FCC PART 15.247

TEST REPORT

For

Shenzhen MingZhan Information Technology Co., Ltd

8th floor, Huaqiang electronic world building 2-02, Shenzhen Huaqiang North Street, Futian District, Shenzhen, China

FCC ID: 2AN3WM5STACK-CORE

Report Type:	**Product Type:**
Original Report	WIFI & Bluetooth Development Board

Test Engineer:	Ada Yu
Report Number:	RSHA170928001-00B
Report Date:	2017-10-19
Reviewed By:	Oscar Ye RF Leader
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan,Jiangsu province,China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Shenzhen MingZhan Information Technology Co., Ltd
Tested Model	M5Stack-CORE
Product Type	WIFI & Bluetooth Development Board
Dimension	54 mm(L)×54 mm(W)×12.6 mm(H)
Power Supply	DC 3.7V by battery and DC 5V from USB port

**All measurement and test data in this report was gathered from production sample serial number: 20170928001. (Assigned by the BACL. The EUT supplied by the applicant was received on 2017-09-28)*

Objective

This report is prepared on behalf of Shenzhen MingZhan Information Technology Co., Ltd 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 Part15.247 DSS submission with FCC ID: 2AN3WM5STACK-CORE.

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 FCC KDB558074 D01 DTS Meas Guidance v04.

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

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19 dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	4.88dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Test channel list is as below:

For 802.11b, 802.11g and 802.11n-HT20 mode, EUT was tested with Channel 1, 6 and 11;

For 802.11n-HT40 mode, EUT was tested with Channel 3, 6 and 9.

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 BLE mode, EUT was tested with channel 0, 19 and 39.

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

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

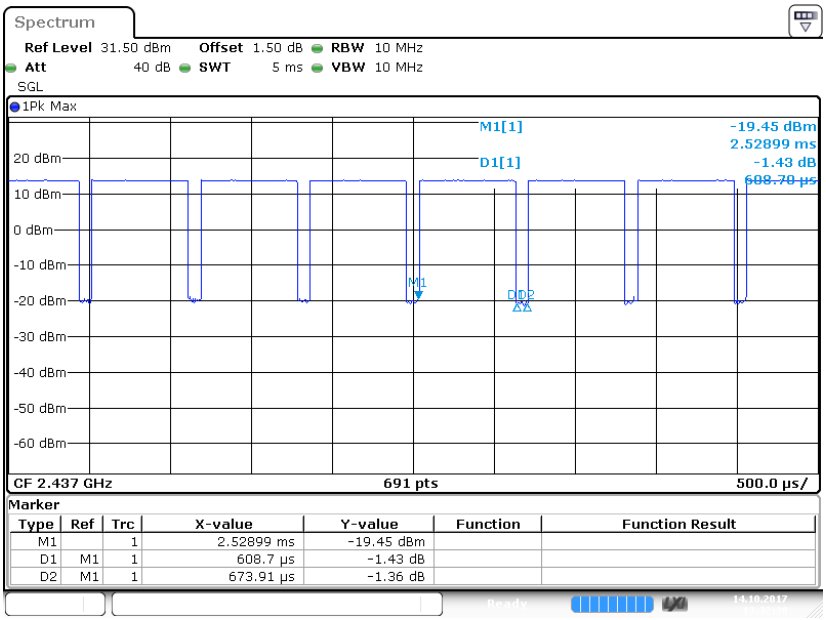
RF test tool: SecureCRT

Pre-scan with all the data rates, and the worst case was performed as below:

Mode	Data rate	Power level
802.11b	1 Mbps	32
802.11g	6 Mbps	32
802.11n-HT20	MCS0	32
802.11n-HT40	MCS0	36
BLE	/	6

Duty Cycle:

802.11b Mode Middle Channel



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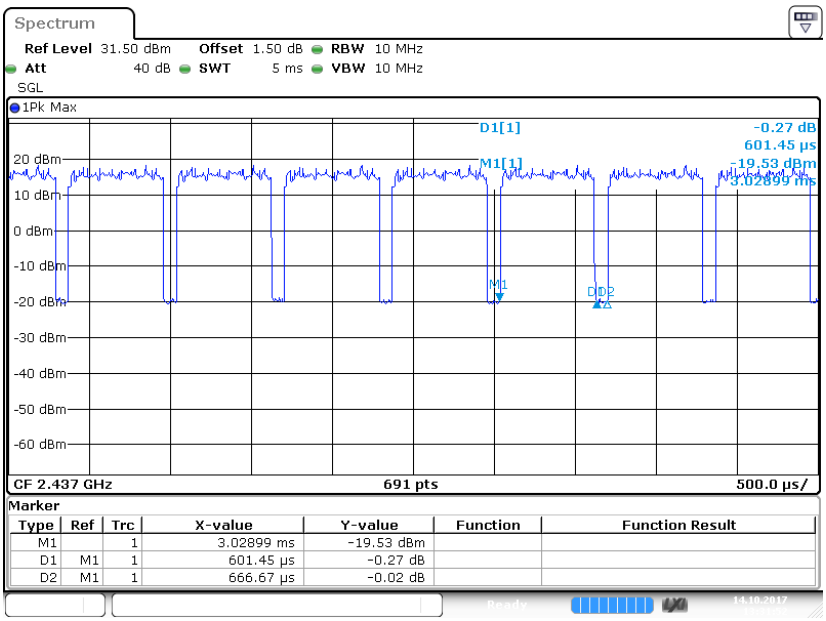
802.11g Mode Middle Channel



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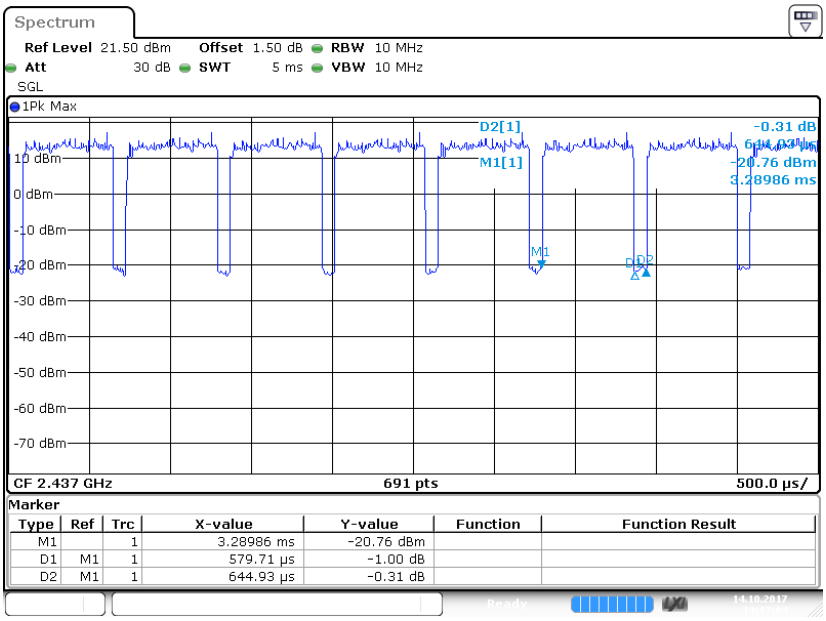
802.11n-HT20 Mode Middle Channel



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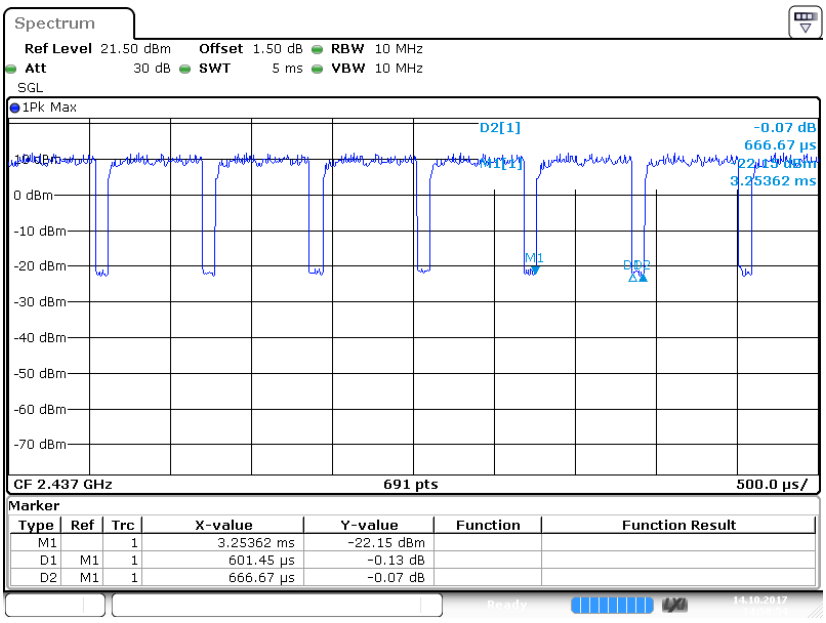
802.11n-HT40 Mode Middle Channel



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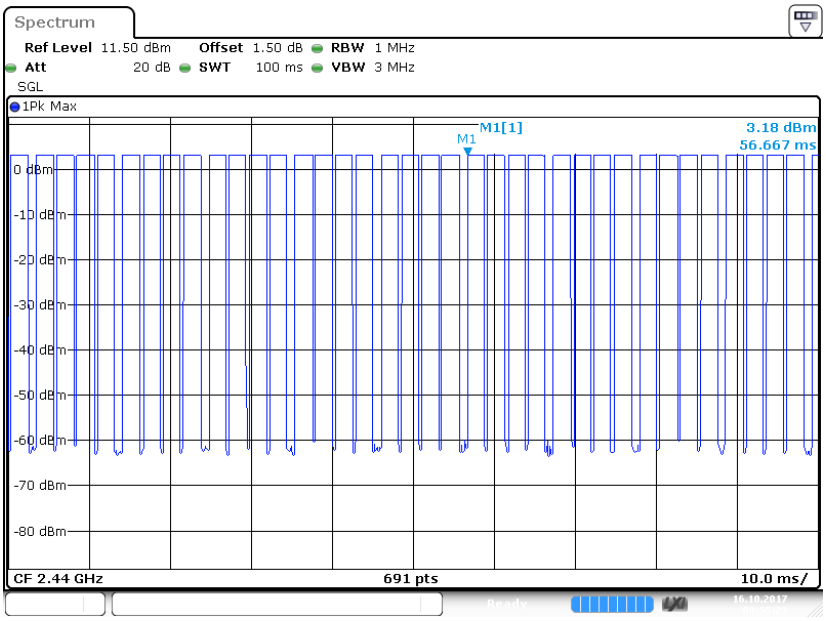
BLE Mode Middle Channel



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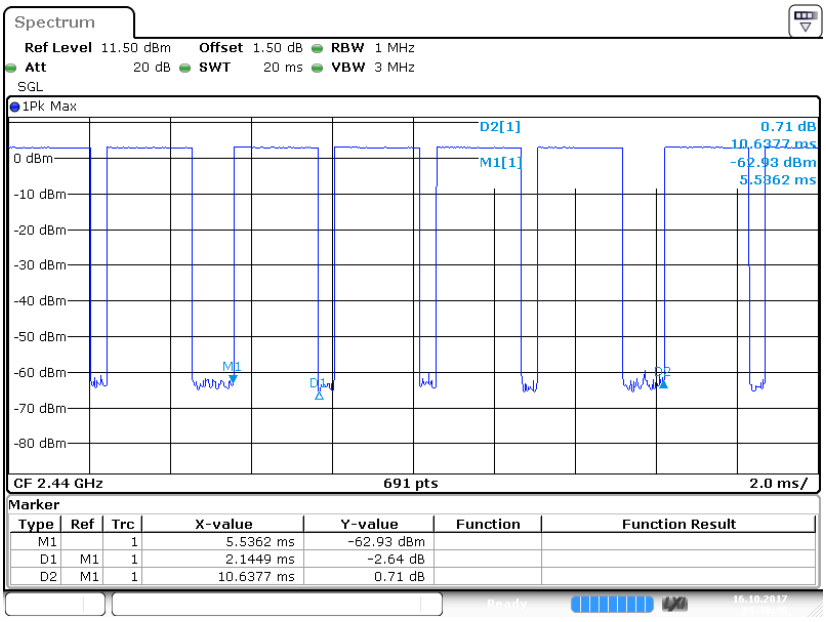

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Mode	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	10log(1/ Duty Cycle)
802.11b	90.36	609	1.64	3kHz	0.44
802.11g	90.10	601	1.66	3kHz	0.45
802.11n-HT20	89.92	580	1.72	3kHz	0.46
802.11n-HT40	90.10	601	1.66	3kHz	0.45
BLE	80.65	2145	0.47	1KHz	0.93

Support Equipment List and Details

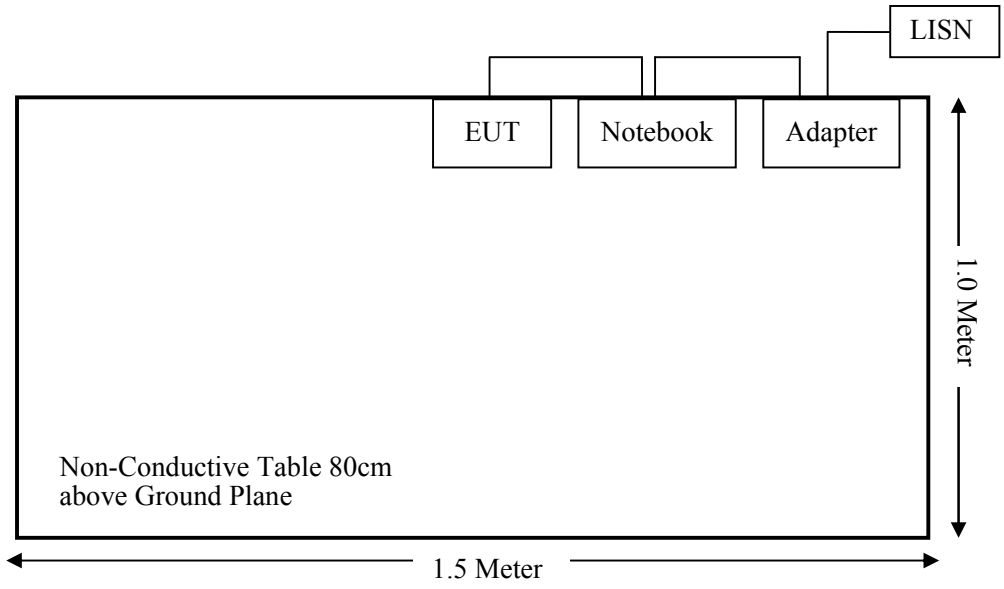
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
DELL	Adapter	LA65NS0-00	DF263

External I/O Cable

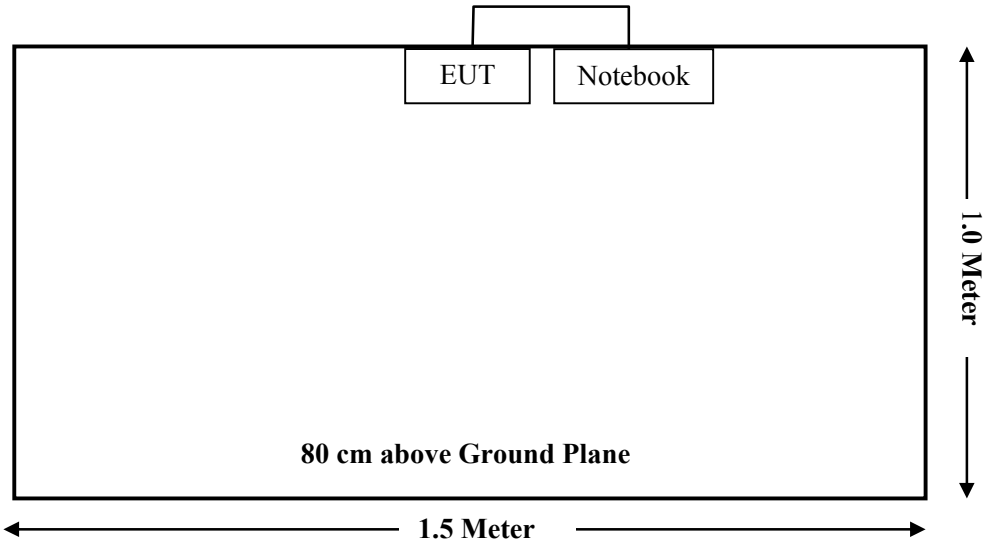
Cable Description	Length (m)	From Port	To
USB Cable	0.3	EUT	Notebook

Block Diagram of Test Setup

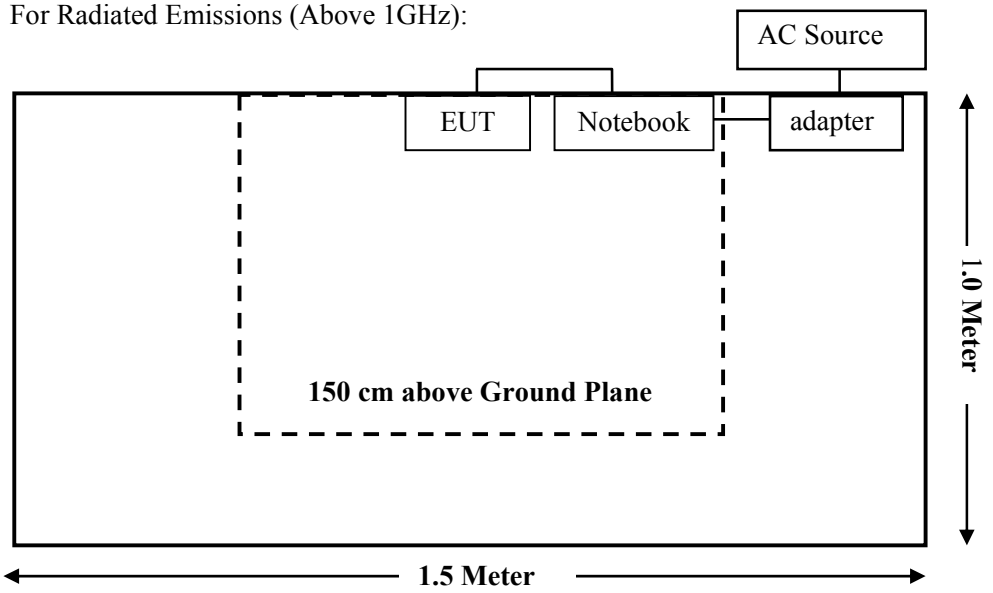
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



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
§15.247(d)	Spurious Emissions at Antenna Port	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
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Sunol Sciences	Broadband Antenna	JB3	A040914-2	2016-01-09	2019-01-08
Sonoma Instrunent	Pre-amplifier	310N	171205	2017-08-15	2018-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2017-08-15	2018-08-14
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2017-08-27	2018-08-26
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-12	2017-12-11
Heatsink Required	Amplifier	QLW-18405536-J0	15964001009	2016-12-12	2017-12-11
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2017-08-15	2018-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2017-07-22	2018-07-21
Agilent	Power Meter	N1912A	MY5000492	2016-11-18	2017-11-17
Agilent	Power Sensor	N1921A	MY54210024	2016-11-18	2017-11-17
Mingzhan	RF Cable	N/A	N/A	/	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2017-10-10	2018-10-09
Rohde & Schwarz	LISN	ENV216	3560655016	2016-11-25	2017-11-24
BACL	BACL-EMC	V1.0	CE001	/	/
Narda	Attenuator/6dB	10690812-2	26850-6	2017-01-10	2018-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2017-08-15	2018-08-14

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) 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), §1.1310& §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

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

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

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

f = frequency in MHz; * = Plane-wave equivalent power density;
According to §1.1310 and §2.1091 RF exposure is calculated.

