



TESTING LABORATORY
CERTIFICATE#4323.01



FCC PART 15.247

TEST REPORT

For

Hangzhou Roombanker Technology Co., Ltd.

A#801 Wantong center, Hangzhou, China

FCC ID: 2AUXBDSGW-040

Report Type: Original Report	Product Type: L-Serial Smart Gateway
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Report Number:	RSHD200316001-00B
Report Date:	2020-05-08
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Hangzhou Roombanker Technology Co., Ltd.
Tested Model	DSGW-040
Product Type	L-Serial Smart Gateway
Power Supply	DC 5V from Adapter
RF Function	2.4G Wi-Fi, BLE(1Mbps), BLE(2Mbps)
Operating Band/Frequency	2.4G Wi-Fi: 2412-2462 MHz(802.11b/g / n-HT20) 2422-2452 MHz(802.11 n-HT40) BLE(1Mbps)/BLE(2Mbps): 2402-2480 MHz
Channel Number	2.4G Wi-Fi: 11(802.11b/g / n-HT20), 9(802.11 n-HT40) BLE(1Mbps)/BLE(2Mbps): 40
Channel Separation	2.4G Wi-Fi: 5 MHz, BLE(1Mbps)/BLE(2Mbps): 2 MHz
Modulation Type	2.4G Wi-Fi: OFDM,DSSS; BLE(1Mbps)/BLE(2Mbps): GFSK
Antenna Type	2.4G Wi-Fi: FPC Antenna, BLE(1Mbps)/BLE(2Mbps): PCB Antenna
Maximum Antenna Gain	2.4G Wi-Fi: 4.7 dBi, BLE(1Mbps)/BLE(2Mbps): 0 dBi

Adapter information:

Model: A8A-050200U-US1

Input: AC 100-240V, 50/60Hz, 0.35A

Output: DC 5V, 2A

**All measurement and test data in this report was gathered from production sample serial number: 20200316001.
(Assigned by the BACL. The EUT supplied by the applicant was received on 2020-03-16)*

Objective

This report is prepared on behalf of *Hangzhou Roombanker Technology Co., 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 DTS for zigbee Submittal with FCC ID: 2AUXBDSGW-040

FCC Part 15.249 DXX Submittal with FCC ID: 2AUXBDSGW-040

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 KDB 558074 D01 15.247 Meas Guidance v05r02.

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°C
Humidity		6%

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

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (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 and CAB identifier CN0004 under the ISED requirement. 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: CRT

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

Mode	Data Rate	Channel	Power Level	
			Chain0	Chain1
802.11b	1 Mbps	Low	12	4
		Middle	12	8
		High	12	12
802.11g	6 Mbps	Low	8	0
		Middle	8	2
		High	8	7
802.11n-HT20	MCS0	Low	0	0
		Middle	0	2
		High	0	5
802.11n-HT40	MCS0	Low	0	0
		Middle	0	2
		High	0	4
BLE	1Mbps	/	0	
	2Mbps	/	0	

Note: 802.11b/g supports SISO, 802.11n20/n40 supports SISO and MIMO mode. For Radiated Emission, according to pretest, the worst case for 802.11n20/n40 is MIMO mode. So 802.11n20/n40 MIMO mode test data were recorded in the report.

For Conducted Test:

802.11b & 802.11g & 802.11n: each transmit chains were tested.

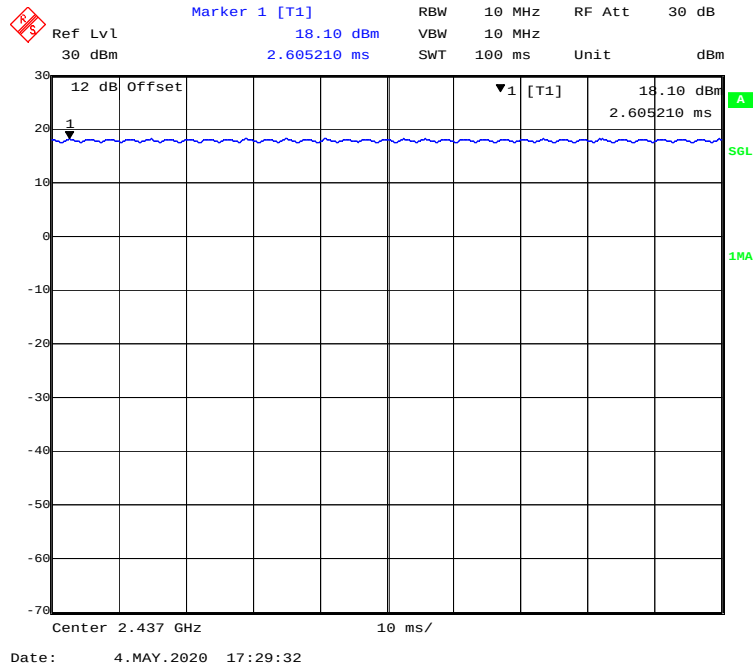
For Radiated Test:

802.11b & 802.11g, SISO for each transmit chain
 802.11n: MIMO for two transmit chains

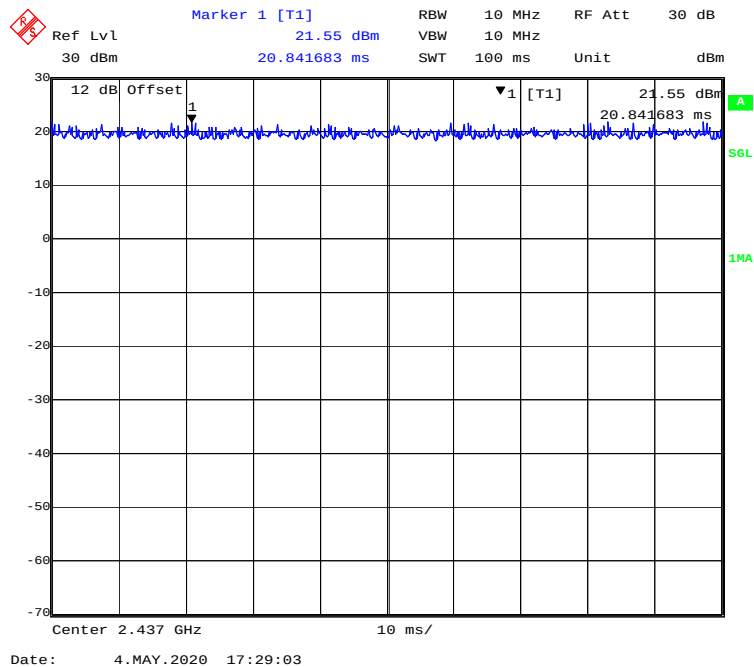
Duty Cycle:

Chain0:

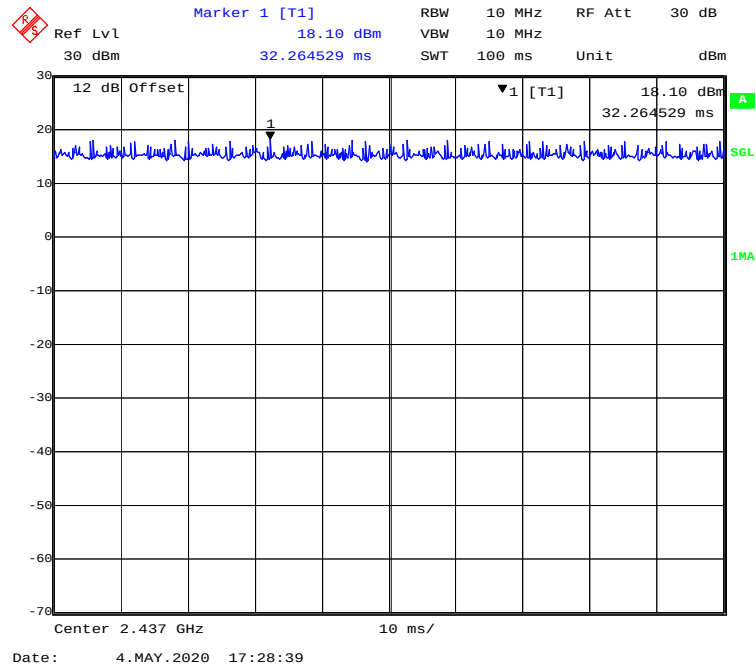
802.11b Mode Middle Channel



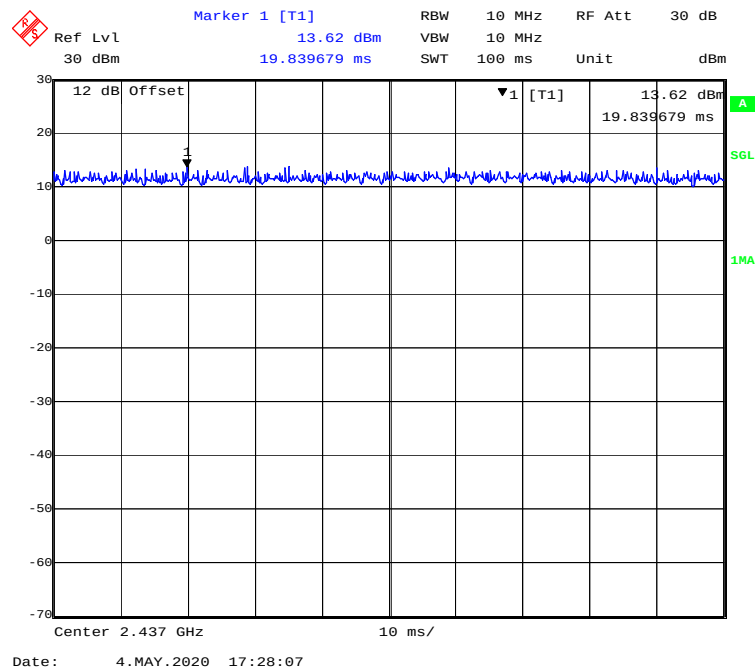
802.11g Mode Middle Channel



802.11n-HT20 Mode Middle Channel

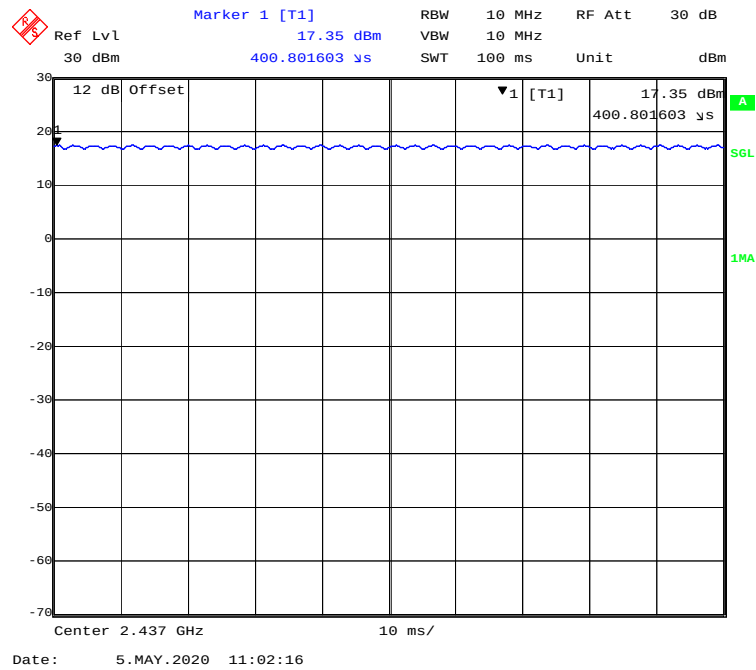


802.11n-HT40 Mode Middle Channel

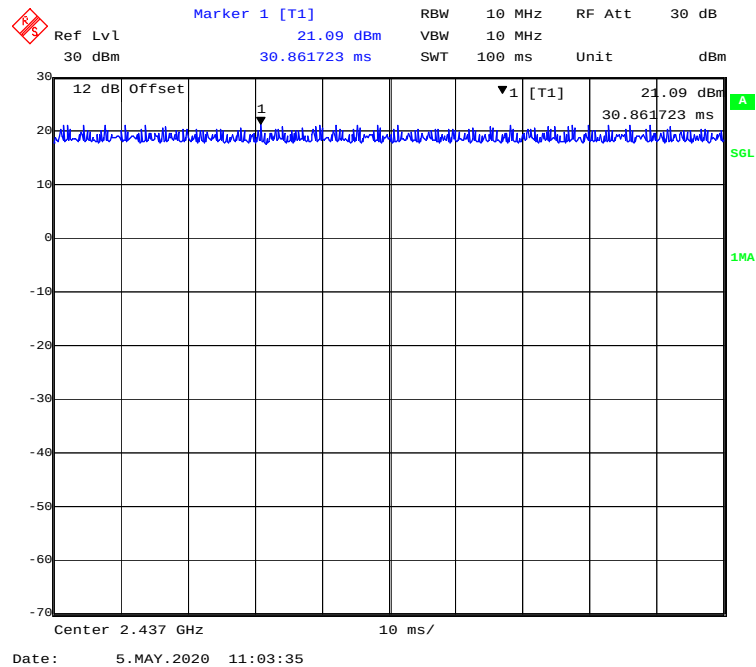


Chain1:

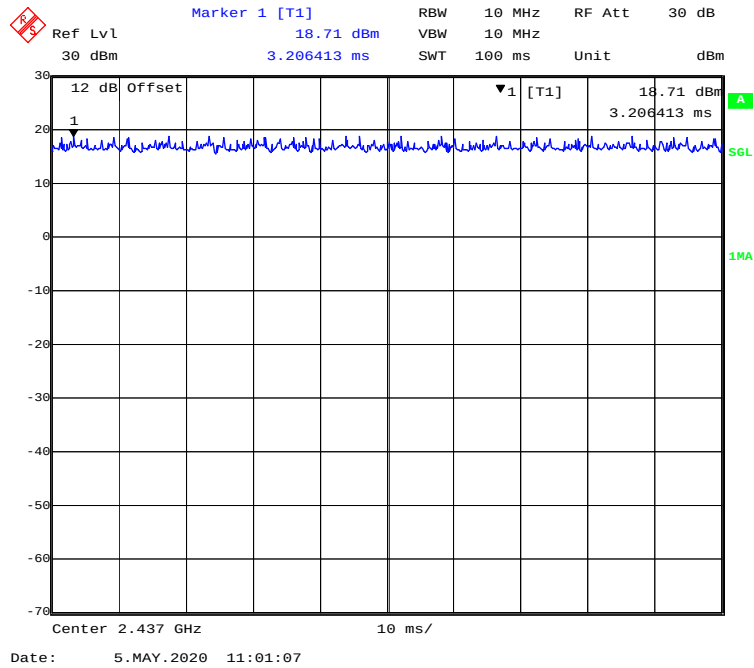
802.11b Mode Middle Channel



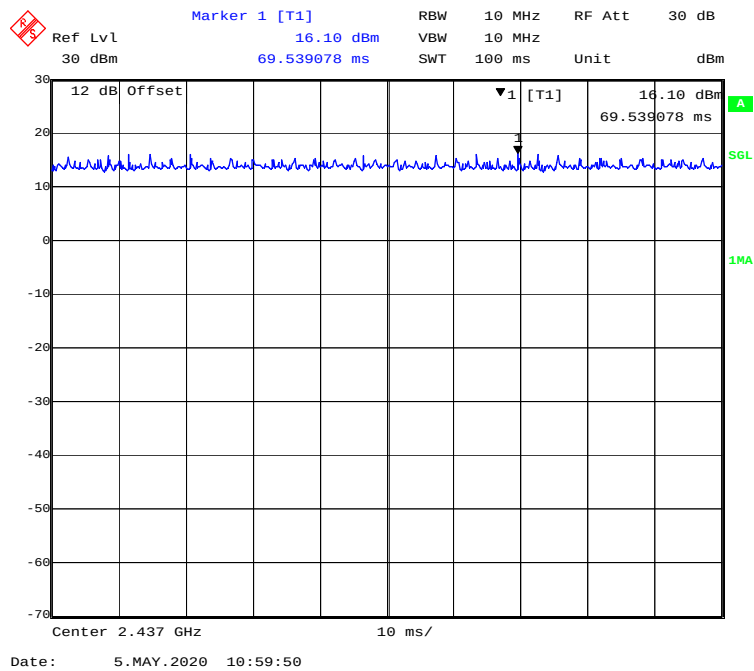
802.11g Mode Middle Channel



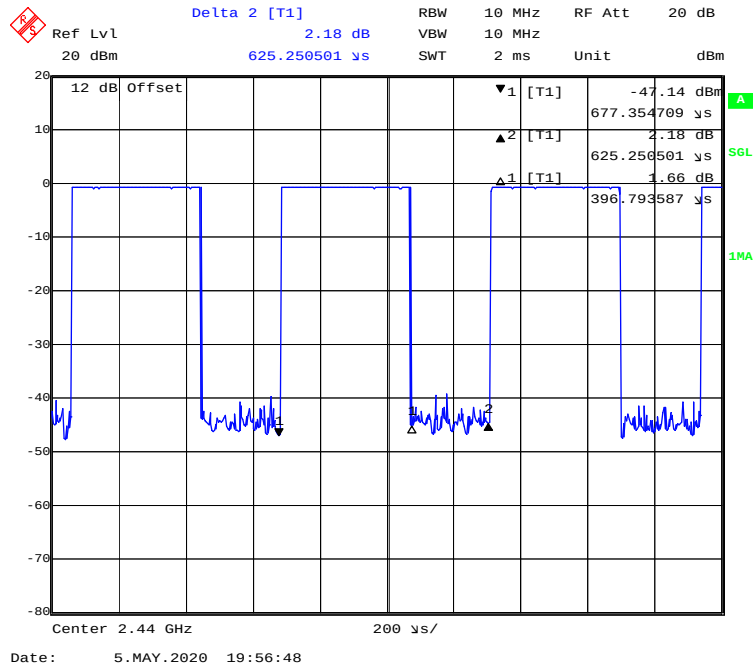
802.11n-HT20 Mode Middle Channel



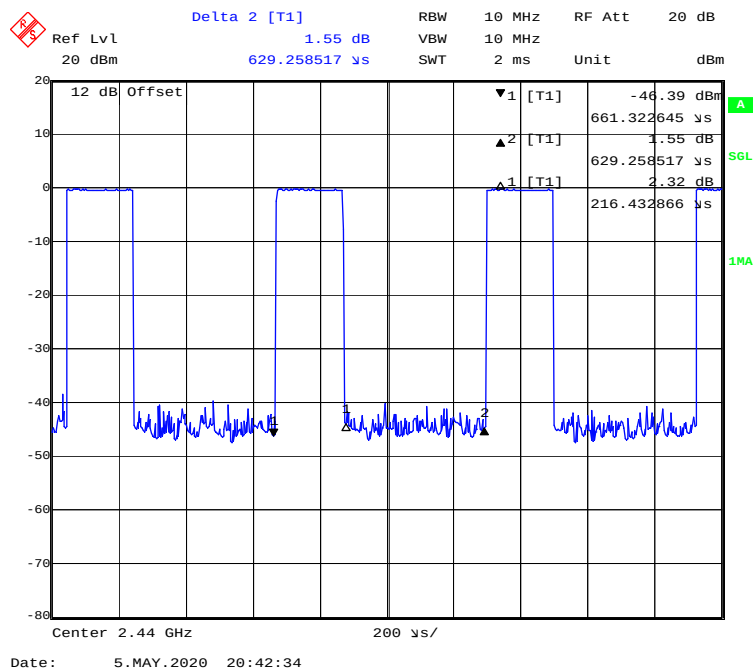
802.11n-HT40 Mode Middle Channel



BLE(1Mbps) Mode Middle Channel



BLE(2Mbps) Mode Middle Channel



Chain	Mode	Duty Cycle (%)	T(ms)	1/T(kHz)	10log(1/x)
Chain0	802.11b	100	/	/	0
	802.11g	100	/	/	0
	802.11n-HT20	100	/	/	0
	802.11n-HT40	100	/	/	0
Chain1	802.11b	100	/	/	0
	802.11g	100	/	/	0
	802.11n-HT20	100	/	/	0
	802.11n-HT40	100	/	/	0
/	BLE(1Mbps)	63.52	0.397	2.52	1.97
/	BLE(2Mbps)	34.34	0.216	4.63	4.64

Note: “x” means the Duty Cycle.

Support Equipment List and Details

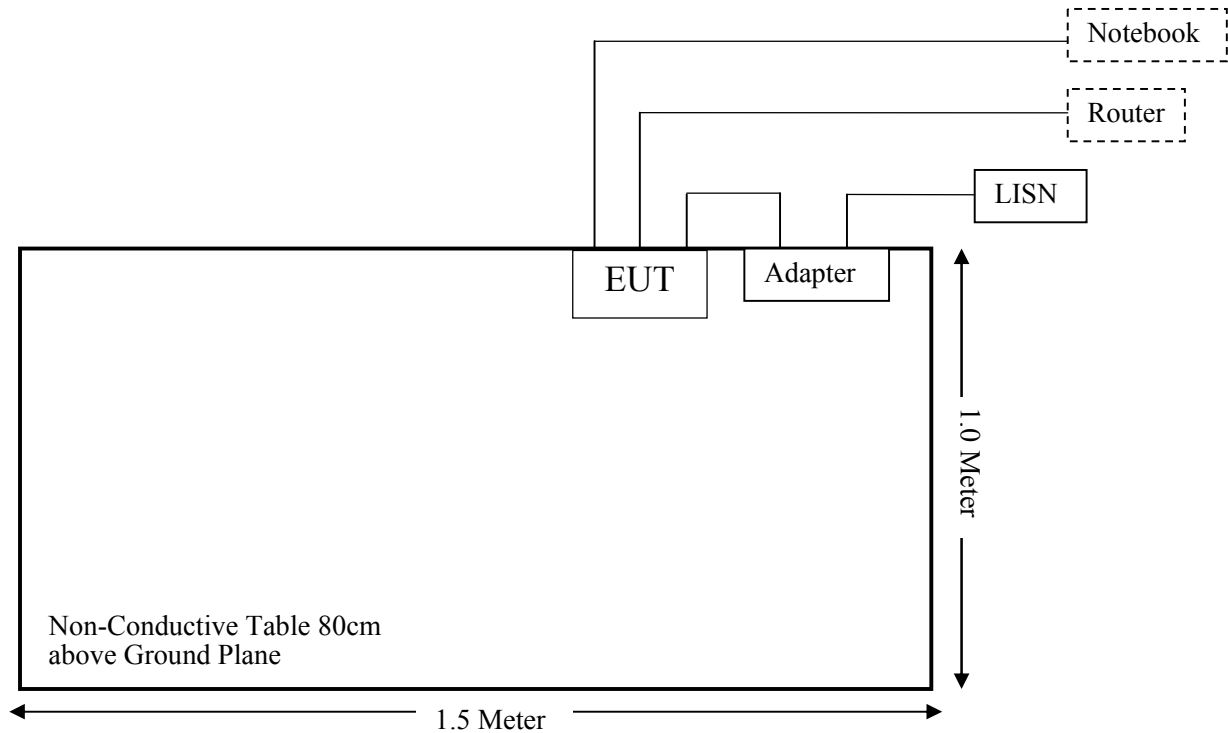
Manufacturer	Description	Model	Serial Number
TP-LINK	Router	TL-WDR5620	1188431022424
DELL	Notebook	GX620	D65874152

External I/O Cable

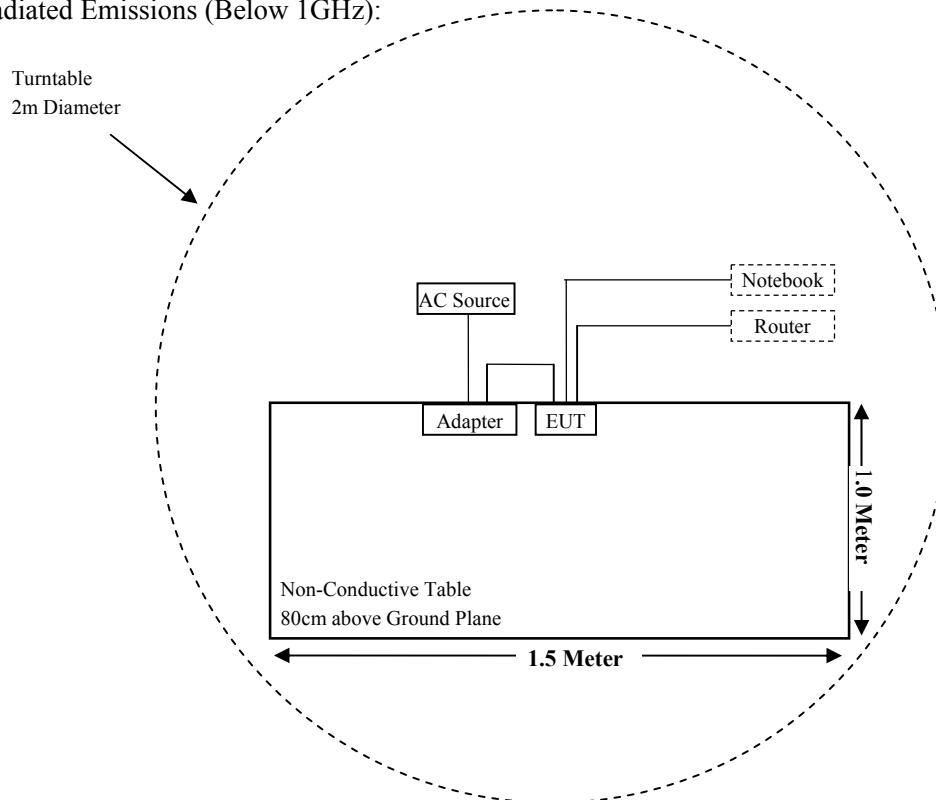
Cable Description	Length (m)	From Port	To
Power Cable	1.0	EUT	Adapter
Power Cable	1.0	Adapter	LISN/AC source
RJ45 Cable	3.0	EUT	Router
RJ45 Cable	3.0	EUT	Notebook

Block Diagram of Test Setup

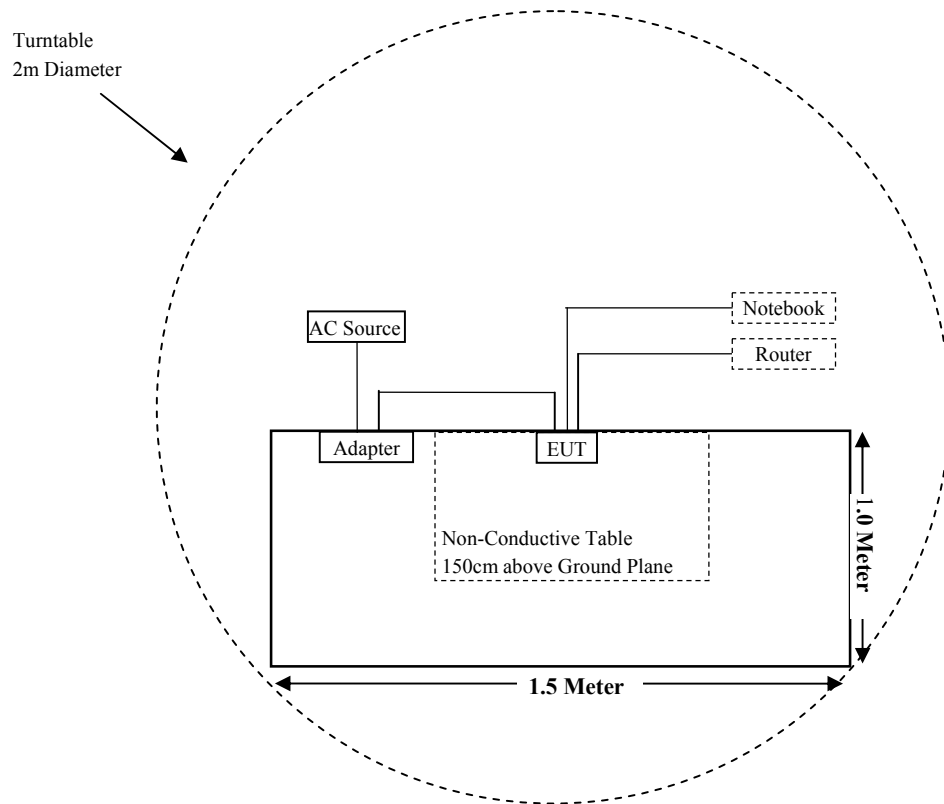
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (I), §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.247(d)	Spurious Emissions at Antenna Port	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

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	2019-12-14	2020-12-13
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2017-12-26	2020-12-25
Sonoma Instrument	Pre-amplifier	310N	171205	2019-08-14	2020-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
Radiated Emission Test (Chamber 2#)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2020-04-01	2021-03-31
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3116	2516	2020-01-17	2023-01-16
A.H.Systems,inc	Amplifier	PAM-0118P	512	2020-02-20	2021-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2020-03-22	2021-03-21
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2019-08-05	2020-08-04
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-12-12	2020-12-11
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/0009	2019-12-14	2020-12-13
Agilent	Power Meter	N1912A	MY5000492	2019-11-18	2020-11-17
Agilent	Power Sensor	N1921A	MY54210024	2019-11-18	2020-11-17
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Roombanker	RF Cable	Roombanker 01	C01	Each Time	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-08-05	2020-08-04
Rohde & Schwarz	LISN	ENV216	101115	2019-12-14	2020-12-13
Audix	Test Software	e3	V9	/	/
Rohde & Schwarz	Pulse limiter	ESH3-Z2	0357.8810.54	2019-08-10	2020-08-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2019-08-15	2020-08-14

* **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/cm²)	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/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

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

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

Calculated Data (worst case):

Mode	Frequency (MHz)	Maximum Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11b	2412-2462	4.7	2.95	18.50	70.79	20	0.0415	1.0
802.11g		4.7	2.95	21.00	125.89	20	0.0739	1.0
802.11n-HT20		4.7	2.95	22.00	158.49	20	0.0930	1.0
802.11n-HT40	2422-2452	4.7	2.95	21.50	141.25	20	0.0829	1.0
BLE(1Mbps)	2402-2480	0	1.00	0	1.00	20	0.0002	1.0
BLE(2Mbps)	2402-2480	0	1.00	0	1.00	20	0.0002	1.0
Zigbee	2405~2480	0	1.00	19.50	89.13	20	0.0177	1.0

Mode	Frequency Range (MHz)	Maximum Antenna Gain		Tune-up EIRP		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
Z-wave	908.4	0	1.00	-1.50	0.71	20	0.0001	0.61

Mode	Frequency Range (MHz)	Maximum Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
GPRS 850	824.2-848.8	4	2.51	27.50	562.34	20	0.2810	0.55
GPRS 1900	1850.2-1909.8	4	2.51	26.50	446.68	20	0.2232	1.00
LTE Band 2	1850.7-1909.3	4	2.51	24	251.19	20	0.1255	1.00
LTE Band 4	1710.7-1754.3	4	2.51	23	199.53	20	0.0997	1.00
LTE Band 5	824.7-848.3	4	2.51	24	251.19	20	0.1255	0.55
LTE Band 12	699.7-715.3	4	2.51	24	251.19	20	0.1255	0.47
LTE Band 13	779.5~784.5	4	2.51	24	251.19	20	0.1255	0.52
LTE Band 25	1850.7~1914.3	4	2.51	25	316.23	20	0.1579	1.00

Note 1:

GPRS 850: Tune-up maximum output power with 1 slot is 32.50 dBm, 2 slots is 32.50 dBm, 3 slots is 31.50 dBm, 4 slots is 30.50 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 27.50dBm.

EGPRS 850: Tune-up maximum output power with 1 slot is 27.00 dBm, 2 slots is 27.00 dBm, 3 slots is 26.50 dBm, 4 slots is 26.50 dBm so the tune-up time based Ave. power compared to slotted Ave. power is 23.50 dBm.

GPRS 1900: Tune-up maximum output power with 1 slot is 30.00 dBm, 2 slots is 30.00 dBm, 3 slots is 30.00 dBm, 4 slots is 29.50 dBm so the tune-up time based Ave. power compared to slotted Ave. power is 26.50 dBm.

EGPRS 1900: Tune-up maximum output power with 1 slot is 26.50 dBm, 2 slots is 26.00 dBm, 3 slots is 26.00 dBm, 4 slots is 26.00 dBm so the tune-up time based Ave. power compared to slotted Ave. power is 23.00 dBm.

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.26 dB	-3 dB

Note 2:

For Z-wave:

ERP=91.53 dB μ V/m-95.2=-3.67dBm

EIRP=ERP+2.15=-1.52 dBm

Tune-up EIRP=-1.5dBm

Note 3:

The LTE module FCC ID: XMR201707BG96(Grant:03/28/2019).

Wi-Fi & BLE & Zigbee & Z-wave & GPRS 850 can transmit simultaneously; the worst condition as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0930/1.00 + 0.0002/1.00 + 0.0177/1.00 + 0.0001/0.61 + 0.2810/0.55 = 0.6220 < 1.0$$

Conclusion: The device meets MPE at distance 20cm.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

- a. Antenna must be permanently attached to the unit.
 - b. Antenna must use a unique type of connector to attach to the EUT.
- Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has two FPC antennas with ipex connector for Wi-Fi, the antenna gain is 4.7dBi for chain0 and 4.7dBi for chain1; and the EUT has a PCB antenna for BLE, the antenna gain is 0dBi; The antennas are permanently attached to the unit, fulfill the requirement of this section. Please refer to the EUT photos.

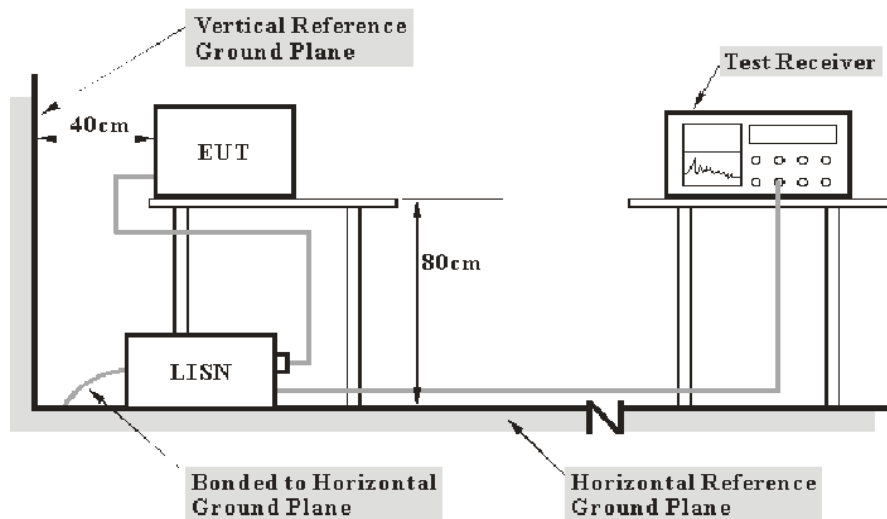
Result: Compliant.

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.

Factor & Over Limit Calculation

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

Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

The “**Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit of 7 dB means the emission is 7 dB above the limit. The equation for Over Limit calculation is as follows:

Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

Test Results Summary

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

Test Data

Environmental Conditions

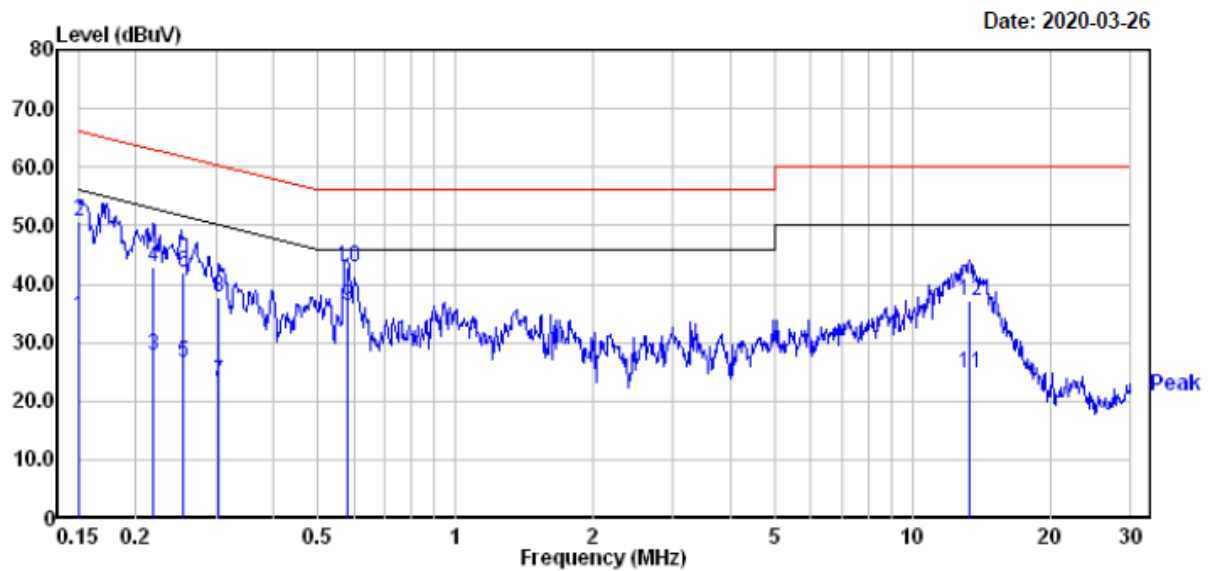
Temperature:	20.2-24.3 °C
Relative Humidity:	46-50 %
ATM Pressure:	101.2-101.5 kPa

The testing was performed by Chao Gao from 2020-03-26 to 2020-05-06.

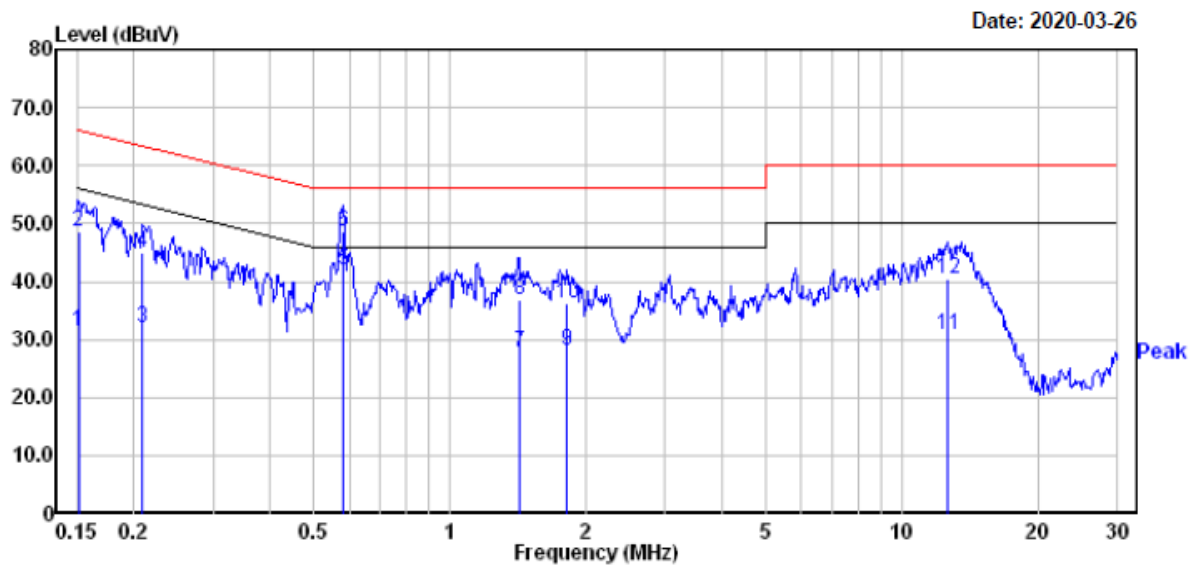
Test Result: Compliant.

