

Report on the FCC and IC Testing of the Dr. Ing. h.c. F. Porsche Aktiengesellschaft Porsche Home Energy Manager In accordance with FCC 47 CFR Part 15C and ISED Canada RSS-247 and ISED Canada RSS- GEN

Prepared for: Dr. Ing. h.c. F. Porsche Aktiengesellschaft
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Germany

FCC ID: 2ATXC-HEM10
IC: 25236-HEM10



Product Service

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Date: 2019-10-01

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Alex Fink	2019-10-01	
Authorised Signatory	Matthias Stumpe	2019-10-01	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C and ISED Canada RSS-247 and ISED Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Alex Fink	2019-10-01	

Laboratory Accreditation

DAKS Reg. No. D-PL-11321-11-02

Laboratory recognition

Registration No. BNetzA-CAB-16/21-15

ISED Canada test site registration

3050A-2

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C, ISED Canada RSS-247 and ISED Canada RSS-GEN:2016 and Issue 2 (2017-02) and Issue 4 (2014-11).

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Contents

1	Report Summary	2
1.1	Report Modification Record.....	2
1.2	Introduction.....	2
1.3	Brief Summary of Results	3
1.4	Product Information	4
1.5	Deviations from the Standard.....	5
1.6	EUT Modification Record	5
1.7	Test Location	5
2	Test Details	6
2.1	Spurious Emissions.....	6
2.2	Spurious Conducted Emissions	12
2.3	Restricted Band Edges	20
2.4	Authorised Band Edges	49
2.5	Emission Bandwidth.....	63
2.6	Power Spectral Density.....	77
2.7	Maximum Conducted Output Power	88
2.8	AC Power Line Conducted Emissions	91
2.9	Transmitter frequency stability	95
2.10	Exposure of Humans to RF Fields	97
3	Measurement Uncertainty	102

1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	2019-06-06
2	Applicant/Manufacturer changed corrected from "Porsche Engineering Group GmbH" to "Dr. Ing. h.c. F. Porsche Aktiengesellschaft". Model/Typ changed from "Charge Manager Model: HCM" to "Porsche Home Energy Manager".	2019-06-11
3	FCC and ISED ID added Chapter "Photographs" moved to Annex	2019-07-16
4	Worst definition added, page 5 Hardware and Software version corrected	2019-10-01

Table 1

1.2 Introduction

Applicant	Dr. Ing. h.c. F. Porsche Aktiengesellschaft
Manufacturer	Dr. Ing. h.c. F. Porsche Aktiengesellschaft
Model Number(s)	Porsche Home Energy Manager
Serial Number(s)	M186 HCM-C1.1
Hardware Version(s)	C12
Software Version(s)	0210
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C, ISED Canada RSS-247 and ISED Canada RSS-GEN:2016 and Issue 2 (2017-02) and Issue 4 (2014-11)
Test Plan/Issue/Date	---
Order Number	5010008667
Date	2018-09-25
Date of Receipt of EUT	2019-01-29
Start of Test	2019-01-23
Finish of Test	2019-03-08
Name of Engineer(s)	Alex Fink
Related Document(s)	ANSI C63.10 (2013) KDB 662911 D01 v02r02

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C and ISED Canada RSS-247 and ISED Canada RSS-GEN is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: Continuously Transmitting				
2.1	15.247 (d), 15.205, 5.5 and 6.13	Spurious Radiated Emissions	Pass	ANSI C63.10 (2013)
2.2	15.247 (d) and 5.5	Spurious Conducted Emissions	Pass	ANSI C63.10 (2013)
2.3	15.205 N/A and 8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.4	15.247 (d), 5.5 and N/A	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.5	15.247 (a)(2), 5.2 and 6.6	Emission Bandwidth	Pass	ANSI C63.10 (2013)
2.6	15.247 (e), 5.2 and 6.12	Power Spectral Density	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r02
2.7	15.247 (b), 5.4 and 6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r02
2.8	15.207, N/A and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)
2.9	RSS-Gen, Issue 5	Transmitter frequency stability	Pass	RSS-Gen, Issue 5, April 2018, chapter 6.11
2.10		Exposure of Humans to RF Fields	Pass	

Table 2

1.4 Product Information

1.4.1 Technical Description

The EUT "Porsche Home Energy Manager" is a WiFi Access Point operating in 2.4 GHz Band.

EUT Technical Parameters relevant for testing in acc. with FCC 47 CFR Part 15C and ISSED Canada RSS-247 and ISSED Canada RSS-GEN:

The type of modulation used by the equipment:	Other forms of modulation
Adaptive / non-adaptive equipment:	Adaptive Equipment without the possibility to switch to a non-adaptive mode The equipment has implemented a LBT based DAA mechanism The equipment is Load Based equipment
The worst case operational modes	802.11b, BW: 20 MHz, DR: 1Mbps 802.11g, BW: 20 MHz, DR: 6Mbps 802.11n, BW: 20 MHz, DR: MCS0 802.11n, BW: 40 MHz, DR: MCS8
Smart Antenna System	No
Operating Frequency Range	2412 to 2462 MHz (centre frequencies)
Nominal Channel Bandwidth	20 MHz, 40 MHz
Number of channels	11 Centre frequencies: 2412 MHz, 2417 MHz, 2422 MHz, 2427 MHz, 2432 MHz, 2437 MHz, 2442 MHz, 2447 MHz, 2452 MHz, 2457 MHz, 2462 MHz
Type of Equipment	Stand-alone
Normal / Extreme operating conditions	20°C / -20°C to +45°C
Antenna Type	Dedicated Antenna EUT with SMA-i coaxial antenna interface Magnet Base Antenna HiRO H50284 Omnidirectional External Antenna Magnetic Base Gain: 2,0 dBi Antenna Gain of +2,0dBi has been included to test results.
Power Level	< 20dBm EIRP (including Antenna Gain)
Supply voltage range	24 V DC +/- 10%
Geo-location capability supported by the equipment	No

Worst-case-definition:

HCM operating mode for worst case

- Software: Test image v 1.7
- CPU core utilizes to maximum load using artificial load using Burn-neon and memtester
- ETH1, WiFi, PLC activated, paired with respective peers (ETH2 only connected)
- Frequent pings to simulate traffic and verify link status
- USB flash disk attached and mounted
- Relays on
- 3 phase mains voltage connected and continuously measured
- Current sensors connected to I1, I2 and I3 inputs, I1 carrying current, I2 and I3 left idle and all 12 channels continuously measured
- RS485/CAN ports are attached only with Cables (Not functional)

1.5 Deviations from the Standard

none

1.6 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing Test Laboratory.

