TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.247

RSS-GEN, ISSUE 5, MARCH 2019 AMENDMENT 1

RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

Anker Innovations Limited

Room 1318-19,Hollywood Plaza,610 Nathan Road,Mongkok,Kowloon,Hong Kong

FCC ID: 2AOKB-T8400X
IC: 23451-T8400X

Report Type:	**Product Type:**
Original Report	Indoor Cam 2K / T8400X Indoor Cam 1080p / T8401X

Report Number:	DG2210525-19121E-00A
Report Date:	2021-06-18
Reviewed By:	Gavin Xu RF Engineer
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Name:		Indoor Cam 2K / T8400X Indoor Cam 1080p / T8401X
Test Model:		T8400X
Multiple Model:		T8401X
Model Difference:		Refer to the DOS letter
Rated Input Voltage:		DC 5V from adapter
Adapter Information:	**Model:**	TEKA-UCA10UN
	Input:	AC 100-240V~50/60Hz 0.2A MAX
	Output:	DC 5.0V 1.0A
Serial Number:		DG2210525-19121E-RF-76T
EUT Received Date:		2021-05-27
EUT Received Status:		GOOD

Technical Specification

Operation Frequency Range (MHz):	BLE: 2402-2480 802.11 b/g/n20: 2412-2462
Max. RF Output Power (Conducted)(dBm):	BLE: 3.14 802.11 b: 22.05 802.11 g: 25.54 802.11 n20: 25.51
Antenna Gain (dBi)▲:	-1.19
Modulation Type:	GFSK, DSSS, OFDM

Objective

This report is prepared on behalf of ***Anker Innovations Limited*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules and RSS-247, Issue 2, February 2017, RSS-Gen, Issue 5, March 2019 Amendment 1 of the Innovation, Science and Economic Development Canada.

The tests were performed in order to determine the EUT compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules and RSS-247, Issue 2, February 2017, RSS-Gen, Issue 5,March 2019 Amendment 1 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

Not related submittal(s)/grant(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And 558074 D01 15.247 Meas Guidance v05r02, RSS-247, Issue 2, February 2017, RSS-Gen Issue 5, March 2019 Amendment 1 of the Innovation, Science and Economic Development Canada.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB,200M~1GHz: 5.92 dB,1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol "▲". Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

This report cannot be reproduced except in full, without prior written approval of the Company.

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk "★".

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For 2.4GHz band, total 11 channels are provided:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

For 802.11b, 802.11g, and 802.11n ht20 modes were test with channel 1,6,11.

The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates, bandwidths, and modulations.

For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	…	…
…	…	…	…
…	…	…	…
..	…	38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

EUT Exercise Software

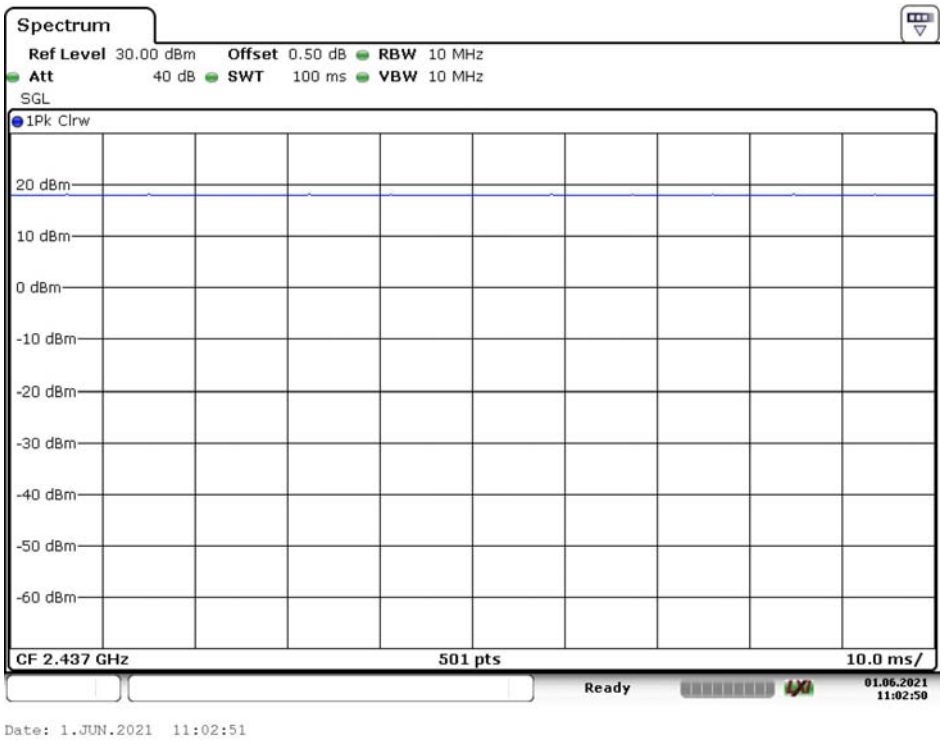
The software “SecureCRT.exe▲” was used for testing, which was provided by manufacturer. The maximum power was configured as below table, that provided by the manufacturer:

Mode	Channel	Frequency (MHz)	Data rate	Power level Setting
802.11 b	Low	2412	1Mbps	82
	Middle	2437	1Mbps	82
	High	2462	1Mbps	84
802.11 g	Low	2412	6Mbps	66
	Middle	2437	6Mbps	82
	High	2462	6Mbps	66
802.11n ht20	Low	2412	MCS0	64
	Middle	2437	MCS0	83
	High	2462	MCS0	64
BLE	Low	2402	1Mbps	default
	Middle	2440	1Mbps	default
	High	2480	1Mbps	default

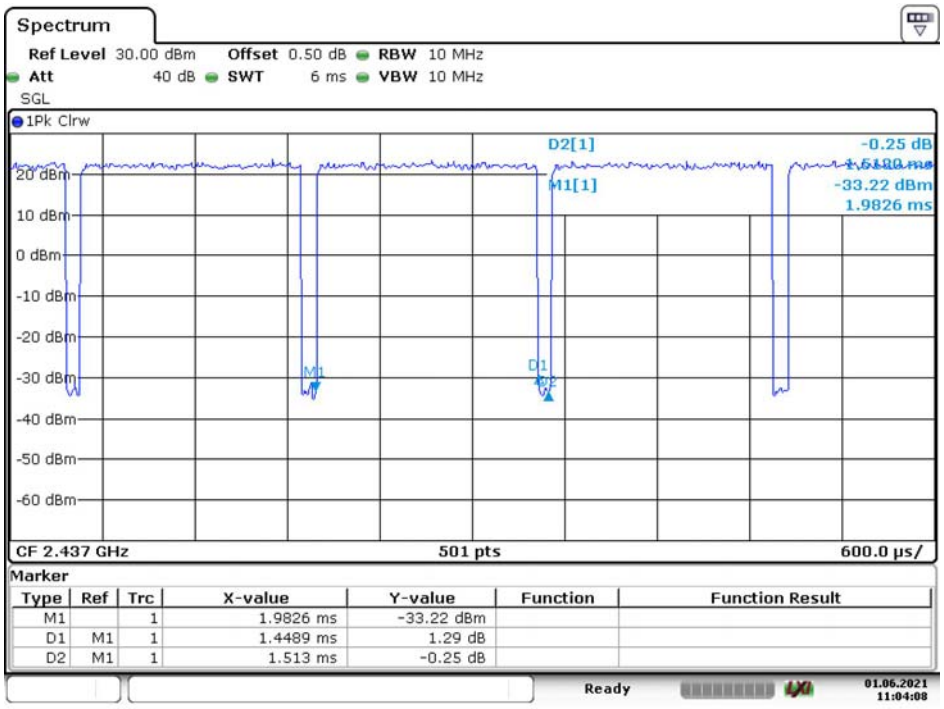
The maximum duty cycle as following table:

Test mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11b	100.00	100.00	100.0
802.11g	1.4489	1.5130	95.76
802.11n ht20	1.3706	1.4435	94.95
BLE	0.1197	0.6234	19.20

802.11b

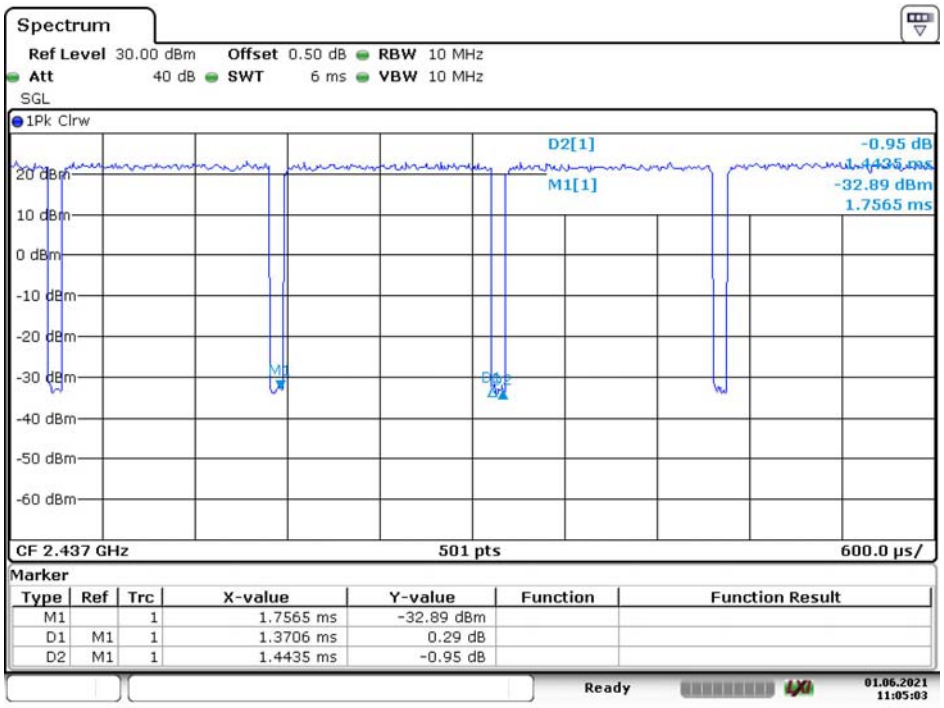


802.11g



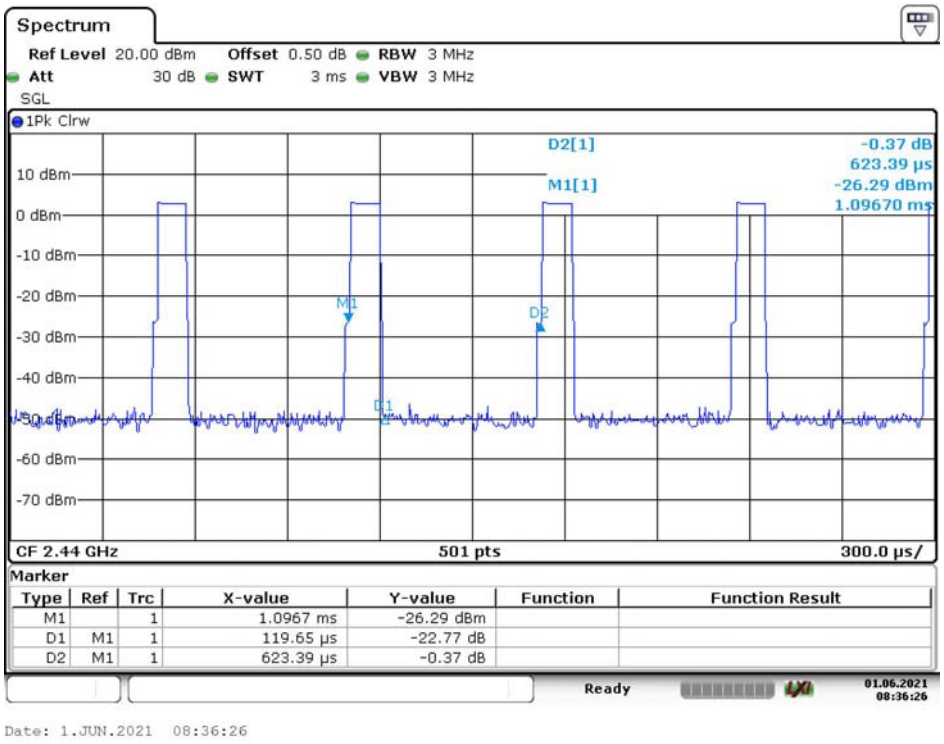
Date: 1.JUN.2021 11:04:08

802.11n ht20



Date: 1.JUN.2021 11:05:03

BLE



Equipment Modifications

No modification was made to the EUT.

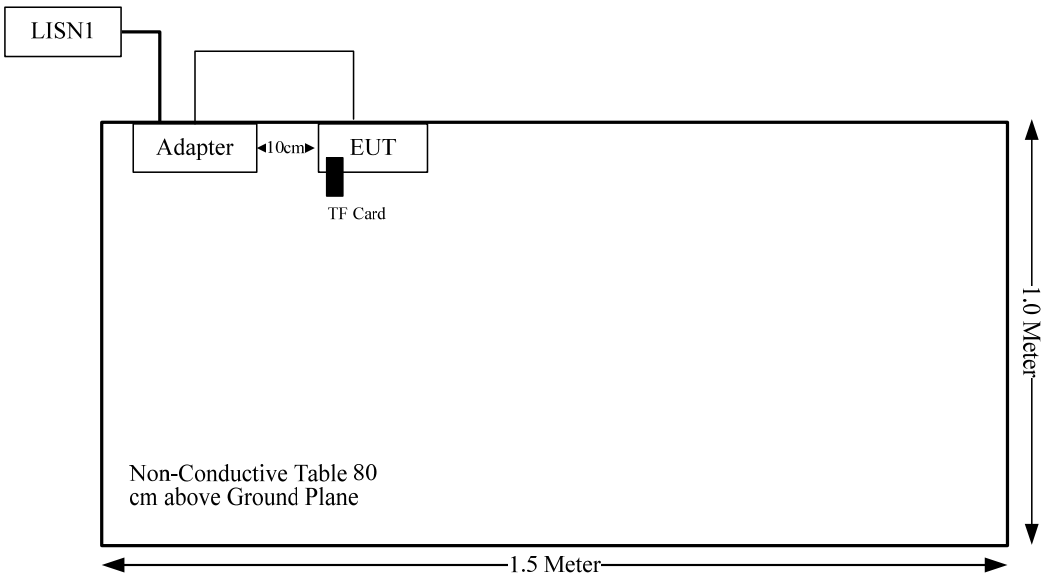
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Sandisk	TF Card	16G	F-08-1601

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	No	No	1.0	Adapter	EUT

Block Diagram of Test Setup



Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted emission					
R&S	LISN	ENV 216	101614	2020-09-12	2021-09-12
R&S	EMI Test Receiver	ESCI	101121	2020-07-07	2021-07-07
MICRO-COAX	Coaxial Cable	C-NJNJ-50	C-0200-01	2020-09-05	2021-09-05
R&S	Test Software	EMC32	Version 9.10.00	N/A	N/A
Radiation Below 1GHz Test					
Sunol Sciences	Antenna	JB3	A060611-2	2020-08-25	2023-08-25
R&S	EMI Test Receiver	ESCI	100224	2020-09-12	2021-09-12
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2020-09-24	2021-09-24
Sonoma	Amplifier	310N	185914	2020-10-13	2021-10-13
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Radiation Above 1GHz Test					
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2020-12-05	2023-12-04
Agilent	Spectrum Analyzer	E4440A	SG43360054	2020-07-07	2021-07-07
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2020-06-27	2021-06-27
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2020-09-05	2021-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2020-06-27	2021-06-27
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2020-06-16	2021-06-16
Mini Circuits	High Pass Filter	VHF-6010+	31118	2020-06-16	2021-06-16
RF Conducted					
R&S	Spectrum Analyzer	FSV40	101591	2020-06-29	2021-06-28
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A
E-Microwave	Blocking Control	EMDCB-00036	0E01201047	2021-05-06	2022-05-05
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	2020-09-06	2021-09-06
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2020-09-12	2021-09-12

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

Test Items	Conducted Emissions	Radiated Emissions (Below 1GHz)	Radiated Emissions (Above 1GHz)	RF Conducted
Temperature:	24.6℃	21.4℃	27.4 ℃	26.7~27.4 ℃
Relative Humidity:	62 %	53 %	39 %	46~48 %
ATM Pressure:	100.5kPa	100.1 kPa	100.5 kPa	100~100.5 kPa
Tester:	Mia Huang	Burt Hu	Jeremy Liang	Tiger Mo
Test Date:	2021-06-08	2021-06-15	2021-06-06	2021-06-01~2021-06-16

