

FCC PART 15.247 TEST REPORT

For

Beijing InHand Networks Technology Co., Ltd.

Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing

**Tested Model: IR615-S-FS39
FCC ID: 2AANYIR6X5-S**

Report Type: Original Report	Product Name: Industrial Cellular Router
Report Number:	RSC200601001-0C
Date of Report Issue:	2020-12-15
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Beijing InHand Networks Technology Co., Ltd.
Product	Industrial Cellular Router
Tested Model	IR615-S-FS39
Multiple Models	IR615-S-FQ38,IR615-FS39,IR615-FQ38
FCC ID	2AANYIR6X5-S
Radio Mode	Wi-Fi
Frequency*	2412-2462MHz (802.11b/g/n20) 2422-2452MHz (802.11n40)
RF Output Power*	802.11b: 18.12 dBm 802.11g: 20.25 dBm 802.11n20: 20.21 dBm 802.11n40: 22.57 dBm
Modulation Type*	802.11b: DSSS 802.11g/n20/n40: OFDM
Voltage Range	DC9-26V(Typical:12V) from adapter
Measure approximately	120 mm (L) x 100 mm (W) x 35 mm (H)
Sample serial number	200601001/01, 200601001/02(assigned by the BAACL, Chengdu)
Sample/EUT Status	The test sample was in good condition and received: 2020-06-01

Note: Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

Objective

This report is prepared on behalf of **Beijing InHand Networks Technology Co., Ltd.** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

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

Related Submittal(s)/Grant(s)

None

Measurement Uncertainty

Item			Uncertainty
AC power line conducted emission			2.48 dB
Radiated Emission	30MHz-200MHz	H	4.31 dB
		V	4.57 dB
	200MHz-1GHz	H	4.68 dB
		V	5.78 dB
	1GHz-6GHz		4.56 dB
	6GHz-18GHz		4.57 dB
	18GHz-40GHz		5.44 dB
RF output power, conducted			±0.65 dB
Occupied Bandwidth			±5 %
Power Spectrum Density, conducted			±2.5 dB
Humidity			±5 %
Temperature			±1 °C
Voltage(DC)			±0.4 %
Voltage(AC,<10kHz)			±1 %
Time			±1 %

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the corresponding inclusion factor K when the inclusion probability is about 95%.

Test Methodology

All measurements contained in this report were conducted with:

1. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
2. KDB558074 D01 DTS Meas Guidance v05r02.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Chengdu) to collect test data is located No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Bay Area Compliance Laboratories Corp. (Chengdu) lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4324.01) and the FCC designation No. CN1186 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration*

The system was configured in testing mode, which was provided by manufacturer.

For 802.11b, 802.11g, and 802.11n-HT20 mode, 11 channels are provided to testing:

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	-	-

EUT were tested with Channel 1, 6 and 11.

For 802.11n-HT40 mode, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	7	2442
4	2427	8	2447
5	2432	9	2452
6	2437	-	-

802.11n HT40 was tested with Channel 3, 6 and 9.

The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates, bandwidths, and modulations.

Note:

802.11b/g supports SISO, 802.11n supports SISO and MIMO mode. For Radiated Emission, according to pretest, the worst case for 802.11b/g is chain 2, the worst case for 802.11n is MIMO mode. So 802.11b/g chain 2 & 802.11n MIMO mode test data were recorded in the report.

The device has two configurations: one contain LTE module: PLAS9-X (EUT: IR615-S-FS39), the other contains LTE module: EC25-AF (EUT: IR615-S-FQ38). The former was fully tested, the latter was only done to conducted emission and radiated emissions (30MHz-1GHz).

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software*

The setting by the software as following table:

Test Mode	Test Software Version	MT7603 QA V0.0.0.71		
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	CCK 1M	CCK 1M	CCK 1M
	Power Level Chain1	1A	1A	1A
	Power Level Chain2	0F	0F	0F
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	OFDM 6M	OFDM 6M	OFDM 6M
	Power Level Chain1	13	13	13
	Power Level Chain2	0B	0B	0B
802.11n-HT20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Chain1	0F	0F	0F
	Power Level Chain2	03	03	03
802.11n-HT40	Test Frequency	2422MHz	2437MHz	2452MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Chain1	8	8	8
	Power Level Chain2	8	8	8

