FCC Part 15.247

TEST REPORT

For

AirTies Wireless Networks

Mithat Uluünlü Sokak No 23, Esentepe, Şişli, ISTANBULI, 34394 Turkey

FCC ID: Z3WAIR7430

Report Type	**Original Report**
Product Type:	**UHD Wireless Set-Top Box**
Report Number :	**RLK1810008-00A**
Report Date :	**2018/12/25**
Reviewed By:	**Jerry Chang**
Prepared By: **Bay Area Compliance Laboratories Corp.(Taiwan)** **70, Lane 169, Sec. 2, Datong Road, Xizhi Dist.,** **New Taipei City 22183, Taiwan, R.O.C.** **Tel: +886 (2)2647 6898 Fax: +886 (2) 2647 6895** **www.bacl.com.tw**	

***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. (Taiwan)*

Revision History

Revision	Report Number	Issue Date	Description	Author/Revised by
1.0	RLK1810008-00A	2018/12/25	Original Report	Himiko Chen

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	**AirTies Wireless Networks** Mithat Uluünlü Sokak No 23, Esentepe, Şişli, ISTANBULI, 34394 Turkey
Manufacturer	**XAVi Technologies Corp.** 3F-1, No. 27, Puding Rd., Hsinchu City 300, Taiwan
Brand(Trade) Name	**AirTies**
Product (Equipment)	**UHD Wireless Set-Top Box**
Model Name	**Air7430**
EUT Function	IEEE 802.11 bgn(HT20/HT40) + BT4.1
Frequency Range	IEEE 802.11 b/g/n HT20/HT40 mode: 2412 ~ 2462 MHz IEEE 802.11 n HT40 mode: 2422 ~ 2452 MHz BLE mode : 2402 ~ 2480 MHz
Number of Channels	IEEE 802.11 b/g/n HT20 mode: 11 Channels IEEE 802.11 n HT40 mode: 9 Channels BLE mode : 40 Channels
Output Power	IEEE 802.11b mode: 24.04 dBm (0.2535 W) IEEE 802.11g mode: 25.14 dBm (0.3266 W) IEEE 802.11n HT20 mode: 26.73 dBm (0.4710 W) IEEE 802.11n HT40 mode: 23.05 dBm (0.2018 W) BLE mode: 7.67 dBm (0.0058 W)
Received Date	Oct. 26, 2018.
Date of Test	Nov. 15, 2018 ~ Dec. 07, 2018
Modulation Type	IEEE 802.11b mode: DSSS IEEE 802.11g/n HT 20/HT40 mode: OFDM BLE mode : GFSK 1Mbps
Related Submittal(s)/Grant(s)	**FCC Part 15.247 DSS with FCC ID : Z3WAIR7430** **FCC Part 15.407 NII with FCC ID : Z3WAIR7430**

**All measurement and test data in this report was gathered from production sample serial number: 1810008 (Assigned by BACL, Taiwan).*

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☒ AC 120V/60Hz ☒ Adapter *Brand Name: MOSO* *Model: MSA-C2000IS12.0-24Y-US* *I/P: 100-240Vac,0.7A* *O/P: 12Vdc,2A* ☐ By Power Core

1.3 Objective and Test Methodology

The Objective of this Test Report was to document the compliance of the AirTies Wireless Networks Appliance (Model: Air7430) 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.

- KDB 662911 D01 Multiple Transmitter Output v02r01.

-KDB 558074 D01 15.247 Meas Guidance v05r02.

1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power with Power Meter	± 0.55 dB
Occupied Channel Bandwidth	± 4.45 %
RF Conducted test with Spectrum	± 1.45 dB
AC Power Line Conducted Emission	± 2.66 dB
Radiated Below 1G	± 3.57 dB
Radiated Above 1G-18G	± 4.29 dB
Radiated Above 18G-40G	± 4.67 dB

1.5 Test Facility

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

☒ 70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

☒ 68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

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.: 974454. Designation No.: TW3180

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. And for 802.11n HT40: Channel **3**, **6** and **9** 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. Radiation and conducted power had been pre-test, and the Antenna Chain 1 was worst chain for 802.11b and 802.11g mode, and recording the worst data and plot in the report, Include conducted test item. Radiated below 1G were tested worst output power mode.

Modulation Used for Conformance Test			
Configuration	**NTX**	**Data Rate**	**Worst Data Rate**
802.11b mode	1	1-11 Mbps	1 Mbps
802.11g mode	1	6-54 Mbps	6 Mbps
802.11n HT 20 mode	2	MCS 0-7	MCS 0
802.11n HT 40 mode	2	MCS 0-7	MCS 0
BLE mode	1	125 kbps-1 Mbps	1 Mbps

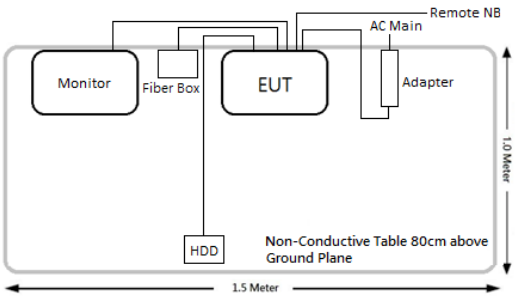
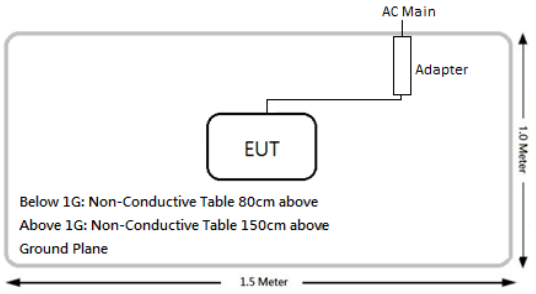
Worst Case of Power Setting				
EUT Exercise Software		accessMtool		
Configuration	NTX	Low CH	Mid CH	High CH
802.11b mode	1	84	86	86
802.11g mode	1	67	70	70
802.11n HT 20 mode	2	58	58	58
802.11n HT 40 mode	2	46	46	46
BLE mode	1	Default	Default	Default

2.2 Support Equipment List and External Cable List

No.	Description	Manufacturer	Model Number	BSMI	FCC ID / DoC
A	Monitor	DELL	PP27LA	R33038	DoC
B	HDD	WD	WESNWDBUZG0014BBK	D33015	DoC
C	Fiber BOX	SPDIF	2RCA	NA	NA
D	Notebook PC	DELL	Latitude E5470	R33002	DoC

No.	Cable Description	Shielding Type	Length (m)	From	To
1	HDMI Cable	Shielded	1.8	EUT	Monitor
2	USB Cable	Shielded	1	EUT	HDD
3	Fiber Cable	Non- Shielded	0.6	EUT	Fiber BOX
4	LAN Cable	Non- Shielded	10	EUT	NB

2.3 Block Diagram of Test Setup

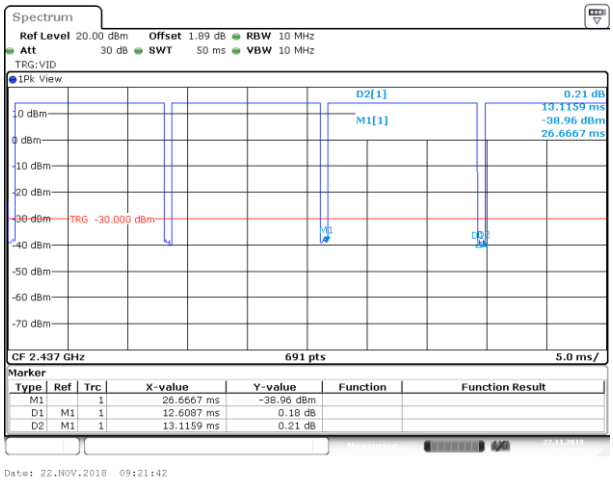
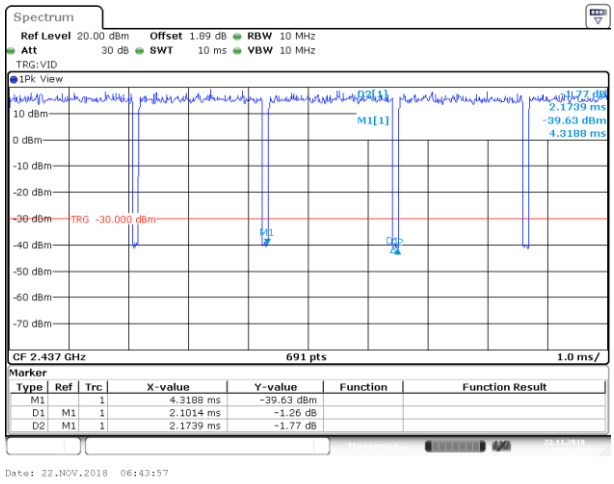
Conduction	Radiation
	

2.4 Duty Cycle

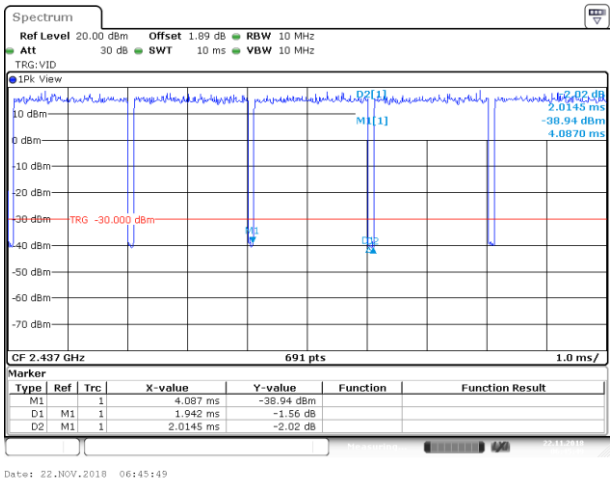
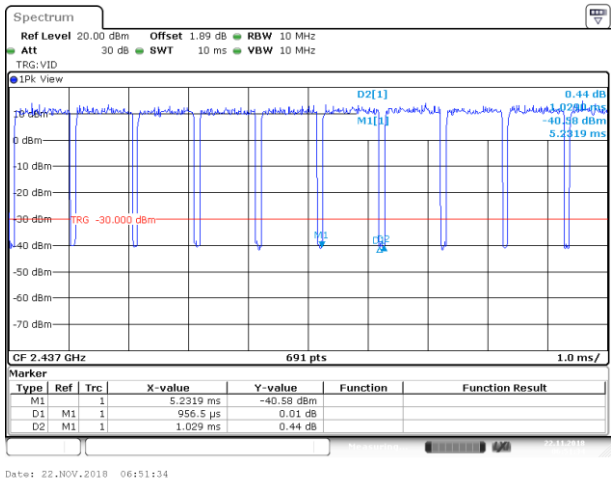
According to KDB 558074 D01 15.247 Meas Guidance v05:

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.

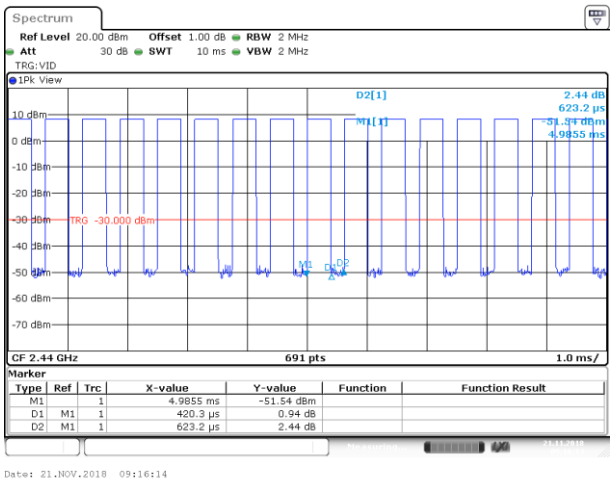
Configuration	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b mode	12.6087	13.1159	96.13	0.17
802.11g mode	2.1014	2.1739	96.66	0.15
802.11n HT20 mode	1.9420	2.0145	96.40	0.16
802.11n HT40 mode	0.9565	1.0290	93.95	0.32
BLE mode	0.4203	0.6232	67.44	1.71

802.11b mode	802.11g mode
	

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

802.11n HT20 mode	802.11n HT40 mode
	

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

BLE mode	-
	-

*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), §1.1310, § 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/cm2);

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	3.60	2.291	27.00	501.187	25	0.1463	1
BLE	2402-2480	-4.30	0.372	8.00	6.310	25	0.0003	1
BR+EDR	2402-2480	-4.30	0.372	11.00	12.589	25	0.0006	1
Wi-Fi 5G UNII-1	5150-5250	9.44	8.790	23.00	199.526	25	0.2234	1
Wi-Fi 5G UNII-2a	5250-5350	9.44	8.790	21.00	158.489	25	0.1409	1
Wi-Fi 5G UNII-2c	5470-5725	9.78	9.506	19.00	79.433	25	0.0961	1
Wi-Fi 5G UNII-3	5745-5850	9.03	7.999	27.00	501.187	25	0.5107	1

The Wi-Fi 2.4G, BT and Wi-Fi 5G can transmit simultaneously:

$= S_{2.4G}/S_{limit\text{-}2.4G} + S_{BR+EDR}/S_{limit\text{-}BR+EDR} + S_{5G\ UNII\text{-}3}/S_{limit\text{-}5G\ UNII\text{-}3}$

$= 0.1463/1 + 0.0006/1 + 0.5107/1 = 0.6576 < 1.0$

Result: MPE evaluation meet 25 cm 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

Brand	Model	Antenna Type	Antenna Gain	Result
AirTies	Wi-Fi Ant-1	PCB Antenna	3.20	Compliance
AirTies	Wi-Fi Ant-4	PCB Antenna	3.60	Compliance
AirTies	BT Ant-1	PCB Antenna	-4.30	Compliance

The EUT has an internal antenna arrangement, which was permanently attached, fulfill the requirement of this section.

Per KDB 662911 D01 Multiple Transmitter Output v02r01,

For 802.11n:

1. *Power Directional Gain:*

   = 10log(((10^(Ant-1)/10)+ 10^(Ant-4)/10))/2)) = 10log(((10^(3.20)/10)+ 10^(3.60)/10))/2)) = 3.40 dBi.

2. *Power Density Directional Gain*

   = 10log(((10^(Ant-1)/10)+ 10^(Ant-4)/10))/2)) + 10log(N_{TX}/N_{SS})

   = 10log(((10^(3.20)/10)+ 10^(3.60)/10))/2)) + 10log(2/1) = 6.41 dBi.

6 FCC §15.207 - AC Line Conducted Emissions

6.1 Applicable Standard

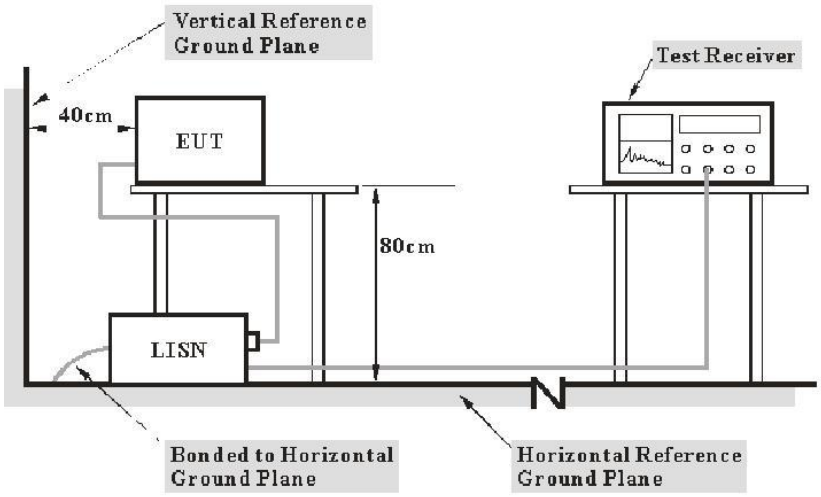
According to FCC §15.207

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.

Channel	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.
Conduction Room					
LISN	Rohde & Schwarz	ENV216	101612	2018/02/22	2019/02/21
LISN	Rohde & Schwarz	ENV216	101248	2018/06/27	2019/06/26
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2018/08/03	2019/08/02
RF Cable	EMEC	EM-CB5D	001	2018/07/02	2019/07/01
Software	AUDIX	e3	V9.150826k	N.C.R	N.C.R

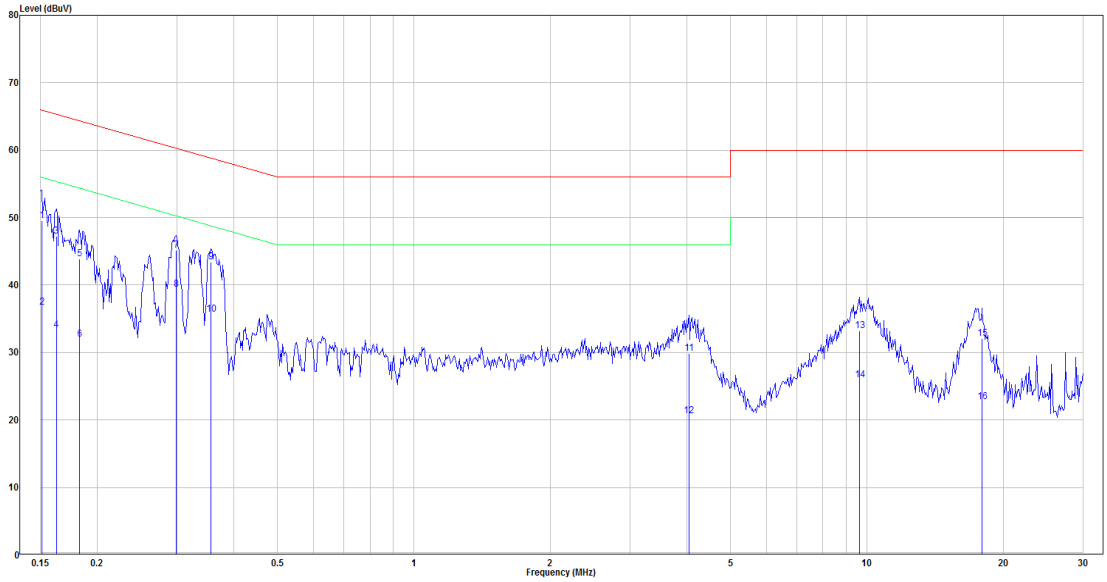
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units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

6.4 Test Environmental Conditions

Temperature:	25 ℃	**Relative Humidity:**	45 %
ATM Pressure:	1010 hPa	**Test Engineer:**	Ray Huang
Test Date:	2018-12-07		

6.5 AC Line Conducted Emission Test Plot and Data

Mode: AC 120V/60 Hz, Wi-Fi mode, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.151	30.12	19.45	49.57	65.96	-16.39	QP
2	0.151	17.27	19.45	36.72	55.96	-19.24	Average
3	0.162	27.79	19.45	47.24	65.34	-18.10	QP
4	0.162	13.87	19.45	33.32	55.34	-22.02	Average
5	0.183	24.48	19.46	43.94	64.34	-20.40	QP
6	0.183	12.53	19.46	31.99	54.34	-22.35	Average
7	0.298	25.68	19.47	45.15	60.29	-15.14	QP
8	0.298	19.92	19.47	39.39	50.29	-10.90	Average
9	0.357	23.97	19.47	43.44	58.80	-15.36	QP
10	0.357	16.17	19.47	35.64	48.80	-13.16	Average
11	4.045	10.24	19.59	29.83	56.00	-26.17	QP
12	4.045	1.07	19.59	20.66	46.00	-25.34	Average
13	9.629	13.46	19.71	33.17	60.00	-26.83	QP
14	9.629	6.25	19.71	25.96	50.00	-24.04	Average
15	17.954	12.33	19.78	32.11	60.00	-27.89	QP
16	17.954	2.91	19.78	22.69	50.00	-27.31	Average

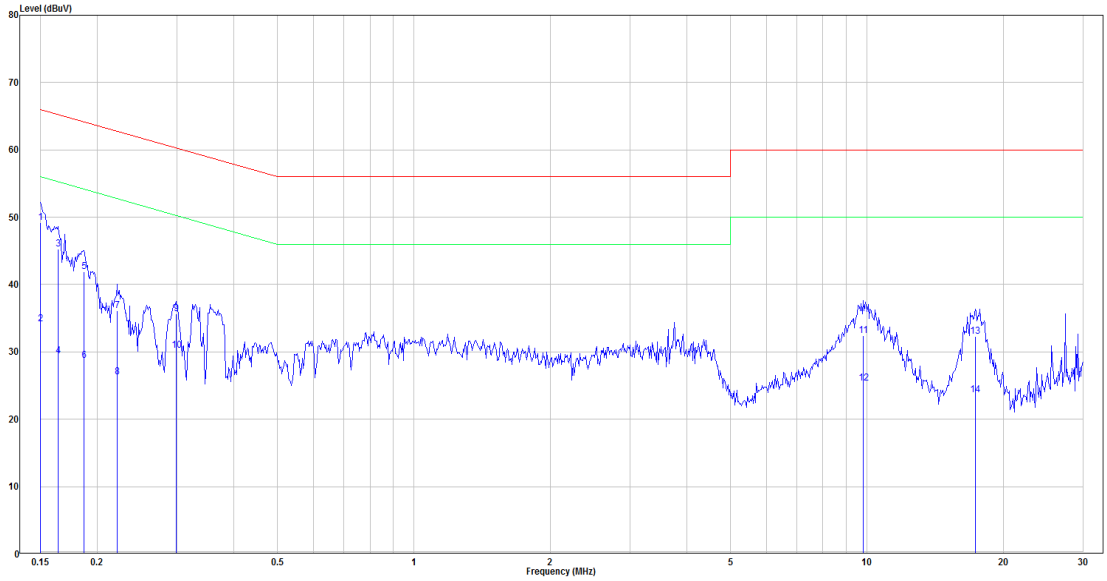
Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

