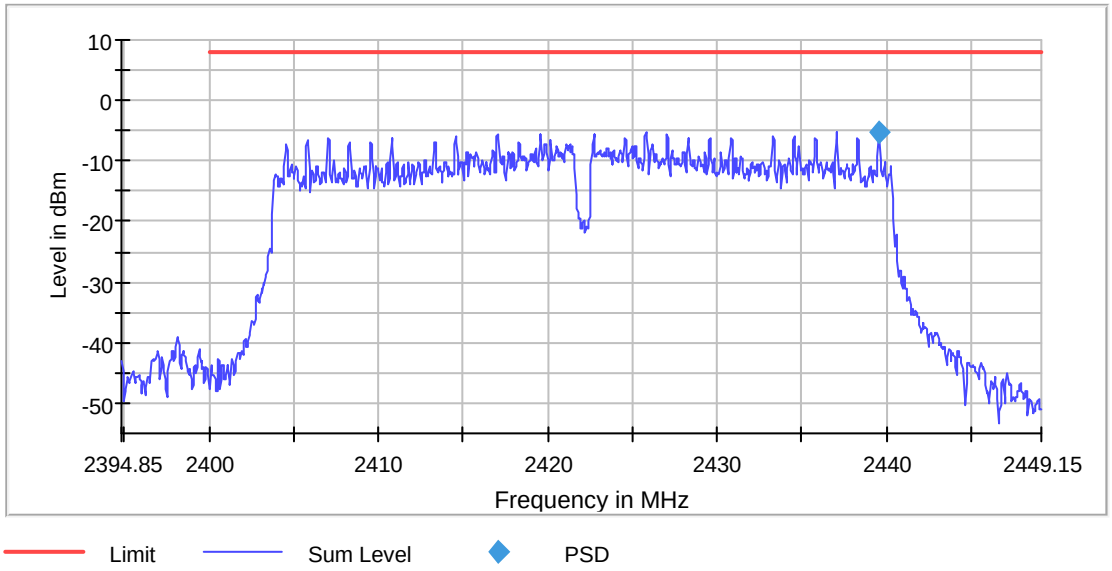
IEEE 802.11n (20MHz), Highest Channel



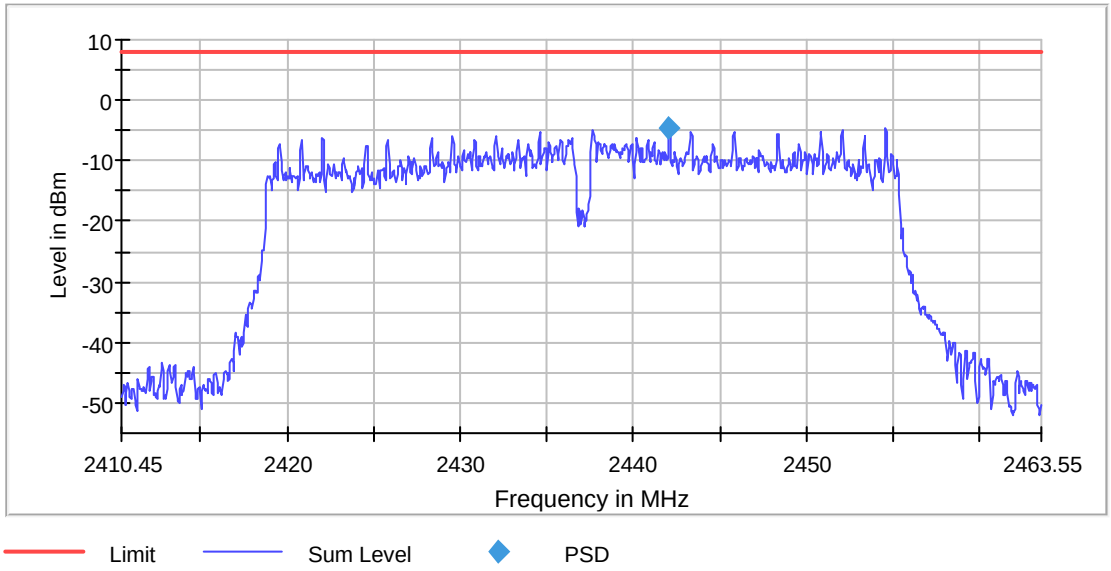
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

IEEE 802.11n (40MHz), Lowest Channel



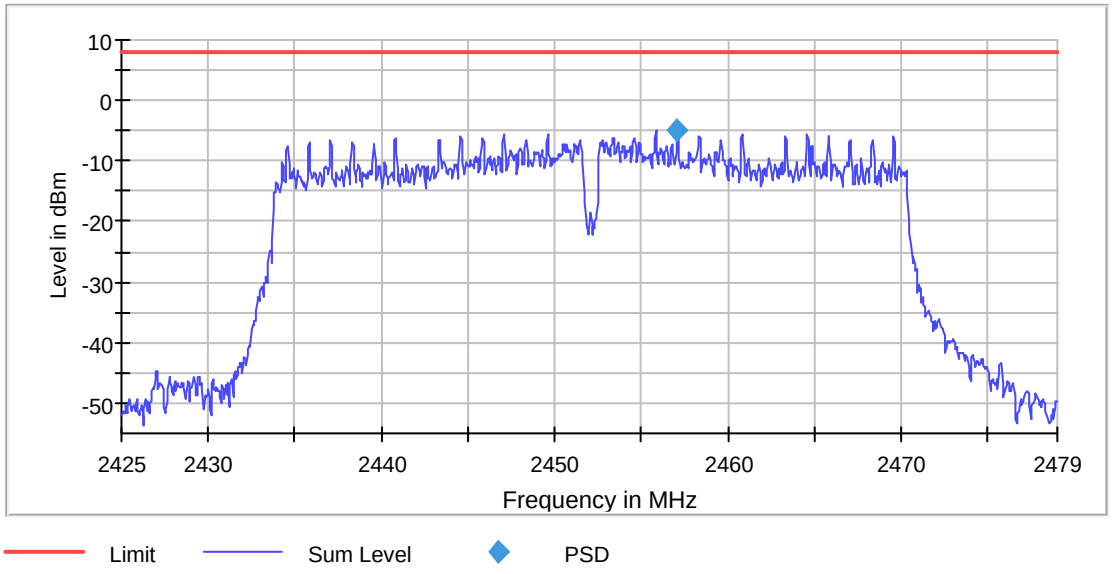
IEEE 802.11n (40MHz), Middle Channel



TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

IEEE 802.11n (40MHz), Highest Channel



TEST REPORT

4.4 Out of Band Conducted Emissions

For IEEE 802.11b/g/n20/n40MHz, 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 IEEE 802.11b/g/n20/n40MHz.

The measurement procedures under sections 11 of KDB558074 D01 v05r02 (April 2, 2019) were used.

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

Limits:

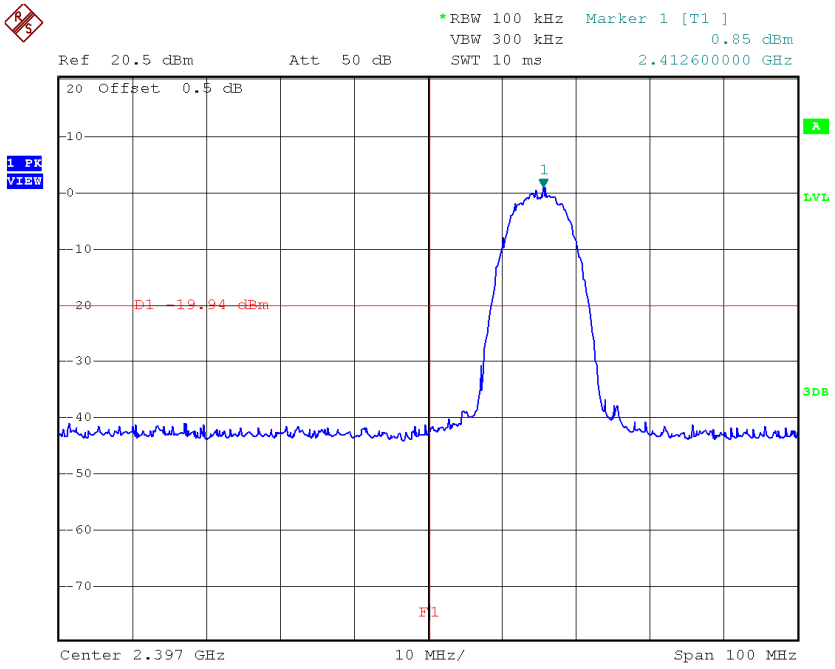
All spurious emission and up to the tenth harmonic was measured and they were found to be at least 20dB below the maximum measured in-band peak PSD level.

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

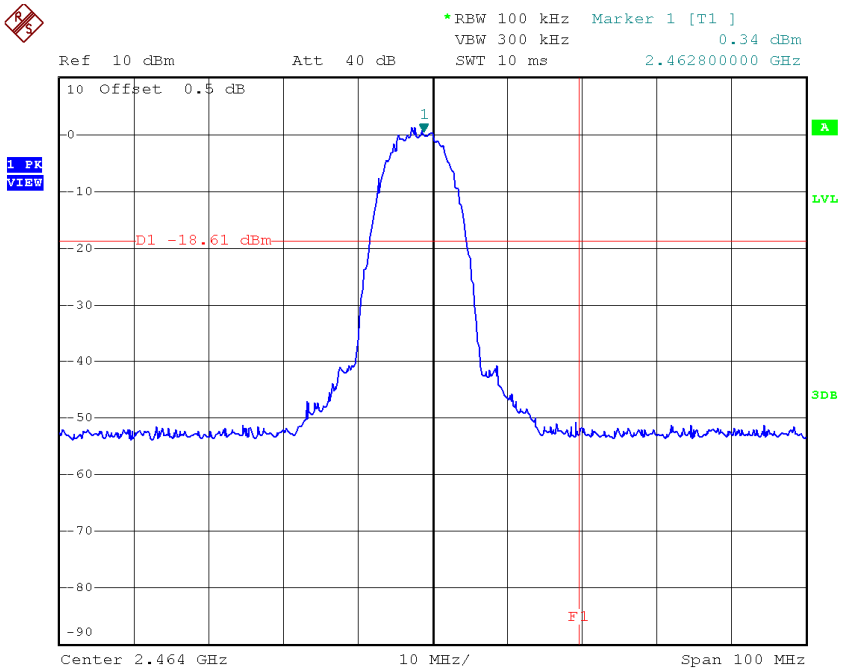
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11b, Lowest Channel, Bandedge



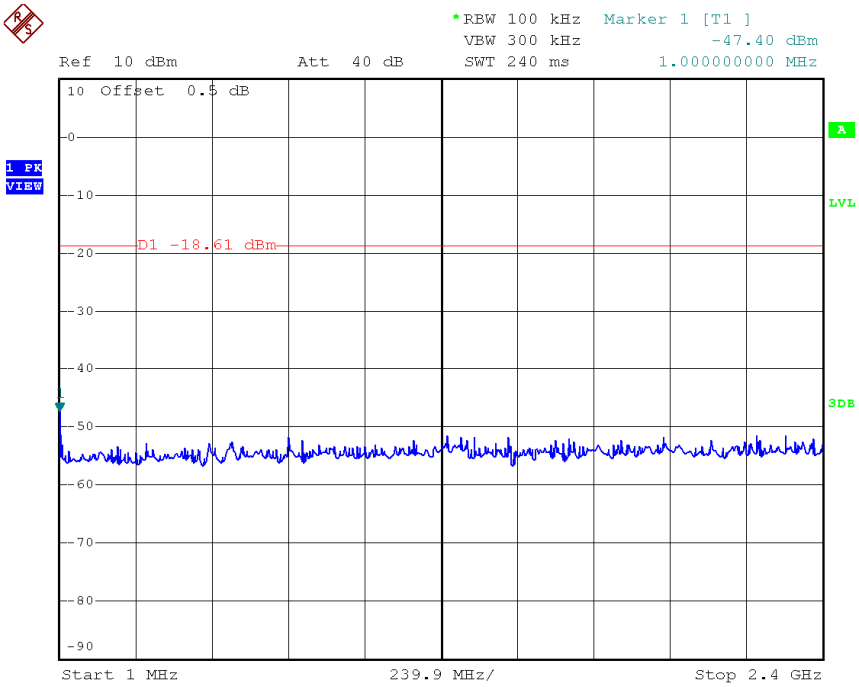
IEEE 802.11b, Highest Channel, Bandedge



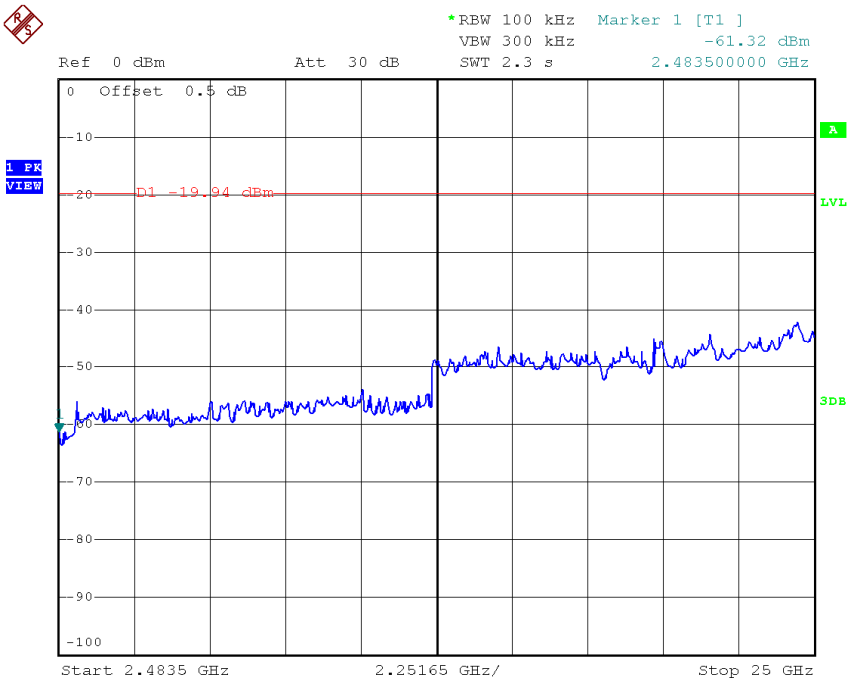
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11b, Lowest Channel, Plot A



