TESTING LABORATORY
CERTIFICATE # 4821.01

FCC PART 15.247

TEST REPORT

For

Fametech Inc.

2F, No.167, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

FCC ID: 2ARXO-GC596511

Report Type:	**Product Type:**
Original Report	Mobile Point of System

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TABLE OF CONTENTS

GENERAL INFORMATION **4**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 4
OBJECTIVE 4
RELATED SUBMITTAL(S)/GRANT(S) 4
TEST METHODOLOGY 4
MEASUREMENT UNCERTAINTY 5
SYSTEM TEST CONFIGURATION **6**
DESCRIPTION OF TEST CONFIGURATION 6
EQUIPMENT MODIFICATIONS 6
EUT EXERCISE SOFTWARE 6
DUTY CYCLE 7
SUPPORT EQUIPMENT LIST AND DETAILS 9
EXTERNAL I/O CABLE 10
BLOCK DIAGRAM OF TEST SETUP 10
SUMMARY OF TEST RESULTS **12**
TEST EQUIPMENT LIST **13**
FCC§15.247 (i), §1.1307 (b) (1) & §2.1093 – RF EXPOSURE **15**
APPLICABLE STANDARD 15
FCC §15.203 - ANTENNA REQUIREMENT **16**
APPLICABLE STANDARD 16
ANTENNA CONNECTOR CONSTRUCTION 16
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS **17**
APPLICABLE STANDARD 17
EUT SETUP 17
EMI TEST RECEIVER SETUP 17
TEST PROCEDURE 17
CORRECTED FACTOR & MARGIN CALCULATION 18
TEST RESULTS SUMMARY 18
TEST DATA 18
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS **25**
APPLICABLE STANDARD 25
EUT SETUP 25
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 26
TEST PROCEDURE 26
CORRECTED AMPLITUDE & MARGIN CALCULATION 26
TEST RESULTS SUMMARY 26
TEST DATA 27
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH **39**
APPLICABLE STANDARD 39
TEST PROCEDURE 39
TEST DATA 39

FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER.....47
APPLICABLE STANDARD 47
TEST PROCEDURE 47
TEST DATA 47
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE.....49
APPLICABLE STANDARD 49
TEST PROCEDURE 49
TEST DATA 49
FCC §15.247(e) - POWER SPECTRAL DENSITY 54
APPLICABLE STANDARD 54
TEST PROCEDURE 54
TEST DATA 54

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Mobile Point of System
Tested Model	MP-1311
Frequency Range	WI-FI: 2412~2472MHz
Conducted Peak Power	WIFI: 802.11b:10.17dBm, 802.11G: 12.83dBm, 802.11N20: 13.64dBm, 802.11N40: 13.59dBm
Modulation Technique	WIFI: DSSS, OFDM
Antenna Specification	1.9 dBi
Voltage Range	DC 3.8V from battery or DC 5V from adapter
Date of Test	2018-11-29~2019-08-07
Sample serial number	MP1913100101(Assigned by the client)
Received date	2018-11-02
Sample/EUT Status	Good condition
Adapter information	Model: PA1015-050IB300 Input: AC 100-240V, 50/60Hz, 0.4A Output: DC 5V, 3.0A

Objective

This report is prepared on behalf of *Fametech Inc.* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS submissions with FCC ID: 2ARXO-GC596511.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1℃
Humidity		±6%
Supply voltages		±0.4%

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

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

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

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

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

EUT was tested with Channel 1, 5 and 9.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

"MP Tool"Software was used for test.

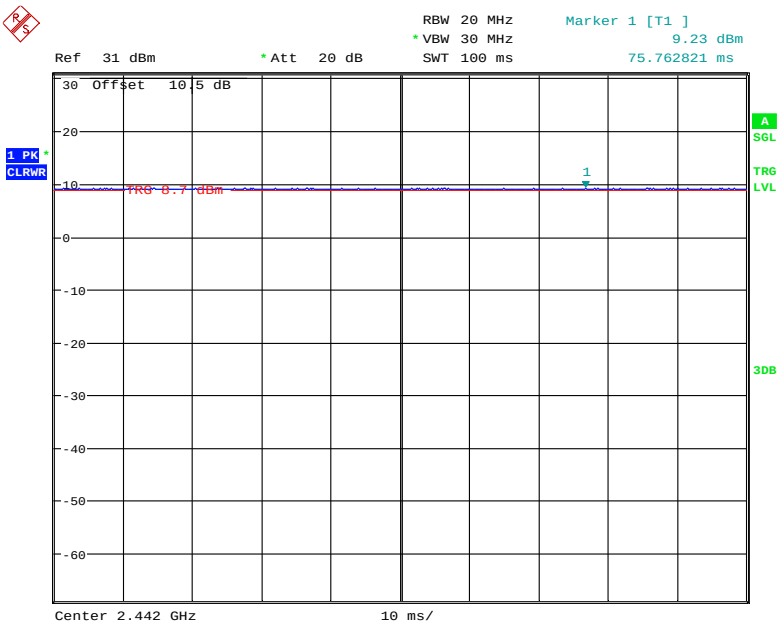
The device was tested with the worst case was performed as below:

Mode	Data rate	Power level		
		Low channel	Middle channel	High channel
802.11b	1 Mbps	32	32	32
802.11g	6 Mbps	39	39	39
802.11n-HT20	MCS0	40	40	40
802.11n-HT40	MCS0	43	43	43

Pre-scan with all the data rates, the above data rate is the worst case for Wi-Fi test.

Duty cycle

802.11b mode



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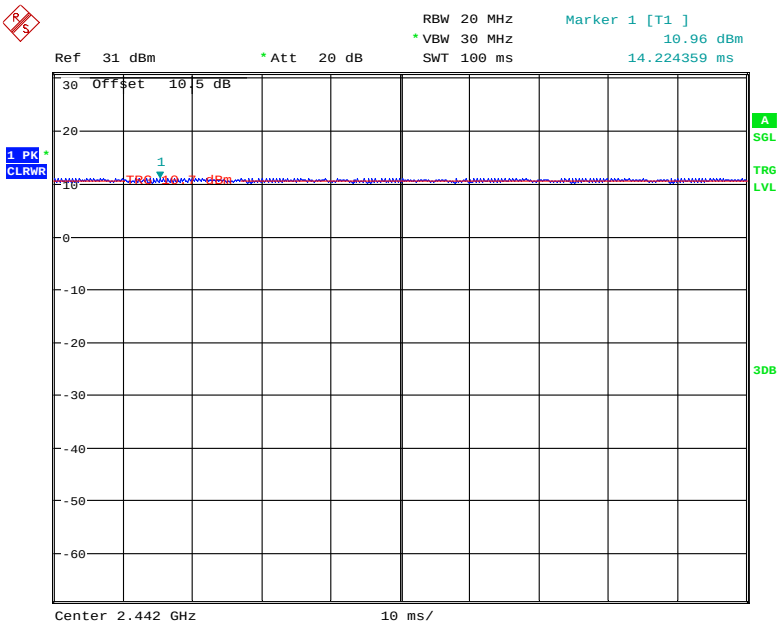
802.11g mode



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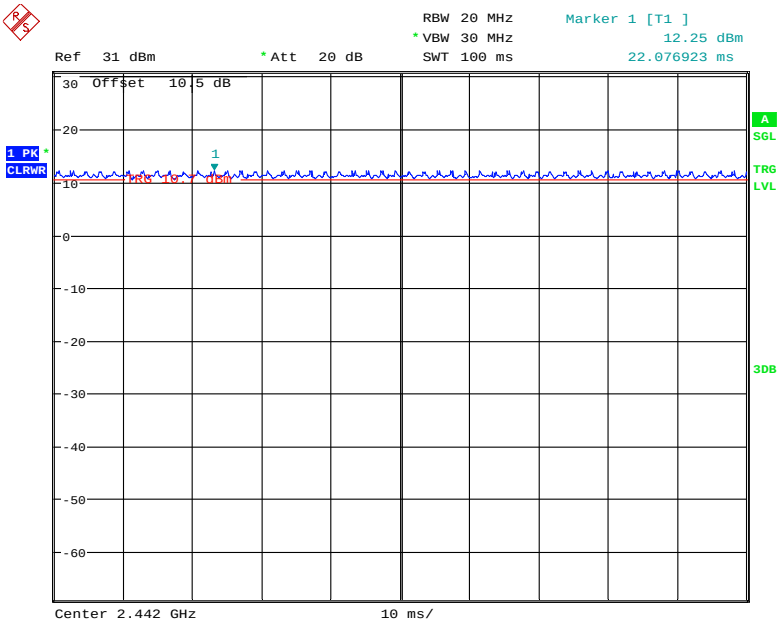
802.11n-HT20 Mode



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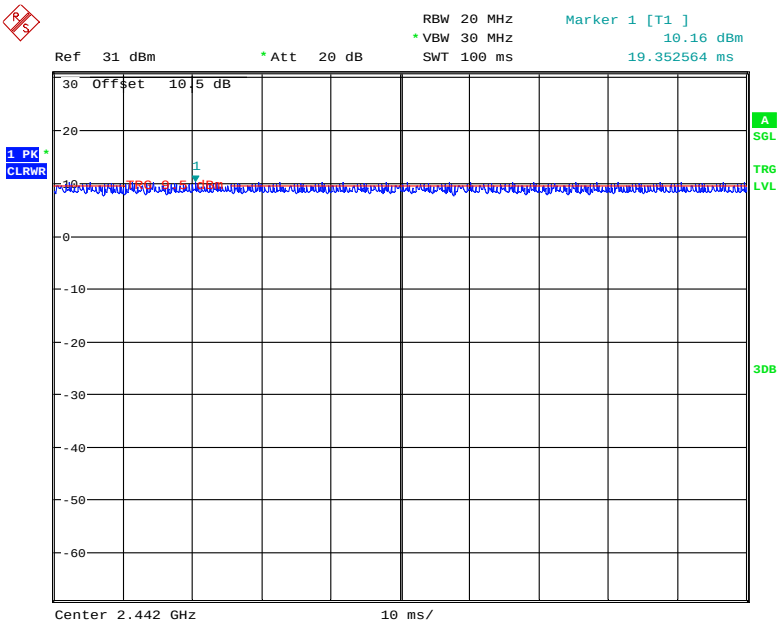
802.11n-HT40 Mode



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Mode	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	10log(1/ Duty Cycle)
802.11b	100	-	-	10Hz	-
802.11g	100	-	-	10Hz	-
802.11n-HT20	100	-	-	10Hz	-
802.11n-HT40	100	-	-	10Hz	-

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
BULL	Receptacle	GN-415K	5503290068073
PHILIPS	Earphone	SBCHP250	N/A
N/A	USB flash disk	N/A	N/A
DELL	HDMI Monitor	ST2420Lb	CN-0X0K27-74261-2AF-090U
SASUNG	HDMI Monitor	225MS	CR22HVZP401073M
Microsoft	Keyboard	1406	0200706128743
DELL	Mouse	MOC5UO	G1900NKD
SAST	Modem	AEM-2100	0293

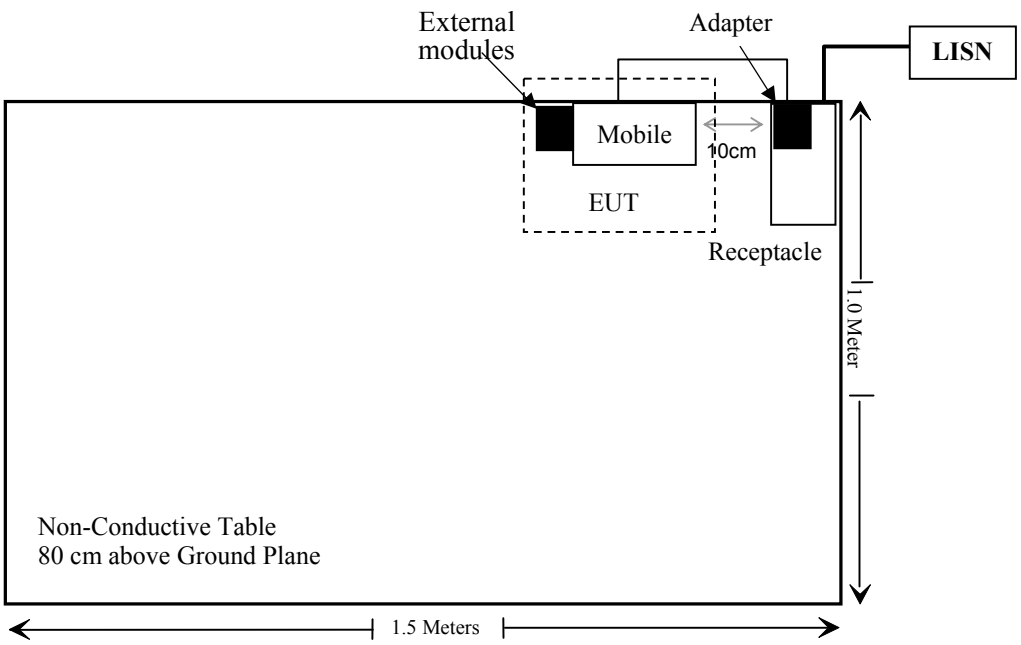
External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-shielding Un-detachable AC cable	1.0	Receptacle	LISN
Un-Shielding Un-Detachable DC Cable	1.2	EUT	Adapter
Un-Shielding Un-Detachable DC Cable	1.2	Base	Adapter
Un-Shielding Un-Detachable USB Cable	1.2	Base	Mouse
Un-Shielding Un-Detachable USB Cable	1.2	Base	Keyboard
Shielding Detachable Serial Cable	1.2	Host PC	Modem
Un-shielding Detachable Earphone Cable	1.2	EUT	Earphone
Shielding Detachable HDMI Cable	1.0	EUT	HDMI Monitor
Un-shielding Detachable AC cable	1.5	HDMI Monitor	LISN 2

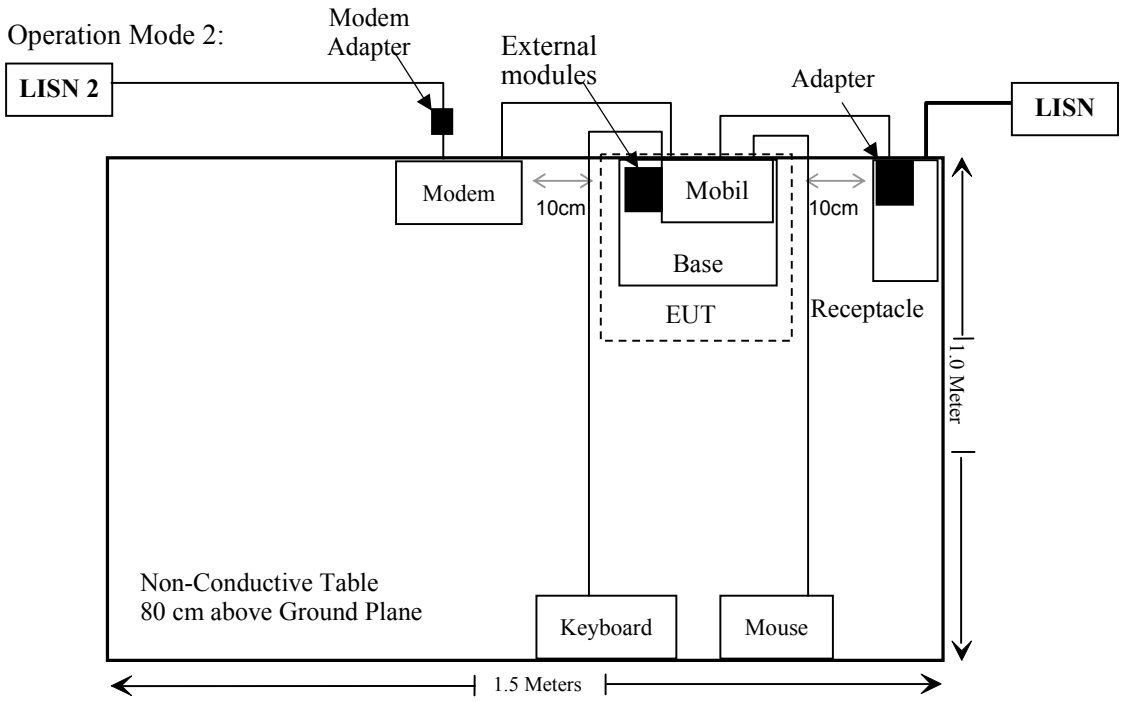
Block Diagram of Test Setup

For conducted emission:

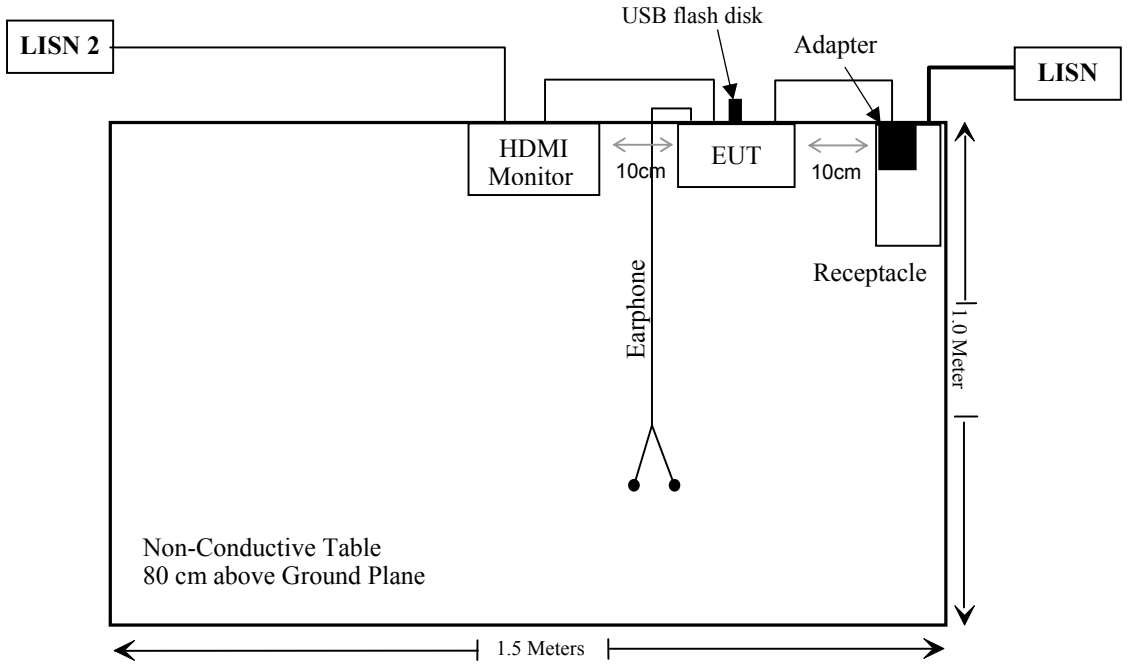
EUT Operation Mode 1:



EUT Operation Mode 2:



EUT Operation Mode 3:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1)& §2.1093	RF Exposure	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 Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2018-07-11	2019-07-11
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2019-01-25	2020-01-25
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2019-03-02	2020-03-01
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Unknown	Conducted Emission Cable	78652	UF A210B-1-0720-504504	2018-11-12	2019-11-12
Radiated Emission Test					
A.H. System	Horn Antenna	SAS-200/571	135	2018-09-01	2021-08-31
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-07-22	2019-07-21
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
COM-POWER	Pre-amplifier	PA-122	181919	2018-11-12	2019-11-12
Sonoma Instrument	Amplifier	310N	186238	2018-11-12	2019-11-12
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2018-07-11	2019-07-11
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-07-11	2020-07-11
UTiFLEX MICRO-C0AX	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-11-12	2019-11-12
Ducommun Technologies	RF Cable	104PEA	218124002	2018-11-12	2019-11-12
Ducommun Technologies	RF Cable	RG-214	1	2018-11-19	2019-05-21
Ducommun Technologies	RF Cable	RG-214	1	2019-05-21	2019-11-19
Ducommun Technologies	RF Cable	RG-214	2	2018-11-12	2019-11-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Heatsink Required	Amplifier	QLW-18405536-J0	15964001002	2018-11-12	2019-11-12
Sinoscite	Band Reject Filter	BSF2402-2480MN-0898-001	99632	2018-11-12	2019-11-12
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Agilent	USB wideband power meter	U2021XA	MY54250003	2018-07-10	2019-07-09
WEINSCHEL	10dB Attenuator	5324	AU 3842	Each Time	
Rohde & Schwarz	Spectrum Analyzer	FSU26	200120	2018-03-02	2019-03-01
Ducommun Technologies	RF Cable	RG-214	3	Each Time	

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

FCC§15.247 (i), §1.1307 (b) (1) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Measurement Result

For worst case:

Mode	Frequency (MHz)	Ave. Tune-up Conducted Power (dBm)	Ave. Tune-up Conducted Power (mW)	Calculated Distance (mm)	Calculated value	Threshold (1-g SAR)	SAR Test Exclusion
Wi-Fi	2472	8.0	6.31	5	2.1	3.0	Yes

Result: No SAR test is required

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

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

Antenna Connector Construction

The EUT has an integrated antenna arrangement, which was permanently attached and the antenna gain is 1.9 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

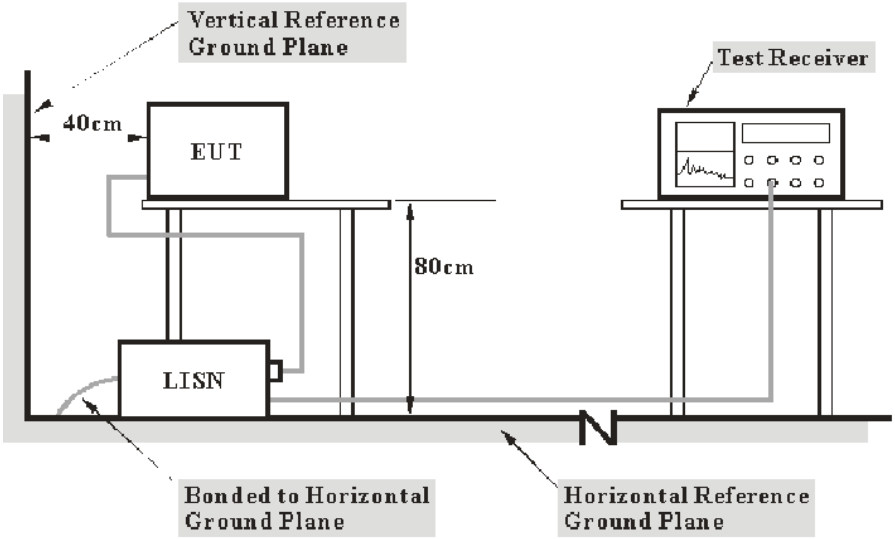
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

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

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

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

Test Procedure

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

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

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

Corrected Factor & Margin Calculation

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

Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

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

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

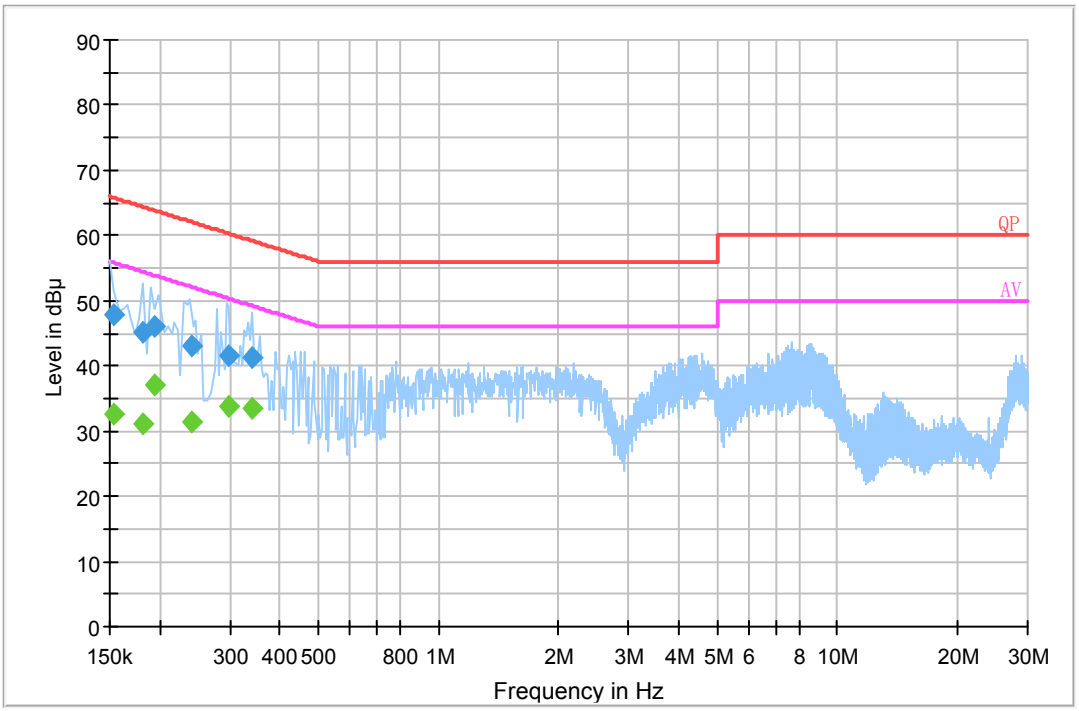
Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2019-04-24.

Wi-Fi Mode:

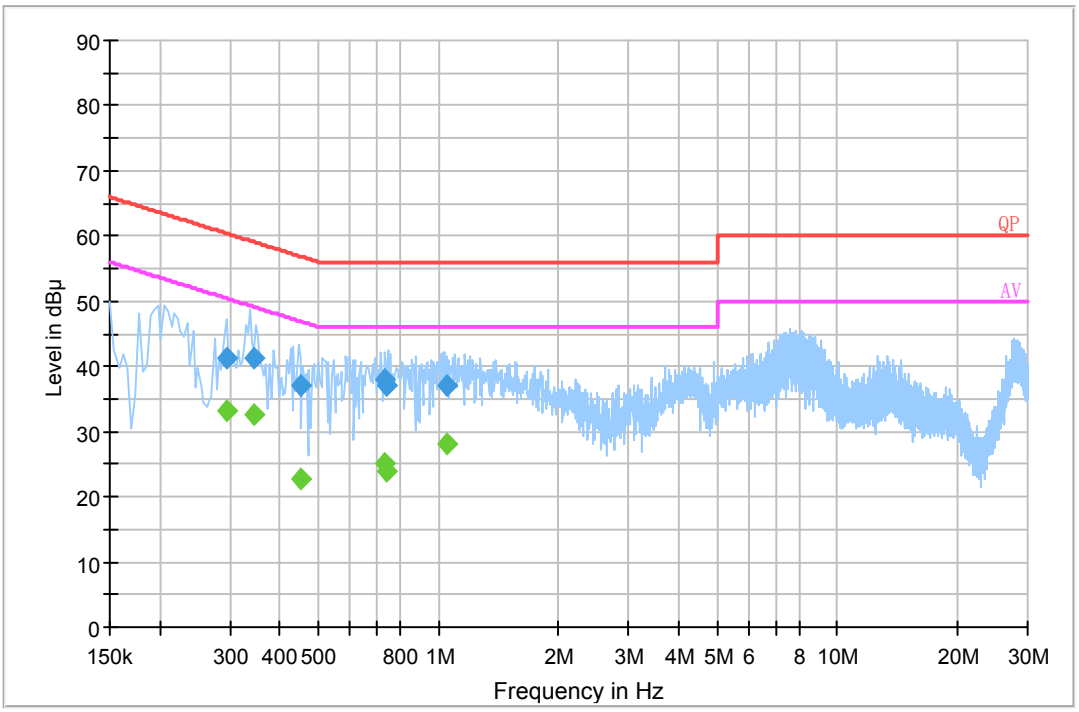
EUT Operation Mode: Transmitting& charging by adapter (with external modules)

AC 120 V/60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.154000	47.8	19.8	65.8	18.0	QP
0.181500	45.2	19.9	64.4	19.2	QP
0.193500	46.1	19.8	63.9	17.8	QP
0.241500	43.0	19.8	62.0	19.0	QP
0.297500	41.6	19.7	60.3	18.7	QP
0.340870	41.2	19.9	59.2	18.0	QP
0.154000	32.6	19.8	55.8	23.2	Ave.
0.181500	31.0	19.9	54.4	23.4	Ave.
0.193500	37.1	19.8	53.9	16.8	Ave.
0.241500	31.4	19.8	52.0	20.6	Ave.
0.297500	33.8	19.7	50.3	16.5	Ave.
0.340870	33.5	19.9	49.2	15.7	Ave.

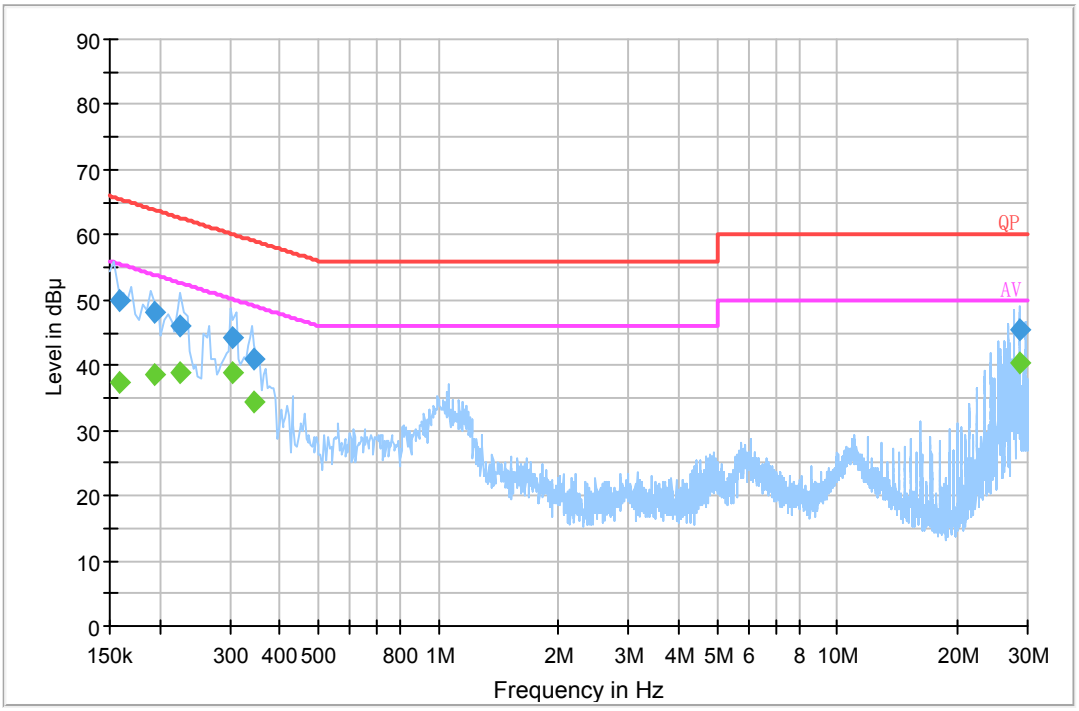
AC 120V/ 60 Hz, Neutral:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.293500	41.4	19.7	60.4	19.0	QP
0.343070	41.3	19.8	59.1	17.8	QP
0.451310	37.1	19.8	56.9	19.8	QP
0.734810	37.9	19.8	56.0	18.1	QP
0.745010	37.0	19.8	56.0	19.0	QP
1.045450	37.2	19.8	56.0	18.8	QP
0.293500	33.3	19.7	50.4	17.1	Ave.
0.343070	32.6	19.8	49.1	16.5	Ave.
0.451310	22.7	19.8	46.9	24.2	Ave.
0.734810	25.2	19.8	46.0	20.8	Ave.
0.745010	24.0	19.8	46.0	22.0	Ave.
1.045450	28.0	19.8	46.0	18.0	Ave.

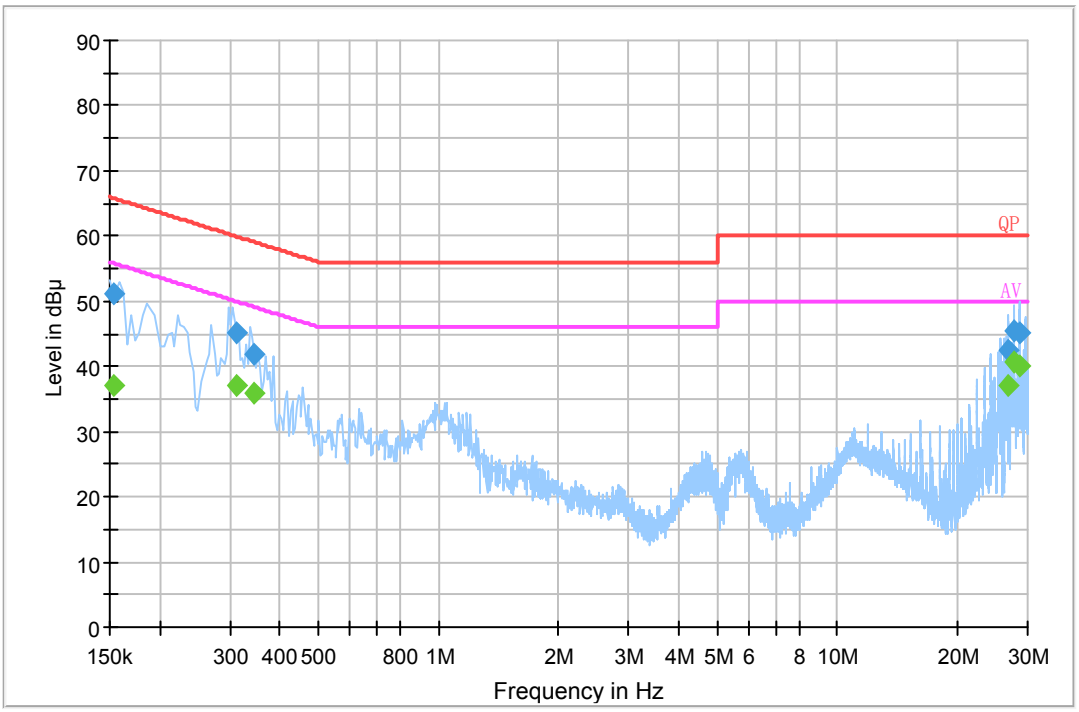
EUT Operation Mode: Transmitting& charging by base (with external modules)

AC 120 V/60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.158500	50.0	19.8	65.5	15.5	QP
0.193500	48.0	19.8	63.9	15.9	QP
0.225500	46.1	19.8	62.6	16.5	QP
0.305470	44.3	19.7	60.1	15.8	QP
0.344870	41.1	19.9	59.1	18.1	QP
28.632670	45.4	20.2	60.0	14.6	QP
0.158500	37.4	19.8	55.5	18.2	Ave.
0.193500	38.5	19.8	53.9	15.4	Ave.
0.225500	38.8	19.8	52.6	13.8	Ave.
0.305470	38.7	19.7	50.1	11.4	Ave.
0.344870	34.5	19.9	49.1	14.6	Ave.
28.632670	40.3	20.2	50.0	9.7	Ave.