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

Mode: AC 120V/60 Hz, Wi-Fi mode, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.150	29.74	19.44	49.18	66.00	-16.82	QP
2	0.150	14.69	19.44	34.13	56.00	-21.87	Average
3	0.164	25.85	19.45	45.30	65.25	-19.95	QP
4	0.164	9.93	19.45	29.38	55.25	-25.87	Average
5	0.187	22.48	19.46	41.94	64.18	-22.24	QP
6	0.187	9.26	19.46	28.72	54.18	-25.46	Average
7	0.221	16.64	19.46	36.10	62.77	-26.67	QP
8	0.221	6.82	19.46	26.28	52.77	-26.49	Average
9	0.298	16.22	19.46	35.68	60.29	-24.61	QP
10	0.298	10.72	19.46	30.18	50.29	-20.11	Average
11	9.823	12.76	19.71	32.47	60.00	-27.53	QP
12	9.823	5.69	19.71	25.40	50.00	-24.60	Average
13	17.338	12.54	19.80	32.34	60.00	-27.66	QP
14	17.338	3.83	19.80	23.63	50.00	-26.37	Average

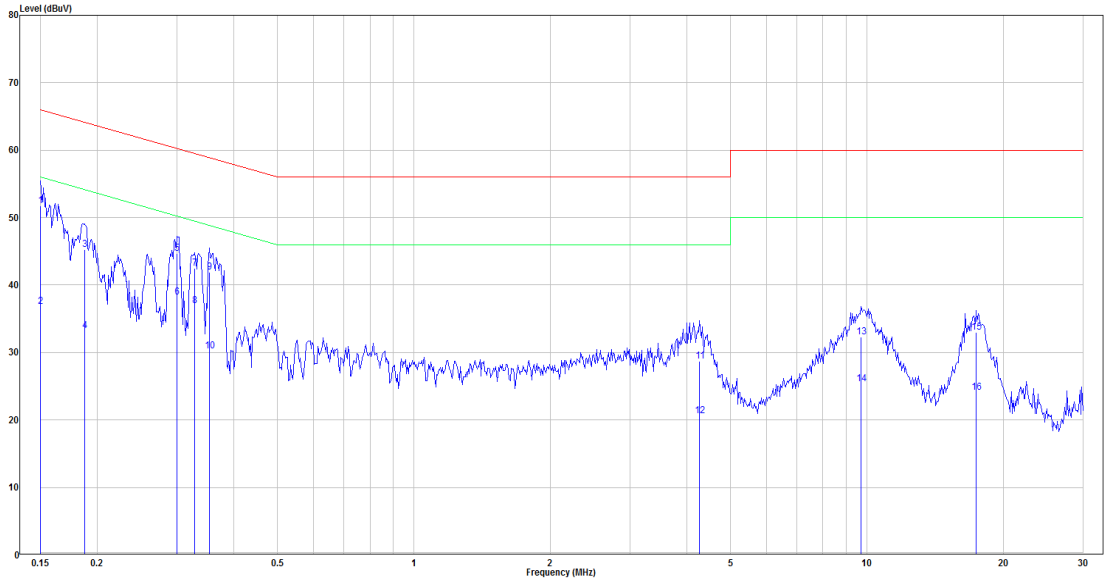
Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

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

Mode: AC 120V/60 Hz, BLE mode, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.150	32.32	19.45	51.77	66.00	-14.23	QP
2	0.150	17.34	19.45	36.79	56.00	-19.21	Average
3	0.188	25.85	19.46	45.31	64.14	-18.83	QP
4	0.188	13.75	19.46	33.21	54.14	-20.93	Average
5	0.300	25.21	19.47	44.68	60.25	-15.57	QP
6	0.300	18.77	19.47	38.24	50.25	-12.01	Average
7	0.328	23.03	19.47	42.50	59.50	-17.00	QP
8	0.328	17.46	19.47	36.93	49.50	-12.57	Average
9	0.354	22.49	19.47	41.96	58.88	-16.92	QP
10	0.354	10.75	19.47	30.22	48.88	-18.66	Average
11	4.273	9.16	19.59	28.75	56.00	-27.25	QP
12	4.273	0.99	19.59	20.58	46.00	-25.42	Average
13	9.725	12.59	19.72	32.31	60.00	-27.69	QP
14	9.725	5.68	19.72	25.40	50.00	-24.60	Average
15	17.425	13.23	19.77	33.00	60.00	-27.00	QP
16	17.425	4.33	19.77	24.10	50.00	-25.90	Average

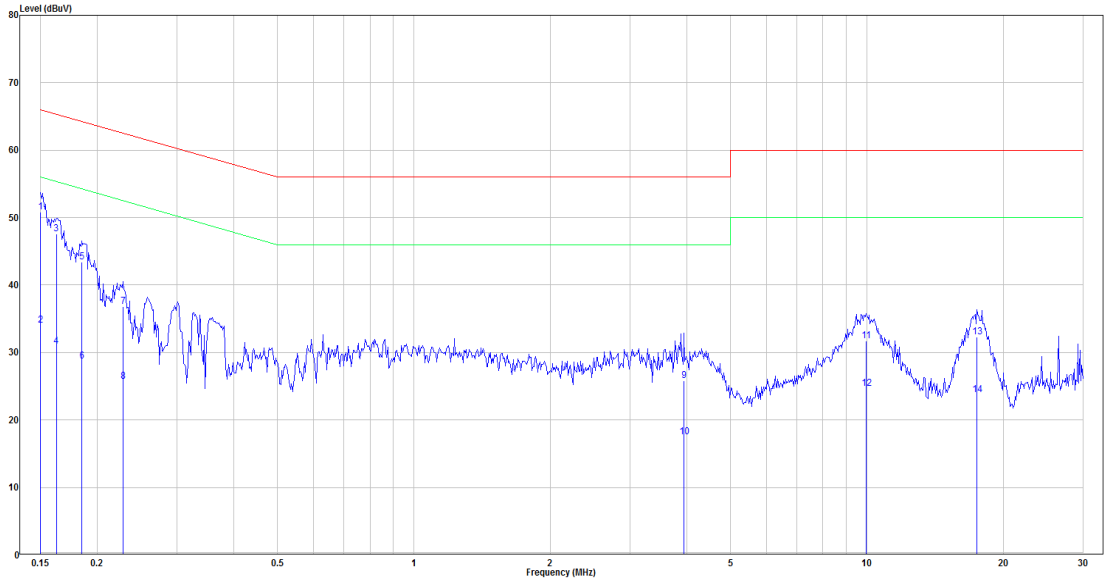
Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

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

Mode: AC 120V/60 Hz, BLE mode, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.150	31.42	19.44	50.86	66.00	-15.14	QP
2	0.150	14.57	19.44	34.01	56.00	-21.99	Average
3	0.162	28.17	19.45	47.62	65.34	-17.72	QP
4	0.162	11.49	19.45	30.94	55.34	-24.40	Average
5	0.185	23.92	19.45	43.37	64.26	-20.89	QP
6	0.185	9.27	19.45	28.72	54.26	-25.54	Average
7	0.228	17.34	19.46	36.80	62.52	-25.72	QP
8	0.228	6.26	19.46	25.72	52.52	-26.80	Average
9	3.946	6.21	19.57	25.78	56.00	-30.22	QP
10	3.946	-2.08	19.57	17.49	46.00	-28.51	Average
11	9.971	12.03	19.71	31.74	60.00	-28.26	QP
12	9.971	4.96	19.71	24.67	50.00	-25.33	Average
13	17.512	12.49	19.81	32.30	60.00	-27.70	QP
14	17.512	3.96	19.81	23.77	50.00	-26.23	Average

Note:

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

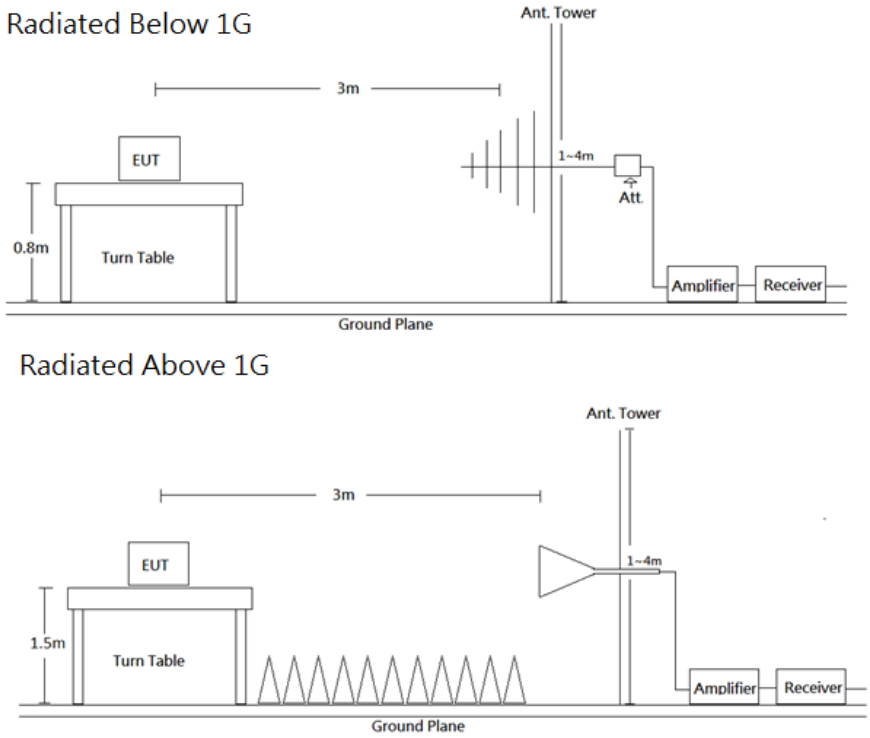
As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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 10 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	Detector	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	QP	-	QP
Above 1 GHz	1 MHz	3 MHz	PK	-	PK
	1 MHz	3 MHz	RMS	>98%	Ave
	1 MHz	1/T	PK	<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 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.
966A Room					
Active Loop Antenna	ETS-Lindgren	6502	00035796	2018/03/13	2019/03/12
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2017/12/20	2018/12/19
Horn Antenna	EMCO	3115	9311-4158	2018/04/20	2019/04/19
Horn Antenna	ETS-Lindgren	3116	62638	2018/08/29	2019/08/28
Preamplifier	Sonoma	310N	130602	2018/07/04	2019/07/03
Preamplifier	EM Electronics Corp.	EM01G18G	060657	2017/12/14	2018/12/13
Microware Preamplifier	EM Electronics Corporation	EM18G40G	060656	2018/01/15	2019/01/14
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Spectrum Analyzer	Spectrum Analyzer	FSV40	101435	2018/02/12	2019/02/13
Micro flex Cable	UTIFLEX	FSCM 64639 / (2M)	93D0127	2018/07/31	2019/07/30
Micro flex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-002	2018/11/16	2019/11/15
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2018/03/05	2019/03/04
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2018/01/17	2019/01/16
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	AUDIX	e3	E3LK-01	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2018/11/21	2019/11/20
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***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 Environmental Conditions

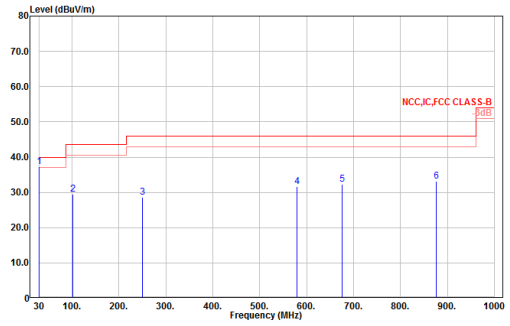
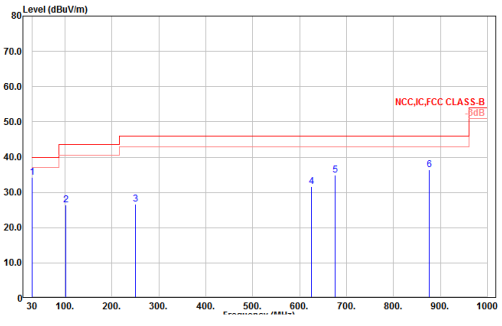
Temperature:	25 ℃	**Relative Humidity:**	45 %
ATM Pressure:	1014hPa	**Test Engineer:**	Leo Chang
Conducted Test Date:	2018-11-26	**Radiated Test Date:**	2018-12-05

7.5 Radiated Emission Test Plot and Data

Wi-Fi Mode:

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

Below 1G (30 MHz-1 GHz) test the output power worst mode: 802.11n HT20 Middle Channel

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 !	30.000	37.25	40.00	-2.75	43.13	-5.88	QP	horizontal
2	101.780	29.48	43.50	-14.02	49.68	-20.20	Peak	horizontal
3	250.190	28.58	46.00	-17.42	48.33	-19.75	Peak	horizontal
4	579.020	31.62	46.00	-14.38	44.62	-13.00	Peak	horizontal
5	675.050	32.36	46.00	-13.64	43.80	-11.44	Peak	horizontal
6	875.840	33.11	46.00	-12.89	42.06	-8.95	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	30.000	34.24	40.00	-5.76	40.12	-5.88	Peak	vertical
2	101.780	26.38	43.50	-17.12	46.58	-20.20	Peak	vertical
3	250.190	26.61	46.00	-19.39	46.36	-19.75	Peak	vertical
4	625.580	31.59	46.00	-14.41	43.73	-12.14	Peak	vertical
5	675.050	34.98	46.00	-11.02	46.42	-11.44	Peak	vertical
6	875.840	36.36	46.00	-9.64	45.31	-8.95	Peak	vertical

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	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.968	52.11	54.00	-1.89	60.80	-8.69	Average
2389.968	60.29	74.00	-13.71	68.98	-8.69	Peak
2413.040	104.00			112.74	-8.74	Average
2413.040	106.62			115.36	-8.74	Peak
3216.000	48.98	54.00	-5.02	54.58	-5.60	Average
3216.000	51.89	74.00	-22.11	57.49	-5.60	Peak
4824.000	44.87	54.00	-9.13	45.89	-1.02	Average
4824.000	49.40	74.00	-24.60	50.42	-1.02	Peak
7236.000	32.88	54.00	-21.12	29.57	3.31	Average
7236.000	46.11	74.00	-27.89	42.80	3.31	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.968	40.22	54.00	-13.78	48.91	-8.69	Average
2389.968	51.68	74.00	-22.32	60.37	-8.69	Peak
2411.248	97.09			105.83	-8.74	Average
2411.248	99.80			108.54	-8.74	Peak
4824.000	46.75	54.00	-7.25	47.77	-1.02	Average
4824.000	49.17	74.00	-24.83	50.19	-1.02	Peak
6906.600	45.37	54.00	-8.63	42.66	2.71	Average
6906.600	51.03	74.00	-22.97	48.32	2.71	Peak
7236.000	32.95	54.00	-21.05	29.64	3.31	Average
7236.000	46.63	74.00	-27.37	43.32	3.31	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2384.640	41.08	54.00	-12.92	49.77	-8.69	Average
2384.640	54.54	74.00	-19.46	63.23	-8.69	Peak
2438.160	105.09			113.84	-8.75	Average
2438.160	107.82			116.57	-8.75	Peak
2486.160	39.82	54.00	-14.18	48.61	-8.79	Average
2486.160	52.76	74.00	-21.24	61.55	-8.79	Peak
3249.000	44.21	54.00	-9.79	49.72	-5.51	Average
3249.000	47.14	74.00	-26.86	52.65	-5.51	Peak
4874.000	43.94	54.00	-10.06	44.82	-0.88	Average
4874.000	48.79	74.00	-25.21	49.67	-0.88	Peak
7311.000	33.15	54.00	-20.85	29.64	3.51	Average
7311.000	46.00	74.00	-28.00	42.49	3.51	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2378.160	36.94	54.00	-17.06	45.61	-8.67	Average
2378.160	49.79	74.00	-24.21	58.46	-8.67	Peak
2436.480	97.75			106.51	-8.76	Average
2436.480	100.08			108.84	-8.76	Peak
2537.040	36.54	54.00	-17.46	45.28	-8.74	Average
2537.040	50.75	74.00	-23.25	59.49	-8.74	Peak
4874.000	47.78	54.00	-6.22	48.66	-0.88	Average
4874.000	50.97	74.00	-23.03	51.85	-0.88	Peak
6906.600	45.03	54.00	-8.97	42.32	2.71	Average
6906.600	51.04	74.00	-22.96	48.33	2.71	Peak
7311.000	32.84	54.00	-21.16	29.29	3.55	Average
7311.000	46.72	74.00	-27.28	43.17	3.55	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.212	104.96			113.72	-8.76	Average
2461.212	107.55			116.31	-8.76	Peak
2486.692	52.43	54.00	-1.57	61.22	-8.79	Average
2486.692	58.88	74.00	-15.12	67.67	-8.79	Peak
3283.000	42.57	54.00	-11.43	47.99	-5.42	Average
3283.000	47.21	74.00	-26.79	52.63	-5.42	Peak
4924.000	42.09	54.00	-11.91	42.84	-0.75	Average
4924.000	46.34	74.00	-27.66	47.09	-0.75	Peak
7386.000	33.68	54.00	-20.32	29.87	3.81	Average
7386.000	46.77	74.00	-27.23	42.96	3.81	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.114	96.84			105.60	-8.76	Average
2461.114	99.49			108.25	-8.76	Peak
2484.144	42.18	54.00	-11.82	50.96	-8.78	Average
2484.144	52.69	74.00	-21.31	61.47	-8.78	Peak
4924.000	48.36	54.00	-5.64	49.11	-0.75	Average
4924.000	51.03	74.00	-22.97	51.78	-0.75	Peak
6906.600	45.22	54.00	-8.78	42.51	2.71	Average
6906.600	51.33	74.00	-22.67	48.62	2.71	Peak
7386.000	33.56	54.00	-20.44	29.75	3.81	Average
7386.000	47.21	74.00	-26.79	43.40	3.81	Peak

802.11g mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.968	52.40	54.00	-1.60	61.09	-8.69	Average
2389.968	71.54	74.00	-2.46	80.23	-8.69	Peak
2412.256	96.57			105.31	-8.74	Average
2412.256	108.58			117.32	-8.74	Peak
3216.000	49.09	54.00	-4.91	54.81	-5.72	Average
3216.000	51.22	74.00	-22.78	56.94	-5.72	Peak
4824.000	30.72	54.00	-23.28	31.60	-0.88	Average
4824.000	43.83	74.00	-30.17	44.71	-0.88	Peak
7236.000	33.11	54.00	-20.89	29.80	3.31	Average
7236.000	46.23	74.00	-27.77	42.92	3.31	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2388.288	41.63	54.00	-12.37	50.32	-8.69	Average
2388.288	57.71	74.00	-16.29	66.40	-8.69	Peak
2411.696	88.36			97.10	-8.74	Average
2411.696	100.30			109.04	-8.74	Peak
4824.000	29.47	54.00	-24.53	30.49	-1.02	Average
4824.000	43.99	74.00	-30.01	45.01	-1.02	Peak
6906.500	51.28	74.00	-22.72	48.57	2.71	Peak
6906.600	45.41	54.00	-8.59	42.70	2.71	Average
7236.000	32.62	54.00	-21.38	29.31	3.31	Average
7236.000	46.56	74.00	-27.44	43.25	3.31	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.200	41.77	54.00	-12.23	50.46	-8.69	Average
2389.200	54.98	74.00	-19.02	63.67	-8.69	Peak
2437.200	96.49			105.25	-8.76	Average
2437.200	107.33			116.09	-8.76	Peak
2484.720	40.43	54.00	-13.57	49.22	-8.79	Average
2484.720	53.75	74.00	-20.25	62.54	-8.79	Peak
3249.000	44.04	54.00	-9.96	49.55	-5.51	Average
3249.000	47.38	74.00	-26.62	52.89	-5.51	Peak
4874.000	30.86	54.00	-23.14	31.75	-0.89	Average
4874.000	44.05	74.00	-29.95	44.94	-0.89	Peak
7311.000	33.61	54.00	-20.39	30.10	3.51	Average
7311.000	47.52	74.00	-26.48	44.01	3.51	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2380.560	36.71	54.00	-17.29	45.39	-8.68	Average
2380.560	50.40	74.00	-23.60	59.08	-8.68	Peak
2438.640	88.12			96.87	-8.75	Average
2438.640	98.83			107.58	-8.75	Peak
2525.040	36.30	54.00	-17.70	45.06	-8.76	Average
2525.040	50.58	74.00	-23.42	59.34	-8.76	Peak
4874.000	29.86	54.00	-24.14	30.74	-0.88	Average
4874.000	44.15	74.00	-29.85	45.03	-0.88	Peak
6906.600	45.29	54.00	-8.71	42.58	2.71	Average
6906.600	51.66	74.00	-22.34	48.95	2.71	Peak
7386.000	34.25	54.00	-19.75	30.44	3.81	Average
7386.000	47.79	74.00	-26.21	43.98	3.81	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.604	97.22			105.98	-8.76	Average
2461.604	109.07			117.83	-8.76	Peak
2483.850	52.41	54.00	-1.59	61.19	-8.78	Average
2483.850	70.48	74.00	-3.52	79.26	-8.78	Peak
3283.000	42.53	54.00	-11.47	47.95	-5.42	Average
3283.000	44.74	74.00	-29.26	50.16	-5.42	Peak
4924.000	31.09	54.00	-22.91	31.84	-0.75	Average
4924.000	43.29	74.00	-30.71	44.04	-0.75	Peak
7386.000	33.44	54.00	-20.56	29.63	3.81	Average
7386.000	46.26	74.00	-27.74	42.45	3.81	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.996	88.19			96.95	-8.76	Average
2461.996	100.80			109.56	-8.76	Peak
2483.948	42.74	54.00	-11.26	51.52	-8.78	Average
2483.948	60.34	74.00	-13.66	69.12	-8.78	Peak
4924.000	31.72	54.00	-22.28	32.47	-0.75	Average
4924.000	45.27	74.00	-28.73	46.02	-0.75	Peak
6906.600	45.19	54.00	-8.81	42.48	2.71	Average
6906.600	49.86	74.00	-24.14	47.15	2.71	Peak
7386.000	33.21	54.00	-20.79	29.66	3.55	Average
7386.000	48.26	74.00	-25.74	44.71	3.55	Peak

