FCC PART 15.247

TEST REPORT

For

Altenergy Power System Inc.

No.1, Yatai Road, Jiaxing Zhejiang 314050 P.R. China

FCC ID: 2AFGR-ECUR

Report Type:	**Product Type:**
Original Report	Energy Communication Unit

Test Engineer:	Edison Hu
Report Number:	RSHA170904003-00A
Report Date:	2018-01-30
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

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Altenergy Power System Inc.
Tested Model	ECU-R
Product Type	Energy Communication Unit
Dimension	122 mm(L) × 87 mm(W) × 25 mm(H)
Power Supply	DC 5V

**All measurement and test data in this report was gathered from production sample serial number: 20170904003. (Assigned by the BACL. The EUT supplied by the applicant was received on 2017-09-04)*

Objective

This report is prepared on behalf of Altenergy Power System Inc. in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions 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)

No Related Submittal(s)/Grant(s).

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		3.19dB
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	5.65dB
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 Zigbee mode, EUT was tested with channel 1, 8 and 16.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2405	9	2445
2	2410	……	……
……	……	……	……
7	2435	15	2475
8	2440	16	2480

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

RF test tool for Wi-Fi: QATool_Dbg

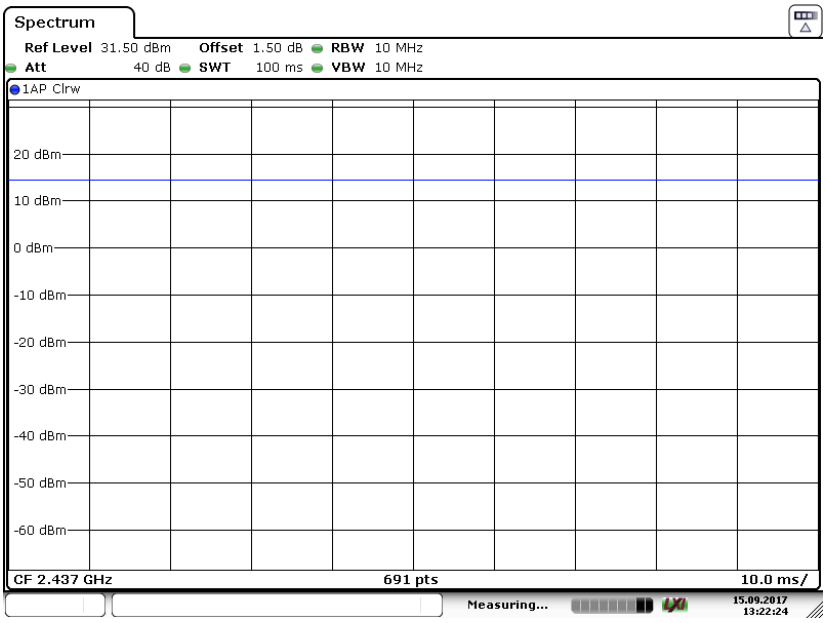
RF test tool for Zigbee: Setup_SmartRF_Studio_7-1.5.0

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

Mode	Data Rate	Channel	Power Level Setting
802.11b	1 Mbps	/	17
802.11g	6 Mbps	/	0b
802.11n-HT20	MCS0	/	0a
802.11n-HT40	MCS0	/	09
Zigbee	250kbps	Low	14
		Middle	13
		High	11

Duty Cycle:

802.11b Mode Middle Channel



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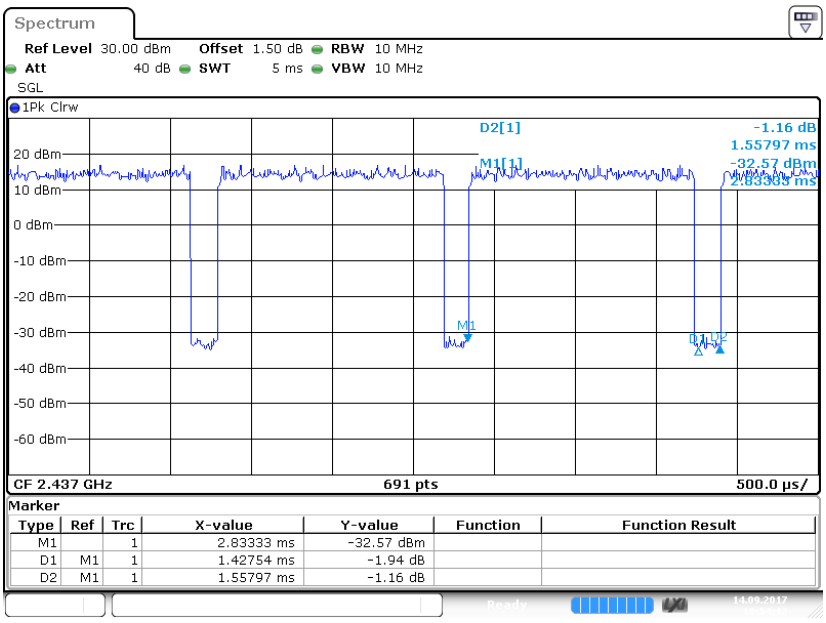
802.11g Mode Middle Channel



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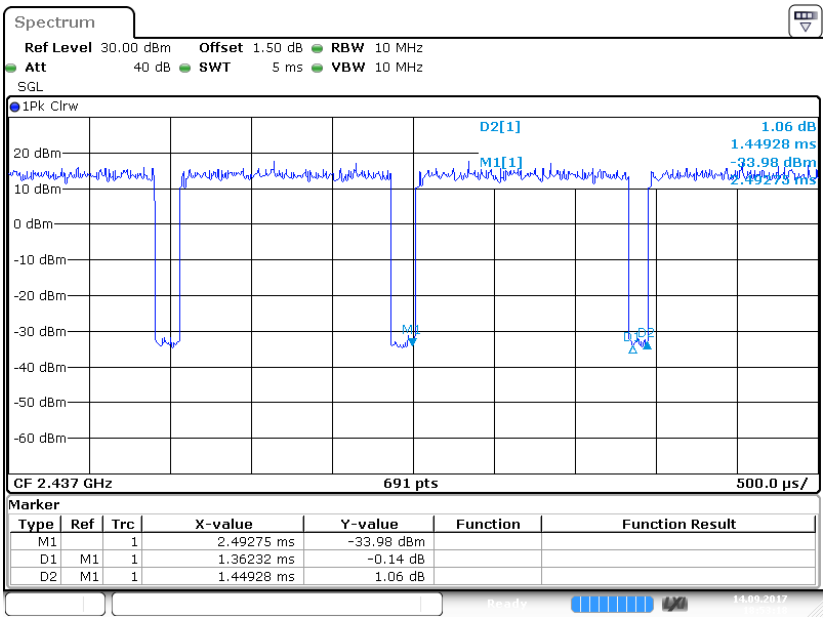
802.11n-HT20 Mode Middle Channel



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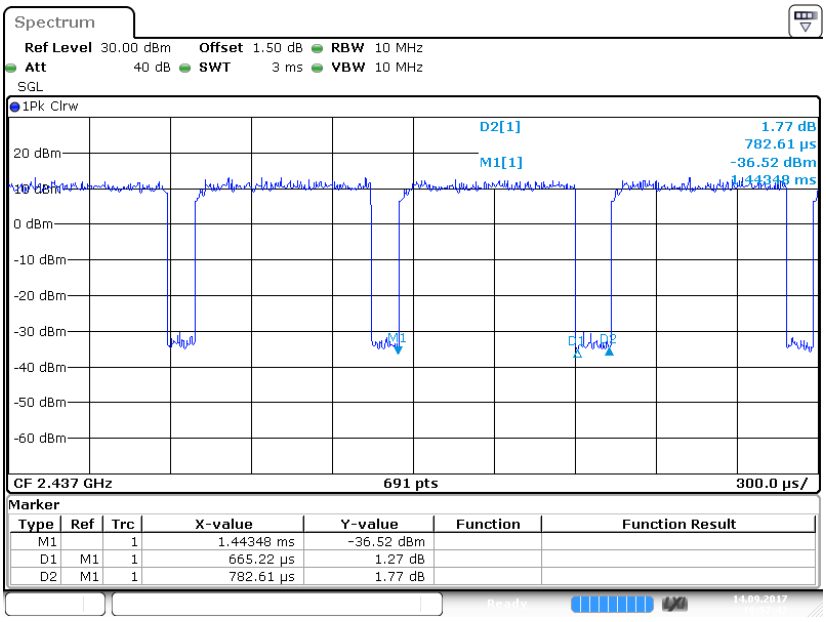
802.11n-HT40 Mode Middle Channel



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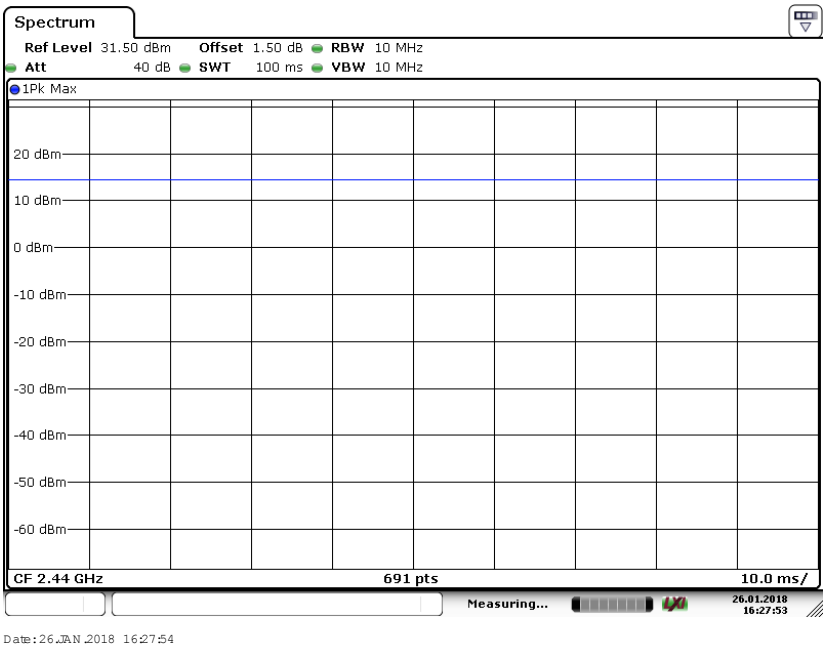
Zigbee Mode Middle Channel



Mode	Duty Cycle(%)	T(us)	1/T(kHz)	10log(1/x)
802.11b	100	/	/	0
802.11g	91.66	1428	1	0.38
802.11n-HT20	94.00	1362	1	0.27
802.11n-HT40	84.93	665	3	0.71
Zigbee	100	/	/	0

Note: “x” means the Duty Cycle.

Support Equipment List and Details

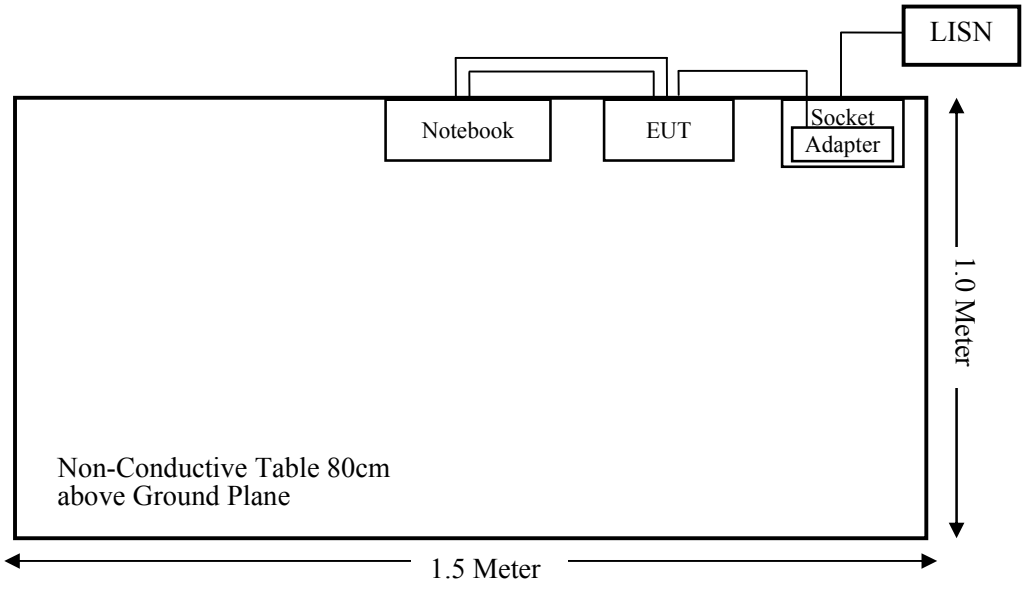
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
SIMSUKIAN	Adapter Input: 100-240V,50/60Hz,0.35A Max Output: DC 5V, 2A	SK02T-0500200C	174501000004

External I/O Cable

Cable Description	Length (m)	From Port	To
USB Cable	0.8	Notebook	EUT
RJ45 Cable	2.0	Notebook	EUT

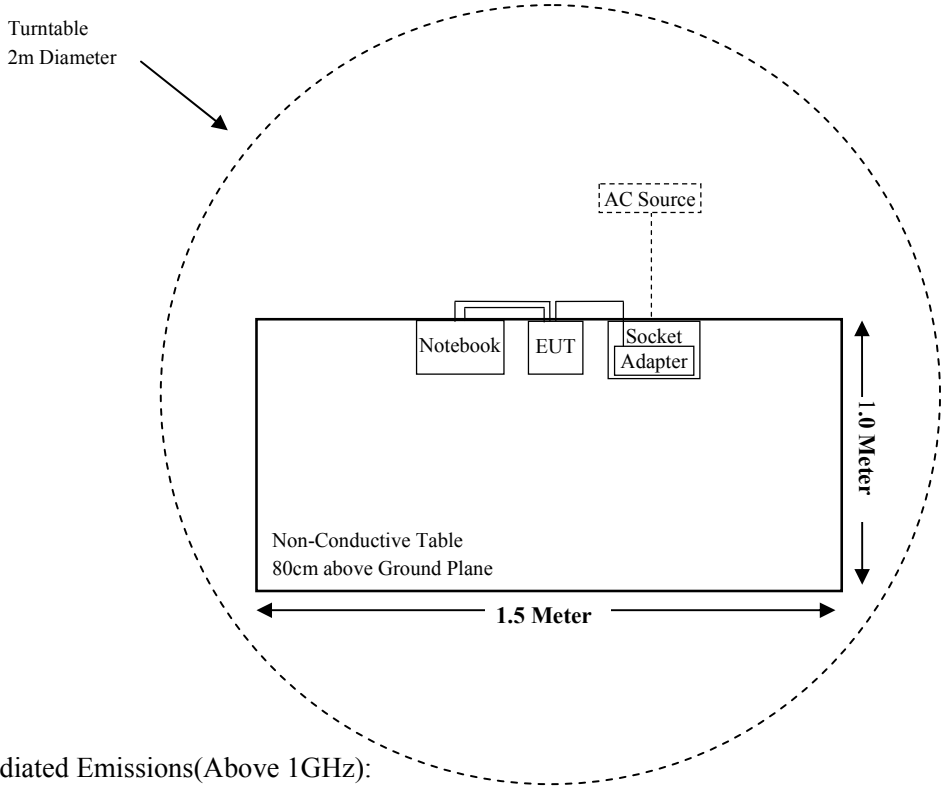
Block Diagram of Test Setup

For Conducted Emissions:

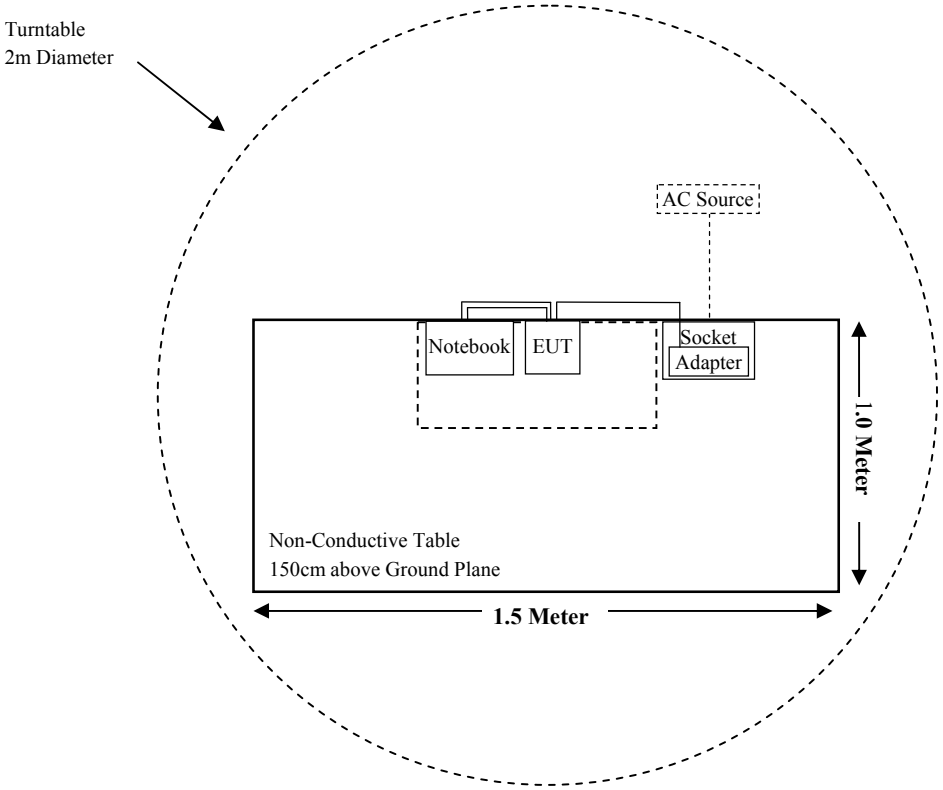


Note: The distance between EUT and notebook is 10 cm.

For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



Note: The distance between EUT and notebook is 10 cm.

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§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	2017-08-25	2018-08-24
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
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	2017-08-22	2018-08-21
QuinStar	Amplifier	QLW-18405536-J0	15964001009	2017-08-22	2018-08-21
Narda	Attenuator/10dB	10dB	/	/	/
SINOSCITE	Band Reject Filter	BSF2402-2480MN-0898	/	2017-08-05	2018-08-04
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	2017-08-18	2018-08-17
Agilent	Power Sensor	N1921A	MY54210024	2017-08-18	2018-08-17
Picosecond	DC Block	5500A-110	131047	2017-08-23	2018-08-22
Narda	Attenuator/2dB	2dB	/	/	/
Altenergy	RF Cable	N/A	N/A	/	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2016/11/12	2017/11/11
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2016/11/12	2017/11/11
Rohde & Schwarz	LISN	ENV216	3560655016	2016/11/12	2017/11/11
BACL	Auto test Software	BACL-EMC	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 §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);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

Mode	Frequency Range	Antenna Gain		Target Output Power		Evaluation Distance	Power Density	MPE Limit	MPE Ratio
	(MHz)	(dBi)	(numeric)	(dBm)	(mW)	(cm)	(mW/cm^2)	(mW/cm^2)	
802.11b	2412~2462	3.00	2.00	17.00	50.12	20	0.0199	1.00	0.0199
802.11g		3.00	2.00	16.00	39.81	20	0.0158	1.00	0.0158
802.11 n-HT20		3.00	2.00	15.50	35.48	20	0.0141	1.00	0.0141
802.11 n-HT40	2422~2452	3.00	2.00	15.00	31.62	20	0.0126	1.00	0.0126
Zigbee	2405~2480	2.50	1.78	7.00	5.01	20	0.0018	1.00	0.0018

Note:

(1) The target output powers are all declared by the manufacturer.

(2) Wi-Fi and Zigbee can transmit simultaneously, The worst condition is as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0199/1.00+0.0018/1.00=0.0199+0.0018= 0.0217< 1.0$$

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 an internal integrated antenna arrangement for Wi-Fi, the antenna gain is 3.0dBi. And a RP-SMA connector to attach an external antenna arrangement for Zigbee, the antenna gain is 2.5dBi, fulfill the requirement of this section. Please refer to the EUT photos.

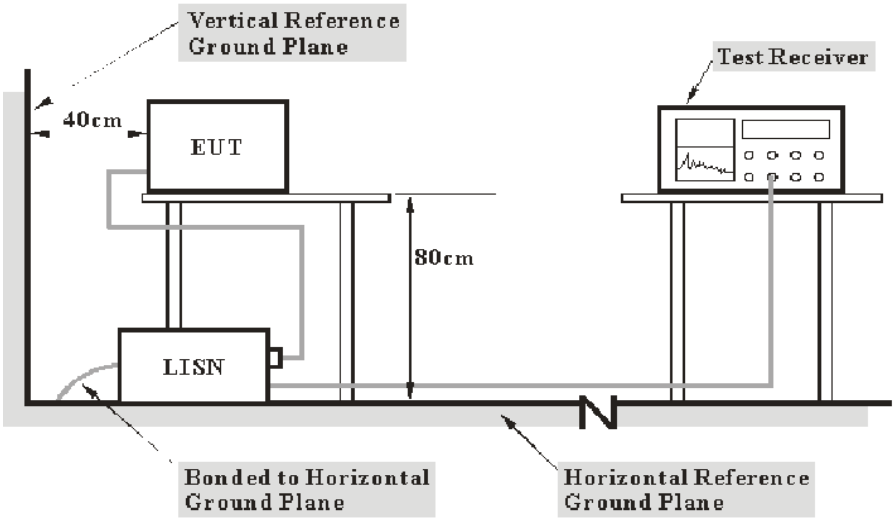
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

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 measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

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

ANSI C63.10-2013 clause 6.2

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:

Corrected 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 –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

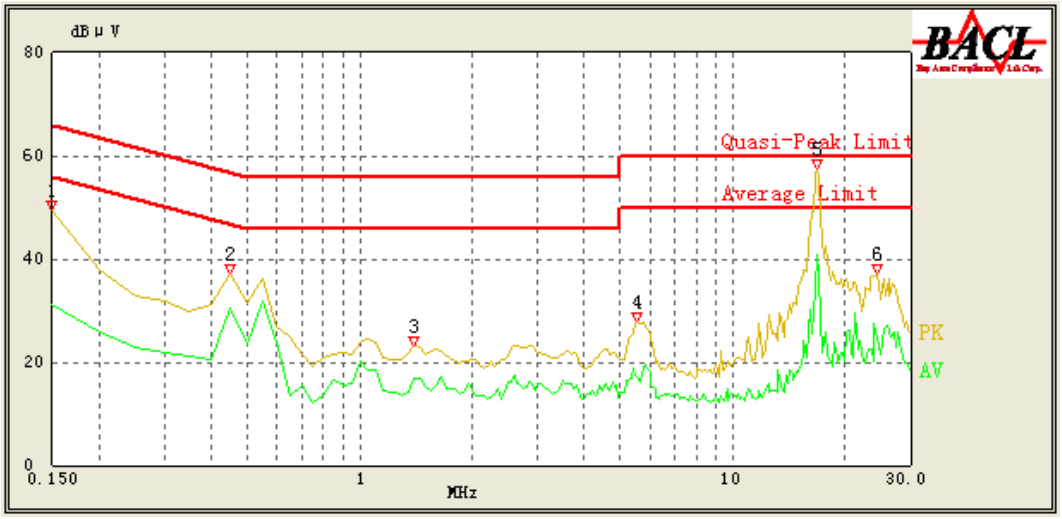
Temperature:	20.2 ℃
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Edison Hu on 2017-09-28.

For Wi-Fi Mode:

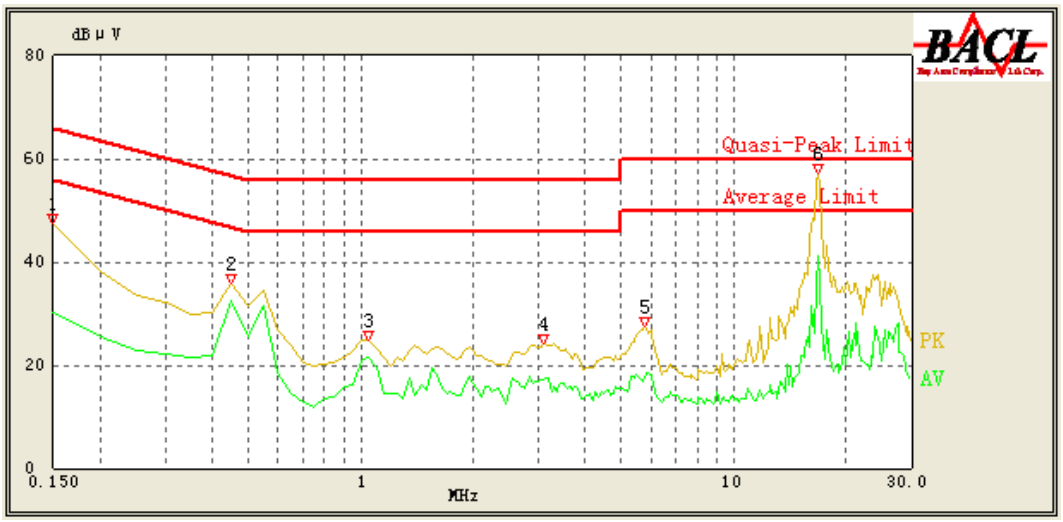
EUT operation mode: Transmitting in 802.11b mode low channel

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	49.62	QP	9.000	L1	16.06	66.00	16.38	Compliance
0.150	31.05	AV	9.000	L1	16.06	56.00	24.95	Compliance
0.450	37.17	QP	9.000	L1	16.07	57.43	20.26	Compliance
0.450	30.52	AV	9.000	L1	16.07	47.43	16.91	Compliance
1.400	23.06	QP	9.000	L1	15.87	56.00	32.94	Compliance
1.400	16.73	AV	9.000	L1	15.87	46.00	29.27	Compliance
5.550	27.76	QP	9.000	L1	15.89	60.00	32.24	Compliance
5.550	17.29	AV	9.000	L1	15.89	50.00	32.71	Compliance
16.800	57.35	QP	9.000	L1	16.29	60.00	2.65	Compliance
16.750	40.99	AV	9.000	L1	16.29	50.00	9.01	Compliance
24.500	37.11	QP	9.000	L1	16.46	60.00	22.89	Compliance
24.500	24.88	AV	9.000	L1	16.46	50.00	25.12	Compliance

AC 120V/60 Hz, Neutral



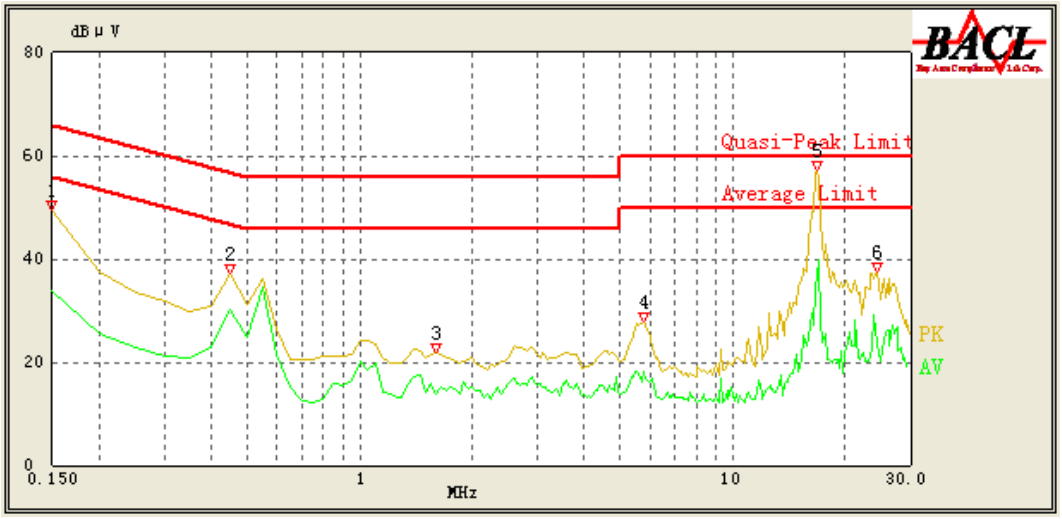
Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	47.65	QP	9.000	N	16.06	66.00	18.35	Compliance
0.150	30.28	AV	9.000	N	16.06	56.00	25.72	Compliance
0.450	35.92	QP	9.000	N	16.10	57.43	21.51	Compliance
0.450	32.42	AV	9.000	N	16.10	47.43	15.01	Compliance
1.050	24.91	QP	9.000	N	15.94	56.00	31.09	Compliance
1.050	21.66	AV	9.000	N	15.94	46.00	24.34	Compliance
3.100	24.14	QP	9.000	N	15.90	56.00	31.86	Compliance
3.100	17.14	AV	9.000	N	15.90	46.00	28.86	Compliance
5.750	27.60	QP	9.000	N	15.89	60.00	32.40	Compliance
5.750	17.52	AV	9.000	N	15.89	50.00	32.48	Compliance
16.750	57.08	QP	9.000	N	16.06	60.00	2.92	Compliance
16.750	41.09	AV	9.000	N	16.06	50.00	8.91	Compliance

Note:
1) Corrected Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation
2) Margin = Limit – Reading

For Zigbee Mode:

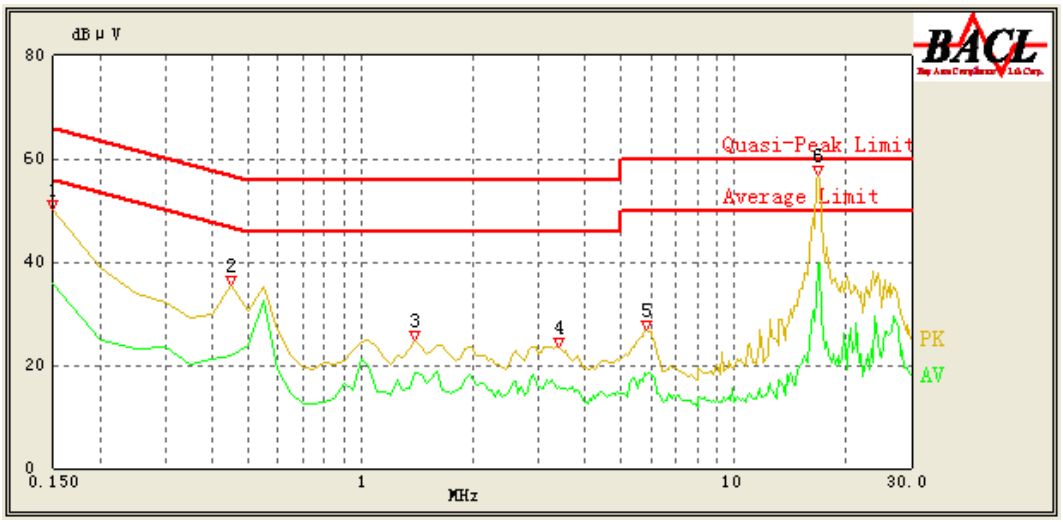
EUT operation mode: Transmitting in middle channel

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	49.62	QP	9.000	L1	16.06	66.00	16.38	Compliance
0.150	33.77	AV	9.000	L1	16.06	56.00	22.23	Compliance
0.450	37.03	QP	9.000	L1	16.07	57.43	20.40	Compliance
0.450	30.25	AV	9.000	L1	16.07	47.43	17.18	Compliance
1.600	21.81	QP	9.000	L1	15.86	56.00	34.19	Compliance
1.600	13.67	AV	9.000	L1	15.86	46.00	32.33	Compliance
5.750	27.81	QP	9.000	L1	15.90	60.00	32.19	Compliance
5.800	18.17	AV	9.000	L1	15.90	50.00	31.83	Compliance
16.750	57.19	QP	9.000	L1	16.29	60.00	2.81	Compliance
16.950	39.70	AV	9.000	L1	16.30	50.00	10.30	Compliance
24.500	37.39	QP	9.000	L1	16.46	60.00	22.61	Compliance
24.450	23.58	AV	9.000	L1	16.46	50.00	26.42	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	50.19	QP	9.000	N	16.06	66.00	15.81	Compliance
0.150	35.73	AV	9.000	N	16.06	56.00	20.27	Compliance
0.450	35.34	QP	9.000	N	16.10	57.43	22.09	Compliance
0.450	21.69	AV	9.000	N	16.10	47.43	25.74	Compliance
1.400	24.70	QP	9.000	N	15.93	56.00	31.30	Compliance
1.400	18.66	AV	9.000	N	15.93	46.00	27.34	Compliance
3.400	23.65	QP	9.000	N	15.89	56.00	32.35	Compliance
3.400	15.67	AV	9.000	N	15.89	46.00	30.33	Compliance
5.850	26.87	QP	9.000	N	15.89	60.00	33.13	Compliance
5.850	18.30	AV	9.000	N	15.89	50.00	31.70	Compliance
16.800	56.88	QP	9.000	N	16.06	60.00	3.12	Compliance
16.750	39.23	AV	9.000	N	16.06	50.00	10.77	Compliance

Note:
1) Corrected Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation
2) Margin = Limit – Reading

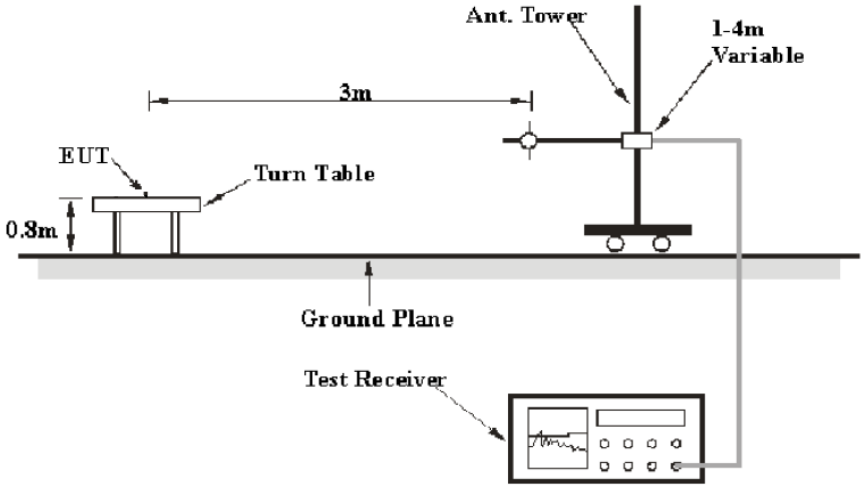
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

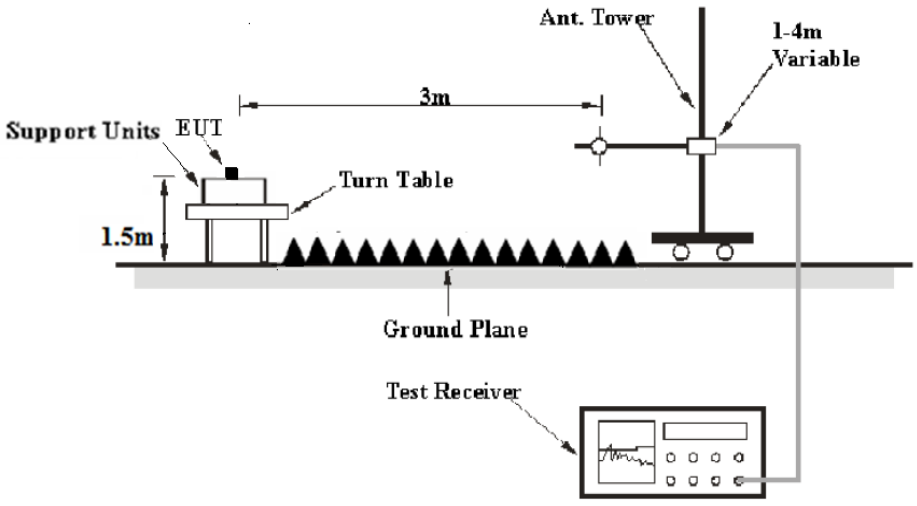
FCC §15.247 (d); §15.209; §15.205;

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 Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver 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
Above 1GHz	1MHz	3 MHz	/	PK
	1MHz	3 MHz	/	Ave.

Test Procedure

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 12.1 and 12.2. and ANSI C63.10-2013 clause 6.5, 6.6 and 6.7.

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 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:	24.1 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2kPa

The testing was performed by Edison Hu from 2017-09-14 to 2018-01-15.

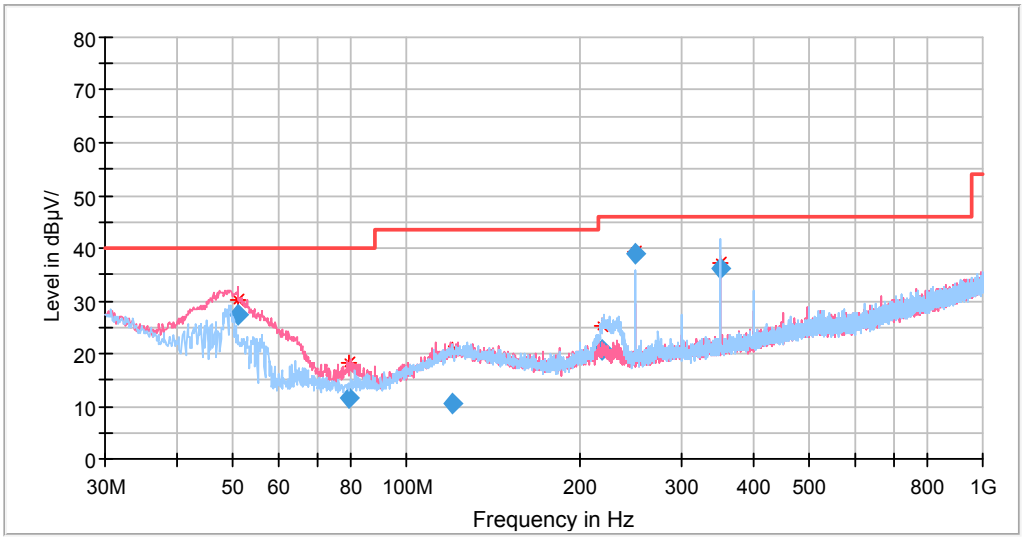
EUT operation mode: Transmitting

For Wi-Fi Mode:

Spurious Emission Test:

30MHz-1GHz:

Pre-scan with 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case ***802.11b mode(channel 1:2412MHz) in X-axis of orientation*** *was recorded*



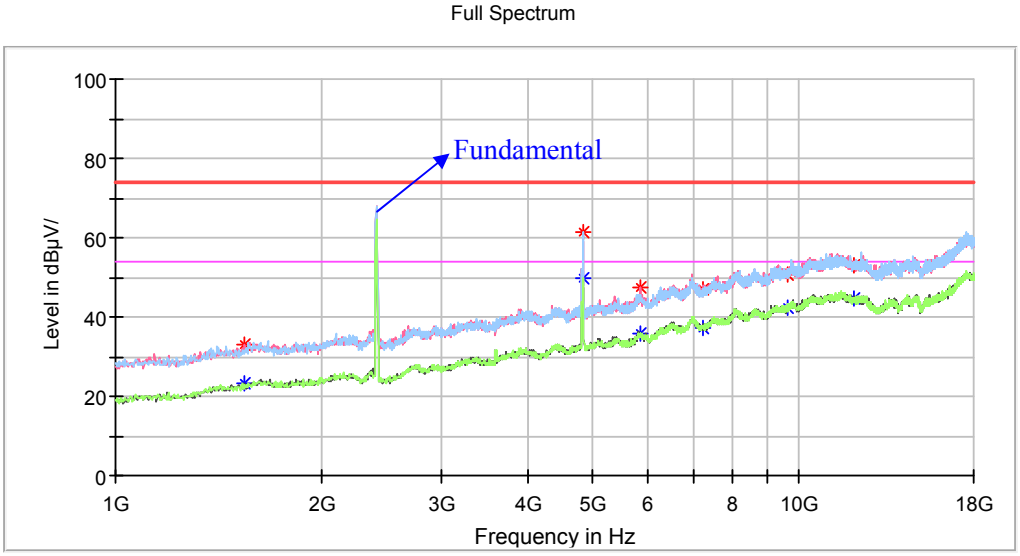
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dB µ V/m)	Height (cm)	Polar (H/V)				
50.961540	27.32	101.0	V	146.0	-18.0	40.00	12.68
79.406730	11.64	101.0	V	134.0	-18.2	40.00	28.36
120.289730	10.50	199.0	V	1.0	-11.6	43.50	33.00
218.734760	20.79	199.0	H	168.0	-12.7	46.00	25.21
250.012650	39.04	101.0	H	189.0	-12.6	46.00	6.96
350.011090	36.08	101.0	H	284.0	-9.8	46.00	9.92

1GHz-18GHz:

802.11b Mode:
*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)*

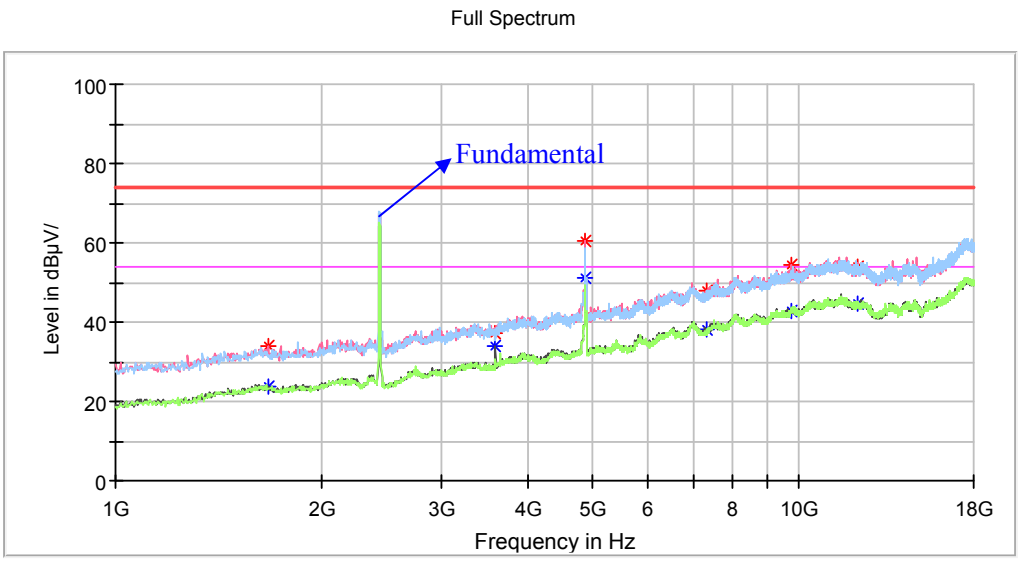
Note:
1. This test was performed with the 2.4-2.4835GHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
3. Corrected Amplitude = Corrected Factor + Reading
4. Margin = Limit - Corrected. Amplitude

Low Channel: 2412MHz



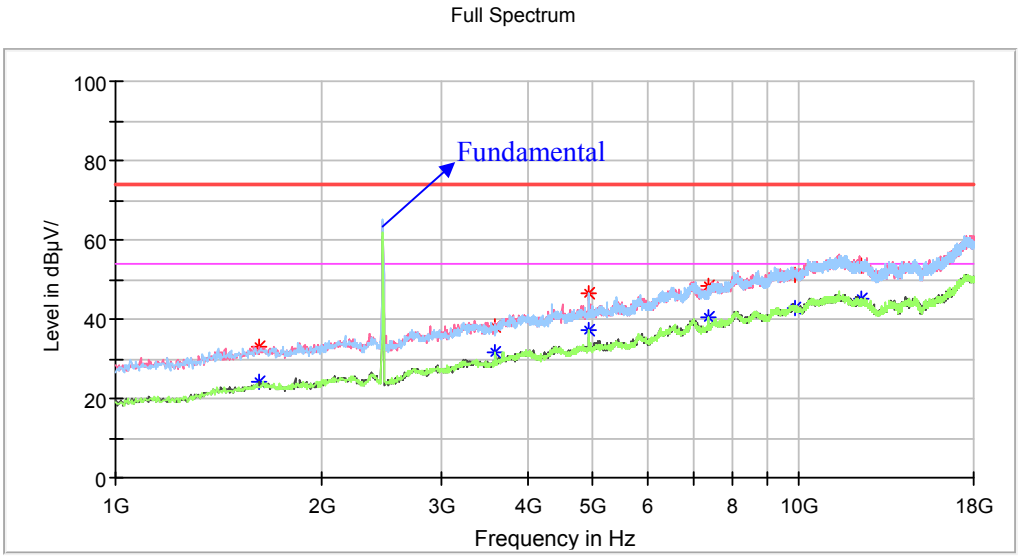
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1544.000000	33.20	---	200.0	V	117.0	-7.8	74.00	40.80
1544.000000	---	23.20	200.0	V	117.0	-7.8	54.00	30.80
4824.000000	---	49.97	100.0	H	104.0	12.3	54.00	4.03
4824.000000	61.29	---	100.0	H	104.0	12.3	74.00	12.71
5848.400000	47.21	---	200.0	V	0.0	5.2	74.00	26.79
5848.400000	---	36.00	200.0	V	0.0	5.2	54.00	18.00
7236.000000	---	37.07	200.0	H	358.0	9.8	54.00	16.93
7236.000000	47.16	---	200.0	H	358.0	9.8	74.00	26.84
9649.600000	50.81	---	100.0	H	186.0	15.1	74.00	23.19
9649.600000	---	42.17	100.0	H	186.0	15.1	54.00	11.83
12056.800000	52.96	---	200.0	H	80.0	16.5	74.00	21.04
12056.800000	---	44.88	200.0	H	80.0	16.5	54.00	9.12

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1669.800000	33.89	---	200.0	V	103.0	-7.3	74.00	40.11
1669.800000	---	23.71	200.0	V	103.0	-7.3	54.00	30.29
3597.600000	37.16	---	200.0	V	305.0	-0.6	74.00	36.84
3597.600000	---	33.91	200.0	V	305.0	-0.6	54.00	20.09
4874.000000	---	50.25	100.0	H	89.0	12.4	54.00	3.75
4874.000000	60.24	---	100.0	H	89.0	12.4	74.00	13.76
7311.000000	48.13	---	100.0	H	227.0	10.0	74.00	25.87
7311.000000	---	38.28	100.0	H	227.0	10.0	54.00	15.72
9748.200000	---	42.91	200.0	V	90.0	15.0	54.00	11.09
9748.200000	54.19	---	200.0	V	90.0	15.0	74.00	19.81
12186.000000	53.77	---	100.0	V	359.0	16.7	74.00	20.23
12186.000000	---	44.48	100.0	V	359.0	16.7	54.00	9.52

High Channel: 2462MHz

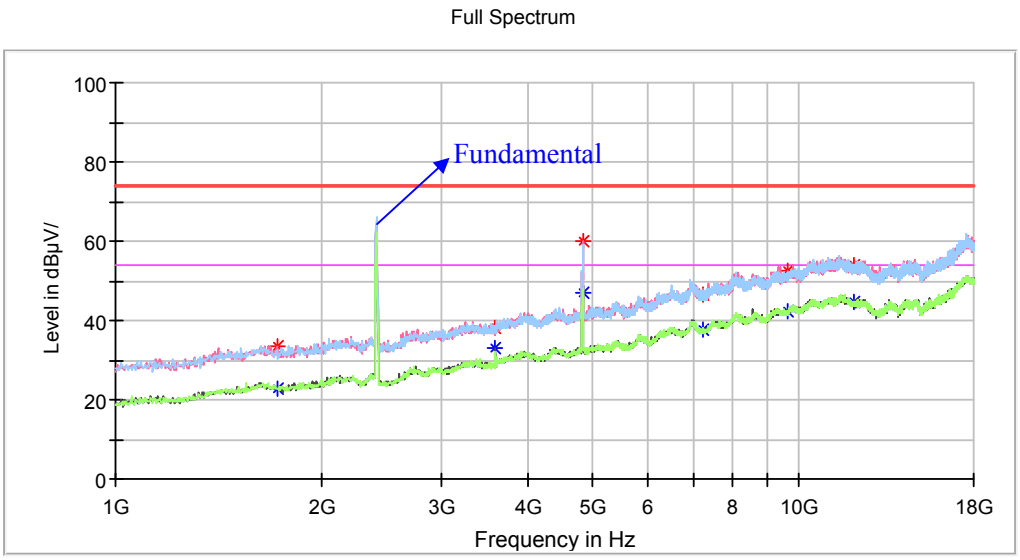


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1625.600000	---	24.06	200.0	V	341.0	-7.5	54.00	29.94
1625.600000	33.23	---	200.0	V	341.0	-7.5	74.00	40.77
3597.600000	---	31.69	100.0	V	218.0	-0.6	54.00	22.31
3597.600000	38.29	---	100.0	V	218.0	-0.6	74.00	35.71
4924.000000	46.35	---	100.0	H	23.0	2.7	74.00	27.65
4924.000000	---	38.89	100.0	H	23.0	2.7	54.00	15.11
7386.000000	---	40.39	200.0	H	17.0	10.1	54.00	13.61
7386.000000	48.55	---	200.0	H	17.0	10.1	74.00	25.45
9846.800000	51.18	---	100.0	H	3.0	14.9	74.00	22.82
9846.800000	---	42.86	100.0	H	3.0	14.9	54.00	11.14
12308.400000	---	45.12	200.0	H	241.0	16.9	54.00	8.88
12308.400000	53.43	---	200.0	H	241.0	16.9	74.00	20.57

802.11g Mode:
*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)*

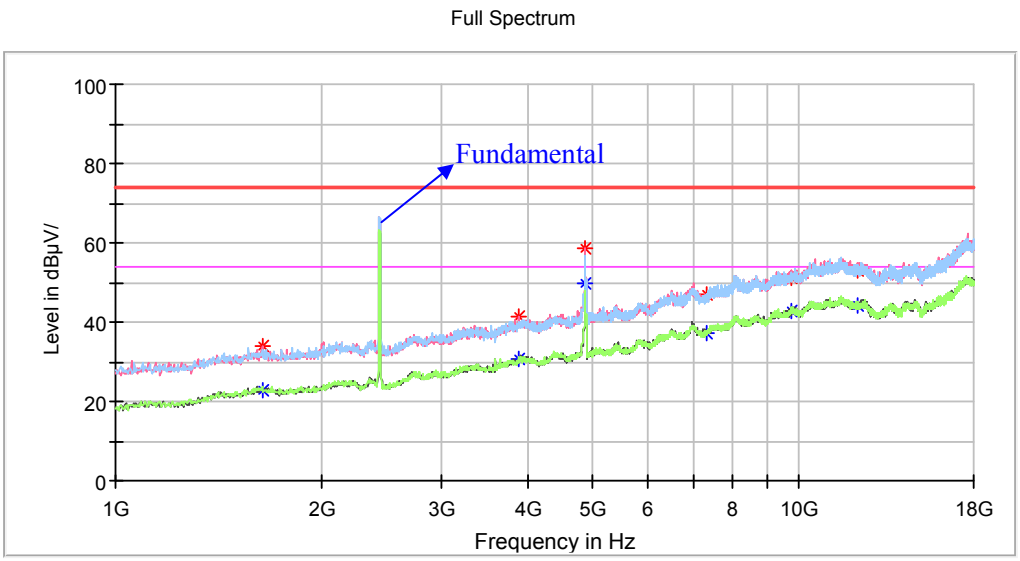
Note:
1. This test was performed with the 2.4-2.4835GHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
3. Corrected Amplitude = Corrected Factor + Reading
4. Margin = Limit - Corrected. Amplitude

Low Channel: 2412MHz



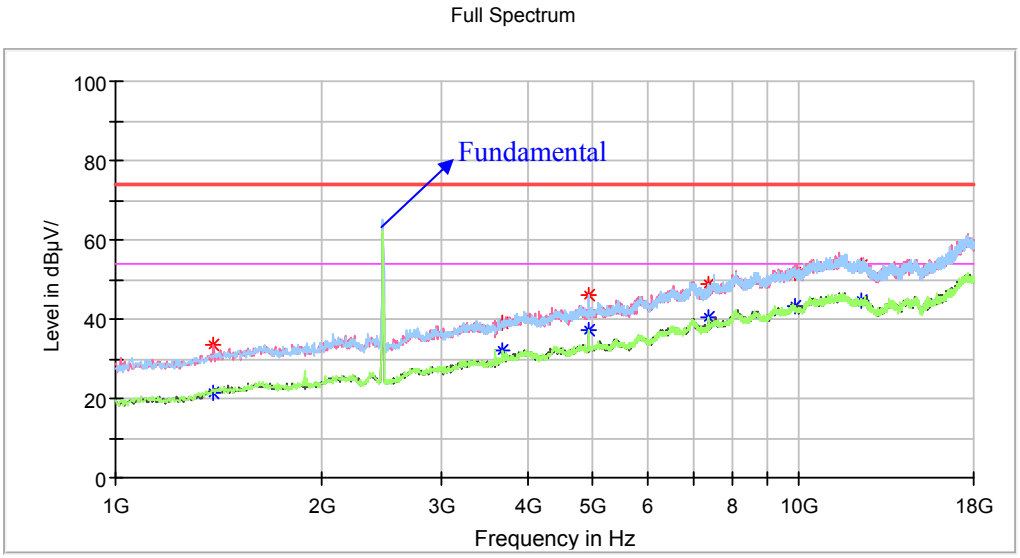
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1720.800000	33.63	---	200.0	V	290.0	-7.1	74.00	40.37
1720.800000	---	23.02	200.0	V	290.0	-7.1	54.00	30.98
3597.600000	38.07	---	100.0	V	238.0	-0.6	74.00	35.93
3597.600000	---	33.22	100.0	V	238.0	-0.6	54.00	20.78
4824.000000	---	47.11	200.0	H	223.0	12.3	54.00	6.89
4824.000000	60.05	---	200.0	H	223.0	12.3	74.00	13.95
7236.000000	---	37.45	200.0	H	70.0	9.8	54.00	16.55
7236.000000	46.59	---	200.0	H	70.0	9.8	74.00	27.41
9649.600000	52.60	---	100.0	V	142.0	15.1	74.00	21.40
9649.600000	---	42.33	100.0	V	142.0	15.1	54.00	11.67
12060.200000	53.82	---	200.0	H	63.0	16.5	74.00	20.18
12060.200000	---	44.45	200.0	H	63.0	16.5	54.00	9.55

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1639.200000	34.10	---	200.0	V	143.0	-7.4	74.00	39.90
1639.200000	---	22.95	200.0	V	143.0	-7.4	54.00	31.05
3896.800000	41.47	---	100.0	V	67.0	0.5	74.00	32.53
3896.800000	---	30.59	100.0	V	67.0	0.5	54.00	23.41
4874.000000	58.79	---	100.0	H	245.0	12.4	74.00	15.21
4874.000000	---	49.91	100.0	H	245.0	12.4	54.00	4.09
7311.000000	46.97	---	200.0	H	91.0	10.0	74.00	27.03
7311.000000	---	37.02	200.0	H	91.0	10.0	54.00	16.98
9748.300000	51.12	---	200.0	V	355.0	15.0	74.00	22.88
9748.300000	---	42.88	200.0	V	355.0	15.0	54.00	11.12
12186.000000	53.22	---	100.0	V	86.0	16.7	74.00	20.78
12186.000000	---	44.23	100.0	V	86.0	16.7	54.00	9.77

High Channel: 2462MHz

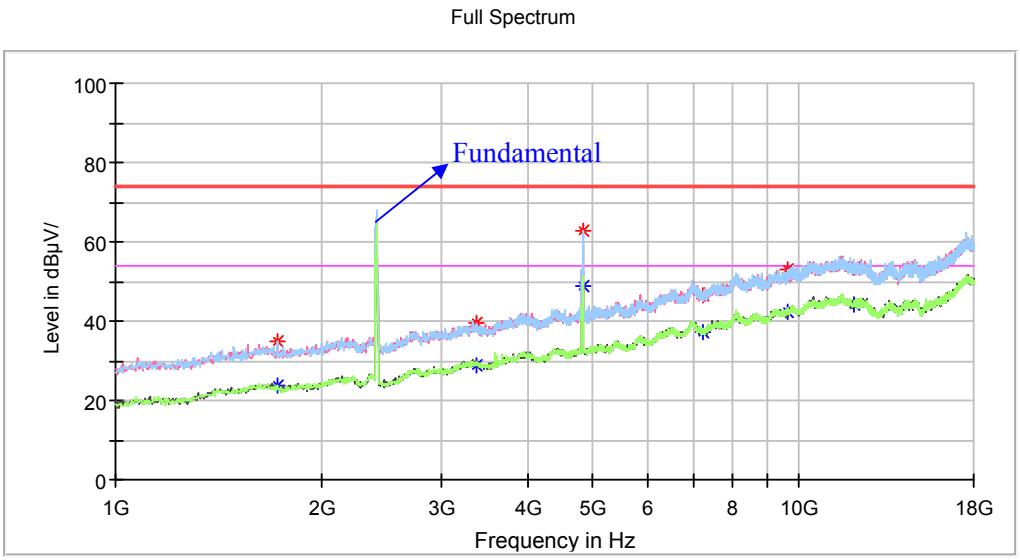


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1391.000000	33.30	---	100.0	V	156.0	-8.9	74.00	40.70
1391.000000	---	21.55	100.0	V	156.0	-8.9	54.00	32.45
3689.400000	39.26	---	200.0	H	250.0	-0.2	74.00	34.74
3689.400000	---	32.08	200.0	H	250.0	-0.2	54.00	21.92
4924.000000	45.91	---	100.0	H	20.0	2.7	74.00	28.09
4924.000000	---	37.82	100.0	H	20.0	2.7	54.00	16.18
7386.000000	49.05	---	200.0	H	19.0	10.1	74.00	24.95
7386.000000	---	40.56	200.0	H	19.0	10.1	54.00	13.44
9846.600000	51.62	---	200.0	H	210.0	14.9	74.00	22.38
9846.600000	---	43.20	200.0	H	210.0	14.9	54.00	10.80
12311.800000	53.54	---	100.0	V	177.0	16.9	74.00	20.46
12311.800000	---	44.46	100.0	V	177.0	16.9	54.00	9.54

802.11n-HT20 Mode:
*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)*

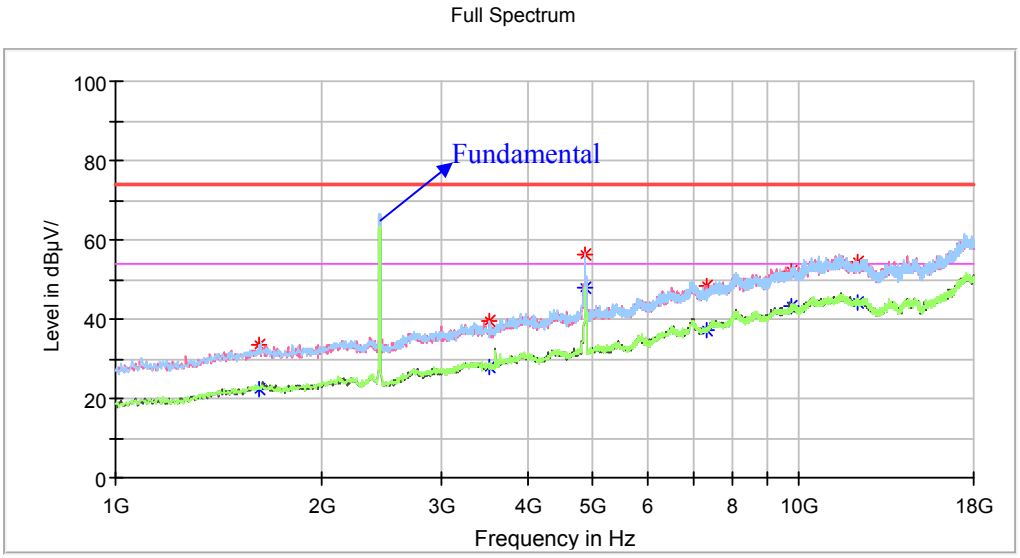
Note:
1. This test was performed with the 2.4-2.4835GHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
3. Corrected Amplitude = Corrected Factor + Reading
4. Margin = Limit - Corrected. Amplitude

Low Channel: 2412MHz



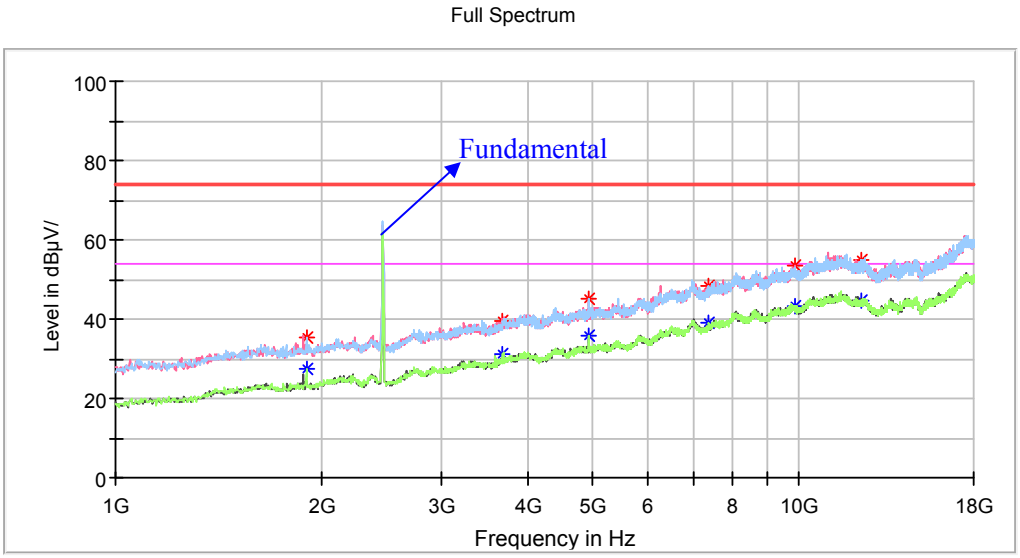
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1724.200000	34.88	---	200.0	H	24.0	-7.1	74.00	39.12
1724.200000	---	23.59	100.0	H	24.0	-7.1	54.00	30.41
3373.200000	39.73	---	100.0	V	3.0	-1.2	74.00	34.27
3373.200000	---	28.89	100.0	V	3.0	-1.2	54.00	25.11
4824.000000	62.76	---	100.0	H	238.0	12.3	74.00	11.24
4824.000000	---	48.73	100.0	H	238.0	12.3	54.00	5.27
7236.000000	46.69	---	100.0	H	244.0	9.8	74.00	27.31
7236.000000	---	37.06	100.0	H	244.0	9.8	54.00	16.94
9649.600000	53.00	---	250.0	H	224.0	15.1	74.00	21.00
9649.600000	---	42.31	250.0	H	224.0	15.1	54.00	11.69
12060.200000	53.27	---	100.0	H	0.0	16.5	74.00	20.73
12060.200000	---	43.98	100.0	H	0.0	16.5	54.00	10.02

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1625.600000	33.61	---	100.0	H	184.0	-7.5	74.00	40.39
1625.600000	---	22.55	100.0	H	184.0	-7.5	54.00	31.45
3533.000000	---	27.74	100.0	H	332.0	-0.8	54.00	26.26
3533.000000	39.60	---	100.0	H	332.0	-0.8	74.00	34.40
4874.000000	56.45	---	200.0	H	48.0	12.4	74.00	17.55
4874.000000	---	48.91	200.0	H	48.0	12.4	54.00	5.09
7311.000000	---	37.26	100.0	H	318.0	10.0	54.00	16.74
7311.000000	48.50	---	100.0	H	318.0	10.0	74.00	25.50
9748.200000	52.32	---	200.0	V	76.0	15.0	74.00	21.68
9748.200000	---	43.11	200.0	V	76.0	15.0	54.00	10.89
12186.000000	---	44.16	200.0	H	183.0	16.7	54.00	9.84
12186.000000	54.61	---	200.0	H	183.0	16.7	74.00	19.39

High Channel: 2462MHz

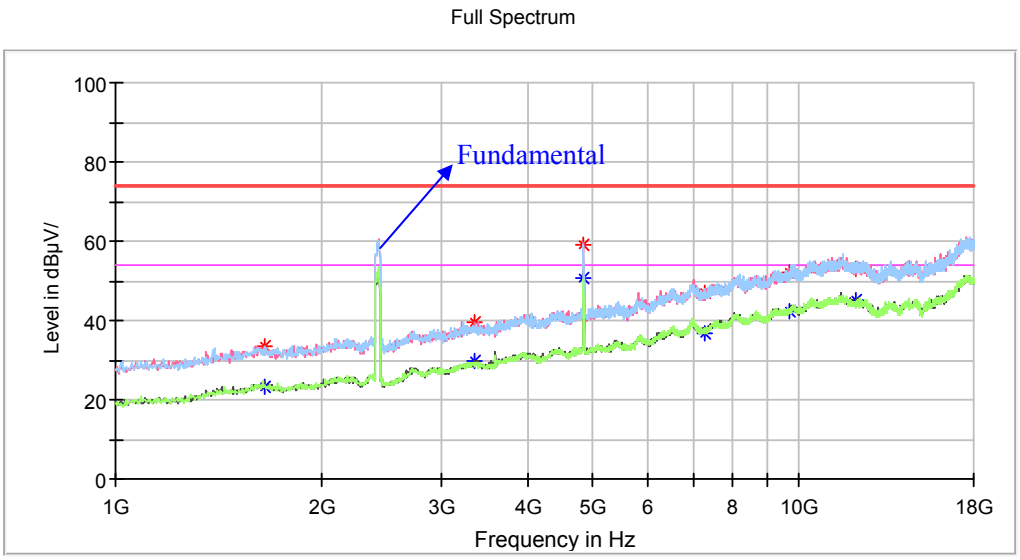


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1901.000000	35.31	---	200.0	H	199.0	-6.4	74.00	38.69
1901.000000	---	27.50	200.0	H	199.0	-6.4	54.00	26.50
3689.400000	39.36	---	200.0	H	149.0	-0.2	74.00	34.64
3689.400000	---	31.30	200.0	H	149.0	-0.2	54.00	22.70
4924.000000	45.30	---	100.0	H	10.0	2.7	74.00	28.70
4924.000000	---	36.03	100.0	H	10.0	2.7	54.00	17.97
7386.000000	48.33	---	100.0	H	33.0	10.1	74.00	25.67
7386.000000	---	39.26	100.0	H	33.0	10.1	54.00	14.74
9846.800000	53.40	---	200.0	V	260.0	14.9	74.00	20.60
9846.800000	---	43.23	200.0	V	260.0	14.9	54.00	10.77
12311.800000	54.77	---	200.0	H	279.0	16.9	74.00	19.23
12311.800000	---	44.57	200.0	H	279.0	16.9	54.00	9.43

802.11n-HT40 Mode:
*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)*

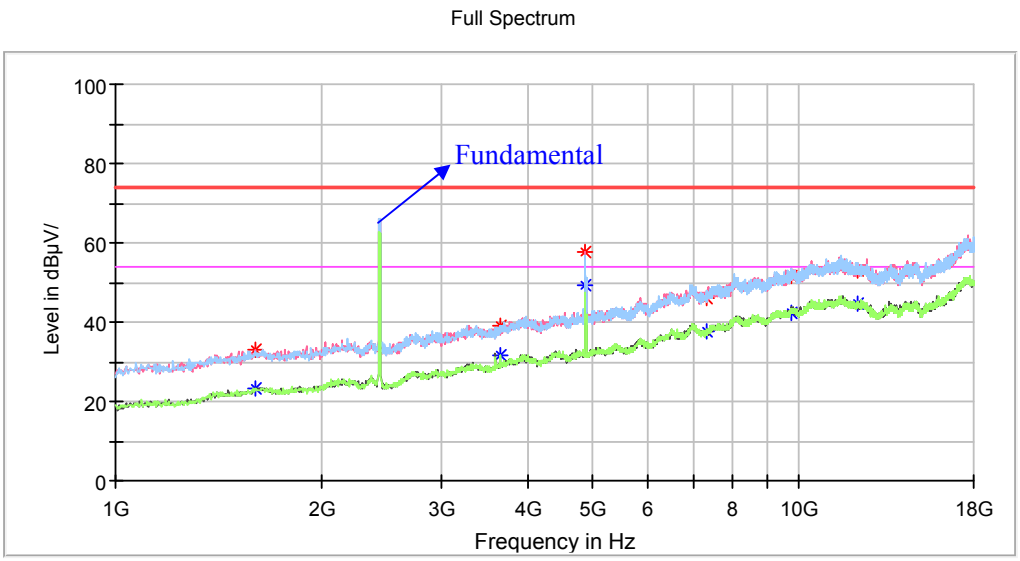
Note:
1. This test was performed with the 2.4-2.4835GHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
3. Corrected Amplitude = Corrected Factor + Reading
4. Margin = Limit - Corrected. Amplitude

Low Channel: 2422MHz



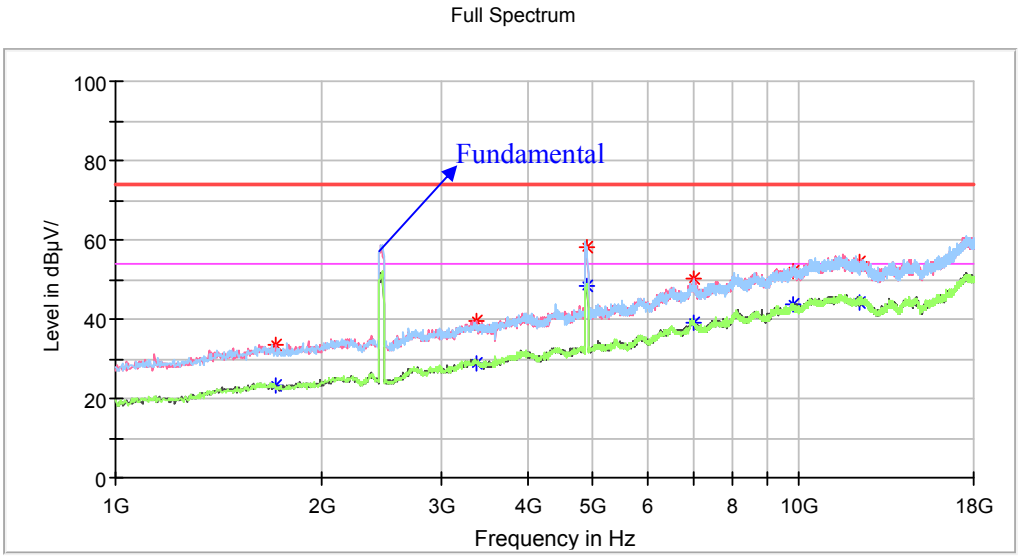
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1649.400000	33.59	---	200.0	H	29.0	-7.4	74.00	40.41
1649.400000	---	23.45	200.0	H	29.0	-7.4	54.00	30.55
3359.600000	39.47	---	200.0	V	156.0	-1.2	74.00	34.53
3359.600000	---	29.70	200.0	V	156.0	-1.2	54.00	24.30
4844.000000	59.28	---	100.0	H	244.0	18.3	74.00	14.72
4844.000000	---	50.63	100.0	H	244.0	18.3	54.00	3.37
7266.000000	47.20	---	200.0	H	103.0	9.9	74.00	26.80
7266.000000	---	36.70	200.0	H	103.0	9.9	54.00	17.30
9687.000000	52.08	---	100.0	H	75.0	15.0	74.00	21.92
9687.000000	---	42.38	100.0	H	75.0	15.0	54.00	11.62
12114.600000	53.23	---	200.0	V	30.0	16.6	74.00	20.77
12114.600000	---	45.05	200.0	V	30.0	16.6	54.00	8.95

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1598.400000	32.97	---	200.0	V	217.0	-7.6	74.00	41.03
1598.400000	---	23.16	200.0	V	217.0	-7.6	54.00	30.84
3652.000000	39.05	---	200.0	H	192.0	-0.4	74.00	34.95
3652.000000	---	31.60	200.0	H	192.0	-0.4	54.00	22.40
4874.000000	57.84	---	100.0	V	231.0	12.4	74.00	16.16
4874.000000	---	49.20	100.0	V	231.0	12.4	54.00	4.80
7311.000000	46.21	---	100.0	V	313.0	10.0	74.00	27.79
7311.000000	---	37.69	100.0	V	313.0	10.0	54.00	16.31
9748.200000	51.79	---	200.0	H	117.0	15.0	74.00	22.21
9748.200000	---	42.50	200.0	H	117.0	15.0	54.00	11.50
12186.000000	52.80	---	100.0	V	338.0	16.7	74.00	21.20
12186.000000	---	44.53	100.0	V	338.0	16.7	54.00	9.47

High Channel: 2452MHz

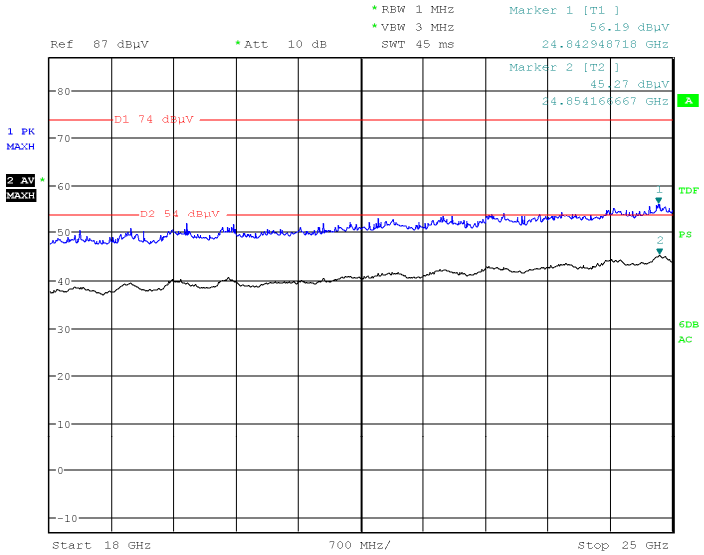


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1717.400000	33.52	---	200.0	V	183.0	-7.1	74.00	40.48
1717.400000	---	23.40	200.0	V	183.0	-7.1	54.00	30.60
3373.200000	39.38	---	100.0	V	306.0	-1.2	74.00	34.62
3373.200000	---	28.99	100.0	V	306.0	-1.2	54.00	25.01
4904.000000	57.95	---	100.0	H	265.0	18.4	74.00	16.05
4904.000000	---	44.30	100.0	H	265.0	18.4	54.00	9.70
7356.000000	50.46	---	200.0	H	332.0	10.0	74.00	23.54
7356.000000	---	39.06	200.0	H	332.0	10.0	54.00	14.94
9806.000000	51.86	---	100.0	H	357.0	15.0	74.00	22.14
9806.000000	---	43.66	100.0	H	357.0	15.0	54.00	10.34
12264.200000	54.28	---	200.0	V	251.0	16.8	74.00	19.72
12264.200000	---	44.31	200.0	V	251.0	16.8	54.00	9.69

18GHz-25GHz:

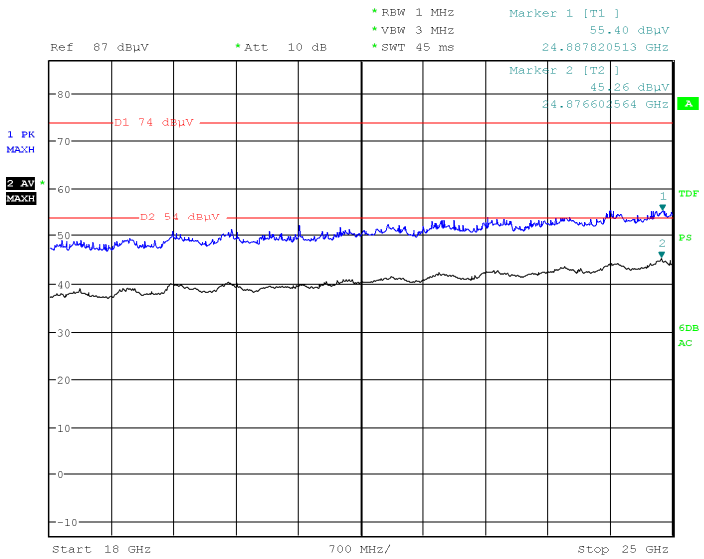
*Pre-scan with 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case **802.11b mode(channel 1:2412MHz) in X-axis of orientation** was recorded*

Horizontal



Date: 15.JAN.2018 15:30:02

Vertical



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Fundamental Test & Restricted Bands Emissions Test:

Note:
1. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
2.Corrected Amplitude = Corrected Factor + Reading
3.Margin = Limit - Corrected. Amplitude

802.11b Mode: *(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)*

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412.000000	108.81	---	150.0	H	198.0	5.1	/	/
2412.000000	---	95.81	150.0	H	198.0	5.1	/	/
2390.000000	---	41.29	150.0	H	201.0	5.1	54.00	12.71
2390.000000	48.46	---	150.0	H	201.0	5.1	74.00	25.54
Middle Channel: 2437MHz								
2437.000000	108.43	---	200.0	H	165.0	5.2	/	/
2437.000000	---	95.66	200.0	H	165.0	5.2	/	/
High Channel: 2462MHz								
2462.000000	108.27	---	150.0	H	154.0	5.3	/	/
2462.000000	---	95.62	150.0	H	154.0	5.3	/	/
2483.500000	47.55	---	200.0	H	146.0	5.3	74.00	26.45
2483.500000	---	40.63	200.0	H	146.0	5.3	54.00	13.37

802.11g Mode: *(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)*

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412.000000	107.55	---	150.0	H	159.0	5.1	/	/
2412.000000	---	94.44	150.0	H	159.0	5.1	/	/
2390.000000	---	40.70	200.0	H	254.0	5.1	54.00	13.30
2390.000000	46.42	---	200.0	H	254.0	5.1	74.00	27.58
Middle Channel: 2437MHz								
2437.000000	106.44	---	250.0	H	175.0	5.2	/	/
2437.000000	---	93.71	250.0	H	175.0	5.2	/	/
High Channel: 2462MHz								
2462.000000	107.01	---	150.0	H	204.0	5.3	/	/
2462.000000	---	94.27	150.0	H	204.0	5.3	/	/
2483.500000	47.74	---	200.0	H	166.0	5.3	74.00	26.26
2483.500000	---	40.94	200.0	H	166.0	5.3	54.00	13.06

802.11n-HT20 Mode: *(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)*

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412.000000	105.36	---	150.0	H	165.0	5.1	/	/
2412.000000	---	93.78	150.0	H	165.0	5.1	/	/
2390.000000	---	40.65	150.0	H	241.0	5.1	54.00	13.35
2390.000000	47.90	---	150.0	H	241.0	5.1	74.00	26.10
Middle Channel: 2437MHz								
2437.000000	105.39	---	200.0	H	185.0	5.2	/	/
2437.000000	---	93.22	200.0	H	185.0	5.2	/	/
High Channel: 2462MHz								
2462.000000	105.08	---	100.0	H	224.0	5.3	/	/
2462.000000	---	93.95	100.0	H	224.0	5.3	/	/
2483.500000	48.30	---	200.0	H	133.0	5.3	74.00	25.70
2483.500000	---	40.33	200.0	H	133.0	5.3	54.00	13.67

802.11n-HT40 Mode: *(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)*

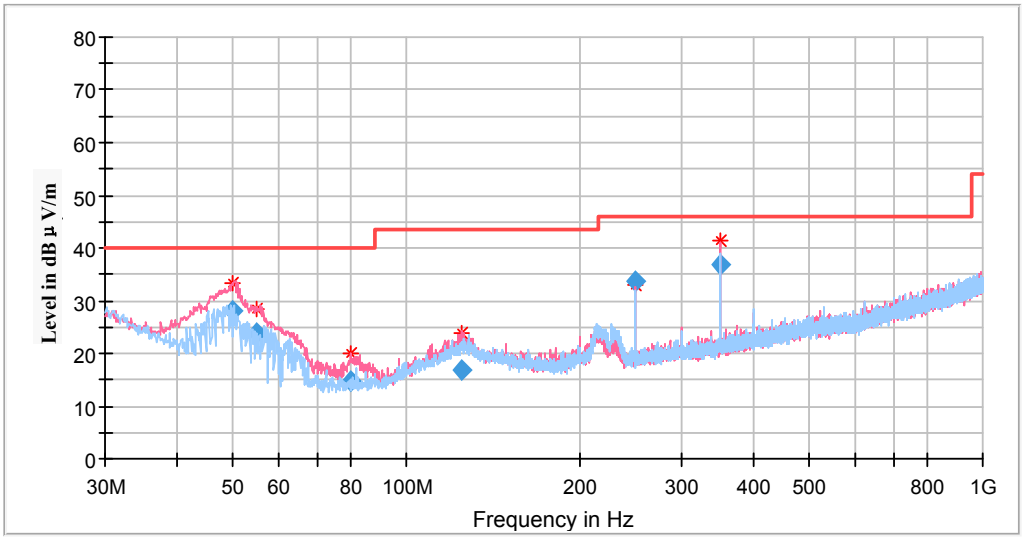
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2422MHz								
2422.000000	102.05	---	200.0	H	169.0	5.1	/	/
2422.000000	---	93.83	200.0	H	169.0	5.1	/	/
2390.000000	---	39.97	150.0	H	188.0	5.1	54.00	14.03
2390.000000	47.21	---	150.0	H	188.0	5.1	74.00	26.79
Middle Channel: 2437MHz								
2437.000000	102.76	---	200.0	H	157.0	5.2	/	/
2437.000000	---	95.03	200.0	H	157.0	5.2	/	/
High Channel: 2452MHz								
2452.000000	102.41	---	100.0	H	211.0	5.3	/	/
2452.000000	---	94.90	100.0	H	211.0	5.3	/	/
2483.500000	48.22	---	250.0	H	106.0	5.3	74.00	25.78
2483.500000	---	40.73	250.0	H	106.0	5.3	54.00	13.27

For Zigbee Mode:

Spurious Emission Test:

30MHz-1GHz

(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case ***middle channel of operation in the X axis of orientation*** *was recorded)*



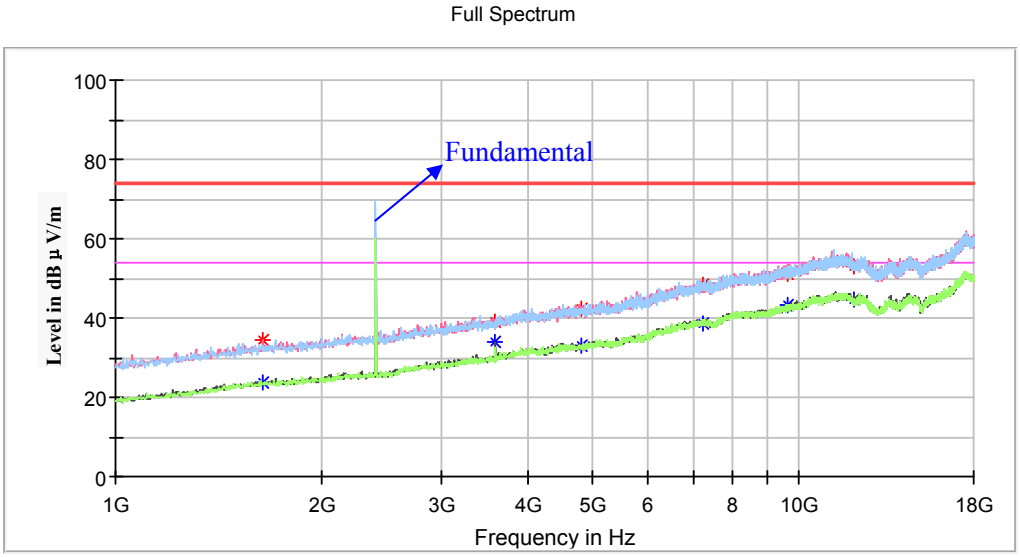
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dB µ V/m)	Height (cm)	Polar (H/V)				
50.082380	28.02	101.0	V	172.0	-18.0	40.00	11.98
55.028170	23.71	101.0	V	344.0	-18.2	40.00	16.29
80.211740	14.62	101.0	V	96.0	-18.2	40.00	25.38
125.108370	16.98	199.0	V	216.0	-11.8	43.50	26.52
250.001100	33.83	101.0	V	210.0	-12.6	46.00	12.17
350.005810	36.78	199.0	V	227.0	-9.8	46.00	9.22

1GHz-18GHz

(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

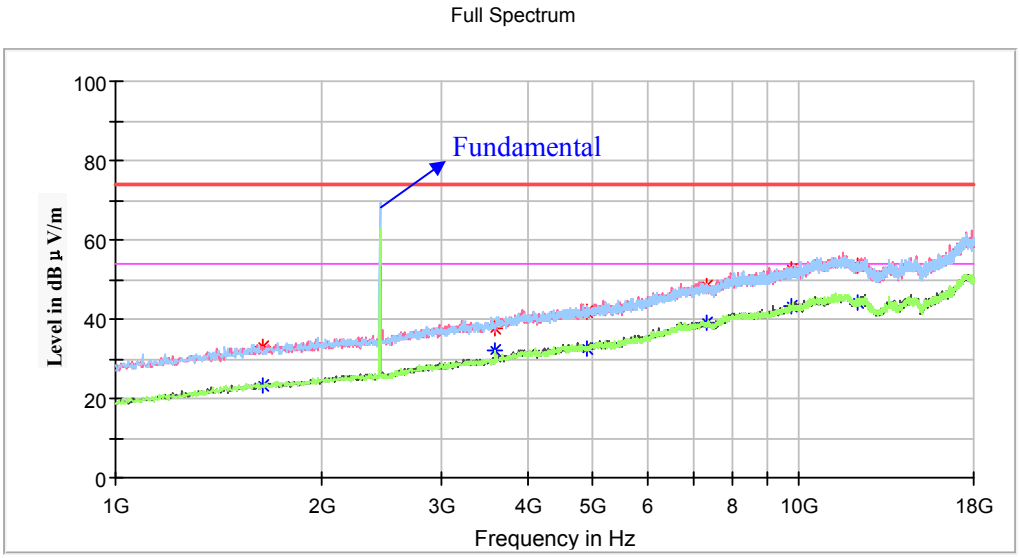
Note:
1. This test was performed with the 2.4-2.4835GHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2405MHz



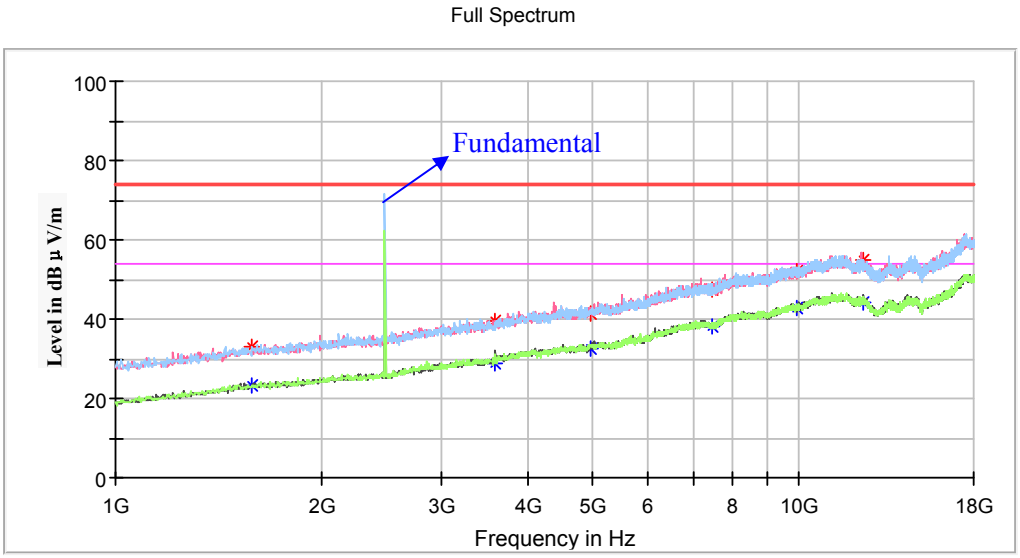
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1642.600000	34.35	---	200.0	V	205.0	-7.4	74.00	39.65
1642.600000	---	23.67	200.0	V	205.0	-7.4	54.00	30.33
3597.600000	38.94	---	150.0	V	21.0	-0.6	74.00	35.06
3597.600000	---	33.93	150.0	V	21.0	-0.6	54.00	20.07
4810.000000	42.43	---	250.0	H	198.0	2.5	74.00	31.57
4810.000000	---	33.02	250.0	H	198.0	2.5	54.00	20.98
7215.000000	48.37	---	200.0	H	118.0	9.8	74.00	25.63
7215.000000	---	38.61	200.0	H	118.0	9.8	54.00	15.39
9622.400000	51.06	---	200.0	V	357.0	14.9	74.00	22.94
9622.400000	---	43.03	200.0	V	357.0	14.9	54.00	10.97
12026.200000	53.01	---	150.0	H	327.0	16.5	74.00	20.99
12026.200000	---	44.88	150.0	H	327.0	16.5	54.00	9.12

Middle Channel: 2440MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1646.000000	33.22	---	150.0	V	3.0	-7.4	74.00	40.78
1646.000000	---	23.20	150.0	V	3.0	-7.4	54.00	30.80
3597.600000	37.58	---	200.0	H	149.0	-0.6	74.00	36.42
3597.600000	---	32.20	200.0	H	149.0	-0.6	54.00	21.80
4880.000000	---	32.34	200.0	H	41.0	2.6	54.00	21.66
4880.000000	41.98	---	200.0	H	41.0	2.6	74.00	32.02
7320.000000	---	39.05	150.0	H	196.0	10.0	54.00	14.95
7320.000000	48.41	---	150.0	H	196.0	10.0	74.00	25.59
9761.800000	---	43.20	200.0	V	285.0	14.9	54.00	10.80
9761.800000	52.47	---	200.0	V	285.0	14.9	74.00	21.53
12199.600000	---	44.22	200.0	H	135.0	16.8	54.00	9.78
12199.600000	53.46	---	200.0	H	135.0	16.8	74.00	20.54

High Channel: 2480MHz

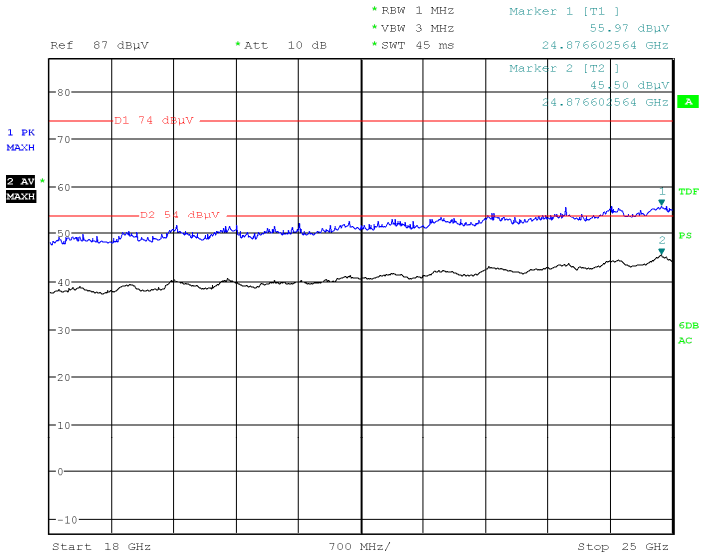


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1584.800000	32.83	---	200.0	H	224.0	-7.7	74.00	41.17
1584.800000	---	23.29	200.0	H	224.0	-7.7	54.00	30.71
3594.200000	39.64	---	200.0	V	312.0	-0.6	74.00	34.36
3594.200000	---	28.95	200.0	V	312.0	-0.6	54.00	25.05
4960.000000	41.55	---	150.0	V	185.0	2.8	74.00	32.45
4960.000000	---	32.77	150.0	V	185.0	2.8	54.00	21.23
7440.000000	47.36	---	200.0	V	11.0	10.1	74.00	26.64
7440.000000	---	38.27	200.0	V	11.0	10.1	54.00	15.73
9918.200000	---	42.74	150.0	V	299.0	14.9	54.00	11.26
9918.200000	52.04	---	150.0	V	299.0	14.9	74.00	21.96
12403.600000	54.99	---	150.0	V	218.0	17.1	74.00	19.01
12403.600000	---	44.34	150.0	V	218.0	17.1	54.00	9.66

18GHz-25GHz

(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case ***middle channel of operation in the X axis of orientation*** *was recorded)*

Horizontal Plot



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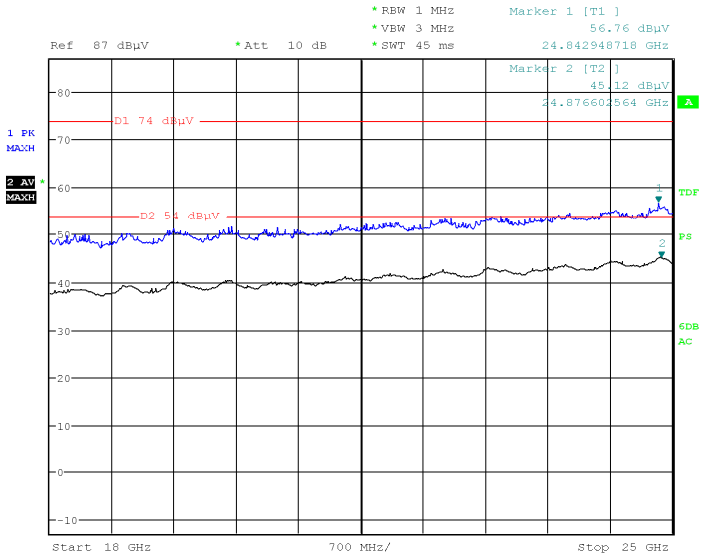
Vertical Plot



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Fundamental Test & Restricted Bands Emissions Test:
(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

Note:
1. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
2. Corrected Amplitude = Corrected Factor + Reading
3. Margin = Limit - Corrected. Amplitude

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2405MHz								
2405.000000	101.22	---	100.0	V	164.0	5.1	/	/
2405.000000	---	88.86	100.0	V	164.0	5.1	/	/
2390.000000	---	43.13	200.0	V	215.0	5.1	54.00	10.87
2390.000000	55.47	---	200.0	V	215.0	5.1	74.00	18.53
Middle Channel: 2440MHz								
2440.000000	101.95	---	250.0	V	162.0	5.2	/	/
2440.000000	---	88.03	250.0	V	162.0	5.2	/	/
High Channel: 2480MHz								
2480.000000	101.07	---	150.0	V	153.0	5.3	/	/
2480.000000	---	87.84	150.0	V	153.0	5.3	/	/
2483.500000	56.51	---	250.0	V	114.0	5.3	74.00	17.49
2483.500000	---	44.20	250.0	V	114.0	5.3	54.00	9.80

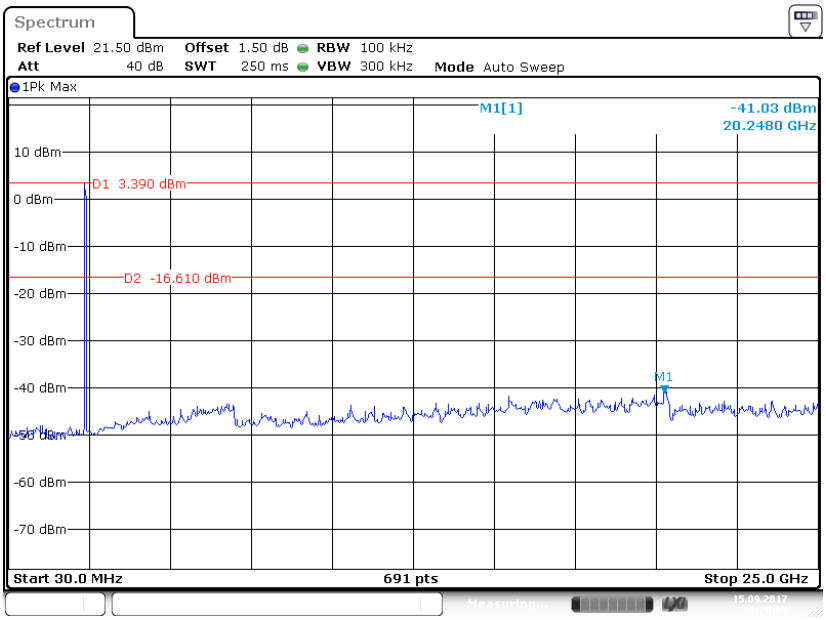
Co-location Mode:
(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

Note:
1. This test was performed with the 2.4-2.4835GHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
3. Corrected Amplitude = Corrected Factor + Reading
4. Margin = Limit - Corrected. Amplitude

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1452.200000	33.41	---	200.0	V	117.0	-6.9	74.00	40.59
1452.200000	---	23.01	200.0	V	117.0	-6.9	54.00	30.99
3138.600000	38.28	---	150.0	H	259.0	-1.7	74.00	35.72
3138.600000	---	27.59	150.0	H	259.0	-1.7	54.00	26.41
3930.800000	42.53	---	100.0	V	0.0	0.7	74.00	31.47
3930.800000	---	30.92	100.0	V	0.0	0.7	54.00	23.08
4825.000000	56.70	---	150.0	V	358.0	18.4	74.00	17.30
4825.000000	---	47.57	150.0	V	358.0	18.4	54.00	6.43
4961.000000	56.02	---	150.0	V	63.0	17.5	74.00	17.98
4961.000000	---	47.20	150.0	V	63.0	17.5	54.00	6.80
7062.200000	49.47	---	150.0	V	352.0	9.6	74.00	24.53
7062.200000	---	37.78	150.0	V	352.0	9.6	54.00	16.22

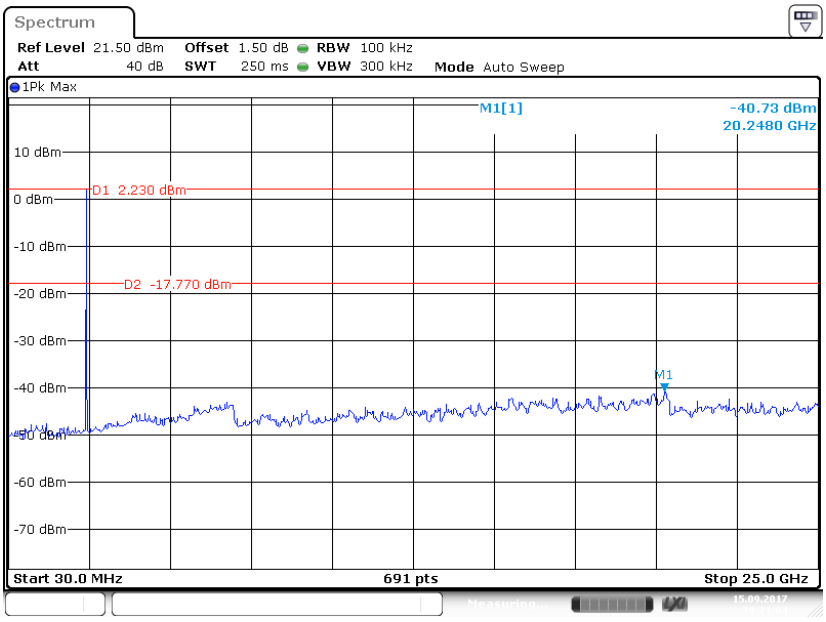
Conducted Spurious Emissions at Antenna Port

802.11b Mode Low Channel



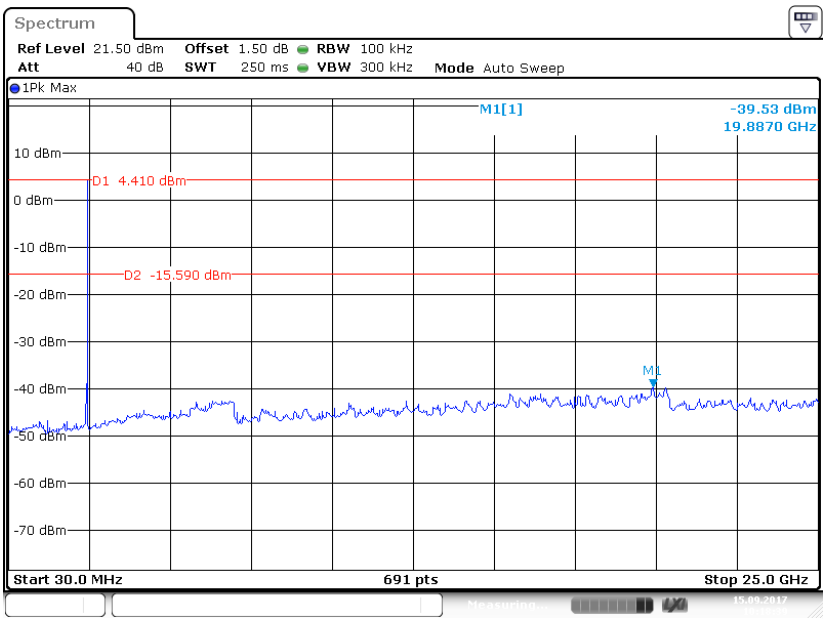
Date:15.SEP.2017 10:20:04

802.11b Mode Middle Channel



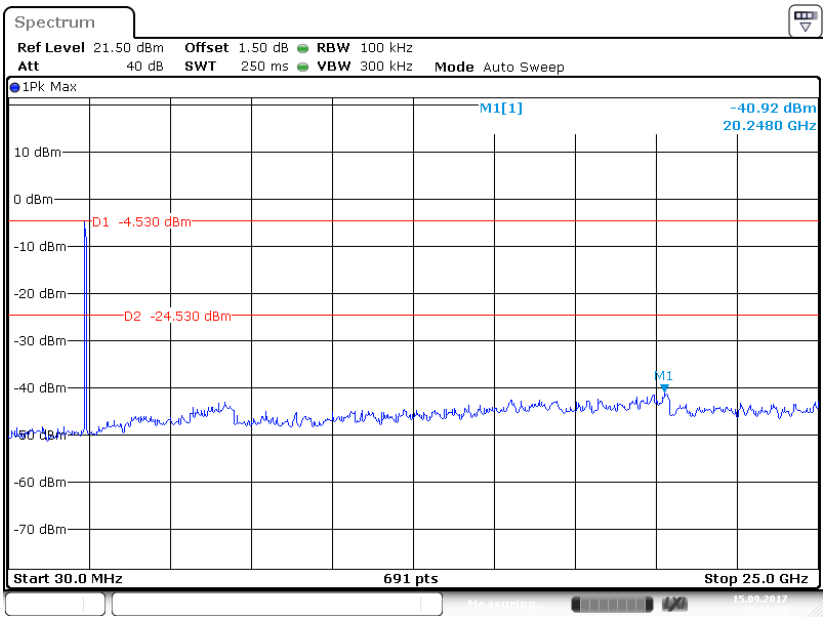
Date:15.SEP.2017 10:21:04

802.11b Mode High Channel



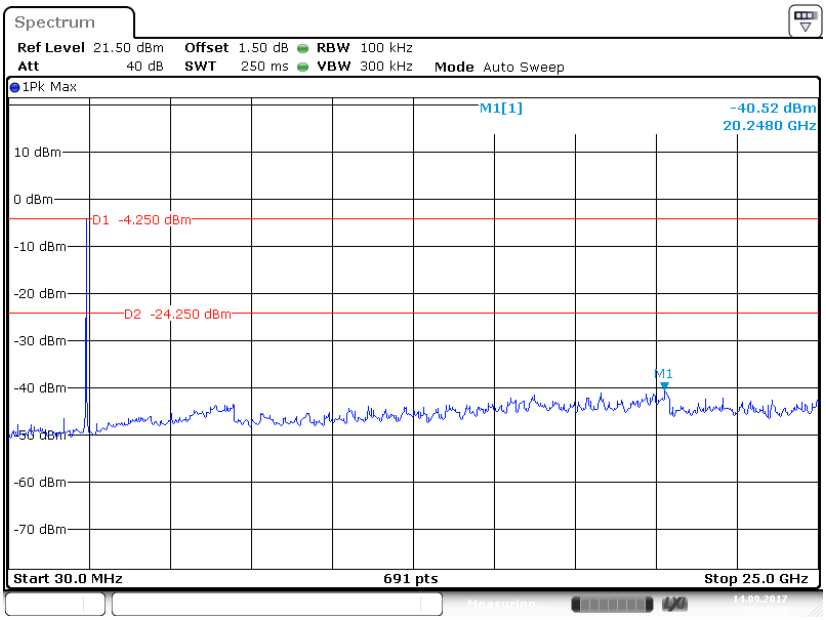
Date:15.SEP.2017 10:18:39

802.11g Mode Low Channel



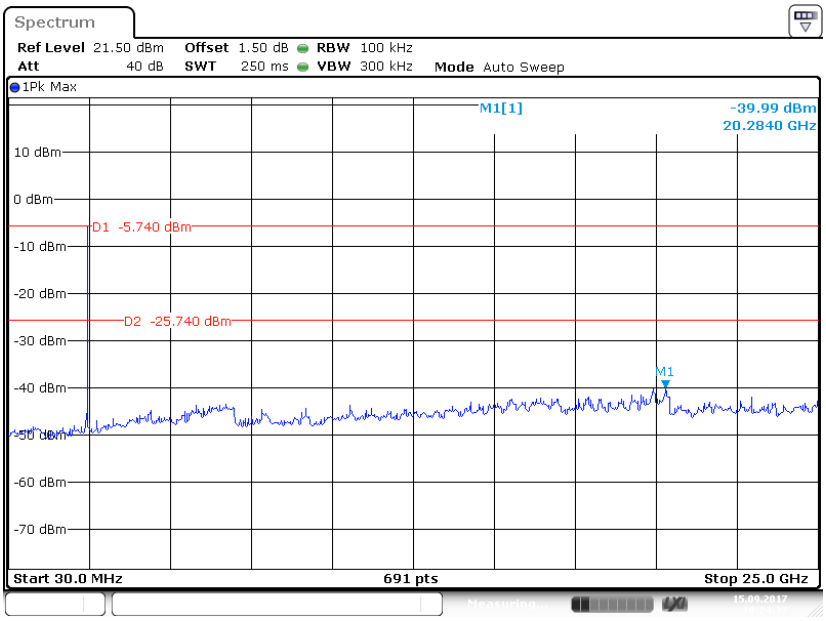
Date:15.SEP.2017 10:22:59

802.11g Mode Middle Channel



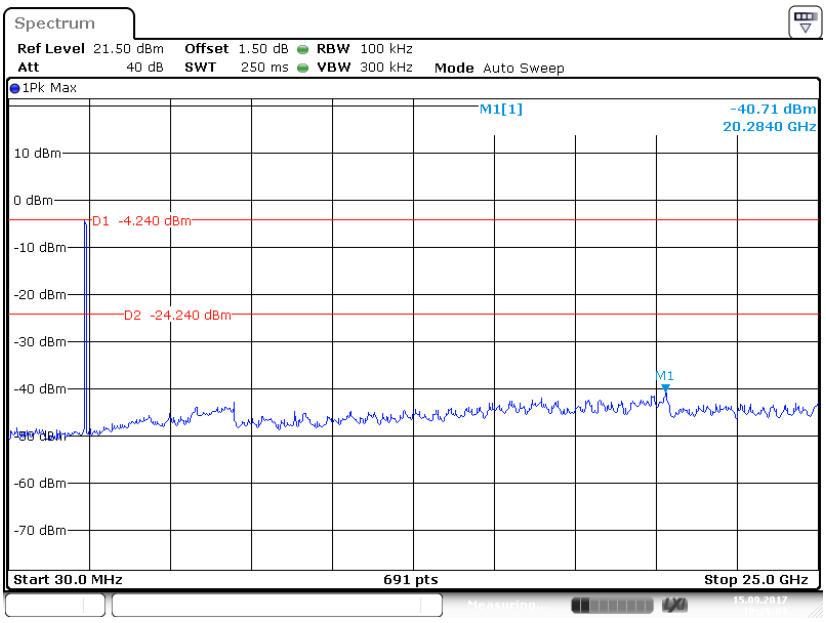
Date:14.SEP.2017 17:15:29

802.11g Mode High Channel



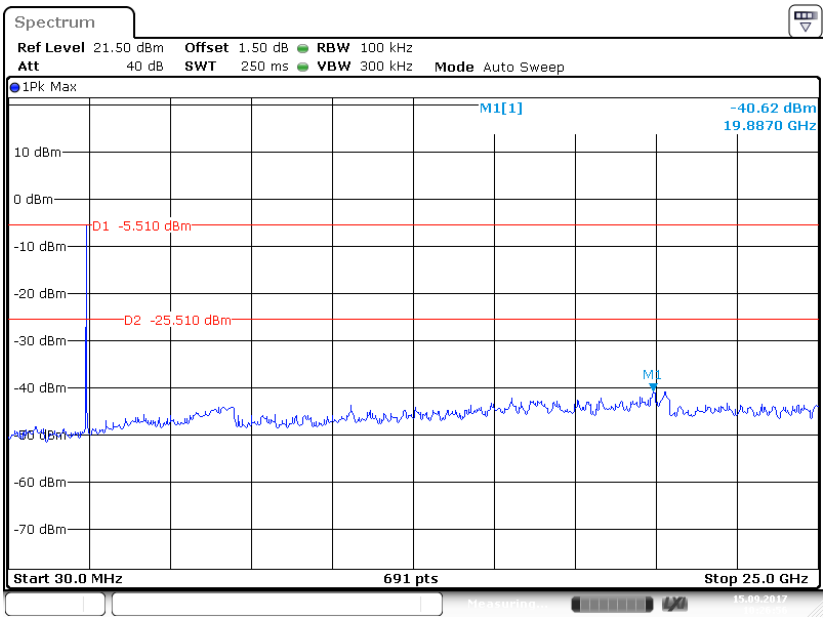
Date:15.SEP.2017 10:24:37

802.11n-HT20 Mode Low Channel



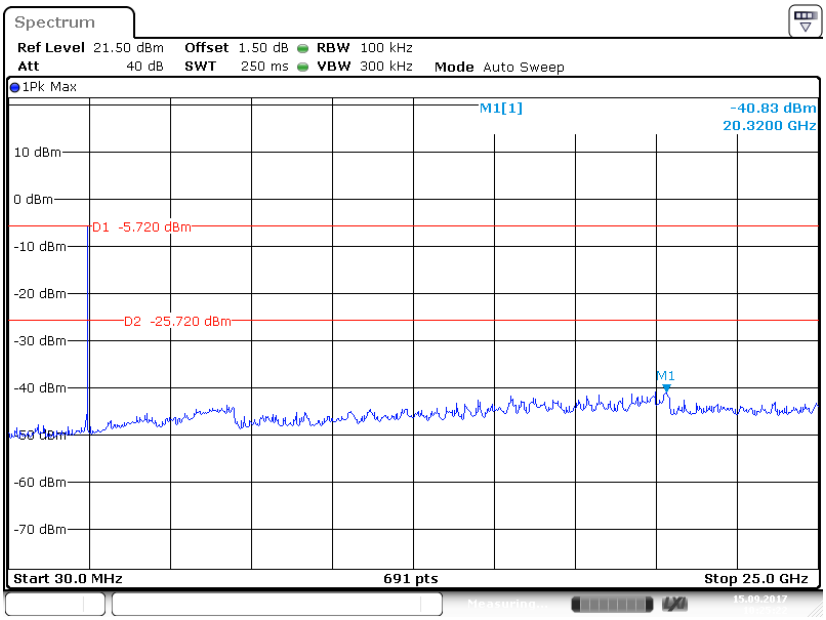
Date:15.SEP.2017 10:26:09

802.11n-HT20 Mode Middle Channel



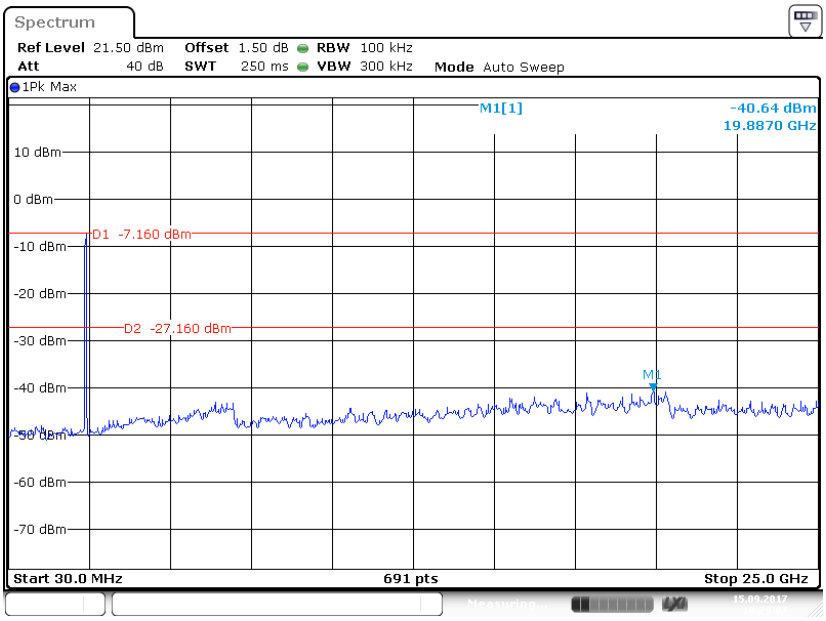
Date:15.SEP.2017 10:26:56

802.11n-HT20 Mode High Channel



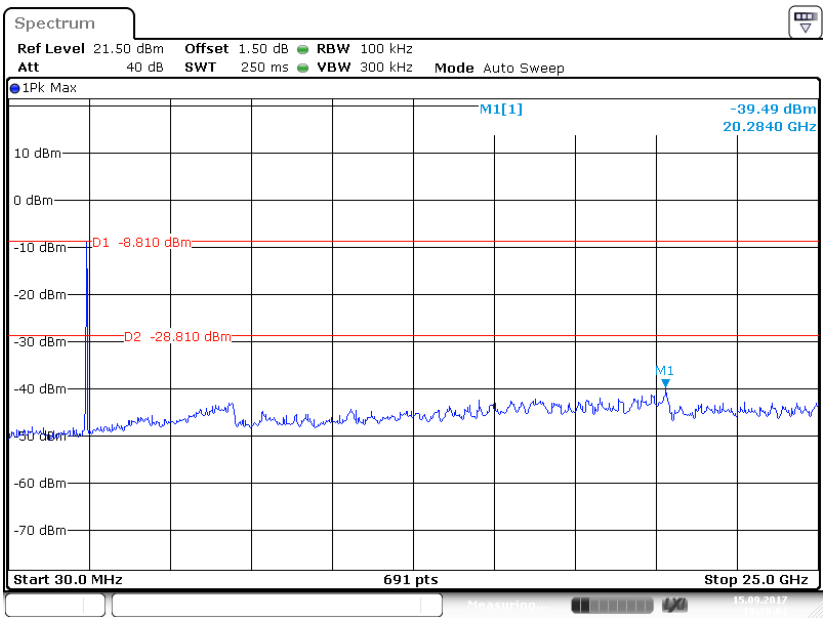
Date:15.SEP.2017 10:25:22

802.11n-HT40 Mode Low Channel



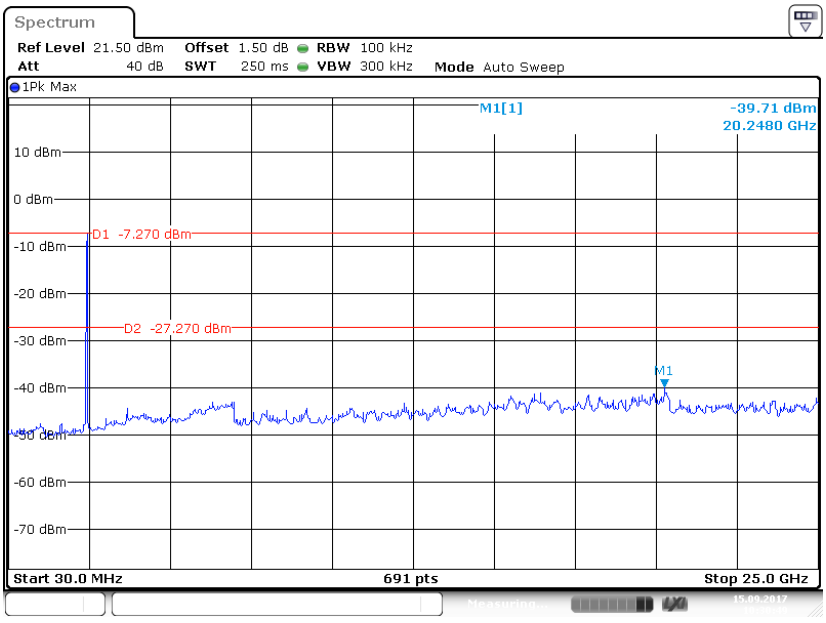
Date:15.SEP.2017 10:29:07

802.11n-HT40 Mode Middle Channel



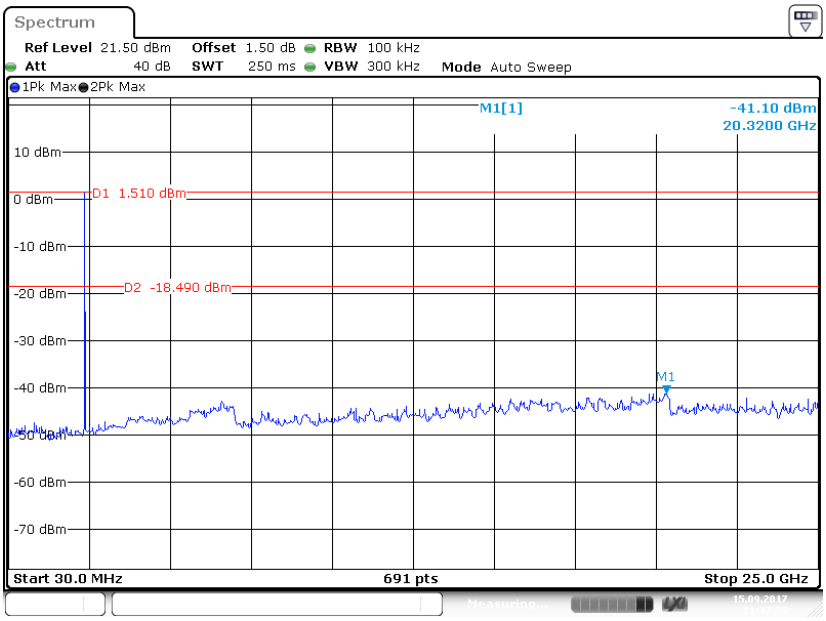
Date:15.SEP.2017 10:28:01

802.11n-HT40 Mode High Channel



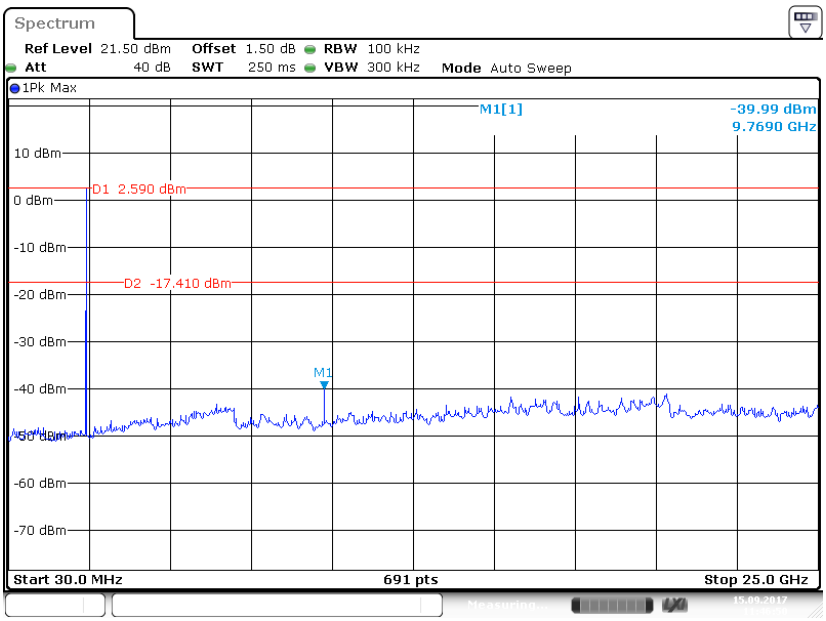
Date:15.SEP.2017 10:30:50

Zigbee Mode Low Channel



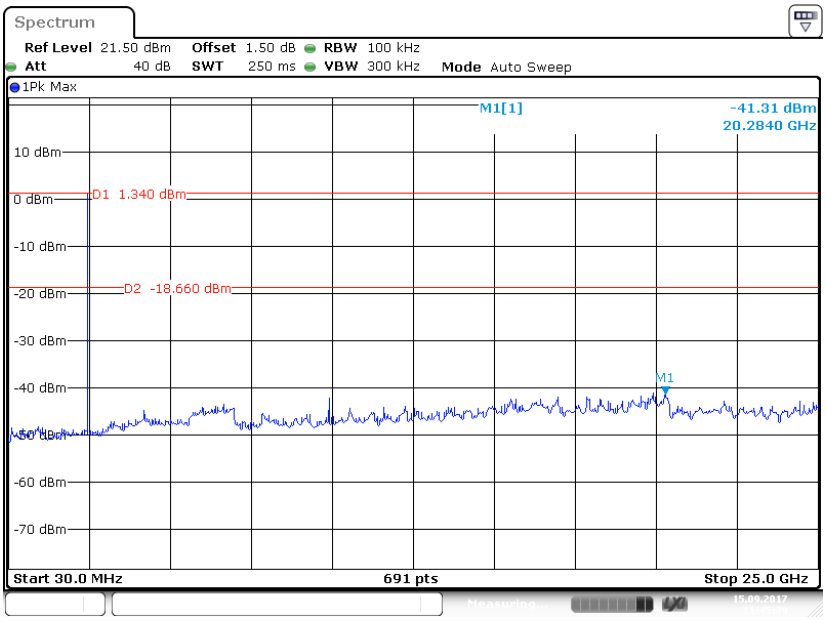
Date:15.SEP.2017 11:47:56

Zigbee Mode Middle Channel



Date:15.SEP.2017 11:46:50

Zigbee Mode High Channel



Date:15.SEP.2017 11:45:39

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

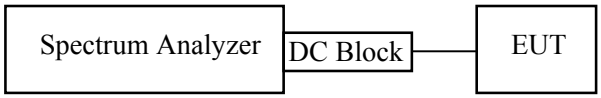
Applicable Standard

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

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 8.1

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

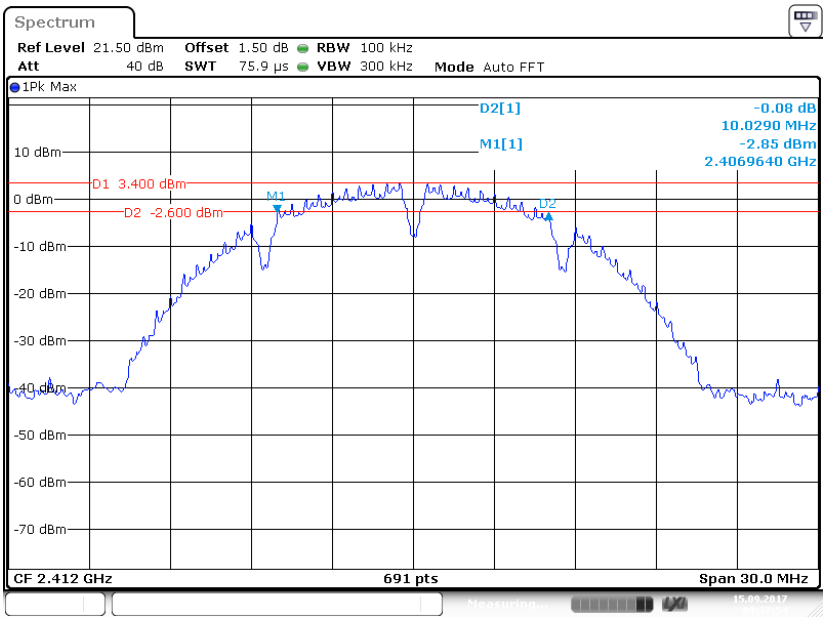
The testing was performed by Edison Hu on 2017-09-15.

EUT operation mode: Transmitting

Test Result: Pass

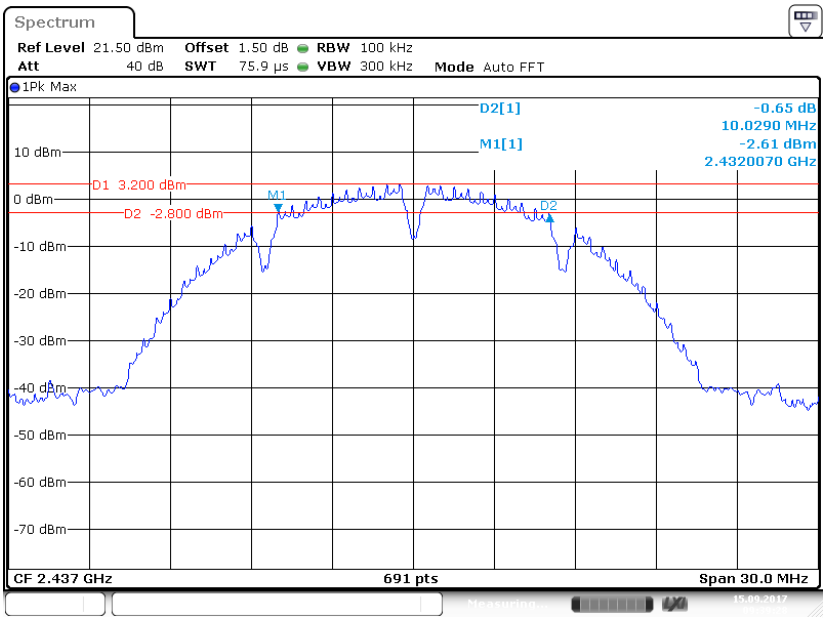
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b Mode			
Low	2412	10.03	≥0.5
Middle	2437	10.03	≥0.5
High	2462	10.03	≥0.5
802.11g Mode			
Low	2412	15.02	≥0.5
Middle	2437	15.02	≥0.5
High	2462	14.98	≥0.5
802.11n-HT20 Mode			
Low	2412	14.98	≥0.5
Middle	2437	15.02	≥0.5
High	2462	15.02	≥0.5
802.11n-HT40 Mode			
Low	2422	35.08	≥0.5
Middle	2437	35.08	≥0.5
High	2452	35.08	≥0.5
Zigbee Mode			
Low	2405	1.61	≥0.5
Middle	2440	1.61	≥0.5
High	2480	1.61	≥0.5

802.11b Mode Low Channel



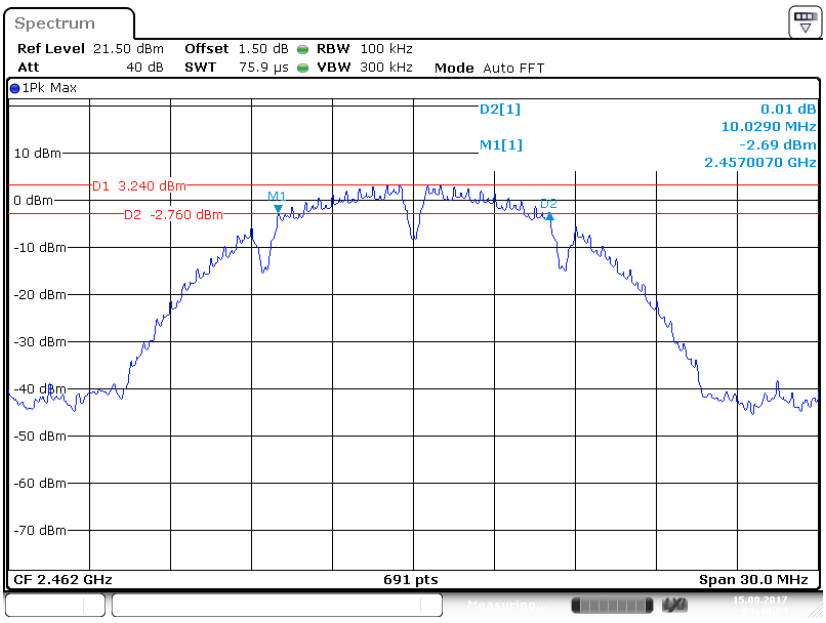
Date:15.SEP.2017 09:37:55

802.11b Mode Middle Channel



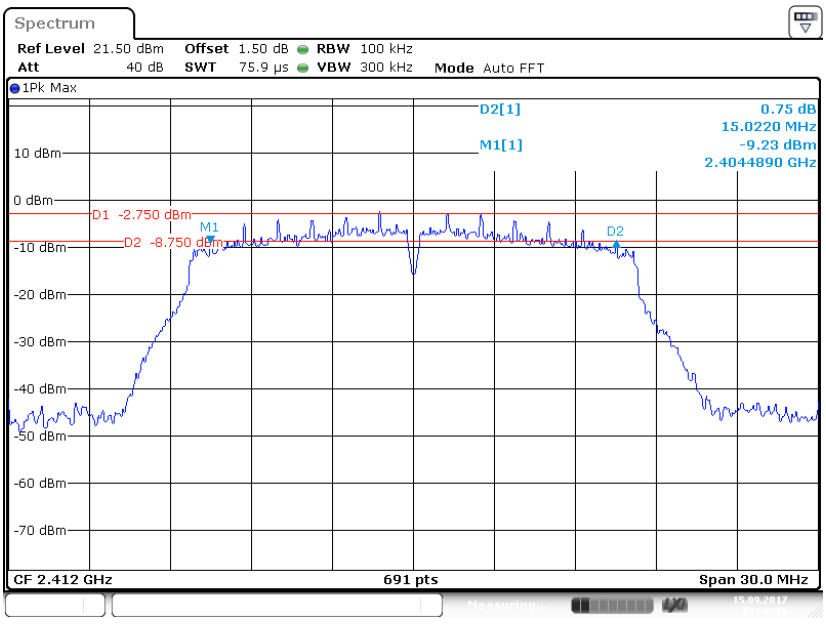
Date:15.SEP.2017 09:39:28

802.11b Mode High Channel



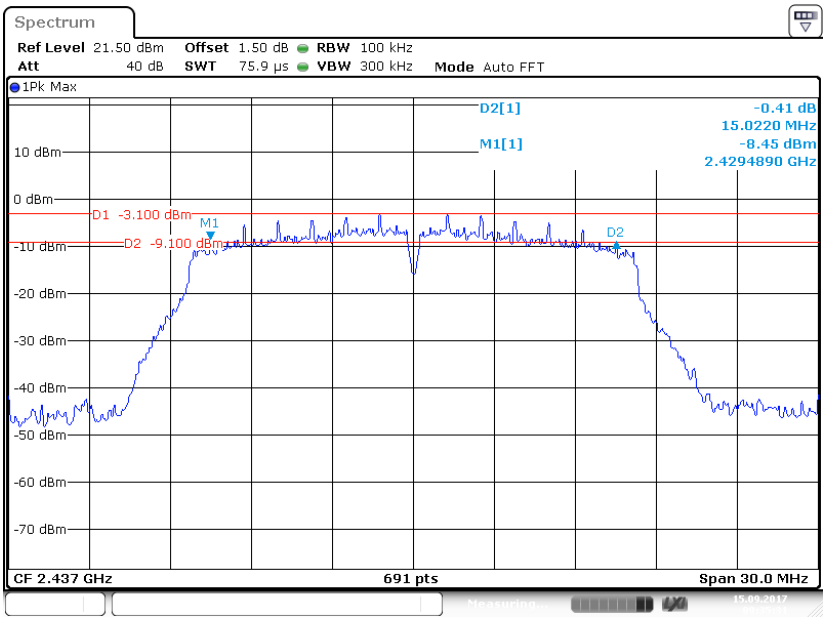
Date:15.SEP.2017 09:40:25

802.11g Mode Low Channel

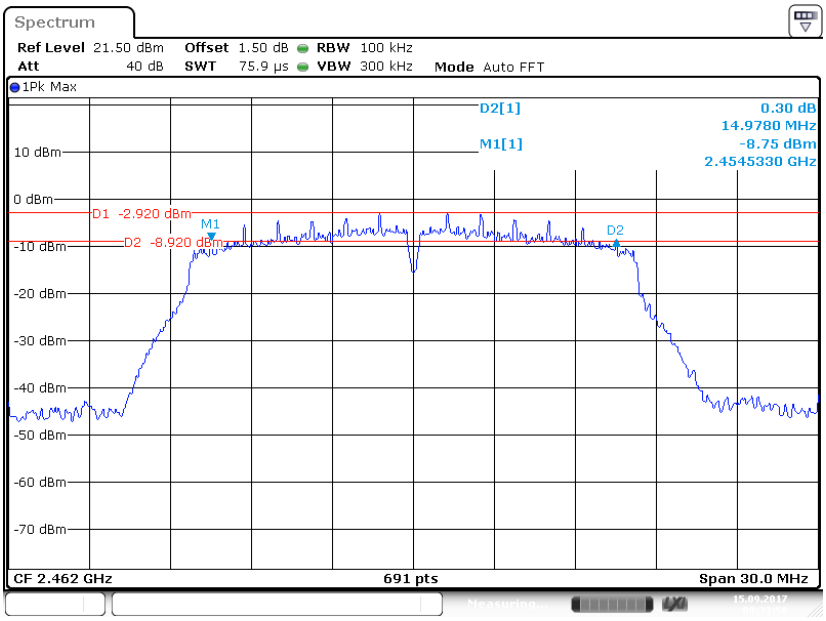


Date:15.SEP.2017 09:36:40

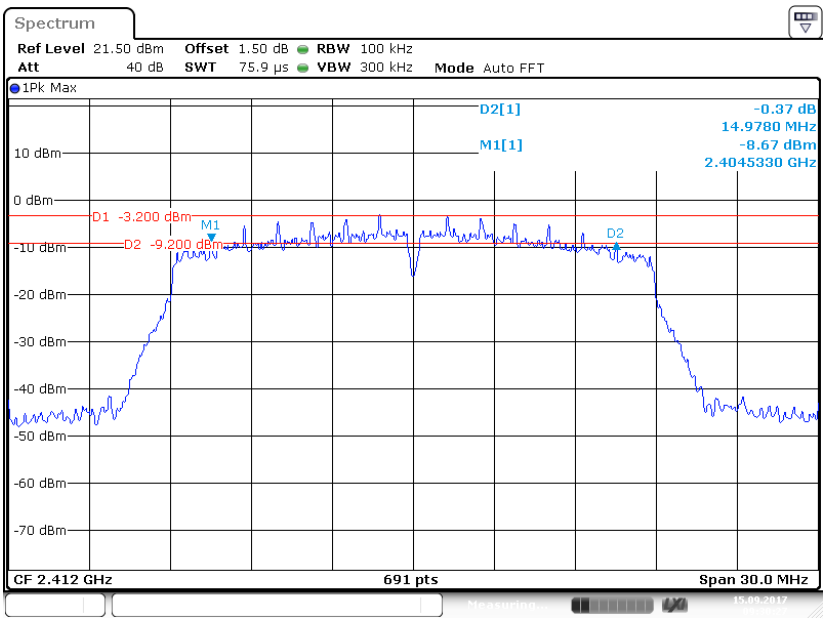
802.11g Mode Middle Channel



802.11g Mode High Channel

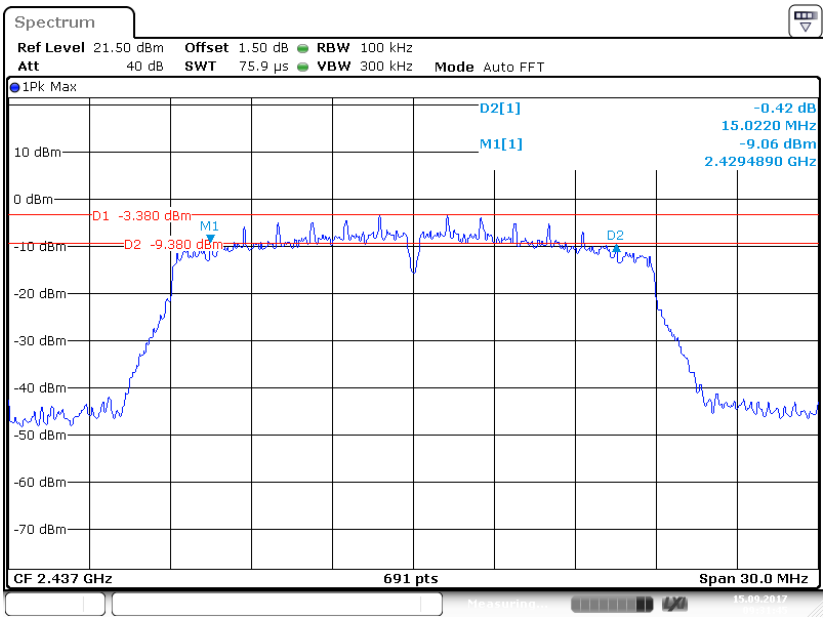


802.11n-HT20 Mode Low Channel



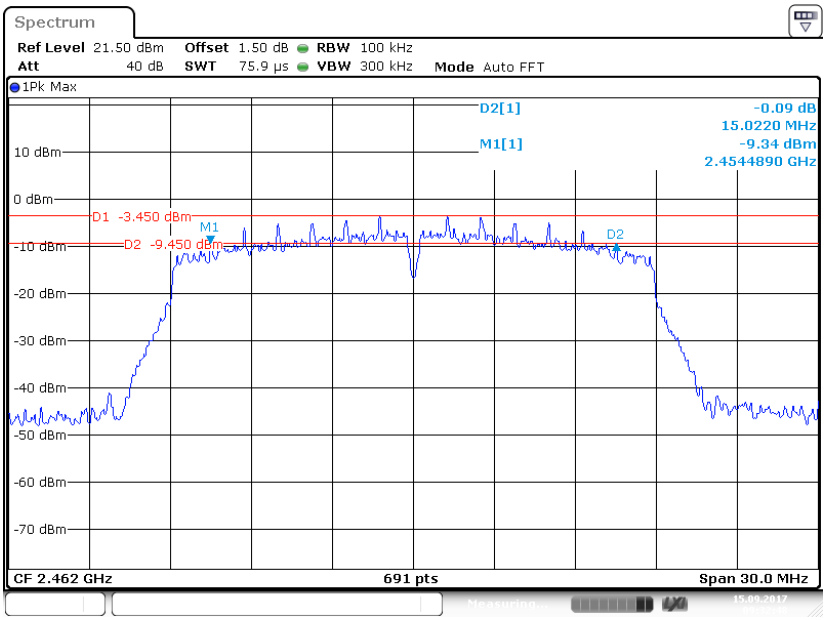
Date:15.SEP.2017 09:30:27

802.11n-HT20 Mode Middle Channel



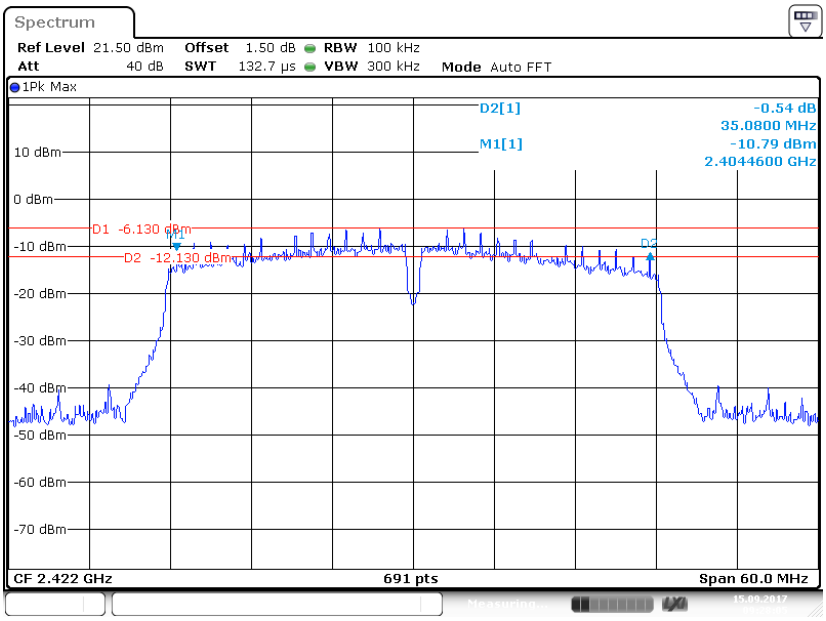
Date:15.SEP.2017 09:31:45

802.11n-HT20 Mode High Channel



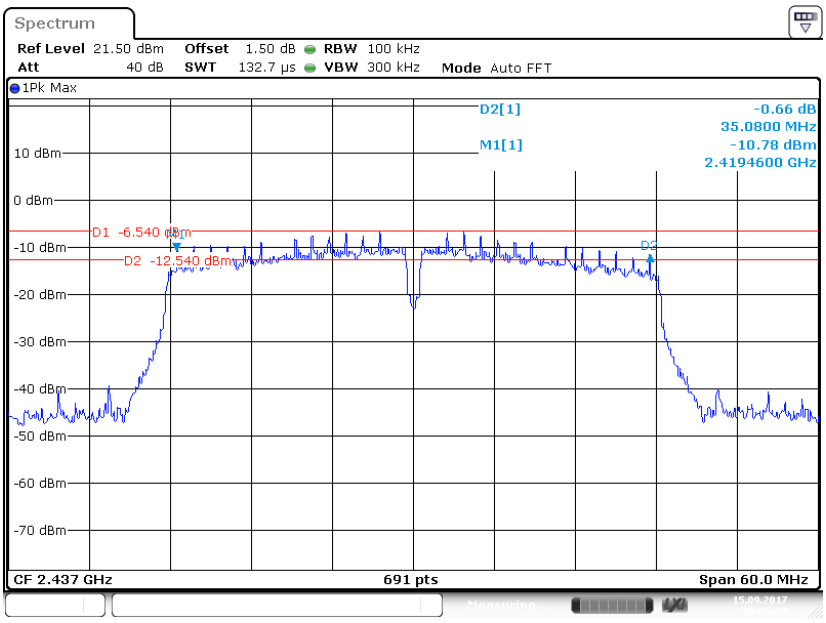
Date:15.SEP.2017 09:32:49

802.11n-HT40 Mode Low Channel



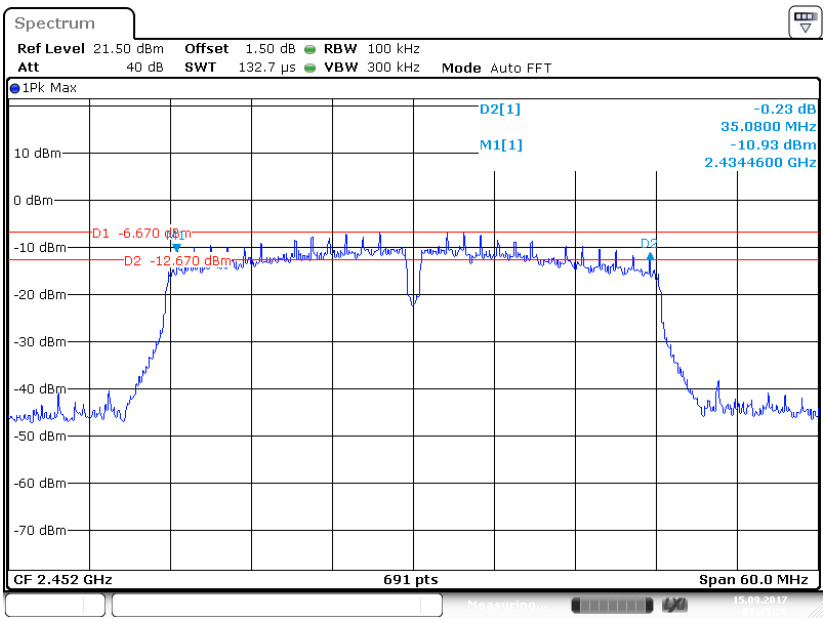
Date:15.SEP.2017 09:28:06

802.11n-HT40 Mode Middle Channel



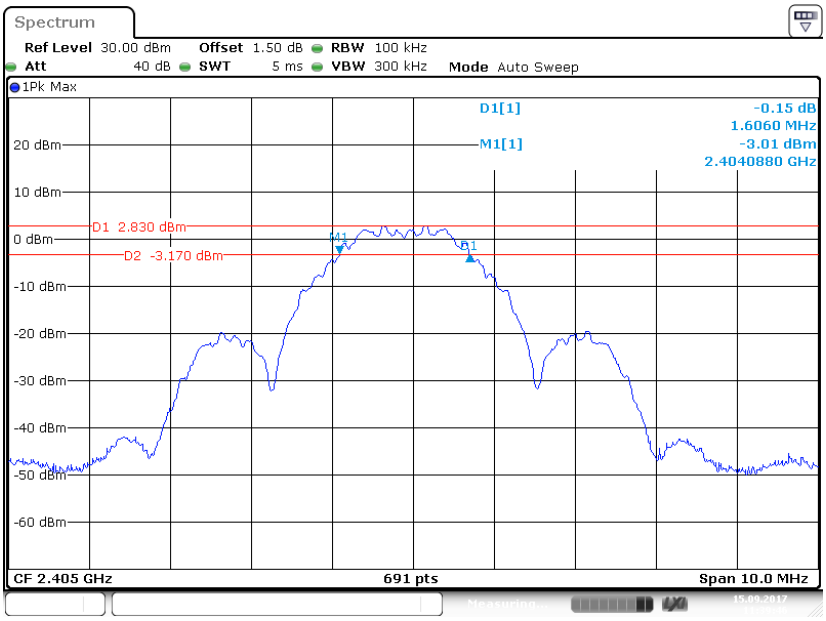
Date:15.SEP.2017 09:26:57

802.11n-HT40 Mode High Channel



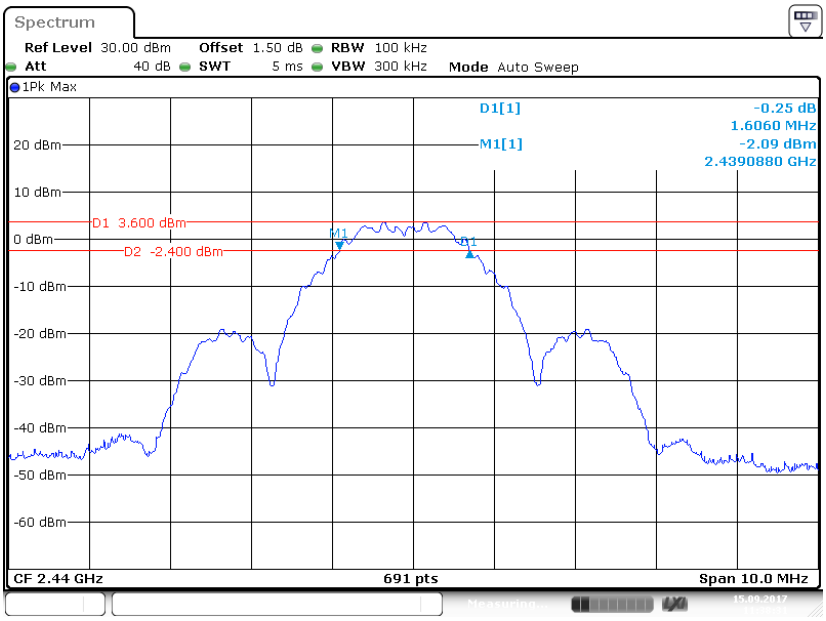
Date:15.SEP.2017 09:25:26

Zigbee Mode Low Channel



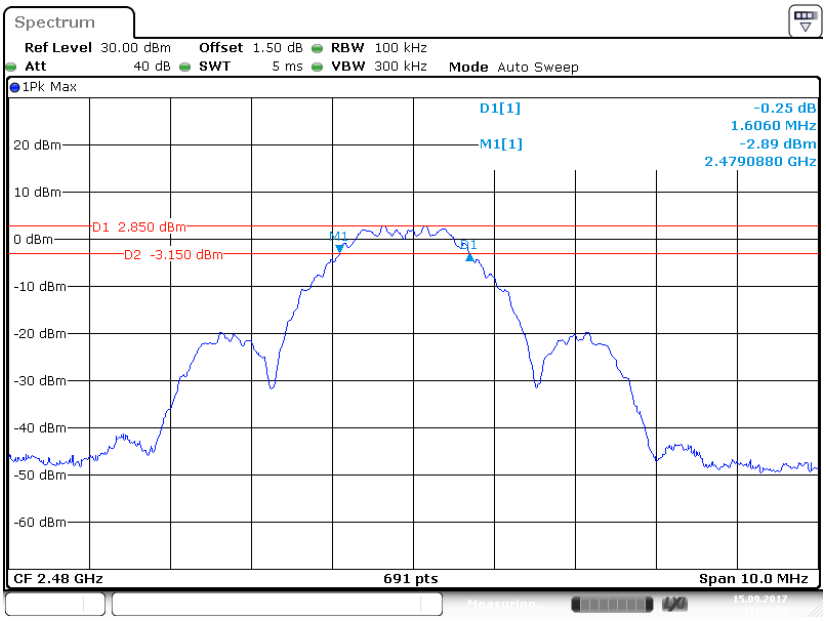
Date:15.SEP.2017 11:39:47

Zigbee Mode Middle Channel



Date:15.SEP.2017 11:38:32

Zigbee 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.

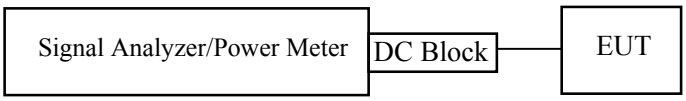
Test Procedure

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 9.1.1

1. Set the RBW ≥ DTS bandwidth.
2. Set VBW ≥ 3 x RBW.
3. Set span ≥ 3 x RBW
4. Sweep time = auto couple.
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 9.1.3

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.



Test Data

Environmental Conditions

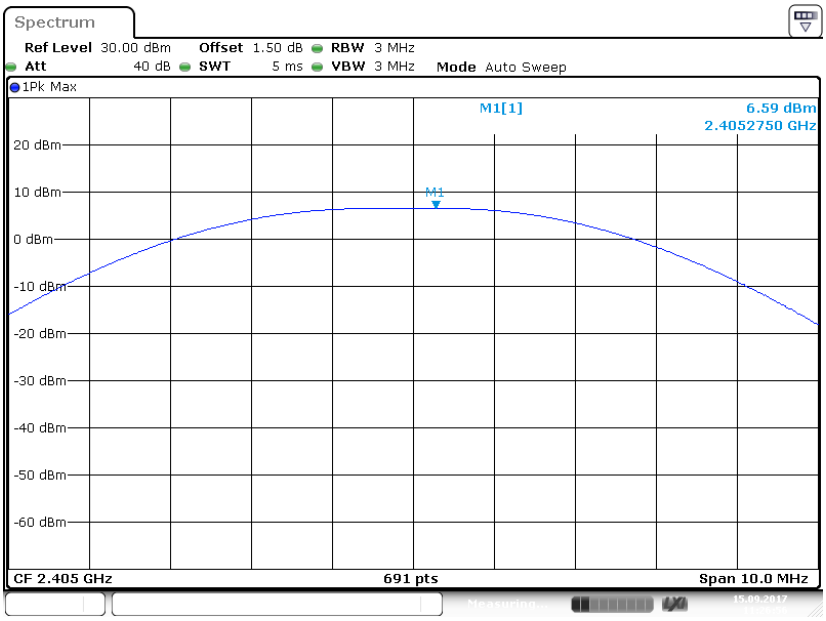
Temperature:	23.8℃
Relative Humidity:	54 %
ATM Pressure:	101.2 kPa

The testing was performed by Edison Hu on 2017-09-15.

EUT operation mode: Transmitting

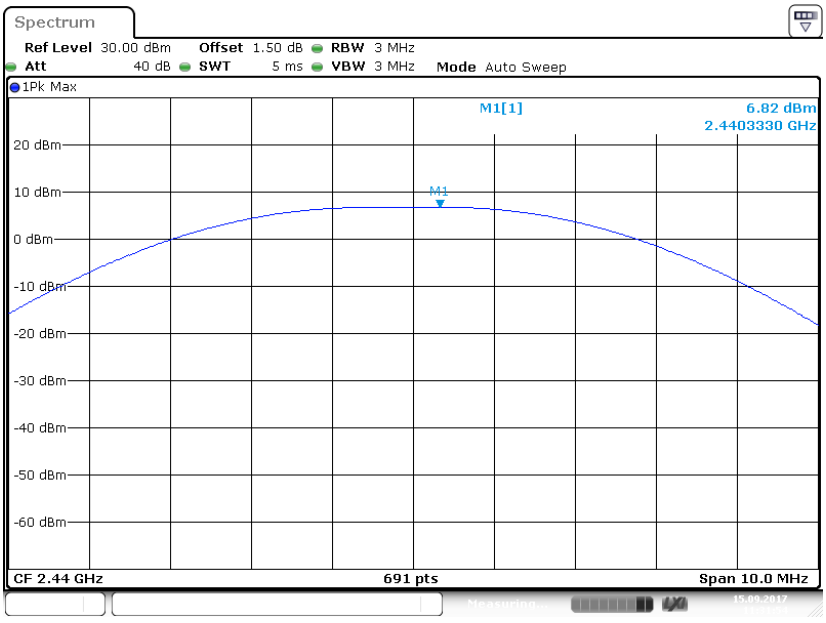
Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
802.11b Mode				
Low	2412	16.70	30	Pass
Middle	2437	16.58	30	Pass
High	2462	16.52	30	Pass
802.11g Mode				
Low	2412	15.75	30	Pass
Middle	2437	15.42	30	Pass
High	2462	15.52	30	Pass
802.11n-HT20 Mode				
Low	2412	15.05	30	Pass
Middle	2437	14.88	30	Pass
High	2462	14.79	30	Pass
802.11n-HT40 Mode				
Low	2422	14.77	30	Pass
Middle	2437	14.45	30	Pass
High	2452	14.35	30	Pass
Zigbee Mode				
Low	2405	6.59	30	Pass
Middle	2440	6.82	30	Pass
High	2480	6.39	30	Pass

Zigbee Mode Low Channel



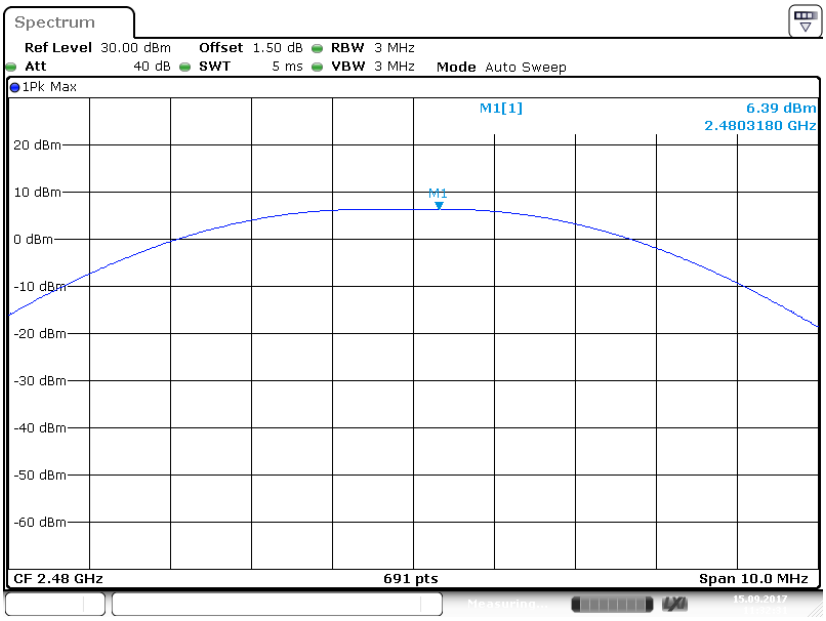
Date:15.SEP.2017 11:26:56

Zigbee Mode Middle Channel



Date:15.SEP.2017 11:31:54

Zigbee Mode High Channel



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

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 13.2 and ANSI C63.10-2013 clause 6.10.

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

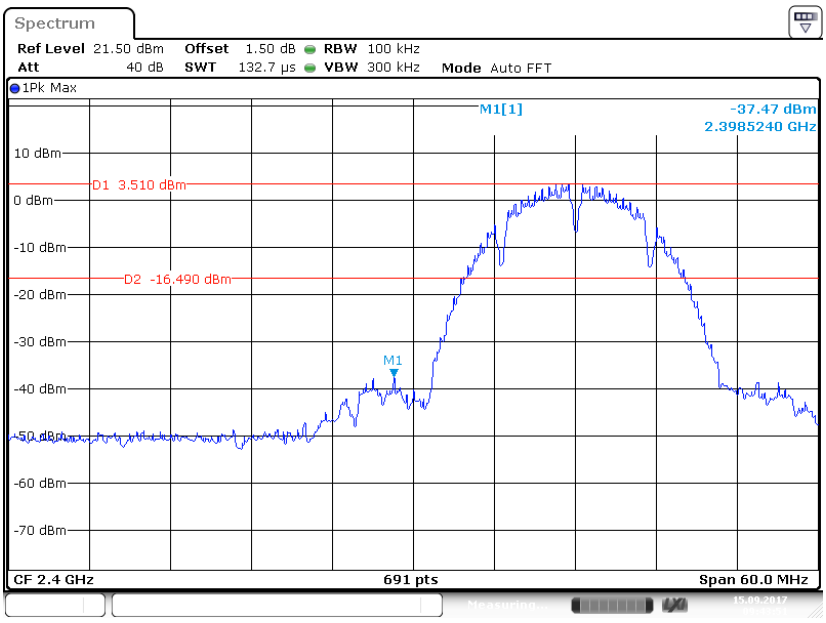
Temperature:	24.3 ℃
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Edison Hu on 2017-09-15 & 2018-01-26.

EUT operation mode: Transmitting

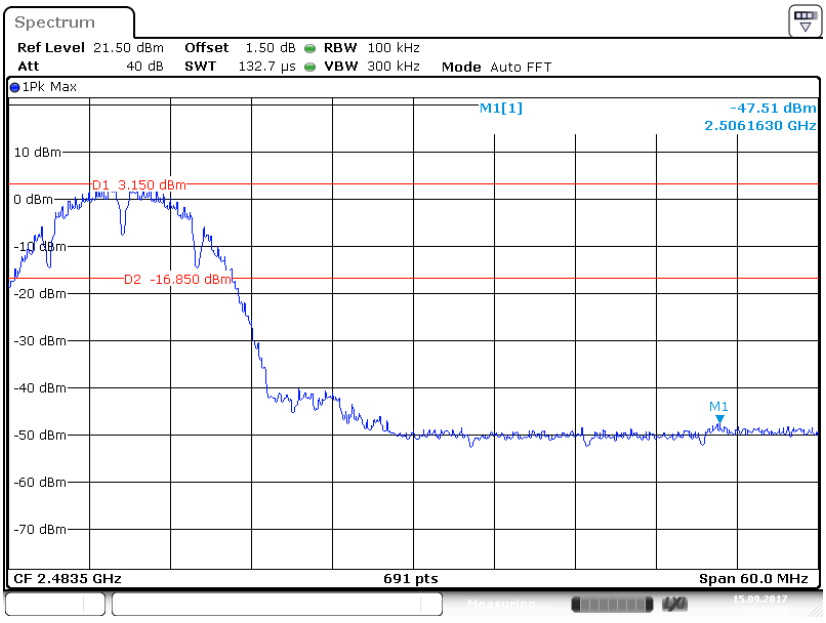
Test Result: Compliance

802.11b Mode Left Side



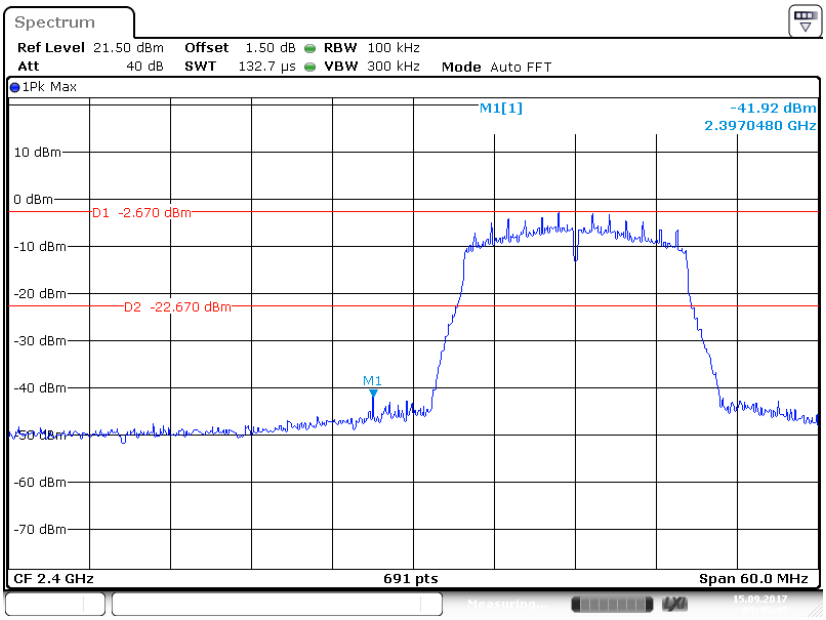
Date:15.SEP.2017 09:43:51

802.11b Mode Right Side



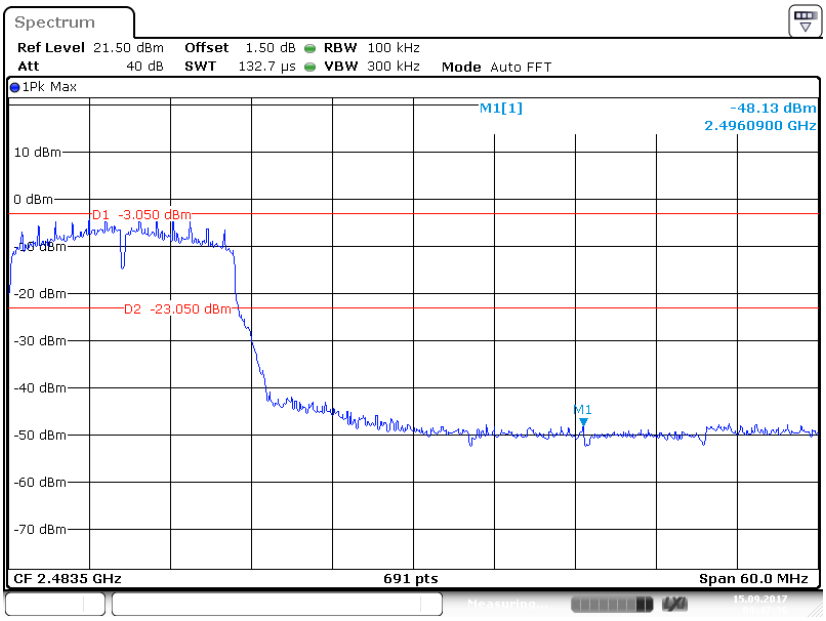
Date:15.SEP.2017 09:42:51

802.11g Mode Left Side



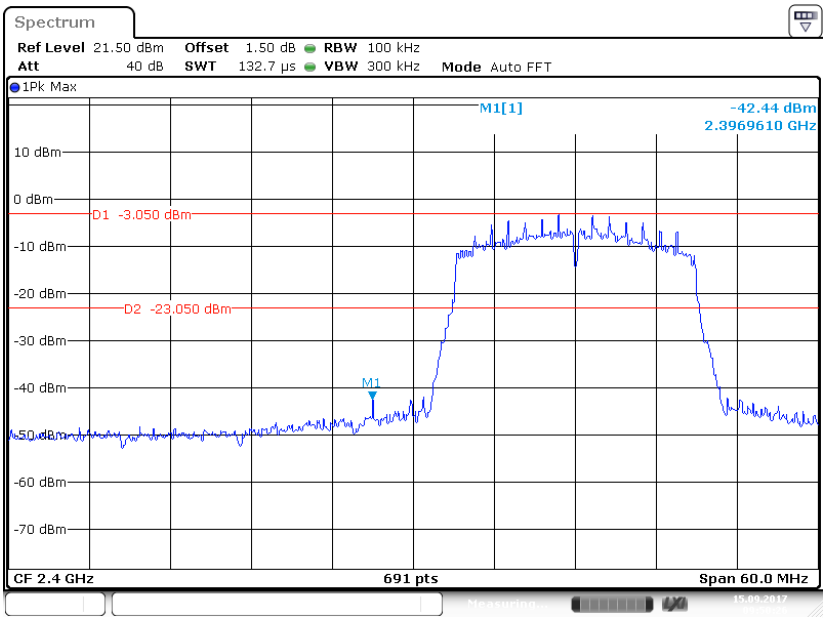
Date:15.SEP.2017 09:45:45

802.11g Mode Right Side



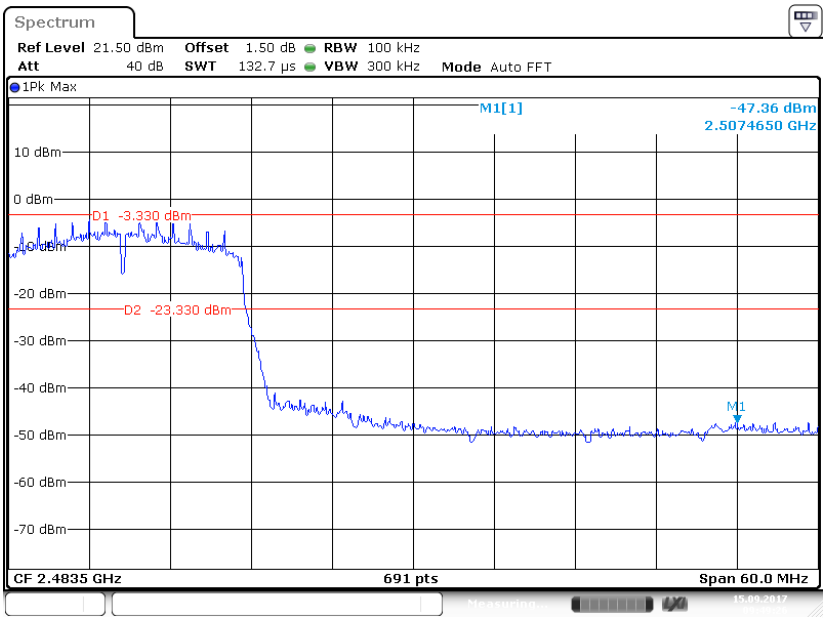
Date:15.SEP.2017 09:47:36

802.11n-HT20 Mode Left Side



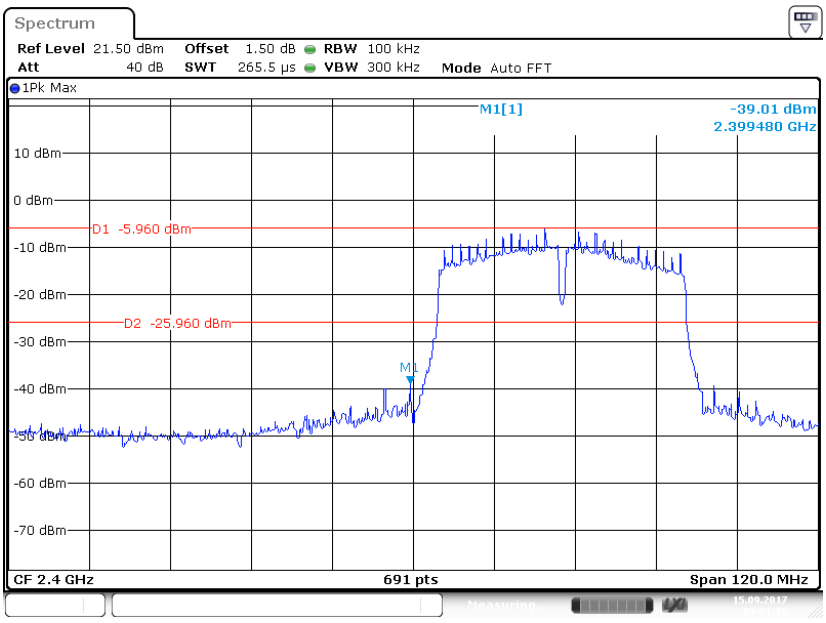
Date:15.SEP.2017 09:50:26

802.11n-HT20 Mode Right Side

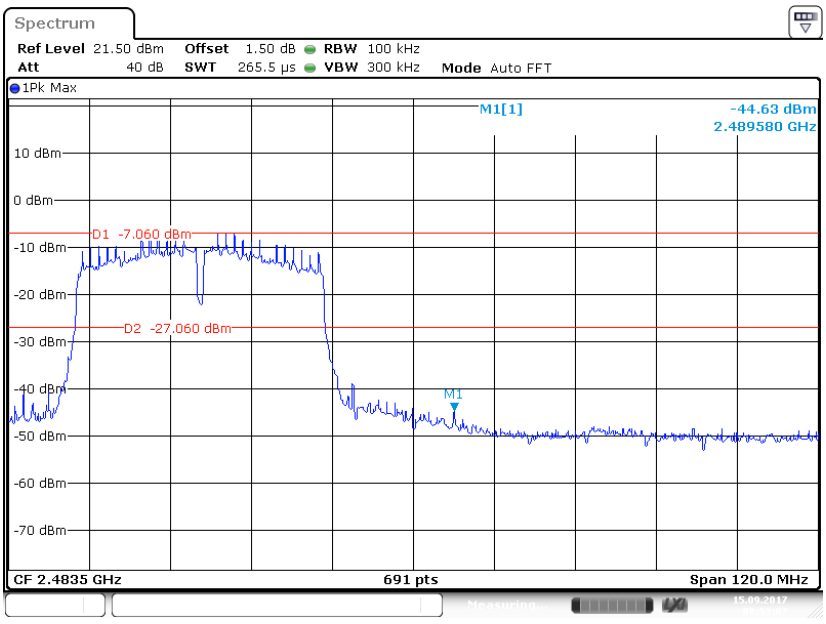


Date:15.SEP.2017 09:49:26

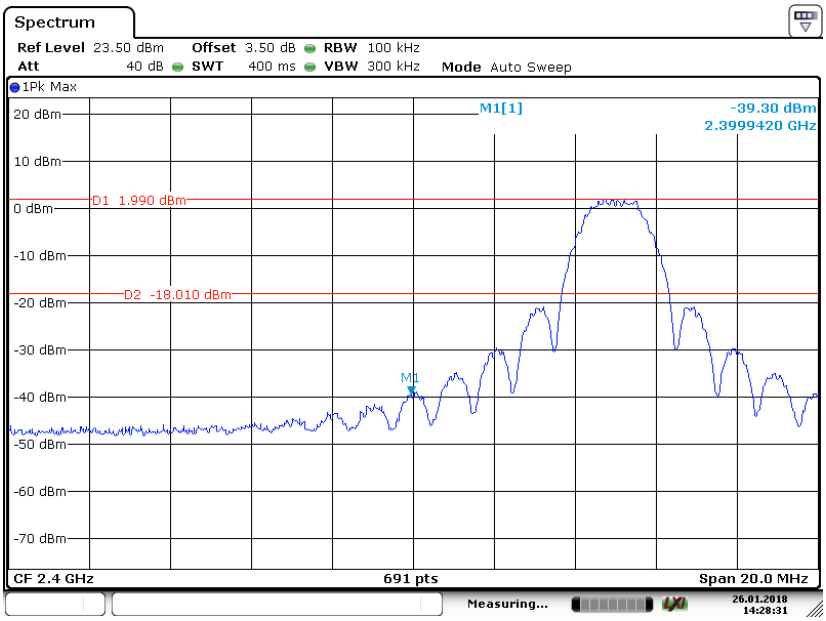
802.11n-HT40 Mode Left Side



802.11n-HT40 Mode Right Side

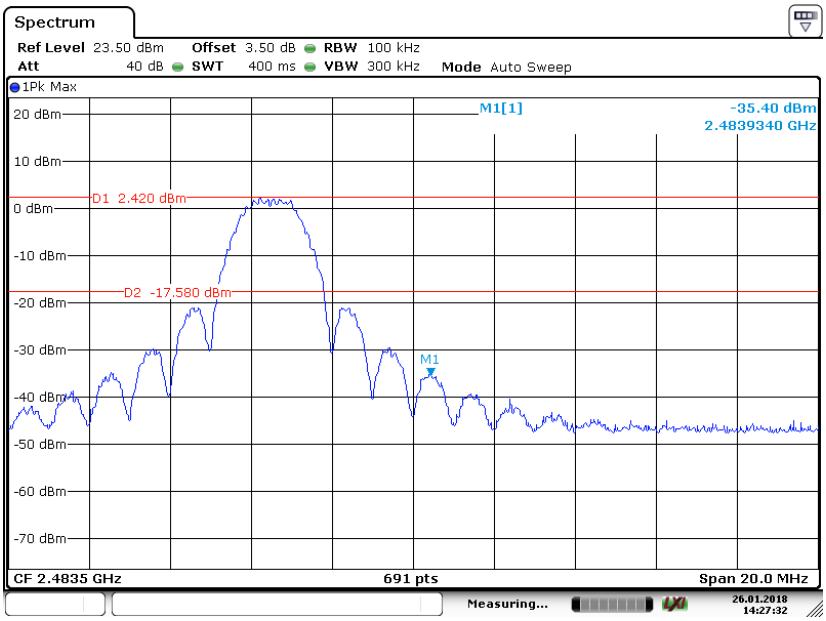


Zigbee Mode Left Side



Date:26.JAN.2018 14:28:32

Zigbee Mode Right Side



Date:26.JAN.2018 14:27:33

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 ≥ 3xRBW.
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:	24.1 ℃
Relative Humidity:	50%
ATM Pressure:	101.3 kPa

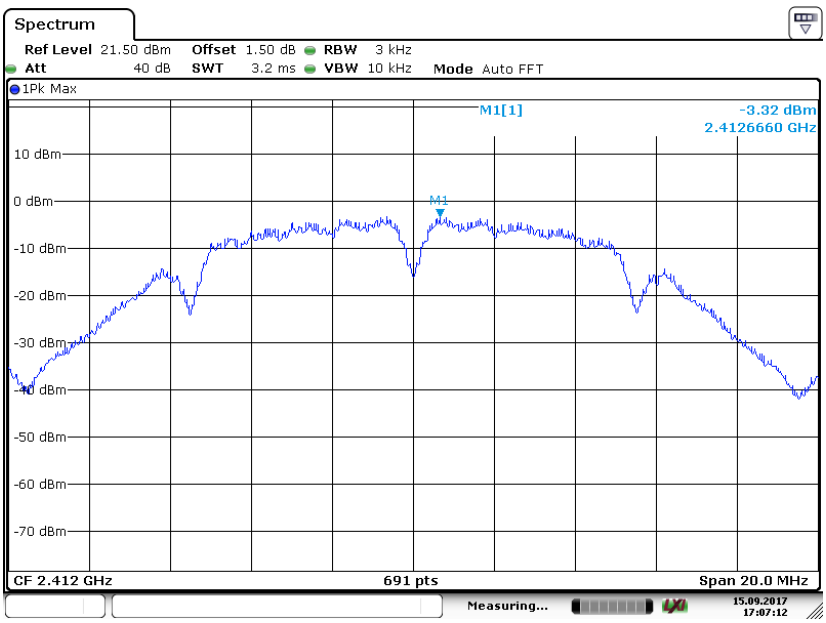
The testing was performed by Edison Hu on 2017-09-15.

EUT operation mode: Transmitting

Test Result: Pass

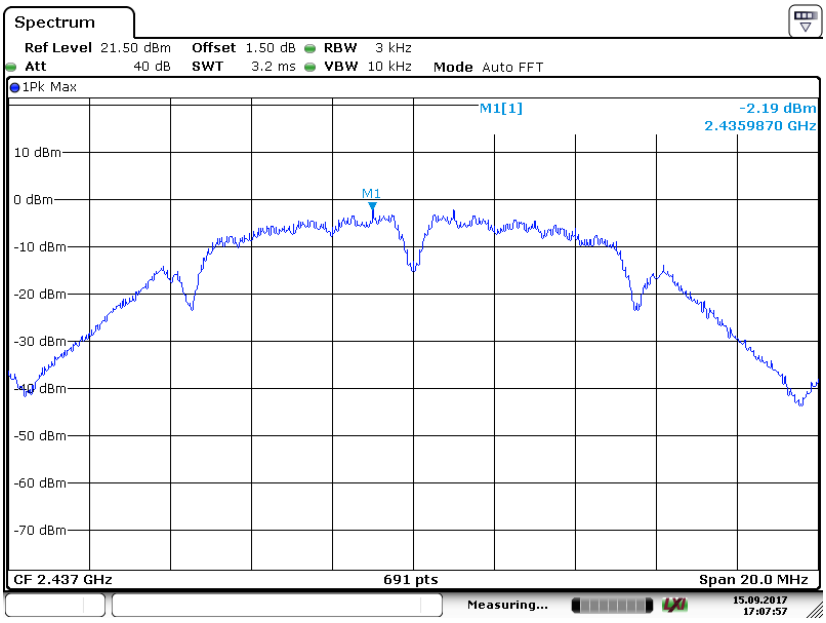
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b Mode			
Low	2412	-3.32	≤8
Middle	2437	-2.19	≤8
High	2462	-2.82	≤8
802.11g Mode			
Low	2412	-17.59	≤8
Middle	2437	-18.39	≤8
High	2462	-17.38	≤8
802.11n-HT20 mode			
Low	2412	-17.78	≤8
Middle	2437	-17.69	≤8
High	2462	-16.93	≤8
802.11n-HT40 Mode			
Low	2422	-21.89	≤8
Middle	2437	-22.99	≤8
High	2452	-21.98	≤8
Zigbee Mode			
Low	2405	-8.10	≤8
Middle	2440	-7.48	≤8
High	2480	-7.86	≤8

802.11b Mode Low Channel



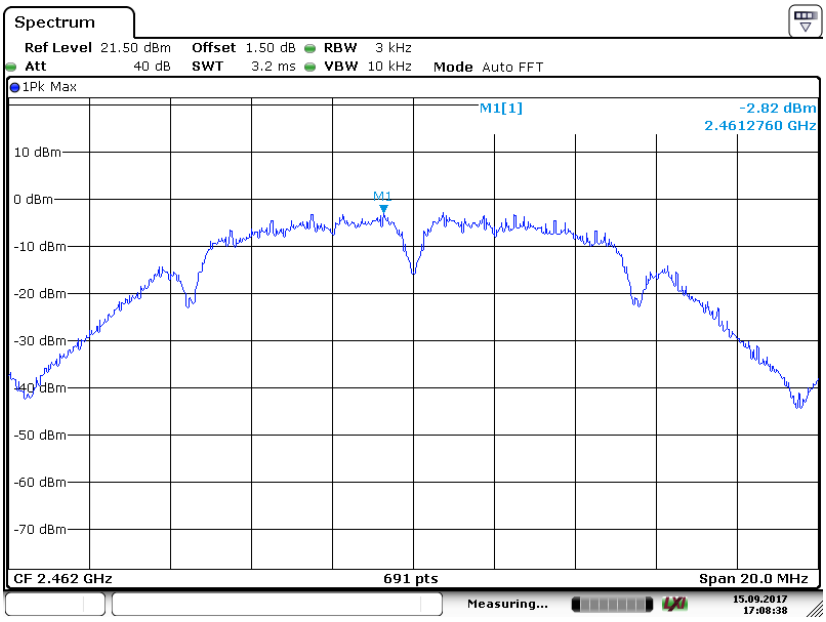
Date:15.SEP.2017 17:07:12

802.11b Mode Middle Channel



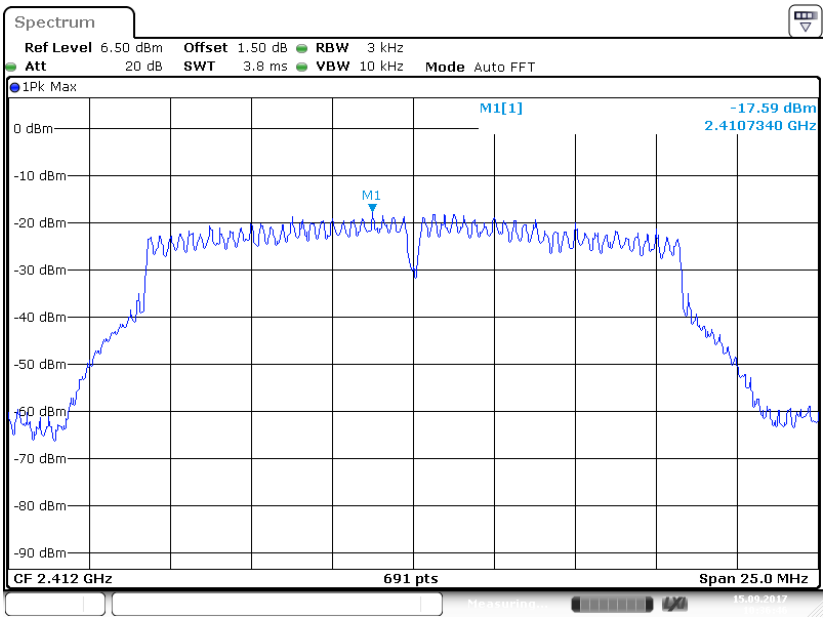
Date:15.SEP.2017 17:07:57

802.11b Mode High Channel



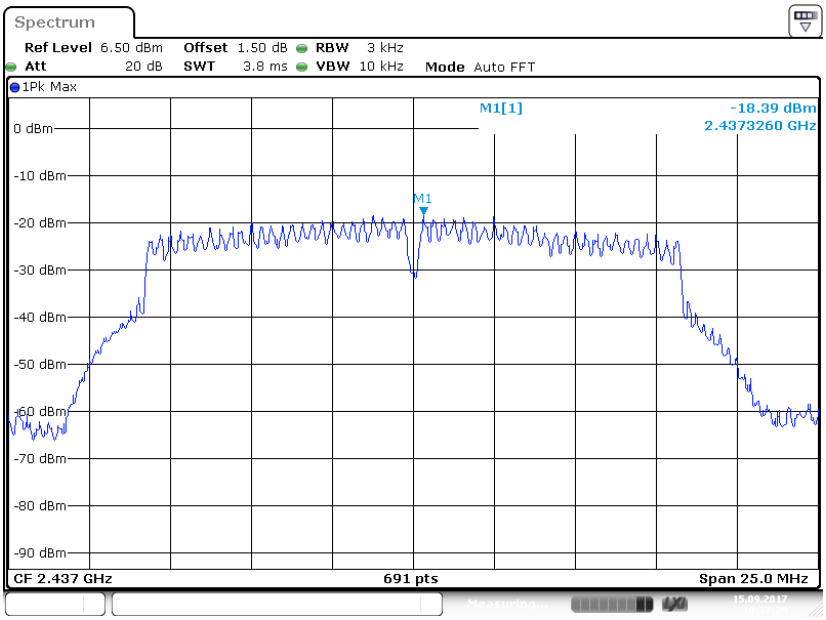
Date:15.SEP.2017 17:08:38

802.11g Mode Low Channel



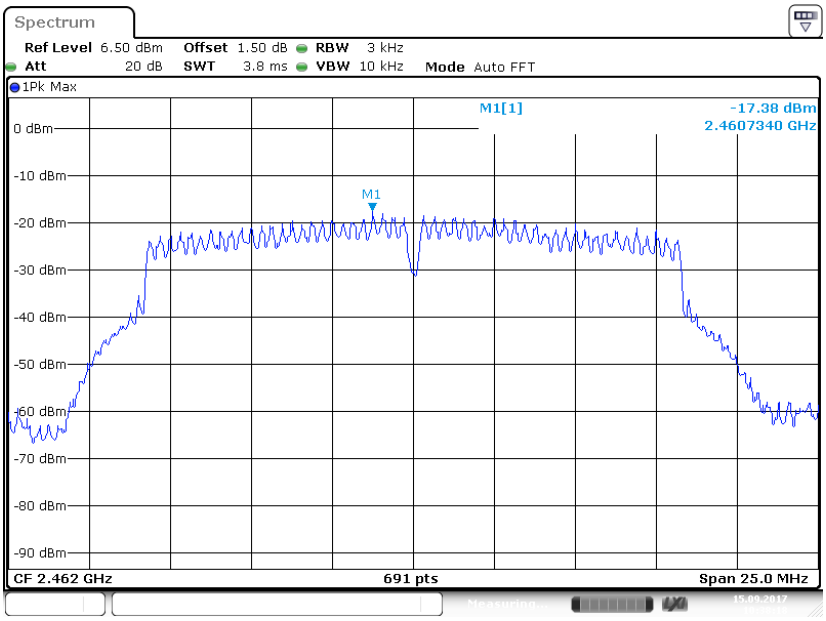
Date:15.SEP.2017 10:36:46

802.11g Mode Middle Channel



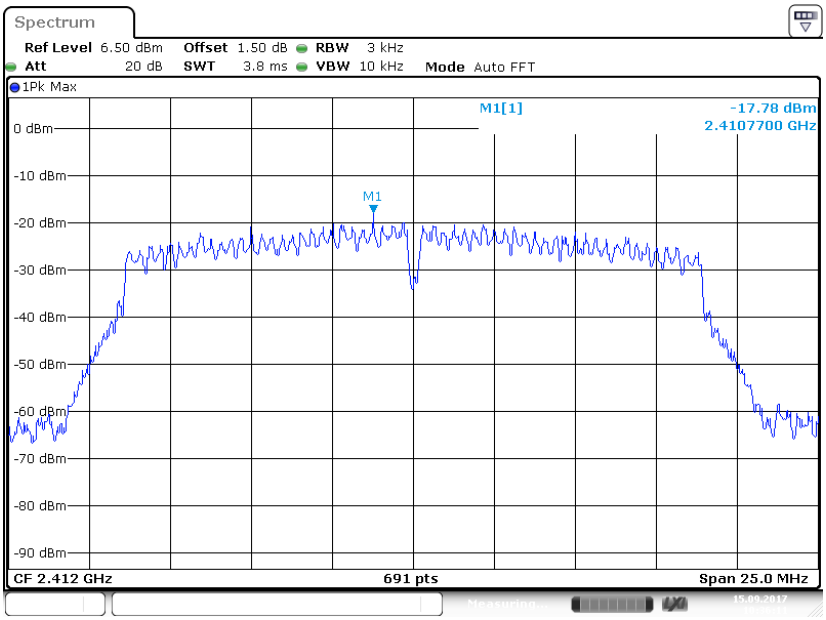
Date:15.SEP.2017 10:37:29

802.11g Mode High Channel



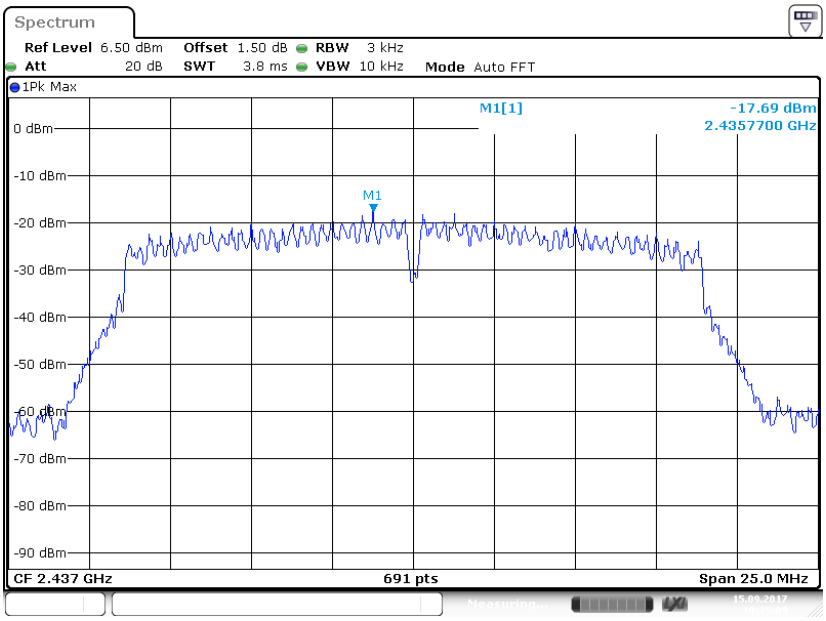
Date:15.SEP.2017 10:38:18

802.11n-HT20 Mode Low Channel



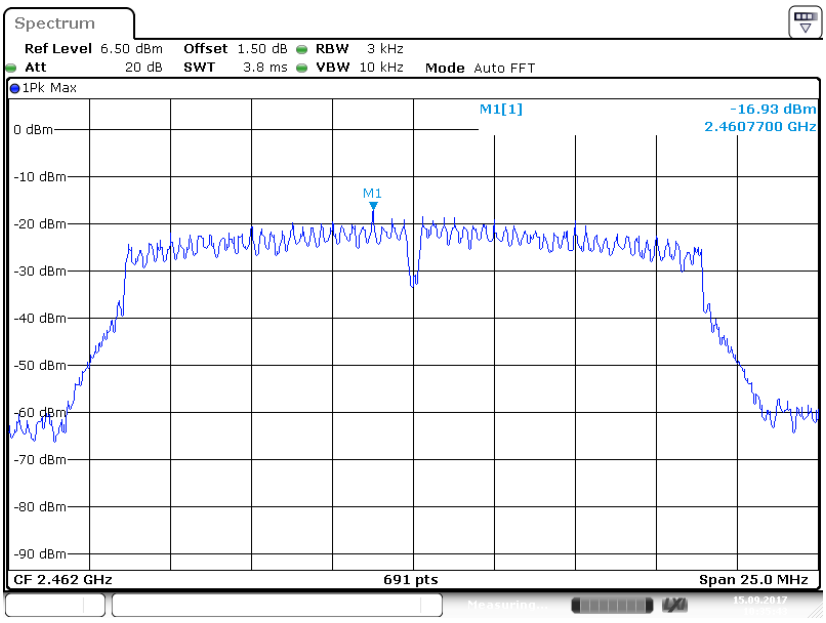
Date:15.SEP.2017 10:36:11

802.11n-HT20 Mode Middle Channel



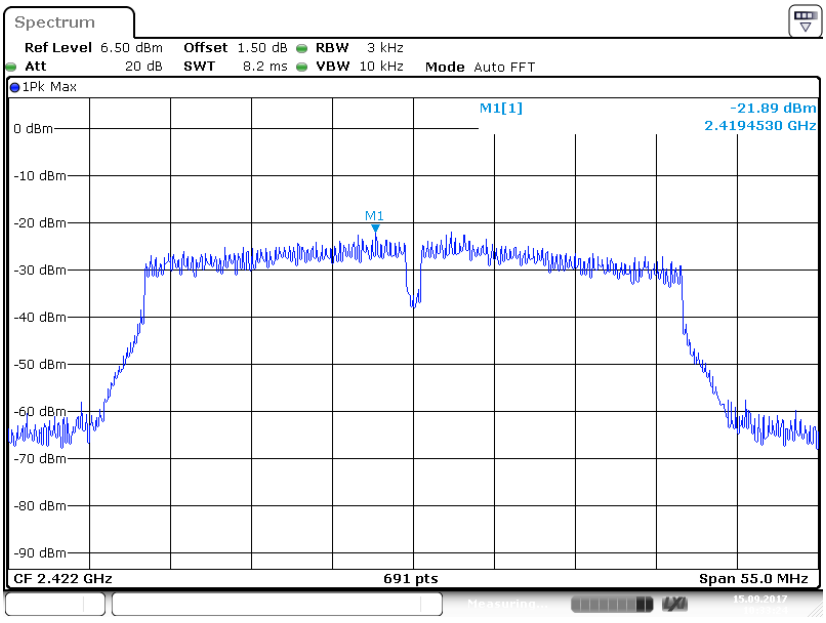
Date:15.SEP.2017 10:35:09

802.11n-HT20 Mode High Channel



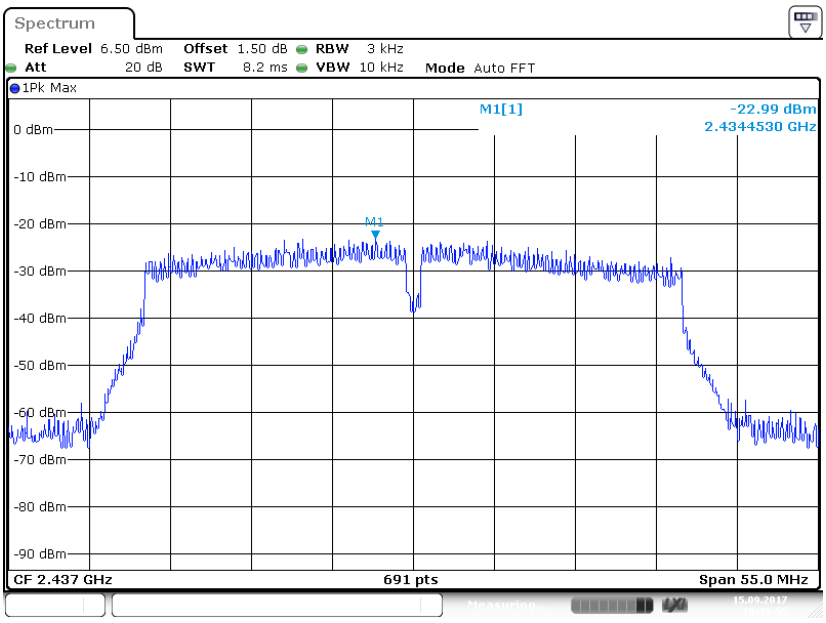
Date:15.SEP.2017 10:35:44

802.11n-HT40 Mode Low Channel



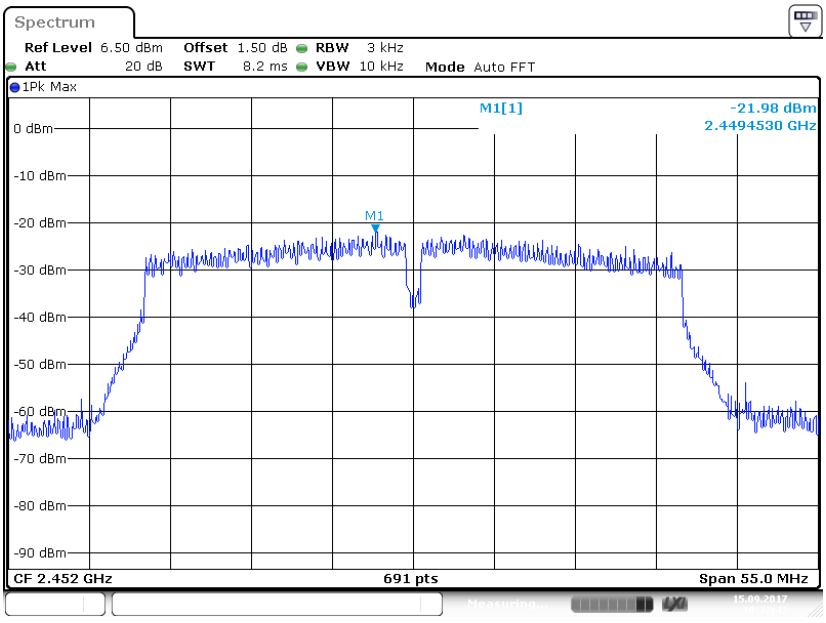
Date:15.SEP.2017 10:33:25

802.11n-HT40 Mode Middle Channel



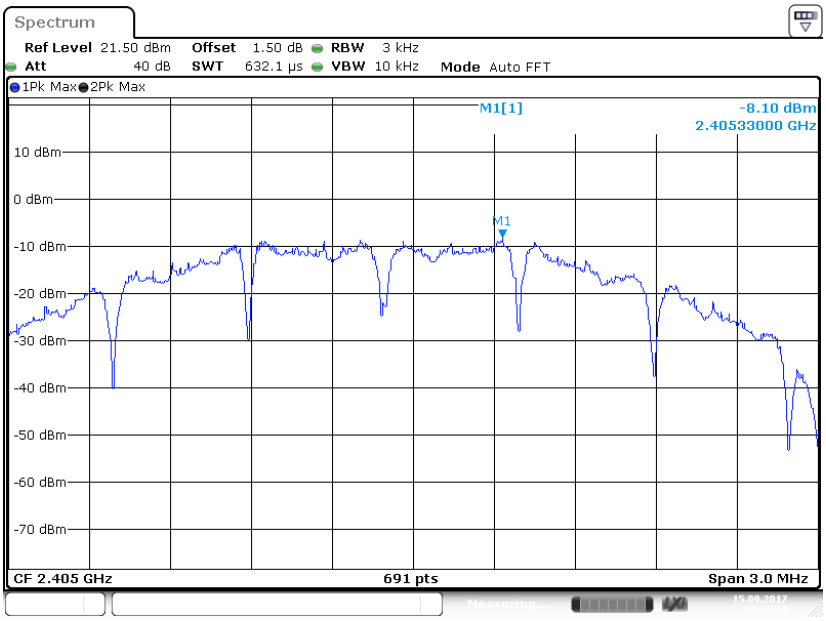
Date:15.SEP.2017 10:33:55

802.11n-HT40 Mode High Channel



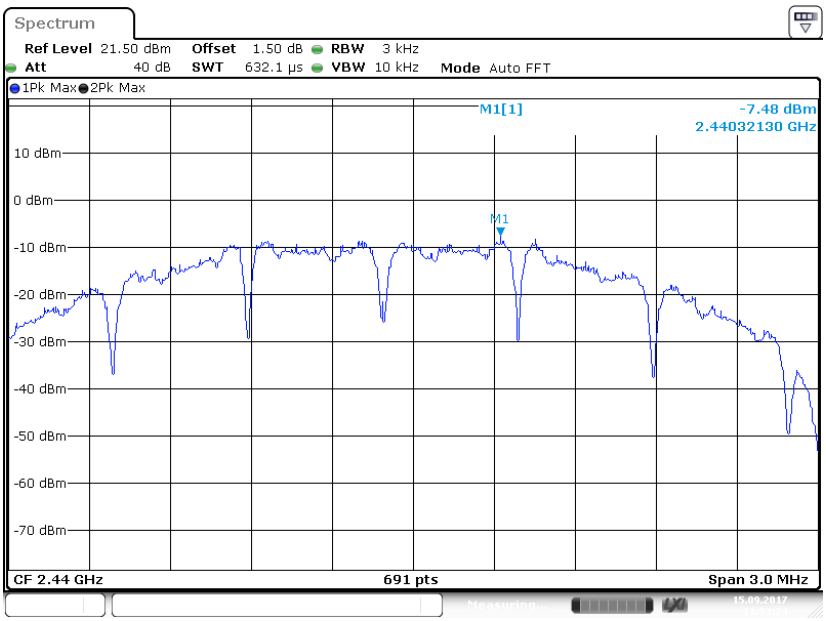
Date:15.SEP.2017 10:32:41

Zigbee Mode Low Channel



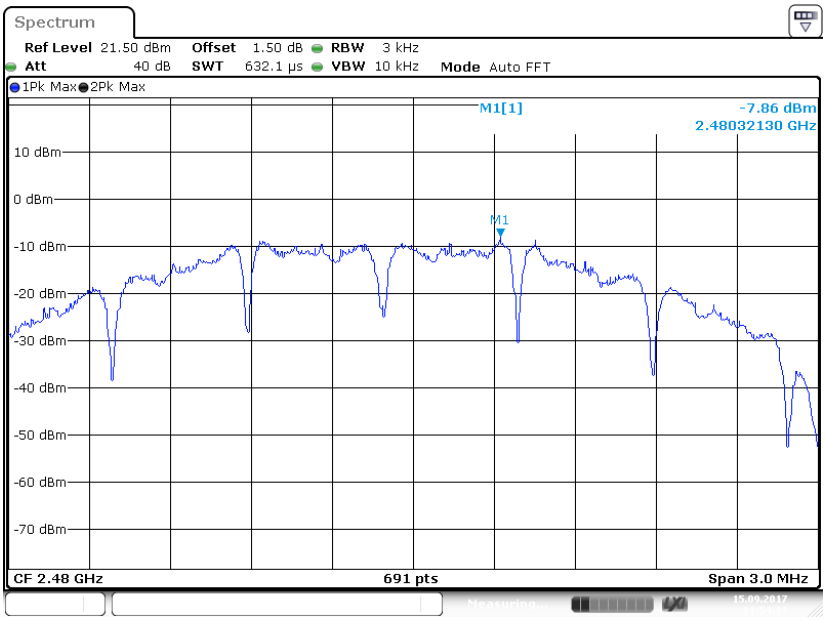
Date:15.SEP.2017 11:53:48

Zigbee Mode Middle Channel



Date:15.SEP.2017 11:53:24

Zigbee Mode High Channel



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