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

Measurement Result

Mode	Frequency Range	Antenna Gain		Target Output Power		Evaluation Distance	Power Density	MPE Limit
	(MHz)	(dBi)	(numeric)	(dBm)	(mW)	(cm)	(mW/cm^2)	(mW/cm^2)
BT(EDR)	2402-2480	2.00	1.58	6.50	4.47	20	0.0014	1
BLE	2402-2480	2.00	1.58	5.00	3.16	20	0.0010	1
802.11b	2412~2462	2.00	1.58	18.00	63.10	20	0.0199	1
802.11g		2.00	1.58	18.50	70.79	20	0.0223	1
802.11 n-HT20		2.00	1.58	18.50	70.79	20	0.0223	1
802.11 n-HT40	2422~2452	2.00	1.58	17.00	50.12	20	0.0158	1

Note:

1. For the above target output power are all declared by the manufacturer.
2. The EUT has the BT, 2.4 GHz Wi-Fi functions, they can transmitting simultaneously. According to KDB 447498 D01 General RF Exposure Guidance v06 and test data, the *EDR mode for BT* and the *802.11g mode for 2.4G WIFI* are the worst case, their sum of MPE ratio is 0.024 which is less than 1.0,so the collocation exposure exclusion applies.

Result: The device meet FCC MPE at 20 cm distance.

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 a PIFA antenna arrangement for Wi-Fi & BLE, which the antenna gain is 2 dBi; fulfill the requirement of this section. Please refer to the EUT photos.

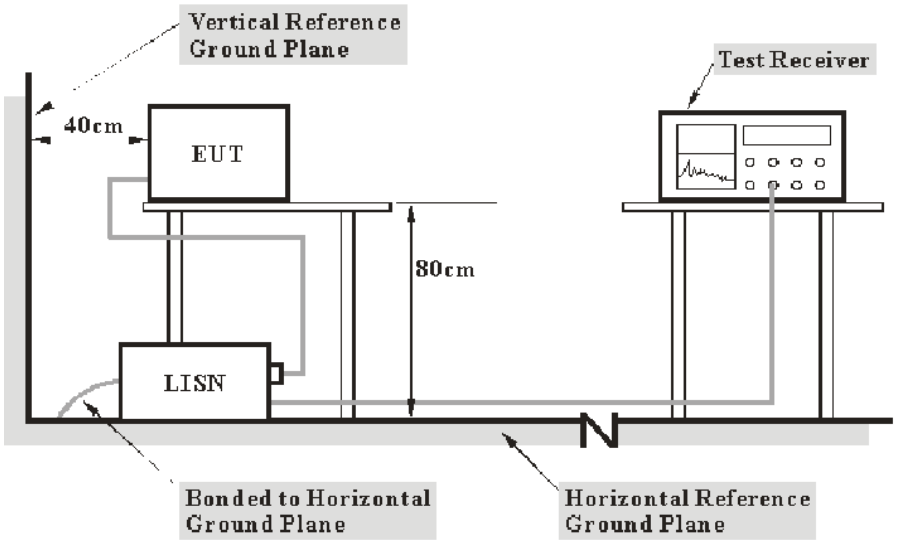
Result: Compliance.

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.

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 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

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 – Reading

Test Results Summary

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

Test Data

Environmental Conditions

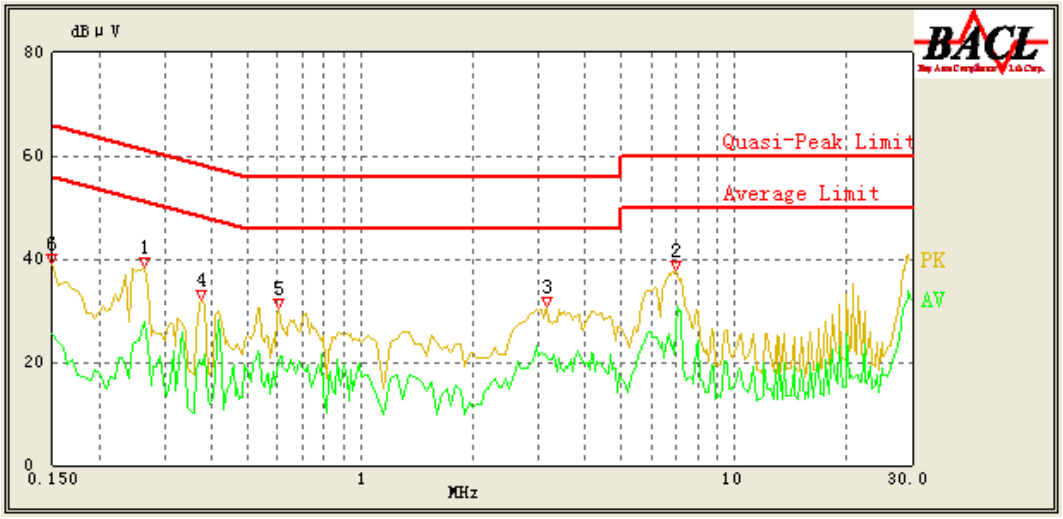
Temperature:	24.5 ℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Ada Yu on 2017-10-19.

EUT operation mode: Transmitting

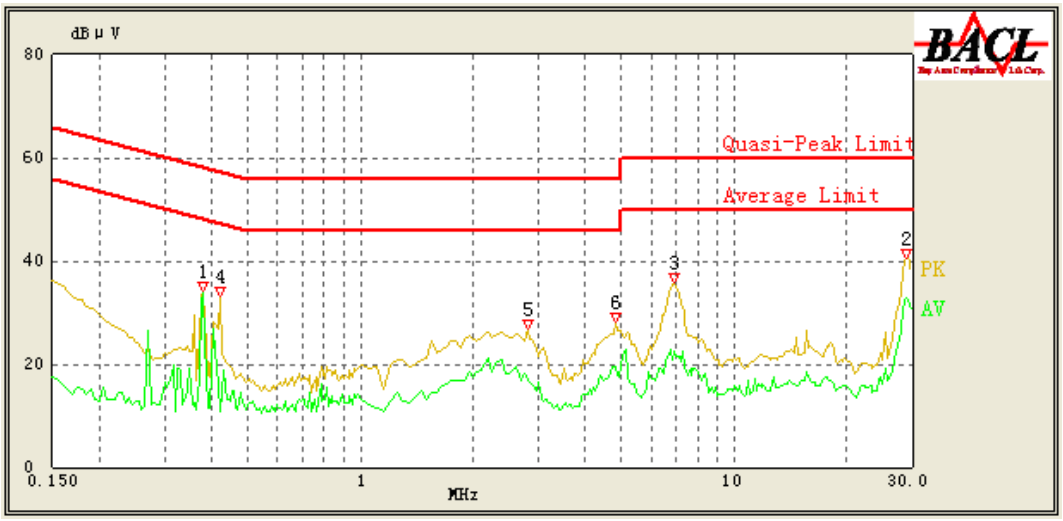
Wi-Fi Mode:

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dB μ V)	Margin (dB)	Comment
0.265	38.54	QP	9.000	L1	16.03	62.71	24.17	Compliance
0.265	27.90	AV	9.000	L1	16.03	52.71	24.81	Compliance
7.000	37.95	QP	9.000	L1	15.98	60.00	22.05	Compliance
7.050	30.94	AV	9.000	L1	15.98	50.00	19.06	Compliance
3.150	30.91	QP	9.000	L1	15.85	56.00	25.09	Compliance
3.150	21.17	AV	9.000	L1	15.85	46.00	24.83	Compliance
0.375	32.20	QP	9.000	L1	16.05	59.57	27.37	Compliance
0.375	19.44	AV	9.000	L1	16.05	49.57	30.13	Compliance
0.605	30.51	QP	9.000	L1	16.01	56.00	25.49	Compliance
0.610	21.19	AV	9.000	L1	16.01	46.00	24.81	Compliance
0.150	39.21	QP	9.000	L1	16.06	66.00	26.79	Compliance
0.150	25.64	AV	9.000	L1	16.06	56.00	30.36	Compliance

AC 120V/60 Hz, Neutral

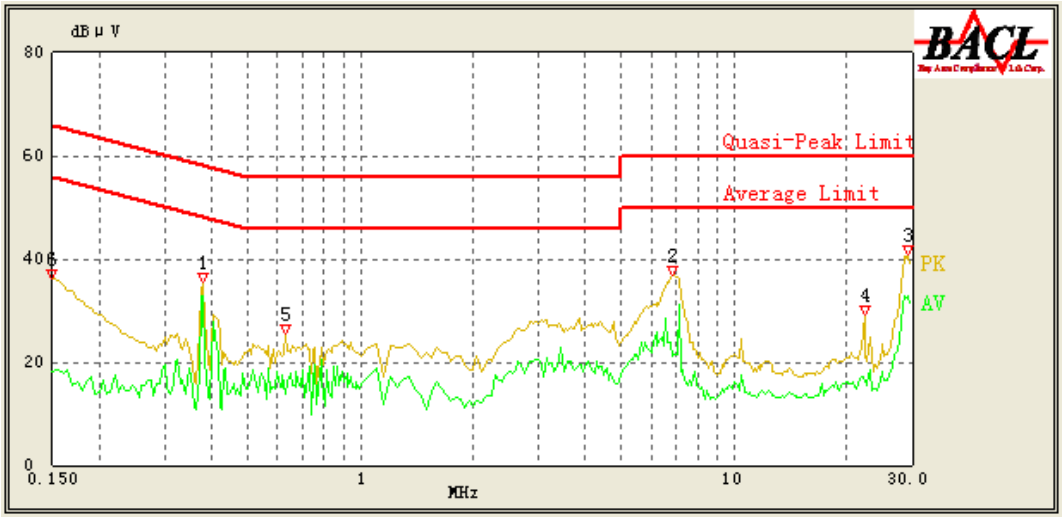


Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dB µ V)	Margin (dB)	Comment
0.380	34.20	QP	9.000	N	16.09	59.43	25.23	Compliance
0.380	34.17	AV	9.000	N	16.09	49.43	15.26	Compliance
28.900	40.60	QP	9.000	N	16.32	60.00	19.40	Compliance
29.000	32.81	AV	9.000	N	16.32	50.00	17.19	Compliance
6.950	35.72	QP	9.000	N	15.92	60.00	24.28	Compliance
6.950	22.50	AV	9.000	N	15.92	50.00	27.50	Compliance
0.420	33.02	QP	9.000	N	16.09	58.29	25.27	Compliance
0.420	10.88	AV	9.000	N	16.09	48.29	37.41	Compliance
2.800	26.78	QP	9.000	N	15.90	56.00	29.22	Compliance
2.800	17.06	AV	9.000	N	15.90	46.00	28.94	Compliance
4.800	28.21	QP	9.000	N	15.87	56.00	27.79	Compliance
4.800	19.35	AV	9.000	N	15.87	46.00	26.65	Compliance

Note:
1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
2) Margin = Limit – Reading

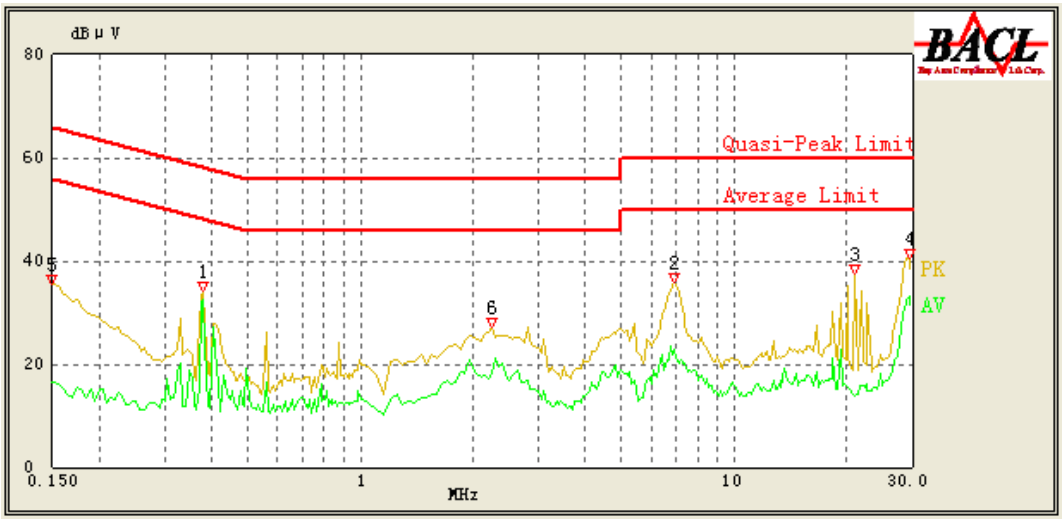
BLE Mode:

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dBµV)	Margin (dB)	Comment
0.380	35.35	QP	9.000	L1	16.05	59.43	24.08	Compliance
0.380	32.94	AV	9.000	L1	16.05	49.43	16.49	Compliance
6.850	36.88	QP	9.000	L1	15.97	60.00	23.12	Compliance
6.850	21.25	AV	9.000	L1	15.97	50.00	28.75	Compliance
29.250	40.71	QP	9.000	L1	16.57	60.00	19.29	Compliance
29.350	32.67	AV	9.000	L1	16.57	50.00	17.33	Compliance
22.300	29.29	QP	9.000	L1	16.45	60.00	30.71	Compliance
22.150	17.01	AV	9.000	L1	16.45	50.00	32.99	Compliance
0.630	25.56	QP	9.000	L1	16.00	56.00	30.44	Compliance
0.630	13.81	AV	9.000	L1	16.00	46.00	32.19	Compliance
0.150	36.08	QP	9.000	L1	16.06	66.00	29.92	Compliance
0.150	18.24	AV	9.000	L1	16.06	56.00	37.76	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dB μ V)	Margin (dB)	Comment
0.380	34.26	QP	9.000	N	16.09	59.43	25.17	Compliance
0.380	32.62	AV	9.000	N	16.09	49.43	16.81	Compliance
6.950	35.98	QP	9.000	N	15.92	60.00	24.02	Compliance
6.950	22.81	AV	9.000	N	15.92	50.00	27.19	Compliance
21.000	37.66	QP	9.000	N	16.18	60.00	22.34	Compliance
21.150	14.14	AV	9.000	N	16.18	50.00	35.86	Compliance
29.400	40.59	QP	9.000	N	16.33	60.00	19.41	Compliance
29.400	33.05	AV	9.000	N	16.33	50.00	16.95	Compliance
0.150	35.51	QP	9.000	N	16.06	66.00	30.49	Compliance
0.150	16.65	AV	9.000	N	16.06	56.00	39.35	Compliance
2.250	27.16	QP	9.000	N	15.91	56.00	28.84	Compliance
2.250	18.02	AV	9.000	N	15.91	46.00	27.98	Compliance

Note:
1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
2) Margin = Limit – Reading

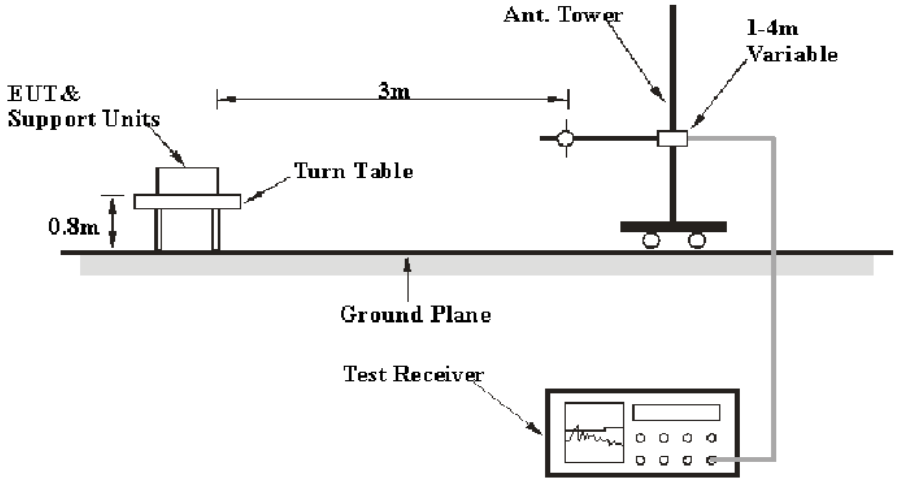
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

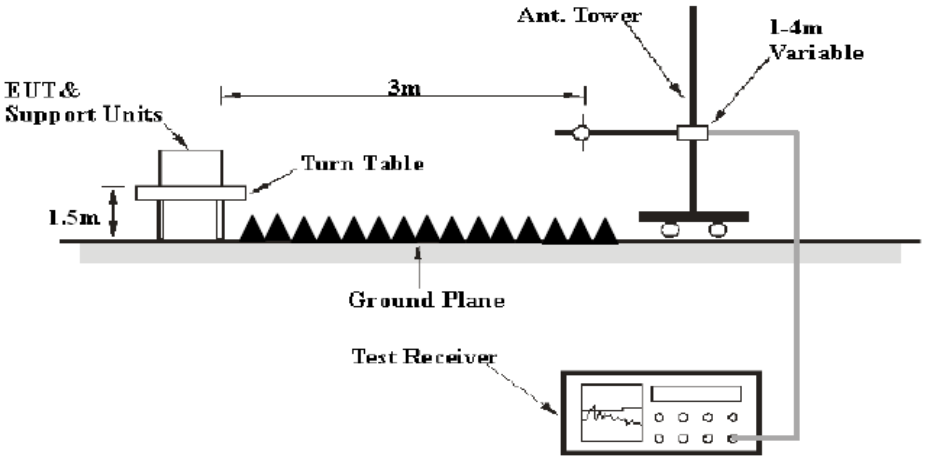
FCC §15.247 (d); §15.209; §15.205;

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	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP

Frequency Range	Item	RBW	Video B/W	Duty cycle	Detector
1GHz – 25GHz	PK Value	1MHz	3 MHz	Any	PK
	AV Value	1MHz	10 Hz	>98%	PK
		1MHz	1/T	<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 detection mode 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 recorded data in following table, 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:	24.8 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Ada Yu on 2017-10-14 to 2017-10-16.

EUT operation mode: Transmitting (Scan with X-Axis, Y-Axis and Z-Axis position, the worst case X-Axis was recorded)

30MHz-25GHz

802.11b Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
97.35	51.36	QP	305	161	H	-13.00	38.36	43.5	5.14
2412.00	104.71	PK	148	189	H	-4.90	99.81	/	/
2412.00	95.20	Ave	148	189	H	-4.90	90.30	/	/
2412.00	111.93	PK	34	245	V	-4.90	107.03	/	/
2412.00	102.25	Ave	34	245	V	-4.90	97.35	/	/
2390.00	64.78	PK	107	173	V	-4.96	59.82	74	14.18
2390.00	51.75	Ave	107	173	V	-4.96	46.79	54	7.21
1803.25	50.35	PK	52	228	H	-6.83	43.52	74	30.48
1803.25	37.32	Ave	52	228	H	-6.83	30.49	54	23.51
3228.00	65.63	PK	302	160	V	-1.53	64.10	74	9.90
3228.00	52.08	Ave	302	160	V	-1.53	50.55	54	3.45
4824.00	61.78	PK	277	140	V	2.52	64.30	74	9.70
4824.00	48.13	Ave	277	140	V	2.52	50.65	54	3.35
7236.00	44.23	PK	9	141	V	9.83	54.06	74	19.94
7236.00	31.24	Ave	9	141	V	9.83	41.07	54	12.93

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2437 MHz)									
97.35	51.44	QP	105	156	H	-13.00	38.44	43.5	5.06
2437.00	106.12	PK	257	110	H	-4.83	101.29	/	/
2437.00	96.56	Ave	257	110	H	-4.83	91.73	/	/
2437.00	111.29	PK	353	126	V	-4.83	106.46	/	/
2437.00	102.20	Ave	353	126	V	-4.83	97.37	/	/
1631.35	48.35	PK	53	209	H	-7.52	40.83	74	33.17
1631.35	37.36	Ave	53	209	H	-7.52	29.84	54	24.16
3264.00	61.66	PK	311	131	V	-1.53	60.13	74	13.87
3264.00	48.05	Ave	311	131	V	-1.53	49.52	54	4.48
4874.00	61.56	PK	231	205	V	2.63	64.19	74	9.81
4874.00	48.24	Ave	231	205	V	2.63	50.87	54	3.13
6677.55	45.75	PK	59	196	H	8.70	54.45	74	19.55
6677.55	31.31	Ave	59	196	H	8.70	40.01	54	13.99
7311.00	44.57	PK	137	206	V	9.95	54.52	74	19.48
7311.00	31.45	Ave	137	206	V	9.95	41.40	54	12.60
High Channel (2462 MHz)									
97.35	51.82	QP	18	232	H	-13.00	38.82	43.5	4.68
2462.00	102.90	PK	275	243	H	-4.76	98.14	/	/
2462.00	93.75	Ave	275	243	H	-4.76	88.99	/	/
2462.00	110.23	PK	360	100	V	-4.76	105.47	/	/
2462.00	100.92	Ave	360	100	V	-4.76	96.16	/	/
2483.50	65.63	PK	19	213	V	-4.71	60.92	74	13.08
2483.50	52.09	Ave	19	213	V	-4.71	47.38	54	6.62
3300.00	61.58	PK	48	103	V	-1.37	60.21	74	13.79
3300.00	49.93	Ave	48	103	V	-1.37	48.56	54	5.44
4924.00	62.99	PK	315	214	V	2.74	65.73	74	8.27
4924.00	48.05	Ave	315	214	V	2.74	50.79	54	3.21
6673.27	42.74	PK	195	241	H	8.69	51.43	74	22.57
6673.27	28.32	Ave	195	241	H	8.69	37.01	54	16.99
7386.00	48.19	PK	318	203	V	10.06	58.25	74	15.75
7386.00	34.55	Ave	318	203	V	10.06	44.61	54	9.39

802.11g Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
97.35	51.22	QP	100	123	H	-13.00	38.22	43.5	5.28
2412.00	101.98	PK	82	207	H	-4.90	97.08	/	/
2412.00	91.14	Ave	82	207	H	-4.90	86.24	/	/
2412.00	108.74	PK	130	102	V	-4.90	103.84	/	/
2412.00	98.18	Ave	130	102	V	-4.90	93.28	/	/
2390.00	65.73	PK	52	185	V	-4.96	60.77	74	13.23
2390.00	51.92	Ave	52	185	V	-4.96	46.96	54	7.04
1476.95	42.17	PK	146	179	H	-8.23	33.94	74	40.06
1476.95	30.56	Ave	146	179	H	-8.23	22.33	54	31.67
3228.00	65.12	PK	312	106	V	-1.53	63.59	74	10.41
3228.00	51.35	Ave	312	106	V	-1.53	49.82	54	4.18
4824.00	62.96	PK	213	105	V	2.52	65.48	74	8.52
4824.00	48.91	Ave	213	105	V	2.52	51.43	54	2.57
7236.00	43.66	PK	102	116	V	9.83	53.49	74	20.51
7236.00	30.2	Ave	102	116	V	9.83	40.03	54	13.97
Middle Channel (2437 MHz)									
97.35	51.44	QP	8	241	H	-13.00	38.44	43.5	5.06
2437.00	101.33	PK	63	136	H	-4.83	96.50	/	/
2437.00	91.17	Ave	63	136	H	-4.83	86.34	/	/
2437.00	108.38	PK	155	217	V	-4.83	103.55	/	/
2437.00	97.74	Ave	155	217	V	-4.83	92.91	/	/
1371.25	41.32	PK	41	239	H	-8.99	32.33	74	41.67
1371.25	28.65	Ave	41	239	H	-8.99	19.66	54	34.34
3264.00	62.98	PK	19	143	V	-1.53	61.45	74	12.55
3264.00	49.91	Ave	19	143	V	-1.53	48.38	54	5.62
4874.00	60.23	PK	46	151	V	2.63	62.86	74	11.14
4874.00	47.15	Ave	46	151	V	2.63	49.78	54	4.22
6311.12	40.52	PK	101	168	H	7.30	47.82	74	26.18
6311.12	28.63	Ave	101	168	H	7.30	35.93	54	18.07
7311.00	44.67	PK	248	166	V	9.95	54.62	74	19.38
7311.00	31.03	Ave	248	166	V	9.95	40.98	54	13.02

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2462 MHz)									
97.35	51.74	QP	79	144	H	-13.00	38.74	43.5	4.76
2462.00	101.15	PK	341	135	H	-4.76	96.39	/	/
2462.00	90.98	Ave	341	135	H	-4.76	86.22	/	/
2462.00	108.04	PK	287	127	V	-4.76	103.28	/	/
2462.00	97.95	Ave	287	127	V	-4.76	93.19	/	/
2483.50	71.29	PK	95	230	V	-4.71	66.58	74	7.42
2483.50	53.99	Ave	95	230	V	-4.71	49.28	54	4.72
3300.00	61.08	PK	335	195	V	-1.37	59.71	74	14.29
3300.00	49.78	Ave	335	195	V	-1.37	48.41	54	5.59
4924.00	60.85	PK	330	176	V	2.74	63.59	74	10.41
4924.00	48.55	Ave	330	176	V	2.74	51.29	54	2.71
6344.32	41.11	PK	278	211	H	7.47	48.58	74	25.42
6344.32	29.87	Ave	278	211	H	7.47	37.34	54	16.66
7386.00	48.96	PK	138	115	V	10.06	59.02	74	14.98
7386.00	33.63	Ave	138	115	V	10.06	43.69	54	10.31

802.11n-HT20 Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
97.35	51.74	QP	237	145	H	-13.00	38.74	43.5	4.76
2412.00	102.69	PK	224	202	H	-4.90	97.79	/	/
2412.00	92.86	Ave	224	202	H	-4.90	87.96	/	/
2412.00	108.88	PK	309	149	V	-4.90	103.98	/	/
2412.00	98.66	Ave	309	149	V	-4.90	93.76	/	/
2390.00	65.61	PK	319	157	V	-4.96	60.65	74	13.35
2390.00	52.09	Ave	319	157	V	-4.96	47.13	54	6.87
1854.31	41.23	PK	2	146	H	-6.63	34.60	74	39.40
1854.31	27.96	Ave	2	146	H	-6.63	21.33	54	32.67
3228.00	64.96	PK	244	209	V	-1.53	63.43	74	10.57
3228.00	50.83	Ave	244	209	V	-1.53	49.3	54	4.7
4824.00	61.58	PK	346	102	V	2.52	64.10	74	9.90
4824.00	47.67	Ave	346	102	V	2.52	50.19	54	3.81
7236.00	43.98	PK	68	214	V	9.83	53.81	74	20.19
7236.00	30.11	Ave	68	214	V	9.83	39.94	54	14.06

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2437 MHz)									
97.35	51.93	QP	147	244	H	-13.00	38.93	43.5	4.57
2437.00	100.45	PK	226	148	H	-4.83	95.62	/	/
2437.00	90.2	Ave	226	148	H	-4.83	85.37	/	/
2437.00	107.54	PK	262	174	V	-4.83	102.71	/	/
2437.00	97.2	Ave	262	174	V	-4.83	92.37	/	/
1135.55	41.20	PK	356	111	H	-10.71	30.49	74	43.51
1135.55	28.35	Ave	356	111	H	-10.71	17.64	54	36.36
3264.00	62.71	PK	123	244	V	-1.53	61.18	74	12.82
3264.00	49.58	Ave	123	244	V	-1.53	48.05	54	5.95
4874.00	60.53	PK	288	244	V	2.63	63.16	74	10.84
4874.00	46.89	Ave	288	244	V	2.63	49.52	54	4.48
6321.52	42.02	PK	112	126	H	7.35	49.37	74	24.63
6321.52	27.03	Ave	112	126	H	7.35	34.38	54	19.62
7311.00	46.13	PK	311	214	V	9.95	56.08	74	17.92
7311.00	31.17	Ave	311	214	V	9.95	41.12	54	12.88
High Channel (2462 MHz)									
97.35	51.47	QP	281	119	H	-13.00	38.47	43.5	5.03
2462.00	99.87	PK	144	238	H	-4.76	95.11	/	/
2462.00	90.23	Ave	144	238	H	-4.76	85.47	/	/
2462.00	107.42	PK	315	156	V	-4.76	102.66	/	/
2462.00	96.97	Ave	315	156	V	-4.76	92.21	/	/
2483.50	68.1	PK	127	103	V	-4.71	63.39	74	10.61
2483.50	54.95	Ave	127	103	V	-4.71	50.24	54	3.76
3300.00	60.96	PK	302	238	V	-1.37	59.59	74	14.41
3300.00	48.54	Ave	302	238	V	-1.37	47.17	54	6.83
4924.00	60.32	PK	102	201	V	2.74	63.06	74	10.94
4924.00	47.49	Ave	102	201	V	2.74	50.23	54	3.77
6403.55	41.02	PK	202	202	H	7.77	48.79	74	25.21
6403.55	27.38	Ave	202	202	H	7.77	35.15	54	18.85
7386.00	49.55	PK	258	123	V	10.06	59.61	74	14.39
7386.00	33.46	Ave	258	123	V	10.06	43.52	54	10.48

802.11n-HT40 Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2422 MHz)									
97.35	51.98	QP	250	140	H	-13.00	38.98	43.5	4.52
2422.00	98.79	PK	314	114	H	-4.88	93.91	/	/
2422.00	88.61	Ave	314	114	H	-4.88	83.73	/	/
2422.00	104.07	PK	125	219	V	-4.88	99.19	/	/
2422.00	93.8	Ave	125	219	V	-4.88	88.92	/	/
2390.00	65.78	PK	46	105	V	-4.96	60.82	74	13.18
2390.00	52.01	Ave	46	105	V	-4.96	47.05	54	6.95
1832.77	44.23	PK	359	242	H	-6.72	37.51	74	36.49
1832.77	31.27	Ave	359	242	H	-6.72	24.55	54	29.45
3228.00	64.35	PK	109	146	V	-1.53	62.82	74	11.18
3228.00	50.05	Ave	109	146	V	-1.53	48.52	54	5.48
4844.00	58.16	PK	2	115	V	2.56	60.72	74	13.28
4844.00	44.87	Ave	2	115	V	2.56	47.43	54	6.57
7266.00	42.86	PK	154	133	V	9.88	52.74	74	21.26
7266.00	29.36	Ave	154	133	V	9.88	39.24	54	14.76
Middle Channel (2437 MHz)									
97.35	51.38	QP	254	181	H	-13.00	38.38	43.5	5.12
2437.00	97.34	PK	342	183	H	-4.83	92.51	/	/
2437.00	87.22	Ave	342	183	H	-4.83	82.39	/	/
2437.00	103.88	PK	78	155	V	-4.83	99.05	/	/
2437.00	93.64	Ave	78	155	V	-4.83	88.81	/	/
1142.35	40.23	PK	18	120	H	-10.66	29.57	74	44.43
1142.35	27.85	Ave	18	120	H	-10.66	17.19	54	36.81
3264.00	61.98	PK	134	209	V	-1.53	60.45	74	13.55
3264.00	48.93	Ave	134	209	V	-1.53	47.4	54	6.6
4874.00	56.65	PK	116	105	V	2.63	59.28	74	14.72
4874.00	43.56	Ave	116	105	V	2.63	46.19	54	7.81
6632.35	40.32	PK	90	214	H	8.59	48.91	74	25.09
6632.35	28.03	Ave	90	214	H	8.59	36.62	54	17.38
7311.00	43.63	PK	137	126	V	9.95	53.58	74	20.42
7311.00	29.96	Ave	137	126	V	9.95	39.91	54	14.09

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2452 MHz)									
97.35	52.03	QP	247	227	H	-13.00	39.03	43.5	4.47
2452.00	97.82	PK	58	176	H	-4.79	93.03	/	/
2452.00	87.87	Ave	58	176	H	-4.79	83.08	/	/
2452.00	103.93	PK	172	194	V	-4.79	99.14	/	/
2452.00	94.82	Ave	172	194	V	-4.79	90.03	/	/
2483.50	69.01	PK	350	194	V	-4.71	64.30	74	9.70
2483.50	55.25	Ave	350	194	V	-4.71	50.54	54	3.46
3300.00	59.68	PK	355	234	V	-1.37	58.31	74	15.69
3300.00	47.96	Ave	355	234	V	-1.37	46.59	54	7.41
4904.00	57.7	PK	120	231	V	2.70	60.40	74	13.60
4904.00	44.39	Ave	120	231	V	2.70	47.09	54	6.91
6671.65	41.35	PK	153	128	H	8.68	50.03	74	23.97
6671.65	29.03	Ave	153	128	H	8.68	37.71	54	16.29
7356.00	43.45	PK	312	223	V	10.01	53.46	74	20.54
7356.00	30.85	Ave	312	223	V	10.01	40.86	54	13.14

BLE Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2402 MHz)									
97.35	51.25	QP	270	187	V	-13.00	38.25	43.5	5.25
2402.00	104.98	PK	296	238	V	-4.93	100.05	/	/
2402.00	102.77	Ave	296	238	V	-4.93	97.84	/	/
2402.00	100.57	PK	78	215	H	-4.93	95.64	/	/
2402.00	98.51	Ave	78	215	H	-4.93	93.58	/	/
2390.00	65.12	PK	143	115	V	-4.96	60.16	74	13.84
2390.00	50.9	Ave	143	115	V	-4.96	45.94	54	8.06
1795.83	51.06	PK	41	218	H	-6.86	44.20	74	29.80
1795.83	38.15	Ave	41	218	H	-6.86	31.29	54	22.71
3192.00	63.69	PK	237	124	V	-1.61	62.08	74	11.92
3192.00	50.16	Ave	237	124	V	-1.61	48.55	54	5.45
4804.00	45.27	PK	125	133	V	2.47	47.74	74	26.26
4804.00	33.98	Ave	125	133	V	2.47	36.45	54	17.55
7206.00	41.23	PK	49	208	V	9.79	51.02	74	22.98
7206.00	27.32	Ave	49	208	V	9.79	37.11	54	16.89

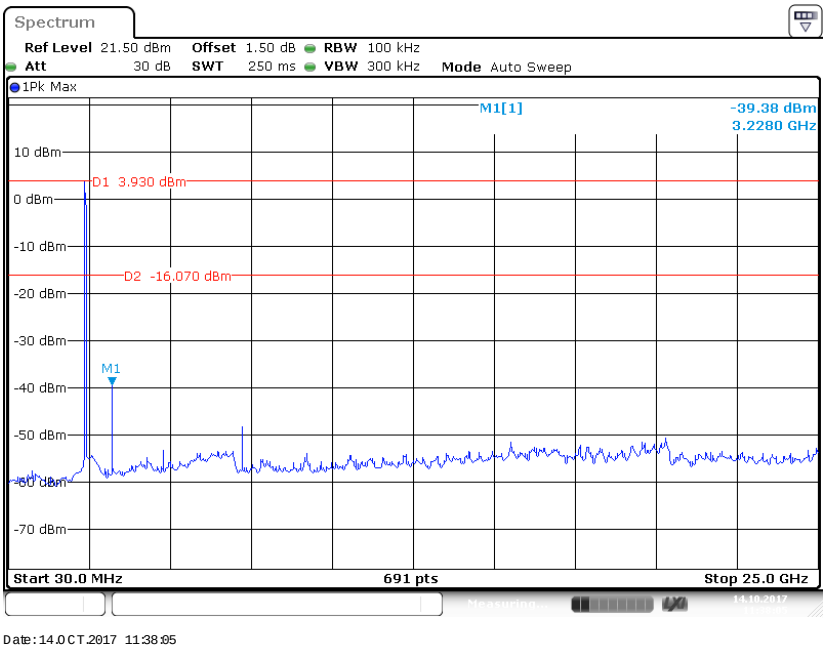
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2440 MHz)									
97.35	51.18	QP	74	182	V	-13.00	38.18	43.5	5.32
2440.00	107.16	PK	254	156	V	-4.82	102.34	/	/
2440.00	104.80	Ave	254	156	V	-4.82	99.98	/	/
2440.00	102.70	PK	154	118	H	-4.82	97.88	/	/
2440.00	100.66	Ave	154	118	H	-4.82	95.84	/	/
1334.00	50.99	PK	210	100	H	-9.26	41.73	74	32.27
1334.00	37.98	Ave	210	100	H	-9.26	28.72	54	25.28
3264.00	58.36	PK	54	250	V	-1.53	56.83	74	17.17
3264.00	45.25	Ave	54	250	V	-1.53	43.72	54	10.28
4882.00	45.14	PK	300	148	V	2.64	47.78	74	26.22
4882.00	33.91	Ave	300	148	V	2.64	36.55	54	17.45
6663.00	50.11	PK	64	127	H	8.66	58.77	74	15.23
6663.00	37.21	Ave	64	127	H	8.66	45.87	54	8.13
7323.00	41.21	PK	103	131	V	9.96	51.17	74	22.83
7323.00	27.31	Ave	103	131	V	9.96	37.27	54	16.73
High Channel (2480 MHz)									
97.35	51.09	QP	290	185	V	-13.00	38.09	43.5	5.41
2480.00	106.15	PK	279	215	V	-4.72	101.43	/	/
2480.00	104.10	Ave	279	215	V	-4.72	99.38	/	/
2480.00	101.73	PK	212	166	H	-4.72	97.01	/	/
2480.00	99.86	Ave	212	166	H	-4.72	95.14	/	/
2483.50	50.98	PK	271	241	V	-4.71	46.27	74	27.73
2483.50	37.84	Ave	271	241	V	-4.71	33.13	54	20.87
3300.00	54.32	PK	144	240	V	-1.37	52.95	74	21.05
3300.00	41.89	Ave	144	240	V	-1.37	40.52	54	13.48
4960.00	45.11	PK	35	200	V	2.82	47.93	74	26.07
4960.00	33.90	Ave	35	200	V	2.82	36.72	54	17.28
6348.00	50.06	PK	159	237	H	7.49	57.55	74	16.45
6348.00	37.08	Ave	159	237	H	7.49	44.57	54	9.43
7440.00	41.05	PK	84	209	V	10.14	51.19	74	22.81
7440.00	27.31	Ave	84	209	V	10.14	37.45	54	16.55

Co-location Mode:

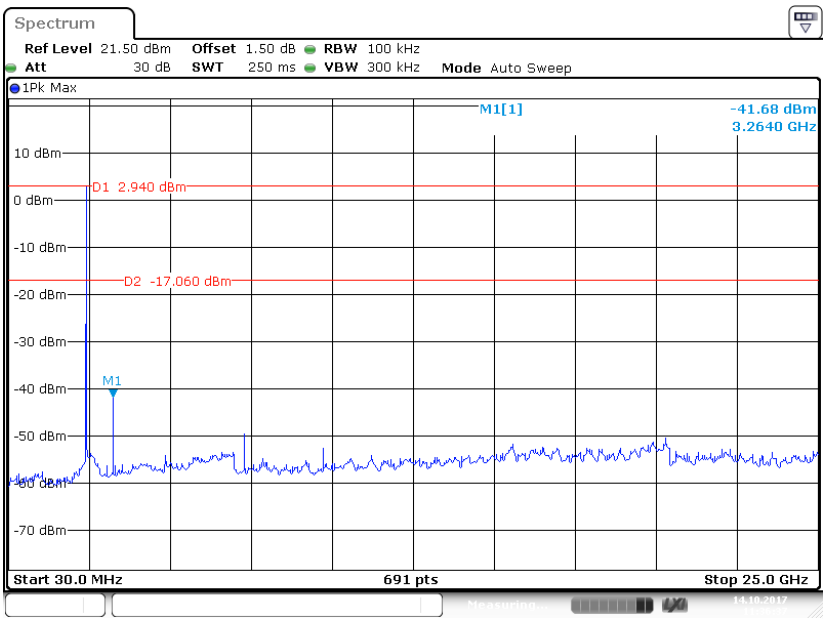
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
97.35	51.56	QP	75	156	V	-13.00	38.56	43.5	4.94
1334.00	50.49	PK	241	125	H	-9.26	41.23	74	32.77
1334.00	37.69	Ave	241	125	H	-9.26	28.43	54	25.57
3300.00	63.39	PK	248	234	V	-1.37	62.02	74	11.98
3300.00	50.36	Ave	248	234	V	-1.37	48.99	54	5.01

Conducted Spurious Emissions at Antenna Port

802.11b Low Channel

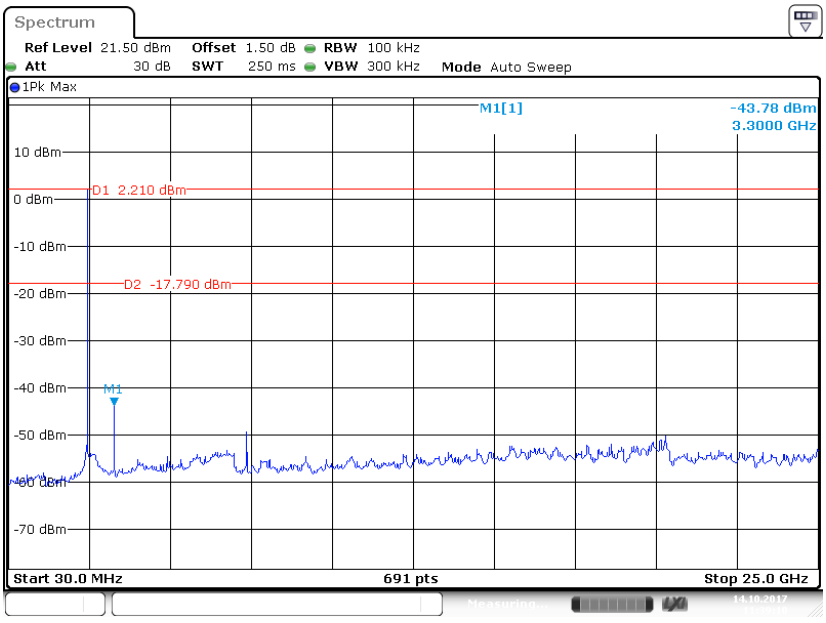


802.11b Middle Channel



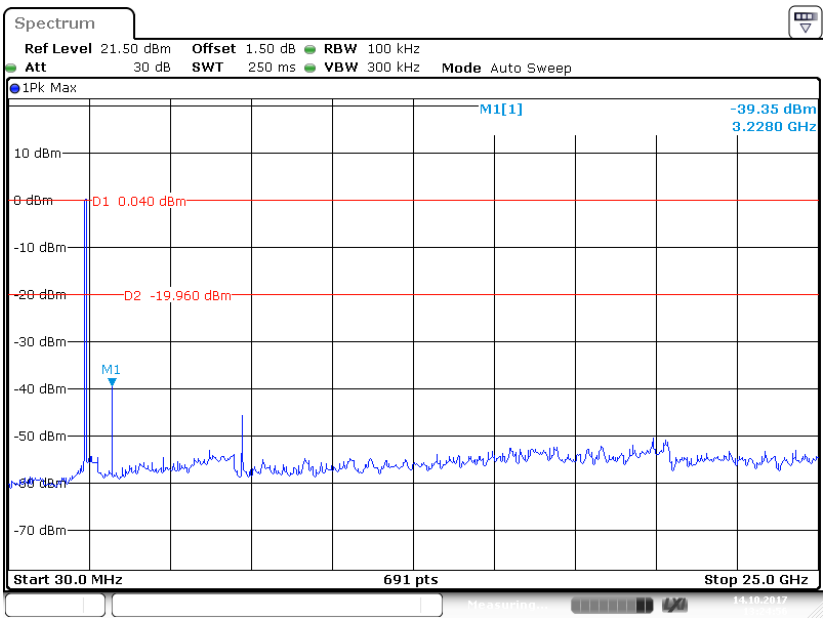
Date:14.OCT.2017 11:36:38

802.11b High Channel



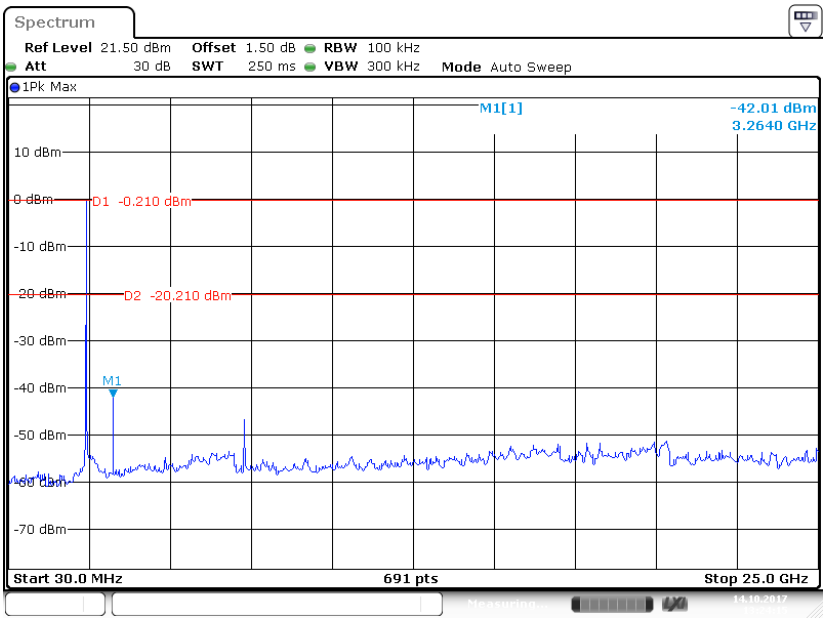
Date:14.OCT.2017 11:39:10

802.11g Low Channel



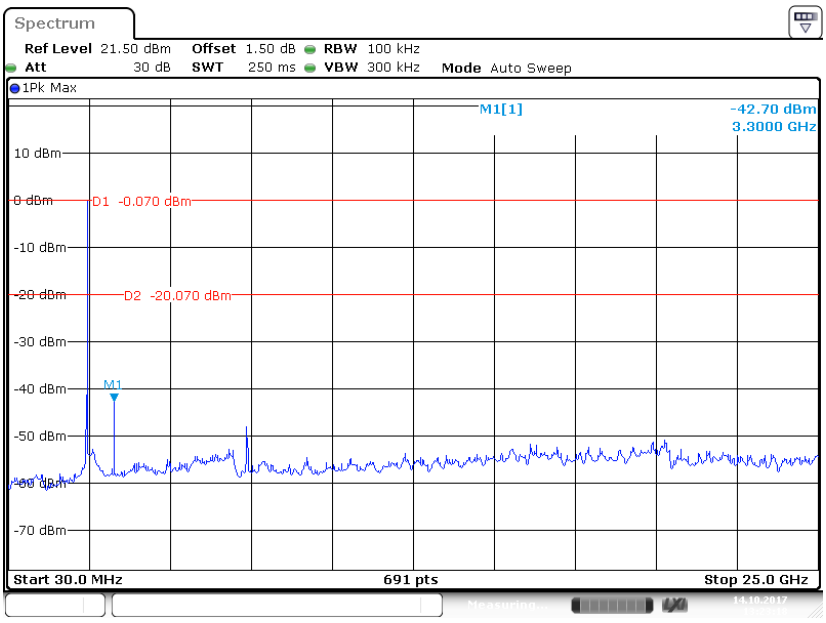
Date:14.OCT.2017 13:24:56

802.11g Middle Channel



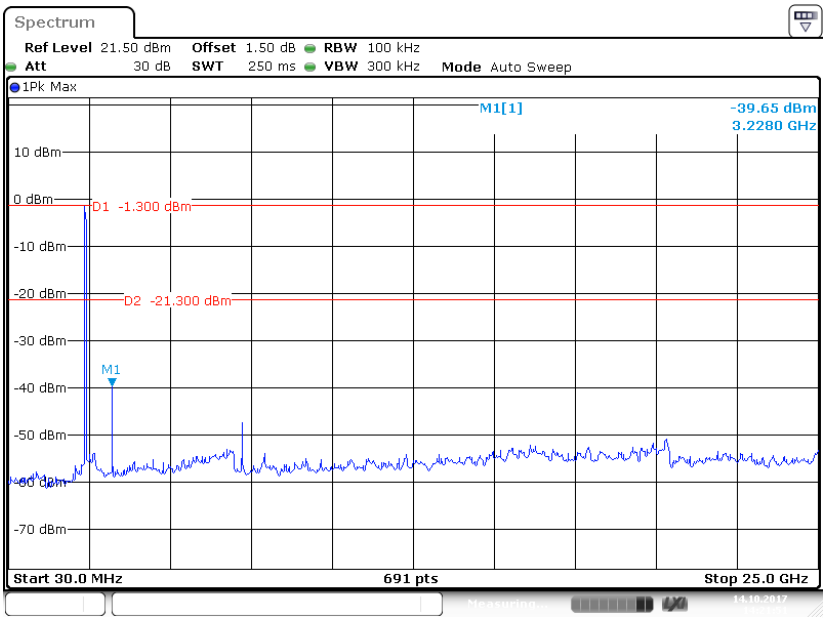
Date:14.OCT.2017 13:24:16

802.11g High Channel



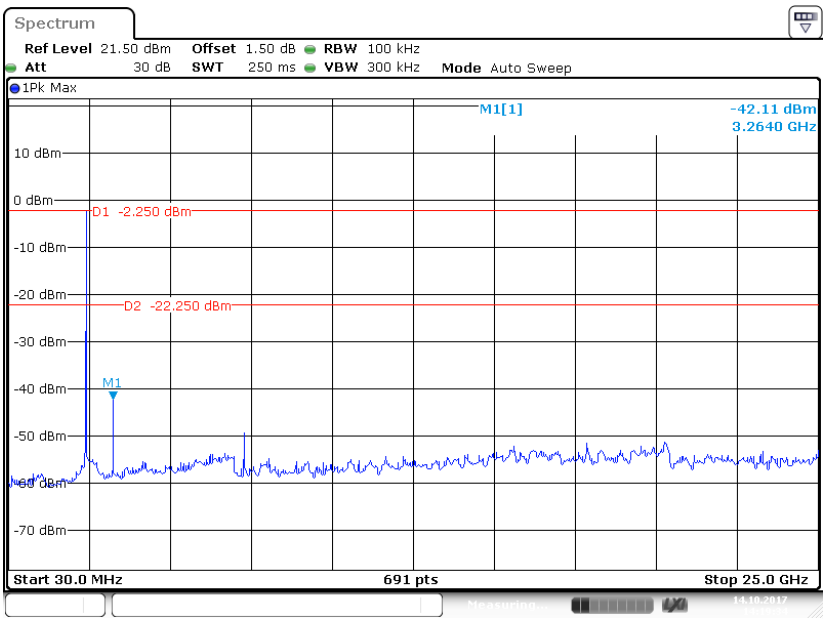
Date:14.OCT.2017 13:23:18

802.11n-HT20 Low Channel



Date:14.OCT.2017 14:21:52

802.11n-HT20 Middle Channel



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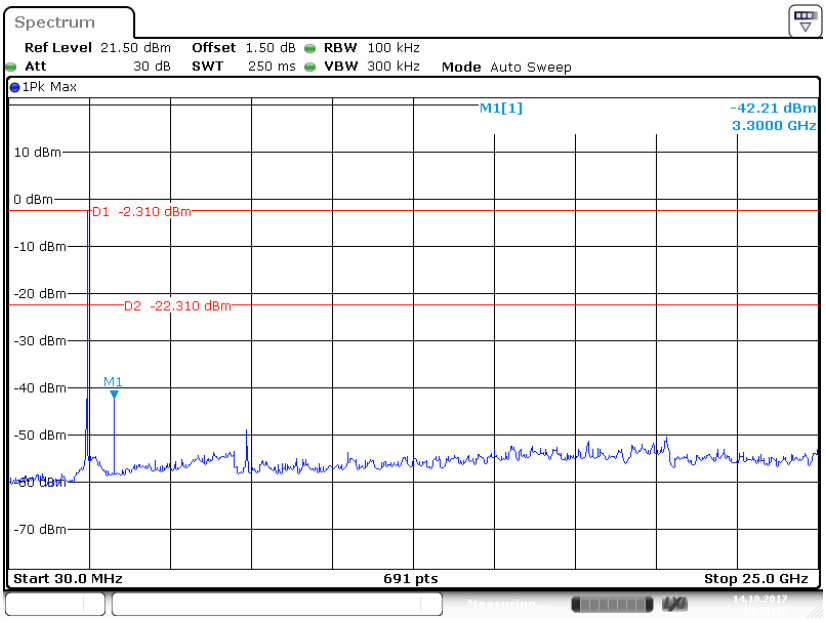
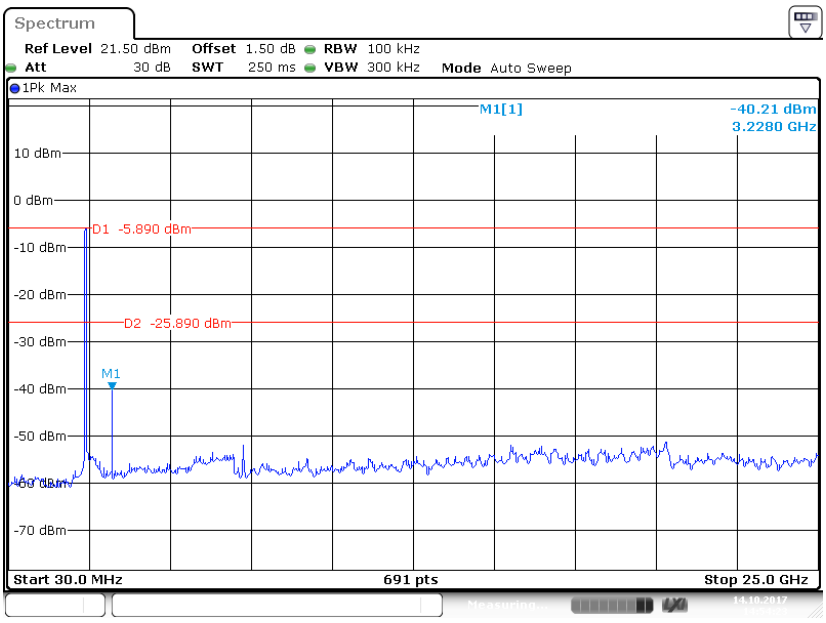
802.11n-HT20 High Channel



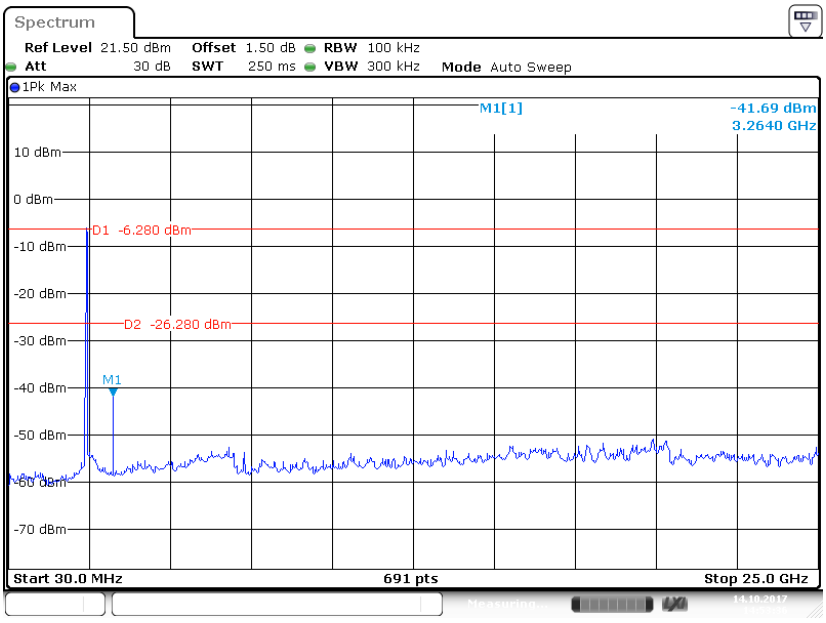
Date:14.OCT.2017 14:21:14

802.11n-HT40 Low Channel



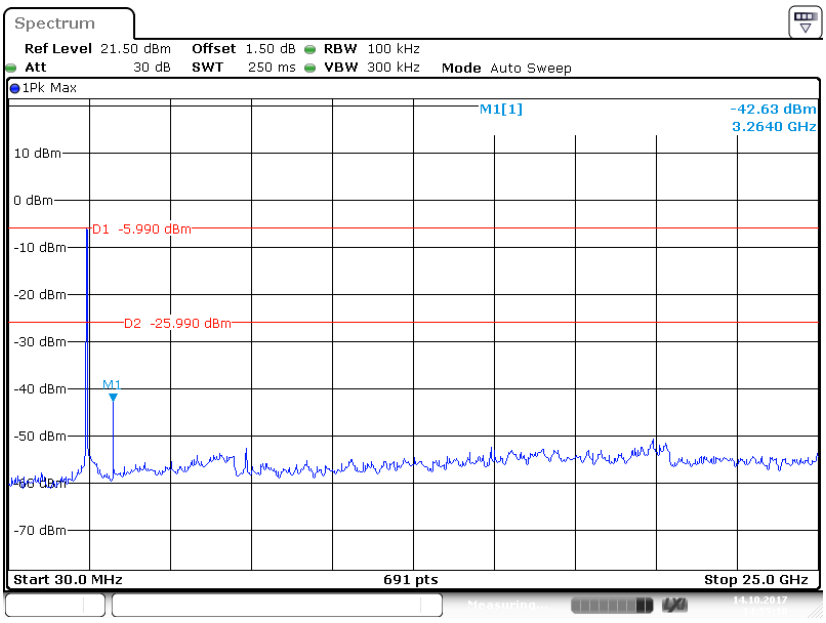
Date:14.OCT.2017 14:54:23

802.11n-HT40 Middle Channel



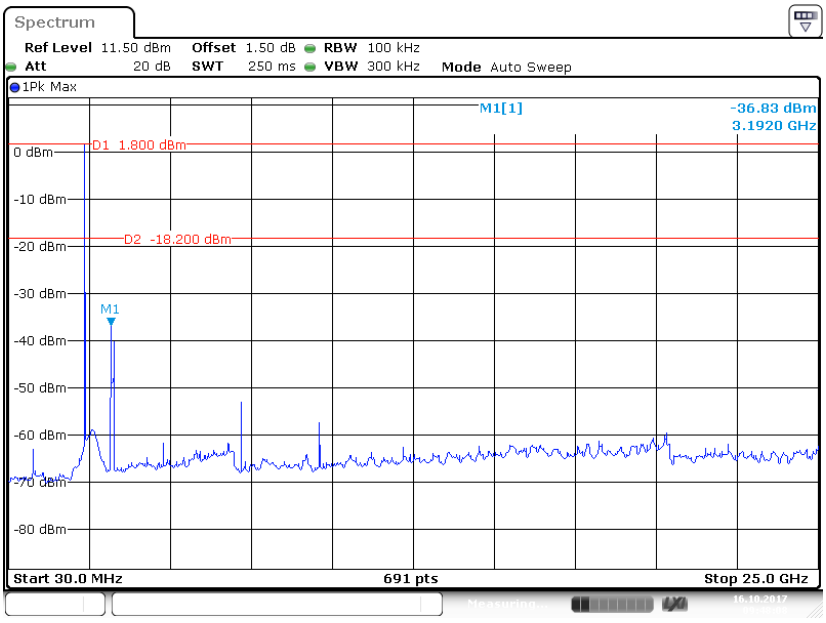
Date:14.OCT.2017 14:53:36

802.11n-HT40 High Channel



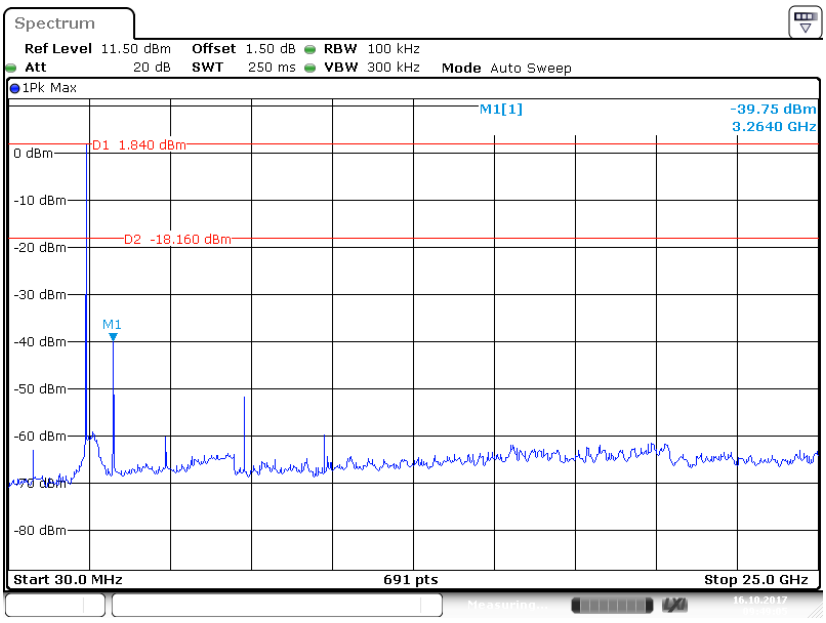
Date:14.OCT.2017 14:55:10

BLE Mode Low Channel



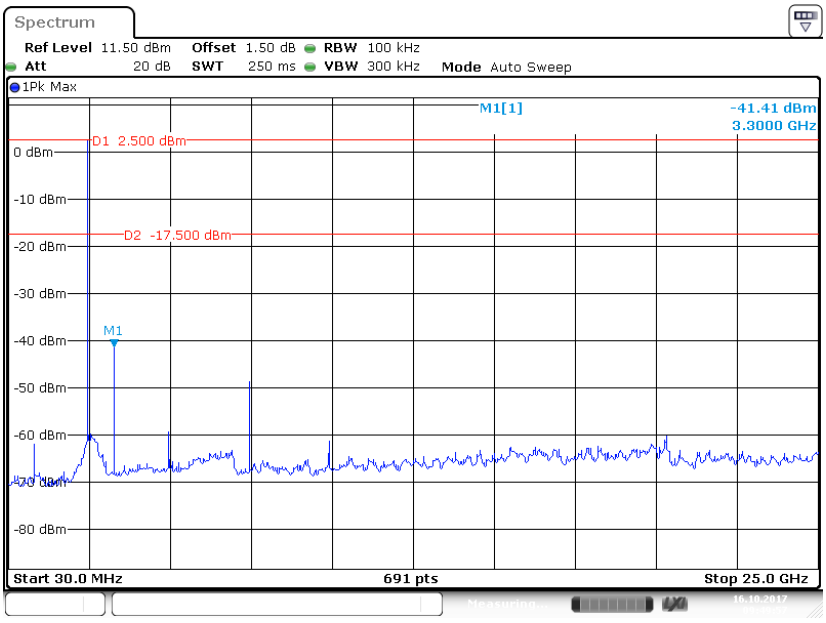
Date:16.OCT.2017 09:48:08

BLE Mode Middle Channel



Date:16.OCT.2017 09:49:05

BLE Mode High Channel



Date:16.OCT.2017 09:49:58

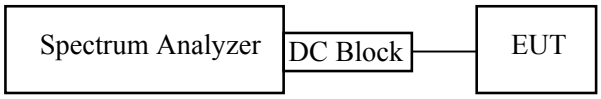
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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:	24.8 ℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

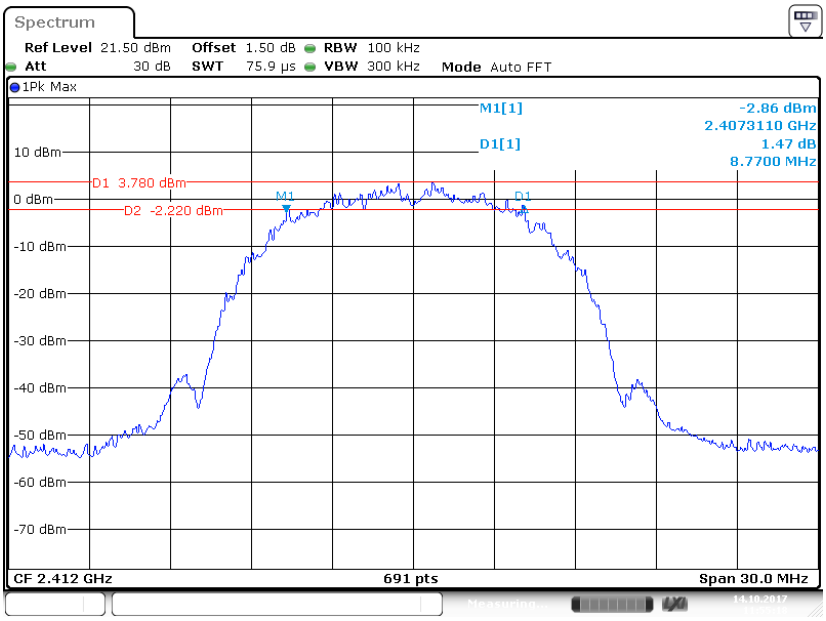
The testing was performed by Ada Yu on 2017-10-14 to 2017-10-16.

EUT operation mode: Transmitting

Test Result: Pass.

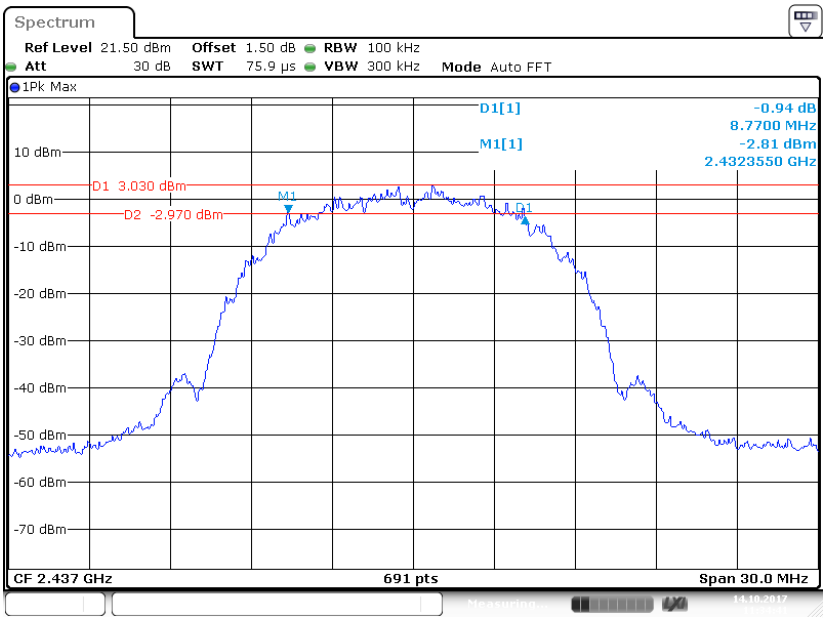
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b mode			
Low	2412	8.770	≥0.5
Middle	2437	8.770	≥0.5
High	2462	8.770	≥0.5
802.11g mode			
Low	2412	16.324	≥0.5
Middle	2437	16.324	≥0.5
High	2462	16.324	≥0.5
802.11n-HT20 mode			
Low	2412	16.889	≥0.5
Middle	2437	16.932	≥0.5
High	2462	16.802	≥0.5
802.11n-HT40 mode			
Low	2422	36.295	≥0.5
Middle	2437	36.035	≥0.5
High	2452	36.122	≥0.5
BLE mode			
Low	2402	0.647	≥0.5
Middle	2440	0.651	≥0.5
High	2480	0.647	≥0.5

802.11b Low Channel



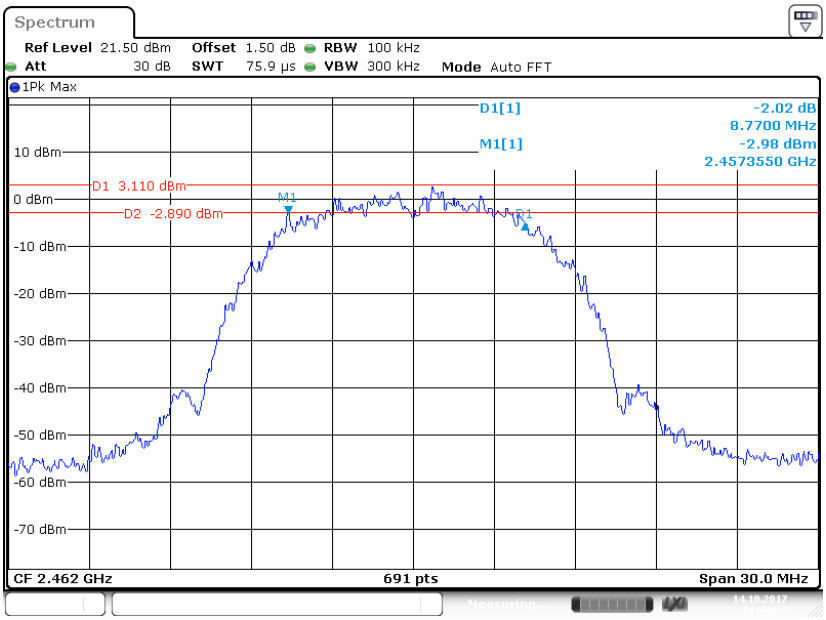
Date:14.OCT.2017 11:55:18

802.11b Middle Channel



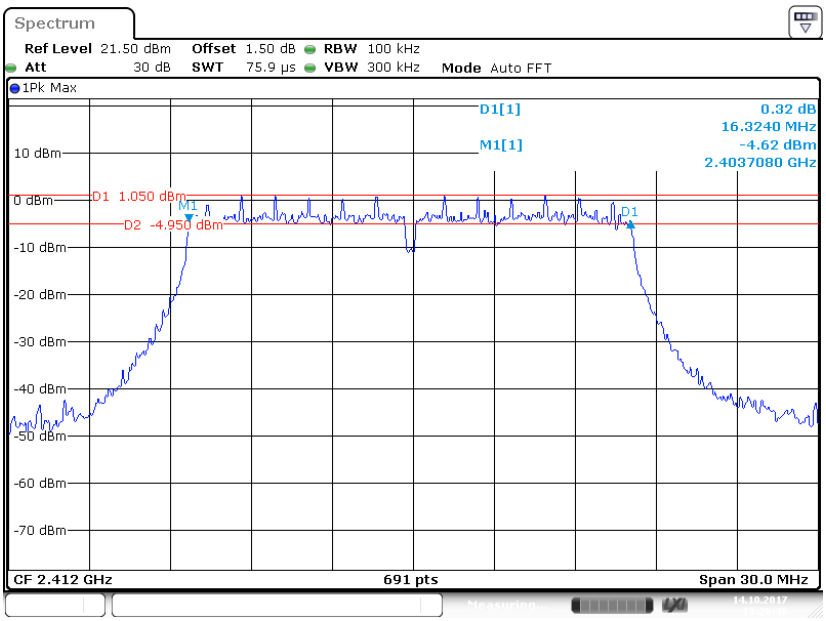
Date:14.OCT.2017 11:34:41

802.11b High Channel



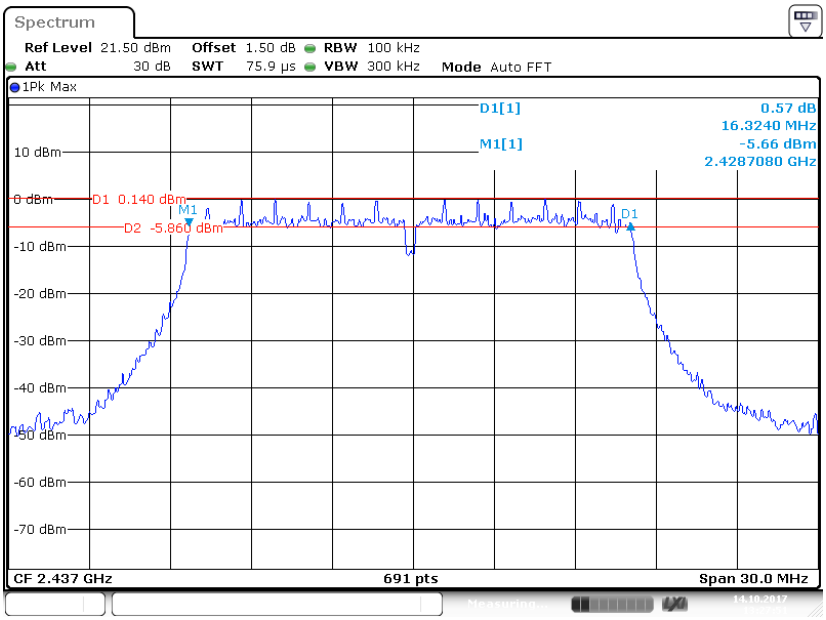
Date:14.OCT.2017 11:44:24

802.11g Low Channel



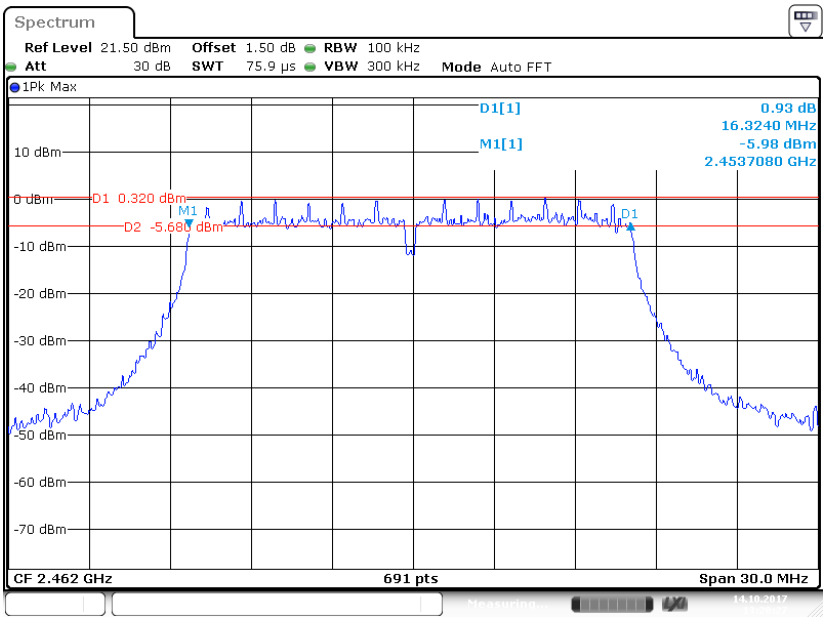
Date:14.OCT.2017 13:26:49

802.11g Middle Channel



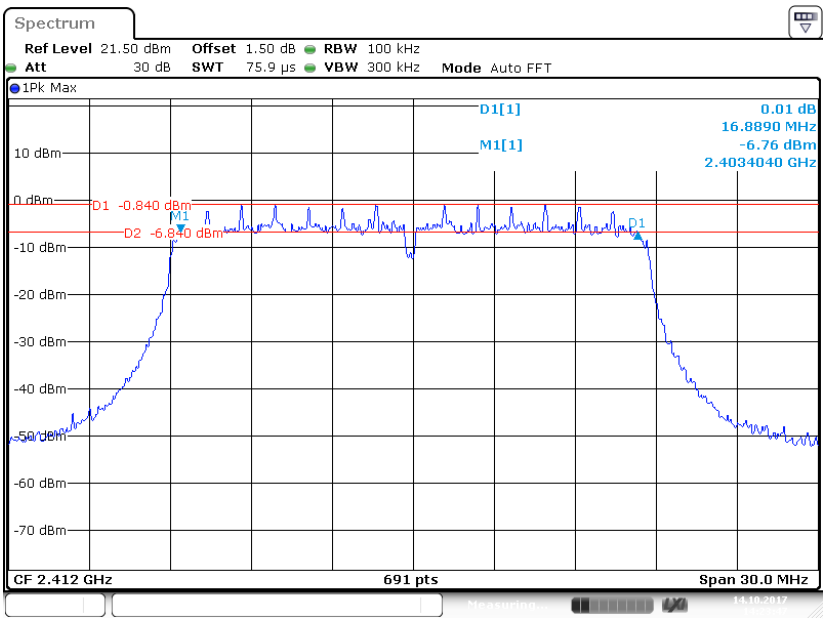
Date:14.OCT.2017 13:27:51

802.11g High Channel



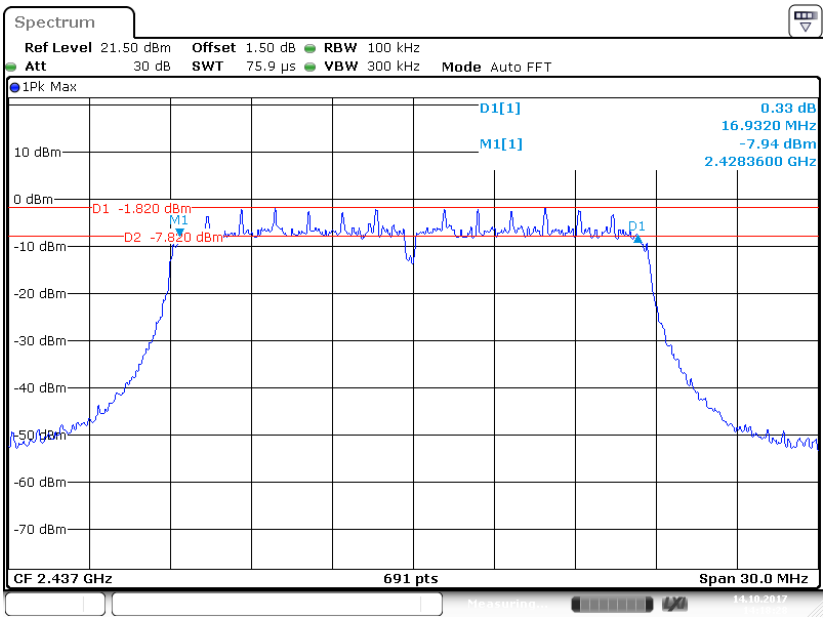
Date:14.OCT.2017 13:20:27

802.11n-HT20 Low Channel



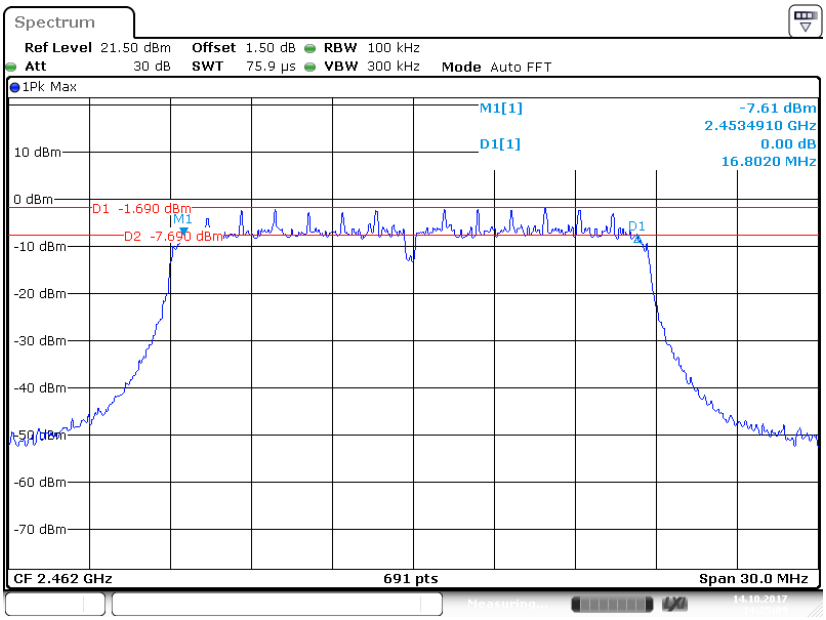
Date:14.OCT.2017 14:23:47

802.11n-HT20 Middle Channel



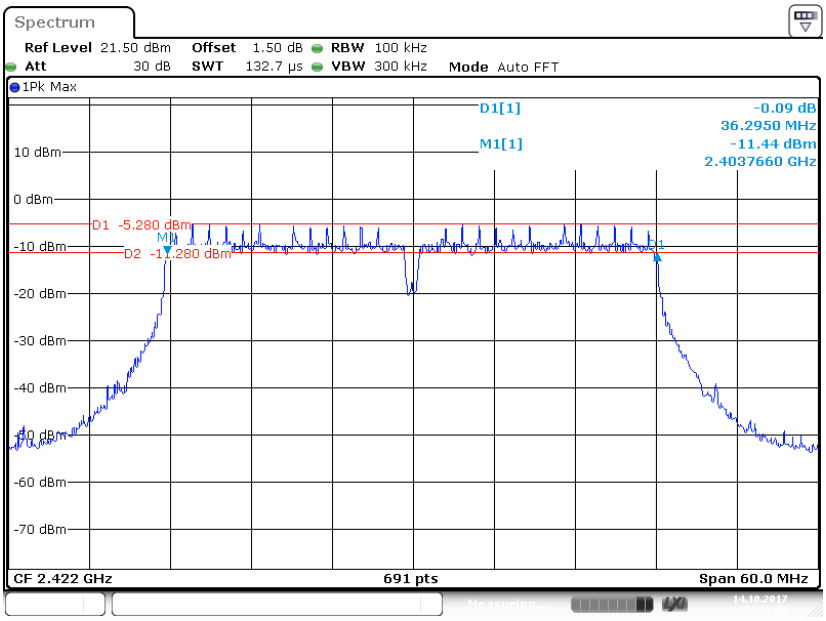
Date:14.OCT.2017 14:18:28

802.11n-HT20 High Channel



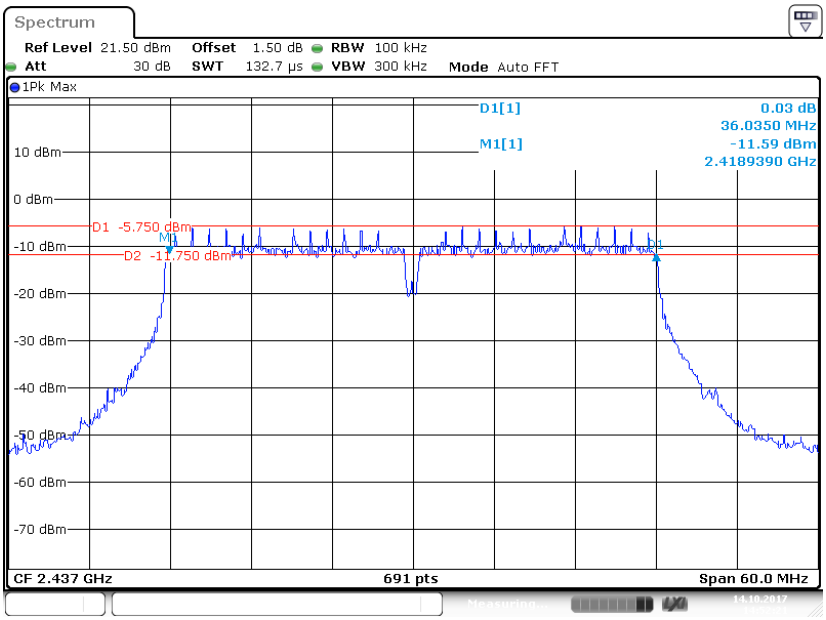
Date:14.OCT.2017 14:25:09

802.11n-HT40 Low Channel



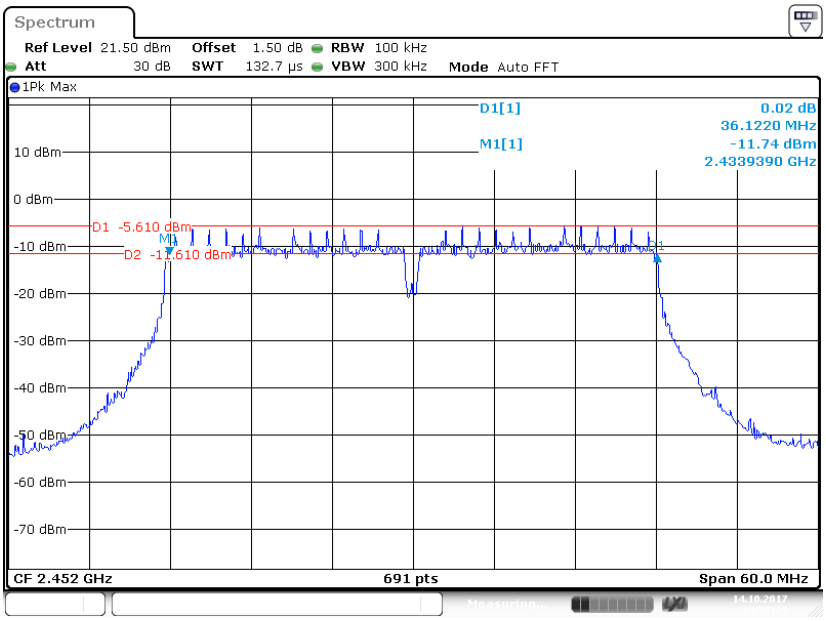
Date:14.OCT.2017 14:58:46

802.11n-HT40 Middle Channel



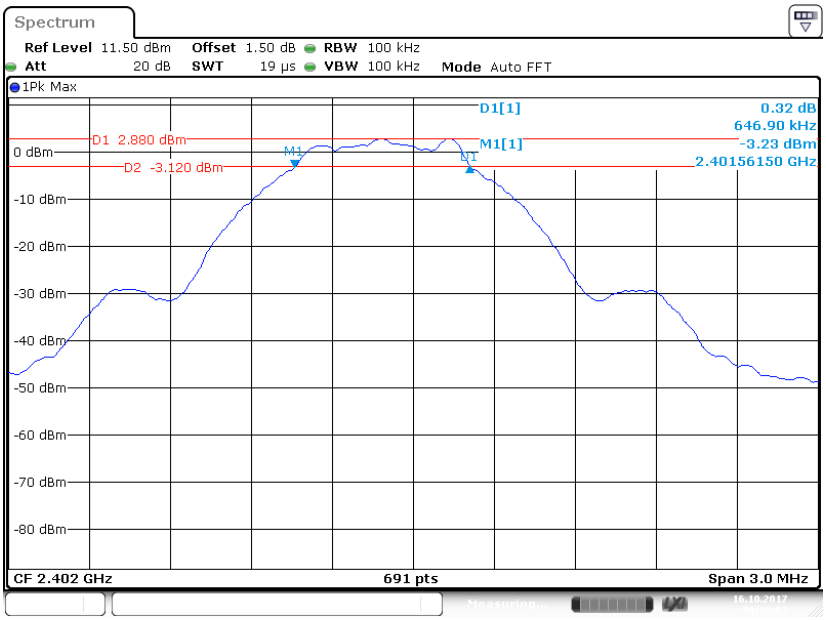
Date:14.OCT.2017 14:52:21

802.11n-HT40 High Channel



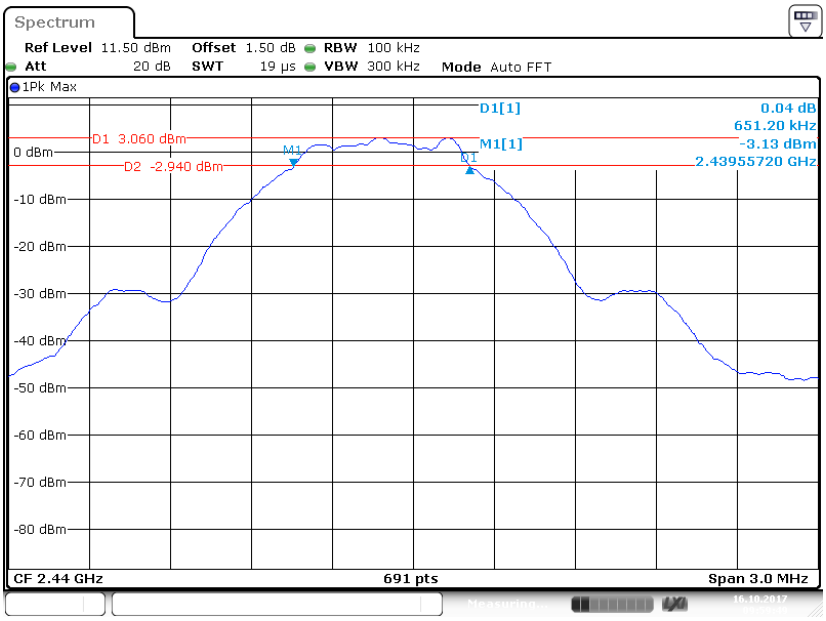
Date:14.OCT.2017 14:57:25

BLE Mode Low Channel



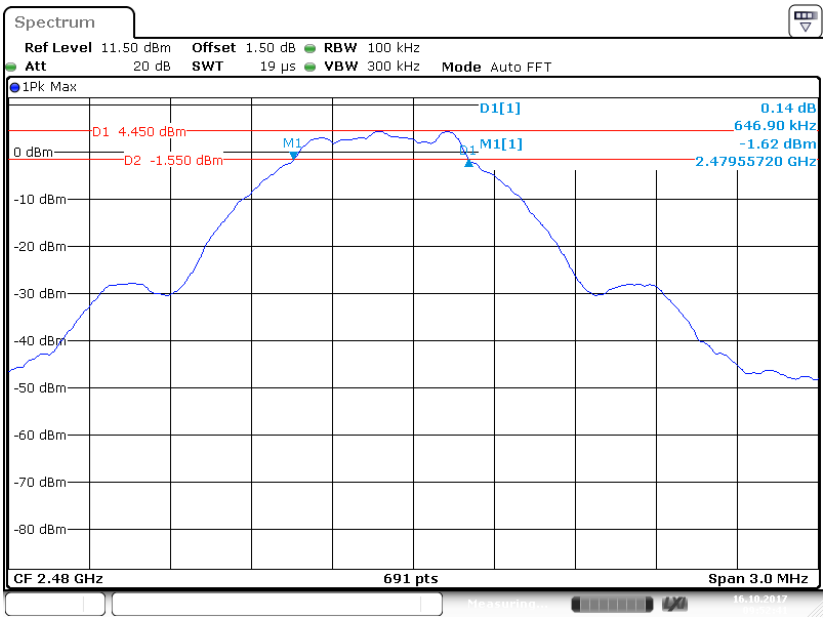
Date:16.OCT.2017 09:36:03

BLE Mode Middle Channel



Date:16.OCT.2017 09:59:49

BLE Mode High Channel



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:	24.5 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Ada Yu on 2017-10-14 to 2017-10-16.

EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
802.11b mode				
Low	2412	17.90	30	Pass
Middle	2437	16.96	30	Pass
High	2462	16.69	30	Pass
802.11g mode				
Low	2412	18.23	30	Pass
Middle	2437	17.44	30	Pass
High	2462	17.06	30	Pass
802.11n-HT20 mode				
Low	2412	18.22	30	Pass
Middle	2437	17.20	30	Pass
High	2462	17.08	30	Pass
802.11n-HT40 mode				
Low	2422	16.82	30	Pass
Middle	2437	16.23	30	Pass
High	2452	16.35	30	Pass
BLE mode				
Low	2402	2.96	30	Pass
Middle	2440	3.27	30	Pass
High	2480	4.55	30	Pass

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:	24.5 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

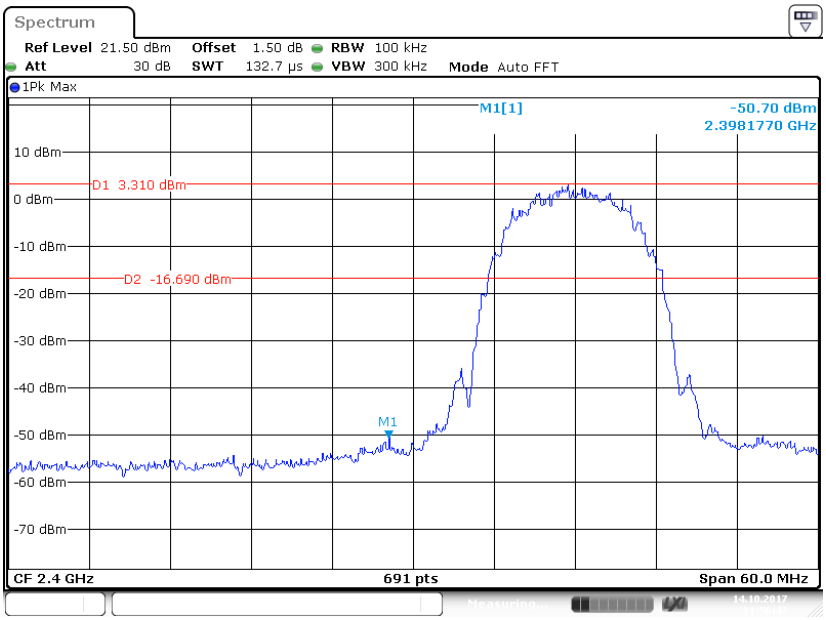
The testing was performed by Ada Yu on 2017-10-14 to 2017-10-16.

EUT operation mode: Transmitting

Test Result: *Compliance*

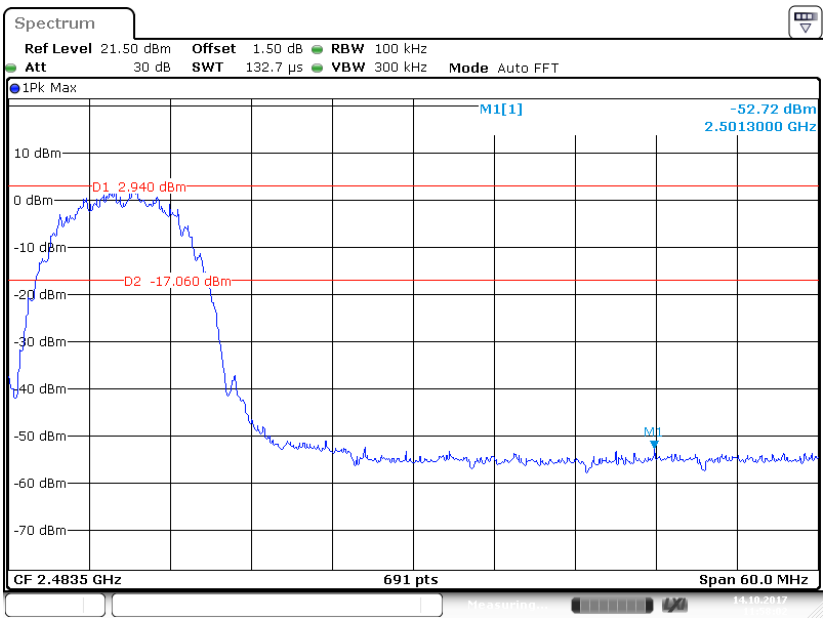
Band Edge

802.11b Mode Left Side



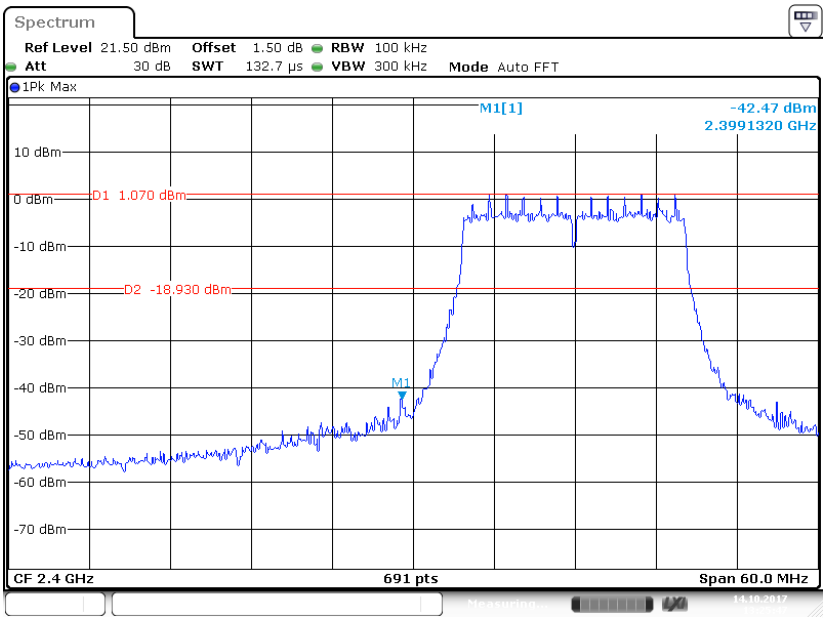
Date:14.OCT.2017 11:56:43

802.11b Mode Right Side



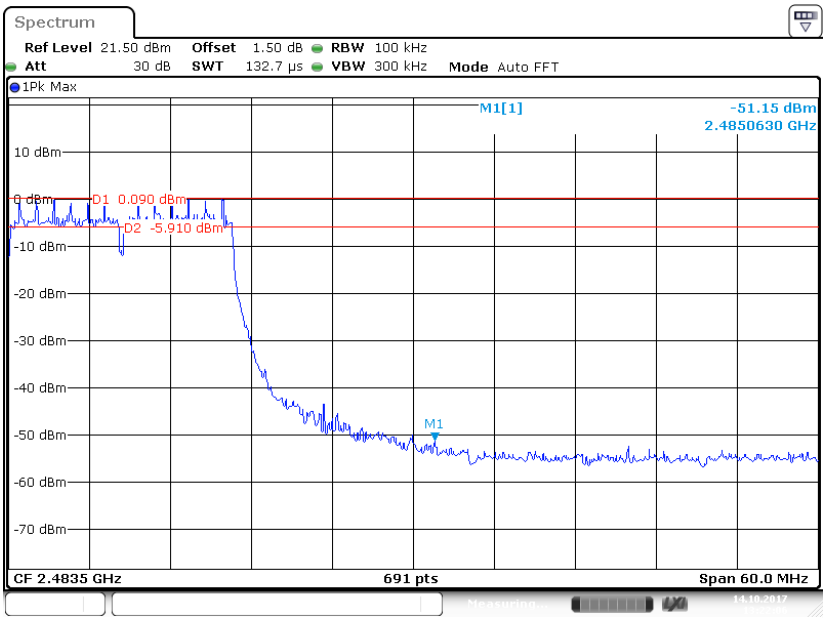
Date:14.OCT.2017 11:58:02

802.11g Mode Left Side



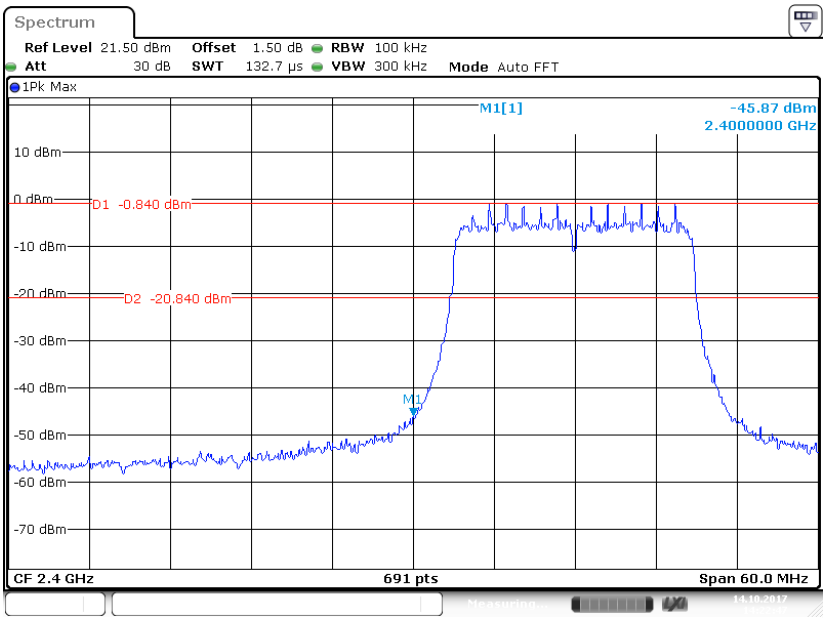
Date:14.OCT.2017 13:25:47

802.11g Mode Right Side



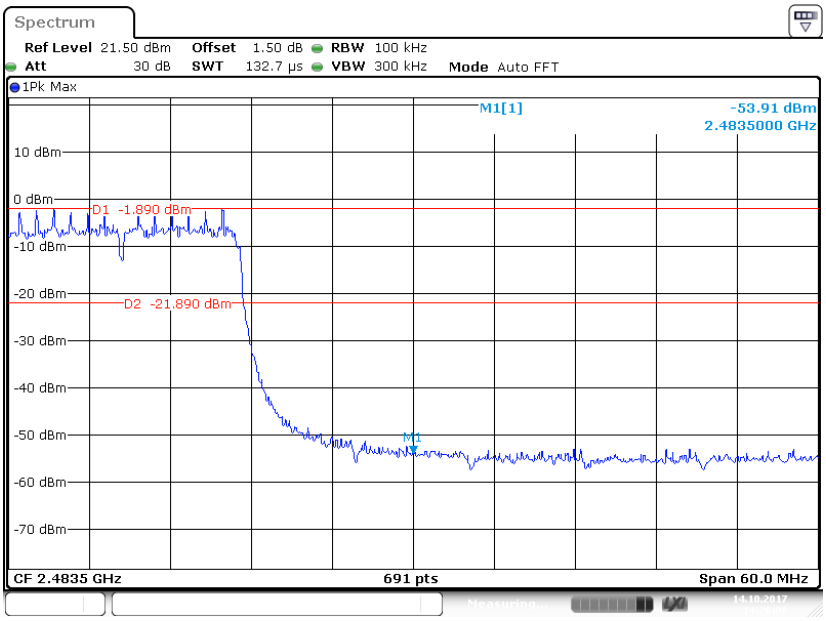
Date:14.OCT.2017 13:22:05

802.11n-HT20 Mode Left Side



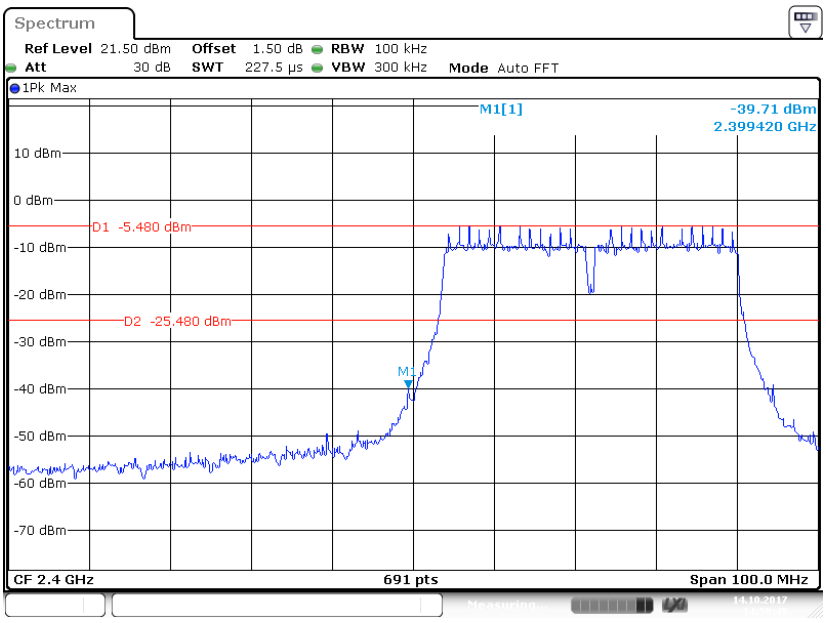
Date:14.OCT.2017 14:22:47

802.11n-HT20 Mode Right Side



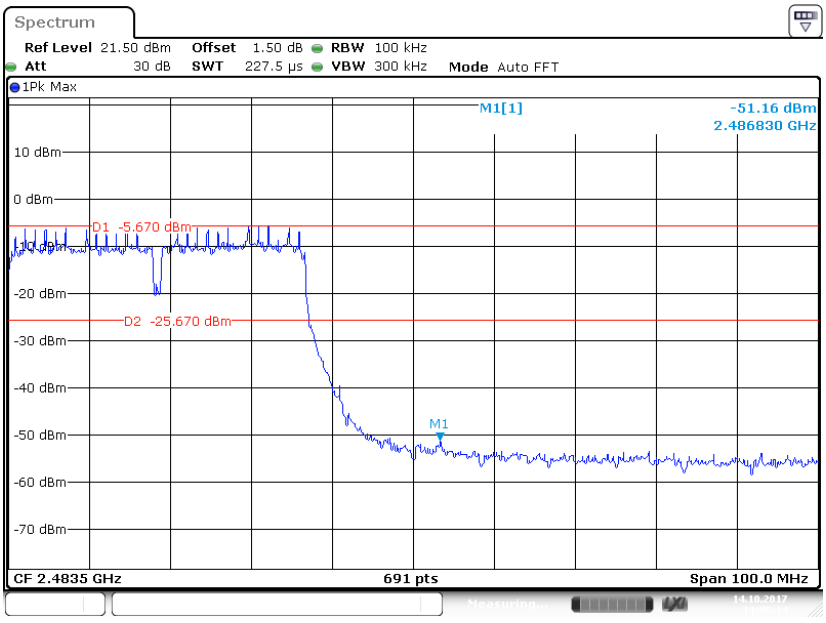
Date:14.OCT.2017 14:26:08

802.11n-HT40 Mode Left Side



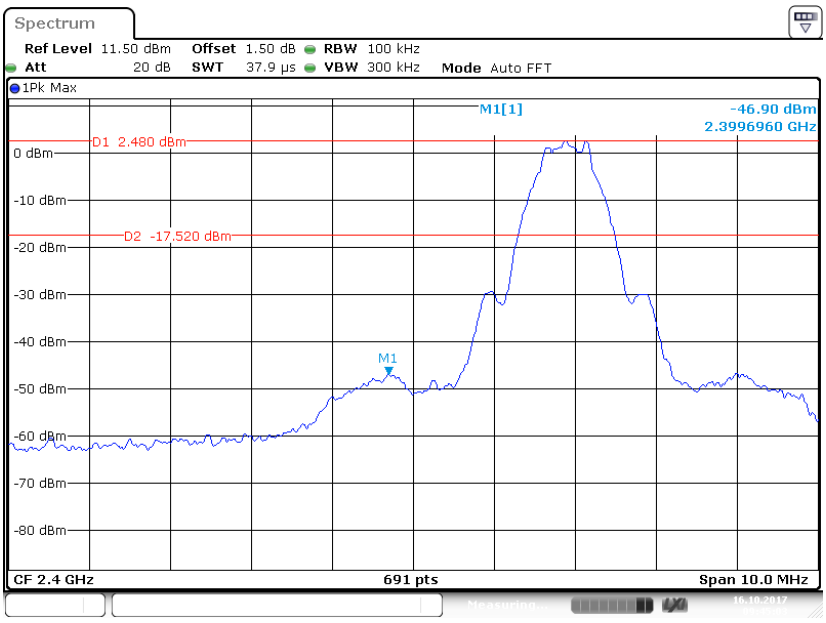
Date:14.OCT.2017 14:59:46

802.11n-HT40 Mode Right Side



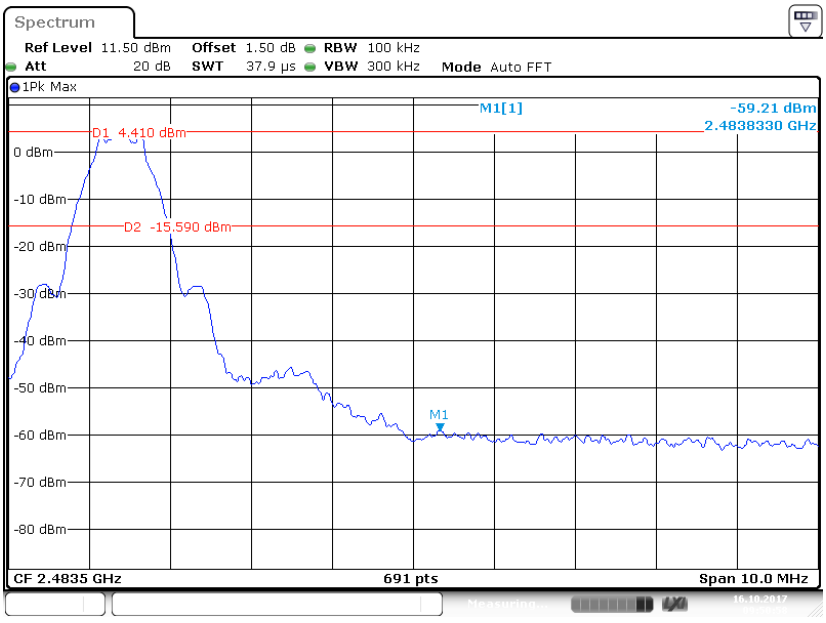
Date:14.OCT.2017 14:56:14

BLE Mode Left Side



Date:16.OCT.2017 09:45:04

BLE Mode Right Side



Date:16.OCT.2017 09:50:59

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

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 10.2

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:	24.6℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

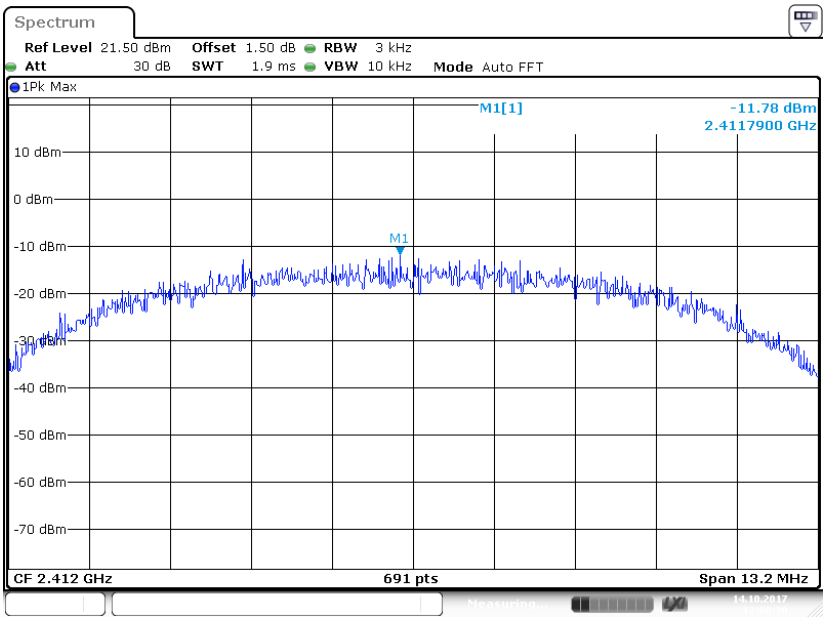
The testing was performed by Ada Yu on 2017-10-14 to 2017-10-16.

EUT operation mode: Transmitting

Test Result: Pass

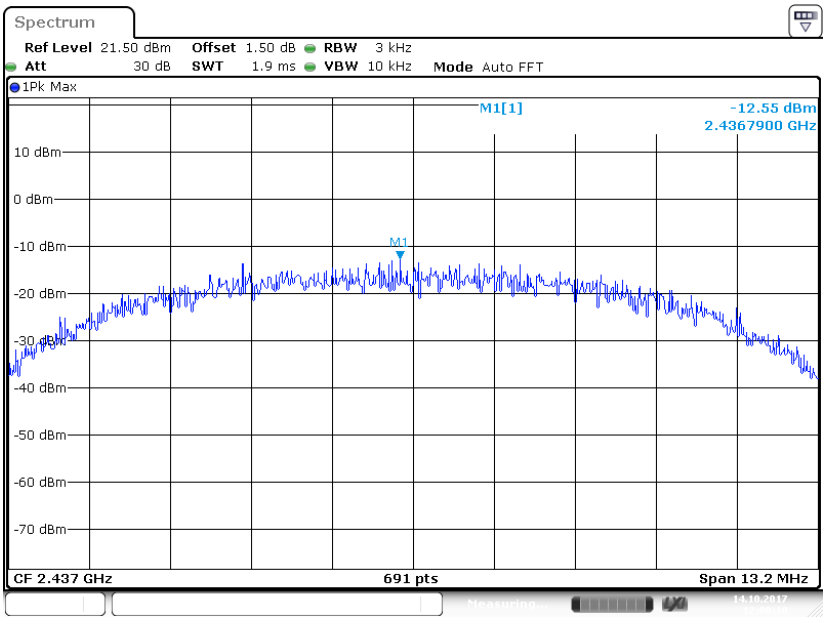
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-11.78	≤8
Middle	2437	-12.55	≤8
High	2462	-12.79	≤8
802.11g mode			
Low	2412	-13.89	≤8
Middle	2437	-14.80	≤8
High	2462	-15.00	≤8
802.11n-HT20 mode			
Low	2412	-16.10	≤8
Middle	2437	-17.26	≤8
High	2462	-17.64	≤8
802.11n-HT40 mode			
Low	2422	-20.39	≤8
Middle	2437	-21.37	≤8
High	2452	-21.06	≤8
BLE mode			
Low	2402	-13.58	≤8
Middle	2440	-13.01	≤8
High	2480	-11.69	≤8

802.11b Low Channel



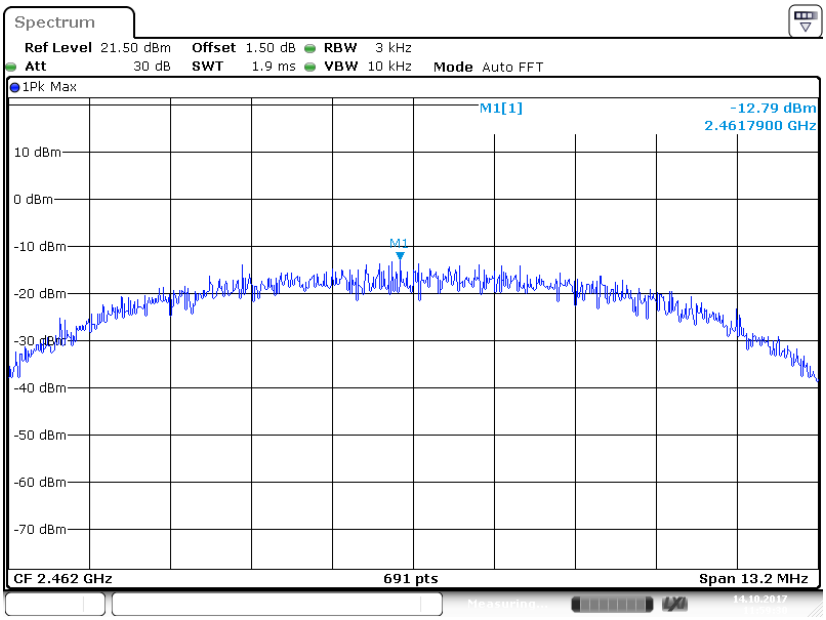
Date:14.OCT.2017 12:00:30

802.11b Middle Channel



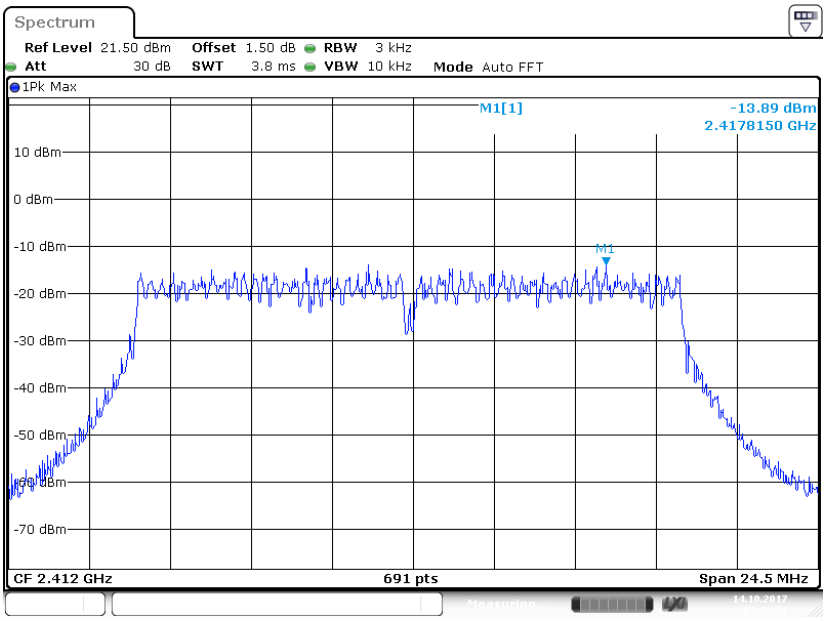
Date:14.OCT.2017 12:00:39

802.11b High Channel



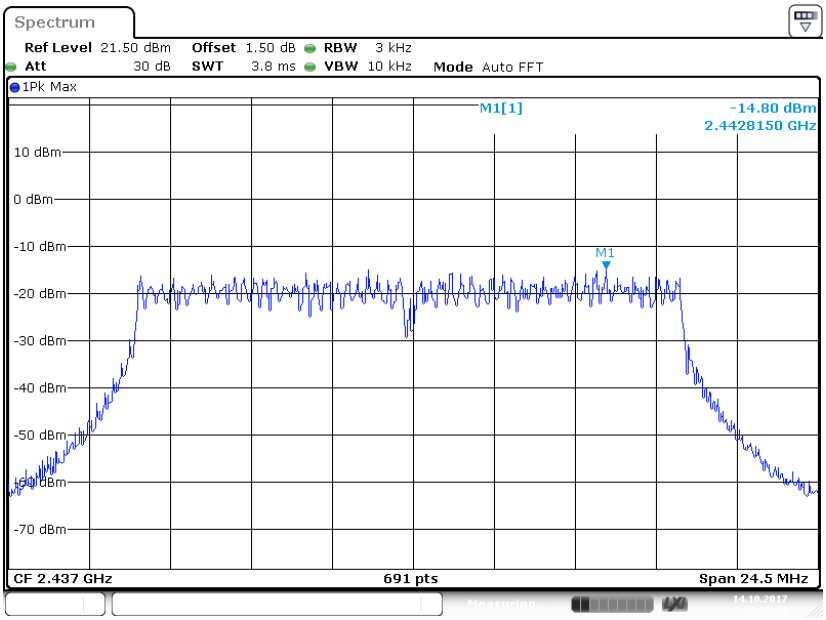
Date:14.OCT.2017 11:59:30

802.11g Low Channel



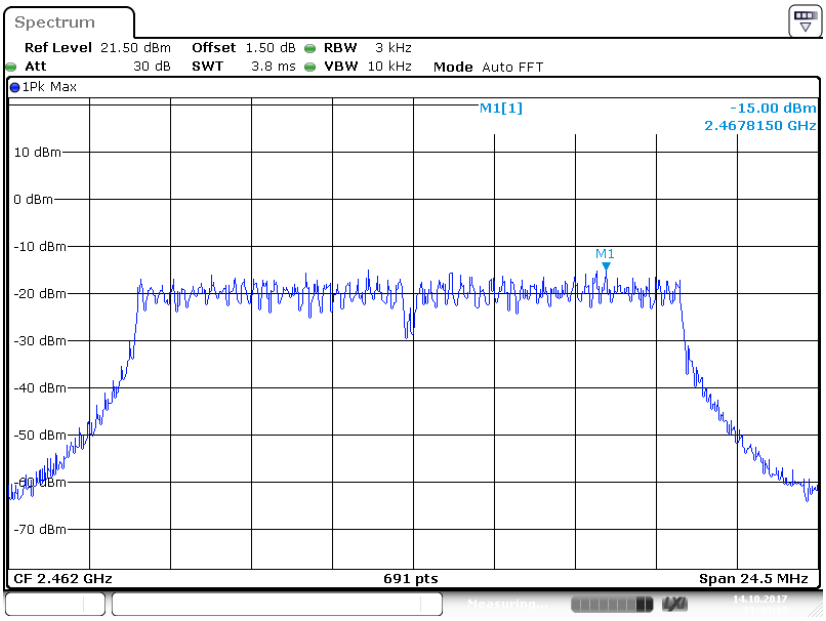
Date:14.OCT.2017 13:42:51

802.11g Middle Channel



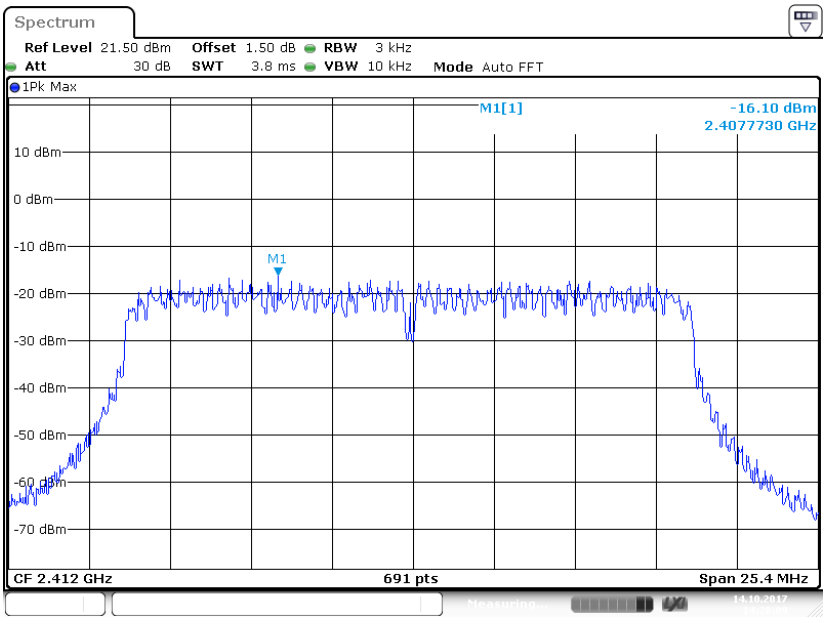
Date:14.OCT.2017 13:35:48

802.11g High Channel



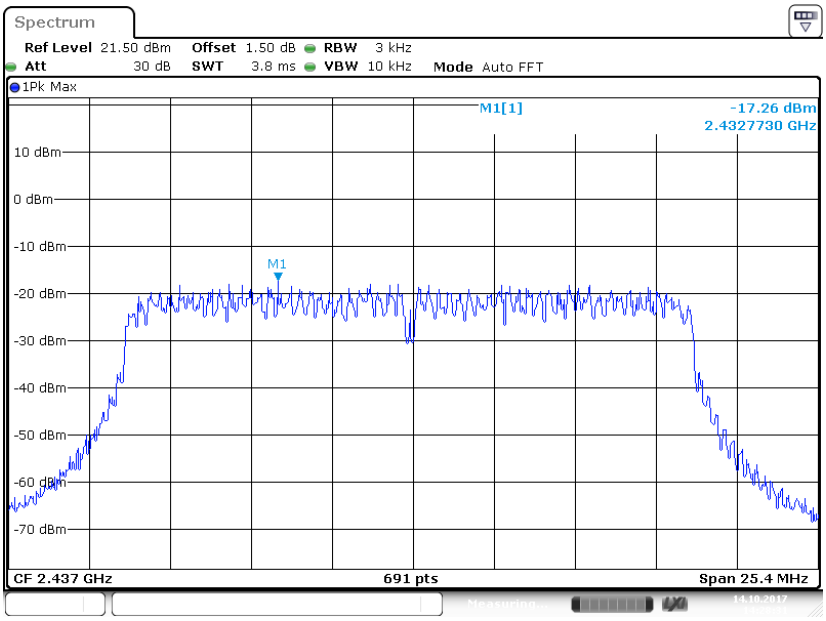
Date:14.OCT.2017 13:43:12

802.11n-HT20 Low Channel



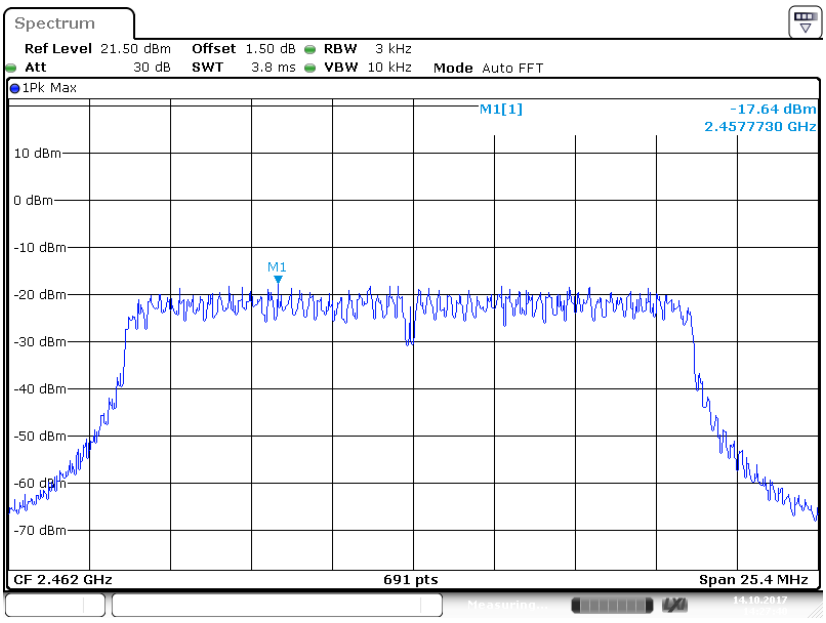
Date:14.OCT.2017 14:28:10

802.11n-HT20 Middle Channel



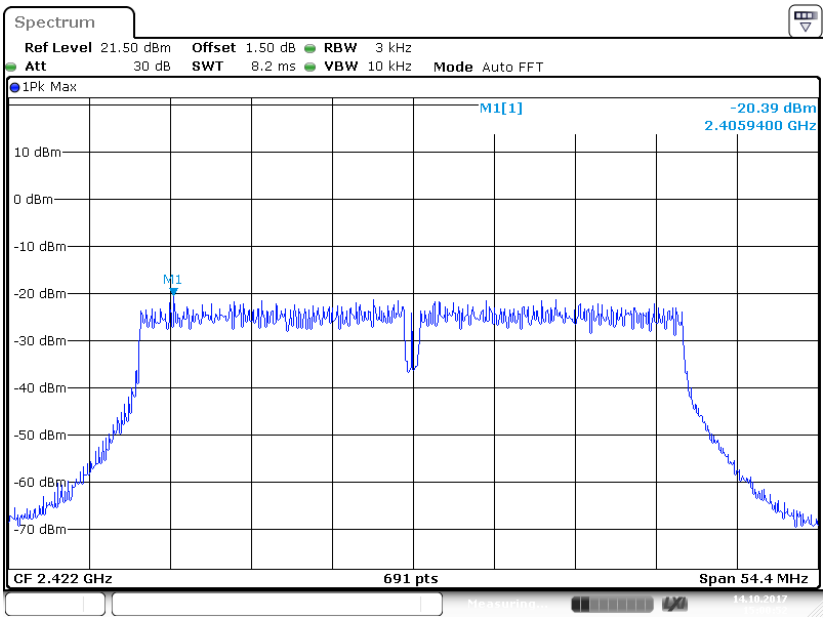
Date:14.OCT.2017 14:28:31

802.11n-HT20 High Channel



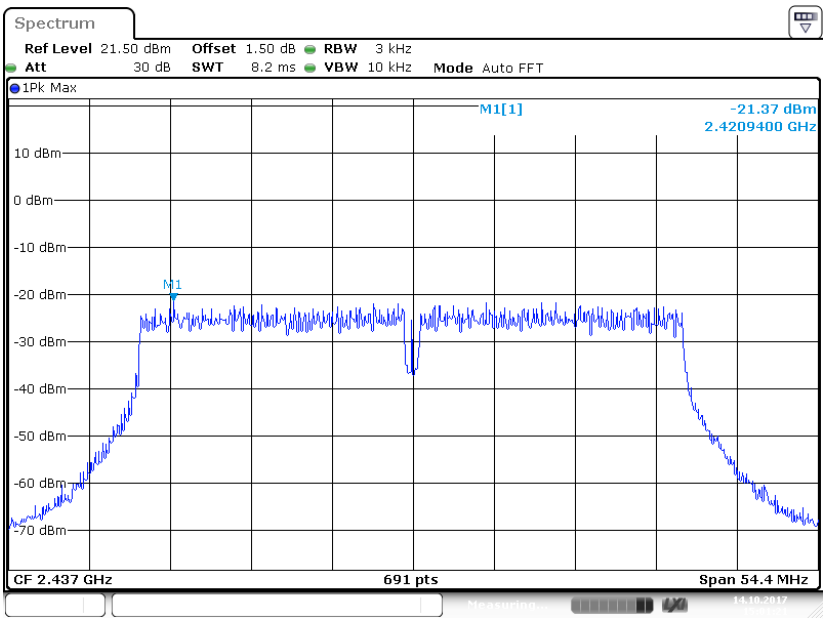
Date:14.OCT.2017 14:27:40

802.11n-HT40 Low Channel



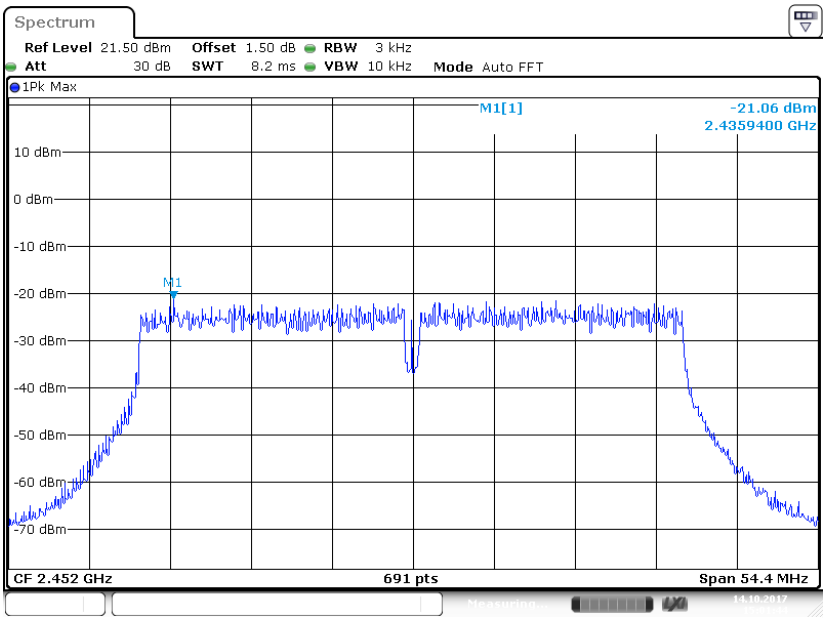
Date:14.OCT.2017 15:30:53

802.11n-HT40 Middle Channel



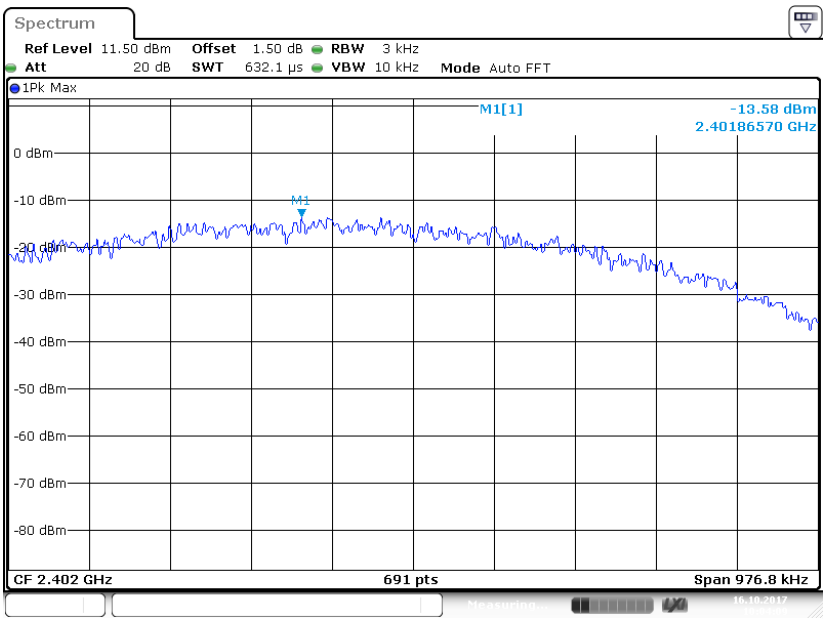
Date:14.OCT.2017 15:01:21

802.11n-HT40 High Channel



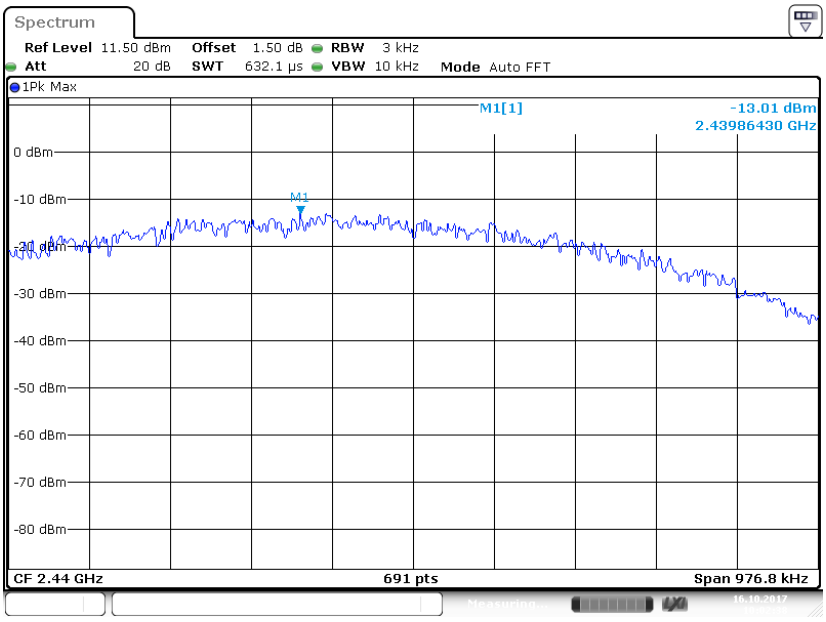
Date:14.OCT.2017 15:01:44

BLE Low Channel



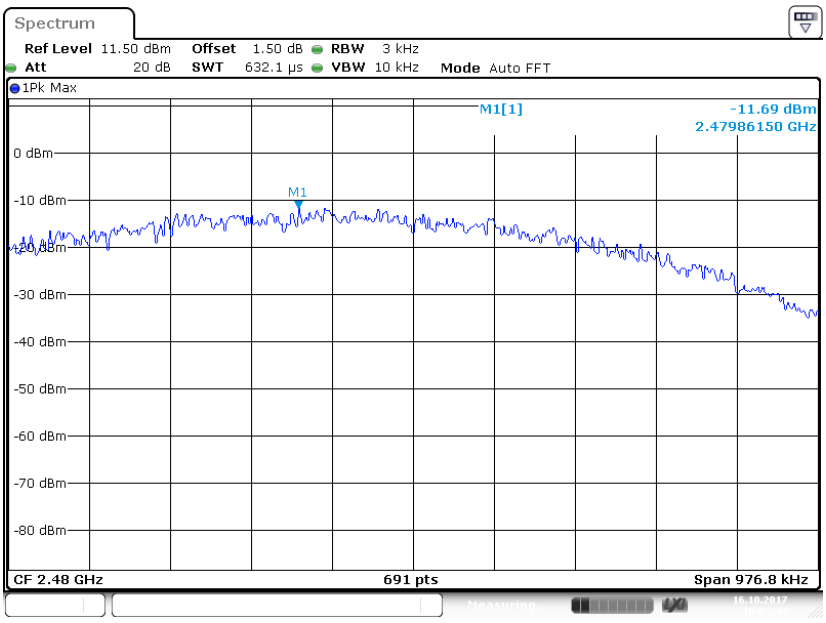
Date:16.OCT.2017 10:04:10

BLE Middle Channel



Date:16.OCT.2017 10:02:38

BLE High Channel



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