SUMMARY OF TEST RESULTS

S/N	Rules	Description of Test	Result
1	FCC §15.247 (i) FCC §1.1310 FCC §2.1091	Maximum Permissible Exposure (MPE)	Compliance
2	RSS-102 Clause 2.5.2	Exemption Limits For Routine Evaluation-RF Exposure Evaluation	Compliance
3	FCC §15.203 RSS-GEN Clause 6.8	Antenna Requirement	Compliance
4	FCC §15.207 (a) RSS-Gen Clause 8.8	AC Line Conducted Emissions	Compliance
5	FCC §15.205 FCC §15.209 FCC §15.247(d) RSS-247 Clause 5.5 RSS-Gen Clause 8.10	Spurious Emissions	Compliance
6	FCC §15.247 (a)(2) RSS-247 Clause 5.2 a) RSS-Gen Clause 6.7	6 dB Bandwidth and 99% Occupied Bandwidth	Compliance
7	FCC §15.247(b)(3) RSS-247 Clause 5.4 d)	Maximum Conducted Output Power	Compliance
8	FCC §15.247(d) RSS-247 Clause 5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
9	FCC §15.247(e) RSS-247 Clause5.2 b)	Power Spectral Density	Compliance

1- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculation formula

Prediction of power density at the distance of the applicable MPE limit
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Result

Operation Mode	**Frequency (MHz)**	**Antenna Gain**		**Conducted Output Power including Tune-up Tolerance**		**Evaluation Distance**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
		(dBi)	**(numeric)**	**(dBm)**	**(mW)**	**(cm)**		
BLE	2402-2480	-1.19	0.76	4	2.51	20	0.0004	1.0
2.4G Wi-Fi	2412-2462	-1.19	0.76	26	398.11	20	0.0602	1.0

Conclusion: Compliance. The device meet FCC MPE at 20 cm distance

2 - EXEMPTION LIMITS FOR ROUTINE EVALUATION – RF EXPOSURE EVALUATION

Applicable Standard

According to RSS-102 § (2.5.2):

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Calculated Result

Operation Mode	Frequency (MHz)	Antenna Gain	Conducted Output Power including Tune-up Tolerance	EIRP		Exemption limits (W)
		(dBi)	(dBm)	(dBm)	(W)	
BLE	2402-2480	-1.19	4	2.81	0.002	2.676
2.4G Wi-Fi	2412-2462	-1.19	26	24.81	0.303	2.684

Conclusion: Compliance. The device is compliance exemption from Routine Evaluation Limits –RF exposure Evaluation.

3 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

According to RSS-Gen §6.8, The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.
For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).
When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.
The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.
For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:
This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has one internal antenna arrangement for BLE and WIFI, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	Input Impedance (Ohm)	Antenna Gain /Frequency Range
PIFA	50	-1.19 dBi/2.4~2.5GHz

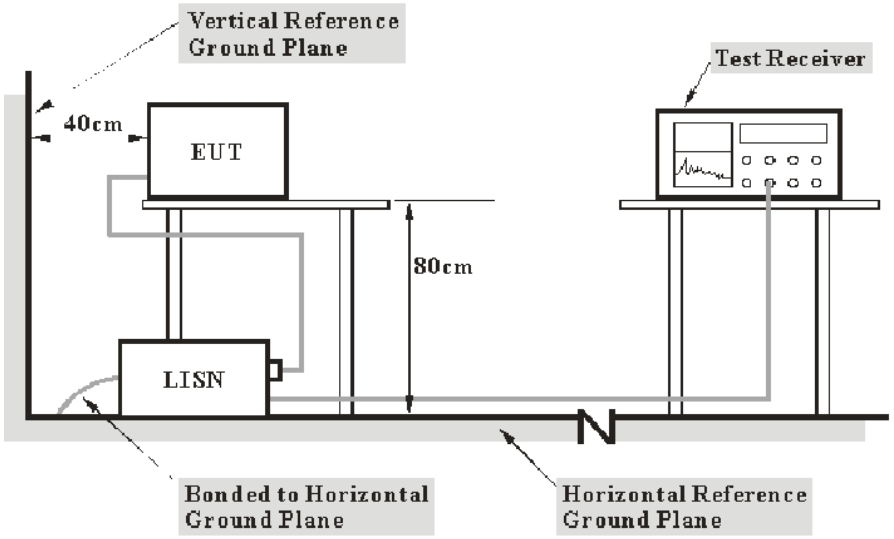
Result: Compliance.

4 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a), RSS-Gen§8.8.

Test System Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 and the RSS-Gen limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main lisn with a 120 V/60 Hz AC power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.
During the conducted emission test, the EUT was connected to the outlet of the first LISN.

The frequency and amplitude of the six highest ac power-line conducted emissions relative to the limit, measured over all the current-carrying conductors of the EUT power cords, and the operating frequency or frequency to which the EUT is tuned (if appropriate), should be reported, unless such emissions are more than 20 dB below the limit. AC power-line conducted emissions measurements are to be separately carried out only on each of the phase ("hot") line(s) and (if used) on the neutral line(s), but not on the ground [protective earth] line(s). If less than six emission frequencies are within 20 dB of the limit, then the noise level of the measuring instrument at representative frequencies should be reported. The specific conductor of the power-line cord for each of the reported emissions should be identified. Measure the six highest emissions with respect to the limit on each current-carrying conductor of each power cord associated with the EUT (but not the power cords of associated or peripheral equipment that are part of the test configuration). Then, report the six highest emissions with respect to the limit from among all the measurements identifying the frequency and specific current-carrying conductor identified with the emission. The six highest emissions should be reported for each of the current-carrying conductors, or the six highest emissions may be reported over all the current-carrying conductors.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN
C_f: Correction Factor

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

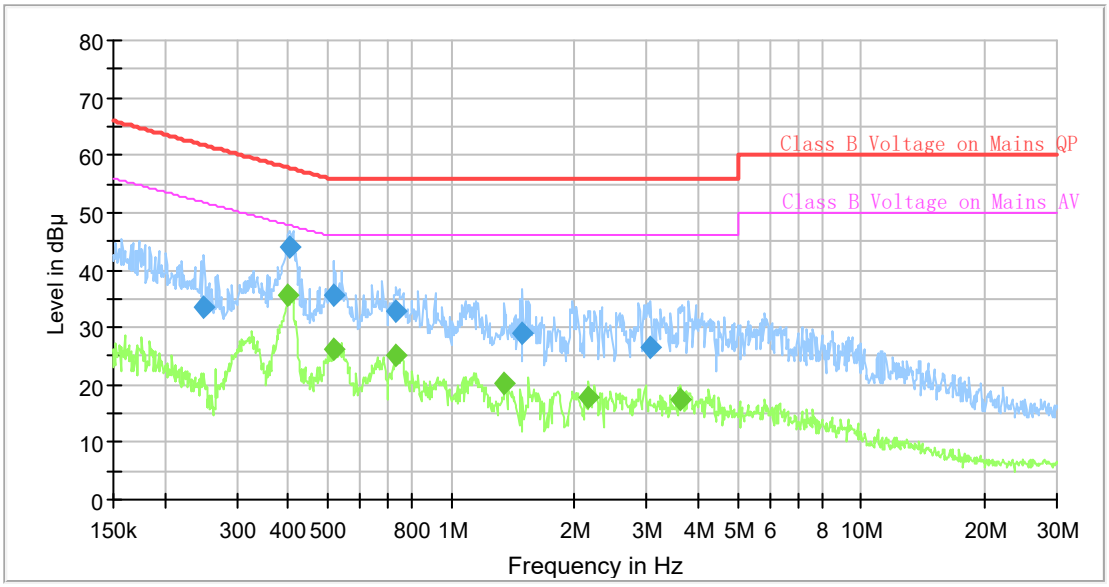
Margin = Limit – Corrected Amplitude

Test Data

Test Mode: Transmitting

Test Result: Compliance

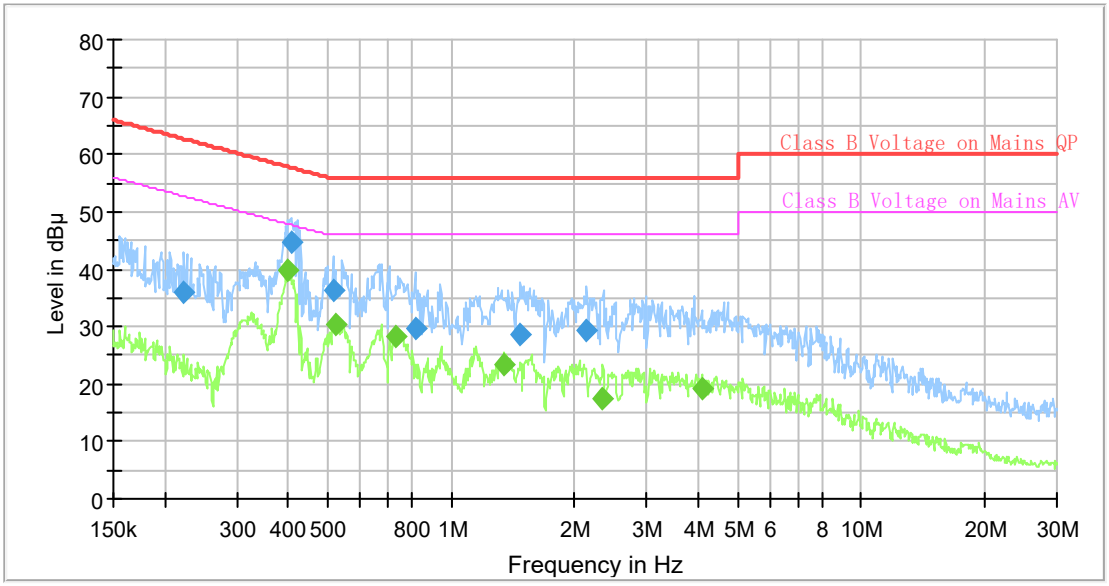
AC120 V, 60 Hz, Line:



Final_Result

Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Limit (dB µ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.249476	33.62	---	61.77	28.15	9.000	L1	9.6
0.400687	---	35.68	47.84	12.16	9.000	L1	9.6
0.404704	43.90	---	57.76	13.86	9.000	L1	9.6
0.516743	35.70	---	56.00	20.30	9.000	L1	9.6
0.519327	---	26.04	46.00	19.96	9.000	L1	9.6
0.736317	---	25.16	46.00	20.84	9.000	L1	9.7
0.736317	32.73	---	56.00	23.27	9.000	L1	9.7
1.346351	---	20.31	46.00	25.69	9.000	L1	9.7
1.495016	28.89	---	56.00	27.11	9.000	L1	9.7
2.162391	---	17.89	46.00	28.11	9.000	L1	9.7
3.065904	26.44	---	56.00	29.56	9.000	L1	9.7
3.632492	---	17.51	46.00	28.49	9.000	L1	9.7

AC120 V, 60 Hz, Neutral:



Final_Result

Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Limit (dB µ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.223551	36.02	---	62.69	26.67	9.000	N	9.6
0.400687	---	39.98	47.84	7.86	9.000	N	9.6
0.406728	44.62	---	57.71	13.09	9.000	N	9.6
0.514172	36.37	---	56.00	19.63	9.000	N	9.6
0.521923	---	30.28	46.00	15.72	9.000	N	9.6
0.736317	---	28.47	46.00	17.53	9.000	N	9.6
0.817621	29.85	---	56.00	26.15	9.000	N	9.6
1.346351	---	23.32	46.00	22.68	9.000	N	9.6
1.472813	28.78	---	56.00	27.22	9.000	N	9.6
2.140929	29.40	---	56.00	26.60	9.000	N	9.6
2.342024	---	17.48	46.00	28.52	9.000	N	9.6
4.074029	---	19.35	46.00	26.65	9.000	N	9.6

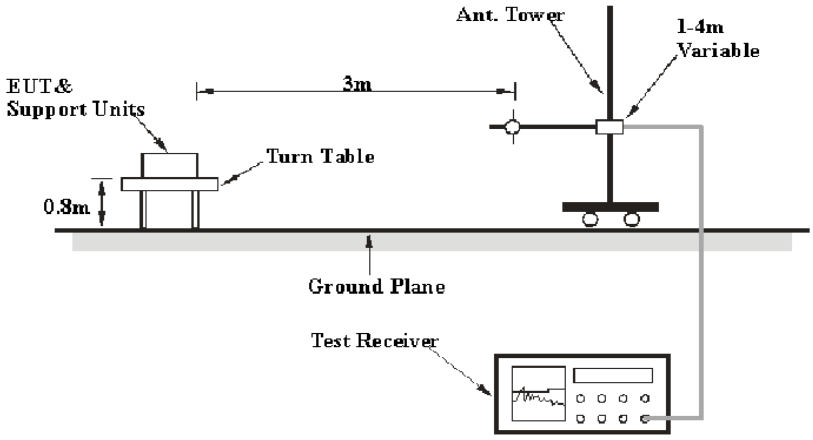
5 - SPURIOUS EMISSIONS

Applicable Standard

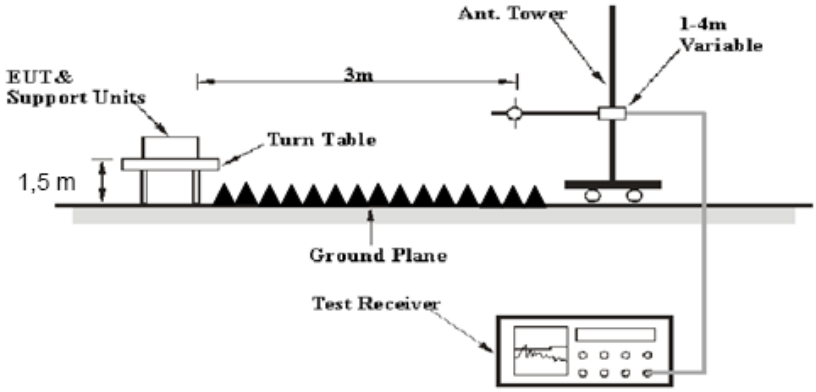
FCC §15.247 (d); §15.209; §15.205; RSS-247 §5.5, RSS-GEN §8.10.