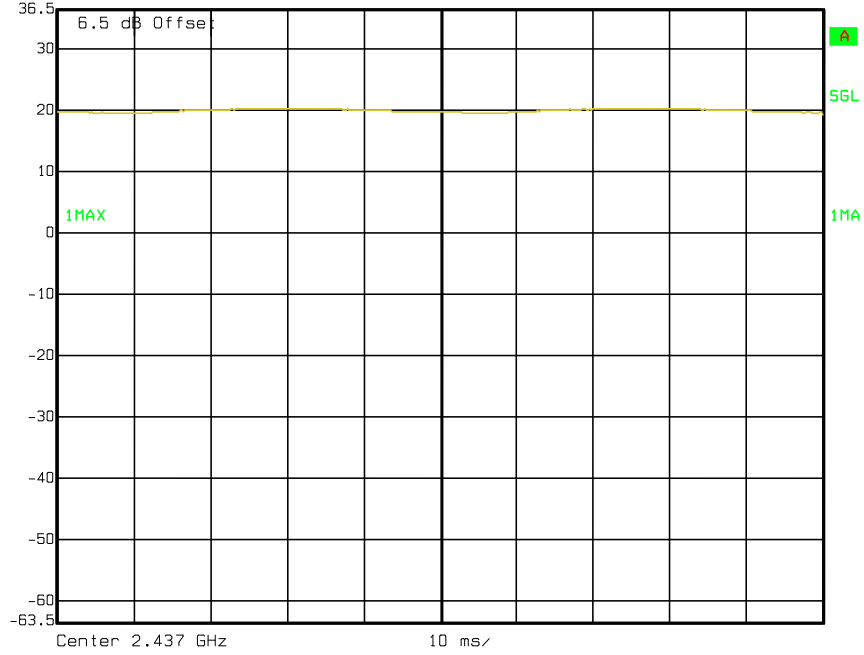
Duty Cycle information is below:

Mode	T _{on}	T _p	Duty Cycle	Duty Cycle Factor
	(ms)	(ms)	(%)	(dB)
802.11b	100	100	100	0
802.11g	100	100	100	0
802.11n-HT20	100	100	100	0
802.11n-HT40	100	100	100	0

Chain 1

802.11b

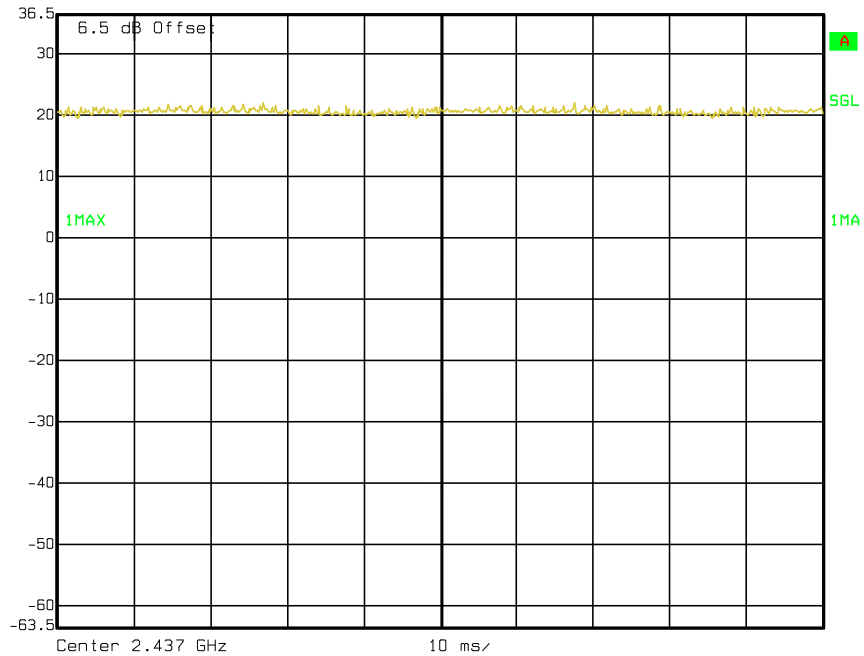
Ref Lvl 36.5 dBm RBW 10 MHz RF Att 40 dB
VBW 10 MHz
SWT 100 ms Unit dBm