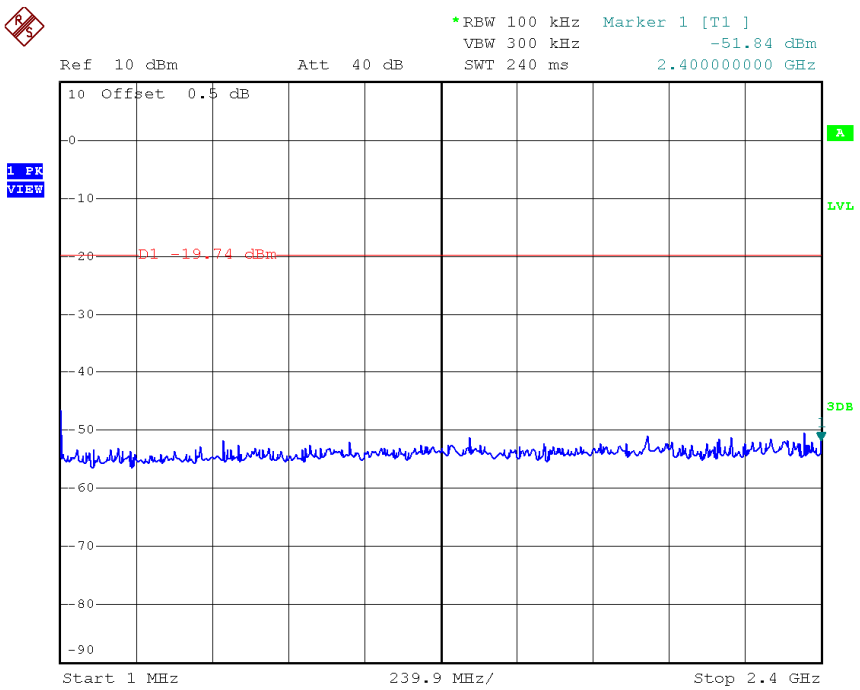
IEEE 802.11b, Lowest Channel, Plot B



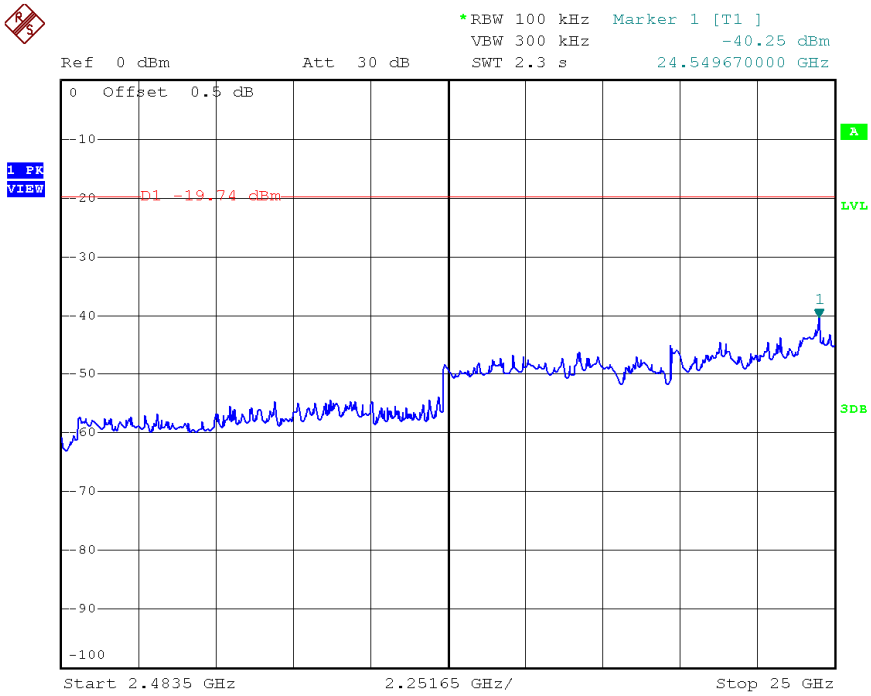
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11b, Middle Channel, Plot A



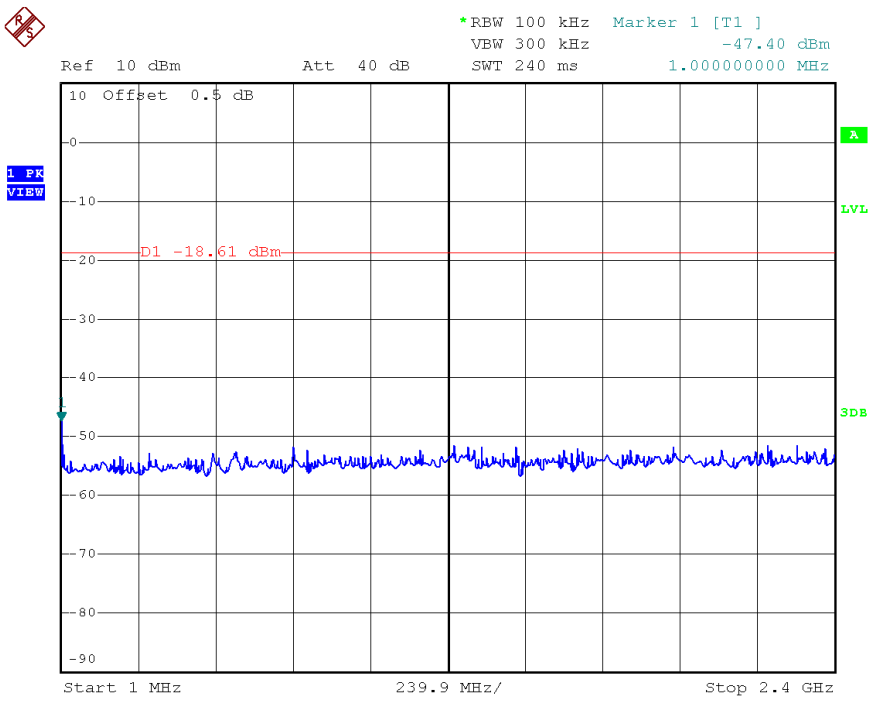
IEEE 802.11b, Middle Channel, Plot B



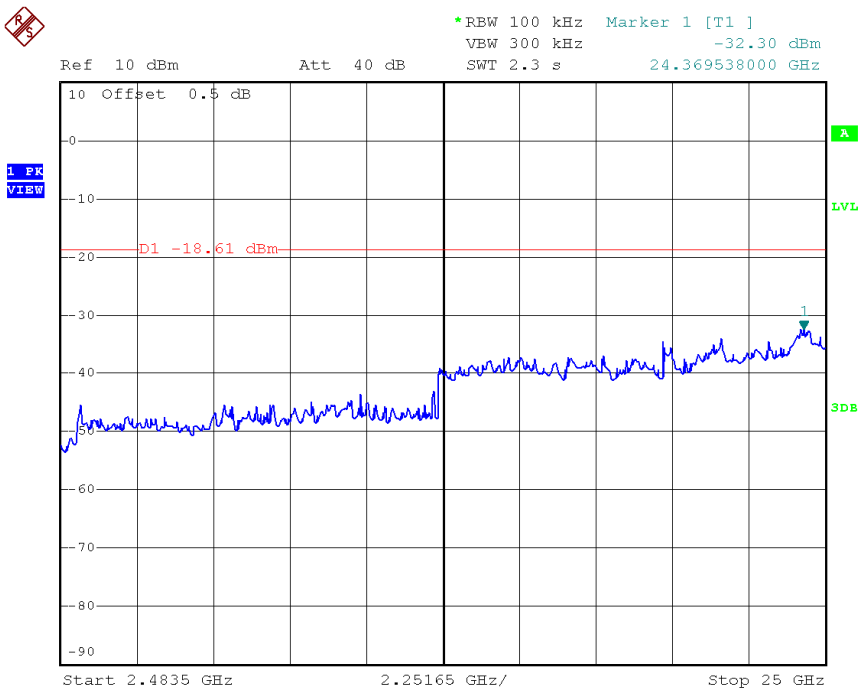
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11b, Highest Channel, Plot A



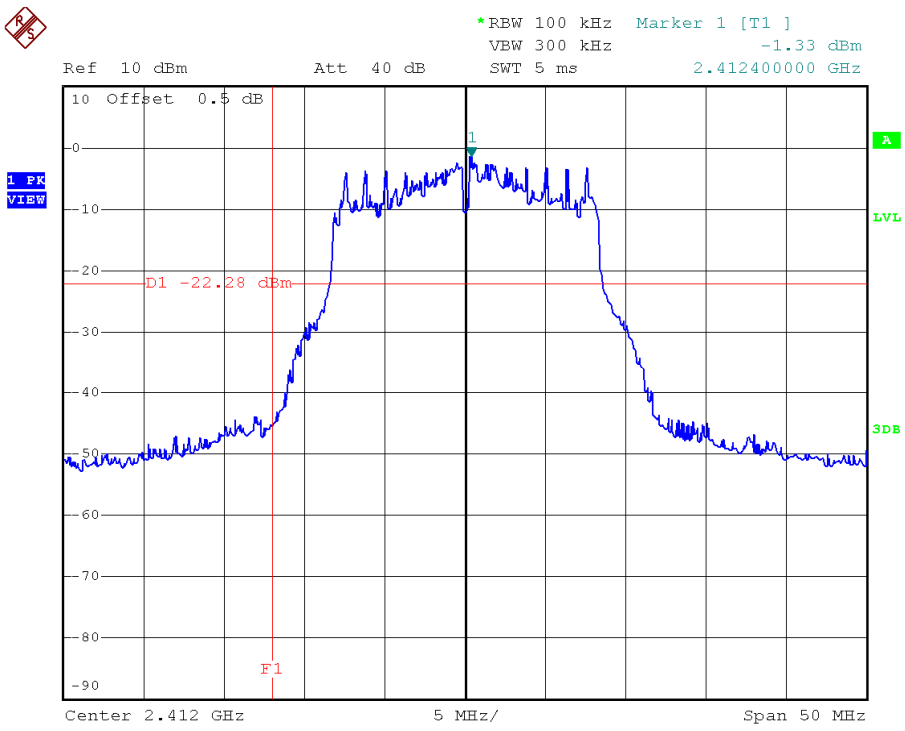
IEEE 802.11b, Highest Channel, Plot B



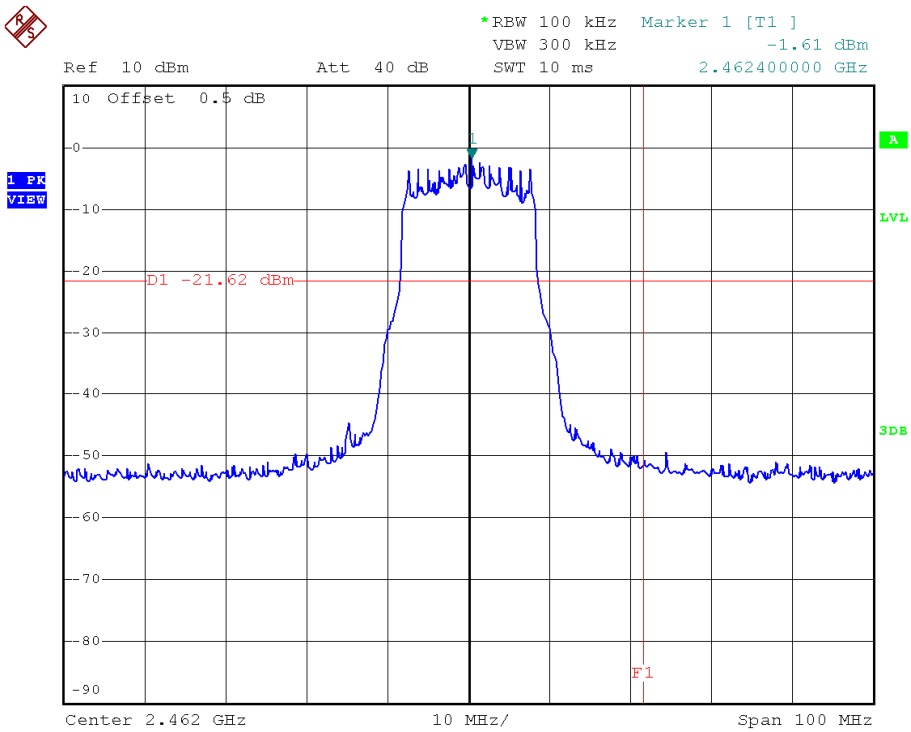
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11g, Lowest Channel, Bandedge