Test System Setup

Below 1GHz:



Above 1GHz:



The radiated emission below 1GHz tests were performed in the 10 meters chamber test site, above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

30MHz-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
AV	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Data

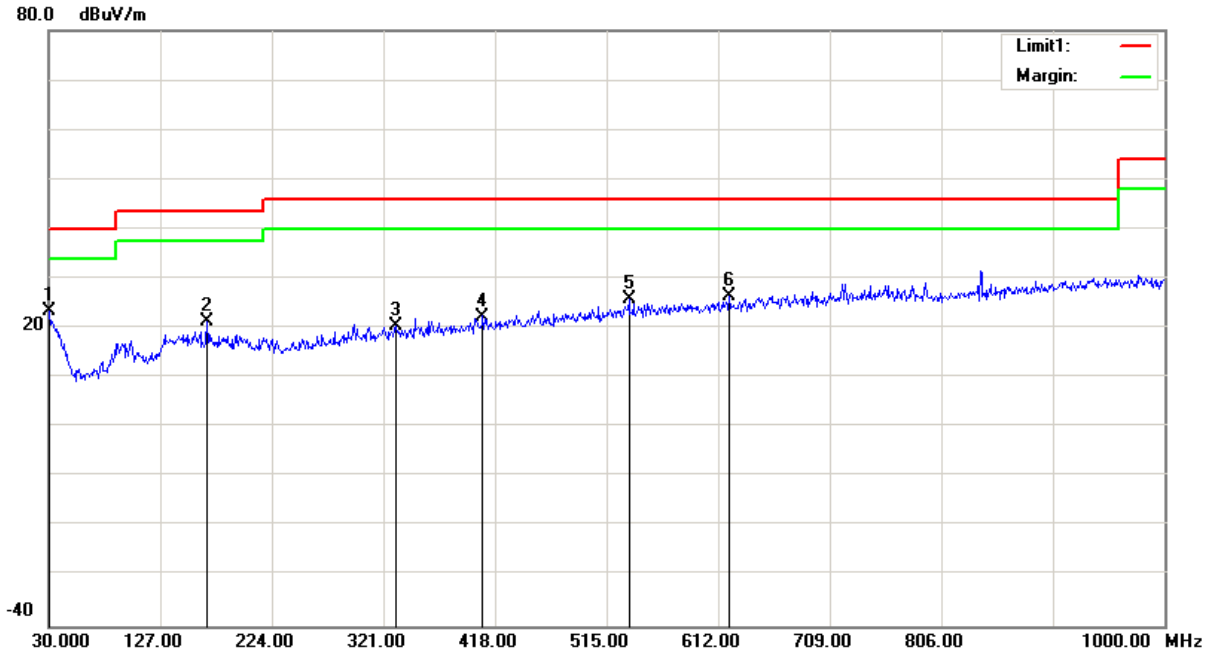
Test Mode: Transmitting

Test Result: Compliance

Please Refer to the following data

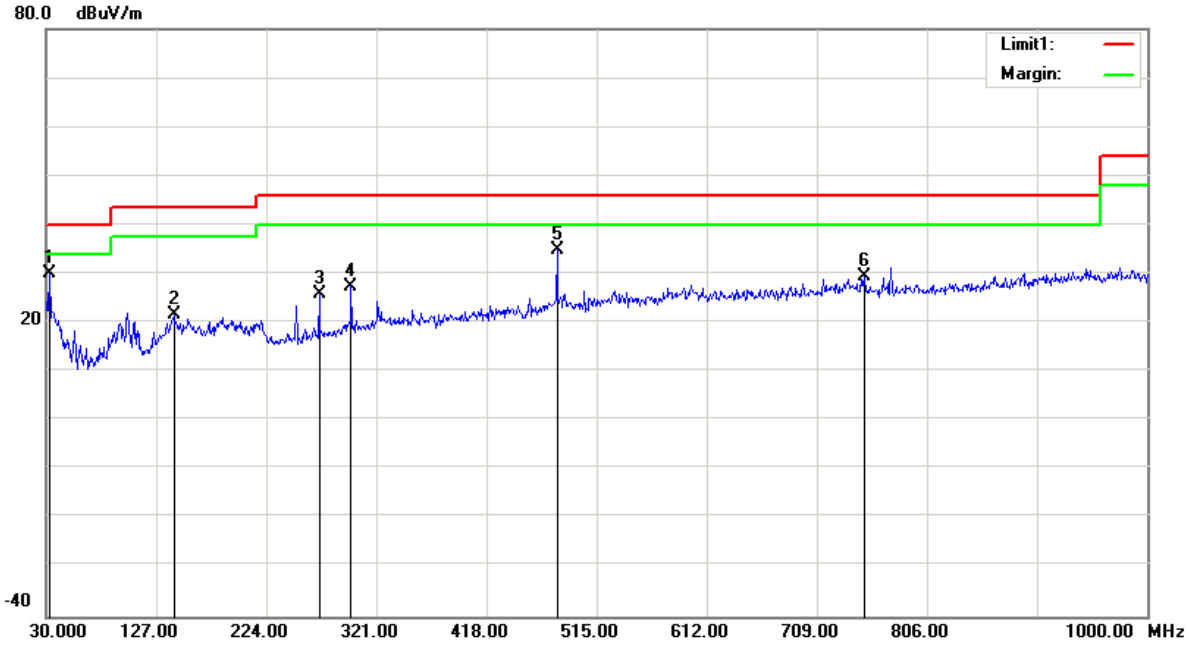
1) 30MHz-1GHz(802.11g mode middle channel was the worst)

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	27.63	peak	-4.10	23.53	40.00	16.47
167.7400	30.65	peak	-9.44	21.21	43.50	22.29
331.6700	27.37	peak	-7.00	20.37	46.00	25.63
407.3300	27.32	peak	-4.92	22.40	46.00	23.60
534.4000	28.13	peak	-2.41	25.72	46.00	20.28
621.7000	27.00	peak	-0.64	26.36	46.00	19.64

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
32.9100	35.80	peak	-5.69	30.11	40.00	9.89
142.5200	30.81	peak	-9.11	21.70	43.50	21.80
270.5600	34.53	peak	-8.73	25.80	46.00	20.20
298.6900	34.92	peak	-7.42	27.50	46.00	18.50
480.0800	38.76	peak	-3.82	34.94	46.00	11.06
750.7100	28.75	peak	0.56	29.31	46.00	16.69

2) 1-25GHz

802.11b Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	85.63	PK	H	28.12	1.81	0.00	115.56	N/A	N/A
2412.00	77.76	AV	H	28.12	1.81	0.00	107.69	N/A	N/A
2412.00	77.64	PK	V	28.12	1.81	0.00	107.57	N/A	N/A
2412.00	69.14	AV	V	28.12	1.81	0.00	99.07	N/A	N/A
2390.00	33.51	PK	H	28.08	1.80	0.00	63.39	74.00	10.61
2390.00	21.78	AV	H	28.08	1.80	0.00	51.66	54.00	2.34
4824.00	34.55	PK	H	32.95	3.19	25.62	45.07	74.00	28.93
4824.00	22.43	AV	H	32.95	3.19	25.62	32.95	54.00	21.05
7236.00	34.57	PK	H	35.81	4.77	25.64	49.51	74.00	24.49
7236.00	22.59	AV	H	35.81	4.77	25.64	37.53	54.00	16.47
Middle Channel: 2437 MHz									
2437.00	86.17	PK	H	28.17	1.82	0.00	116.16	N/A	N/A
2437.00	78.38	AV	H	28.17	1.82	0.00	108.37	N/A	N/A
2437.00	77.99	PK	V	28.17	1.82	0.00	107.98	N/A	N/A
2437.00	69.54	AV	V	28.17	1.82	0.00	99.53	N/A	N/A
4874.00	34.64	PK	H	33.05	3.26	25.65	45.30	74.00	28.70
4874.00	22.16	AV	H	33.05	3.26	25.65	32.82	54.00	21.18
7311.00	34.64	PK	H	36.01	4.64	25.71	49.58	74.00	24.42
7311.00	22.86	AV	H	36.01	4.64	25.71	37.80	54.00	16.20
High Channel: 2462 MHz									
2462.00	86.07	PK	H	28.22	1.83	0.00	116.12	N/A	N/A
2462.00	78.28	AV	H	28.22	1.83	0.00	108.33	N/A	N/A
2462.00	77.89	PK	V	28.22	1.83	0.00	107.94	N/A	N/A
2462.00	69.41	AV	V	28.22	1.83	0.00	99.46	N/A	N/A
2483.50	34.49	PK	H	28.27	1.84	0.00	64.60	74.00	9.40
2483.50	22.55	AV	H	28.27	1.84	0.00	52.66	54.00	1.34
4924.00	34.97	PK	H	33.15	3.27	25.65	45.74	74.00	28.26
4924.00	22.12	AV	H	33.15	3.27	25.65	32.89	54.00	21.11
7386.00	34.44	PK	H	36.20	4.51	25.79	49.36	74.00	24.64
7386.00	22.92	AV	H	36.20	4.51	25.79	37.84	54.00	16.16

802.11g Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	80.29	PK	H	28.12	1.81	0.00	110.22	N/A	N/A
2412.00	72.08	AV	H	28.12	1.81	0.00	102.01	N/A	N/A
2412.00	76.37	PK	V	28.12	1.81	0.00	106.30	N/A	N/A
2412.00	66.78	AV	V	28.12	1.81	0.00	96.71	N/A	N/A
2390.00	36.69	PK	H	28.08	1.80	0.00	66.57	74.00	7.43
2390.00	23.45	AV	H	28.08	1.80	0.00	53.33	54.00	0.67
4824.00	34.85	PK	H	32.95	3.19	25.62	45.37	74.00	28.63
4824.00	21.89	AV	H	32.95	3.19	25.62	32.41	54.00	21.59
7236.00	34.23	PK	H	35.81	4.77	25.64	49.17	74.00	24.83
7236.00	22.03	AV	H	35.81	4.77	25.64	36.97	54.00	17.03
Middle Channel: 2437 MHz									
2437.00	85.15	PK	H	28.17	1.82	0.00	115.14	N/A	N/A
2437.00	75.95	AV	H	28.17	1.82	0.00	105.94	N/A	N/A
2437.00	79.52	PK	V	28.17	1.82	0.00	109.51	N/A	N/A
2437.00	69.13	AV	V	28.17	1.82	0.00	99.12	N/A	N/A
4874.00	34.52	PK	H	33.05	3.26	25.65	45.18	74.00	28.82
4874.00	22.64	AV	H	33.05	3.26	25.65	33.30	54.00	20.70
7311.00	34.75	PK	H	36.01	4.64	25.71	49.69	74.00	24.31
7311.00	22.56	AV	H	36.01	4.64	25.71	37.50	54.00	16.50
High Channel: 2462 MHz									
2462.00	82.11	PK	H	28.22	1.83	0.00	112.16	N/A	N/A
2462.00	71.64	AV	H	28.22	1.83	0.00	101.69	N/A	N/A
2462.00	74.83	PK	V	28.22	1.83	0.00	104.88	N/A	N/A
2462.00	65.14	AV	V	28.22	1.83	0.00	95.19	N/A	N/A
2483.50	42.77	PK	H	28.27	1.84	0.00	72.88	74.00	1.12
2483.50	22.34	AV	H	28.27	1.84	0.00	52.45	54.00	1.55
4924.00	34.67	PK	H	33.15	3.27	25.65	45.44	74.00	28.56
4924.00	22.14	AV	H	33.15	3.27	25.65	32.91	54.00	21.09
7386.00	34.72	PK	H	36.20	4.51	25.79	49.64	74.00	24.36
7386.00	22.62	AV	H	36.20	4.51	25.79	37.54	54.00	16.46

802.11n ht20 Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	81.02	PK	H	28.12	1.81	0.00	110.95	N/A	N/A
2412.00	72.61	AV	H	28.12	1.81	0.00	102.54	N/A	N/A
2412.00	75.21	PK	V	28.12	1.81	0.00	105.14	N/A	N/A
2412.00	65.83	AV	V	28.12	1.81	0.00	95.76	N/A	N/A
2390.00	39.21	PK	H	28.08	1.80	0.00	69.09	74.00	4.91
2390.00	23.24	AV	H	28.08	1.80	0.00	53.12	54.00	0.88
4824.00	34.26	PK	H	32.95	3.19	25.62	44.78	74.00	29.22
4824.00	22.15	AV	H	32.95	3.19	25.62	32.67	54.00	21.33
7236.00	34.52	PK	H	35.81	4.77	25.64	49.46	74.00	24.54
7236.00	22.16	AV	H	35.81	4.77	25.64	37.10	54.00	16.90
Middle Channel: 2437 MHz									
2437.00	85.58	PK	H	28.17	1.82	0.00	115.57	N/A	N/A
2437.00	75.71	AV	H	28.17	1.82	0.00	105.70	N/A	N/A
2437.00	79.62	PK	V	28.17	1.82	0.00	109.61	N/A	N/A
2437.00	70.13	AV	V	28.17	1.82	0.00	100.12	N/A	N/A
4874.00	35.09	PK	H	33.05	3.26	25.65	45.75	74.00	28.25
4874.00	23.64	AV	H	33.05	3.26	25.65	34.30	54.00	19.70
7311.00	34.91	PK	H	36.01	4.64	25.71	49.85	74.00	24.15
7311.00	22.14	AV	H	36.01	4.64	25.71	37.08	54.00	16.92
High Channel: 2462 MHz									
2462.00	79.56	PK	H	28.22	1.83	0.00	109.61	N/A	N/A
2462.00	71.02	AV	H	28.22	1.83	0.00	101.07	N/A	N/A
2462.00	73.46	PK	V	28.22	1.83	0.00	103.51	N/A	N/A
2462.00	64.25	AV	V	28.22	1.83	0.00	94.30	N/A	N/A
2483.50	42.36	PK	H	28.27	1.84	0.00	72.47	74.00	1.53
2483.50	22.04	AV	H	28.27	1.84	0.00	52.15	54.00	1.85
4924.00	34.56	PK	H	33.15	3.27	25.65	45.33	74.00	28.67
4924.00	22.57	AV	H	33.15	3.27	25.65	33.34	54.00	20.66
7386.00	34.26	PK	H	36.20	4.51	25.79	49.18	74.00	24.82
7386.00	22.36	AV	H	36.20	4.51	25.79	37.28	54.00	16.72

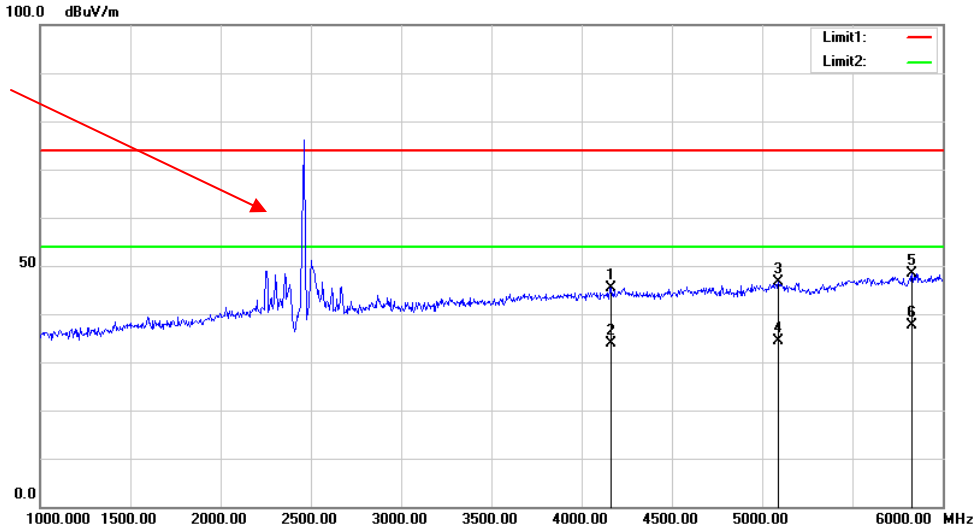
BLE:

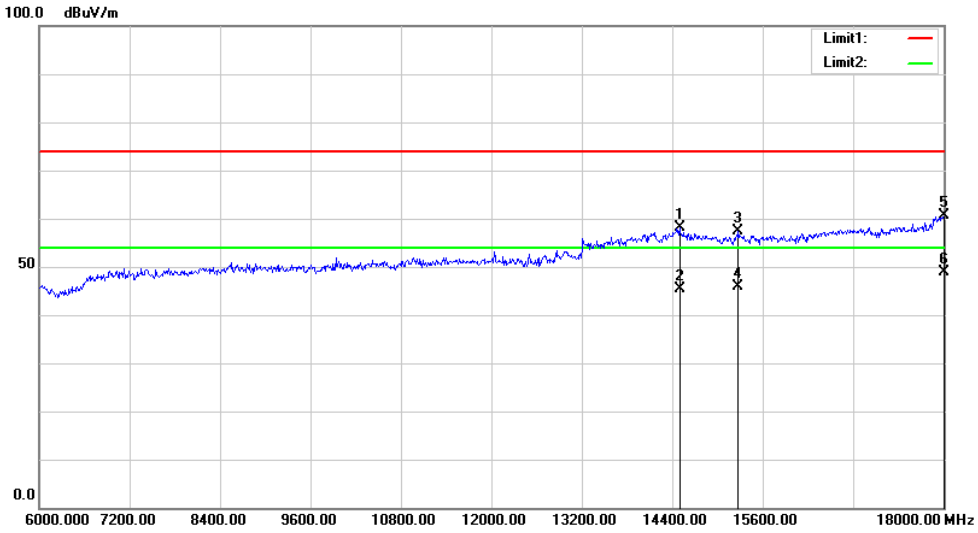
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	71.18	PK	H	28.10	1.80	0.00	101.08	N/A	N/A
2402.00	69.42	AV	H	28.10	1.80	0.00	99.32	N/A	N/A
2402.00	68.08	PK	V	28.10	1.80	0.00	97.98	N/A	N/A
2402.00	66.78	AV	V	28.10	1.80	0.00	96.68	N/A	N/A
2390.00	24.33	PK	H	28.08	1.80	0.00	54.21	74.00	19.79
2390.00	16.00	AV	H	28.08	1.80	0.00	45.88	54.00	8.12
4804.00	34.61	PK	H	32.91	3.17	25.60	45.09	74.00	28.91
4804.00	22.36	AV	H	32.91	3.17	25.60	32.84	54.00	21.16
7206.00	34.33	PK	H	35.74	4.82	25.60	49.29	74.00	24.71
7206.00	22.03	AV	H	35.74	4.82	25.60	36.99	54.00	17.01
Middle Channel: 2440 MHz									
2440.00	71.21	PK	H	28.18	1.82	0.00	101.21	N/A	N/A
2440.00	69.89	AV	H	28.18	1.82	0.00	99.89	N/A	N/A
2440.00	66.54	PK	V	28.18	1.82	0.00	96.54	N/A	N/A
2440.00	64.79	AV	V	28.18	1.82	0.00	94.79	N/A	N/A
4880.00	34.75	PK	H	33.06	3.27	25.66	45.42	74.00	28.58
4880.00	22.34	AV	H	33.06	3.27	25.66	33.01	54.00	20.99
7320.00	34.25	PK	H	36.03	4.62	25.72	49.18	74.00	24.82
7320.00	22.15	AV	H	36.03	4.62	25.72	37.08	54.00	16.92
High Channel: 2480 MHz									
2480.00	71.08	PK	H	28.26	1.84	0.00	101.18	N/A	N/A
2480.00	70.39	AV	H	28.26	1.84	0.00	100.49	N/A	N/A
2480.00	66.74	PK	V	28.26	1.84	0.00	96.84	N/A	N/A
2480.00	65.41	AV	V	28.26	1.84	0.00	95.51	N/A	N/A
2483.50	27.83	PK	H	28.27	1.84	0.00	57.94	74.00	16.06
2483.50	15.73	AV	H	28.27	1.84	0.00	45.84	54.00	8.16
4960.00	34.97	PK	H	33.22	3.23	25.63	45.79	74.00	28.21
4960.00	22.69	AV	H	33.22	3.23	25.63	33.51	54.00	20.49
7440.00	34.12	PK	H	36.34	4.41	25.85	49.02	74.00	24.98
7440.00	22.52	AV	H	36.34	4.41	25.85	37.42	54.00	16.58

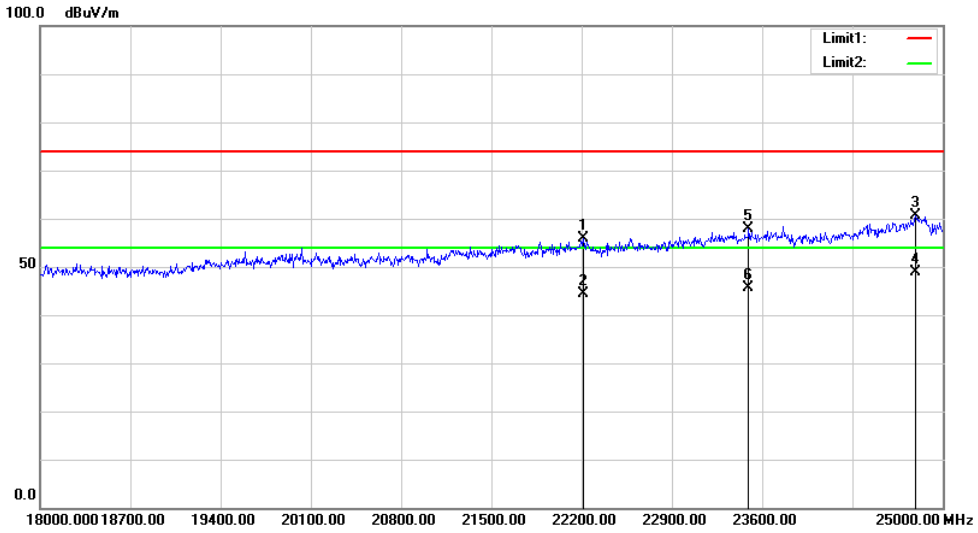
3) Test plots (802.11b High channel was the worst)

Horizontal:

Fundamental Test with Band Rejection Filter

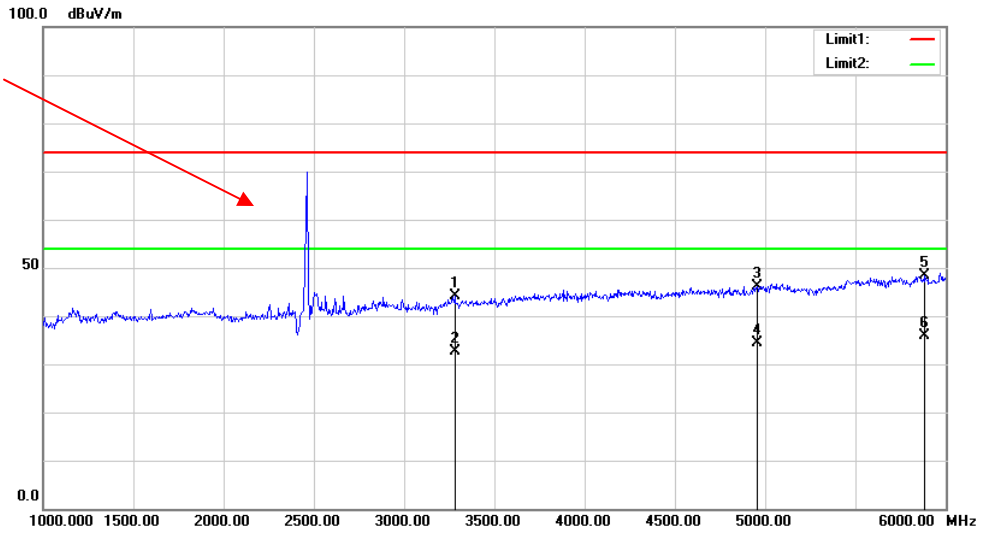


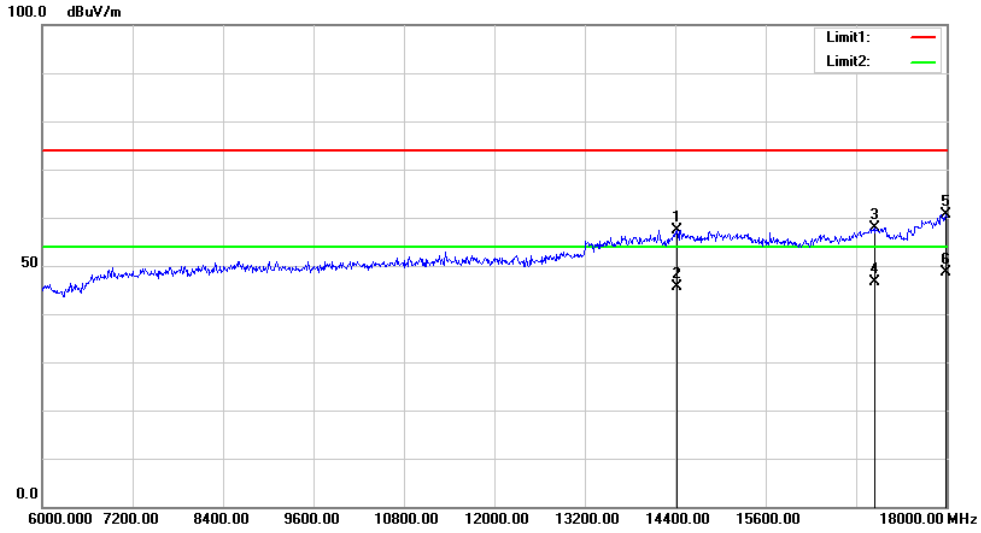


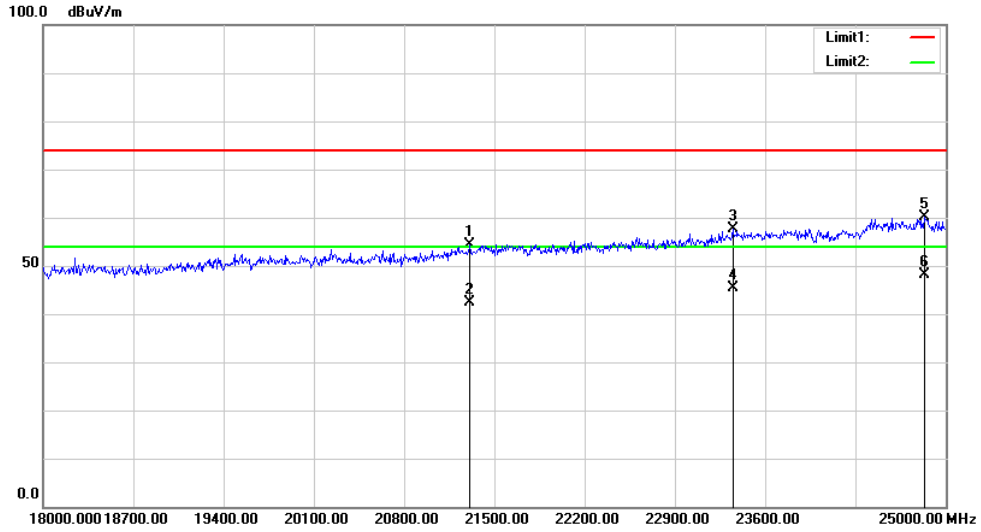


Vertical:

Fundamental Test with Band Rejection Filter







6– 6 dB EMISSION BANDWIDTH AND 99% OCCUPIED BANDWIDTH

Applicable Standard

According to FCC §15.247(a) (2)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

According to RSS-247 §5.2 a)

The minimum 6 dB bandwidth shall be 500 kHz.

According to RSS-Gen §6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.
The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Test Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3×RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum

level measured in the fundamental emission.

Test Data

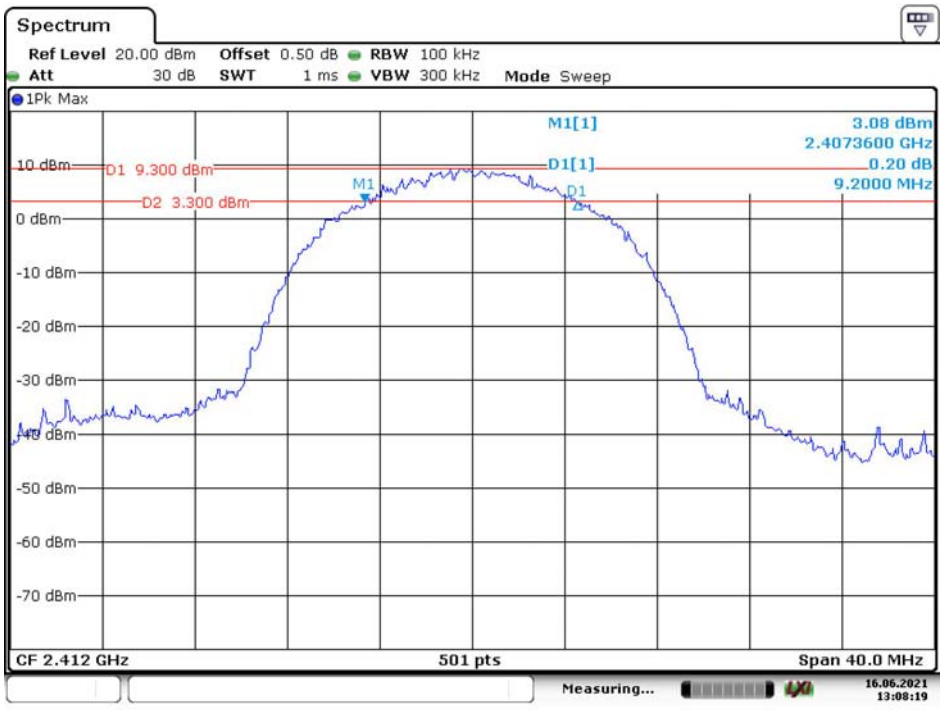
Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

Test mode	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)
802.11 b	2412	9.200	13.892	≥0.5
	2437	9.600	13.892	≥0.5
	2462	10.240	14.052	≥0.5
802.11 g	2412	15.360	16.527	≥0.5
	2437	15.280	17.166	≥0.5
	2462	15.280	16.527	≥0.5
802.11n ht20	2412	15.440	17.565	≥0.5
	2437	15.120	18.283	≥0.5
	2462	15.120	17.725	≥0.5
BLE	2402	0.664	1.050	≥0.5
	2440	0.660	1.050	≥0.5
	2480	0.664	1.054	≥0.5

6dB Bandwidth:

802.11b Low Channel



Date: 16.JUN.2021 13:08:20

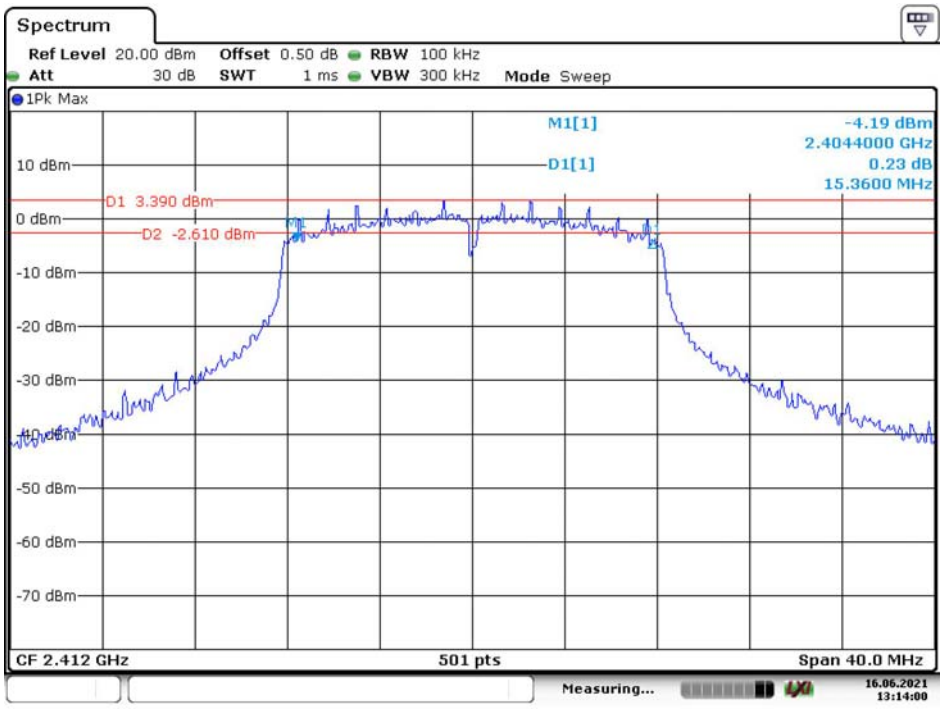
802.11b Middle Channel

Date: 16.JUN.2021 13:10:29

802.11b High Channel

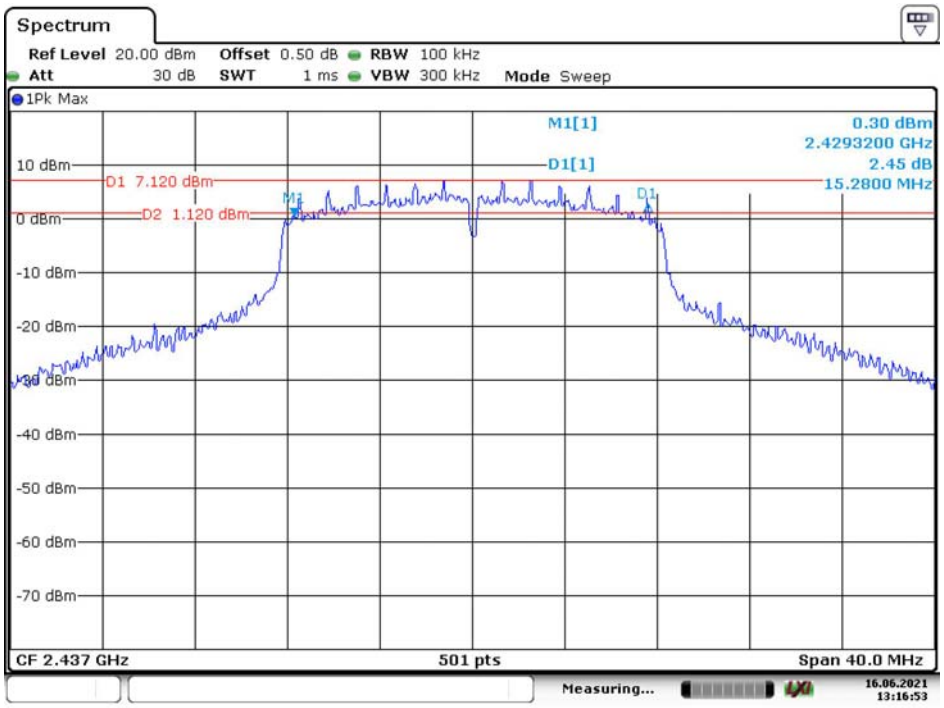
Date: 16.JUN.2021 13:12:06

802.11g Low Channel



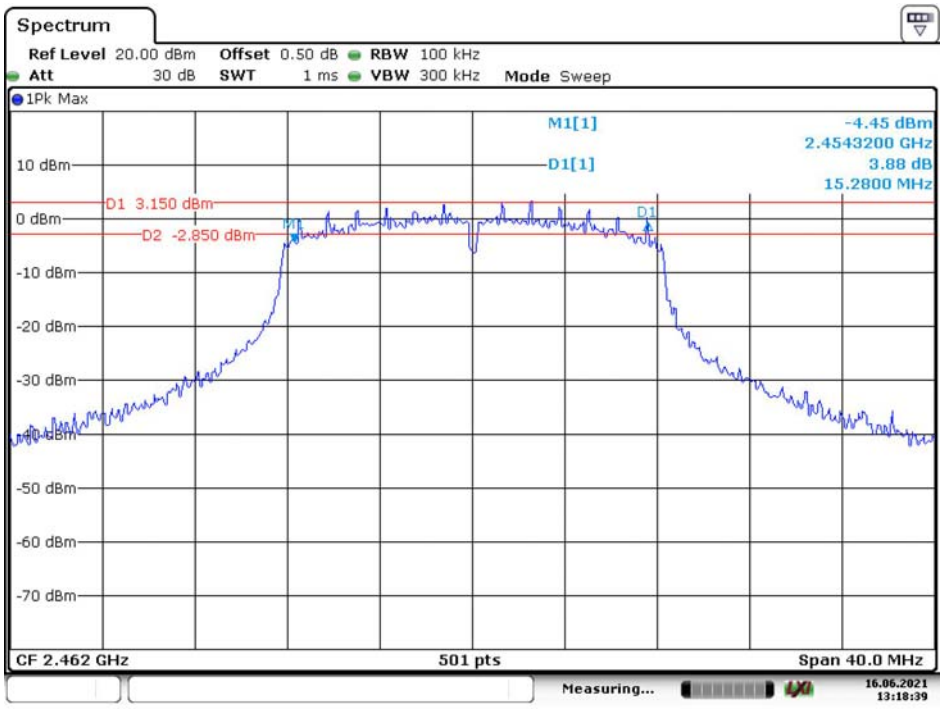
Date: 16.JUN.2021 13:14:01

802.11g Middle Channel



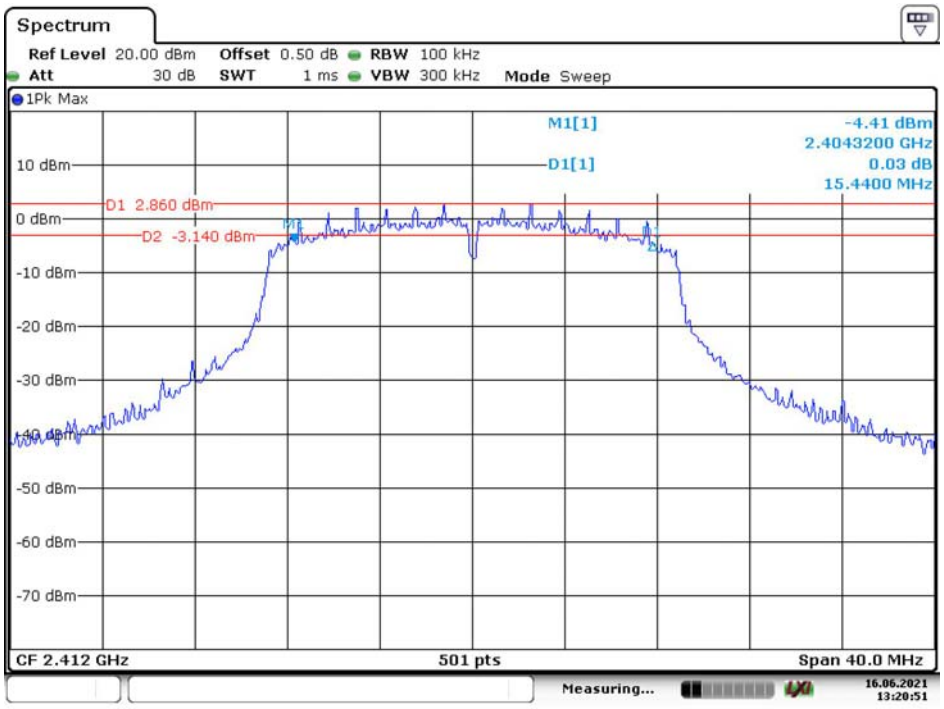
Date: 16.JUN.2021 13:16:54

802.11g High Channel



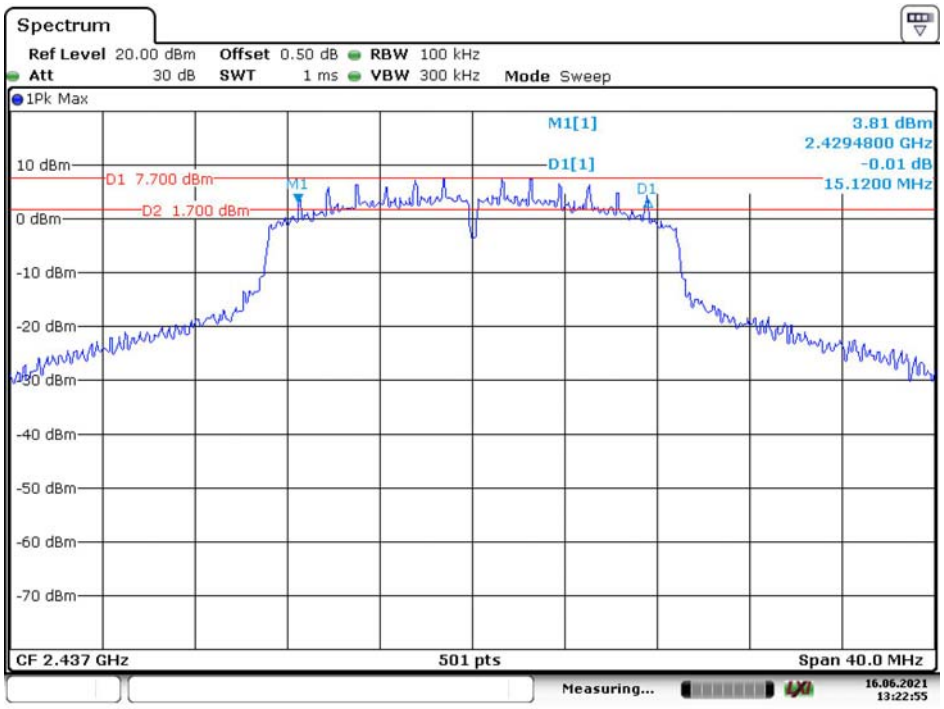
Date: 16.JUN.2021 13:18:39

802.11n ht20 Low Channel



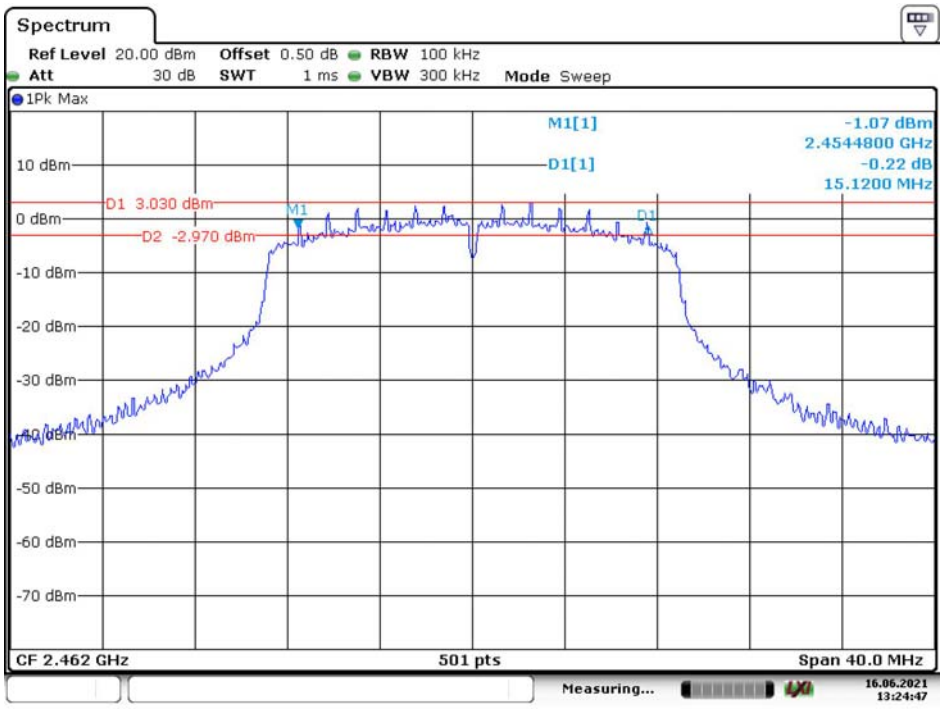
Date: 16.JUN.2021 13:20:52

802.11n ht20 Middle Channel



Date: 16.JUN.2021 13:22:56

802.11n ht20 High Channel



Date: 16.JUN.2021 13:24:47

BLE Low Channel

Date: 1.JUN.2021 08:30:42

BLE Middle Channel

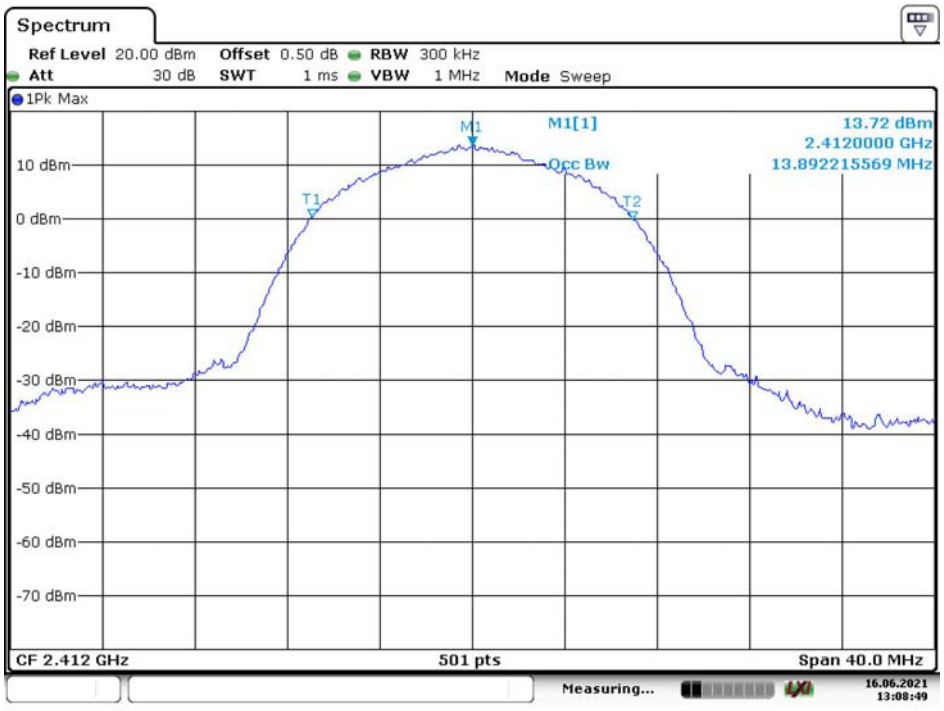
Date: 1.JUN.2021 08:32:08

BLE High Channel

Date: 1.JUN.2021 08:33:22

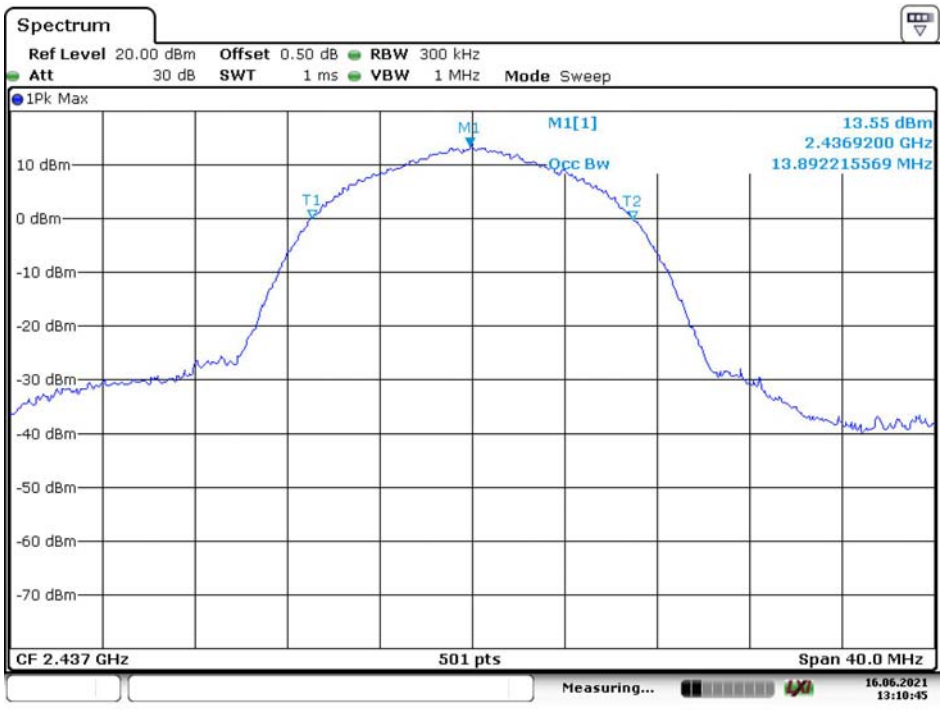
99% Occupied Bandwidth:

802.11b Low Channel



Date: 16.JUN.2021 13:08:49

802.11b Middle Channel

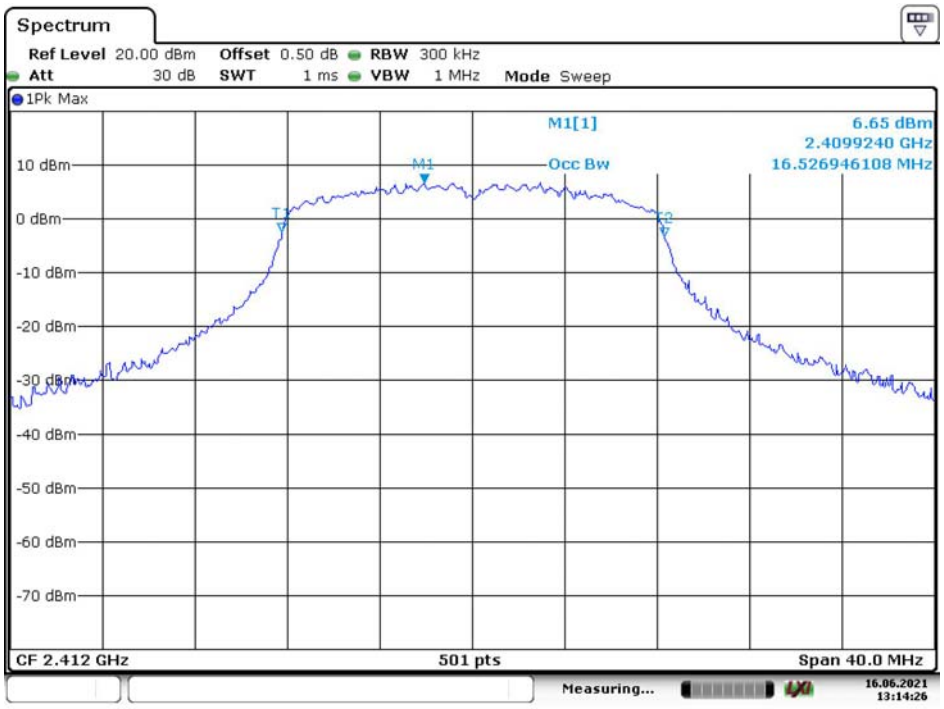


Date: 16.JUN.2021 13:10:46

802.11b High Channel

Date: 16.JUN.2021 13:12:23

802.11g Low Channel

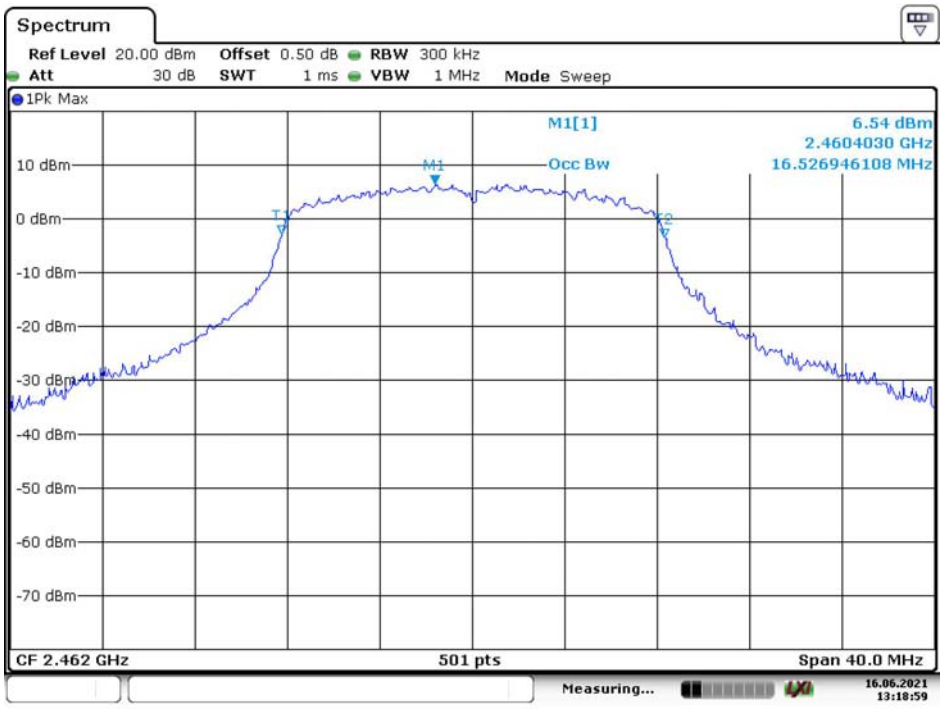


Date: 16.JUN.2021 13:14:27

802.11g Middle Channel

Date: 16.JUN.2021 13:17:26

802.11g High Channel



Date: 16.JUN.2021 13:18:59

802.11n ht20 Low Channel

Date: 16.JUN.2021 13:21:15

802.11n ht20 Middle Channel

Date: 16.JUN.2021 13:23:15

802.11n ht20 High Channel

Date: 16.JUN.2021 13:25:23

BLE Low Channel

Date: 1.JUN.2021 08:30:53

BLE Middle Channel

Date: 1.JUN.2021 08:32:18

BLE High Channel

Date: 1.JUN.2021 08:33:33

7 - MAXIMUM PEAK CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to RSS-247§5.4 d) For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(e), the e.i.r.p. shall not exceed 4 W.
As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.
4. Set the power meter to test average output power, record the result as average power.

Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

Mode	Frequency (MHz)	Peak Conducted Output Power (dBm)	Peak Conducted Output Power Limit (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit For ISED (dBm)
802.11b	2412	22.03	30	-1.19	20.84	36
	2437	21.96	30	-1.19	20.77	36
	2462	**22.05**	30	-1.19	**20.86**	36
802.11g	2412	24.69	30	-1.19	23.50	36
	2437	**25.54**	30	-1.19	**24.35**	36
	2462	24.36	30	-1.19	23.17	36
802.11n ht20	2412	24.43	30	-1.19	23.24	36
	2437	**25.51**	30	-1.19	**24.32**	36
	2462	23.76	30	-1.19	22.57	36
BLE	2402	**3.14**	30	-1.19	**1.95**	36
	2440	2.96	30	-1.19	1.77	36
	2480	2.37	30	-1.19	1.18	36

8 – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

According to FCC§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) (see §15.205(c)).

According to RSS-247 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(d), 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.

Test Procedure

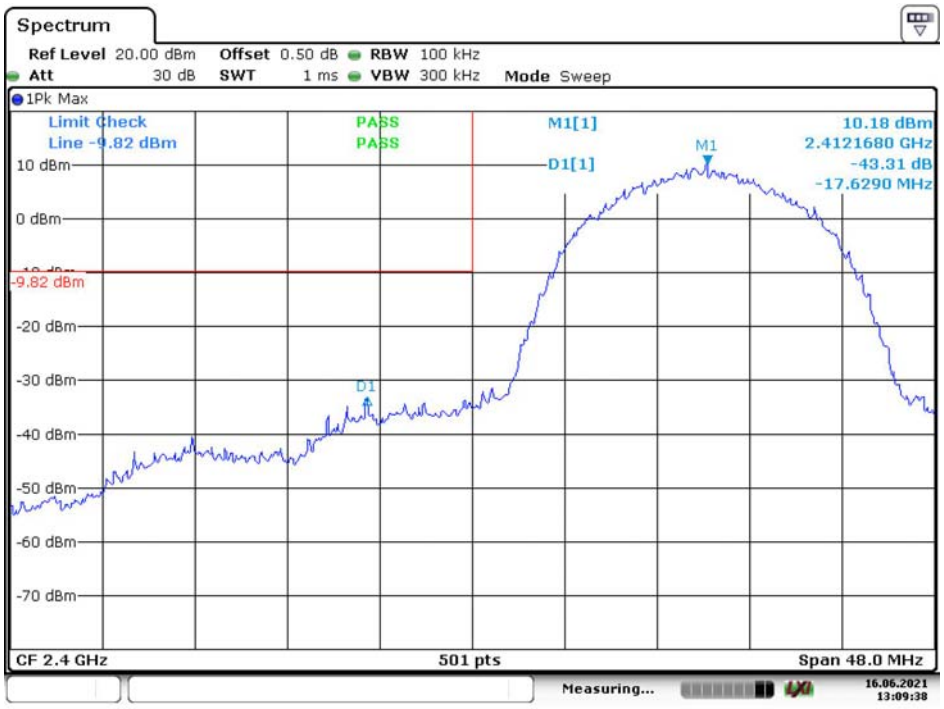
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Data

Test Mode: Transmitting

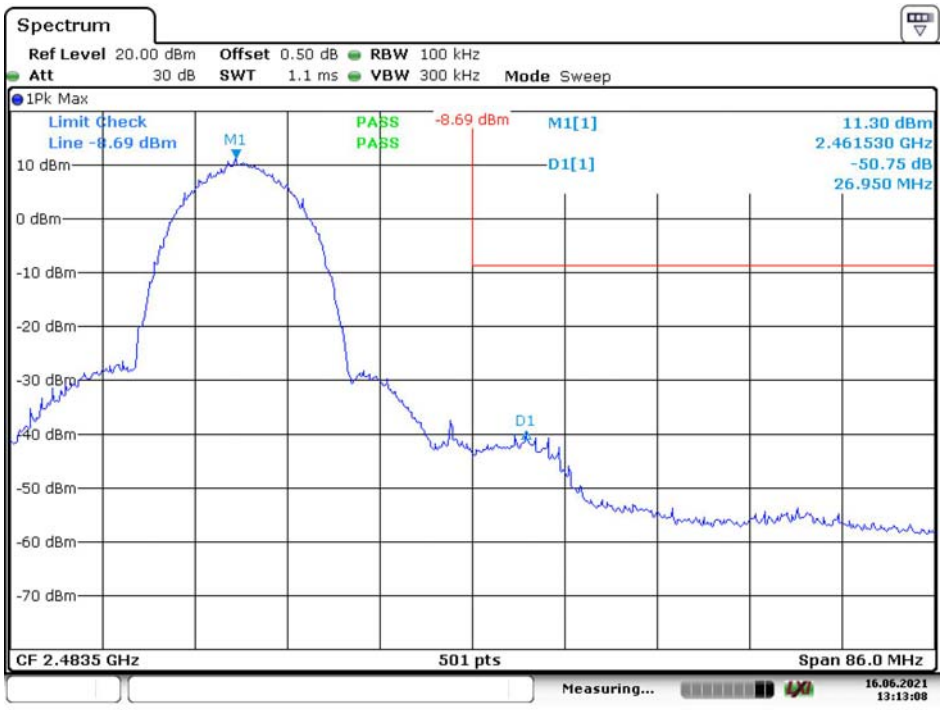
Test Result: Compliance. Please refer to following tables and plots.