Test Name	Name of Engineer(s)
Configuration and Mode: Continuously Transmitting	
Spurious Radiated Emissions	Alex Fink
Spurious Conducted Emissions	Alex Fink
Restricted Band Edges	Alex Fink
Authorised Band Edges	Alex Fink
Emission Bandwidth	Alex Fink
Power Spectral Density	Alex Fink
Maximum Conducted Output Power	Alex Fink
AC Power Line Conducted Emissions	Alex Fink
Transmitter frequency stability	Alex Fink
Exposure of Humans to RF Fields	Alex Fink

Table 4

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



Product Service

2 Test Details

2.1 Spurious Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-247 and ISED Canada RSS-GEN, Clause 15.247 (d), 15.205, 5.5 and 6.13

2.1.2 Equipment Under Test and Modification State

Porsche Home Energy Manager, S/N: M186 HCM-C1.1 - Modification State 0

2.1.3 Date of Test

2019-01-25 to 2019-02-13

2.1.4 Test Method

Plots for average measurements were taken in accordance with ANSI C63.10-2013 clause 4.1.4.2.3 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10-2013 clause 4.1.4.2.2.

The plots shown are the characterization of the EUT. The limits on the plots represent the most stringent case for restricted bands, (54/74 dBuV/m) when compared to 20 dBc outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBμV/m to μV/m:
 $10^{(\text{Field Strength in dB}\mu\text{V/m}/20)}$

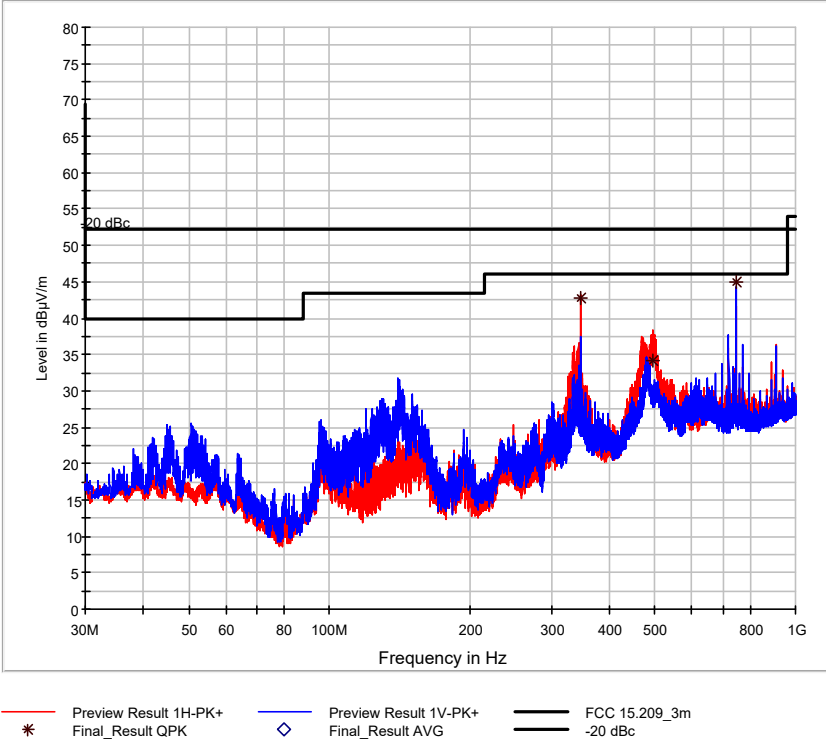
2.1.5 Environmental Conditions

Ambient Temperature	22,0 °C
Relative Humidity	24,0 %



Product Service

2.1.6 Test Results

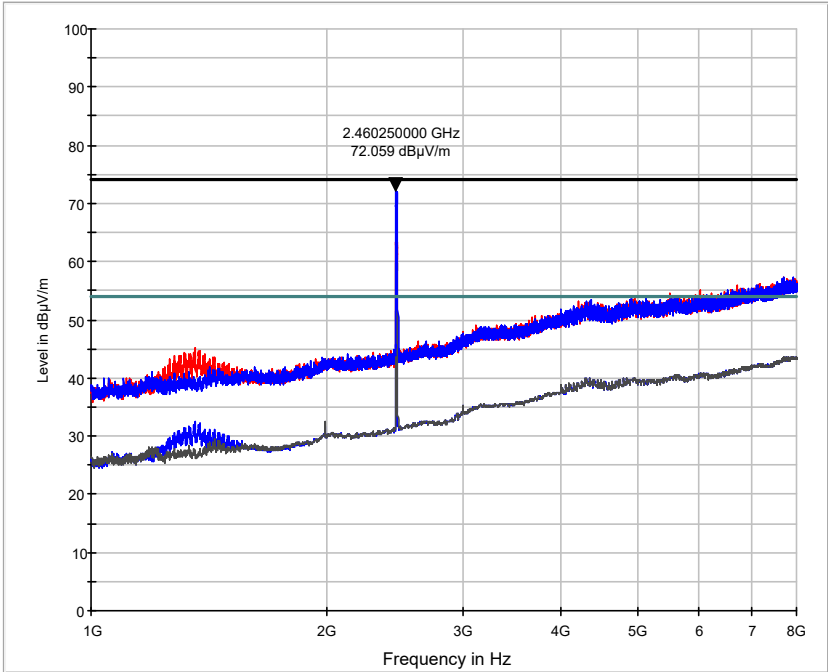


Final Results:

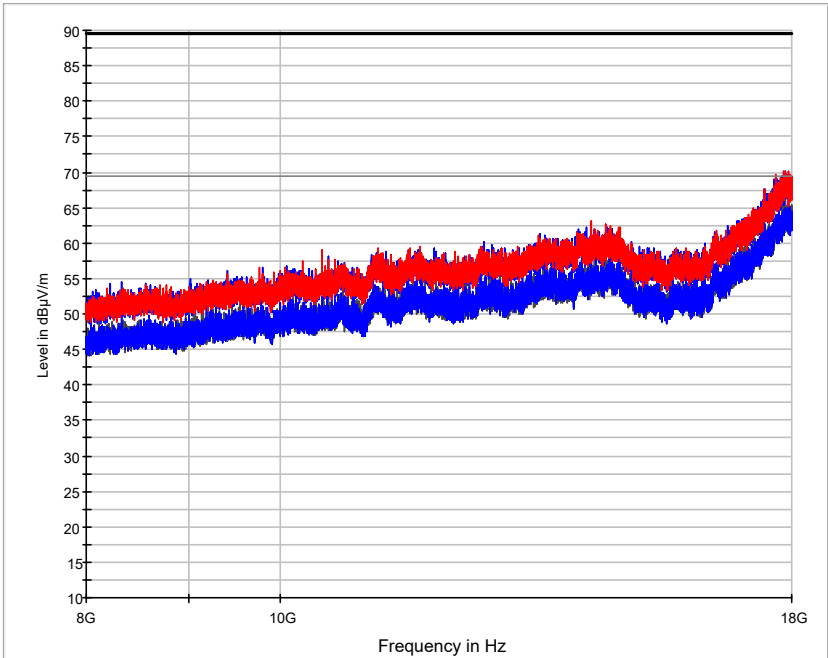
Frequency	QuasiPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
346.470000	42.86	---	46.00	3.14	1000.0	120.000	145.0	H	-137.0	17.0
492.795000	34.19	---	46.00	11.81	1000.0	120.000	103.0	H	152.0	19.4
743.940000	44.89	---	46.00	1.11	1000.0	120.000	159.0	V	-17.0	23.5



Product Service



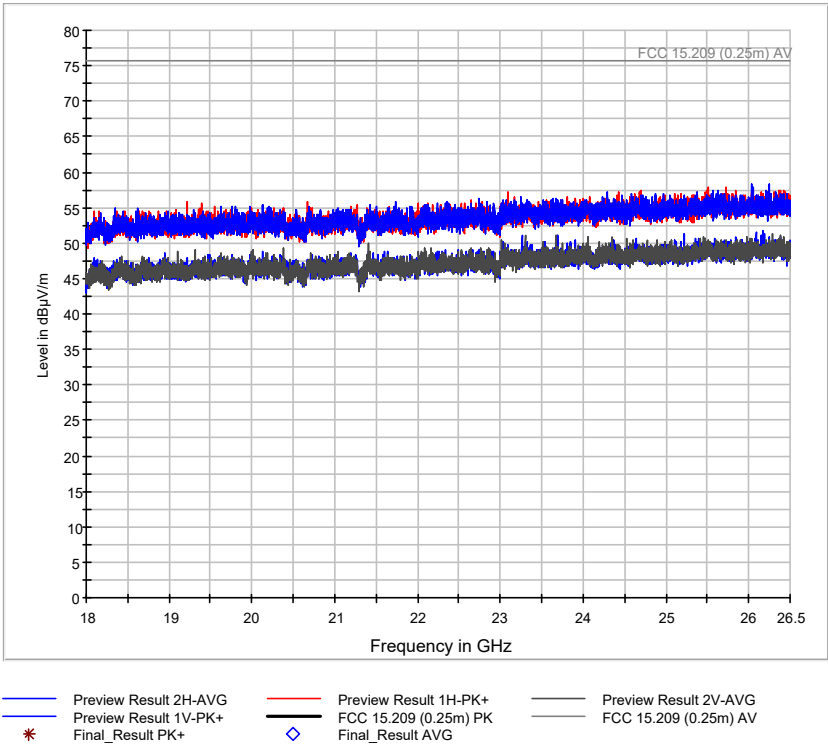
Preview Result 2H-AVG Preview Result 1H-PK+ Preview Result 2V-AVG
Preview Result 1V-PK+ FCC 15.209 3 m PK FCC 15.209 3 m AV



Preview Result 2V-AVG Preview Result 1V-PK+ Preview Result 2H-AVG
Preview Result 1H-PK+ FCC 15.209 (0.5m) PK FCC 15.209 (0.5m) AV
* Final_Result PK+ ♦ Final_Result AVG



Product Service





FCC 47 CFR Part 15, Limit Clause 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

ISED Canada RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.



2.1.7 Test Location and Test Equipment Used

Conducted test was carried out in Non-shielded room with Test system TS8997.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Spectrum Analyzer	Rohde&Schwarz	FSV40	20219	12	2020-01-31
Vector Signal Generator	Rohde&Schwarz	SMBV100A	20238	24	2019-10-31
Signal Generator	Rohde&Schwarz	SMB100A	20215	36	2021-03-31
Switching Device	Rohde&Schwarz	OSP120 I	20248	24	2020-01-31
Switching Device	Rohde&Schwarz	OSP120 II	38807	24	2020-09-30
Radio Communication Tester	Rohde&Schwarz	CMW500	38845	12	2019-09-30
EMC Measurement Software	Rohde&Schwarz	EMC32	19719	---	---

Table 5

Radiated Test was carried out in FAR No.8

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESW26	28268	12	2019-05-31
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	19918	36	2019-07-31
Horn Antenna	Rohde&Schwarz	HF907	19933	24	2029-06-30
Semi Anechoic Room	Albatross	Cabin No. 8	19917	36	2020-09-30
EMC Measurement Software	Rohde&Schwarz	EMC32	23229	---	---

Table 6

TU - Traceability Unscheduled
 O/P Mon – Output Monitored using calibrated equipment
 N/A - Not Applicable



Product Service

2.2 Spurious Conducted Emissions

2.2.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-247 and ISED Canada RSS-GEN, Clause 15.247 (d) and 5.5

2.2.2 Equipment Under Test and Modification State

Porsche Home Energy Manager, S/N: M186 HCM-C1.1 - Modification State 0

2.2.3 Date of Test

2019-02-13

2.2.4 Test Method

The test was performed in accordance with KDB 558074 D01 v03r02, clause 11.0.

