FCC PART 15.247

TEST REPORT

For

ShenZhen Foscam Intelligent Technology Co., Ltd.

Room 901，Unit B, Building 7, Xingke 1st Street，Vanke Cloud City Phase 1,
Nanshan Dist., Shenzhen, China.

FCC ID: ZDER3

Report Type:	**Product Type:**
Original Report	Wireless IP Camera

Report Number: SZ4210827-52937E-RF-00

Report Date: 2021-10-25

Reviewed By: Candy Li, RF Engineer

Prepared By: Shenzhen Accurate Technology Co., Ltd.
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Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

Shenzhen Accurate Technology Co., Ltd. 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 an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Wireless IP Camera
Tested Model	R3
Multiple Model	R3 V2, R3 V3, R3 V4, R3 VX, X3, X3 V2, X3 V3, X3 VX, X3E, X3E V2, X3E V3, X3E VX, X2E, X2E V2, X2E V3, X2E VX, X4, X4E V2, X4E V3, X4E VX, R5,R5 V2, R5 V3, R5 VX, X5, X5 V2, X5 V3, X5 VX, R2, R2M, R4, R4M, R4S, FI9926P, FI9926P VX, FI9936P,FI9936P VX. (Remark: "VX" denote the software version which can be from V0 to V9. The default state is empty while it is V0.）
Model Differences	Refer to the DoS letter
Frequency Range	Wi-Fi: 2412-2472MHz/2422-2462MHz
Maximum Conducted Peak Output Power	17.43dBm(802.11b), 19.53dBm(802.11g) 19.51dBm(802.11n20), 20.02dBm(802.11n40)
Modulation Technique	Wi-Fi: DSSS, OFDM
Antenna Specification*	4 dBi (provided by the applicant)
Voltage Range	DC 5V From Adapter
Date of Test	2021-09-12 to 2021-10-01
Sample serial number	SZ4210827-52937E-RF-S1
Received date	2021-08-27
Sample/EUT Status	Good condition
Adapter 1 information	Model: SAW12-050-2000UB Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5V, 2000mA
Adapter 2 information	Model: KA12C-0501500US Input: AC 100-240V, 50/60Hz, 0.35A Max Output: DC 5V, 1500mA

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission’s rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

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 KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz- 18GHz	4.98dB
	18GHz- 26.5GHz	5.06dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

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

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For 802.11b, 802.11g and 802.11n-HT20 mode, 13 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442	/	/

For 802.11b, 802.11g, 802.11n-HT20 mode, EUT was tested with Channel 1, 7 and 13

For 802.11n-HT40 mode, 9 channels are provided to testing:

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

EUT was tested with Channel 1, 5 and 9.

Equipment Modifications

No modification was made to the EUT tested.

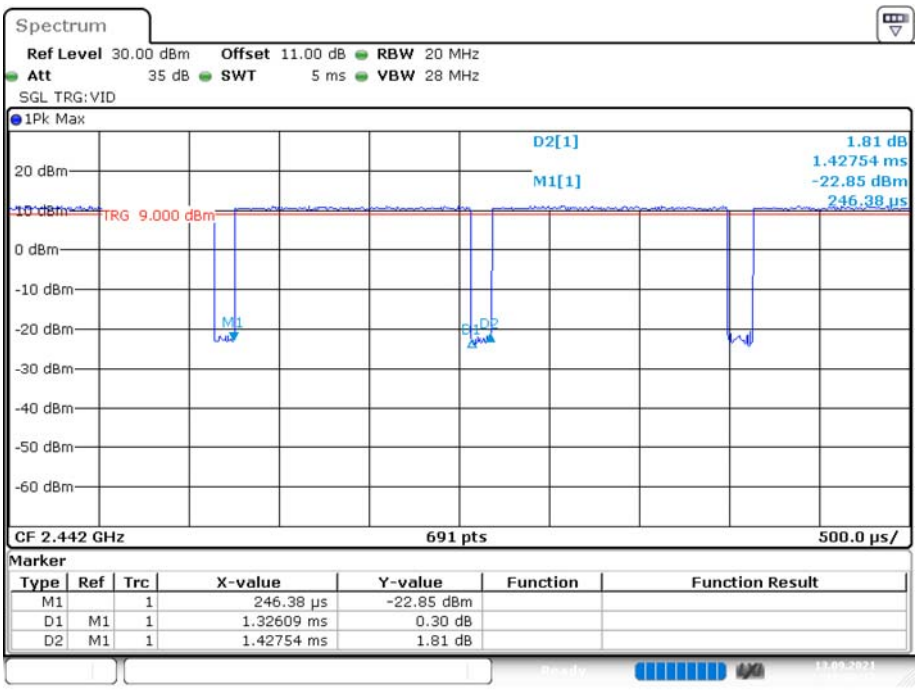
EUT Exercise Software

"SecureCRTPortable.exe" software was used to test, which provided by manufacturer and power level as below:

Item	Mode	Data Rate (Mbps)	Power Level*
Wi-Fi	802.11 b	1	20
	802.11 g	6	Default
	802.11 n20	MCS0	Default
	802.11 n40	MCS0	Default

Duty cycle

802.11b mode



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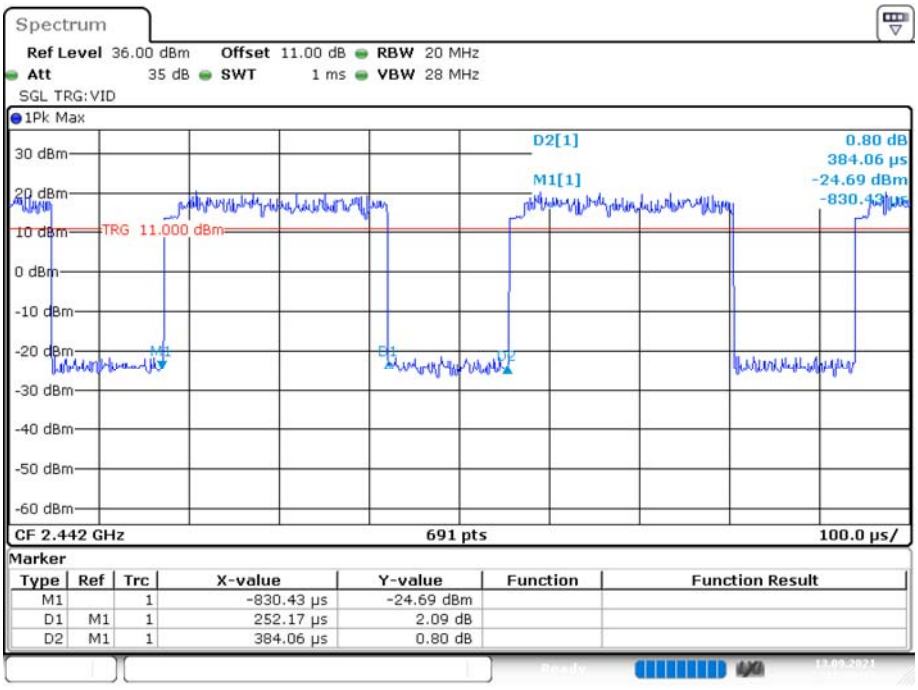
802.11g mode



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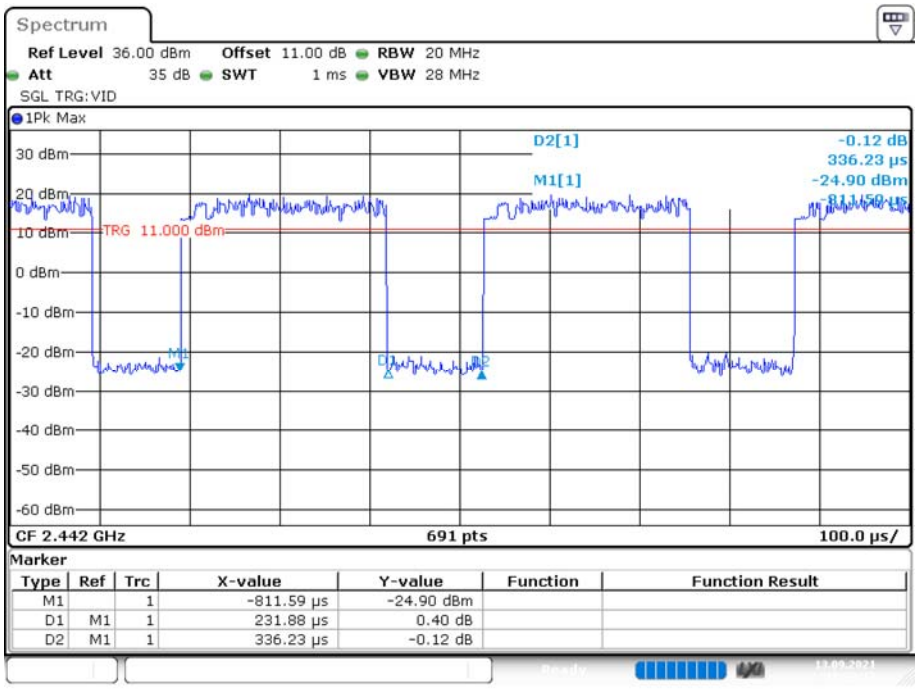
802.11n-HT20 Mode



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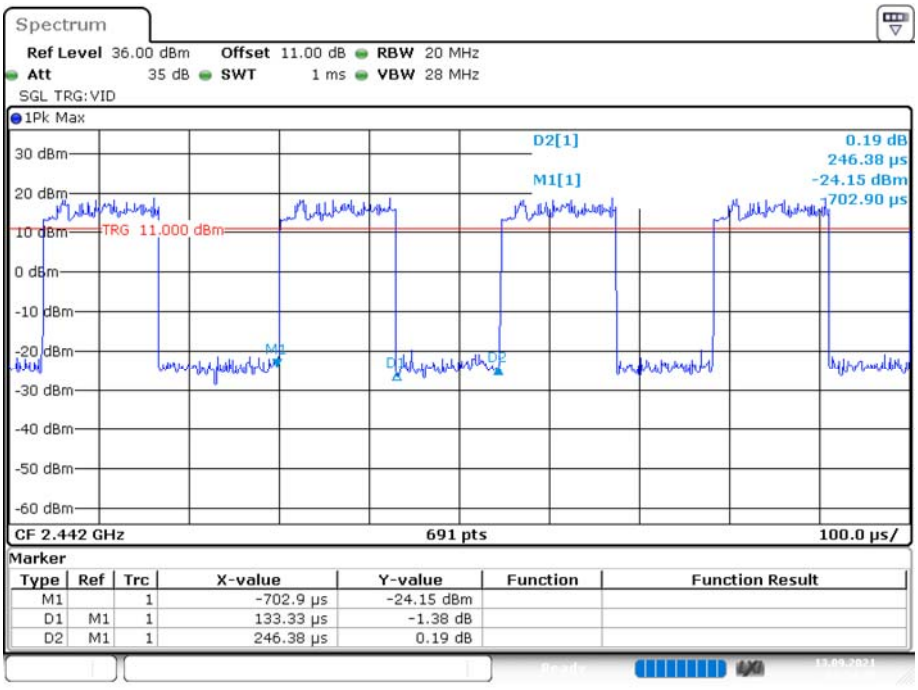
802.11n-HT40 Mode



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Mode	Ton(ms)	Ton+Toff(ms)	Duty Cycle
80.211b	1.326	1.428	92.86
80.211g	0.252	0.384	65.63
80.211n20	0.232	0.336	69.05
80.211n40	0.133	0.246	54.07

Support Equipment List and Details

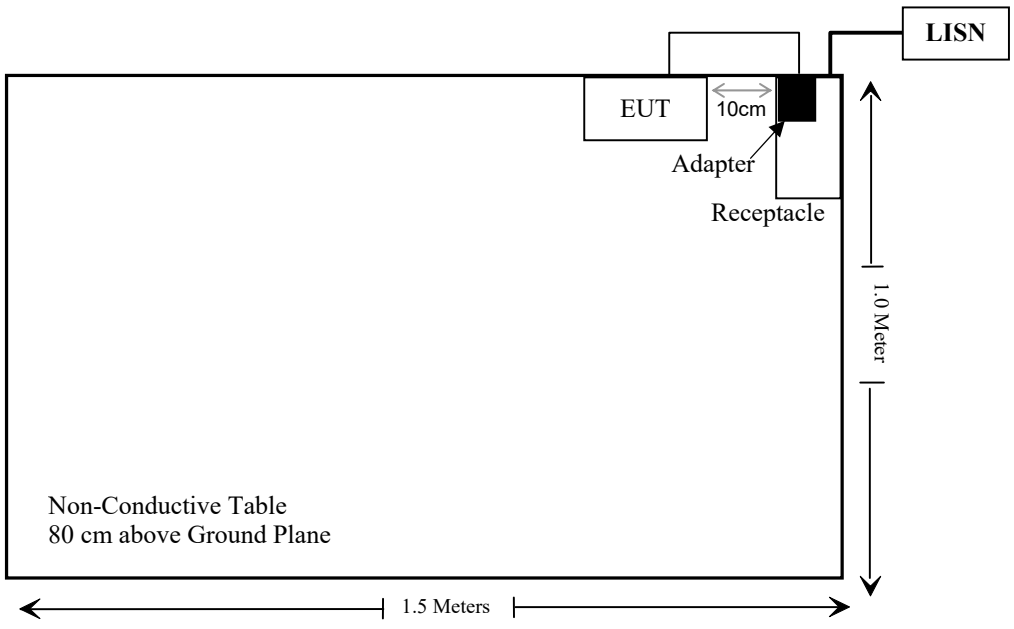
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Detachable USB Cable	2.0	EUT	Adapter

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i), §2.1091	Maximum Permissible Exposure(MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth & Occupied Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	Test Receiver	ESPI3	100396	2020/12/24	2021/12/23
R & S	L.I.S.N.	ENV216	101314	2020/12/25	2021/12/24
Anritsu Corp	50ΩCoaxial Switch	MP59B	6200506474	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-2m	No.2	2020/12/25	2021/12/24
Conducted Emission Test Software: ES-K1 V1.71					
Radiated Emissions Test					
Rohde& Schwarz	Test Receiver	ESR	101817	2020/12/24	2021/12/23
Rohde&Schwarz	Spectrum Analyzer	FSV40	101495	2020/12/24	2021/12/23
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2021/07/08	2022/07/07
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/28	2021/11/27
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/12/25	2021/12/24
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/05	2023/01/04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Unknown	RF Coaxial Cable	N-5m	No.3	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-5m	No.4	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.5	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.6	2020/12/25	2021/12/24
Wainwright	High Pass Filter	WHKX3.6/18G-10SS	5	2020/12/25	2021/12/24
Radiated Emission Test Software: EZ_EMC V 1.1.4.2					
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
Rohde & Schwarz	Open Switch and Control Unit	OSP120 + OSP-B157	101244 + 100866	2020/12/24	2021/12/23

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

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

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = 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)

For worst case:

Frequency (MHz)	**Maximum Antenna Gain**		**Tune up conducted power**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
2412-2472	4	2.51	20.5	112.20	20	0.06	1

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

FCC §15.203 - 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.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has one internal antenna arrangement, which was permanently attached and the antenna gain is 4 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

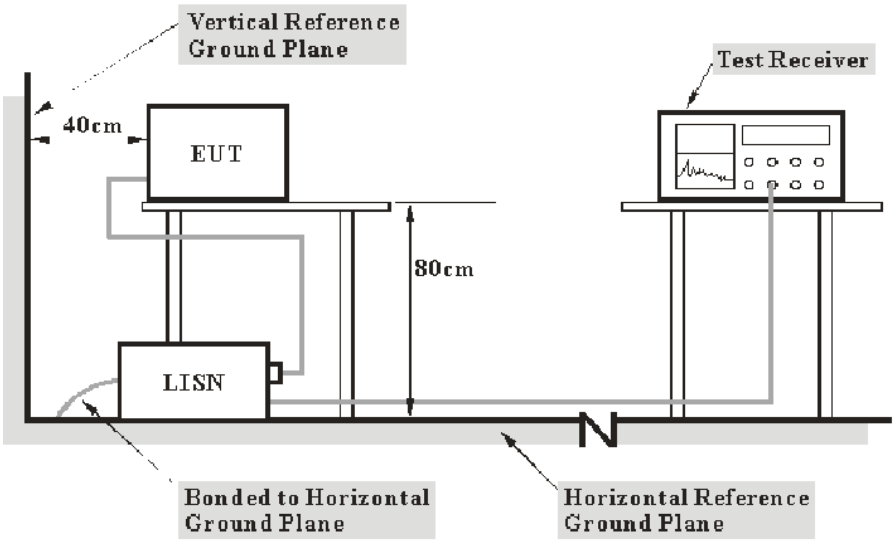
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT 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 limits.

The spacing between the peripherals was 10 cm.

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 outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Transd Factor & Margin Calculation

The Transd factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Transd Factor = LISN VDF + Cable Loss

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

Margin = Limit – level
Level= reading level+ Transd Factor

Test Data

Environmental Conditions

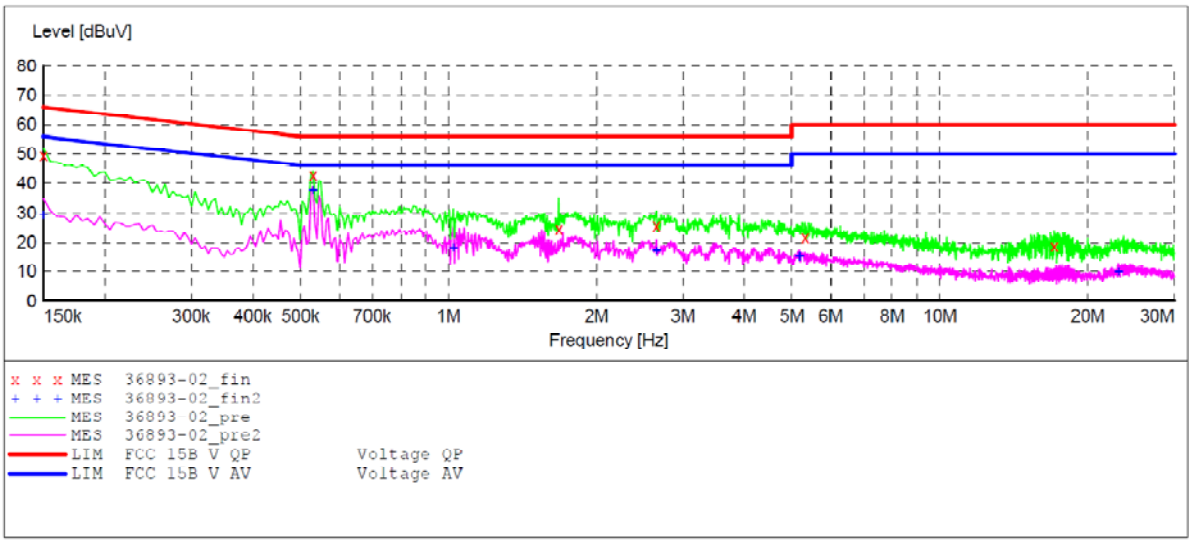
Temperature:	24 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul on 2021-10-01.