For Wi-Fi Mode:

EUT operation mode: Transmitting in 802.11n-HT20 mode low channel (worst case)

AC 120V/60 Hz, Line

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.150	14.50	19.82	34.32	56.00	-21.68	Average
2	0.150	31.00	19.82	50.82	66.00	-15.18	QP
3	0.219	8.10	19.82	27.92	52.88	-24.96	Average
4	0.219	22.90	19.82	42.72	62.88	-20.16	QP
5	0.253	6.70	19.82	26.52	51.64	-25.12	Average
6	0.253	22.10	19.82	41.92	61.64	-19.72	QP
7	0.303	3.49	19.83	23.32	50.15	-26.83	Average
8	0.303	17.99	19.83	37.82	60.15	-22.33	QP
9	0.582	16.40	19.75	36.15	46.00	-9.85	Average
10	0.582	23.10	19.75	42.85	56.00	-13.15	QP
11	13.337	5.00	19.61	24.61	50.00	-25.39	Average
12	13.337	17.50	19.61	37.11	60.00	-22.89	QP

AC 120V/60 Hz, Neutral

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.151	11.70	19.82	31.52	55.96	-24.44	Average
2	0.151	28.70	19.82	48.52	65.96	-17.44	QP
3	0.209	12.30	19.82	32.12	53.23	-21.11	Average
4	0.209	25.30	19.82	45.12	63.23	-18.11	QP
5	0.582	22.20	19.75	41.95	46.00	-4.05	Average
6	0.582	29.00	19.75	48.75	56.00	-7.25	QP
7	1.426	7.91	19.83	27.74	46.00	-18.26	Average
8	1.426	16.91	19.83	36.74	56.00	-19.26	QP
9	1.810	8.10	19.84	27.94	46.00	-18.06	Average
10	1.810	16.40	19.84	36.24	56.00	-19.76	QP
11	12.649	11.30	19.60	30.90	50.00	-19.10	Average
12	12.649	20.90	19.60	40.50	60.00	-19.50	QP

Note:

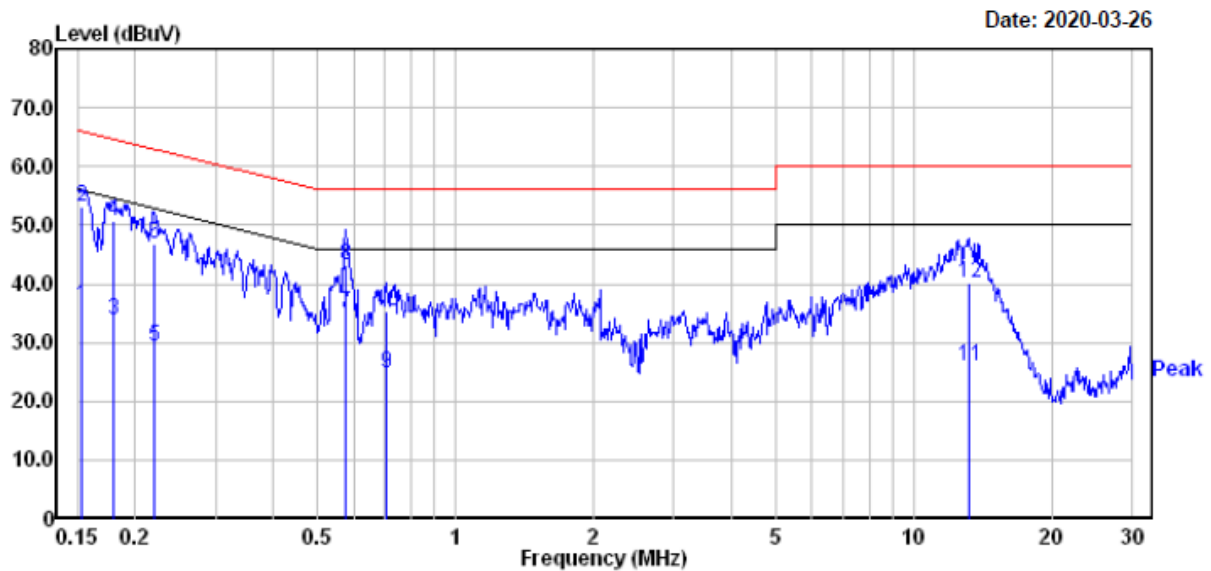
1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

2) Over Limit (dB) = Read level (dBuV) + Factor (dB) - Limit (dBuV)

For BLE Mode:

EUT operation mode: Transmitting in BLE(2Mbps) mode middle channel (worst case)

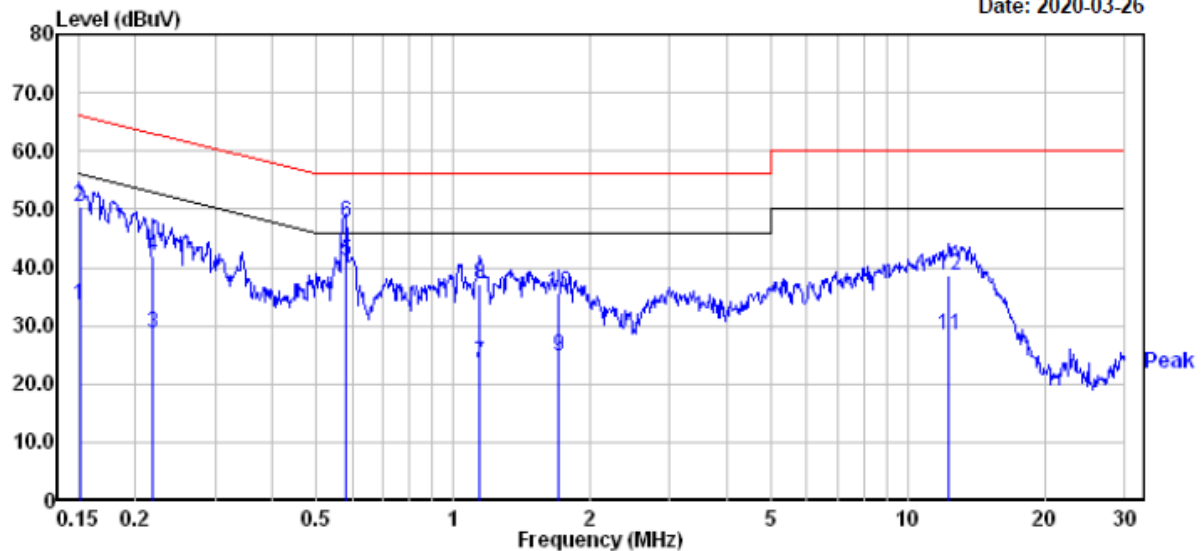
AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.152	16.30	19.82	36.12	55.87	-19.75	Average
2	0.152	33.40	19.82	53.22	65.87	-12.65	QP
3	0.179	13.90	19.83	33.73	54.55	-20.82	Average
4	0.179	31.00	19.83	50.83	64.55	-13.72	QP
5	0.220	9.60	19.82	29.42	52.83	-23.41	Average
6	0.220	27.00	19.82	46.82	62.83	-16.01	QP
7	0.576	15.20	19.75	34.95	46.00	-11.05	Average
8	0.576	23.50	19.75	43.25	56.00	-12.75	QP
9	0.705	5.10	19.75	24.85	46.00	-21.15	Average
10	0.705	15.70	19.75	35.45	56.00	-20.55	QP
11	13.197	6.40	19.60	26.00	50.00	-24.00	Average
12	13.197	20.60	19.60	40.20	60.00	-19.80	QP

AC 120V/60 Hz, Neutral

Date: 2020-03-26



	Freq	Read		Limit	Over	
	MHz	Level	Factor	Level	Line	Limit Remark
	MHz	dBuV	dB	dBuV	dBuV	dB
1	0.151	13.60	19.82	33.42	55.96	-22.54 Average
2	0.151	30.70	19.82	50.52	65.96	-15.44 QP
3	0.217	9.00	19.82	28.82	52.92	-24.10 Average
4	0.217	22.20	19.82	42.02	62.92	-20.90 QP
5	0.579	21.20	19.75	40.95	46.00	-5.05 Average
6	0.579	28.00	19.75	47.75	56.00	-8.25 QP
7	1.147	3.60	19.81	23.41	46.00	-22.59 Average
8	1.147	17.40	19.81	37.21	56.00	-18.79 QP
9	1.707	4.90	19.84	24.74	46.00	-21.26 Average
10	1.707	15.70	19.84	35.54	56.00	-20.46 QP
11	12.318	8.89	19.60	28.49	50.00	-21.51 Average
12	12.318	18.99	19.60	38.59	60.00	-21.41 QP

Note:

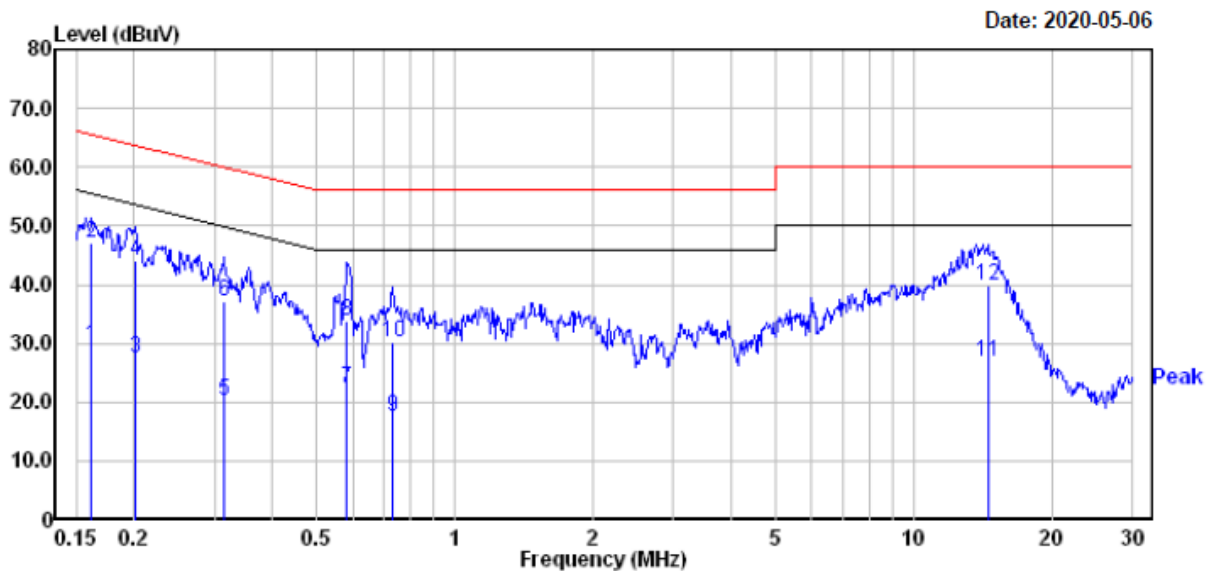
1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

2) Over Limit (dB) = Read level (dBUV) + Factor (dB) - Limit (dBUV)

Transmitting simultaneously test:

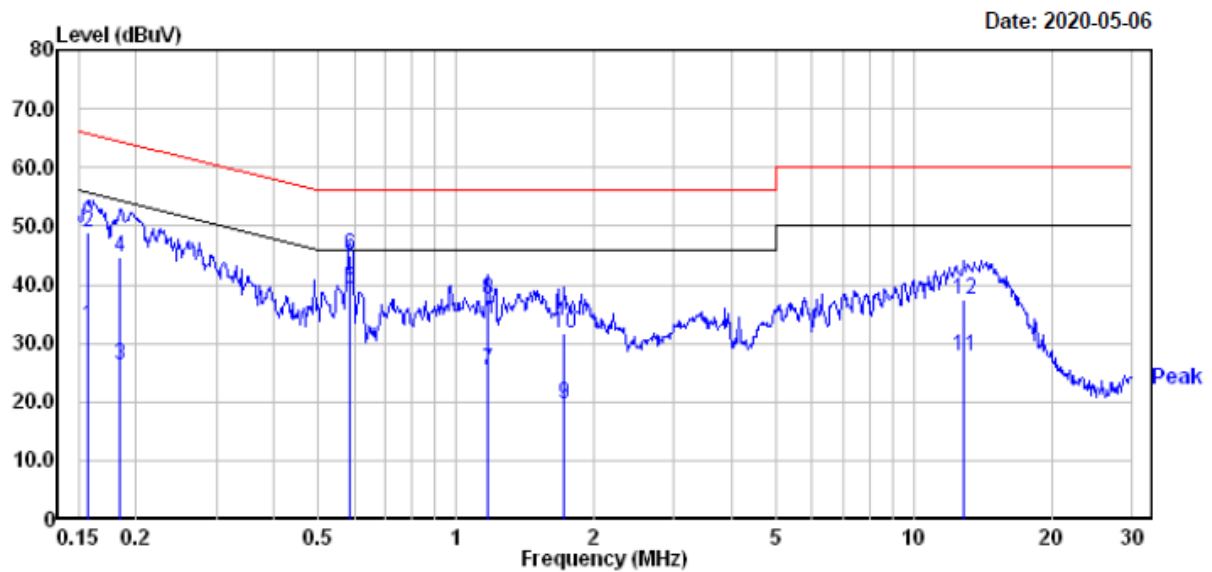
(The worst case Wi-Fi 802.11n-HT20 mode low channel & BLE(2Mbps) mode middle channel & Zigbee low channel & Z-wave & GPRS 850 high channel transmitting simultaneously was recorded)

AC 120V/60 Hz, Line



	Freq	Read		Limit	Over	
	MHz	Level	Factor	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB
1	0.162	9.90	19.83	29.73	55.38	-25.65 Average
2	0.162	27.20	19.83	47.03	65.38	-18.35 QP
3	0.201	7.70	19.82	27.52	53.58	-26.06 Average
4	0.201	24.40	19.82	44.22	63.58	-19.36 QP
5	0.313	0.50	19.82	20.32	49.88	-29.56 Average
6	0.313	17.20	19.82	37.02	59.88	-22.86 QP
7	0.579	2.50	19.75	22.25	46.00	-23.75 Average
8	0.579	14.20	19.75	33.95	56.00	-22.05 QP
9	0.735	-2.10	19.73	17.63	46.00	-28.37 Average
10	0.735	10.40	19.73	30.13	56.00	-25.87 QP
11	14.517	7.29	19.63	26.92	50.00	-23.08 Average
12	14.517	20.29	19.63	39.92	60.00	-20.08 QP

AC 120V/60 Hz, Neutral



	Freq	Read Level	Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.157	13.10	19.82	32.92	55.60	-22.68	Average
2	0.157	29.20	19.82	49.02	65.60	-16.58	QP
3	0.184	6.51	19.82	26.33	54.28	-27.95	Average
4	0.184	24.81	19.82	44.63	64.28	-19.65	QP
5	0.589	19.60	19.75	39.35	46.00	-6.65	Average
6	0.589	25.20	19.75	44.95	56.00	-11.05	QP
7	1.178	5.60	19.81	25.41	46.00	-20.59	Average
8	1.178	17.60	19.81	37.41	56.00	-18.59	QP
9	1.716	-0.10	19.84	19.74	46.00	-26.26	Average
10	1.716	11.80	19.84	31.64	56.00	-24.36	QP
11	12.920	8.10	19.60	27.70	50.00	-22.30	Average
12	12.920	17.90	19.60	37.50	60.00	-22.50	QP

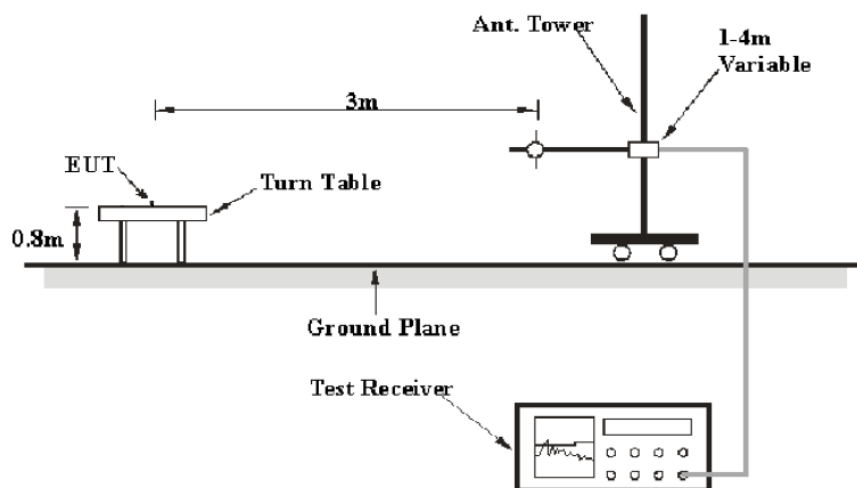
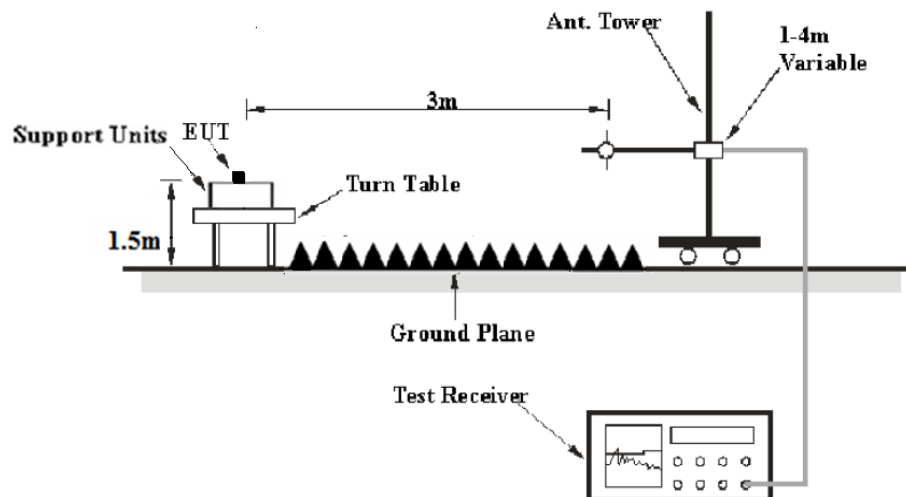
Note:

1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

2) Over Limit (dB) = Read level (dBuV) + Factor (dB) - Limit (dBuV)

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.

Test Procedure

According to 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 (dB μ V/m) = Meter Reading (dB μ V) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

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 (dB) = Limit (dB μ V/m) – Corrected Amplitude (dB μ V/m)

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:	21.1~24.5 °C
Relative Humidity:	50~52 %
ATM Pressure:	101.2~101.5 kPa

The testing was performed by Chao Gao from 2020-04-28 to 2020-05-05.

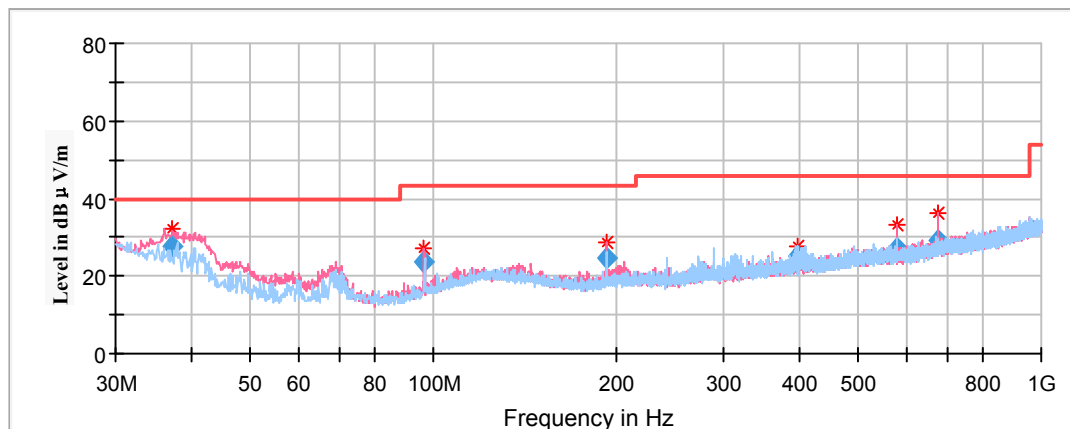
Test Result: Compliant.

EUT operation mode: Transmitting

For Wi-Fi Mode:

Spurious Emission Test:**30MHz-1GHz:**

Pre-scan with 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case **low channel of 802.11n-HT20 mode in Z-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)				
37.275000	27.67	100.0	V	34.0	-8.9	40.00	12.33
96.566250	23.40	100.0	V	171.0	-15.7	43.50	20.10
193.323750	24.55	100.0	V	34.0	-12.8	43.50	18.95
397.023750	25.16	100.0	H	223.0	-8.2	46.00	20.84
579.990000	27.05	100.0	V	136.0	-5.4	46.00	18.95
677.747500	29.17	100.0	V	136.0	-3.6	46.00	16.83

1GHz-18GHz:**802.11b Mode (Chain0):**

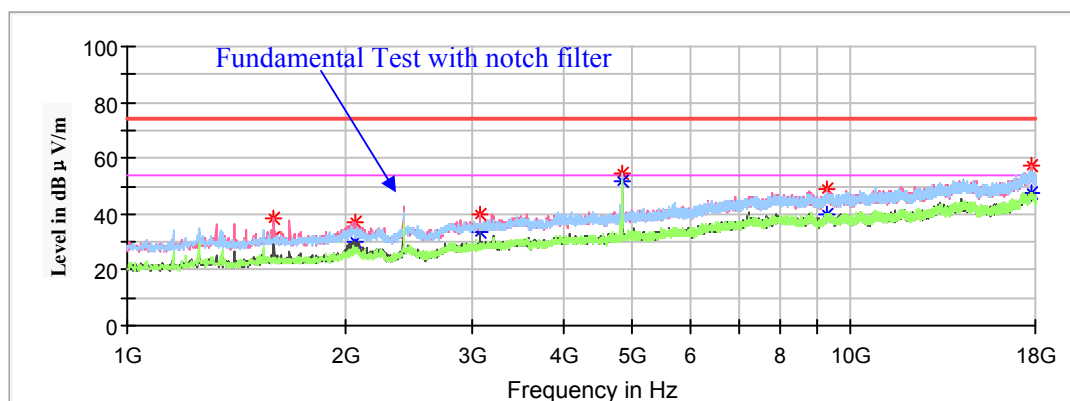
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

Note:

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

Low Channel: 2412MHz

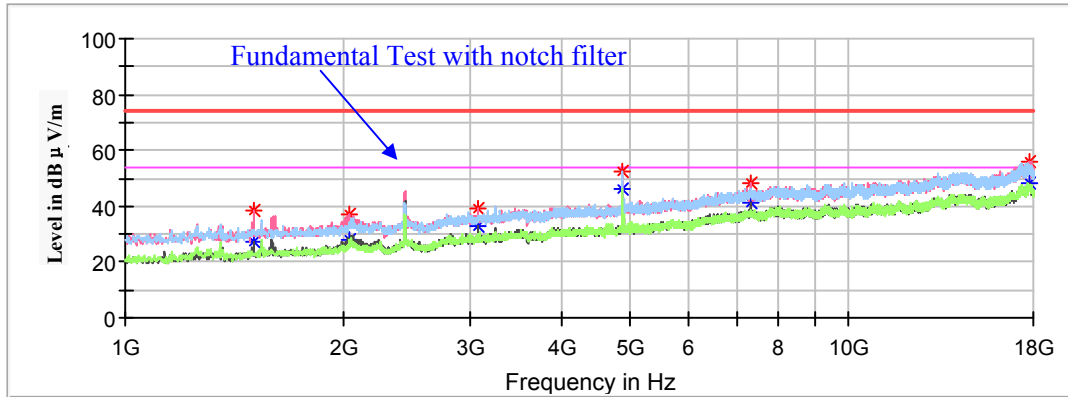
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1591.600000	38.20	---	150.0	V	295.0	-16.0	74.00	35.80
1591.600000	---	31.48	150.0	V	295.0	-16.0	54.00	22.52
2062.500000	37.11	---	200.0	V	97.0	-14.2	74.00	36.89
2062.500000	---	30.05	200.0	V	97.0	-14.2	54.00	23.95
3070.600000	40.08	---	200.0	V	218.0	-9.9	74.00	33.92
3070.600000	---	33.31	200.0	V	218.0	-9.9	54.00	20.69
4824.000000	---	51.77	200.0	H	80.0	-5.5	54.00	2.23
4824.000000	54.68	---	200.0	H	80.0	-5.5	74.00	19.32
9267.100000	---	39.58	150.0	H	359.0	2.0	54.00	14.42
9267.100000	49.12	---	150.0	H	359.0	2.0	74.00	24.88
17787.500000	---	47.60	150.0	V	50.0	8.8	54.00	6.40
17787.500000	57.32	---	150.0	V	50.0	8.8	74.00	16.68

Middle Channel: 2437MHz

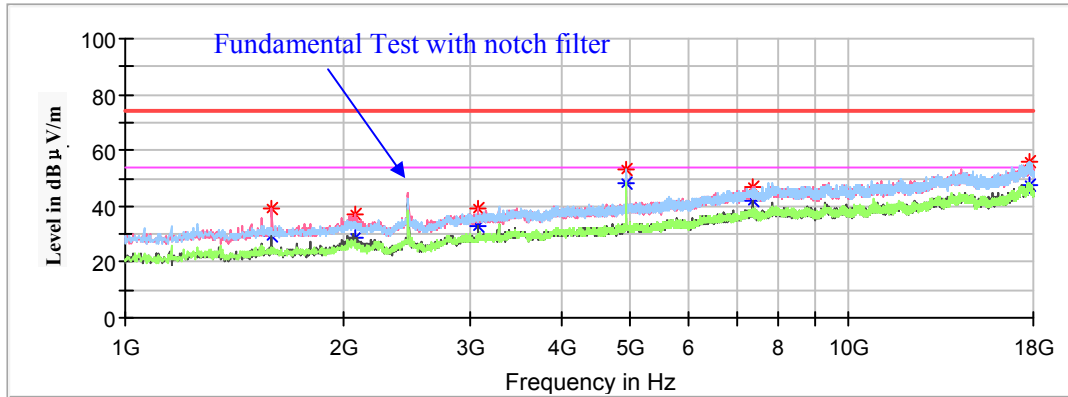
Full Spectrum



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)				
1508.300000	38.64	---	200.0	V	277.0	-16.3	74.00	35.36
1508.300000	---	27.05	200.0	V	277.0	-16.3	54.00	26.95
2037.000000	37.14	---	150.0	V	248.0	-14.3	74.00	36.86
2037.000000	---	28.21	150.0	V	248.0	-14.3	54.00	25.79
3070.600000	38.92	---	200.0	V	358.0	-9.9	74.00	35.08
3070.600000	---	33.05	200.0	V	358.0	-9.9	54.00	20.95
4874.000000	52.14	---	150.0	H	88.0	-5.4	74.00	21.86
4874.000000	---	45.92	150.0	H	88.0	-5.4	54.00	8.08
7311.000000	48.17	---	200.0	H	207.0	0.6	74.00	25.83
7311.000000	---	41.46	200.0	H	207.0	0.6	54.00	12.54
17831.700000	---	48.14	150.0	V	310.0	8.8	54.00	5.86
17831.700000	56.08	---	150.0	V	310.0	8.8	74.00	17.92

High Channel: 2462MHz

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)				
1591.600000	39.01	---	200.0	V	264.0	-16.0	74.00	34.99
1591.600000	---	29.60	200.0	V	264.0	-16.0	54.00	24.40
2079.500000	36.88	---	200.0	V	49.0	-14.1	74.00	37.12
2079.500000	---	28.33	200.0	V	49.0	-14.1	54.00	25.67
3070.600000	39.50	---	200.0	V	359.0	-9.9	74.00	34.50
3070.600000	---	32.78	200.0	V	359.0	-9.9	54.00	21.22
4924.000000	---	48.35	150.0	H	88.0	-5.3	54.00	5.65
4924.000000	53.24	---	150.0	H	88.0	-5.3	74.00	20.76
7386.000000	---	41.97	200.0	H	216.0	0.8	54.00	12.03
7386.000000	46.58	---	200.0	H	216.0	0.8	74.00	27.42
17738.200000	---	47.43	200.0	H	294.0	8.8	54.00	6.57
17738.200000	56.23	---	200.0	H	294.0	8.8	74.00	17.77

802.11g Mode (Chain0):

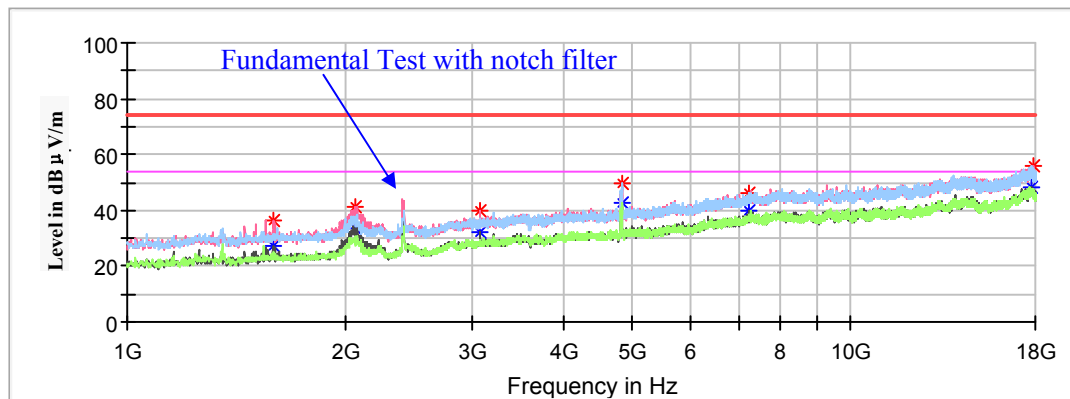
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

Note:

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

Low Channel: 2412MHz

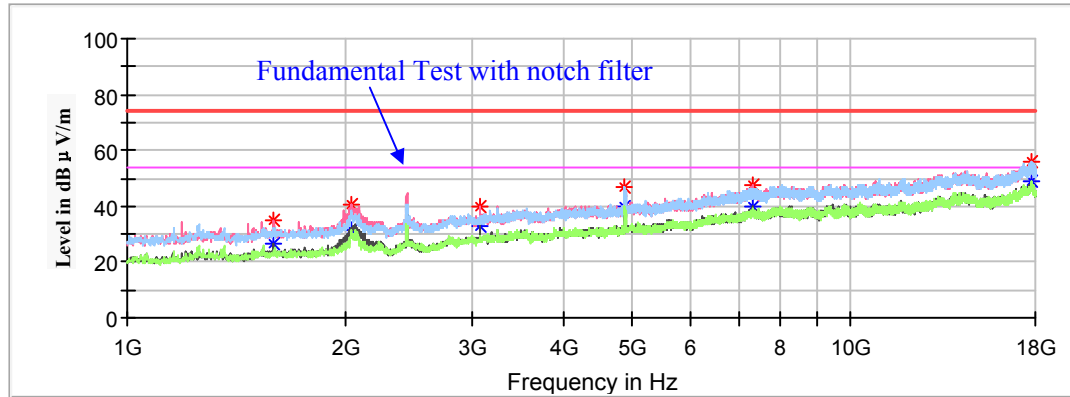
Full Spectrum



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)				
1595.000000	---	27.09	150.0	V	312.0	-16.0	54.00	26.91
1595.000000	36.67	---	150.0	V	312.0	-16.0	74.00	37.33
2062.500000	---	33.44	150.0	V	273.0	-14.2	54.00	20.56
2062.500000	41.48	---	150.0	V	273.0	-14.2	74.00	32.52
3070.600000	---	32.38	200.0	V	216.0	-9.9	54.00	21.62
3070.600000	39.54	---	200.0	V	216.0	-9.9	74.00	34.46
4824.000000	---	42.55	150.0	V	49.0	-5.5	54.00	11.45
4824.000000	49.56	---	150.0	V	49.0	-5.5	74.00	24.44
7236.000000	---	39.61	200.0	V	184.0	0.4	54.00	14.39
7236.000000	46.21	---	200.0	V	184.0	0.4	74.00	27.79
17828.300000	---	48.30	150.0	V	273.0	8.8	54.00	5.70
17828.300000	55.89	---	150.0	V	273.0	8.8	74.00	18.11

Middle Channel: 2437MHz

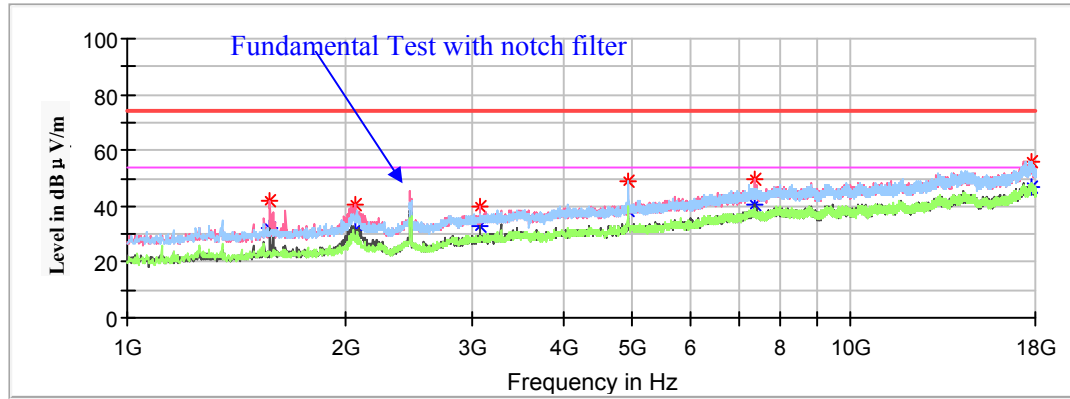
Full Spectrum



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)				
1595.000000	---	26.84	200.0	V	264.0	-16.0	54.00	27.16
1595.000000	35.12	---	200.0	V	264.0	-16.0	74.00	38.88
2037.000000	---	31.78	200.0	V	345.0	-14.3	54.00	22.22
2037.000000	40.82	---	200.0	V	345.0	-14.3	74.00	33.18
3070.600000	---	32.89	200.0	V	345.0	-9.9	54.00	21.11
3070.600000	39.70	---	200.0	V	345.0	-9.9	74.00	34.30
4874.000000	46.83	---	150.0	H	110.0	-5.4	74.00	27.17
4874.000000	---	39.84	150.0	H	110.0	-5.4	54.00	14.16
7311.000000	---	39.71	150.0	H	327.0	0.6	54.00	14.29
7311.000000	47.28	---	150.0	H	327.0	0.6	74.00	26.72
17739.900000	---	48.69	150.0	H	183.0	8.8	54.00	5.31
17739.900000	55.70	---	150.0	H	183.0	8.8	74.00	18.30

High Channel: 2462MHz

Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1576.300000	---	32.36	150.0	V	273.0	-16.1	54.00	21.64
1576.300000	42.13	---	150.0	V	273.0	-16.1	74.00	31.87
2067.600000	---	31.54	150.0	V	15.0	-14.2	54.00	22.46
2067.600000	40.24	---	150.0	V	15.0	-14.2	74.00	33.76
3070.600000	---	32.70	200.0	V	0.0	-9.9	54.00	21.30
3070.600000	39.90	---	200.0	V	0.0	-9.9	74.00	34.10
4924.000000	---	38.50	150.0	H	88.0	-5.3	54.00	15.50
4924.000000	48.82	---	150.0	H	88.0	-5.3	74.00	25.18
7386.000000	---	40.40	200.0	H	216.0	0.8	54.00	13.60
7386.000000	49.58	---	200.0	H	216.0	0.8	74.00	24.42
17745.000000	---	46.51	200.0	H	312.0	8.8	54.00	7.49
17745.000000	56.10	---	200.0	H	312.0	8.8	74.00	17.90

802.11b Mode (Chain1):

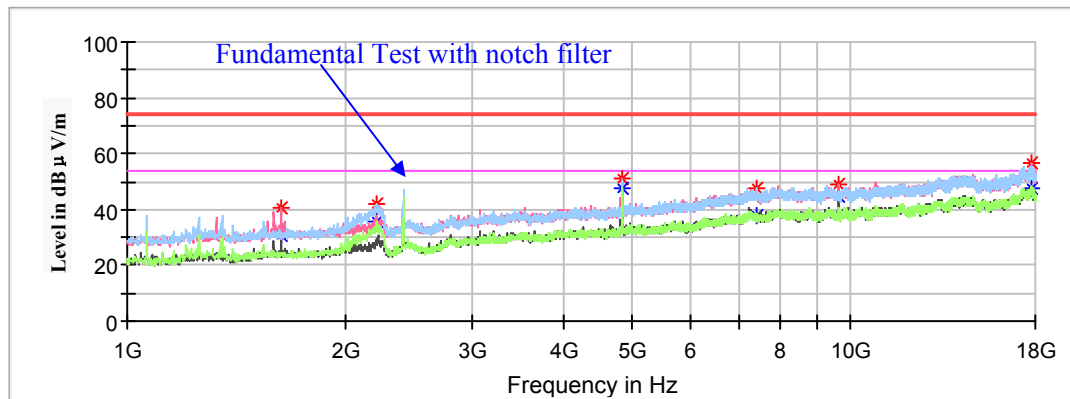
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

Note:

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

Low Channel: 2412MHz

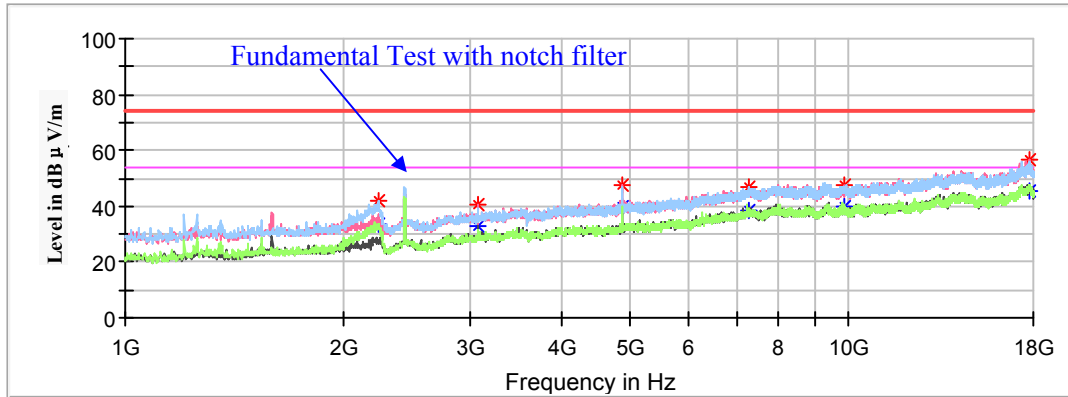
Full Spectrum



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)				
1632.400000	40.68	---	200.0	V	296.0	-15.9	74.00	33.32
1632.400000	---	30.67	200.0	V	296.0	-15.9	54.00	23.33
2217.200000	42.18	---	200.0	H	79.0	-13.6	74.00	31.82
2217.200000	---	35.94	200.0	H	79.0	-13.6	54.00	18.06
4824.000000	51.30	---	150.0	V	67.0	-5.5	74.00	22.70
4824.000000	---	47.80	150.0	V	67.0	-5.5	54.00	6.20
7236.000000	47.88	---	150.0	V	206.0	0.4	74.00	26.12
7236.000000	---	37.65	150.0	V	206.0	0.4	54.00	16.35
9647.900000	48.98	---	150.0	V	9.0	2.1	74.00	25.02
9647.900000	---	44.50	150.0	V	9.0	2.1	54.00	9.50
17782.400000	---	47.69	200.0	V	296.0	8.8	54.00	6.31
17782.400000	56.43	---	200.0	V	296.0	8.8	74.00	17.57

Middle Channel: 2437MHz

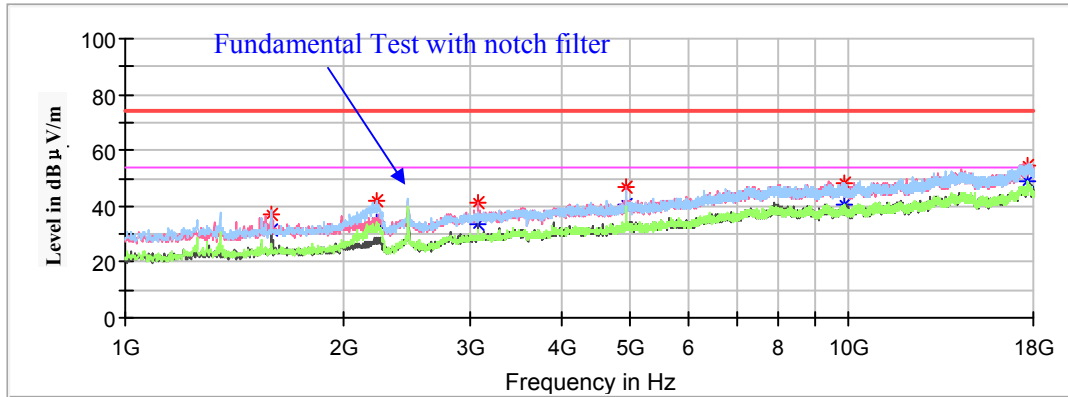
Full Spectrum



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)				
2241.000000	---	33.64	200.0	H	80.0	-13.5	54.00	20.36
2241.000000	42.01	---	200.0	H	80.0	-13.5	74.00	31.99
3070.600000	---	32.88	150.0	V	201.0	-9.9	54.00	21.12
3070.600000	40.40	---	150.0	V	201.0	-9.9	74.00	33.60
4874.000000	---	40.04	200.0	V	82.0	-5.4	54.00	13.96
4874.000000	47.55	---	200.0	V	82.0	-5.4	74.00	26.45
7311.000000	---	38.13	200.0	V	353.0	0.6	54.00	15.87
7311.000000	46.62	---	200.0	V	353.0	0.6	74.00	27.38
9833.200000	---	39.93	150.0	V	49.0	2.0	54.00	14.07
9833.200000	47.70	---	150.0	V	49.0	2.0	74.00	26.30
17799.400000	---	45.38	150.0	V	357.0	8.8	54.00	8.62
17799.400000	56.39	---	150.0	V	357.0	8.8	74.00	17.61

High Channel: 2462MHz

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)				
1591.600000	---	31.24	200.0	V	293.0	-16.0	54.00	22.76
1591.600000	37.19	---	200.0	V	293.0	-16.0	74.00	36.81
2227.400000	---	33.98	200.0	H	80.0	-13.5	54.00	20.02
2227.400000	41.87	---	200.0	H	80.0	-13.5	74.00	32.13
3070.600000	---	33.50	150.0	V	205.0	-9.9	54.00	20.50
3070.600000	41.06	---	150.0	V	205.0	-9.9	74.00	32.94
4924.000000	---	40.65	150.0	V	86.0	-5.3	54.00	13.35
4924.000000	46.78	---	150.0	V	86.0	-5.3	74.00	27.22
9833.200000	---	40.62	200.0	H	111.0	2.0	54.00	13.38
9833.200000	47.94	---	200.0	H	111.0	2.0	74.00	26.06
17692.300000	---	48.74	150.0	H	341.0	8.9	54.00	5.26
17692.300000	54.45	---	150.0	H	341.0	8.9	74.00	19.55