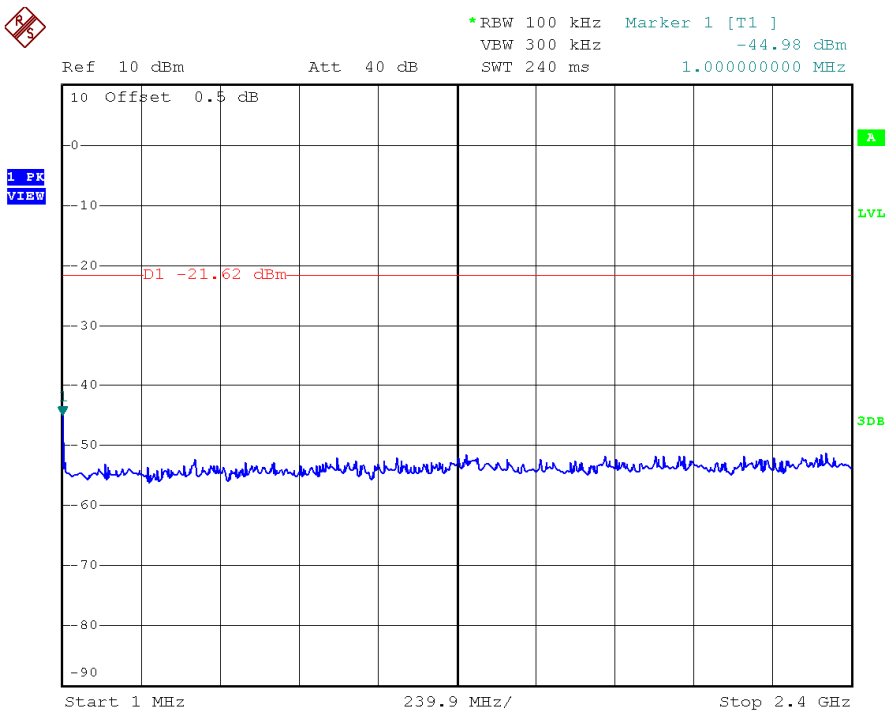
IEEE 802.11g, Highest Channel, Bandedge



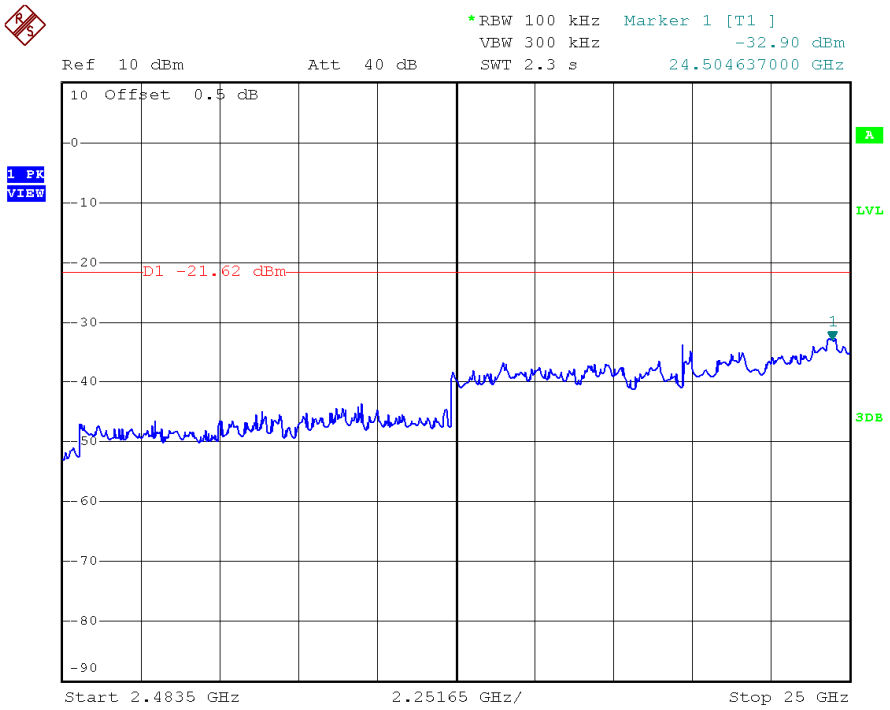
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11g, Lowest Channel, Plot A



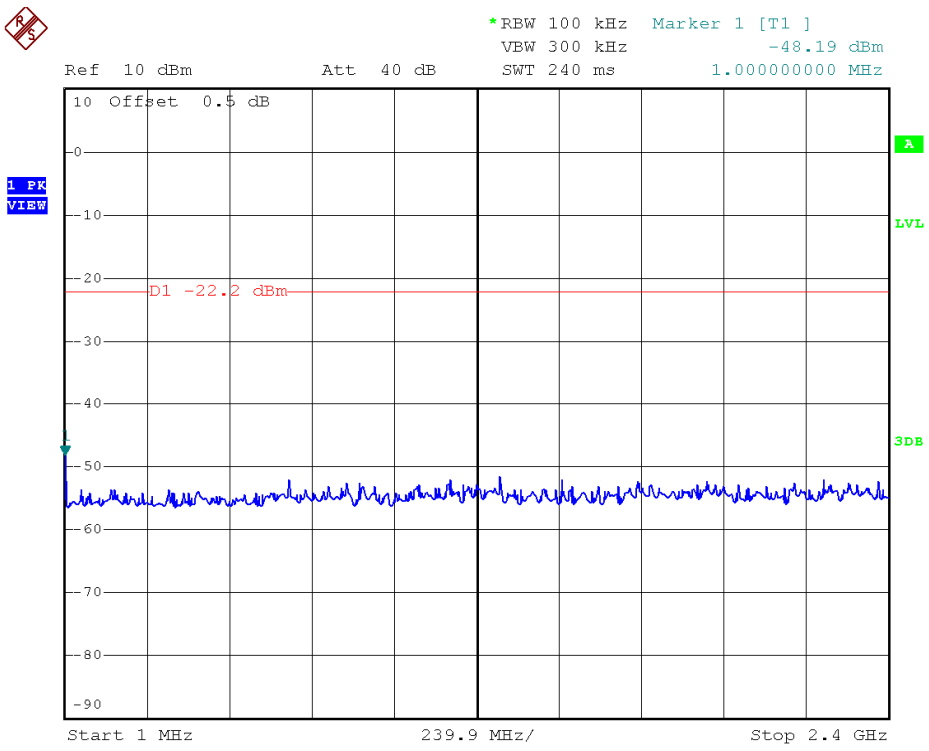
IEEE 802.11g, Lowest Channel, Plot B



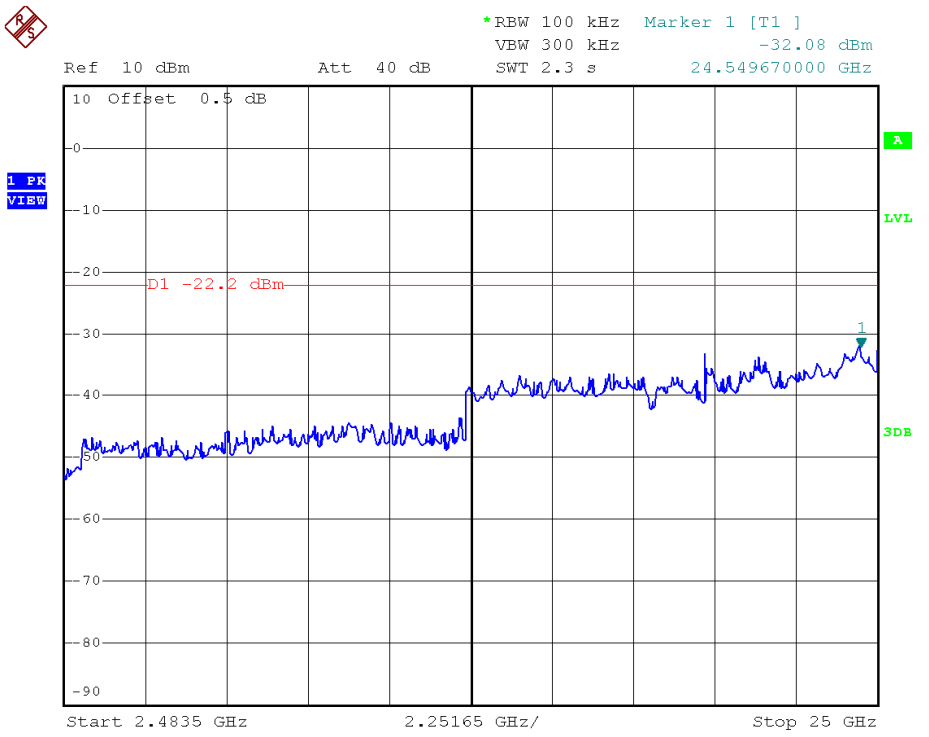
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11g, Middle Channel, Plot A



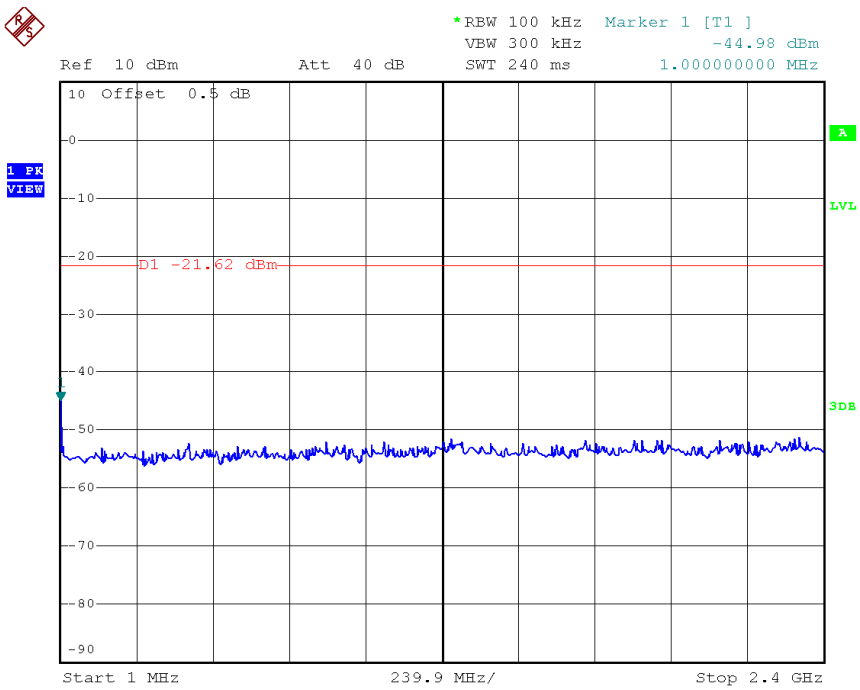
IEEE 802.11g, Middle Channel, Plot B



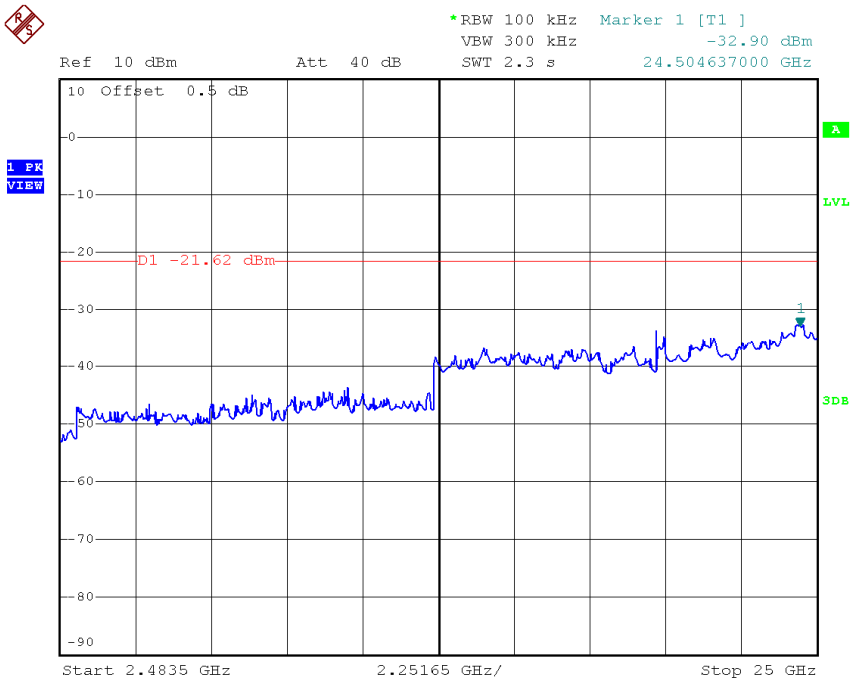
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11g, Highest Channel, Plot A



