FCC Part 15.247

TEST REPORT

For

Xiaomi Communications Co.,Ltd.

#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, 100085, China

FCC ID: 2AFZZMHCWB4P-IB

Report Type	**Original Report**
Product Name:	**2.4Ghz WIFI+BLE dual-mode module**
Model Name:	**MHCWB4P-IB**
Report Number :	**RLK200226002-00A**
Report Date :	**2020/03/23**
Reviewed By :	**Zeus Chen**

Prepared By:

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***Note**: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Linkou Laboratory)*

Revision History

Revision	Report Number	Issue Date	Description
1.0	RLK200226002-00A	2020/03/23	Original Report

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	**Xiaomi Communications Co.,Ltd.** #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, 100085, China
Manufacturer	**Xiaomi Communications Co.,Ltd.** #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, 100085, China
Brand Name	
Product (Equipment)	**2.4Ghz WIFI+BLE dual-mode module**
Model Name	MHCWB4P-IB
Frequency Range	IEEE 802.11b/g/n HT20: 2412 - 2462 MHz BLE: 2402 - 2480 MHz
Number of Channels	IEEE 802.11 b/g/n HT20: 11 Channels BLE: 40 Channels
Output Power	IEEE 802.11b: 23.42 dBm IEEE 802.11g: 26.15 dBm IEEE 802.11n HT20: 26.11 dBm BLE: 6.97 dBm
Modulation Type	IEEE 802.11b: DSSS IEEE 802.11g/n HT 20: OFDM BLE: GFSK
Related Submittal(s)/Grant(s)	**N/A**
Received Date	Feb. 26, 2020
Date of Test	Feb. 28, 2020 ~ Mar. 09, 2020

**All measurement and test data in this report was gathered from production sample serial number: 200226002 Assigned by BACL, Linkou Laboratory).*

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☒ **DC Type** ☒ DC Power: 3.3 Vdc ☐ Battery: ☐ External from USB Cable ☐ External DC Adapter

1.3 Objective and Test Methodology

The Objective of this Test Report was to document the compliance of the Xiaomi Communications Co.,Ltd. (Model: MHCWB4P-IB) to the requirements of the following Standards:

- Part 2, Subpart J, Part 15, Subparts A and C, section 15.247 of the Federal Communication Commission's rules.

- ANSI C63.10-2013 of t American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power	± 1.488 dB
Occupied Channel Bandwidth	± 453.927 Hz
RF Conducted Emission test	± 2.77 dB
AC Power Line Conducted Emission	± 2.66 dB
Radiated Below 1G (966A)	± 3.57 dB
Radiated Above 1G (966A)	± 5.32 dB
Radiated Below 1G (966B)	± 3.78 dB
Radiated Above 1G (966B)	± 4.29 dB

1.5 Environmental Conditions and Test Date

Test Site	Test Date	Temperature (°C)	Relative Humidity (% RH)	Test Engineer
Conduction (CON-01)	2020-03-09	22.1	60	Blake Wang
Radiated (966A)	2020-03-08	25	53	David Lee
Radiated (966B)	2020-02-28	23.2	63.2	David Lee
Conducted (TH-02)	2020-03-03	20.5	57	David Lee

1.6 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Linkou Laboratory) to collect test data is located on

☒ No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.).

Bay Area Compliance Laboratories Corp. (Linkou Laboratory) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3546) by Mutual Recognition Agreement (MRA). 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. The FCC Registration No.: 0027578244. Designation No.: TW3546. The Test Firm Registration No.: 181430.

2 System Test Configuration

2.1 Test Channels and Description of Worst Test Configuration

The system was configured for testing in testing mode which was provided by manufacturer.

No special accessory, No modification was made to the EUT and No special equipment used during test.

For Wi-Fi 2.4G mode, there are totally 11 channels.

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/g/n HT20: Channel **1**, **6** and **11** were tested.

For BLE, there are totally 40 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	20	2442
1	2404	--	--
2	2406	--	--
3	2408	37	2476
--	--	38	2478
19	**2440**	**39**	**2480**

For BLE: Channel **0**, **19** and **39** were tested.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the Peak power and PSD across all date rates bandwidths, and modulations. Radiated below 1G were tested worst output power.

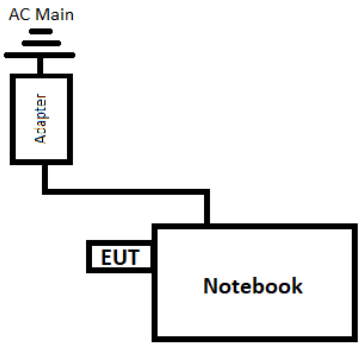
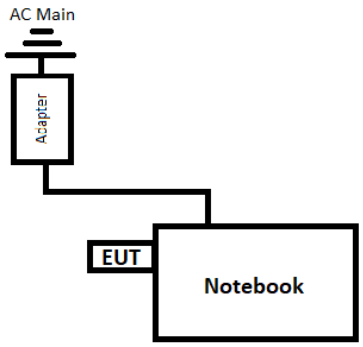
Modulation Used for Conformance Test			
Configuration	**NTX**	**Data Rate**	**Worst Data Rate**
802.11b	1	1-11 Mbps	1 Mbps
802.11g	1	6-54 Mbps	6 Mbps
802.11n HT 20	1	MCS 0-7	MCS 0
BLE	1	125 kbps-1 Mbps	1 Mbps

Worst Case of Power Setting				
EUT Exercise Software		Command		
Configuration	NTX	Low CH	Mid CH	High CH
802.11b	1	97	106	90
802.11g	1	98	116	92
802.11n HT 20	1	95	116	92
BLE	1	Default	Default	Default

2.2 Support Equipment List and External Cable List

No.	Description	Manufacturer	Model Number	Series Number
A	Notebook	DELL	Latitude E6410	PP27LA001
B	Notebook	DELL	E5470	726RWN2

2.3 Block Diagram of Test Setup

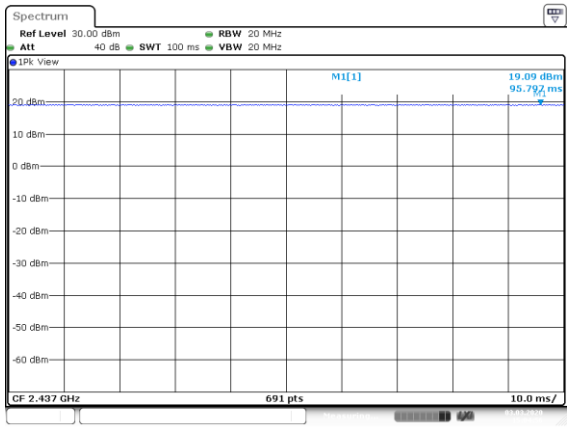
Conduction	Radiation
	

2.4 Duty Cycle

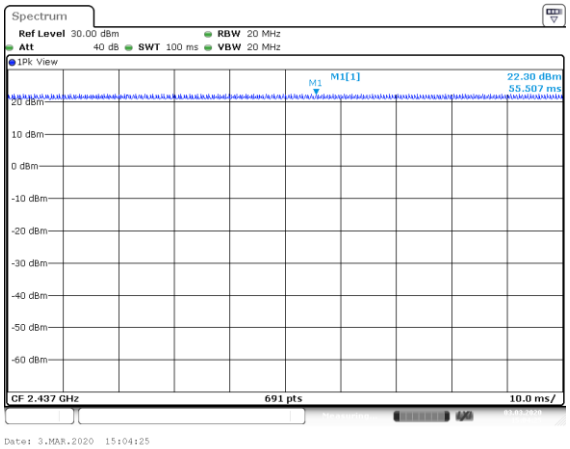
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum power transmission duration, T, are required for each tested mode of operation.

Configuration	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b	100.00	100.00	100.00	0.00
802.11g	100.00	100.00	100.00	0.00
802.11n HT20	100.00	100.00	100.00	0.00
BLE	0.3913	0.6232	63.00	2.01

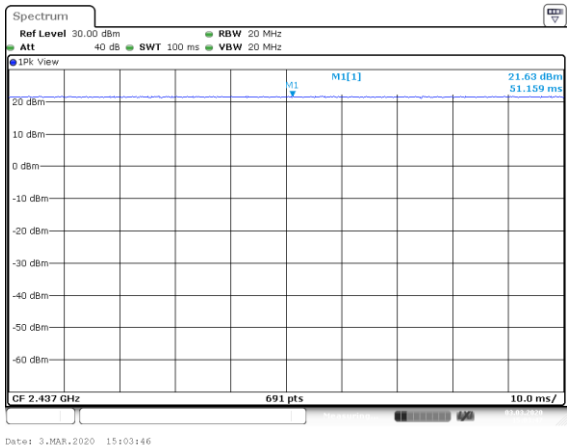
802.11b



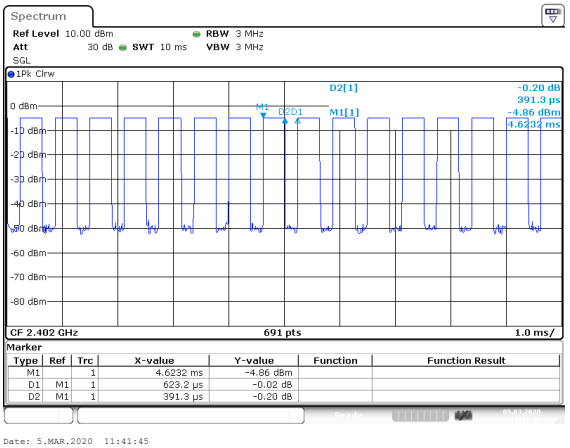
802.11g



802.11n HT20



BLE



**Note: Duty Factor = 10*log (1/Duty cycle)*

3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.247(i), §1.1310, §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

4 FCC§15.247(i), §1.1307, § 2.1091 – Maximum Permissible Exposure (MPE)

4.1 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.

Calculated Formulary: Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = 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);

For simultaneously transmit system, the calculated power density should comply with: $\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$

4.2 RF Exposure Evaluation Result

MPE Evaluation:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
Wi-Fi 2.4G	2412-2462	3.01	1.9999	26.50	446.6836	20	0.1778	1.0
BLE	2402-2480	3.01	1.9999	7.00	5.0119	20	0.0020	1.0

Note: Wi-Fi and BT can't simultaneously.

Result: MPE evaluation of single and simultaneous transmission meet the requirement of standard.

5 FCC §15.203 - Antenna Requirements

5.1 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.

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 does not exceed 6dBi

5.2 Antenna List and Details

Model	Model	Antenna Type	Antenna Gain	Result
Shenzhen Xindingxing Electronic Co ., Ltd	RFW300225-A-01-P 2.4	PIFA Antenna	3.01 dBi	Compliance

The EUT has an external dedicated antennas arrangement, fulfill the requirement of this section.

6 FCC §15.207 - AC Line Conducted Emissions

6.1 Applicable Standard

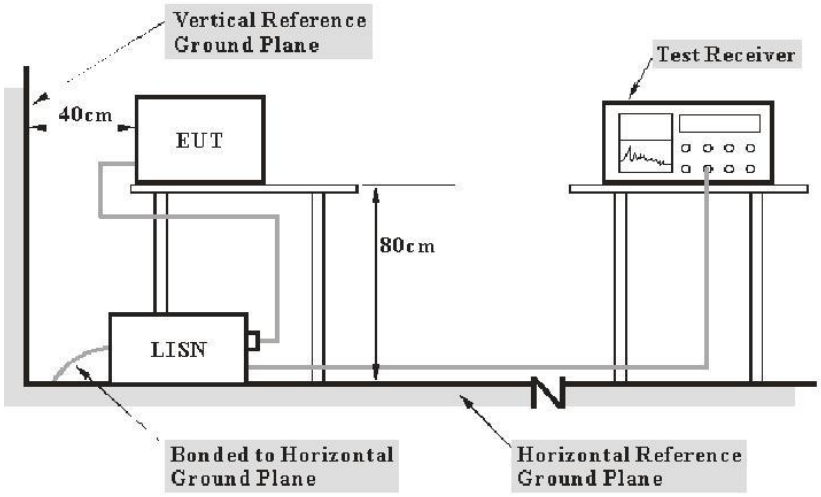
According to FCC §15.207,

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency. Note 2: A linear average detector is required

6.2 EUT Setup and Test Procedure



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 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	Receiver RBW
150 kHz - 30 MHz	9 kHz

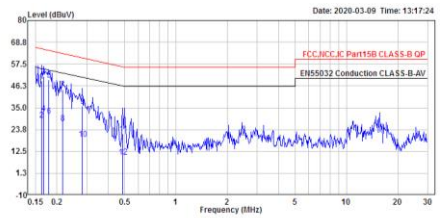
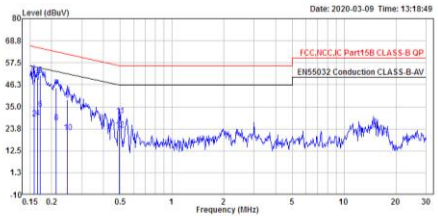
During the conducted emission test, the adapter was connected to the outlet of the LISN. Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the Quasi-peak and average detection mode.

6.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
AC Line Conduction Room (CON-01)					
Two-Line V-Network	Rohde & Schwarz	ENV216	100010	2019/09/02	2020/09/01
Pulse Limiter	SCHWARZBECK	VSTD 9561-F	00432	2019/08/28	2020/08/27
ESR EMI Test Receiver	Rohde & Schwarz	ESR3	102430	2019/03/27	2020/03/26
RF Cable	EMCI	EMCCFD300-BM-BM-8000	180526	2019/08/08	2020/08/07
Software	Audix	e3 v9	E3LK-03	N.C.R	N.C.R

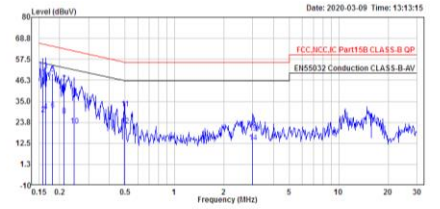
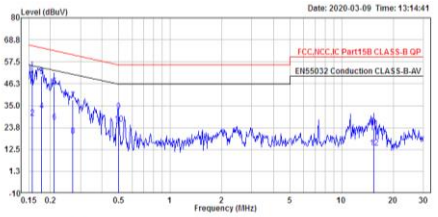
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

6.4 Test Result

BLE - Line	BLE - Neutral
	

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.162	28.72	48.66	19.94	65.34	-16.68	QP
2	0.162	8.66	28.60	19.94	55.34	-26.74	Average
3	0.168	31.10	51.04	19.94	65.07	-14.03	QP
4	0.168	12.18	32.12	19.94	55.07	-22.95	Average
5	0.180	29.48	49.42	19.94	64.48	-15.06	QP
6	0.180	10.90	30.84	19.94	54.48	-23.64	Average
7	0.216	24.48	44.42	19.94	62.96	-18.54	QP
8	0.216	7.11	27.05	19.94	52.96	-25.91	Average
9	0.281	15.94	35.88	19.94	60.77	-24.89	QP
10	0.281	-0.97	18.97	19.94	50.77	-31.80	Average
11	0.488	1.78	21.74	19.96	56.21	-34.47	QP
12	0.488	-10.11	9.85	19.96	46.21	-36.36	Average

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.159	29.04	48.99	19.95	65.54	-16.55	QP
2	0.159	9.01	28.96	19.95	55.54	-26.58	Average
3	0.165	29.87	49.82	19.95	65.21	-15.39	QP
4	0.165	9.59	29.54	19.95	55.21	-25.67	Average
5	0.172	31.32	51.27	19.95	64.88	-13.61	QP
6	0.172	13.70	33.65	19.95	54.88	-21.23	Average
7	0.213	24.65	44.59	19.94	63.09	-18.50	QP
8	0.213	6.95	26.89	19.94	53.09	-26.20	Average
9	0.248	18.78	38.72	19.94	61.83	-23.11	QP
10	0.248	1.91	21.85	19.94	51.83	-29.98	Average
11	0.496	10.31	30.28	19.97	56.07	-25.79	QP
12	0.496	3.27	23.24	19.97	46.07	-22.83	Average

Wi-Fi - Line	Wi- Fi - Neutral
	

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.159	28.24	48.18	19.94	65.54	-17.36	QP
2	0.159	8.13	28.07	19.94	55.54	-27.47	Average
3	0.164	31.63	51.57	19.94	65.27	-13.70	QP
4	0.164	9.68	29.62	19.94	55.27	-25.65	Average
5	0.182	29.81	49.75	19.94	64.41	-14.66	QP
6	0.182	10.54	30.48	19.94	54.41	-23.93	Average
7	0.213	24.76	44.70	19.94	63.09	-18.39	QP
8	0.213	7.37	27.31	19.94	53.09	-25.78	Average
9	0.246	18.04	37.98	19.94	61.90	-23.92	QP
10	0.246	1.85	21.79	19.94	51.90	-30.11	Average
11	0.496	11.20	31.16	19.96	56.07	-24.91	QP
12	0.496	1.82	21.78	19.96	46.07	-24.29	Average
13	3.000	-1.91	18.10	20.01	56.00	-37.90	QP
14	3.000	-7.07	12.94	20.01	46.00	-33.06	Average

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.157	28.90	48.85	19.95	65.60	-16.75	QP
2	0.157	8.75	28.70	19.95	55.60	-26.90	Average
3	0.177	30.17	50.11	19.94	64.61	-14.50	QP
4	0.177	12.38	32.32	19.94	54.61	-22.29	Average
5	0.211	25.08	45.02	19.94	63.15	-18.13	QP
6	0.211	6.62	26.56	19.94	53.15	-26.59	Average
7	0.270	18.00	37.94	19.94	61.10	-23.16	QP
8	0.270	-0.37	19.57	19.94	51.10	-31.53	Average
9	0.500	12.01	31.98	19.97	56.01	-24.03	QP
10	0.500	5.73	25.70	19.97	46.01	-20.31	Average
11	15.363	3.08	23.34	20.26	60.00	-36.66	QP
12	15.363	-6.96	13.30	20.26	50.00	-36.70	Average

Note1: Transmit mode

Note2:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

7 FCC §15.209, §15.205, §15.247(d) – Spurious Emissions

7.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	13.36-13.41	399.9-410	4.5-5.15
0.495-0.505	16.42-16.423	608-614	5.35-5.46
2.1735-2.1905	16.69475-16.69525	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6

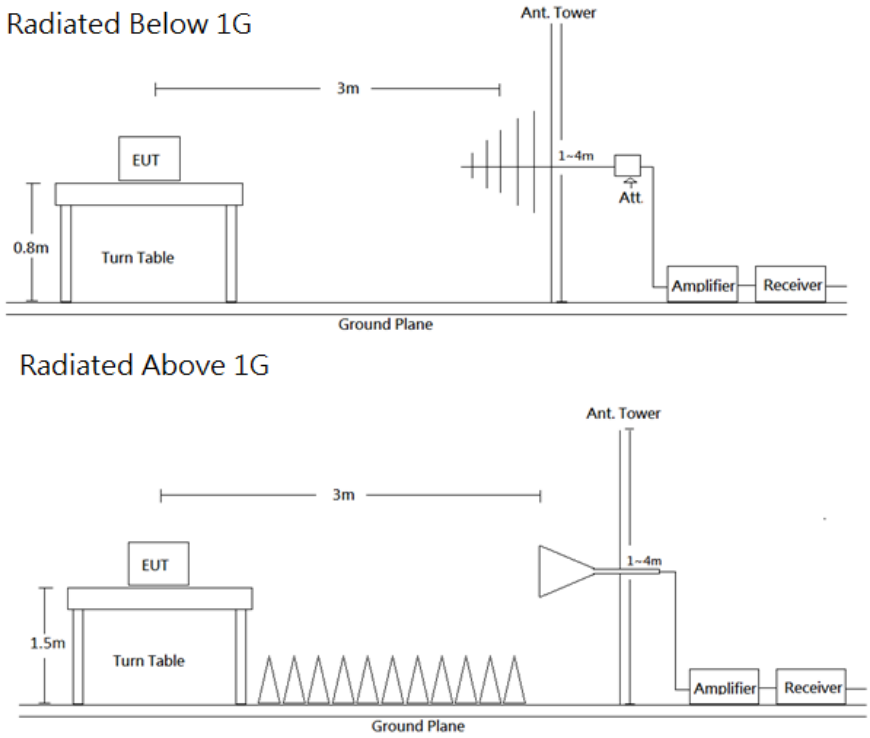
As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per 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 20dB. 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).

7.2 EUT Setup and Test Procedure



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

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	-	QP
Above 1 GHz	1 MHz	3 MHz	-	PK
	1 MHz	10 Hz	>98%	Ave
	1 MHz	1/T	<98%	Ave

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations. All data was recorded in the PK or Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

7.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Radiation 3M Room (966A)					
Active Loop	EMCO	6502	0001-3322	2019/03/15	2020/03/14
Bilog Antenna/6 dB Attenuator	SUNOL SCIENCES & EMEC /EMCI	JB3/N-6-06	A111513/AT-N0668	2019/03/29	2020/03/28
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	101434	2019/04/17	2020/04/16
Horn Antenna	ETS-Lindgren	3115	00109141	2019/07/05	2020/07/04
Horn Antenna	ETS-Lindgren	3160-09	00123852	2019/07/11	2020/07/10
Preamplifier	EMIC	EMI18G40G	060656	2020/01/03	2021/01/02
Preamplifier	A.H. Systems	PAM-0118	478	2019/03/28	2020/03/27
Microflex Cable (1m)	EMCI	EMC106-SM-SM-2000	180515	2019/08/07	2020/08/06
Microflex Cable (2m)	MTJ	H0919	00000-MT28A-100	2019/08/07	2020/08/06
Microflex Cable (8m)	UTIFLEX	UFA210A-1-3149-300300	MFR 64639 232490-001	2019/08/07	2020/08/06
Turn Table	Chaintek	T-200-S-1	003501	N.C.R	N.C.R
Antenna Tower	Chaintek	MBD-400-1	003504	N.C.R	N.C.R
Controller	Chaintek	3000-1	003507	N.C.R	N.C.R
Software	Audix	e3 v9	E3LK-01	N.C.R	N.C.R
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

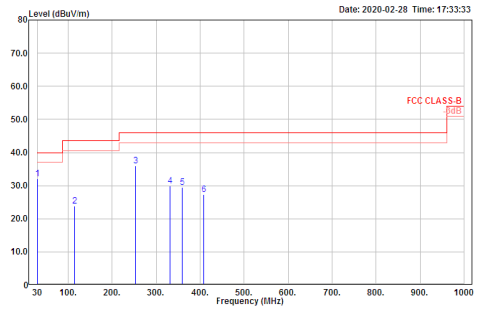
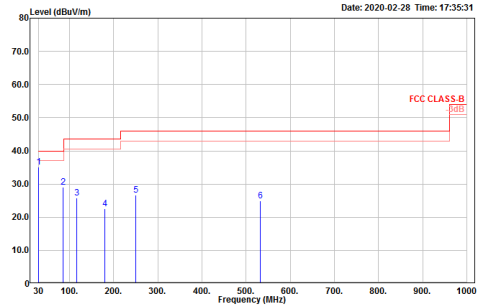
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

7.4 Test Result

Wi-Fi Mode:

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

Below 1G (30 MHz-1 GHz) test the output power worst mode

Horizontal	Vertical
	

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	30.000	39.54	-7.45	32.09	40.00	-7.91	Peak
2	115.360	41.27	-17.37	23.90	43.50	-19.60	Peak
3	253.100	55.72	-19.64	36.08	46.00	-9.92	Peak
4	331.670	47.59	-17.62	29.97	46.00	-16.03	Peak
5	359.800	46.18	-16.59	29.59	46.00	-16.41	Peak
6	408.300	42.87	-15.53	27.34	46.00	-18.66	Peak

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	30.000	42.65	-7.45	35.20	40.00	-4.80	QP
2	85.290	51.71	-22.76	28.95	40.00	-11.05	Peak
3	117.300	43.10	-17.20	25.90	43.50	-17.60	Peak
4	180.350	42.61	-19.96	22.65	43.50	-20.85	Peak
5	250.190	46.28	-19.69	26.59	46.00	-19.41	Peak
6	532.460	38.49	-13.55	24.94	46.00	-21.06	Peak

Note1: Transmit mode

Note2:

Level = Read Level + Factor

Over Limit = Level – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Above 1G (1 GHz-26.5 GHz)

802.11b mode:

Low CH

Horizontal

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2387.168	54.83	-6.08	48.75	74.00	-25.25	Peak
2387.168	46.95	-6.08	40.87	54.00	-13.13	Average
2412.032	102.65	-5.89	96.76			Peak
2412.032	100.79	-5.89	94.90			Average
4824.000	51.46	1.66	53.12	74.00	-20.88	Peak
4824.000	48.29	1.66	49.95	54.00	-4.05	Average
7236.000	41.01	7.69	48.70	74.00	-25.30	Peak
7236.000	31.27	7.69	38.96	54.00	-15.04	Average

Vertical

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2386.160	61.24	-6.09	55.15	74.00	-18.85	Peak
2386.160	52.59	-6.09	46.50	54.00	-7.50	Average
2412.144	115.20	-5.89	109.31			Peak
2412.144	113.46	-5.89	107.57			Average
4824.000	50.36	1.66	52.02	74.00	-21.98	Peak
4824.000	48.13	1.66	49.79	54.00	-4.21	Average
7236.000	41.40	7.69	49.09	74.00	-24.91	Peak
7236.000	31.57	7.69	39.26	54.00	-14.74	Average

Middle CH

Horizontal

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2349.446	53.82	-6.32	47.50	74.00	-26.50	Peak
2349.446	46.41	-6.32	40.09	54.00	-13.91	Average
2437.050	103.79	-5.68	98.11			Peak
2437.050	102.05	-5.68	96.37			Average
2536.996	54.43	-5.24	49.19	74.00	-24.81	Peak
2536.996	42.41	-5.24	37.17	54.00	-16.83	Average
4874.000	53.31	1.65	54.96	74.00	-19.04	Peak
4874.000	51.52	1.65	53.17	54.00	-0.83	Average
7311.000	40.30	7.74	48.04	74.00	-25.96	Peak
7311.000	31.52	7.74	39.26	54.00	-14.74	Average

Vertical

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2388.892	57.55	-6.06	51.49	74.00	-22.51	Peak
2388.892	48.72	-6.06	42.66	54.00	-11.34	Average
2436.808	115.19	-5.68	109.51			Peak
2436.808	113.49	-5.68	107.81			Average
2518.120	57.25	-5.33	51.92	74.00	-22.08	Peak
2518.120	46.87	-5.33	41.54	54.00	-12.46	Average
4874.000	51.68	1.65	53.33	74.00	-20.67	Peak
4874.000	49.41	1.65	51.06	54.00	-2.94	Average
7311.000	40.37	7.74	48.11	74.00	-25.89	Peak
7311.000	32.71	7.74	40.45	54.00	-13.55	Average

High CH

Horizontal

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2461.900	101.62	-5.53	96.09			Peak
2461.900	99.92	-5.53	94.39			Average
2513.100	54.02	-5.36	48.66	74.00	-25.34	Peak
2513.100	42.61	-5.36	37.25	54.00	-16.75	Average
4924.000	50.43	1.69	52.12	74.00	-21.88	Peak
4924.000	48.08	1.69	49.77	54.00	-4.23	Average
7386.000	39.35	7.99	47.34	74.00	-26.66	Peak
7386.000	29.62	7.99	37.61	54.00	-16.39	Average

Vertical

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2461.900	114.12	-5.53	108.59			Peak
2461.900	112.56	-5.53	107.03			Average
2487.800	59.30	-5.46	53.84	74.00	-20.16	Peak
2487.800	49.48	-5.46	44.02	54.00	-9.98	Average
4924.000	50.41	1.69	52.10	74.00	-21.90	Peak
4924.000	47.56	1.69	49.25	54.00	-4.75	Average
7386.000	39.56	7.99	47.55	74.00	-26.45	Peak
7386.000	29.56	7.99	37.55	54.00	-16.45	Average

802.11g mode:

Low CH

Horizontal

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2389.860	56.73	-6.06	50.67	74.00	-23.33	Peak
2389.860	47.11	-6.06	41.05	54.00	-12.95	Average
2413.620	101.35	-5.88	95.47			Peak
2413.620	93.63	-5.88	87.75			Average
4824.000	45.26	1.66	46.92	74.00	-27.08	Peak
4824.000	34.56	1.66	36.22	54.00	-17.78	Average
7236.000	41.47	7.69	49.16	74.00	-24.84	Peak
7236.000	30.75	7.69	38.44	54.00	-15.56	Average

Vertical

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2389.992	72.60	-6.06	66.54	74.00	-7.46	Peak
2389.992	56.10	-6.06	50.04	54.00	-3.96	Average
2413.620	113.88	-5.88	108.00			Peak
2413.620	106.15	-5.88	100.27			Average
4824.000	43.89	1.66	45.55	74.00	-28.45	Peak
4824.000	34.46	1.66	36.12	54.00	-17.88	Average
7236.000	40.91	7.69	48.60	74.00	-25.40	Peak
7236.000	30.71	7.69	38.40	54.00	-15.60	Average

Middle CH

Horizontal

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2370.984	54.03	-6.18	47.85	74.00	-26.15	Peak
2370.984	42.32	-6.18	36.14	54.00	-17.86	Average
2440.196	103.80	-5.65	98.15			Peak
2440.196	96.17	-5.65	90.52			Average
2524.412	53.90	-5.30	48.60	74.00	-25.40	Peak
2524.412	42.63	-5.30	37.33	54.00	-16.67	Average
4874.000	44.98	1.65	46.63	74.00	-27.37	Peak
4874.000	36.26	1.65	37.91	54.00	-16.09	Average
7311.000	41.05	7.74	48.79	74.00	-25.21	Peak
7311.000	30.85	7.74	38.59	54.00	-15.41	Average

Vertical

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2388.650	58.36	-6.07	52.29	74.00	-21.71	Peak
2388.650	47.52	-6.07	41.45	54.00	-12.55	Average
2440.196	116.29	-5.65	110.64			Peak
2440.196	108.44	-5.65	102.79			Average
2484.240	61.61	-5.47	56.14	74.00	-17.86	Peak
2484.240	47.61	-5.47	42.14	54.00	-11.86	Average
4874.000	46.91	1.65	48.56	74.00	-25.44	Peak
4874.000	36.36	1.65	38.01	54.00	-15.99	Average
7311.000	40.52	7.74	48.26	74.00	-25.74	Peak
7311.000	31.26	7.74	39.00	54.00	-15.00	Average

High CH

Horizontal

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2463.500	100.59	-5.53	95.06			Peak
2463.500	92.86	-5.53	87.33			Average
2483.800	57.18	-5.47	51.71	74.00	-22.29	Peak
2483.800	43.33	-5.47	37.86	54.00	-16.14	Average
2463.500	100.59	-5.53	95.06	74.00	21.06	Peak
2463.500	92.86	-5.53	87.33	54.00	33.33	Average
2483.800	57.18	-5.47	51.71	74.00	-22.29	Peak
2483.800	43.33	-5.47	37.86	54.00	-16.14	Average

Vertical

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2463.500	112.91	-5.53	107.38			Peak
2463.500	105.33	-5.53	99.80			Average
2483.600	70.43	-5.47	64.96	74.00	-9.04	Peak
2483.600	54.45	-5.47	48.98	54.00	-5.02	Average
4924.000	42.00	1.69	43.69	74.00	-30.31	Peak
4924.000	32.44	1.69	34.13	54.00	-19.87	Average
7386.000	39.25	7.99	47.24	74.00	-26.76	Peak
7386.000	29.68	7.99	37.67	54.00	-16.33	Average

802.11n HT20 mode:

Low CH

Horizontal

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2388.936	55.54	-6.06	49.48	74.00	-24.52	Peak
2388.936	43.49	-6.06	37.43	54.00	-16.57	Average
2409.000	101.18	-5.92	95.26			Peak
2409.000	92.57	-5.92	86.65			Average
4824.000	42.85	1.66	44.51	74.00	-29.49	Peak
4824.000	33.52	1.66	35.18	54.00	-18.82	Average
7236.000	40.92	7.69	48.61	74.00	-25.39	Peak
7236.000	30.81	7.69	38.50	54.00	-15.50	Average

Vertical

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2389.992	76.25	-6.06	70.19	74.00	-3.81	Peak
2389.992	56.83	-6.06	50.77	54.00	-3.23	Average
2409.132	113.85	-5.92	107.93			Peak
2409.132	105.40	-5.92	99.48			Average
4824.000	41.63	1.66	43.29	74.00	-30.71	Peak
4824.000	31.65	1.66	33.31	54.00	-20.69	Average
7236.000	40.09	7.69	47.78	74.00	-26.22	Peak
7236.000	30.57	7.69	38.26	54.00	-15.74	Average

Middle CH

Horizontal

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2387.440	58.86	-6.08	52.78	74.00	-21.22	Peak
2387.440	42.94	-6.08	36.86	54.00	-17.14	Average
2440.196	106.30	-5.65	100.65			Peak
2440.196	99.06	-5.65	93.41			Average
2533.124	58.29	-5.25	53.04	74.00	-20.96	Peak
2533.124	43.15	-5.25	37.90	54.00	-16.10	Average
4874.000	46.32	1.65	47.97	74.00	-26.03	Peak
4874.000	36.48	1.65	38.13	54.00	-15.87	Average
7311.000	39.74	7.74	47.48	74.00	-26.52	Peak
7311.000	31.13	7.74	38.87	54.00	-15.13	Average

Vertical

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2389.860	62.03	-6.06	55.97	74.00	-18.03	Peak
2389.860	48.37	-6.06	42.31	54.00	-11.69	Average
2433.904	116.51	-5.71	110.80			Peak
2433.904	108.61	-5.71	102.90			Average
2484.966	64.20	-5.47	58.73	74.00	-15.27	Peak
2484.966	47.53	-5.47	42.06	54.00	-11.94	Average
4874.000	45.32	1.65	46.97	74.00	-27.03	Peak
4874.000	35.88	1.65	37.53	54.00	-16.47	Average
7311.000	40.53	7.74	48.27	74.00	-25.73	Peak
7311.000	30.98	7.74	38.72	54.00	-15.28	Average

High CH

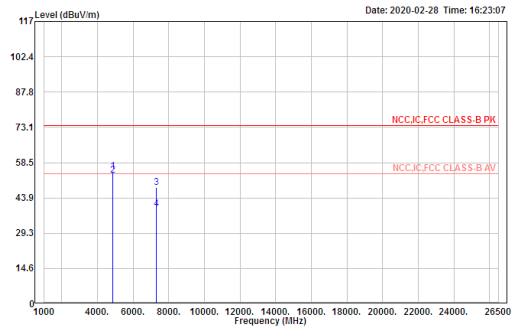
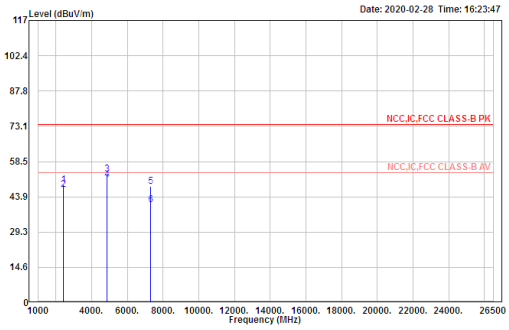
Horizontal

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2459.050	102.30	-5.54	96.76			Peak
2459.050	94.01	-5.54	88.47			Average
2485.670	57.67	-5.46	52.21	74.00	-21.79	Peak
2485.670	44.57	-5.46	39.11	54.00	-14.89	Average
4924.000	43.41	1.69	45.10	74.00	-28.90	Peak
4924.000	34.37	1.69	36.06	54.00	-17.94	Average
7386.000	40.87	7.99	48.86	74.00	-25.14	Peak
7386.000	29.64	7.99	37.63	54.00	-16.37	Average

Vertical

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
2458.940	113.21	-5.54	107.67			Peak
2458.940	104.54	-5.54	99.00			Average
2483.580	73.92	-5.47	68.45	74.00	-5.55	Peak
2483.580	56.30	-5.47	50.83	54.00	-3.17	Average
4924.000	40.66	1.69	42.35	74.00	-31.65	Peak
4924.000	32.27	1.69	33.96	54.00	-20.04	Average
7386.000	39.38	7.99	47.37	74.00	-26.63	Peak
7386.000	29.76	7.99	37.75	54.00	-16.25	Average

Above 1G (1 GHz-26.5 GHz): The worst mode: 802.11b Middle CH.

Horizontal	Vertical
	

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	4874.000	53.31	1.65	54.96	74.00	-19.04	Peak
2 !	4874.000	51.52	1.65	53.17	54.00	-0.83	Average
3	7311.000	40.30	7.74	48.04	74.00	-25.96	Peak
4	7311.000	31.52	7.74	39.26	54.00	-14.74	Average

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	2428.000	54.48	-5.75	48.73	74.00	-25.27	Peak
2	2428.000	52.61	-5.75	46.86	54.00	-7.14	Average
3	4874.000	51.68	1.65	53.33	74.00	-20.67	Peak
4 !	4874.000	49.41	1.65	51.06	54.00	-2.94	Average
5	7311.000	40.37	7.74	48.11	74.00	-25.89	Peak
6	7311.000	32.71	7.74	40.45	54.00	-13.55	Average

Note1: Transmit mode

Note2:

Level = Read Level + Factor

Over Limit = Level – Limit

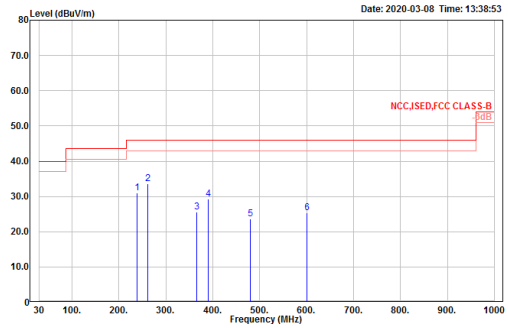
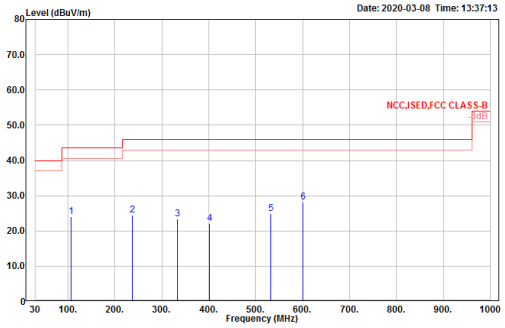
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

BLE Mode:

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

Below 1G (30 MHz-1 GHz) test the worst mode

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	239.520	31.01	46.00	-14.99	50.70	-19.69	Peak	horizontal
2	260.860	33.59	46.00	-12.41	52.76	-19.17	Peak	horizontal
3	366.590	25.64	46.00	-20.36	42.37	-16.73	Peak	horizontal
4	390.840	29.25	46.00	-16.75	45.50	-16.25	Peak	horizontal
5	480.080	23.73	46.00	-22.27	38.22	-14.49	Peak	horizontal
6	600.360	25.38	46.00	-20.62	37.92	-12.54	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	106.630	24.03	43.50	-19.47	43.24	-19.21	Peak	vertical
2	236.610	24.51	46.00	-21.49	44.34	-19.83	Peak	vertical
3	332.640	23.32	46.00	-22.68	40.74	-17.42	Peak	vertical
4	401.510	22.14	46.00	-23.86	38.20	-16.06	Peak	vertical
5	531.490	24.95	46.00	-21.05	38.56	-13.61	Peak	vertical
6	600.360	28.09	46.00	-17.91	40.63	-12.54	Peak	vertical

Note1: Transmit mode

Note2:

Level = Read Level + Factor

Over Limit = Level – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Above 1G (1 GHz-26.5 GHz)

BLE mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2311.200	32.31	54.00	-21.69	40.14	-7.83	Average
2311.200	44.51	74.00	-29.49	52.34	-7.83	Peak
2402.200	89.72			97.34	-7.62	Average
2402.200	91.20			98.82	-7.62	Peak
4804.000	37.64	54.00	-16.36	37.02	0.62	Average
4804.000	46.58	74.00	-27.42	45.96	0.62	Peak
7206.000	32.35	54.00	-21.65	27.10	5.25	Average
7206.000	43.92	74.00	-30.08	38.67	5.25	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2379.500	34.27	54.00	-19.73	41.92	-7.65	Average
2379.500	44.95	74.00	-29.05	52.60	-7.65	Peak
2402.300	102.31			109.93	-7.62	Average
2402.300	103.74			111.36	-7.62	Peak
4804.000	33.01	54.00	-20.99	32.39	0.62	Average
4804.000	41.57	74.00	-32.43	40.95	0.62	Peak
7206.000	33.17	54.00	-20.83	27.92	5.25	Average
7206.000	43.25	74.00	-30.75	38.00	5.25	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2311.210	32.28	54.00	-21.72	40.11	-7.83	Average
2311.210	44.05	74.00	-29.95	51.88	-7.83	Peak
2440.196	89.47			96.99	-7.52	Average
2440.196	90.93			98.45	-7.52	Peak
2497.550	32.93	54.00	-21.07	40.25	-7.32	Average
2497.550	44.36	74.00	-29.64	51.68	-7.32	Peak
4880.000	38.92	54.00	-15.08	38.11	0.81	Average
4880.000	47.12	74.00	-26.88	46.31	0.81	Peak
7320.000	33.52	54.00	-20.48	27.82	5.70	Average
7320.000	44.57	74.00	-29.43	38.87	5.70	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2363.482	34.06	54.00	-19.94	41.75	-7.69	Average
2363.482	45.15	74.00	-28.85	52.84	-7.69	Peak
2440.196	101.78			109.30	-7.52	Average
2440.196	103.10			110.62	-7.52	Peak
2492.226	33.06	54.00	-20.94	40.39	-7.33	Average
2492.226	45.33	74.00	-28.67	52.66	-7.33	Peak
4880.000	35.81	54.00	-18.19	35.00	0.81	Average
4880.000	44.92	74.00	-29.08	44.11	0.81	Peak
7320.000	33.71	54.00	-20.29	28.01	5.70	Average
7320.000	44.47	74.00	-29.53	38.77	5.70	Peak

High CH

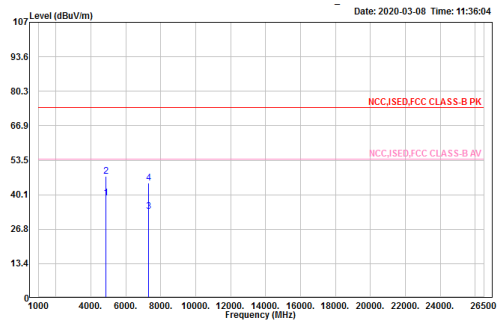
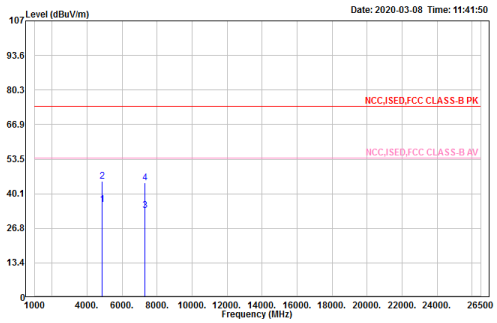
Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.004	89.27			96.62	-7.35	Average
2480.004	90.35			97.70	-7.35	Peak
2488.368	32.94	54.00	-21.06	40.27	-7.33	Average
2488.368	45.49	74.00	-28.51	52.82	-7.33	Peak
4960.000	37.54	54.00	-16.46	36.73	0.81	Average
4960.000	46.42	74.00	-27.58	45.61	0.81	Peak
7440.000	34.77	54.00	-19.23	28.71	6.06	Average
7440.000	45.51	74.00	-28.49	39.45	6.06	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.004	101.97			109.32	-7.35	Average
2480.004	103.08			110.43	-7.35	Peak
2484.186	37.39	54.00	-16.61	44.73	-7.34	Average
2484.186	47.38	74.00	-26.62	54.72	-7.34	Peak
4960.000	37.00	54.00	-17.00	36.19	0.81	Average
4960.000	46.08	74.00	-27.92	45.27	0.81	Peak
7440.000	34.65	54.00	-19.35	28.59	6.06	Average
7440.000	45.99	74.00	-28.01	39.93	6.06	Peak

Above 1G (1 GHz-26.5 GHz): The worst mode: BLE Middle CH

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	4880.000	38.92	54.00	-15.08	38.11	0.81	Average	horizontal
2	4880.000	47.12	74.00	-26.88	46.31	0.81	Peak	horizontal
3	7320.000	33.52	54.00	-20.48	27.82	5.70	Average	horizontal
4	7320.000	44.57	74.00	-29.43	38.87	5.70	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	4880.000	35.81	54.00	-18.19	35.00	0.81	Average	vertical
2	4880.000	44.92	74.00	-29.08	44.11	0.81	Peak	vertical
3	7320.000	33.71	54.00	-20.29	28.01	5.70	Average	vertical
4	7320.000	44.47	74.00	-29.53	38.77	5.70	Peak	vertical

Note1: Transmit mode

Note2:

Level = Read Level + Factor

Over Limit = Level – Limit

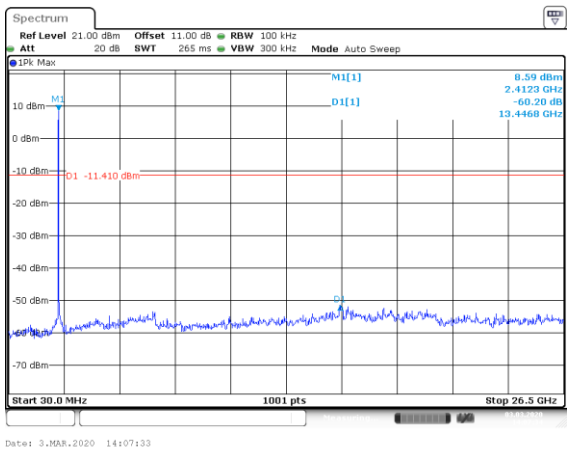
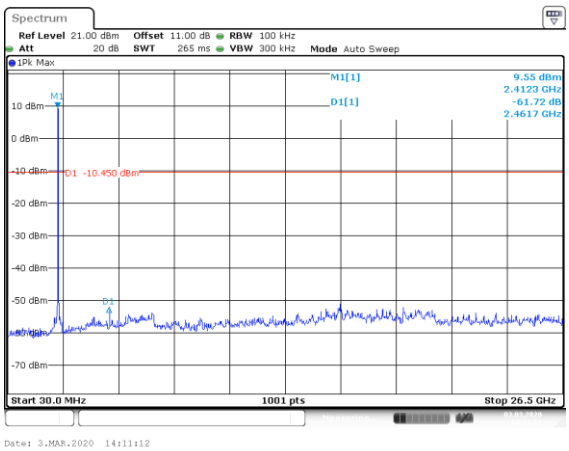
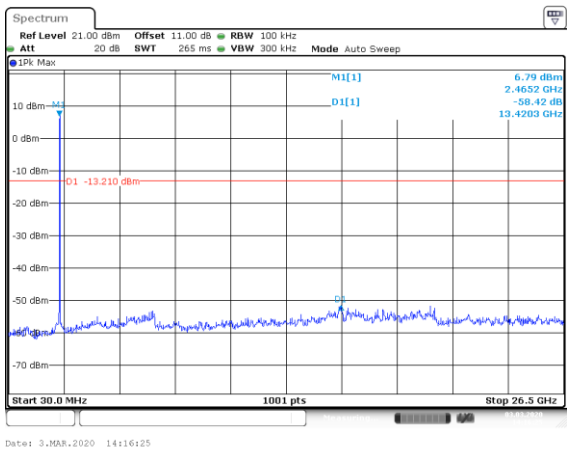
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

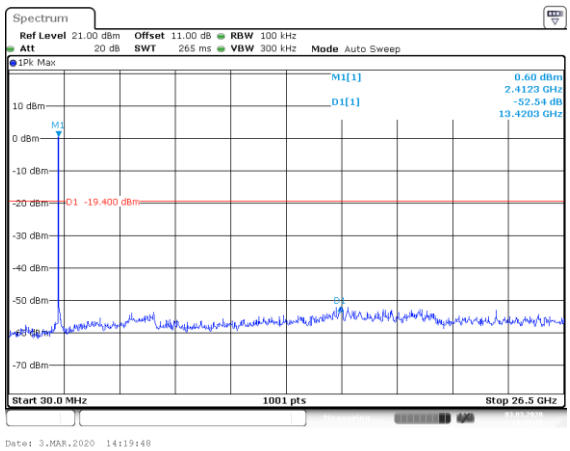
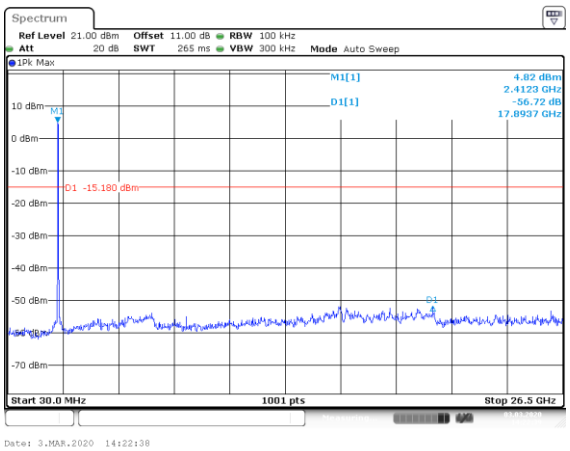
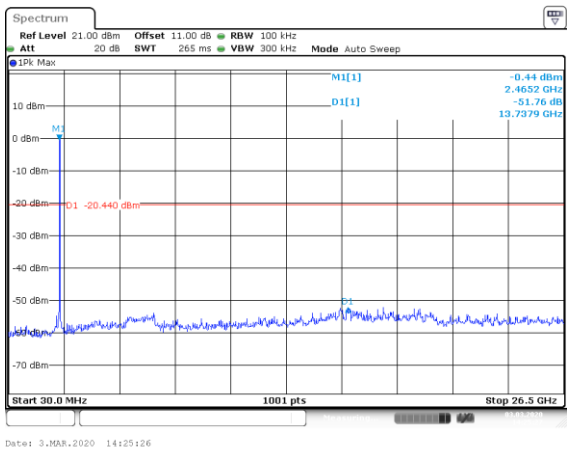
Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
802.11b mode				
Low	2412	60.2	≥ 20	Compliance
Mid	2437	61.72	≥ 20	Compliance
High	2462	58.42	≥ 20	Compliance
802.11g mode				
Low	2412	52.54	≥ 20	Compliance
Mid	2437	56.72	≥ 20	Compliance
High	2462	51.76	≥ 20	Compliance
802.11n HT20 mode				
Low	2412	51.69	≥ 20	Compliance
Mid	2437	57.05	≥ 20	Compliance
High	2462	51.53	≥ 20	Compliance
BLE-1Mbps mode				
Low	2402	47	≥ 20	Compliance
Mid	2440	48.07	≥ 20	Compliance
High	2480	46.14	≥ 20	Compliance

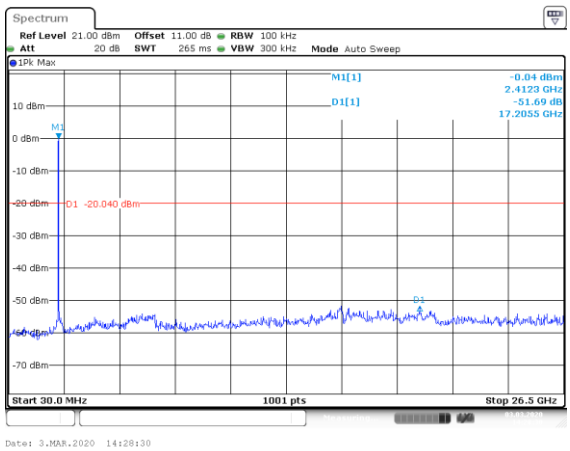
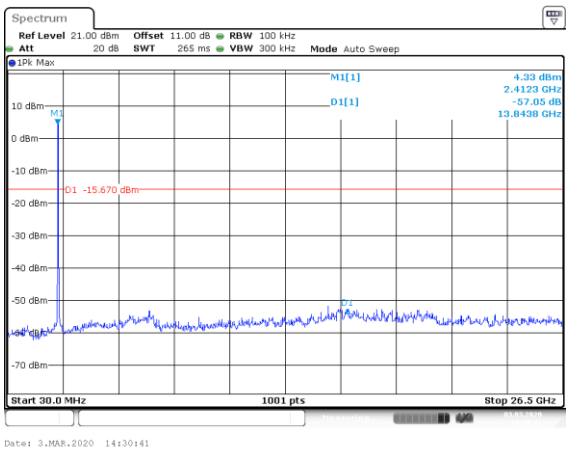
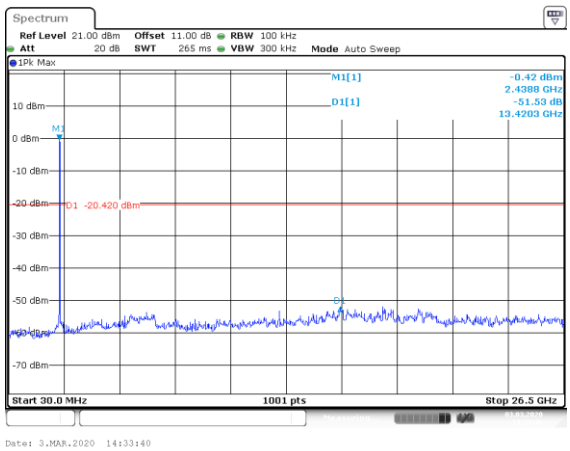
802.11b mode

Low CH	Middle CH
	
High CH	**-**
	-

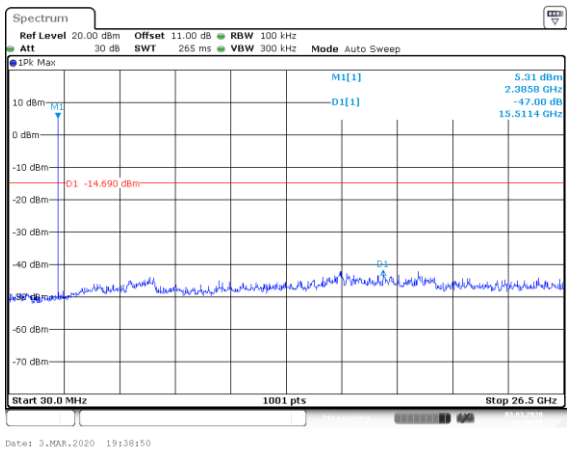
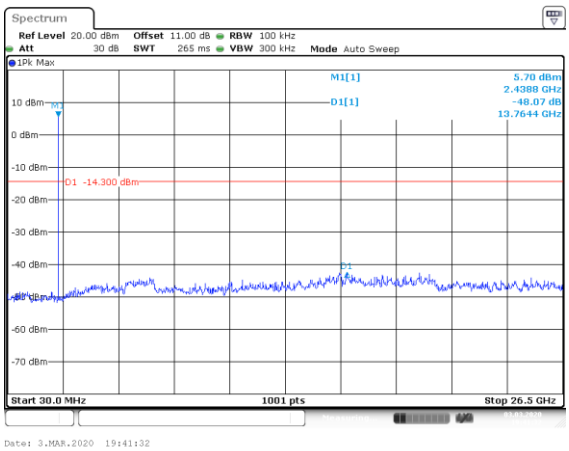
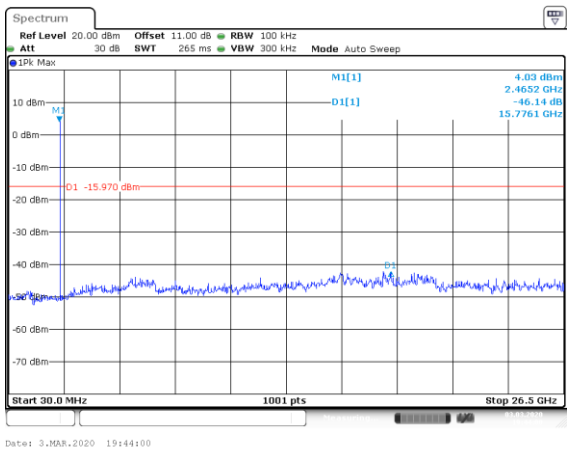
802.11g mode

Low CH	Middle CH
	
High CH	**-**
	-

802.11n HT20 mode:

Low CH	Middle CH
	
High CH	**-**
	-

BLE Mode

Low CH	Middle CH
	
High CH	**-**
	-

8 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

8.1 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.

8.2 Test Procedure

According to ANSI C63.10-2013, the steps for the first option are as follows:

(1) Set RBW = 100 kHz. (2) Set the VBW ≥ [3 × RBW]. (3) Detector = peak. (4) Trace mode = max hold.

(5) Sweep = auto couple. (6) Allow the trace to stabilize. (7) 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.

8.3 Test Equipment List and Details

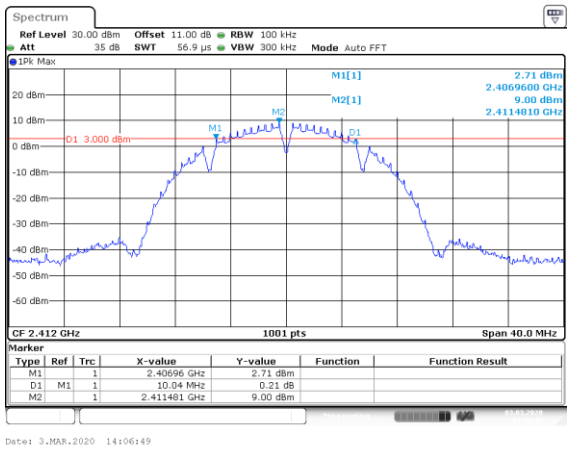
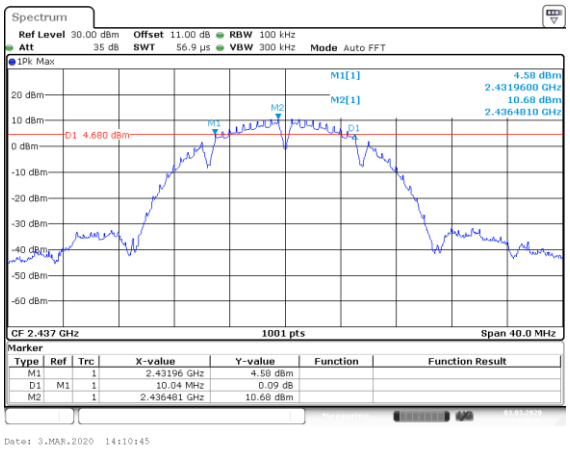
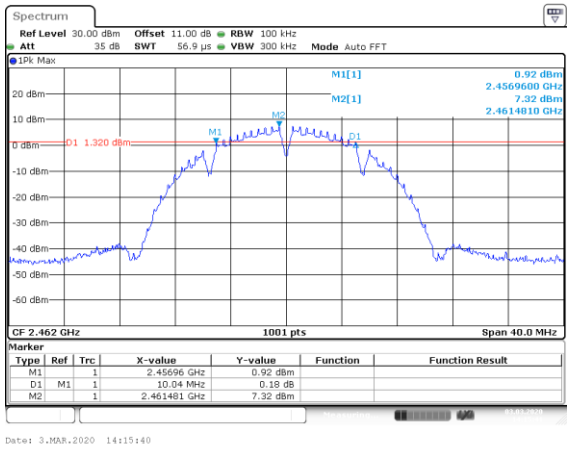
Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

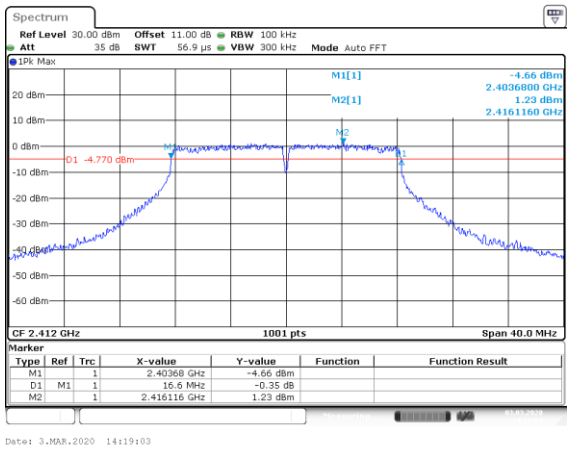
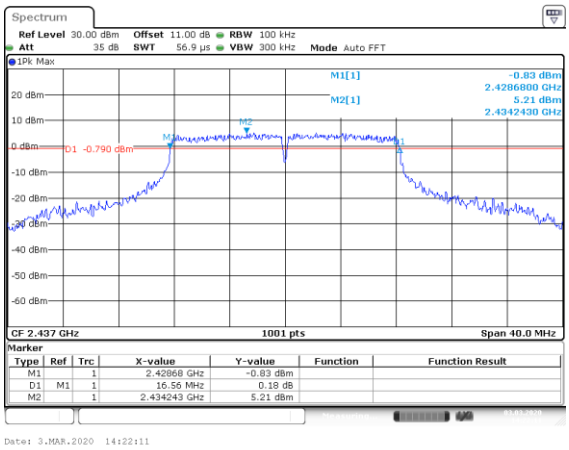
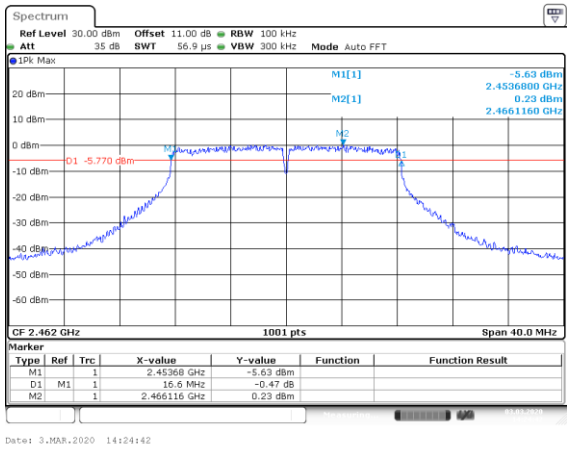
8.4 Test Results

Channel	Frequency (MHz)	6 dB BW (MHz)	6dB Limit (MHz)	Result
802.11b mode				
Low	2412	10.04	> 0.5	Compliance
Middle	2437	10.04	> 0.5	Compliance
High	2462	10.04	> 0.5	Compliance
802.11g mode				
Low	2412	16.60	> 0.5	Compliance
Middle	2437	16.56	> 0.5	Compliance
High	2462	16.60	> 0.5	Compliance
802.11n HT20 mode				
Low	2412	17.80	> 0.5	Compliance
Middle	2437	17.80	> 0.5	Compliance
High	2462	17.80	> 0.5	Compliance
BLE mode				
Low	2402	0.68	> 0.5	Compliance
Middle	2440	0.67	> 0.5	Compliance
High	2480	0.67	> 0.5	Compliance

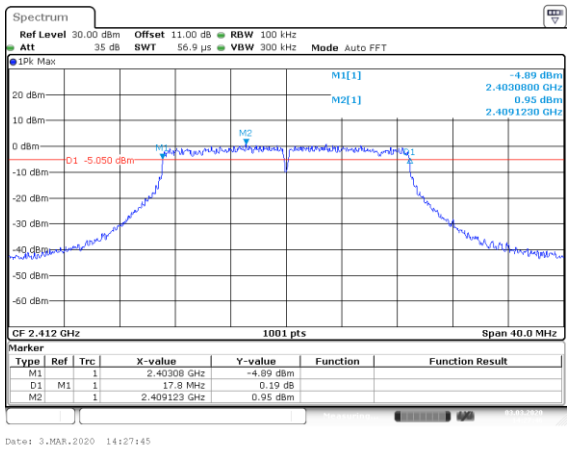
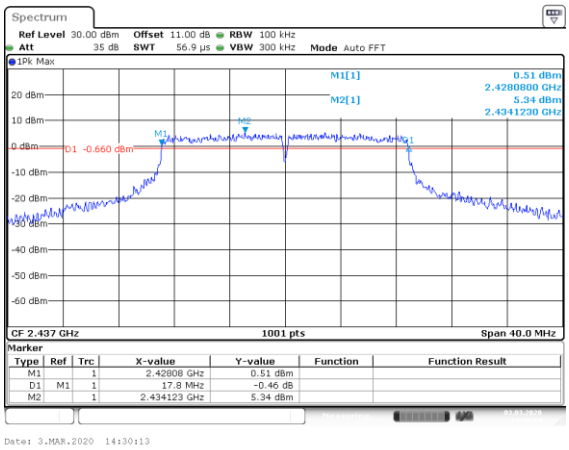
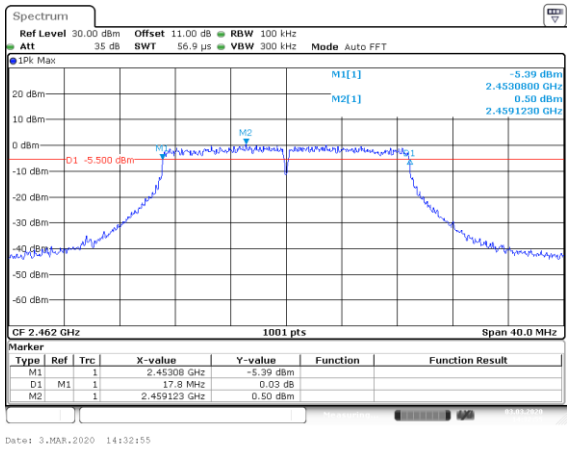
802.11b mode:

Low CH	Middle CH
	
High CH	**-**
	-

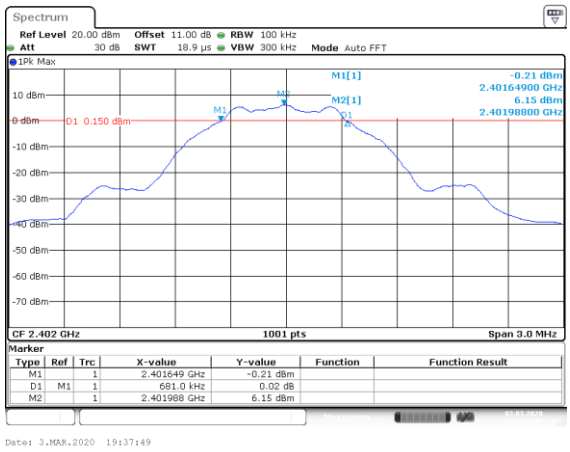
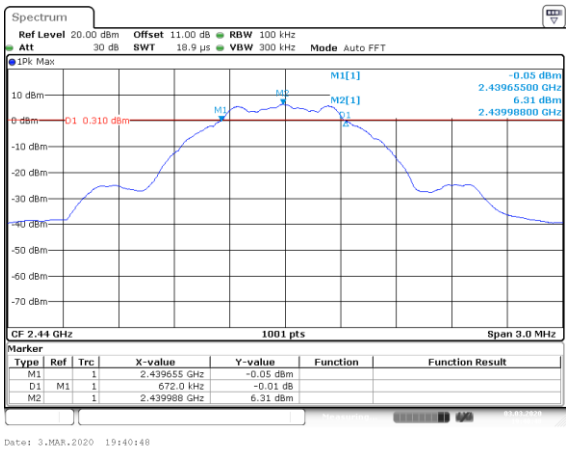
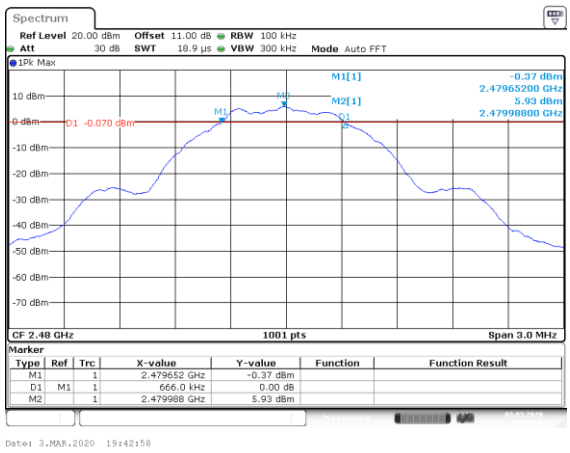
802.11g mode:

Low CH	Middle CH
	
High CH	**-**
	-

802.11n HT20 mode:

Low CH	Middle CH
	
High CH	**-**
	-

BLE

Low CH	Middle CH
	
High CH	**-**
	-

9 FCC §15.247(b) (3) – Maximum Output Power

9.1 Applicable Standard

According to FCC §15.247(b) (3),

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.

9.2 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 measuring equipment.

(3). Add a correction factor to the display.

9.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
USB Wideband Power Sensor	Agilent	U2021XA	MY56120026	2019/09/06	2020/09/05
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

9.4 Test Results

Channel	Frequency (MHz)	Maximum Peak Output Power (dBm)	Maximum Peak Output Power (W)	Limit (dBm)	Result
802.11b mode:					
Low	2412	21.57	0.144	30	Compliance
Middle	2437	23.42	0.220	30	Compliance
High	2462	20.57	0.114	30	Compliance
802.11g mode:					
Low	2412	24.49	0.281	30	Compliance
Middle	2437	26.15	0.412	30	Compliance
High	2462	23.96	0.249	30	Compliance
802.11n HT20 mode:					
Low	2412	23.25	0.211	30	Compliance
Middle	2437	26.11	0.408	30	Compliance
High	2462	23.39	0.218	30	Compliance
BLE mode:					
Low	2402	6.65	0.0046	30	Compliance
Middle	2440	6.97	0.0050	30	Compliance
High	2480	6.53	0.0045	30	Compliance

10 FCC §15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

10.1 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)).

10.2 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.

10.3 Test Equipment List and Details

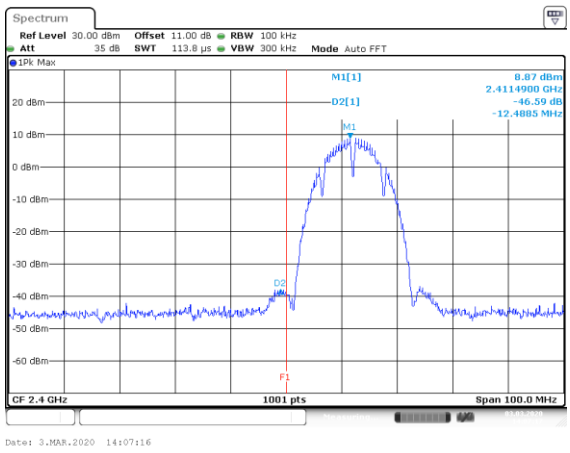
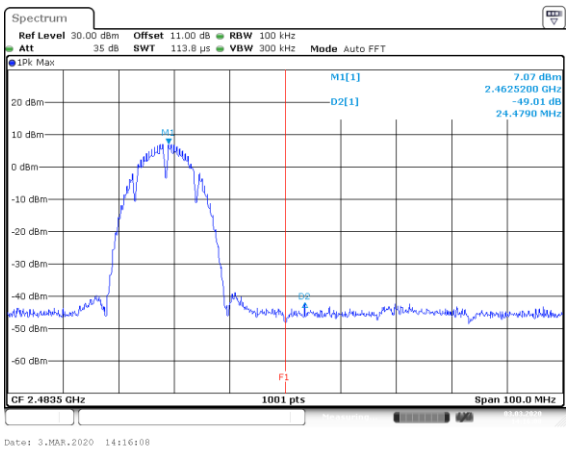
Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

10.4 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
802.11b mode				
Low	2412	46.59	≥ 20	Compliance
High	2462	49.01	≥ 20	Compliance
802.11g mode				
Low	2412	33.02	≥ 20	Compliance
High	2462	41.56	≥ 20	Compliance
802.11n HT20 mode				
Low	2412	33.59	≥ 20	Compliance
High	2462	42.84	≥ 20	Compliance
BLE mode				
Low	2402	48.71	≥ 20	Compliance
High	2480	55.17	≥ 20	Compliance

802.11b mode:

Left Side	Right Side
	

802.11g mode:

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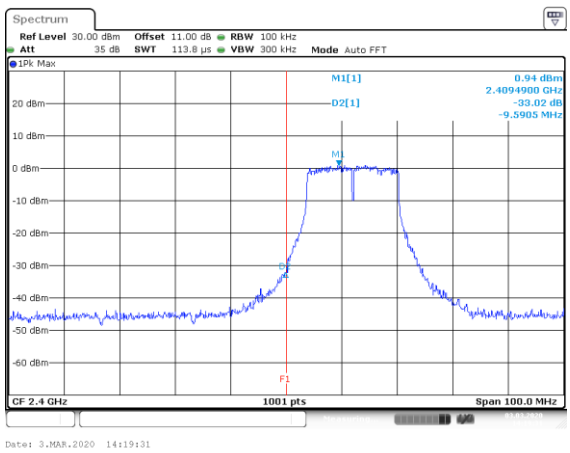
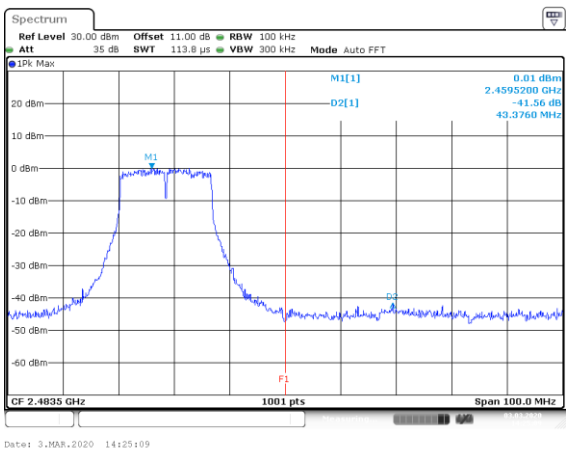
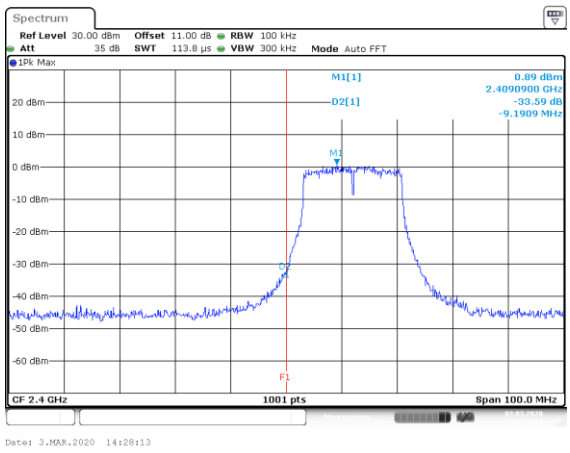
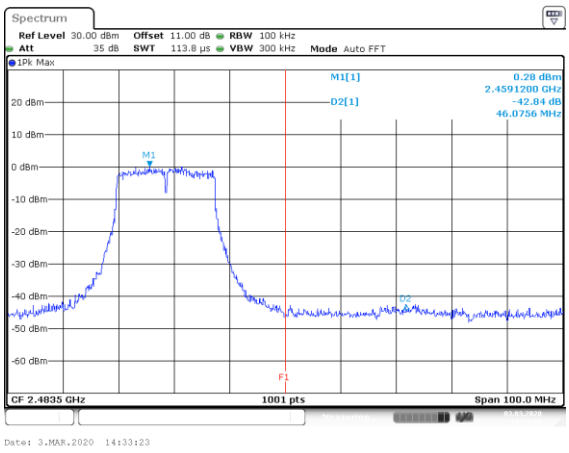
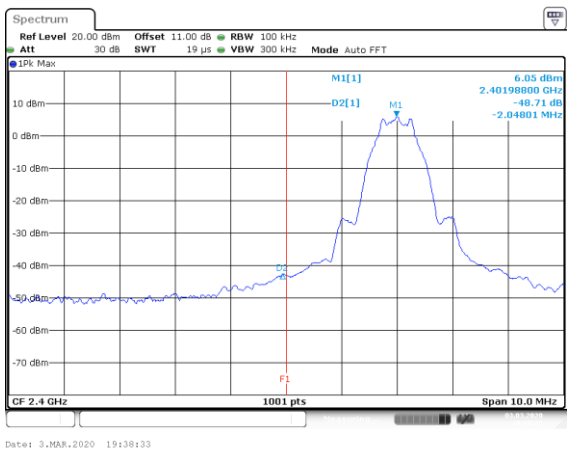
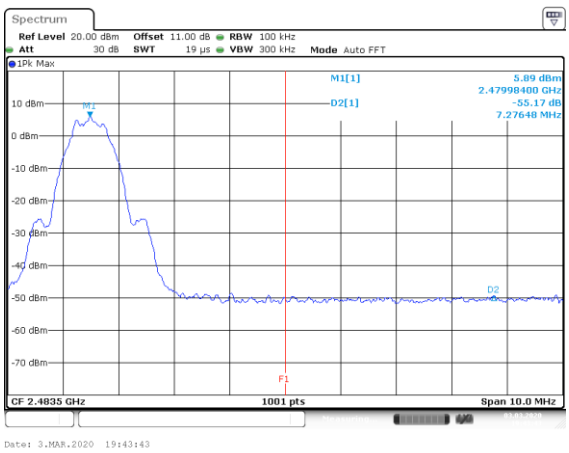
	

802.11n HT20 mode:

Left Side	Right Side
	

BLE

Left Side	Right Side
	

11 FCC §15.247(e) – Power Spectral Density

11.1 Applicable Standard

According to FCC §15.247(e),

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.

11.2 Test Procedure

According to ANSI C63.10-2013,

(1) Set analyzer center frequency to DTS channel center frequency.

(2) Set the span to 1.5 times the DTS bandwidth. (3) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

(4) Set the VBW ≥ [3 × RBW]. (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 requirement, then reduce RBW (but no less than 3 kHz) and repeat.

11.3 Test Equipment List and Details

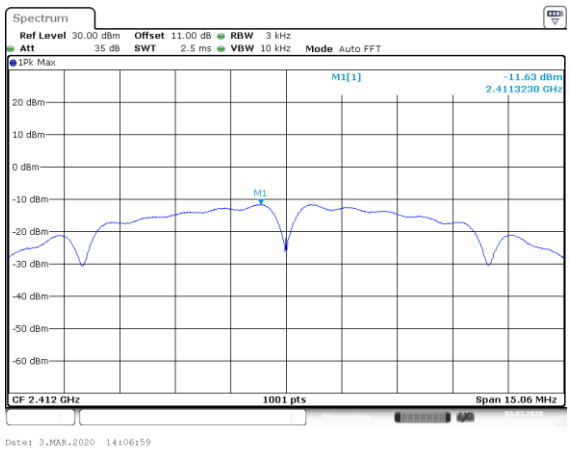
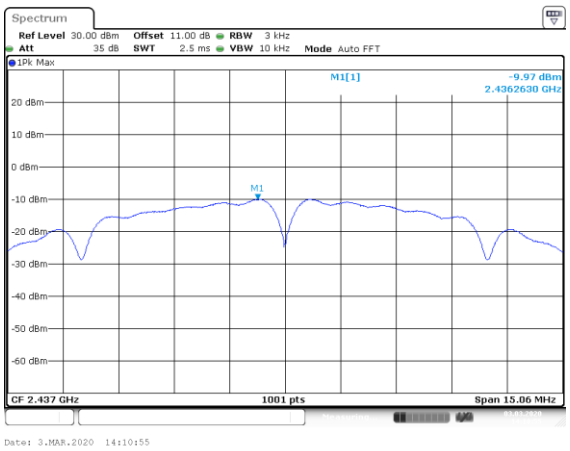
Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Signal Analyzer 40GHZ	Rohde & Schwarz	FSV40-N	102248	2019/09/11	2020/09/10
RF Cable	MTJ	MT40S	MT40S-001	Each Use	/

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

11.4 Test Results

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
802.11b mode				
Low	2412	-11.63	8	Compliance
Middle	2437	-9.97	8	Compliance
High	2462	-13.28	8	Compliance
802.11g mode				
Low	2412	-13.4	8	Compliance
Middle	2437	-9.39	8	Compliance
High	2462	-14.26	8	Compliance
802.11n HT20 mode				
Low	2412	-13.19	8	Compliance
Middle	2437	-8.85	8	Compliance
High	2462	-13.78	8	Compliance
BLE mode				
Low	2402	-8.94	8	Compliance
Middle	2440	-10.13	8	Compliance
High	2480	-8.89	8	Compliance

802.11b mode:

Low CH	Middle CH
	
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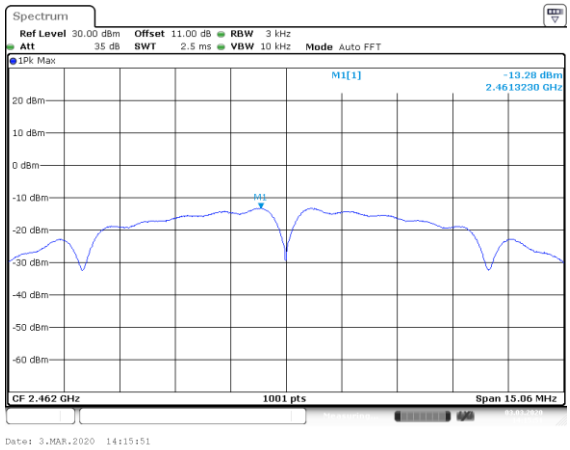
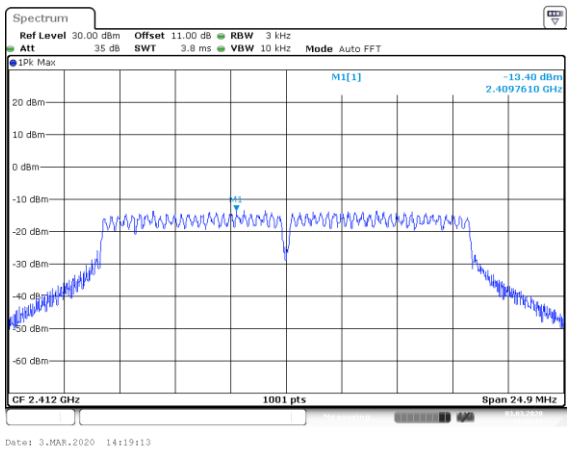
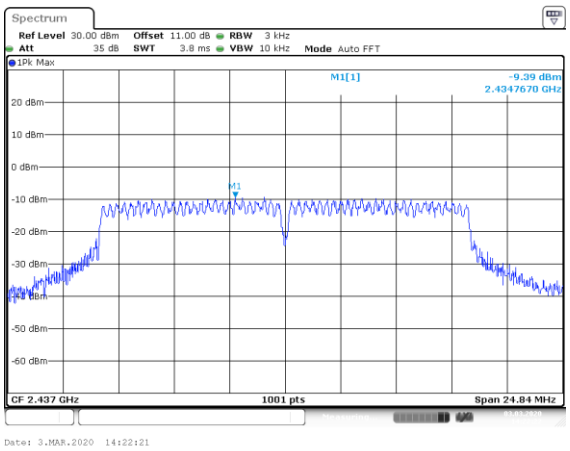
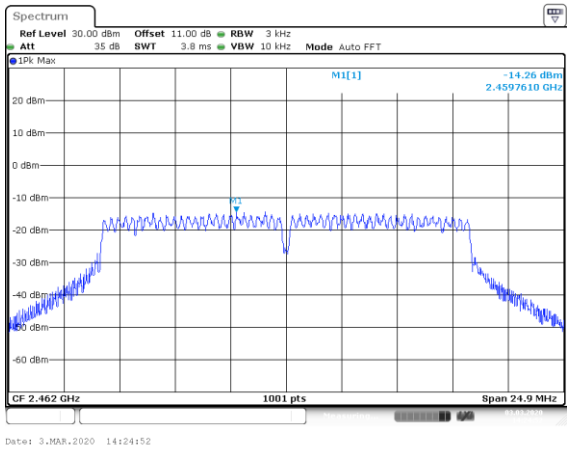
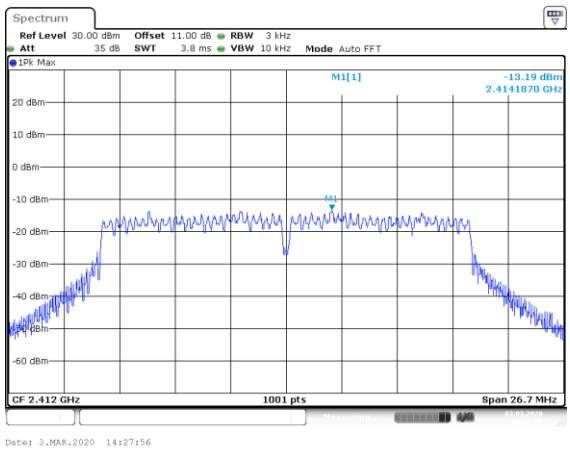
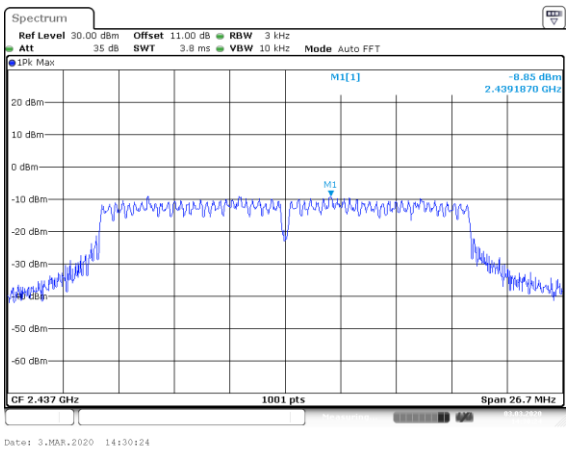
	-

802.11g mode:

Low CH	Middle CH
	
High CH	**-**
	-

802.11n HT20 mode:

Low CH	Middle CH
	
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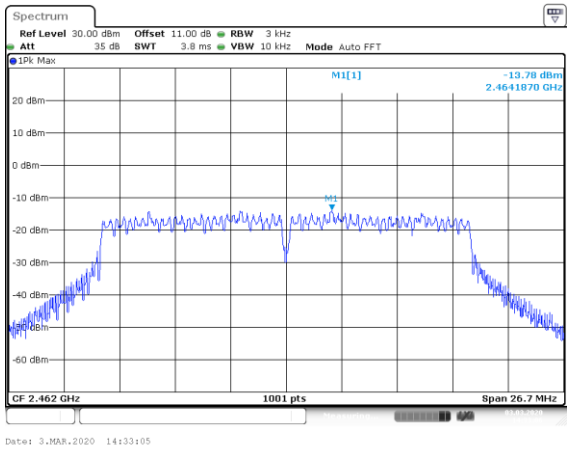
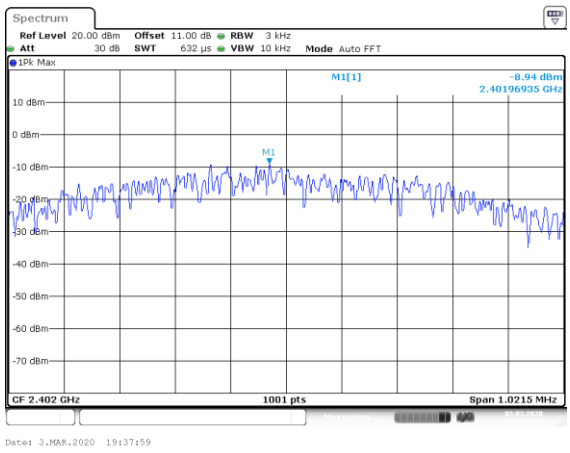
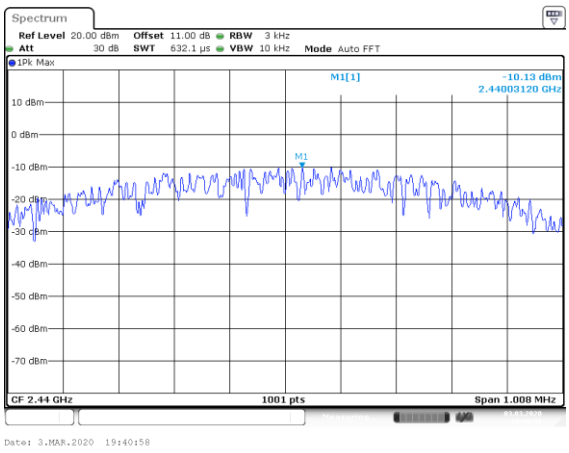
	-

BLE

Low CH	Middle CH
	
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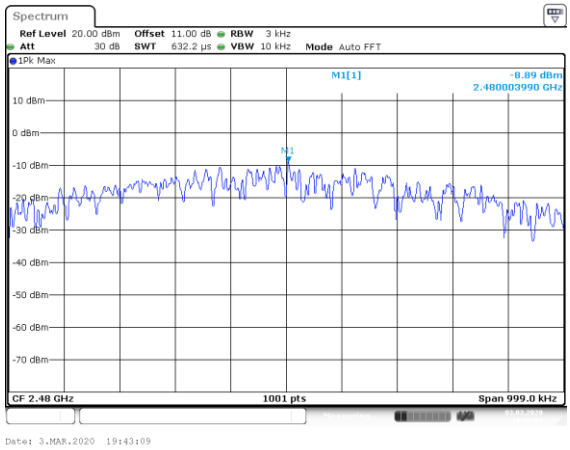	-

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