802.11g Mode (Chain1):

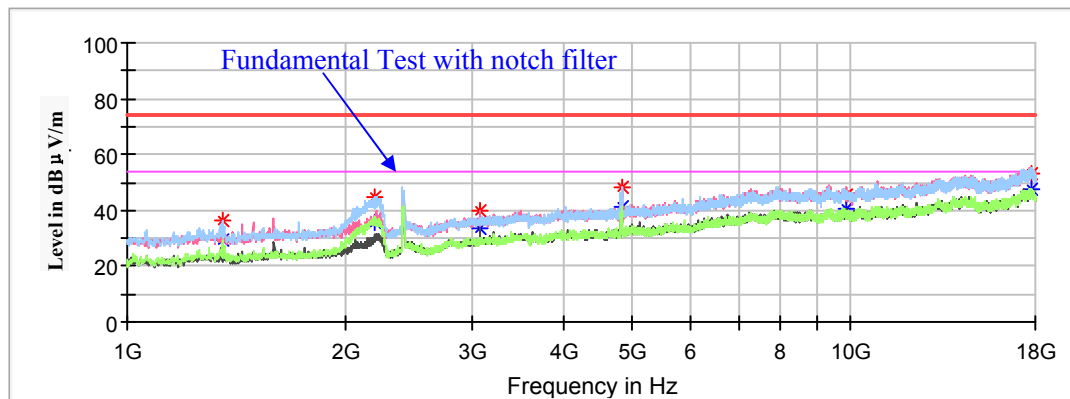
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

Note:

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

Low Channel: 2412MHz

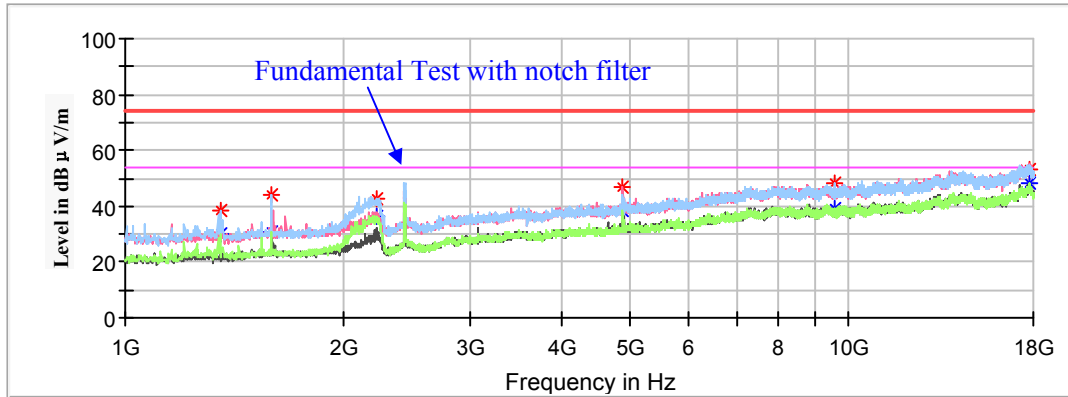
Full Spectrum



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)				
1351.900000	---	29.26	200.0	H	39.0	-17.2	54.00	24.74
1351.900000	36.10	---	200.0	H	39.0	-17.2	74.00	37.90
2201.900000	---	35.64	150.0	H	86.0	-13.6	54.00	18.36
2201.900000	44.69	---	150.0	H	86.0	-13.6	74.00	29.31
3070.600000	---	33.35	200.0	V	354.0	-9.9	54.00	20.65
3070.600000	40.13	---	200.0	V	354.0	-9.9	74.00	33.87
4824.000000	---	40.93	150.0	V	80.0	-5.5	54.00	13.07
4824.000000	48.45	---	150.0	V	80.0	-5.5	74.00	25.55
9845.100000	---	40.66	150.0	V	154.0	2.0	54.00	13.34
9845.100000	45.30	---	150.0	V	154.0	2.0	74.00	28.70
17736.500000	---	47.75	150.0	H	337.0	8.8	54.00	6.25
17736.500000	53.12	---	150.0	H	337.0	8.8	74.00	20.88

Middle Channel: 2437MHz

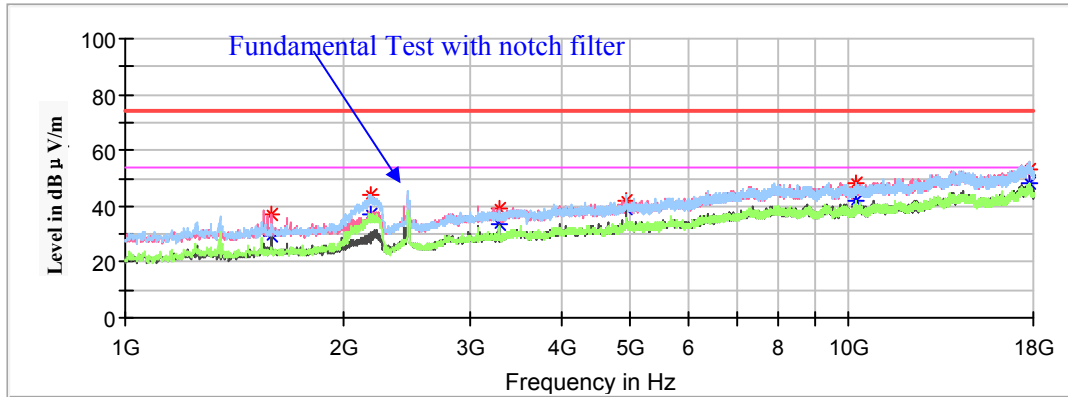
Full Spectrum



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)				
1351.900000	---	30.00	200.0	H	34.0	-17.2	54.00	24.00
1351.900000	38.55	---	200.0	H	34.0	-17.2	74.00	35.45
1593.300000	---	30.61	150.0	H	23.0	-16.0	54.00	23.39
1593.300000	44.00	---	150.0	H	23.0	-16.0	74.00	30.00
2232.500000	---	36.33	200.0	H	78.0	-13.5	54.00	17.67
2232.500000	42.79	---	200.0	H	78.0	-13.5	74.00	31.21
4874.000000	---	38.30	150.0	V	80.0	-5.4	54.00	15.70
4874.000000	46.99	---	150.0	V	80.0	-5.4	74.00	27.01
9549.300000	---	39.39	150.0	H	162.0	2.1	54.00	14.61
9549.300000	48.32	---	150.0	H	162.0	2.1	74.00	25.68
17746.700000	---	48.09	200.0	H	0.0	8.8	54.00	5.91
17746.700000	53.05	---	200.0	H	0.0	8.8	74.00	20.95

High Channel: 2462MHz

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)				
1595.000000	37.22	---	150.0	V	265.0	-16.0	74.00	36.78
1595.000000	---	29.63	150.0	V	265.0	-16.0	54.00	24.37
2183.200000	44.39	---	150.0	H	96.0	-13.7	74.00	29.61
2183.200000	---	37.38	150.0	H	96.0	-13.7	54.00	16.62
3281.400000	---	33.36	150.0	V	351.0	-9.4	54.00	20.64
3281.400000	39.07	---	150.0	V	351.0	-9.4	74.00	34.93
4924.000000	---	39.06	150.0	V	58.0	-5.3	54.00	14.94
4924.000000	42.20	---	150.0	V	58.0	-5.3	74.00	31.80
10212.300000	---	41.80	150.0	H	350.0	2.1	54.00	12.20
10212.300000	48.27	---	150.0	H	350.0	2.1	74.00	25.73
17739.900000	53.28	---	150.0	H	250.0	8.8	74.00	20.72
17739.900000	---	47.92	150.0	H	250.0	8.8	54.00	6.08

802.11n-HT20 Mode (Chain0+Chain1):

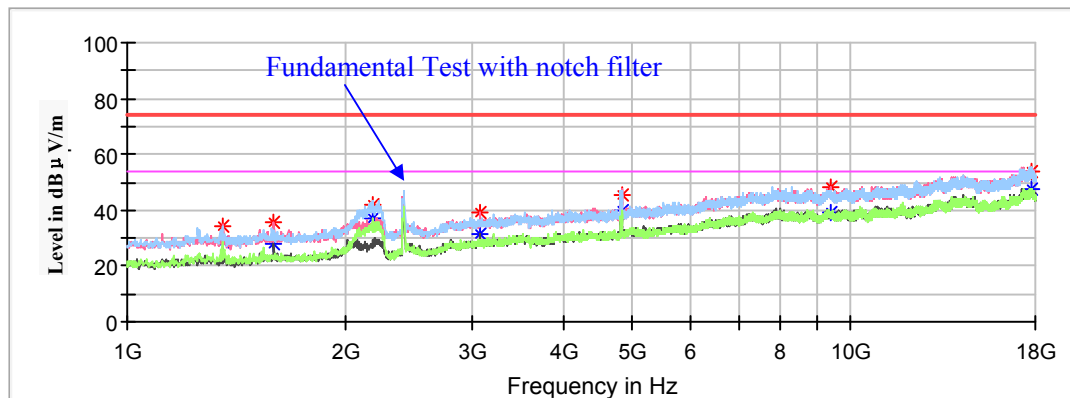
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

Note:

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

Low Channel: 2412MHz

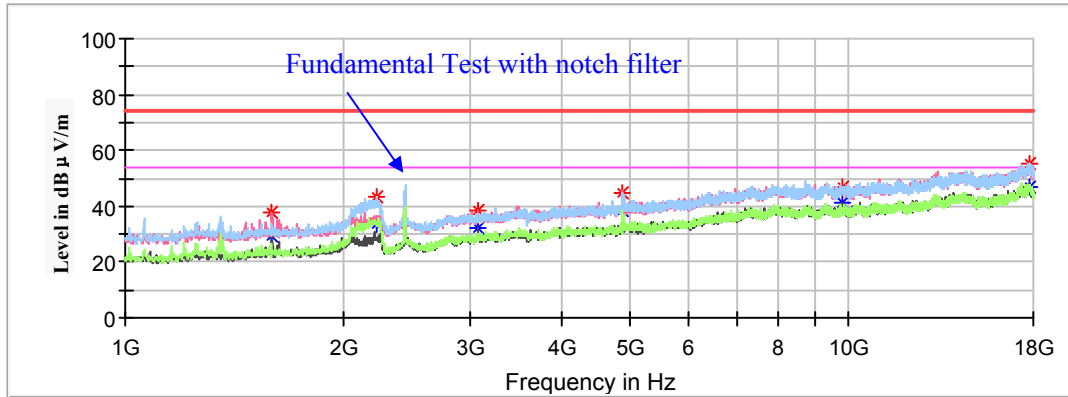
Full Spectrum



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)				
1351.900000	---	28.91	200.0	H	32.0	-17.2	54.00	25.09
1351.900000	34.11	---	200.0	H	32.0	-17.2	74.00	39.89
1595.000000	---	28.16	200.0	V	290.0	-16.0	54.00	25.84
1595.000000	35.86	---	200.0	V	290.0	-16.0	74.00	38.14
2184.900000	---	36.74	200.0	H	135.0	-13.7	54.00	17.26
2184.900000	41.95	---	200.0	H	135.0	-13.7	74.00	32.05
3070.600000	---	31.66	200.0	V	217.0	-9.9	54.00	22.34
3070.600000	38.81	---	200.0	V	217.0	-9.9	74.00	35.19
4824.000000	---	40.18	200.0	H	46.0	-5.5	54.00	13.82
4824.000000	45.16	---	200.0	H	46.0	-5.5	74.00	28.84
9398.000000	---	38.90	150.0	V	261.0	2.1	54.00	15.10
9398.000000	48.53	---	150.0	V	261.0	2.1	74.00	25.47
17796.000000	---	47.79	200.0	V	339.0	8.8	54.00	6.21
17796.000000	53.58	---	200.0	V	339.0	8.8	74.00	20.42

Middle Channel: 2437MHz

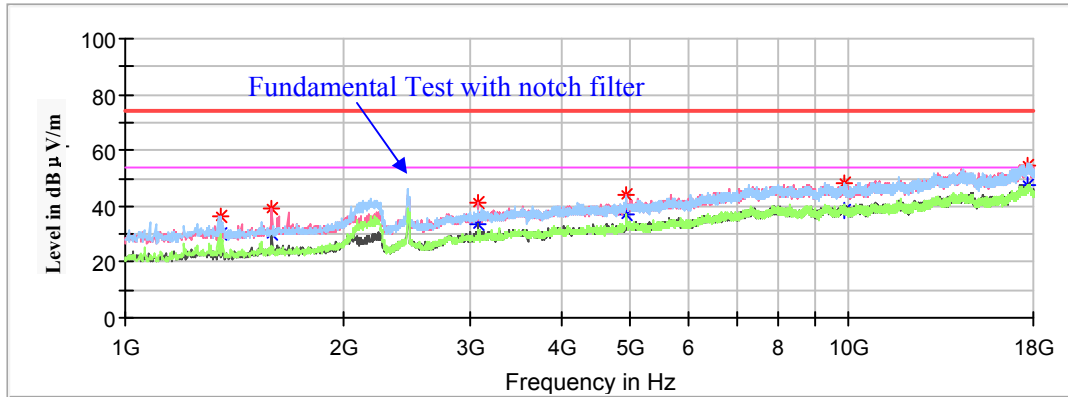
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1596.700000	---	29.04	150.0	V	79.0	-16.0	54.00	24.96
1596.700000	38.11	---	150.0	V	79.0	-16.0	74.00	35.89
2222.300000	---	33.90	150.0	H	135.0	-13.6	54.00	20.10
2222.300000	43.32	---	150.0	H	135.0	-13.6	74.00	30.68
3070.600000	---	32.29	200.0	V	218.0	-9.9	54.00	21.71
3070.600000	38.16	---	200.0	V	218.0	-9.9	74.00	35.84
4874.000000	---	38.75	150.0	H	72.0	-5.4	54.00	15.25
4874.000000	44.77	---	150.0	H	72.0	-5.4	74.00	29.23
9800.900000	---	41.25	200.0	V	20.0	2.0	54.00	12.75
9800.900000	47.16	---	200.0	V	20.0	2.0	74.00	26.84
17758.600000	---	46.51	150.0	V	79.0	8.8	54.00	7.49
17758.600000	55.17	---	150.0	V	79.0	8.8	74.00	18.83

High Channel: 2462MHz

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)				
1351.900000	---	29.88	200.0	H	19.0	-17.2	54.00	24.12
1351.900000	36.04	---	200.0	H	19.0	-17.2	74.00	37.96
1596.700000	---	30.00	200.0	V	65.0	-16.0	54.00	24.00
1596.700000	39.49	---	200.0	V	65.0	-16.0	74.00	34.51
3070.600000	---	33.42	150.0	V	233.0	-9.9	54.00	20.58
3070.600000	41.23	---	150.0	V	233.0	-9.9	74.00	32.77
4924.000000	---	36.83	200.0	V	65.0	-5.3	54.00	17.17
4924.000000	43.97	---	200.0	V	65.0	-5.3	74.00	30.03
9838.300000	---	38.12	150.0	H	0.0	2.0	54.00	15.88
9838.300000	48.29	---	150.0	H	0.0	2.0	74.00	25.71
17694.000000	---	47.89	150.0	V	39.0	8.9	54.00	6.11
17694.000000	54.34	---	150.0	V	39.0	8.9	74.00	19.66

802.11n-HT40 Mode (Chain0+Chain1):

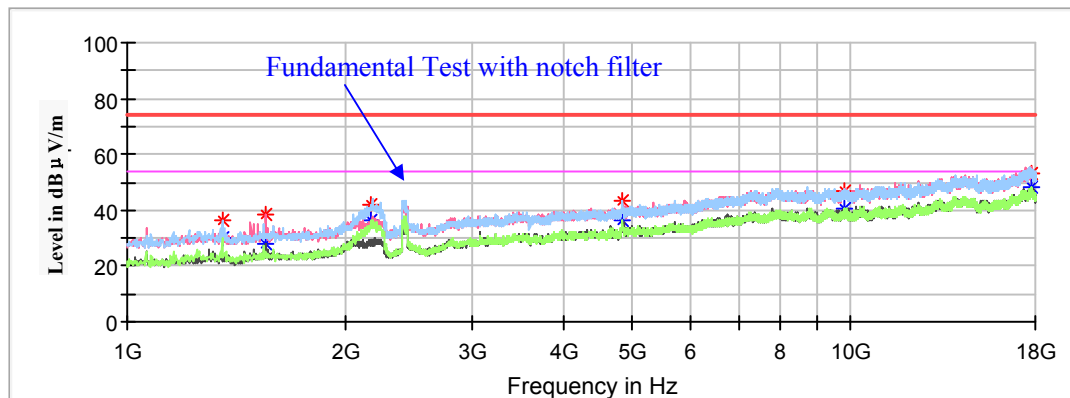
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

Note:

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

Low Channel: 2422MHz

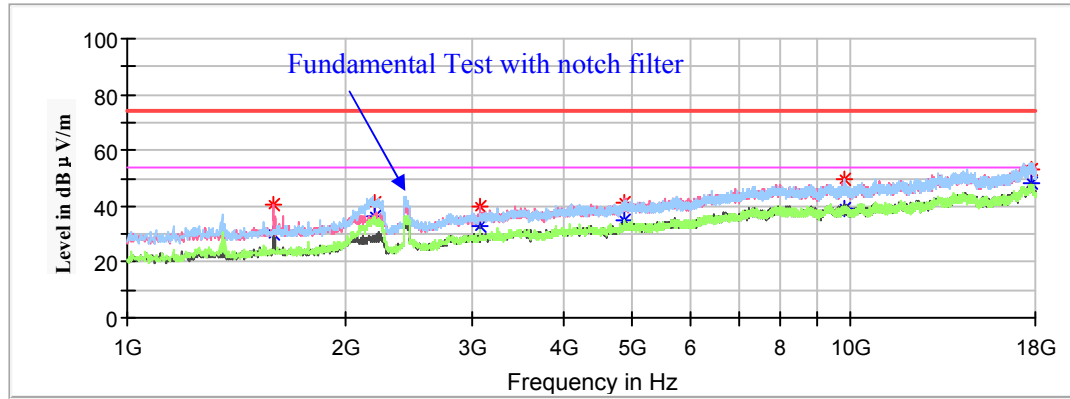
Full Spectrum



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)				
1351.900000	36.44	---	150.0	H	236.0	-17.2	74.00	37.56
1351.900000	---	30.19	150.0	H	236.0	-17.2	54.00	23.81
1552.500000	38.61	---	200.0	V	292.0	-16.2	74.00	35.39
1552.500000	---	28.24	200.0	V	292.0	-16.2	54.00	25.76
2176.400000	42.29	---	150.0	H	86.0	-13.7	74.00	31.71
2176.400000	---	36.46	150.0	H	86.0	-13.7	54.00	17.54
4844.000000	---	36.18	150.0	H	102.0	-5.5	54.00	17.82
4844.000000	43.63	---	150.0	H	102.0	-5.5	74.00	30.37
9794.100000	---	40.86	150.0	H	0.0	2.0	54.00	13.14
9794.100000	46.90	---	150.0	H	0.0	2.0	74.00	27.10
17746.700000	52.97	---	150.0	H	221.0	8.8	74.00	21.03
17746.700000	---	48.12	150.0	H	221.0	8.8	54.00	5.88

Middle Channel: 2437MHz

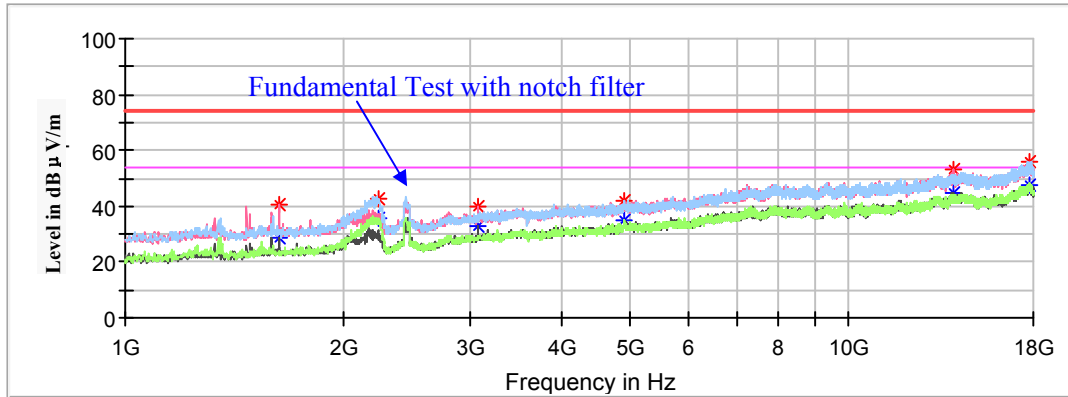
Full Spectrum



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)				
1591.600000	---	30.20	200.0	V	259.0	-16.0	54.00	23.80
1591.600000	40.47	---	200.0	V	259.0	-16.0	74.00	33.53
2191.700000	---	36.26	150.0	H	83.0	-13.7	54.00	17.74
2191.700000	40.96	---	150.0	H	83.0	-13.7	74.00	33.04
3070.600000	---	32.66	200.0	V	215.0	-9.9	54.00	21.34
3070.600000	39.85	---	200.0	V	215.0	-9.9	74.00	34.15
4874.000000	---	34.88	150.0	H	98.0	-5.4	54.00	19.12
4874.000000	41.40	---	150.0	H	98.0	-5.4	74.00	32.60
9826.400000	---	38.88	150.0	H	21.0	2.0	54.00	15.12
9826.400000	49.46	---	150.0	H	21.0	2.0	74.00	24.54
17724.600000	---	48.11	200.0	V	64.0	8.8	54.00	5.89
17724.600000	53.44	---	200.0	V	64.0	8.8	74.00	20.56

High Channel: 2452MHz

Full Spectrum

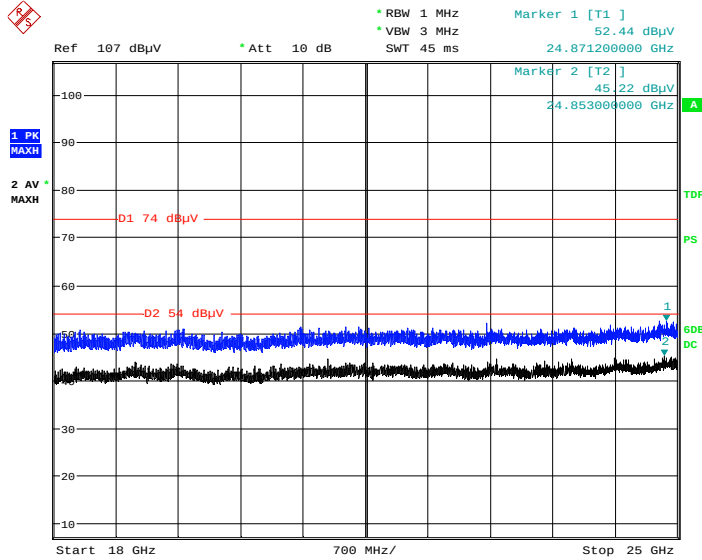


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1629.000000	---	28.86	200.0	V	280.0	-15.9	54.00	25.14
1629.000000	40.49	---	200.0	V	280.0	-15.9	74.00	33.51
2246.100000	---	35.66	200.0	H	86.0	-13.5	54.00	18.34
2246.100000	42.92	---	200.0	H	86.0	-13.5	74.00	31.08
3070.600000	---	32.96	200.0	V	357.0	-9.9	54.00	21.04
3070.600000	40.06	---	200.0	V	357.0	-9.9	74.00	33.94
4904.000000	---	34.75	200.0	V	192.0	-5.4	54.00	19.25
4904.000000	41.83	---	200.0	V	192.0	-5.4	74.00	32.17
13923.400000	---	44.61	200.0	V	251.0	6.1	54.00	9.39
13923.400000	52.95	---	200.0	V	251.0	6.1	74.00	21.05
17731.400000	---	47.23	150.0	H	0.0	8.8	54.00	6.77
17731.400000	55.86	---	150.0	H	0.0	8.8	74.00	18.14

18GHz-25GHz:

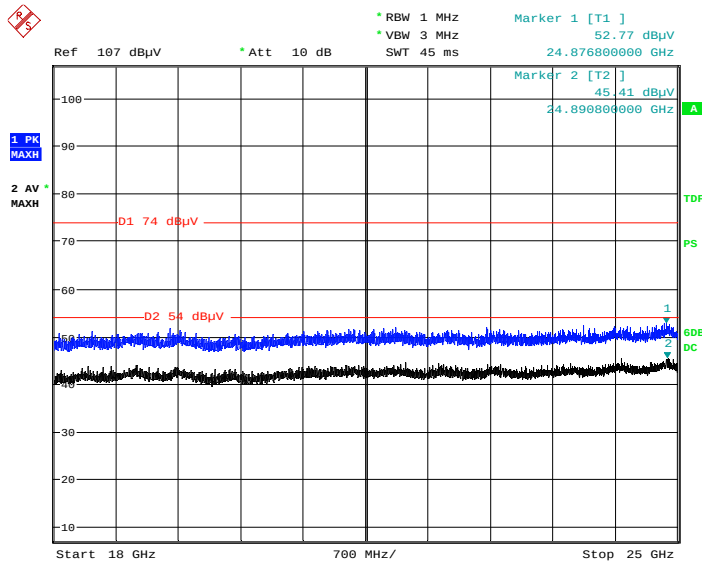
Pre-scan with 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case **low channel of 802.11n-HT20 mode in Z-axis of orientation** was recorded

Horizontal



Date: 29.APR.2020 00:31:23

Vertical



Date: 29.APR.2020 00:13:52

Restricted Bands Emissions Test:

Note:

1. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)

Corrected Amplitude (dB μ V/m) = Corrected Factor (dB/m) + Reading (dB μ V)Margin (dB) = Limit (dB μ V/m) – Corrected Amplitude (dB μ V/m)**802.11b Mode (Chain0):** (Pre-scan in the X,Y and Z axes of orientation, the worst case Z-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								
2390.000000	---	40.10	200.0	V	199.0	-2.9	54.00	13.90
2390.000000	48.33	---	200.0	V	199.0	-2.9	74.00	25.67
High Channel: 2462MHz								
2483.500000	50.88	---	200.0	V	255.0	-2.5	74.00	23.12
2483.500000	---	44.76	200.0	V	255.0	-2.5	54.00	9.24

802.11g Mode (Chain0): (Pre-scan in the X,Y and Z axes of orientation, the worst case Z-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								
2390.000000	49.30	---	150.0	V	229.0	-2.9	74.00	24.70
2390.000000	---	41.35	150.0	V	229.0	-2.9	54.00	12.65
High Channel: 2462MHz								
2483.500000	---	53.09	200.0	V	223.0	-2.5	54.00	0.91
2483.500000	64.55	---	200.0	V	223.0	-2.5	74.00	9.45

802.11b Mode (Chain1): (Pre-scan in the X,Y and Z axes of orientation, the worst case Z-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								
2390.000000	47.65	---	200.0	V	121.0	-2.9	74.00	26.35
2390.000000	---	39.69	200.0	V	121.0	-2.9	54.00	14.31
High Channel: 2462MHz								
2483.500000	46.33	---	200.0	V	149.0	-2.5	74.00	27.67
2483.500000	---	38.54	200.0	V	149.0	-2.5	54.00	15.46

802.11g Mode (Chain1): (Pre-scan in the X,Y and Z axes of orientation, the worst case Z-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								
2390.000000	65.55	---	200.0	V	170.0	-2.9	74.00	8.45
2390.000000	---	53.20	200.0	V	170.0	-2.9	54.00	0.80
High Channel: 2462MHz								
2483.500000	---	44.56	150.0	V	151.0	-2.5	54.00	9.44
2483.500000	56.00	---	150.0	V	151.0	-2.5	74.00	18.00

802.11n-HT20 Mode (Chain0+Chain1): (Pre-scan in the X,Y and Z axes of orientation, the worst case Z-axis of orientation was recorded)

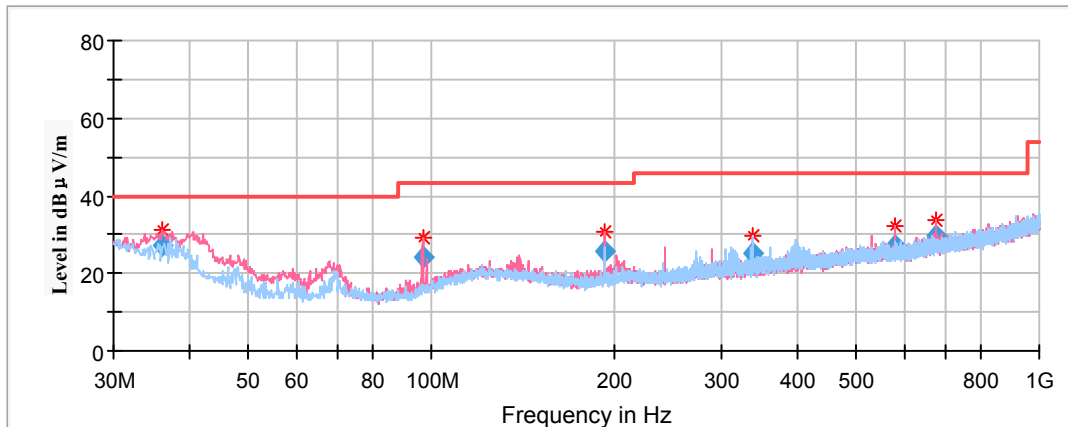
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2390.000000	66.67	---	150.0	V	181.0	-2.9	74.00	7.33
2390.000000	---	53.49	150.0	V	181.0	-2.9	54.00	0.51
High Channel: 2462MHz								
2483.500000	---	47.82	200.0	V	163.0	-2.5	54.00	6.18
2483.500000	61.43	---	200.0	V	163.0	-2.5	74.00	12.57

802.11n-HT40 Mode (Chain0+Chain1): (Pre-scan in the X,Y and Z axes of orientation, the worst case Z-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								
2390.000000	61.61	---	200.0	V	159.0	-2.9	74.00	12.39
2390.000000	---	53.25	200.0	V	159.0	-2.9	54.00	0.75
High Channel: 2452MHz								
2483.500000	---	49.10	200.0	V	176.0	-2.5	54.00	4.90
2483.500000	58.19	---	200.0	V	176.0	-2.5	74.00	15.81

For BLE Mode:**Spurious Emission Test:****30MHz-1GHz**

(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case BLE(2Mbps) mode middle channel of operation in the Z 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)				
36.062500	26.98	100.0	V	347.0	-8.6	40.00	13.02
96.687500	24.20	100.0	V	69.0	-15.5	43.50	19.30
193.284450	25.83	100.0	V	125.0	-12.7	43.50	17.67
338.003650	25.02	100.0	H	236.0	-9.6	46.00	20.98
579.991800	27.23	100.0	V	75.0	-5.4	46.00	18.77
676.602550	29.56	100.0	V	69.0	-3.6	46.00	16.44

1GHz-18GHz:**BLE(1Mbps) mode:**

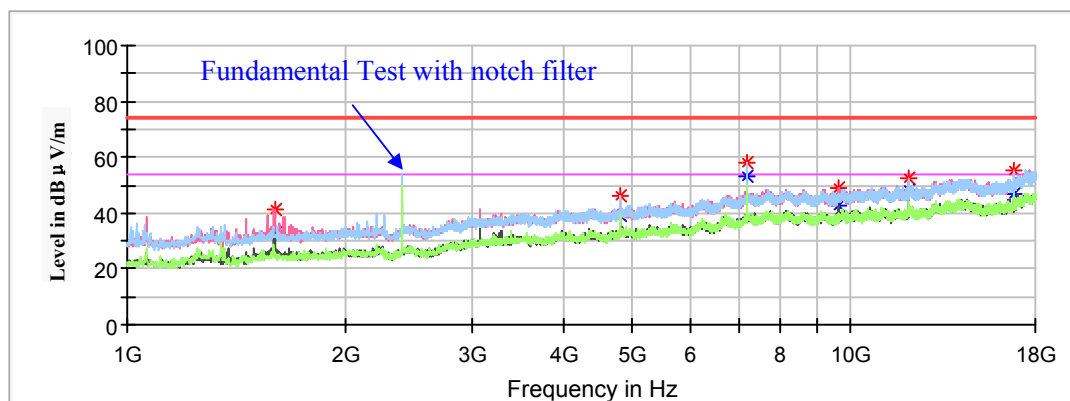
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

Note:

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

Low Channel: 2402MHz

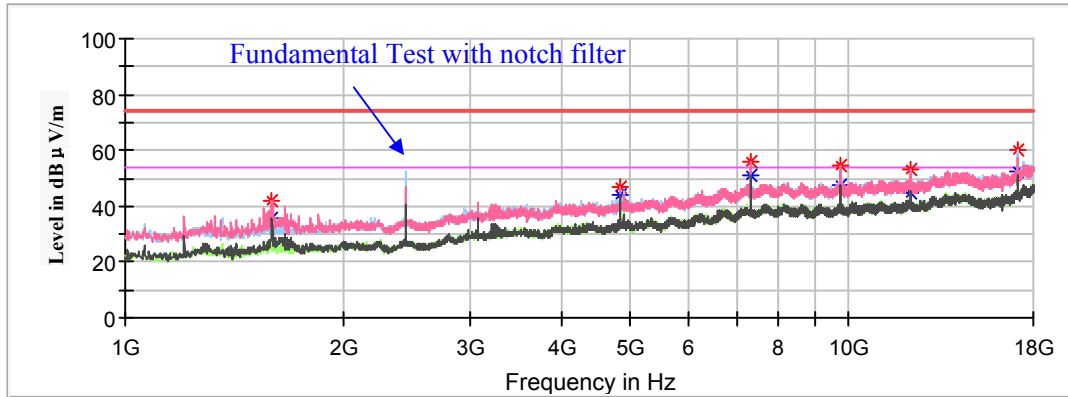
Full Spectrum



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)				
1598.400000	---	33.17	150.0	V	295.0	-16.0	54.00	20.83
1598.400000	41.04	---	150.0	V	295.0	-16.0	74.00	32.96
4804.000000	---	39.23	150.0	H	338.0	-5.6	54.00	14.77
4804.000000	46.03	---	150.0	H	338.0	-5.6	74.00	27.97
7206.000000	---	52.98	200.0	H	81.0	0.4	54.00	1.02
7206.000000	57.78	---	200.0	H	81.0	0.4	74.00	16.22
9607.100000	---	42.68	200.0	V	237.0	2.1	54.00	11.32
9607.100000	49.16	---	200.0	V	237.0	2.1	74.00	24.84
12010.900000	---	48.01	150.0	V	203.0	3.8	54.00	5.99
12010.900000	52.21	---	150.0	V	203.0	3.8	74.00	21.79
16813.400000	---	46.96	150.0	V	173.0	6.5	54.00	7.04
16813.400000	55.05	---	150.0	V	173.0	6.5	74.00	18.95

Middle Channel: 2440MHz

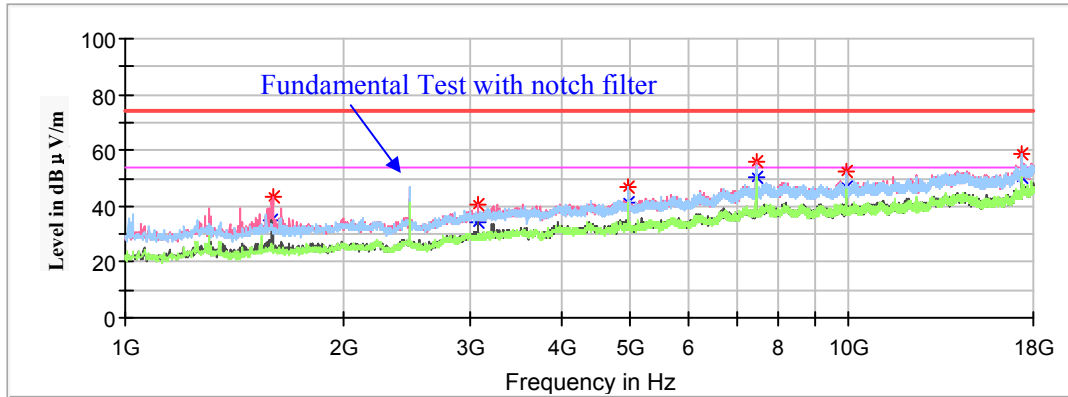
Full Spectrum



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)				
1596.700000	---	35.37	200.0	V	279.0	-16.0	54.00	18.63
1596.700000	42.18	---	200.0	V	279.0	-16.0	74.00	31.82
4880.000000	---	43.74	150.0	V	328.0	-5.5	54.00	10.26
4880.000000	47.07	---	150.0	V	328.0	-5.5	74.00	26.93
7320.000000	---	50.95	150.0	V	265.0	0.6	54.00	3.05
7320.000000	56.21	---	150.0	V	265.0	0.6	74.00	17.79
9760.100000	---	47.31	200.0	V	235.0	2.0	54.00	6.69
9760.100000	54.61	---	200.0	V	235.0	2.0	74.00	19.39
12201.300000	---	44.90	200.0	V	265.0	3.5	54.00	9.10
12201.300000	53.17	---	200.0	V	265.0	3.5	74.00	20.83
17078.600000	---	52.57	200.0	H	297.0	7.4	54.00	1.43
17078.600000	60.00	---	200.0	H	297.0	7.4	74.00	14.00

High Channel: 2480MHz

Full Spectrum

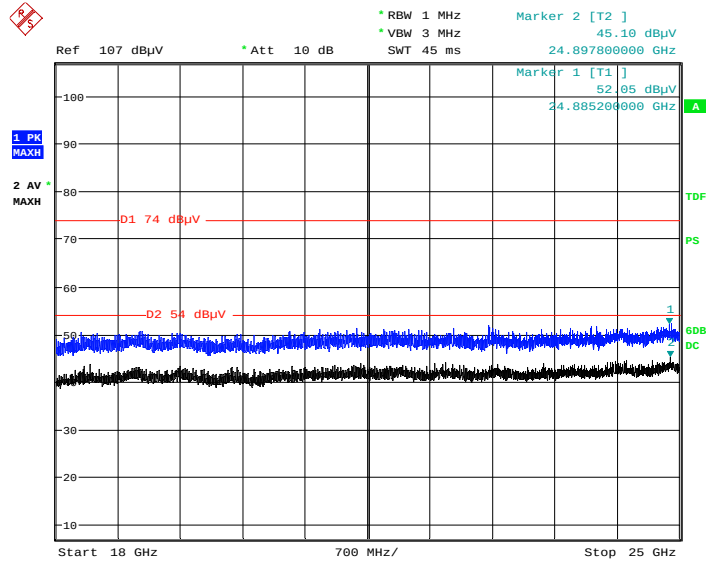


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1593.300000	---	35.28	200.0	V	280.0	-16.0	54.00	18.72
1593.300000	43.54	---	200.0	V	280.0	-16.0	74.00	30.46
3070.600000	---	33.98	200.0	V	358.0	-9.9	54.00	20.02
3070.600000	40.51	---	200.0	V	358.0	-9.9	74.00	33.49
4960.000000	---	41.38	150.0	H	338.0	-5.3	54.00	12.62
4960.000000	47.16	---	150.0	H	338.0	-5.3	74.00	26.84
7440.000000	55.64	---	200.0	H	236.0	0.9	74.00	18.36
7440.000000	---	50.14	200.0	H	236.0	0.9	54.00	3.86
9918.200000	52.17	---	200.0	V	236.0	1.9	74.00	21.83
9918.200000	---	46.63	200.0	V	236.0	1.9	54.00	7.37
17360.800000	---	50.29	200.0	H	264.0	8.4	54.00	3.71
17360.800000	58.58	---	200.0	H	264.0	8.4	74.00	15.42

18GHz-25GHz

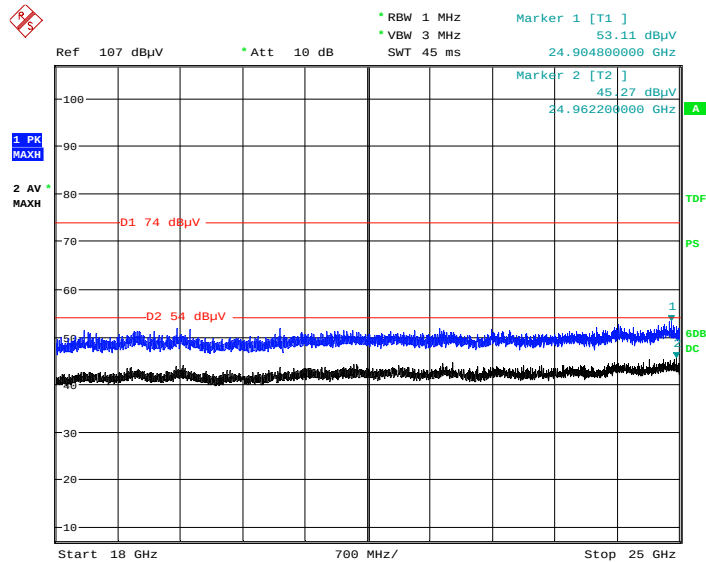
(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **middle** channel of operation in the Z axis of orientation was recorded)