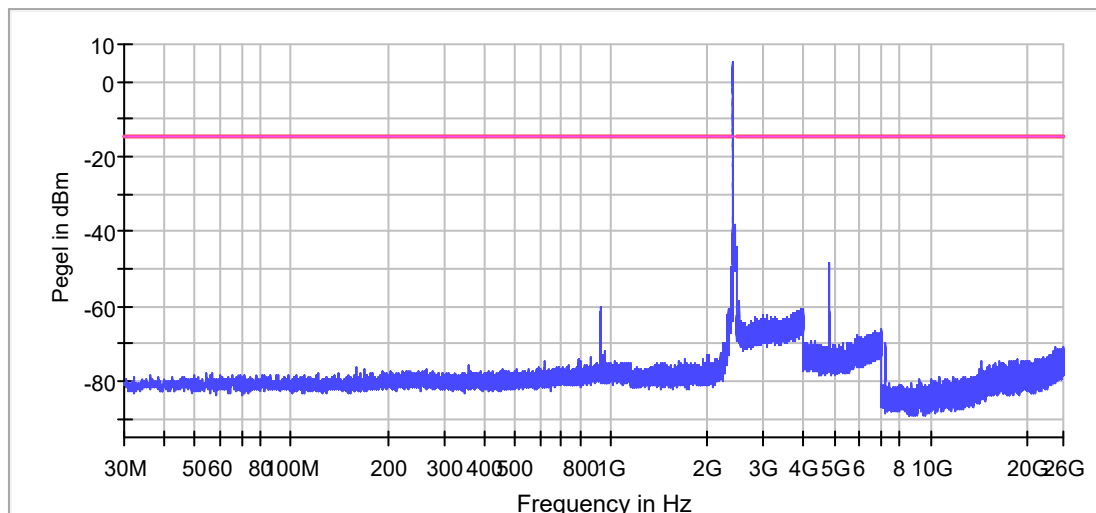
2.2.5 Environmental Conditions

Ambient Temperature	22,0 °C
Relative Humidity	32,0 %



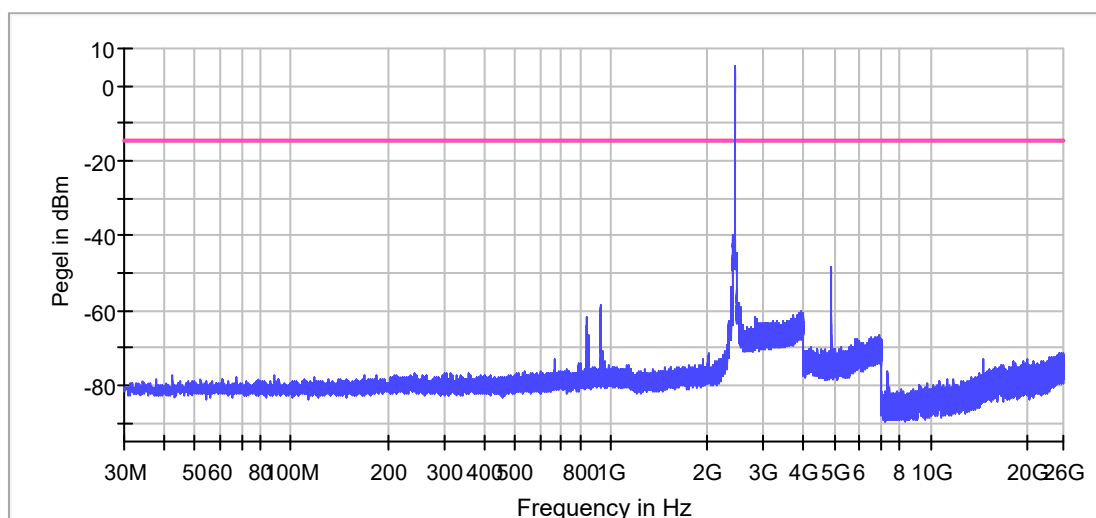
2.2.6 Test Results

Mode: 802.11 b, BW 20MHz, 1Mbps, $f_{\text{Center}} = 2412$ MHz



— Limit — Sum Level — Threshold × Critical × Final Critical

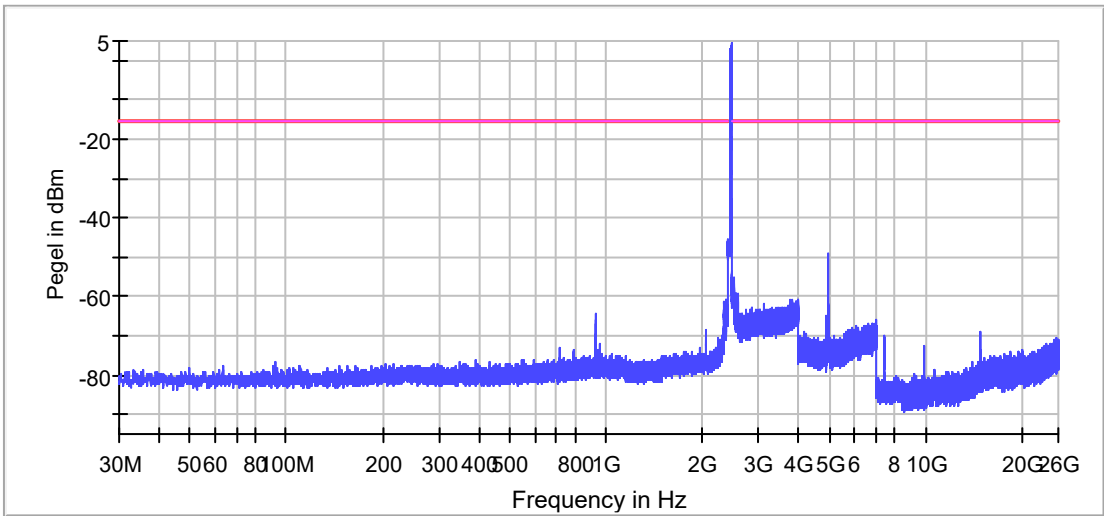
Mode: 802.11 b, BW 20MHz, 1Mbps, $f_{\text{Center}} = 2437$ MHz