Date: 08.DEC.2020 14:00:19

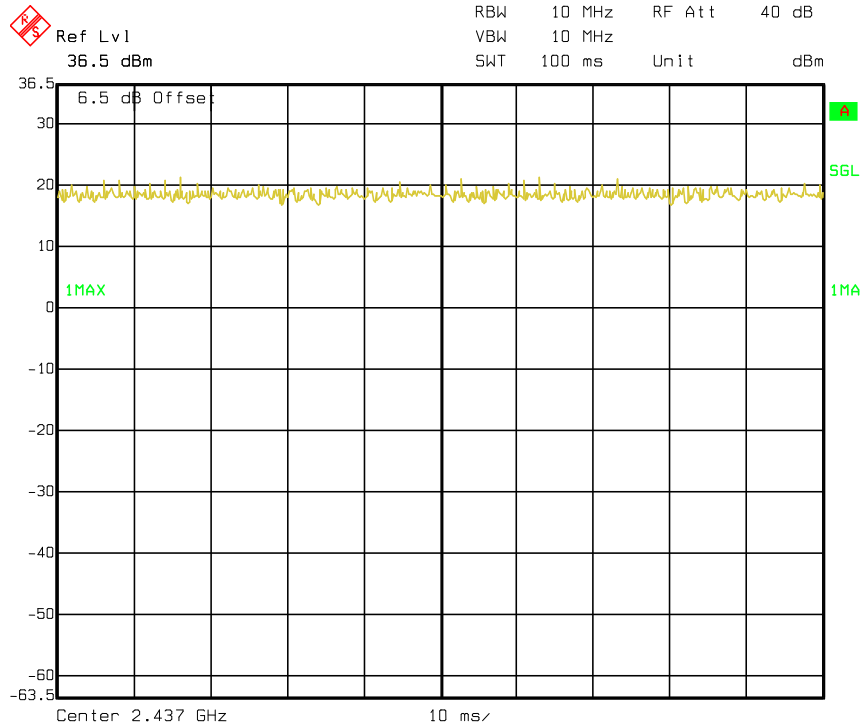
802.11g

Ref Lvl 36.5 dBm RBW 10 MHz RF Att 40 dB
VBW 10 MHz
SWT 100 ms Unit dBm

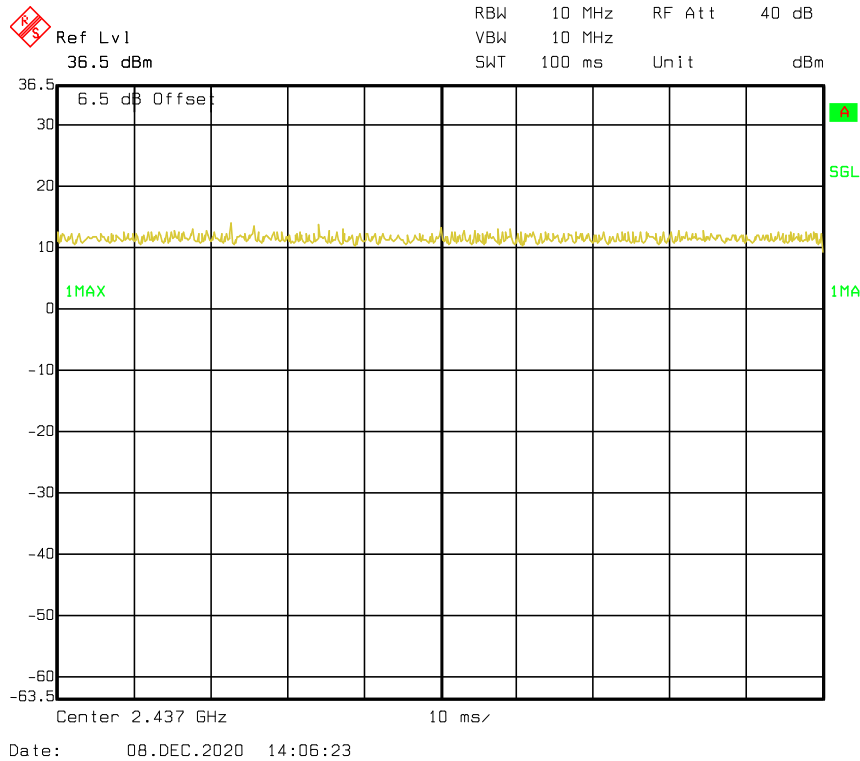


Date: 08.DEC.2020 14:01:08

802.11n-HT20

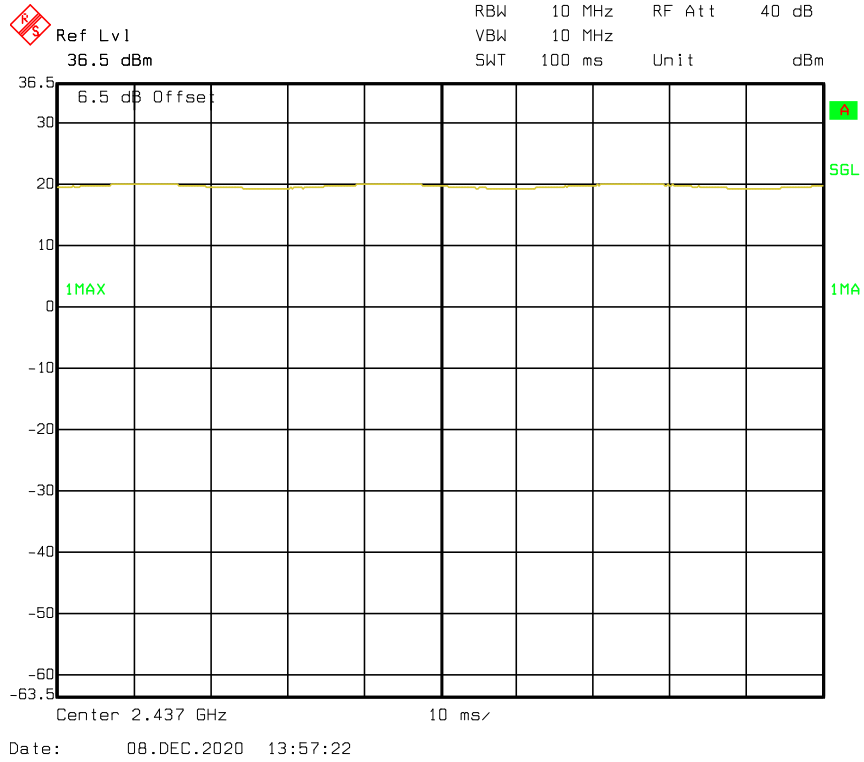