Horizontal



Date: 28.APR.2020 23:53:20

Vertical



Date: 28.APR.2020 23:33:49

BLE(2Mbps) mode:

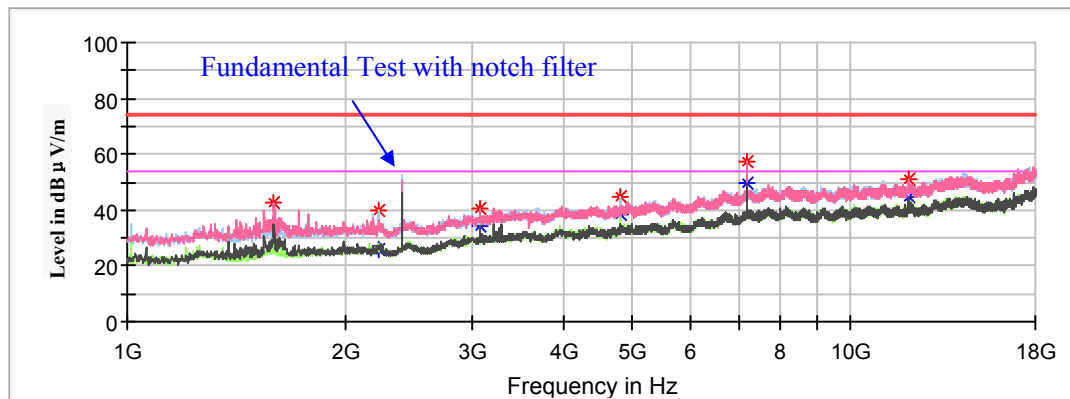
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

Note:

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

Low Channel: 2402MHz

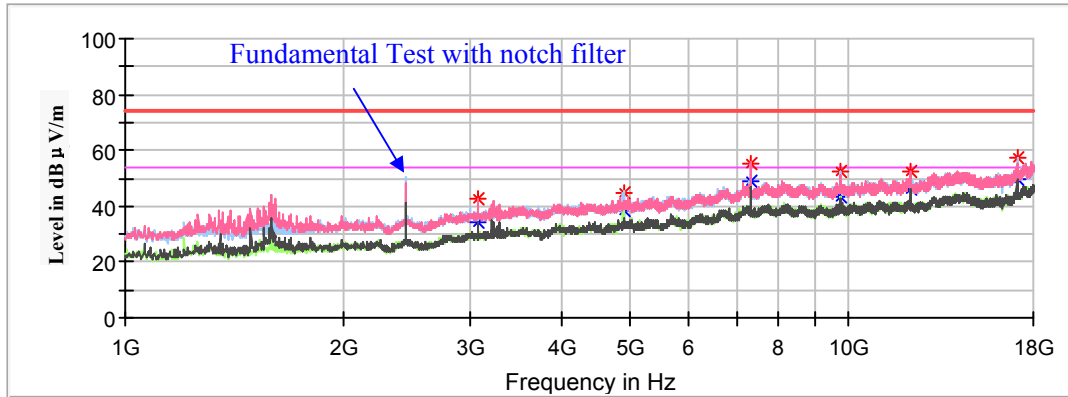
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1596.700000	---	35.18	200.0	V	287.0	-16.0	54.00	18.82
1596.700000	42.53	---	200.0	V	287.0	-16.0	74.00	31.47
2227.400000	---	26.16	150.0	H	0.0	-13.5	54.00	27.84
2227.400000	40.04	---	150.0	H	0.0	-13.5	74.00	33.96
3070.600000	---	34.27	200.0	V	344.0	-9.9	54.00	19.73
3070.600000	40.77	---	200.0	V	344.0	-9.9	74.00	33.23
4804.000000	---	38.50	200.0	H	340.0	-5.6	54.00	15.50
4804.000000	44.79	---	200.0	H	340.0	-5.6	74.00	29.21
7206.000000	---	49.93	200.0	H	258.0	0.4	54.00	4.07
7206.000000	57.27	---	200.0	H	258.0	0.4	74.00	16.73
12012.600000	---	44.45	200.0	V	273.0	3.8	54.00	9.55
12012.600000	51.34	---	200.0	V	273.0	3.8	74.00	22.66

Middle Channel: 2440MHz

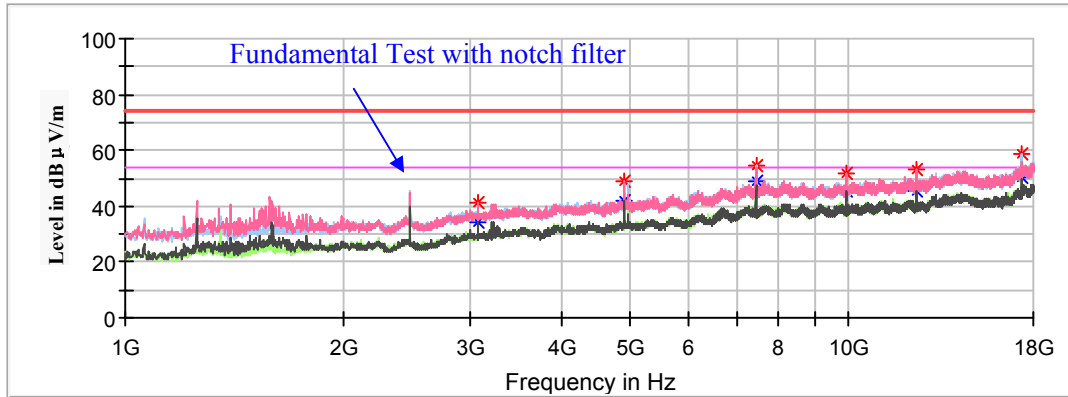
Full Spectrum



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)				
3070.600000	---	34.29	200.0	V	354.0	-9.9	54.00	19.71
3070.600000	42.81	---	200.0	V	354.0	-9.9	74.00	31.19
4880.000000	---	38.45	200.0	H	297.0	-5.5	54.00	15.55
4880.000000	44.85	---	200.0	H	297.0	-5.5	74.00	29.15
7320.000000	---	48.75	200.0	H	205.0	0.6	54.00	5.25
7320.000000	54.93	---	200.0	H	205.0	0.6	74.00	19.07
9758.400000	---	43.64	150.0	H	99.0	2.0	54.00	10.36
9758.400000	52.53	---	150.0	H	99.0	2.0	74.00	21.47
12197.900000	---	45.91	150.0	V	125.0	3.5	54.00	8.09
12197.900000	52.55	---	150.0	V	125.0	3.5	74.00	21.45
17083.700000	---	49.92	200.0	H	297.0	7.5	54.00	4.08
17083.700000	57.03	---	200.0	H	297.0	7.5	74.00	16.97

High Channel: 2480MHz

Full Spectrum

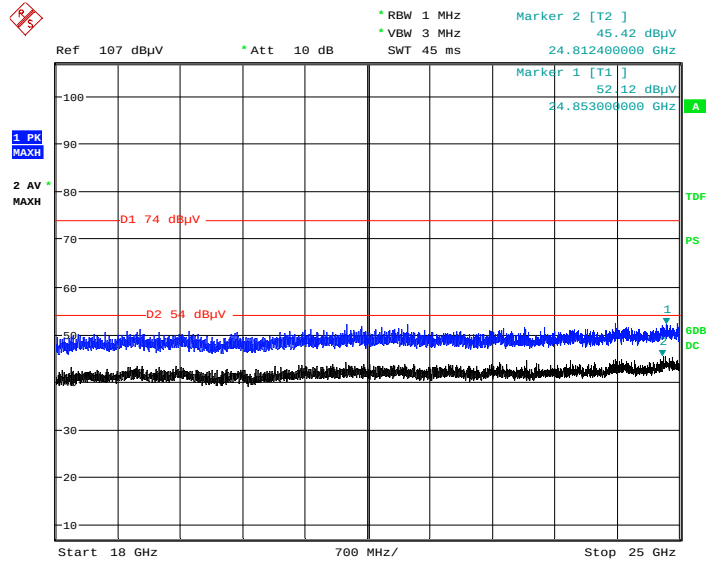


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
3070.600000	---	34.44	200.0	V	214.0	-9.9	54.00	19.56
3070.600000	41.21	---	200.0	V	214.0	-9.9	74.00	32.79
4960.000000	---	42.30	200.0	V	170.0	-5.3	54.00	11.70
4960.000000	49.05	---	200.0	V	170.0	-5.3	74.00	24.95
7440.000000	---	49.28	200.0	V	214.0	0.9	54.00	4.72
7440.000000	54.65	---	200.0	V	214.0	0.9	74.00	19.35
9921.600000	---	45.31	200.0	V	229.0	1.9	54.00	8.69
9921.600000	52.07	---	200.0	V	229.0	1.9	74.00	21.93
12401.900000	---	45.51	200.0	V	111.0	3.1	54.00	8.49
12401.900000	52.92	---	200.0	V	111.0	3.1	74.00	21.08
17357.400000	---	50.42	150.0	H	291.0	8.4	54.00	3.58
17357.400000	58.67	---	150.0	H	291.0	8.4	74.00	15.33

18GHz-25GHz

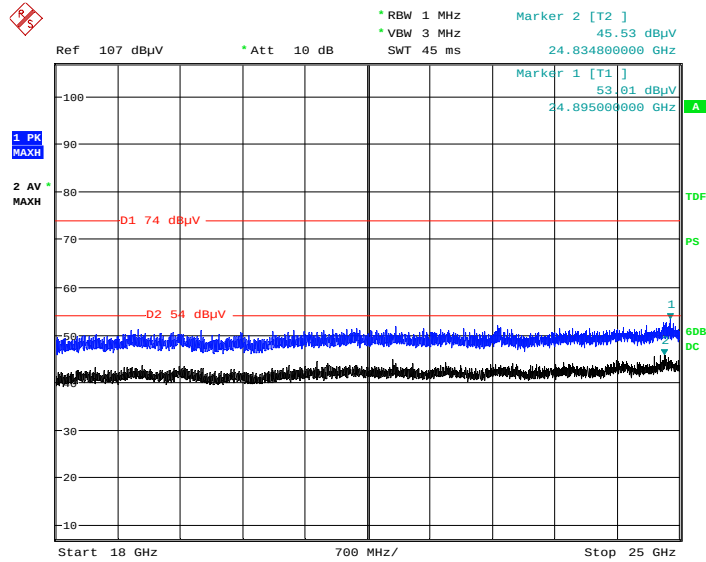
(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **middle** channel of operation in the **Z** axis of orientation was recorded)

Horizontal



Date: 29.APR.2020 01:42:59

Vertical



Date: 29.APR.2020 01:59:48

Restricted Bands Emissions Test:

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

Note:

- Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
 Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
 Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

BLE(1Mbps) mode:

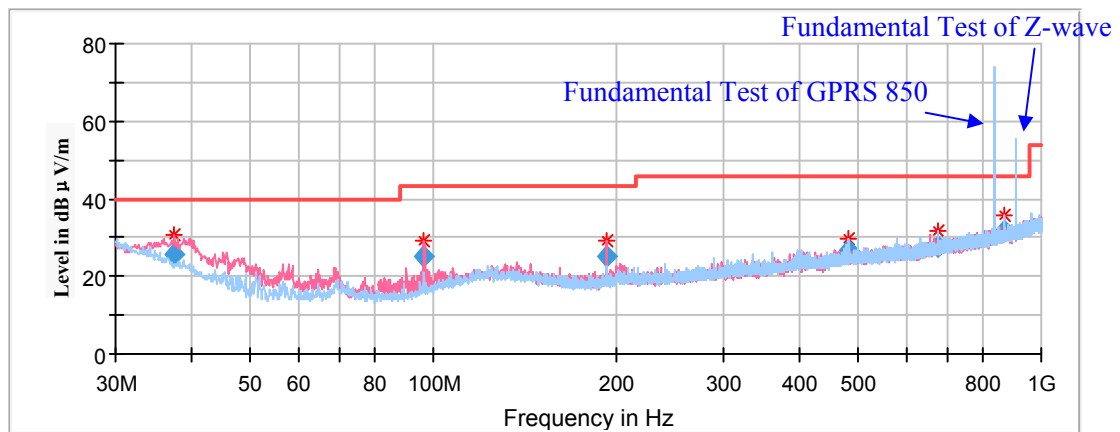
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
Low Channel: 2402MHz								
2390.000000	45.53	---	200.0	V	82.0	-12.9	74.00	28.47
2390.000000	---	32.02	200.0	V	82.0	-12.9	54.00	21.98
High Channel: 2480MHz								
2483.500000	---	38.89	150.0	V	39.0	-12.5	54.00	15.11
2483.500000	44.31	---	150.0	V	39.0	-12.5	74.00	29.69

BLE(2Mbps) mode:

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								
2390.000000	---	42.62	200.0	V	33.0	-2.9	54.00	11.38
2390.000000	55.85	---	200.0	V	33.0	-2.9	74.00	18.15
High Channel: 2480MHz								
2483.500000	59.85	---	150.0	V	28.0	-2.5	74.00	14.15
2483.500000	---	52.45	150.0	V	28.0	-2.5	54.00	1.55

Transmitting simultaneously test:

(The worst case Wi-Fi 802.11n-HT20 mode low channel & BLE(2Mbps) mode middle channel & Zigbee low channel & Z-wave & GPRS 850 high channel transmitting simultaneously in Z-axis of orientation was recorded)

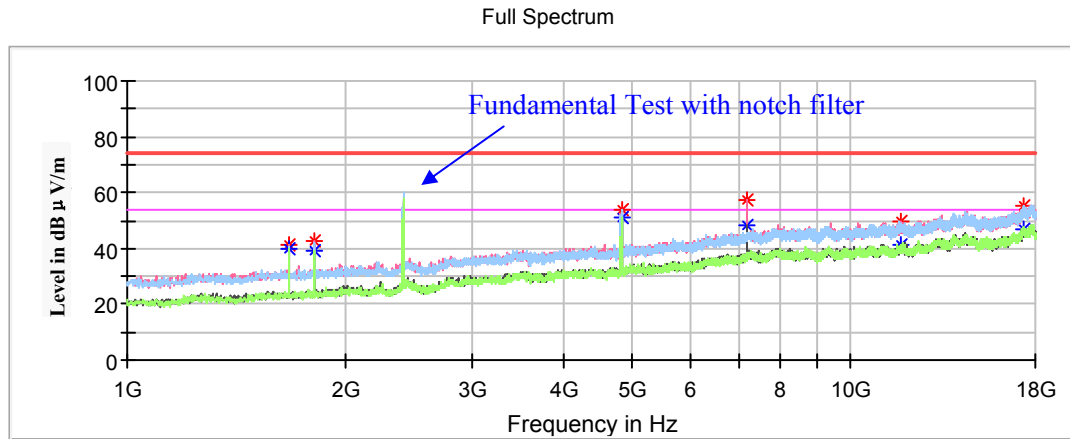
30MHz-1GHz

Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	QuasiPeak (dB μ V/m)	Height (cm)	Polar (H/V)				
37.517500	25.80	100.0	V	153.0	-8.4	40.00	14.20
96.566250	24.99	100.0	V	265.0	-15.7	43.50	18.51
193.298550	25.30	100.0	V	50.0	-12.7	43.50	18.20
483.232500	26.63	100.0	H	336.0	-6.6	46.00	19.37
676.747500	27.89	200.0	H	13.0	-3.6	46.00	18.11
870.200000	31.45	200.0	H	191.0	-0.6	46.00	14.55

1GHz-18GHz

Note:

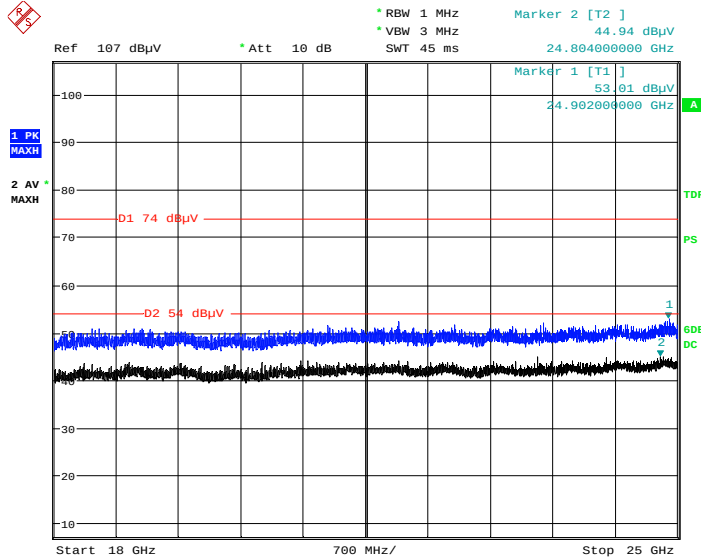
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
 Corrected Amplitude (dB μ V/m) = Corrected Factor (dB/m) + Reading (dB μ V)
 Margin (dB) = Limit (dB μ V/m) – Corrected Amplitude (dB μ V/m)



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1673.200000	40.91	---	100.0	V	142.0	-15.7	74.00	33.09
1673.200000	---	39.98	100.0	V	142.0	-15.7	54.00	14.02
1816.000000	---	38.95	200.0	H	172.0	-15.2	54.00	15.05
1816.000000	42.96	---	200.0	H	172.0	-15.2	74.00	31.04
4823.300000	53.61	---	200.0	H	172.0	-5.5	74.00	20.39
4823.300000	---	51.32	200.0	H	172.0	-5.5	54.00	2.68
7206.700000	57.37	---	200.0	V	23.0	0.4	74.00	16.63
7206.700000	---	48.21	200.0	V	23.0	0.4	54.00	5.79
11745.700000	---	40.93	100.0	V	2.0	3.3	54.00	13.07
11745.700000	49.92	---	100.0	V	2.0	3.3	74.00	24.08
17389.700000	55.03	---	100.0	H	12.0	8.5	74.00	18.97
17389.700000	---	47.04	100.0	H	12.0	8.5	54.00	6.96

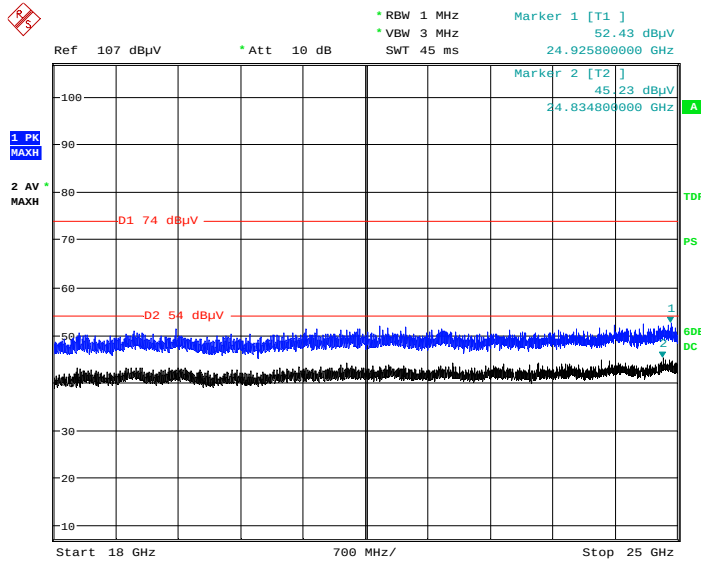
18GHz-25GHz

Horizontal

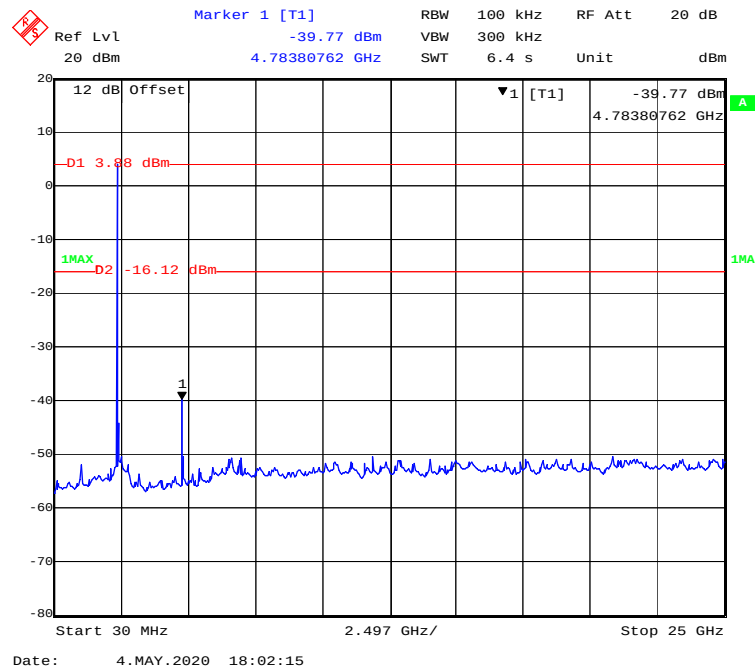
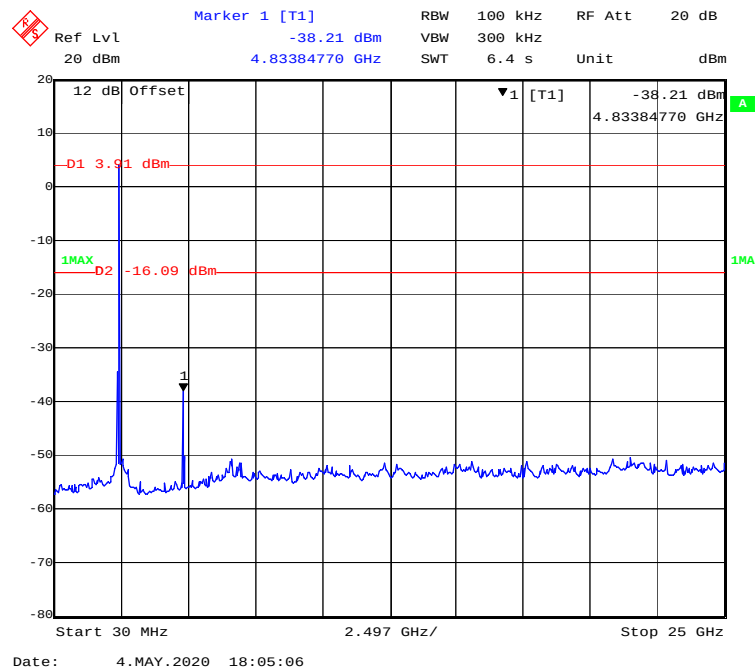


Date: 29.APR.2020 01:26:28

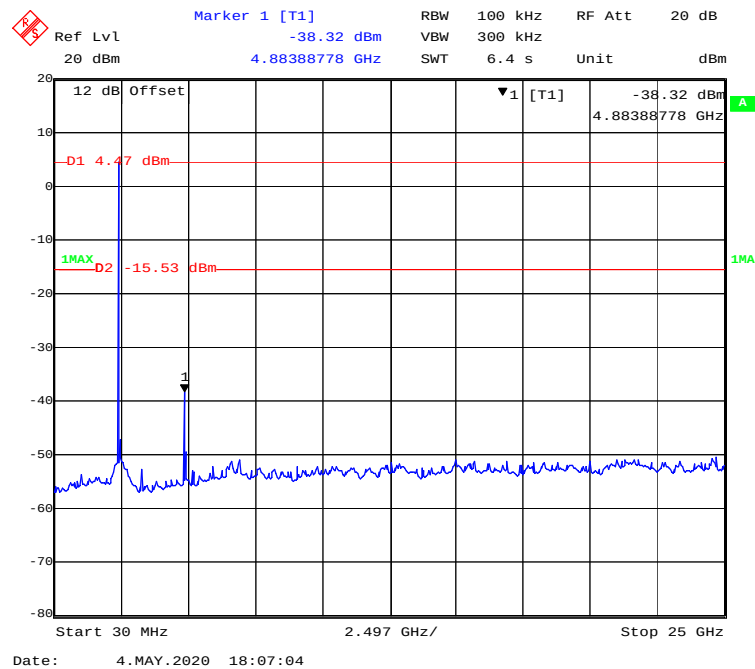
Vertical



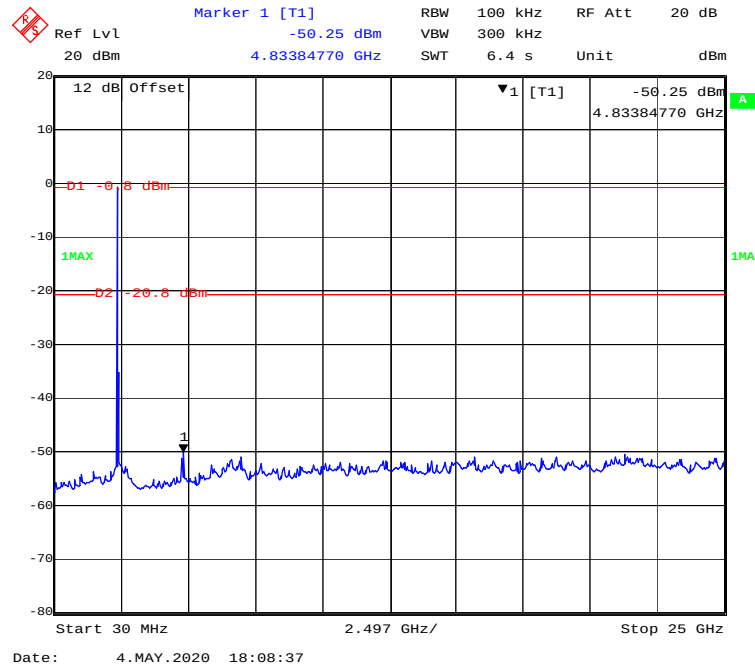
Date: 29.APR.2020 01:13:53

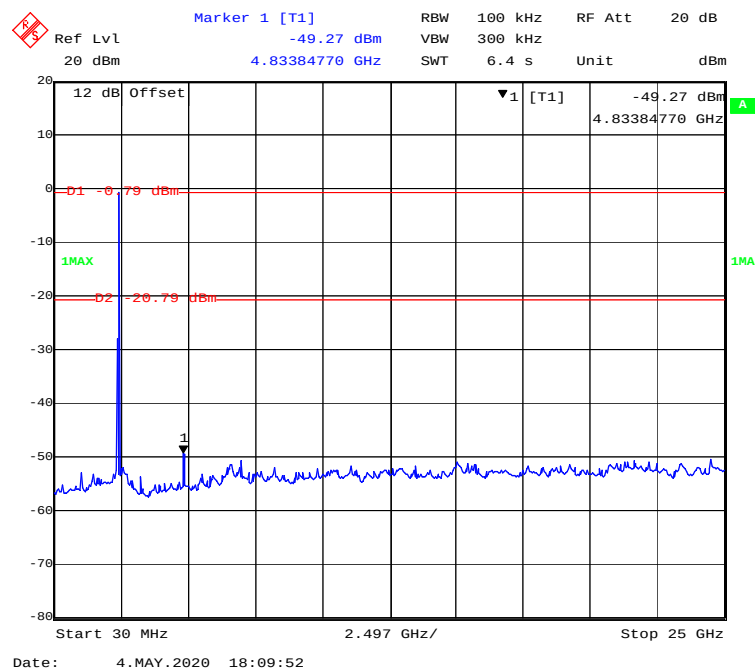
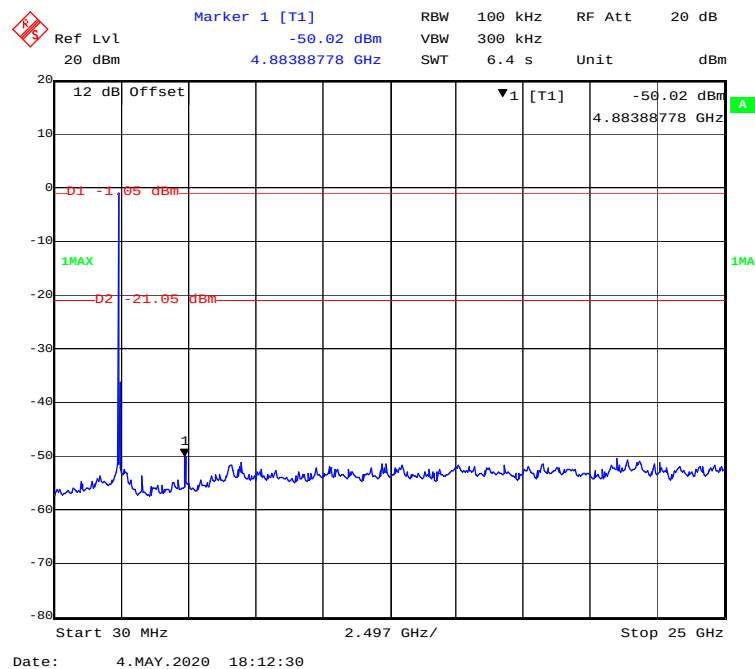
Conducted Spurious Emissions at Antenna Port**Chain0:****802.11b Mode Low Channel****802.11b Mode Middle Channel**

802.11b Mode High Channel

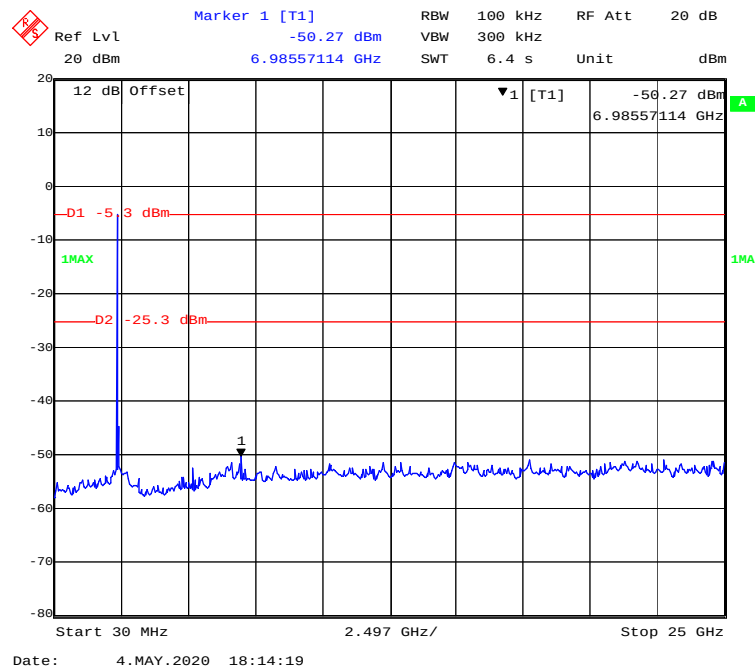


802.11g Mode Low Channel

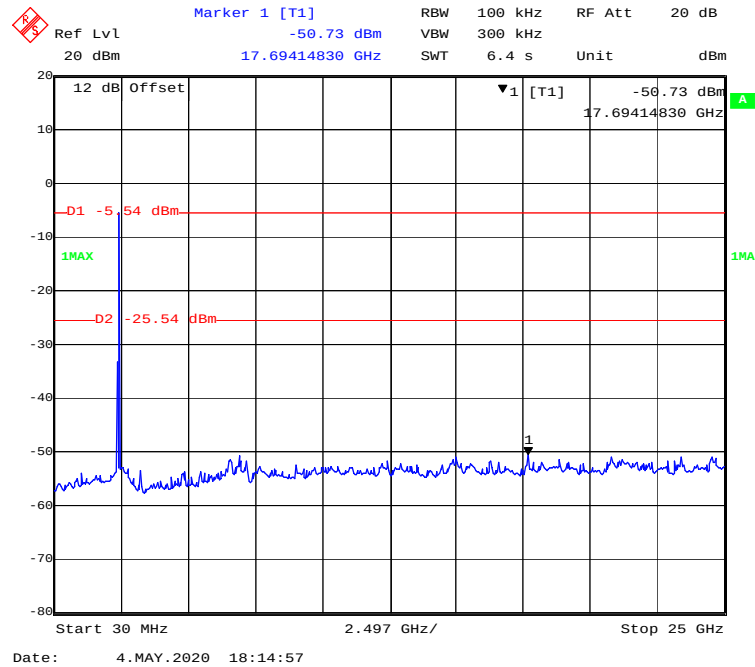


802.11g Mode Middle Channel**802.11g Mode High Channel**

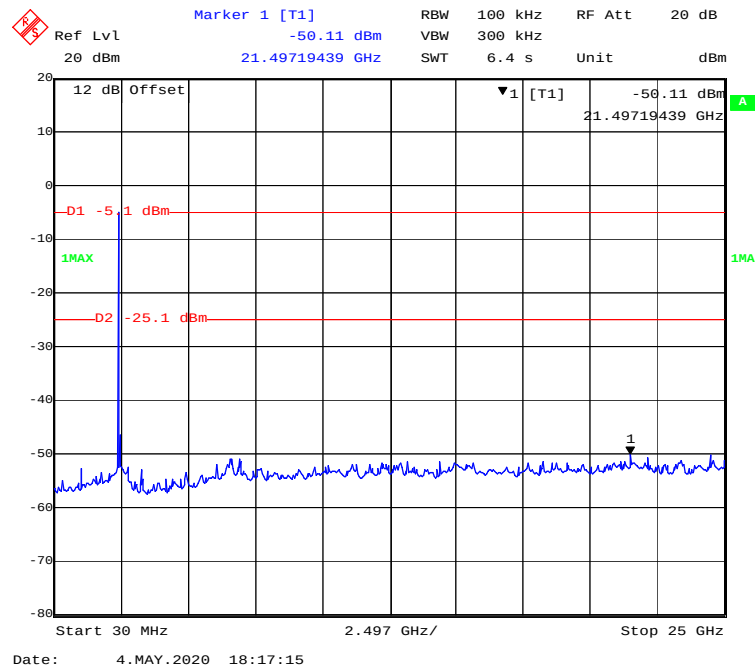
802.11n-HT20 Mode Low Channel



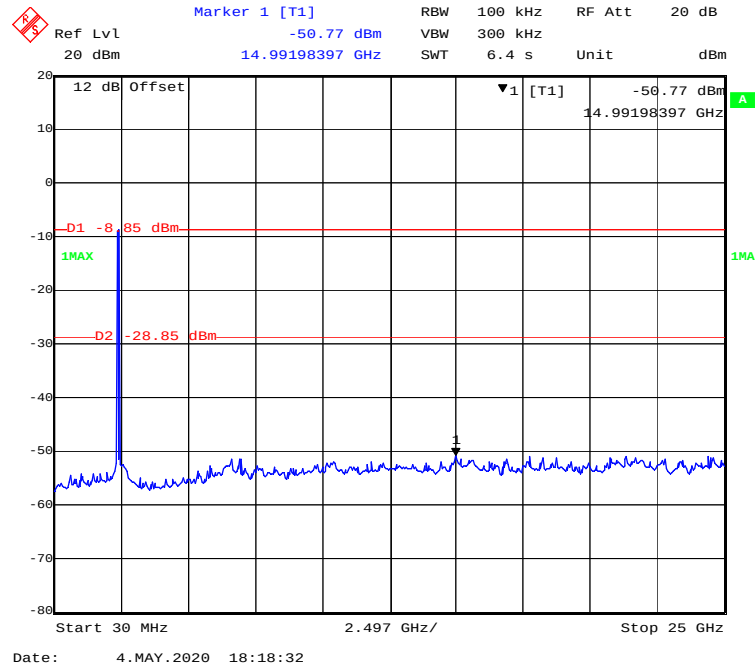
802.11n-HT20 Mode Middle Channel



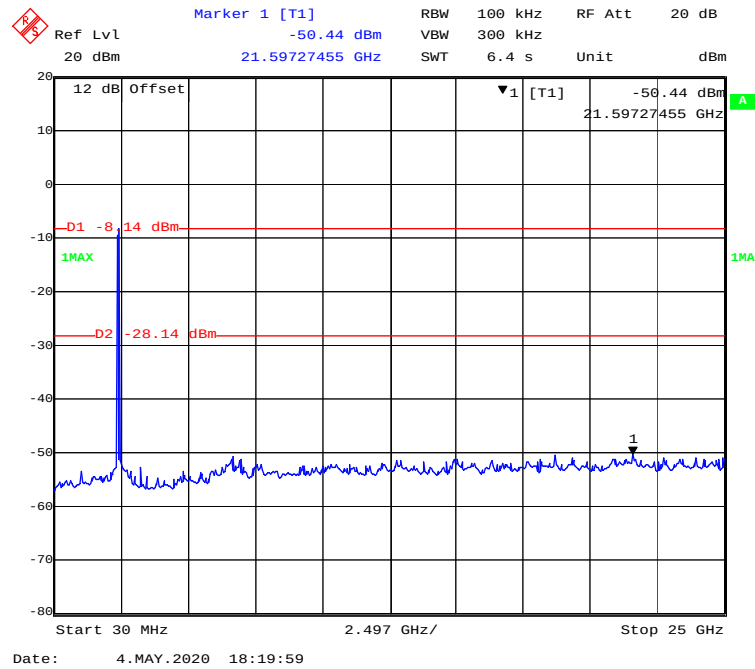
802.11n-HT20 Mode High Channel



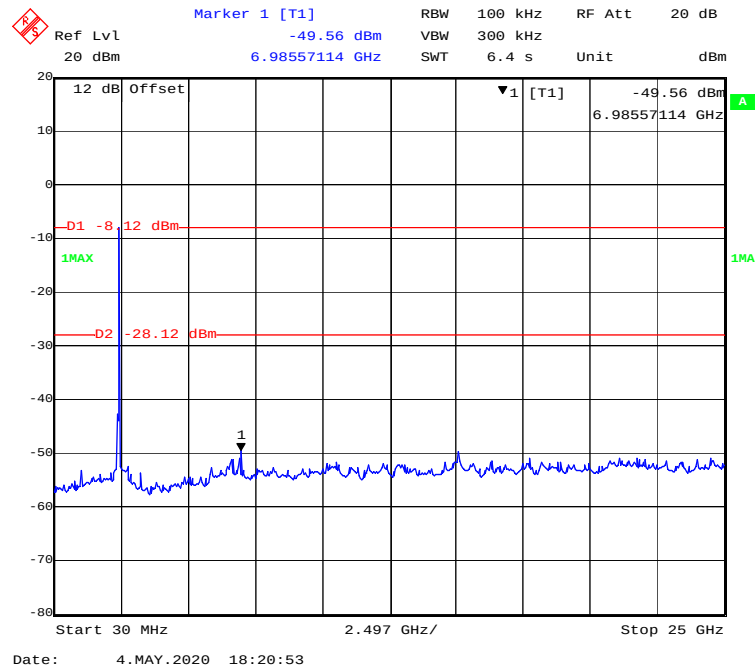
802.11n-HT40 Mode Low Channel



802.11n-HT40 Mode Middle Channel

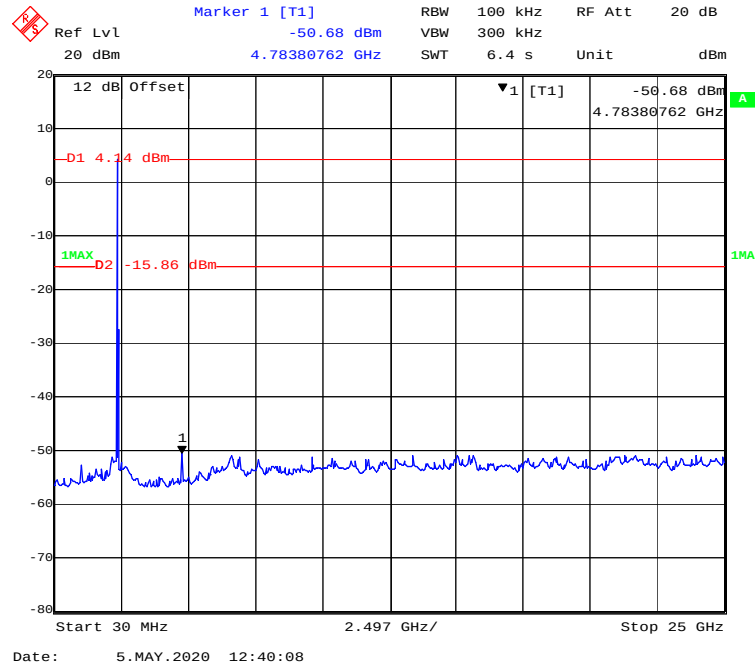


802.11n-HT40 Mode High Channel

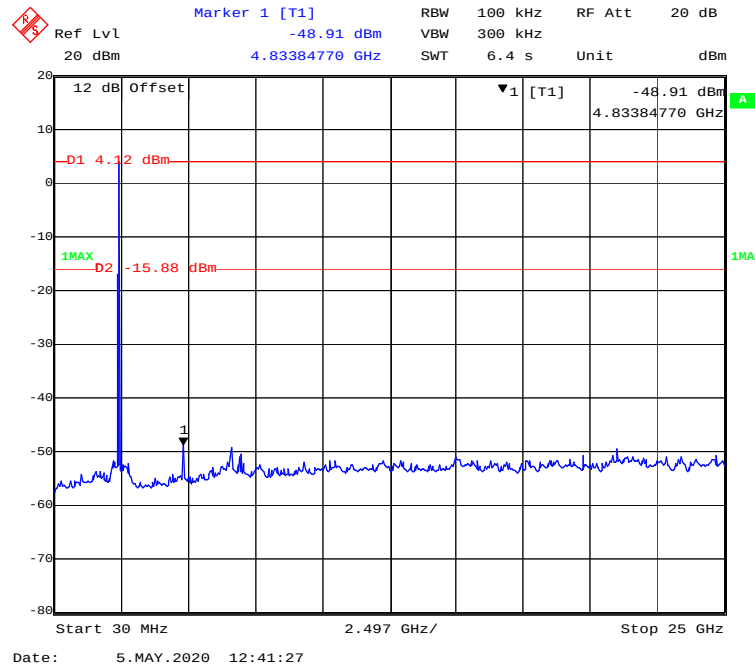


Chain1:

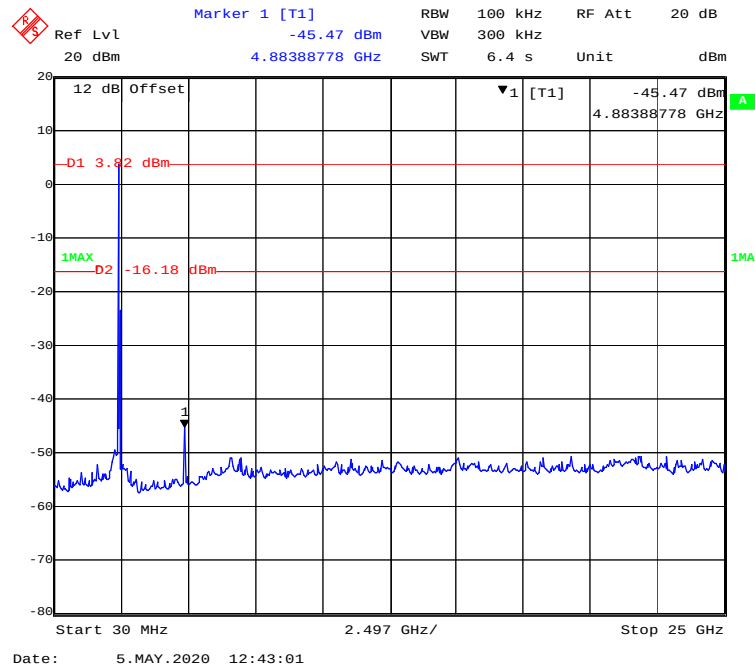
802.11b Mode Low Channel



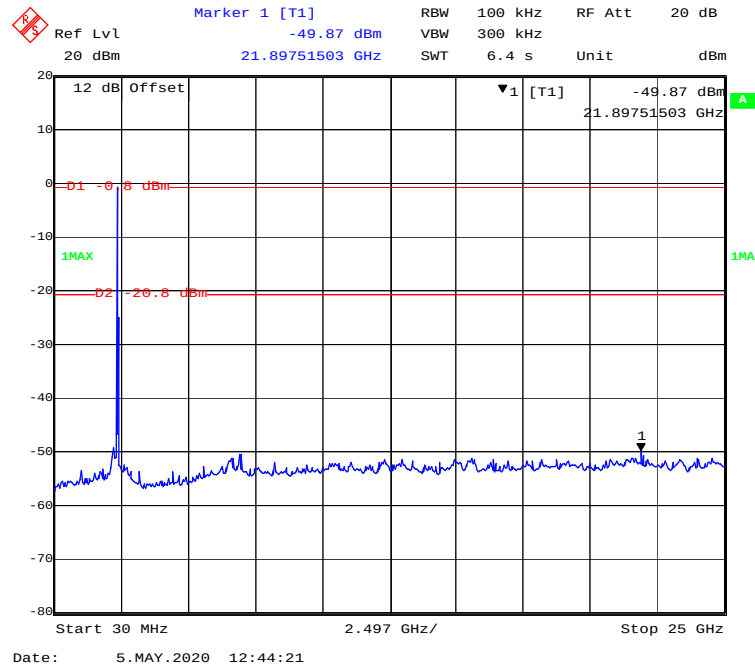
802.11b Mode Middle Channel



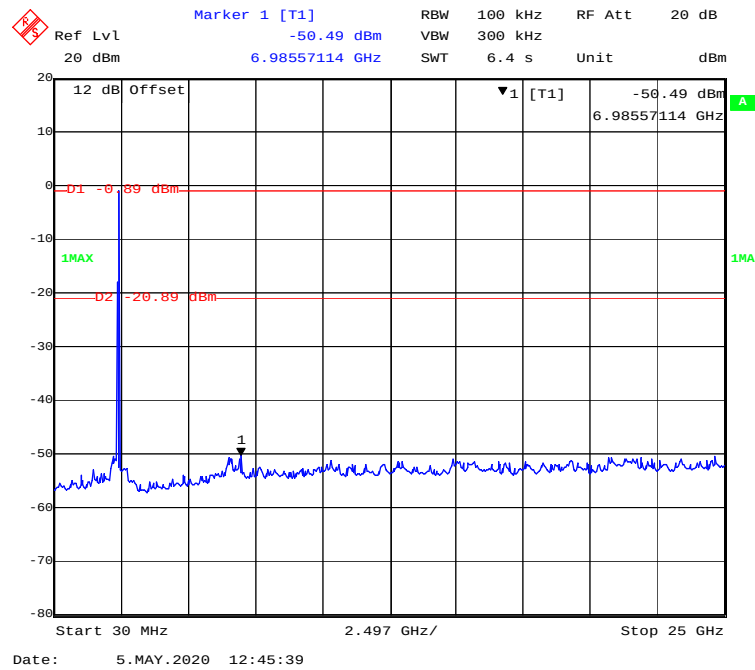
802.11b Mode High Channel



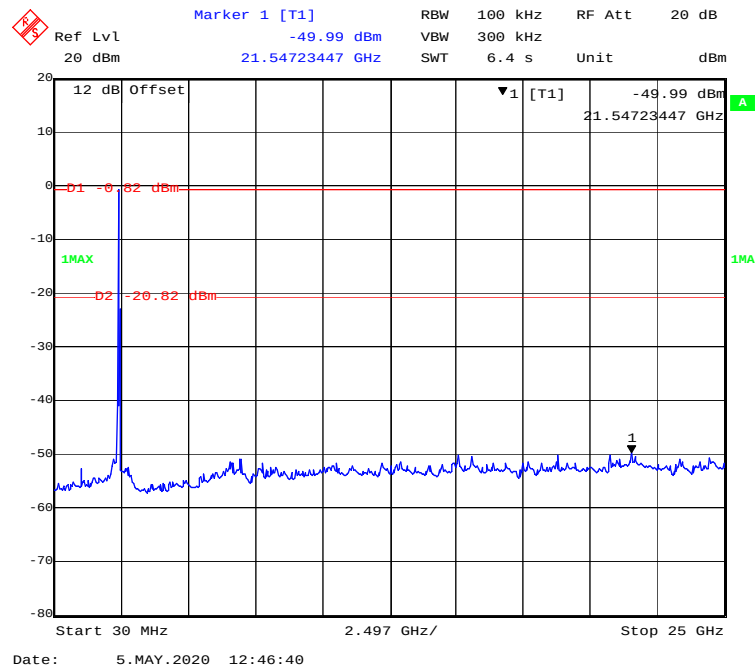
802.11g Mode Low Channel



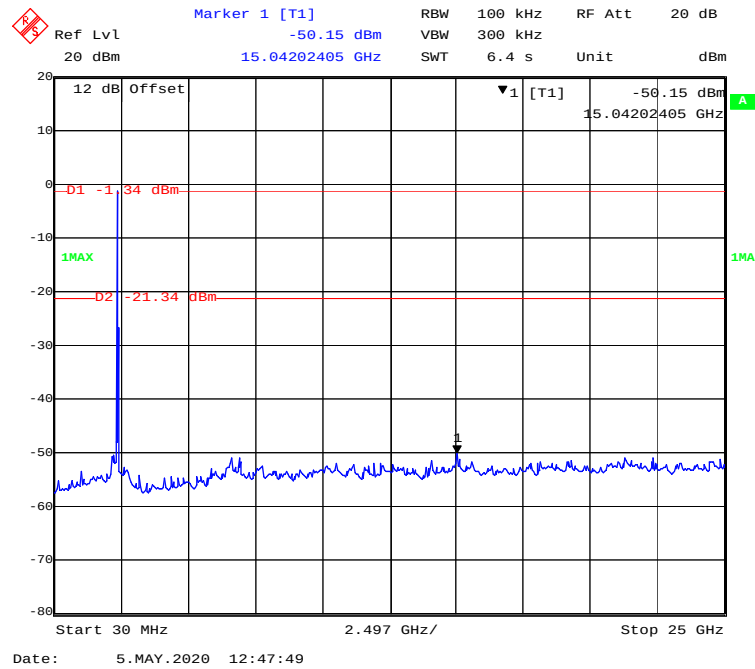
802.11g Mode Middle Channel



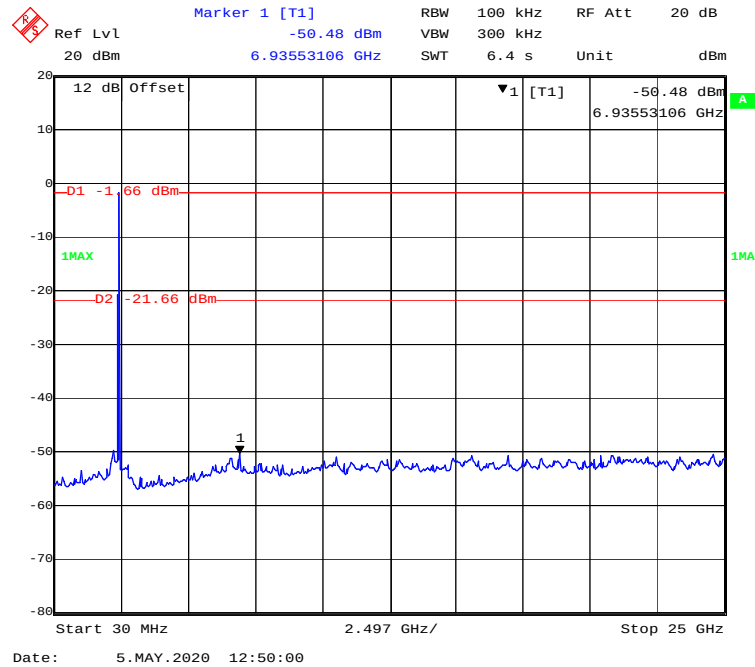
802.11g Mode High Channel



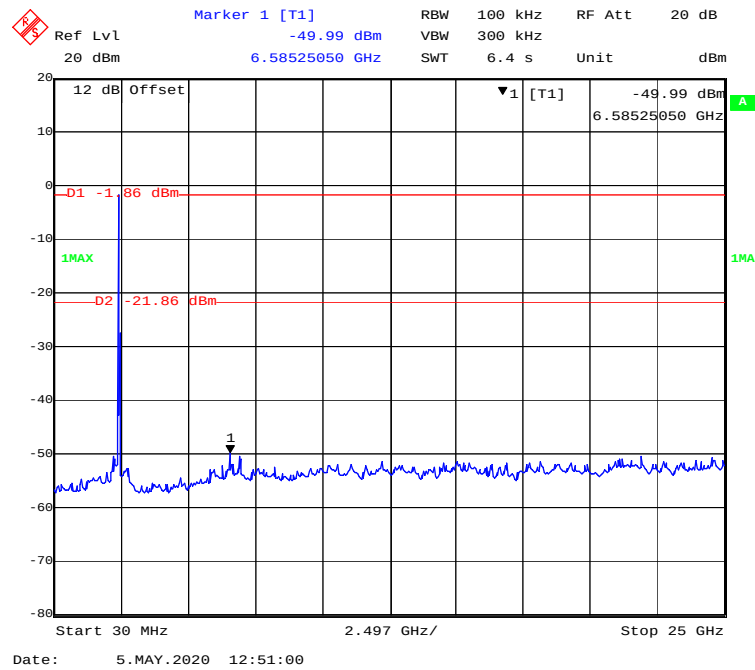
802.11n-HT20 Mode Low Channel



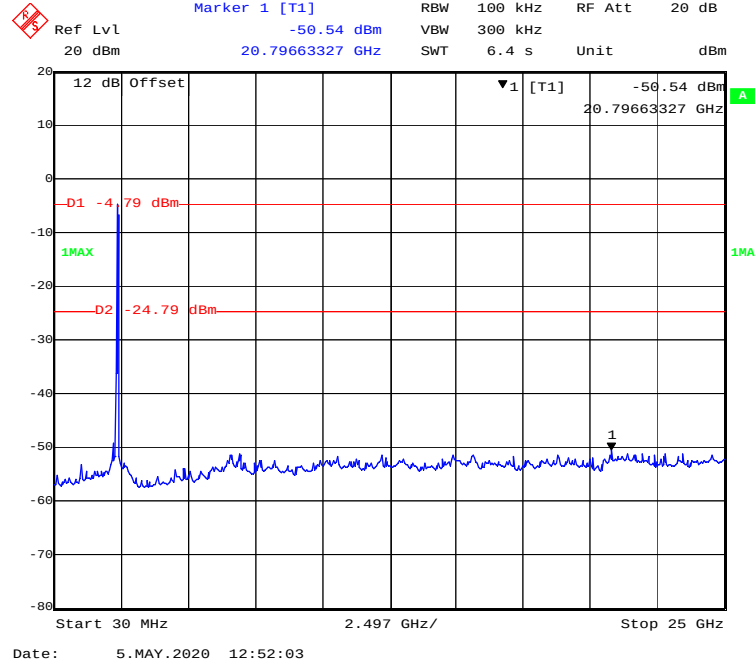
802.11n-HT20 Mode Middle Channel



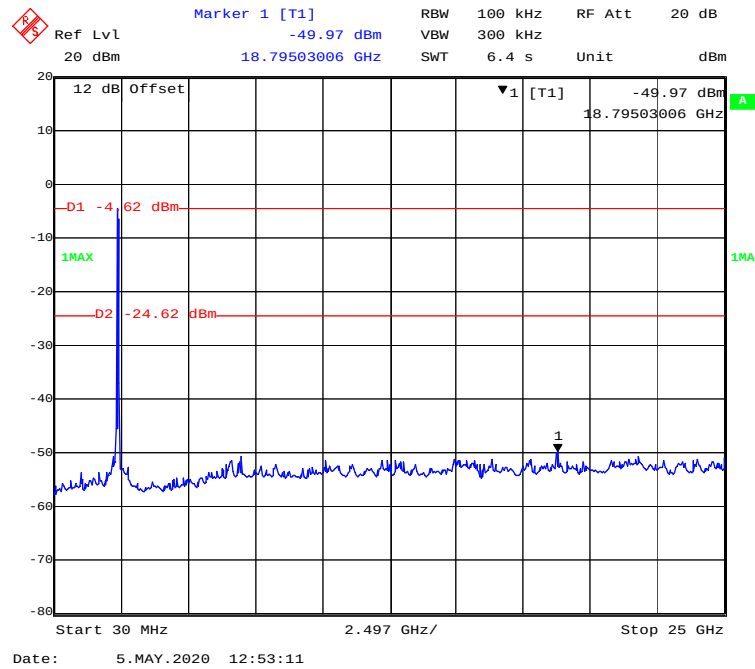
802.11n-HT20 Mode High Channel



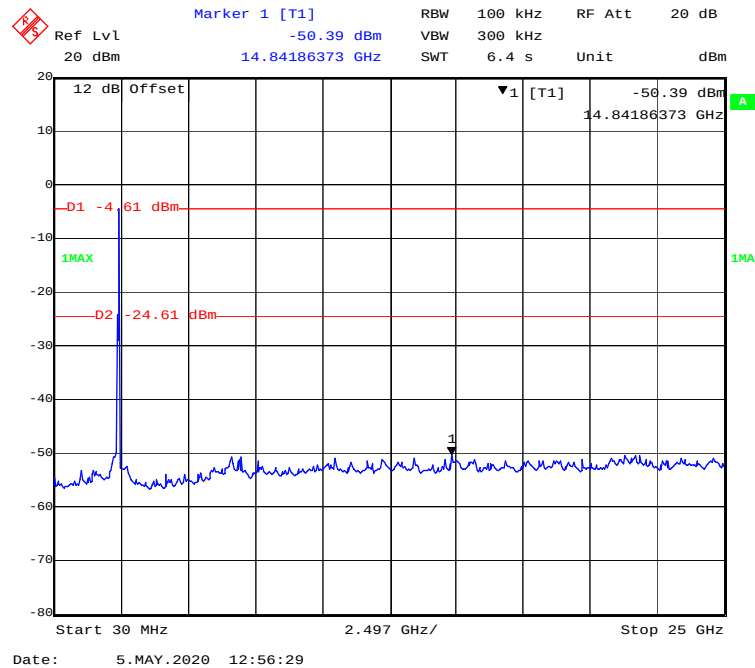
802.11n-HT40 Mode Low Channel

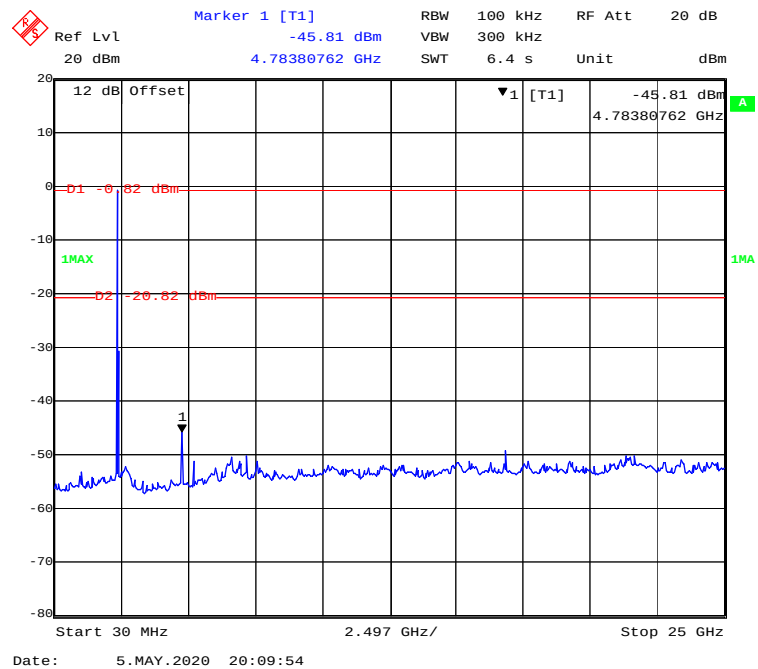
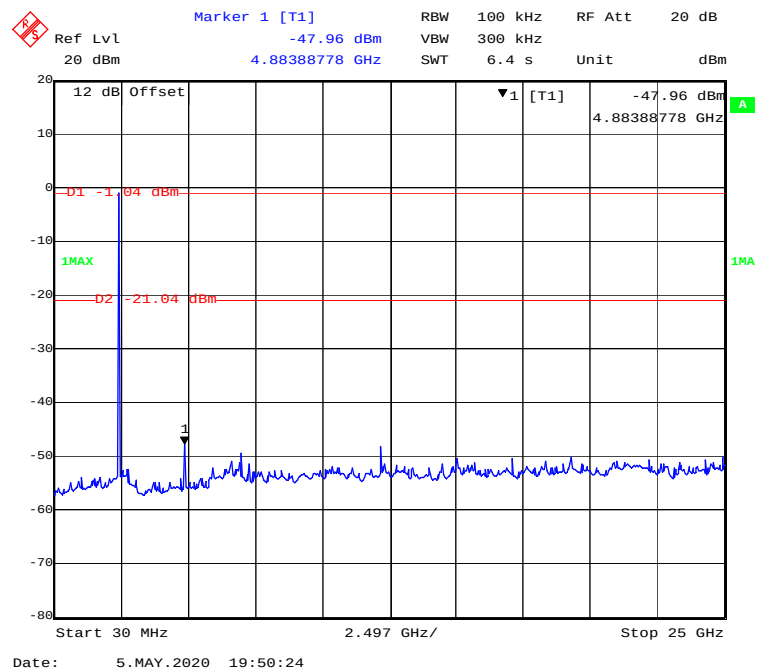


802.11n-HT40 Mode Middle Channel

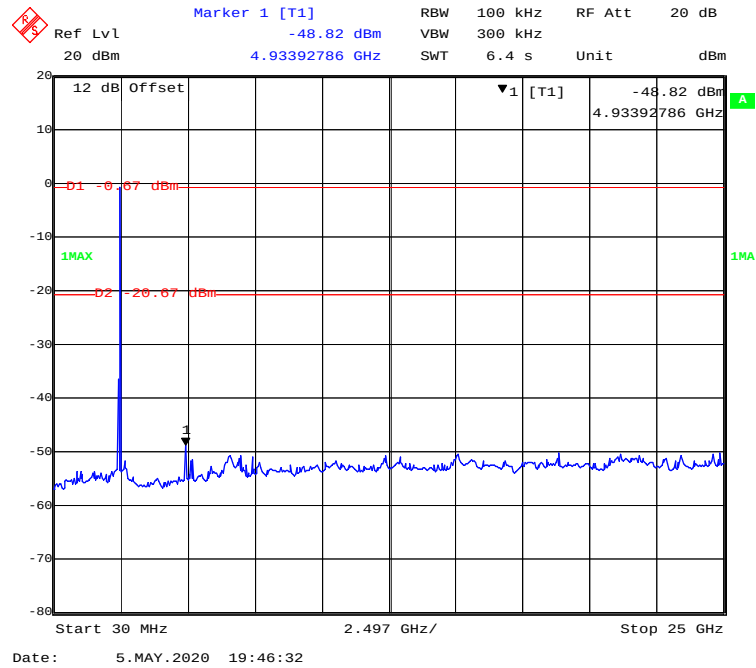


802.11n-HT40 Mode High Channel

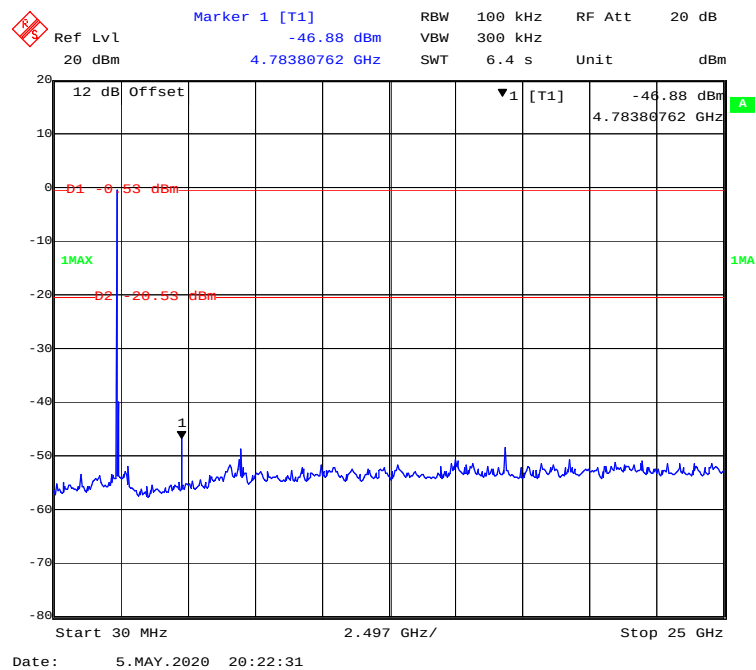


BLE(1Mbps) Mode Low Channel**BLE(1Mbps) Mode Middle Channel**

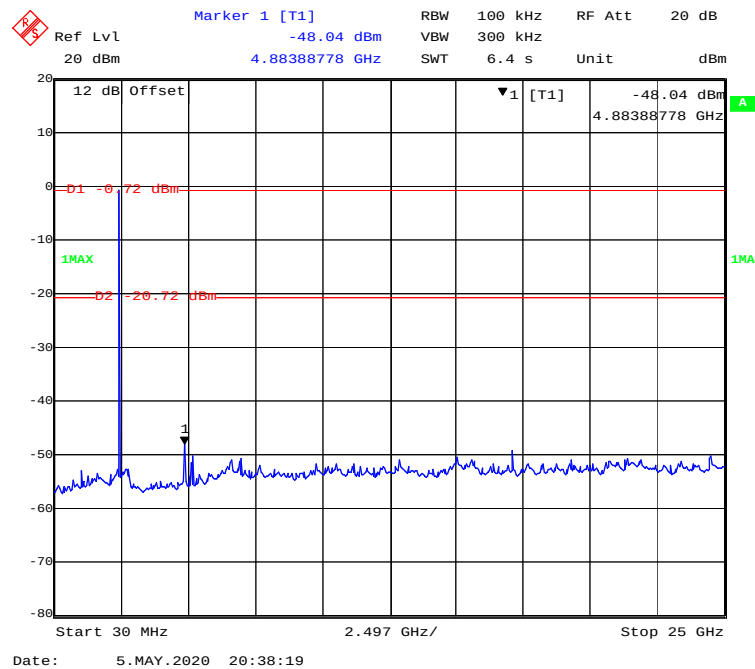
BLE(1Mbps) Mode High Channel



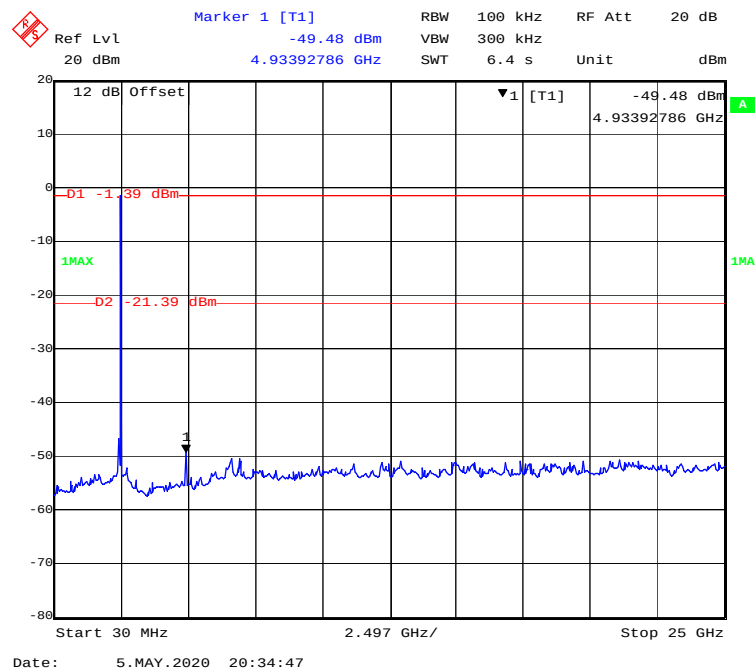
BLE(2Mbps) Mode Low Channel



BLE(2Mbps) Mode Middle Channel



BLE(2Mbps) Mode High Channel



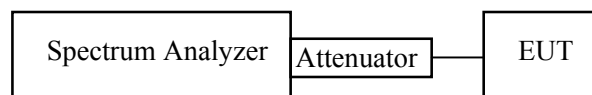
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH**Applicable Standard**

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 ANSI C63.10-2013 sub-clause 11.8.1

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ 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:	21.1-24.3 °C
Relative Humidity:	45-50 %
ATM Pressure:	101.3-101.5 kPa

The testing was performed by Chao Gao from 2020-05-04 to 2020-05-05.

Test Result: Compliant.

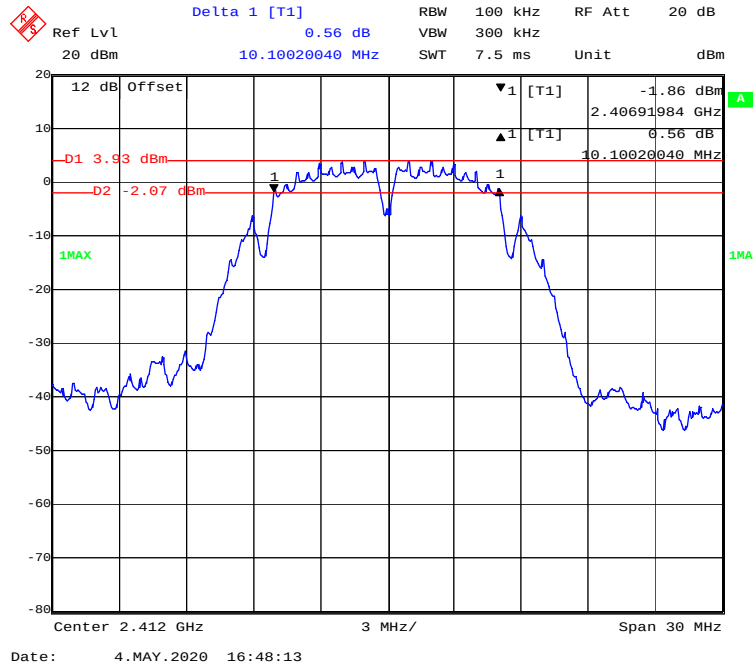
EUT operation mode: Transmitting

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)		Limit (kHz)
		Chain0	Chain1	
802.11b mode				
Low	2412	10.100	10.160	≥500
Middle	2437	10.100	10.160	≥500
High	2462	10.100	10.160	≥500
802.11g mode				
Low	2412	16.653	16.653	≥500
Middle	2437	16.593	16.653	≥500
High	2462	16.653	16.593	≥500
802.11n-HT20 mode				
Low	2412	17.735	17.735	≥500
Middle	2437	17.796	17.735	≥500
High	2462	17.796	17.735	≥500
802.11n-HT40 mode				
Low	2422	36.673	36.553	≥500
Middle	2437	36.673	36.553	≥500
High	2452	36.673	36.553	≥500

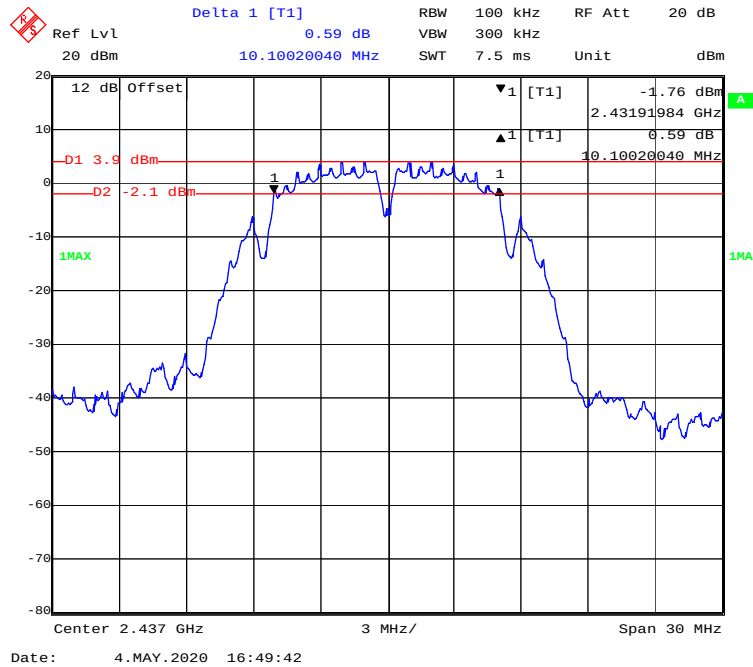
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
BLE(1Mbps) Mode			
Low	2402	0.709	≥0.5
Middle	2440	0.709	≥0.5
High	2480	0.709	≥0.5
BLE(2Mbps) Mode			
Low	2402	1.192	≥0.5
Middle	2440	1.192	≥0.5
High	2480	1.192	≥0.5

Chain0:

802.11b Mode Low Channel



802.11b Mode Middle Channel



Delta 1 [T1] 0.71 dB

RBW 100 kHz RF Att 20 dB

Ref Lvl 20 dBm Unit dBm

12 dB Offset

-D1 4.4 dBm

-D2 -1.6 dBm

1MAX

▼1 [T1] -1.56 dBm

▲1 [T1] 0.71 dB

2.45691984 GHz

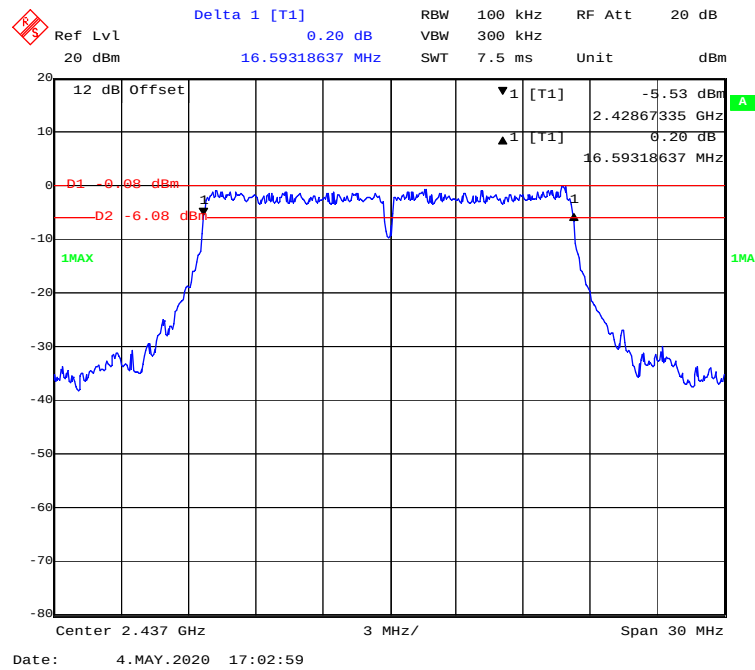
10.10020040 MHz

Center 2.462 GHz 3 MHz/ Span 30 MHz

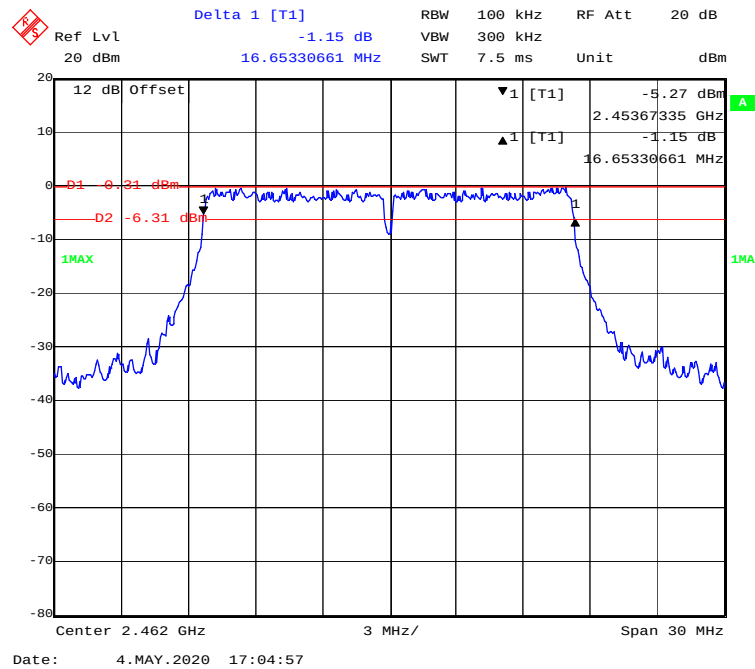
Date: 4.MAY.2020 16:52:20

The screenshot displays a spectrum analyzer interface. At the top, various parameters are listed: Ref Lvl is 20 dBm, Delta 1 [T1] is -1.54 dB, RBW is 100 kHz, RF Att is 20 dB, Unit is dBm, BW is 300 kHz, and SWT is 7.5 ms. The main plot shows a frequency range from approximately 2.403 GHz to 2.404 GHz. A blue trace represents the signal, which has a peak at -1.54 dBm. Two horizontal red lines indicate reference levels: D1 at -8.53 dBm and D2 at -6.53 dBm. The x-axis is labeled 'Center 2.412 GHz' and 'Span 30 MHz'. The y-axis ranges from -80 dBm to 20 dBm.