EUT operation mode: Transmitting (Worst case as below)

Wi-Fi: 802.11B mode, low Channel

AC 120V/60 Hz, Line



MEASUREMENT RESULT: "36893-02_fin"

2021-10-1 11:52

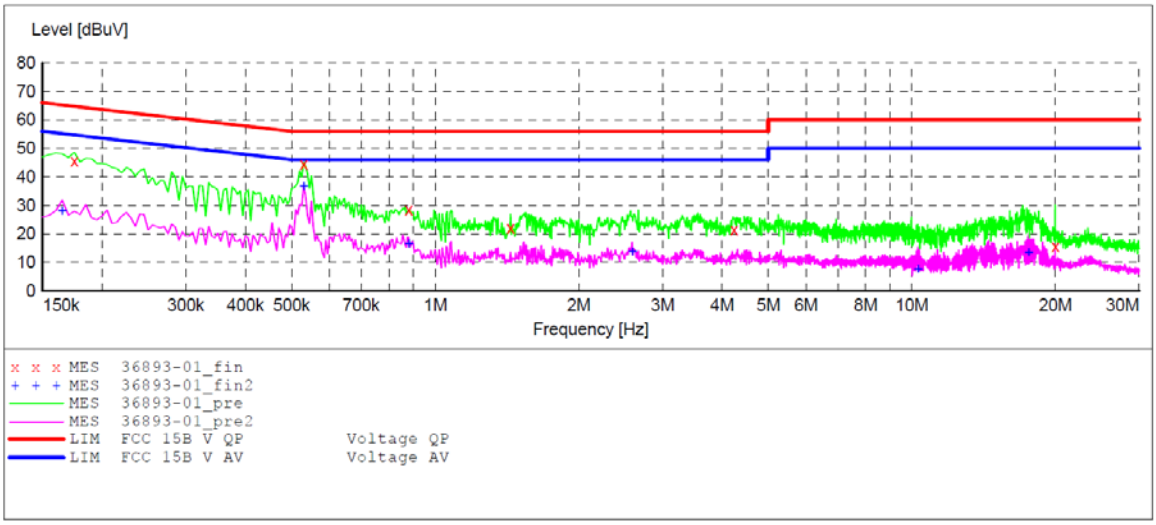
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	49.50	10.8	66	15.5	QP	L1	GND
0.530000	42.70	11.0	56	13.3	QP	L1	GND
1.675000	24.60	11.2	56	31.4	QP	L1	GND
2.650000	25.60	11.3	56	30.4	QP	L1	GND
5.310000	21.70	11.4	60	38.3	QP	L1	GND
17.075000	18.70	11.7	60	41.3	QP	L1	GND

MEASUREMENT RESULT: "36893-02_fin2"

2021-10-1 11:52

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	29.00	10.8	56	27.0	AV	L1	GND
0.530000	37.50	11.0	46	8.5	AV	L1	GND
1.025000	18.30	11.1	46	27.7	AV	L1	GND
2.650000	17.00	11.3	46	29.0	AV	L1	GND
5.180000	15.20	11.4	50	34.8	AV	L1	GND
23.075000	9.90	11.7	50	40.1	AV	L1	GND

AC 120V/60 Hz, Neutral



MEASUREMENT RESULT: "36893-01_fin"

2021-10-1 11:51

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.175000	45.60	10.8	65	19.4	QP	N	GND
0.530000	44.40	11.0	56	11.6	QP	N	GND
0.880000	28.40	11.1	56	27.6	QP	N	GND
1.440000	22.00	11.2	56	34.0	QP	N	GND
4.240000	21.60	11.4	56	34.4	QP	N	GND
20.000000	15.60	11.7	60	44.4	QP	N	GND

MEASUREMENT RESULT: "36893-01_fin2"

2021-10-1 11:51

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.165000	28.00	10.8	55	27.0	AV	N	GND
0.530000	36.50	11.0	46	9.5	AV	N	GND
0.880000	16.40	11.1	46	29.6	AV	N	GND
2.590000	13.80	11.3	46	32.2	AV	N	GND
10.300000	7.60	11.6	50	42.4	AV	N	GND
17.600000	13.50	11.7	50	36.5	AV	N	GND

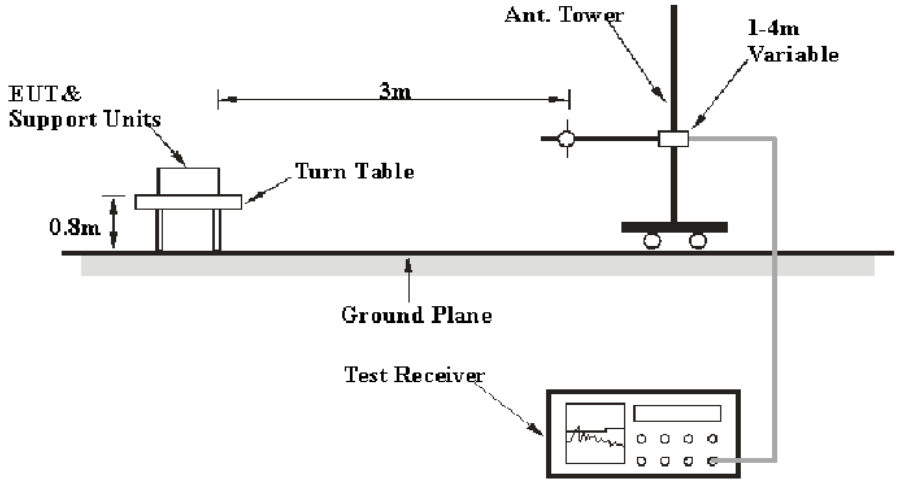
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

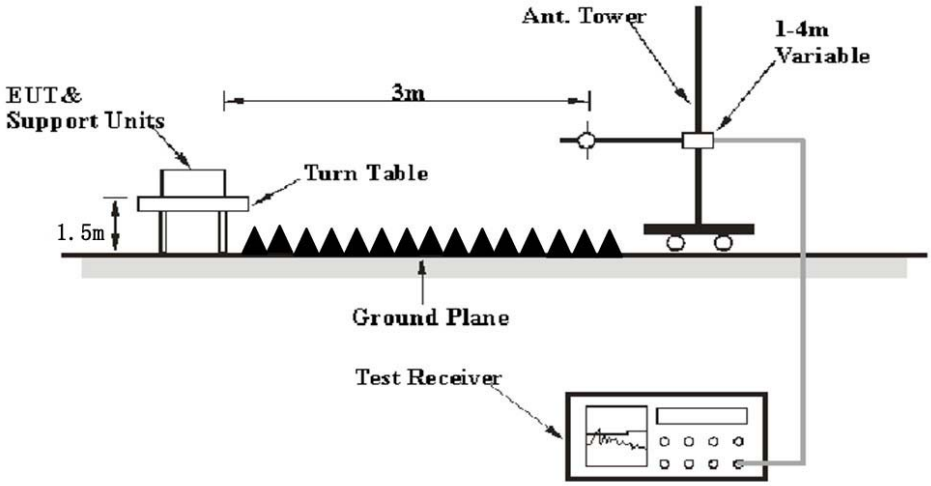
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



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

EMI Test Receiver & Spectrum Analyzer Setup

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

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Average
	1MHz	＞1/T Note 2	/	Average

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

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.

Factor & Margin Calculation

The Factor 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:

Factor = 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 = Result-Limit
Result = Reading + Factor

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

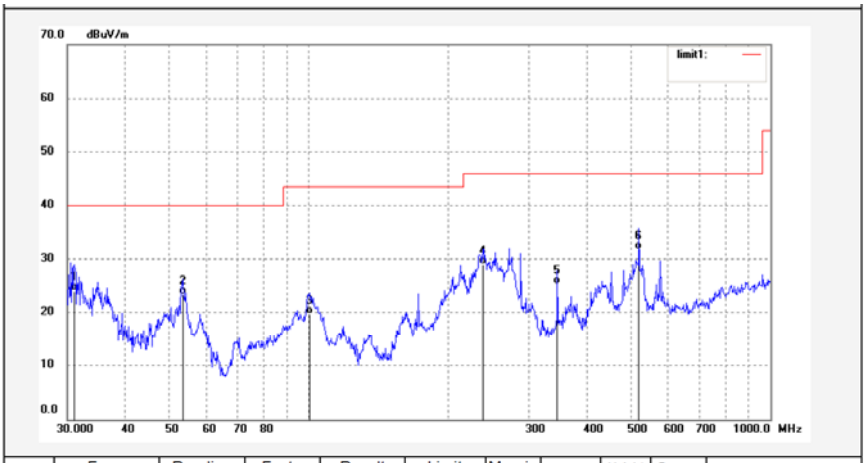
The testing was performed by Chao Mo on 2021-09-12 and 2021-10-01.

EUT operation mode: Transmitting

30MHz-1GHz: (Worst case)

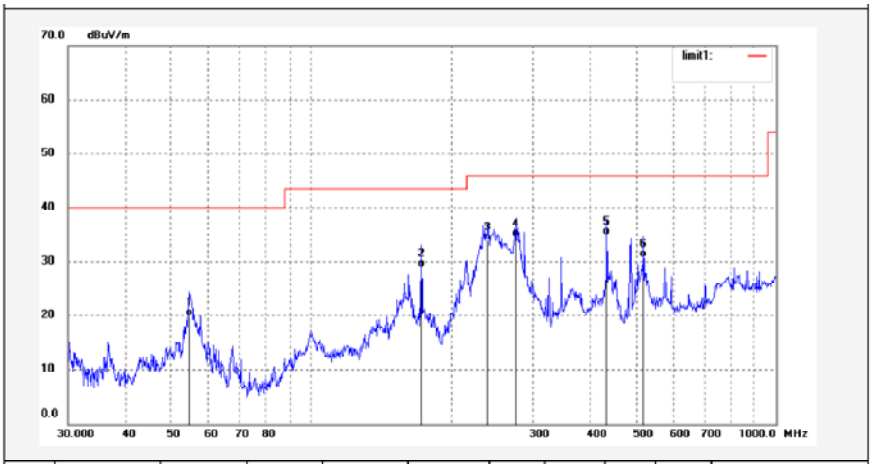
Wi-Fi: 802.11B mode, Low Channel

Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	31.1798	38.04	-13.90	24.14	40.00	-15.86	QP			
2	53.5052	40.95	-17.57	23.38	40.00	-16.62	QP			
3	100.5806	37.83	-18.19	19.64	43.50	-23.86	QP			
4	238.3102	45.48	-16.47	29.01	46.00	-16.99	QP			
5	345.5952	38.62	-13.39	25.23	46.00	-20.77	QP			
6	519.0649	41.73	-9.96	31.77	46.00	-14.23	QP			

Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	54.6429	37.25	-17.37	19.88	40.00	-20.12	QP			
2	172.5988	47.61	-18.68	28.93	43.50	-14.57	QP			
3	239.9874	50.31	-16.42	33.89	46.00	-12.11	QP			
4	275.1570	49.95	-15.43	34.52	46.00	-11.48	QP			
5	432.5457	46.11	-11.12	34.99	46.00	-11.01	QP			
6	519.0649	40.61	-9.96	30.65	46.00	-15.35	QP			

1-25GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/AV		Height (m)	Polar (H/V)				
802.11B, Low Channel									
2310	67.69	PK	210	1.1	H	-6.84	60.85	74	-13.15
2310	53.43	Ave	210	1.1	H	-6.84	46.59	54	-7.41
2310	67.19	PK	277	1.2	V	-6.84	60.35	74	-13.65
2310	53.01	Ave	277	1.2	V	-6.84	46.17	54	-7.83
2390	68.18	PK	331	1.3	H	-6.44	61.74	74	-12.26
2390	53.21	Ave	331	1.3	H	-6.44	46.77	54	-7.23
2390	66.7	PK	163	1.9	V	-6.44	60.26	74	-13.74
2390	52.43	Ave	163	1.9	V	-6.44	45.99	54	-8.01
4824	53.55	PK	91	1.6	H	2.87	56.42	74	-17.58
4824	49.67	Ave	91	1.6	H	2.87	52.54	54	-1.46
4824	50.77	PK	70	1.2	V	2.87	53.64	74	-20.36
802.11B, Middle Channel									
4884	53.41	PK	56	1.6	H	3.01	56.42	74	-17.58
4884	48.89	Ave	56	1.6	H	3.01	51.9	54	-2.10
4884	50.85	PK	97	1.1	V	3.01	53.86	74	-20.14
11B, High Channel									
2483.5	67.03	PK	158	1.1	H	-5.96	61.07	74	-12.93
2483.5	52.52	Ave	158	1.1	H	-5.96	46.56	54	-7.44
2483.5	66.44	PK	116	1.3	V	-5.96	60.48	74	-13.52
2483.5	52.17	Ave	116	1.3	V	-5.96	46.21	54	-7.79
2500	67.75	PK	16	1.7	H	-5.88	61.87	74	-12.13
2500	52.76	Ave	16	1.7	H	-5.88	46.88	54	-7.12
2500	66.24	PK	98	1.3	V	-5.88	60.36	74	-13.64
2500	51.94	Ave	98	1.3	V	-5.88	46.06	54	-7.94
4944	53.81	PK	19	1.8	H	3.17	56.98	74	-17.02
4944	48.86	Ave	19	1.8	H	3.17	52.03	54	-1.97
4944	50.75	PK	208	1.9	V	3.17	53.92	74	-20.08

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/AV		Height (m)	Polar (H/V)				
802.11G, Low Channel									
2310	72.96	PK	17	1.3	H	-6.84	66.12	74	-7.88
2310	55.43	Ave	17	1.3	H	-6.84	48.59	54	-5.41
2310	75.45	PK	267	1.1	V	-6.84	68.61	74	-5.39
2310	57.71	Ave	267	1.1	V	-6.84	50.87	54	-3.13
2390	72.08	PK	186	1.8	H	-6.44	65.64	74	-8.36
2390	54.43	Ave	186	1.8	H	-6.44	47.99	54	-6.01
2390	74.19	PK	199	1.9	V	-6.44	67.75	74	-6.25
2390	56.09	Ave	199	1.9	V	-6.44	49.65	54	-4.35
4824	57.47	PK	98	1.5	H	2.87	60.34	74	-13.66
4824	46.79	Ave	98	1.5	H	2.87	49.66	54	-4.34
4824	50.96	PK	49	1.6	V	2.87	53.83	74	-20.17
802.11G, Middle Channel									
4884	59.72	PK	136	1.6	H	3.01	62.73	74	-11.27
4884	47	Ave	136	1.6	H	3.01	50.01	54	-3.99
4884	49.94	PK	225	1.9	V	3.01	52.95	74	-21.05
802.11G, High Channel									
2483.5	75.31	PK	3	1.7	H	-5.96	69.35	74	-4.65
2483.5	57.94	Ave	3	1.7	H	-5.96	51.98	54	-2.02
2483.5	76.89	PK	24	1.2	V	-5.96	70.93	74	-3.07
2483.5	58.85	Ave	24	1.2	V	-5.96	52.89	54	-1.11
2500	76.01	PK	317	1.6	H	-5.88	70.13	74	-3.87
2500	58.63	Ave	317	1.6	H	-5.88	52.75	54	-1.25
2500	76.86	PK	154	1.6	V	-5.88	70.98	74	-3.02
2500	58.9	Ave	154	1.6	V	-5.88	53.02	54	-0.98
4944	61.31	PK	331	2.2	H	3.17	64.48	74	-9.52
4944	47.79	Ave	331	2.2	H	3.17	50.96	54	-3.04
4944	50.52	PK	10	1.3	V	3.17	53.69	74	-20.31