802.11n-HT40

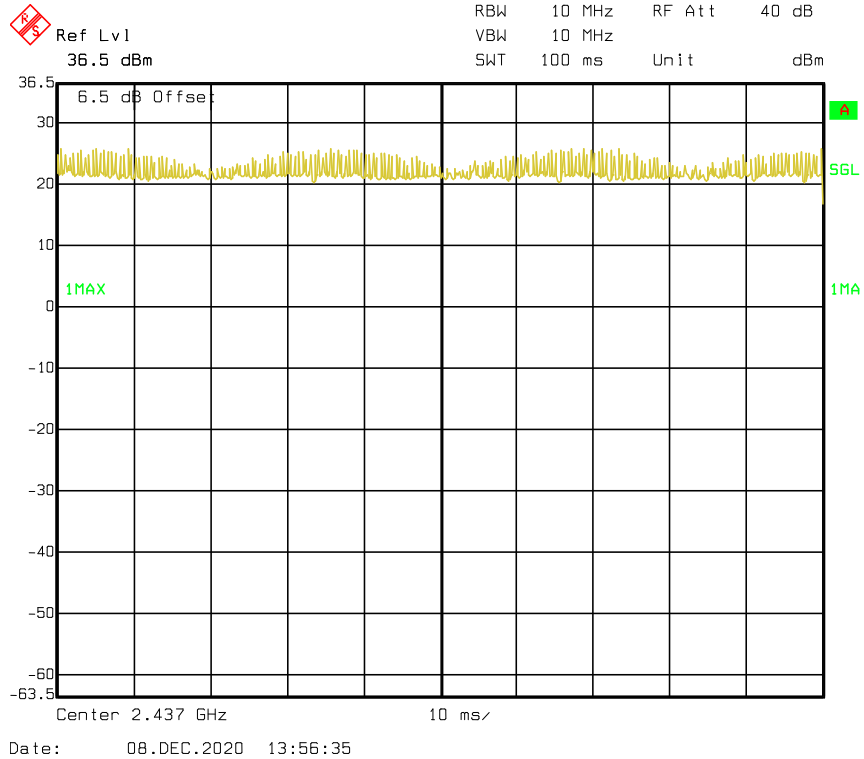


Chain 2

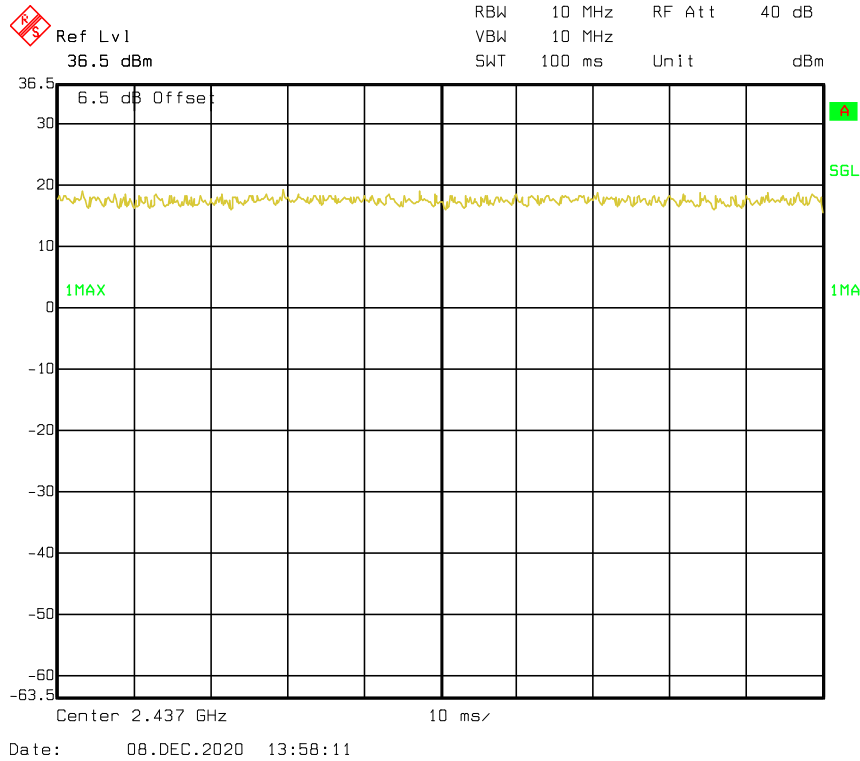
802.11b



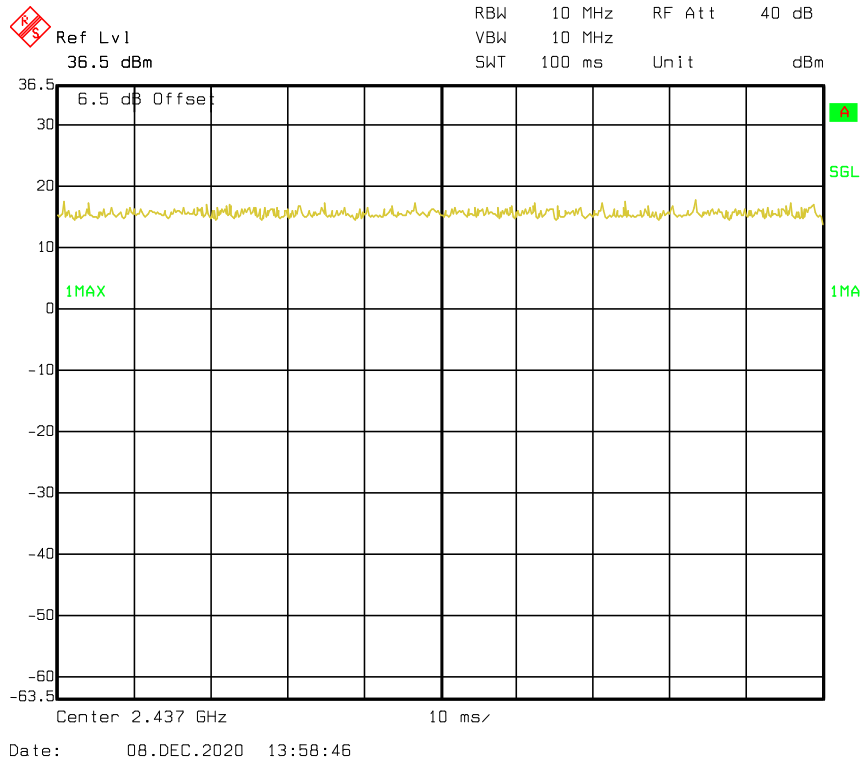
802.11g



802.11n-HT20



802.11n-HT40



Support Equipment List and Details