802.11n HT20 mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.856	52.17	54.00	-1.83	60.86	-8.69	Average
2389.856	69.94	74.00	-4.06	78.63	-8.69	Peak
2412.928	98.11			106.85	-8.74	Average
2412.928	108.21			116.95	-8.74	Peak
3216.000	48.26	54.00	-5.74	53.98	-5.72	Average
3216.000	50.95	74.00	-23.05	56.67	-5.72	Peak
4824.000	31.70	54.00	-22.30	32.72	-1.02	Average
4824.000	44.26	74.00	-29.74	45.28	-1.02	Peak
7236.000	33.72	54.00	-20.28	30.41	3.31	Average
7236.000	45.94	74.00	-28.06	42.63	3.31	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.408	42.12	54.00	-11.88	50.81	-8.69	Average
2389.408	57.04	74.00	-16.96	65.73	-8.69	Peak
2412.816	88.17			96.91	-8.74	Average
2412.816	100.26			109.00	-8.74	Peak
4824.000	32.86	54.00	-21.14	34.97	-2.11	Average
4824.000	45.31	74.00	-28.69	47.42	-2.11	Peak
6906.600	46.82	54.00	-7.18	44.11	2.71	Average
6906.600	48.82	74.00	-25.18	46.11	2.71	Peak
7236.000	33.85	54.00	-20.15	30.18	3.67	Average
7236.000	47.39	74.00	-26.61	43.72	3.67	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2385.840	40.72	54.00	-13.28	49.41	-8.69	Average
2385.840	54.16	74.00	-19.84	62.85	-8.69	Peak
2438.400	98.97			107.72	-8.75	Average
2438.400	109.12			117.87	-8.75	Peak
2483.760	42.62	54.00	-11.38	51.40	-8.78	Average
2483.760	55.94	74.00	-18.06	64.72	-8.78	Peak
3249.000	43.87	54.00	-10.13	49.38	-5.51	Average
3249.000	47.42	74.00	-26.58	52.93	-5.51	Peak
4874.000	30.35	54.00	-23.65	31.24	-0.89	Average
4874.000	43.77	74.00	-30.23	44.66	-0.89	Peak
7311.000	33.24	54.00	-20.76	29.73	3.51	Average
7311.000	46.99	74.00	-27.01	43.48	3.51	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2369.520	36.29	54.00	-17.71	44.94	-8.65	Average
2369.520	49.60	74.00	-24.40	58.25	-8.65	Peak
2436.000	88.75			97.51	-8.76	Average
2436.000	99.02			107.78	-8.76	Peak
2485.920	36.06	54.00	-17.94	44.85	-8.79	Average
2485.920	50.54	74.00	-23.46	59.33	-8.79	Peak
4874.000	30.79	54.00	-23.21	31.68	-0.89	Average
4874.000	43.68	74.00	-30.32	44.57	-0.89	Peak
6906.600	45.55	54.00	-8.45	42.84	2.71	Average
6906.600	48.92	74.00	-25.08	46.21	2.71	Peak
7311.000	32.95	54.00	-21.05	29.44	3.51	Average
7311.000	46.59	74.00	-27.41	43.08	3.51	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2460.134	99.11			107.87	-8.76	Average
2460.134	109.00			117.76	-8.76	Peak
2484.340	53.00	54.00	-1.00	61.78	-8.78	Average
2484.340	71.75	74.00	-2.25	80.53	-8.78	Peak
3283.000	40.27	54.00	-13.73	45.69	-5.42	Average
3283.000	44.98	74.00	-29.02	50.40	-5.42	Peak
4924.000	30.81	54.00	-23.19	31.56	-0.75	Average
4924.000	44.38	74.00	-29.62	45.13	-0.75	Peak
7386.000	34.25	54.00	-19.75	30.12	4.13	Average
7386.000	47.55	74.00	-26.45	43.42	4.13	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.408	87.90			96.66	-8.76	Average
2461.408	98.88			107.64	-8.76	Peak
2483.654	39.04	54.00	-14.96	47.82	-8.78	Average
2483.654	55.95	74.00	-18.05	64.73	-8.78	Peak
4924.000	30.67	54.00	-23.33	31.40	-0.73	Average
4924.000	44.59	74.00	-29.41	45.32	-0.73	Peak
6906.600	45.66	54.00	-8.34	42.95	2.71	Average
6906.600	50.44	74.00	-23.56	47.73	2.71	Peak
7386.000	33.54	54.00	-20.46	29.40	4.14	Average
7386.000	47.87	74.00	-26.13	43.73	4.14	Peak

802.11n HT40 mode:

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2387.088	52.61	54.00	-1.39	61.30	-8.69	Average
2387.088	70.61	74.00	-3.39	79.30	-8.69	Peak
2420.220	91.75			100.50	-8.75	Average
2420.220	103.73			112.48	-8.75	Peak
3229.000	46.18	54.00	-7.82	51.78	-5.60	Average
3229.000	50.07	74.00	-23.93	55.67	-5.60	Peak
4844.000	29.45	54.00	-24.55	30.74	-1.29	Average
4844.000	44.23	74.00	-29.77	45.52	-1.29	Peak
7266.000	32.34	54.00	-21.66	28.67	3.67	Average
7266.000	48.48	74.00	-25.52	44.81	3.67	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2385.504	43.13	54.00	-10.87	51.82	-8.69	Average
2385.504	58.10	74.00	-15.90	66.79	-8.69	Peak
2420.748	83.97			92.72	-8.75	Average
2420.748	96.53			105.28	-8.75	Peak
4844.000	29.77	54.00	-24.23	30.65	-0.88	Average
4844.000	44.32	74.00	-29.68	45.20	-0.88	Peak
6906.600	46.38	54.00	-7.62	43.67	2.71	Average
6906.600	49.36	74.00	-24.64	46.65	2.71	Peak
7266.000	32.73	54.00	-21.27	28.70	4.03	Average
7266.000	48.35	74.00	-25.65	44.32	4.03	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2388.720	45.61	54.00	-8.39	54.30	-8.69	Average
2388.720	60.36	74.00	-13.64	69.05	-8.69	Peak
2438.400	91.62			100.37	-8.75	Average
2438.400	103.89			112.64	-8.75	Peak
2485.680	46.03	54.00	-7.97	54.82	-8.79	Average
2485.680	60.40	74.00	-13.60	69.19	-8.79	Peak
3249.000	43.42	54.00	-10.58	48.93	-5.51	Average
3249.000	47.35	74.00	-26.65	52.86	-5.51	Peak
4874.000	30.57	54.00	-23.43	31.46	-0.89	Average
4874.000	44.05	74.00	-29.95	44.94	-0.89	Peak
7311.000	33.31	54.00	-20.69	29.80	3.51	Average
7311.000	46.25	74.00	-27.75	42.74	3.51	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2388.240	37.87	54.00	-16.13	46.56	-8.69	Average
2388.240	50.22	74.00	-23.78	58.91	-8.69	Peak
2438.880	81.50			90.25	-8.75	Average
2438.880	93.76			102.51	-8.75	Peak
2535.360	37.08	54.00	-16.92	45.82	-8.74	Average
2535.360	50.64	74.00	-23.36	59.38	-8.74	Peak
4874.000	30.51	54.00	-23.49	31.40	-0.89	Average
4874.000	43.87	74.00	-30.13	44.76	-0.89	Peak
6906.600	45.20	54.00	-8.80	42.49	2.71	Average
6906.600	48.76	74.00	-25.24	46.05	2.71	Peak
7311.000	34.31	54.00	-19.69	30.80	3.51	Average
7311.000	46.68	74.00	-27.32	43.17	3.51	Peak

High CH

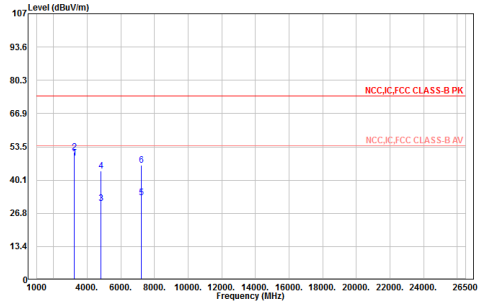
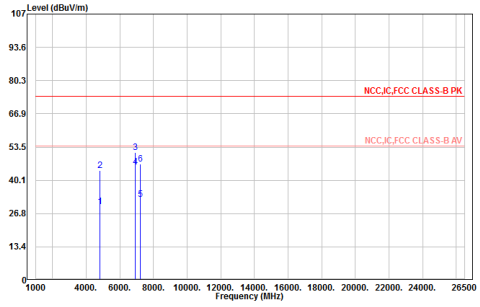
Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2450.172	91.03			99.79	-8.76	Average
2450.172	103.33			112.09	-8.76	Peak
2490.056	52.13	54.00	-1.87	60.92	-8.79	Average
2490.056	69.49	74.00	-4.51	78.28	-8.79	Peak
3269.000	42.04	74.00	-31.96	47.46	-5.42	Average
3269.000	45.63	74.00	-28.37	51.05	-5.42	Peak
4904.000	29.56	54.00	-24.44	30.44	-0.88	Average
4904.000	43.12	74.00	-30.88	44.00	-0.88	Peak
7356.000	33.13	54.00	-20.87	29.29	3.84	Average
7356.000	47.89	74.00	-26.11	44.05	3.84	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2453.476	79.96			88.72	-8.76	Average
2453.476	92.14			100.90	-8.76	Peak
2488.522	38.82	54.00	-15.18	47.61	-8.79	Average
2488.522	52.79	74.00	-21.21	61.58	-8.79	Peak
4904.000	29.79	54.00	-24.21	30.53	-0.74	Average
4904.000	44.14	74.00	-29.86	44.88	-0.74	Peak
6906.600	45.55	54.00	-8.45	42.84	2.71	Average
6906.600	50.99	74.00	-23.01	48.28	2.71	Peak
7356.000	32.94	54.00	-21.06	29.16	3.78	Average
7356.000	47.13	74.00	-26.87	43.35	3.78	Peak

Above 1G (1 GHz-26.5 GHz): The worst mode: 802.11g mode Low Channel

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 !	3216.000	49.09	54.00	-4.91	54.81	-5.72	Average	horizontal
2	3216.000	51.22	74.00	-22.78	56.94	-5.72	Peak	horizontal
3	4824.000	30.72	54.00	-23.28	31.60	-0.88	Average	horizontal
4	4824.000	43.83	74.00	-30.17	44.71	-0.88	Peak	horizontal
5	7236.000	33.11	54.00	-20.89	29.80	3.31	Average	horizontal
6	7236.000	46.23	74.00	-27.77	42.92	3.31	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	4824.000	29.47	54.00	-24.53	30.49	-1.02	Average	vertical
2	4824.000	43.99	74.00	-30.01	45.01	-1.02	Peak	vertical
3	6906.500	51.28	74.00	-22.72	48.57	2.71	Peak	vertical
4 !	6906.600	45.41	54.00	-8.59	42.70	2.71	Average	vertical
5	7236.000	32.62	54.00	-21.38	29.31	3.31	Average	vertical
6	7236.000	46.56	74.00	-27.44	43.25	3.31	Peak	vertical

Level = Read Level + Factor

Over Limit = Level – Limit

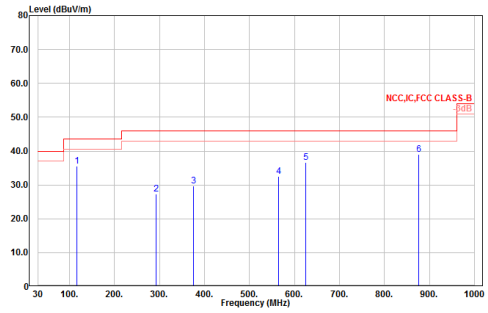
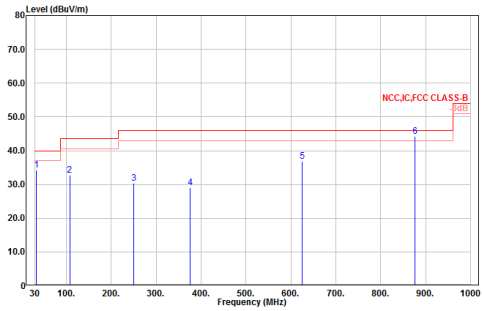
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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 X axis)

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

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	117.300	35.62	43.50	-7.88	52.88	-17.26	Peak	horizontal
2	292.870	27.34	46.00	-18.66	45.56	-18.22	Peak	horizontal
3	375.320	29.69	46.00	-16.31	46.22	-16.53	Peak	horizontal
4	565.440	32.45	46.00	-13.55	45.65	-13.20	Peak	horizontal
5	625.580	36.72	46.00	-9.28	48.86	-12.14	Peak	horizontal
6	875.840	39.12	46.00	-6.88	48.07	-8.95	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	32.910	34.20	40.00	-5.80	42.28	-8.08		vertical
2	107.600	32.66	43.50	-10.84	51.37	-18.71	Peak	vertical
3	250.190	30.32	46.00	-15.68	50.07	-19.75	Peak	vertical
4	375.320	29.07	46.00	-16.93	45.60	-16.53	Peak	vertical
5	625.580	36.90	46.00	-9.10	49.04	-12.14	Peak	vertical
6 !	875.840	44.21	46.00	-1.79	53.16	-8.95	QP	vertical

Result = Reading + Correct Factor

Margin = Result – 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	
2390.000	37.05	54.00	-16.95	45.74	-8.69	Average
2390.000	56.58	74.00	-17.42	65.27	-8.69	Peak
2402.300	98.52			107.24	-8.72	Average
2402.300	99.63			108.35	-8.72	Peak
4804.000	37.63	54.00	-16.37	38.73	-1.10	Average
4804.000	46.80	74.00	-27.20	47.90	-1.10	Peak
7206.000	35.72	54.00	-18.28	32.51	3.21	Average
7206.000	47.57	74.00	-26.43	44.36	3.21	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2351.400	37.90	54.00	-16.10	46.51	-8.61	Average
2351.400	49.56	74.00	-24.44	58.17	-8.61	Peak
2402.300	88.06			96.78	-8.72	Average
2402.300	89.30			98.02	-8.72	Peak
4804.000	31.84	54.00	-22.16	32.94	-1.10	Average
4804.000	43.23	74.00	-30.77	44.33	-1.10	Peak
6906.600	47.19	54.00	-6.81	44.48	2.71	Average
6906.600	50.96	74.00	-23.04	48.25	2.71	Peak
7206.000	35.88	54.00	-18.12	32.67	3.21	Average
7206.000	45.90	74.00	-28.10	42.69	3.21	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2318.400	37.58	54.00	-16.42	46.11	-8.53	Average
2318.400	49.43	74.00	-24.57	57.96	-8.53	Peak
2440.320	97.40			106.15	-8.75	Average
2440.320	98.37			107.12	-8.75	Peak
2504.640	37.14	54.00	-16.86	45.94	-8.80	Average
2504.640	49.64	74.00	-24.36	58.44	-8.80	Peak
4880.000	33.65	54.00	-20.35	34.52	-0.87	Average
4880.000	43.08	74.00	-30.92	43.95	-0.87	Peak
7320.000	36.20	54.00	-17.80	32.67	3.53	Average
7320.000	45.46	74.00	-28.54	41.93	3.53	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2332.560	37.15	54.00	-16.85	45.71	-8.56	Average
2332.560	49.68	74.00	-24.32	58.24	-8.56	Peak
2440.320	86.43			95.18	-8.75	Average
2440.320	87.51			96.26	-8.75	Peak
2491.440	36.99	54.00	-17.01	45.79	-8.80	Average
2491.440	49.22	74.00	-24.78	58.02	-8.80	Peak
4880.000	31.65	54.00	-22.35	32.53	-0.88	Average
4880.000	43.65	74.00	-30.35	44.53	-0.88	Peak
6906.600	46.41	54.00	-7.59	43.70	2.71	Average
6906.600	49.81	74.00	-24.19	47.10	2.71	Peak
7320.000	37.13	54.00	-16.87	33.60	3.53	Average
7320.000	46.10	74.00	-27.90	42.57	3.53	Peak

High CH

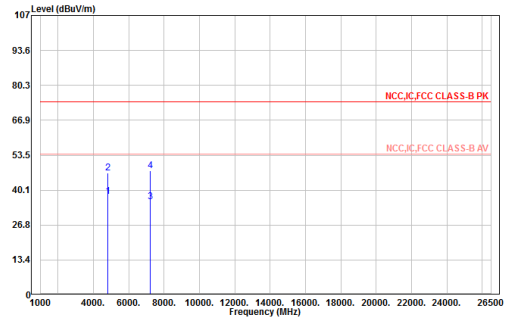
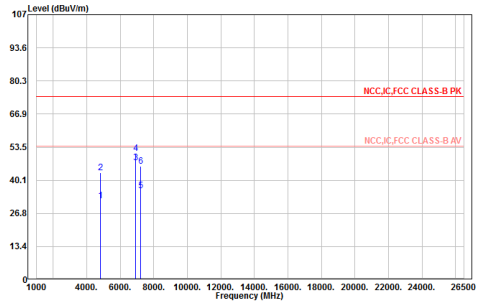
Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2480.240	97.43			106.21	-8.78	Average
2480.240	98.37			107.15	-8.78	Peak
2521.440	37.06	54.00	-16.94	45.83	-8.77	Average
2521.440	50.27	74.00	-23.73	59.04	-8.77	Peak
4960.000	40.00	54.00	-14.00	40.74	-0.74	Average
4960.000	48.08	74.00	-25.92	48.82	-0.74	Peak
7440.000	34.52	54.00	-19.48	30.55	3.97	Average
7440.000	44.66	74.00	-29.34	40.69	3.97	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.760	85.31			94.09	-8.78	Average
2479.760	86.35			95.13	-8.78	Peak
2491.680	36.82	54.00	-17.18	45.62	-8.80	Average
2491.680	49.96	74.00	-24.04	58.76	-8.80	Peak
4960.000	34.97	54.00	-19.03	35.71	-0.74	Average
4960.000	43.64	74.00	-30.36	44.38	-0.74	Peak
6906.600	46.19	54.00	-7.81	43.48	2.71	Average
6906.600	50.13	74.00	-23.87	47.42	2.71	Peak
7440.000	36.49	54.00	-17.51	32.52	3.97	Average
7440.000	46.72	74.00	-27.28	42.75	3.97	Peak

Above 1G (1 GHz-26.5 GHz): The worst mode: BLE Low Channel

Horizontal	Vertical
	

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 !	4804.000	37.63	54.00	-16.37	38.73	-1.10	Average	horizontal
2	4804.000	46.80	74.00	-27.20	47.90	-1.10	Peak	horizontal
3 !	7206.000	35.72	54.00	-18.28	32.51	3.21	Average	horizontal
4	7206.000	47.57	74.00	-26.43	44.36	3.21	Peak	horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1	4804.000	31.84	54.00	-22.16	32.94	-1.10	Average	vertical
2	4804.000	43.23	74.00	-30.77	44.33	-1.10	Peak	vertical
3 !	6906.600	47.19	54.00	-6.81	44.48	2.71	Average	vertical
4	6906.600	50.96	74.00	-23.04	48.25	2.71	Peak	vertical
5 !	7206.000	35.88	54.00	-18.12	32.67	3.21	Average	vertical
6	7206.000	45.90	74.00	-28.10	42.69	3.21	Peak	vertical