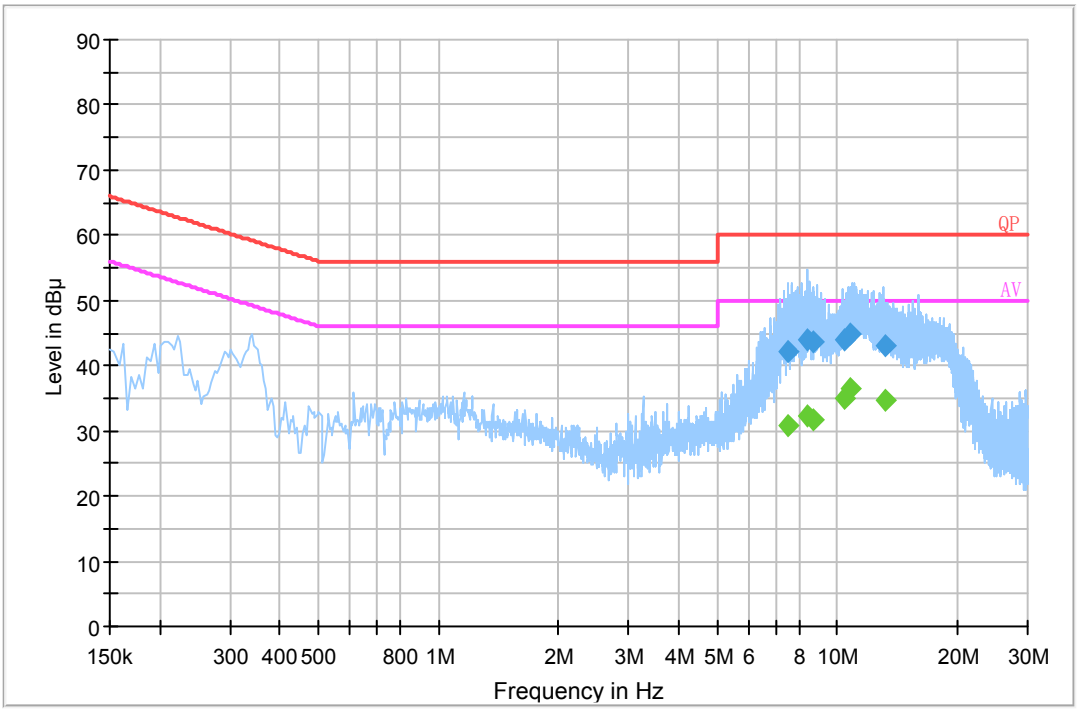
AC 120V/ 60 Hz, Neutral:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.153500	51.0	19.8	65.8	14.8	QP
0.310590	45.1	19.7	60.0	14.9	QP
0.343070	41.9	19.8	59.1	17.2	QP
26.721470	42.3	20.2	60.0	17.7	QP
27.659430	45.4	20.2	60.0	14.6	QP
28.604910	45.2	20.2	60.0	14.8	QP
0.153500	36.9	19.8	55.8	18.9	Ave.
0.310590	37.2	19.7	50.0	12.8	Ave.
0.343070	35.8	19.8	49.1	13.3	Ave.
26.721470	37.0	20.2	50.0	13.0	Ave.
27.659430	40.5	20.2	50.0	9.5	Ave.
28.604910	40.0	20.2	50.0	10.0	Ave.

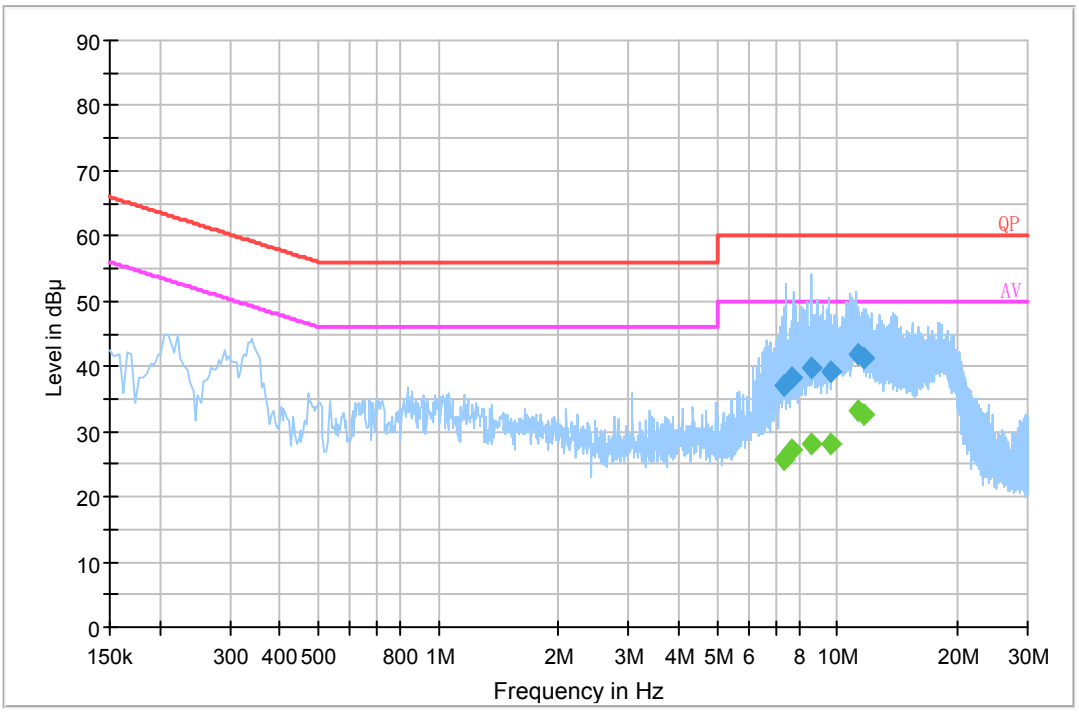
EUT Operation Mode: Transmitting& charging by adapter& HDMI out (only tablet)

AC 120 V/60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
7.524810	42.1	19.9	60.0	17.9	QP
8.440030	44.0	20.0	60.0	16.0	QP
8.677630	43.5	20.0	60.0	16.5	QP
10.446750	44.0	20.0	60.0	16.0	QP
10.827130	44.9	20.0	60.0	15.1	QP
13.201890	42.9	20.0	60.0	17.1	QP
7.524810	30.8	19.9	50.0	19.2	Ave.
8.440030	32.2	20.0	50.0	17.8	Ave.
8.677630	31.7	20.0	50.0	18.3	Ave.
10.446750	34.9	20.0	50.0	15.1	Ave.
10.827130	36.5	20.0	50.0	13.5	Ave.
13.201890	34.6	20.0	50.0	15.4	Ave.

AC 120V/ 60 Hz, Neutral:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
7.378850	37.2	19.9	60.0	22.8	QP
7.728790	38.4	19.9	60.0	21.6	QP
8.589450	39.6	19.9	60.0	20.4	QP
9.603350	39.0	20.0	60.0	21.0	QP
11.306210	41.7	20.0	60.0	18.3	QP
11.666530	41.2	20.0	60.0	18.8	QP
7.378850	25.7	19.9	50.0	24.3	Ave.
7.728790	27.3	19.9	50.0	22.7	Ave.
8.589450	28.0	19.9	50.0	22.0	Ave.
9.603350	28.2	20.0	50.0	21.8	Ave.
11.306210	33.3	20.0	50.0	16.7	Ave.
11.666530	32.5	20.0	50.0	17.5	Ave.

Note:
1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
2) Corrected Amplitude = Reading + Correction Factor
3) Margin = Limit – Corrected Amplitude

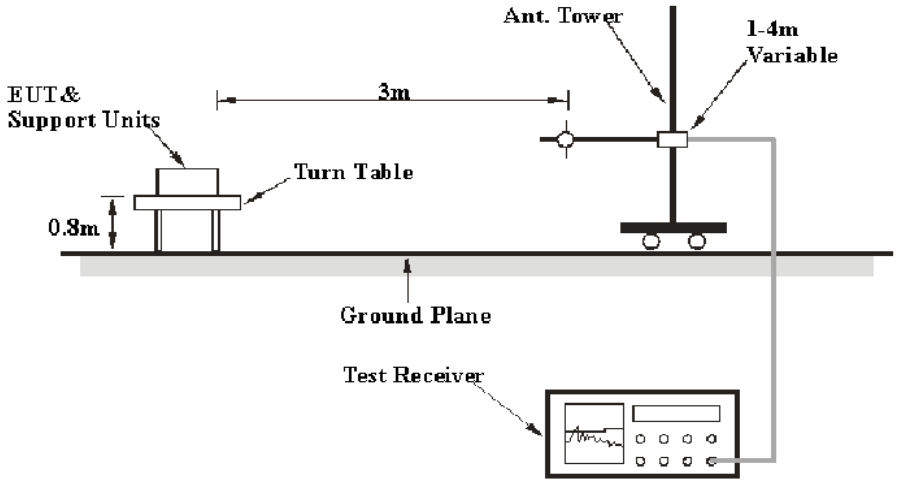
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

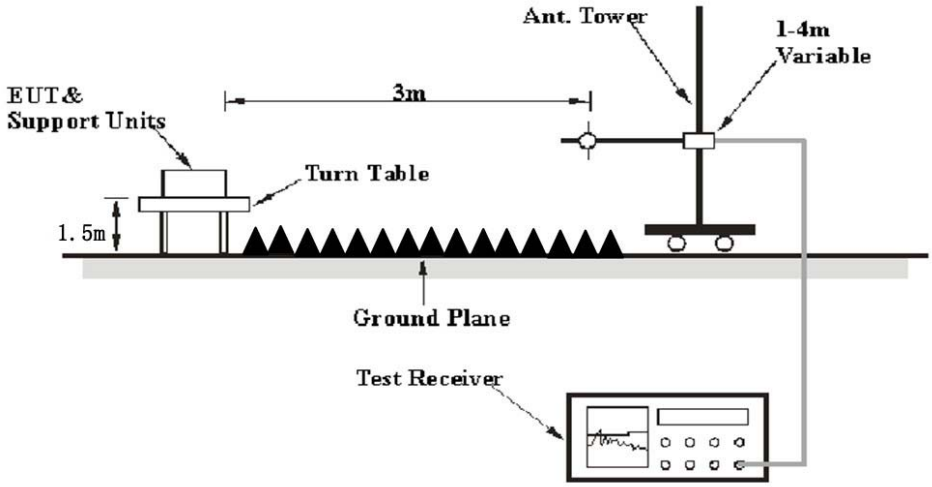
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



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

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

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

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

Test Procedure

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

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

Corrected Amplitude & Margin Calculation

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

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

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

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Test Data

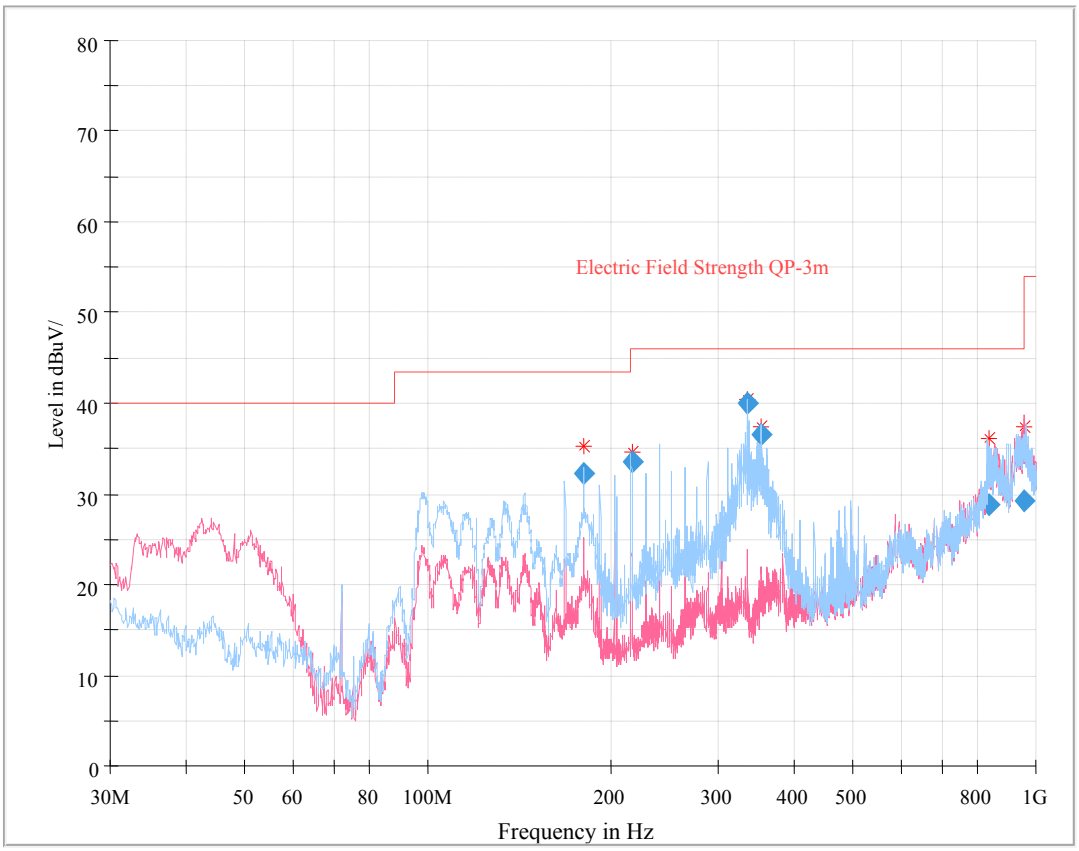
Environmental Conditions

Temperature:	23~25 ℃
Relative Humidity:	49~50 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Leo Huang and Curry Xiang from 2019-04-21 to 2019-08-07.