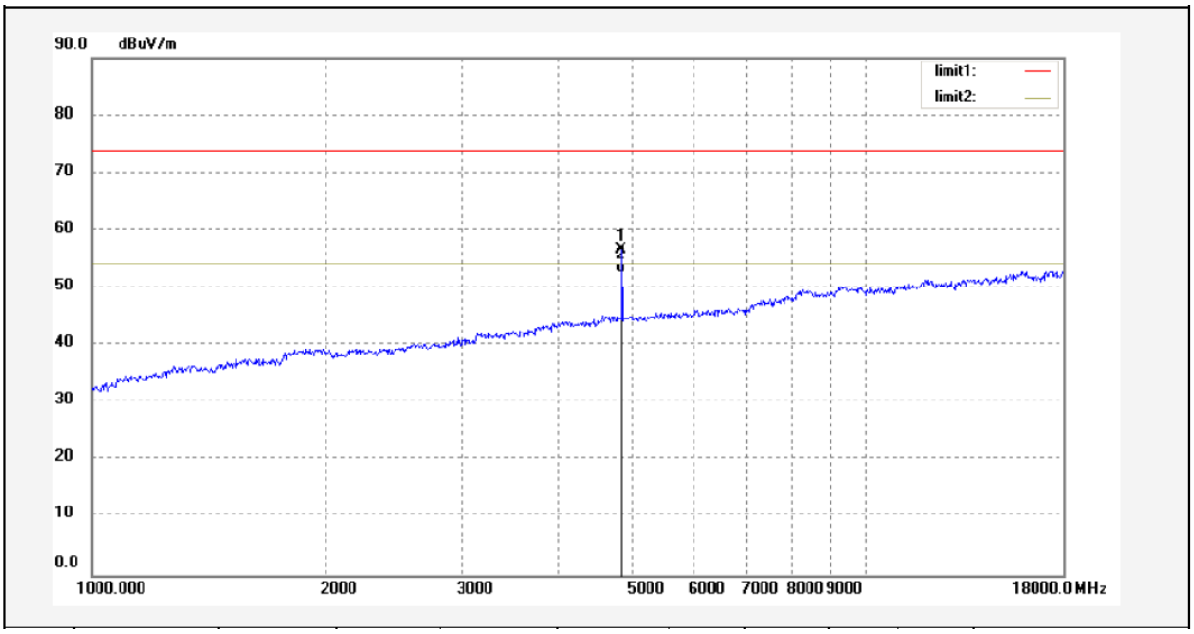
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/AV		Height (m)	Polar (H/V)				
802.11N20, Low Channel									
2310	68.48	PK	302	1.7	H	-6.84	61.64	74	-12.36
2310	53.53	Ave	302	1.7	H	-6.84	46.69	54	-7.31
2310	67.79	PK	254	1.4	V	-6.84	60.95	74	-13.05
2310	53.28	Ave	254	1.4	V	-6.84	46.44	54	-7.56
2390	67.5	PK	273	1.4	H	-6.44	61.06	74	-12.94
2390	53.31	Ave	273	1.4	H	-6.44	46.87	54	-7.13
2390	67.02	PK	275	2	V	-6.44	60.58	74	-13.42
2390	52.56	Ave	275	2	V	-6.44	46.12	54	-7.88
4824	58.04	PK	197	1.9	H	2.87	60.91	74	-13.09
4824	45.06	Ave	197	1.9	H	2.87	47.93	54	-6.07
4824	49.47	PK	284	1.7	V	2.87	52.34	74	-21.66
802.11N20, Middle Channel									
4884	56.47	PK	116	2.2	H	3.01	59.48	74	-14.52
4884	46.14	Ave	116	2.2	H	3.01	49.15	54	-4.85
4884	50.85	PK	172	1.9	V	3.01	53.86	74	-20.14
802.11N20, High Channel									
2483.5	67.58	PK	2	1.3	H	-5.96	61.62	74	-12.38
2483.5	52.64	Ave	2	1.3	H	-5.96	46.68	54	-7.32
2483.5	67.27	PK	114	1.2	V	-5.96	61.31	74	-12.69
2483.5	52.29	Ave	114	1.2	V	-5.96	46.33	54	-7.67
2500	67.21	PK	256	1.6	H	-5.88	61.33	74	-12.67
2500	53	Ave	256	1.6	H	-5.88	47.12	54	-6.88
2500	66.71	PK	27	1.7	V	-5.88	60.83	74	-13.17
2500	52.29	Ave	27	1.7	V	-5.88	46.41	54	-7.59
4944	60.48	PK	93	1.3	H	3.17	63.65	74	-10.35
4944	47.42	Ave	93	1.3	H	3.17	50.59	54	-3.41
4944	50.82	PK	110	1.9	V	3.17	53.99	74	-20.01

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/AV		Height (m)	Polar (H/V)				
802.11N40, Low Channel									
2310	72.18	PK	227	2.1	H	-6.84	65.34	74	-8.66
2310	55.58	Ave	227	2.1	H	-6.84	48.74	54	-5.26
2310	68.39	PK	248	2.2	V	-6.84	61.55	74	-12.45
2310	51.83	Ave	248	2.2	V	-6.84	44.99	54	-9.01
2390	71.3	PK	317	1.3	H	-6.44	64.86	74	-9.14
2390	53.55	Ave	317	1.3	H	-6.44	47.11	54	-6.89
2390	67.36	PK	69	1.5	V	-6.44	60.92	74	-13.08
2390	50.68	Ave	69	1.5	V	-6.44	44.24	54	-9.76
4844	51.54	PK	142	1.2	H	2.92	54.46	74	-19.54
4844	41.21	Ave	142	1.2	H	2.92	44.13	54	-9.87
4844	42.78	PK	246	2.0	V	2.92	45.7	74	-28.3
802.11N40, Middle Channel									
4884	54.48	PK	97	2.1	H	3.01	57.49	74	-16.51
4884	44.87	Ave	97	2.1	H	3.01	47.88	54	-6.12
4884	49.68	PK	134	2.2	V	3.01	52.69	74	-21.31
802.11N40, High Channel (2457MHz)									
2483.5	66.85	PK	241	1.5	H	-5.96	60.89	74	-13.11
2483.5	51.91	Ave	241	1.5	H	-5.96	45.95	54	-8.05
2483.5	65.72	PK	156	1.4	V	-5.96	59.76	74	-14.24
2483.5	51.07	Ave	156	1.4	V	-5.96	45.11	54	-8.89
2500	66.37	PK	31	1.6	H	-5.88	60.49	74	-13.51
2500	51.37	Ave	31	1.6	H	-5.88	45.49	54	-8.51
2500	65.9	PK	197	1.3	V	-5.88	60.02	74	-13.98
2500	51.05	Ave	197	1.3	V	-5.88	45.17	54	-8.83
4914	50.85	PK	185	1.5	H	3.11	53.96	74	-20.04
4914	48.77	PK	211	1.4	V	3.11	51.88	74	-22.12
802.11N40, High Channel (2462MHz)									
2483.5	76.45	PK	138	1.2	H	-5.96	70.49	74	-3.51
2483.5	58.95	Ave	138	1.2	H	-5.96	52.99	54	-1.01
2483.5	75.68	PK	110	1.1	V	-5.96	69.72	74	-4.28
2483.5	58.09	Ave	110	1.1	V	-5.96	52.13	54	-1.87
2500	76.64	PK	315	1.6	H	-5.88	70.76	74	-3.24
2500	58.99	Ave	315	1.6	H	-5.88	53.11	54	-0.89
2500	75.26	PK	97	1.8	V	-5.88	69.38	74	-4.62
2500	57.97	Ave	97	1.8	V	-5.88	52.09	54	-1.91
4924	49.5	PK	282	1.4	H	3.11	52.61	74	-21.39
4924	47.53	PK	114	1.1	V	3.11	50.64	74	-23.36

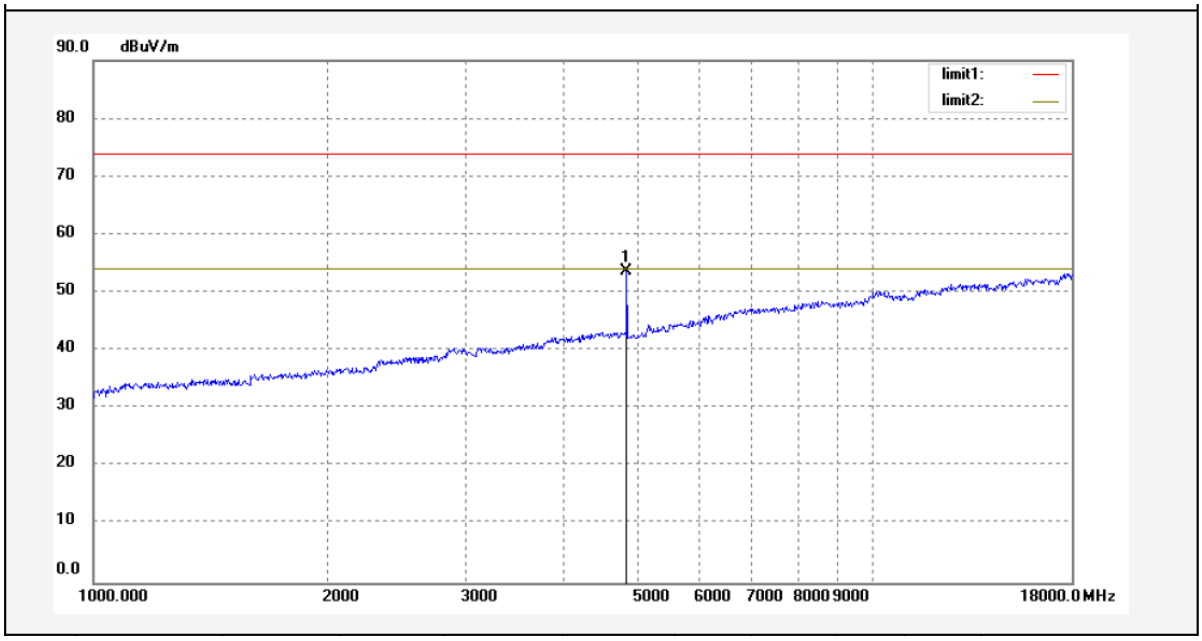
Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Corrected. Amplitude- Limit
The other spurious emission which is 20dB to the limit was not recorded.
The test result of peak was less than the limit of average, so just peak values were recorded.

1-18 GHz:

Pre-scan for Peak
802.11 b Low Channel
Horizontal

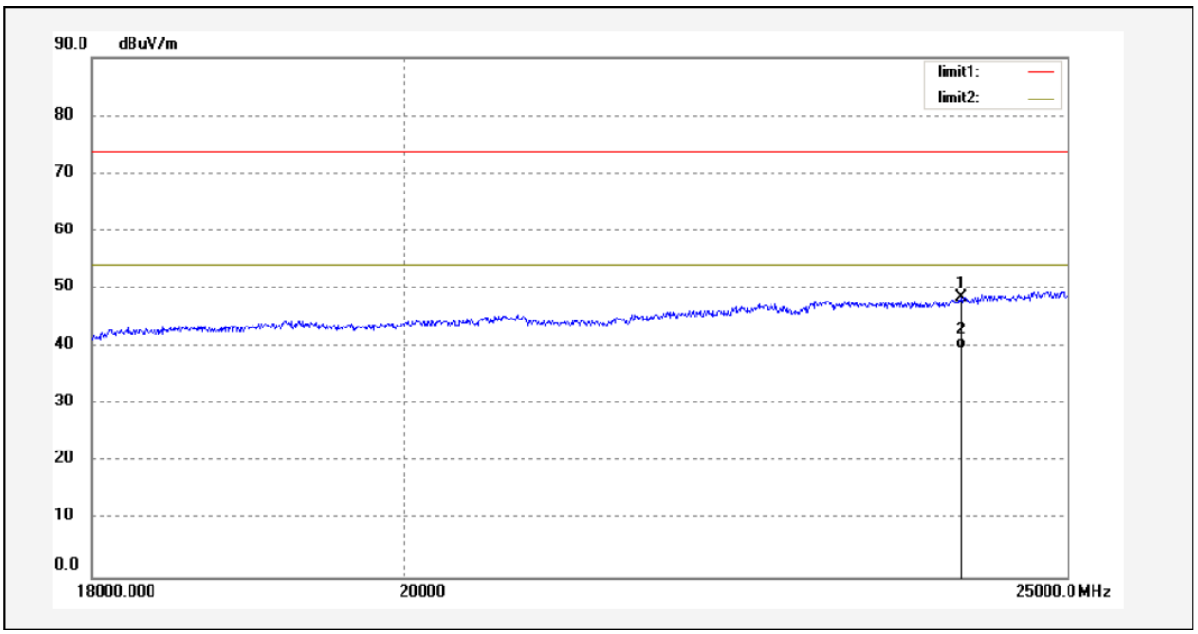


Vertical

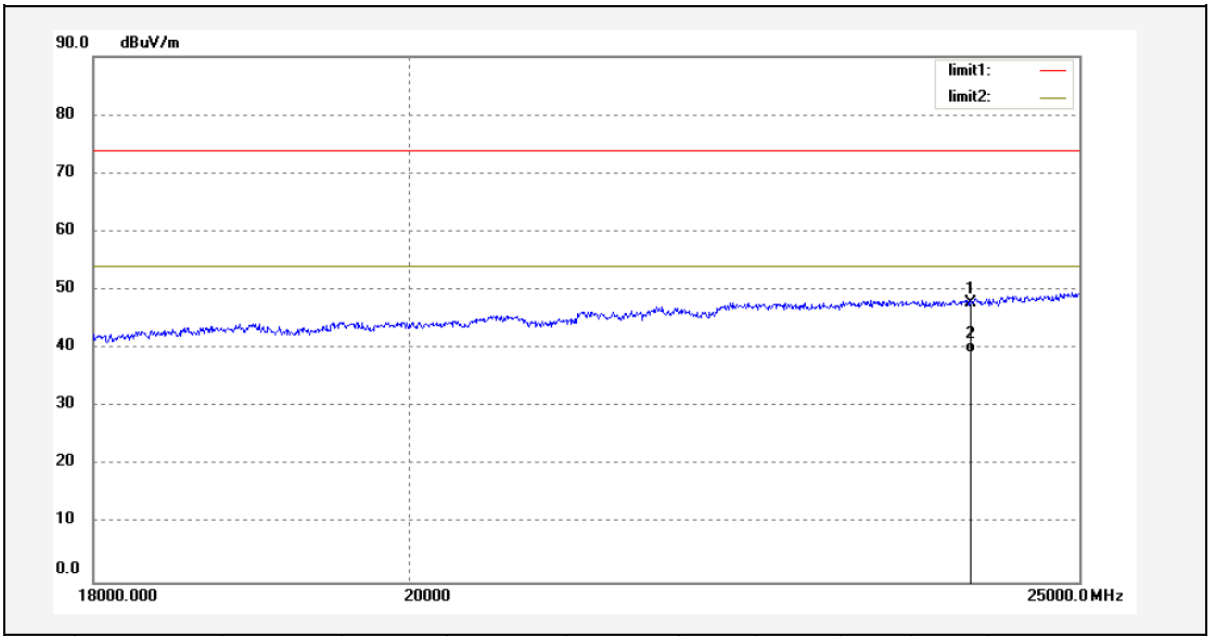


18 -25GHz:

Pre-scan for Peak
802.11 b Low Channel
Horizontal



Vertical



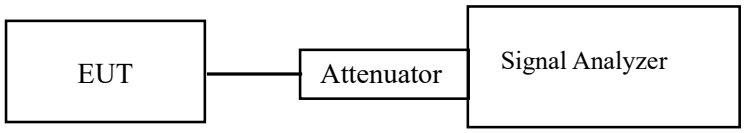
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

Applicable Standard

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.

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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Data

Environmental Conditions

Temperature:	25.6 ℃
Relative Humidity:	48 ℃
ATM Pressure:	101.0 kPa

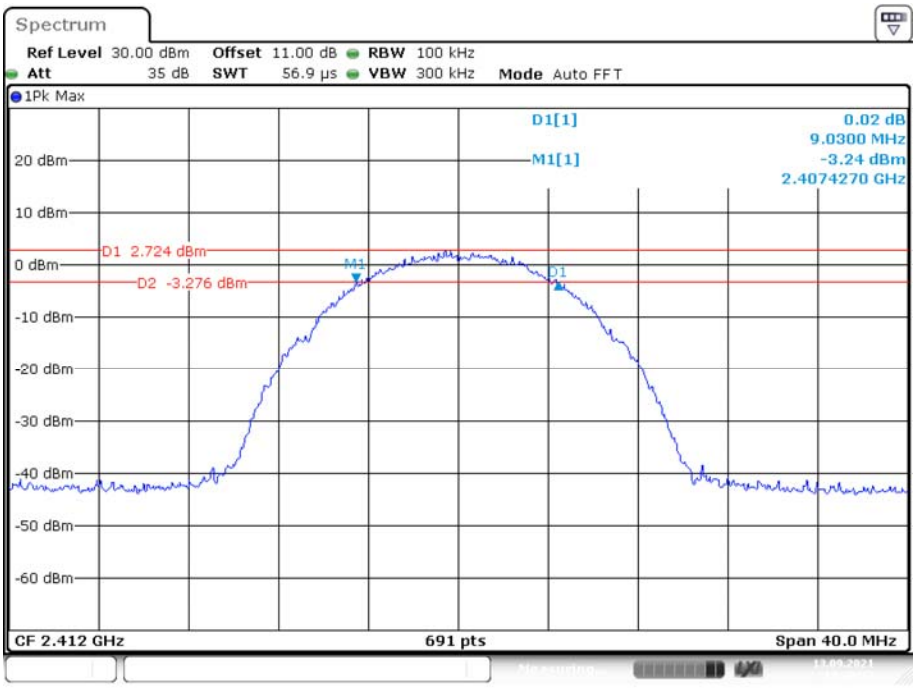
The testing was performed by Ting Lv on 2021-09-13.

EUT operation mode: Transmitting

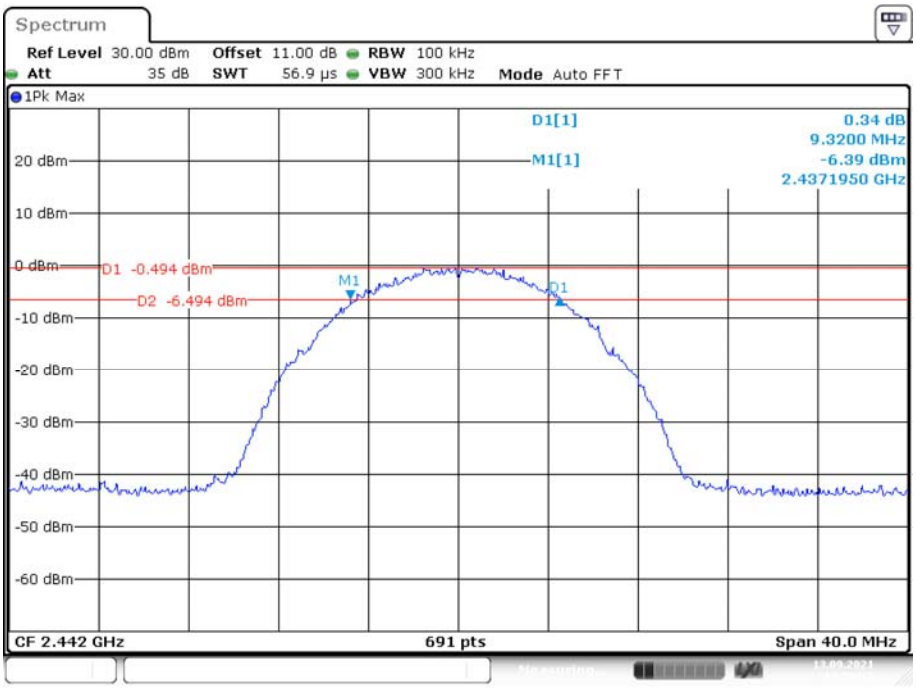
Please refer to the following table and plots.