— Limit — Sum Level — Threshold × Critical × Final Critical

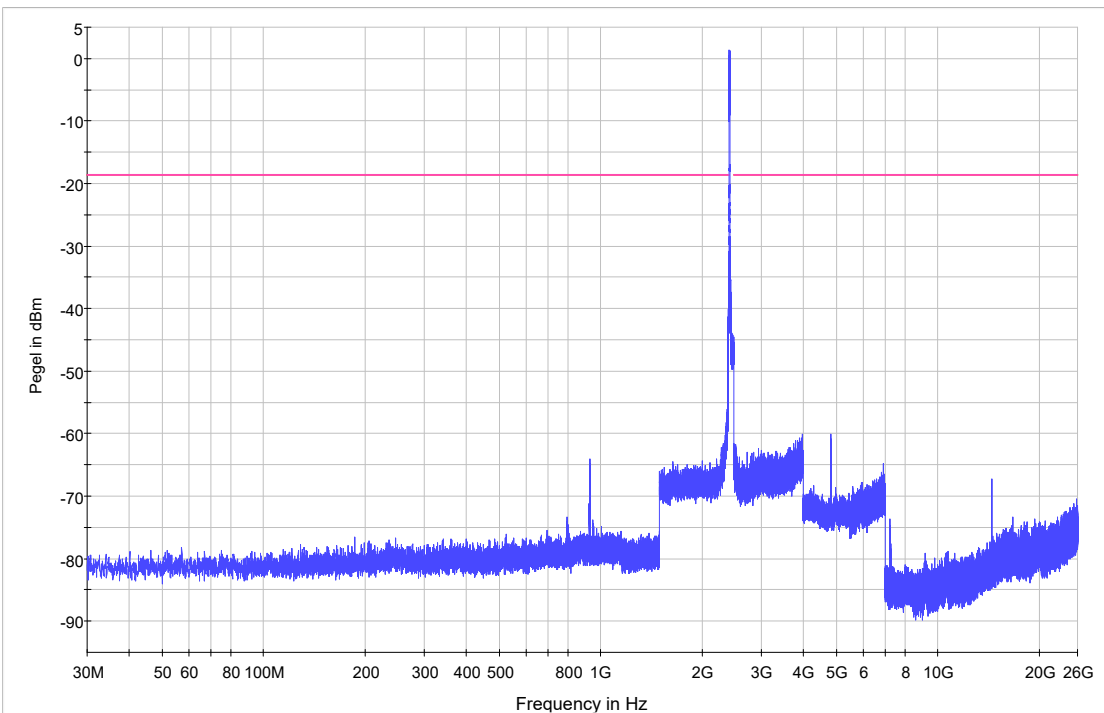


Mode: 802.11 b, BW 20MHz, 1Mbps, $f_{Center} = 2437\text{ MHz}$



— Limit — Sum Level — Threshold × Critical × Final Critical

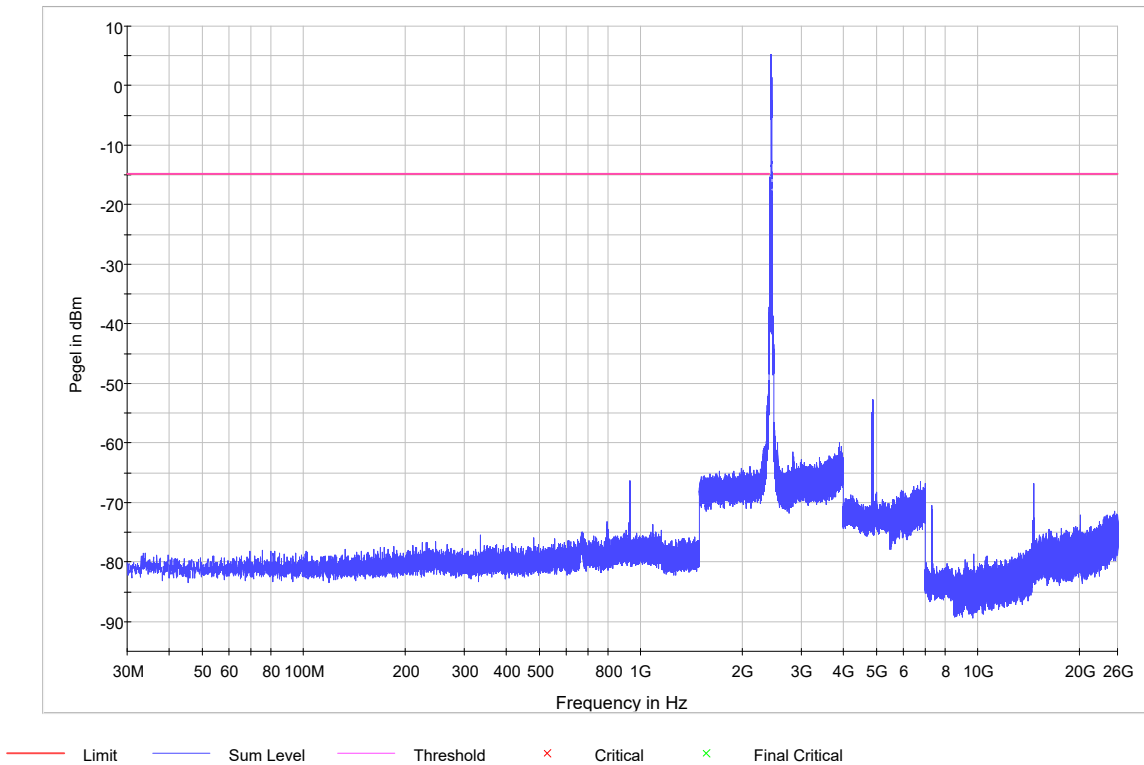
Mode: 802.11 g, BW 20MHz, 6Mbps, $f_{Center} = 2412\text{ MHz}$