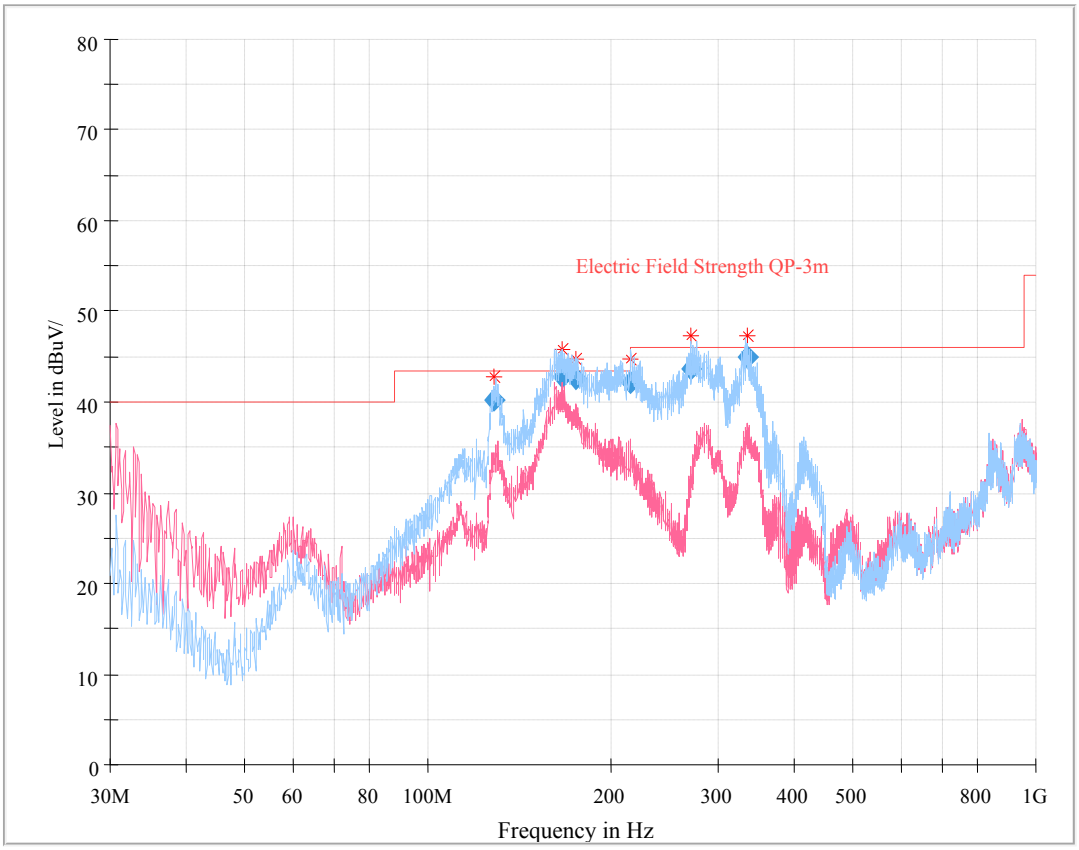
30 MHz~1 GHz:

EUT Operation Mode: Transmitting& charging by adapter (with external modules)



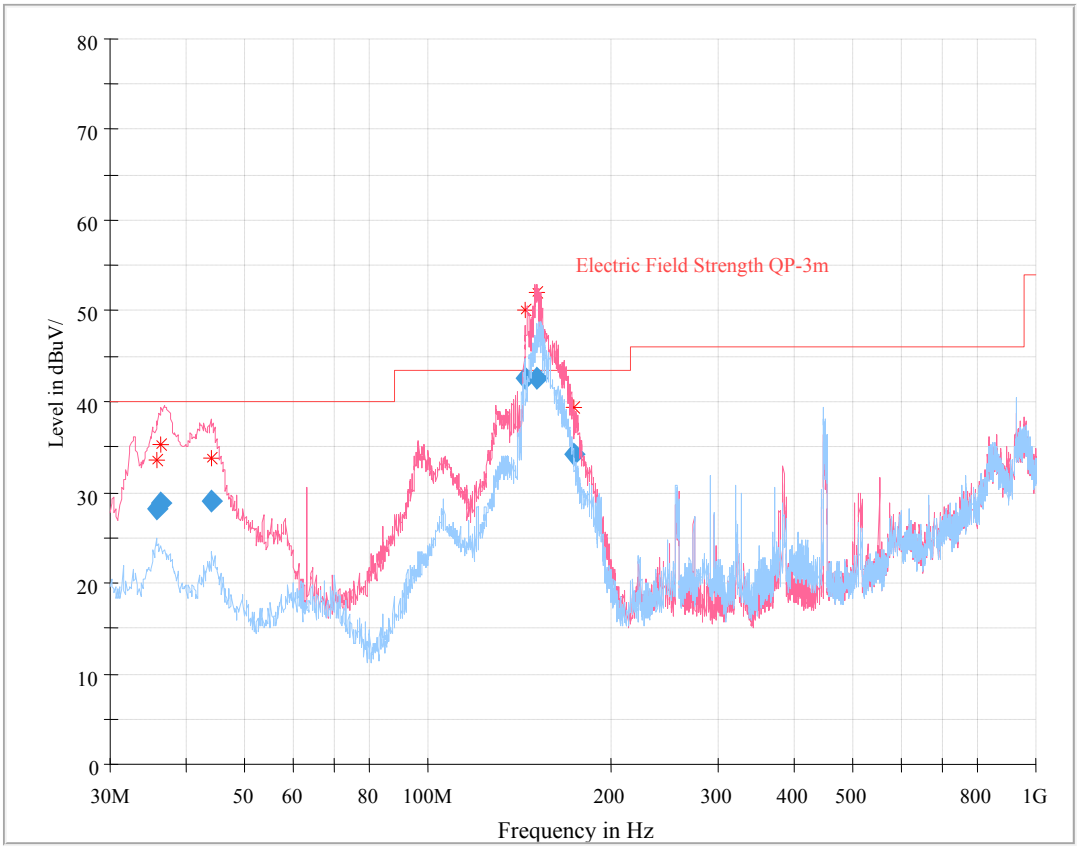
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
179.989875	32.30	140.0	H	101.0	-15.2	43.50	11.20
216.184000	33.48	118.0	H	263.0	-13.9	46.00	12.52
336.353875	40.03	108.0	H	74.0	-10.8	46.00	5.97
353.756875	36.53	108.0	H	84.0	-10.8	46.00	9.47
840.358000	28.80	204.0	H	220.0	6.0	46.00	17.20
959.751375	29.35	393.0	V	0.0	9.2	46.00	16.65

EUT Operation Mode: Transmitting& charging by base (with external modules)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
128.905500	40.27	308.0	H	317.0	-13.7	43.50	3.23
166.020000	42.77	157.0	H	279.0	-14.7	43.50	0.73
174.950000	42.62	157.0	H	289.0	-15.1	43.50	0.88
215.693000	42.25	114.0	H	309.0	-13.9	43.50	1.25
271.027125	43.63	122.0	H	280.0	-12.6	46.00	2.37
334.222500	44.89	110.0	H	64.0	-10.8	46.00	1.11

EUT Operation Mode: Transmitting& charging by adapter& HDMI out (only tablet)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
35.692750	28.13	108.0	V	103.0	-11.0	40.00	11.87
36.443375	28.82	109.0	V	90.0	-11.5	40.00	11.18
43.926250	29.10	106.0	V	173.0	-16.5	40.00	10.90
144.617375	42.56	100.0	V	289.0	-14.2	43.50	0.94
150.992500	42.51	100.0	V	283.0	-14.2	43.50	0.99
173.286875	34.16	106.0	V	0.0	-15.0	43.50	9.34

1 GHz-25 GHz: (worst case)

802.11b Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2412 MHz)									
2390.00	27.60	PK	115	1.0	H	33.00	60.60	74	13.40
2390.00	13.54	AV	115	1.0	H	33.00	46.54	54	7.46
2483.50	27.84	PK	147	2.4	H	33.20	61.04	74	12.96
2483.50	13.76	AV	147	2.4	H	33.20	46.96	54	7.04
4824.00	44.69	PK	171	1.3	H	7.88	52.57	74	21.43
4824.00	31.10	AV	171	1.3	H	7.88	38.98	54	15.02
Middle Channel (2442MHz)									
4884.00	42.90	PK	155	1.9	H	9.21	52.11	74	21.89
4884.00	28.77	AV	155	1.9	H	9.21	37.98	54	16.02
High Channel (2472 MHz)									
2390.00	27.84	PK	45	1.9	H	33.00	60.84	74	13.16
2390.00	13.86	AV	45	1.9	H	33.00	46.86	54	7.14
2483.50	31.23	PK	248	1.3	H	33.20	64.43	74	9.57
2483.50	20.75	AV	248	1.3	H	33.20	53.95	54	0.05
4944.00	43.82	PK	105	1.4	H	9.21	53.03	74	20.97
4944.00	29.70	AV	105	1.4	H	9.21	38.91	54	15.09

802.11g Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2412 MHz)									
2390.00	27.40	PK	49	1.4	H	33.00	60.40	74	13.60
2390.00	13.65	AV	49	1.4	H	33.00	46.65	54	7.35
2483.50	27.49	PK	245	1.1	H	33.20	60.69	74	13.31
2483.50	13.74	AV	245	1.1	H	33.20	46.94	54	7.06
4824.00	42.59	PK	85	1.6	H	7.88	50.47	74	23.53
4824.00	28.44	AV	85	1.6	H	7.88	36.32	54	17.68
Middle Channel (2442MHz)									
4884.00	42.77	PK	246	1.0	H	9.21	51.98	74	22.02
4884.00	28.61	AV	246	1.0	H	9.21	37.82	54	16.18
High Channel (2472 MHz)									
2390.00	27.48	PK	14	1.9	H	33.00	60.48	74	13.52
2390.00	13.60	AV	14	1.9	H	33.00	46.60	54	7.40
2483.50	38.66	PK	243	2.2	H	33.20	71.86	74	2.14
2483.50	17.95	AV	243	2.2	H	33.20	51.15	54	2.85
4944.00	43.40	PK	48	2.4	H	9.21	52.61	74	21.39
4944.00	29.60	AV	48	2.4	H	9.21	38.81	54	15.19

802.11n-HT20 Mode:

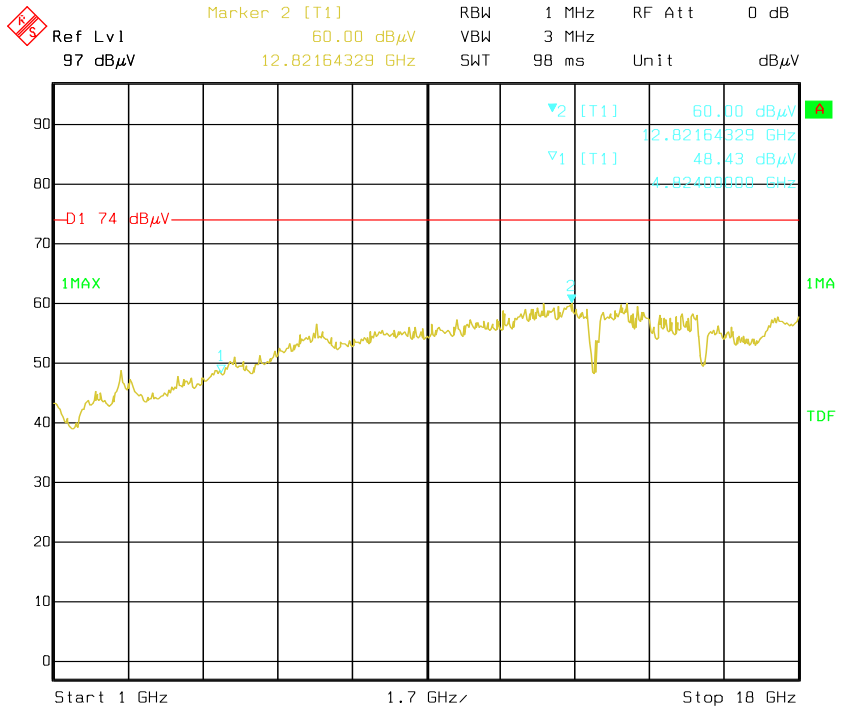
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2412 MHz)									
2390.00	27.46	PK	351	2.4	H	33.00	60.46	74	13.54
2390.00	13.55	AV	351	2.4	H	33.00	46.55	54	7.45
2483.50	27.84	PK	345	1.6	H	33.20	61.04	74	12.96
2483.50	13.59	AV	345	1.6	H	33.20	46.79	54	7.21
4824.00	42.55	PK	182	1.0	H	7.88	50.43	74	23.57
4824.00	28.37	AV	182	1.0	H	7.88	36.25	54	17.75
Middle Channel (2442MHz)									
4884.00	42.90	PK	199	1.6	H	9.21	52.11	74	21.89
4884.00	28.66	AV	199	1.6	H	9.21	37.87	54	16.13
High Channel (2472 MHz)									
2390.00	27.84	PK	357	1.8	H	33.00	60.84	74	13.16
2390.00	13.65	AV	357	1.8	H	33.00	46.65	54	7.35
2483.50	40.30	PK	275	1.1	H	33.20	73.50	74	0.50
2483.50	19.21	AV	275	1.1	H	33.20	52.41	54	1.59
4944.00	43.51	PK	109	1.2	H	9.21	52.72	74	21.28
4944.00	28.99	AV	109	1.2	H	9.21	38.20	54	15.80

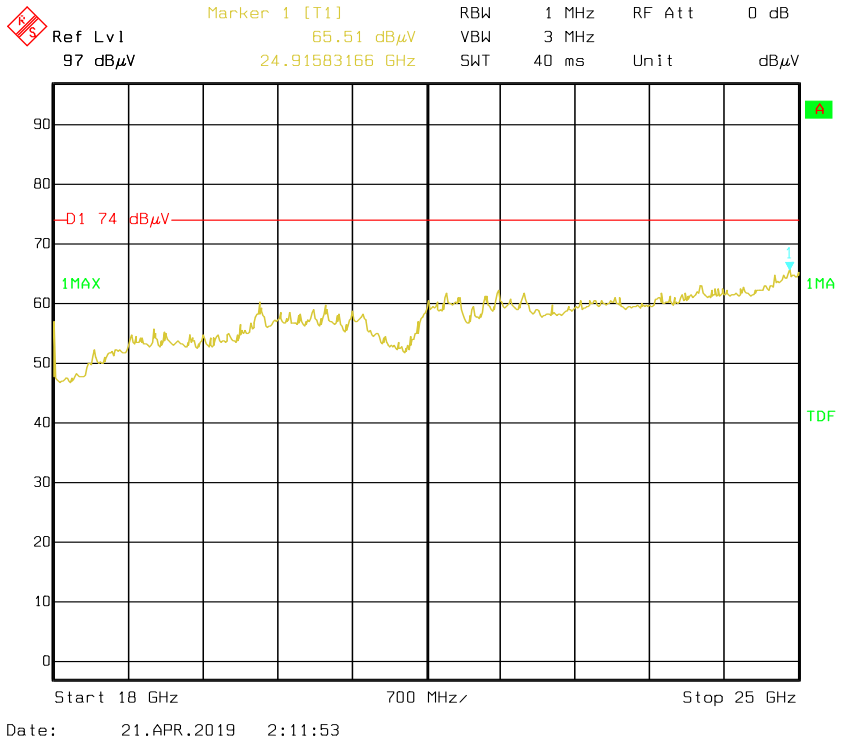
802.11n-HT40 Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2422 MHz)									
2390.00	27.84	PK	190	1.1	H	33.00	60.84	74	13.16
2390.00	13.57	AV	190	1.1	H	33.00	46.57	54	7.43
2483.50	27.48	PK	48	2.2	H	33.20	60.68	74	13.32
2483.50	13.62	AV	48	2.2	H	33.20	46.82	54	7.18
4844.00	42.90	PK	322	1.3	H	7.88	50.78	74	23.22
4844.00	29.05	AV	322	1.3	H	7.88	36.93	54	17.07
Middle Channel (2442MHz)									
4884.00	42.87	PK	312	1.3	H	9.21	52.08	74	21.92
4884.00	29.01	AV	312	1.3	H	9.21	38.22	54	15.78
High Channel (2462 MHz)									
2389.00	28.40	PK	142	2.0	H	33.00	61.40	74	12.60
2389.00	13.75	AV	142	2.0	H	33.00	46.75	54	7.25
2483.50	35.70	PK	327	1.8	H	33.20	68.90	74	5.10
2483.50	18.28	AV	327	1.8	H	33.20	51.48	54	2.52
4924.00	43.20	PK	9	1.2	H	9.21	52.41	74	21.59
4924.00	29.40	AV	9	1.2	H	9.21	38.61	54	15.39

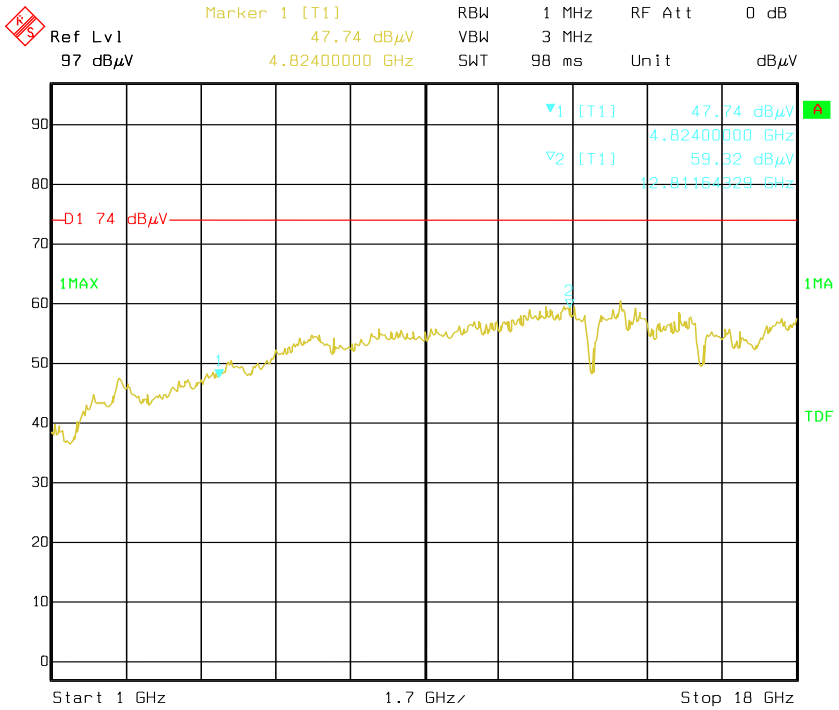
Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude
The other spurious emission which is 20dB to the limit was not recorded.
And for the pre-scan is performed with the 2400-2483.5MHz band filter.