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (kHz)
802.11b mode				
Low	2412	9.030	13.459	≥500
Middle	2442	9.320	13.329	≥500
High	2472	9.378	13.329	≥500
802.11g mode				
Low	2412	16.440	16.585	≥500
Middle	2442	16.440	16.541	≥500
High	2472	16.440	16.541	≥500
802.11n-HT20 mode				
Low	2412	17.424	17.713	≥500
Middle	2442	17.540	17.627	≥500
High	2472	17.656	17.670	≥500
802.11n-HT40 mode				
Low	2422	36.350	36.469	≥500
Middle	2442	35.660	36.237	≥500
High	2462	36.030	36.237	≥500

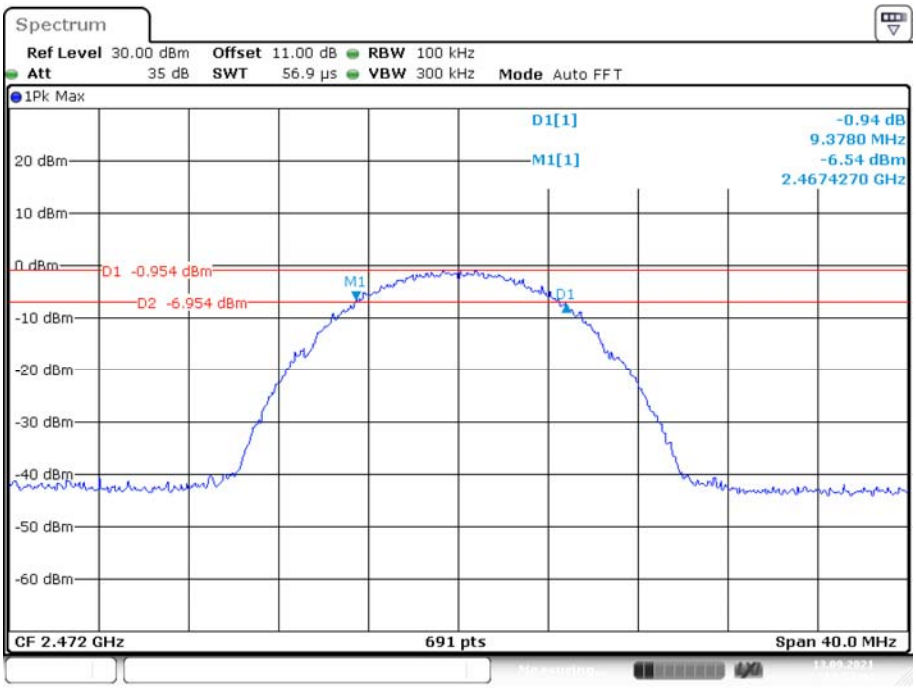
6dB Bandwidth, 802.11b Low Channel



6dB Bandwidth, 802.11b Middle Channel

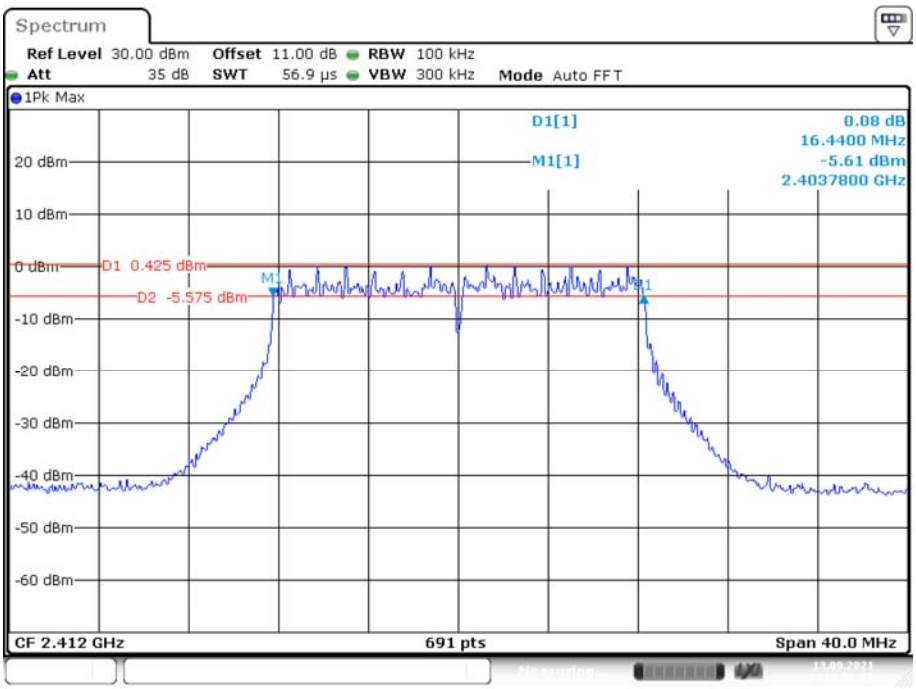


6dB Bandwidth, 802.11b High Channel



Date: 13.SEP.2021 17:52:05

6dB Bandwidth, 802.11g Low Channel



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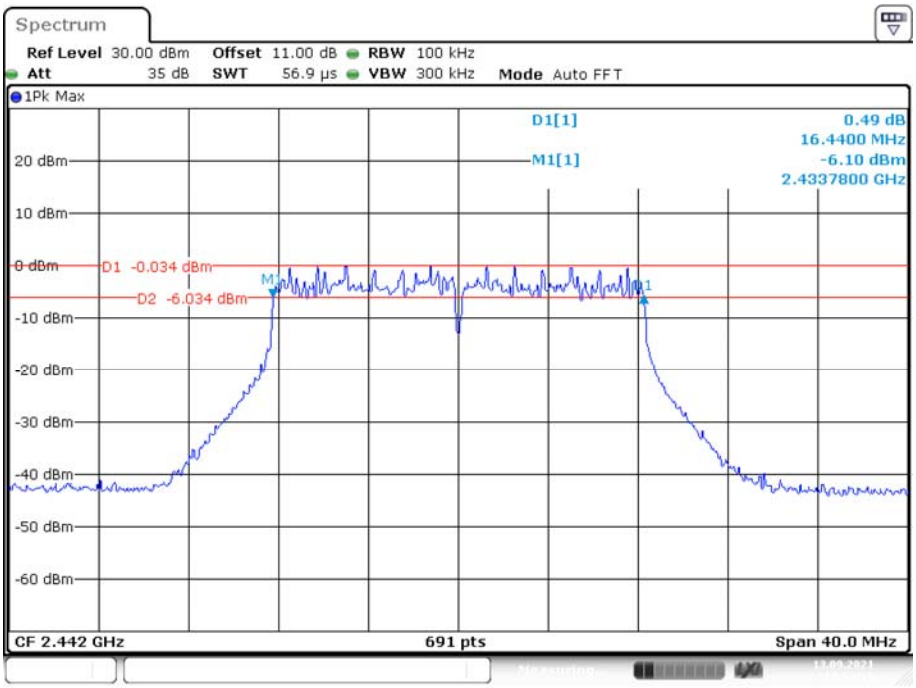
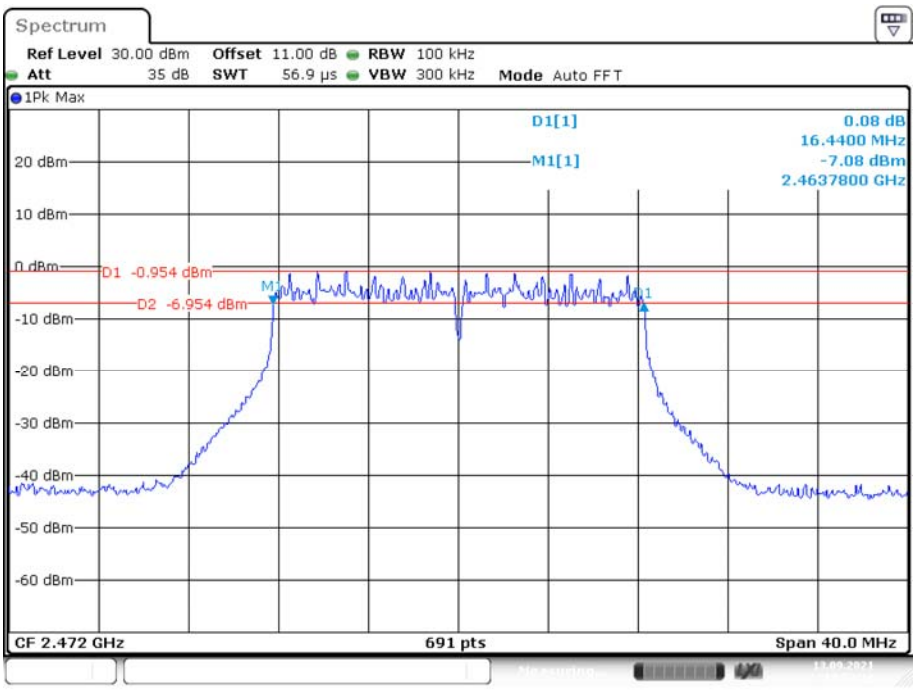
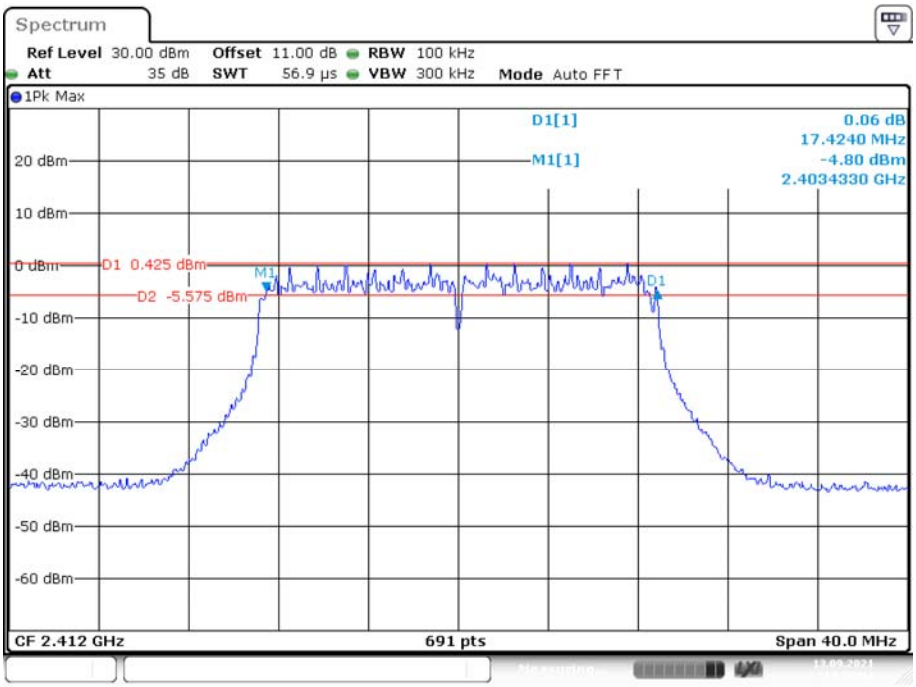
6dB Bandwidth, 802.11g Middle Channel



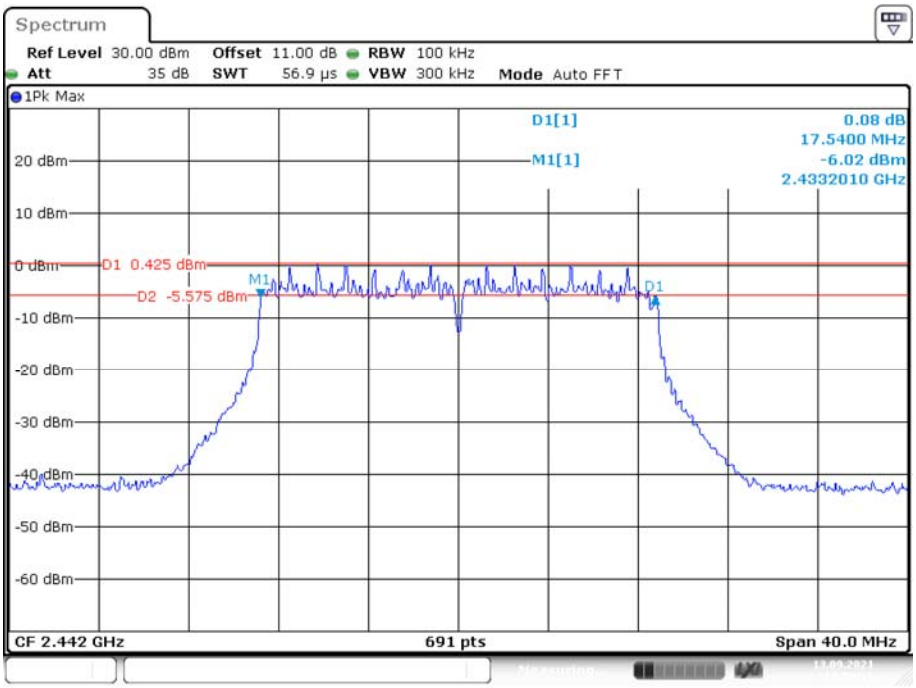
6dB Bandwidth, 802.11g High Channel



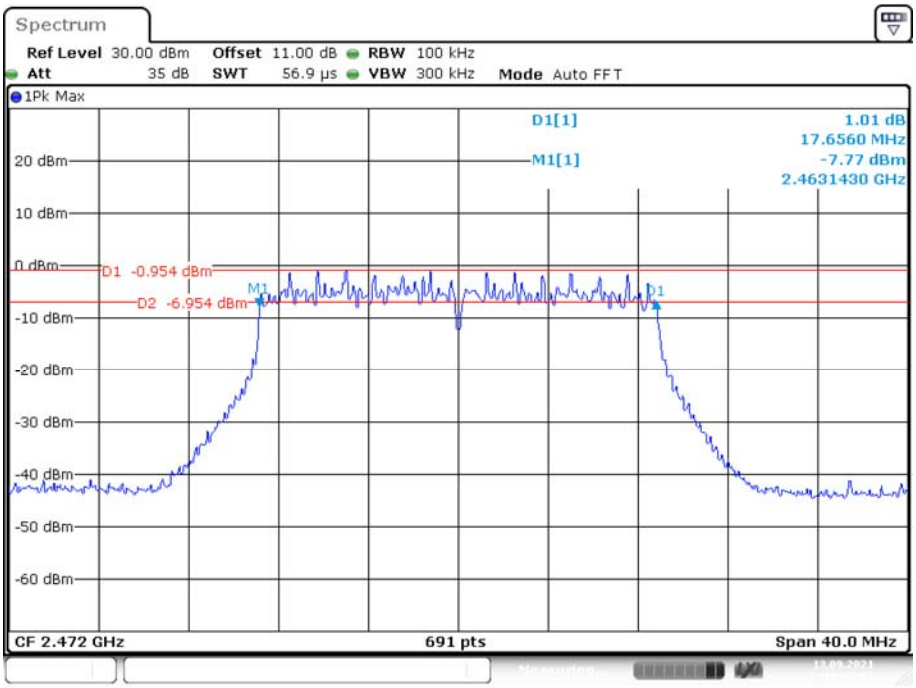
6dB Bandwidth, 802.11n-HT20 Low Channel



6dB Bandwidth, 802.11n-HT20 Middle Channel



6dB Bandwidth, 802.11n-HT20 High Channel



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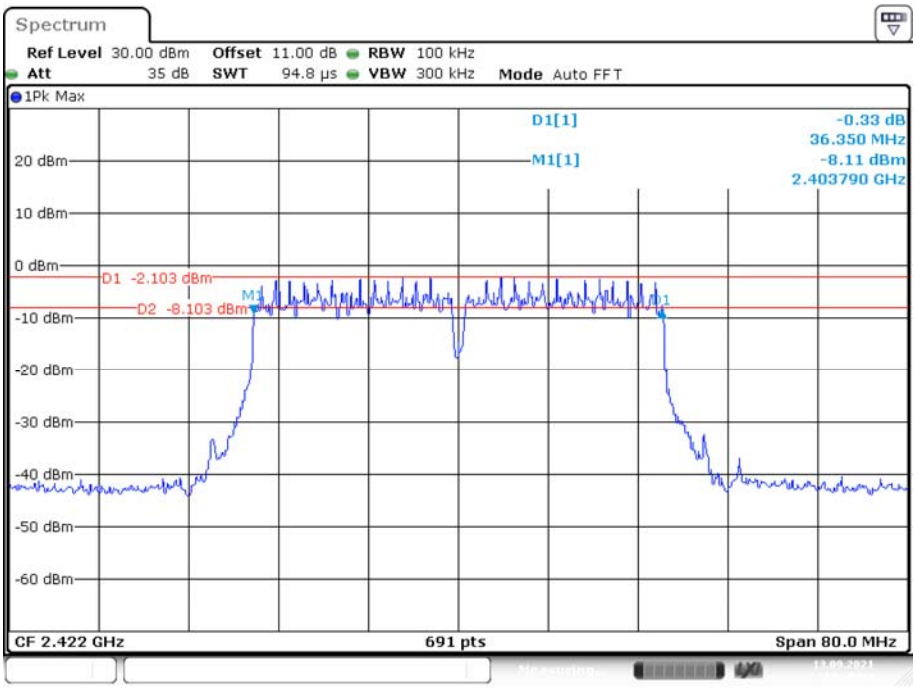
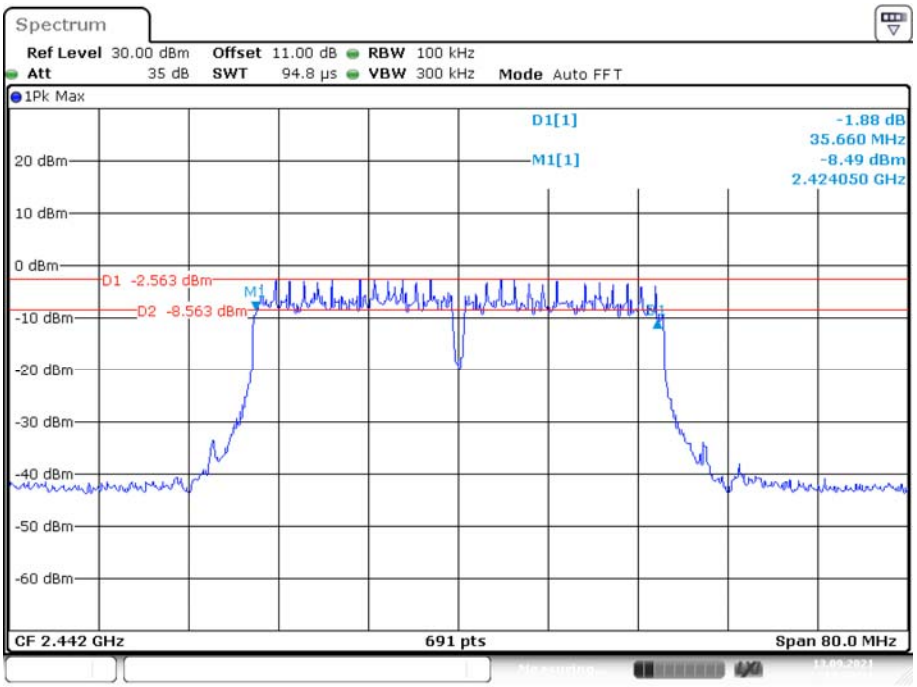
6dB Bandwidth, 802.11n-HT40 Low Channel