Level = Read Level + Factor

Over Limit = Level – Limit

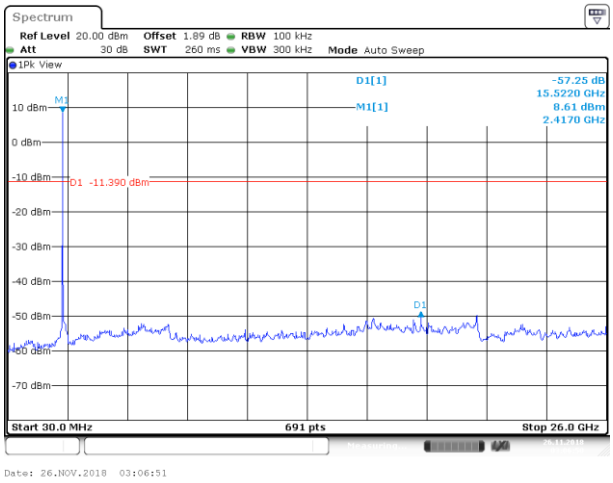
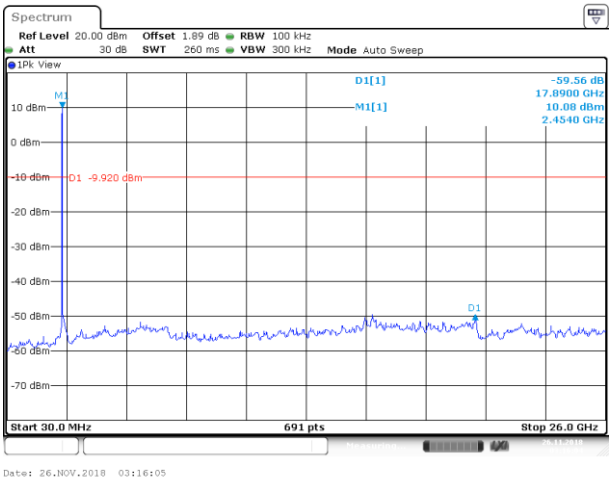
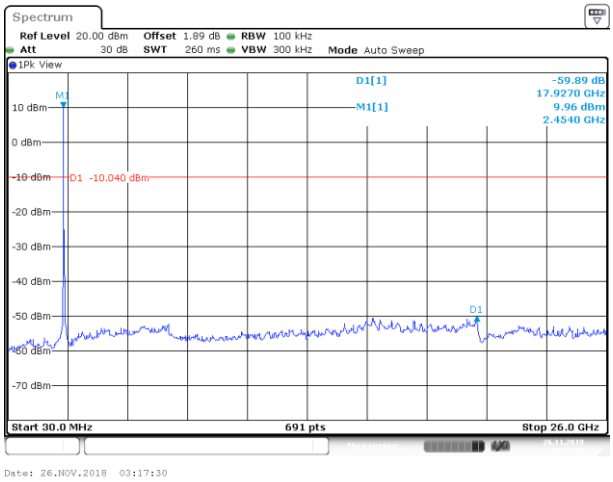
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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

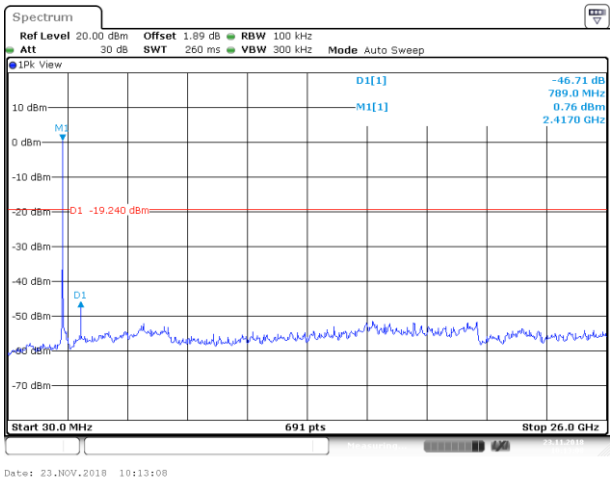
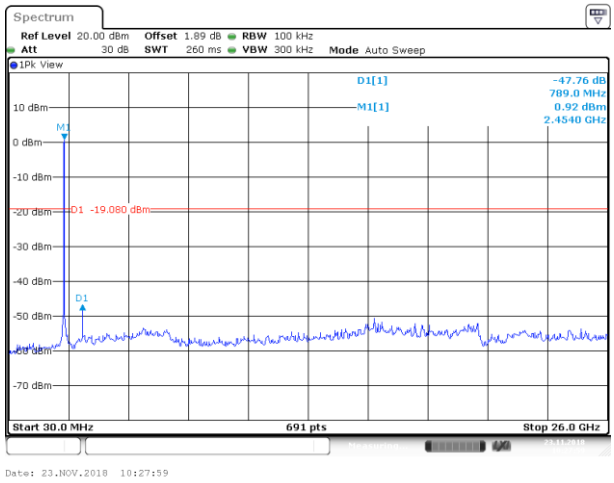
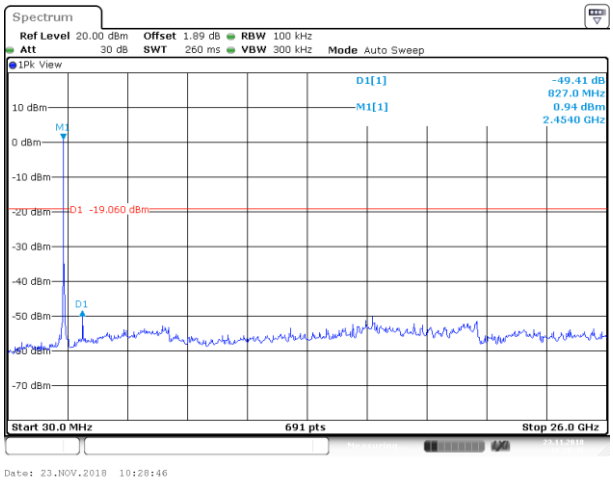
Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
802.11b mode Chain 1				
Low	2412	57.25	≥ 20	Compliance
Mid	2437	59.56	≥ 20	Compliance
High	2462	59.89	≥ 20	Compliance
802.11g mode Chain 1				
Low	2412	46.71	≥ 20	Compliance
Mid	2437	47.76	≥ 20	Compliance
High	2462	49.41	≥ 20	Compliance
802.11n HT20 mode Chain 0				
Low	2412	49.18	≥ 20	Compliance
Mid	2437	49.07	≥ 20	Compliance
High	2462	48.35	≥ 20	Compliance
802.11n HT20 mode Chain 1				
Low	2412	45.79	≥ 20	Compliance
Mid	2437	48.97	≥ 20	Compliance
High	2462	48.64	≥ 20	Compliance
802.11n HT40 mode Chain 0				
Low	2422	43.91	≥ 20	Compliance
Mid	2437	43.61	≥ 20	Compliance
High	2452	45.46	≥ 20	Compliance
802.11n HT40 mode Chain 1				
Low	2422	42.20	≥ 20	Compliance
Mid	2437	44.56	≥ 20	Compliance
High	2452	44.22	≥ 20	Compliance
BLE mode				
Low	2402	56.69	≥ 20	Compliance
Mid	2440	56.65	≥ 20	Compliance
High	2480	52.87	≥ 20	Compliance

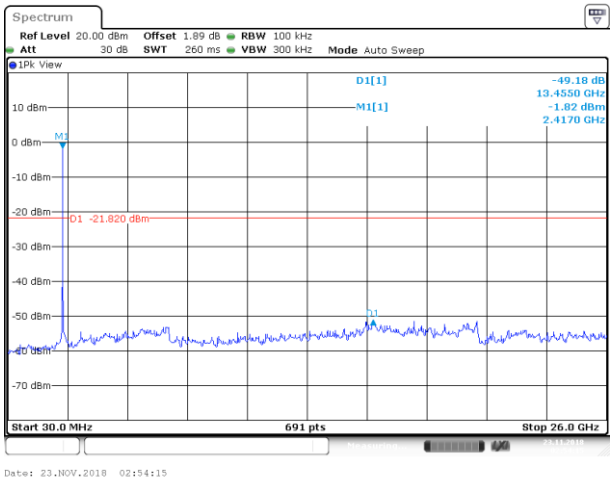
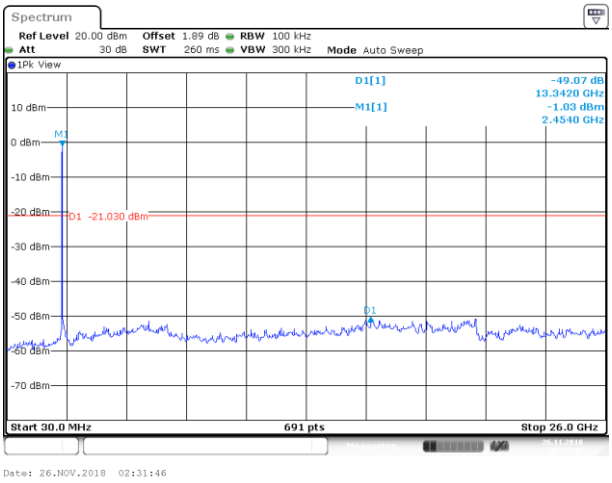
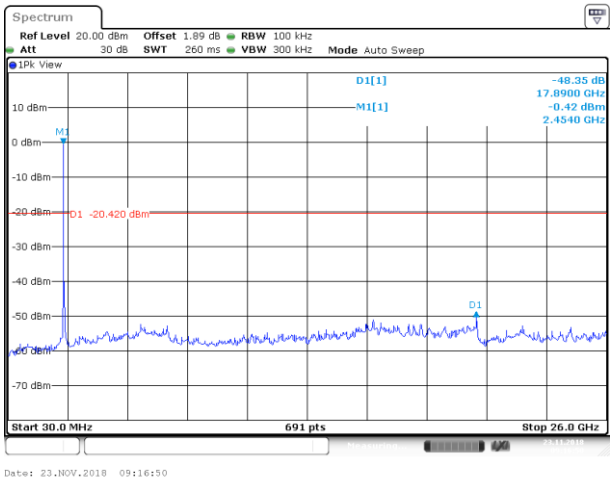
802.11b mode Chain 1:

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

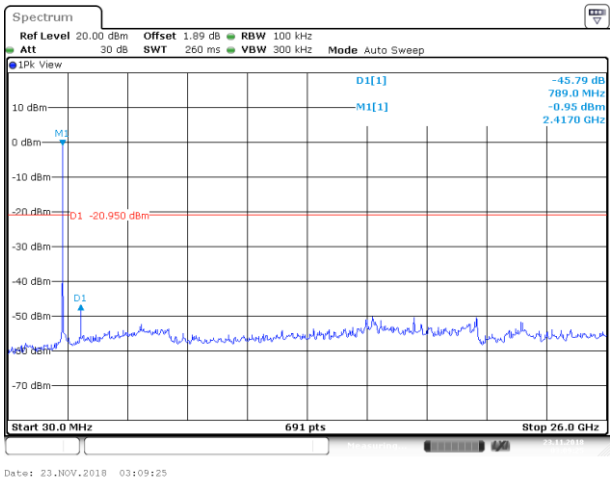
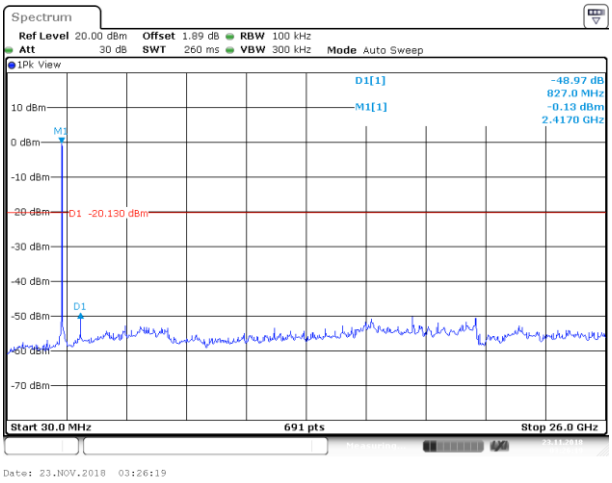
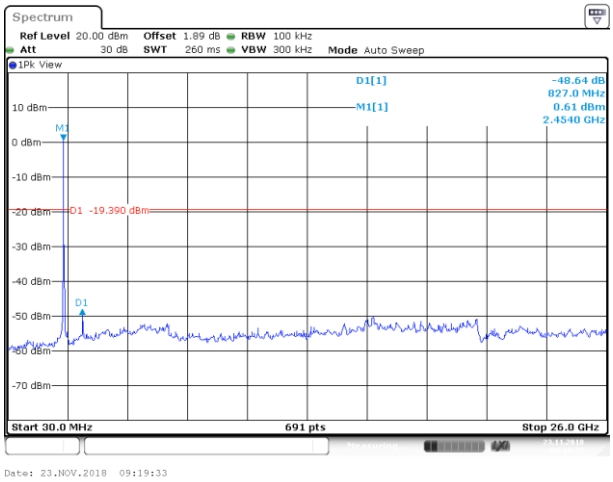
802.11g mode Chain 1:

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

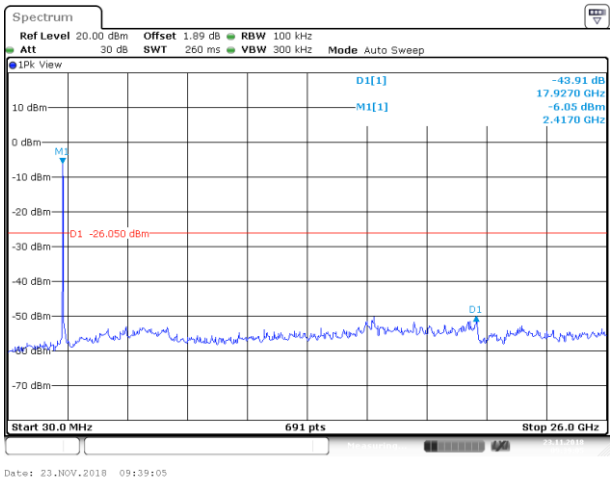
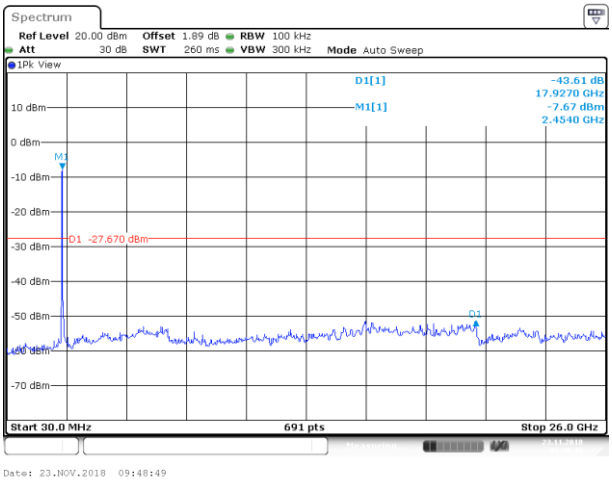
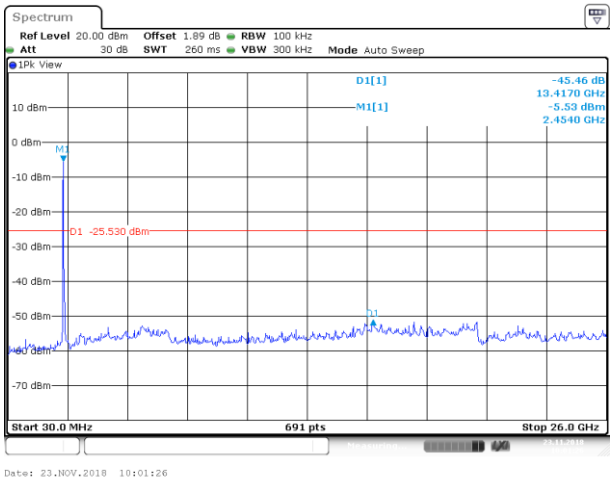
802.11n HT20 mode Chain 0:

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

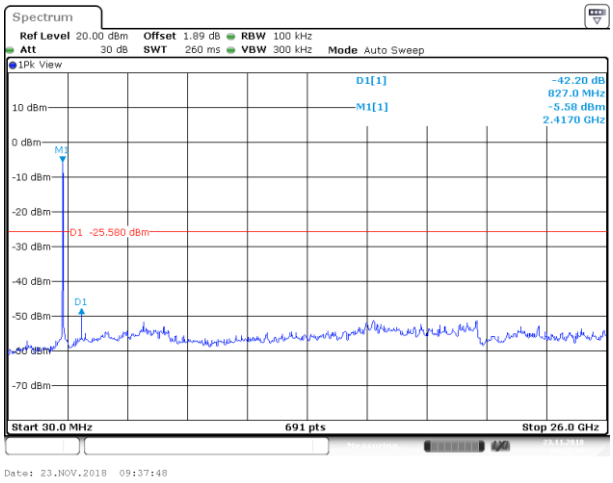
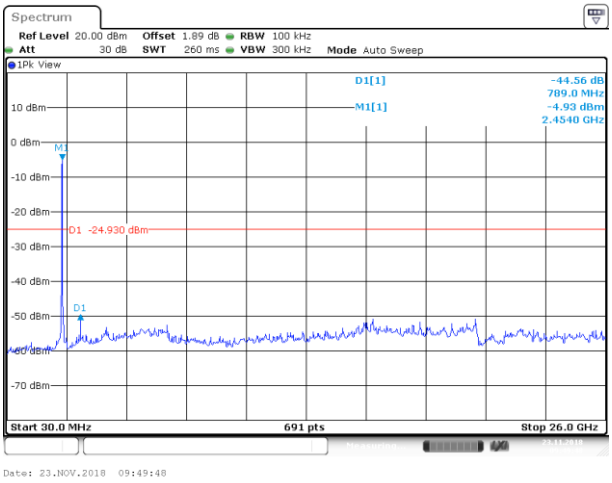
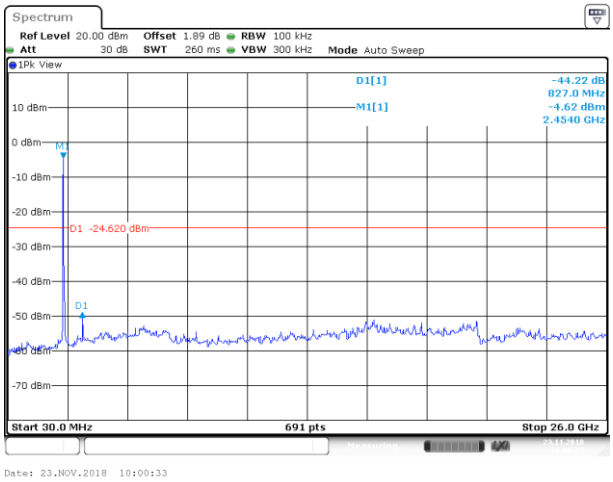
802.11n HT20 mode Chain 1:

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

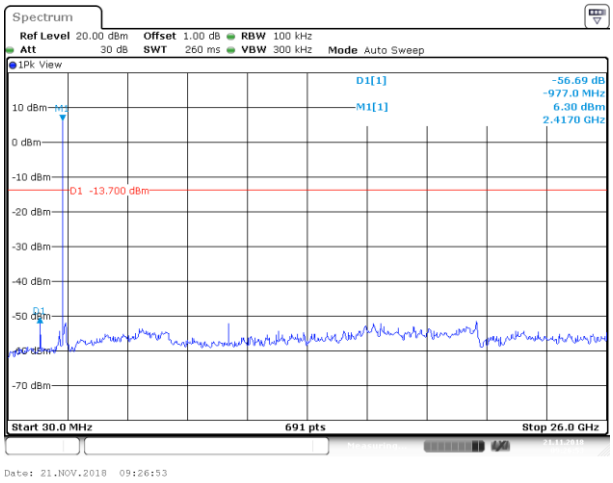
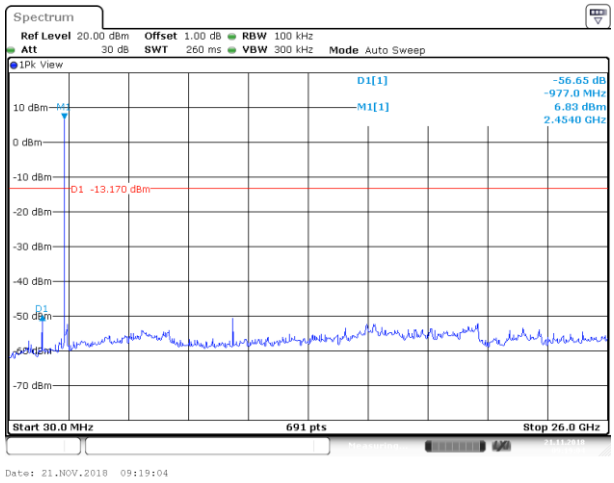
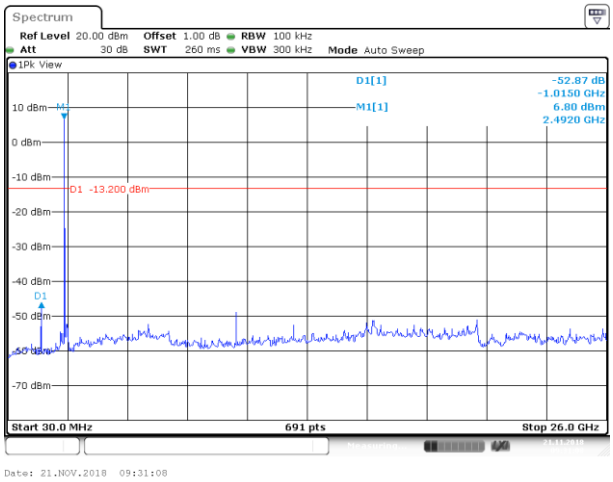
802.11n HT40 mode Chain 0:

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

802.11n HT40 mode Chain 1:

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					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2018/11/14	2019/11/13
Cable	WOKEN	SFL402	S02-160323-07	2019/02/11	2020/02/10

***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).*

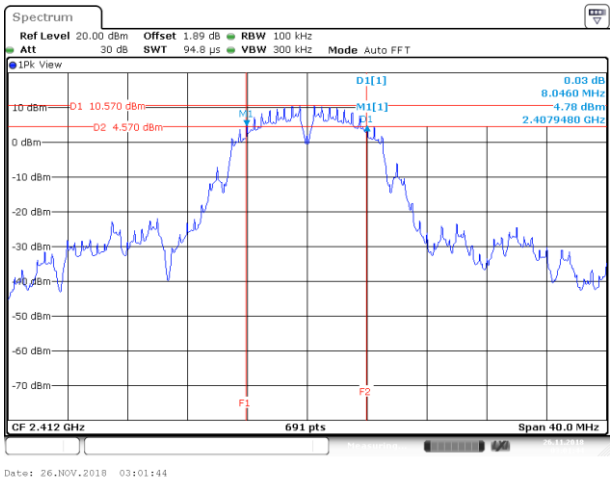
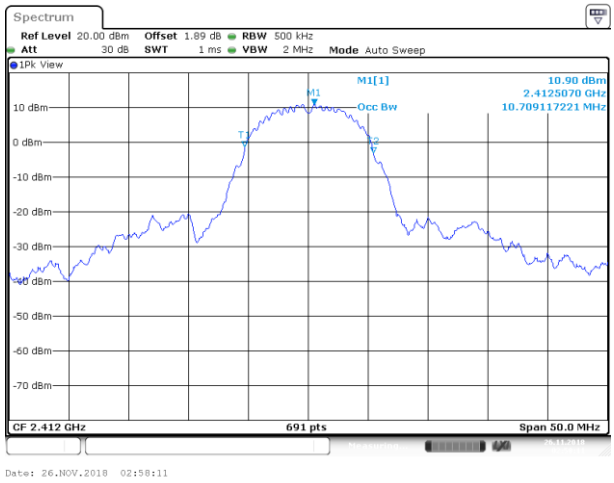
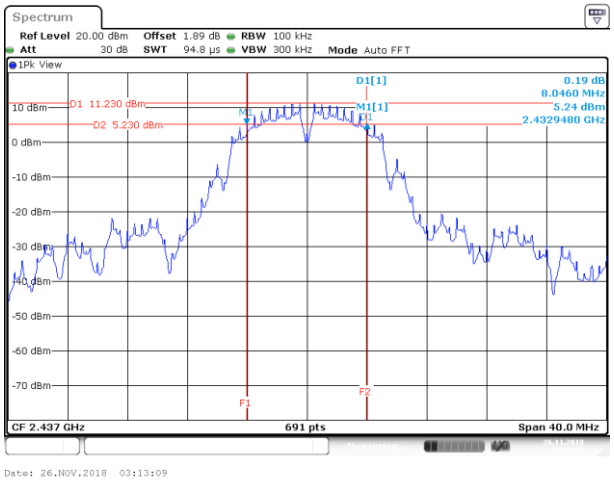
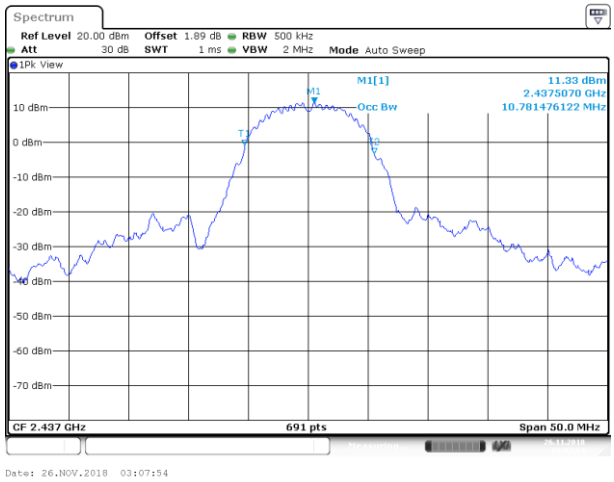
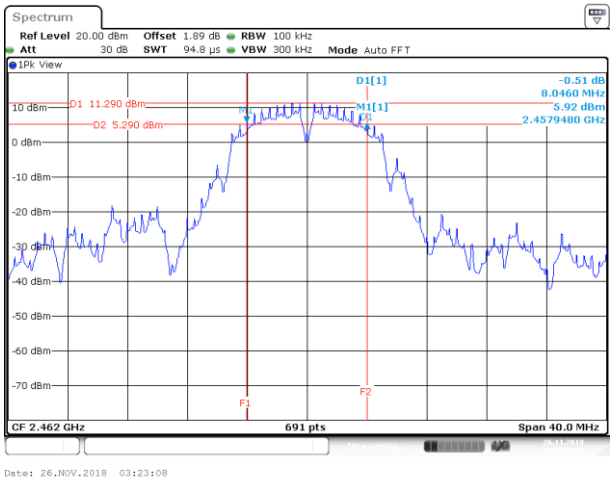
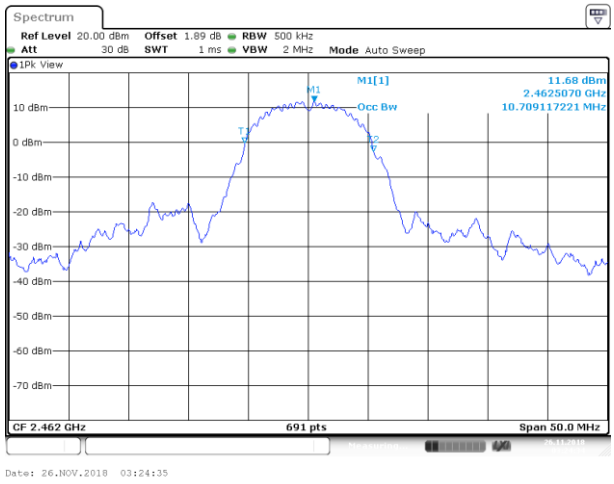
8.4 Test Environmental Conditions

Temperature:	25 ℃	**Relative Humidity:**	45 %
ATM Pressure:	1015hPa	**Test Engineer:**	Leo Chang
Conducted Test Date:	2018-11-26	-	-

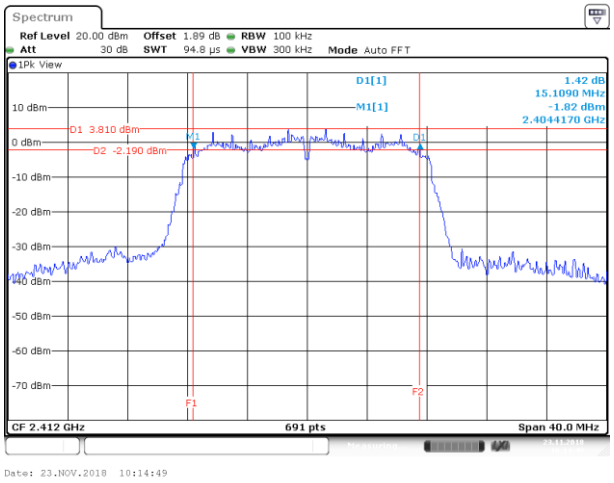
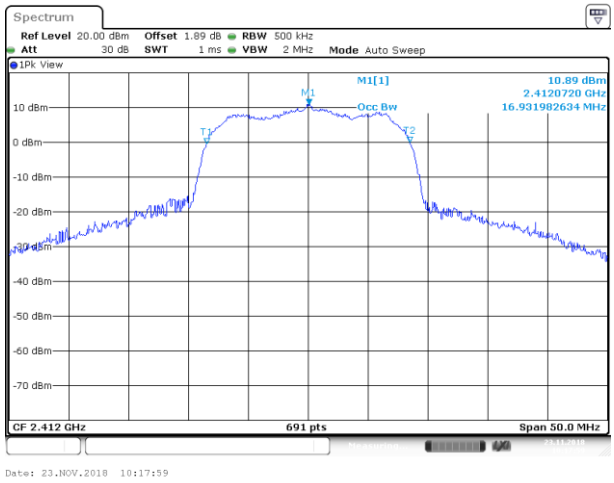
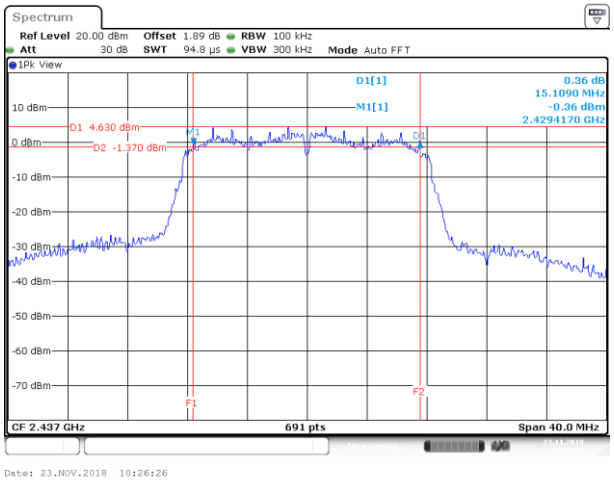
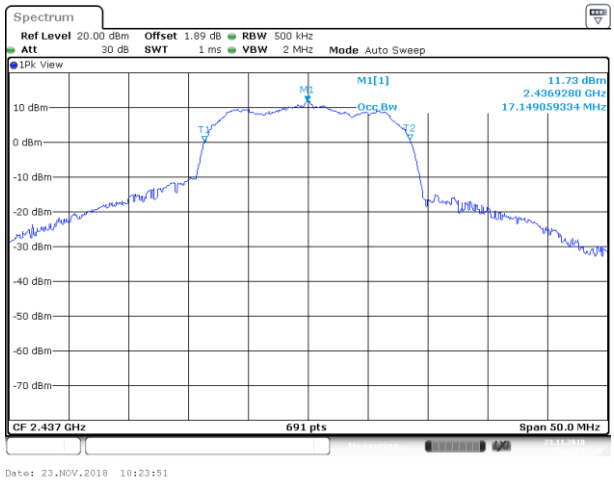
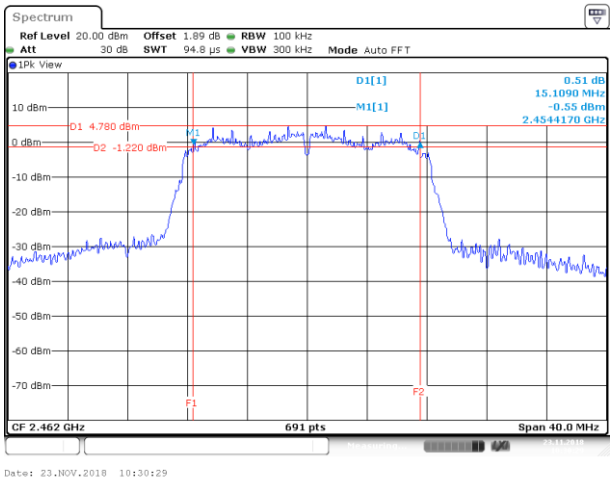
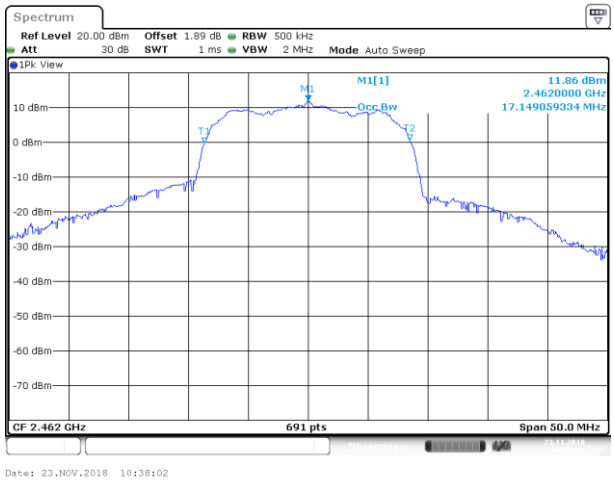
8.5 Test Results

Channel	Frequency (MHz)	99% OBW (MHz)	6 dB BW (MHz)	6dB Limit (MHz)	Result
802.11b mode Chain 1					
Low	2412	10.71	8.05	> 0.5	Compliance
Middle	2437	10.78	8.05	> 0.5	Compliance
High	2462	10.71	8.05	> 0.5	Compliance
802.11g mode Chain 1					
Low	2412	16.93	15.11	> 0.5	Compliance
Middle	2437	17.15	15.11	> 0.5	Compliance
High	2462	17.15	15.11	> 0.5	Compliance
802.11n HT20 mode Chain0					
Low	2412	17.58	16.04	> 0.5	Compliance
Middle	2437	17.58	15.17	> 0.5	Compliance
High	2462	17.51	15.11	> 0.5	Compliance
802.11 n HT20 mode Chain1					
Low	2412	17.58	16.90	> 0.5	Compliance
Middle	2437	17.51	15.12	> 0.5	Compliance
High	2462	17.51	15.75	> 0.5	Compliance
802.11n HT40 mode Chain0					
Low	2422	36.76	35.77	> 0.5	Compliance
Middle	2437	36.90	35.89	> 0.5	Compliance
High	2452	36.90	35.77	> 0.5	Compliance
802.11n HT40 mode Chain1					
Low	2422	36.76	35.54	> 0.5	Compliance
Middle	2437	36.76	36.47	> 0.5	Compliance
High	2452	36.90	36.35	> 0.5	Compliance
BLE mode					
Low	2402	1.055	0.729	> 0.5	Compliance
Middle	2440	1.055	0.734	> 0.5	Compliance
High	2480	1.0549	0.729	> 0.5	Compliance

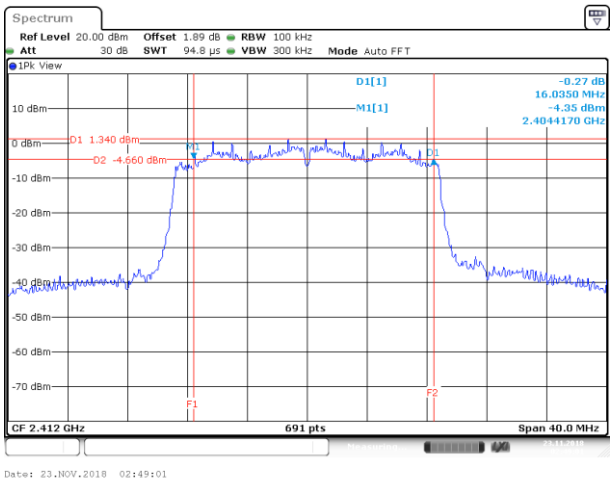
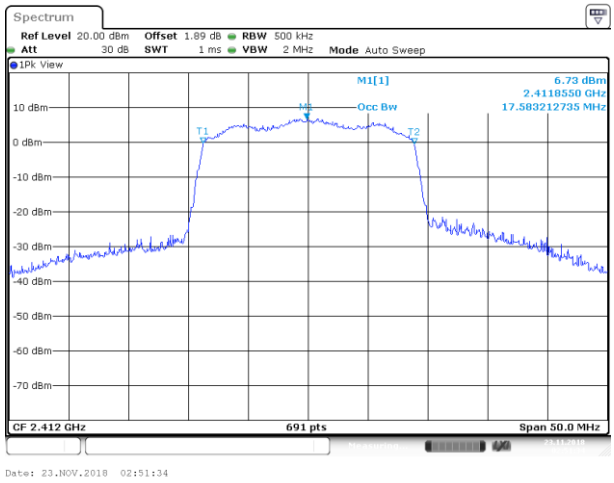
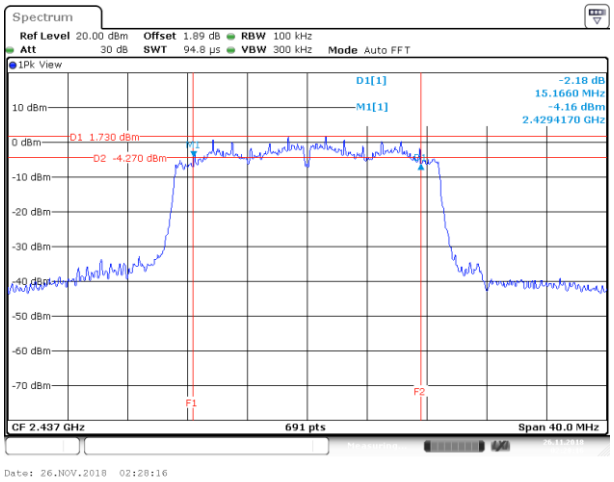
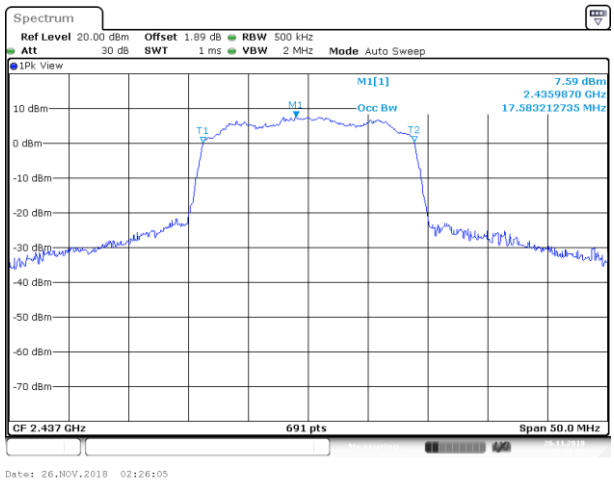
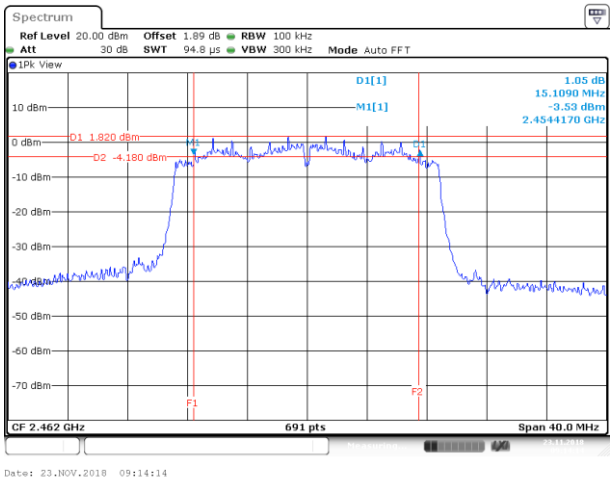
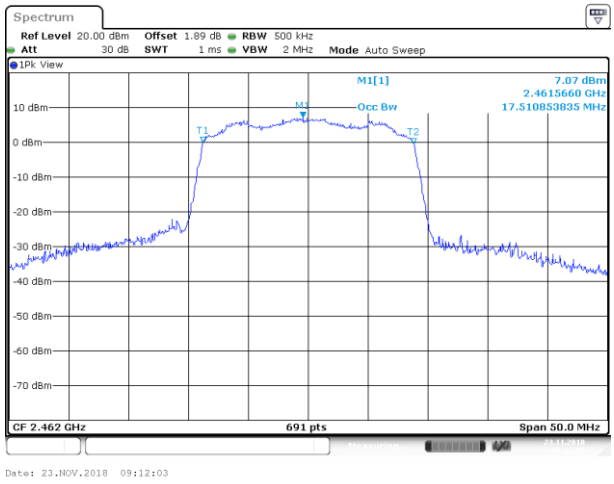
802.11b mode Chain 1:

6 dB BW Low CH	99% OBW Low CH
	
6 dB BW Middle CH	99% OBW Middle CH
	
6 dB BW High CH	99% OBW High CH
	

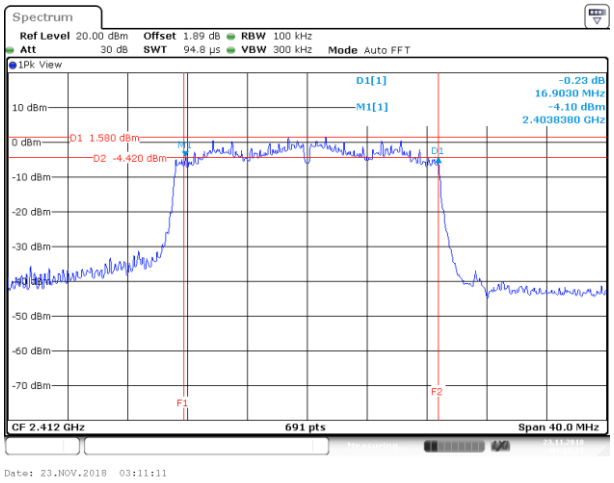
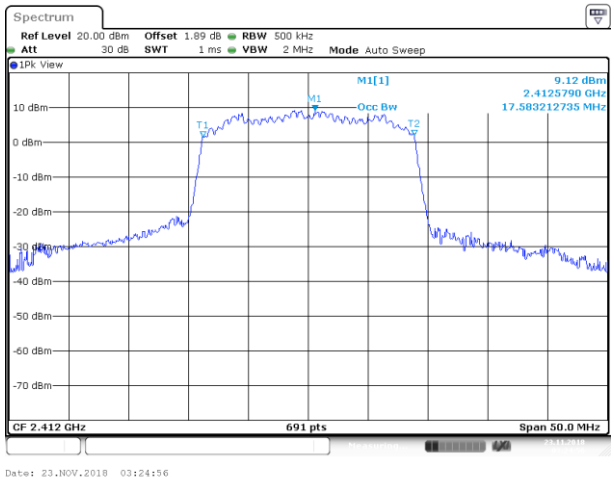
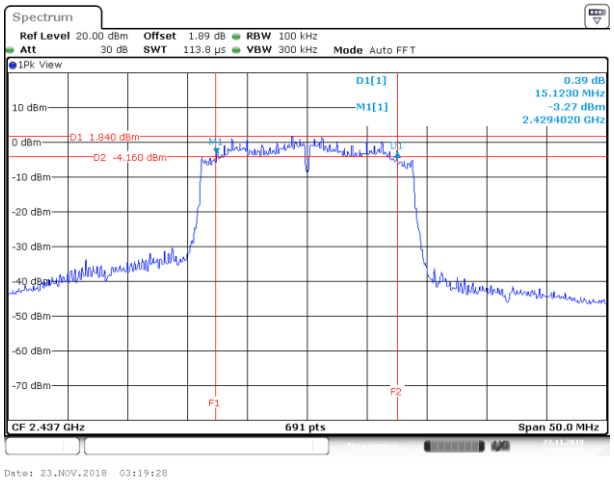
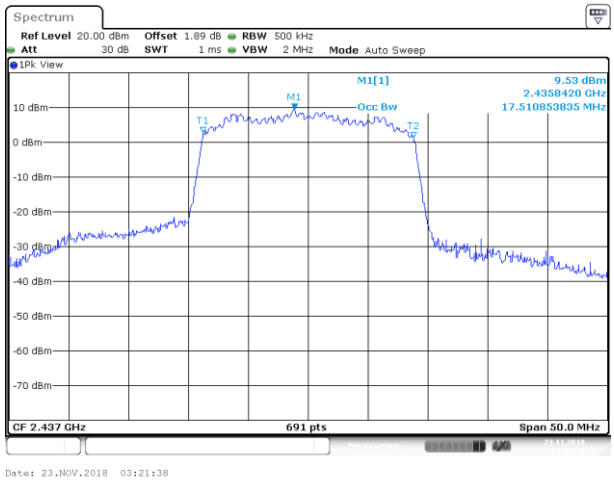
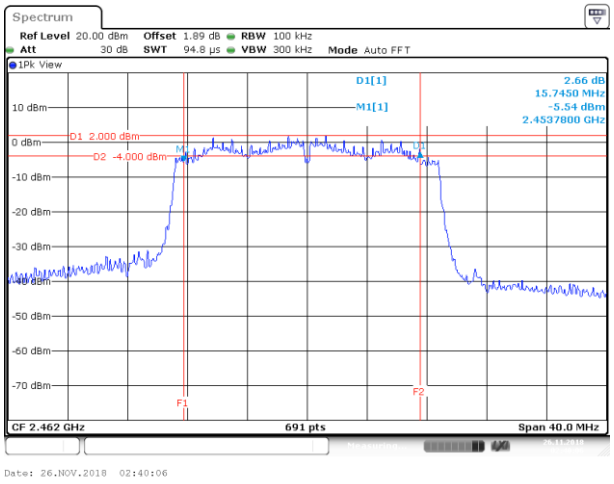
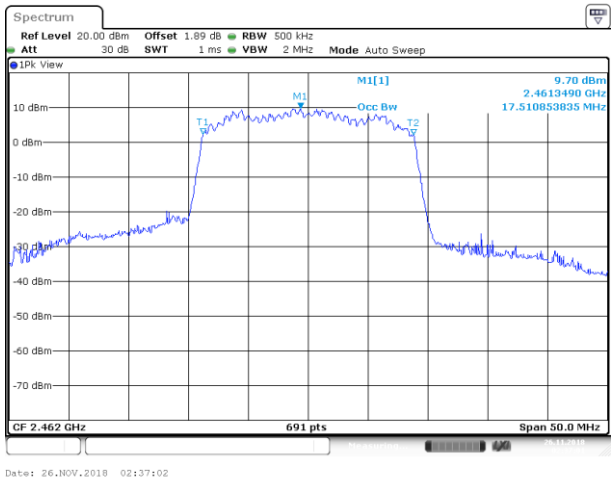
802.11g mode Chain 1:

6 dB BW Low CH	99% OBW Low CH
	
6 dB BW Middle CH	**99% OBW Middle CH**
	
6 dB BW High CH	**99% OBW High CH**
	

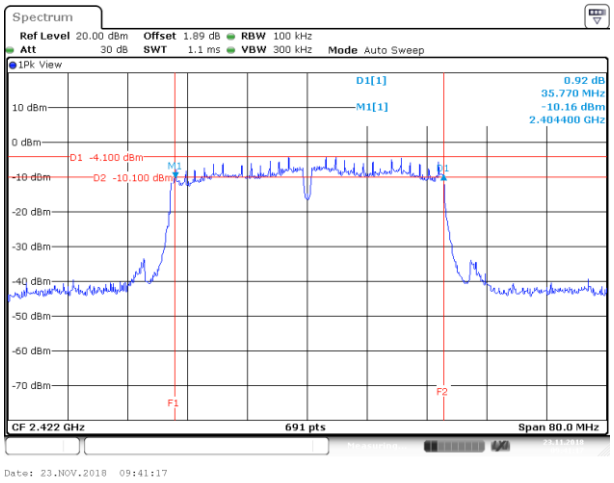
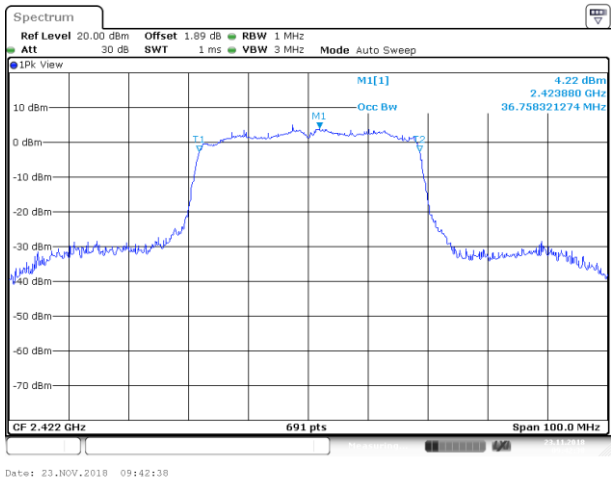
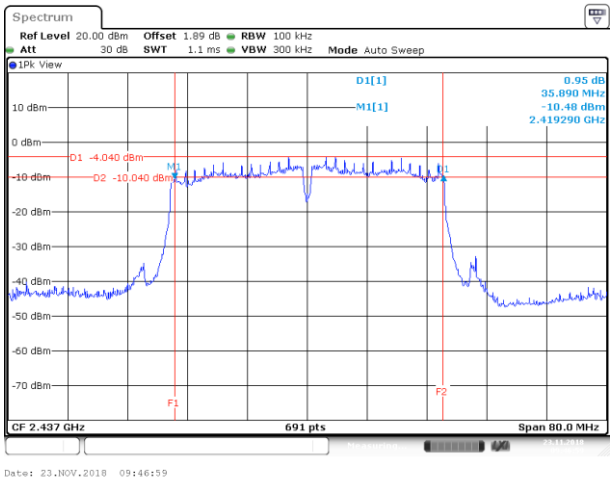
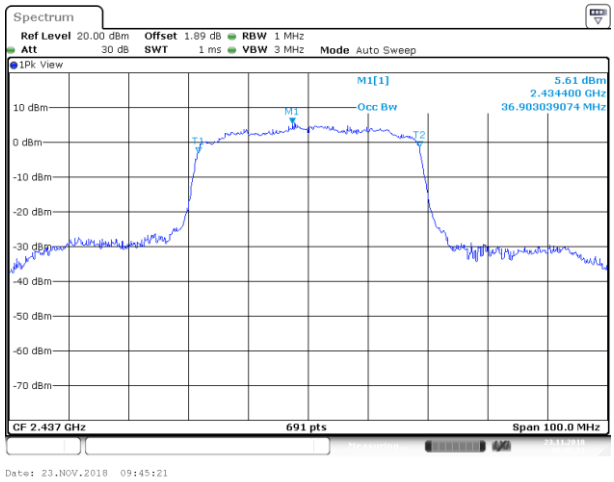
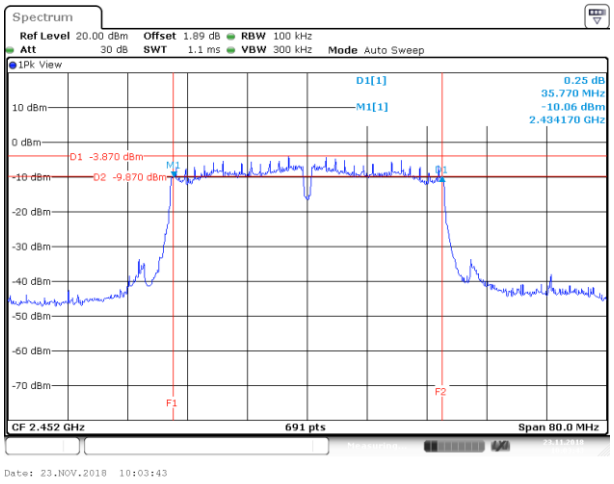
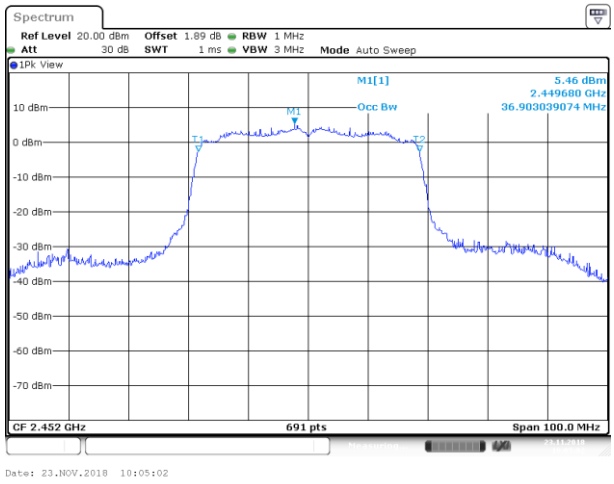
802.11n HT20 mode Chain0:

6 dB BW Low CH	99% OBW Low CH
	
6 dB BW Middle CH	99% OBW Middle CH
	
6 dB BW High CH	99% OBW High CH
	

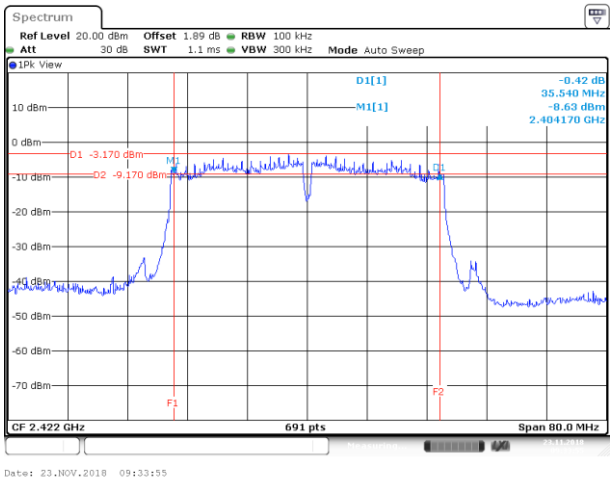
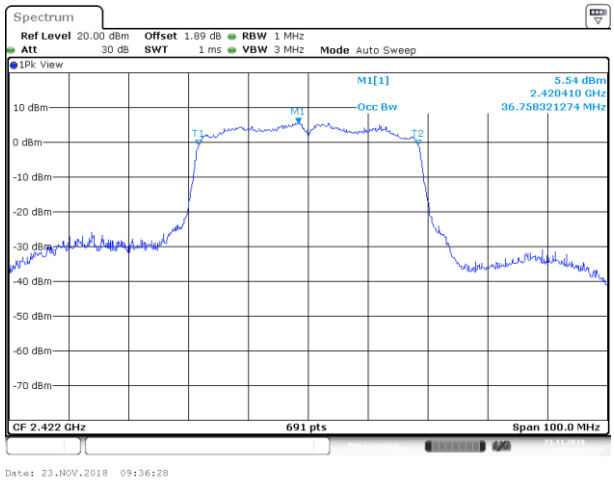
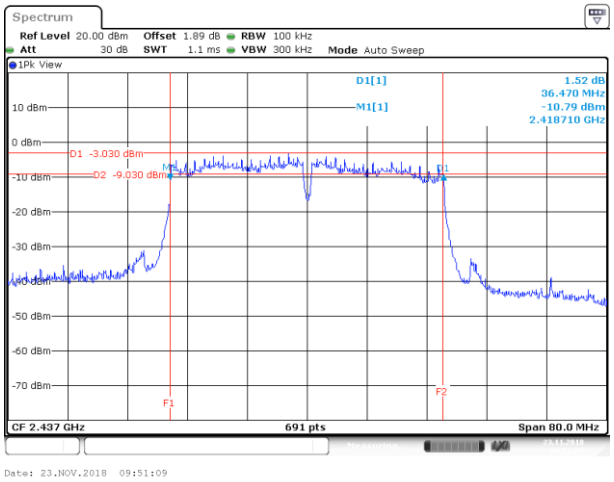
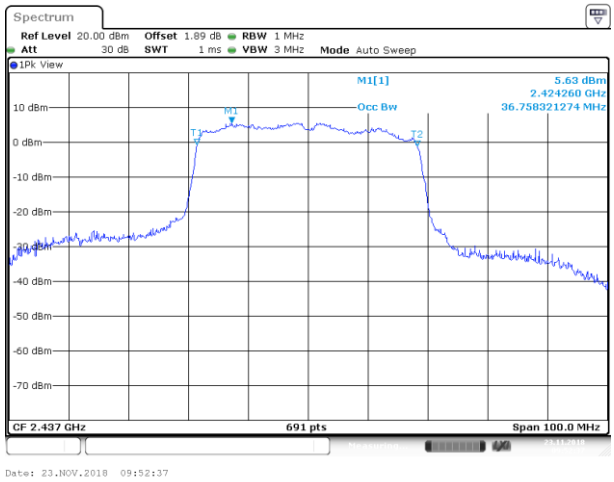
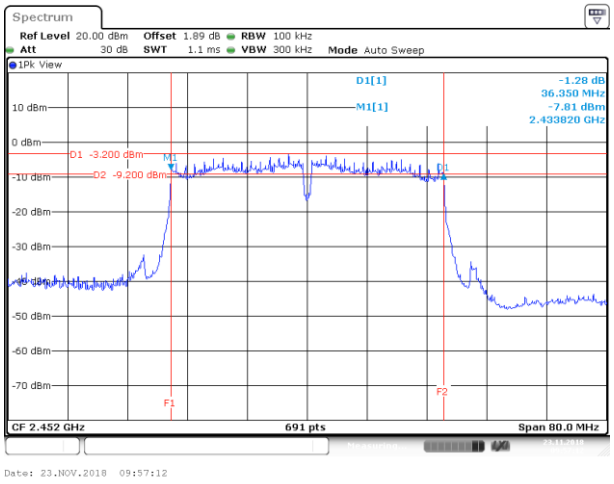
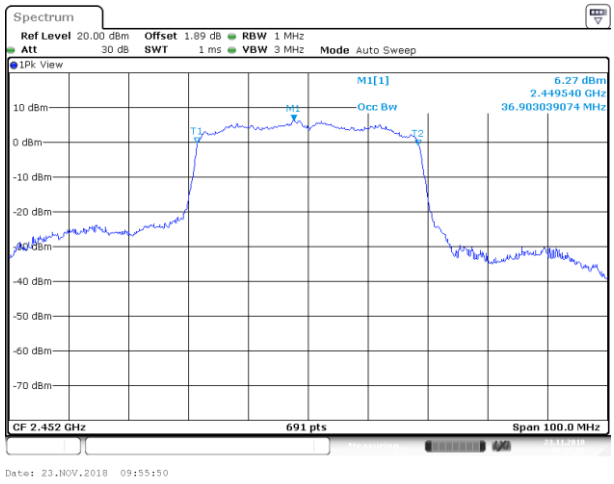
802.11n HT20 mode Chain1:

6 dB BW Low CH	99% OBW Low CH
	
6 dB BW Middle CH	99% OBW Middle CH
	
6 dB BW High CH	99% OBW High CH
	

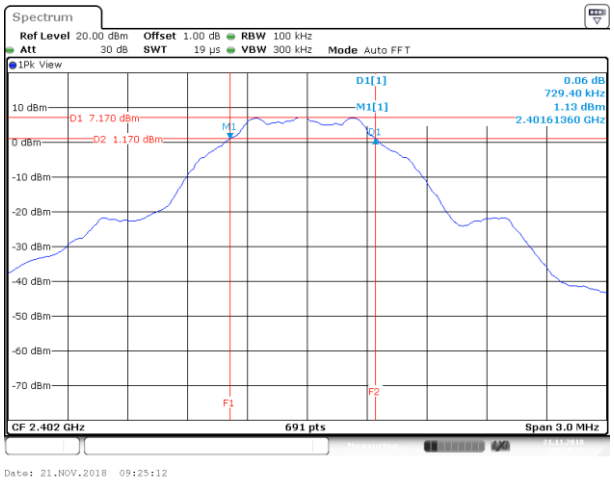
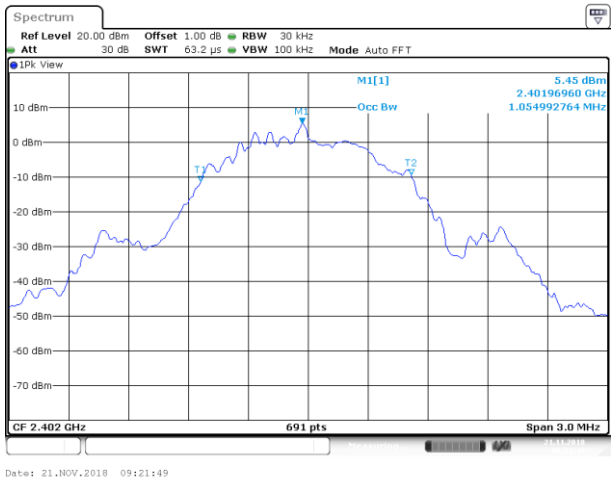
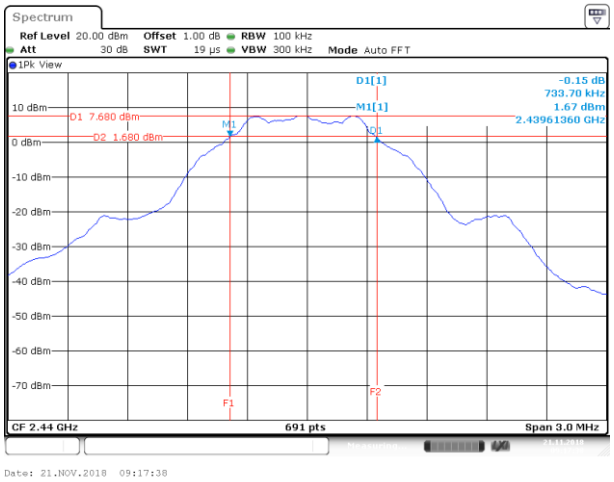
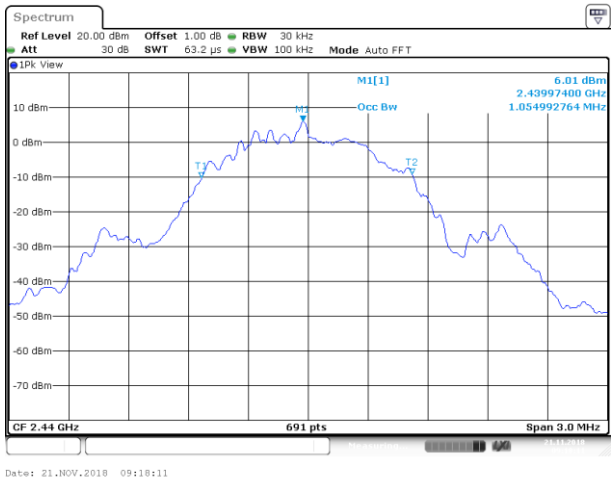
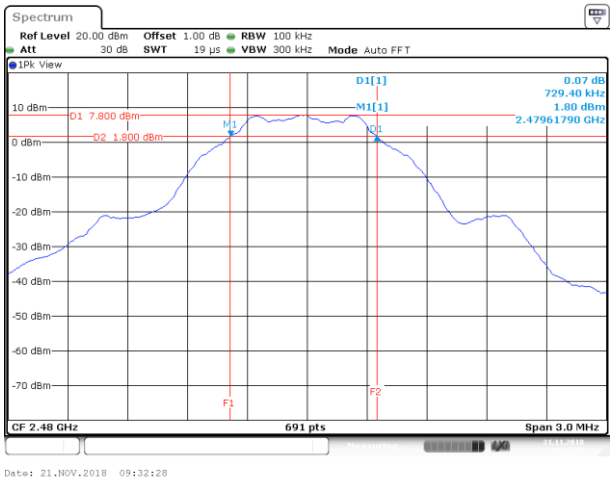
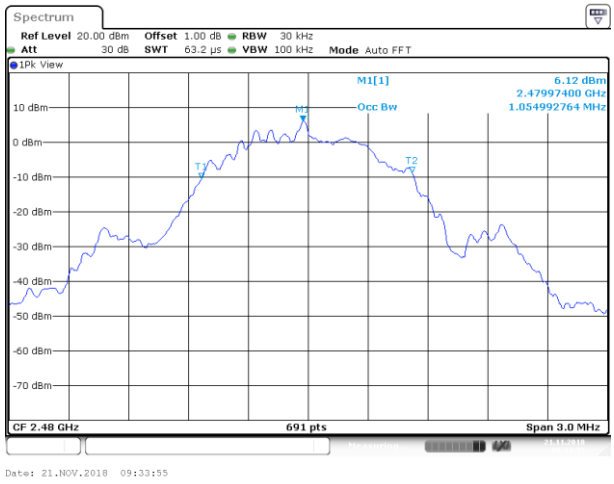
802.11n HT40 mode Chain0:

6 dB BW Low CH	99% OBW Low CH
	
6 dB BW Middle CH	**99% OBW Middle CH**
	
6 dB BW High CH	**99% OBW High CH**
	

802.11n HT40 mode Chain1:

6 dB BW Low CH	99% OBW Low CH
	
6 dB BW Middle CH	**99% OBW Middle CH**
	
6 dB BW High CH	**99% OBW High CH**
	

BLE mode:

6 dB BW Low CH	99% OBW Low CH
	
6 dB BW Middle CH	99% OBW Middle CH
	
6 dB BW High CH	99% OBW 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					
Power Sensor	Keysight	U2021XA	MY54080018	2018/03/07	2019/03/06
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***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 Environmental Conditions

Temperature:	25 ℃	**Relative Humidity:**	45 %
ATM Pressure:	1015hPa	**Test Engineer:**	Leo Chang
Conducted Test Date:	2018-11-26	-	-

9.5 Test Results

Channel	Frequency (MHz)	Chain0 Peak Output Power (dBm)	Chain1 Peak Output Power (dBm)	Total Peak Output Power (dBm)	Total Peak Output Power (W)	Limit (dBm)	Result
802.11b mode							
Low	2412	-	23.09	23.09	0.2037	30	Compliance
Middle	2437	-	23.39	23.39	0.2183	30	Compliance
High	2462	-	24.04	24.04	0.2535	30	Compliance
802.11g mode							
Low	2412	-	24.43	24.43	0.2773	30	Compliance
Middle	2437	-	25.06	25.06	0.3206	30	Compliance
High	2462	-	25.14	25.14	0.3266	30	Compliance
802.11n HT20 mode							
Low	2412	22.19	23.71	26.03	0.4009	30	Compliance
Middle	2437	23.01	24.33	**26.73**	**0.4710**	30	Compliance
High	2462	22.20	23.40	25.85	0.3846	30	Compliance
802.11n HT40 mode							
Low	2422	18.89	20.67	22.88	0.1941	30	Compliance
Middle	2437	19.32	19.56	22.45	0.1758	30	Compliance
High	2452	19.73	20.33	23.05	0.2018	30	Compliance
BLE mode							
Low	2402	7.02	-	7.02	0.0050	30	Compliance
Middle	2440	7.67	-	**7.67**	**0.0058**	30	Compliance
High	2480	7.59	-	7.59	0.0057	30	Compliance

Note: For 802.11n, DG is 3.40 dBi, less 6 dBi. Therefore, Limit not need decline.

Channel	Frequency (MHz)	Chain0 Average Output Power (dBm)	Chain1 Average Output Power (dBm)	Duty Cycle	Total Average Output Power (dBm)	Limit (dBm)	Result
802.11b mode							
Low	2412	-	19.47	0.17	19.64	30	Compliance
Middle	2437	-	20.06	0.17	20.23	30	Compliance
High	2462	-	19.91	0.17	20.08	30	Compliance
802.11g mode							
Low	2412	-	14.89	0.14	15.03	30	Compliance
Middle	2437	-	15.66	0.14	15.80	30	Compliance
High	2462	-	15.68	0.14	15.82	30	Compliance
802.11n HT20 mode							
Low	2412	12.32	12.91	0.15	15.79	30	Compliance
Middle	2437	12.39	13.17	0.15	15.96	30	Compliance
High	2462	12.45	12.46	0.15	15.62	30	Compliance
802.11n HT40 mode							
Low	2422	9.77	10.43	0.31	13.12	30	Compliance
Middle	2437	9.70	10.30	0.31	13.02	30	Compliance
High	2452	9.86	10.40	0.31	13.15	30	Compliance
BLE mode							
Low	2402	5.22	-	1.69	6.91	30	Compliance
Middle	2440	5.81	-	1.69	7.50	30	Compliance
High	2480	5.79	-	1.69	7.48	30	Compliance

Note: For 802.11n, DG is 3.40 dBi, less 6 dBi. Therefore, Limit not need decline.

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					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2018/11/14	2019/11/13
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***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).*

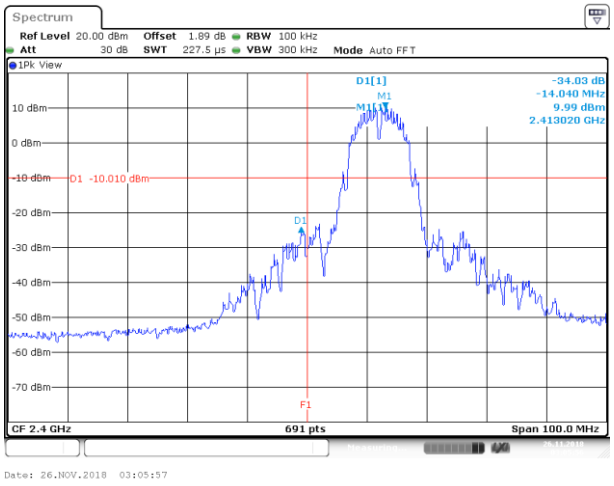
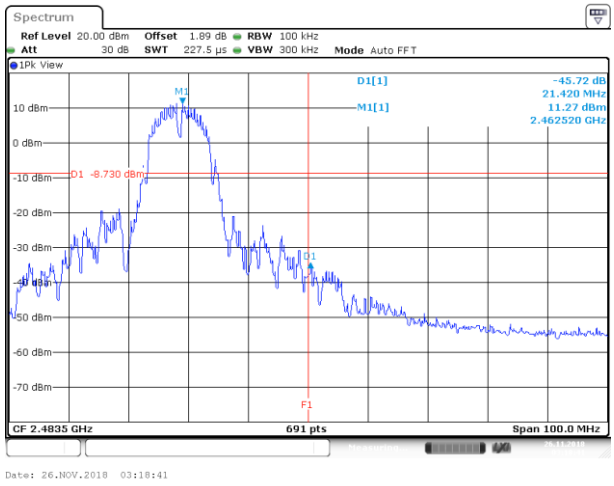
10.4 Test Environmental Conditions

Temperature:	25 ℃	**Relative Humidity:**	45 %
ATM Pressure:	1015hPa	**Test Engineer:**	Leo Chang
Conducted Test Date:	2018-11-21~2018-11-26	-	-

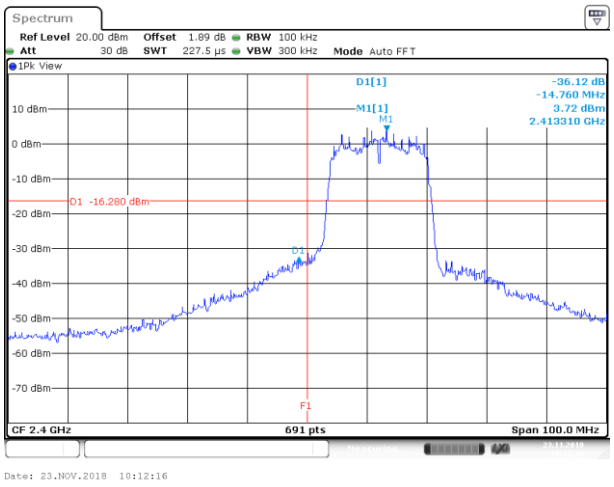
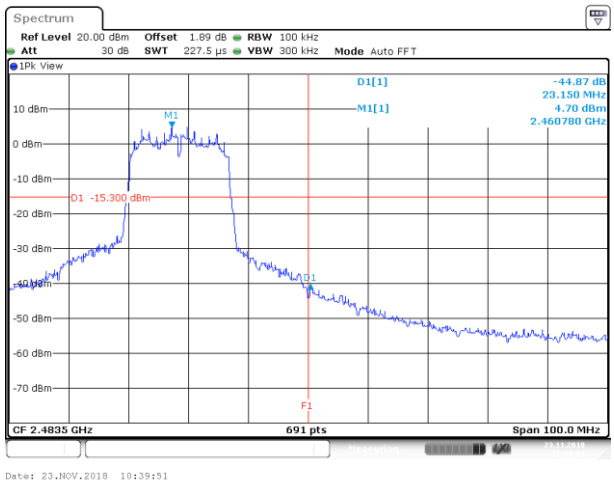
10.5 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
802.11b mode Chain 1				
Low	2412	34.03	≥ 20	Compliance
High	2462	45.72	≥ 20	Compliance
802.11g mode Chain 1				
Low	2412	36.12	≥ 20	Compliance
High	2462	44.87	≥ 20	Compliance
802.11n HT20 mode Chain0				
Low	2412	39.71	≥ 20	Compliance
High	2462	46.49	≥ 20	Compliance
802.11n HT20 mode Chain1				
Low	2412	36.44	≥ 20	Compliance
High	2462	45.44	≥ 20	Compliance
802.11n HT40 mode Chain0				
Low	2422	33.05	≥ 20	Compliance
High	2452	35.80	≥ 20	Compliance
802.11n HT40 mode Chain1				
Low	2422	32.24	≥ 20	Compliance
High	2452	40.87	≥ 20	Compliance
BLE mode				
Low	2402	59.22	≥ 20	Compliance
High	2480	63.63	≥ 20	Compliance

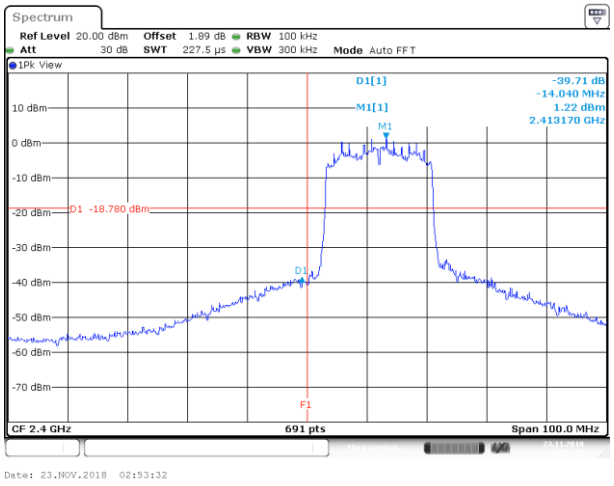
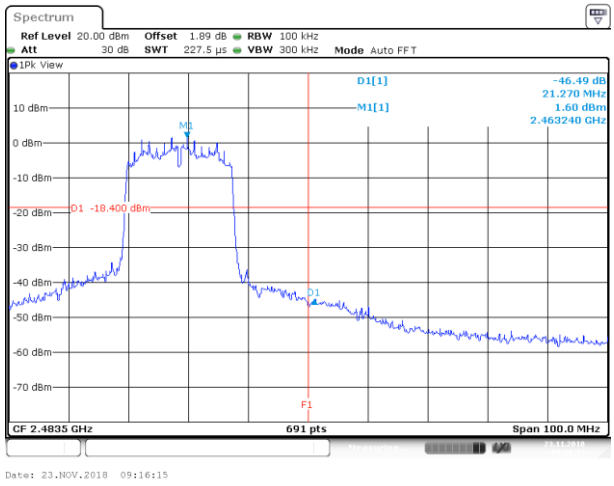
802.11b mode:

Left Side	Right Side
	

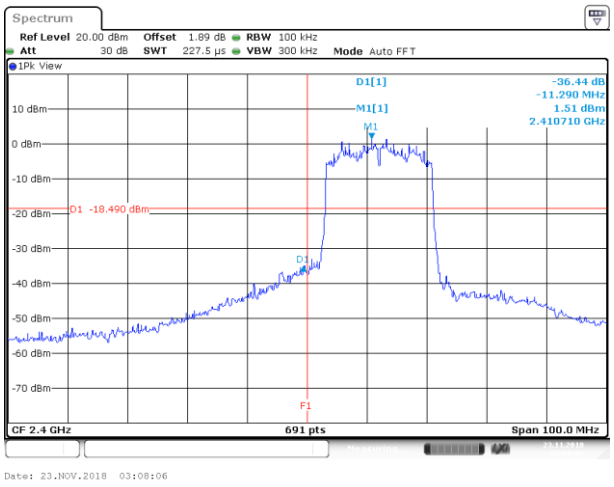
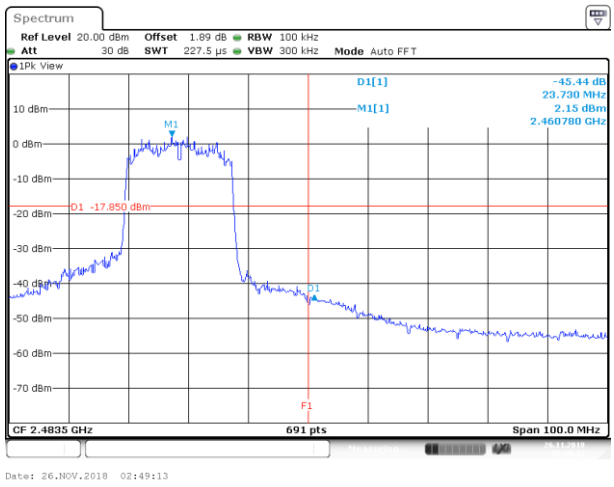
802.11g mode:

Left Side	Right Side
	

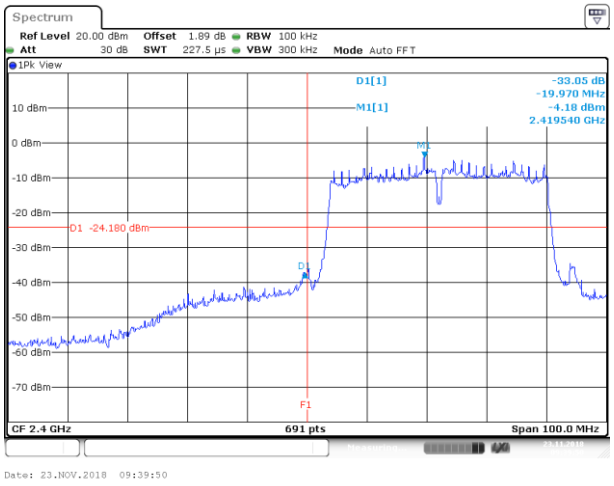
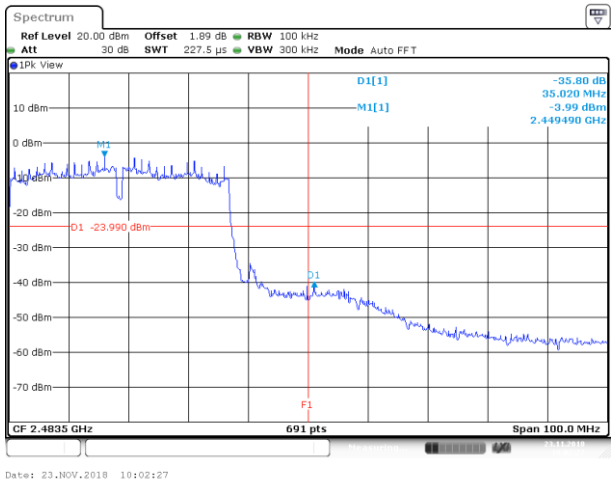
802.11n HT20 mode Chain0:

Left Side	Right Side
	

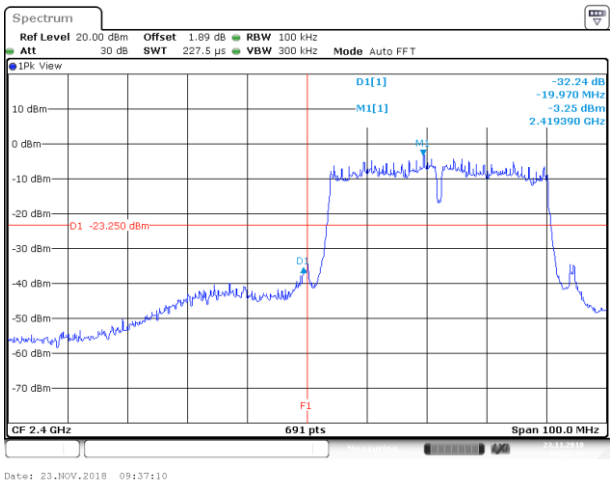
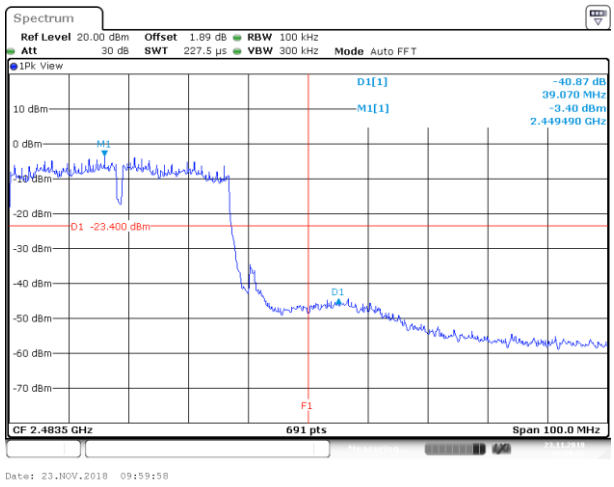
802.11n HT20 mode Chain1:

Left Side	Right Side
	

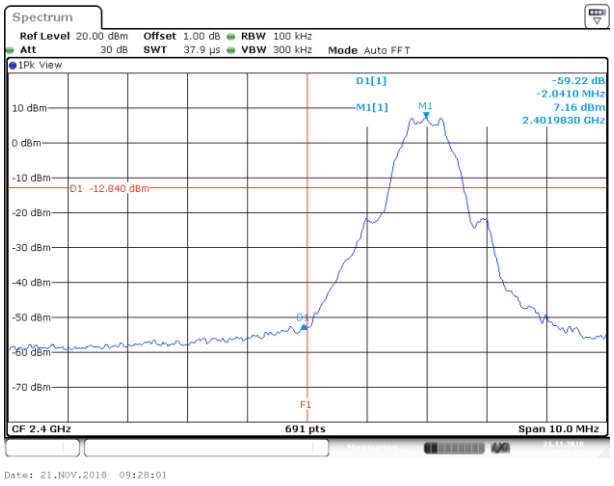
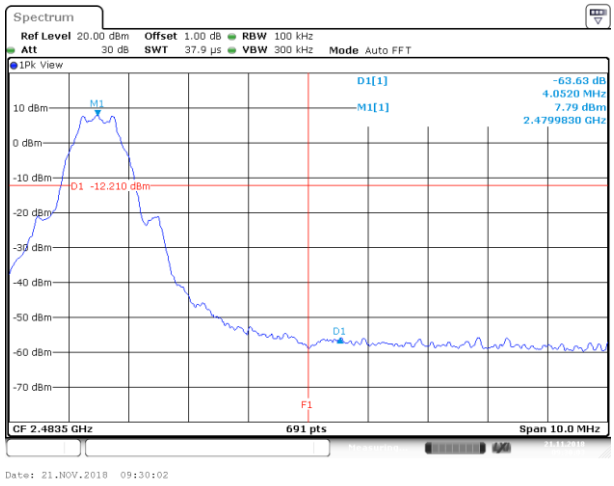
802.11n HT40 mode Chain0:

Left Side	Right Side
	

802.11n HT40 mode Chain1:

Left Side	Right Side
	

BLE mode:

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 $\leq$ RBW $\leq$ 100 kHz.