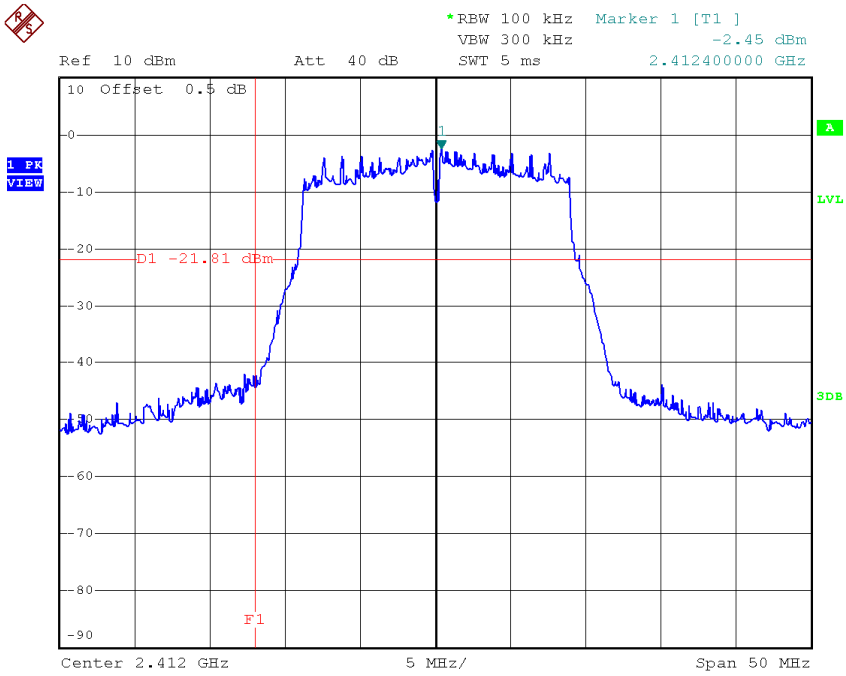
IEEE 802.11g, Highest Channel, Plot B



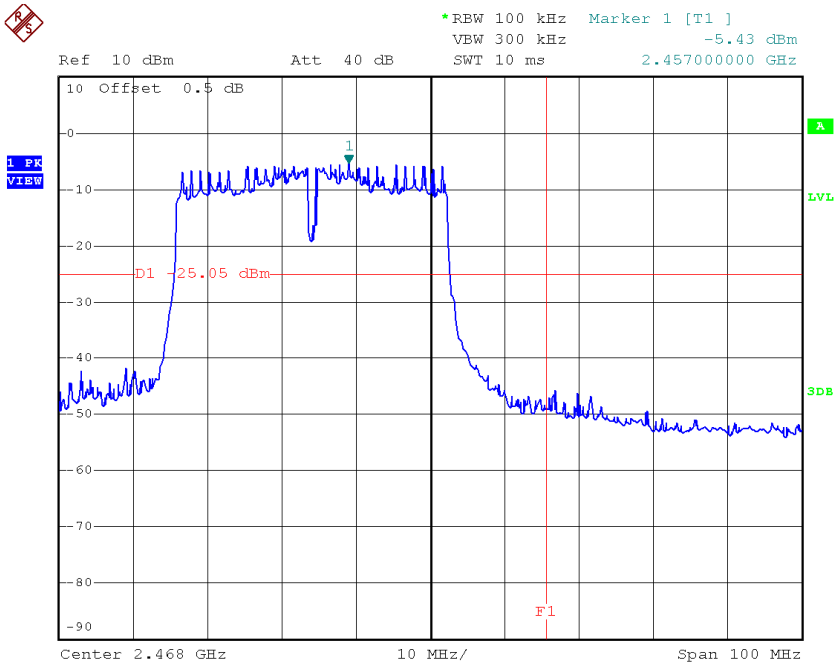
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11n (20MHz), Lowest Channel, Bandedge



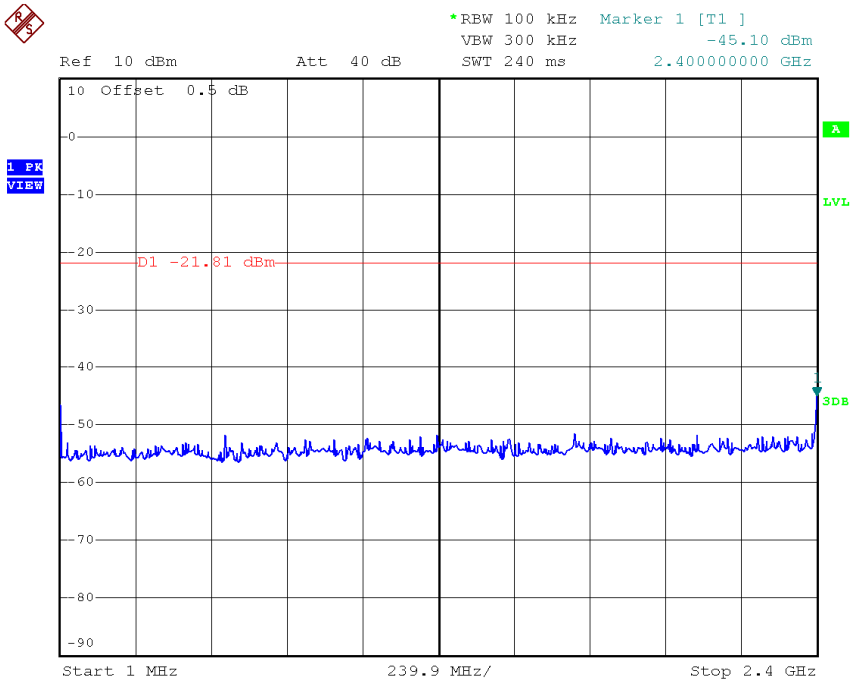
IEEE 802.11n (20MHz), Highest Channel, Bandedge



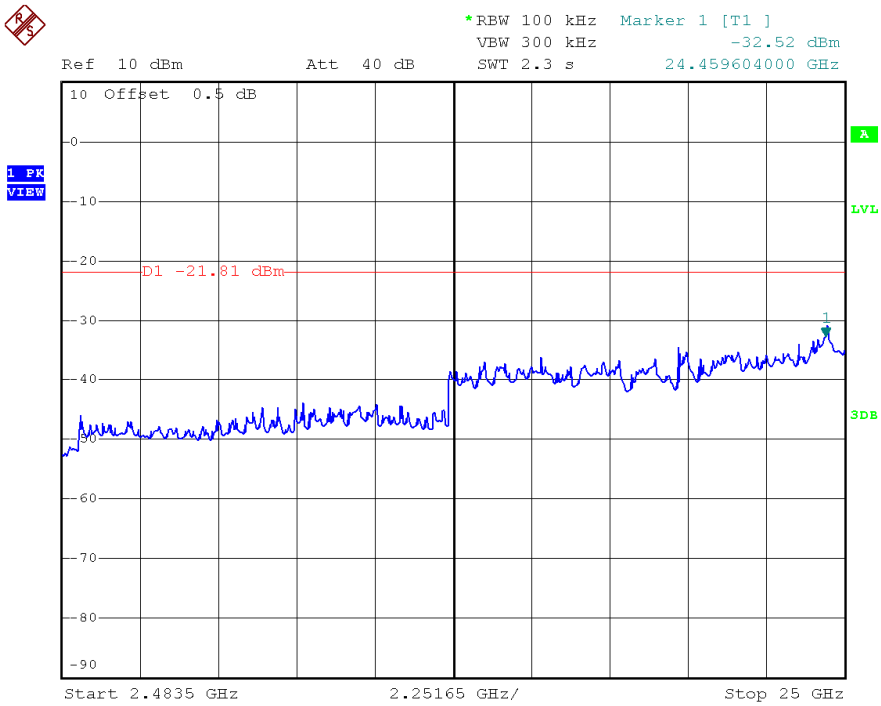
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

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



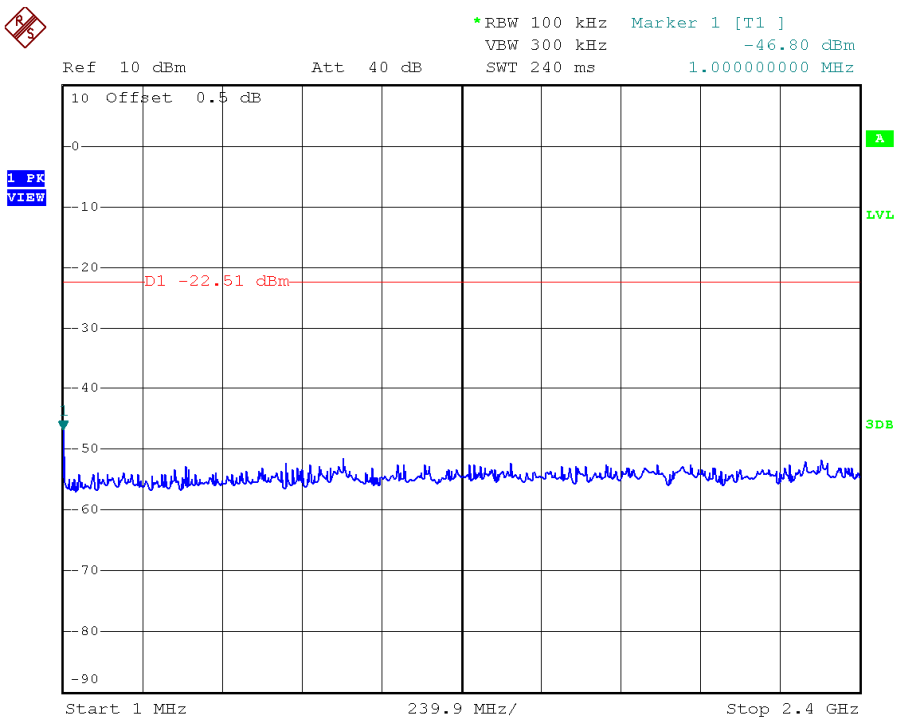
IEEE 802.11n (20MHz), Lowest Channel, Plot B



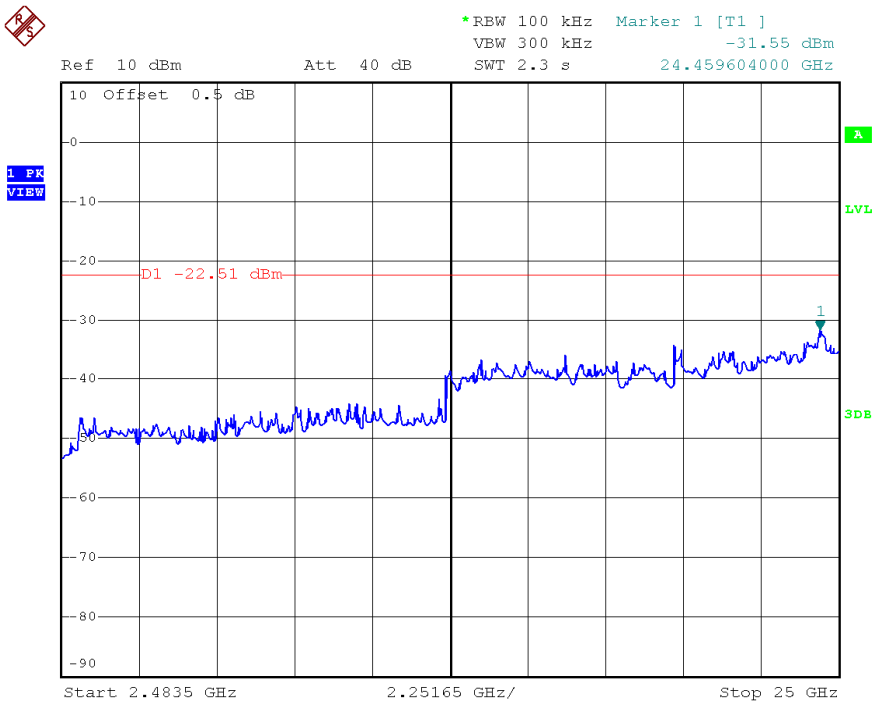
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