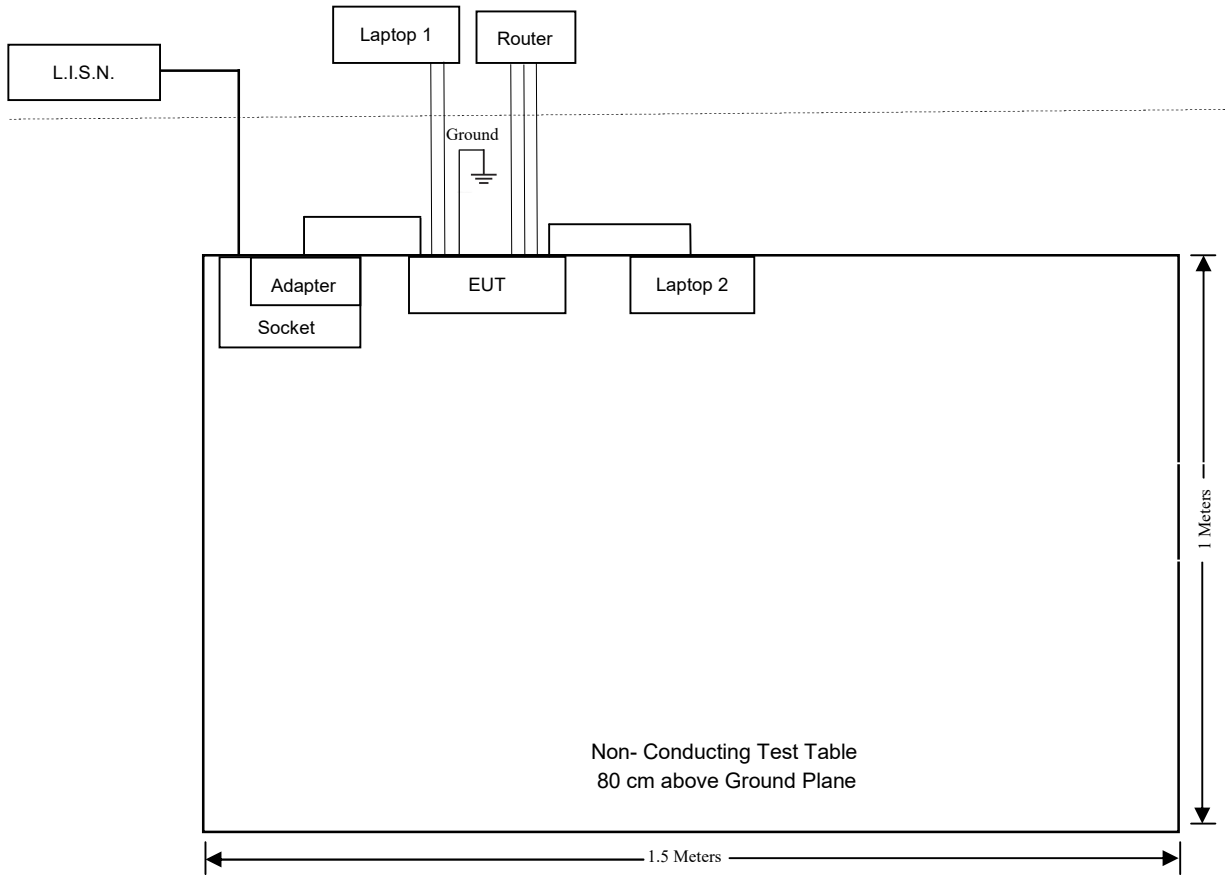
Manufacturer	Description	Model	Serial Number
DELL	Laptop1	Latitude E5430	BTXWLX1
DELL	Laptop2	E6410	353854366585
SHENZHEN FRECOM ELECTRONICS CO.,LTD.	Adapter	F24W5-120200SPAU	01460146600R
BILLION	Router	Unknown	Unknown