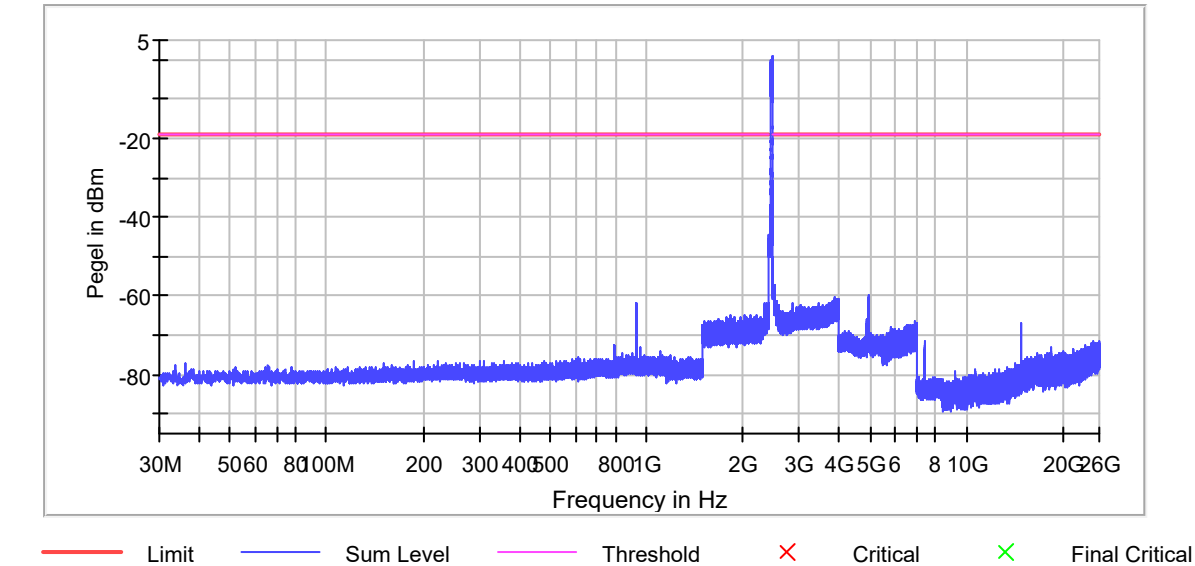
— Limit — Sum Level — Threshold × Critical × Final Critical