(4) Set the VBW $\geq$ [3 $\times$ 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					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2018/11/14	2019/11/13
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***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 Environmental Conditions

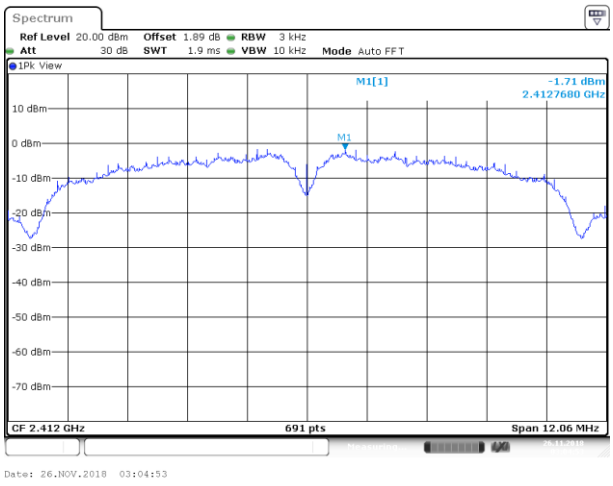
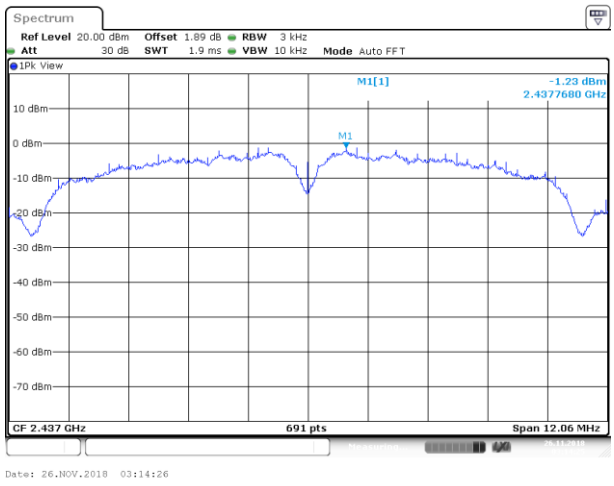
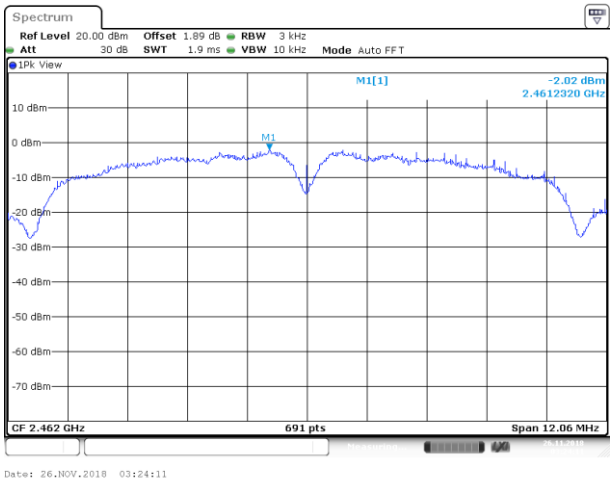
Temperature:	25 ℃	**Relative Humidity:**	45 %
ATM Pressure:	1015hPa	**Test Engineer:**	Leo Chang
Conducted Test Date:	2018-11-21~2018-11-26	-	-

11.5 Test Results

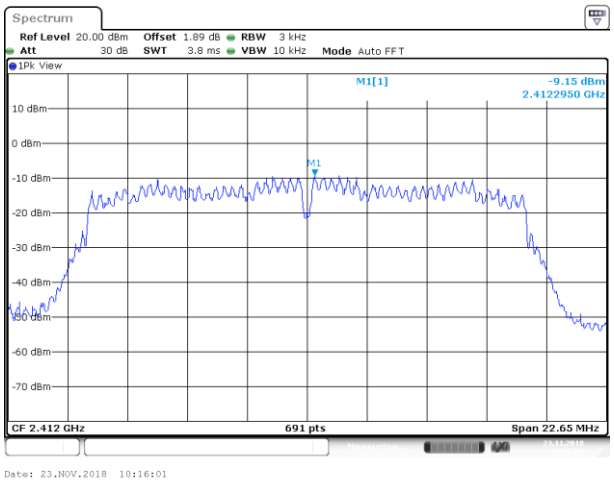
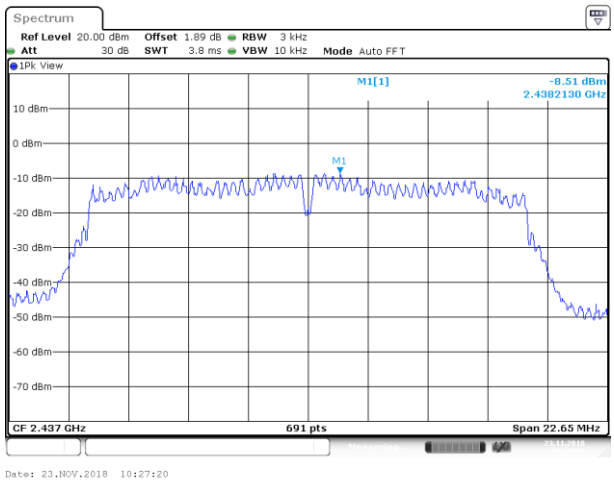
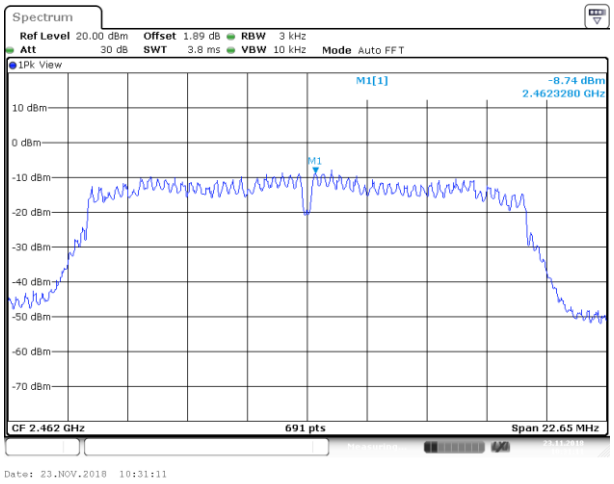
Channel	Frequency (MHz)	Chain0 PSD (dBm/3 kHz)	Chain1 PSD (dBm/3 kHz)	Total PSD (dBm/3 kHz)	PSD DG(dBi)	Limit (dBm/3 kHz)	Result
802.11b mode							
Low	2412	-	-1.71	-1.71	3.20	8	Compliance
Middle	2437	-	-1.23	-1.23	3.20	8	Compliance
High	2462	-	-2.02	-2.02	3.20	8	Compliance
802.11g mode							
Low	2412	-	-9.15	-9.15	3.20	8	Compliance
Middle	2437	-	-8.51	-8.51	3.20	8	Compliance
High	2462	-	-8.74	-8.74	3.20	8	Compliance
802.11n HT20 mode							
Low	2412	-11.65	-11.77	-8.55	6.41	7.59	Compliance
Middle	2437	-11.30	-10.90	-7.93	6.41	7.59	Compliance
High	2462	-11.05	-10.68	-7.70	6.41	7.59	Compliance
802.11n HT40 mode							
Low	2422	-17.86	-16.26	-13.67	6.41	7.59	Compliance
Middle	2437	-16.83	-15.92	-13.03	6.41	7.59	Compliance
High	2452	-17.44	-15.95	-13.31	6.41	7.59	Compliance
BLE mode							
Low	2402	-6.35	-	-6.35	-4.30	8	Compliance
Middle	2440	-5.66	-	-5.66	-4.30	8	Compliance
High	2480	-5.61	-	-5.61	-4.30	8	Compliance

Note: For 802.11n, Due to Antenna with PSD DG (6.41 dBi) greater than 6 dBi. Therefore, Limit = 8 - (DG-6) = 8 - (6.41 – 6) = 7.59 (dBm/3 kHz).

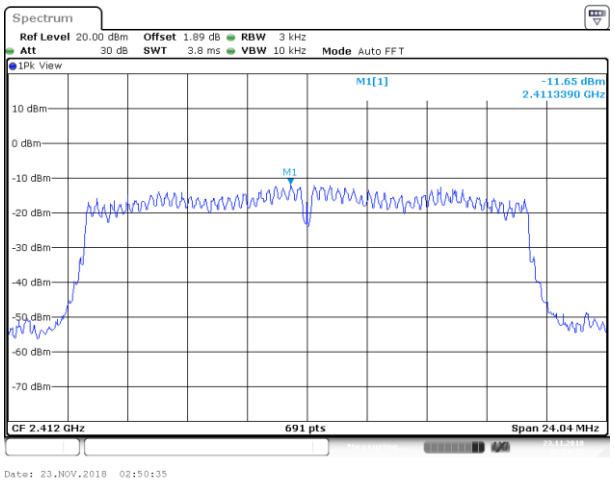
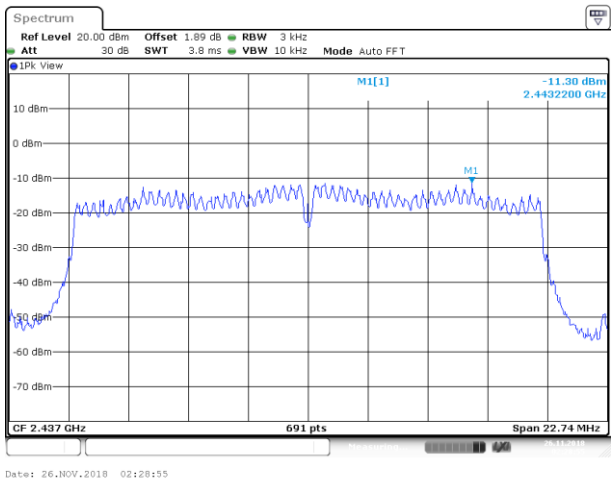
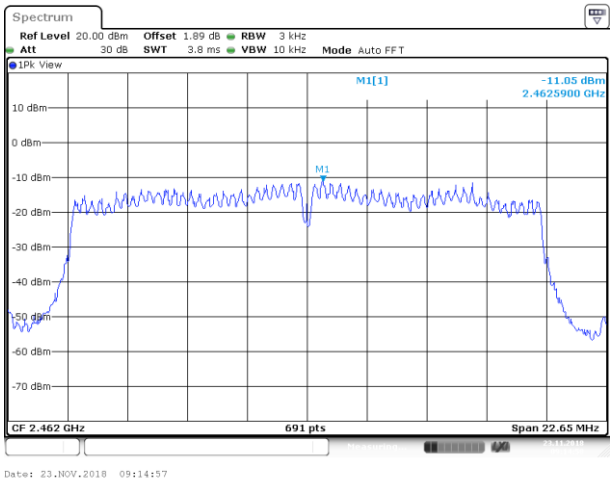
802.11b mode:

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

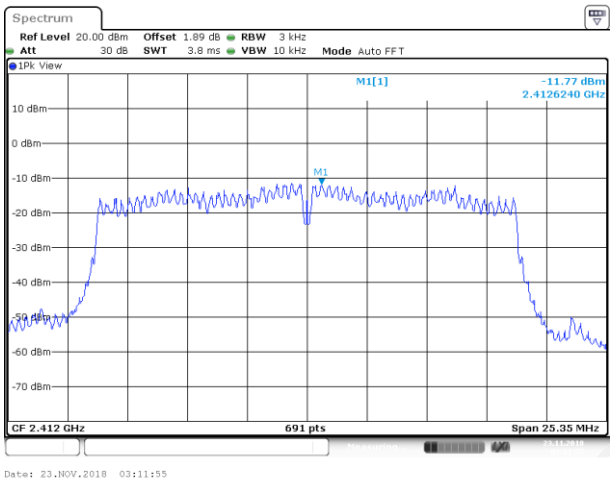
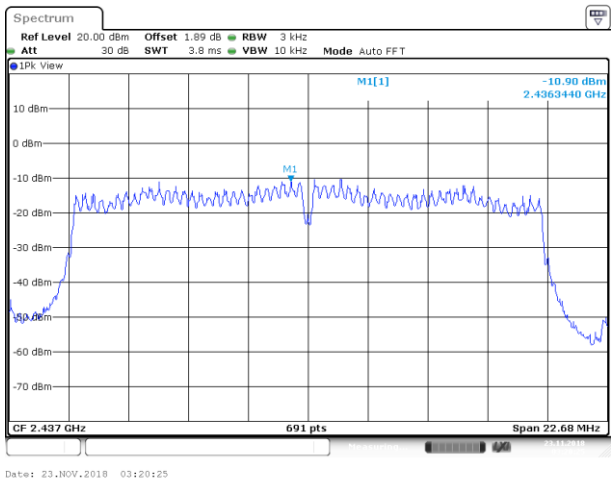
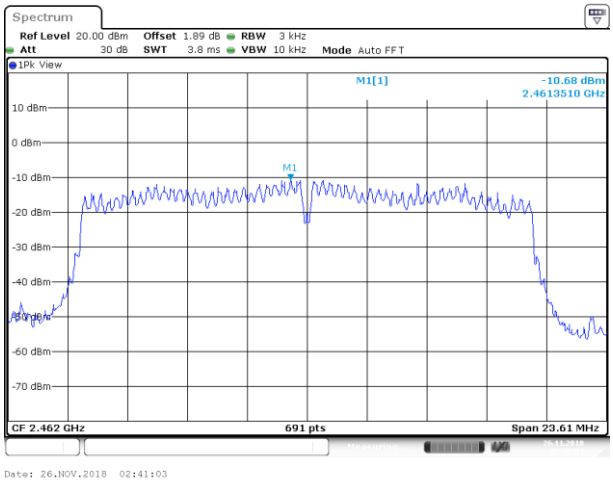
802.11g mode:

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

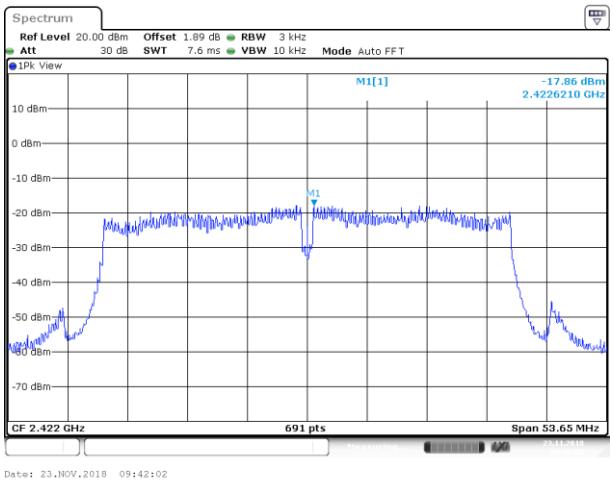
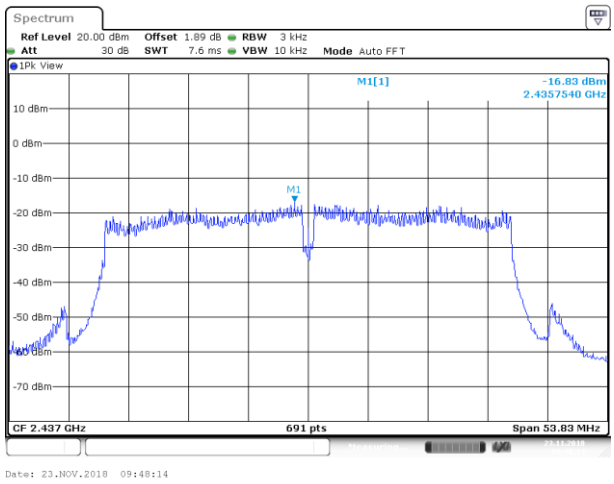
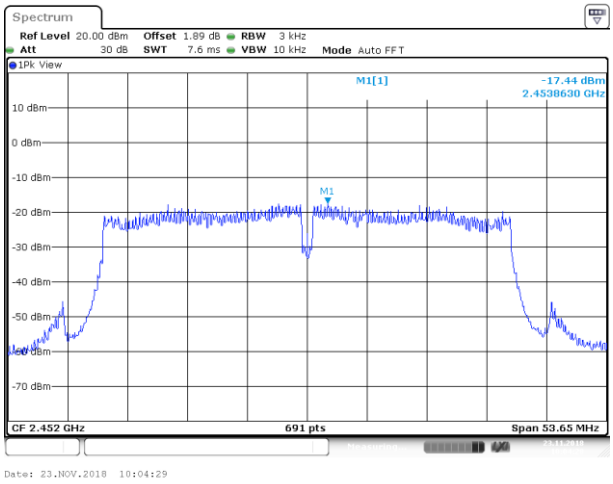
802.11n HT20 mode Chain0:

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

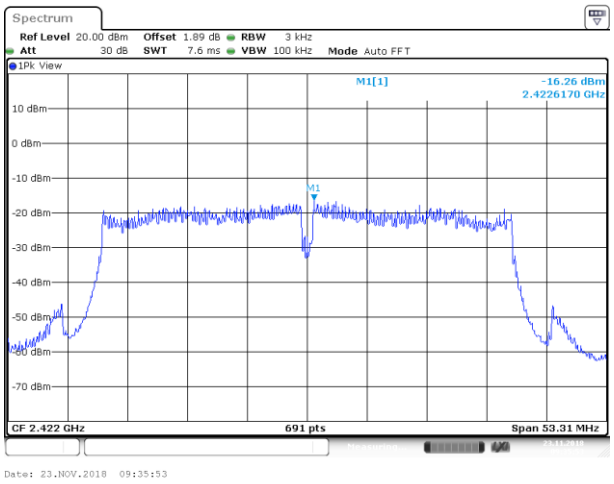
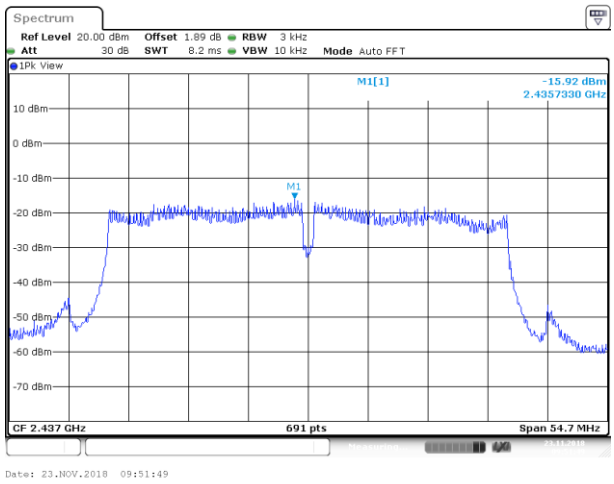
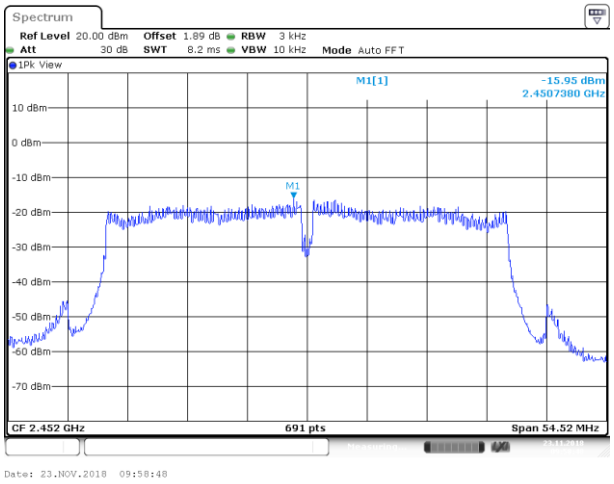
802.11n HT20 mode Chain1:

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

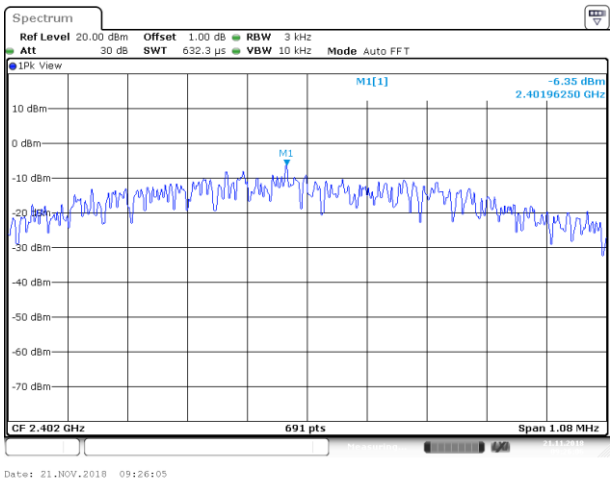
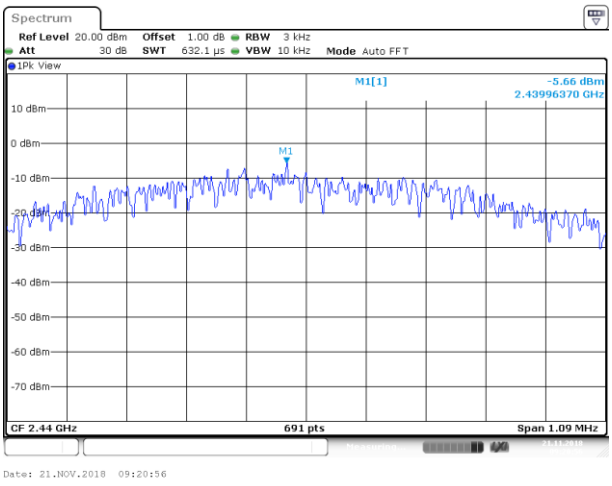
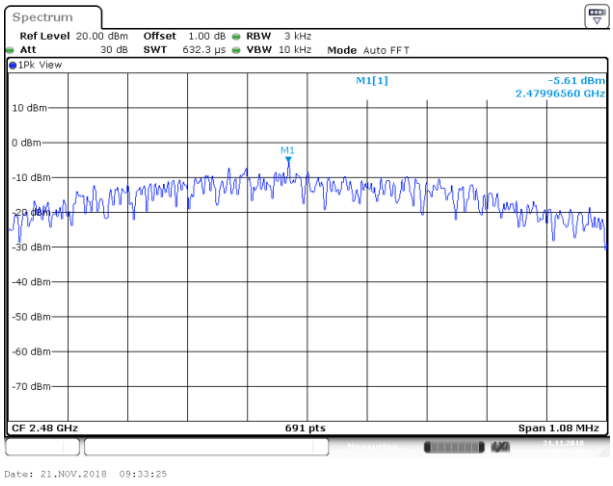
802.11n HT40 mode Chain0:

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

802.11n HT40 mode Chain1:

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

BLE mode:

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

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