External I/O Cable

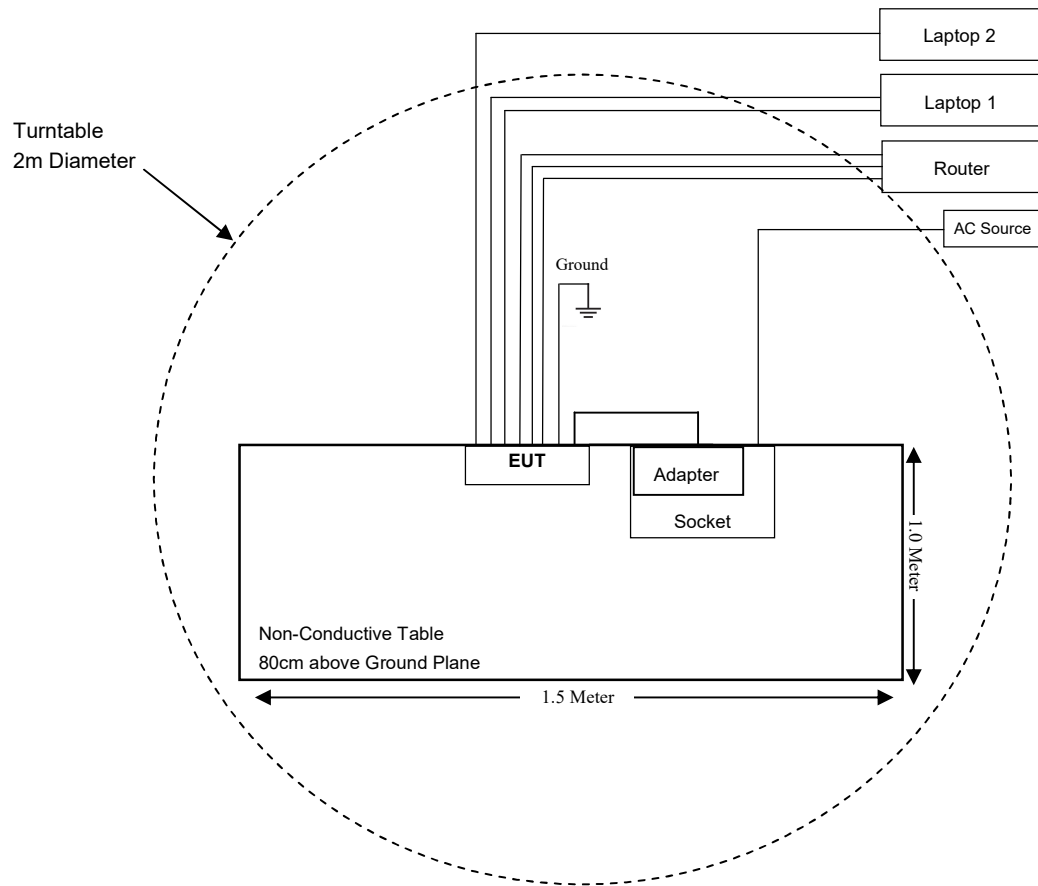
Cable Description	Length (m)	From	To
Unshielded DC Power Cable	1.50	Adapter	EUT
Unshielded Ethernet Cable	10.0	EUT	Laptop 1
Unshielded Serial Cable	10.0	EUT	Laptop 1
Unshielded Ethernet Cable	10.0(RE)	EUT	Laptop 2
	1.50(CE)		
Unshielded Ethernet Cable x3	10.0	EUT	Router