Mode: 802.11 g, BW 20MHz, 6Mbps, $f_{Center} = 2437\text{ MHz}$

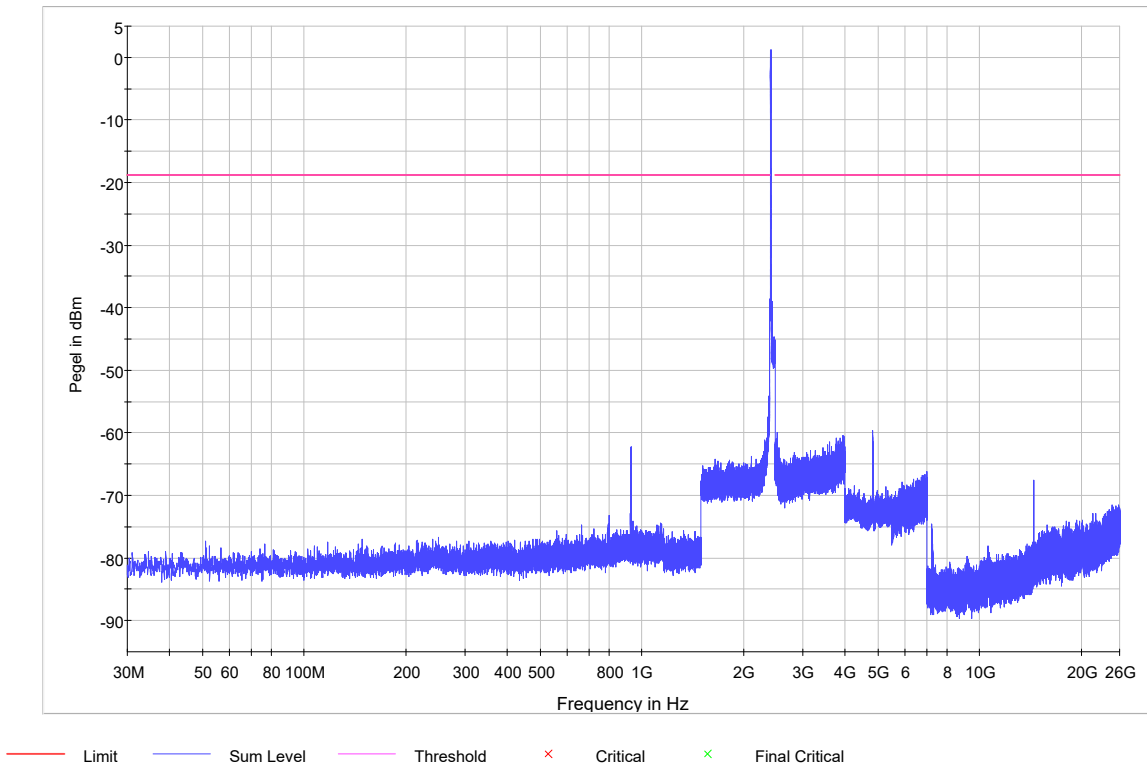


Mode: 802.11 g, BW 20MHz, 6Mbps, $f_{Center} = 2462\text{ MHz}$

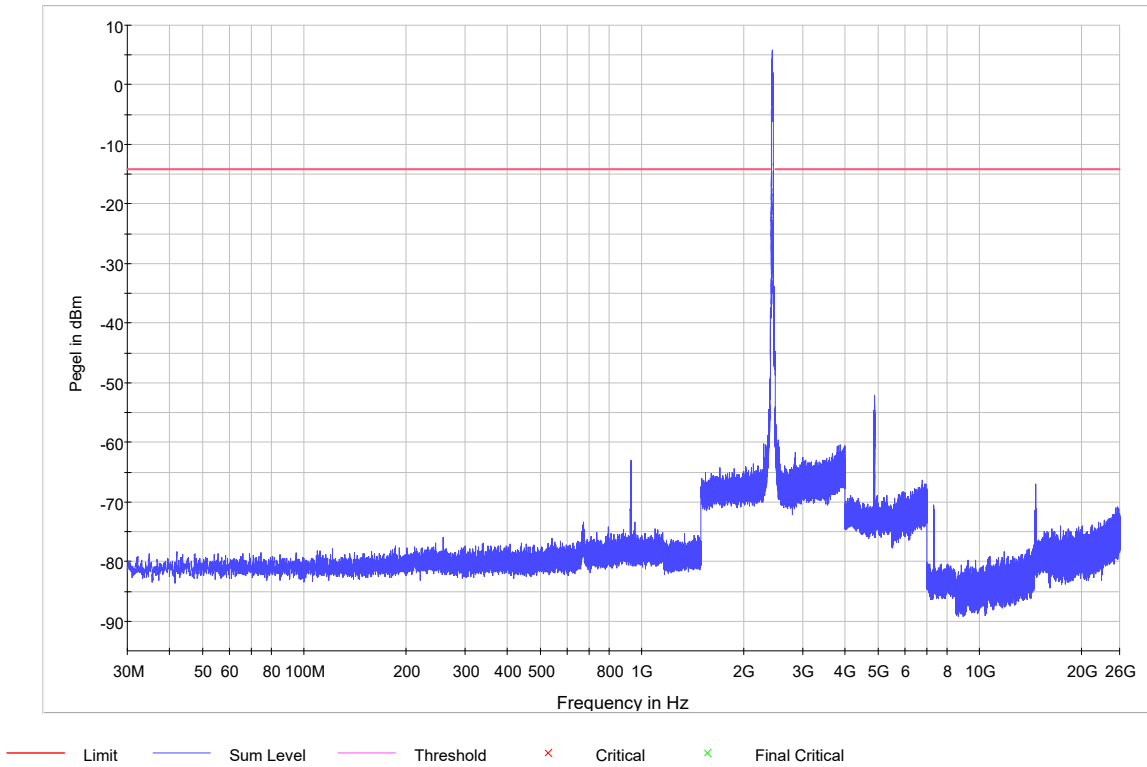




Mode: 802.11n, BW 20MHz, MCS0, $f_{Center} = 2412\text{ MHz}$



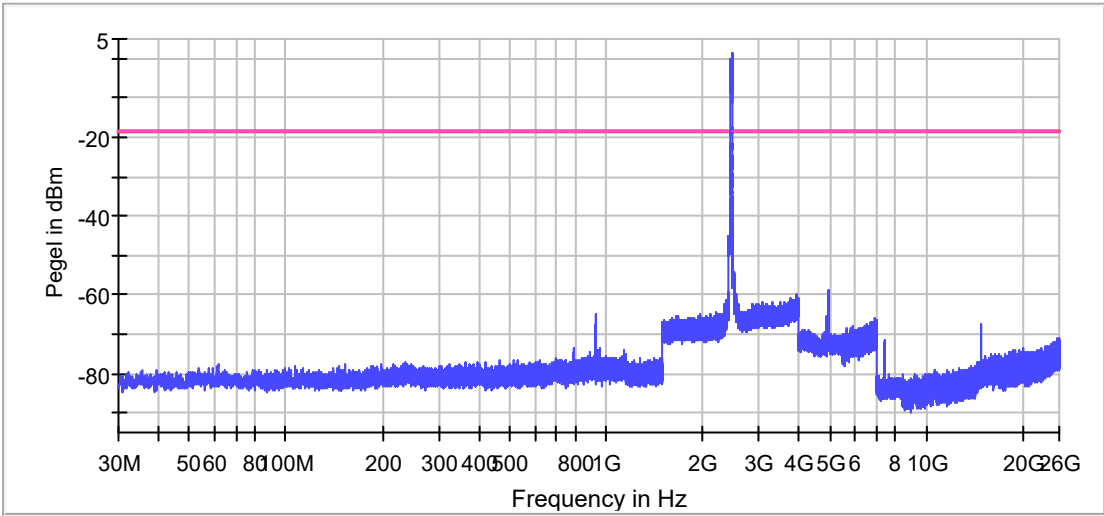
Mode: 802.11n, BW 20MHz, MCS0, $f_{Center} = 2437\text{ MHz}$