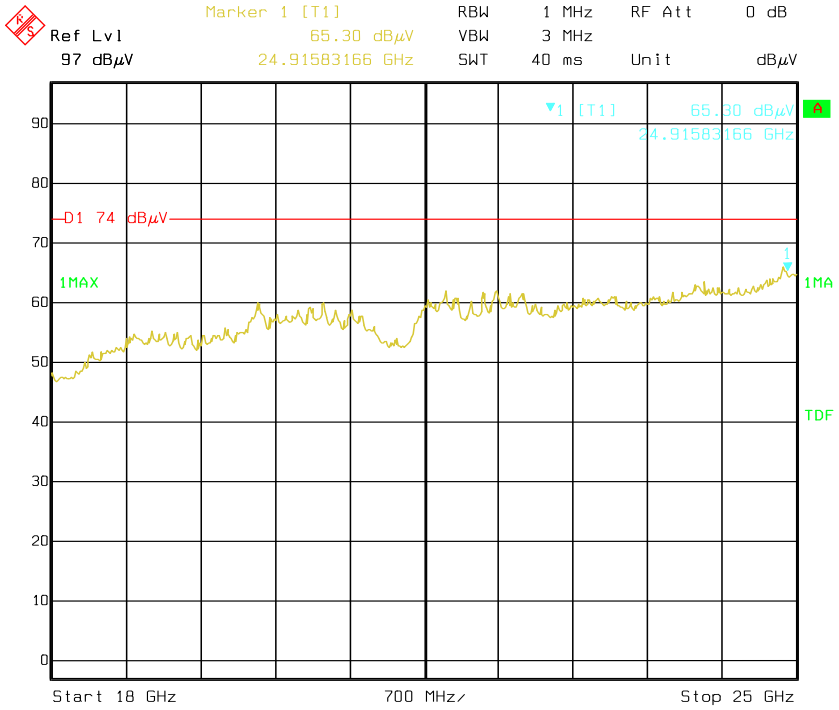
Pre-scan with 802.11B Mode, Low channel
Horizontal



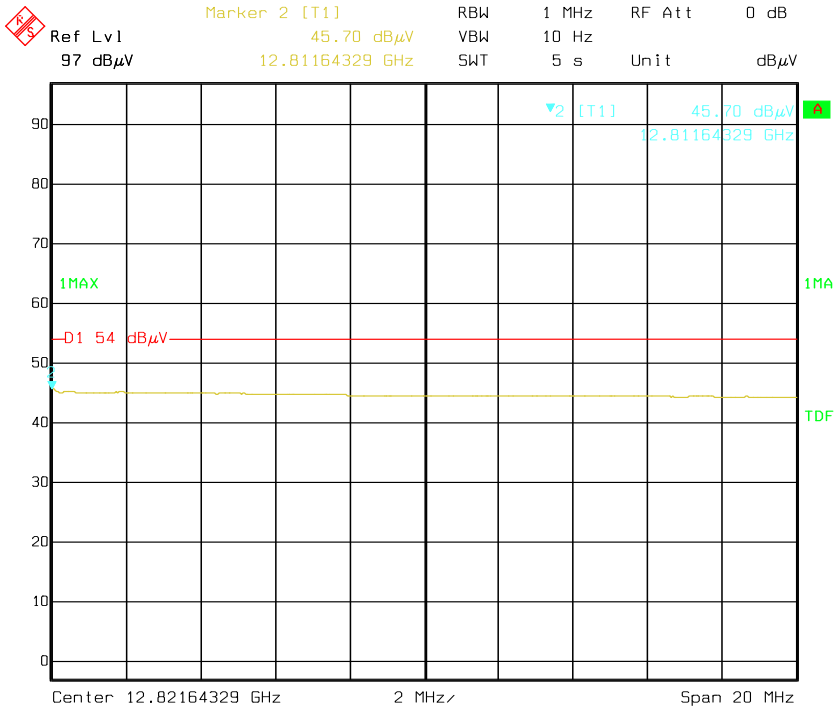


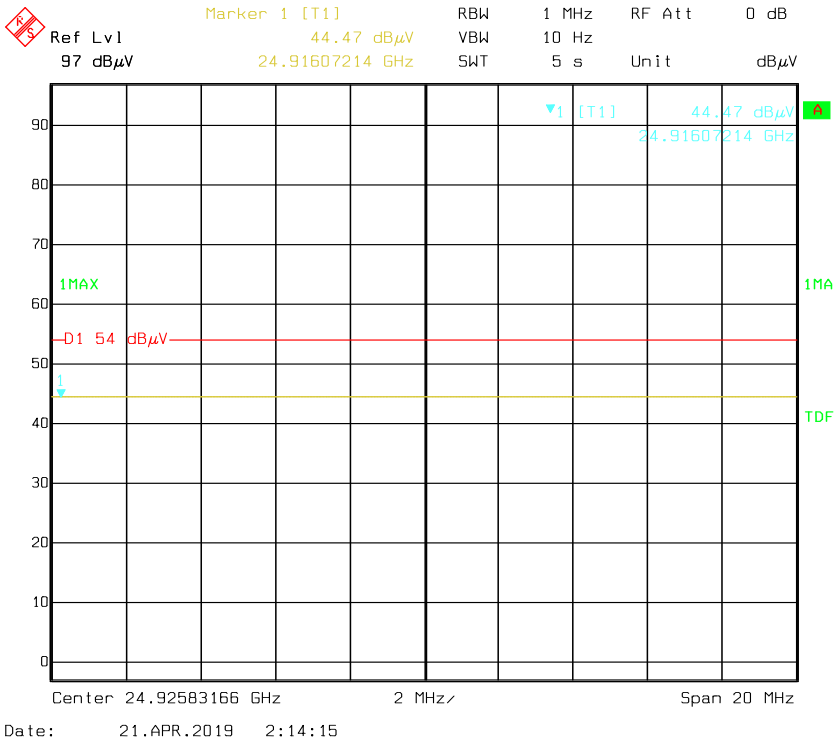
Vertical


Marker 1 [T1]
47.74 dBµV
4.82400000 GHz
RBW 1 MHz
VBW 3 MHz
SWT 98 ms
RF Att 0 dB
Unit dBµV
Ref Lvl
97 dBµV
▼1 [T1] 47.74 dBµV
4.82400000 GHz
▽2 [T1] 59.32 dBµV
D1 74 dBµV
1MAX
1MA
TDF
Start 1 GHz
1.7 GHz/
Stop 18 GHz
Date: 21.APR.2019 1:31:07

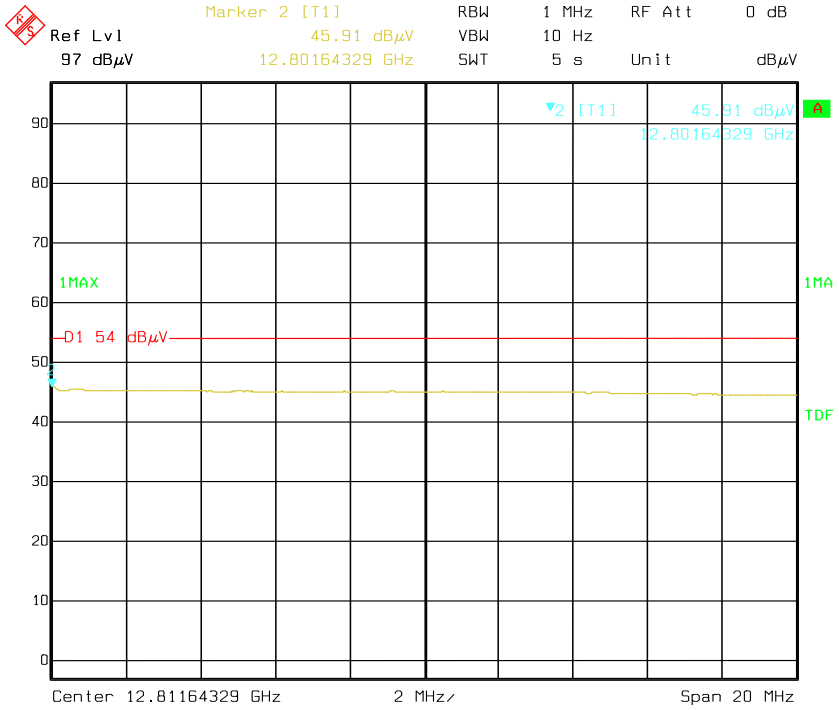

Marker 1 [T1]
65.30 dBµV
24.91583166 GHz
RBW 1 MHz
VBW 3 MHz
SWT 40 ms
RF Att 0 dB
Unit dBµV
Ref Lvl
97 dBµV
▼1 [T1] 65.30 dBµV
24.91583166 GHz
D1 74 dBµV
1MAX
1MA
TDF
Start 18 GHz
700 MHz/
Stop 25 GHz
Date: 21.APR.2019 2:17:07

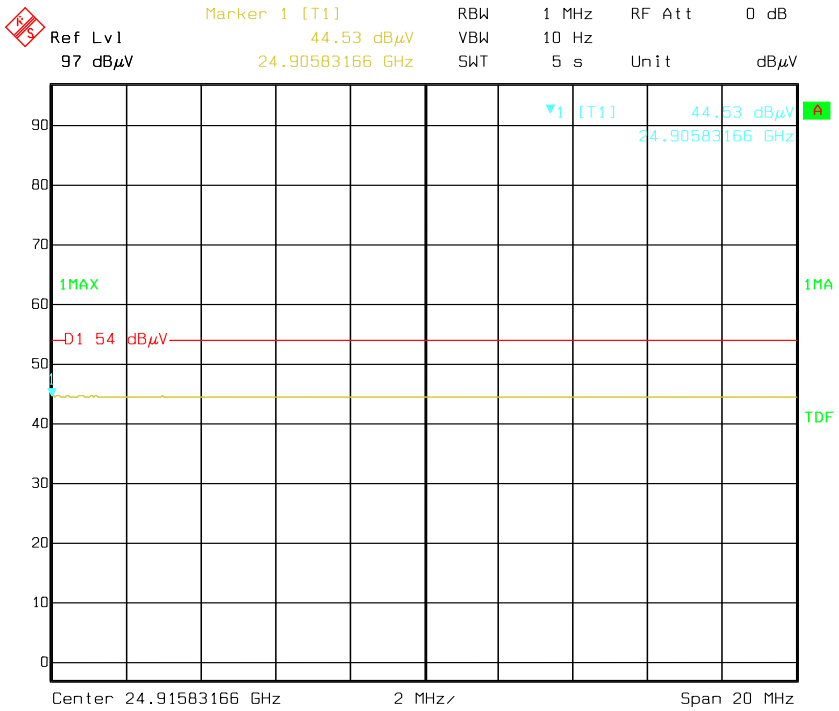
Pre-scan for Average
Horizontal





Vertical


Marker 2 [T1]
45.91 dBμV
12.80164329 GHz
RBW 1 MHz
VBW 10 Hz
SWT 5 s
RF Att 0 dB
Unit dBμV
Ref Lvl
97 dBμV
▼2 [T1] 45.91 dBμV
12.80164329 GHz
A
1MAX
1MA
D1 54 dBμV
TDF
90
80
70
60
50
40
30
20
10
0
Center 12.81164329 GHz
2 MHz/
Span 20 MHz
Date: 21.APR.2019 1:33:33


Marker 1 [T1]
44.53 dBμV
24.90583166 GHz
RBW 1 MHz
VBW 10 Hz
SWT 5 s
RF Att 0 dB
Unit dBμV
Ref Lvl
97 dBμV
▼1 [T1] 44.53 dBμV
24.90583166 GHz
A
1MAX
1MA
D1 54 dBμV
TDF
90
80
70
60
50
40
30
20
10
0
Center 24.91583166 GHz
2 MHz/
Span 20 MHz
Date: 21.APR.2019 2:20:39

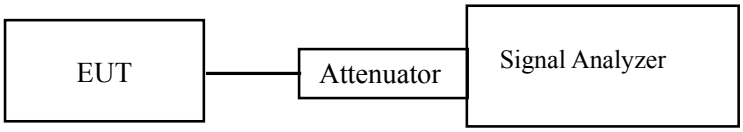
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

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

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by James fu on 2018-11-29.

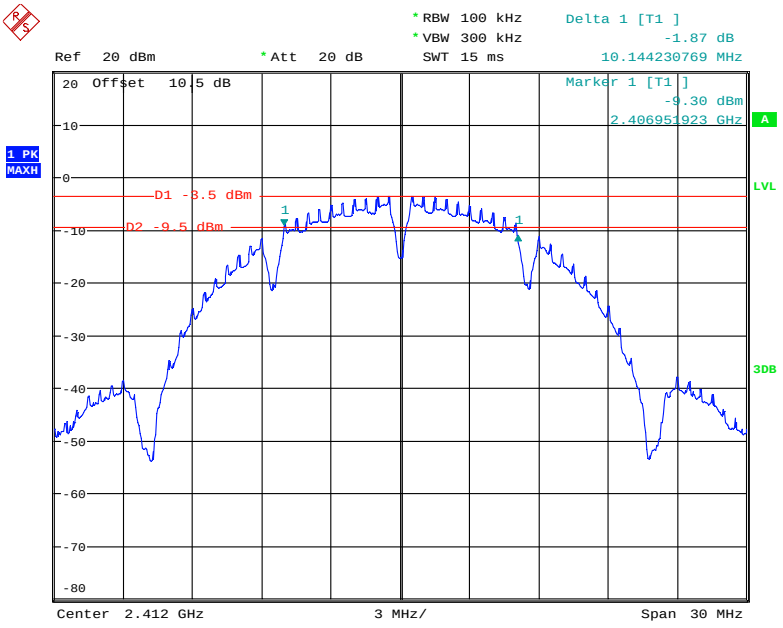
Test Result: Pass.

Please refer to the following table and plots.

EUT operation mode: Transmitting

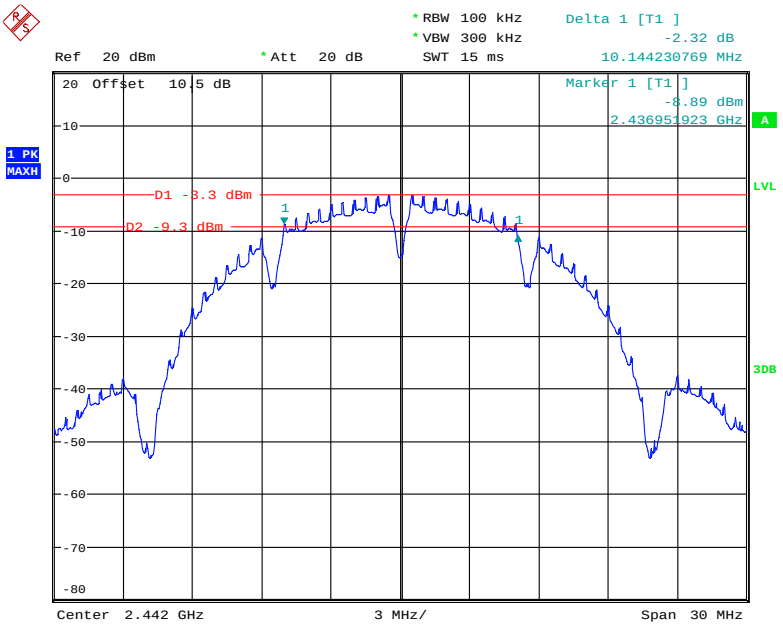
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
802.11b mode			
Low	2412	10.14	≥500
Middle	2442	10.14	≥500
High	2472	10.14	≥500
802.11g			
Low	2412	16.63	≥500
Middle	2442	16.63	≥500
High	2472	16.63	≥500
802.11n-HT20 mode			
Low	2412	17.88	≥500
Middle	2442	17.84	≥500
High	2472	17.84	≥500
802.11n-HT40 mode			
Low	2422	36.63	⩾500
Middle	2442	36.63	⩾500
High	2462	36.54	⩾500