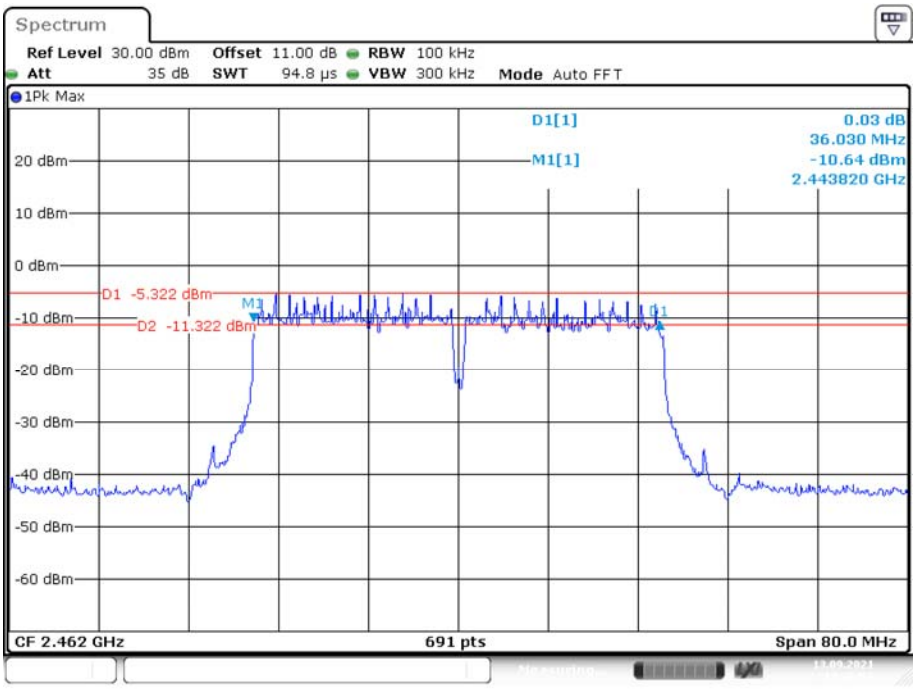


Date: 13.SEP.2021 17:45:20

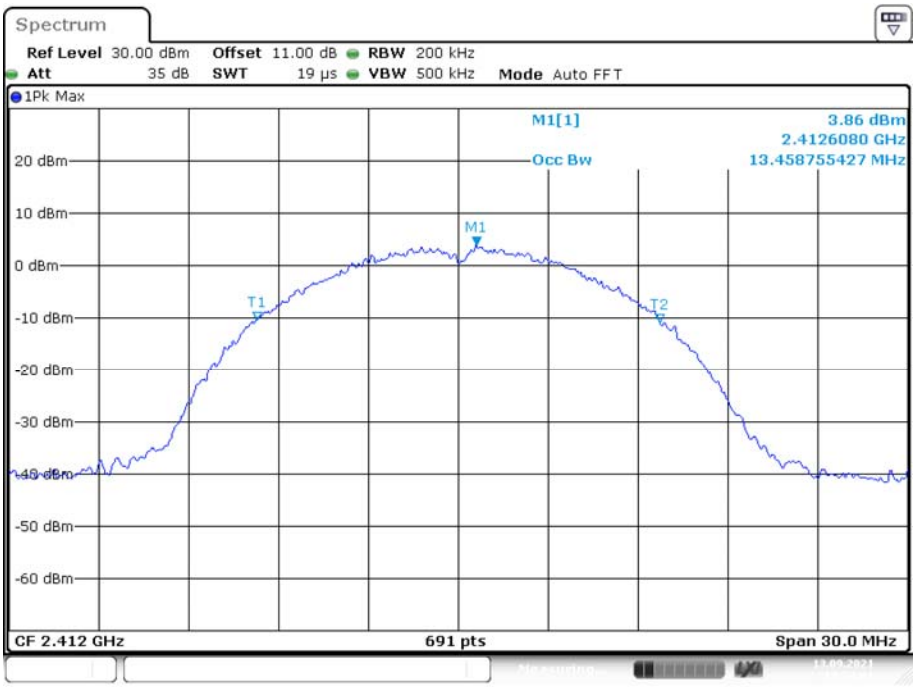
6dB Bandwidth, 802.11n-HT40 Middle Channel



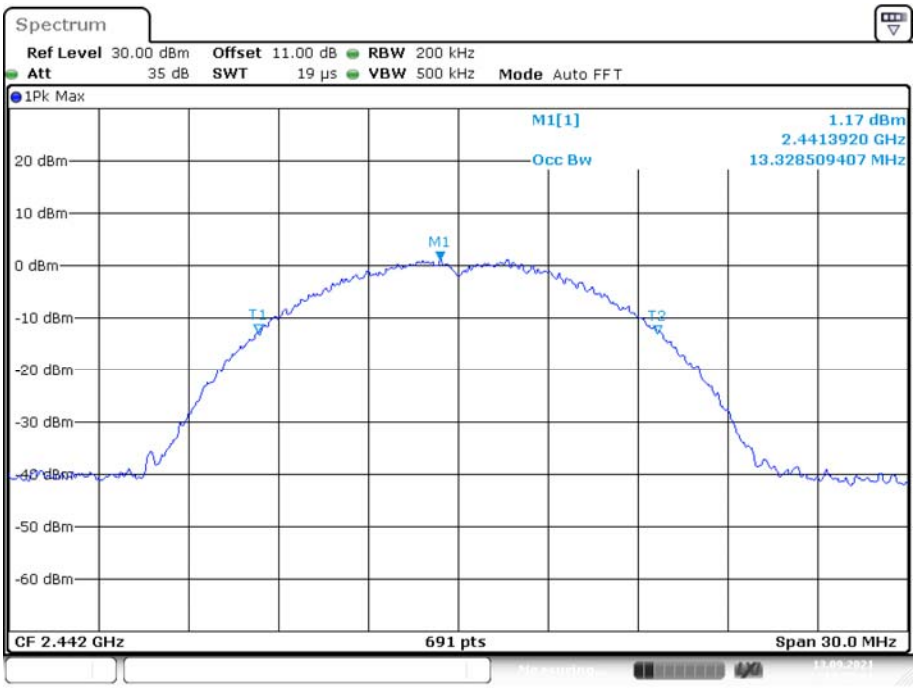
6dB Bandwidth, 802.11n-HT40 High Channel



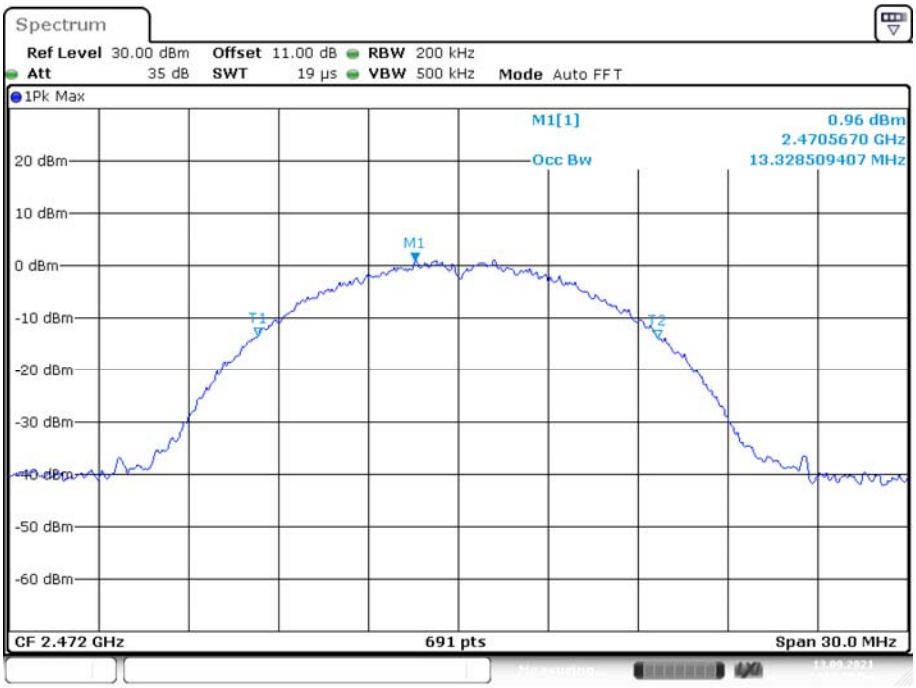
Occupied Bandwidth, 802.11b Low Channel



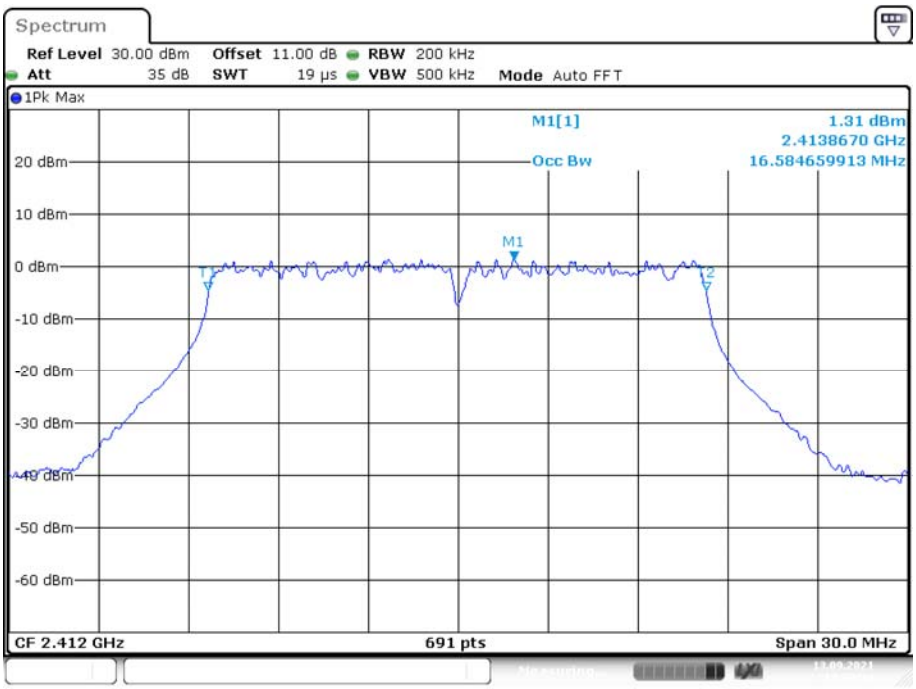
Occupied Bandwidth, 802.11b Middle Channel



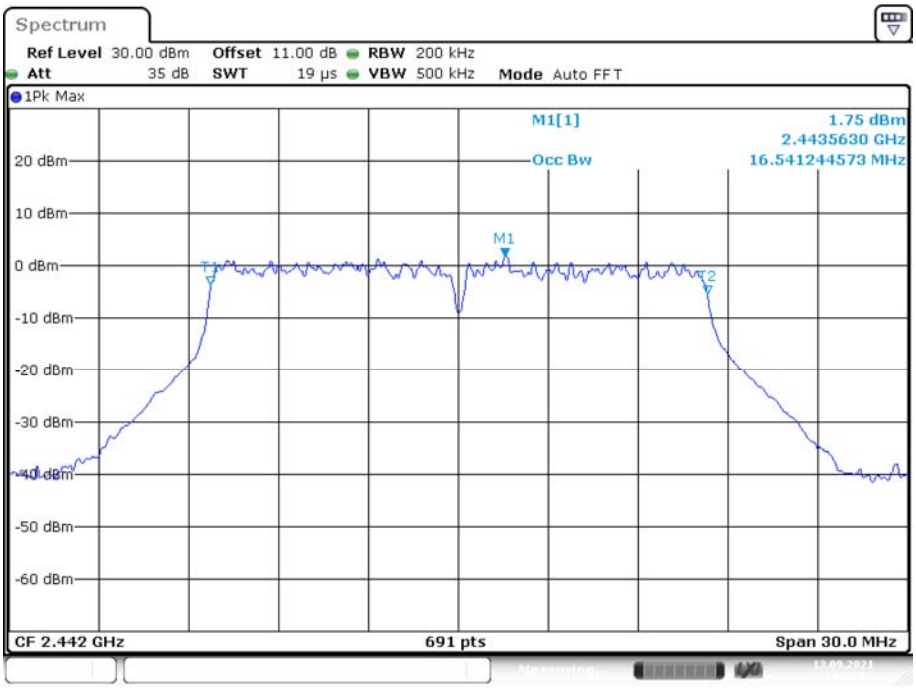
Occupied Bandwidth, 802.11b High Channel



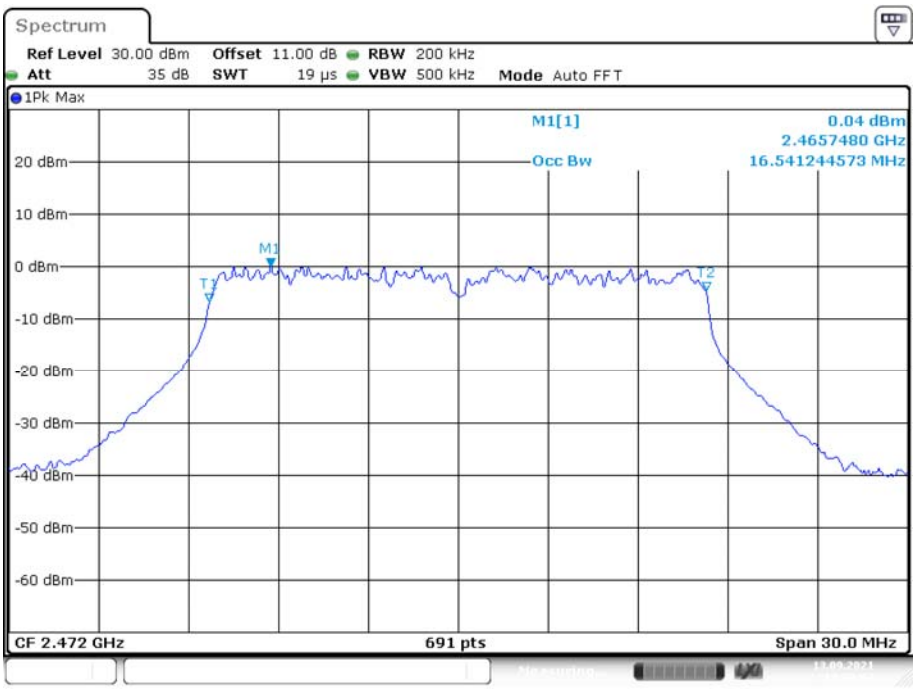
Occupied Bandwidth, 802.11g Low Channel



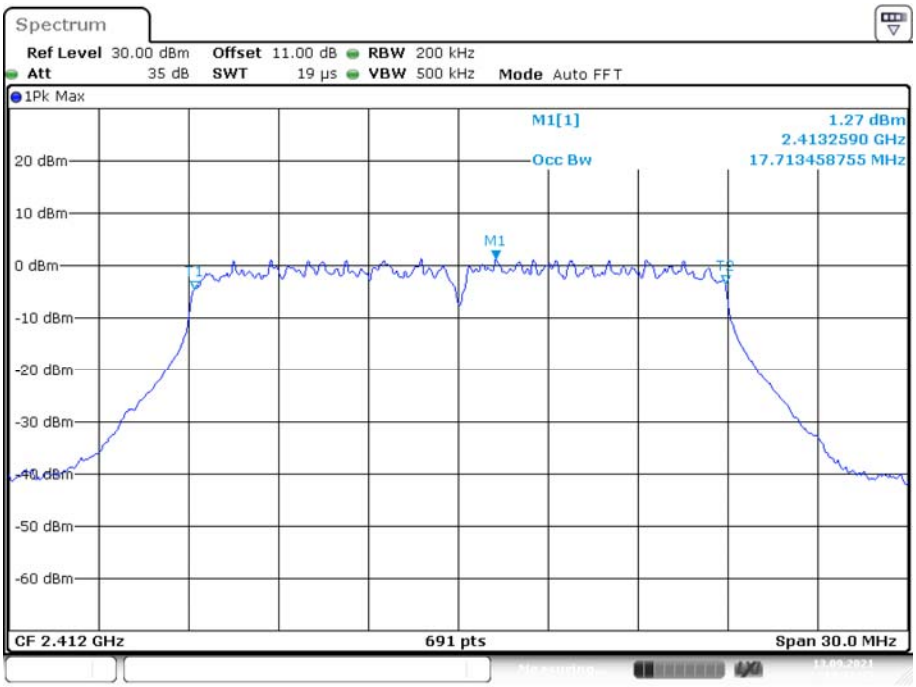
Occupied Bandwidth, 802.11g Middle Channel