802.11b: Band Edge, Left Side



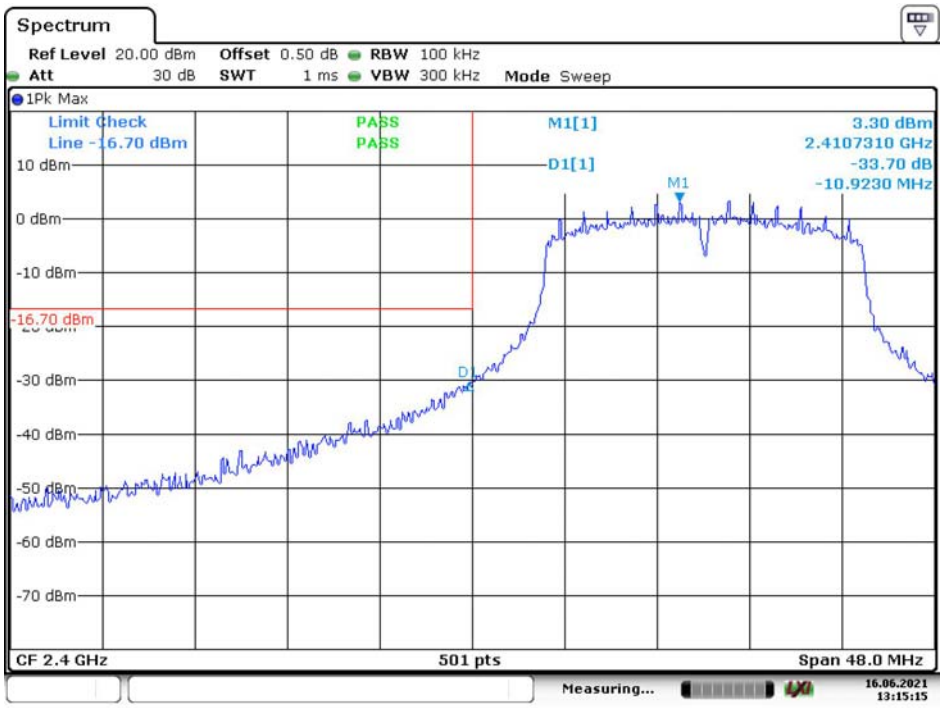
Date: 16.JUN.2021 13:09:38

802.11b: Band Edge, Right Side



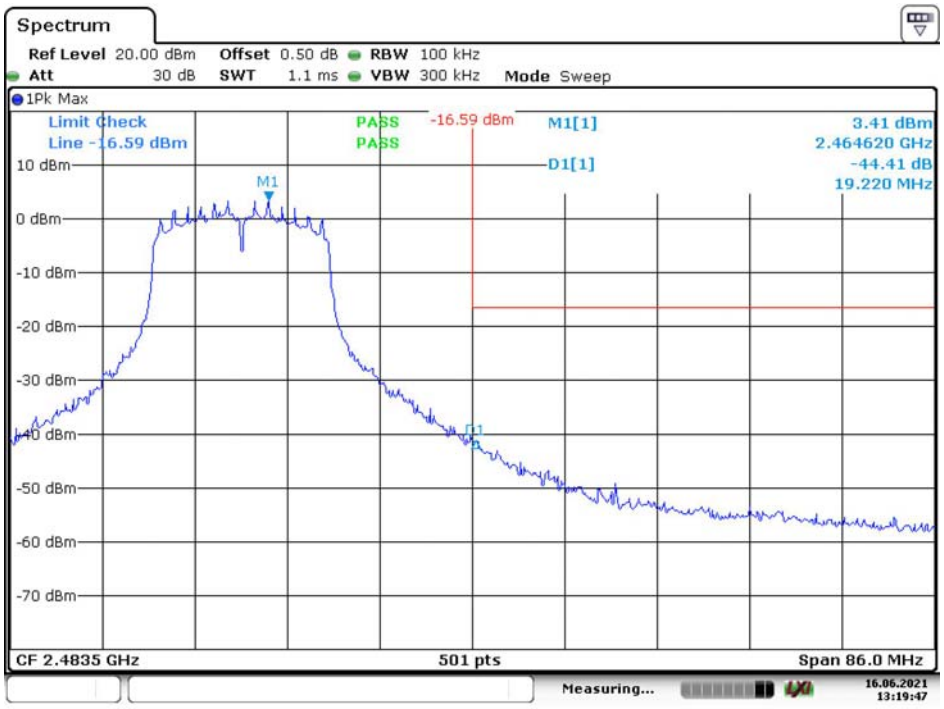
Date: 16.JUN.2021 13:13:08

802.11g: Band Edge, Left Side



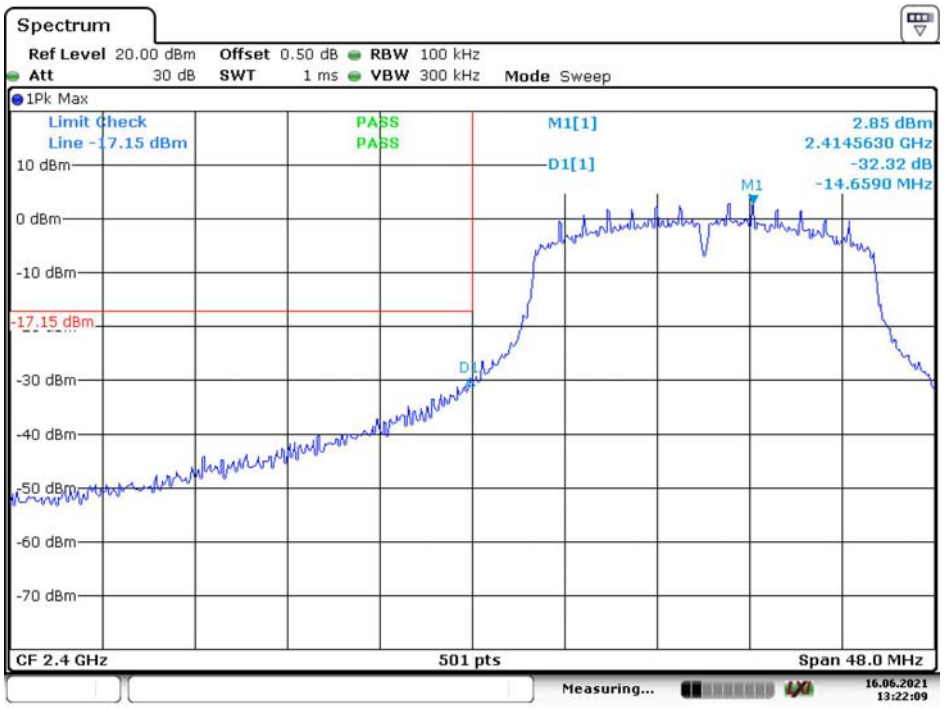
Date: 16.JUN.2021 13:15:16

802.11g: Band Edge, Right Side



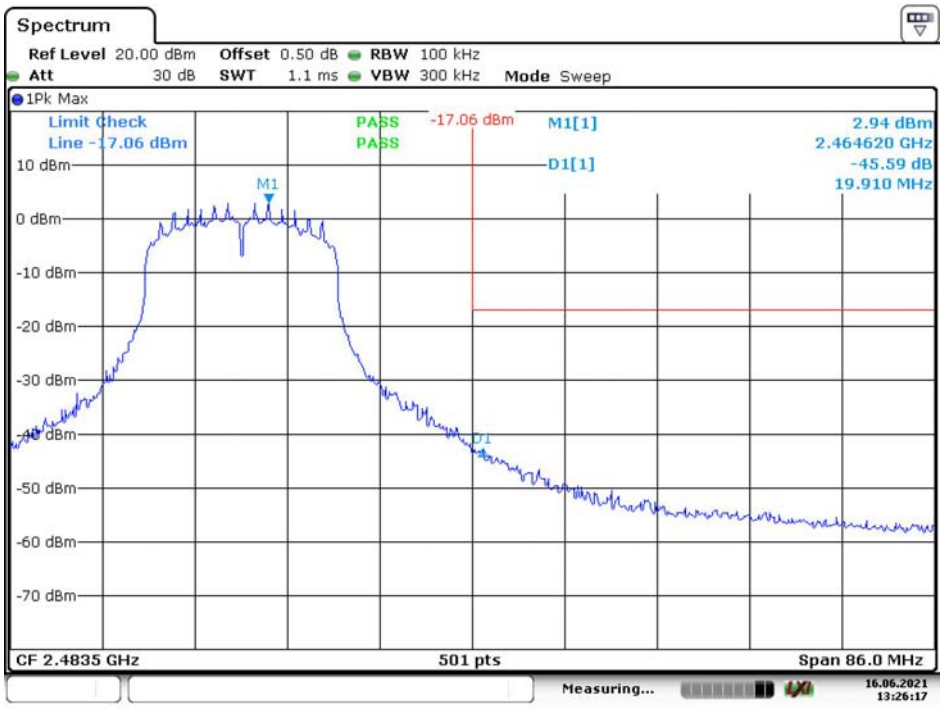
Date: 16.JUN.2021 13:19:48

802.11n ht20: Band Edge, Left Side



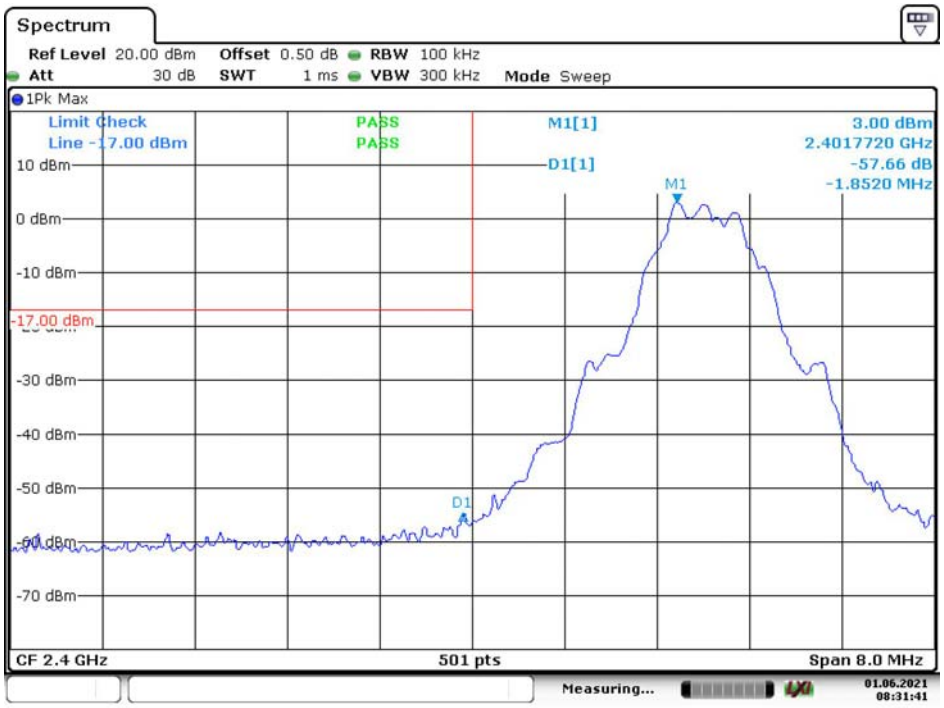
Date: 16.JUN.2021 13:22:10

802.11n ht20: Band Edge, Right Side



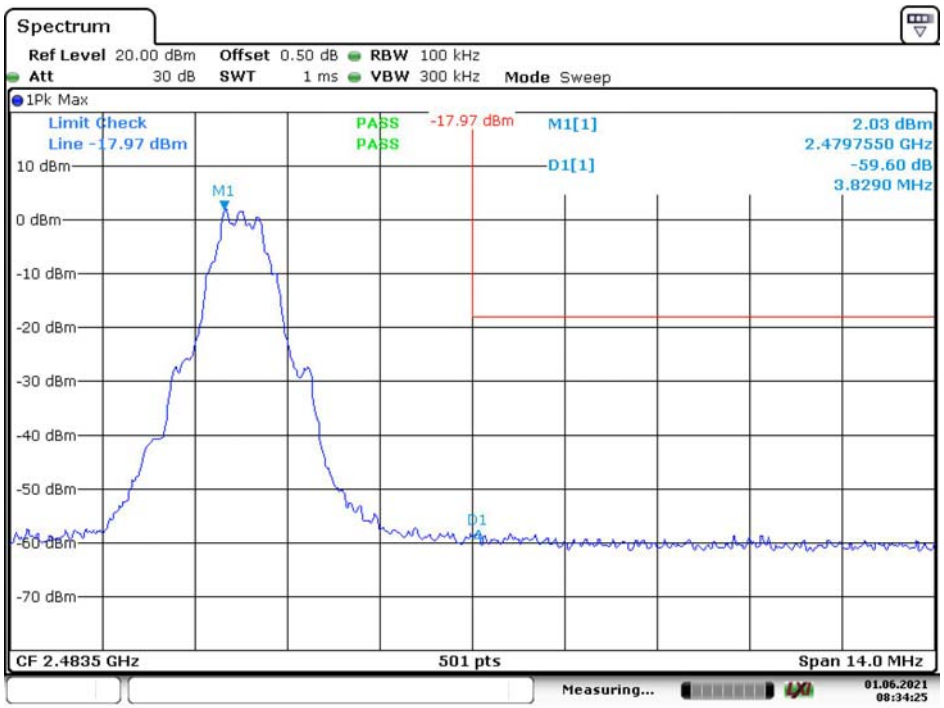
Date: 16.JUN.2021 13:26:18

BLE: Band Edge, Left Side



Date: 1.JUN.2021 08:31:41

BLE: Band Edge, Right Side



Date: 1.JUN.2021 08:34:25

9 - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

According to RSS-247 §5.2 b):

> b) The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

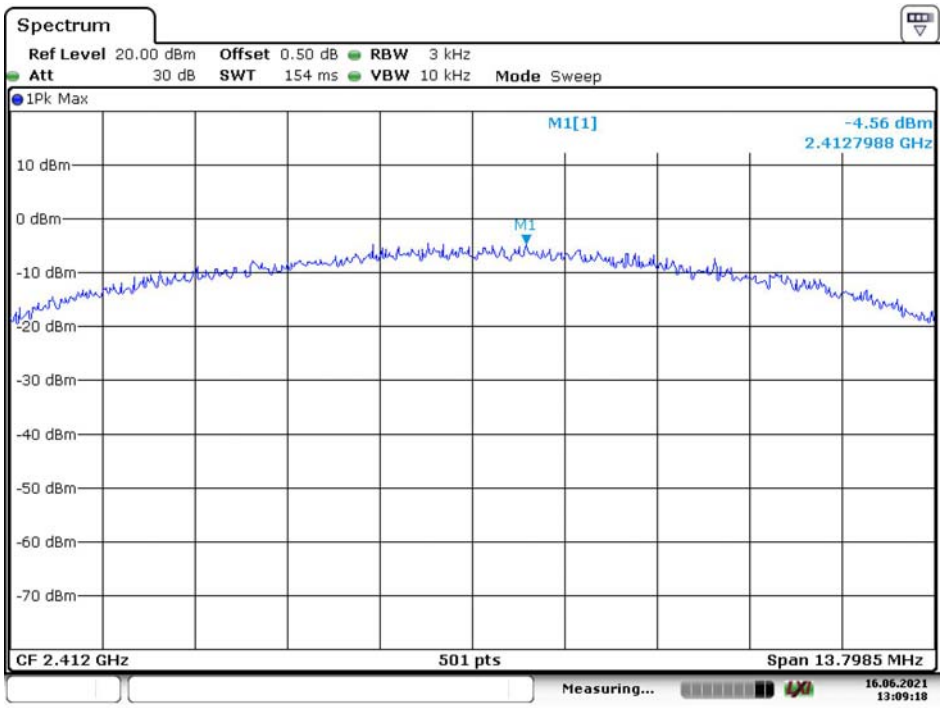
Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

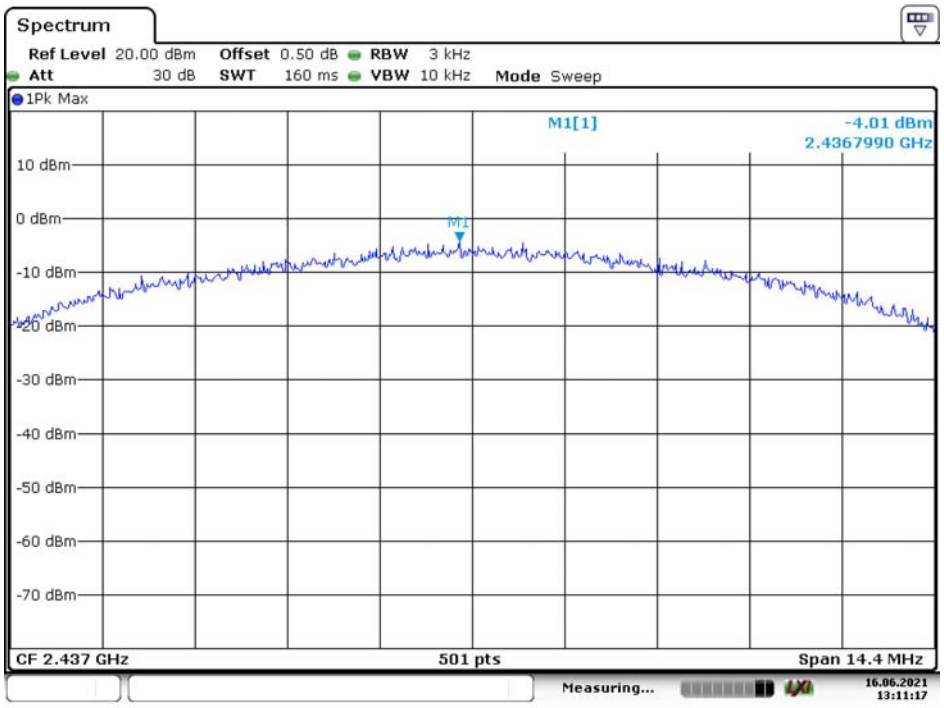
Test mode	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
802.11 b	2412	-4.56	≤8
	2437	-4.01	≤8
	2462	-3.59	≤8
802.11 g	2412	-10.82	≤8
	2437	-7.64	≤8
	2462	-11.00	≤8
802.11n ht20	2412	-10.71	≤8
	2437	-7.12	≤8
	2462	-10.63	≤8
BLE	2402	-12.77	≤8
	2440	-13.01	≤8
	2480	-13.65	≤8