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



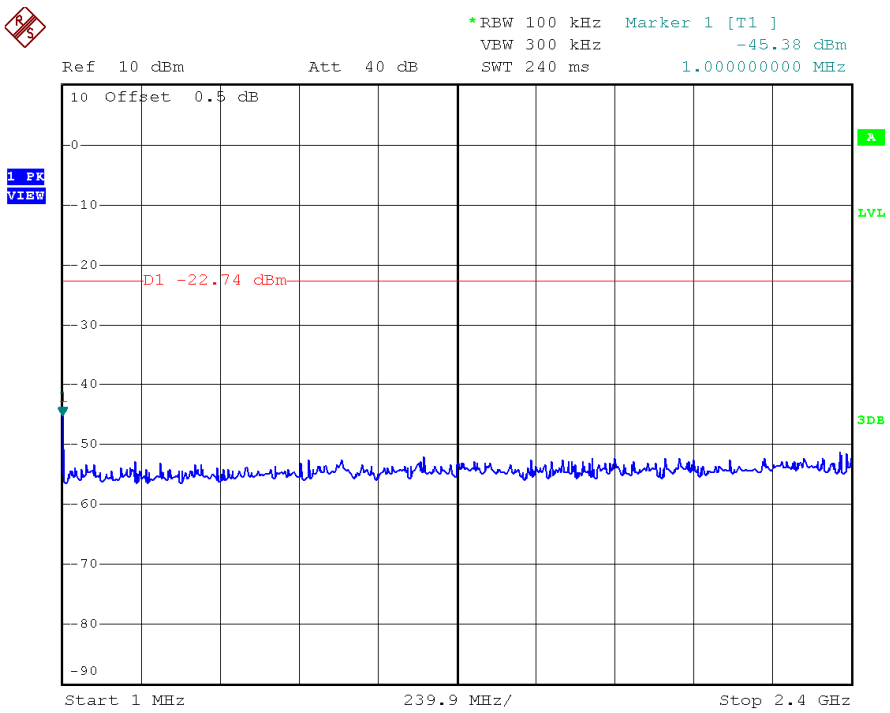
IEEE 802.11n (20MHz), Middle Channel, Plot B



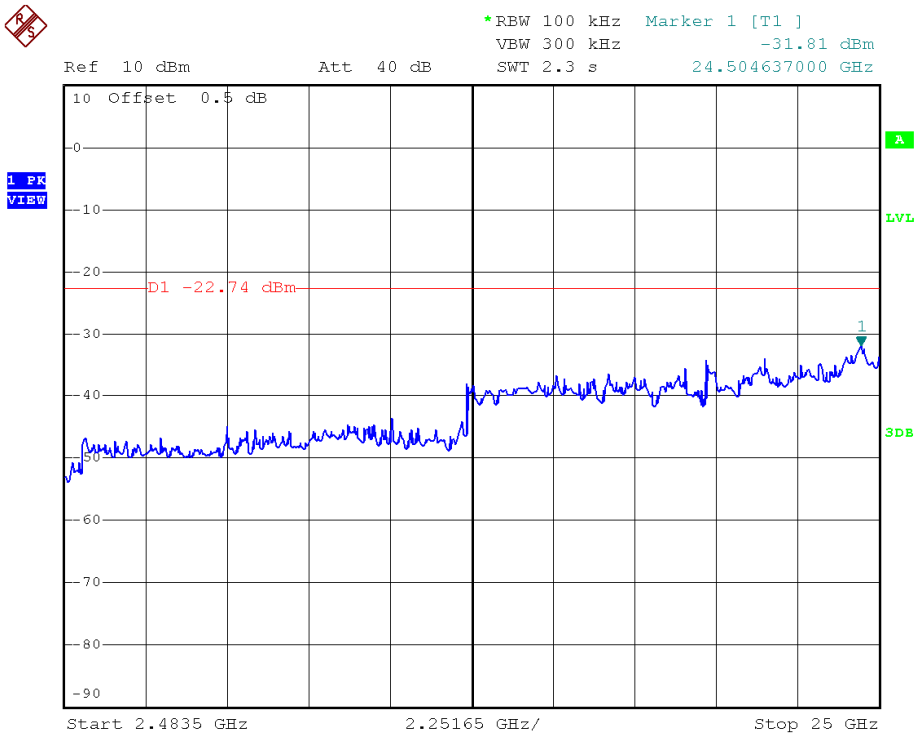
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

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



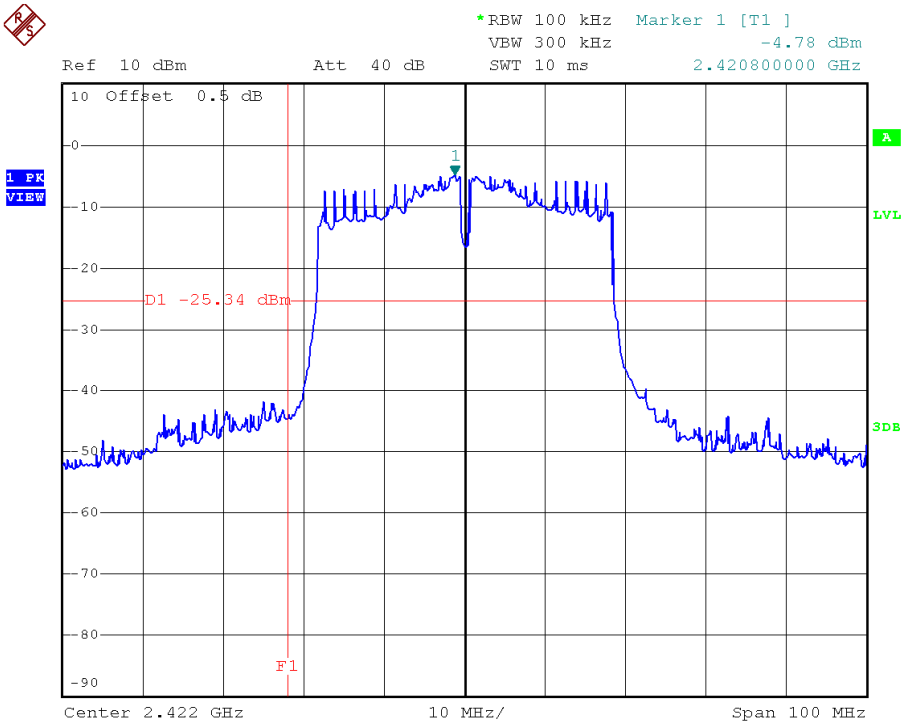
IEEE 802.11n (20MHz), Highest Channel, Plot B



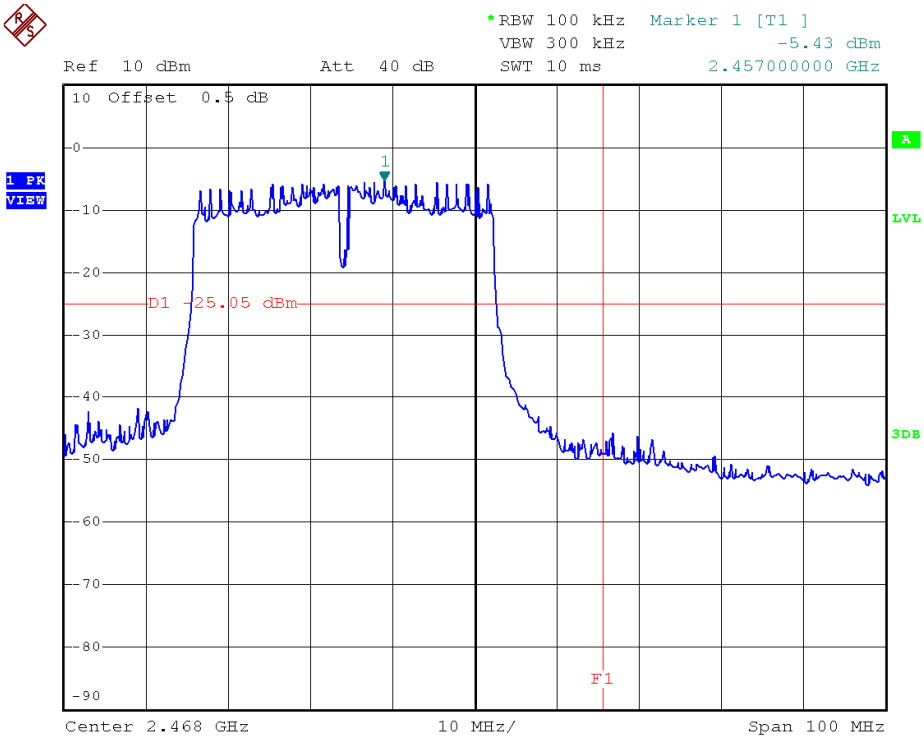
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11n (40MHz), Lowest Channel, Bandedge



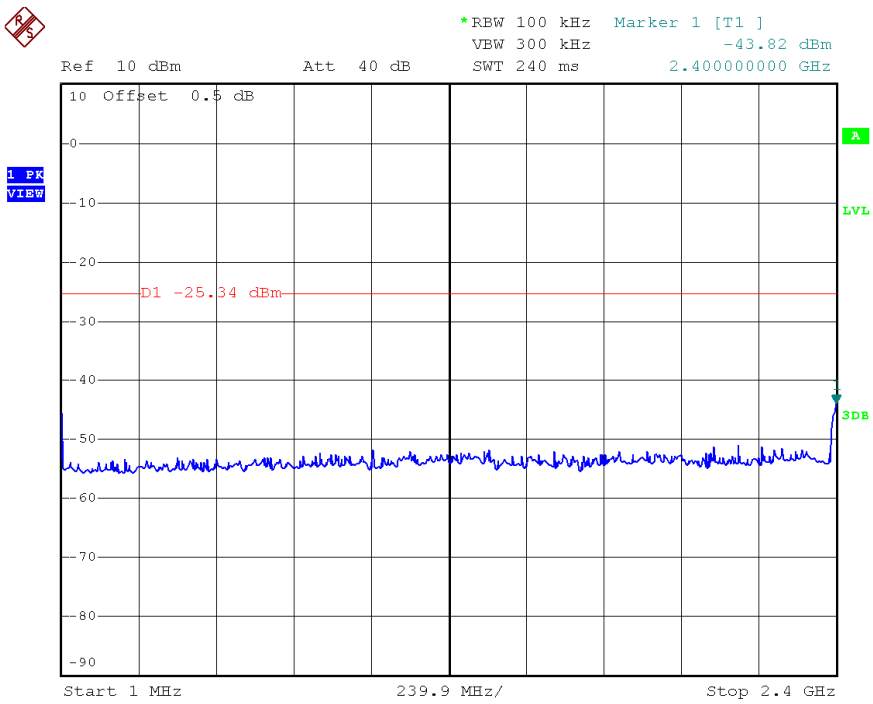
IEEE 802.11n (40MHz), Highest Channel, Bandedge



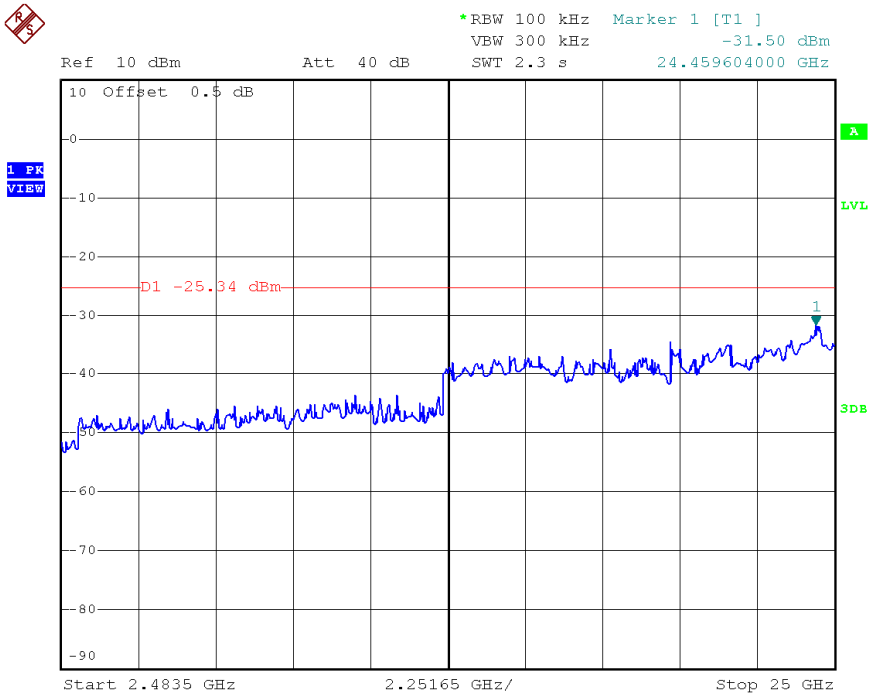
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11n (40MHz), Lowest Channel, Plot A