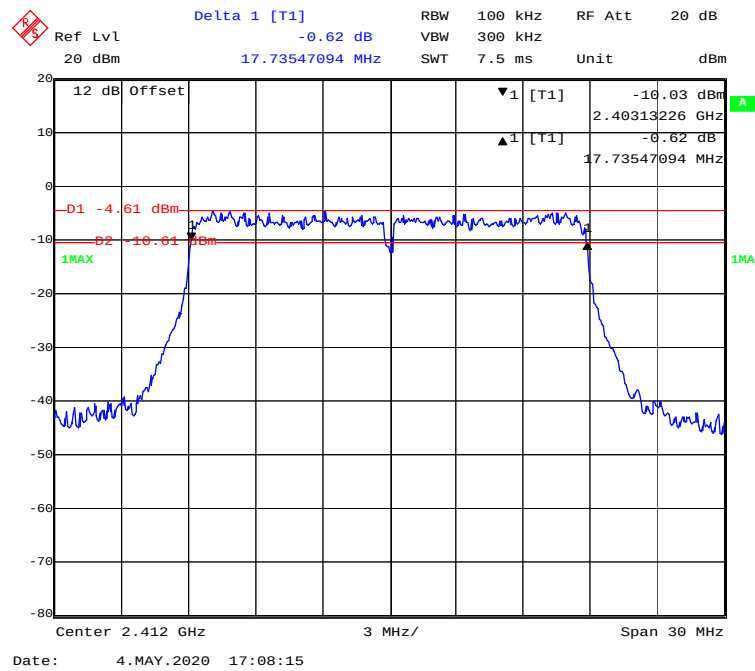
802.11g Mode Middle Channel



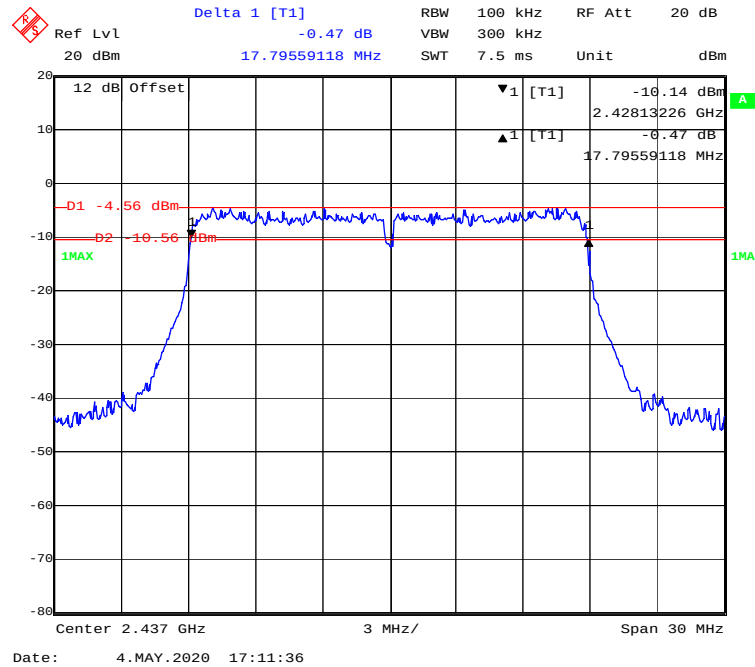
802.11g Mode High Channel



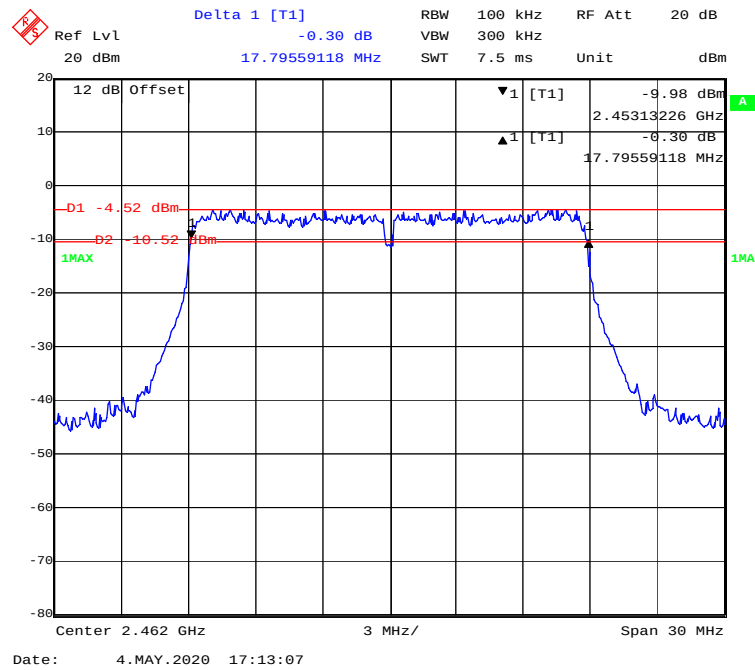
802.11n-HT20 Mode Low Channel



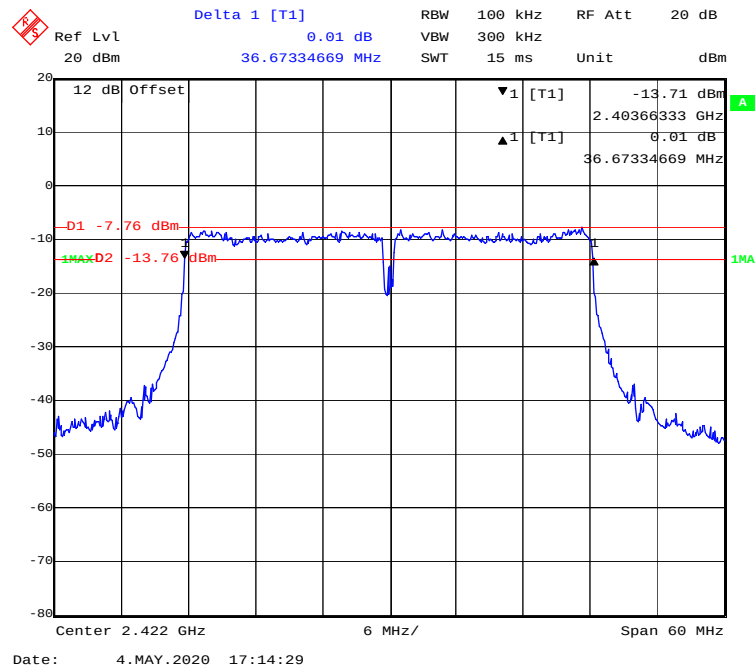
802.11n-HT20 Mode Middle Channel



802.11n-HT20 Mode High Channel



802.11n-HT40 Mode Low Channel



Delta 1 [T1] 0.01 dB
 RBW 100 kHz RF Att 20 dB
 Ref Lvl 20 dBm VBW 300 kHz
 SWT 15 ms Unit dBm

12 dB Offset
 -13.56 dBm
 -7.56 dBm
 -13.56 dBm

Center 2.437 GHz
 6 MHz/
 Span 60 MHz

Date: 4.MAY.2020 17:16:18

Delta 1 [T1] 0.07 dB

Ref Lvl 20 dBm

RBW 100 kHz RF Att 20 dB

VBW 300 kHz

SWT 15 ms Unit dBm

12 dB Offset

▼1 [T1] -13.65 dBm

▲1 [T1] 0.07 dB

2.4366333 GHz

36.67334669 MHz

-D1 -7.6 dBm

-13.6 dBm

-13.6 dBm

1 [T1]

Center 2.452 GHz

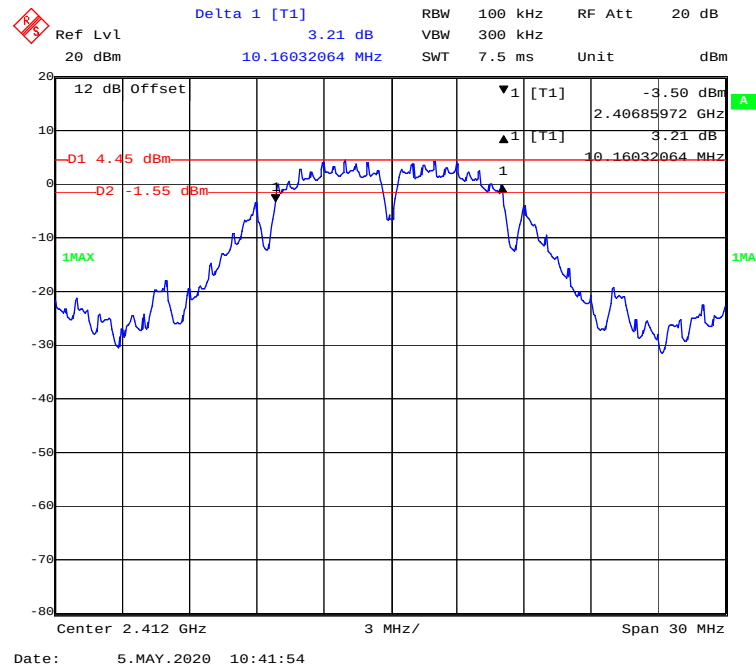
6 MHz/

Span 60 MHz

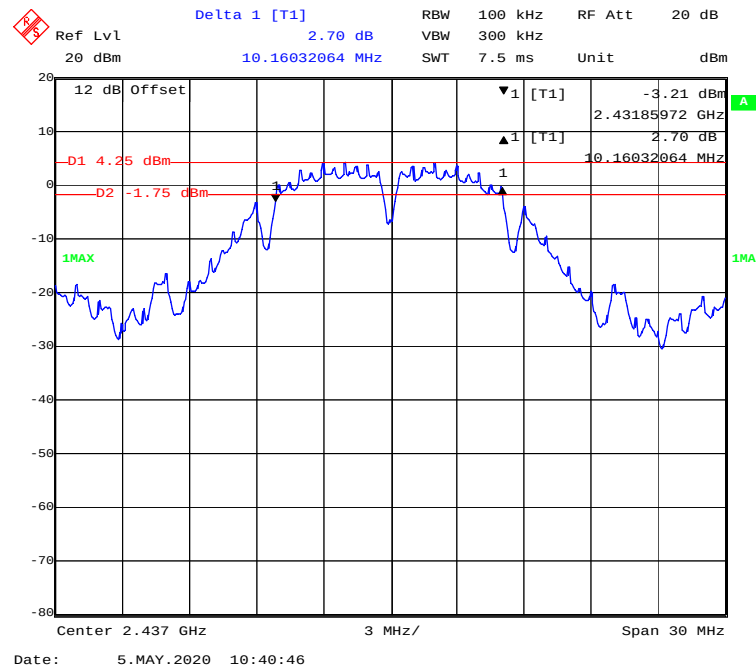
Date: 4.MAY.2020 17:17:33

Chain1:

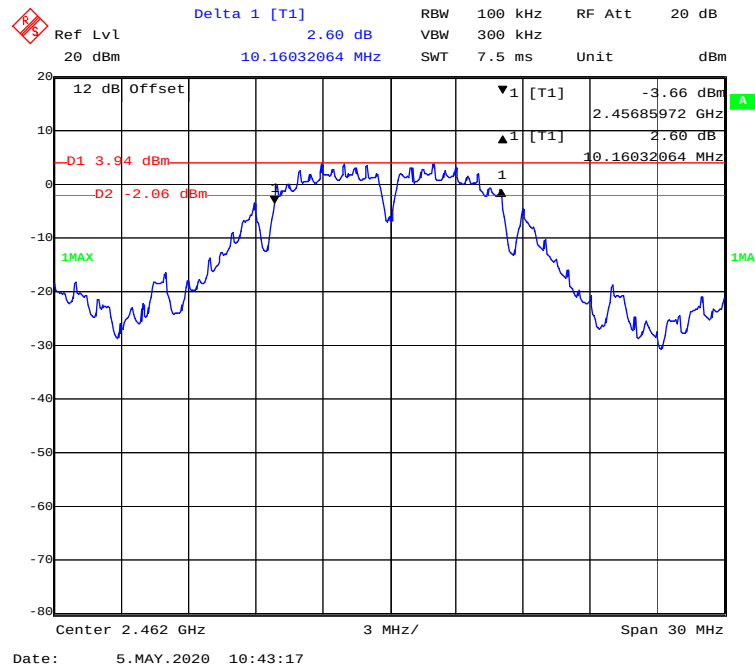
802.11b Mode Low Channel



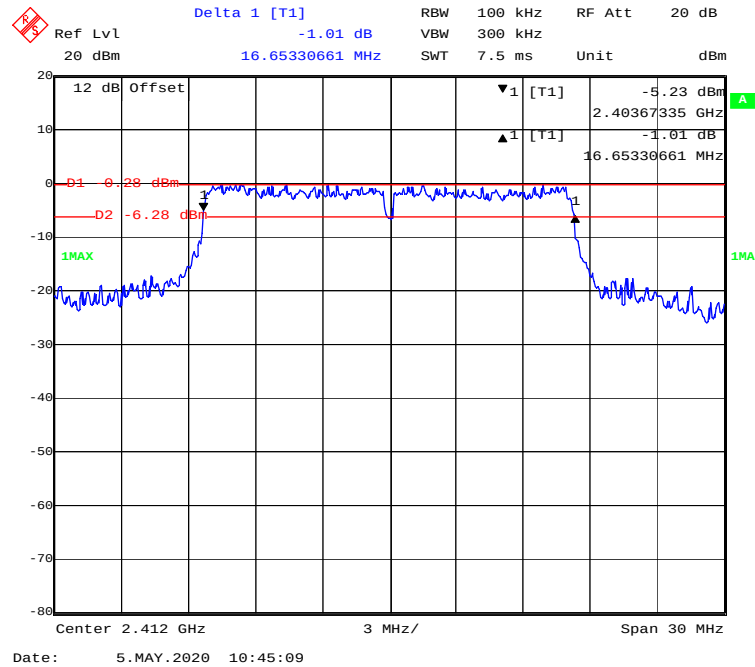
802.11b Mode Middle Channel



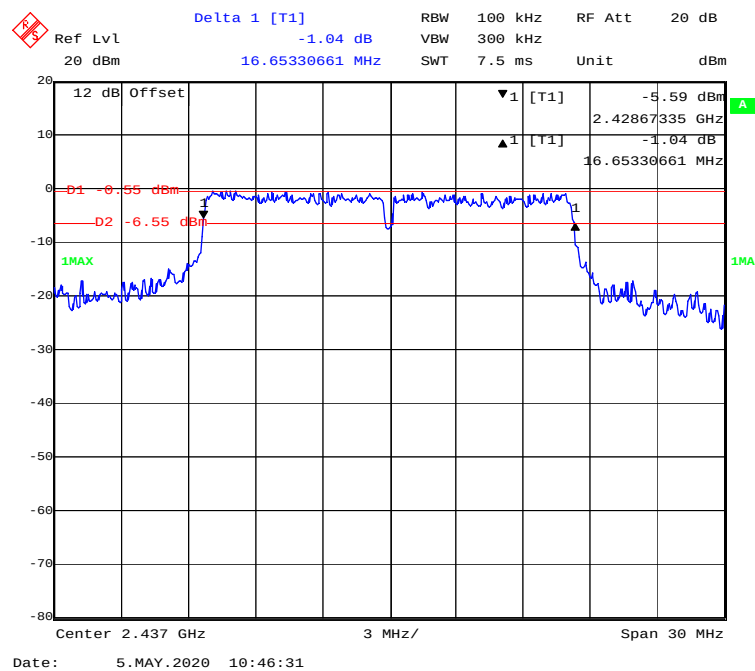
802.11b Mode High Channel



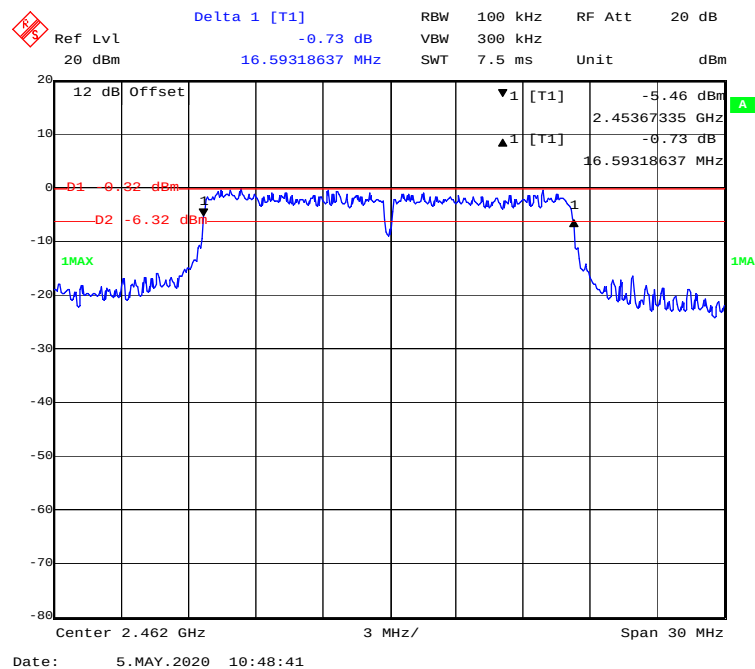
802.11g Mode Low Channel



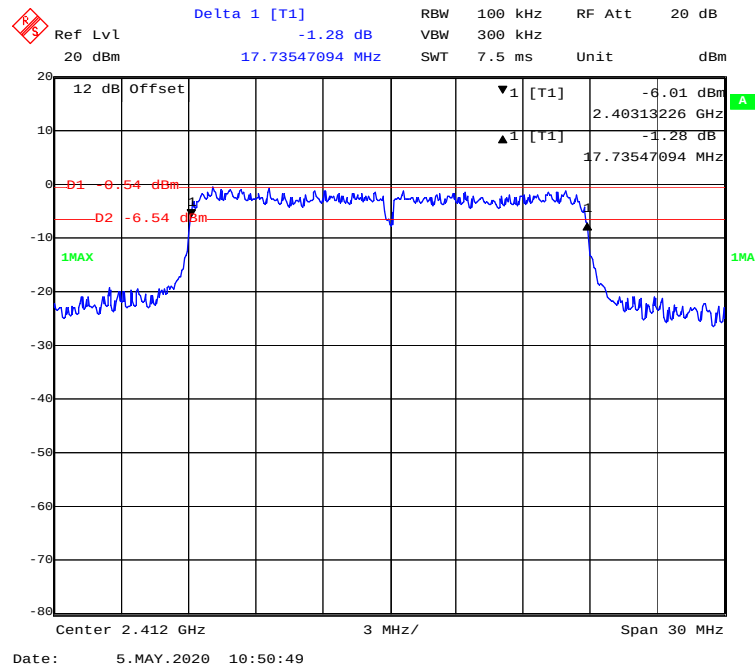
802.11g Mode Middle Channel



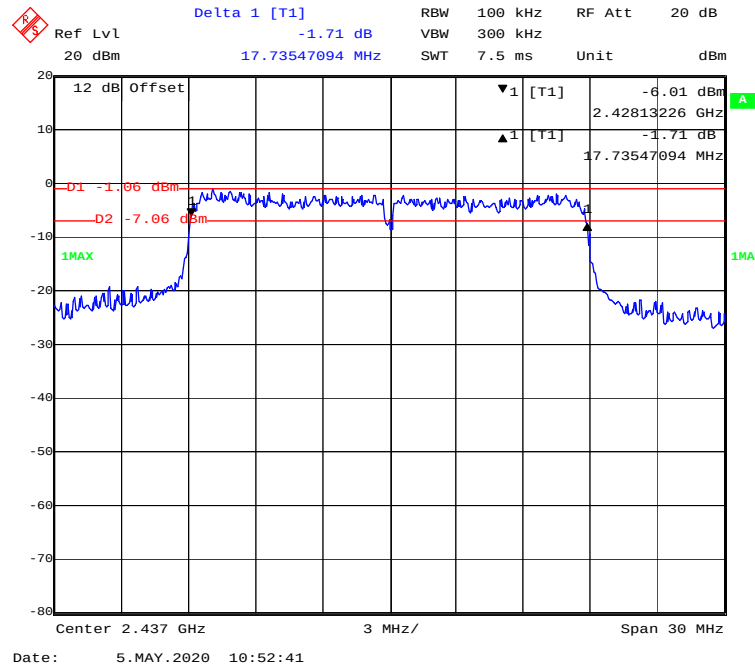
802.11g Mode High Channel



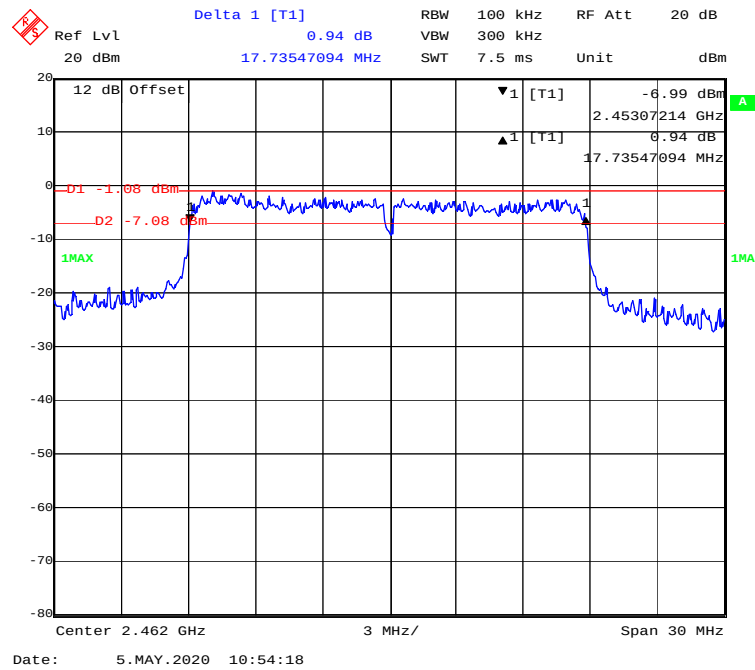
802.11n-HT20 Mode Low Channel



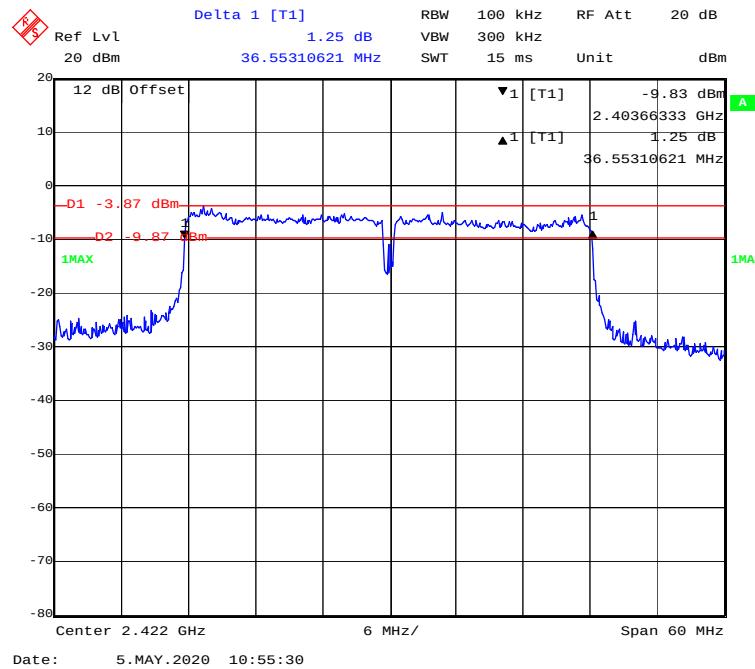
802.11n-HT20 Mode Middle Channel



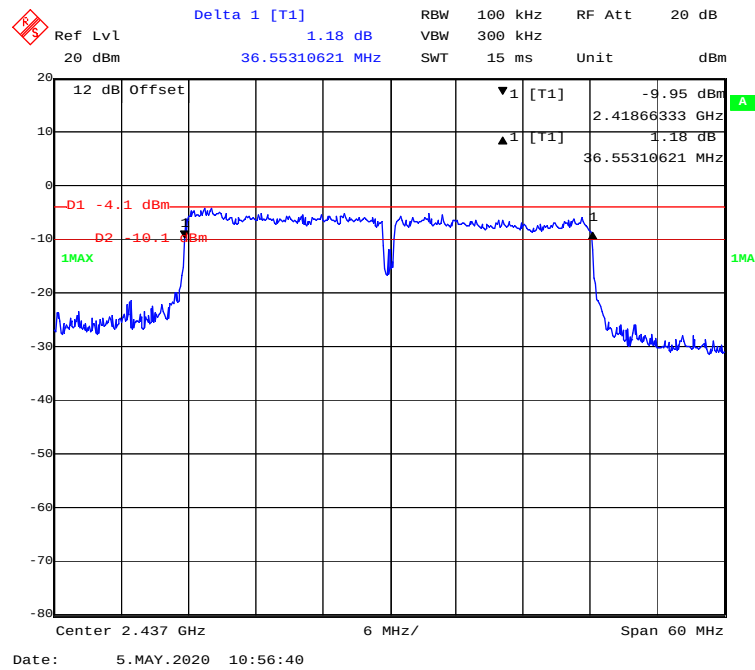
802.11n-HT20 Mode High Channel



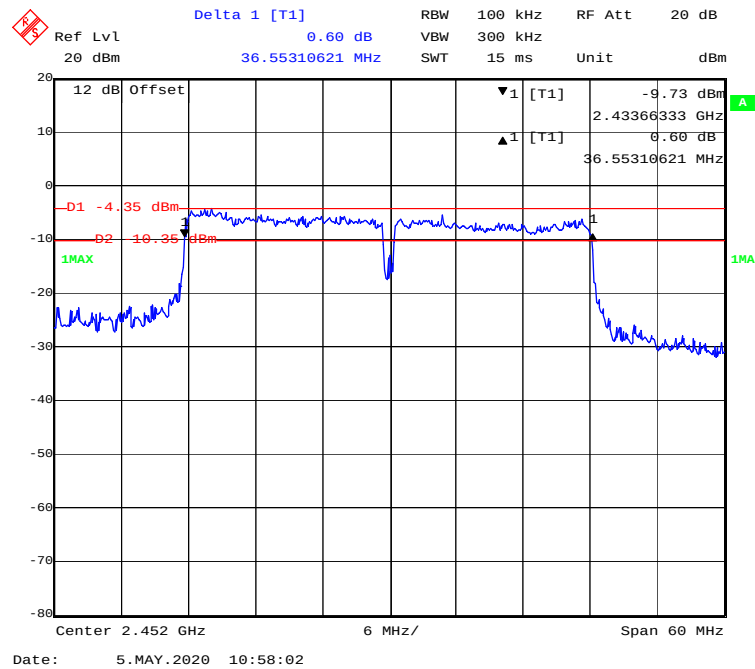
802.11n-HT40 Mode Low Channel



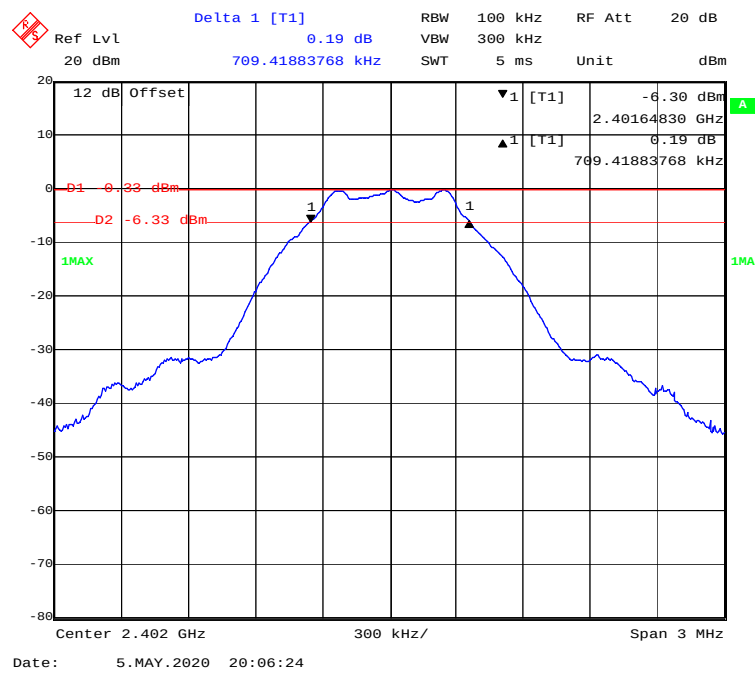
802.11n-HT40 Mode Middle Channel



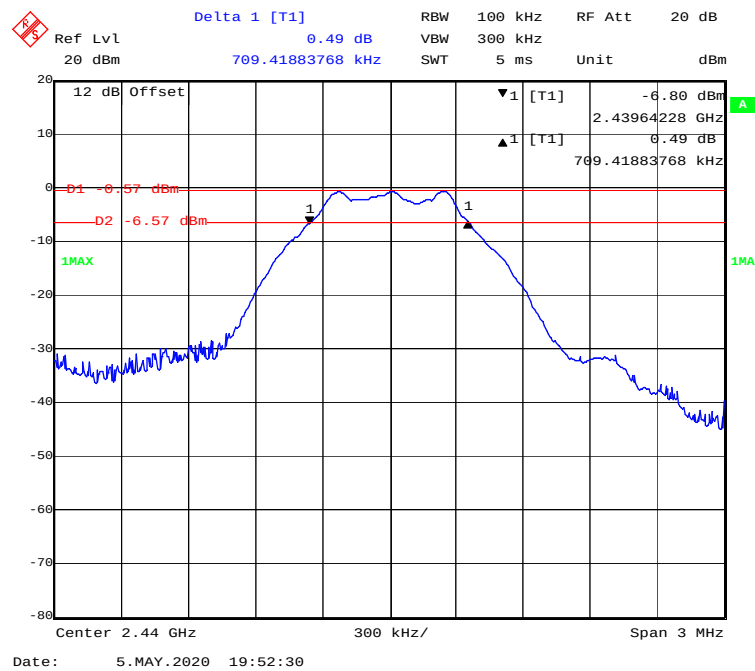
802.11n-HT40 Mode High Channel



BLE(1Mbps) Mode Low Channel



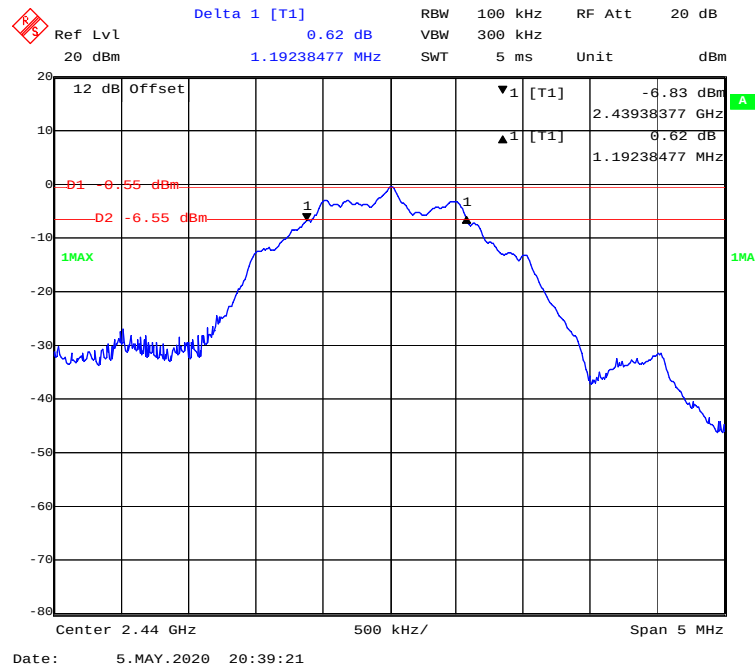
BLE(1Mbps) Mode Middle Channel



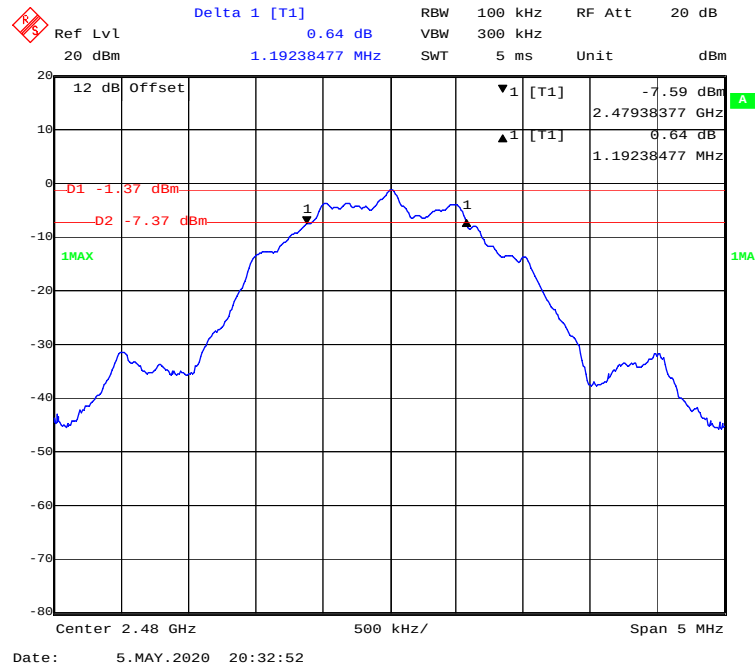
Delta 1 [T1] 0.47 dB
 RBW 100 kHz
 SWT 5 ms
 RF Att 20 dB
 Unit dBm
 12 dB Offset
 -6.57 dBm
 2.47964228 GHz
 0.47 dB
 769.41883768 kHz
 D1 -0.36 dBm
 D2 -6.36 dBm
 1MAX
 1
 1
 Center 2.48 GHz
 300 kHz/
 Span 3 MHz
 Date: 5.MAY.2020 19:39:23

Delta 1 [T1] 0.72 dB
 RBW 100 kHz RF Att 20 dB
 Ref Lvl 20 dBm Unit dBm
 1.19238477 MHz
 12 dB Offset
 -6.70 dBm
 2.40138377 GHz
 0.72 dB
 1.19238477 MHz
 -6.70 dBm
 0.72 dB
 1.19238477 MHz
 1MAX
 1MAX
 Center 2.402 GHz 500 kHz/ Span 5 MHz
 Date: 5.MAY.2020 20:24:21

BLE(2Mbps) Mode Middle Channel



BLE(2Mbps) Mode High Channel



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

Applicable Standard

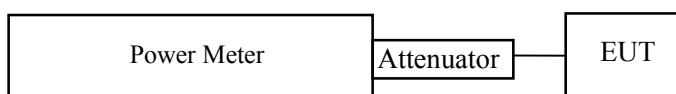
According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, Compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted 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

For Wi-Fi:

According to ANSI C63.10-2013 sub-clause 11.9.1.3

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



For BLE:

According to ANSI C63.10-2013 sub-clause 11.9.1.1

1. Set the RBW $\geq$ DTS bandwidth.
2. Set VBW $\geq 3 \times$ RBW.
3. Set span $\geq 3 \times$ 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:	22.8-24.3 °C
Relative Humidity:	48-54 %
ATM Pressure:	101.2-101.5 kPa

The testing was performed by Chao Gao from 2020-05-04 to 2020-05-05.

Test Result: Compliant.

EUT operation mode: Transmitting

Test mode	Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)			Limit (dBm)	Result
			Chain0	Chain1	Total		
802.11b	Low	2412	17.38	18.06	/	30	Pass
	Middle	2437	17.46	17.84	/	30	Pass
	High	2462	17.77	17.35	/	30	Pass
802.11g	Low	2412	20.58	20.46	/	30	Pass
	Middle	2437	20.78	20.22	/	30	Pass
	High	2462	20.99	20.17	/	30	Pass
802.11n-HT20	Low	2412	16.83	20.08	21.76	30	Pass
	Middle	2437	17.09	19.64	21.56	30	Pass
	High	2462	17.33	19.29	21.43	30	Pass
802.11n-HT40	Low	2422	16.41	19.59	21.30	30	Pass
	Middle	2437	16.53	19.52	21.29	30	Pass
	High	2452	16.66	19.24	21.15	30	Pass

Note: The total output power = $10 \log_{10} (10^{\wedge}(\text{Chain } 0/10) + 10^{\wedge}(\text{Chain } 1/10))$

The maximum antenna gain is 4.7dBi, the device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:

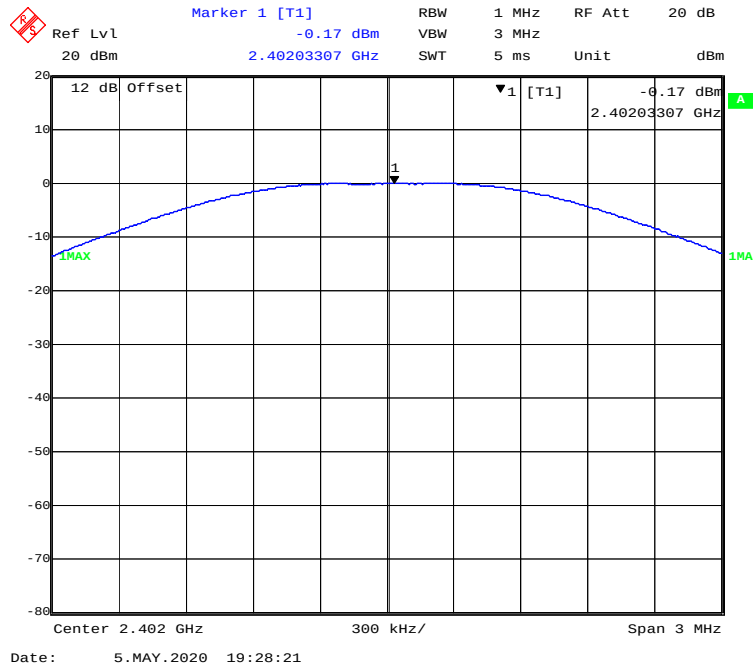
Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

So:

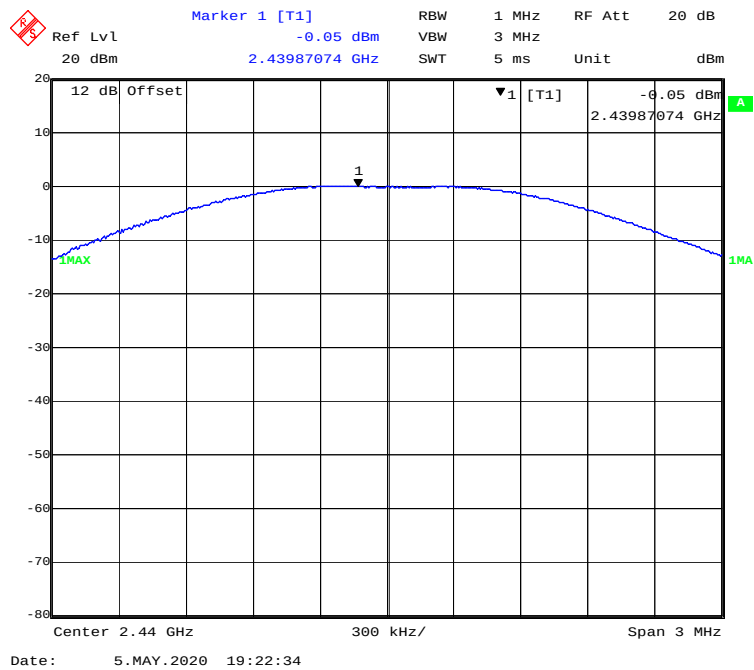
Directional gain = GANT + Array Gain = 4.7dBi < 6dBi

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
BLE(1Mbps) Mode				
Low	2402	-0.17	30	Pass
Middle	2440	-0.05	30	Pass
High	2480	-0.17	30	Pass
BLE(2Mbps) Mode				
Low	2402	-0.17	30	Pass
Middle	2440	-0.02	30	Pass
High	2480	-1.02	30	Pass

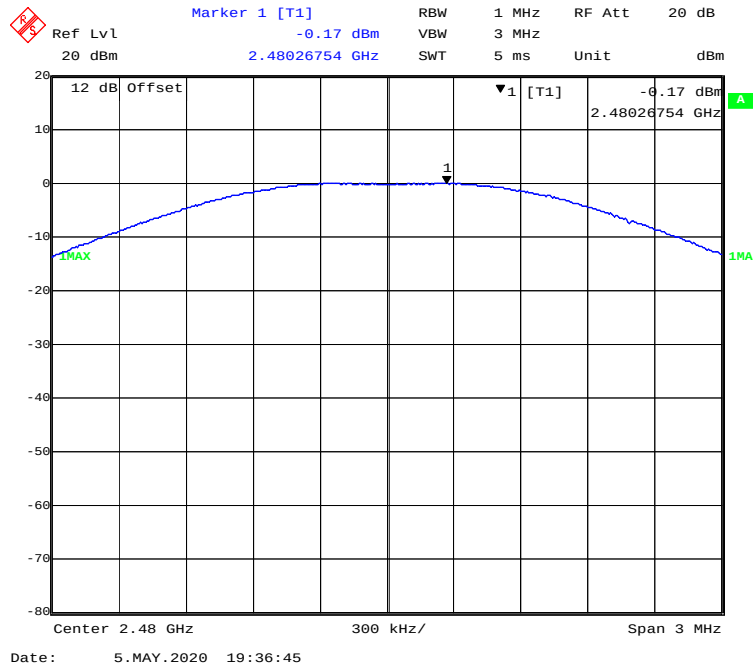
BLE(1Mbps) Mode Low Channel



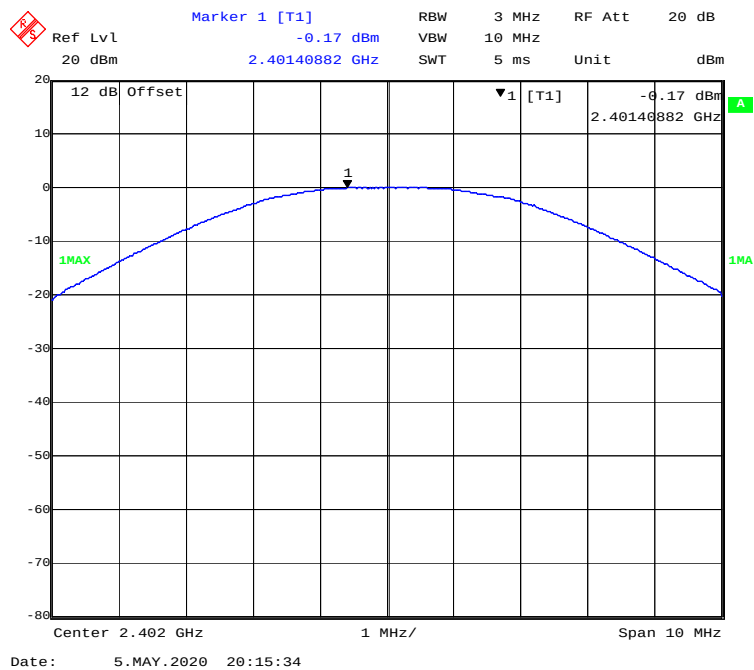
BLE(1Mbps) Mode Middle Channel



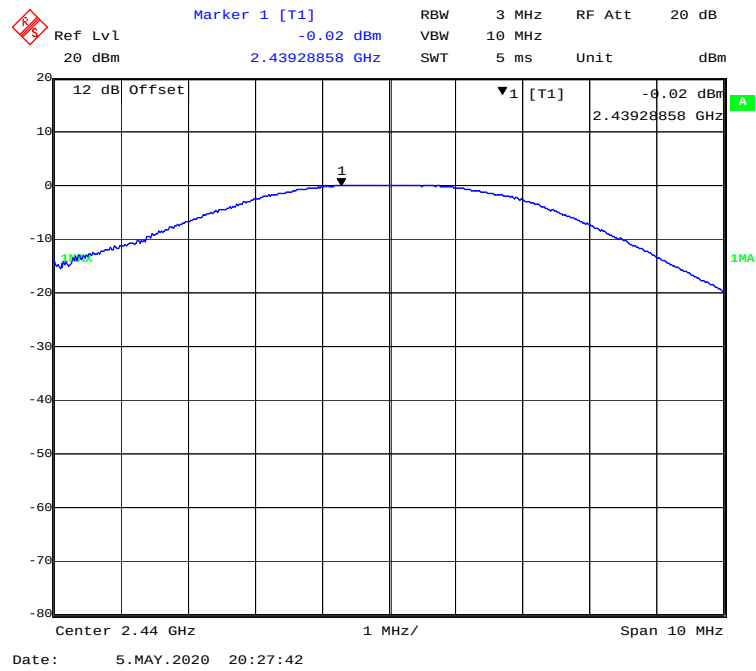
BLE(1Mbps) Mode High Channel



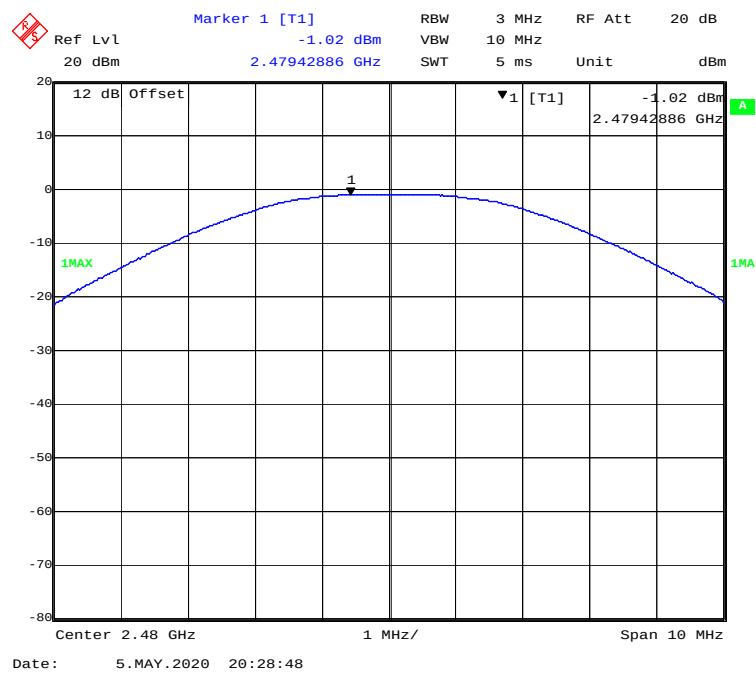
BLE(2Mbps) Mode Low Channel



BLE(2Mbps) Mode Middle Channel



BLE(2Mbps) Mode High Channel



FCC §15.247(d) – 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 ANSI C63.10-2013 sub-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:	21.3-24.3 °C
Relative Humidity:	46-50 %
ATM Pressure:	101.1-101.3 kPa

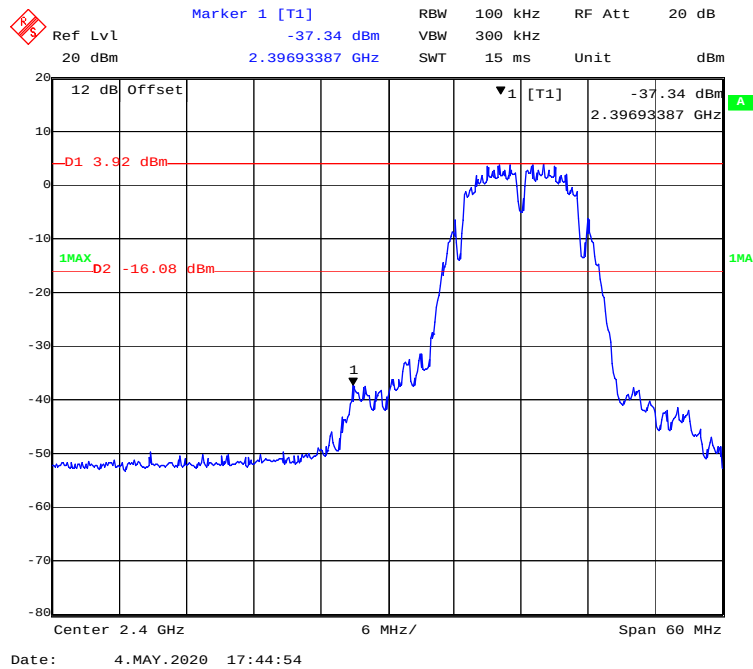
The testing was performed by Chao Gao from 2020-05-04 to 2020-05-05.