802.11b Low Channel



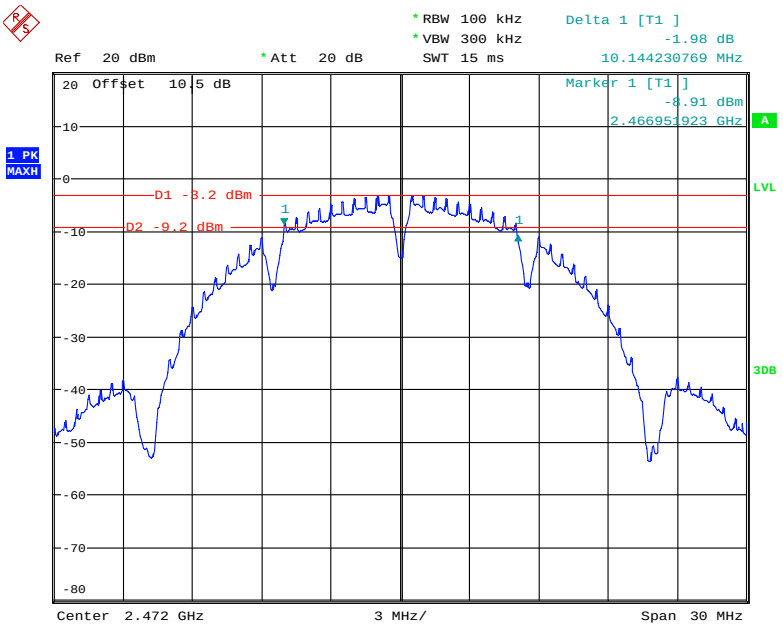
Date: 29.NOV.2018 13:31:58

802.11b Middle Channel



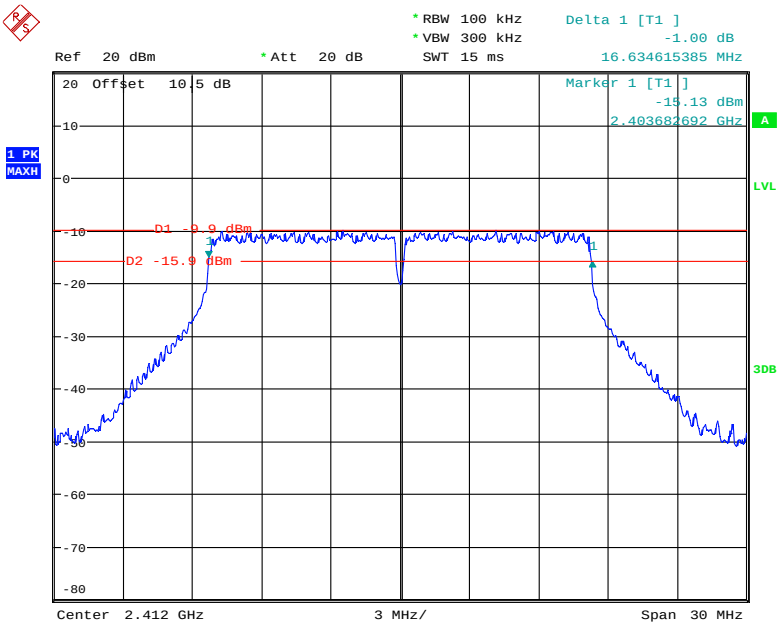
Date: 29.NOV.2018 13:33:19

802.11b High Channel



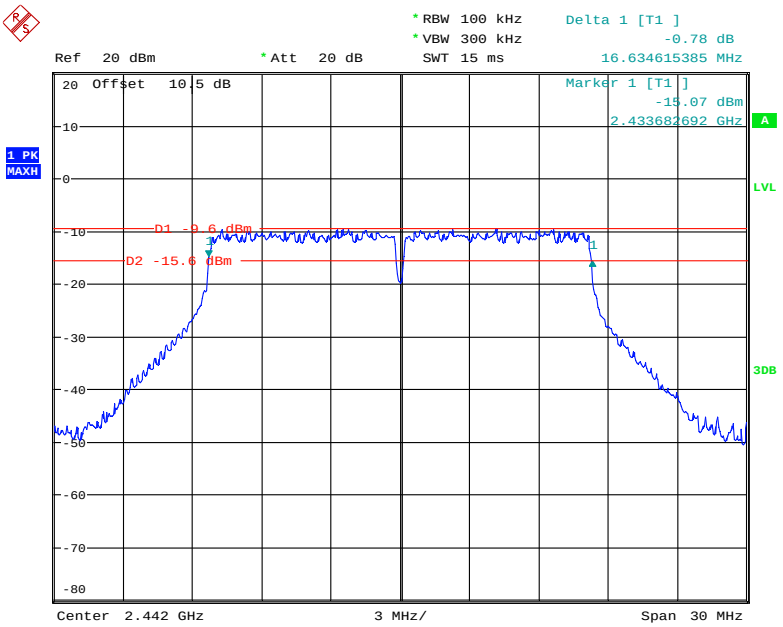
Date: 29.NOV.2018 13:34:30

802.11g Low Channel



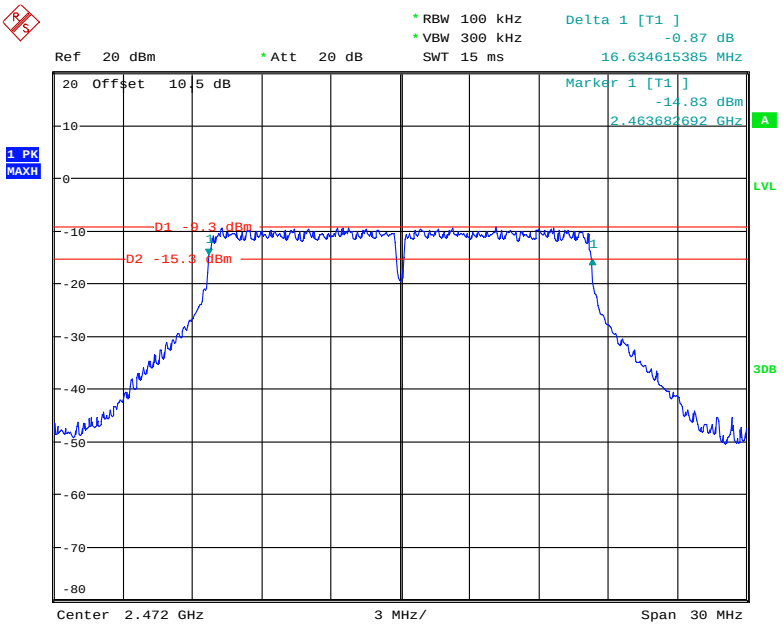
Date: 29.NOV.2018 13:29:50

802.11g Middle Channel



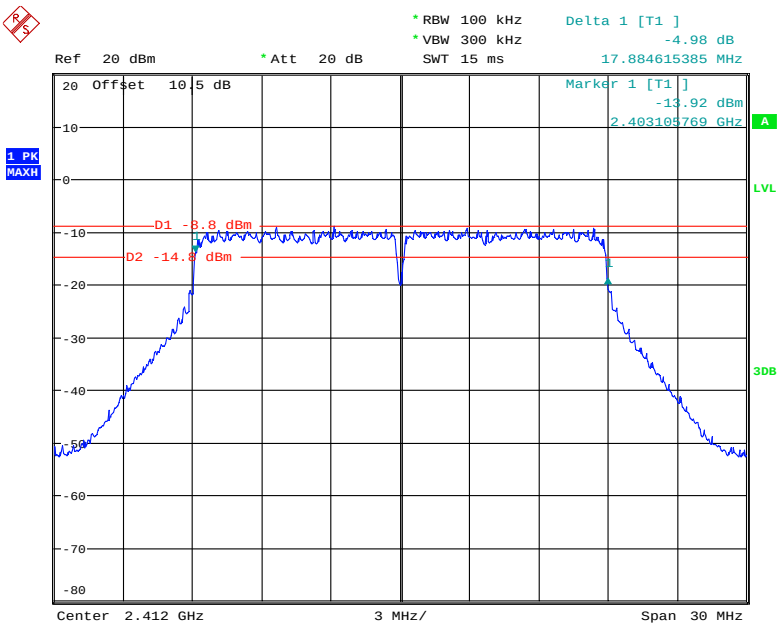
Date: 29.NOV.2018 13:28:34

802.11g High Channel



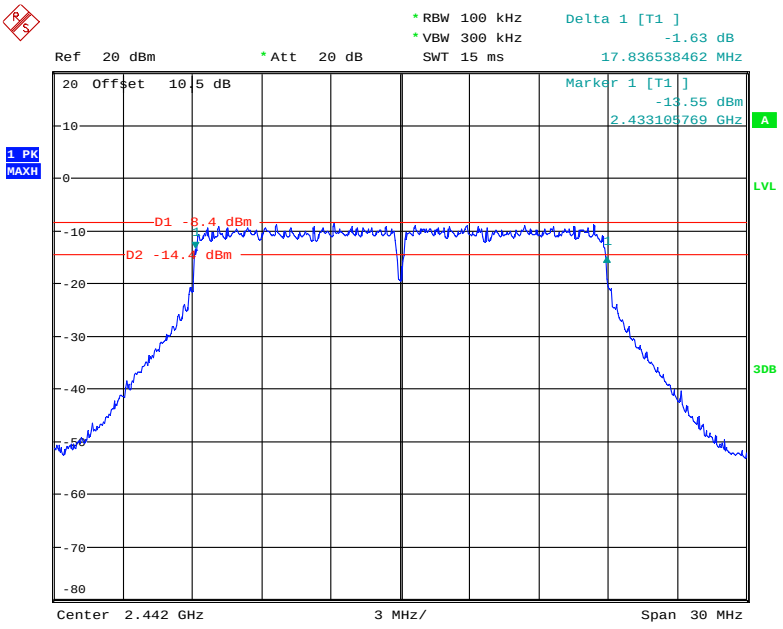
Date: 29.NOV.2018 13:27:10

802.11n-HT20 Low Channel



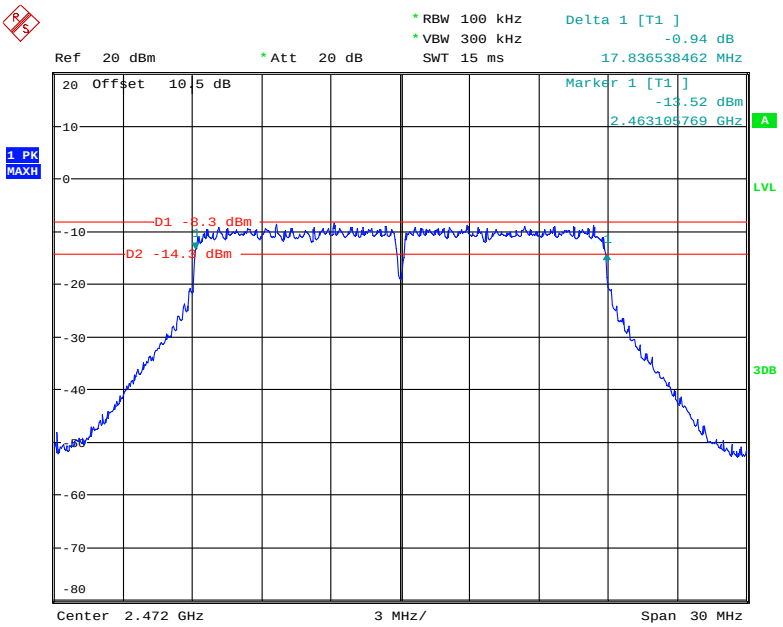
Date: 29.NOV.2018 13:18:16

802.11n-HT20 Middle Channel



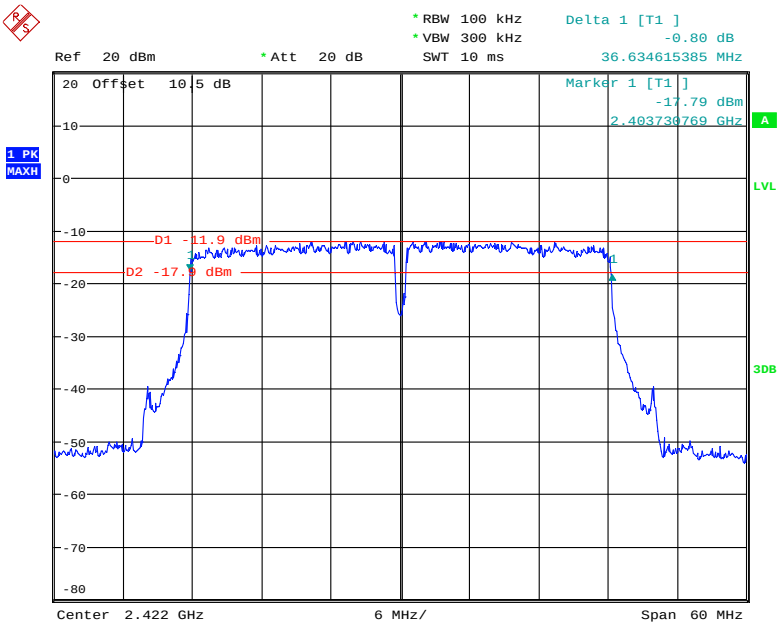
Date: 29.NOV.2018 13:21:18

802.11n-HT20 High Channel



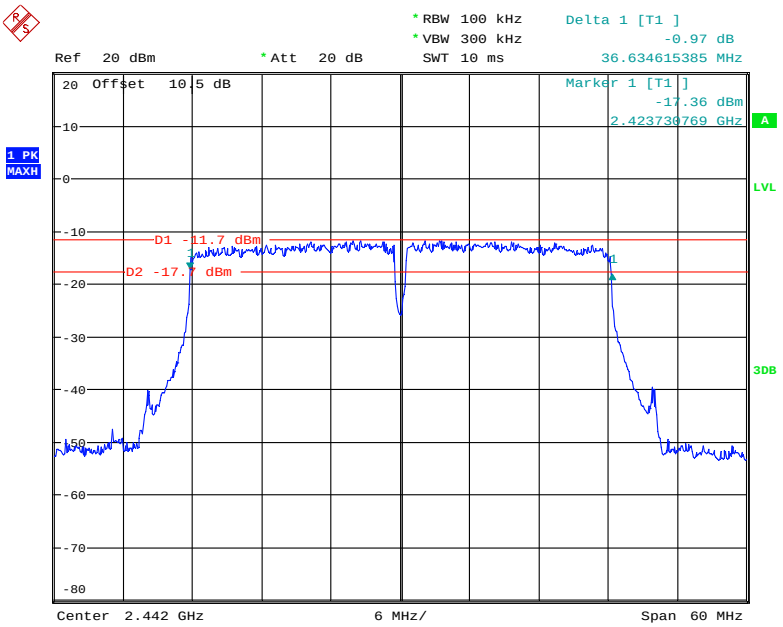
Date: 29.NOV.2018 13:23:39

802.11n-HT40 Low Channel



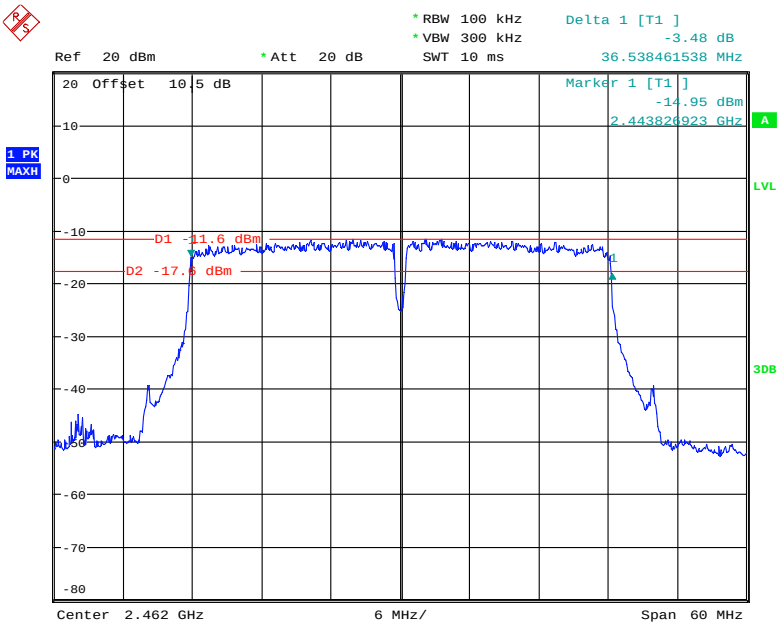
Date: 29.NOV.2018 12:01:37

802.11n-HT40 Middle Channel



Date: 29.NOV.2018 12:00:16

802.11n-HT40 High Channel



Date: 29.NOV.2018 11:57:11

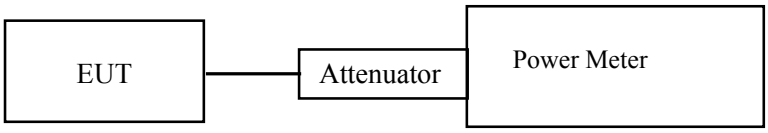
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

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

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by James fu on 2018-11-29.

EUT operation mode: Transmitting

Wi-Fi mode

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Max Conducted Average Output Power (dBm)	Limit (dBm)
802.11b				
Low	2412	9.55	7.14	30
Middle	2442	9.87	7.38	30
High	2472	10.17	7.36	30
802.11g				
Low	2412	12.35	6.67	30
Middle	2442	12.77	6.93	30
High	2472	12.83	7.03	30
802.11n HT20				
Low	2412	13.02	7.20	30
Middle	2442	13.59	7.41	30
High	2472	13.64	7.66	30
802.11n HT40				
Low	2422	13.29	7.44	30
Middle	2442	13.55	7.57	30
High	2462	13.59	7.85	30

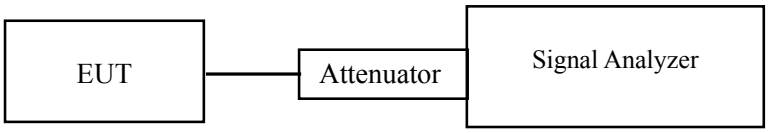
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

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



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

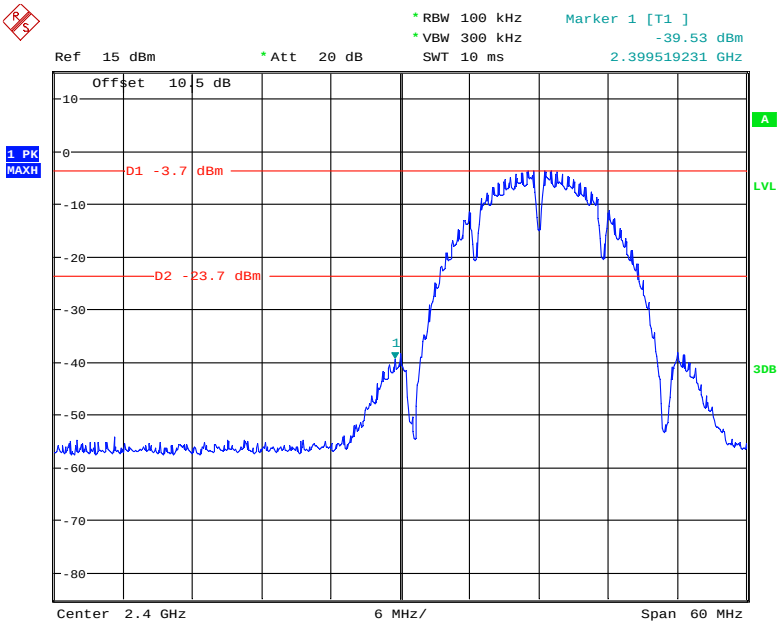
The testing was performed by James fu on 2018-11-29.