Block Diagram of Test Setup

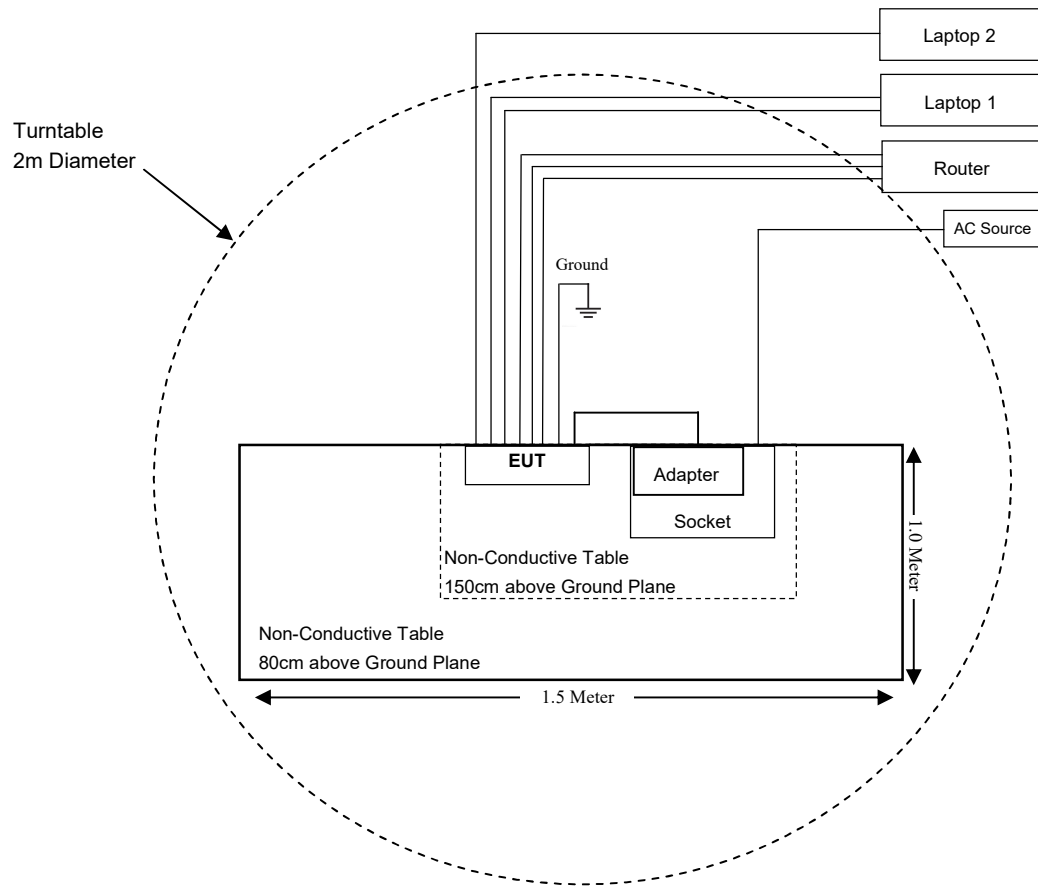
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 & §1.1310 & §2.1091	Maximum Permissible exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	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)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

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

TEST EQUIPMENTS LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emission					
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2020-04-13	2021-04-12
ROHDE&SCHWARZ	L.I.S.N.	ENV216	3560.6550.16	2020-01-13	2021-01-12
HP	RF Limiter	11947A	3107A01270	2020-08-13	2021-08-12
Unknown	Conducted Cable	L-E-003	000003	2020-08-04	2021-08-03
Rohde & Schwarz	EMC32	EMC32	V 8.52.0	NCR	NCR
Radiated Emission					
EMCT	Semi-Anechoic Chamber	966	001	2020-07-24	2025-07-23
SONOMA INSTRUMENT	Amplifier	310 N	186684	2020-08-10	2021-08-09
SUNOL SCIENCES	Broadband Antenna	JB3	A121808	2019-12-10	2022-12-09
INMET	Attenuator	18N-6dB	Unknown	2019-12-10	2022-12-09
Rohde & Schwarz	EMI Test Receiver	ESR3	102456	2020-04-13	2021-04-12
Unknown	RF Cable (Below 1GHz)	L-E-005	000005	2020-09-04	2021-09-03
Unknown	RF Cable (Below 1GHz)	T-E128	000128	2020-10-16	2021-10-15
MICRO-COAX	RF Cable (Below 1GHz)	T-E237	233522-001	2020-07-17	2021-07-16
Rohde & Schwarz	Spectrum Analyzer	FSU26	200835	2020-04-13	2021-04-12
EMCO	Horn Antenna	3115	2192	2019-09-25	2021-09-24
Mini-circuits	Pre-Amplifier	ZVA-183-S+	771001215	2020-09-20	2021-09-19
EM Electronics	Pre-Amplifier	EM18G40	060725	2020-07-23	2021-07-22
A.H. Systems, Inc	Horn Antenna	SAS-574	510	2019-09-02	2021-09-01
MICRO-TRONICS	2.4GHz Notch Filter	BRM50702	G396	2020-02-22	2021-02-21
SUHNER+HUBER	RF Cable (Above 1GHz)	SUCOFLEX 104PE	93533/4PE	2020-05-18	2021-05-17
IW-MICROWAVE	RF Cable (Above 1GHz)	SPS-2301	11503	2020-08-31	2021-08-30
SUHNER+HUBER	RF Cable (Above 18GHz)	T-E222	2551/2	2020-07-18	2021-07-17
FLORIDA RF LABS	RF Cable (Above 18GHz)	T-E210	1042	2020-07-18	2021-07-17
Rohde & Schwarz	EMC32	EMC32	V9.10.00	NCR	NCR
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2020-04-13	2021-04-12
Agilent	USB power sensor	U2021XA	MY53320008	2020-01-13	2021-01-12
Mini-circuits	6dB Attenuator	BW-S6W5+	00433	2020-09-10	2021-09-09
UTIFLEX	RF Coaxial Cable	UFA210B-0-0360-300300	209232-009	2020-10-16	2021-10-15

FCC §15.247 & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE

Applicable Standard

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

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

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/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;

According to §1.1310 and §2.1091 RF exposure is calculated.

Per 447498 D01 General RF Exposure Guidance v06, simultaneous transmission MPE test exclusion applies when the sum of the MPE for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0.