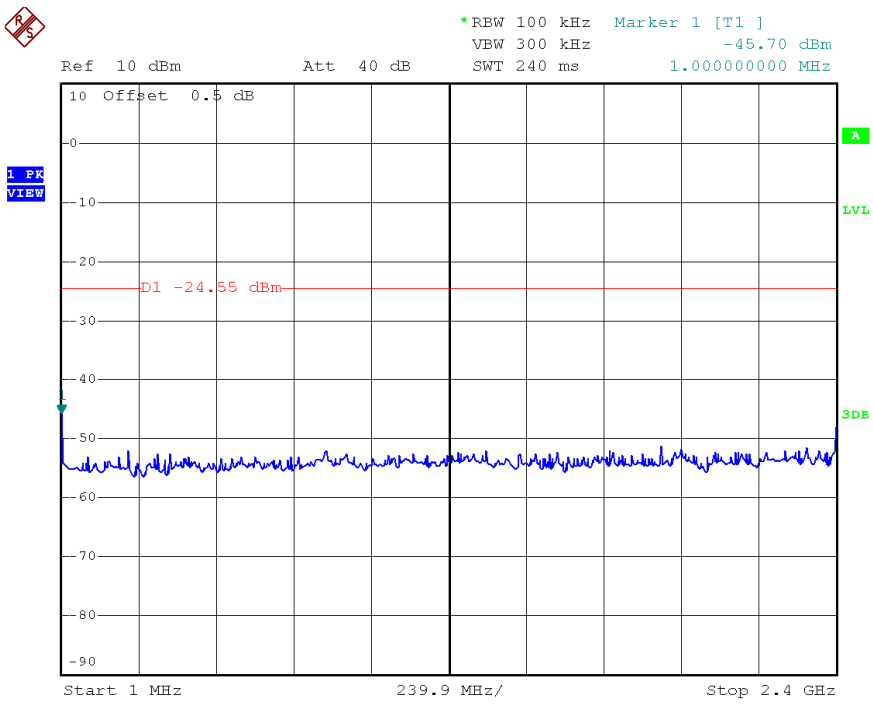
IEEE 802.11n (40MHz), Lowest Channel, Plot B



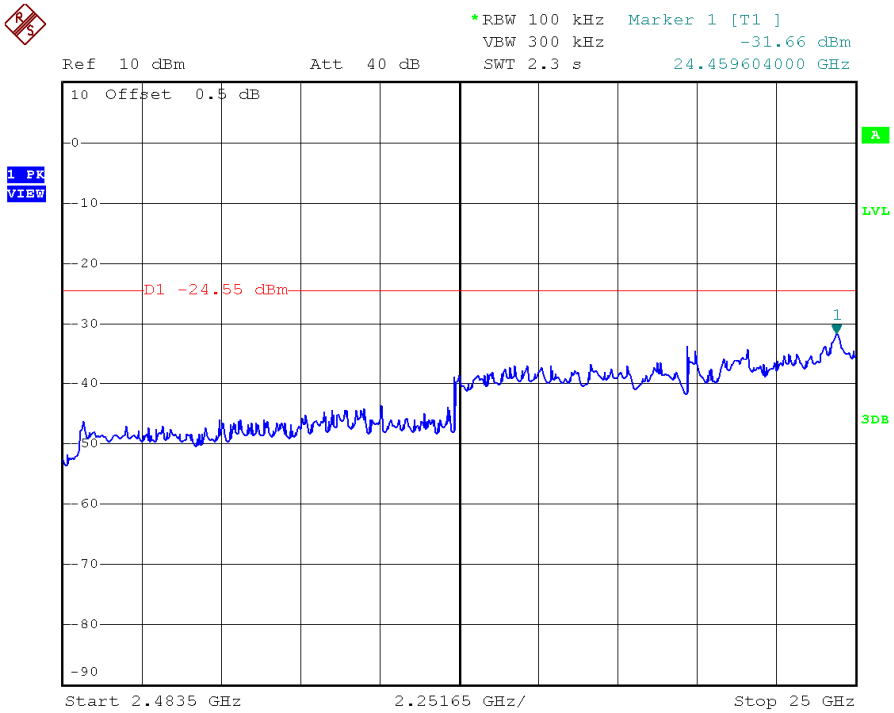
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11n (40MHz), Middle Channel, Plot A



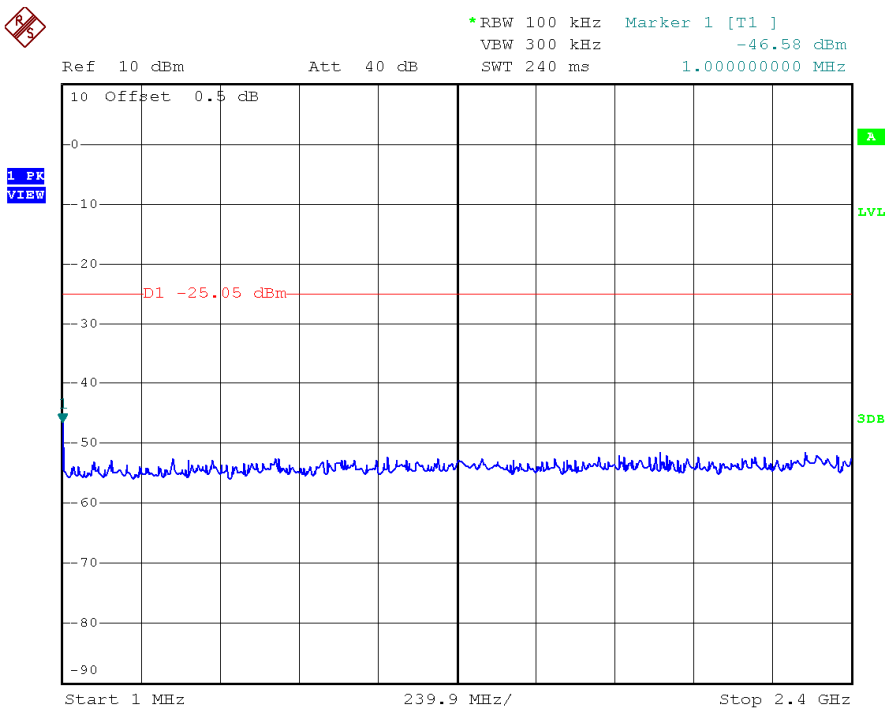
IEEE 802.11n (40MHz), Middle Channel, Plot B



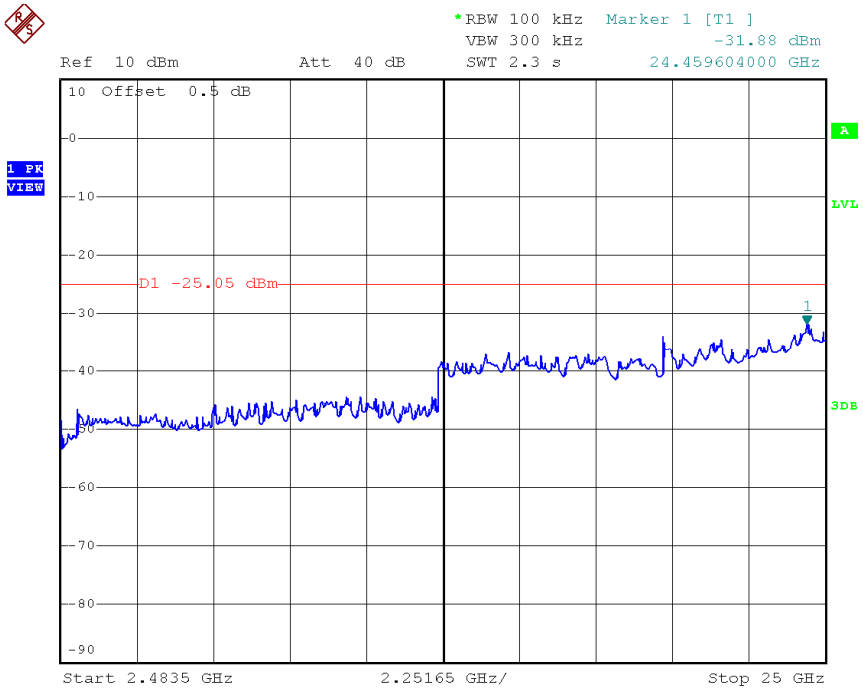
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

IEEE 802.11n (40MHz), Highest Channel, Plot A



IEEE 802.11n (40MHz), Highest Channel, Plot B

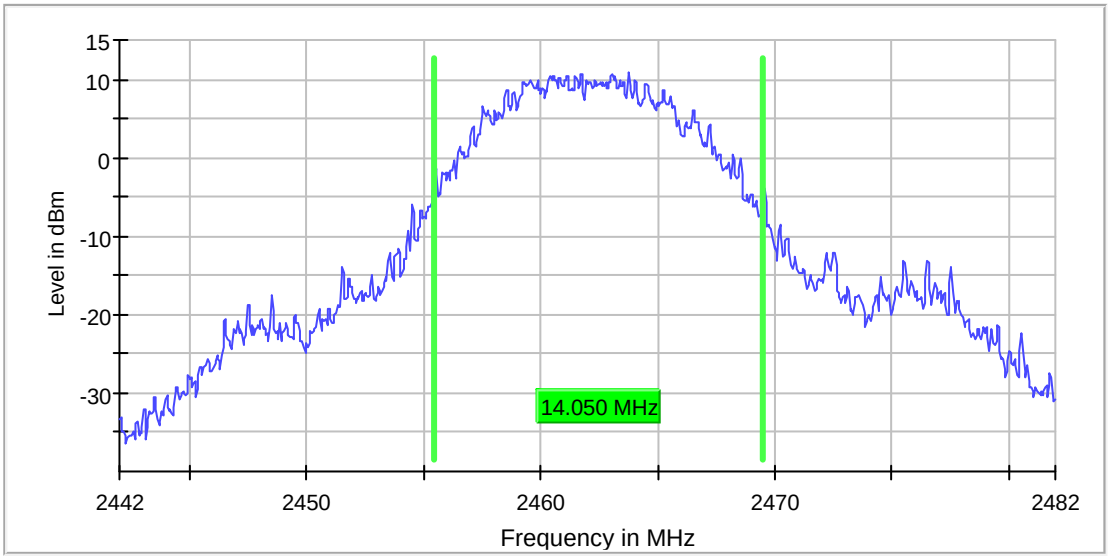


TEST REPORT

Occupied Bandwidth Results: (IEEE 802.11b)

(IEEE 802.11b)		Occupied Bandwidth (MHz)
Low Channel:	2412	12.90
Middle Channel:	2437	13.40
High Channel:	2462	14.05

The worst case is shown as below:

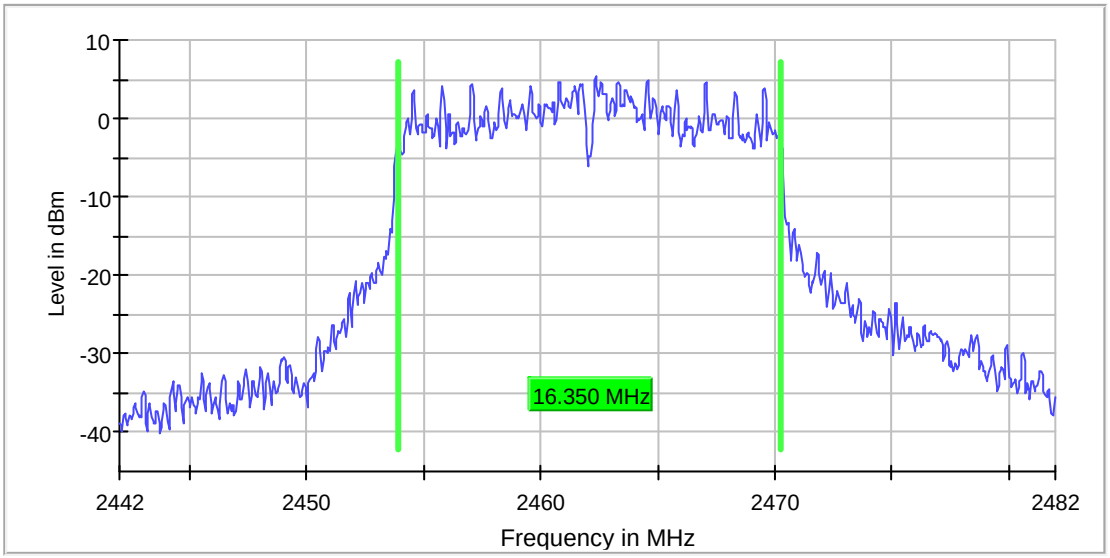


TEST REPORT

Occupied Bandwidth Results: (IEEE 802.11g)

(IEEE 802.11g)		Occupied Bandwidth (MHz)
Low Channel:	2412	16.30
Middle Channel:	2437	16.20
High Channel:	2462	16.35

The worst case is shown as below:

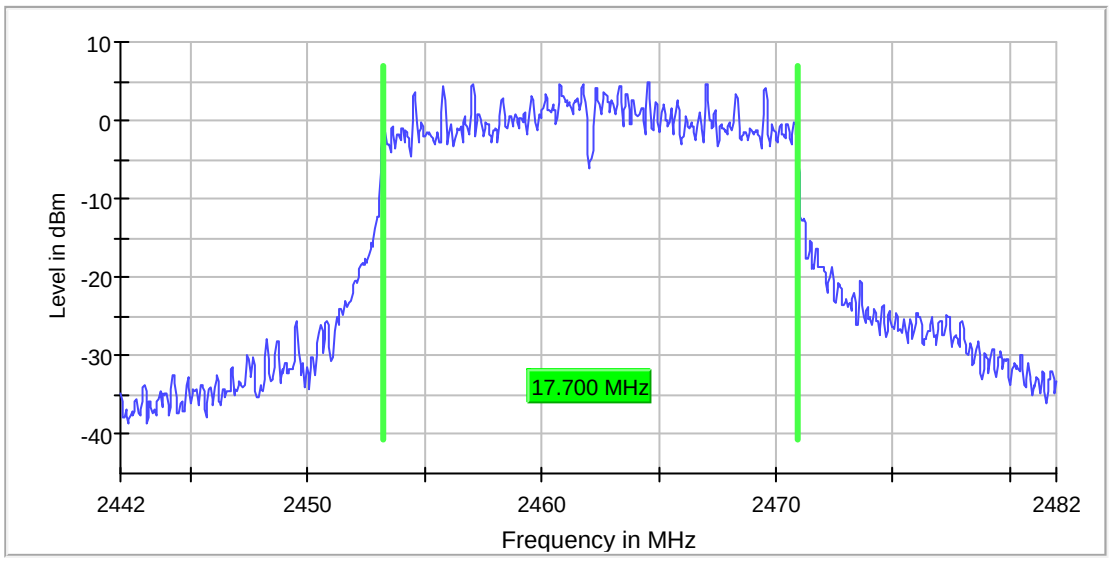


TEST REPORT

Occupied Bandwidth Results: (IEEE 802.11n (20MHz))

(IEEE 802.11n (20MHz))		Occupied Bandwidth (MHz)
Low Channel:	2412	17.50
Middle Channel:	2437	17.55
High Channel:	2462	17.70

The worst case is shown as below:

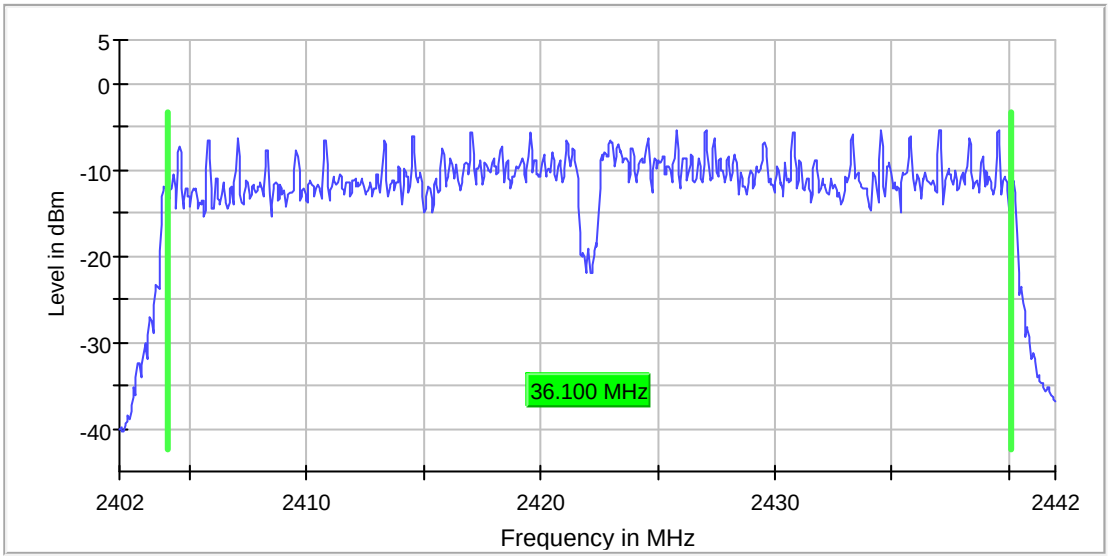


TEST REPORT

Occupied Bandwidth Results: (Bluetooth)

(IEEE 802.11n (HT20))		Occupied Bandwidth (MHz)
Low Channel:	2422	36.10
Middle Channel:	2437	35.95
High Channel:	2462	35.90

The worst case is shown as below:



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 reflects the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

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

Example:

Assume a receiver reading of 62.0 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 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

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 599.996 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.

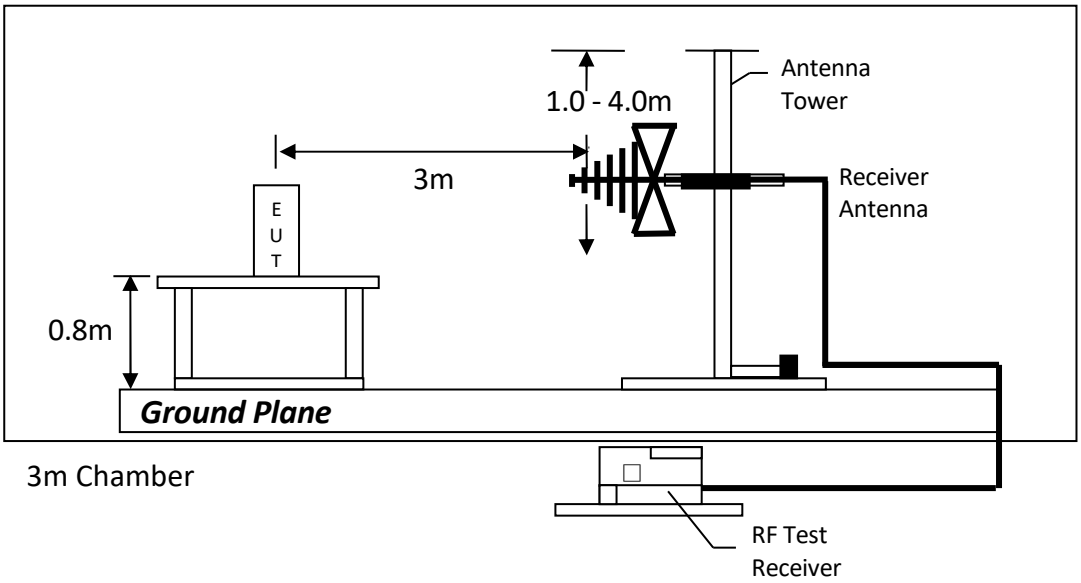
Judgement –

Passed by 1.2 dB margin

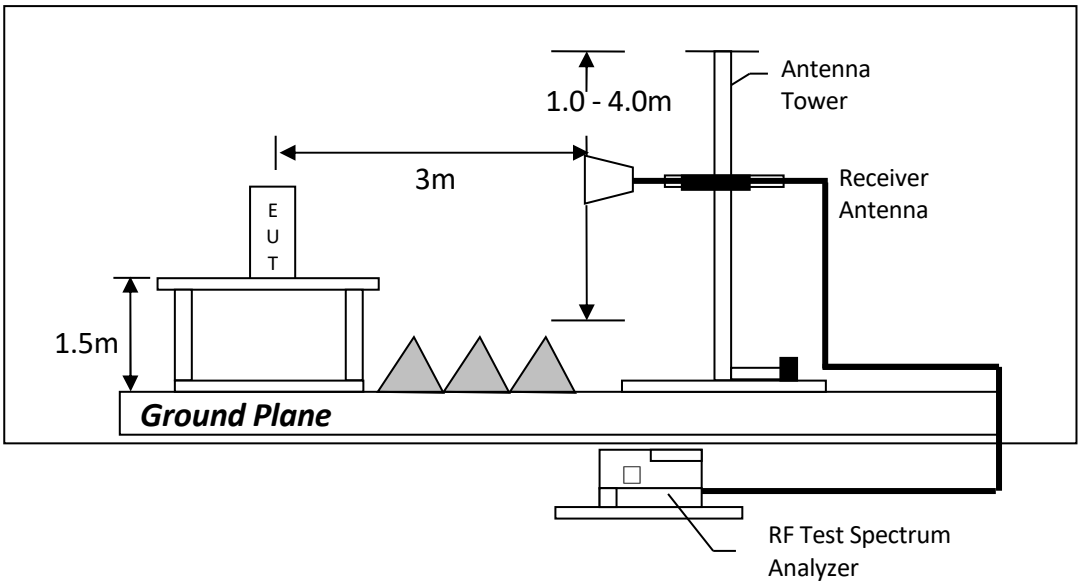
TEST REPORT

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

RADIATED EMISSION DATA

Mode: TX-Channel 01

Table 1, IEEE 802.11b DSSS 1Mbps

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	40.7	33	29.4	37.1	54.0	-16.9
V	4824.000	42.4	33	34.9	44.3	54.0	-9.7
H	12060.000	25.3	33	40.5	32.8	54.0	-21.2

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	55.9	33	29.4	52.3	74.0	-21.7
V	4824.000	47.1	33	34.9	49.0	74.0	-25.0
H	12060.000	38.8	33	40.5	46.3	74.0	-27.7

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.
4. Negative value in the margin column shows emission below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

Mode: TX-Channel 06

Table 2, IEEE 802.11b DSSS 1Mbps

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	36.7	33	34.9	38.6	54.0	-15.4
V	7311.000	34.7	33	37.9	39.6	54.0	-14.4
V	12185.000	22.9	33	40.5	30.4	54.0	-23.6

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	44.0	33	34.9	45.9	74.0	-28.1
V	7311.000	39.3	33	37.9	44.2	74.0	-29.8
V	12185.000	36.3	33	40.5	43.8	74.0	-30.2

NOTES:
1. Peak detector is used unless otherwise stated.
2. Average detector is used for the average data of emission measurement.
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. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

Mode: TX-Channel 11

Table 3, IEEE 802.11b DSSS 1Mbps

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	41.5	33	29.4	37.9	54.0	-16.1
V	4924.000	26.8	33	34.9	28.7	54.0	-25.3
V	7386.000	25.8	33	37.9	30.7	54.0	-23.3
H	12310.000	26.4	33	40.5	33.9	54.0	-20.1

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	40.4	33	34.9	42.3	74.0	-31.7
V	7386.000	39.5	33	37.9	44.4	74.0	-29.6
H	12310.000	39.9	33	40.5	47.4	74.0	-26.6

NOTES:
1. Peak detector is used unless otherwise stated.
2. Average detector is used for the average data of emission measurement.
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. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

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	41.9	33	29.4	38.3	54.0	-15.7
V	4824.000	26.9	33	34.9	28.8	54.0	-25.2
V	12060.000	25.2	33	40.5	32.7	54.0	-21.3

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	61.2	33	29.4	57.6	74.0	-16.4
V	4824.000	40.3	33	34.9	42.2	74.0	-31.8
V	12060.000	38.9	33	40.5	46.4	74.0	-27.6

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.
4. Negative value in the margin column shows emission below limit.
5. Horn antenna is used for the emission over 1000MHz
6. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

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	23.3	33	34.9	25.2	54.0	-28.8
V	7311.000	35.2	33	37.9	40.1	54.0	-13.9
H	12185.000	23.2	33	40.5	30.7	54.0	-23.3

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	36.8	33	34.9	38.7	74.0	-35.3
V	7311.000	51.6	33	37.9	56.5	74.0	-17.5
H	12185.000	35.2	33	40.5	42.7	74.0	-31.3

NOTES:
1. Peak detector is used unless otherwise stated.
2. Average detector is used for the average data of emission measurement.
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. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

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	43.3	33	29.4	39.7	54.0	-14.3
V	4924.000	25.0	33	34.9	26.9	54.0	-27.1
V	7386.000	34.2	33	37.9	39.1	54.0	-14.9
H	12310.000	22.4	33	40.5	29.9	54.0	-24.1

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	61.7	33	29.4	58.1	74.0	-15.9
V	4924.000	38.0	33	34.9	39.9	74.0	-34.1
V	7386.000	49.6	33	37.9	54.5	74.0	-19.5
H	12310.000	36.0	33	40.5	43.5	74.0	-30.5

NOTES:
1. Peak detector is used unless otherwise stated.
2. Average detector is used for the average data of emission measurement.
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. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

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)
H	2390.000	41.4	33	29.4	37.8	54.0	-16.2
V	4824.000	29.2	33	34.9	31.1	54.0	-22.9
H	12060.000	25.3	33	40.5	32.8	54.0	-21.2

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	58.9	33	29.4	55.3	74.0	-18.7
V	4824.000	45.1	33	34.9	47.0	74.0	-27.0
H	12060.000	38.8	33	40.5	46.3	74.0	-27.7

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.
4. Negative value in the margin column shows emission below limit.
5. Horn antenna is used for the emission over 1000MHz
6. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