EUT operation mode: Transmitting

Test Result: Compliance

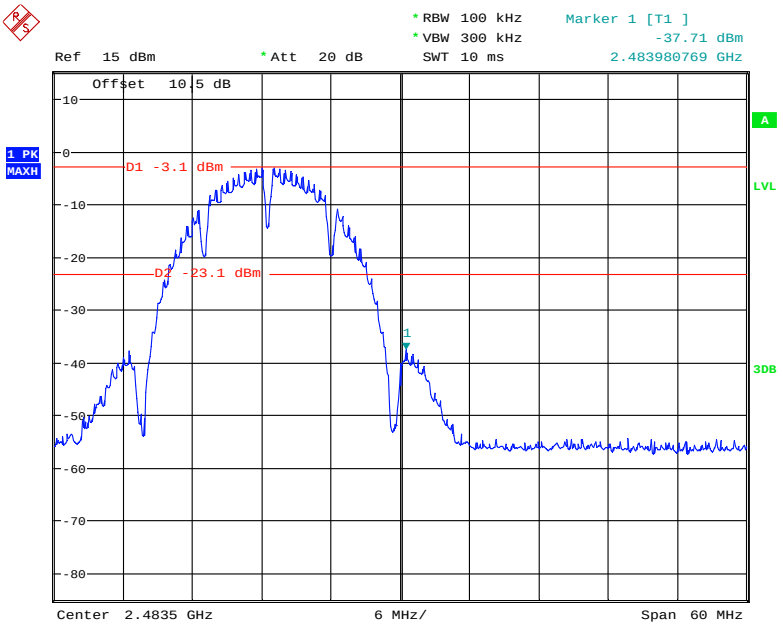
Please refer to the following plots.

802.11b: Band Edge, Left Side



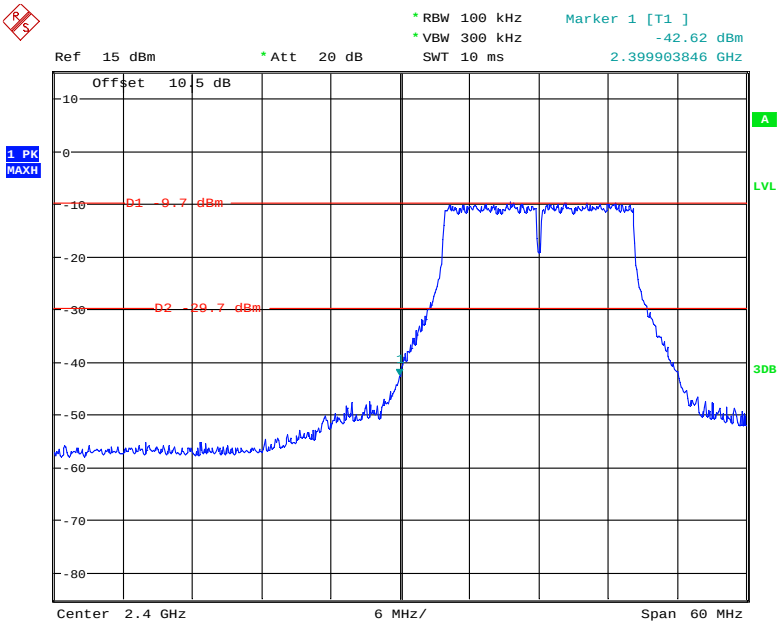
Date: 29.NOV.2018 14:13:44

802.11b: Band Edge, Right Side



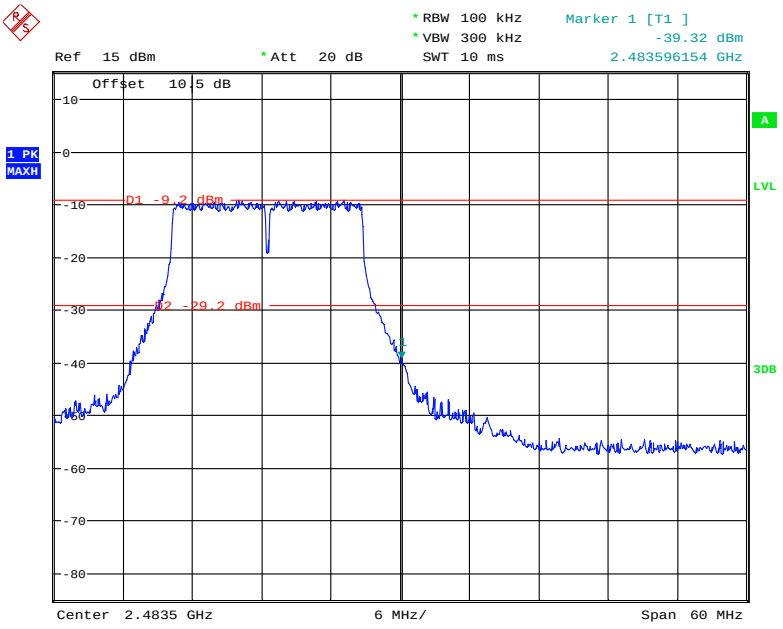
Date: 29.NOV.2018 14:15:08

802.11g: Band Edge, Left Side



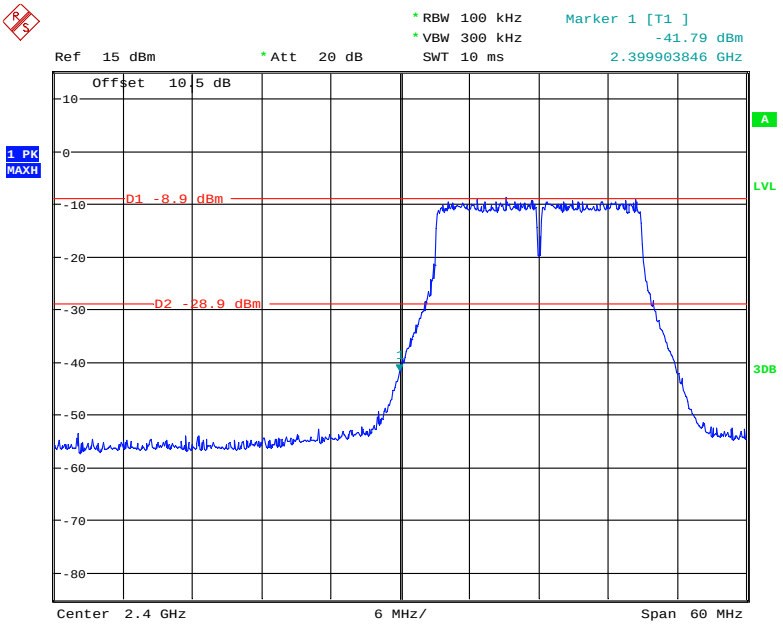
Date: 29.NOV.2018 14:17:07

802.11g: Band Edge, Right Side



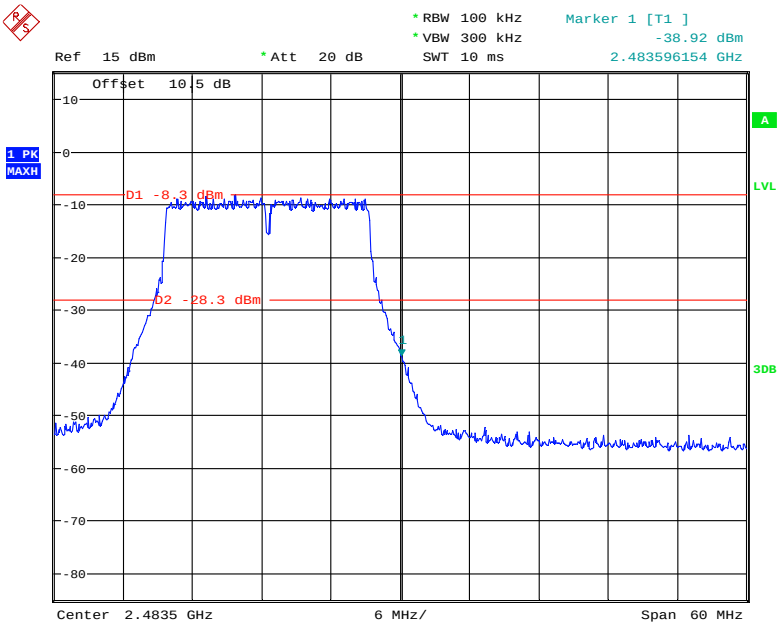
Date: 29.NOV.2018 14:16:14

802.11n-HT20: Band Edge, Left Side



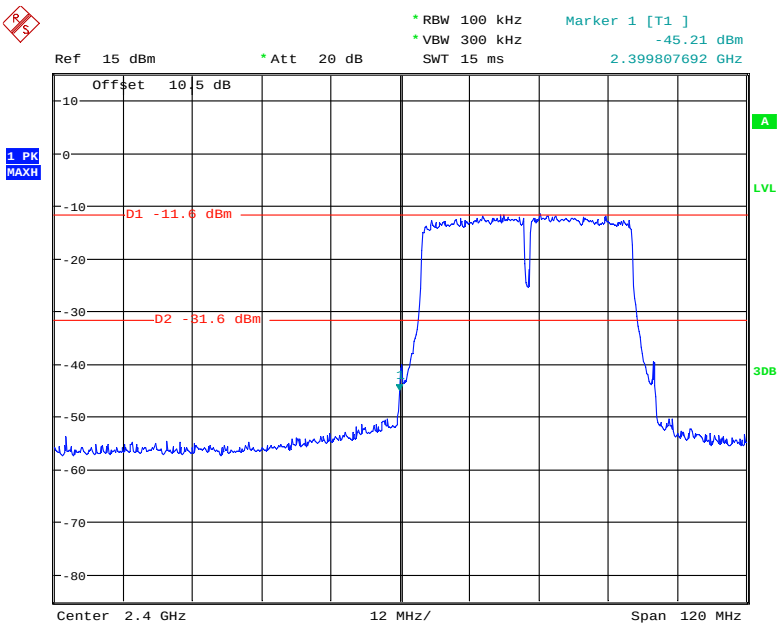
Date: 29.NOV.2018 14:18:28

802.11n-HT20: Band Edge, Right Side



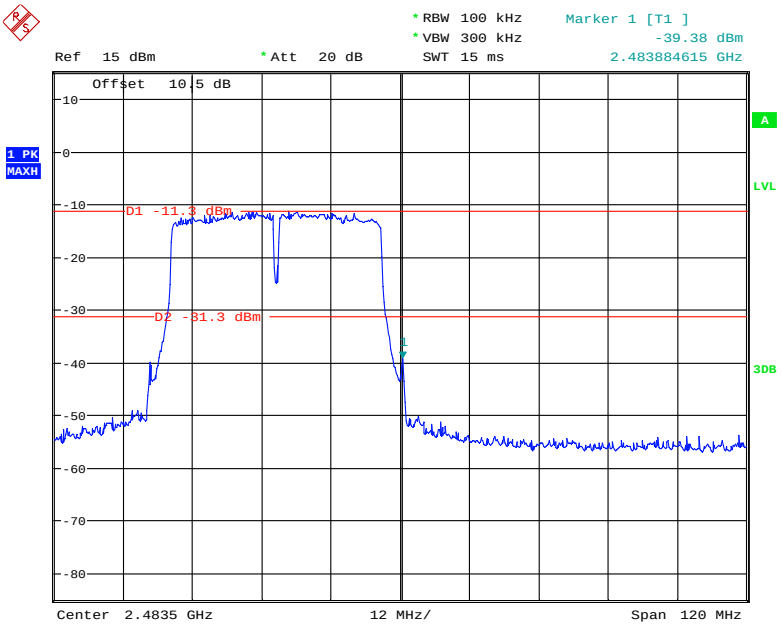
Date: 29.NOV.2018 14:19:39

802.11n-HT40: Band Edge, Left Side



Date: 29.NOV.2018 14:22:07

802.11n-HT40: Band Edge, Right Side



Date: 29.NOV.2018 14:21:01

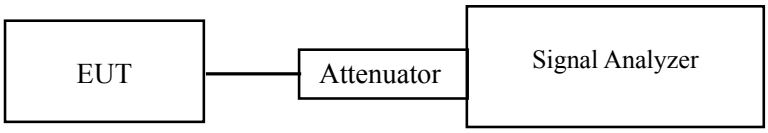
FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

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

Test Procedure

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



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

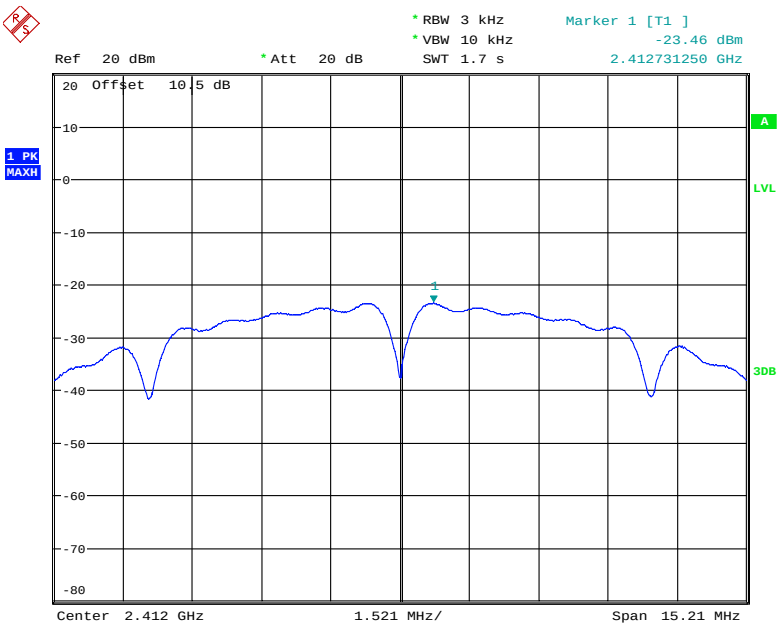
The testing was performed by James fu on 2018-11-29.