Occupied Bandwidth, 802.11g High Channel

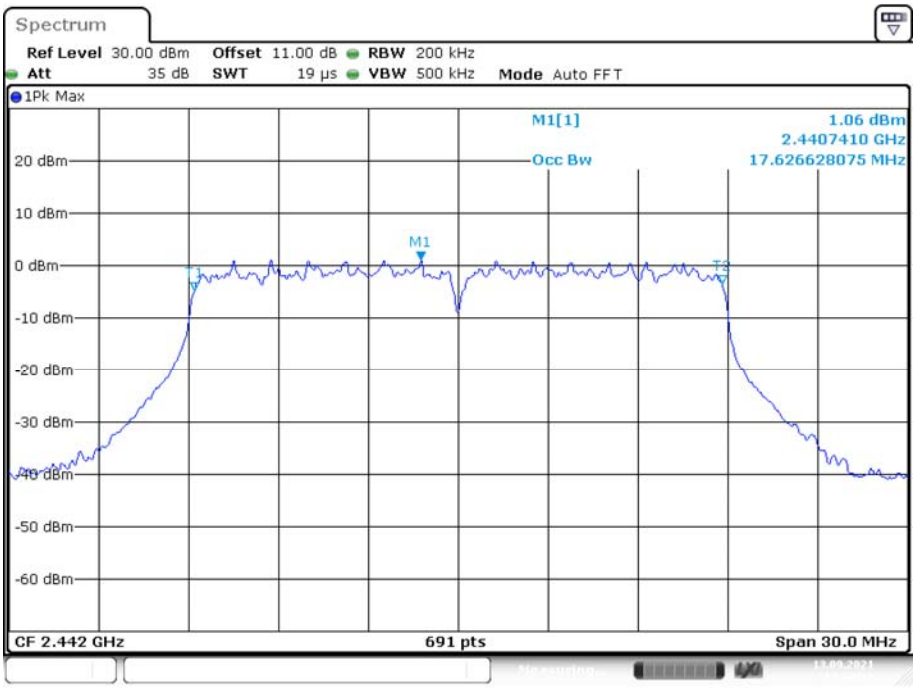


Occupied Bandwidth, 802.11n-HT20 Low Channel



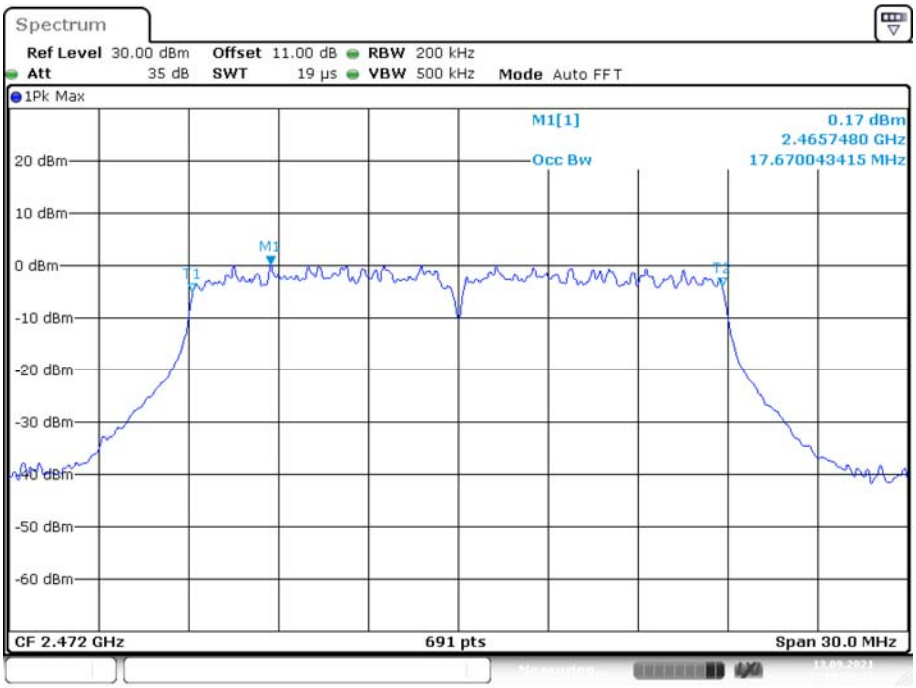
Date: 13.SEP.2021 17:31:24

Occupied Bandwidth, 802.11n-HT20 Middle Channel



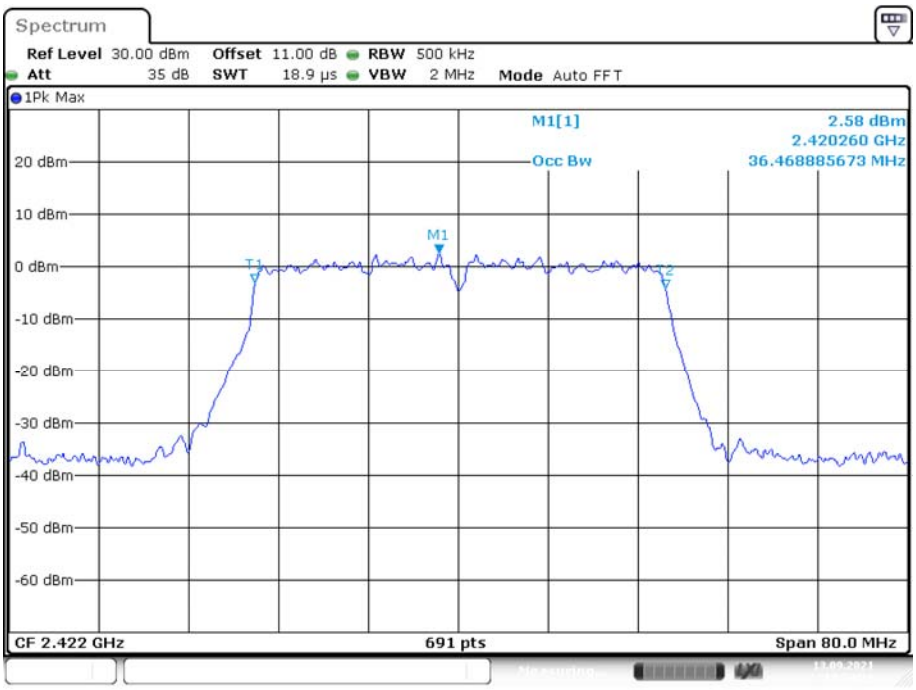
Date: 13.SEP.2021 17:32:29

Occupied Bandwidth, 802.11n-HT20 High Channel



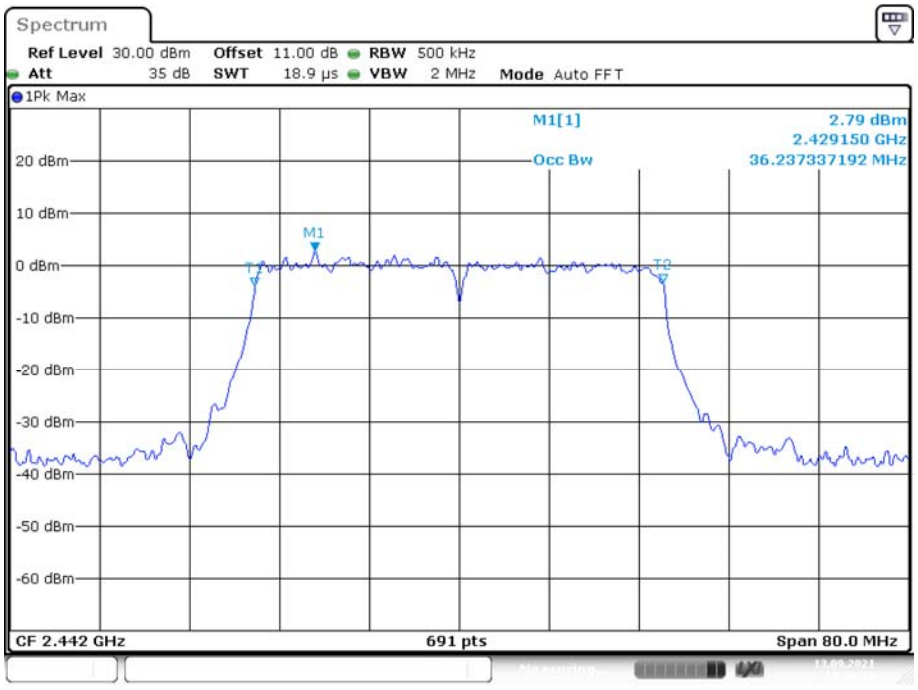
Date: 13.SEP.2021 17:33:19

Occupied Bandwidth, 802.11n-HT40 Low Channel



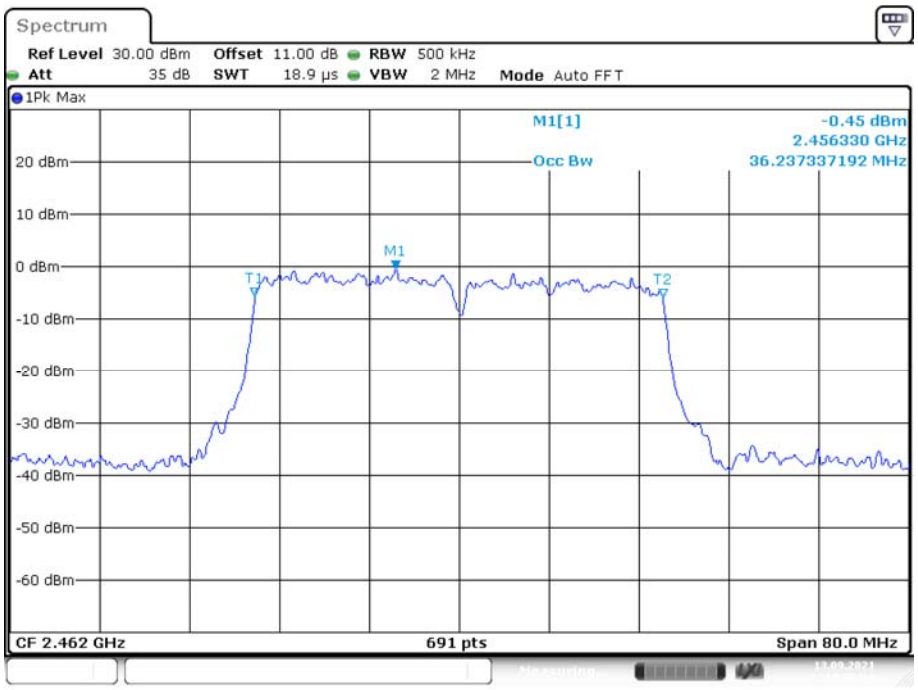
Date: 13.SEP.2021 17:34:22

Occupied Bandwidth, 802.11n-HT40 Middle Channel



Date: 13.SEP.2021 17:38:10

Occupied Bandwidth, 802.11n-HT40 High Channel



Date: 13.SEP.2021 17:36:22

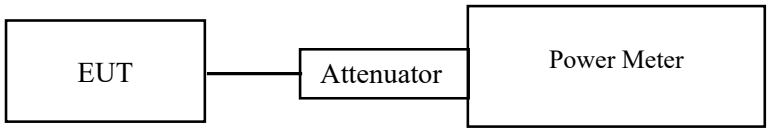
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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.

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 one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	25.6 ℃
Relative Humidity:	48 ℃
ATM Pressure:	101.0 kPa

The testing was performed by Ting Lv on 2021-09-13.

EUT operation mode: Transmitting

Wi-Fi mode

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Max Conducted Average Output Power (dBm)	Limit (dBm)
802.11b mode				
Low	2412	17.43	15.07	30
Middle	2442	14.81	12.45	30
High	2472	14.11	11.81	30
802.11g mode				
Low	2412	19.53	16.62	30
Middle	2442	19.51	16.48	30
High	2472	18.44	15.56	30
802.11n HT20 mode				
Low	2412	19.51	16.85	30
Middle	2442	19.33	16.43	30
High	2472	18.37	15.58	30
802.11n HT40 mode				
Low	2422	20.02	16.79	30
Middle	2442	19.53	16.35	30
High	2457	18.87	15.69	30
	2462	16.44	13.58	30

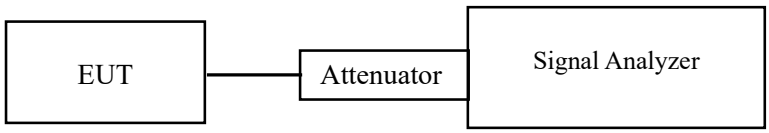
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

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)).

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

Environmental Conditions

Temperature:	25.6 ℃
Relative Humidity:	48 ℃
ATM Pressure:	101.0 kPa

The testing was performed by Ting Lv on 2021-09-13.

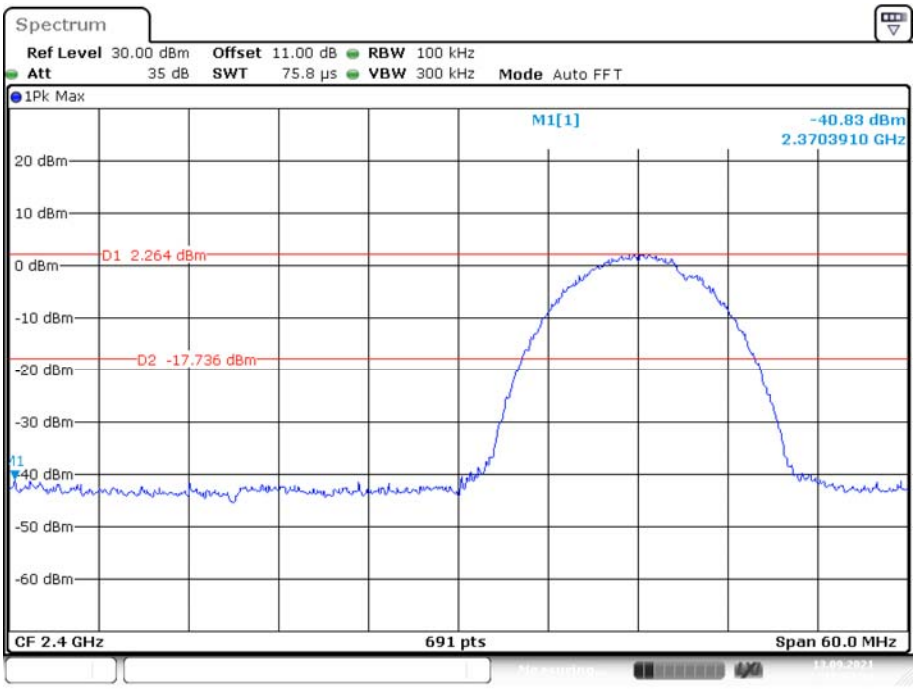
EUT operation mode: Transmitting

Test Result: Compliant.

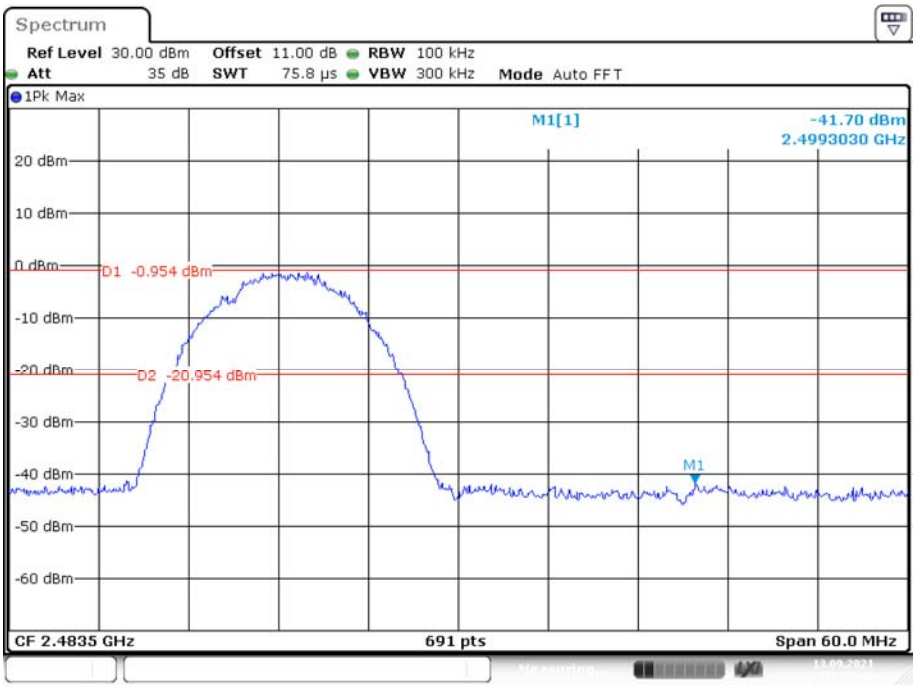
Conducted Band Edge Result:

Please refer to the following plots.