Test Result: Compliant.

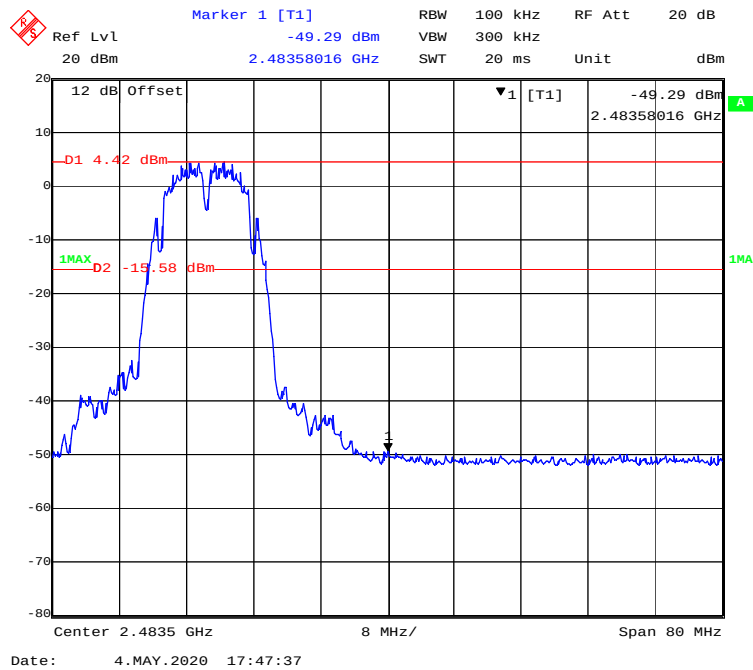
EUT operation mode: Transmitting

Chain0:

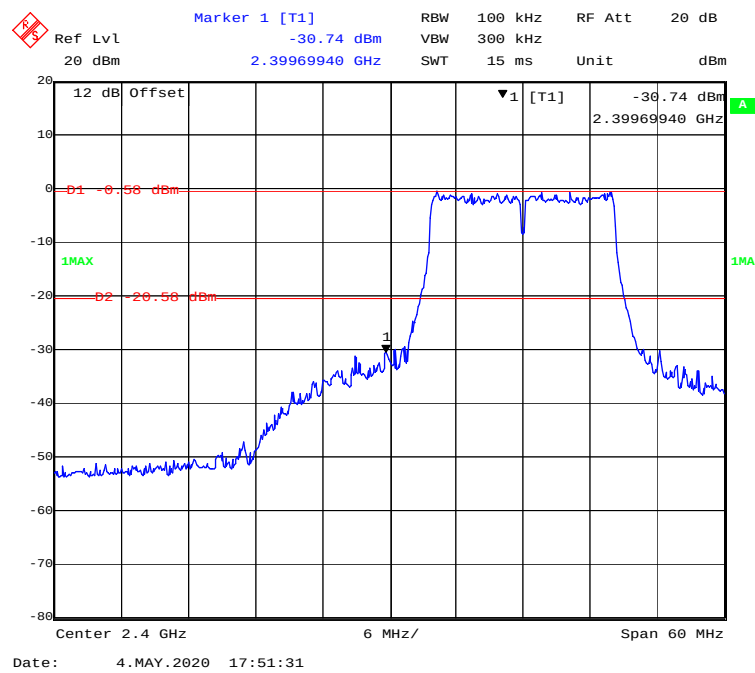
802.11b Mode Left Side



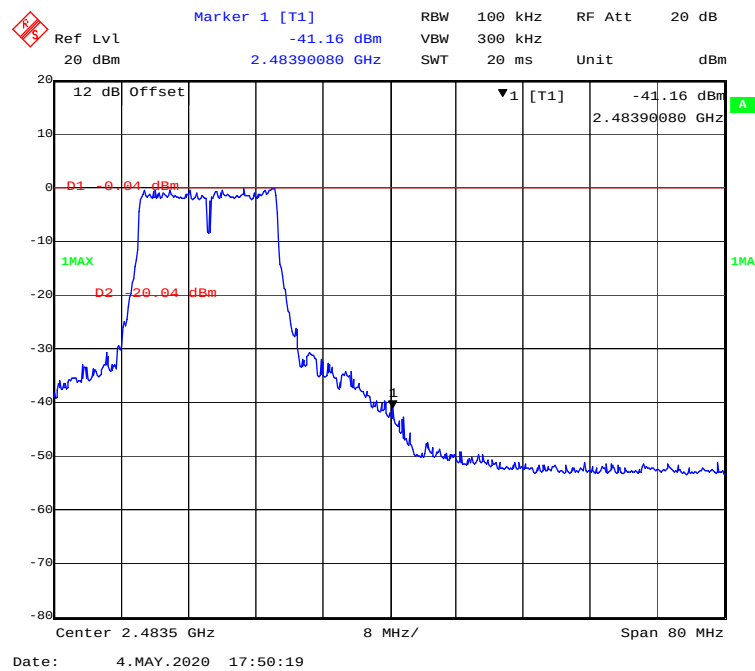
802.11b Mode Right Side



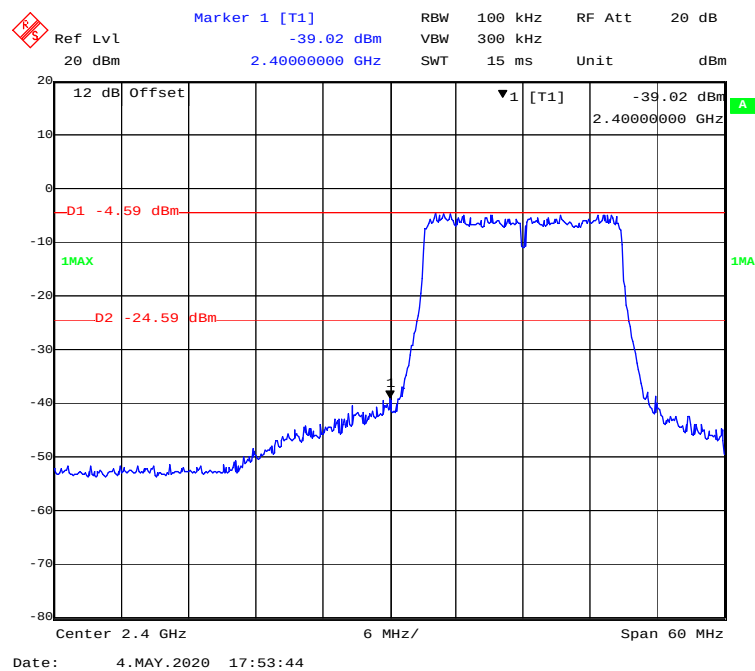
802.11g Mode Left Side



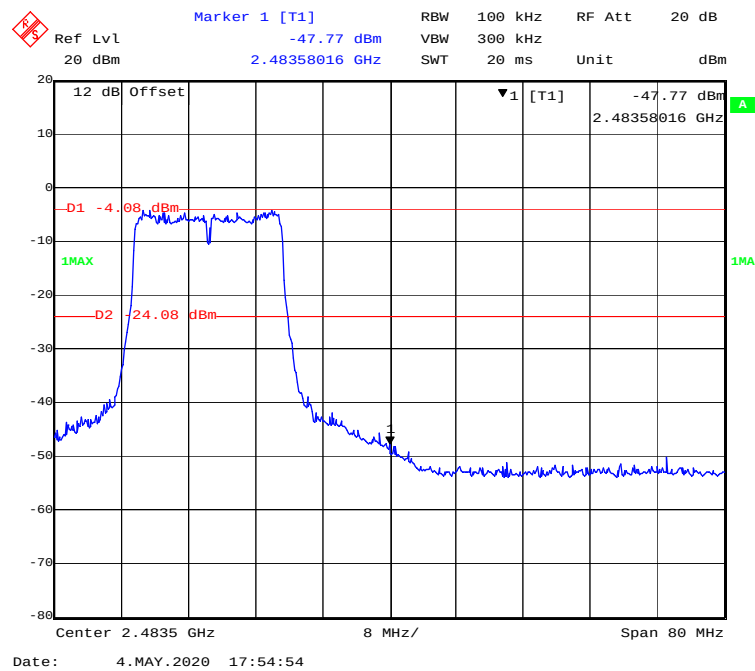
802.11g Mode Right Side



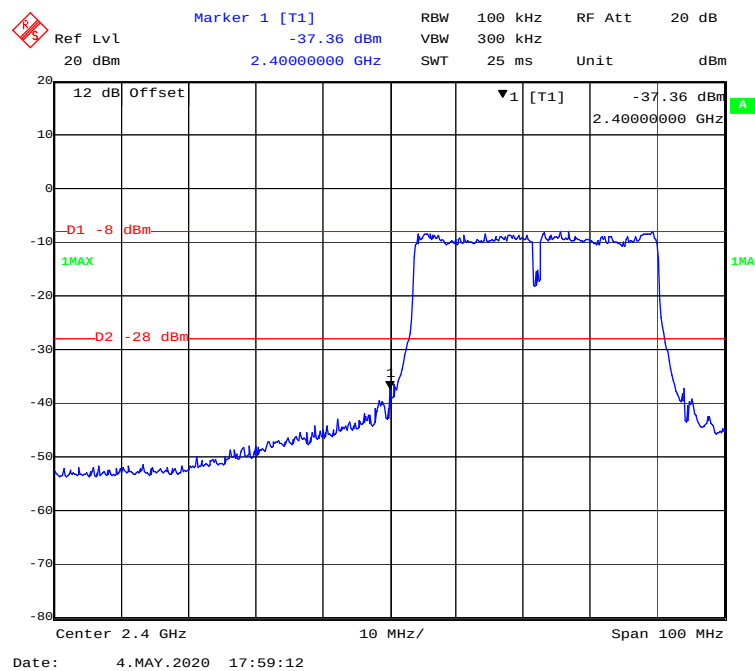
802.11n-HT20 Mode Left Side



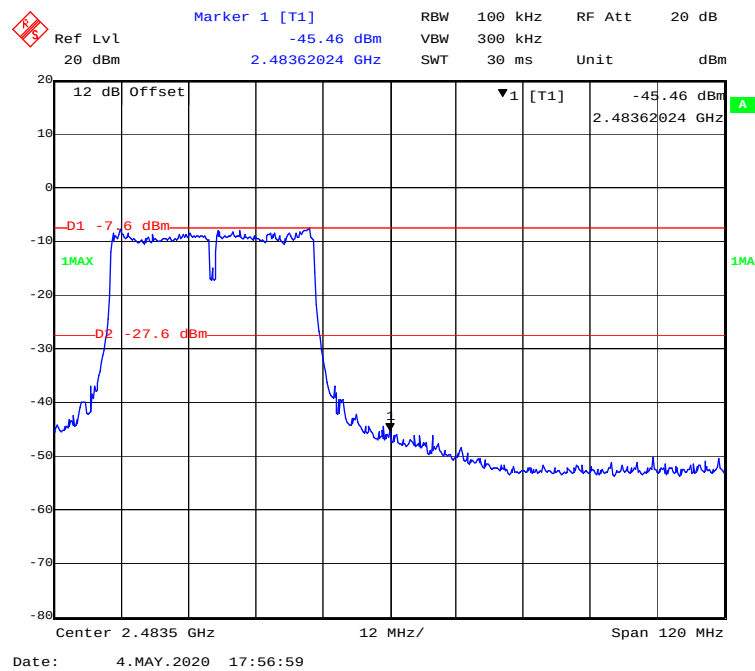
802.11n-HT20 Mode Right Side



802.11n-HT40 Mode Left Side

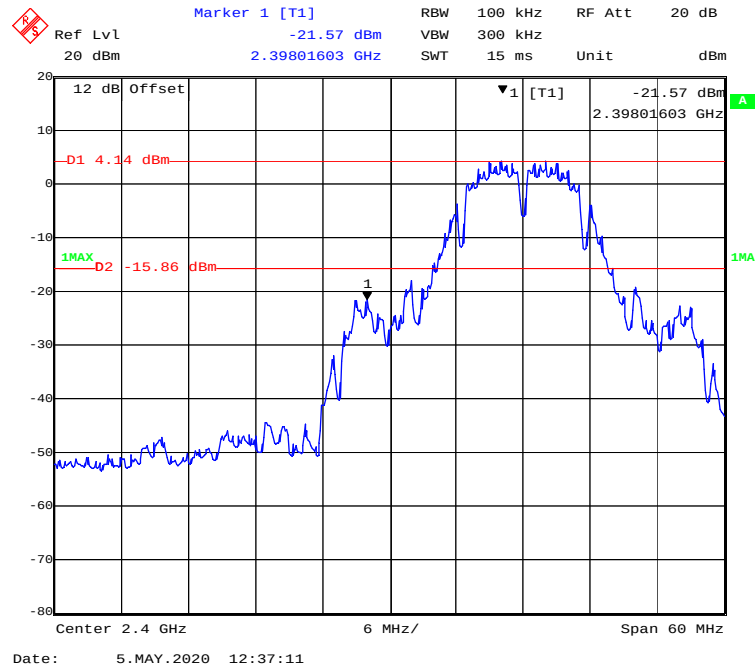


802.11n-HT40 Mode Right Side

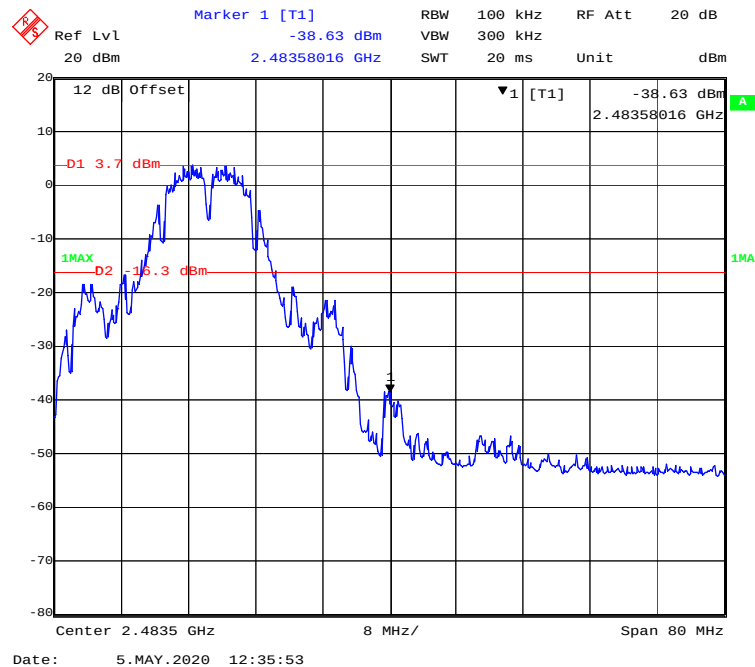


Chain1:

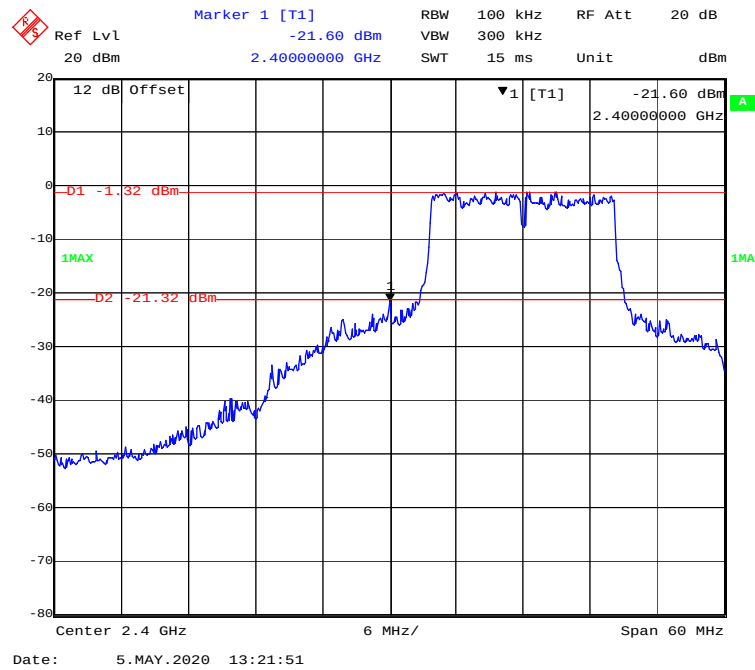
802.11b Mode Left Side



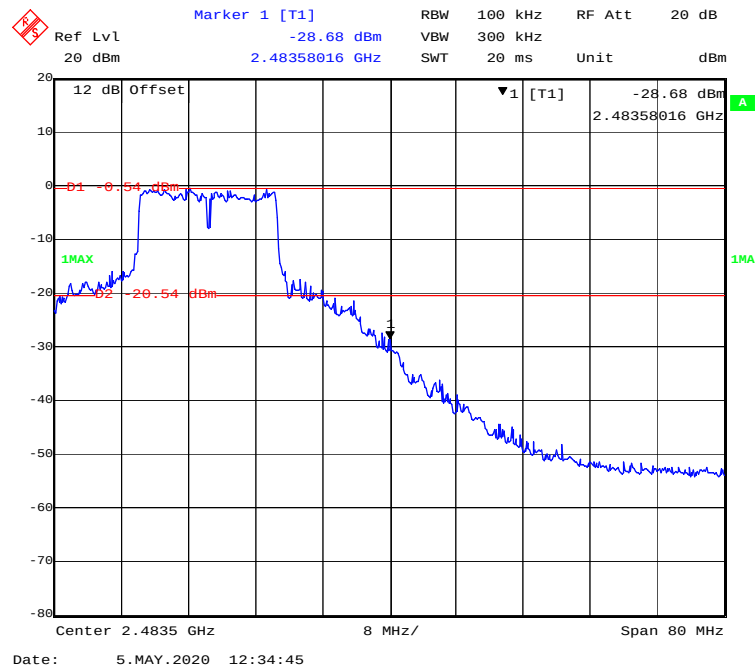
802.11b Mode Right Side



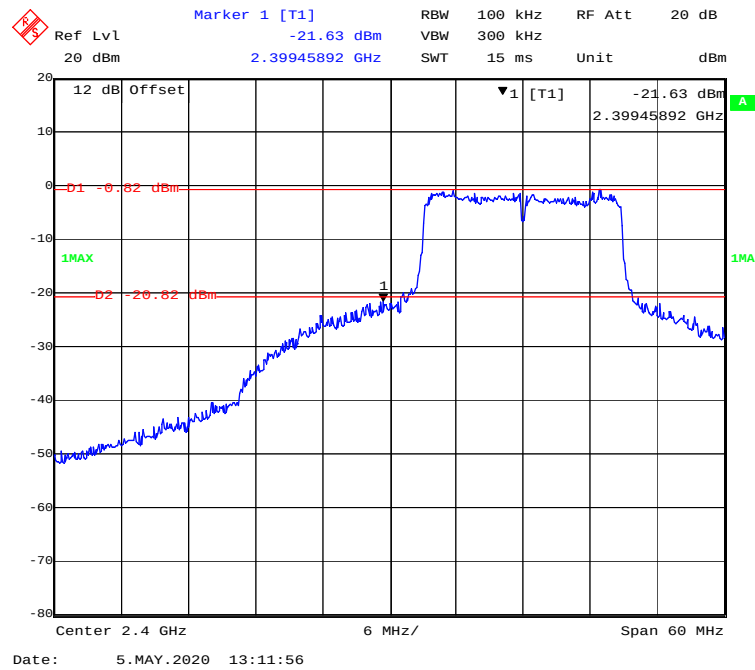
802.11g Mode Left Side



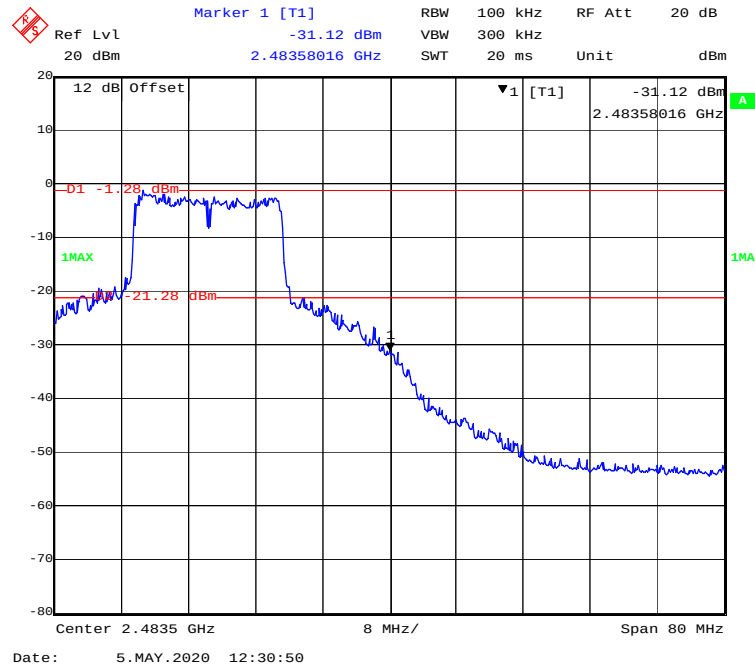
802.11g Mode Right Side



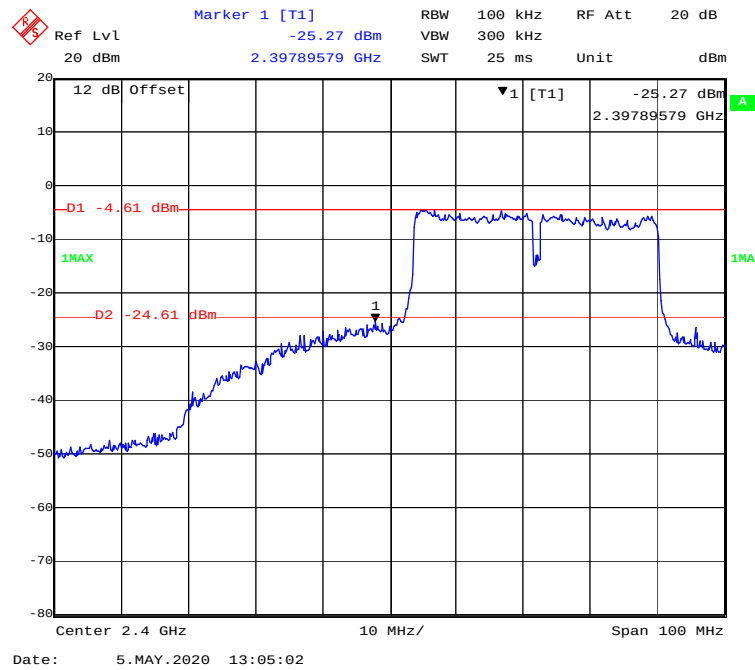
802.11n-HT20 Mode Left Side



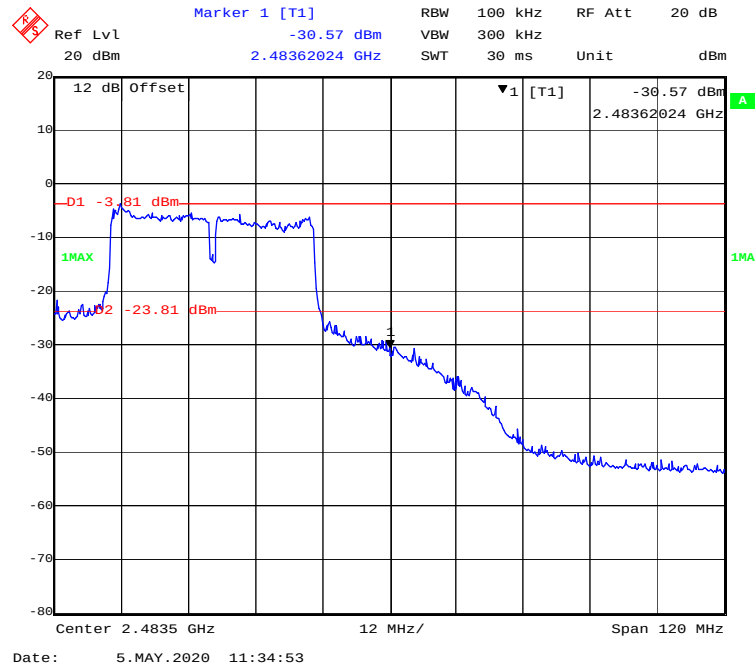
802.11n-HT20 Mode Right Side



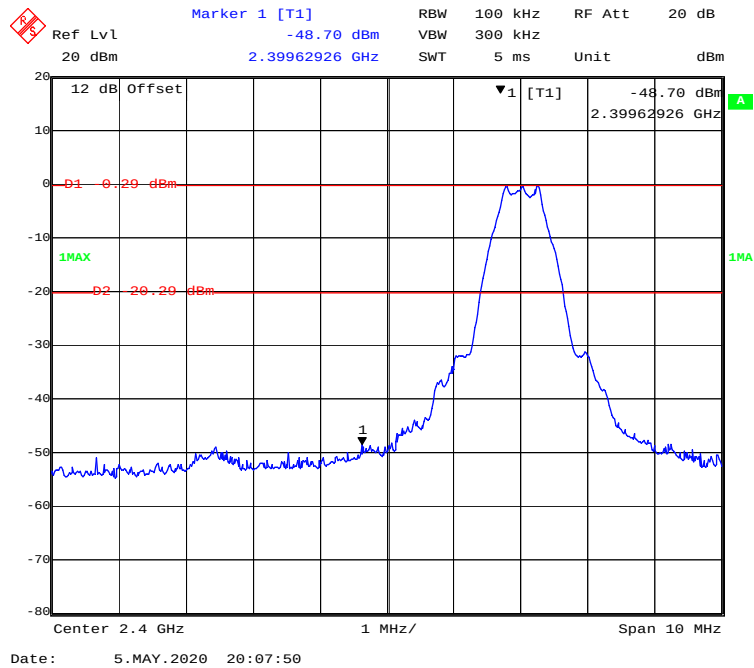
802.11n-HT40 Mode Left Side



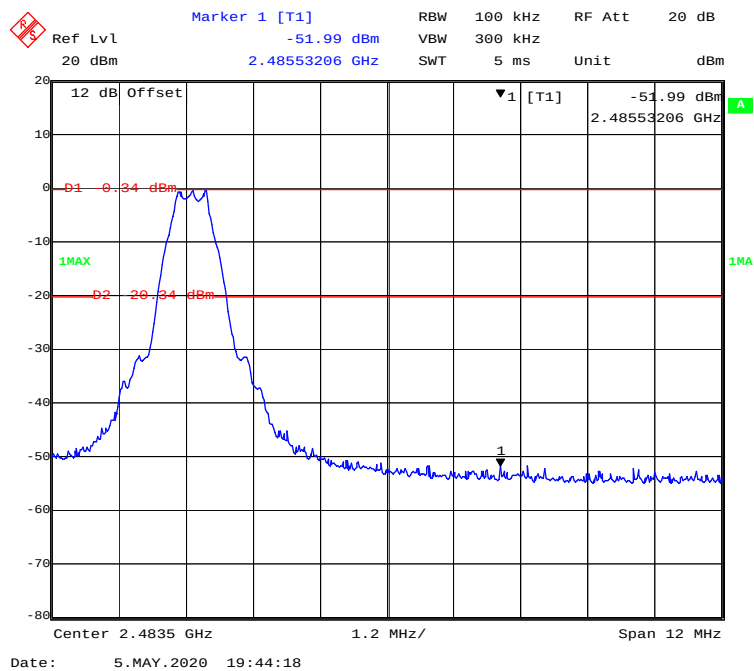
802.11n-HT40 Mode Right Side



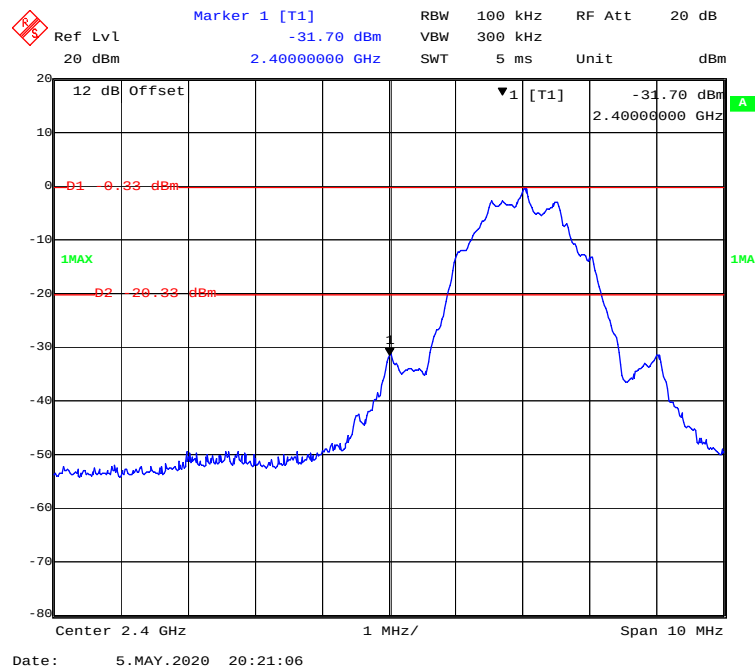
BLE(1Mbps) Mode Left Side



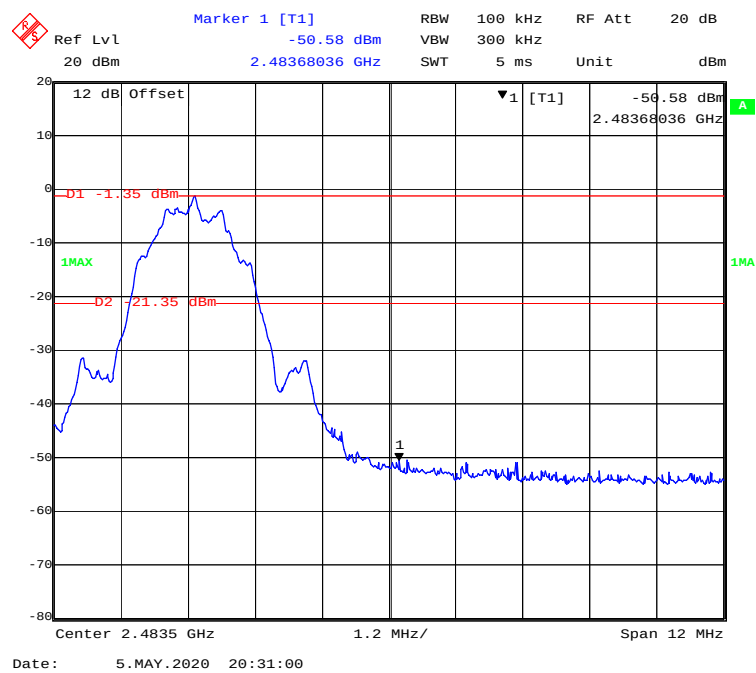
BLE(1Mbps) Mode Right Side



BLE(2Mbps) Mode Left Side



BLE(2Mbps) Mode Right Side



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 ANSI C63.10-2013 sub-clause 11.10.2

The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

1. Set the RBW to: $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
2. Set the VBW $\geq 3 \times \text{RBW}$.
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level within the RBW.
9. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Data

Environmental Conditions

Temperature:	22.1-24.3 °C
Relative Humidity:	48-52 %
ATM Pressure:	101.1-101.3 kPa

The testing was performed by Chao Gao from 2020-05-04 to 2020-05-05.

Test Result: Compliant.

EUT operation mode: Transmitting

Channel	Frequency (MHz)	PSD (dBm/3kHz)			Limit (dBm/3kHz)
		Chain0	Chain1	Total	
802.11b mode					
Low	2412	-15.04	-14.66	/	≤8
Middle	2437	-15.00	-14.83	/	≤8
High	2462	-14.80	-14.61	/	≤8
802.11g mode					
Low	2412	-15.62	-14.45	/	≤8
Middle	2437	-15.50	-15.36	/	≤8
High	2462	-15.06	-14.98	/	≤8
802.11n-HT20 mode					
Low	2412	-18.81	-14.47	-13.11	≤6.29
Middle	2437	-18.81	-15.60	-13.90	≤6.29
High	2462	-17.96	-15.90	-13.80	≤6.29
802.11n-HT40 mode					
Low	2422	-20.29	-15.40	-14.18	≤6.29
Middle	2437	-20.21	-17.13	-15.39	≤6.29
High	2452	-20.23	-17.87	-15.88	≤6.29

Note:

The total PSD=10*Log₁₀ (10[^] (Chain 0/10) +10[^] (Chain 1/10))

The maximum antenna gain is 4.7dBi. The device employed Cyclic Delay Diversity (CDD) for 802.11MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

Array Gain = 10*log(N_{ANT}/N_{SS}) dB.

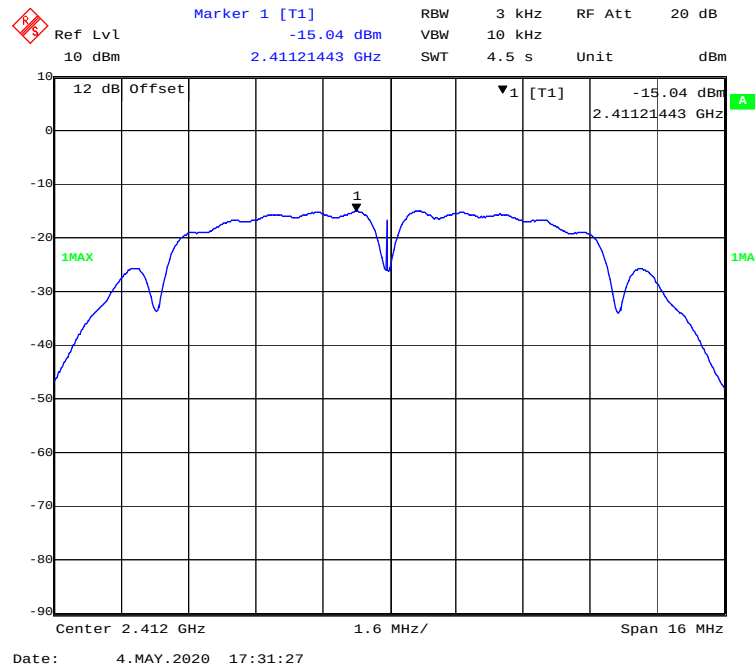
So:

Directional gain = G_{ANT} + Array Gain = 4.7+10*log(2/1) =7.71dBi.

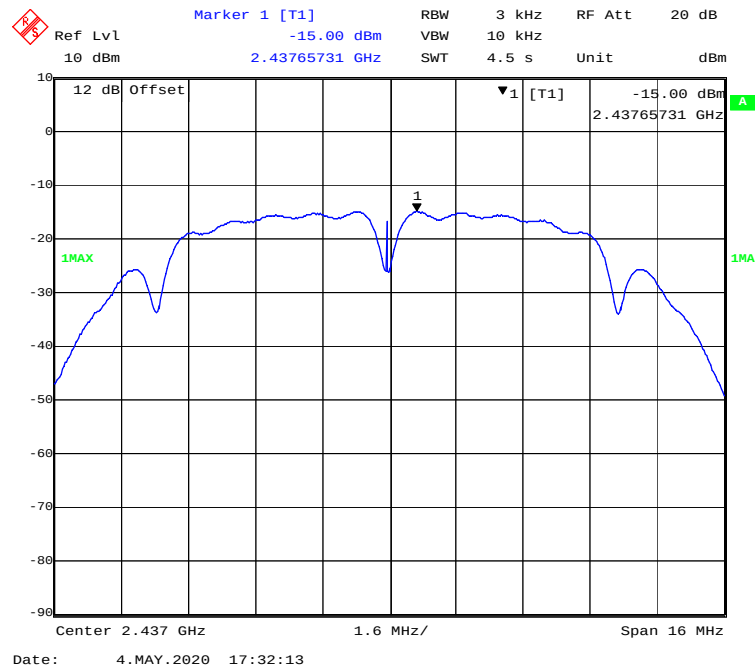
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
BLE(1Mbps) Mode			
Low	2402	-15.33	≤ 8
Middle	2440	-15.91	≤ 8
High	2480	-15.67	≤ 8
BLE(2Mbps) Mode			
Low	2402	-16.51	≤ 8
Middle	2440	-16.76	≤ 8
High	2480	-17.44	≤ 8

Chain0:

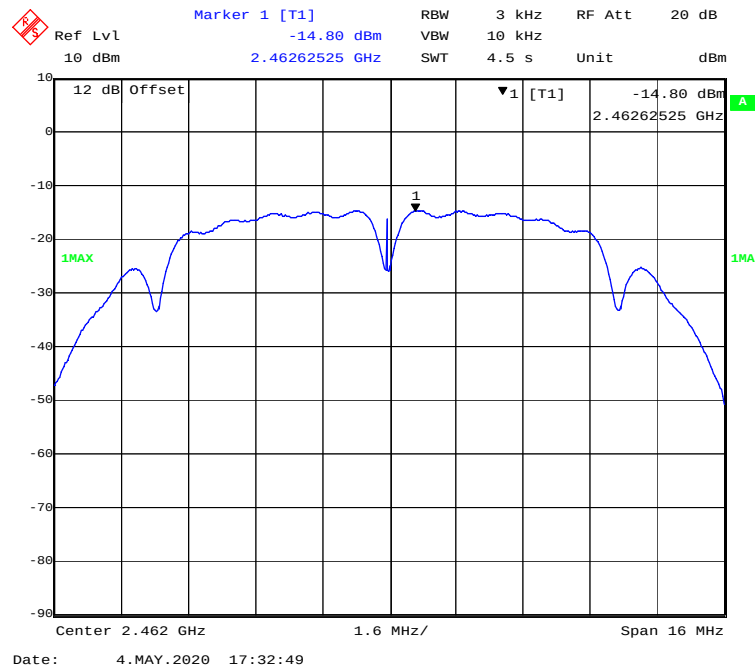
802.11b Low Channel



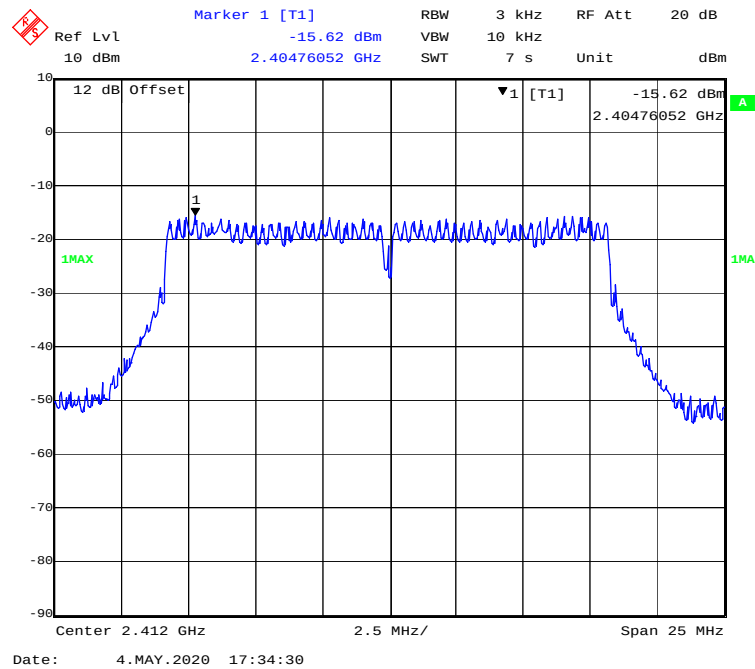
802.11b Middle Channel



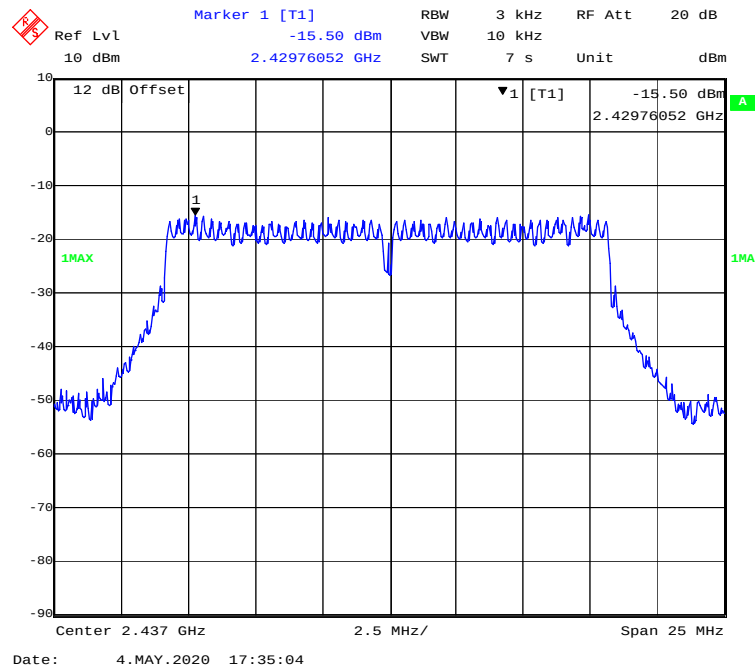
802.11b High Channel



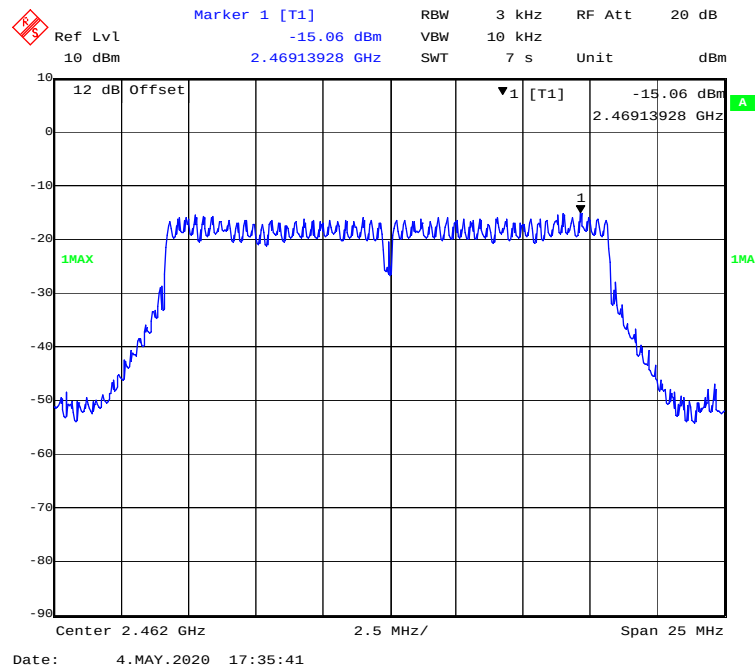
802.11g Low Channel



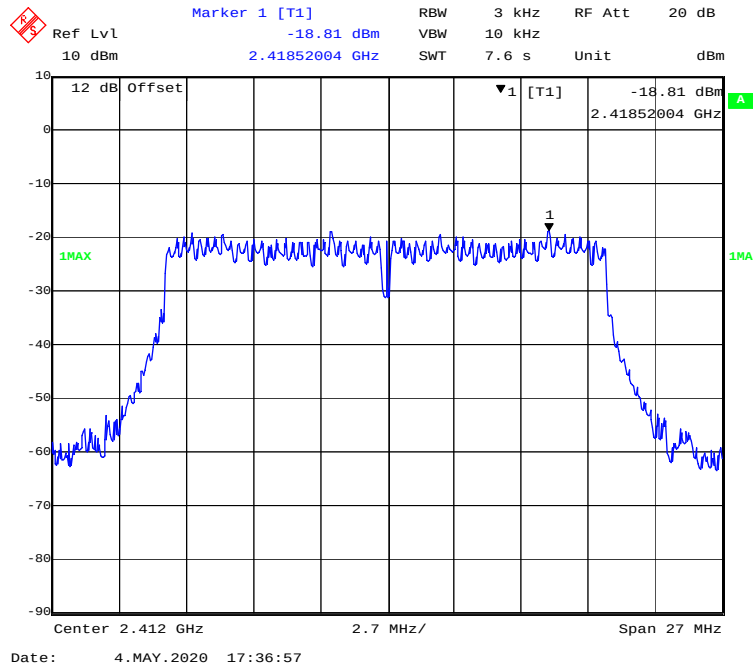
802.11g Middle Channel



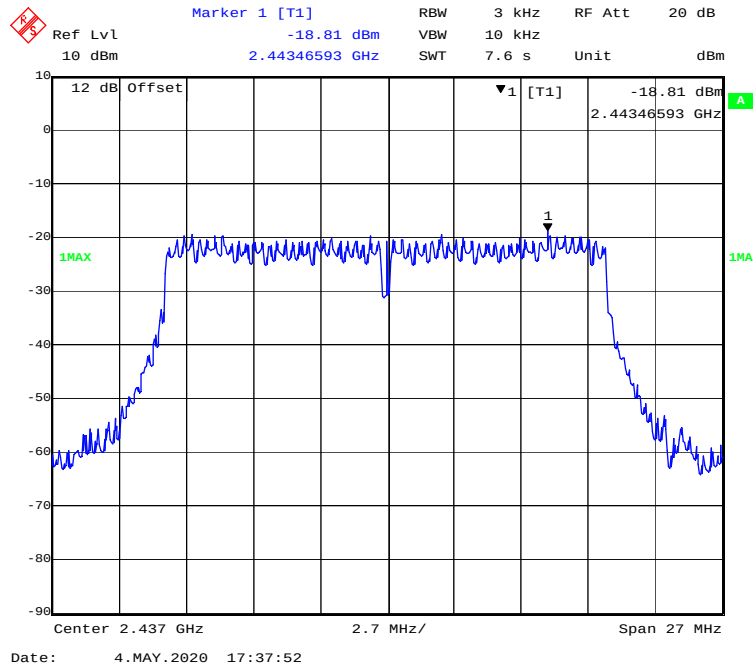
802.11g High Channel

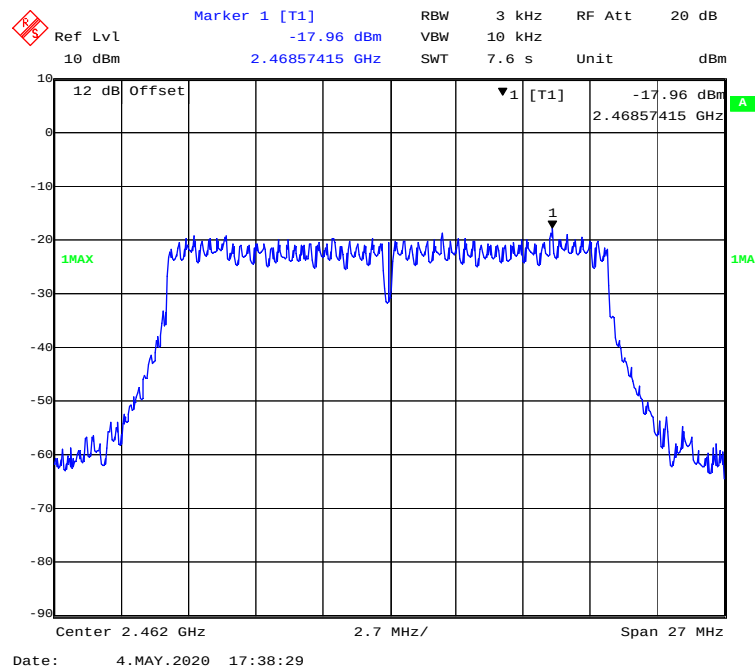
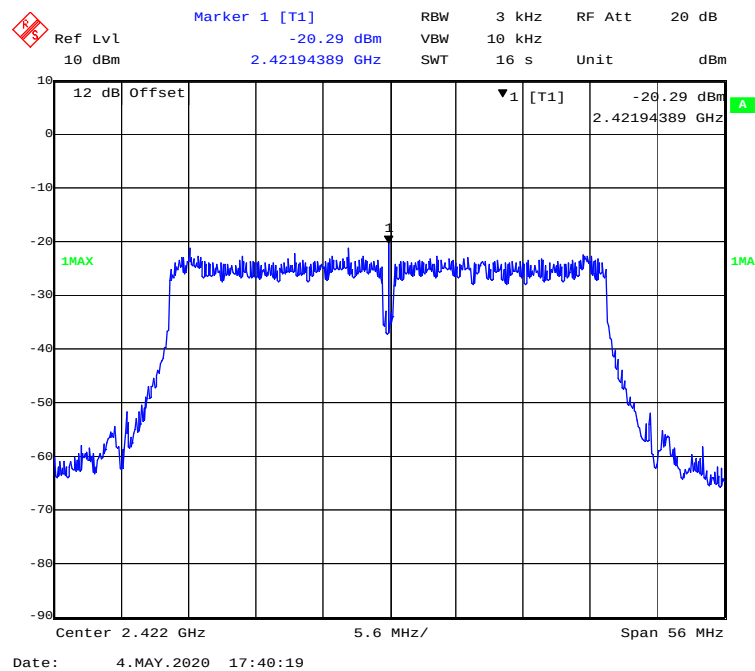


802.11n-HT20 Low Channel

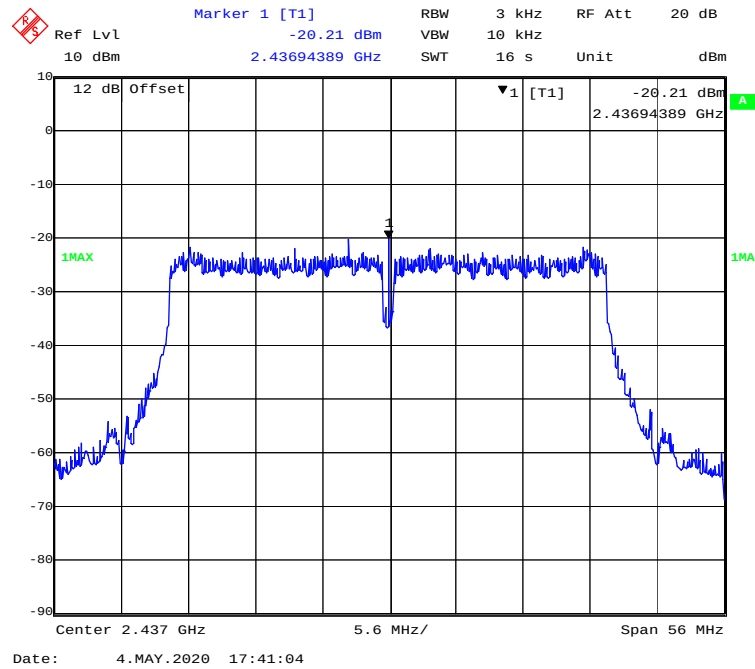


802.11n-HT20 Middle Channel

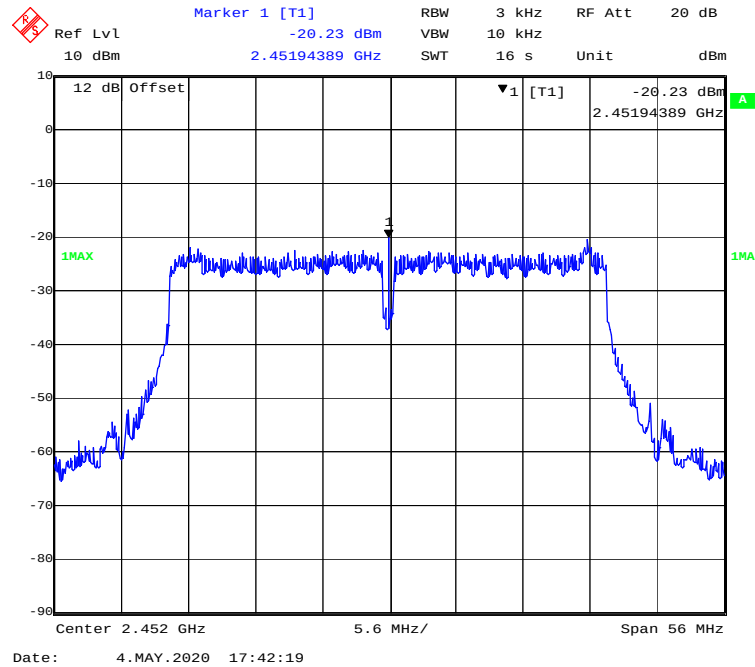


802.11n-HT20 High Channel**802.11n-HT40 Low Channel**

802.11n-HT40 Middle Channel

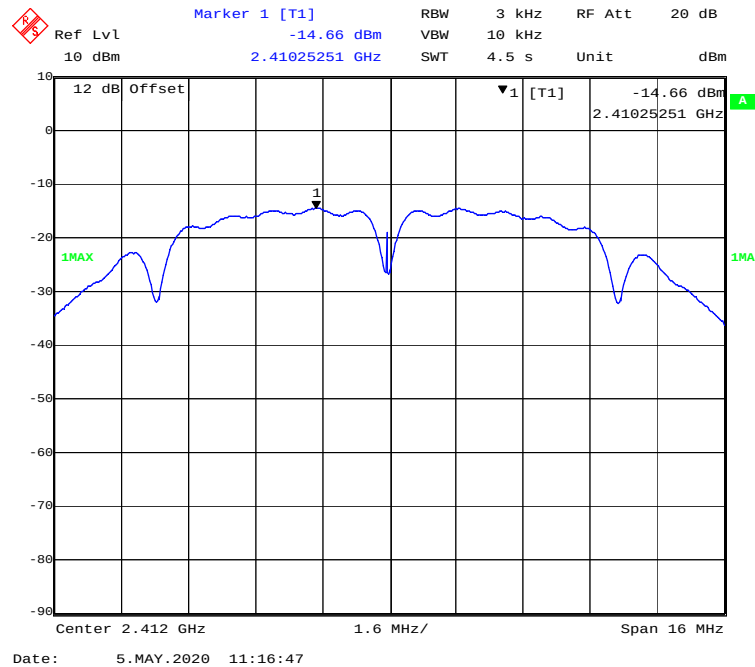


802.11n-HT40 High Channel

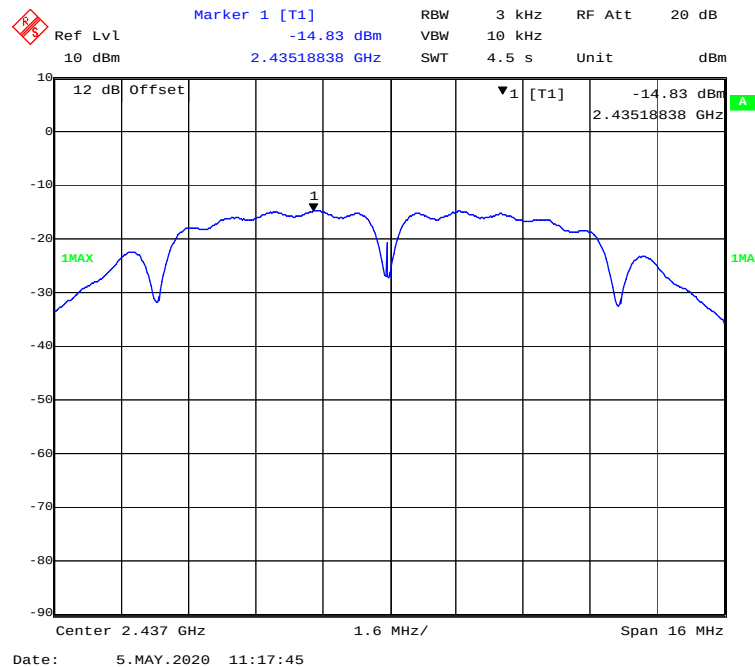


Chain1:

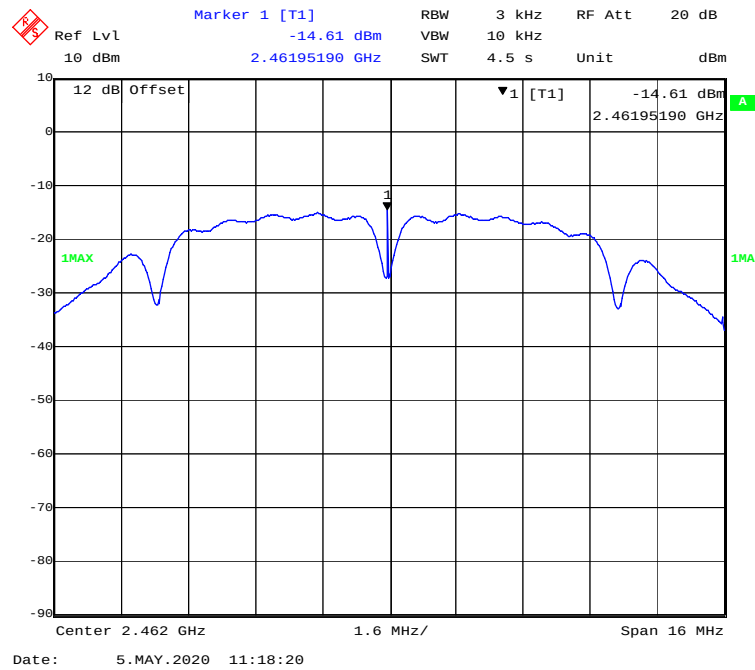
802.11b Low Channel



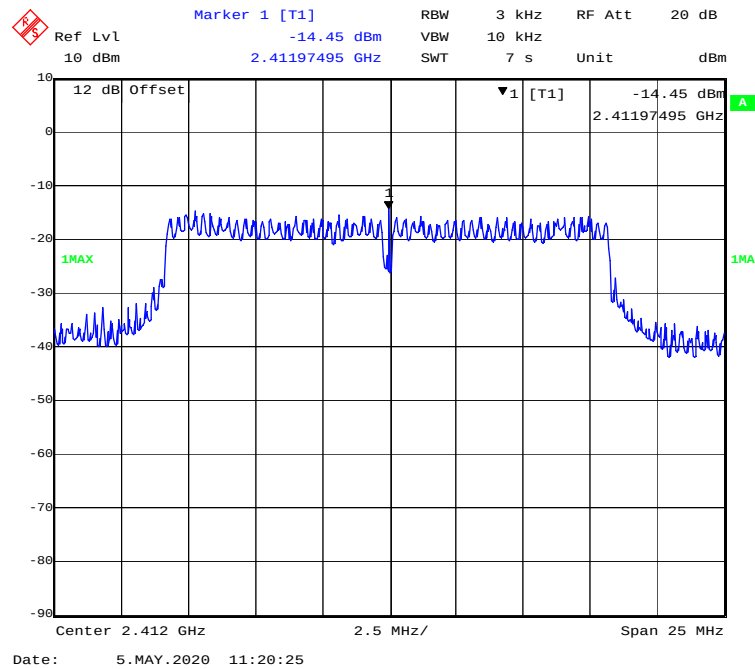
802.11b Middle Channel



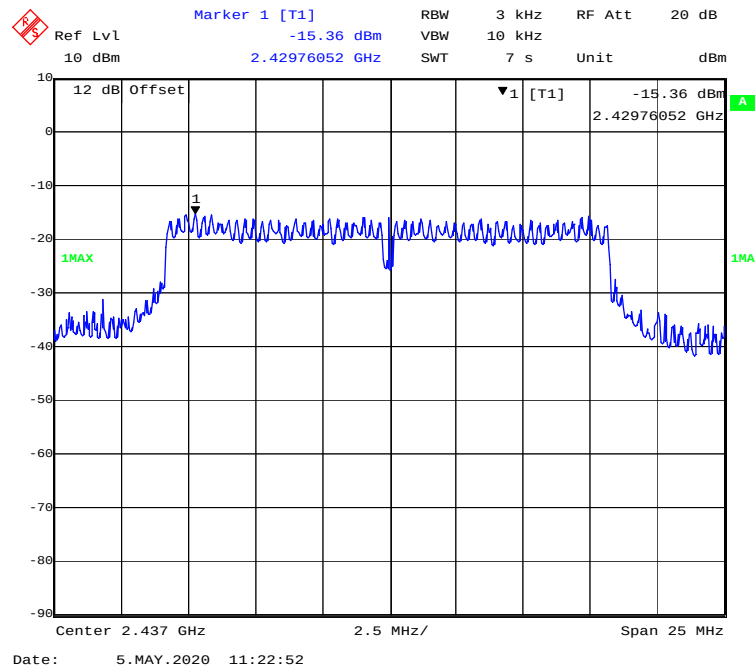
802.11b High Channel



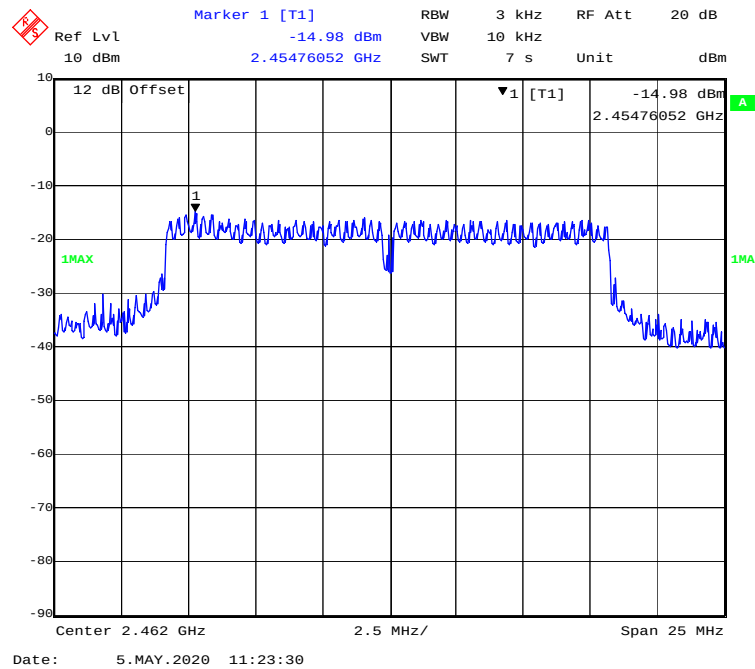
802.11g Low Channel



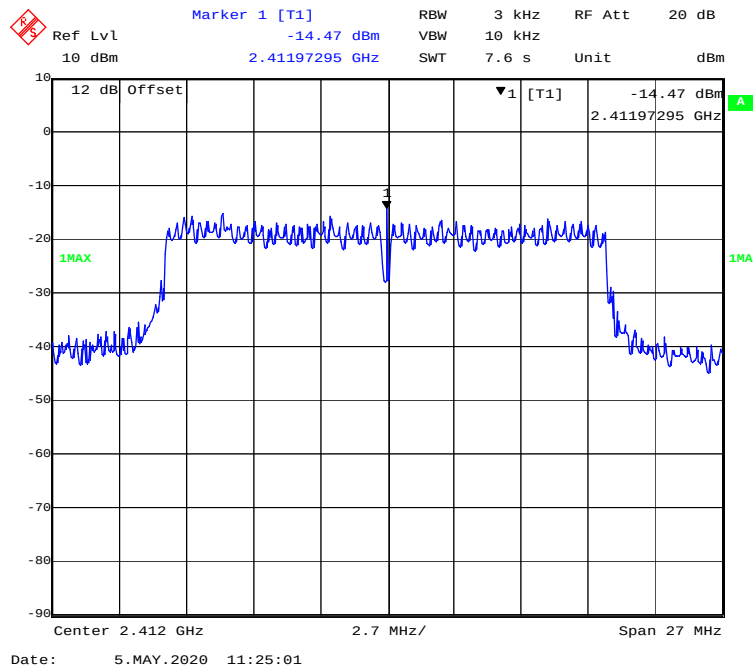
802.11g Middle Channel



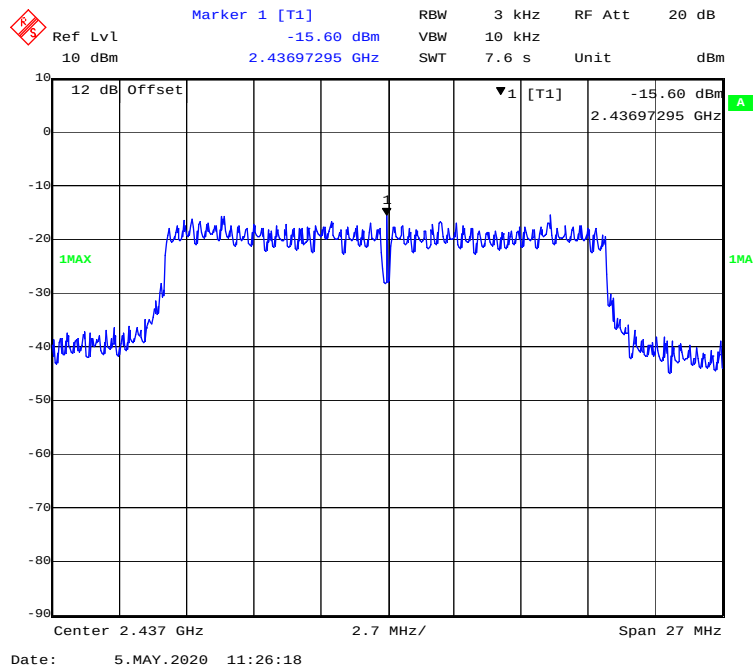
802.11g High Channel



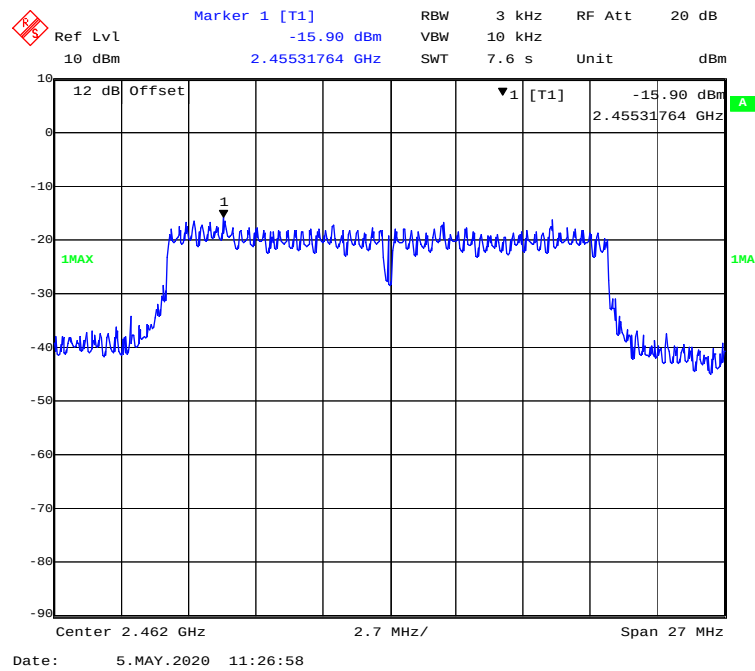
802.11n-HT20 Low Channel



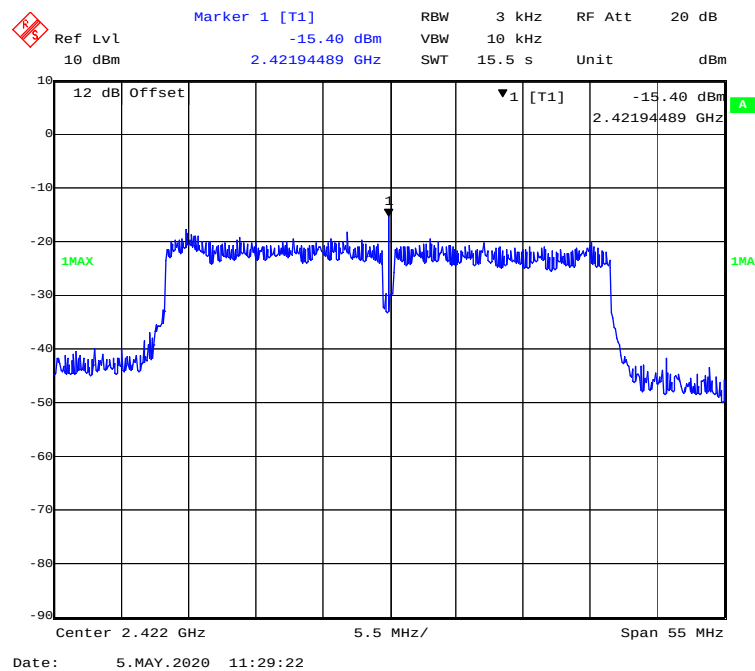
802.11n-HT20 Middle Channel



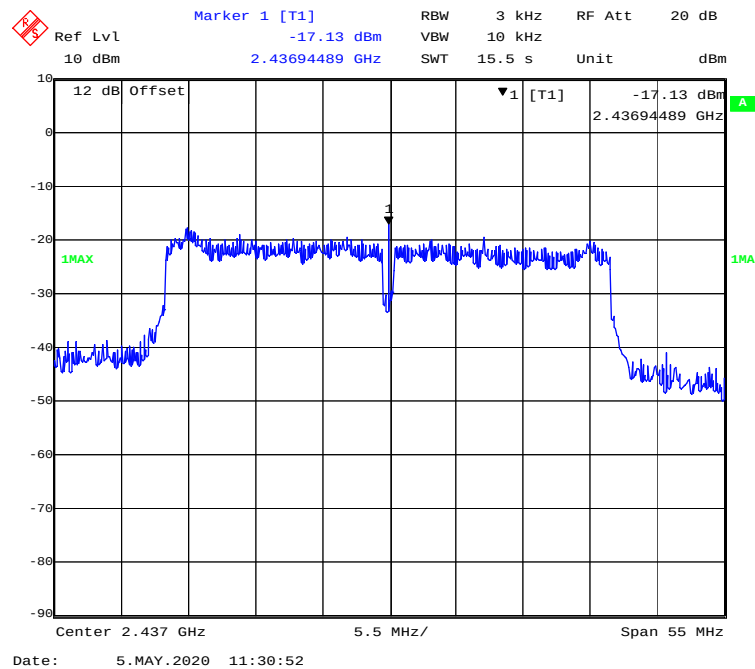
802.11n-HT20 High Channel



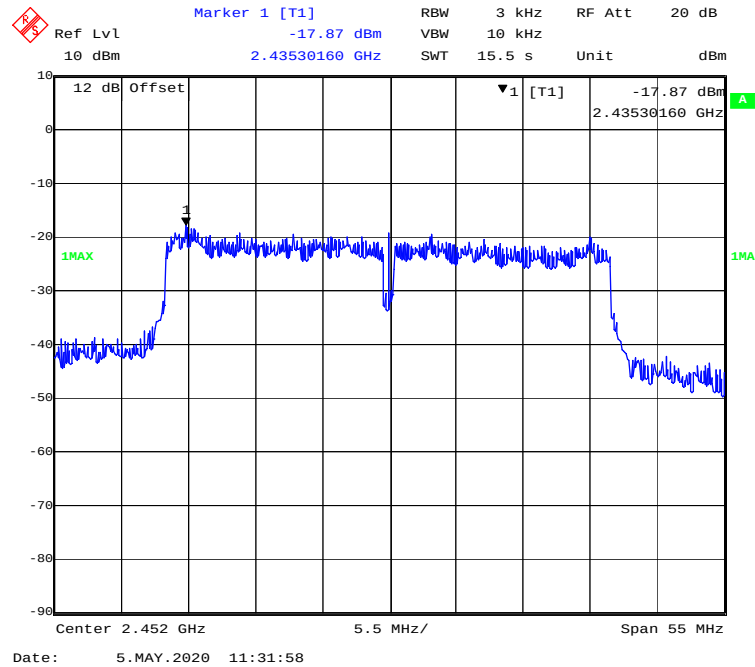
802.11n-HT40 Low Channel



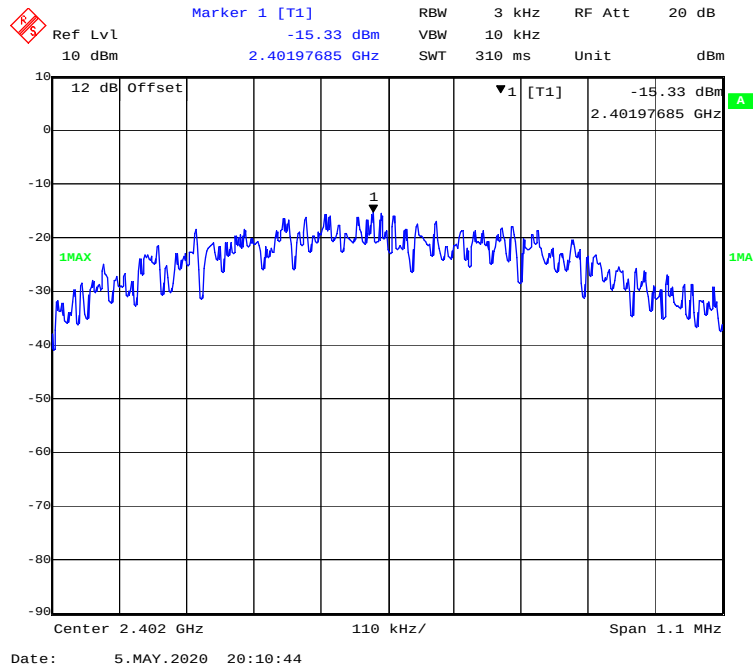
802.11n-HT40 Middle Channel



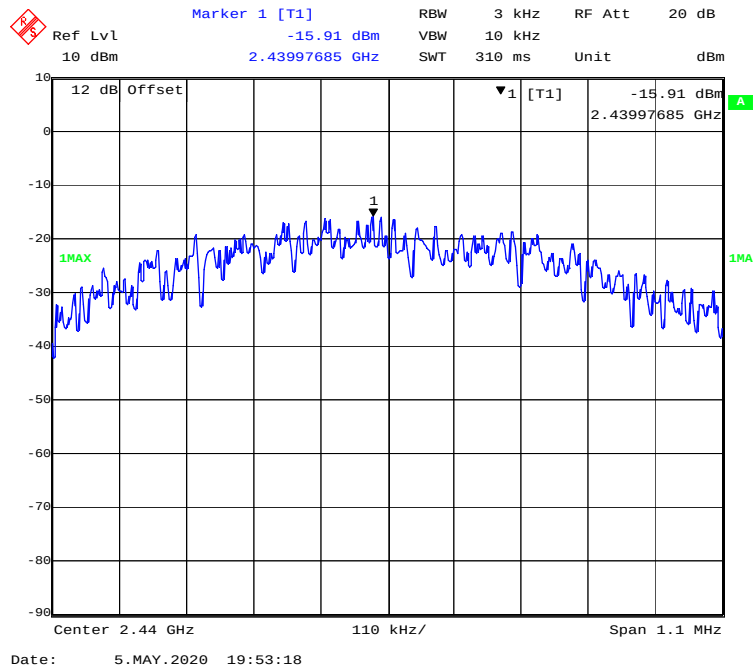
802.11n-HT40 High Channel



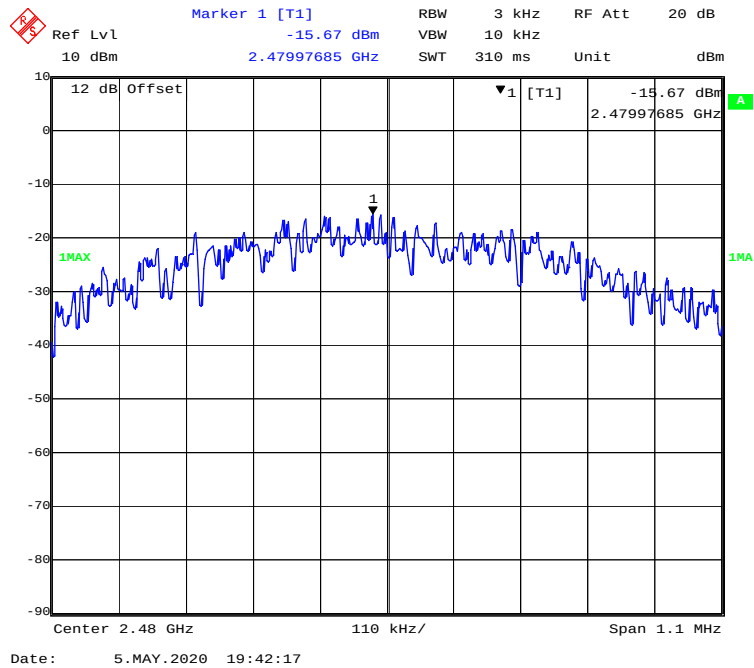
BLE(1Mbps) Mode Low Channel



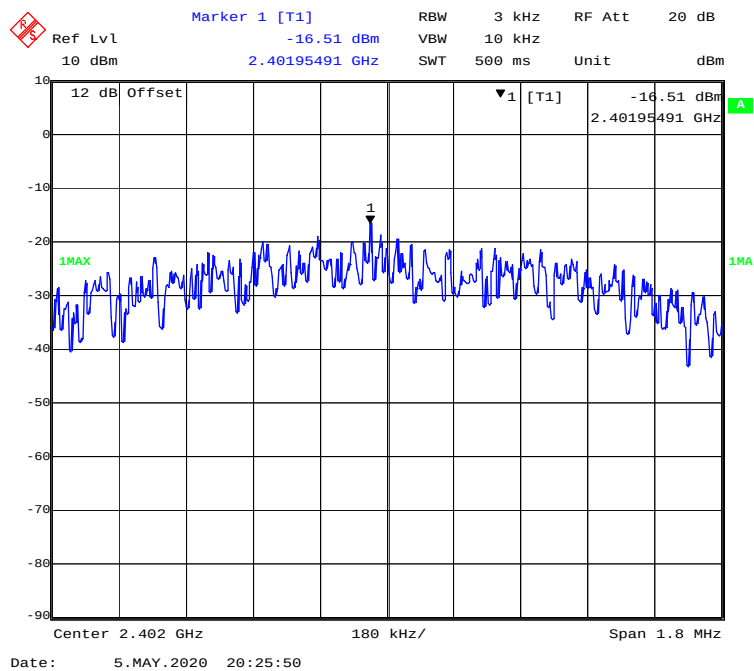
BLE(1Mbps) Mode Middle Channel



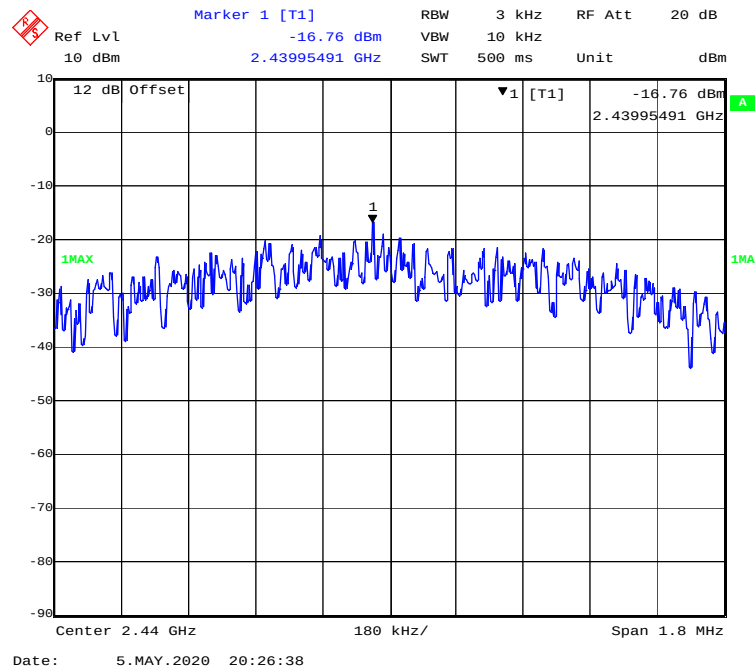
BLE(1Mbps) Mode High Channel



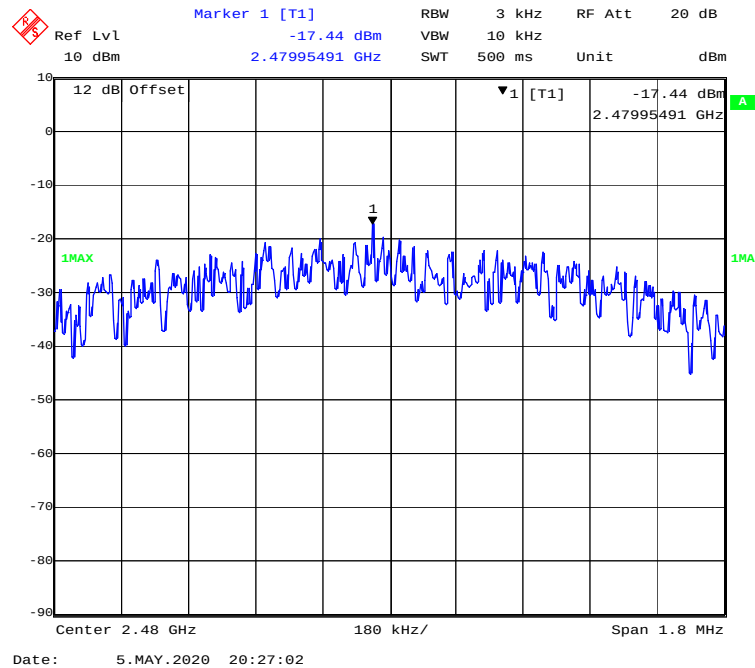
BLE(2Mbps) Mode Low Channel



BLE(2Mbps) Mode Middle Channel



BLE(2Mbps) Mode High Channel



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