Power Spectral Density, 802.11b Low Channel



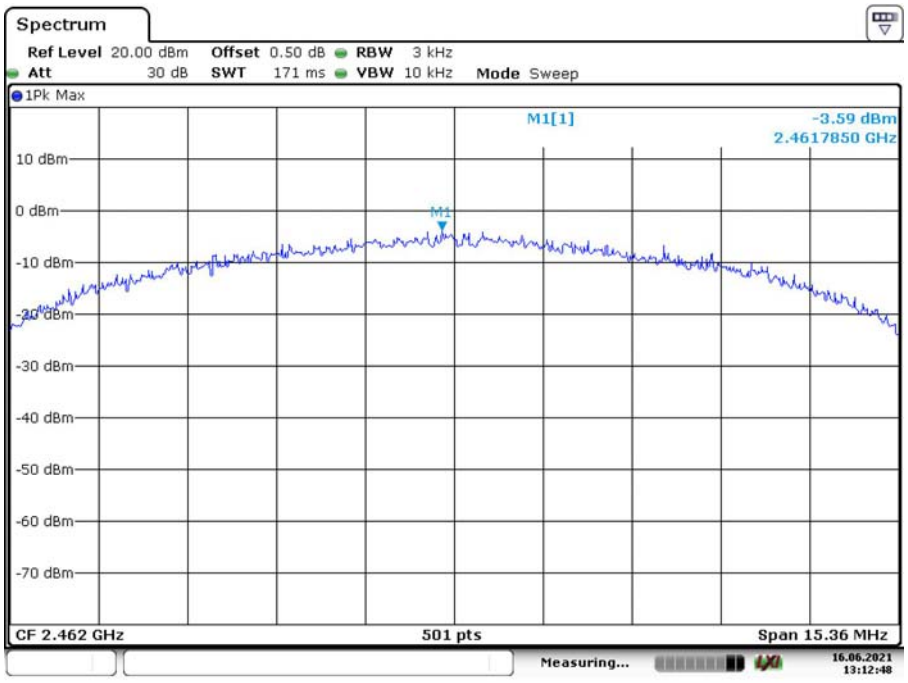
Date: 16.JUN.2021 13:09:18

Power Spectral Density, 802.11b Middle Channel



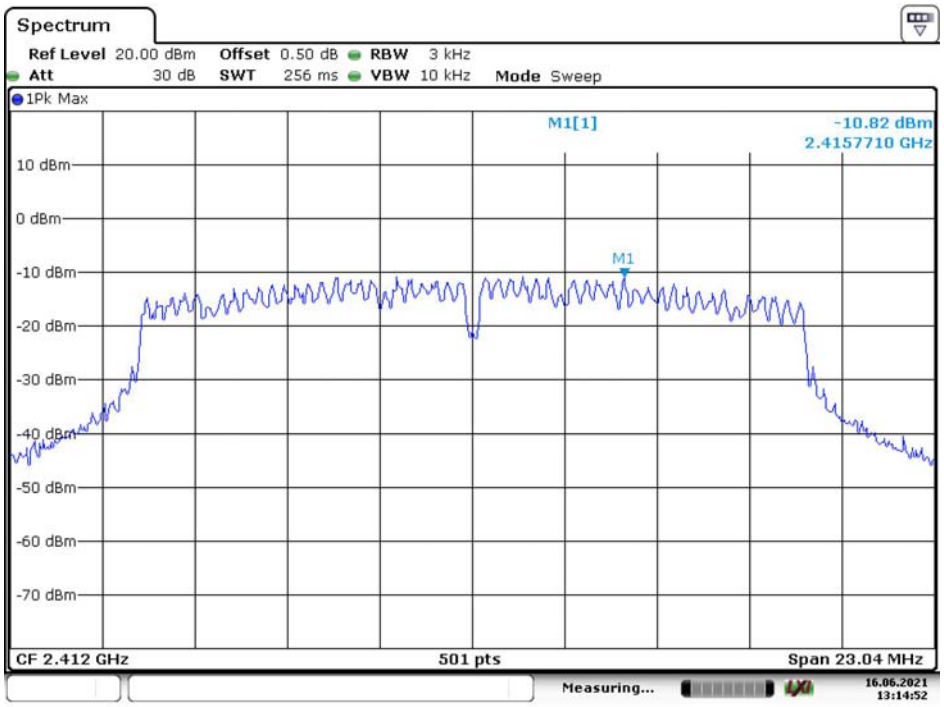
Date: 16.JUN.2021 13:11:18

Power Spectral Density, 802.11b High Channel



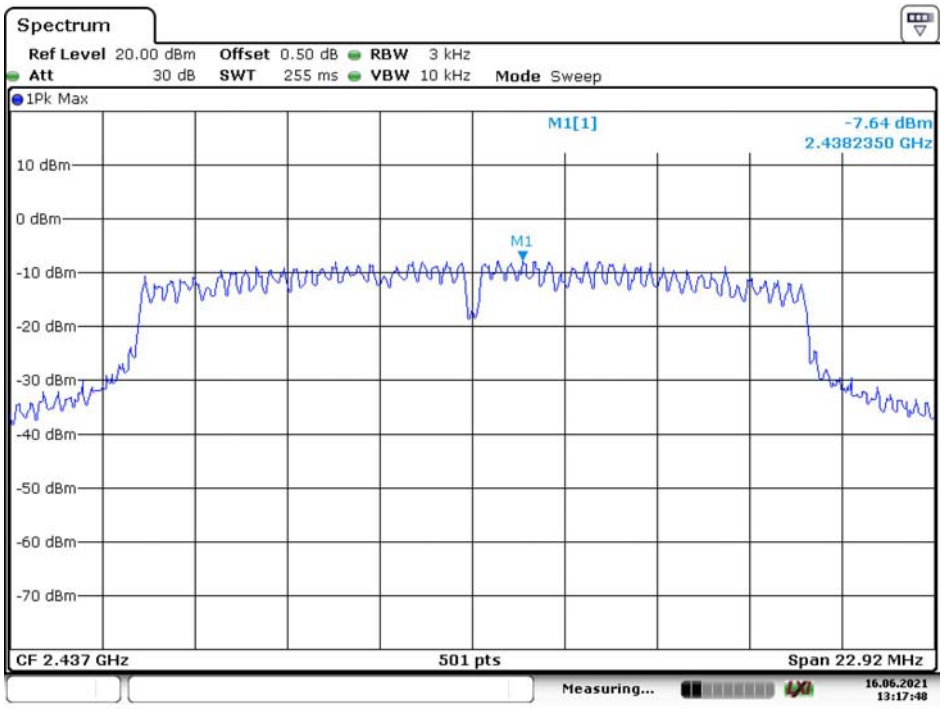
Date: 16.JUN.2021 13:12:48

Power Spectral Density, 802.11g Low Channel



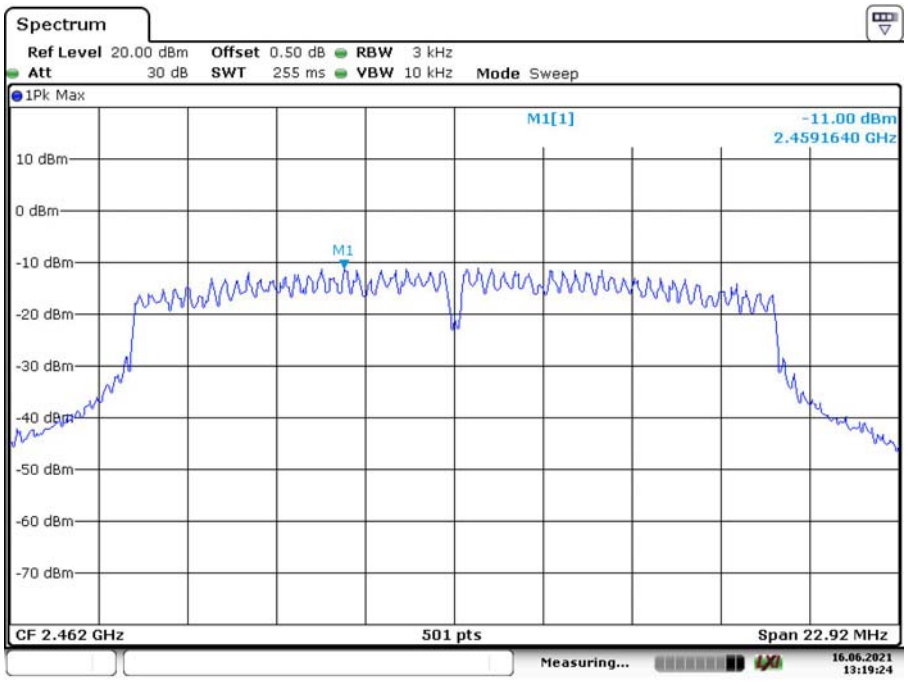
Date: 16.JUN.2021 13:14:52

Power Spectral Density, 802.11g Middle Channel



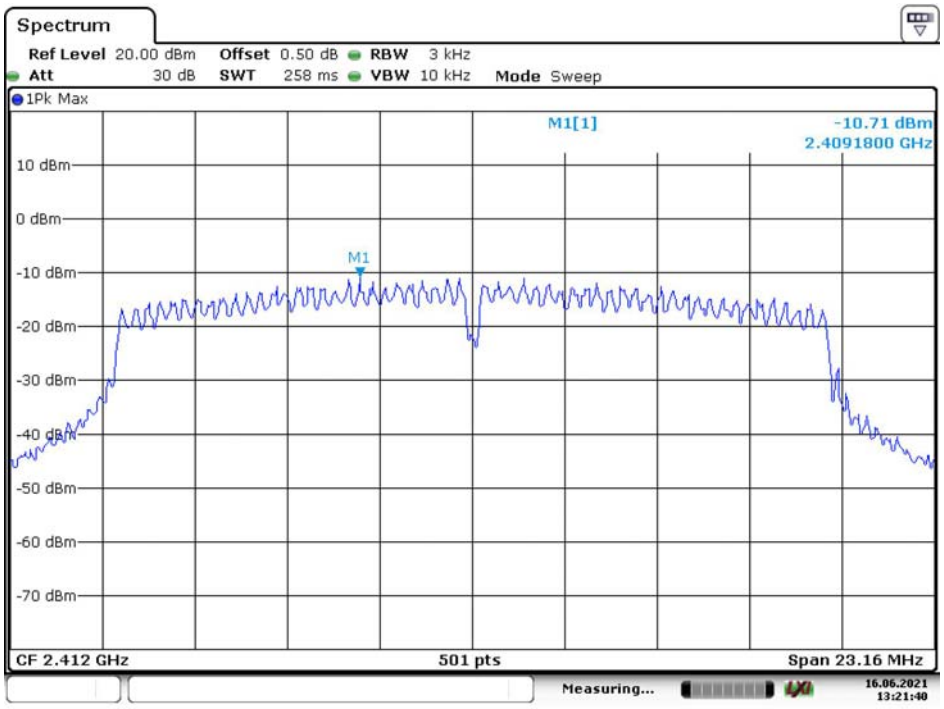
Date: 16.JUN.2021 13:17:49

Power Spectral Density, 802.11g High Channel



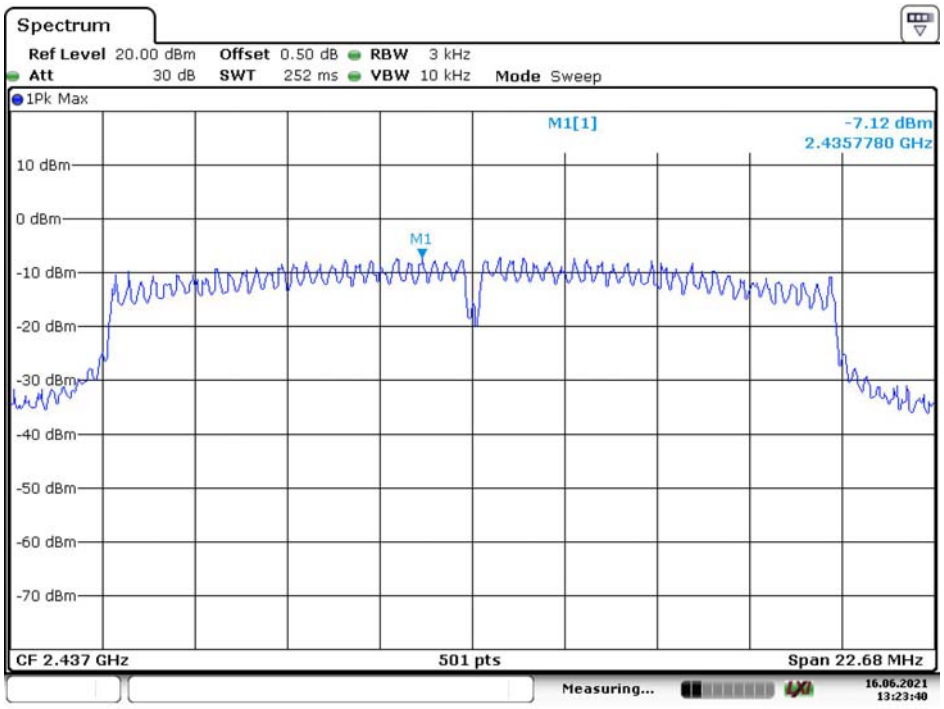
Date: 16.JUN.2021 13:19:25

Power Spectral Density, 802.11n ht20 Low Channel



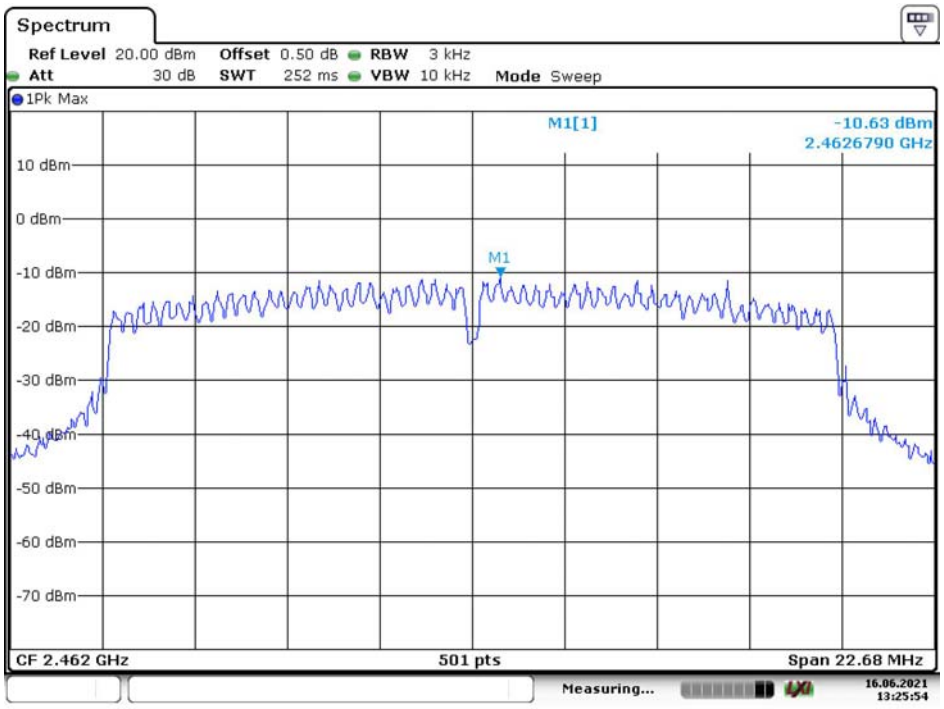
Date: 16.JUN.2021 13:21:41

Power Spectral Density, 802.11n ht20 Middle Channel



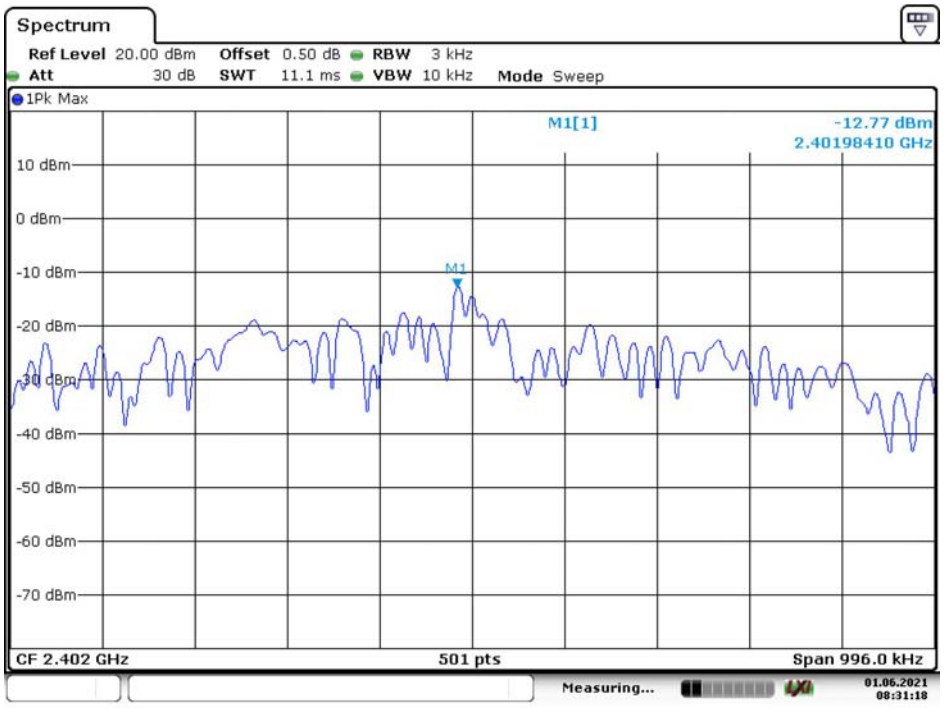
Date: 16.JUN.2021 13:23:41

Power Spectral Density, 802.11n ht20 High Channel



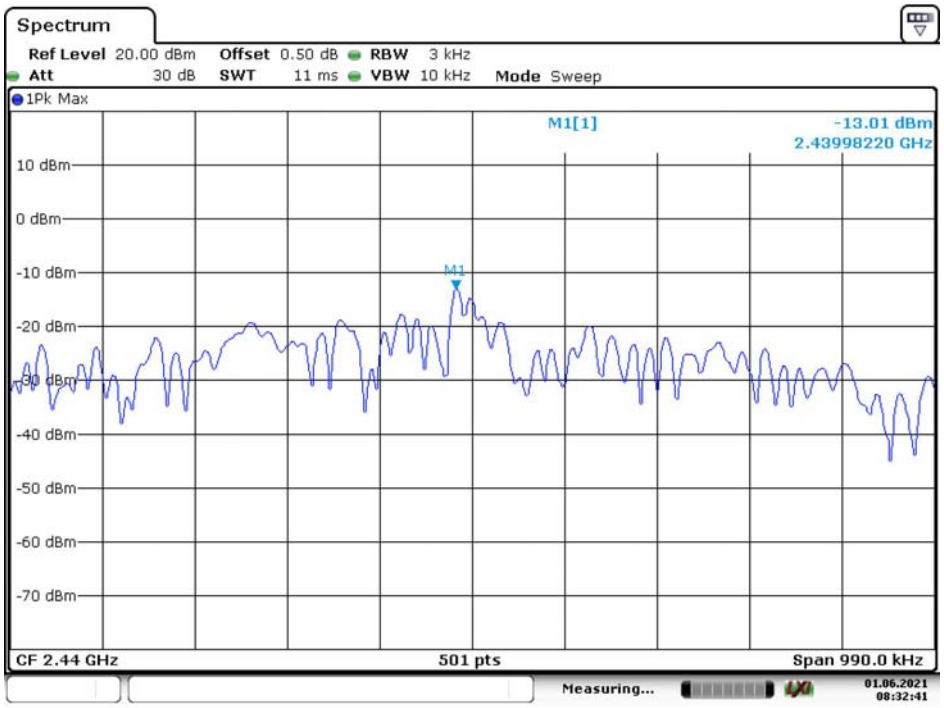
Date: 16.JUN.2021 13:25:54

Power Spectral Density, 802.11n ht40 Low Channel



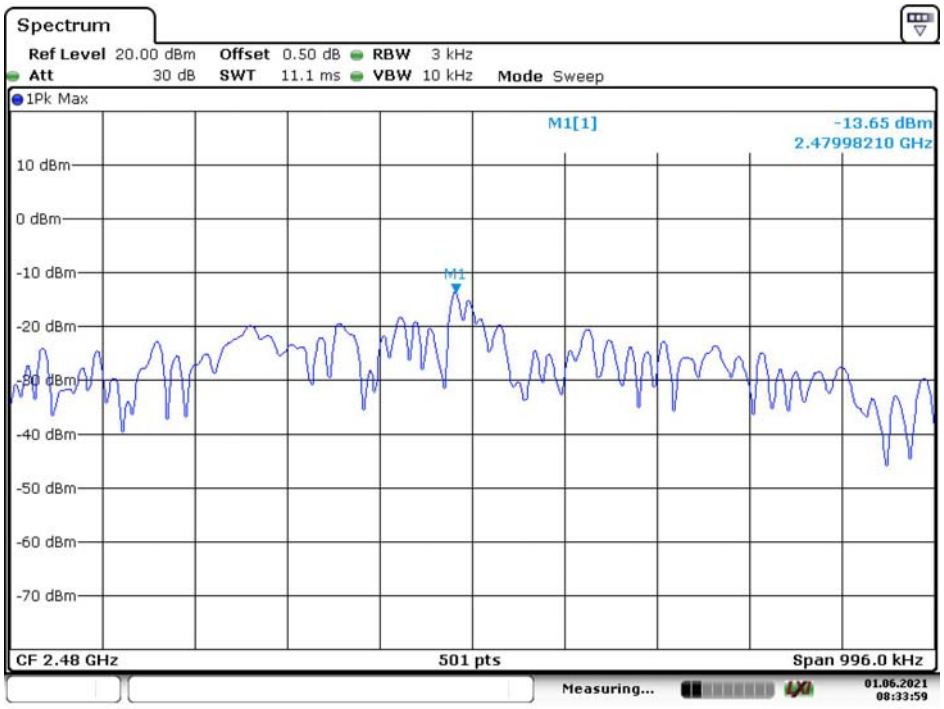
Date: 1.JUN.2021 08:31:18

Power Spectral Density, 802.11n ht40 Middle Channel



Date: 1.JUN.2021 08:32:41

Power Spectral Density, 802.11n ht40 High Channel



Date: 1.JUN.2021 08:33:58

******* END OF REPORT *******