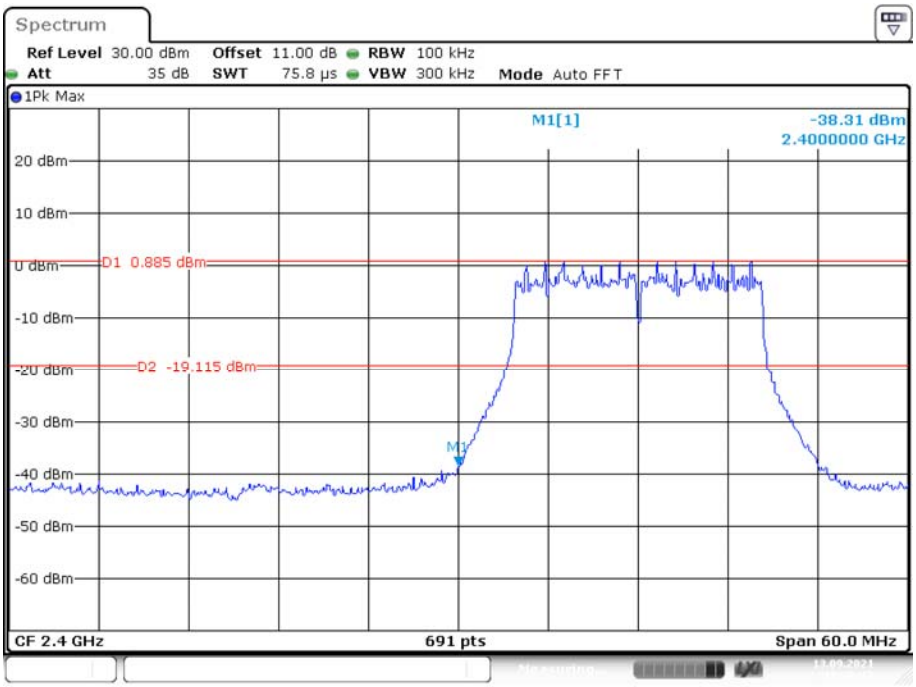
802.11b: Band Edge, Left Side



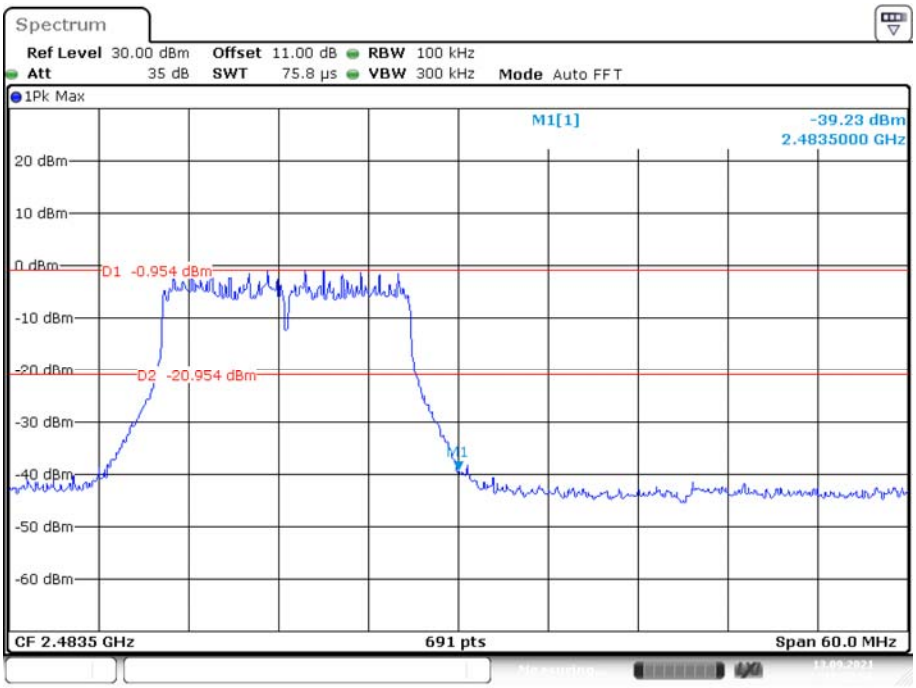
802.11b: Band Edge, Right Side



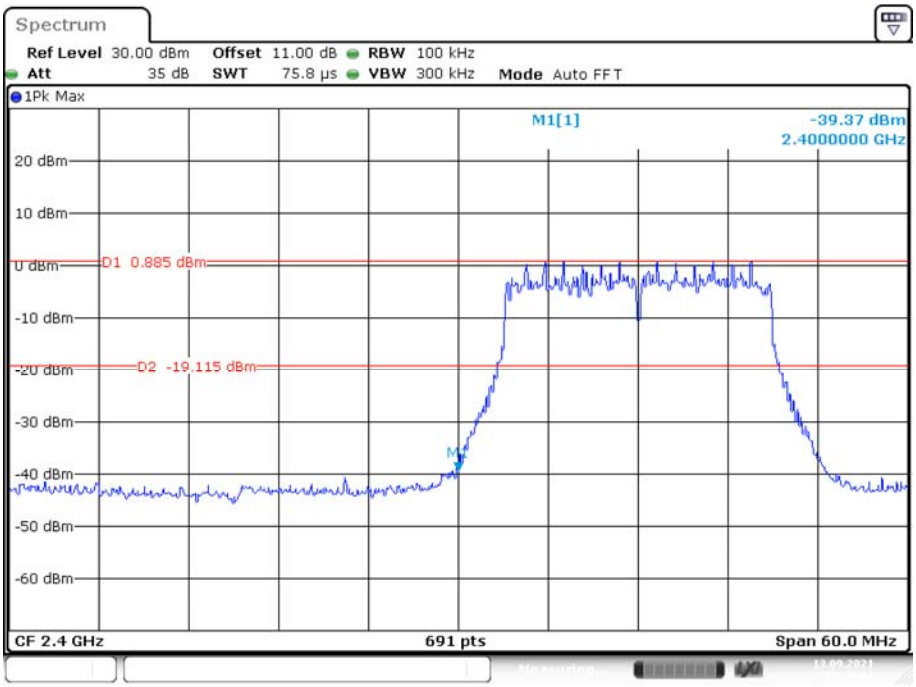
802.11g: Band Edge, Left Side



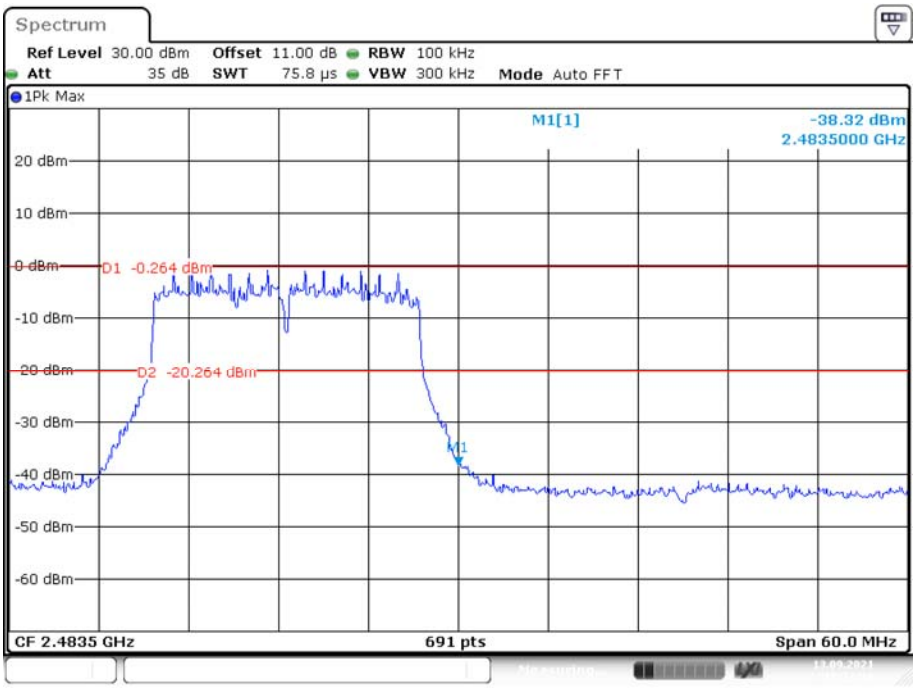
802.11g: Band Edge, Right Side



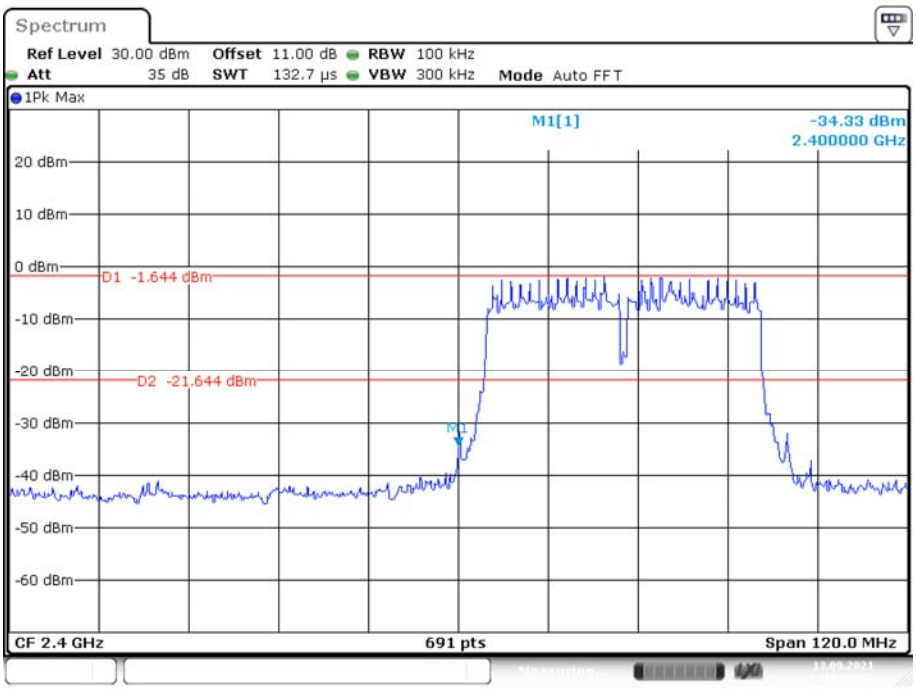
802.11n-HT20: Band Edge, Left Side



802.11n-HT20: Band Edge, Right Side



802.11n-HT40: Band Edge, Left Side



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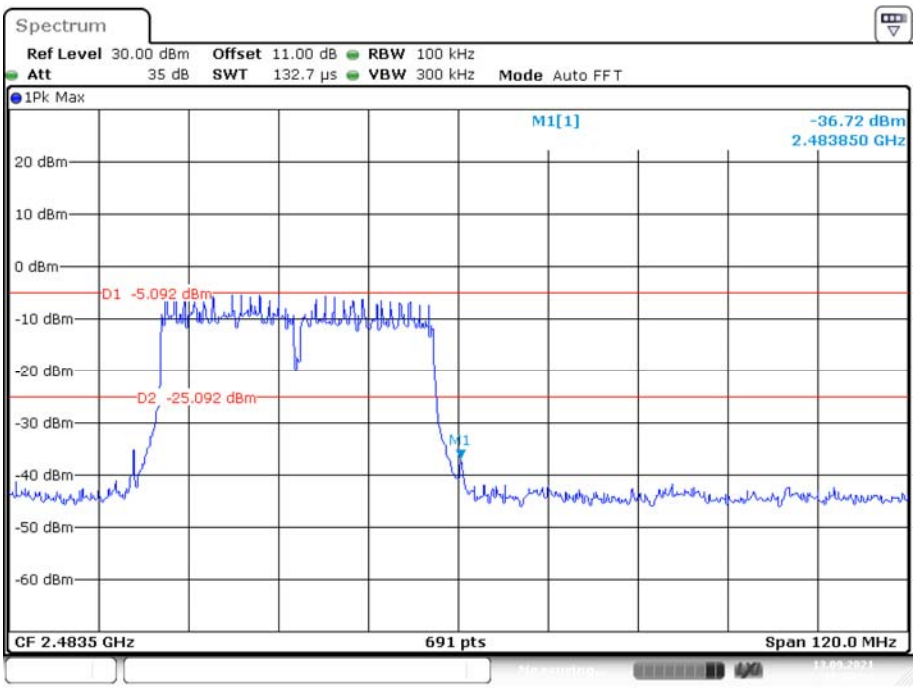
802.11n-HT40: Band Edge, Right Side



Date: 13.SEP.2021 18:20:25

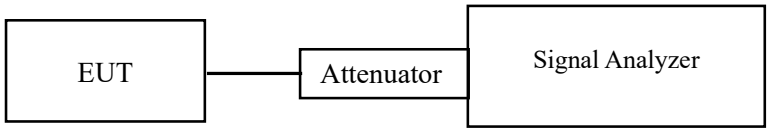
FCC §15.247(e) - POWER SPECTRAL DENSITY

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.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Data

Environmental Conditions

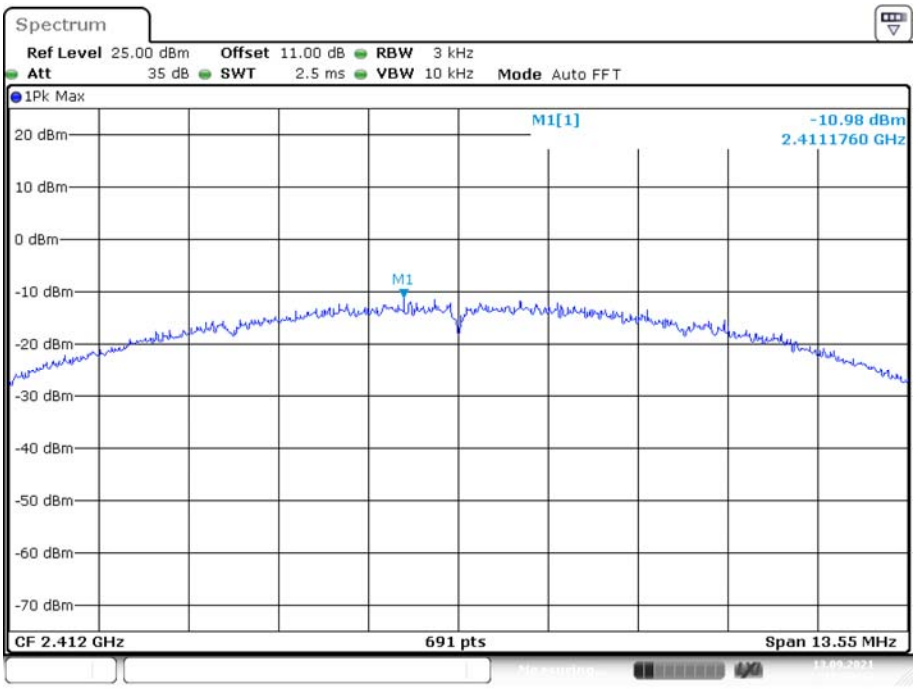
Temperature:	25.6 ℃
Relative Humidity:	48 ℃
ATM Pressure:	101.0 kPa

The testing was performed by Ting Lv on 2021-09-13.

EUT operation mode: Transmitting

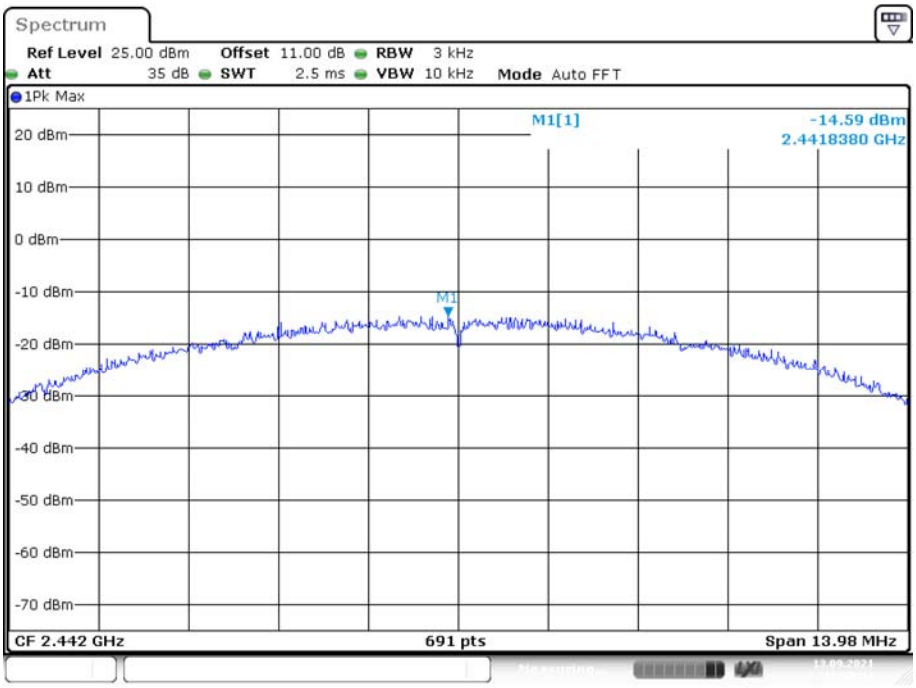
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-10.98	≤8
Middle	2442	-14.59	≤8
High	2472	-14.41	≤8
802.11g mode			
Low	2412	-14.02	≤8
Middle	2442	-14.78	≤8
High	2472	-14.97	≤8
802.11n-HT20 mode			
Low	2412	-15.07	≤8
Middle	2442	-15.36	≤8
High	2472	-16.38	≤8
802.11n-HT40 mode			
Low	2422	-14.92	≤8
Middle	2442	-15.70	≤8
High	2462	-18.42	≤8

Power Spectral Density, 802.11b Low Channel



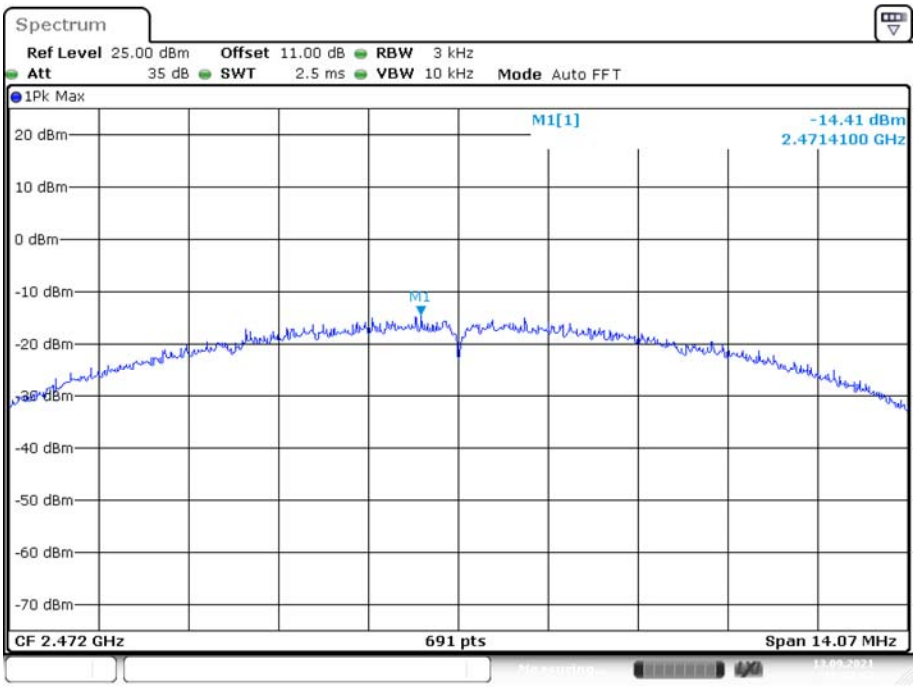
Date: 13.SEP.2021 18:39:43

Power Spectral Density, 802.11b Middle Channel



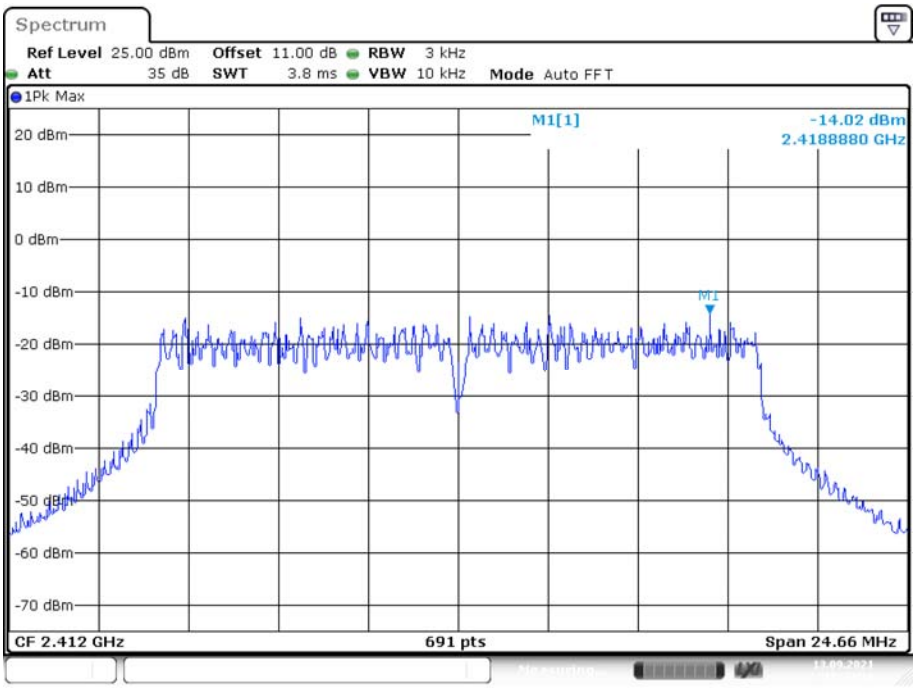
Date: 13.SEP.2021 18:40:42

Power Spectral Density, 802.11b High Channel



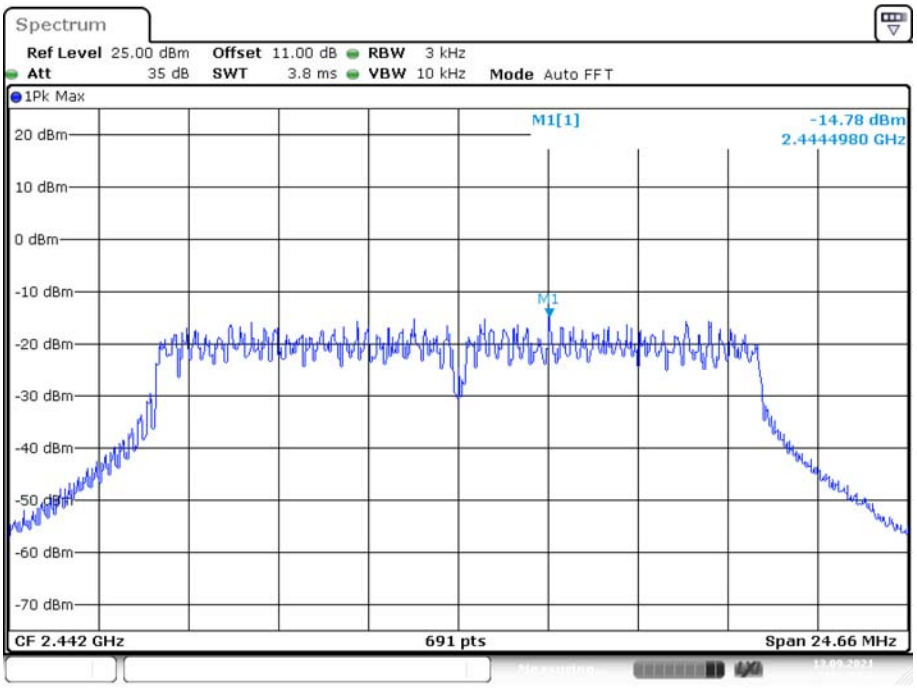
Date: 13.SEP.2021 18:42:03

Power Spectral Density, 802.11g Low Channel



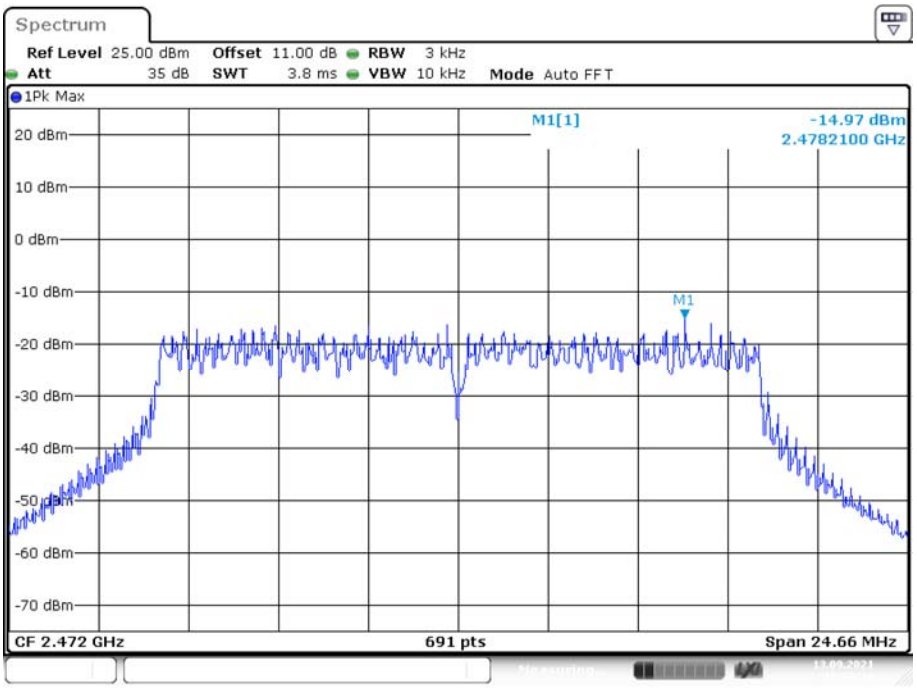
Date: 13.SEP.2021 18:44:18

Power Spectral Density, 802.11g Middle Channel



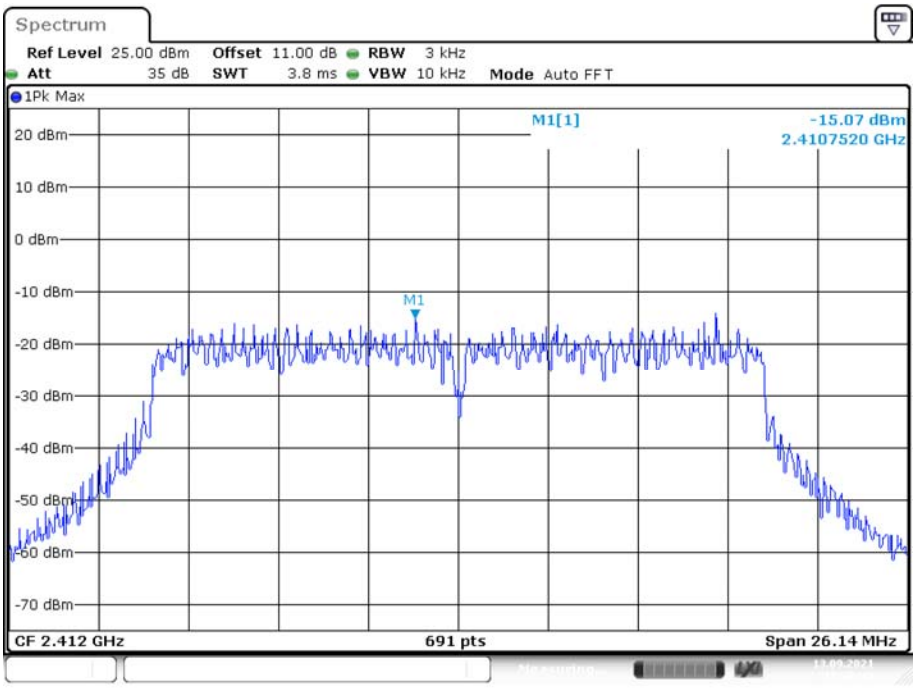
Date: 13.SEP.2021 18:45:37

Power Spectral Density, 802.11g High Channel



Date: 13.SEP.2021 18:43:19

Power Spectral Density, 802.11n-HT20 Low Channel



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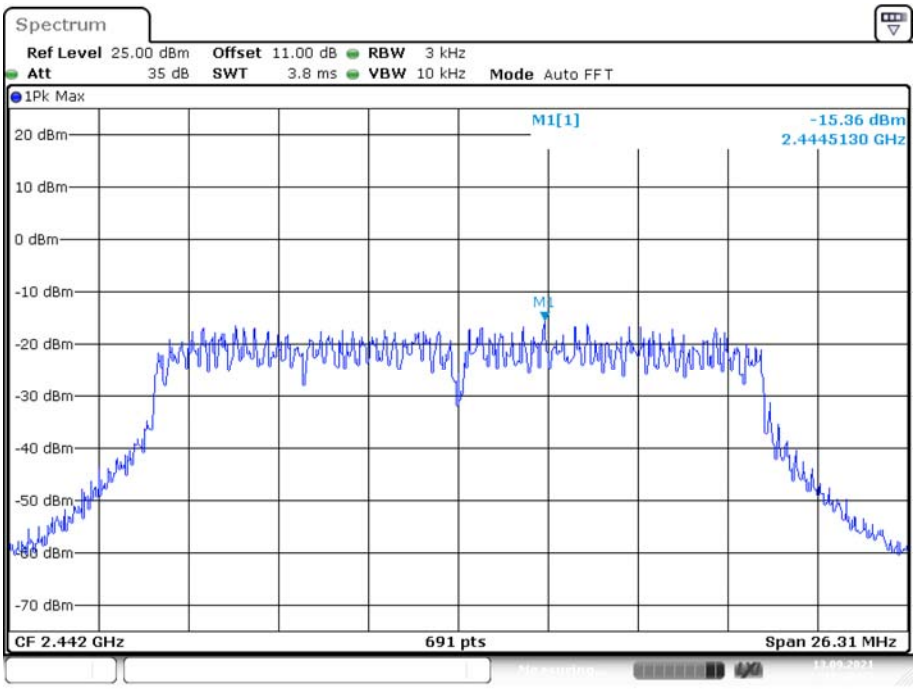
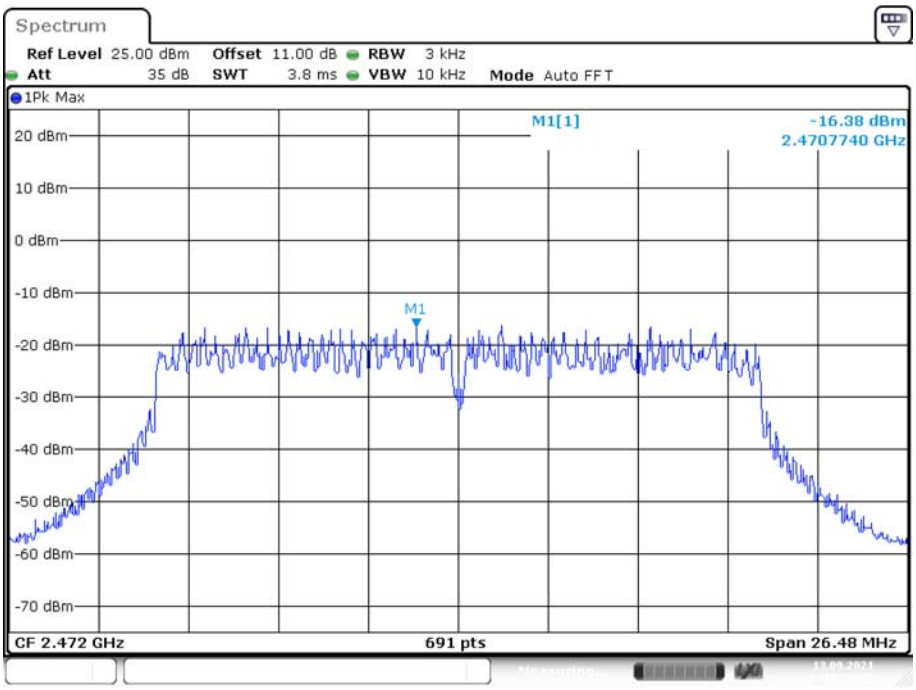
Power Spectral Density, 802.11n-HT20 Middle Channel



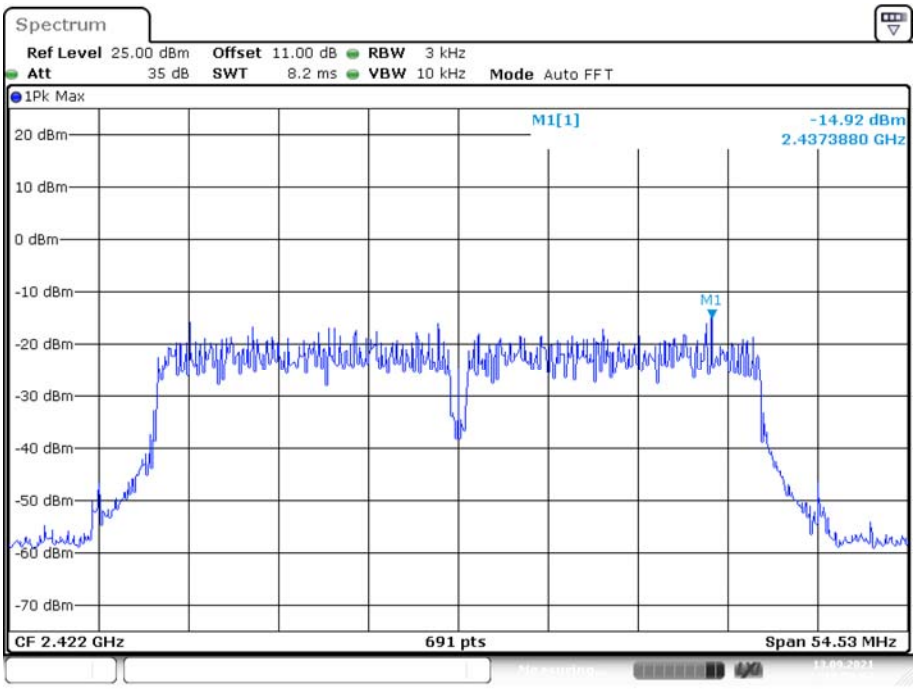
Date: 13.SEP.2021 18:47:35

Power Spectral Density, 802.11n-HT20 High Channel



Date: 13.SEP.2021 18:48:26

Power Spectral Density, 802.11n-HT40 Low Channel



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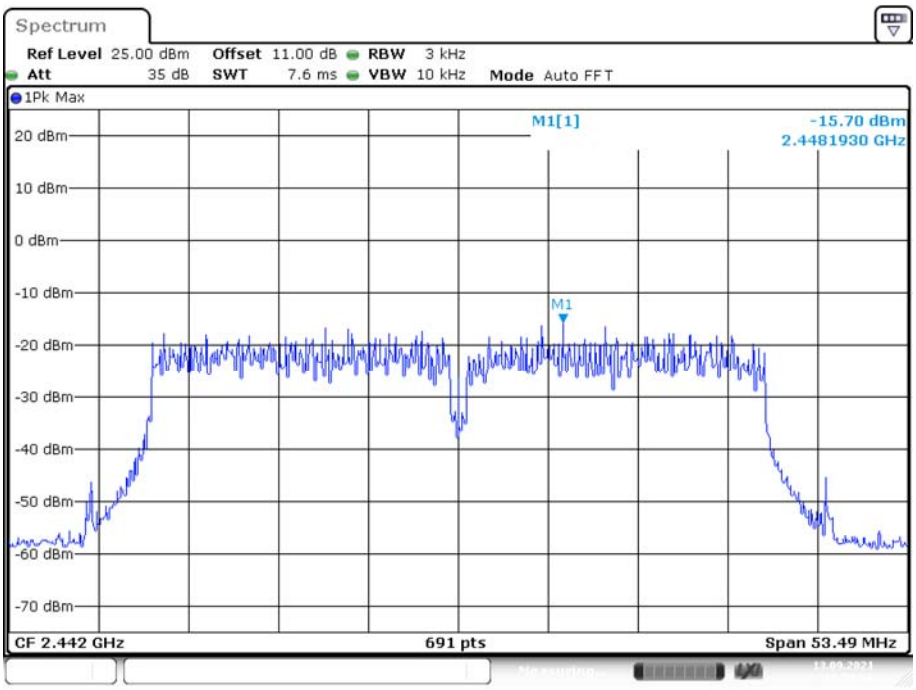
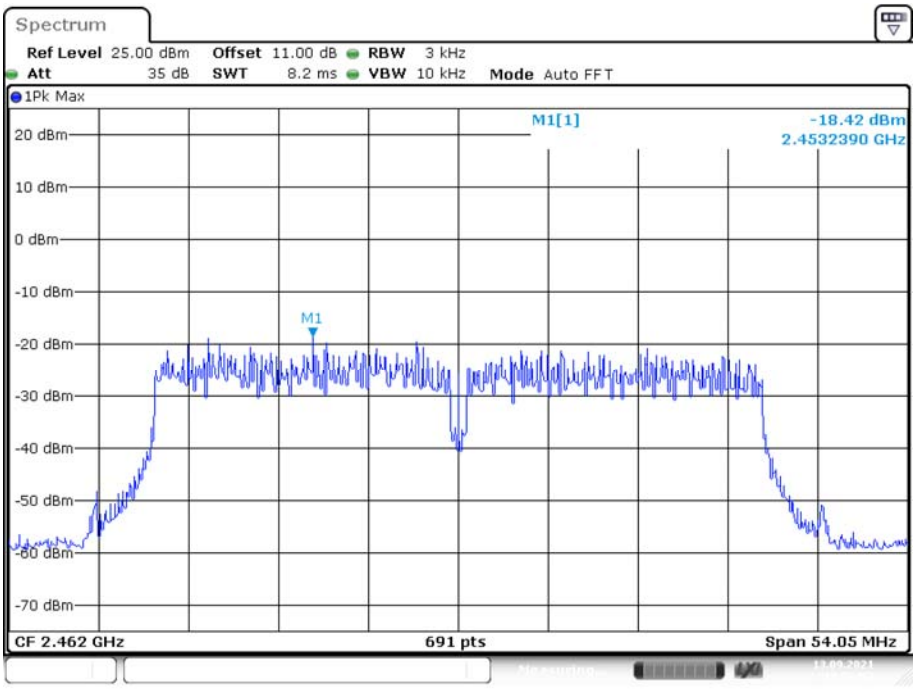
Power Spectral Density, 802.11n-HT40 Middle Channel



Power Spectral Density, 802.11n-HT40 High Channel



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