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	25.4	33	34.9	27.3	54.0	-26.7
V	7311.000	33.2	33	37.9	38.1	54.0	-15.9
H	12185.000	23.6	33	40.5	31.1	54.0	-22.9

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	38.9	33	34.9	40.8	74.0	-33.2
V	7311.000	49.5	33	37.9	54.4	74.0	-19.6
H	12185.000	37.0	33	40.5	44.5	74.0	-29.5

NOTES:
1. Peak detector is used unless otherwise stated.
2. Average detector is used for the average data of emission measurement.
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. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

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 Avergae (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2483.500	43.2	33	29.4	39.6	54.0	-14.4
V	4924.000	23.3	33	34.9	25.2	54.0	-28.8
H	7386.000	31.9	33	37.9	36.8	54.0	-17.2
V	12310.000	23.1	33	40.5	30.6	54.0	-23.4

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	59.7	33	29.4	56.1	74.0	-17.9
V	4924.000	36.7	33	34.9	38.6	74.0	-35.4
H	7386.000	41.8	33	37.9	46.7	74.0	-27.3
V	12310.000	33.1	33	40.5	40.6	74.0	-33.4

NOTES:
1. Peak detector is used unless otherwise stated.
2. Average detector is used for the average data of emission measurement.
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. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

Mode: TX-Channel 3

Table 10, IEEE 802.11n (40MHz) 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	2390.000	42.8	33	29.4	39.2	54.0	-14.8
V	4844.000	26.3	33	34.9	28.2	54.0	-25.8
V	12110.000	26.8	33	40.5	34.3	54.0	-19.7

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	63.7	33	29.4	60.1	74.0	-13.9
V	4844.000	39.4	33	34.9	41.3	74.0	-32.7
V	12110.000	41.2	33	40.5	48.7	74.0	-25.3

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.
4. Negative value in the margin column shows emission below limit.
5. Horn antenna is used for the emission over 1000MHz
6. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

Mode: TX-Channel 6

Table 11, IEEE 802.11n (40MHz) 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	4874.000	26.9	33	34.9	28.8	54.0	-25.2
H	7311.000	27.0	33	37.9	31.9	54.0	-22.1
V	12185.000	27.6	33	40.5	35.1	54.0	-18.9

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)
H	4874.000	40.3	33	34.9	42.2	74.0	-31.8
H	7311.000	41.9	33	37.9	46.8	74.0	-27.2
V	12185.000	41.0	33	40.5	48.5	74.0	-25.5

NOTES:
1. Peak detector is used unless otherwise stated.
2. Average detector is used for the average data of emission measurement.
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. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

Mode: TX-Channel 9

Table 12, IEEE 802.11n (40MHz) 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	44.2	33	29.4	40.6	54.0	-13.4
V	4904.000	27.2	33	34.9	29.1	54.0	-24.9
V	7356.000	26.2	33	37.9	31.1	54.0	-22.9
V	12260.000	26.7	33	40.5	34.2	54.0	-19.8

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	63.4	33	29.4	59.8	74.0	-14.2
V	4904.000	40.4	33	34.9	42.3	74.0	-31.7
V	7356.000	39.7	33	37.9	44.6	74.0	-29.4
V	12260.000	40.4	33	40.5	47.9	74.0	-26.1

NOTES:
1. Peak detector is used unless otherwise stated.
2. Average detector is used for the average data of emission measurement.
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. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSION DATA

Mode: Transmitting

Table 13

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
H	320.030	30.9	16	23.0	37.9	46.0	-8.1
H	335.998	36.3	16	24.0	44.3	46.0	-1.7
H	479.997	34.0	16	26.0	44.0	46.0	-2.0
H	656.256	26.9	16	29.0	39.9	46.0	-6.1
H	718.821	24.9	16	30.0	38.9	46.0	-7.1
H	840.071	24.3	16	31.0	39.3	46.0	-6.7

NOTES:
1. Peak detector is used unless otherwise stated.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
5. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

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.

4.7.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration

at 0.5325 MHz

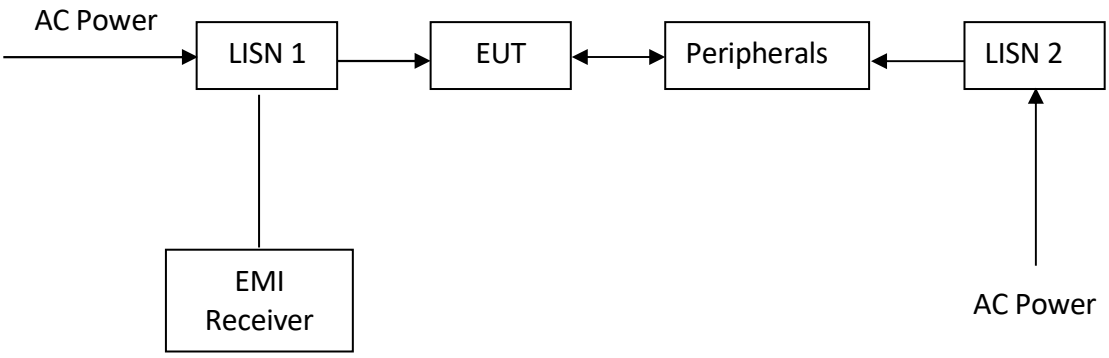
The worst case line conducted configuration photographs are attached in the Appendix and saved with filename: config photos.pdf.

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 14.53 dB margin compare with Quasi-peak limit

4.7.3 Conducted Emission Test Setup



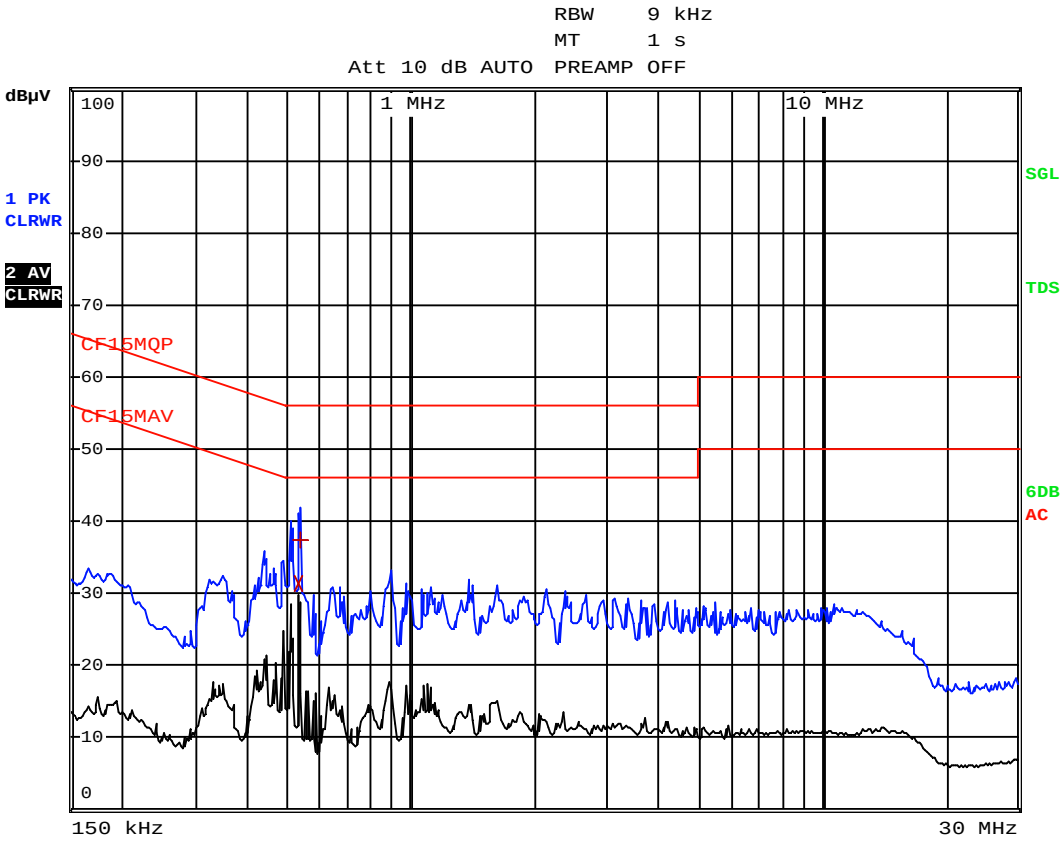
The EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

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

TEST REPORT

AC POWER LINE CONDUCTED EMISSION

Worst Case: Transmitting + Charging Internal Battery



TEST REPORT

AC POWER LINE CONDUCTED EMISSION (CONT'D)

Worst Case: Transmitting + Charging Internal Battery

EDIT PEAK LIST (Final Measurement Results)

Trace1:	CF15MQP
Trace2:	CF15MAV
Trace3:	---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	532.5 kHz	31.47	N	-14.53
1	Quasi Peak	537 kHz	37.39	L1	-18.60

TEST REPORT

EXHIBIT 5 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver (9kHz to 26.5GHz)	Biconical Antenna (30MHz to 300MHz)	EMI Test Receiver 7GHz
Registration No.	EW-3156	EW-3241	EW-3481
Manufacturer	ROHDESCHWARZ	EMCO	ROHDESCHWARZ
Model No.	ESR26	3110C	ESR7
Calibration Date	September 26, 2022	May 26, 2021	December 21, 2021
Calibration Due Date	September 26, 2023	May 26, 2023	December 21, 2022

Equipment	Log Periodic Antenna	Double Ridged Guide Antenna	Active Loop H-field (9kHz to 30MHz)
Registration No.	EW-3243	EW-1133	EW-3302
Manufacturer	EMCO	EMCO	EMCO
Model No.	3148B	3115	6502
Calibration Date	June 03, 2021	May 26, 2021	December 13, 2021
Calibration Due Date	December 30, 2022	November 26, 2022	June 13, 2023

Equipment	RF Preamplifier (9kHz to 6000MHz)	2.4GHz Notch Filter	14m Double Shield RF Cable (20MHz to 6GHz)
Registration No.	EW-3006b	EW-3435	EW-2074
Manufacturer	SCHWARZBECK	MICROWAVE	RADIALL
Model No.	BBV9718	N0324413	N(m)-RG142-BNC(m) L=14M
Calibration Date	February 15, 2022	June 16, 2022	December 10, 2021
Calibration Due Date	February 15, 2023	June 16, 2023	December 10, 2022

Equipment	Pyramidal Horn Antenna	RF Cable 14m (1GHz to 26.5GHz)
Registration No.	EW-0905	EW-2781
Manufacturer	EMCO	GREATBILLION
Model No.	3160-09	SMA m/SHF5MPU /SMA m ra14m,26G
Calibration Date	July 20, 2021	November 24, 2020
Calibration Due Date	January 20, 2023	November 24, 2022

TEST REPORT

5.0 EQUIPMENT LIST (CONT'D)

2) Conducted Emissions Test

Equipment	RF Cable 240cm (RG142) (9kHz to 30MHz)	Artificial Mains Network	EMI Test Receiver
Registration No.	EW-2454	EW-2501	EW-3156
Manufacturer	RADIALL	ROHDESCHWARZ	R&S
Model No.	bnc m st / 142 /bnc m ra 240cm	ENV-216	ESCI7
Calibration Date	January 26, 2022	November 09, 2021	December 21, 2021
Calibration Due Date	January 26, 2023	November 09, 2022	December 21, 2022

3) Bandedge Measurement

Equipment	EMI Test Receiver 7GHz	5m RF Cable (40GHz)
Registration No.	EW-3481	EW-2107
Manufacturer	ROHDESCHWARZ	N/A
Model No.	ESR7	SMA-M to SMA-M
Calibration Date	December 21, 2021	December 11, 2021
Calibration Due Date	December 21, 2022	December 11, 2022

4) Conductive Measurement Test

Equipment	5m RF Cable (40GHz)	RF Power Meter with Power Sensor (NRP-Z81)	EMI Test Receiver (9kHz to 26.5GHz)
Registration No.	EW-2701	EW-3309	EW-3156
Manufacturer	RADIALL	ROHDESCHWARZ	ROHDESCHWARZ
Model No.	sma m-m 5m 40G	NRP-Z81	ESR26
Calibration Date	November 24, 2021	December 01, 2021	September 26, 2022
Calibration Due Date	November 24, 2022	December 01, 2022	September 26, 2023

5) Bandedge & Bandwidth Measurement

Equipment	5m RF Cable (40GHz)	EMI Test Receiver (9kHz to 26.5GHz)
Registration No.	EW-2701	EW-3156
Manufacturer	RADIALL	ROHDESCHWARZ
Model No.	sma m-m 5m 40G	ESR26
Calibration Date	November 24, 2021	September 26, 2022
Calibration Due Date	November 24, 2022	September 26, 2023

6) Control Software for Radiated Emission

Software Information	
Software Name	EMC32
Manufacturer	ROHDESCHWARZ
Software version	10.50.40

END OF TEST REPORT