EUT operation mode: Transmitting

Test Result: Pass

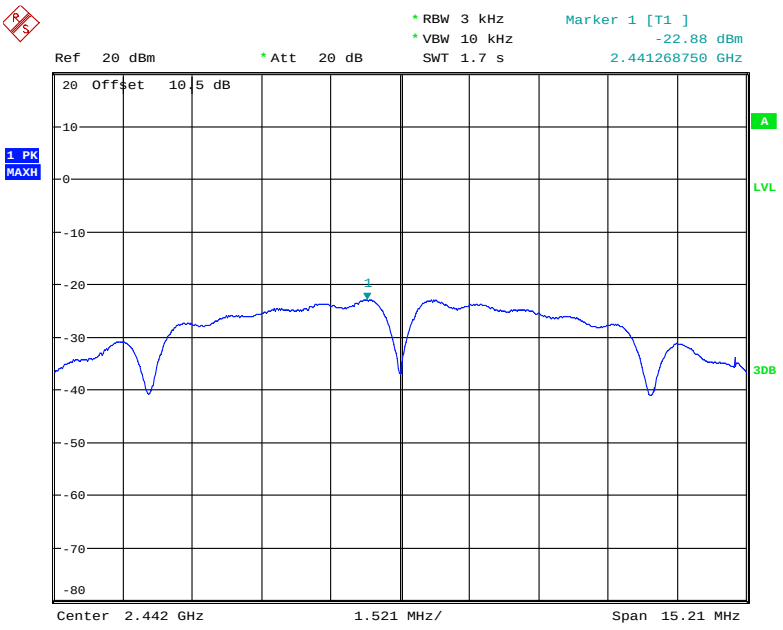
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-23.46	≤8
Middle	2442	-22.88	≤8
High	2472	-21.83	≤8
802.11g mode			
Low	2412	-23.90	≤8
Middle	2442	-23.95	≤8
High	2472	-23.47	≤8
802.11n-HT20 mode			
Low	2412	-23.03	≤8
Middle	2442	-22.90	≤8
High	2472	-21.91	≤8
802.11n-HT40 mode			
Low	2422	-20.70	≤8
Middle	2442	-24.40	≤8
High	2462	-24.62	≤8

Power Spectral Density, 802.11b Low Channel



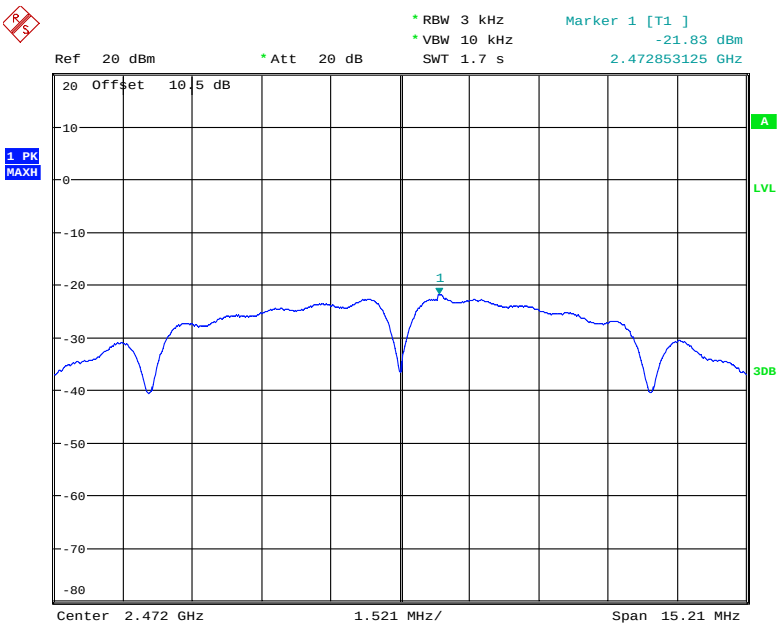
Date: 29.NOV.2018 13:45:42

Power Spectral Density, 802.11b Middle Channel



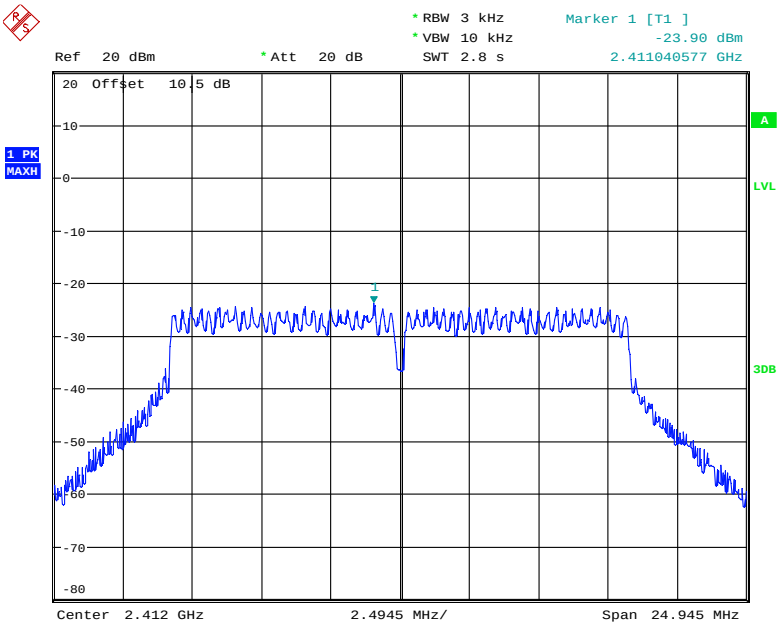
Date: 29.NOV.2018 13:45:12

Power Spectral Density, 802.11b High Channel



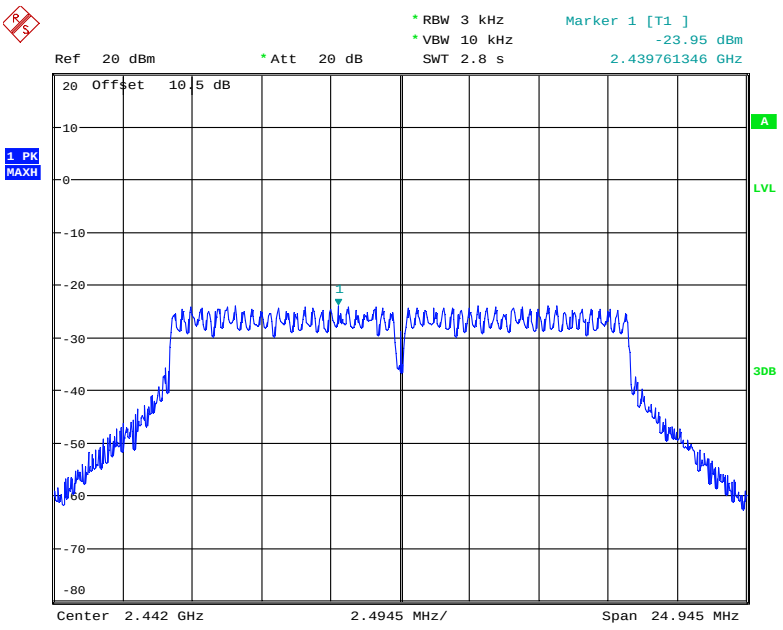
Date: 29.NOV.2018 13:44:34

Power Spectral Density, 802.11g Low Channel



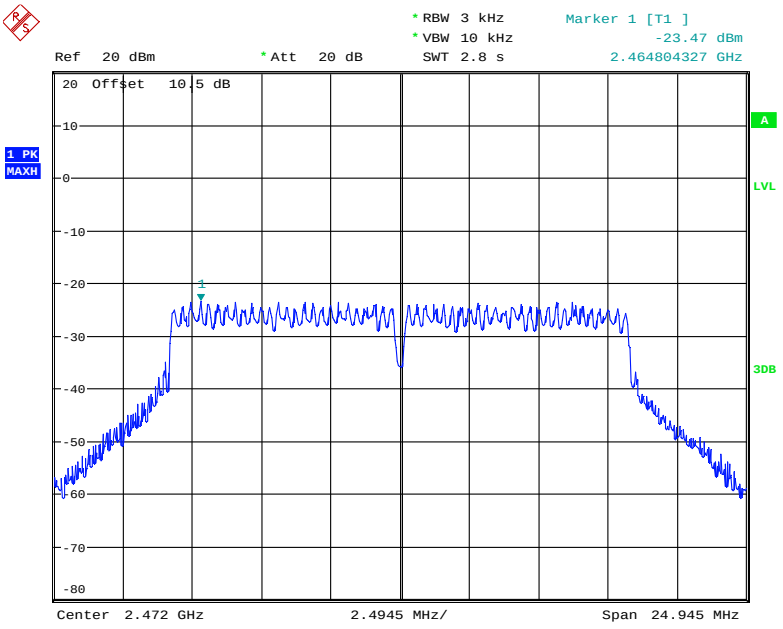
Date: 29.NOV.2018 13:46:42

Power Spectral Density, 802.11g Middle Channel



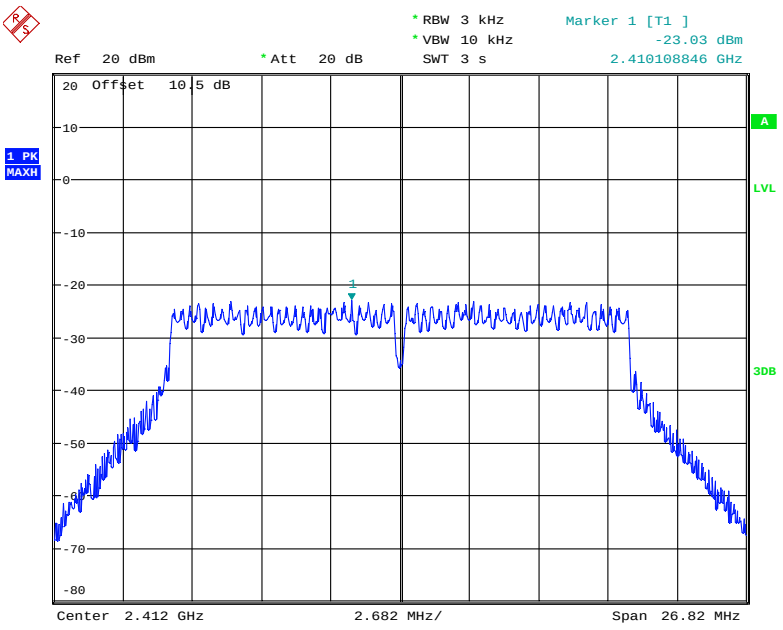
Date: 29.NOV.2018 13:47:38

Power Spectral Density, 802.11g High Channel



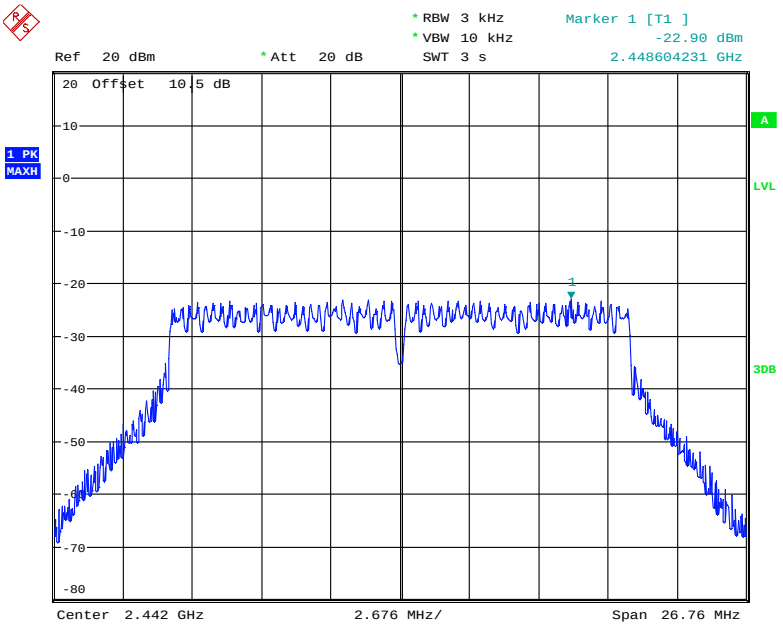
Date: 29.NOV.2018 13:48:35

Power Spectral Density, 802.11n-HT20 Low Channel



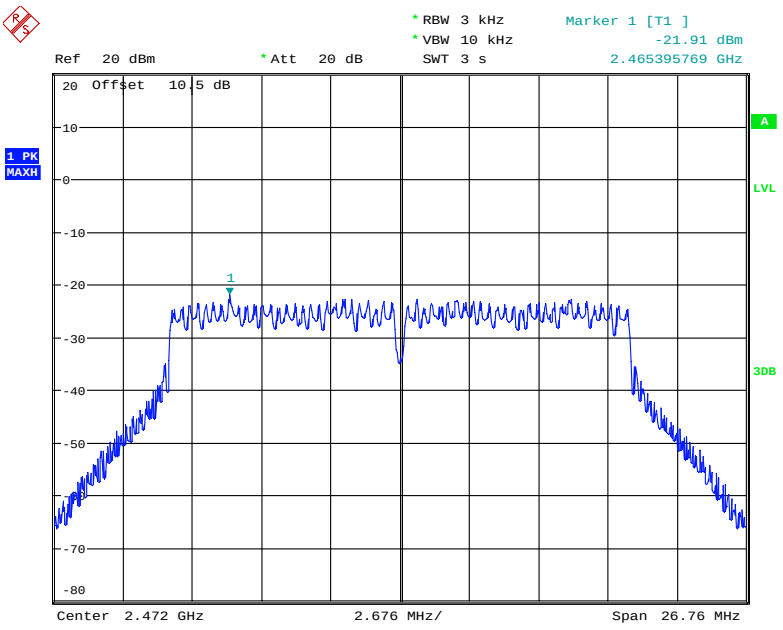
Date: 29.NOV.2018 13:53:32

Power Spectral Density, 802.11n-HT20 Middle Channel



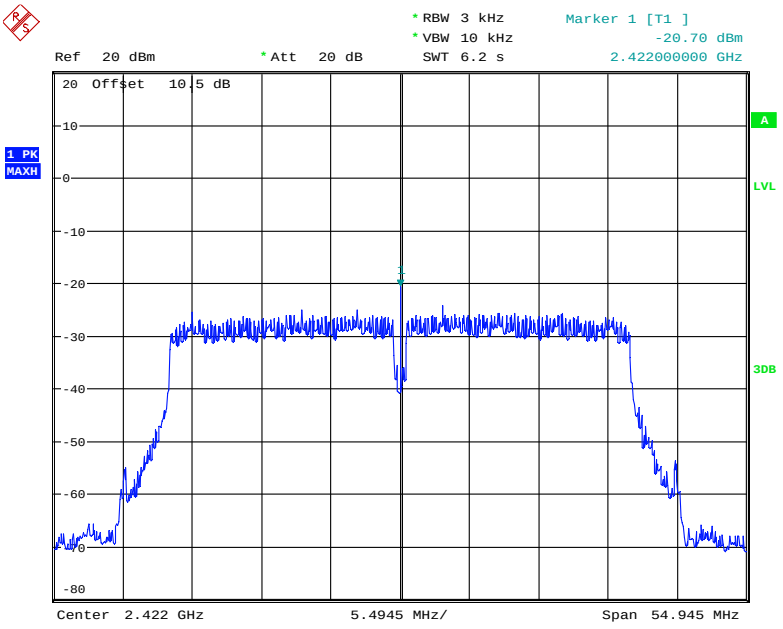
Date: 29.NOV.2018 13:52:16

Power Spectral Density, 802.11n-HT20 High Channel



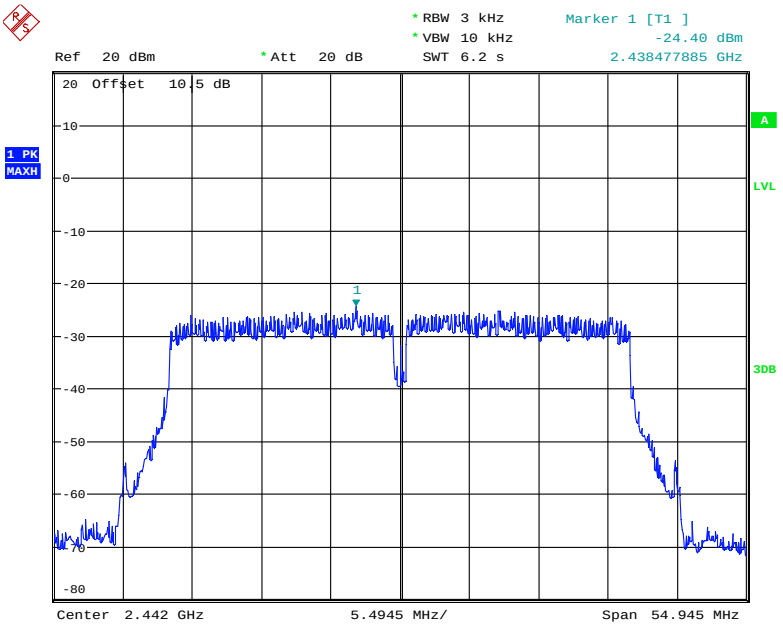
Date: 29.NOV.2018 13:51:47

Power Spectral Density, 802.11n-HT40 Low Channel



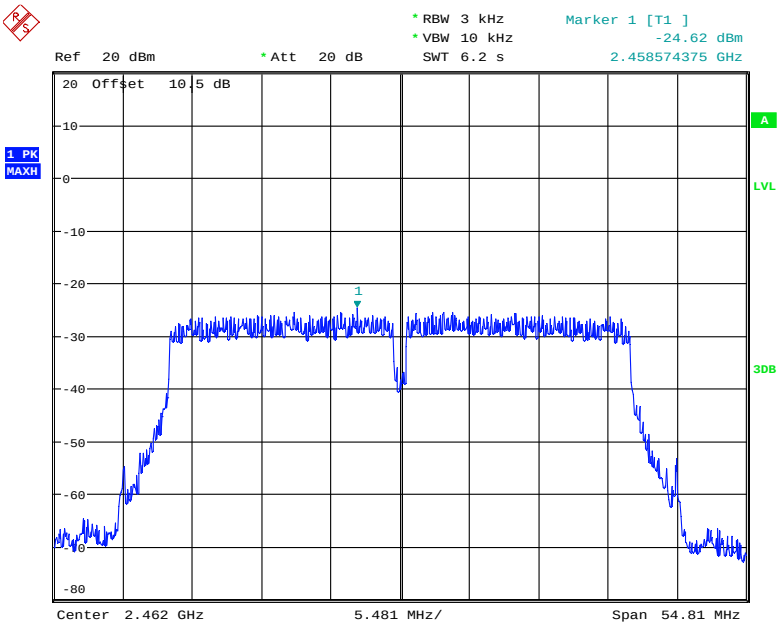
Date: 29.NOV.2018 13:54:59

Power Spectral Density, 802.11n-HT40 Middle Channel



Date: 29.NOV.2018 13:58:21

Power Spectral Density, 802.11n-HT40 High Channel



Date: 29.NOV.2018 13:57:01

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