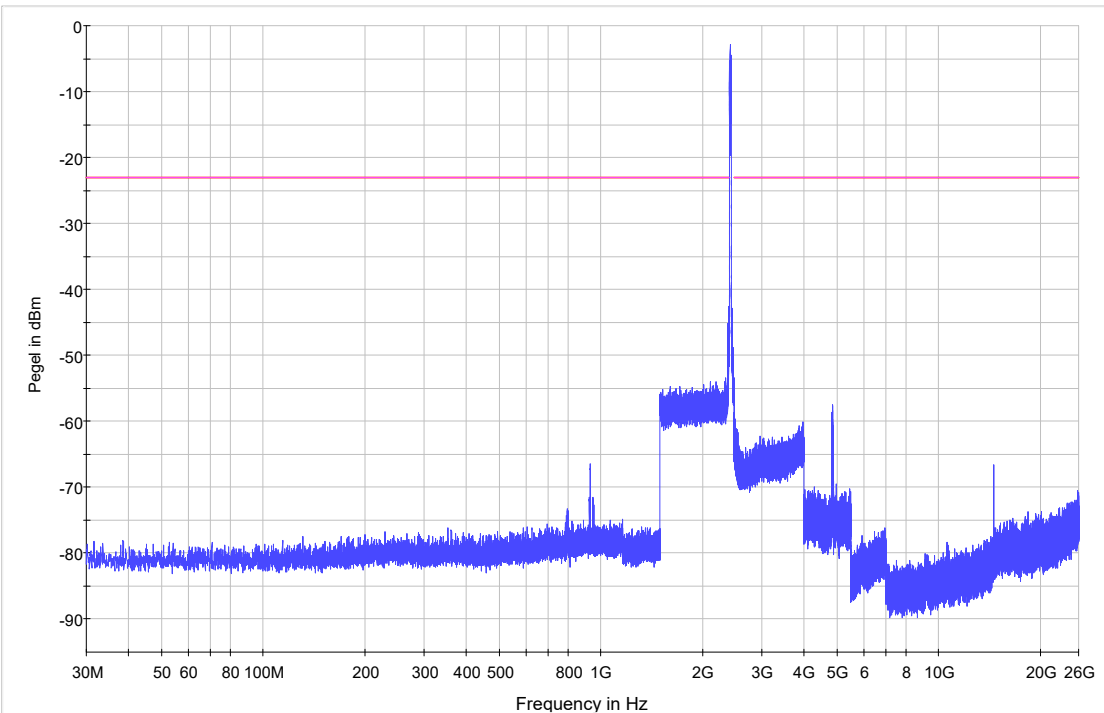
Product Service

Mode: 802.11n, BW 20MHz, MCS0, $f_{\text{Center}} = 2462 \text{ MHz}$



— Limit — Sum Level — Threshold × Critical × Final Critical

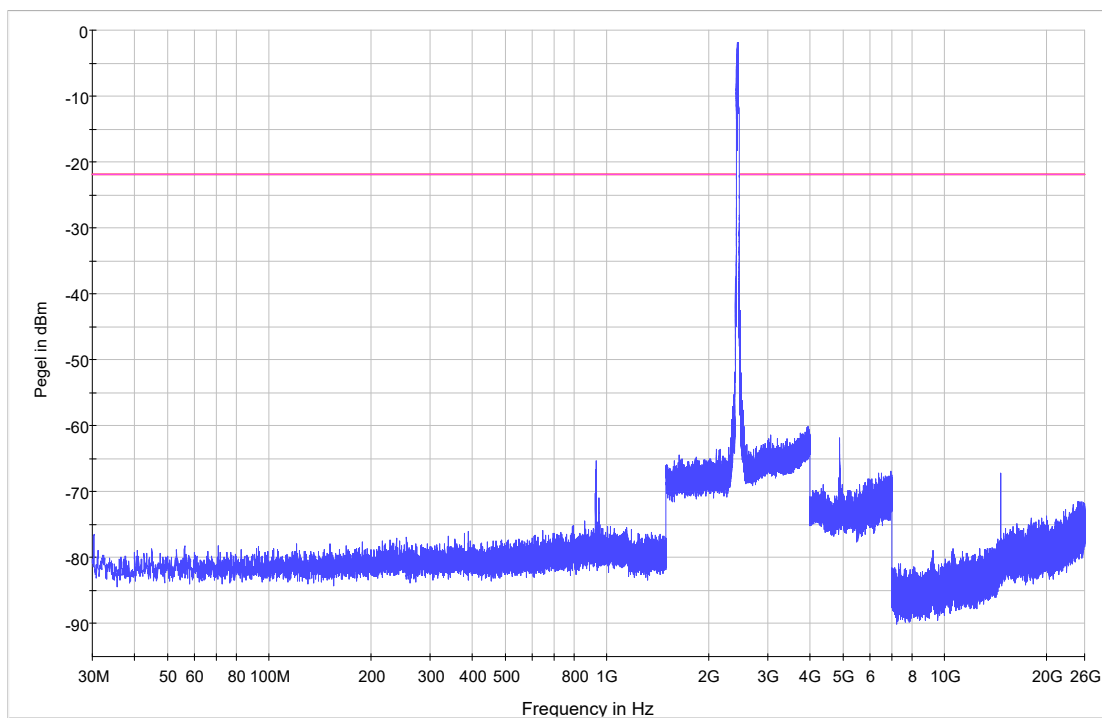
Mode: 802.11n, BW 40MHz, MCS8, $f_{\text{Center}} = 2422 \text{ MHz}$



— Limit — Sum Level — Threshold × Critical × Final Critical

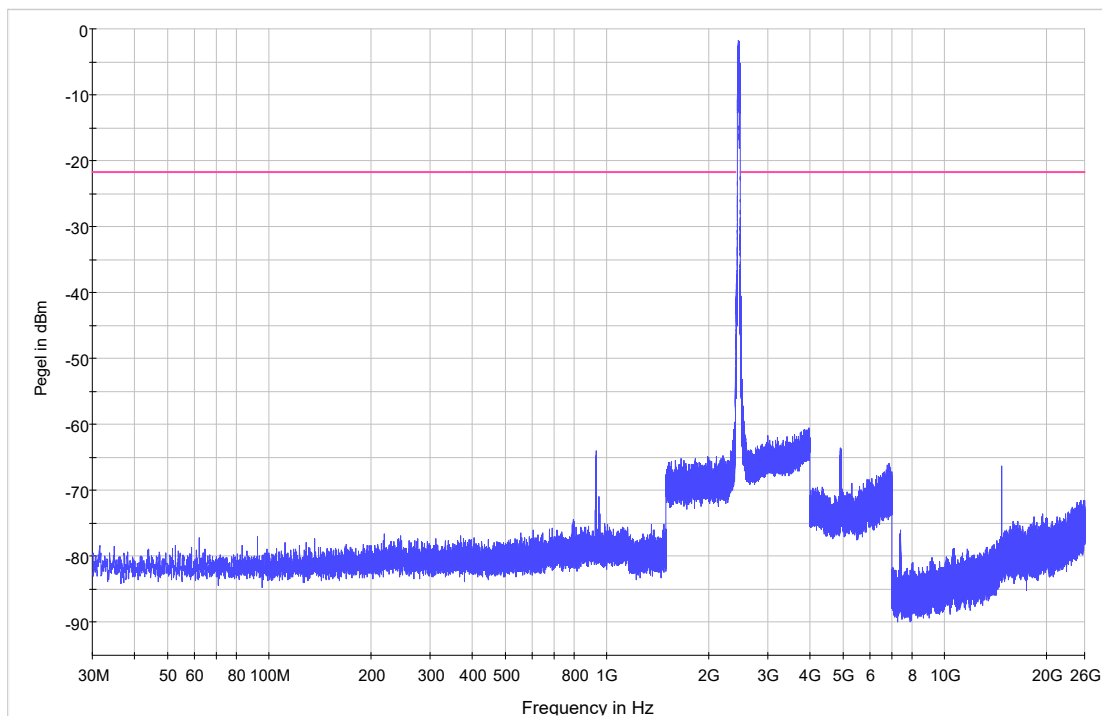


Mode: 802.11n, BW 40MHz, MCS8, $f_{\text{Center}} = 2442$ MHz



— Limit — Sum Level — Threshold × Critical × Final Critical

Mode: 802.11n, BW 40MHz, MCS8, $f_{\text{Center}} = 2462$ MHz



— Limit — Sum Level — Threshold × Critical × Final Critical

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

2.2.7 Test Location and Test Equipment Used

Conducted test was carried out in Non-shielded room with Test system TS8997.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Spectrum Analyzer	Rohde&Schwarz	FSV40	20219	12	2020-01-31
Vector Signal Generator	Rohde&Schwarz	SMBV100A	20238	24	2019-10-31
Signal Generator	Rohde&Schwarz	SMB100A	20215	36	2021-03-31
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Switching Device	Rohde&Schwarz	OSP120 II	38807	24	2020-09-30
Radio Communication Tester	Rohde&Schwarz	CMW500	38845	12	2019-09-30
EMC Measurement Software	Rohde&Schwarz	EMC32	19719	---	---

Table 7

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable