TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 15.247

TEST REPORT

For

ESPRESSIF SYSTEMS (SHANGHAI) PTE LTD

456 Bibo Road Room A201, Shanghai, China, 201203

FCC ID: 2AC7Z-ESP32WROVERB

Report Type:	Product Type:
Original Report	WIFI &Bluetooth Module

Test Engineer:	Max Min
Report Number:	RSHA180425002-00A
Report Date:	2018-06-13
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	ESPRESSIF SYSTEMS (SHANGHAI) PTE LTD
Tested Model	ESP32-WROVER-B
Series Model	ESP32-WROVER-IB
Model Difference	Antenna type
Product Type	WIFI &Bluetooth Module
Dimension	18.0mm(L)*31.4mm(W)*3.3mm(H)
Power Supply	DC 3.3V

**All measurement and test data in this report was gathered from production sample serial number: 20180425002. (Assigned by the BACL. The EUT supplied by the applicant was received on 2018-04-25)*

Objective

This report is prepared on behalf of ESPRESSIF SYSTEMS (SHANGHAI) PTE LTD 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)

FCC Part 15.247 DSS submissions with FCC ID: 2AC7Z-ESP32WROVERB.

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

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	…	…
…	…	…	…
…	…	…	…
18	2438	38	2478
19	2440	39	2480

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

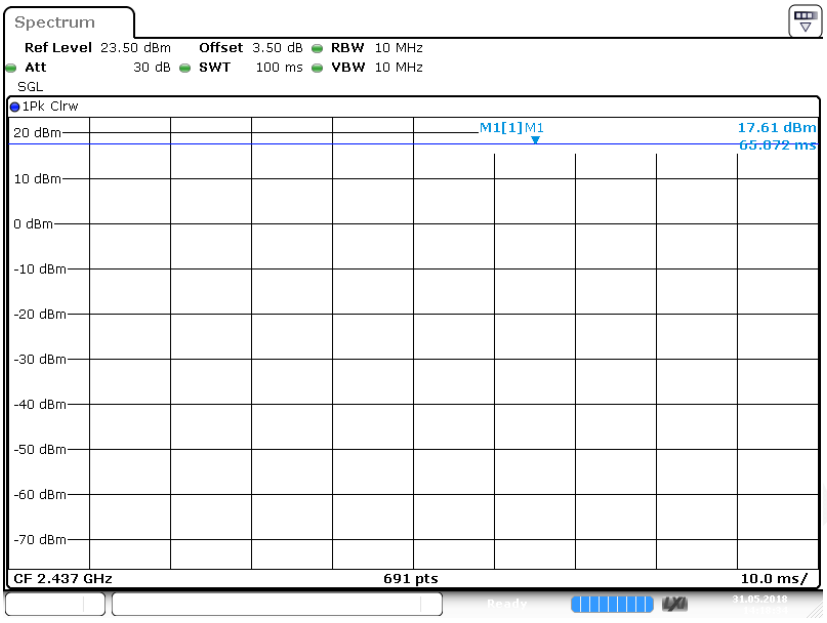
RF Test tool: SecureCRT

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

Mode	Data rate	Channel	Power level
802.11b	1 Mbps	Low	0
802.11b	1 Mbps	Middle	0
802.11b	1 Mbps	High	0
802.11g	6 Mbps	Low	0
802.11g	6 Mbps	Middle	0
802.11g	6 Mbps	High	2
802.11n-HT20	MCS0	Low	0
802.11n-HT20	MCS0	Middle	0
802.11n-HT20	MCS0	High	4
802.11n-HT40	MCS0	Low	0
802.11n-HT40	MCS0	Middle	0
802.11n-HT40	MCS0	High	14
BLE	/	/	5

Duty Cycle:

802.11b Mode Middle Channel



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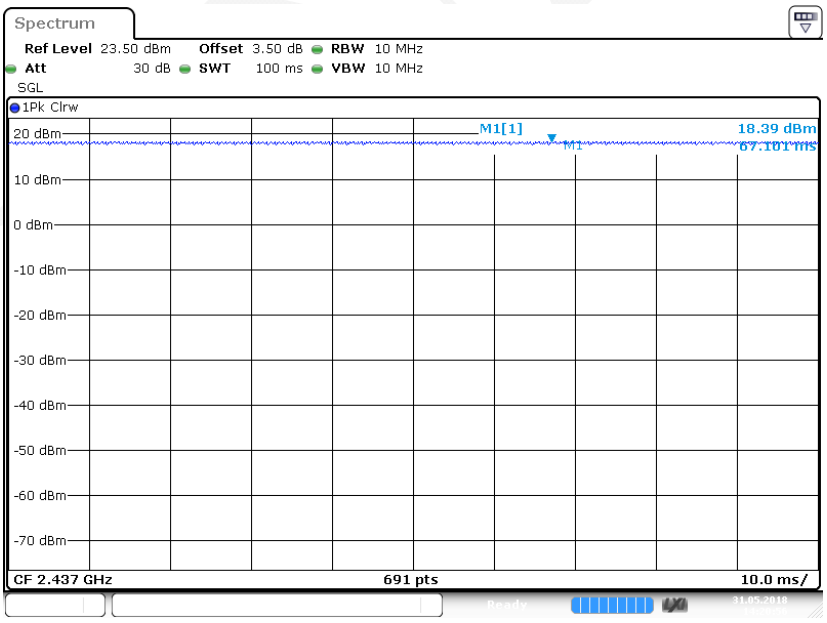
802.11g Mode Middle Channel



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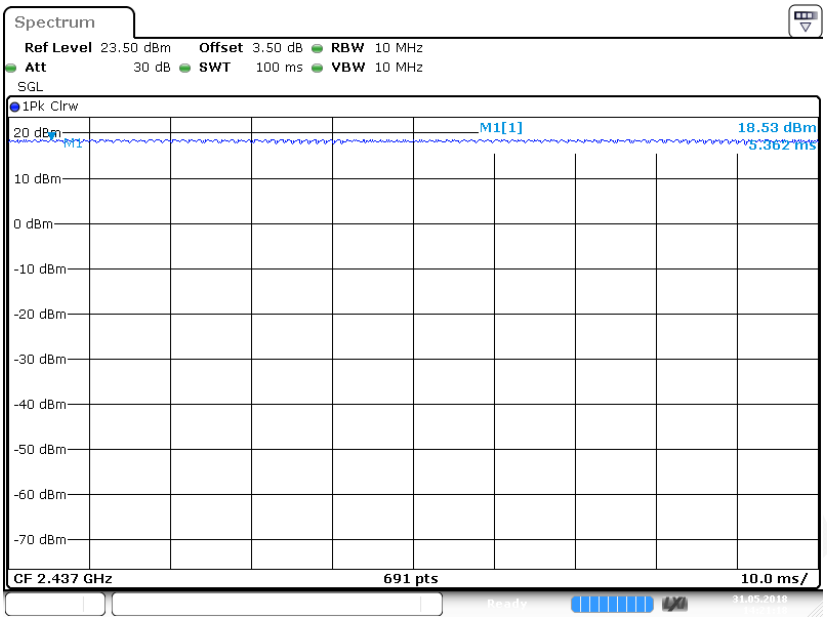
802.11n-HT20 Mode Middle Channel



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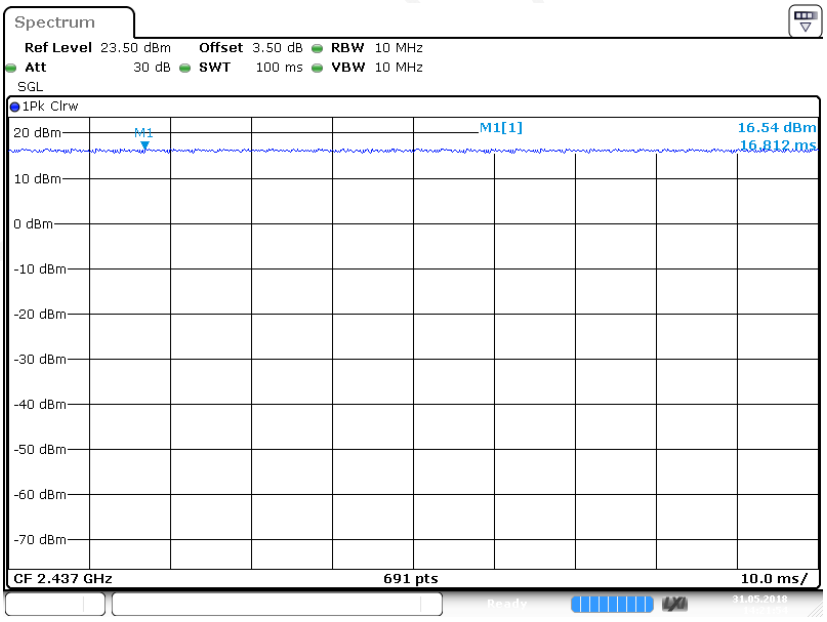
802.11n-HT40 Mode Middle Channel



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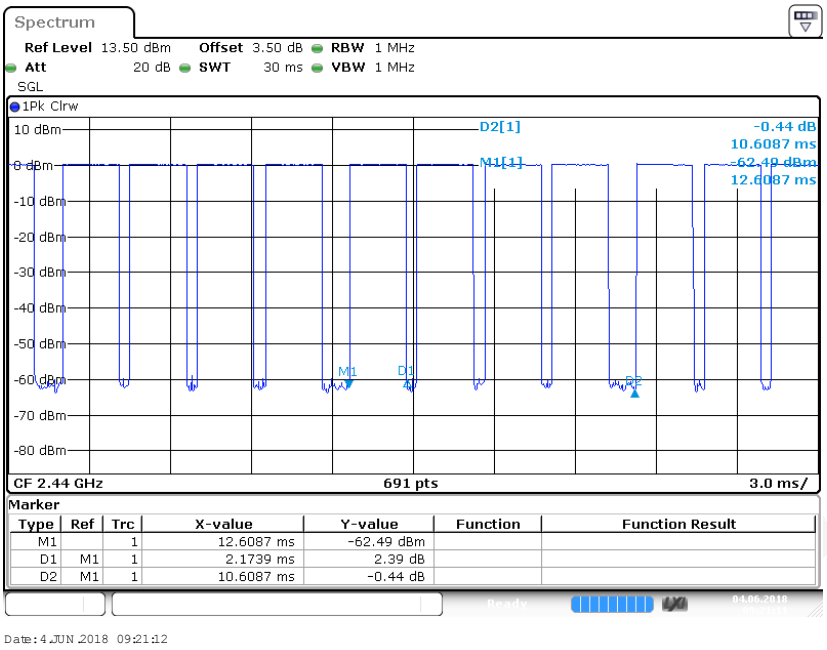
BLE Mode Middle Channel



Mode	Duty Cycle (%)	T(ms)	1/T(kHz)	10log(1/x)
802.11b	100.00	/	/	0.00
802.11g	100.00	/	/	0.00
802.11n-HT20	100.00	/	/	0.00
802.11n-HT40	100.00	/	/	0.00
BLE	81.97	2.174	0.460	0.86

Note: “x” means the Duty Cycle.

Support Equipment List and Details

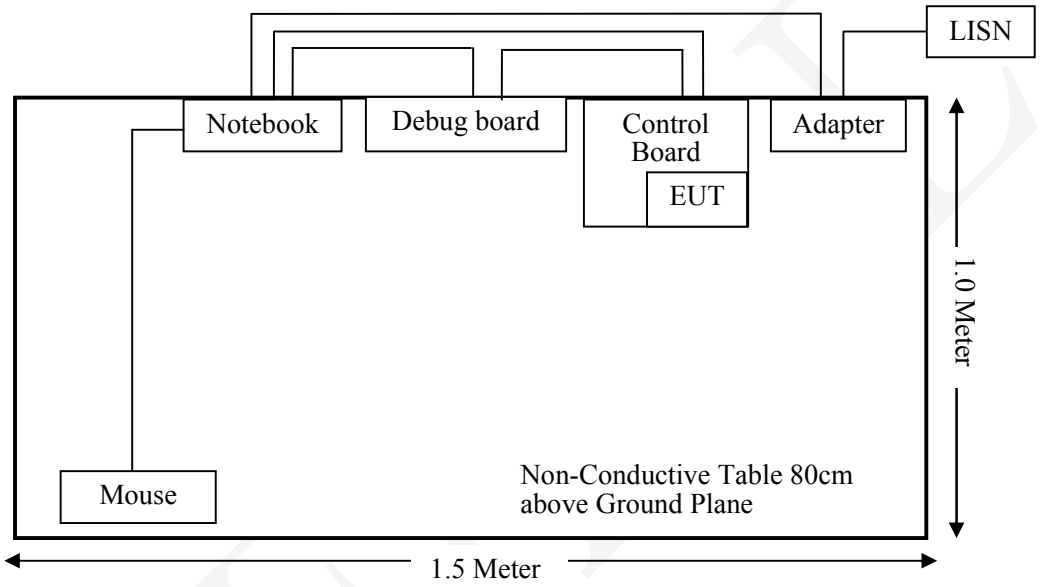
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
DELL	Adapter	LA65NS0-00	DF263
ESPRESSIF	Debug Board	ESP-WROOM-03	/
ESPRESSIF	Control Board	ESP32_Module_Test board_2L_V1	/
Logitech	Mouse	M-U0026	HS529HB

External I/O Cable

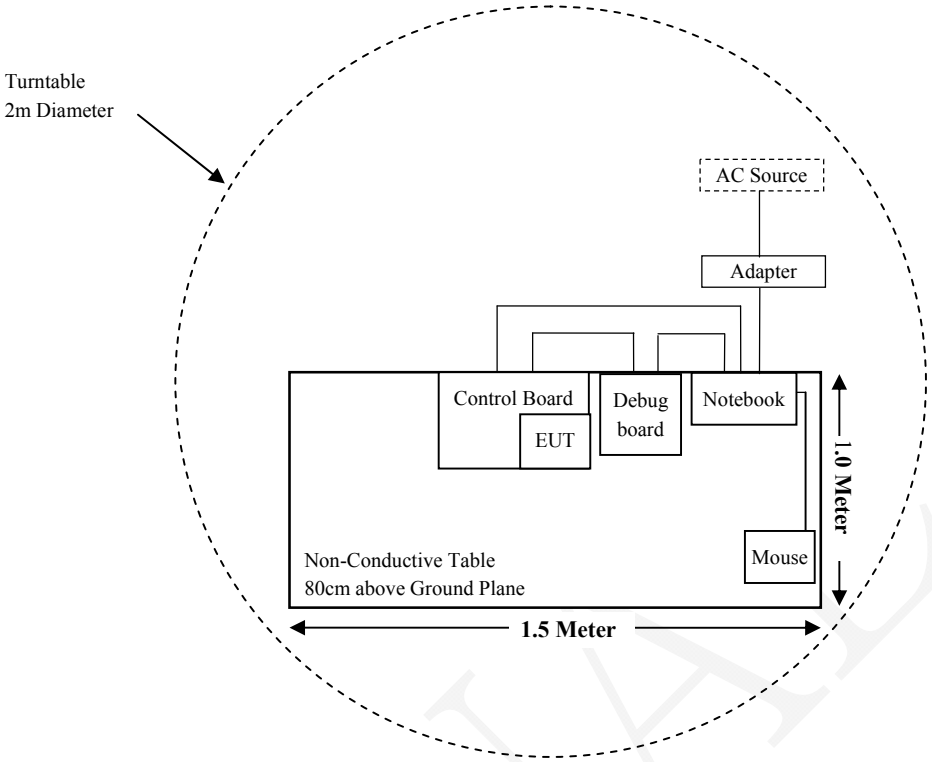
Cable Description	Length (m)	From Port	To
Data Cable	0.3	Control Board	Debug Board
USB Cable-1	0.8	Debug Board	Notebook
USB Cable-2	1.5	Control Board	Notebook
Power Cable	1.2	Notebook	Adapter

Block Diagram of Test Setup

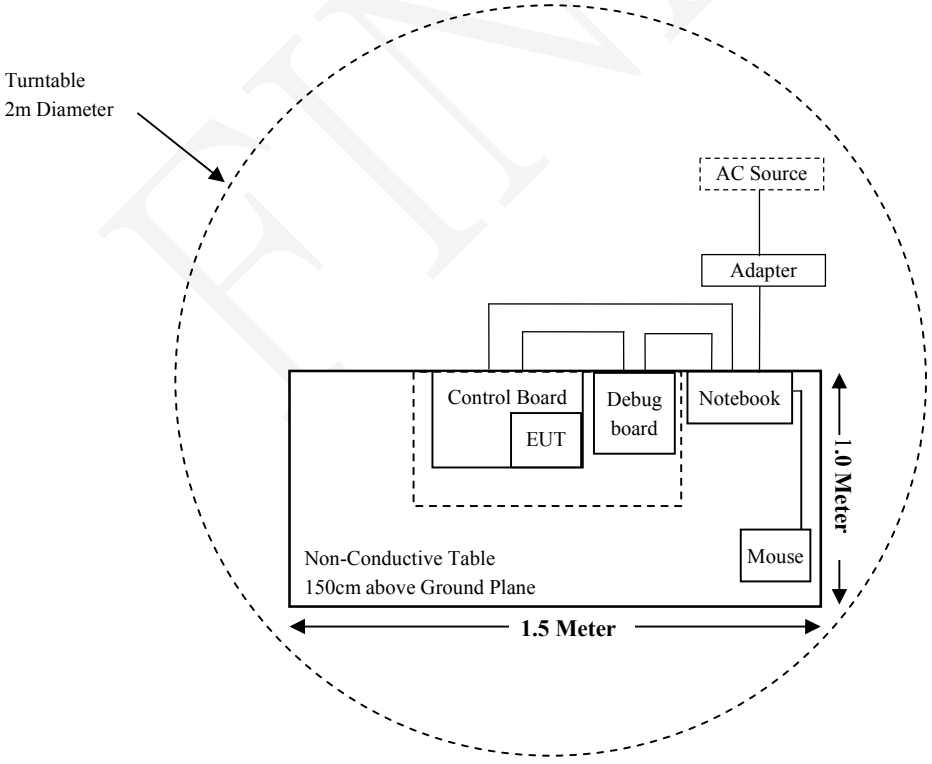
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§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	2017-11-12	2018-11-11
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
Mini-Circuits	Amplifier	ZVA-183W-S+	220701818	2018-05-20	2019-05-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2018-03-22	2019-03-21
MICRO-TRONICS	Notch Filter	BRM50702	/	2017-08-05	2018-08-04
Narda	Attenuator/10dB	10dB	/	2017-08-15	2018-08-14
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	2017-12-18	2018-12-17
Agilent	Power Sensor	N1921A	MY54210024	2017-12-18	2018-12-17
Narda	Attenuator/2dB	2dB	/	2017-08-15	2018-08-14
ESPRESSIF SYSTEMS	RF Cable	/	/	Each Time	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2017-11-12	2018-11-11
Rohde & Schwarz	LISN	ENV216	3560655016	2017-11-15	2018-11-14
BACL	Auto test Software	BACL-EMC	CE001	/	/
Narda	Attenuator/6dB	10690812-2	26850-6	2018-01-10	2019-01-09
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, 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

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

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);

Calculated Data:

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
Wi-Fi	2412-2462	3.74	2.37	24.00	251.19	20	0.1182	1.00
BLE	2402-2480	3.74	2.37	2.00	1.58	20	0.0007	1.00

Conclusion: The EUT meets exemption requirement - RF exposure evaluation greater than 20cm distance specified in § 2.1091. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by§ 2.1093.

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 have two types of antennas as below; fulfill the requirement of this section. Please refer to the EUT photos.

Model Name	Antenna Type	Antenna Gain (dBi)
ESP32-WROVER-B	On-board PCB Antenna	3.74
ESP32-WROVER-IB	IPEX Connector antenna	2.33

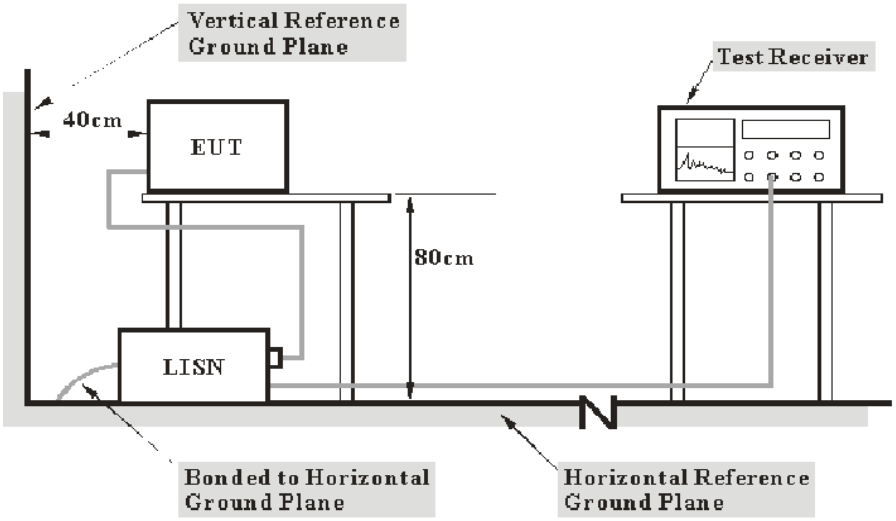
Result: Compliance.

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

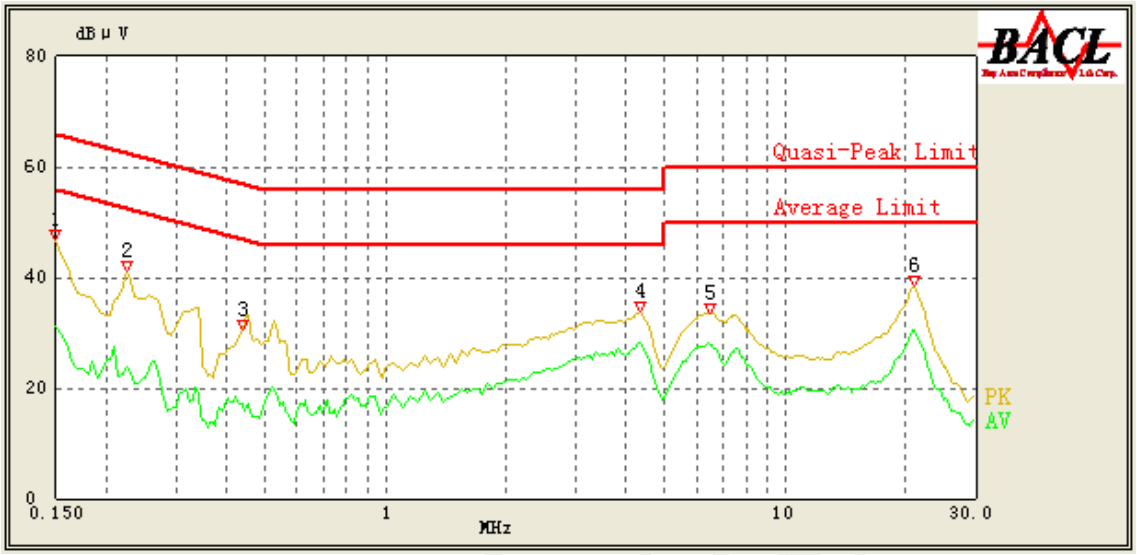
Temperature:	20.2 ℃
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Max Min on 2018-06-05.

For Wi-Fi Mode:

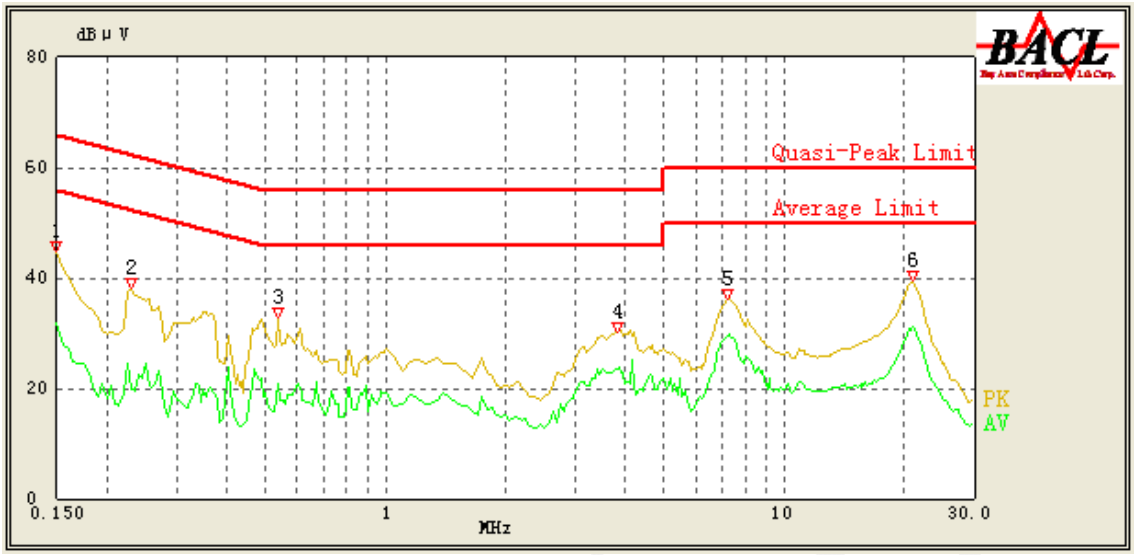
EUT operation mode: Transmitting in 802.11n-HT40 mode low channel (worst case)

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	46.78	QP	9.000	L1	16.06	66.00	19.22	Compliance
0.150	31.05	AV	9.000	L1	16.06	56.00	24.95	Compliance
0.225	41.29	QP	9.000	L1	16.02	63.86	22.57	Compliance
0.225	23.72	AV	9.000	L1	16.02	53.86	30.14	Compliance
0.440	30.49	QP	9.000	L1	16.07	57.71	27.22	Compliance
0.440	17.25	AV	9.000	L1	16.07	47.71	30.46	Compliance
4.350	33.97	QP	9.000	L1	15.85	56.00	22.03	Compliance
4.350	28.07	AV	9.000	L1	15.85	46.00	17.93	Compliance
6.500	33.51	QP	9.000	L1	15.95	60.00	26.49	Compliance
6.500	27.88	AV	9.000	L1	15.95	50.00	22.12	Compliance
21.000	38.39	QP	9.000	L1	16.44	60.00	21.61	Compliance
21.100	30.49	AV	9.000	L1	16.44	50.00	19.51	Compliance

AC 120V/60 Hz, Neutral



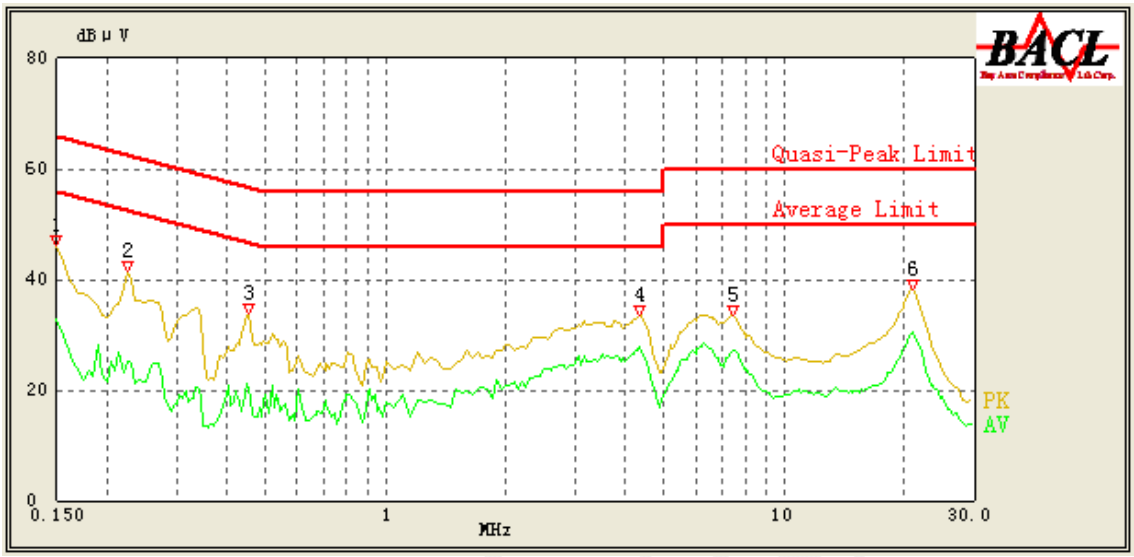
Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	44.97	QP	9.000	N	16.06	66.00	21.03	Compliance
0.150	31.92	AV	9.000	N	16.06	56.00	24.08	Compliance
0.230	38.05	QP	9.000	N	16.06	63.71	25.66	Compliance
0.230	19.71	AV	9.000	N	16.06	53.71	34.00	Compliance
0.540	32.97	QP	9.000	N	16.09	56.00	23.03	Compliance
0.540	20.85	AV	9.000	N	16.09	46.00	25.15	Compliance
3.800	30.13	QP	9.000	N	15.89	56.00	25.87	Compliance
3.850	23.96	AV	9.000	N	15.89	46.00	22.04	Compliance
7.200	36.02	QP	9.000	N	15.92	60.00	23.98	Compliance
7.200	29.52	AV	9.000	N	15.92	50.00	20.48	Compliance
21.000	39.43	QP	9.000	N	16.18	60.00	20.57	Compliance
21.000	31.08	AV	9.000	N	16.18	50.00	18.92	Compliance

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

For BLE Mode:

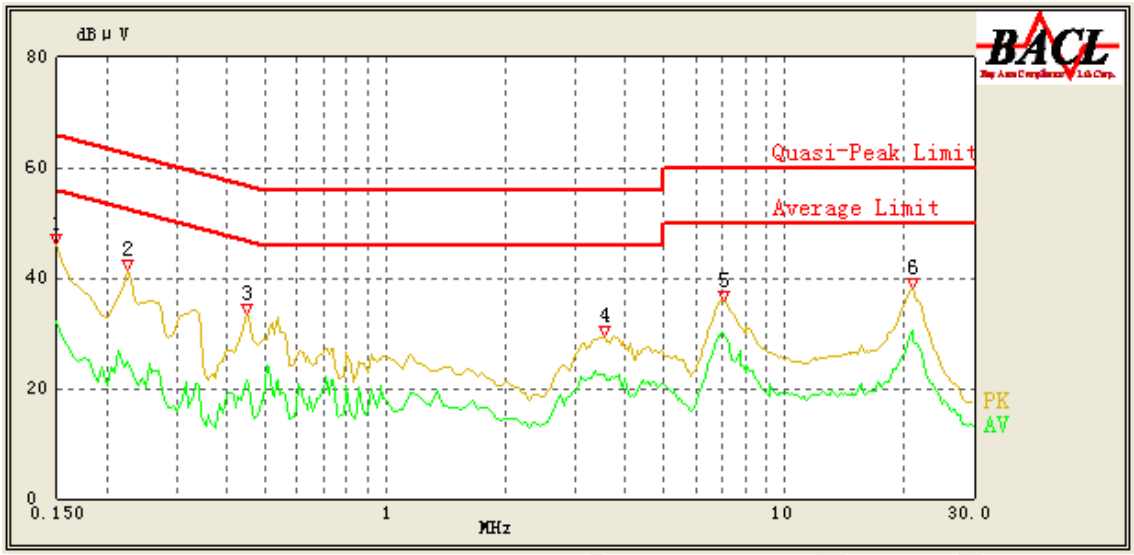
EUT operation mode: Transmitting in high channel (worst case)

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	46.32	QP	9.000	L1	16.06	66.00	19.68	Compliance
0.150	32.77	AV	9.000	L1	16.06	56.00	23.23	Compliance
0.225	41.37	QP	9.000	L1	16.02	63.86	22.49	Compliance
0.225	25.32	AV	9.000	L1	16.02	53.86	28.54	Compliance
0.455	33.67	QP	9.000	L1	16.07	57.29	23.62	Compliance
0.455	20.24	AV	9.000	L1	16.07	47.29	27.05	Compliance
4.350	33.63	QP	9.000	L1	15.85	56.00	22.37	Compliance
4.350	27.98	AV	9.000	L1	15.85	46.00	18.02	Compliance
7.450	33.41	QP	9.000	L1	15.99	60.00	26.59	Compliance
7.450	27.07	AV	9.000	L1	15.99	50.00	22.93	Compliance
21.000	38.29	QP	9.000	L1	16.44	60.00	21.71	Compliance
21.000	30.63	AV	9.000	L1	16.44	50.00	19.37	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	46.09	QP	9.000	N	16.06	66.00	19.91	Compliance
0.150	32.14	AV	9.000	N	16.06	56.00	23.86	Compliance
0.225	41.59	QP	9.000	N	16.06	63.86	22.27	Compliance
0.225	24.94	AV	9.000	N	16.06	53.86	28.92	Compliance
0.450	33.46	QP	9.000	N	16.10	57.43	23.97	Compliance
0.450	21.36	AV	9.000	N	16.10	47.43	26.07	Compliance
3.550	29.39	QP	9.000	N	15.89	56.00	26.61	Compliance
3.550	22.51	AV	9.000	N	15.89	46.00	23.49	Compliance
7.050	35.92	QP	9.000	N	15.92	60.00	24.08	Compliance
7.000	30.24	AV	9.000	N	15.92	50.00	19.76	Compliance
21.000	38.29	QP	9.000	N	16.18	60.00	21.71	Compliance
21.000	28.83	AV	9.000	N	16.18	50.00	21.17	Compliance

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

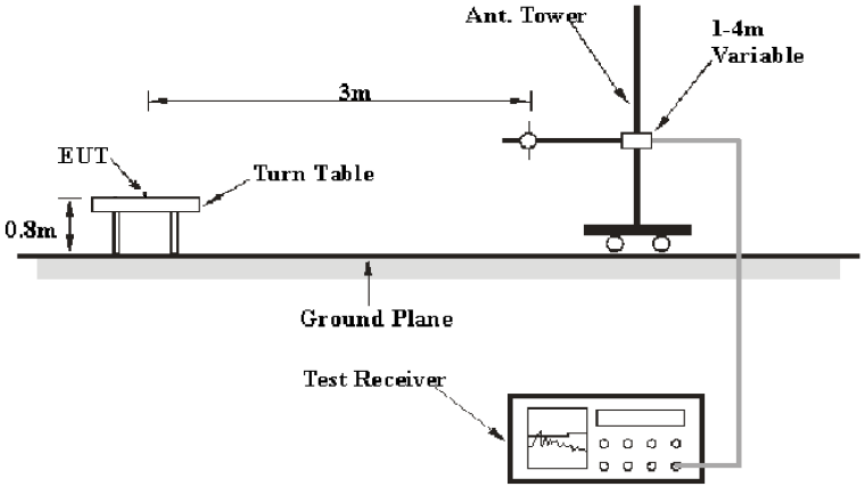
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

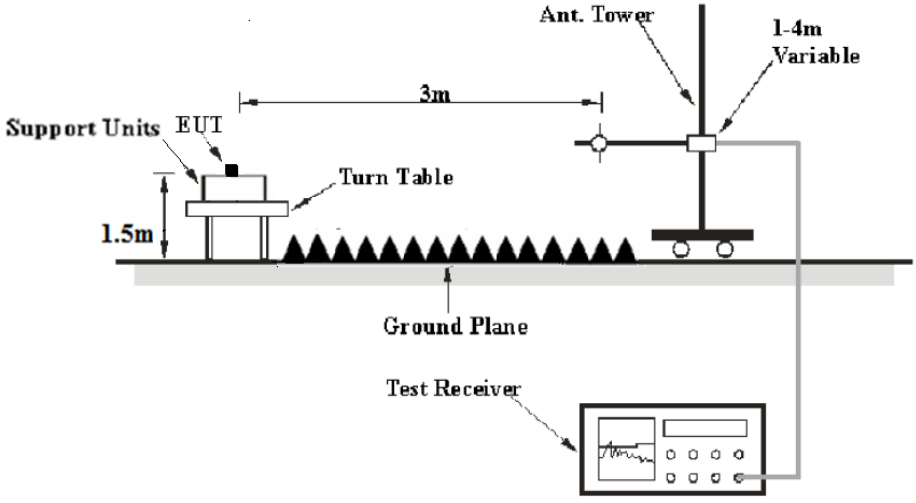
FCC §15.247 (d); §15.209; §15.205;

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 was 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.

Note: When duty cycle less than 98%, a correction factor shall be added to the average measurement results. Correction factor is 10*log(1/x), where "x" is the duty cycle.

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 Max Min on 2018-05-31 to 2018-06-06.

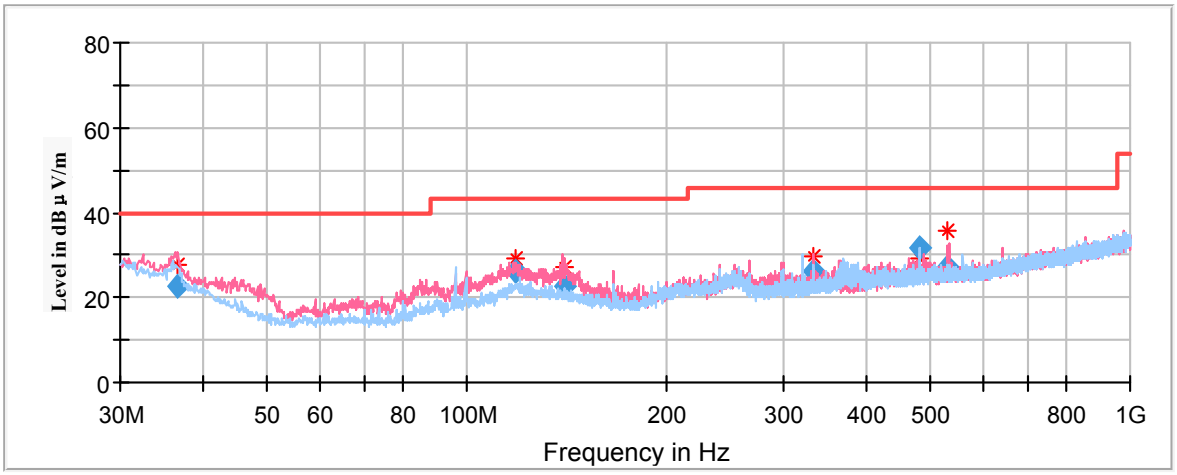
EUT operation mode: Transmitting

For Wi-Fi Mode for ESP32-WROVER-B:

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 ***low channel of 802.11n-HT40 mode in X-axis of orientation*** *was recorded*



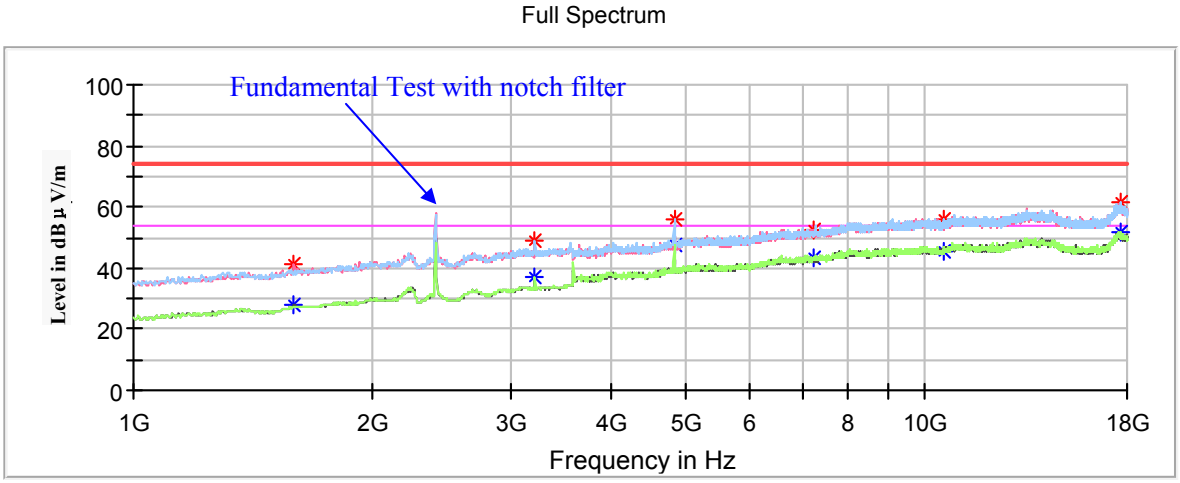
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dBµV/m)	Height (cm)	Polar (H/V)				
36.510500	22.85	101.0	V	255.0	-8.8	40.00	17.15
118.273700	25.95	101.0	V	3.0	-11.9	43.50	17.55
139.885450	22.67	101.0	V	0.0	-12.4	43.50	20.83
331.971950	26.15	199.0	V	39.0	-10.2	46.00	19.85
479.996250	31.75	199.0	H	304.0	-6.6	46.00	14.25
531.775500	27.30	101.0	V	71.0	-5.9	46.00	18.70

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)*

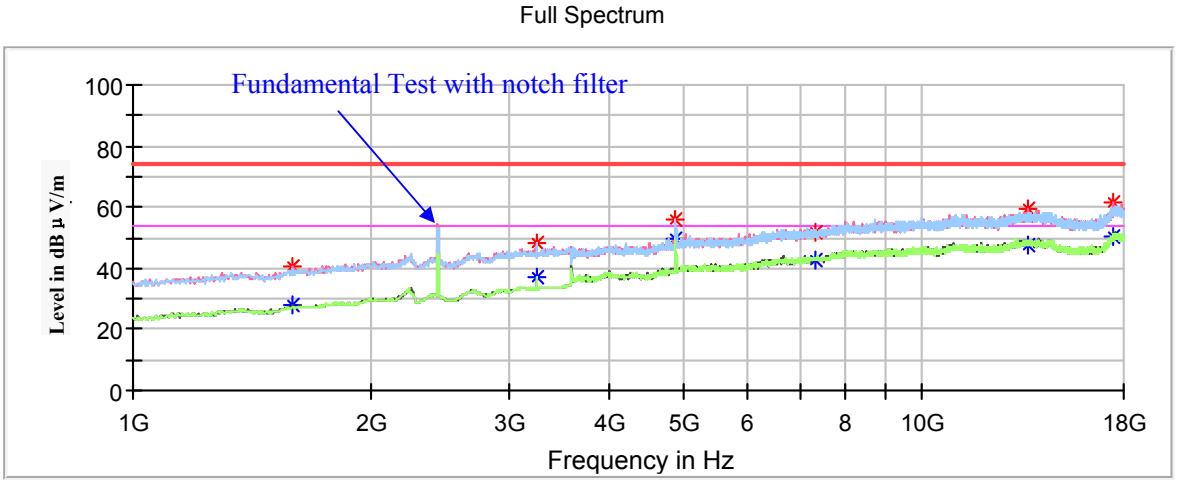
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2412MHz



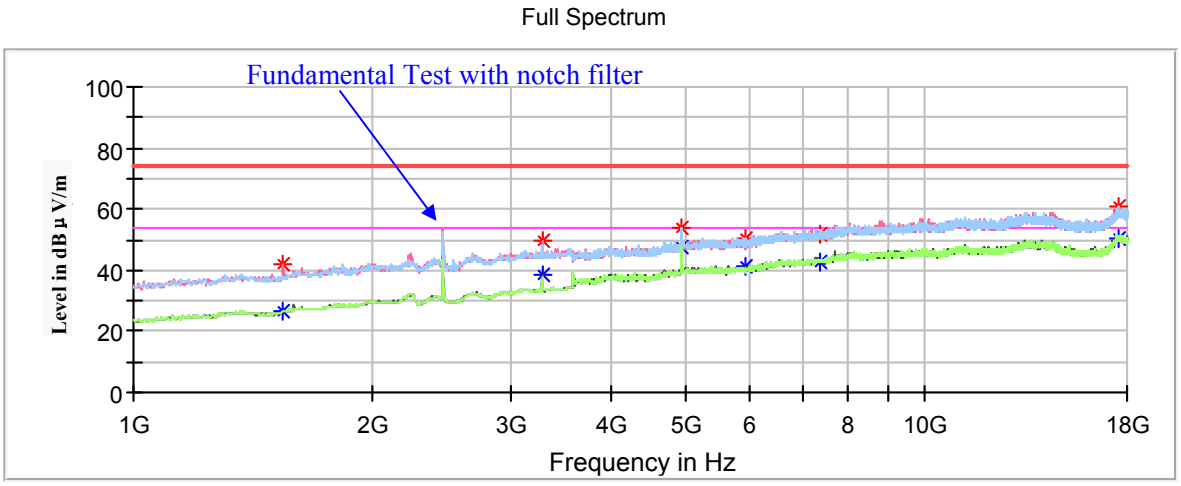
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	28.01	150.0	V	13.0	-0.6	54.00	25.99
1595.000000	41.14	---	150.0	V	13.0	-0.6	74.00	32.86
3216.800000	---	45.95	200.0	H	187.0	6.6	54.00	8.05
3216.800000	48.79	---	200.0	H	187.0	6.6	74.00	25.21
4824.000000	---	47.82	150.0	V	205.0	10.8	54.00	6.18
4824.000000	55.64	---	150.0	V	205.0	10.8	74.00	18.36
7236.000000	---	43.08	150.0	V	218.0	15.3	54.00	10.92
7236.000000	52.46	---	150.0	V	218.0	15.3	74.00	21.54
10550.600000	---	45.25	100.0	V	268.0	18.2	54.00	8.75
10550.600000	55.96	---	100.0	V	268.0	18.2	74.00	18.04
17643.000000	---	51.86	150.0	H	56.0	22.9	54.00	2.14
17643.000000	61.36	---	150.0	H	56.0	22.9	74.00	12.64

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)				
1591.600000	---	27.71	150.0	V	198.0	-0.6	54.00	26.29
1591.600000	40.54	---	150.0	V	198.0	-0.6	74.00	33.46
3247.400000	---	44.88	200.0	H	23.0	6.6	54.00	9.12
3247.400000	48.50	---	200.0	H	23.0	6.6	74.00	25.50
4874.000000	---	49.54	150.0	V	229.0	11.1	54.00	4.46
4874.000000	55.65	---	150.0	V	229.0	11.1	74.00	18.35
7311.000000	---	42.90	150.0	V	293.0	15.4	54.00	11.10
7311.000000	51.93	---	150.0	V	293.0	15.4	74.00	22.07
13600.400000	---	47.88	150.0	V	0.0	20.8	54.00	6.12
13600.400000	59.36	---	150.0	V	0.0	20.8	74.00	14.64
17490.000000	---	50.11	100.0	V	92.0	23.1	54.00	3.89
17490.000000	61.41	---	100.0	V	92.0	23.1	74.00	12.59

High Channel: 2462MHz

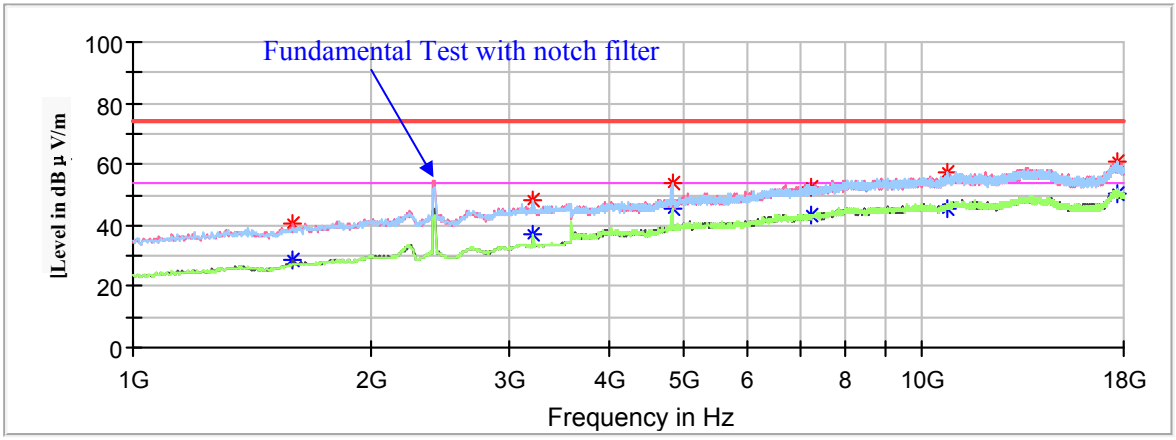


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1547.400000	---	26.48	150.0	V	219.0	-0.9	54.00	27.52
1547.400000	41.98	---	150.0	V	219.0	-0.9	74.00	32.02
3281.400000	---	46.38	200.0	V	134.0	6.7	54.00	7.62
3281.400000	49.35	---	200.0	V	134.0	6.7	74.00	24.65
4924.000000	---	47.53	200.0	V	314.0	11.3	54.00	6.47
4924.000000	54.17	---	200.0	V	314.0	11.3	74.00	19.83
5947.000000	---	41.25	150.0	V	282.0	12.9	54.00	12.75
5947.000000	50.39	---	150.0	V	282.0	12.9	74.00	23.61
7386.000000	---	42.93	200.0	V	166.0	15.5	54.00	11.07
7386.000000	51.49	---	200.0	V	166.0	15.5	74.00	22.51
17602.200000	---	50.28	100.0	H	220.0	23.0	54.00	3.72
17602.200000	60.66	---	100.0	H	220.0	23.0	74.00	13.34

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

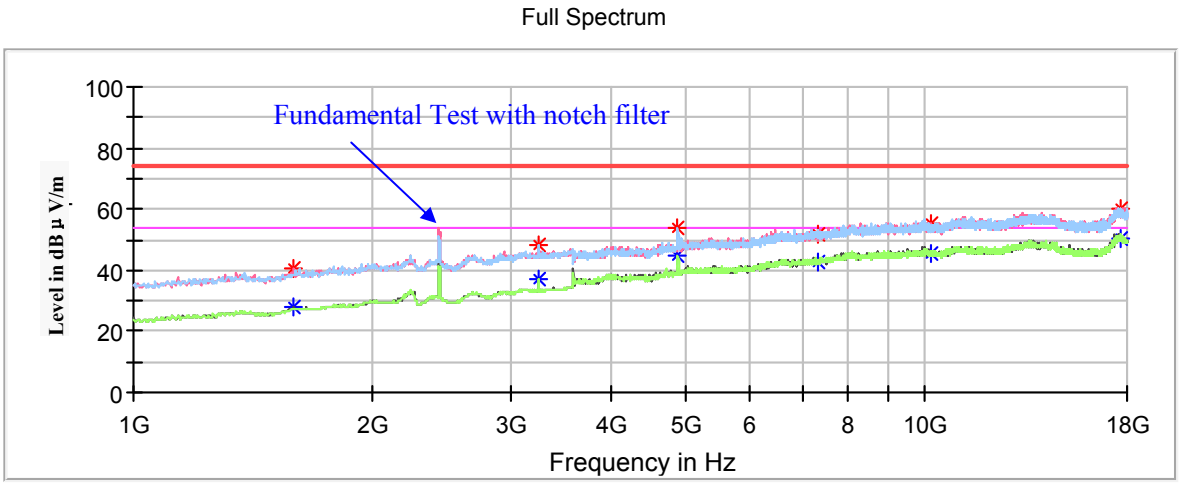
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2412MHz



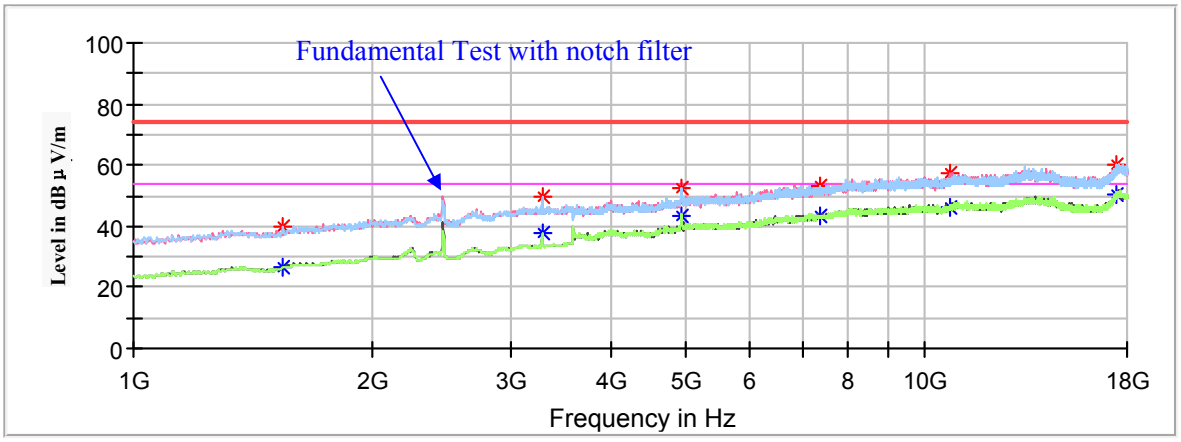
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	28.35	200.0	V	24.0	-0.6	54.00	25.65
1595.000000	40.26	---	200.0	V	24.0	-0.6	74.00	33.74
3216.800000	---	45.07	200.0	V	174.0	6.6	54.00	8.93
3216.800000	48.58	---	200.0	V	174.0	6.6	74.00	25.42
4824.000000	---	45.20	150.0	V	218.0	10.8	54.00	8.80
4824.000000	53.75	---	150.0	V	218.0	10.8	74.00	20.25
7236.000000	---	43.45	200.0	V	284.0	15.3	54.00	10.55
7236.000000	52.38	---	200.0	V	284.0	15.3	74.00	21.62
10764.800000	---	45.49	100.0	V	100.0	18.9	54.00	8.51
10764.800000	57.52	---	100.0	V	100.0	18.9	74.00	16.48
17714.400000	---	50.45	150.0	H	28.0	22.8	54.00	3.55
17714.400000	61.00	---	150.0	H	28.0	22.8	74.00	13.00

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)				
1595.000000	---	28.08	150.0	V	282.0	-0.6	54.00	25.92
1595.000000	40.70	---	150.0	V	282.0	-0.6	74.00	33.30
3247.400000	---	45.74	150.0	V	27.0	6.6	54.00	8.26
3247.400000	48.43	---	150.0	V	27.0	6.6	74.00	25.57
4874.000000	---	44.86	150.0	V	217.0	11.1	54.00	9.14
4874.000000	53.52	---	150.0	V	217.0	11.1	74.00	20.48
7311.000000	---	42.43	200.0	V	250.0	15.4	54.00	11.57
7311.000000	51.91	---	200.0	V	250.0	15.4	74.00	22.09
10203.800000	---	45.42	100.0	V	251.0	18.2	54.00	8.58
10203.800000	55.48	---	100.0	V	251.0	18.2	74.00	18.52
17639.600000	---	50.50	150.0	H	90.0	22.9	54.00	3.50
17639.600000	59.96	---	150.0	H	90.0	22.9	74.00	14.04

High Channel: 2462MHz

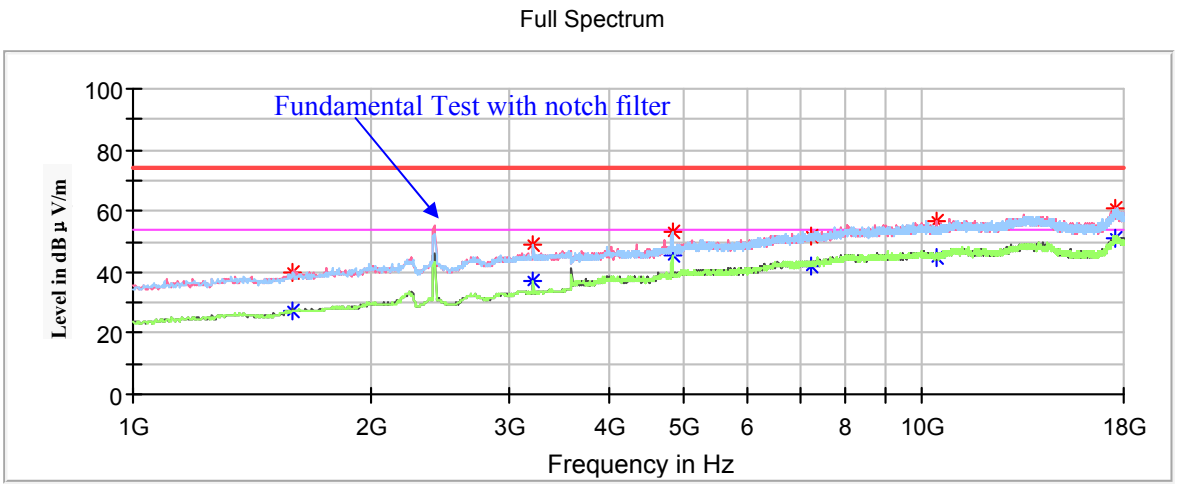


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1547.400000	---	26.65	150.0	H	225.0	-0.9	54.00	27.35
1547.400000	39.52	---	150.0	H	225.0	-0.9	74.00	34.48
3281.400000	---	46.65	200.0	H	120.0	6.7	54.00	7.35
3281.400000	49.95	---	200.0	H	120.0	6.7	74.00	24.05
4924.000000	---	43.68	200.0	V	290.0	11.3	54.00	10.32
4924.000000	52.77	---	200.0	V	290.0	11.3	74.00	21.23
7386.000000	---	43.06	150.0	V	45.0	15.5	54.00	10.94
7386.000000	52.82	---	150.0	V	45.0	15.5	74.00	21.18
10724.000000	---	46.06	100.0	V	359.0	18.8	54.00	7.94
10724.000000	57.36	---	100.0	V	359.0	18.8	74.00	16.64
17496.800000	---	50.38	200.0	V	282.0	23.1	54.00	3.62
17496.800000	60.01	---	200.0	V	282.0	23.1	74.00	13.99

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

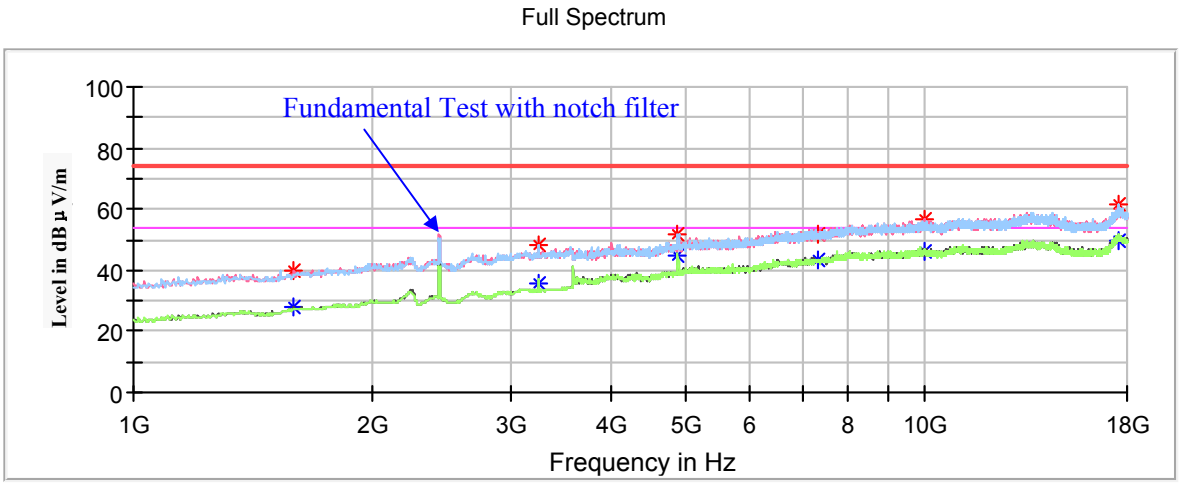
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2412MHz



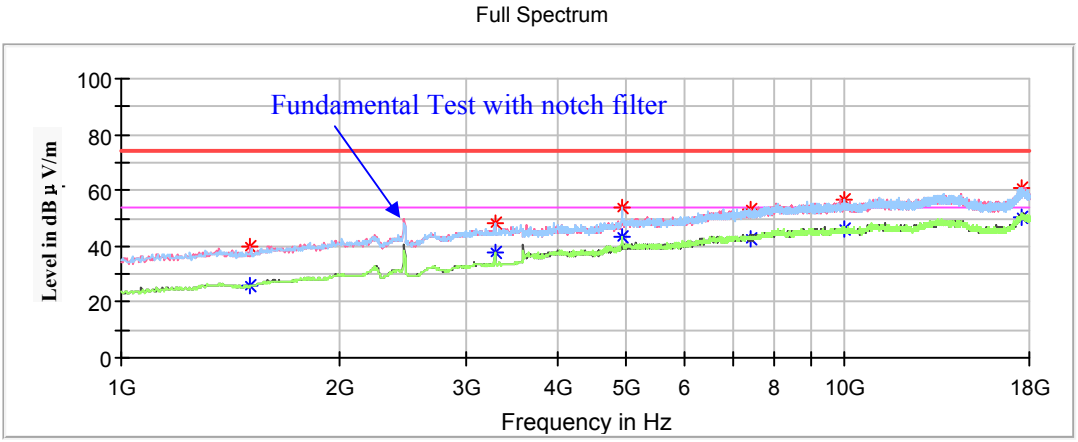
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	27.54	200.0	V	29.0	-0.6	54.00	26.46
1591.600000	40.17	---	200.0	V	29.0	-0.6	74.00	33.83
3216.800000	---	46.22	200.0	H	177.0	6.6	54.00	7.78
3216.800000	49.24	---	200.0	H	177.0	6.6	74.00	24.76
4824.000000	---	45.31	150.0	V	208.0	10.8	54.00	8.69
4824.000000	53.08	---	150.0	V	208.0	10.8	74.00	20.92
7236.000000	---	42.25	200.0	V	355.0	15.3	54.00	11.75
7236.000000	51.69	---	200.0	V	355.0	15.3	74.00	22.31
10452.000000	---	45.08	100.0	V	124.0	18.0	54.00	8.92
10452.000000	56.78	---	100.0	V	124.0	18.0	74.00	17.22
17547.800000	---	51.03	150.0	V	359.0	23.1	54.00	2.97
17547.800000	60.76	---	150.0	V	359.0	23.1	74.00	13.24

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)				
1595.000000	---	28.23	150.0	V	194.0	-0.6	54.00	25.77
1595.000000	39.70	---	150.0	V	194.0	-0.6	74.00	34.30
3247.400000	---	45.71	150.0	V	131.0	6.6	54.00	8.29
3247.400000	48.48	---	150.0	V	131.0	6.6	74.00	25.52
4874.000000	---	44.54	200.0	V	204.0	11.0	54.00	9.46
4874.000000	51.82	---	200.0	V	204.0	11.0	74.00	22.18
7311.000000	---	43.30	200.0	V	299.0	15.4	54.00	10.70
7311.000000	52.04	---	200.0	V	299.0	15.4	74.00	21.96
9965.800000	---	46.41	100.0	V	66.0	18.3	54.00	7.59
9965.800000	56.93	---	100.0	V	66.0	18.3	74.00	17.07
17527.400000	---	49.69	150.0	H	299.0	23.1	54.00	4.31
17527.400000	61.23	---	150.0	H	299.0	23.1	74.00	12.77

High Channel: 2462MHz

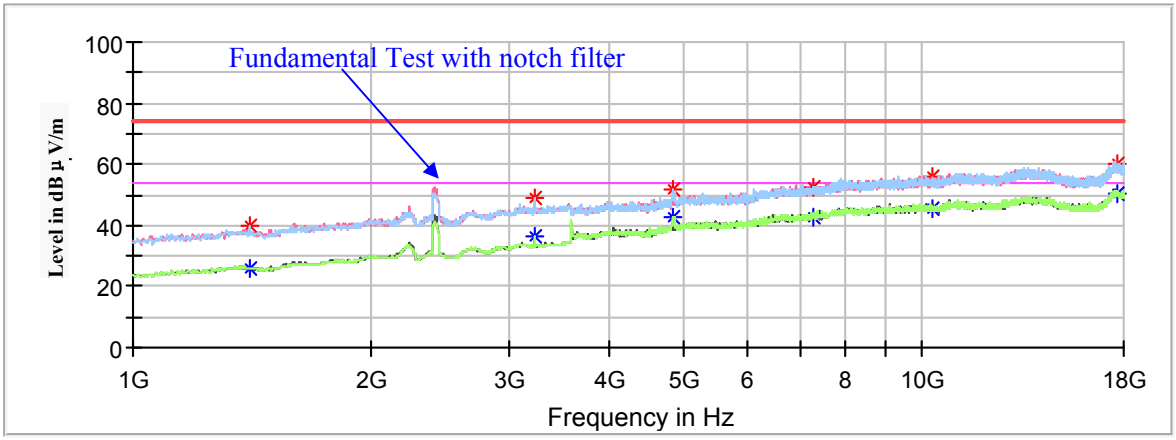


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1510.000000	39.51	---	150.0	V	194.0	-1.2	74.00	34.49
1510.000000	---	26.00	150.0	V	194.0	-1.2	54.00	28.00
3281.400000	---	45.74	150.0	H	130.0	6.7	54.00	8.26
3281.400000	48.32	---	150.0	H	130.0	6.7	74.00	25.68
4924.000000	---	43.37	200.0	V	204.0	11.3	54.00	10.63
4924.000000	53.93	---	200.0	V	204.0	11.3	74.00	20.07
7386.000000	---	42.57	200.0	V	293.0	15.5	54.00	11.43
7386.000000	52.87	---	200.0	V	293.0	15.5	74.00	21.13
9969.200000	---	46.07	100.0	H	194.0	18.3	54.00	7.93
9969.200000	56.51	---	100.0	H	194.0	18.3	74.00	17.49
17571.600000	---	50.43	150.0	V	336.0	23.0	54.00	3.57
17571.600000	60.99	---	150.0	V	336.0	23.0	74.00	13.01

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

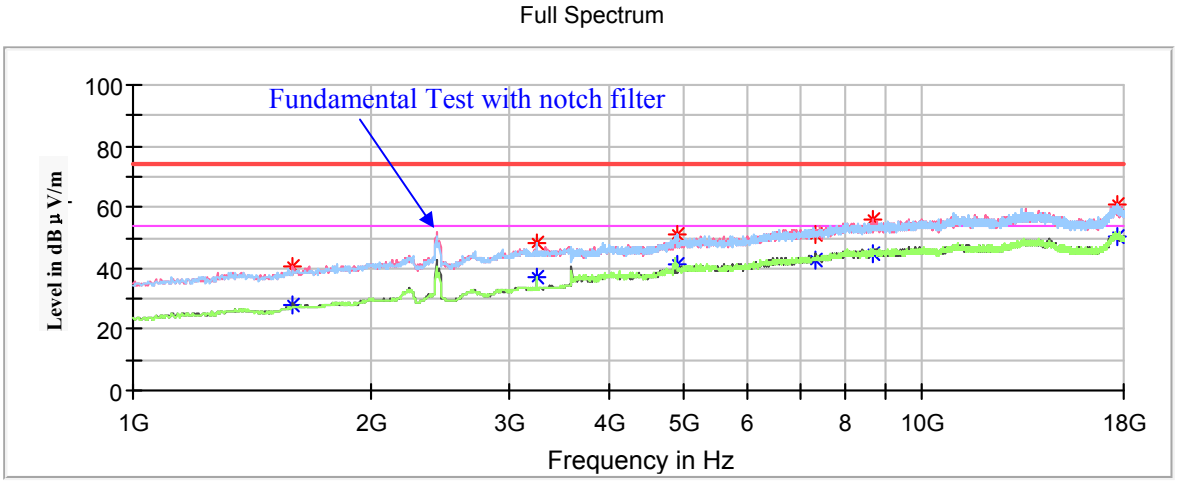
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2422MHz



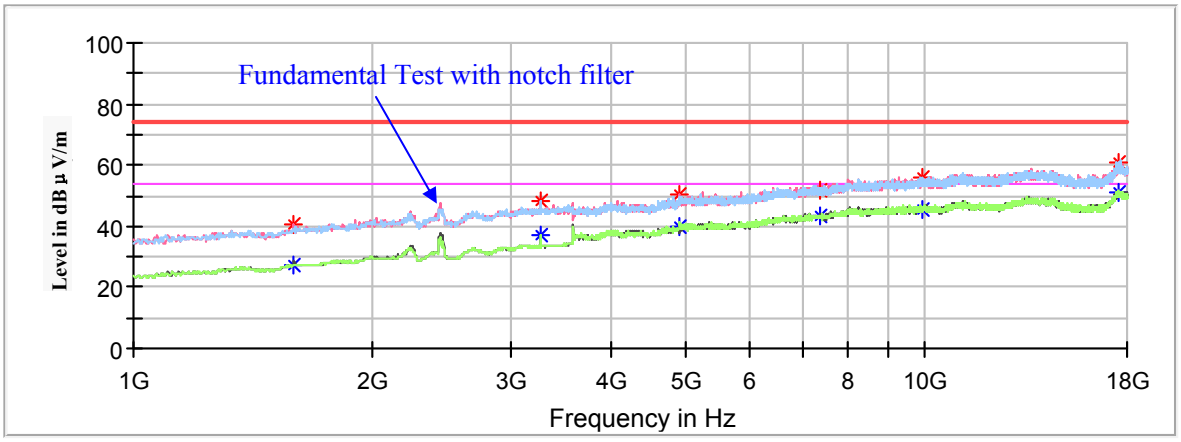
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1404.600000	---	26.22	200.0	H	310.0	-1.8	54.00	27.78
1404.600000	39.52	---	200.0	H	310.0	-1.8	74.00	34.48
3230.400000	---	46.27	200.0	H	184.0	6.6	54.00	7.73
3230.400000	49.13	---	200.0	H	184.0	6.6	74.00	24.87
4844.000000	---	42.44	200.0	V	194.0	10.9	54.00	11.56
4844.000000	51.82	---	200.0	V	194.0	10.9	74.00	22.18
7266.000000	---	42.65	150.0	V	76.0	15.3	54.00	11.35
7266.000000	52.74	---	150.0	V	76.0	15.3	74.00	21.26
10268.400000	---	45.36	100.0	V	351.0	18.1	54.00	8.64
10268.400000	56.19	---	100.0	V	351.0	18.1	74.00	17.81
17660.000000	---	50.68	150.0	V	305.0	22.9	54.00	3.32
17660.000000	60.10	---	150.0	V	305.0	22.9	74.00	13.90

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)				
1591.600000	---	27.77	200.0	V	24.0	-0.6	54.00	26.23
1591.600000	40.49	---	200.0	V	24.0	-0.6	74.00	33.51
3247.400000	---	45.87	200.0	H	130.0	6.6	54.00	8.13
3247.400000	48.22	---	200.0	H	130.0	6.6	74.00	25.78
4874.000000	---	41.47	200.0	V	240.0	11.1	54.00	12.53
4874.000000	51.07	---	200.0	V	240.0	11.1	74.00	22.93
7311.000000	---	42.52	150.0	V	184.0	15.4	54.00	11.48
7311.000000	51.33	---	150.0	V	184.0	15.4	74.00	22.67
8673.800000	---	45.08	150.0	V	272.0	17.3	54.00	8.92
8673.800000	56.16	---	150.0	V	272.0	17.3	74.00	17.84
17680.400000	---	50.18	150.0	V	188.0	22.9	54.00	3.82
17680.400000	60.53	---	150.0	V	188.0	22.9	74.00	13.47

High Channel: 2452MHz

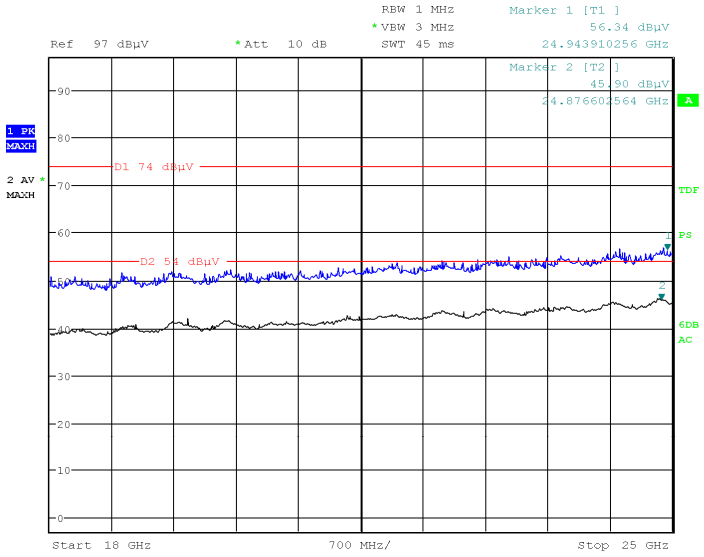


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	40.62	---	200.0	V	39.0	-0.6	74.00	33.38
1591.600000	---	27.46	200.0	V	39.0	-0.6	54.00	26.54
3267.800000	47.99	---	200.0	V	135.0	6.7	74.00	26.01
3267.800000	---	46.88	200.0	V	135.0	6.7	54.00	7.12
4904.000000	---	39.68	200.0	V	209.0	11.2	54.00	14.32
4904.000000	50.20	---	200.0	V	209.0	11.2	74.00	23.80
7356.000000	52.02	---	150.0	V	240.0	15.4	74.00	21.98
7356.000000	---	43.56	150.0	V	240.0	15.4	54.00	10.44
9952.200000	---	45.64	100.0	H	124.0	18.3	54.00	8.36
9952.200000	56.17	---	100.0	H	124.0	18.3	74.00	17.83
17541.000000	---	50.86	200.0	H	7.0	23.1	54.00	3.14
17541.000000	60.73	---	200.0	H	7.0	23.1	74.00	13.27

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 **low channel of 802.11n-HT40 mode in X-axis of orientation** was recorded*

Horizontal



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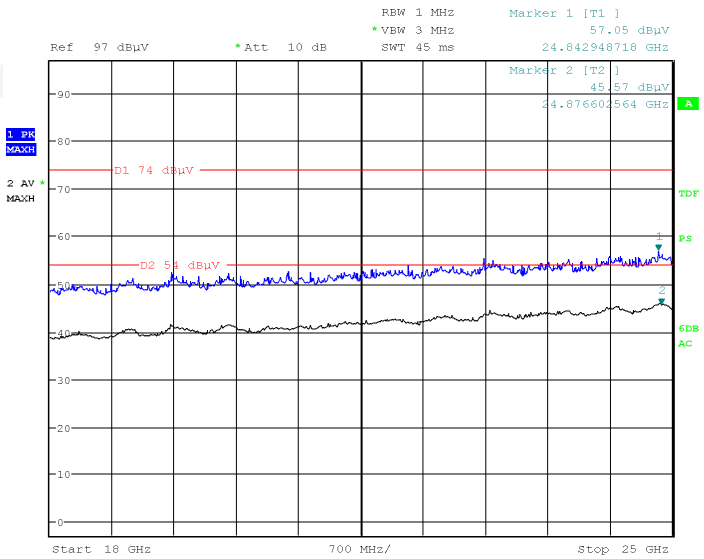
Vertical



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Fundamental Test & Restricted Bands Emissions Test:

Note:
1. The test is performed with a 10dB Attenuator.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor + Attenuator
   Corrected Amplitude = Corrected Factor + Reading
   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	---	105.25	200.0	V	250.0	12.9	/	/
2412.000000	113.76	---	200.0	V	250.0	12.9	/	/
2412.000000	---	102.25	200.0	H	149.0	12.9	/	/
2412.000000	110.36	---	200.0	H	149.0	12.9	/	/
2390.000000	52.11	---	100.0	V	211.0	12.9	74.00	21.89
2390.000000	---	43.59	100.0	V	211.0	12.9	54.00	10.41
Middle Channel: 2437MHz								
2437.000000	---	105.05	200.0	V	88.0	12.9	/	/
2437.000000	113.45	---	200.0	V	88.0	12.9	/	/
2437.000000	---	102.86	150.0	H	127.0	12.9	/	/
2437.000000	110.37	---	150.0	H	127.0	12.9	/	/
High Channel: 2462MHz								
2462.000000	---	104.63	150.0	V	319.0	13.0	/	/
2462.000000	112.85	---	150.0	V	319.0	13.0	/	/
2462.000000	---	101.42	250.0	H	210.0	13.0	/	/
2462.000000	109.88	---	250.0	H	210.0	13.0	/	/
2483.500000	54.55	---	150.0	V	267.0	13.0	74.00	19.45
2483.500000	---	47.41	150.0	V	267.0	13.0	54.00	6.59

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	---	98.75	150.0	V	261.0	12.9	/	/
2412.000000	106.35	---	150.0	V	261.0	12.9	/	/
2412.000000	---	95.24	200.0	H	234.0	12.9	/	/
2412.000000	103.83	---	200.0	H	234.0	12.9	/	/
2390.000000	54.24	---	150.0	V	288.0	12.9	74.00	19.76
2390.000000	---	45.57	150.0	V	288.0	12.9	54.00	8.43
Middle Channel: 2437MHz								
2437.000000	106.42	---	150.0	V	11.0	12.9	/	/
2437.000000	---	98.85	150.0	V	11.0	12.9	/	/
2437.000000	103.18	---	250.0	H	199.0	12.9	/	/
2437.000000	---	95.36	250.0	H	199.0	12.9	/	/
High Channel: 2462MHz								
2462.000000	---	97.96	250.0	V	261.0	13.0	/	/
2462.000000	105.28	---	250.0	V	261.0	13.0	/	/
2462.000000	---	94.28	250.0	H	72.0	13.0	/	/
2462.000000	102.47	---	250.0	H	72.0	13.0	/	/
2483.500000	57.32	---	100.0	V	204.0	13.0	74.00	16.68
2483.500000	---	48.60	100.0	V	204.0	13.0	54.00	5.40

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	---	98.52	100.0	V	160.0	12.9	/	/
2412.000000	106.46	---	100.0	V	160.0	12.9	/	/
2412.000000	---	95.85	200.0	H	236.0	12.9	/	/
2412.000000	103.09	---	200.0	H	236.0	12.9	/	/
2390.000000	54.19	---	100.0	V	255.0	12.9	74.00	19.81
2390.000000	---	46.79	100.0	V	255.0	12.9	54.00	7.21
Middle Channel: 2437MHz								
2437.000000	106.16	---	150.0	V	203.0	12.9	/	/
2437.000000	---	98.85	150.0	V	203.0	12.9	/	/
2437.000000	103.43	---	200.0	H	240.0	12.9	/	/
2437.000000	---	95.28	200.0	H	240.0	12.9	/	/
High Channel: 2462MHz								
2462.000000	---	97.64	200.0	V	178.0	13.0	/	/
2462.000000	105.38	---	200.0	V	178.0	13.0	/	/
2462.000000	---	94.75	250.0	H	264.0	13.0	/	/
2462.000000	102.83	---	250.0	H	264.0	13.0	/	/
2483.500000	56.36	---	100.0	V	301.0	13.0	74.00	17.64
2483.500000	---	48.85	100.0	V	301.0	13.0	54.00	5.15

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

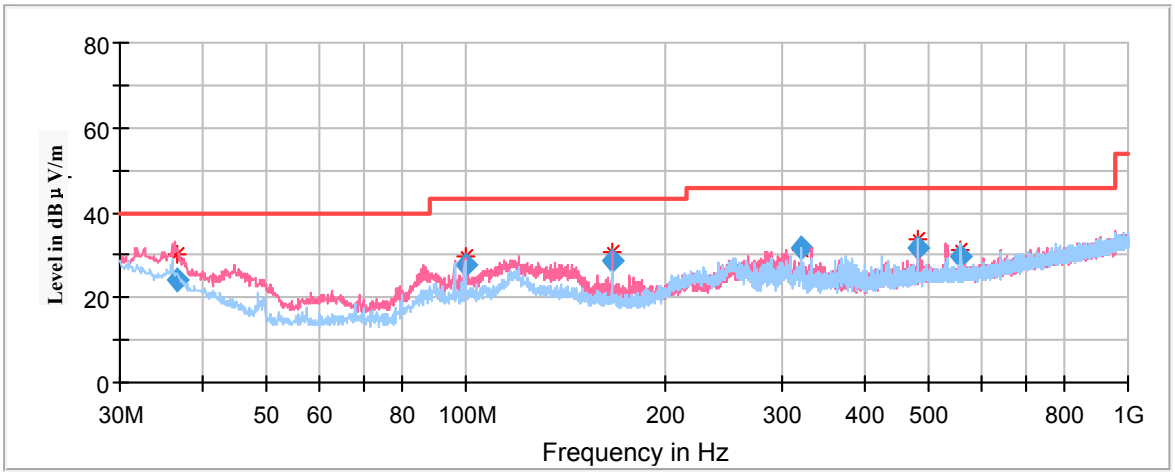
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2422MHz								
2422.000000	---	96.25	200.0	V	48.0	12.9	/	/
2422.000000	104.04	---	200.0	V	48.0	12.9	/	/
2422.000000	---	93.76	150.0	H	251.0	12.9	/	/
2422.000000	101.79	---	150.0	H	251.0	12.9	/	/
2390.000000	54.63	---	150.0	V	283.0	12.9	74.00	19.37
2390.000000	---	48.33	150.0	V	265.0	12.9	54.00	5.67
Middle Channel: 2437MHz								
2437.000000	103.35	---	200.0	V	87.0	12.9	/	/
2437.000000	---	95.72	200.0	V	87.0	12.9	/	/
2437.000000	100.30	---	150.0	H	4.0	12.9	/	/
2437.000000	---	92.86	150.0	H	4.0	12.9	/	/
High Channel: 2452MHz								
2452.000000	100.06	---	250.0	V	105.0	13.0	/	/
2452.000000	---	92.72	250.0	V	105.0	13.0	/	/
2452.000000	---	89.06	100.0	H	187.0	13.0	/	/
2452.000000	97.82	---	100.0	H	187.0	13.0	/	/
2483.500000	57.04	---	150.0	V	272.0	13.0	74.00	16.96
2483.500000	---	50.64	150.0	V	272.0	13.0	54.00	3.36

For BLE Mode for ESP32-WROVER-B:

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 **high channel of operation in the X axis of orientation** was recorded)*



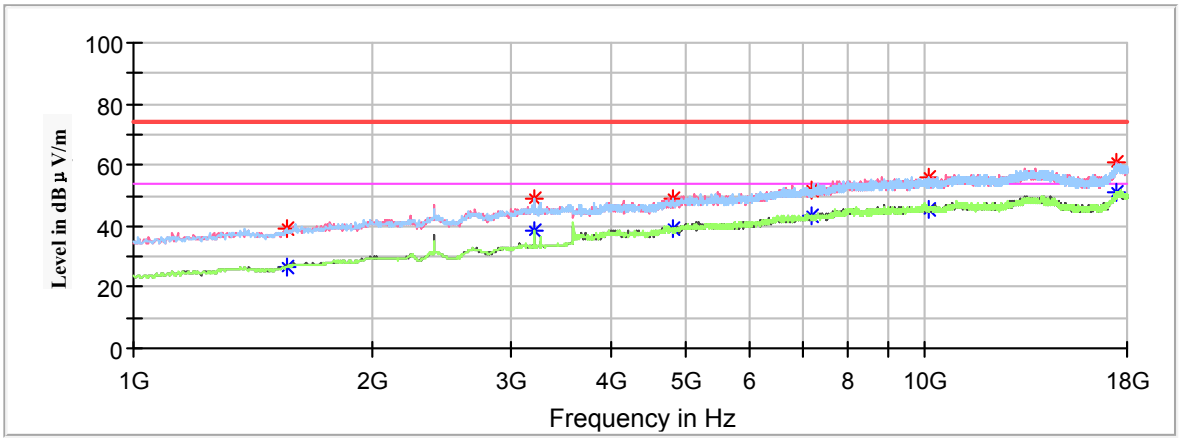
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dB µ V/m)	Height (cm)	Polar (H/V)				
36.663500	24.30	101.0	V	125.0	-8.9	40.00	15.70
99.606600	27.81	101.0	V	0.0	-15.5	43.50	15.69
165.996300	28.55	101.0	V	218.0	-13.5	43.50	14.95
319.996700	31.84	101.0	H	39.0	-10.5	46.00	14.16
480.009450	31.90	199.0	H	281.0	-6.6	46.00	14.10
559.994550	29.71	199.0	H	209.0	-5.7	46.00	16.29

1GHz-18GHz

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

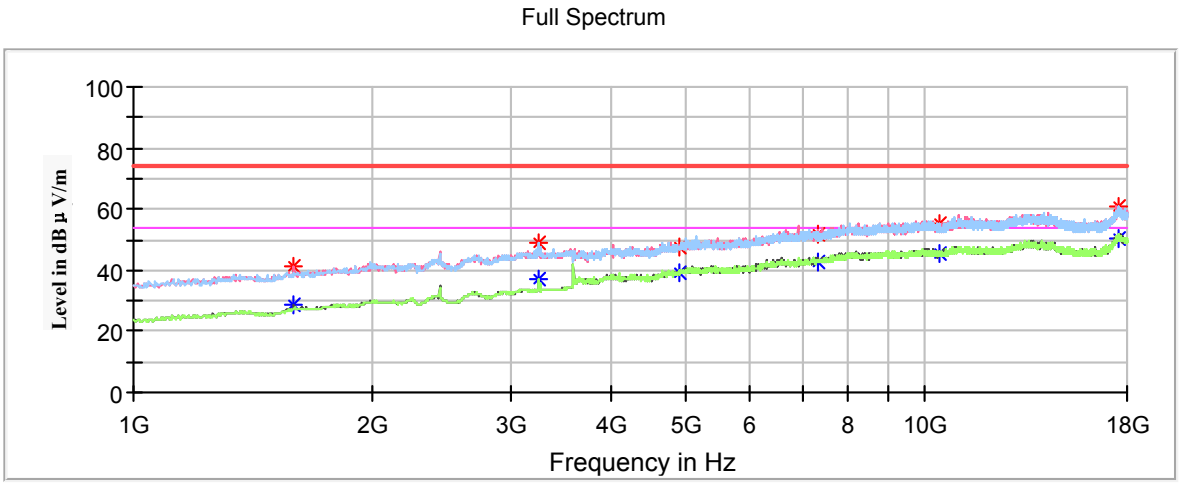
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2402MHz



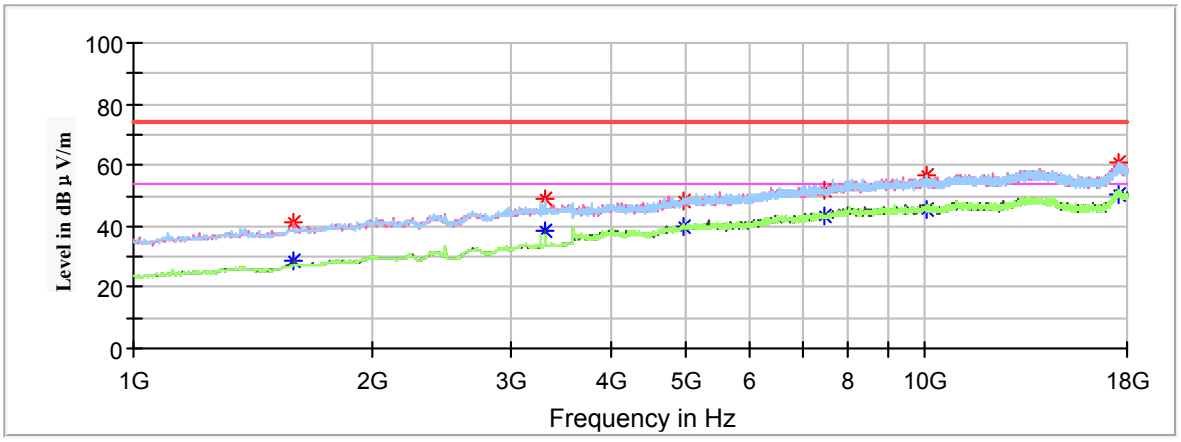
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1564.400000	---	26.76	200.0	V	6.0	-0.8	54.00	27.24
1564.400000	39.19	---	200.0	V	6.0	-0.8	74.00	34.81
3203.200000	---	45.41	150.0	H	5.0	6.5	54.00	8.59
3203.200000	48.73	---	150.0	H	5.0	6.5	74.00	25.27
4804.000000	---	39.16	150.0	V	1.0	10.7	54.00	14.84
4804.000000	48.68	---	150.0	V	1.0	10.7	74.00	25.32
7206.000000	---	43.36	200.0	V	220.0	15.2	54.00	10.64
7206.000000	51.94	---	200.0	V	220.0	15.2	74.00	22.06
10135.800000	---	45.39	100.0	V	152.0	18.2	54.00	8.61
10135.800000	55.77	---	100.0	V	152.0	18.2	74.00	18.23
17503.600000	---	51.14	250.0	V	353.0	23.2	54.00	2.86
17503.600000	60.52	---	250.0	V	353.0	23.2	74.00	13.48

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)				
1595.000000	---	28.44	150.0	V	198.0	-0.6	54.00	25.56
1595.000000	41.47	---	150.0	V	198.0	-0.6	74.00	32.53
3250.800000	---	45.30	200.0	H	23.0	6.6	54.00	8.70
3250.800000	49.13	---	200.0	H	23.0	6.6	74.00	24.87
4880.000000	---	38.83	200.0	V	13.0	11.1	54.00	15.17
4880.000000	47.78	---	200.0	V	13.0	11.1	74.00	26.22
7320.000000	---	42.93	200.0	V	187.0	15.4	54.00	11.07
7320.000000	51.78	---	200.0	V	187.0	15.4	74.00	22.22
10407.800000	---	45.18	100.0	H	283.0	18.1	54.00	8.82
10407.800000	55.30	---	100.0	H	283.0	18.1	74.00	18.70
17551.200000	---	50.39	150.0	H	124.0	23.1	54.00	3.61
17551.200000	60.93	---	150.0	H	124.0	23.1	74.00	13.07

High Channel: 2480MHz

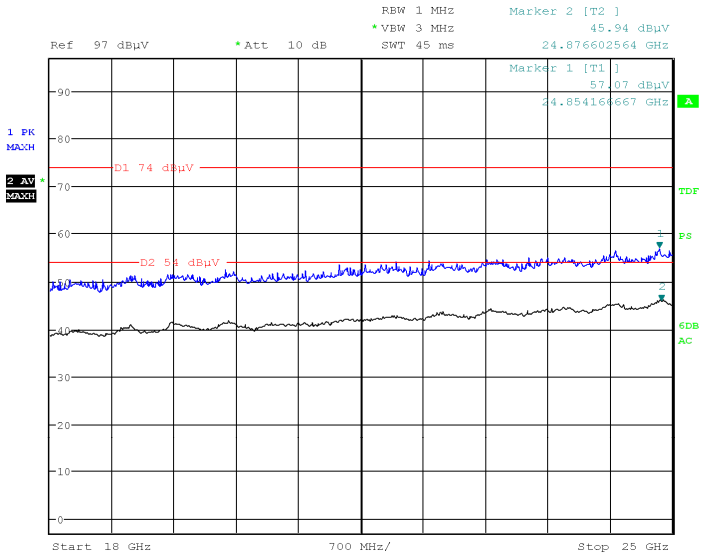


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	28.34	150.0	V	198.0	-0.6	54.00	25.66
1595.000000	41.30	---	150.0	V	198.0	-0.6	74.00	32.70
3305.200000	---	46.17	200.0	V	70.0	6.8	54.00	7.83
3305.200000	49.25	---	200.0	V	70.0	6.8	74.00	24.75
4960.000000	---	39.94	200.0	V	251.0	11.5	54.00	14.06
4960.000000	48.00	---	200.0	V	251.0	11.5	74.00	26.00
7440.000000	---	43.38	200.0	V	59.0	15.6	54.00	10.62
7440.000000	52.01	---	200.0	V	59.0	15.6	74.00	21.99
10016.800000	---	45.21	200.0	H	209.0	18.3	54.00	8.79
10016.800000	56.64	---	200.0	H	209.0	18.3	74.00	17.36
17537.600000	---	50.22	150.0	H	0.0	23.1	54.00	3.78
17537.600000	60.77	---	150.0	H	0.0	23.1	74.00	13.23

18GHz-25GHz

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

Horizontal Plot



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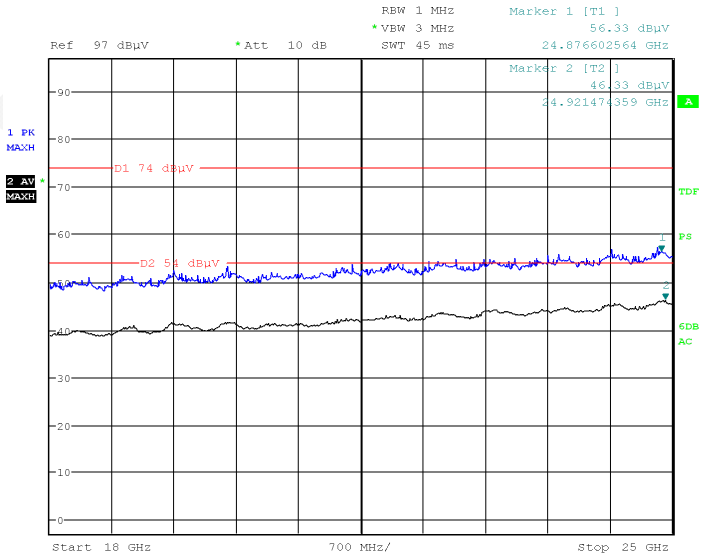
Vertical Plot



Date: 6.JUN.2018 13:24:14

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
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

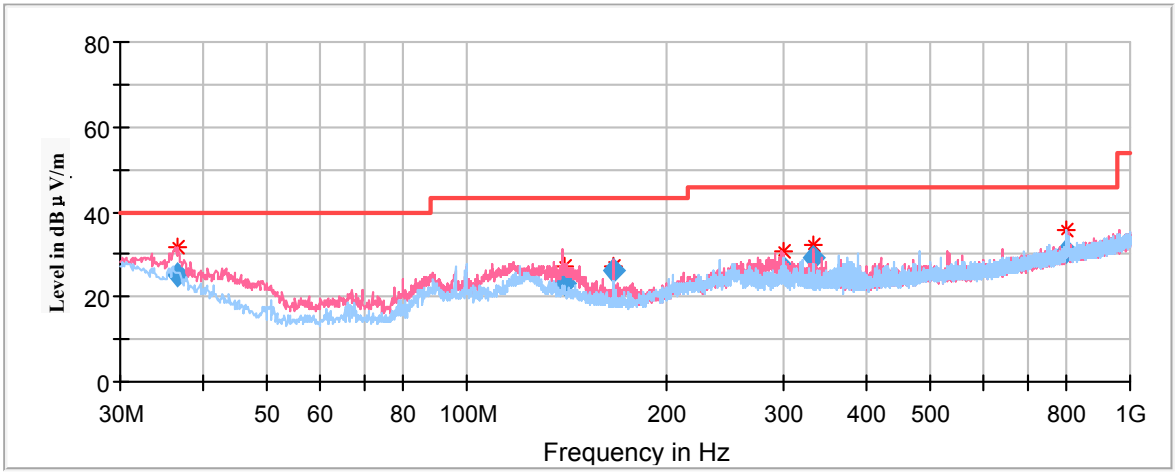
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2402MHz								
2402.000000	96.46	---	200.0	V	191.0	2.9	/	/
2402.000000	---	94.56	200.0	V	191.0	2.9	/	/
2402.000000	93.82	---	150.0	H	77.0	2.9	/	/
2402.000000	---	91.76	150.0	H	77.0	2.9	/	/
2390.000000	44.74	---	150.0	V	297.0	2.9	74.00	29.26
2390.000000	---	37.07	150.0	V	297.0	2.9	54.00	16.93
Middle Channel: 2440MHz								
2440.000000	97.48	---	200.0	V	206.0	2.9	/	/
2440.000000	---	95.26	200.0	V	206.0	2.9	/	/
2440.000000	94.06	---	150.0	H	351.0	2.9	/	/
2440.000000	---	92.83	150.0	H	351.0	2.9	/	/
High Channel: 2480MHz								
2480.000000	---	96.15	200.0	V	44.0	3.0	/	/
2480.000000	98.42	---	200.0	V	44.0	3.0	/	/
2480.000000	95.85	---	200.0	H	287.0	3.0	/	/
2480.000000	---	93.73	200.0	H	287.0	3.0	/	/
2483.500000	53.37	---	150.0	V	115.0	3.0	74.00	20.63
2483.500000	---	46.20	150.0	V	115.0	3.0	54.00	7.80

For Wi-Fi Mode for ESP32-WROVER-IB:

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 ***low channel of 802.11n-HT40 mode in X-axis of orientation*** *was recorded*



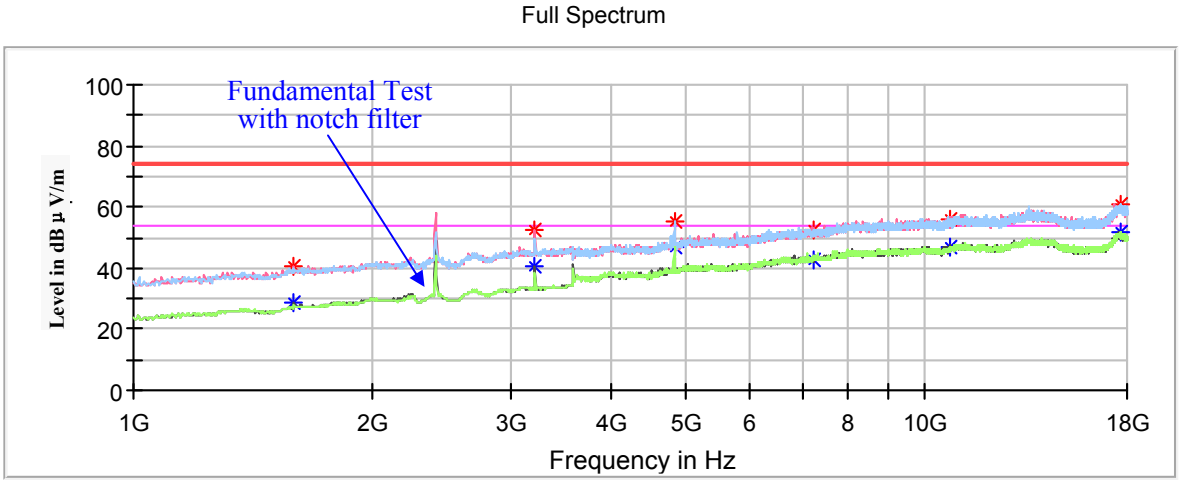
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dBµV/m)	Height (cm)	Polar (H/V)				
36.707150	24.98	101.0	V	77.0	-8.9	40.00	15.02
140.283400	22.95	101.0	V	2.0	-12.4	43.50	20.55
166.505250	26.04	101.0	V	242.0	-13.5	43.50	17.46
299.789250	26.85	199.0	V	146.0	-11.0	46.00	19.15
331.999550	29.05	199.0	V	19.0	-10.2	46.00	16.95
803.383300	30.57	101.0	H	208.0	-1.4	46.00	15.43

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)*

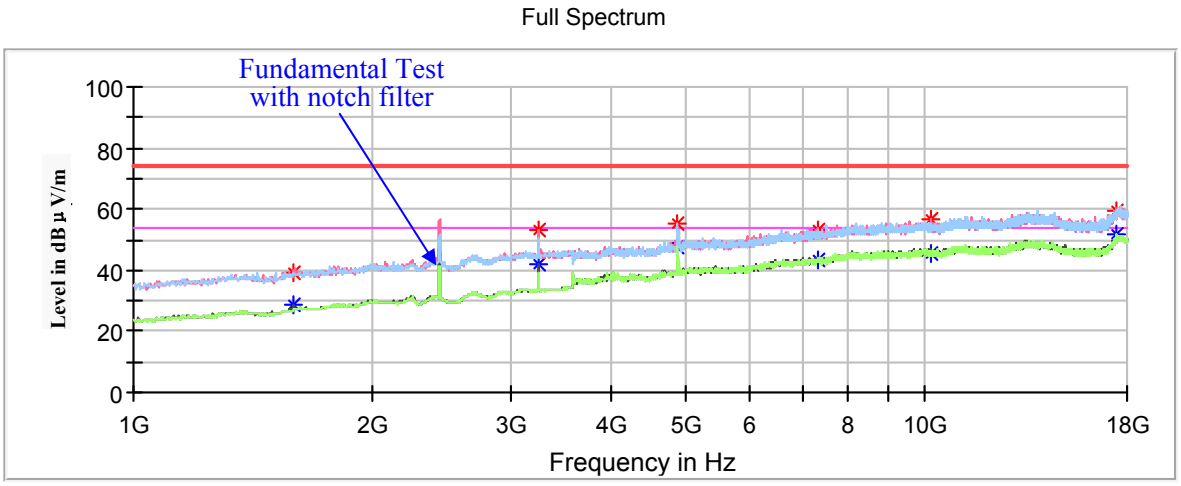
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2412MHz



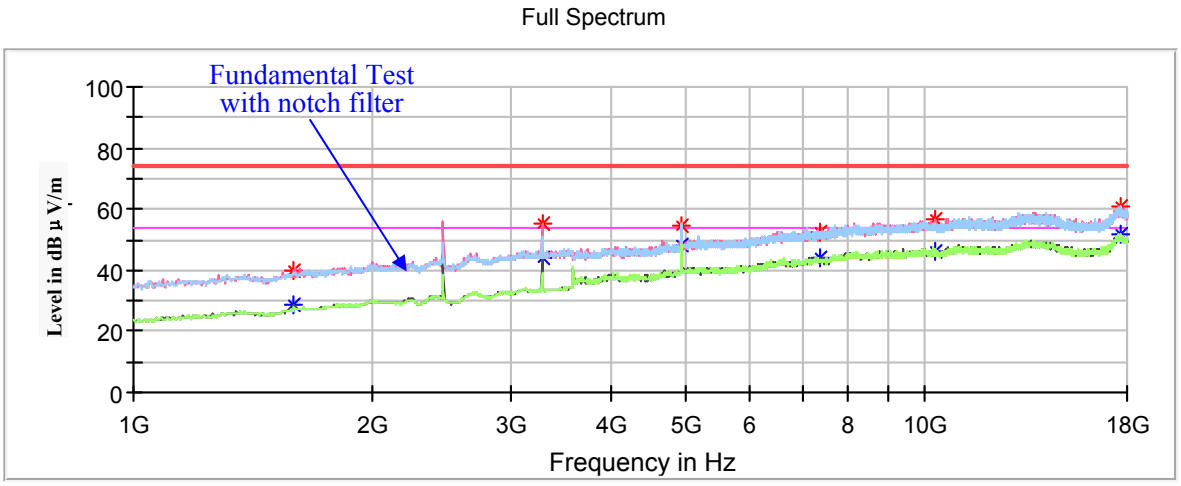
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	40.62	---	200.0	V	23.0	-0.6	74.00	33.38
1595.000000	---	28.35	200.0	V	23.0	-0.6	54.00	25.65
3216.800000	---	49.69	200.0	V	239.0	6.6	54.00	4.31
3216.800000	52.76	---	200.0	V	239.0	6.6	74.00	21.24
4824.000000	55.12	---	150.0	V	199.0	10.8	74.00	18.88
4824.000000	---	47.08	150.0	V	199.0	10.8	54.00	6.92
7236.000000	52.57	---	200.0	V	35.0	15.3	74.00	21.43
7236.000000	---	42.72	200.0	V	35.0	15.3	54.00	11.28
10768.200000	---	46.67	100.0	V	164.0	18.9	54.00	7.33
10768.200000	55.91	---	100.0	V	164.0	18.9	74.00	18.09
17680.400000	60.58	---	200.0	H	358.0	22.9	74.00	13.42
17680.400000	---	51.59	200.0	H	358.0	22.9	54.00	2.41

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)				
1595.000000	39.46	---	150.0	V	187.0	-0.6	74.00	34.54
1595.000000	---	28.37	150.0	V	187.0	-0.6	54.00	25.63
3247.400000	---	49.75	200.0	V	271.0	6.6	54.00	4.25
3247.400000	53.07	---	200.0	V	271.0	6.6	74.00	20.93
4874.000000	55.23	---	200.0	V	199.0	11.1	74.00	18.77
4874.000000	---	47.49	200.0	V	199.0	11.1	54.00	6.51
7311.000000	52.99	---	200.0	V	56.0	15.4	74.00	21.01
7311.000000	---	43.22	200.0	V	56.0	15.4	54.00	10.78
10183.400000	---	45.63	150.0	V	359.0	18.2	54.00	8.37
10183.400000	56.41	---	150.0	V	359.0	18.2	74.00	17.59
17496.800000	59.27	---	150.0	H	60.0	23.1	74.00	14.73
17496.800000	---	51.87	150.0	H	60.0	23.1	54.00	2.13

High Channel: 2462MHz

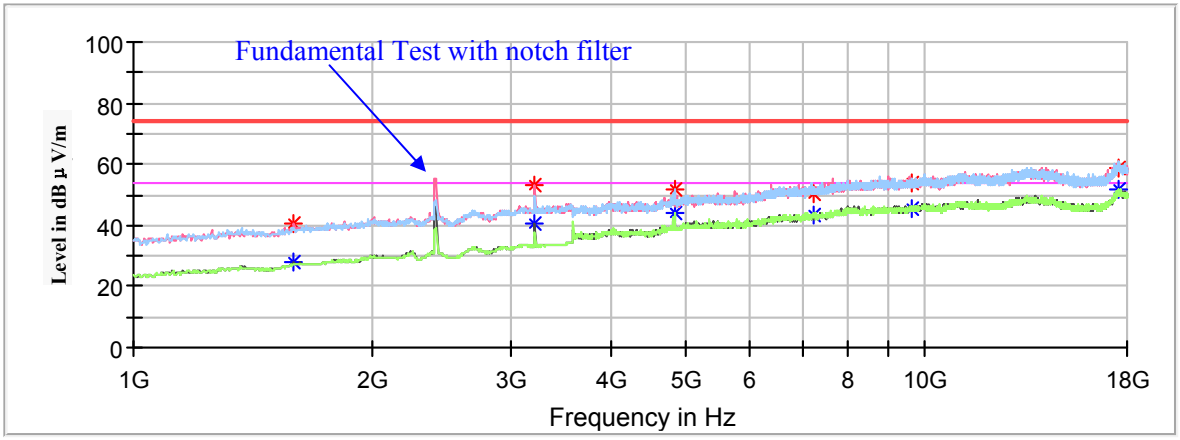


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	39.82	---	200.0	V	199.0	-0.6	74.00	34.18
1595.000000	---	28.43	200.0	V	199.0	-0.6	54.00	25.57
3281.400000	54.46	---	150.0	V	219.0	6.7	74.00	19.54
3281.400000	---	50.26	150.0	V	219.0	6.7	54.00	3.74
4924.000000	---	48.04	200.0	V	304.0	11.3	54.00	5.96
4924.000000	54.42	---	200.0	V	304.0	11.3	74.00	19.58
7386.000000	52.34	---	200.0	V	203.0	15.5	74.00	21.66
7386.000000	---	43.74	200.0	V	203.0	15.5	54.00	10.26
10329.600000	---	45.91	150.0	V	124.0	18.1	54.00	8.09
10329.600000	56.44	---	150.0	V	124.0	18.1	74.00	17.56
17687.200000	60.64	---	150.0	H	35.0	22.9	74.00	13.36
17687.200000	---	51.82	150.0	H	35.0	22.9	54.00	2.18

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

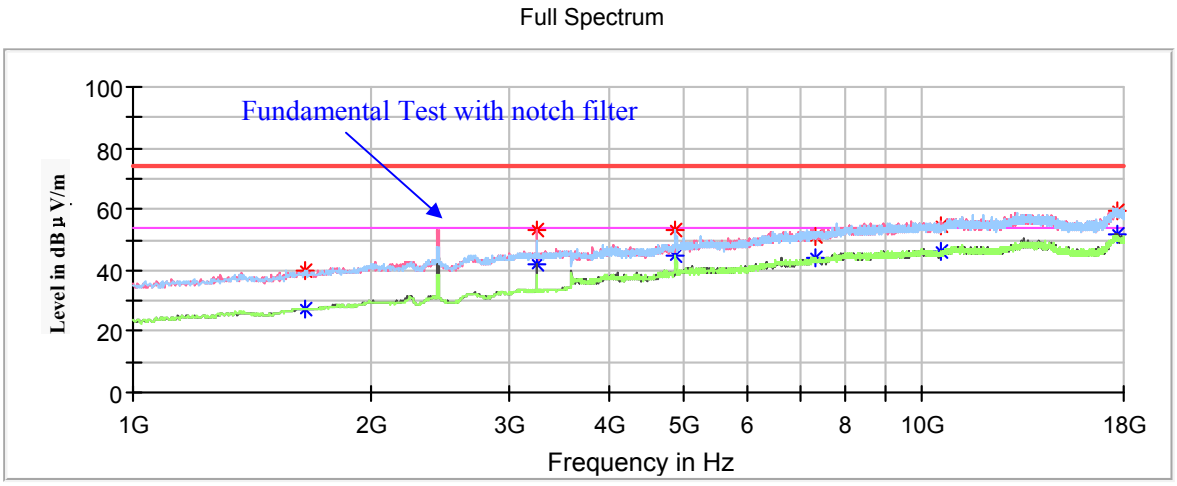
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2412MHz



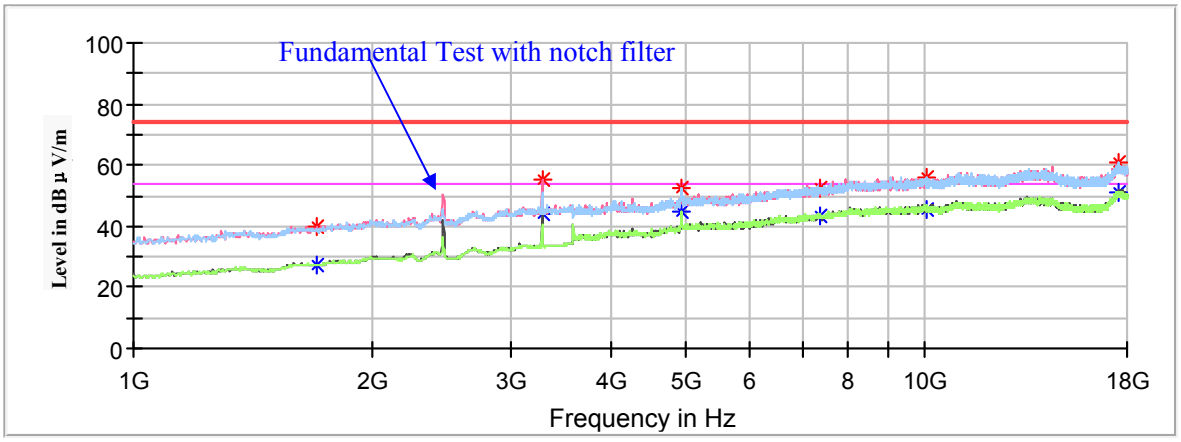
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	40.30	---	200.0	V	198.0	-0.6	74.00	33.70
1595.000000	---	28.15	200.0	V	198.0	-0.6	54.00	25.85
3216.800000	---	49.44	200.0	V	246.0	6.6	54.00	4.56
3216.800000	52.90	---	200.0	V	246.0	6.6	74.00	21.10
4824.000000	51.52	---	150.0	V	215.0	10.8	74.00	22.48
4824.000000	---	43.99	150.0	V	215.0	10.8	54.00	10.01
7236.000000	50.32	---	200.0	V	194.0	15.3	74.00	23.68
7236.000000	---	43.24	200.0	V	194.0	15.3	54.00	10.76
9602.000000	---	45.72	200.0	V	56.0	17.9	54.00	8.28
9605.400000	53.65	---	200.0	V	56.0	17.9	74.00	20.35
17598.800000	58.56	---	200.0	H	257.0	23.0	74.00	15.44
17598.800000	---	51.48	200.0	H	257.0	23.0	54.00	2.52

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)				
1652.800000	---	27.25	150.0	H	355.0	-0.2	54.00	26.75
1652.800000	39.81	---	150.0	H	355.0	-0.2	74.00	34.19
3247.400000	---	49.79	150.0	V	67.0	6.6	54.00	4.21
3247.400000	53.23	---	150.0	V	67.0	6.6	74.00	20.77
4874.000000	52.97	---	200.0	V	229.0	11.1	74.00	21.03
4874.000000	---	44.60	200.0	V	229.0	11.1	54.00	9.40
7311.000000	51.29	---	150.0	V	24.0	15.4	74.00	22.71
7311.000000	---	43.95	150.0	V	24.0	15.4	54.00	10.05
10564.200000	54.31	---	100.0	V	145.0	18.2	74.00	19.69
10564.200000	---	46.20	100.0	V	145.0	18.2	54.00	7.80
17660.000000	59.73	---	150.0	V	355.0	22.9	74.00	14.27
17660.000000	---	51.48	150.0	V	355.0	22.9	54.00	2.52

High Channel: 2462MHz

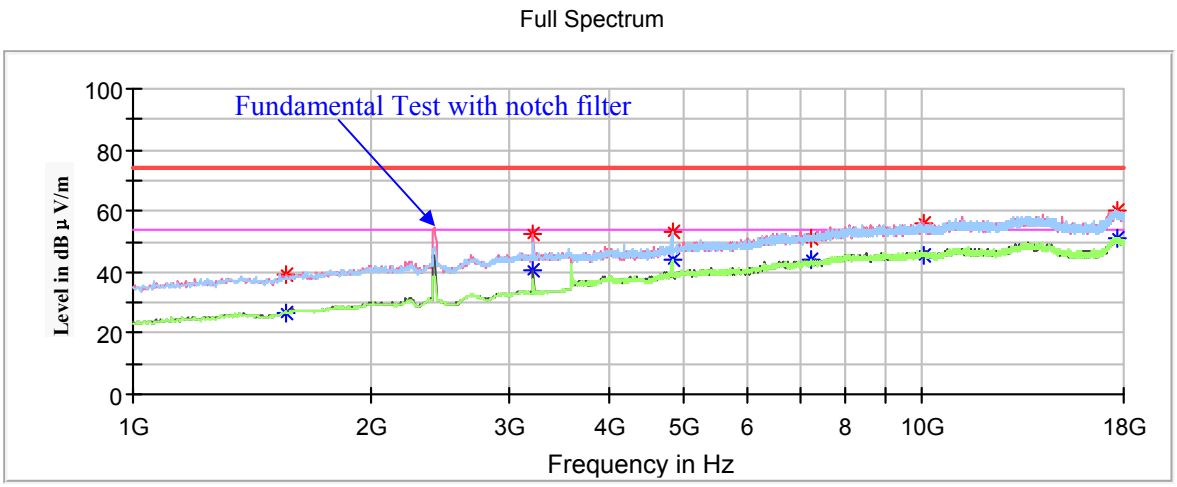


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1707.200000	40.04	---	200.0	V	13.0	0.2	74.00	33.96
1707.200000	---	27.30	200.0	V	13.0	0.2	54.00	26.70
3281.400000	54.02	---	200.0	V	45.0	6.7	74.00	19.98
3281.400000	---	50.33	200.0	V	45.0	6.7	54.00	3.67
4924.000000	---	44.69	150.0	V	240.0	11.3	54.00	9.31
4924.000000	52.40	---	150.0	V	240.0	11.3	74.00	21.60
7386.000000	52.13	---	200.0	V	346.0	15.5	74.00	21.87
7386.000000	---	43.25	200.0	V	346.0	15.5	54.00	10.75
10040.600000	---	45.69	150.0	V	13.0	18.3	54.00	8.31
10044.000000	56.01	---	150.0	V	13.0	18.3	74.00	17.99
17578.400000	---	50.91	150.0	H	219.0	23.0	54.00	3.09
17578.400000	60.76	---	150.0	H	219.0	23.0	74.00	13.24

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

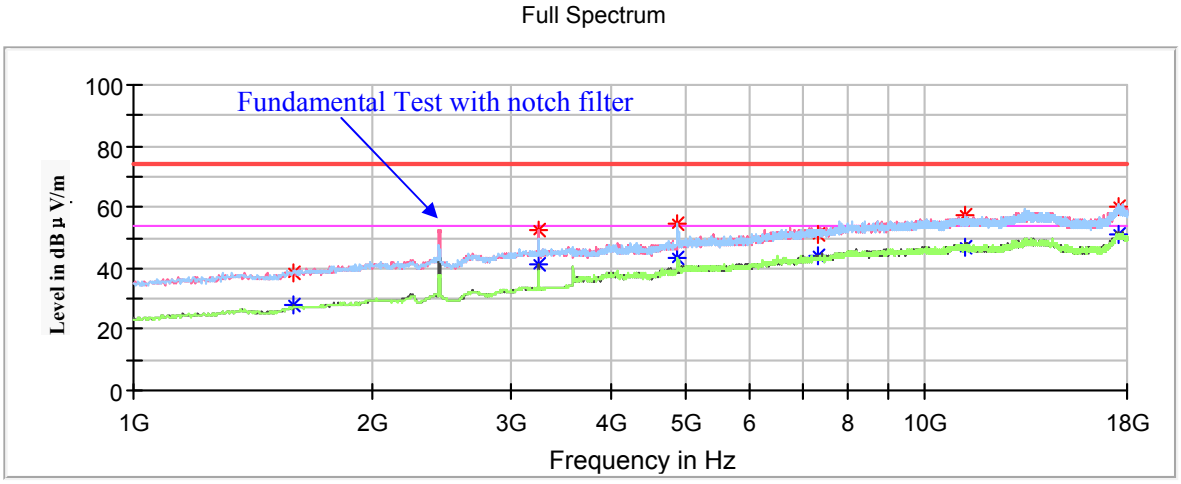
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2412MHz



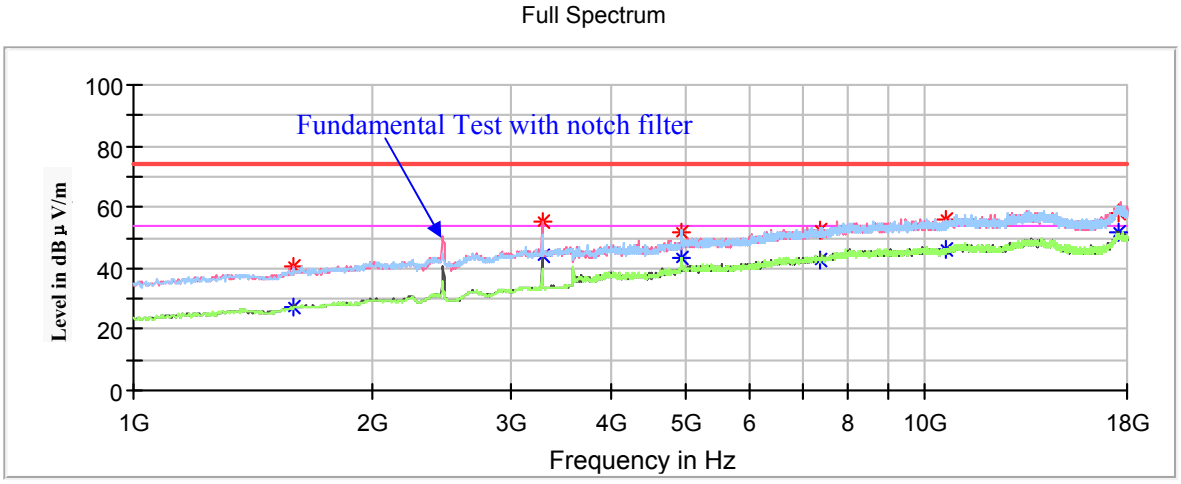
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1567.800000	---	26.73	200.0	V	77.0	-0.8	54.00	27.27
1567.800000	38.88	---	200.0	V	77.0	-0.8	74.00	35.12
3216.800000	---	49.44	150.0	V	240.0	6.6	54.00	4.56
3216.800000	52.26	---	150.0	V	240.0	6.6	74.00	21.74
4824.000000	53.02	---	200.0	V	205.0	10.8	74.00	20.98
4824.000000	---	44.23	200.0	V	205.0	10.8	54.00	9.77
7236.000000	50.80	---	200.0	V	120.0	15.3	74.00	23.20
7236.000000	---	44.38	200.0	V	120.0	15.3	54.00	9.62
10050.800000	---	45.48	150.0	V	293.0	18.3	54.00	8.52
10050.800000	56.20	---	150.0	V	293.0	18.3	74.00	17.80
17717.800000	59.86	---	150.0	H	262.0	22.8	74.00	14.14
17717.800000	---	51.37	150.0	H	262.0	22.8	54.00	2.63

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)				
1595.000000	---	27.89	200.0	V	258.0	-0.6	54.00	26.11
1595.000000	38.71	---	200.0	V	258.0	-0.6	74.00	35.29
3247.400000	52.58	---	200.0	V	279.0	6.6	74.00	21.42
3247.400000	---	49.51	200.0	V	279.0	6.6	54.00	4.49
4874.000000	---	43.65	200.0	V	213.0	11.1	54.00	10.35
4874.000000	54.45	---	200.0	V	213.0	11.1	74.00	19.55
7311.000000	51.18	---	150.0	V	67.0	15.4	74.00	22.82
7311.000000	---	44.22	150.0	V	67.0	15.4	54.00	9.78
11220.400000	---	46.89	150.0	V	359.0	19.5	54.00	7.11
11220.400000	57.09	---	150.0	V	359.0	19.5	74.00	16.91
17598.800000	---	51.27	100.0	H	204.0	23.0	54.00	2.73
17598.800000	60.24	---	100.0	H	204.0	23.0	74.00	13.76

High Channel: 2462MHz

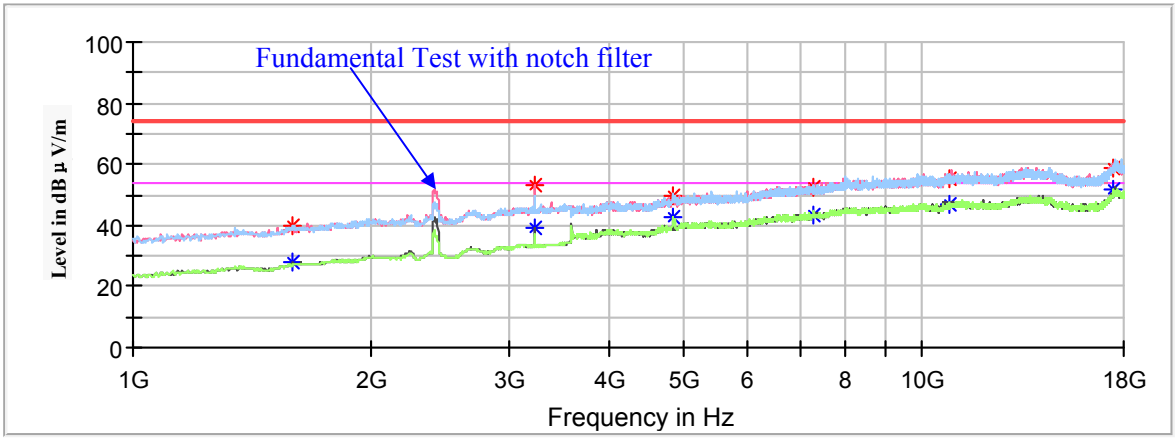


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	27.57	150.0	V	225.0	-0.6	54.00	26.43
1591.600000	40.41	---	150.0	V	225.0	-0.6	74.00	33.59
3281.400000	---	50.40	150.0	V	204.0	6.7	54.00	3.60
3281.400000	54.31	---	150.0	V	204.0	6.7	74.00	18.69
4924.000000	51.69	---	150.0	V	208.0	11.3	74.00	22.31
4924.000000	---	43.13	150.0	V	208.0	11.3	54.00	10.87
7386.000000	---	42.82	200.0	V	342.0	15.5	54.00	11.18
7386.000000	52.41	---	200.0	V	342.0	15.5	74.00	21.59
10656.000000	---	46.27	150.0	V	0.0	18.5	54.00	7.73
10656.000000	55.63	---	150.0	V	0.0	18.5	74.00	18.37
17534.200000	58.07	---	100.0	H	173.0	23.1	74.00	15.93
17534.200000	---	51.56	100.0	H	173.0	23.1	54.00	2.44

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 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

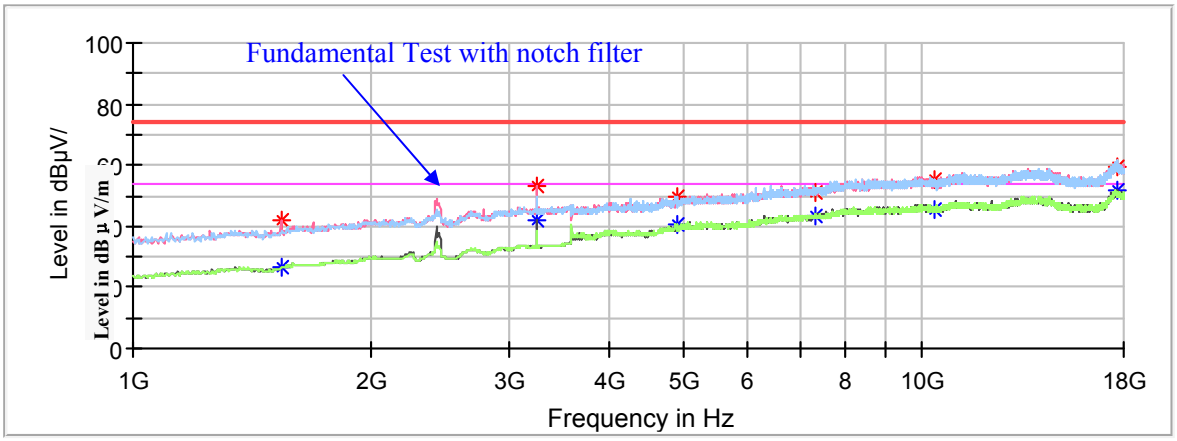
Low Channel: 2422MHz



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)				
1595.000000	---	28.29	200.0	V	33.0	-0.6	54.00	25.71
1595.000000	39.89	---	200.0	V	33.0	-0.6	74.00	34.11
3230.400000	---	49.44	200.0	V	44.0	6.6	54.00	4.56
3230.400000	53.06	---	200.0	V	44.0	6.6	74.00	20.94
4844.000000	49.73	---	100.0	V	172.0	10.9	74.00	24.27
4844.000000	---	42.38	100.0	V	172.0	10.9	54.00	11.62
7266.000000	52.61	---	100.0	V	290.0	15.3	74.00	21.39
7266.000000	---	43.35	100.0	V	290.0	15.3	54.00	10.65
10802.200000	55.13	---	100.0	V	216.0	19.0	74.00	18.87
10802.200000	---	46.60	100.0	V	216.0	19.0	54.00	7.40
17503.600000	58.53	---	150.0	H	197.0	23.2	74.00	15.47
17503.600000	---	51.40	150.0	H	197.0	23.2	54.00	2.60

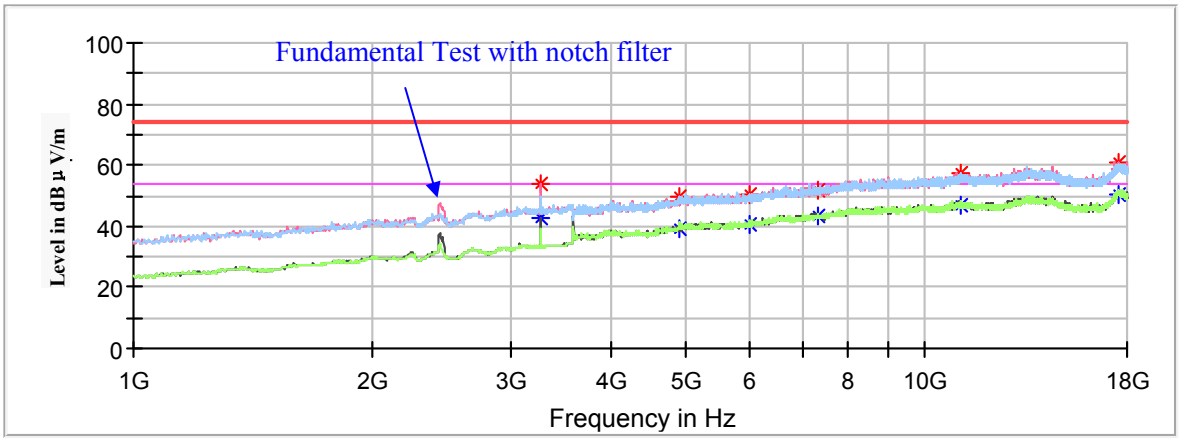
Middle Channel: 2437MHz

Full Spectrum



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)				
1540.600000	---	26.42	100.0	V	145.0	-1.0	54.00	27.58
1540.600000	41.98	---	100.0	V	145.0	-1.0	74.00	32.02
3247.400000	53.13	---	100.0	V	135.0	6.6	74.00	20.87
3247.400000	---	49.25	100.0	V	135.0	6.6	54.00	4.75
4874.000000	49.73	---	200.0	V	219.0	11.2	74.00	24.27
4874.000000	---	40.24	200.0	V	219.0	11.2	54.00	13.76
7311.000000	---	43.45	150.0	V	355.0	15.4	54.00	10.55
7311.000000	51.21	---	150.0	V	355.0	15.4	74.00	22.79
10390.800000	55.20	---	200.0	V	113.0	18.1	74.00	18.80
10390.800000	---	45.17	200.0	V	113.0	18.1	54.00	8.83
17643.000000	59.71	---	200.0	H	124.0	22.9	74.00	14.29
17643.000000	---	51.70	200.0	H	124.0	22.9	54.00	2.30

High Channel: 2452MHz

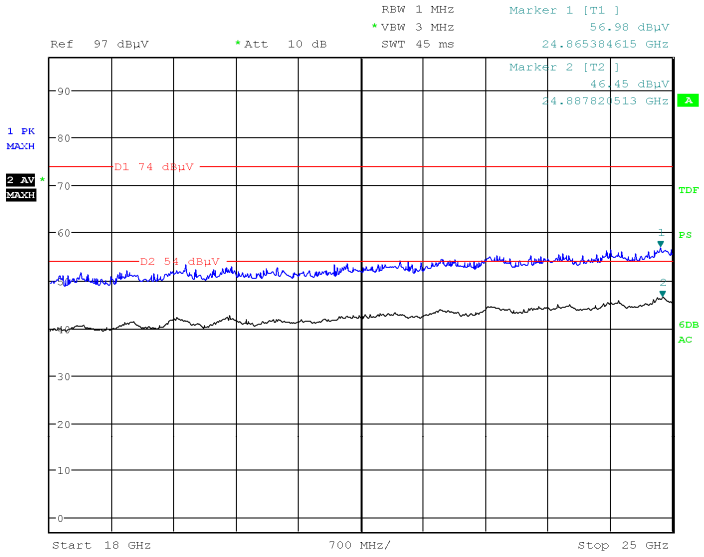


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
3267.800000	---	49.62	150.0	V	114.0	6.7	54.00	4.38
3267.800000	53.53	---	150.0	V	114.0	6.7	74.00	20.47
4904.000000	---	39.51	100.0	H	141.0	11.2	54.00	14.49
4904.000000	49.47	---	100.0	H	141.0	11.2	74.00	24.53
5998.000000	---	40.45	200.0	V	25.0	12.9	54.00	13.55
5998.000000	50.20	---	200.0	V	25.0	12.9	74.00	23.80
7356.000000	---	43.57	100.0	V	124.0	15.4	54.00	10.43
7356.000000	52.05	---	100.0	V	124.0	15.4	74.00	21.95
11084.400000	---	46.61	100.0	V	162.0	19.6	54.00	7.39
11084.400000	57.21	---	100.0	V	162.0	19.6	74.00	16.79
17534.200000	---	50.63	150.0	V	67.0	23.1	54.00	3.37
17534.200000	60.65	---	150.0	V	67.0	23.1	74.00	13.35

18GHz-25GHz:

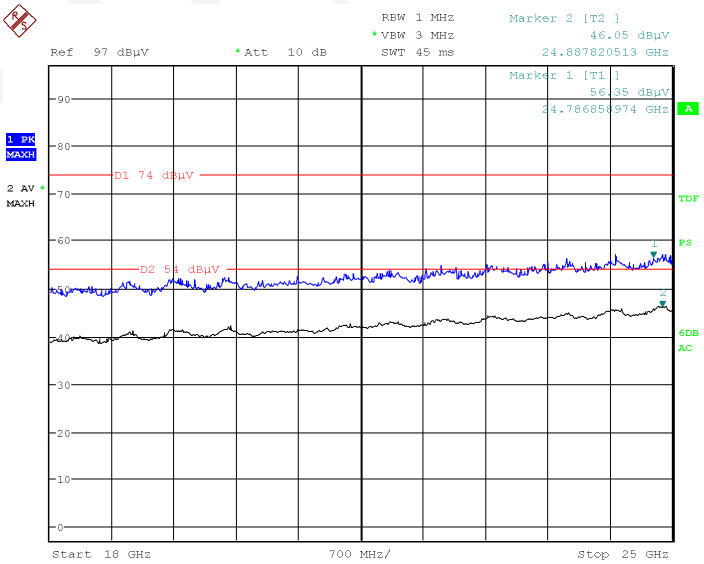
*Pre-scan with 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case **low channel of 802.11n-HT40 mode in X-axis of orientation** was recorded*

Horizontal



Date: 2.JUN.2018 19:06:16

Vertical



Date: 1.JUN.2018 09:35:46

Fundamental Test & Restricted Bands Emissions Test:

Note:
1. The test is performed with a 10dB Attenuator.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor + Attenuator
   Corrected Amplitude = Corrected Factor + Reading
   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	---	104.78	200.0	V	184.0	12.9	/	/
2412.000000	112.25	---	200.0	V	184.0	12.9	/	/
2412.000000	---	101.46	200.0	H	112.0	12.9	/	/
2412.000000	109.73	---	200.0	H	112.0	12.9	/	/
2390.000000	52.61	---	100.0	V	262.0	12.9	74.00	21.39
2390.000000	---	44.22	100.0	V	262.0	12.9	54.00	9.78
Middle Channel: 2437MHz								
2437.000000	---	104.58	200.0	V	173.0	12.9	/	/
2437.000000	112.42	---	200.0	V	173.0	12.9	/	/
2437.000000	---	101.45	150.0	H	110.0	12.9	/	/
2437.000000	109.28	---	150.0	H	110.0	12.9	/	/
High Channel: 2462MHz								
2462.000000	---	103.75	150.0	V	91.0	13.0	/	/
2462.000000	111.26	---	150.0	V	91.0	13.0	/	/
2462.000000	---	100.38	200.0	H	118.0	13.0	/	/
2462.000000	108.42	---	200.0	H	118.0	13.0	/	/
2483.500000	52.81	---	150.0	V	210.0	13.0	74.00	21.19
2483.500000	---	44.92	150.0	V	210.0	13.0	54.00	9.08

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	---	97.33	150.0	V	327.0	12.9	/	/
2412.000000	105.88	---	150.0	V	327.0	12.9	/	/
2412.000000	---	94.37	200.0	H	189.0	12.9	/	/
2412.000000	102.71	---	200.0	H	189.0	12.9	/	/
2390.000000	55.64	---	100.0	V	218.0	12.9	74.00	18.36
2390.000000	---	47.21	100.0	V	218.0	12.9	54.00	6.79
Middle Channel: 2437MHz								
2437.000000	105.56	---	150.0	V	175.0	12.9	/	/
2437.000000	---	97.25	150.0	V	175.0	12.9	/	/
2437.000000	102.07	---	200.0	H	230.0	12.9	/	/
2437.000000	---	94.29	200.0	H	230.0	12.9	/	/
High Channel: 2462MHz								
2462.000000	---	96.46	250.0	V	327.0	13.0	/	/
2462.000000	104.07	---	250.0	V	327.0	13.0	/	/
2462.000000	---	93.60	150.0	H	231.0	13.0	/	/
2462.000000	101.13	---	150.0	H	231.0	13.0	/	/
2483.500000	58.72	---	200.0	V	259.0	13.0	74.00	15.28
2483.500000	---	50.86	200.0	V	259.0	13.0	54.00	3.14

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	---	97.82	100.0	V	220.0	12.9	/	/
2412.000000	105.07	---	100.0	V	220.0	12.9	/	/
2412.000000	---	94.56	200.0	H	289.0	12.9	/	/
2412.000000	102.72	---	200.0	H	289.0	12.9	/	/
2390.000000	56.74	---	100.0	V	278.0	12.9	74.00	17.26
2390.000000	---	49.29	100.0	V	278.0	12.9	54.00	4.71
Middle Channel: 2437MHz								
2437.000000	105.06	---	150.0	V	275.0	12.9	/	/
2437.000000	---	97.78	150.0	V	275.0	12.9	/	/
2437.000000	102.22	---	200.0	H	259.0	12.9	/	/
2437.000000	---	94.20	200.0	H	259.0	12.9	/	/
High Channel: 2462MHz								
2462.000000	---	96.35	200.0	V	165.0	13.0	/	/
2462.000000	104.85	---	200.0	V	165.0	13.0	/	/
2462.000000	---	93.08	200.0	H	223.0	13.0	/	/
2462.000000	101.29	---	200.0	H	223.0	13.0	/	/
2483.500000	59.30	---	150.0	V	290.0	13.0	74.00	14.70
2483.500000	---	49.04	150.0	V	290.0	13.0	54.00	4.96

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

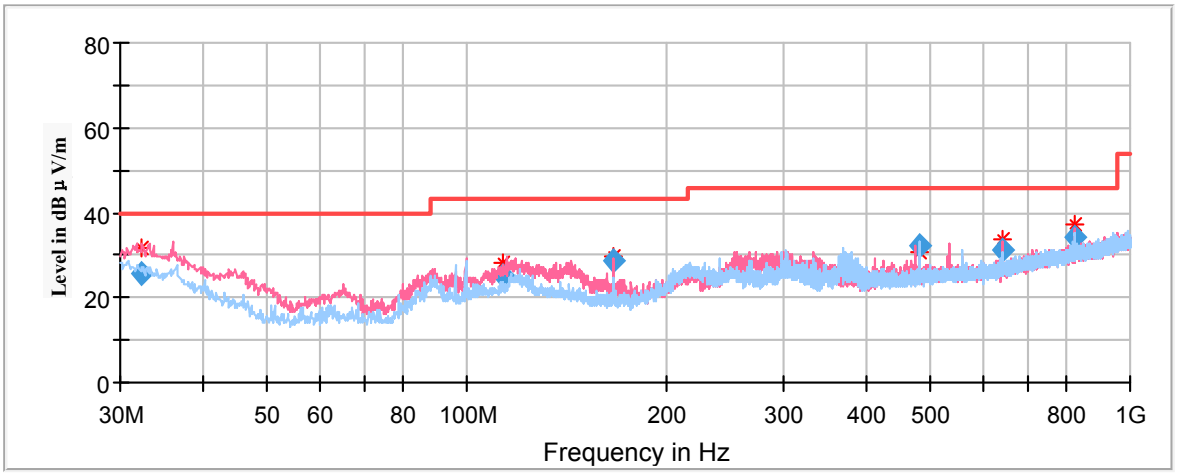
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2422MHz								
2422.000000	---	95.85	200.0	V	192.0	12.9	/	/
2422.000000	103.71	---	200.0	V	192.0	12.9	/	/
2422.000000	---	92.62	150.0	H	290.0	12.9	/	/
2422.000000	100.69	---	150.0	H	290.0	12.9	/	/
2390.000000	58.34	---	200.0	V	244.0	12.9	74.00	15.66
2390.000000	---	50.51	200.0	V	244.0	12.9	54.00	3.49
Middle Channel: 2437MHz								
2437.000000	102.37	---	200.0	V	165.0	12.9	/	/
2437.000000	---	94.49	200.0	V	165.0	12.9	/	/
2437.000000	99.72	---	250.0	H	256.0	12.9	/	/
2437.000000	---	91.95	250.0	H	256.0	12.9	/	/
High Channel: 2452MHz								
2452.000000	99.87	---	250.0	V	172.0	13.0	/	/
2452.000000	---	91.08	250.0	V	172.0	13.0	/	/
2452.000000	---	88.64	200.0	H	84.0	13.0	/	/
2452.000000	96.43	---	200.0	H	84.0	13.0	/	/
2483.500000	---	50.64	200.0	V	119.0	13.0	54.00	3.36
2483.500000	60.05	---	200.0	V	119.0	13.0	74.00	13.95

For BLE Mode for ESP32-WROVER-IB:

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 **high channel of operation in the X axis of orientation** was recorded)*



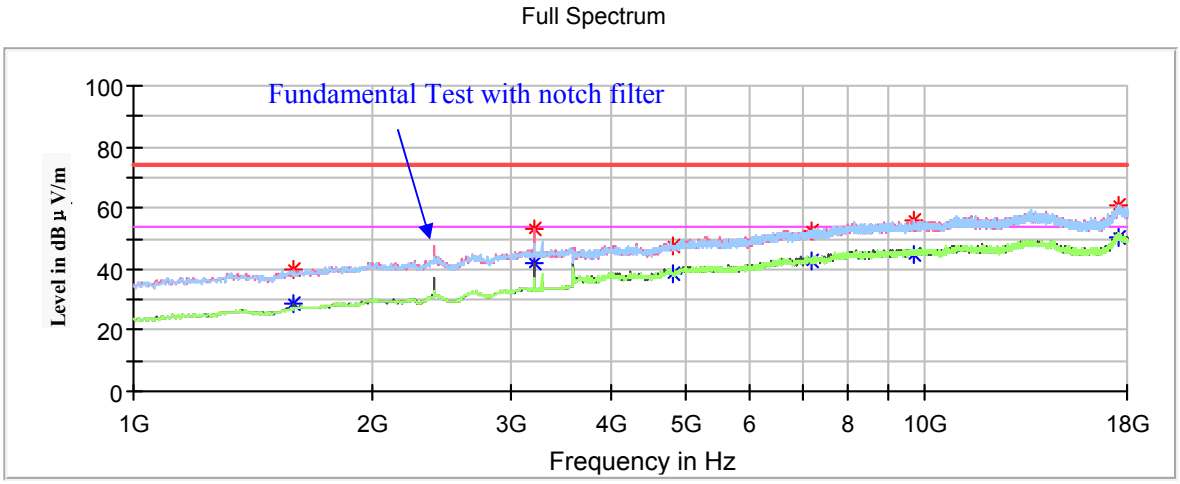
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dB µ V/m)	Height (cm)	Polar (H/V)				
32.214150	25.85	101.0	V	123.0	-5.9	40.00	14.15
113.585800	24.96	101.0	V	359.0	-12.8	43.50	18.54
166.508600	28.60	101.0	V	215.0	-13.5	43.50	14.90
480.003800	31.99	199.0	H	315.0	-6.6	46.00	14.01
640.002750	31.42	101.0	V	304.0	-4.5	46.00	14.58
826.663300	34.16	199.0	V	231.0	-1.0	46.00	11.84

1GHz-18GHz

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

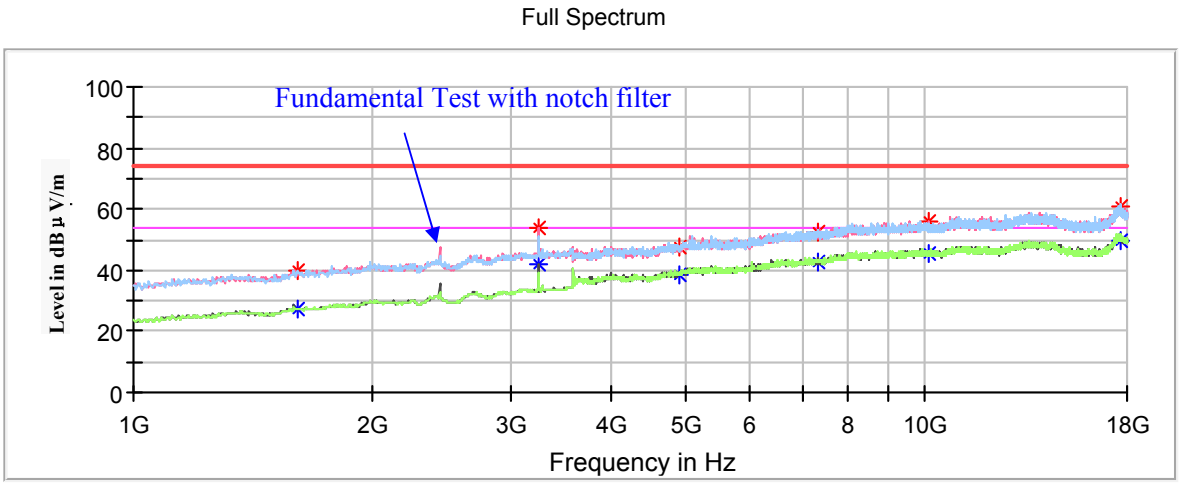
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude

Low Channel: 2402MHz



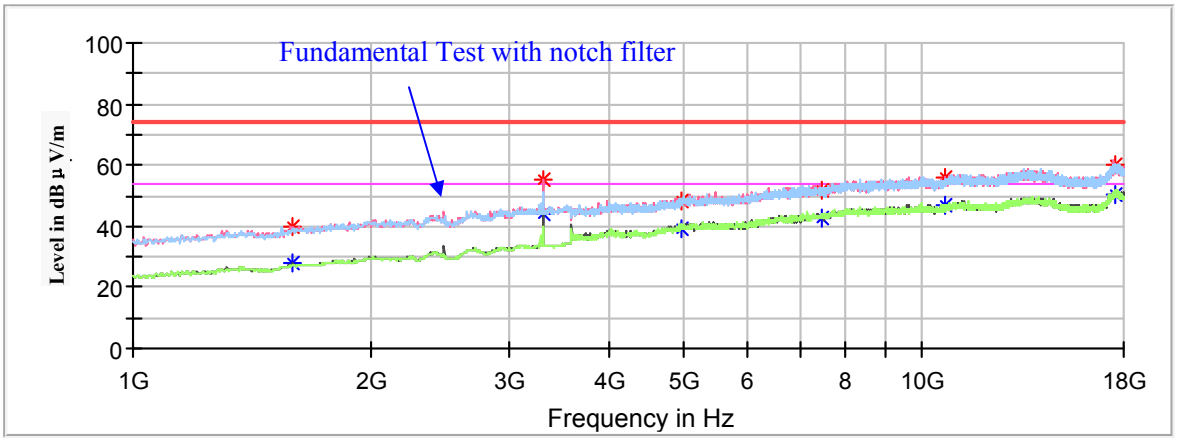
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	28.41	200.0	V	23.0	-0.6	54.00	25.59
1595.000000	40.13	---	200.0	V	23.0	-0.6	74.00	33.87
3203.200000	---	49.94	150.0	V	70.0	6.5	54.00	4.06
3203.200000	53.22	---	150.0	V	70.0	6.5	74.00	20.78
4804.000000	---	38.51	150.0	V	216.0	10.7	54.00	15.49
4804.000000	47.90	---	150.0	V	216.0	10.7	74.00	26.10
7206.000000	---	42.48	150.0	V	39.0	15.2	54.00	11.52
7206.000000	52.14	---	150.0	V	39.0	15.2	74.00	21.86
9676.800000	---	44.90	200.0	V	1.0	18.0	54.00	9.10
9676.800000	55.76	---	200.0	V	1.0	18.0	74.00	18.24
17564.800000	---	50.65	150.0	H	279.0	23.1	54.00	3.35
17564.800000	60.80	---	150.0	H	279.0	23.1	74.00	13.20

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)				
1608.600000	---	27.13	150.0	H	279.0	-0.5	54.00	26.87
1608.600000	40.02	---	150.0	H	279.0	-0.5	74.00	33.98
3250.800000	---	50.23	150.0	V	77.0	6.6	54.00	3.77
3250.800000	54.01	---	150.0	V	77.0	6.6	74.00	19.99
4880.000000	---	38.64	150.0	V	268.0	11.1	54.00	15.36
4880.000000	47.84	---	150.0	V	268.0	11.1	74.00	26.16
7320.000000	---	42.70	150.0	V	131.0	15.4	54.00	11.30
7320.000000	52.39	---	150.0	V	131.0	15.4	74.00	21.61
10084.800000	---	45.28	100.0	V	120.0	18.3	54.00	8.72
10084.800000	56.09	---	100.0	V	120.0	18.3	74.00	17.91
17680.400000	---	49.86	150.0	V	140.0	22.9	54.00	4.14
17680.400000	60.70	---	150.0	V	140.0	22.9	74.00	13.30

High Channel: 2480MHz

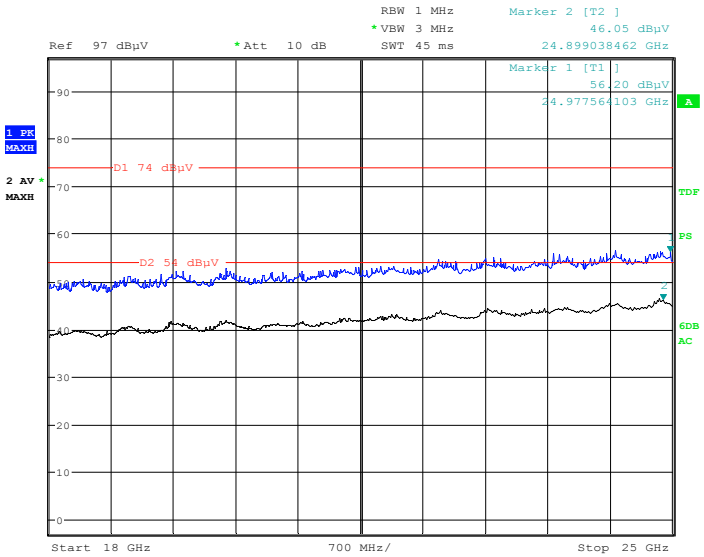


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	40.06	---	200.0	V	14.0	-0.6	74.00	33.94
1595.000000	---	28.00	200.0	V	14.0	-0.6	54.00	26.00
3305.200000	---	50.12	150.0	V	67.0	6.8	54.00	3.88
3305.200000	54.32	---	150.0	V	67.0	6.8	74.00	19.68
4960.000000	---	39.49	150.0	V	240.0	11.5	54.00	14.51
4960.000000	48.59	---	150.0	V	240.0	11.5	74.00	25.41
7440.000000	---	42.45	200.0	V	46.0	15.6	54.00	11.55
7440.000000	51.79	---	200.0	V	46.0	15.6	74.00	22.21
10683.200000	---	46.69	150.0	V	67.0	18.6	54.00	7.31
10683.200000	56.04	---	150.0	V	67.0	18.6	74.00	17.96
17602.200000	---	50.66	150.0	H	272.0	23.0	54.00	3.34
17602.200000	60.05	---	150.0	H	272.0	23.0	74.00	13.95

18GHz-25GHz

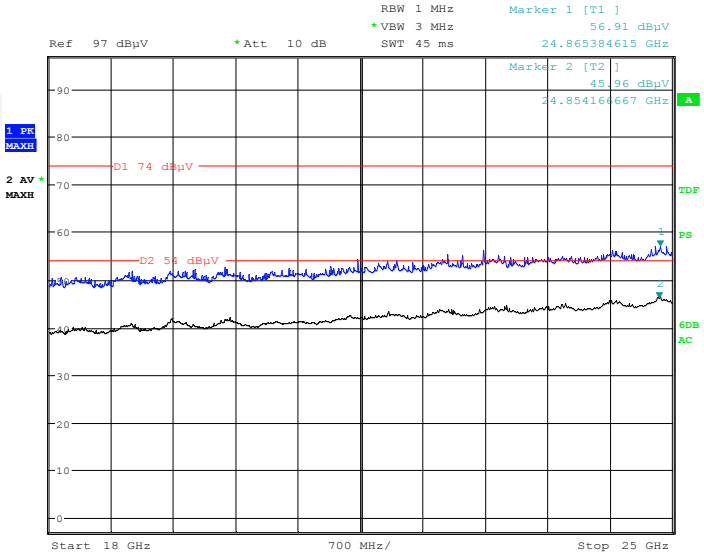
*(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **high channel of operation in the X axis of orientation** was recorded)*

Horizontal Plot



Date: 6.JUN.2018 14:26:47

Vertical Plot



Date: 6.JUN.2018 14:20:56

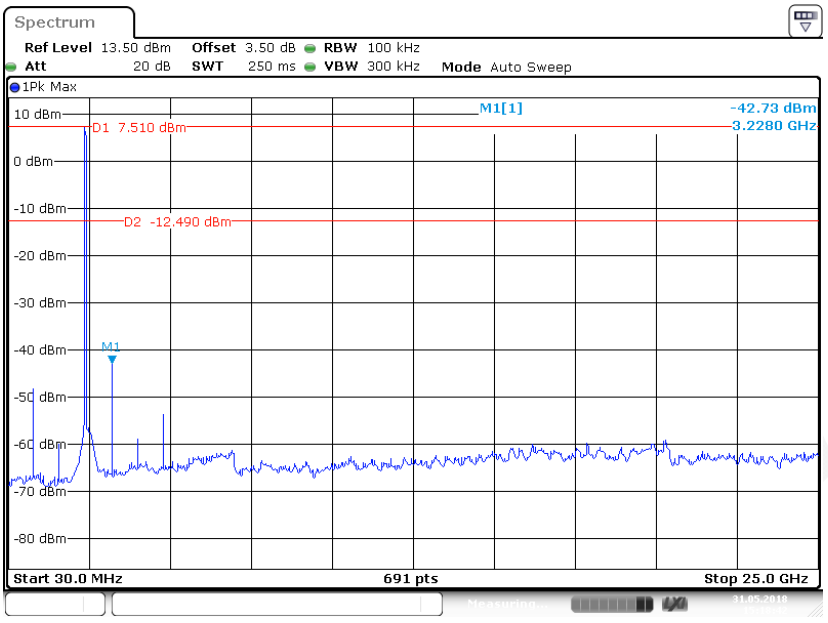
Fundamental Test & Restricted Bands Emissions Test:
*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)*

Note:
1. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   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: 2402MHz								
2402.000000	95.43	---	200.0	V	88.0	2.9	/	/
2402.000000	---	93.93	200.0	V	88.0	2.9	/	/
2402.000000	92.89	---	200.0	H	312.0	2.9	/	/
2402.000000	---	90.15	200.0	H	312.0	2.9	/	/
2390.000000	47.65	---	200.0	V	249.0	2.9	74.00	26.35
2390.000000	---	38.09	200.0	V	249.0	2.9	54.00	15.91
Middle Channel: 2440MHz								
2440.000000	96.44	---	200.0	V	223.0	2.9	/	/
2440.000000	---	94.23	200.0	V	223.0	2.9	/	/
2440.000000	92.65	---	150.0	H	156.0	2.9	/	/
2440.000000	---	91.71	150.0	H	156.0	2.9	/	/
High Channel: 2480MHz								
2480.000000	---	95.08	150.0	V	242.0	3.0	/	/
2480.000000	97.67	---	150.0	V	242.0	3.0	/	/
2480.000000	94.32	---	150.0	H	242.0	3.0	/	/
2480.000000	---	92.47	150.0	H	242.0	3.0	/	/
2483.500000	---	45.93	200.0	V	183.0	3.0	54.00	8.07
2483.500000	54.46	---	200.0	V	183.0	3.0	74.00	19.54

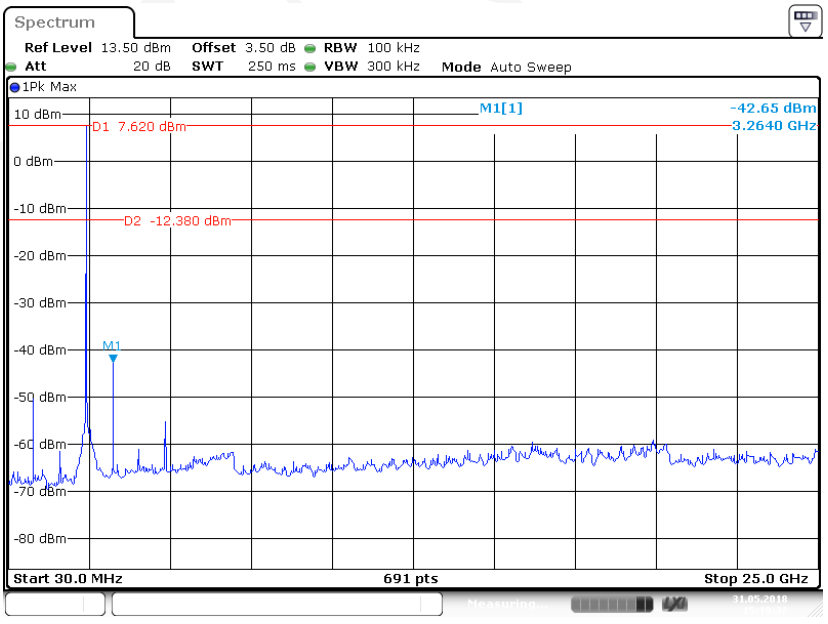
Conducted Spurious Emissions at Antenna Port

802.11b Mode Low Channel



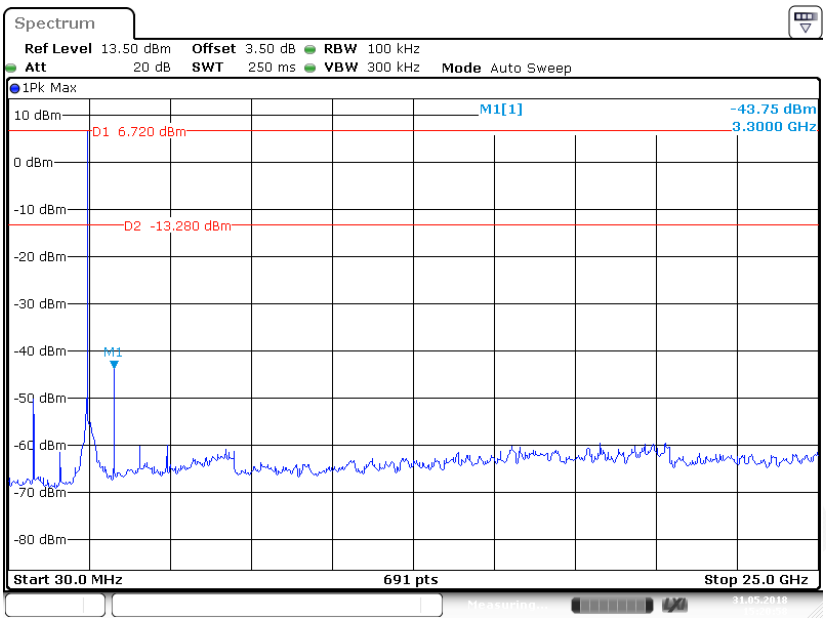
Date: 31.MAY.2018 15:18:42

802.11b Mode Middle Channel



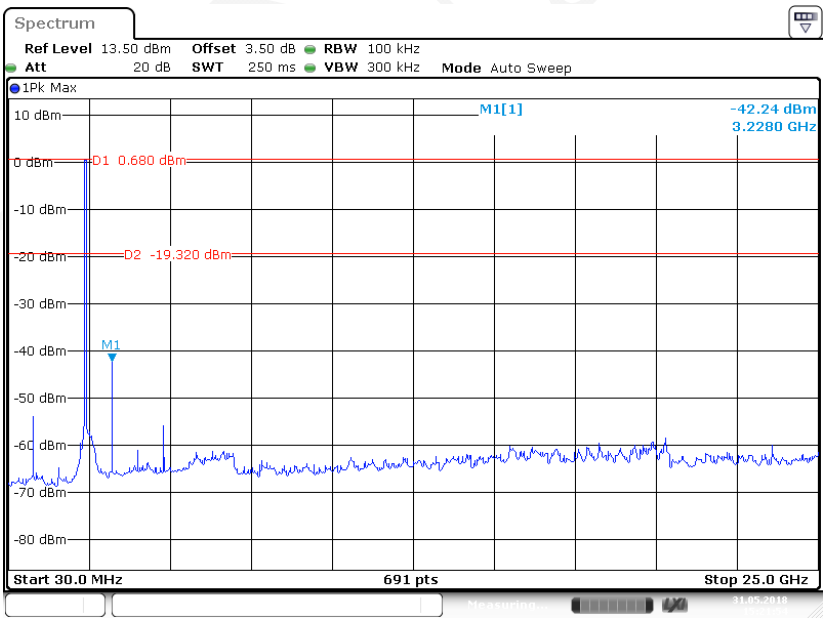
Date: 31.MAY.2018 15:19:32

802.11b Mode High Channel



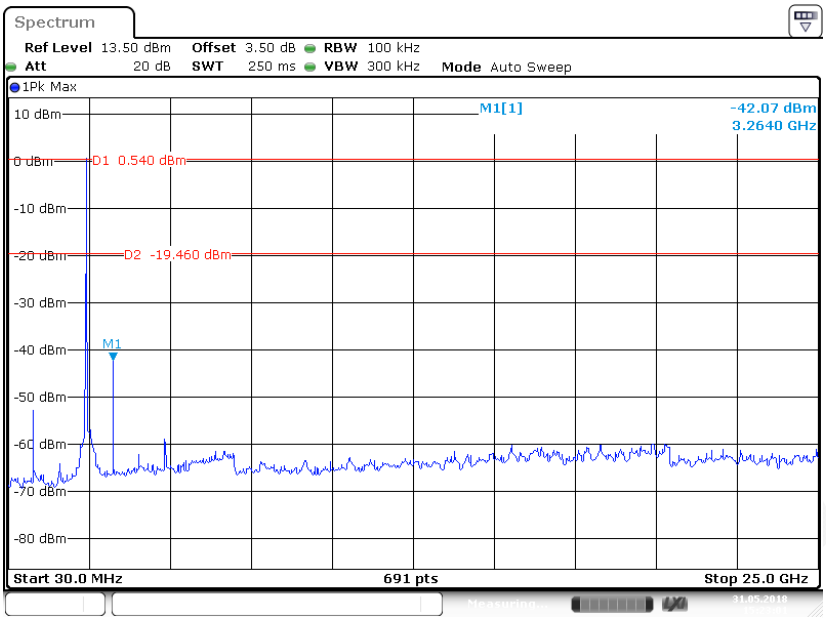
Date: 31.MAY.2018 15:20:58

802.11g Mode Low Channel



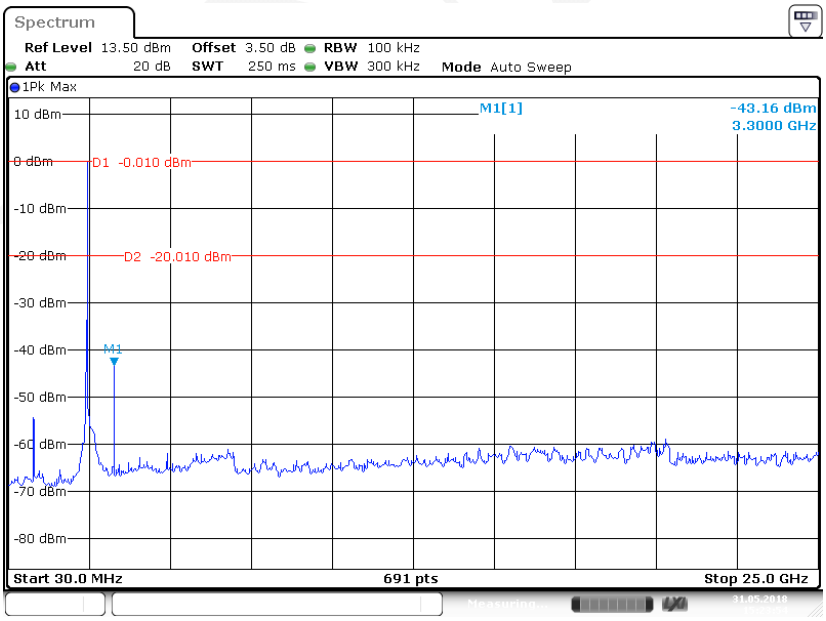
Date: 31.MAY.2018 15:21:54

802.11g Mode Middle Channel



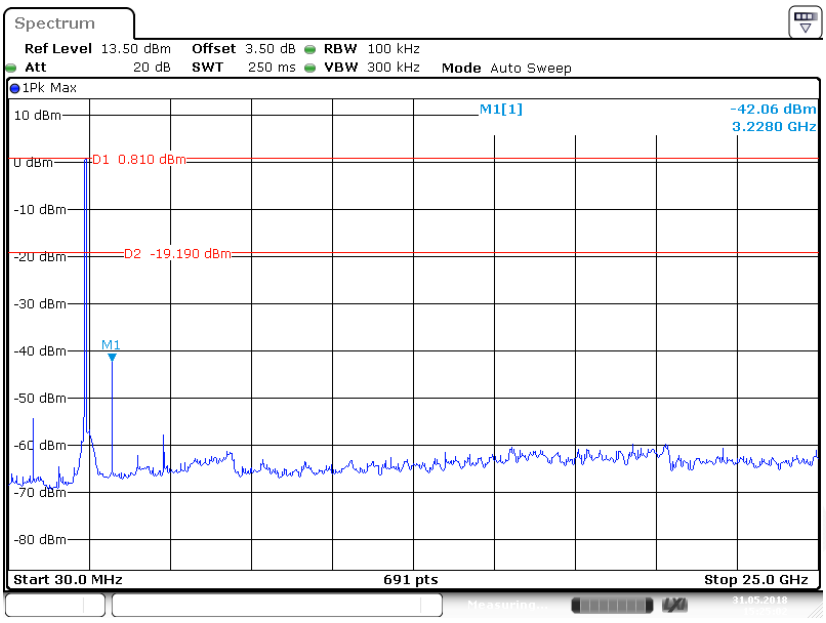
Date: 31.MAY.2018 15:23:02

802.11g Mode High Channel



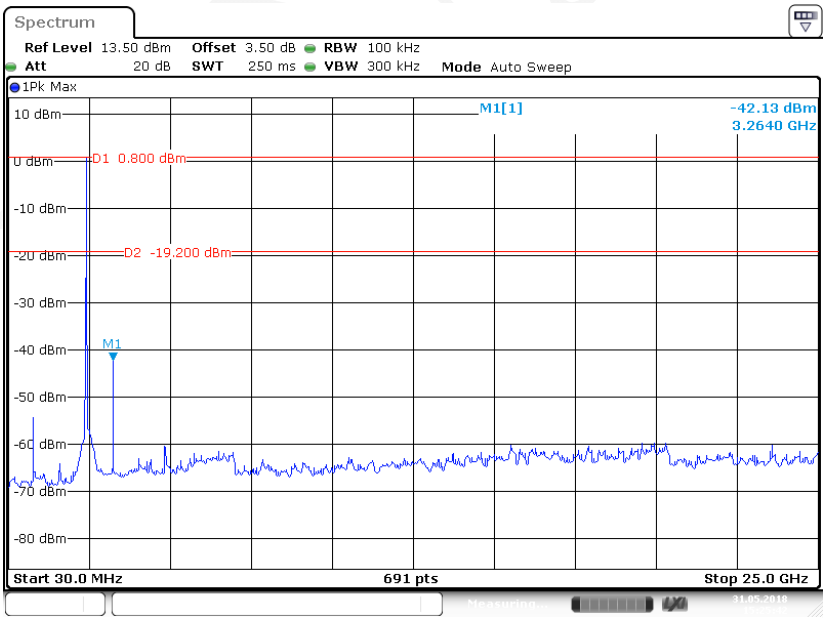
Date: 31.MAY.2018 15:23:54

802.11n-HT20 Mode Low Channel



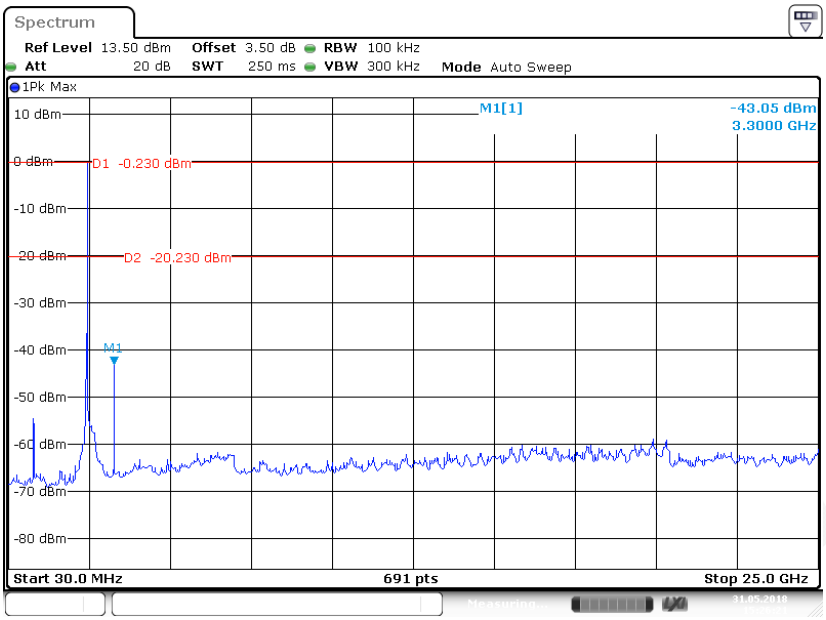
Date: 31.MAY.2018 15:25:02

802.11n-HT20 Mode Middle Channel



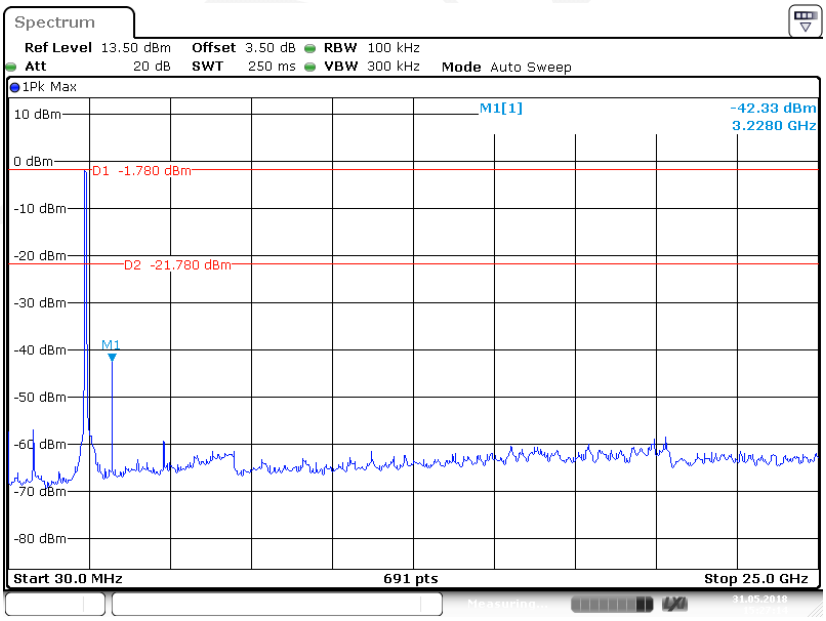
Date: 31.MAY.2018 15:25:42

802.11n-HT20 Mode High Channel



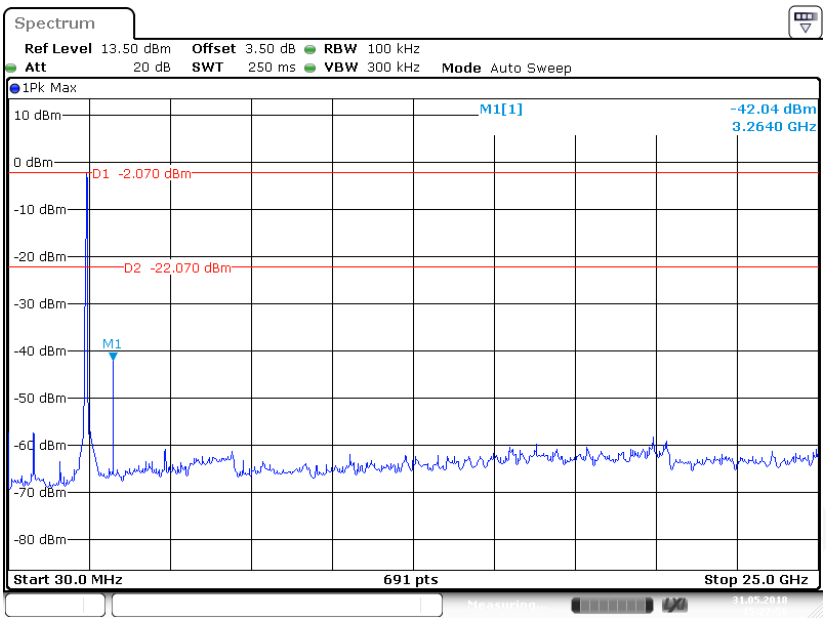
Date: 31.MAY.2018 15:26:22

802.11n-HT40 Mode Low Channel



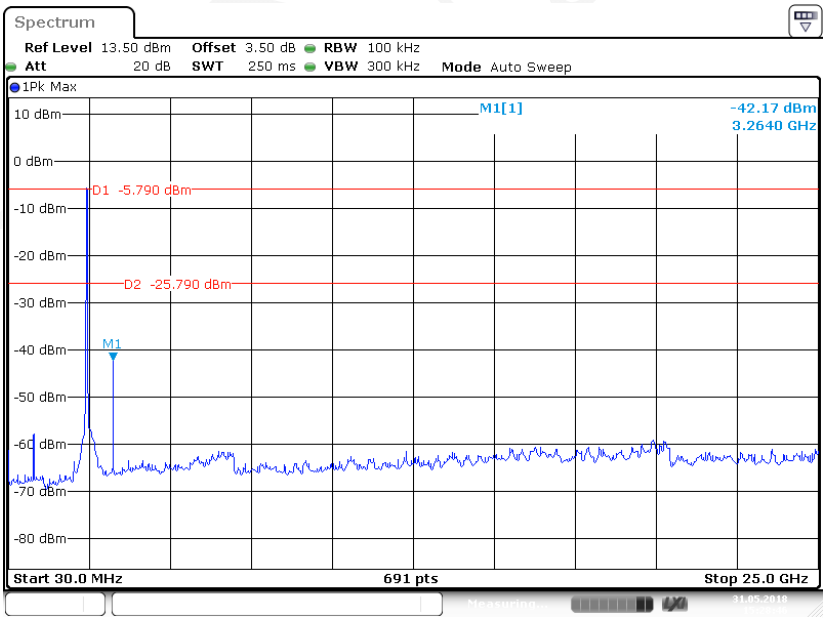
Date: 31.MAY.2018 15:27:14

802.11n-HT40 Mode Middle Channel



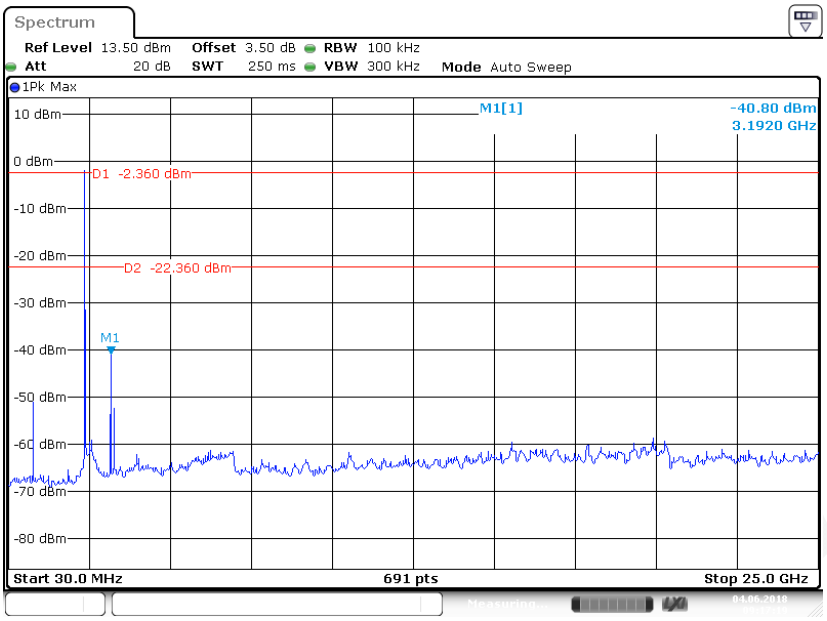
Date: 31.MAY.2018 15:27:56

802.11n-HT40 Mode High Channel



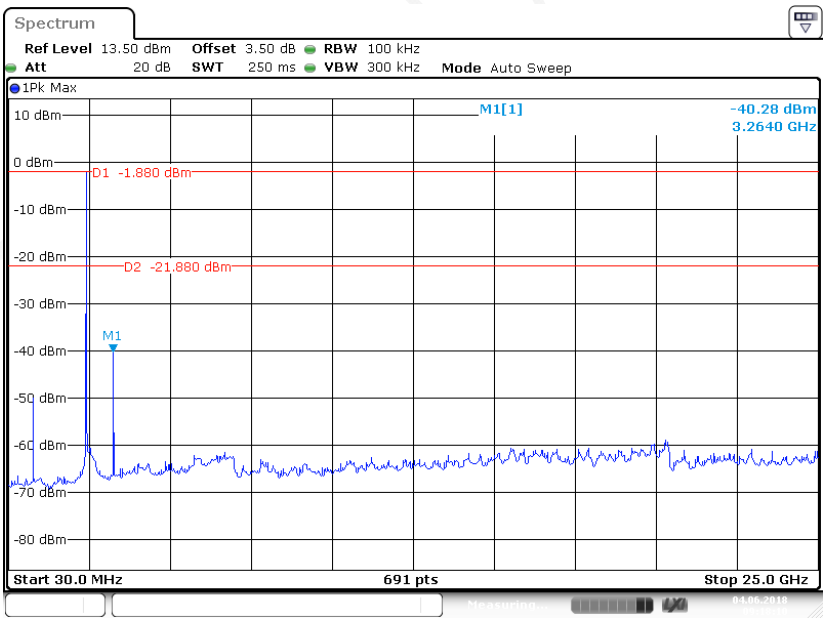
Date: 31.MAY.2018 15:28:46

BLE Mode Low Channel



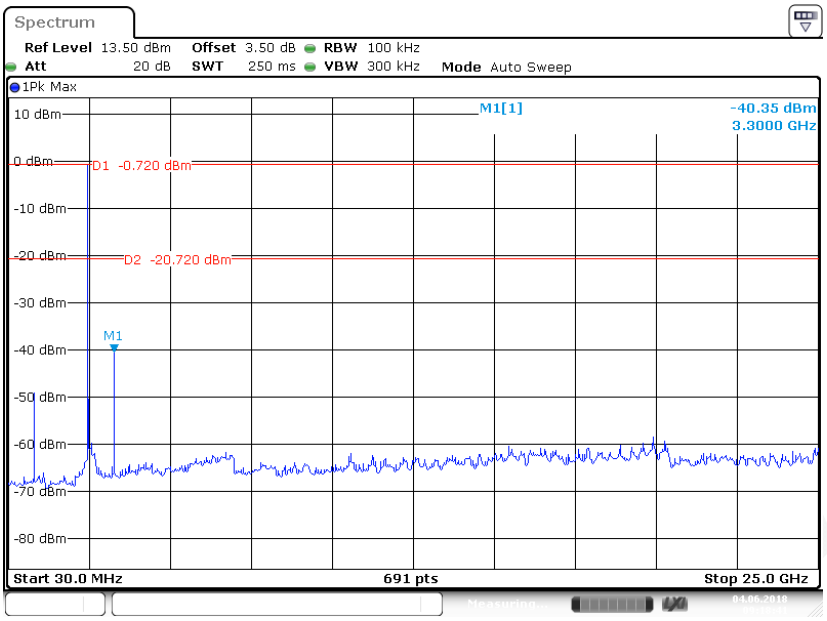
Date: 4.JUN.2018 09:17:20

BLE Mode Middle Channel



Date: 4.JUN.2018 09:18:10

BLE Mode High Channel



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

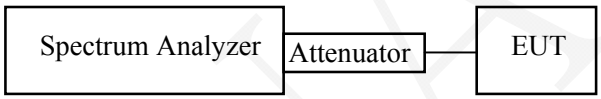
Applicable Standard

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

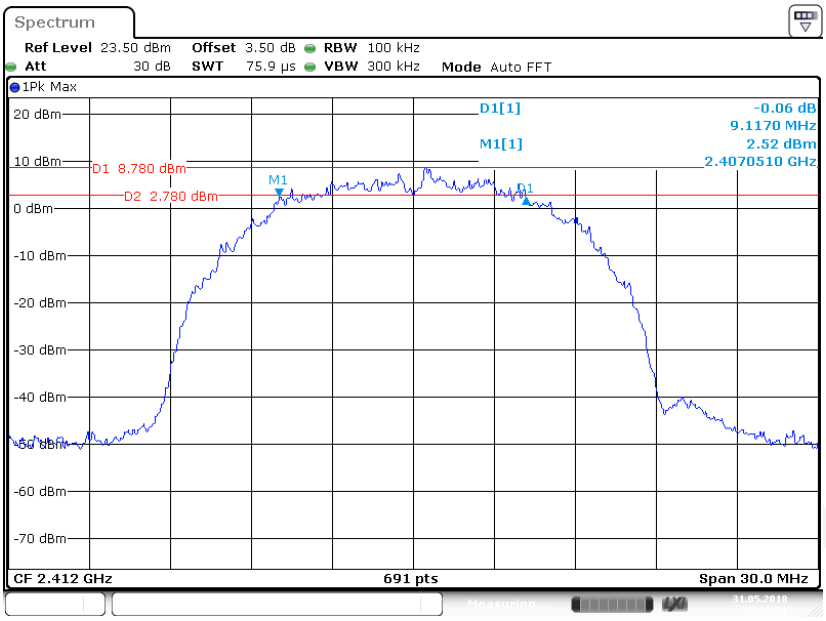
The testing was performed by Max Min on 2018-05-31 to 2018-06-04.

Test Result: Pass

EUT operation mode: Transmitting

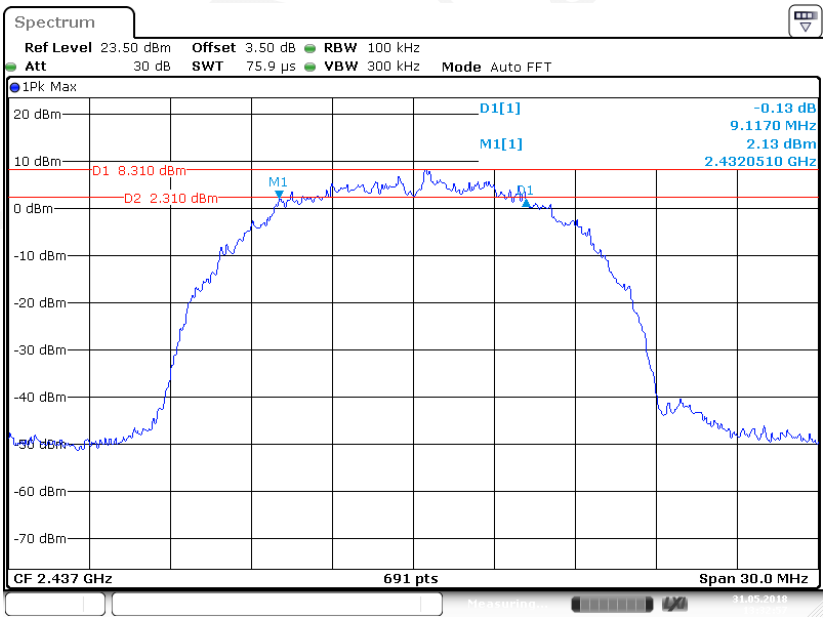
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b Mode			
Low	2412	9.117	≥0.5
Middle	2437	9.117	≥0.5
High	2462	9.117	≥0.5
802.11g Mode			
Low	2412	16.411	≥0.5
Middle	2437	16.411	≥0.5
High	2462	16.411	≥0.5
802.11n-HT20 Mode			
Low	2412	17.540	≥0.5
Middle	2437	17.540	≥0.5
High	2462	17.540	≥0.5
802.11n-HT40 Mode			
Low	2422	36.447	≥0.5
Middle	2437	36.469	≥0.5
High	2452	36.491	≥0.5
BLE Mode			
Low	2402	0.651	≥0.5
Middle	2440	0.651	≥0.5
High	2480	0.651	≥0.5

802.11b Mode Low Channel



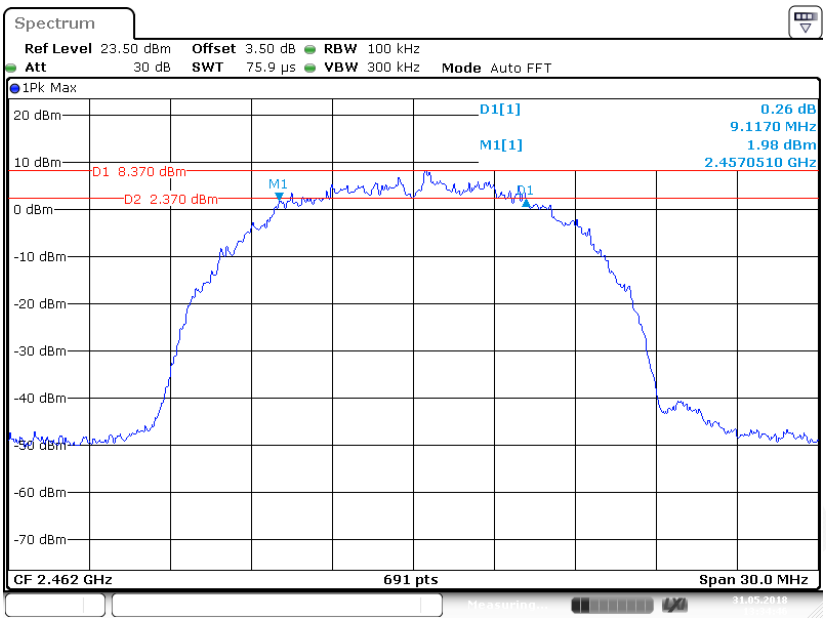
Date: 31.MAY.2018 13:30:51

802.11b Mode Middle Channel



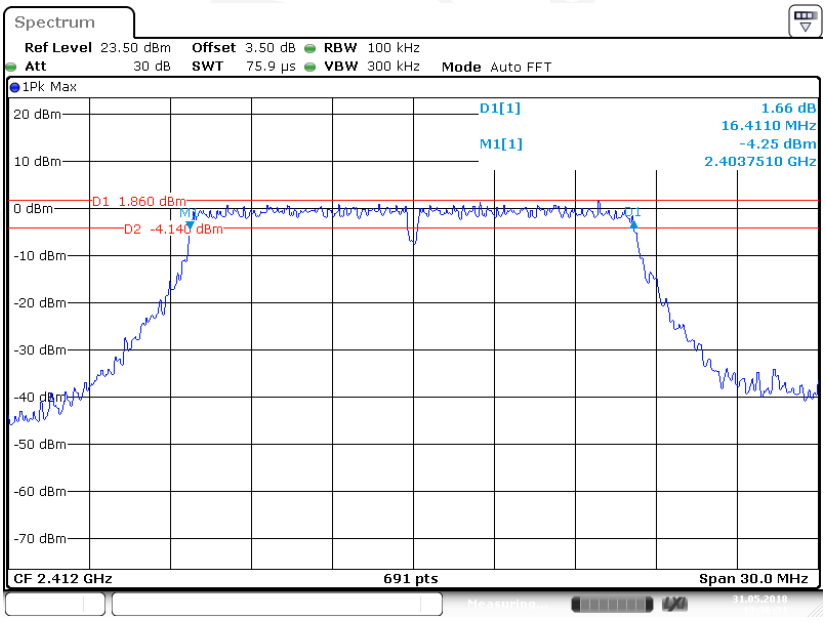
Date: 31.MAY.2018 13:32:57

802.11b Mode High Channel



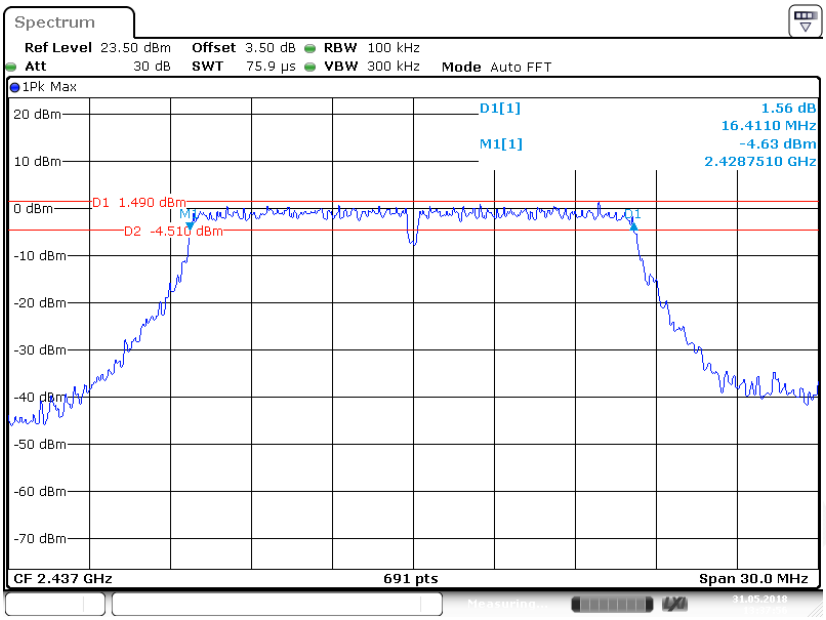
Date: 31.MAY.2018 13:34:46

802.11g Mode Low Channel



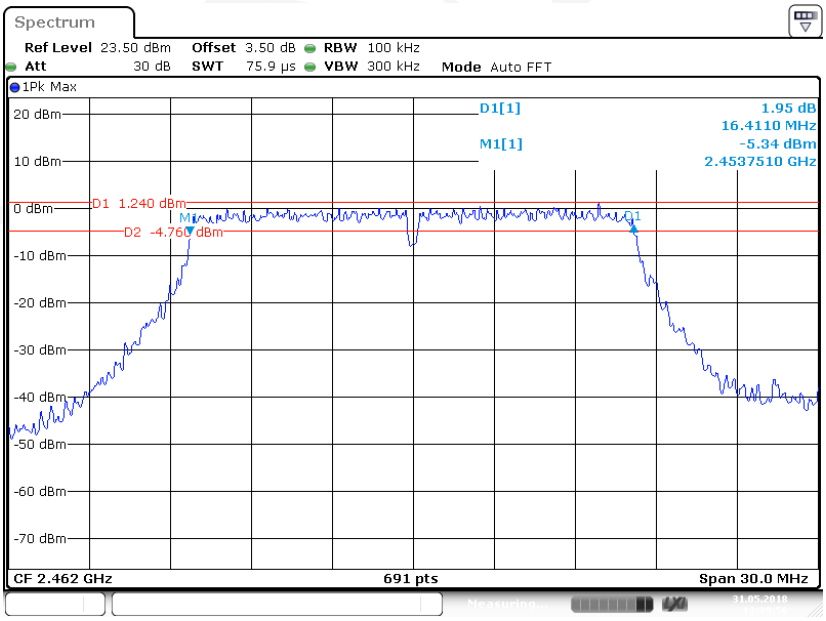
Date: 31.MAY.2018 13:36:31

802.11g Mode Middle Channel



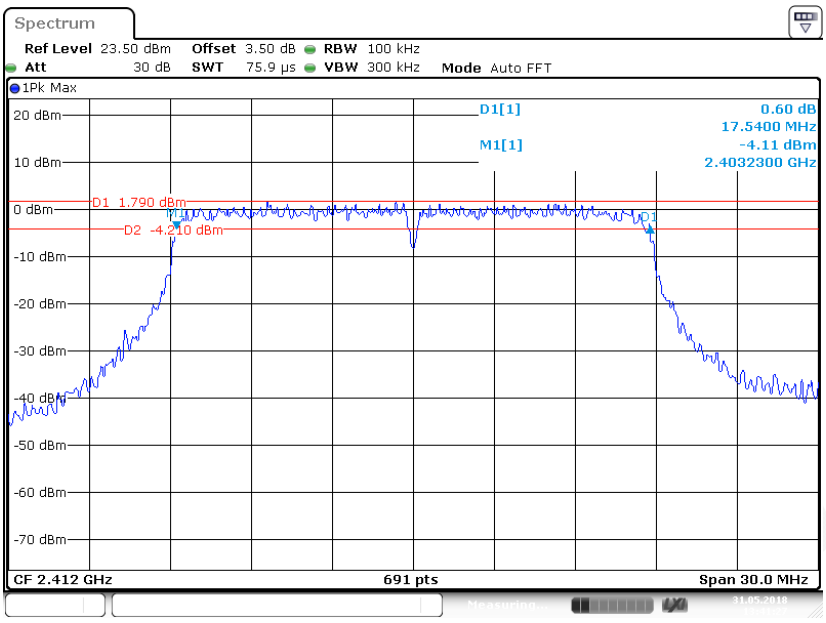
Date: 31.MAY.2018 13:37:57

802.11g Mode High Channel



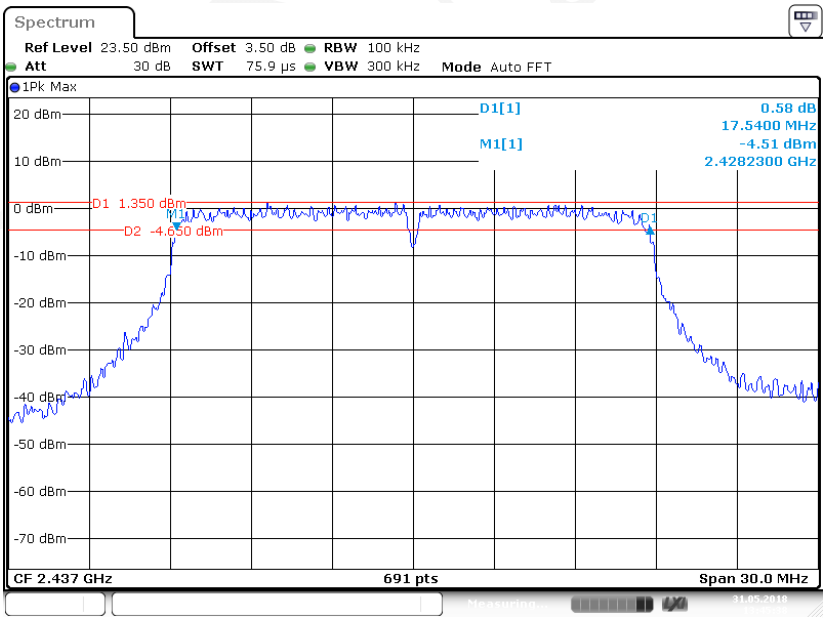
Date: 31.MAY.2018 13:39:56

802.11n-HT20 Mode Low Channel



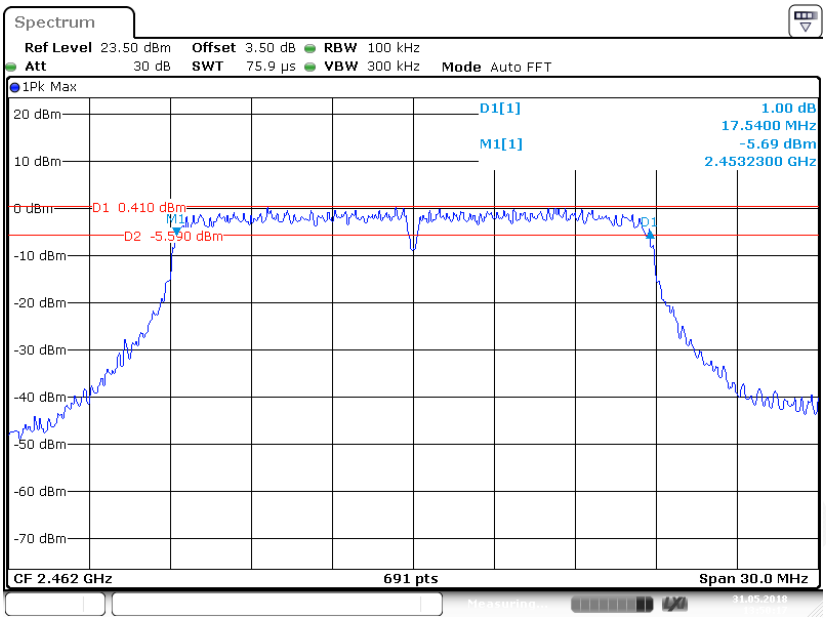
Date: 31.MAY.2018 13:41:28

802.11n-HT20 Mode Middle Channel



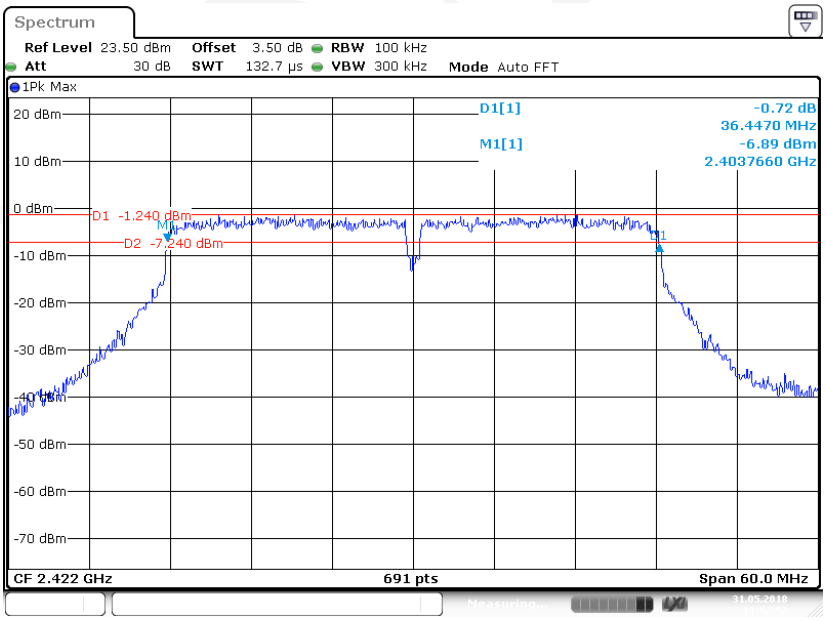
Date: 31.MAY.2018 13:45:38

802.11n-HT20 Mode High Channel



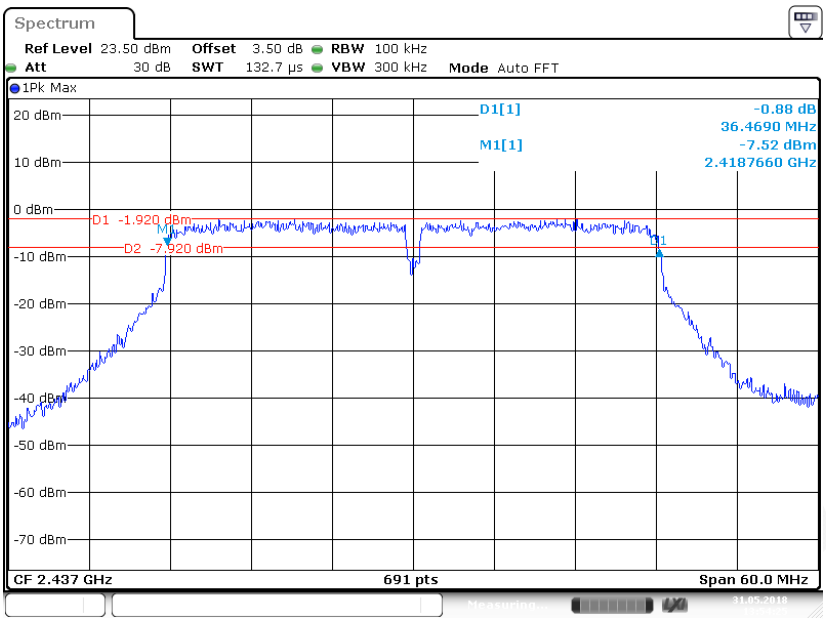
Date: 31.MAY.2018 13:50:17

802.11n-HT40 Mode Low Channel



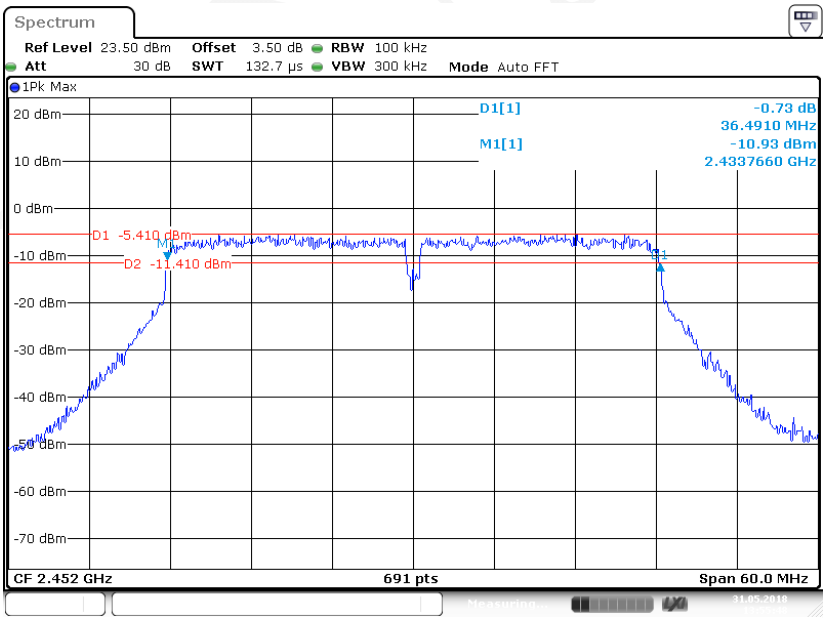
Date: 31.MAY.2018 13:52:51

802.11n-HT40 Mode Middle Channel



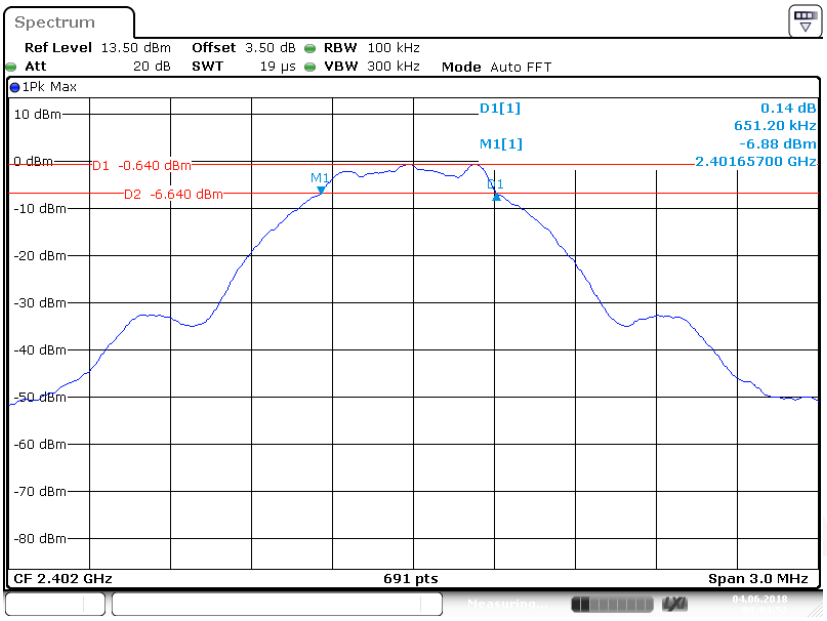
Date: 31.MAY.2018 13:54:25

802.11n-HT40 Mode High Channel



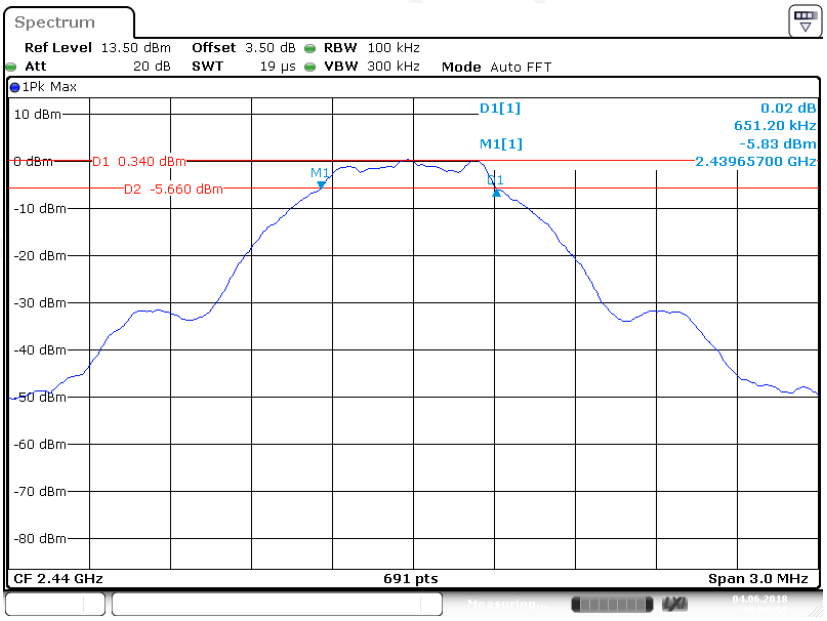
Date: 31.MAY.2018 13:55:48

BLE Mode Low Channel



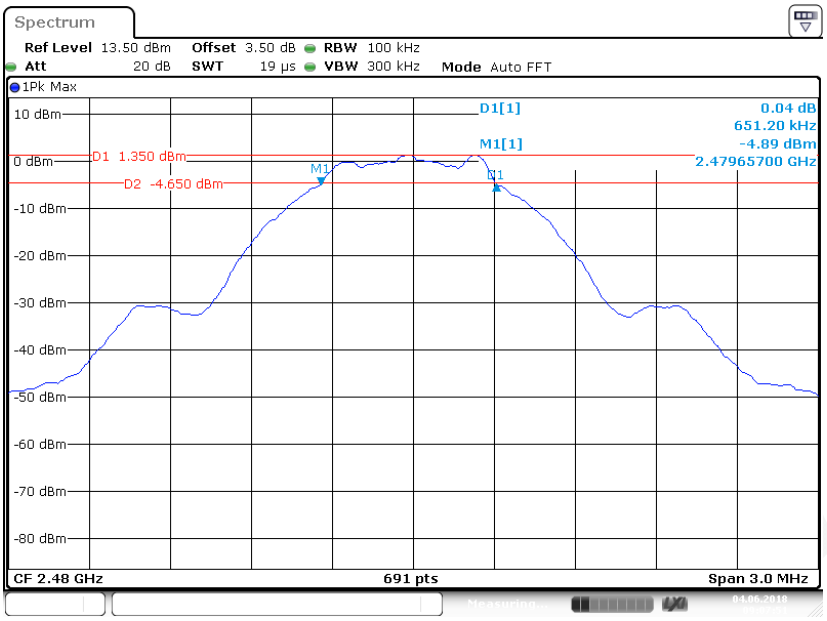
Date: 4.JUN.2018 09:04:52

BLE Mode Middle Channel



Date: 4.JUN.2018 09:06:52

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

According to KDB558074 D01 DTS Meas Guidance v04

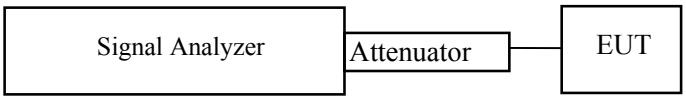
For Wi-Fi:

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.

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.

For BLE:

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.



Test Data

Environmental Conditions

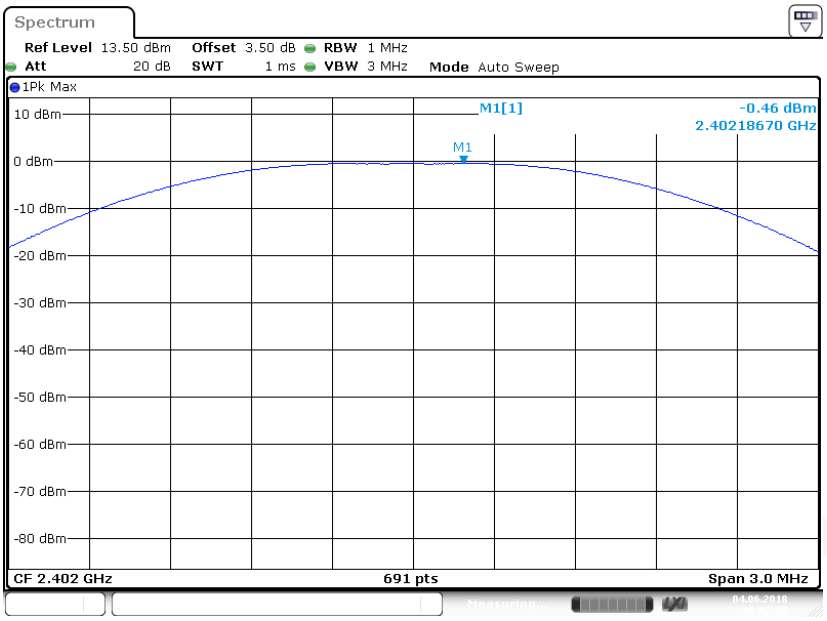
Temperature:	23.8℃
Relative Humidity:	54 %
ATM Pressure:	101.2 kPa

The testing was performed by Max Min on 2018-06-04.

EUT operation mode: Transmitting

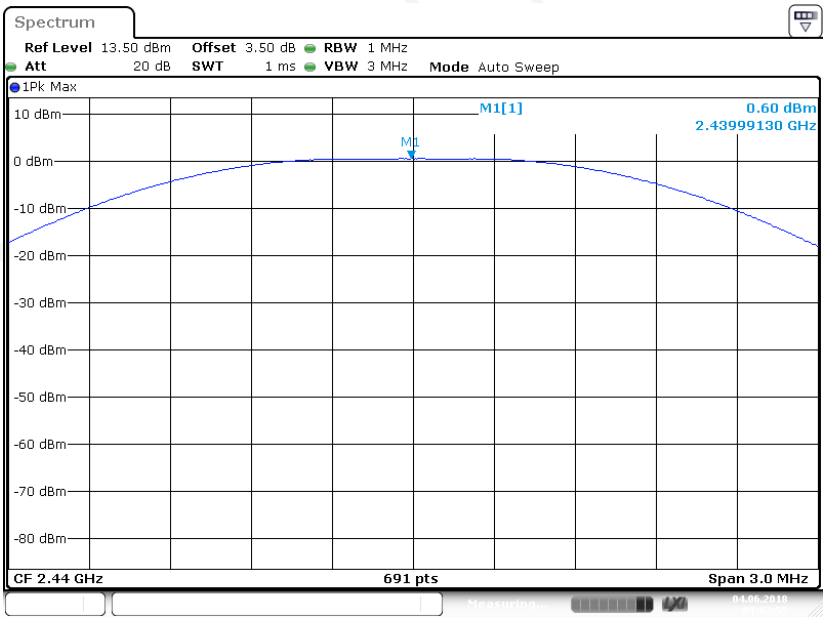
Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
802.11b Mode				
Low	2412	23.32	30	Pass
Middle	2437	22.98	30	Pass
High	2462	22.88	30	Pass
802.11g Mode				
Low	2412	22.82	30	Pass
Middle	2437	22.52	30	Pass
High	2462	22.08	30	Pass
802.11n-HT20 Mode				
Low	2412	23.21	30	Pass
Middle	2437	22.84	30	Pass
High	2462	21.93	30	Pass
802.11n-HT40 Mode				
Low	2422	23.72	30	Pass
Middle	2437	23.33	30	Pass
High	2452	20.03	30	Pass
BLE Mode				
Low	2402	-0.46	30	Pass
Middle	2440	0.60	30	Pass
High	2480	1.59	30	Pass

BLE Mode Low Channel



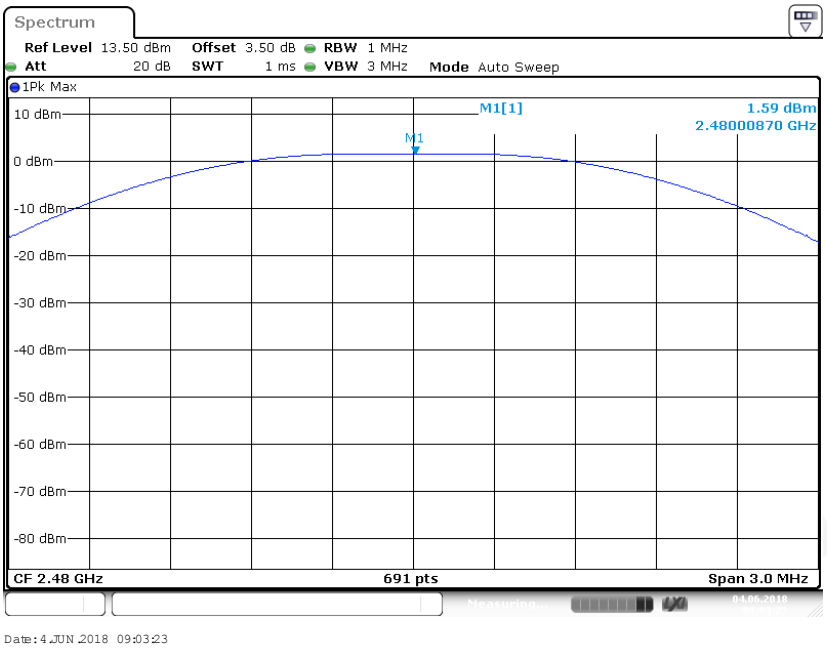
Date: 4.JUN.2018 09:02:30

BLE Mode Middle Channel



Date: 4.JUN.2018 09:02:55

BLE 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

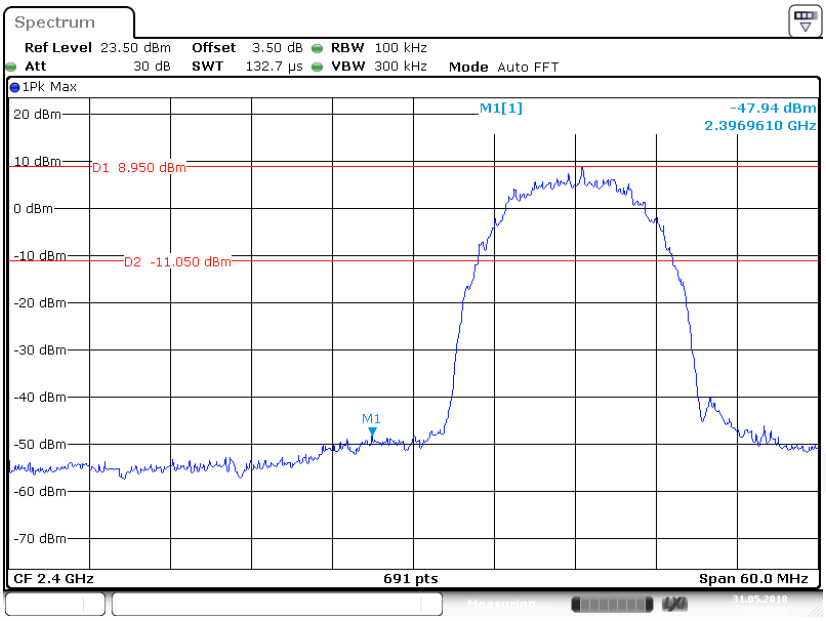
Temperature:	24.3 ℃
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Max Min on 2018-05-31 to 2018-06-04.

Test Result: Compliance

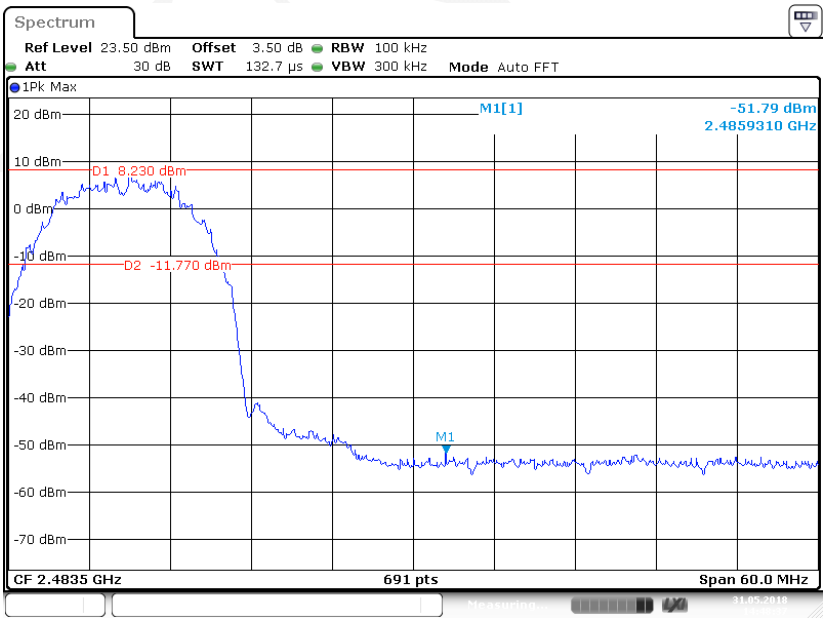
EUT operation mode: Transmitting

802.11b Mode Left Side



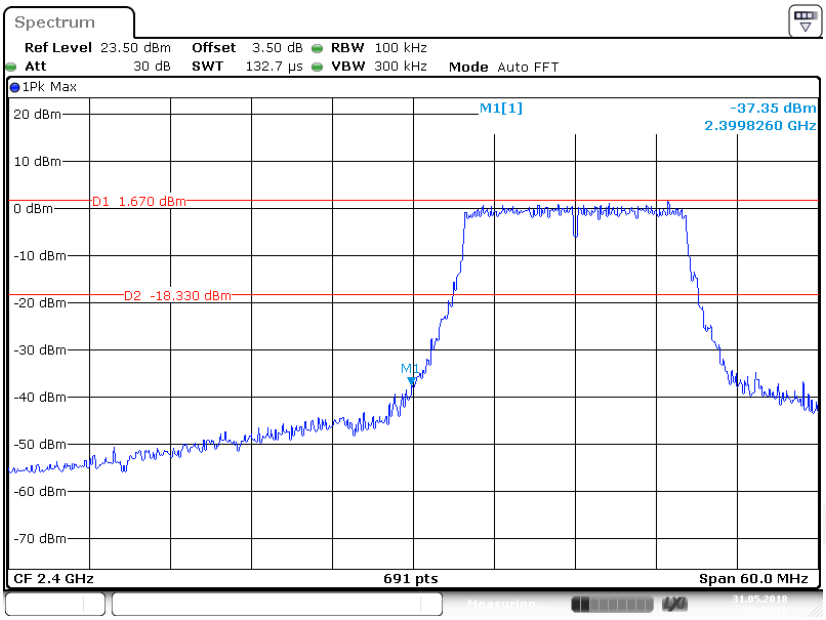
Date: 31.MAY.2018 14:35:52

802.11b Mode Right Side



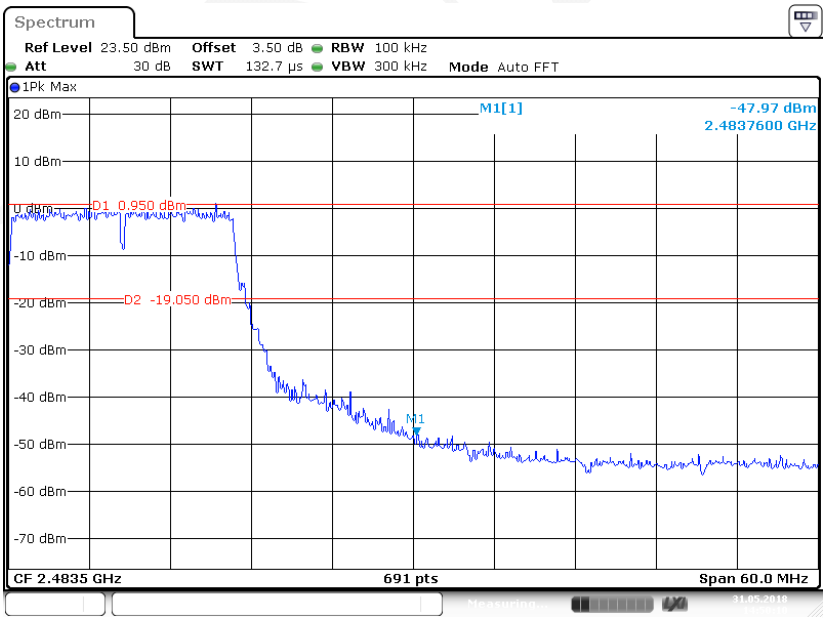
Date: 31.MAY.2018 14:48:37

802.11g Mode Left Side



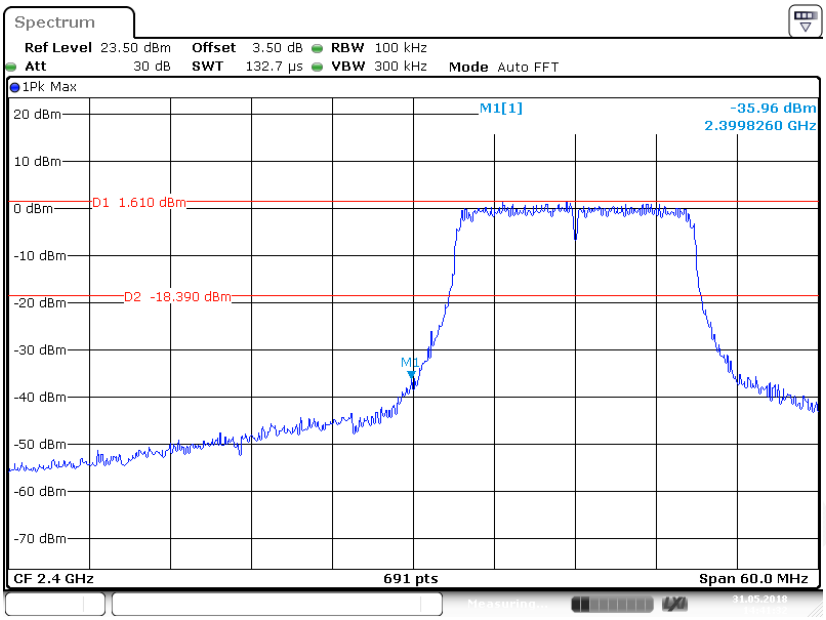
Date: 31.MAY.2018 14:40:16

802.11g Mode Right Side



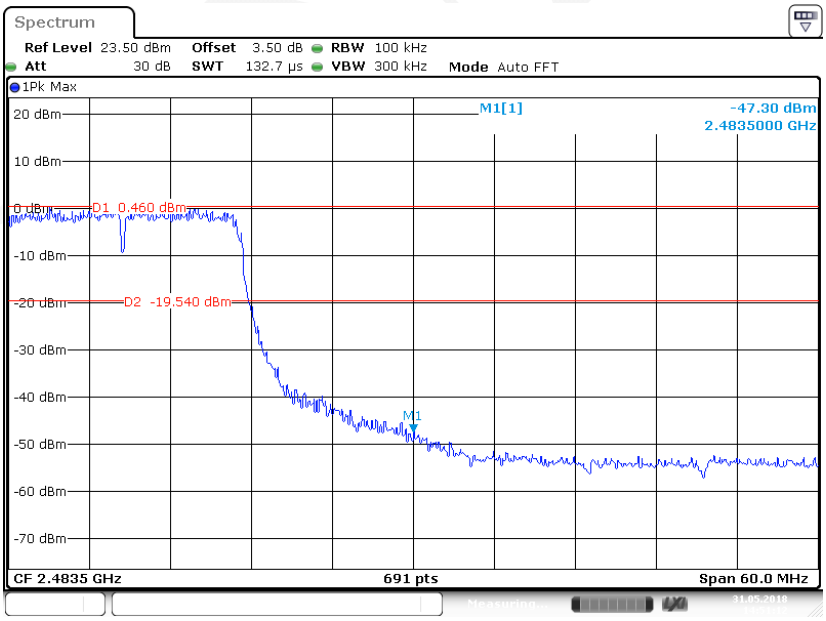
Date: 31.MAY.2018 14:50:10

802.11n-HT20 Mode Left Side



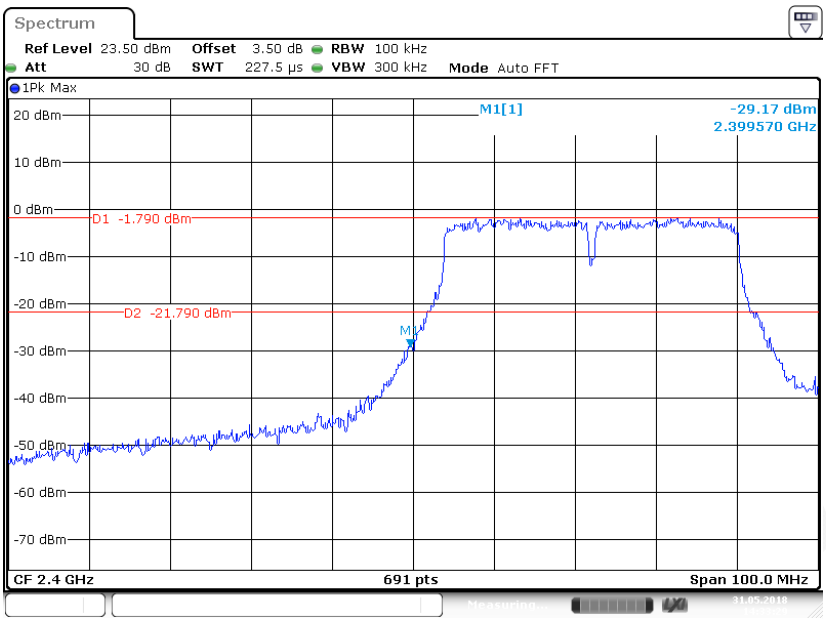
Date: 31.MAY.2018 14:41:32

802.11n-HT20 Mode Right Side



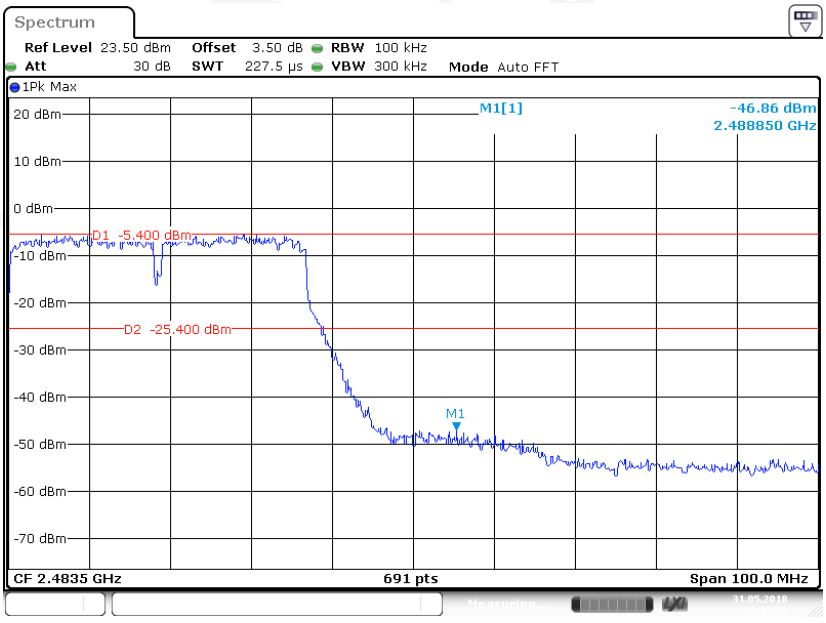
Date: 31.MAY.2018 14:51:12

802.11n-HT40 Mode Left Side



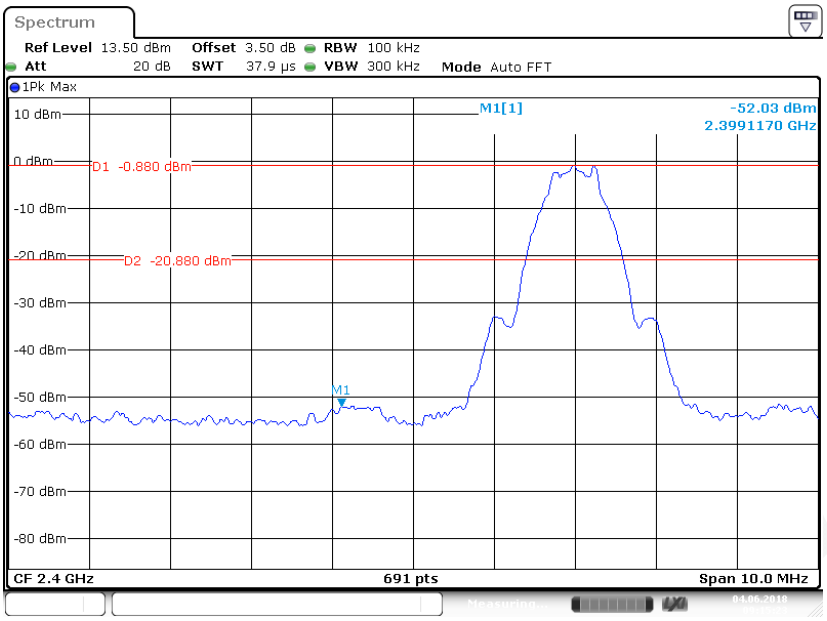
Date: 31.MAY.2018 14:33:30

802.11n-HT40 Mode Right Side



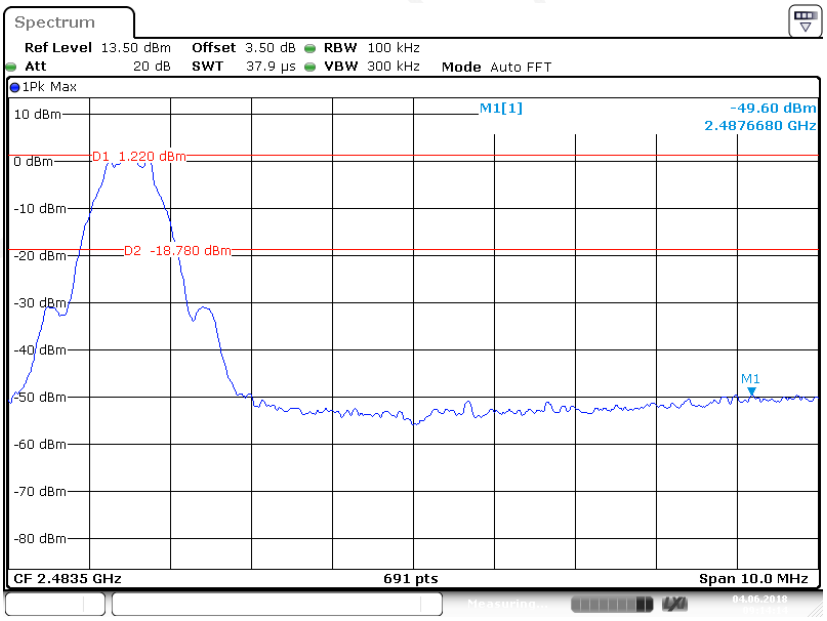
Date: 31.MAY.2018 14:34:40

BLE Mode Left Side



Date: 4.JUN.2018 09:15:24

BLE Mode Right Side



Date: 4.JUN.2018 09:14:15

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

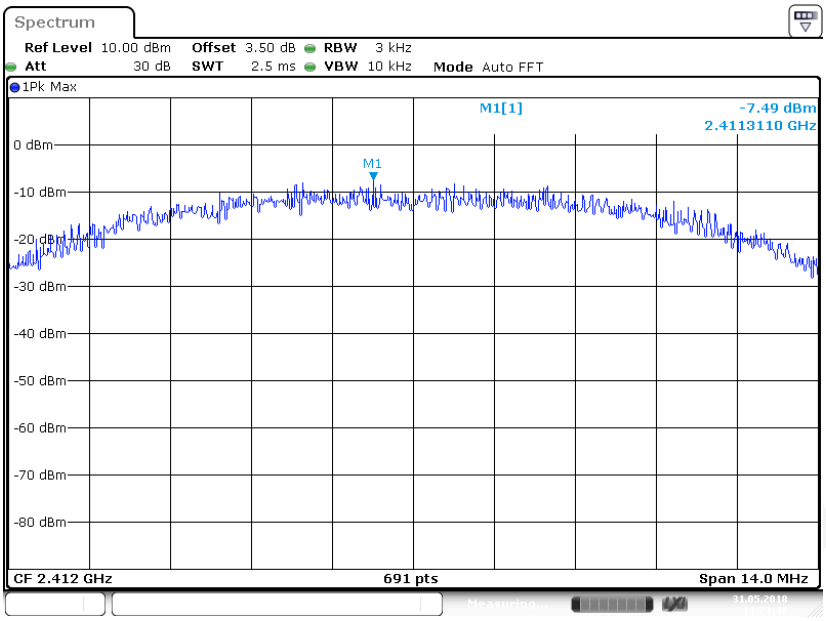
The testing was performed by Max Min on 2018-05-31 to 2018-06-04.

Test Result: Pass

EUT operation mode: Transmitting

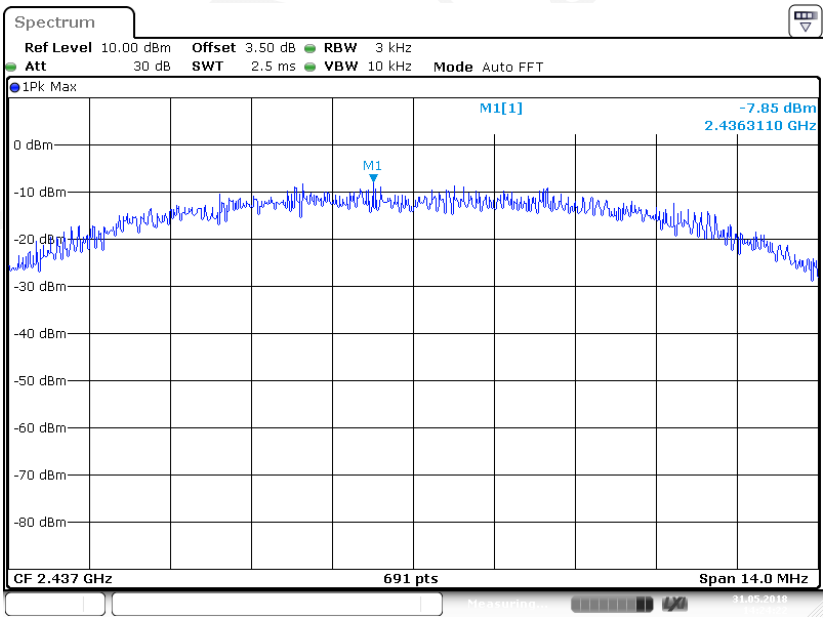
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b Mode			
Low	2412	-7.49	≤8
Middle	2437	-7.85	≤8
High	2462	-7.96	≤8
802.11g Mode			
Low	2412	-13.86	≤8
Middle	2437	-14.18	≤8
High	2462	-14.53	≤8
802.11n-HT20 mode			
Low	2412	-12.98	≤8
Middle	2437	-13.35	≤8
High	2462	-14.37	≤8
802.11n-HT40 Mode			
Low	2422	-14.62	≤8
Middle	2437	-14.94	≤8
High	2452	-18.31	≤8
BLE Mode			
Low	2402	-16.96	≤8
Middle	2440	-15.74	≤8
High	2480	-14.77	≤8

802.11b Mode Low Channel



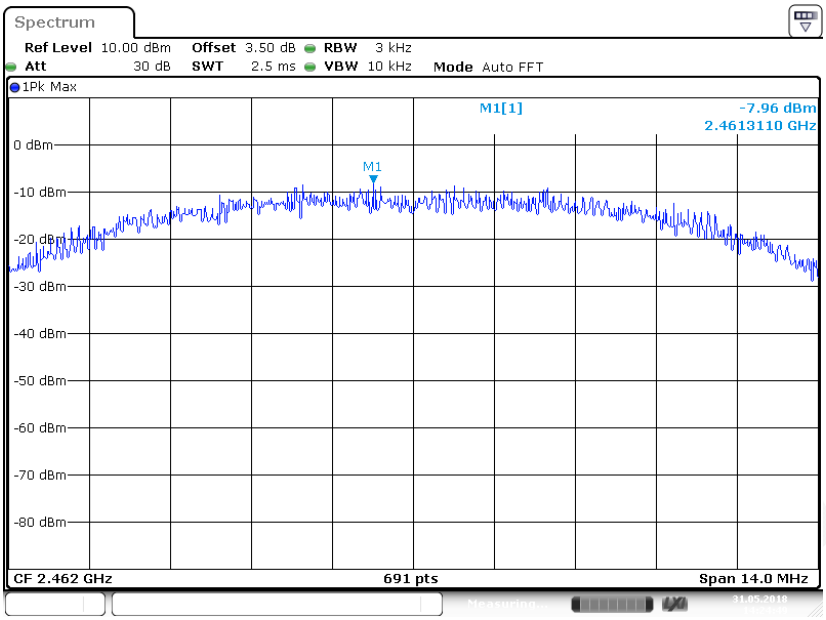
Date: 31.MAY.2018 14:23:49

802.11b Mode Middle Channel



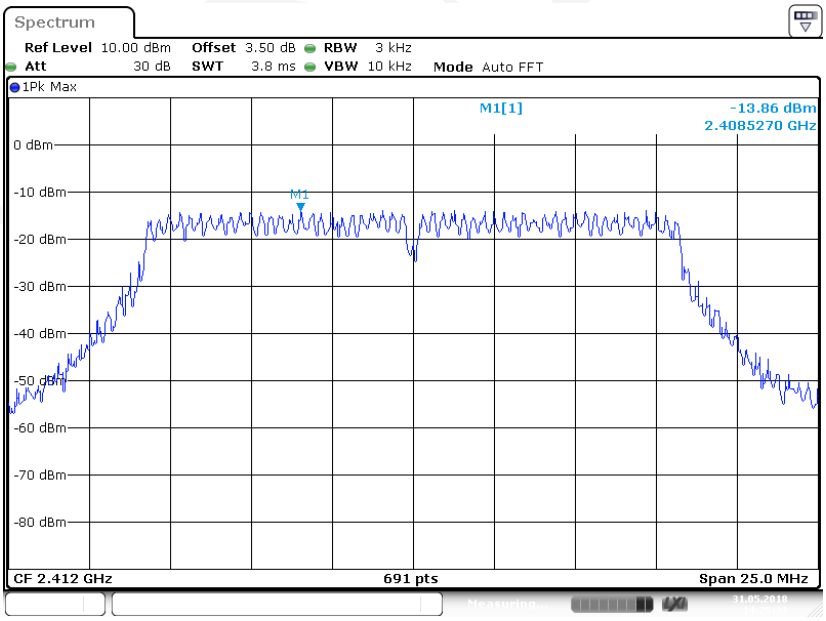
Date: 31.MAY.2018 14:24:22

802.11b Mode High Channel



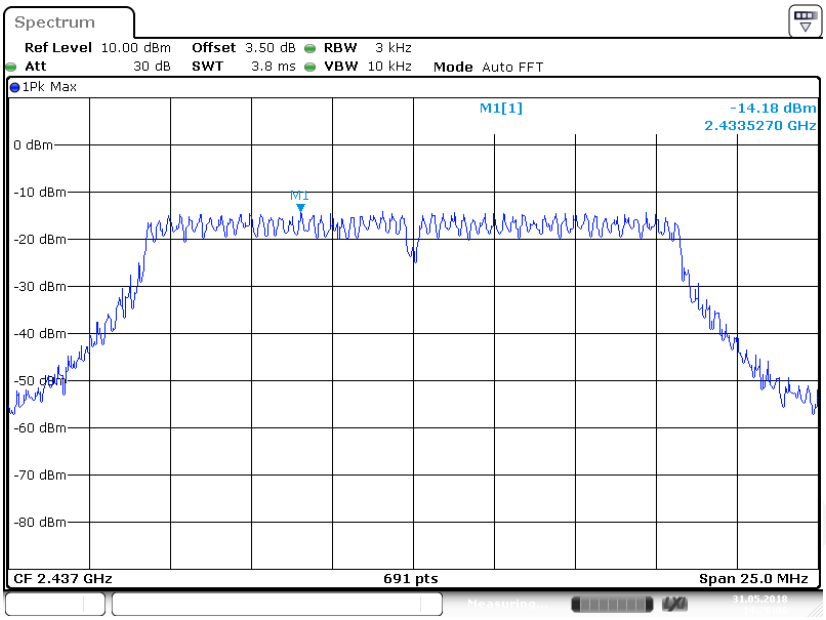
Date: 31.MAY.2018 14:24:49

802.11g Mode Low Channel



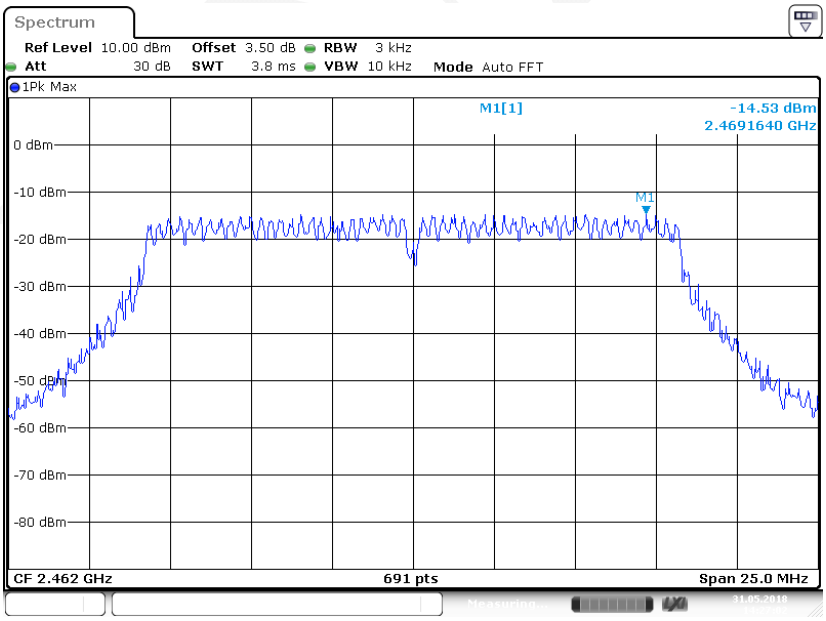
Date: 31.MAY.2018 14:25:34

802.11g Mode Middle Channel



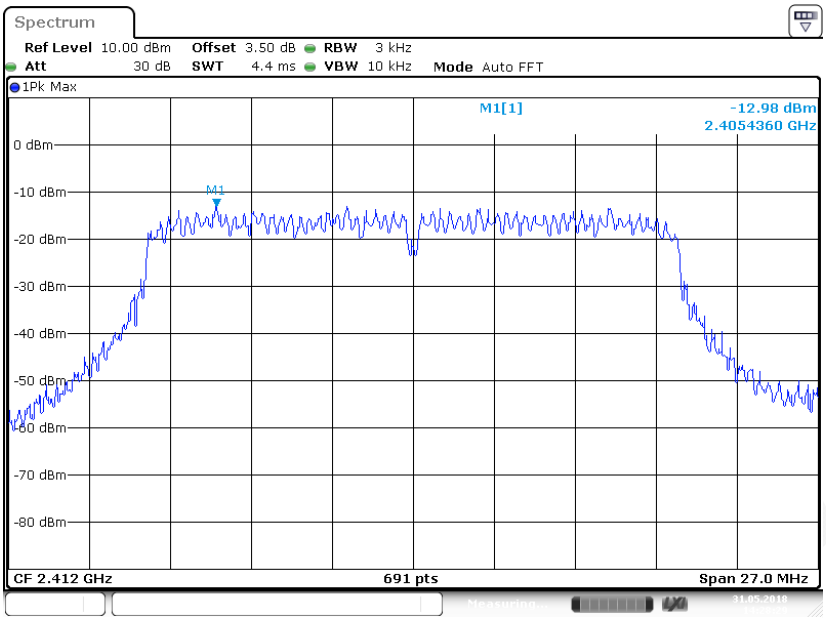
Date: 31.MAY.2018 14:26:06

802.11g Mode High Channel



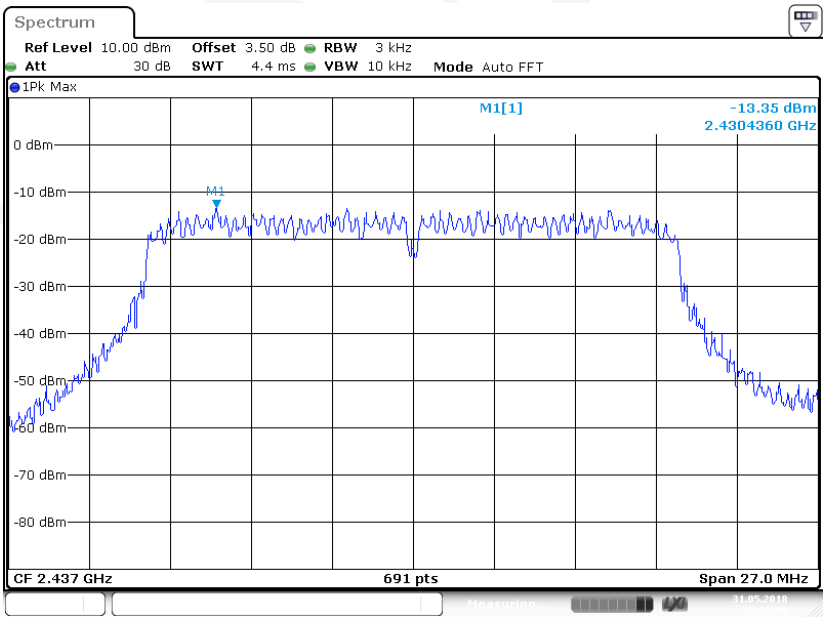
Date: 31.MAY.2018 14:27:02

802.11n-HT20 Mode Low Channel



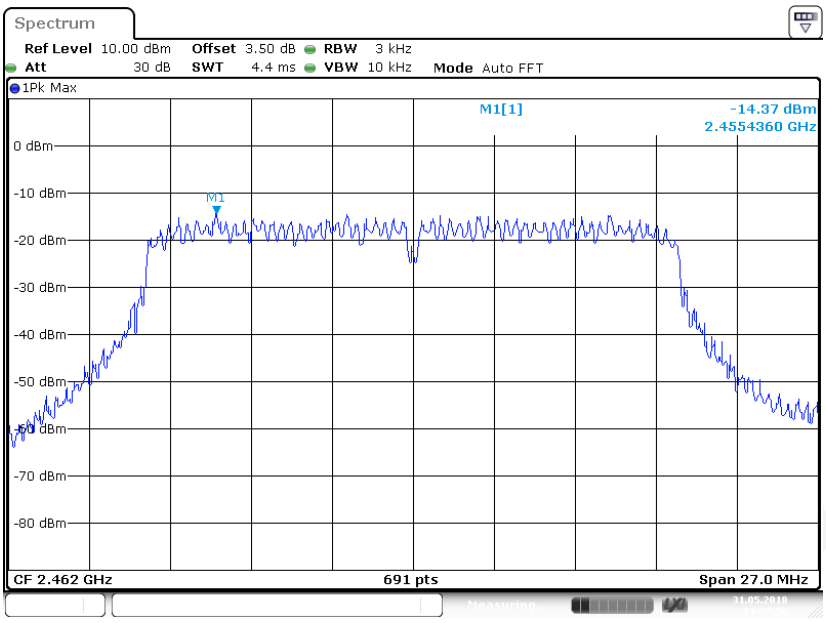
Date: 31.MAY.2018 14:28:29

802.11n-HT20 Mode Middle Channel



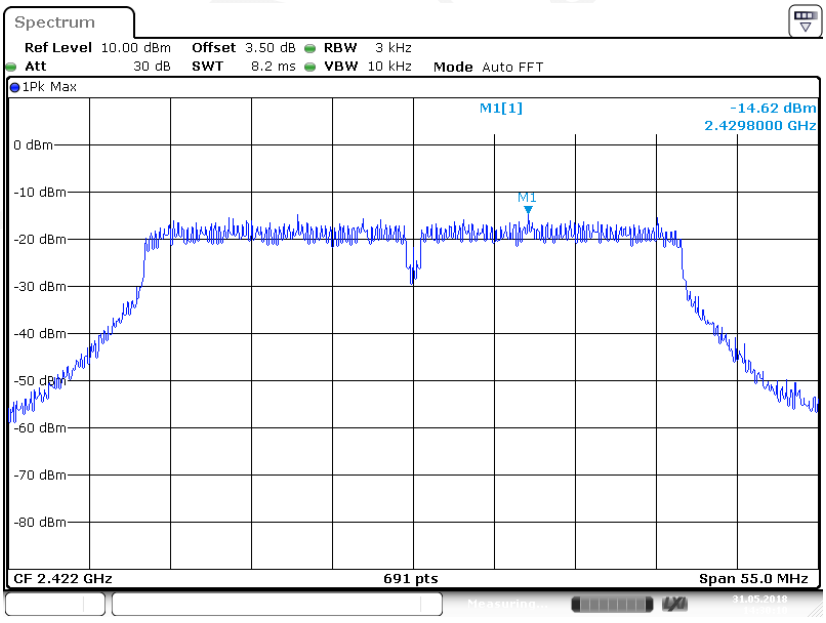
Date: 31.MAY.2018 14:29:00

802.11n-HT20 Mode High Channel



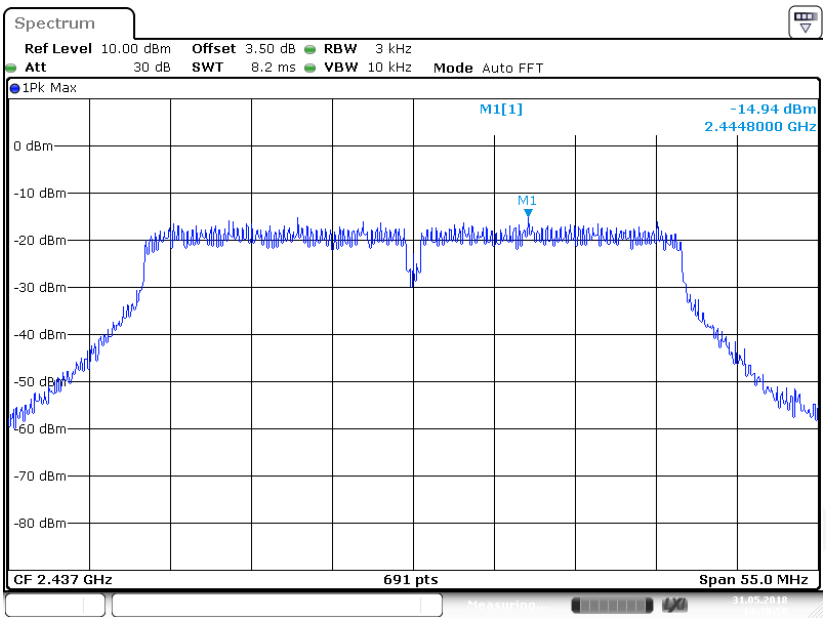
Date: 31.MAY.2018 14:27:56

802.11n-HT40 Mode Low Channel



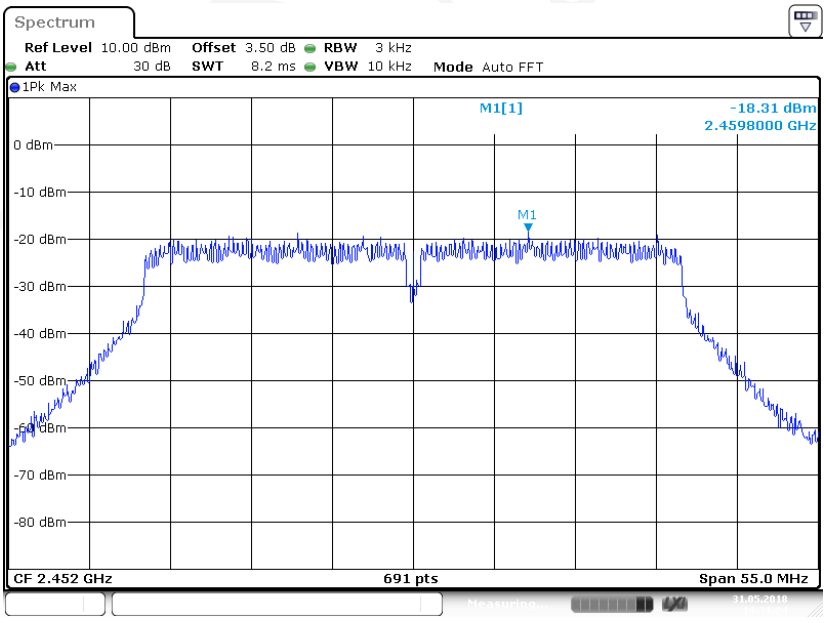
Date: 31.MAY.2018 14:30:10

802.11n-HT40 Mode Middle Channel



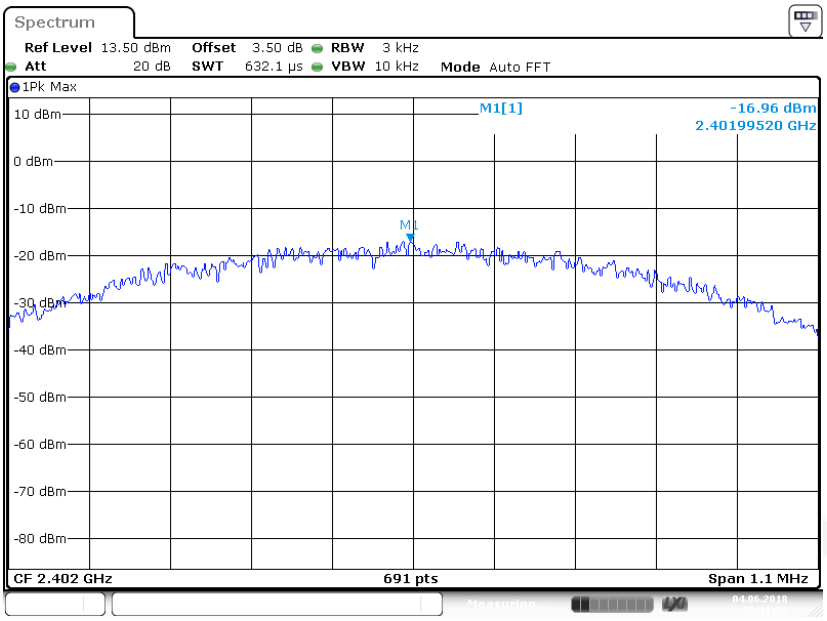
Date: 31.MAY.2018 14:30:51

802.11n-HT40 Mode High Channel



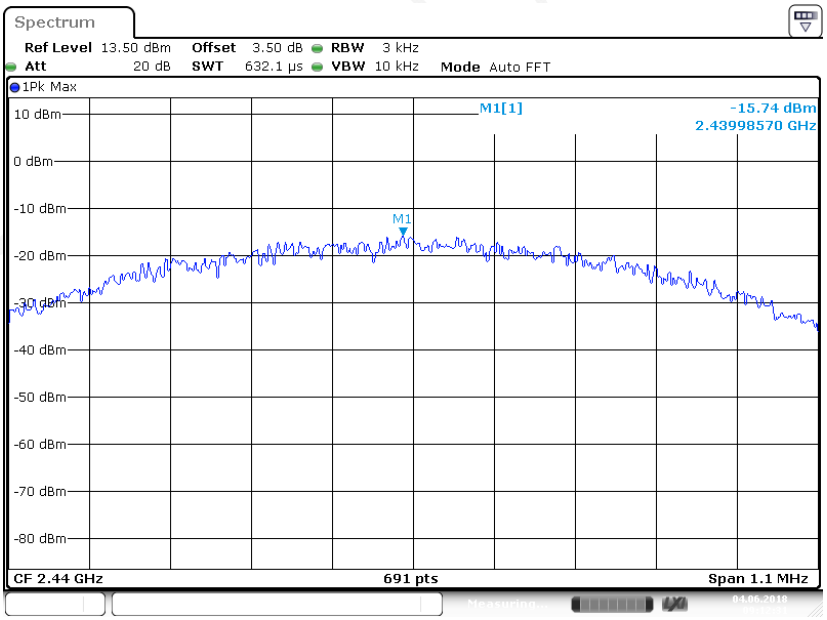
Date: 31.MAY.2018 14:31:24

BLE Mode Low Channel



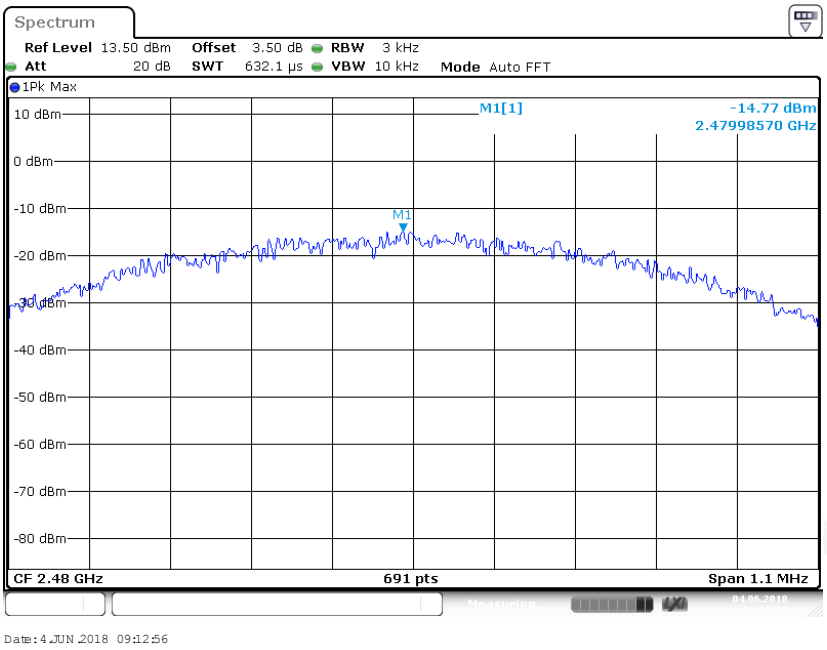
Date: 4.JUN.2018 09:11:56

BLE Mode Middle Channel



Date: 4.JUN.2018 09:12:31

BLE Mode High Channel



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