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where:

S = 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:

WiFi +LTE module (FCC ID: 2AANYIR6X5-S contains FCC ID: QIPPLAS9-X)

MPE evaluation for single transmission:

Radio Mode	Frequency Range (MHz)	Antenna Gain*		Tune-up Conducted Power		Evaluation Distance (cm)	Duty Cycle (%)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	Ratio
		(dBi)	(numeric)	(dBm)	(mW)					
WLAN	2412-2462	3.0	2.00	23.0	199.53	20	100	0.08	1.0	0.08
GSM850*	824-849	2.5	1.78	34.0	2511.89	20	50	0.44	0.55	0.81
PCS1900*	1850-1910	2.5	1.78	31.0	1258.93	20	50	0.22	1.0	0.22
WCDMA Band 5*	824-849	2.5	1.78	24.5	281.84	20	100	0.10	0.55	0.18
WCDMA Band 2*	1850-1910	2.5	1.78	24.5	281.84	20	100	0.10	1.0	0.10
WCDMA Band 4*	1710-1755	2.5	1.78	24.5	281.84	20	100	0.10	1.0	0.10
LTE Band 2*	1850-1910	2.5	1.78	23.5	223.87	20	100	0.08	1.0	0.08
LTE Band 4*	1710-1755	2.5	1.78	23.5	223.87	20	100	0.08	1.0	0.08
LTE Band 5*	824-849	2.5	1.78	23.5	223.87	20	100	0.08	0.55	0.15
LTE Band 12*	699-716	2.5	1.78	23.5	223.87	20	100	0.08	0.47	0.17
LTE Band 13*	777-787	2.5	1.78	23.5	223.87	20	100	0.08	0.52	0.15

MPE evaluation for simultaneous transmission:

Note: WLAN, WWAN can transmit simultaneously, MPE evaluation is as below formula:

$$PD1/Limit1 + PD2/Limit2 + \dots < 1, \text{ PD (Power Density)}$$

The worst case is as below:

$$\text{MPE of WLAN} + \text{MPE of WWAN} = 0.08/1.0 + 0.44/0.55 = 0.89 < 1.0$$

Result: The device meets FCC MPE at ≥ 20 cm distance.

WiFi +LTE module (FCC ID: 2AANYIR6X5-S contains FCC ID: XMR201808EC25AF)

MPE evaluation for single transmission:

Radio Mode	Frequency Range (MHz)	Antenna Gain*		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	Ratio
		(dBi)	(numeric)	(dBm)	(mW)				
WLAN	2412-2462	3.0	2.00	23.0	199.53	20	0.08	1.0	0.08
WCDMA BAND 5*	824-849	2.5	1.78	25.0	316.23	20	0.11	0.55	0.20
WCDMA BAND 2*	1850-1910	2.5	1.78	25.0	316.23	20	0.11	1.0	0.11
WCDMA BAND 4*	1710-1755	2.5	1.78	25.0	316.23	20	0.11	1.0	0.11
LTE Band 2*	1850-1910	2.5	1.78	25.0	316.23	20	0.11	1.0	0.11
LTE Band 4*	1710-1755	2.5	1.78	25.0	316.23	20	0.11	1.0	0.11
LTE Band 5*	824-849	2.5	1.78	25.0	316.23	20	0.11	0.55	0.20
LTE Band 12*	699-716	2.5	1.78	25.0	316.23	20	0.11	0.47	0.23
LTE Band 13*	777-787	2.5	1.78	25.0	316.23	20	0.11	0.52	0.21
LTE Band 14*	788-798	2.5	1.78	25.0	316.23	20	0.11	0.53	0.21
LTE Band 66*	1710-1780	2.5	1.78	25.0	316.23	20	0.11	1.0	0.11
LTE Band 71*	663-698	2.5	1.78	25.0	316.23	20	0.11	0.44	0.25

MPE evaluation for simultaneous transmission:

Note: WLAN, WWAN can transmit simultaneously, MPE evaluation is as below formula:

$PD1/Limit1+PD2/Limit2+..... < 1$, PD (Power Density)

The worst case is as below:

MPE of WLAN + MPE of WWAN = $0.08/1.0+0.11/0.44=0.33 < 1.0$

Result: The device meets FCC MPE at ≥ 20 cm distance.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

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

Antenna Information*

The EUT has two external Wi-Fi antennas and one LTE antenna, which fulfill the requirement of this section. Please refer to the table below and EUT photos.

Antenna	Manufacturer	Model Number	Antenna Gain (Max)	Impedance (Ohm)	Antenna Connector	Antenna Type
Wi-Fi Ant. 1	SHENZHEN GUYOU TECHNOLOGY CO.LTD	GY-XPF-BCL2.5-GJG22	3.0dBi	50	Reverse SMA male	Monopole
Wi-Fi Ant. 2	SHENZHEN GUYOU TECHNOLOGY CO.LTD	GY-XPF-BCL2.5-GJG22	3.0dBi	50	Reverse SMA male	Monopole
LTE Ant.	SHENZHEN GUYOU TECHNOLOGY CO.LTD	GY-XPL-BDL2-AJG30	2.5dBi	50	SMA(Male)	Monopole

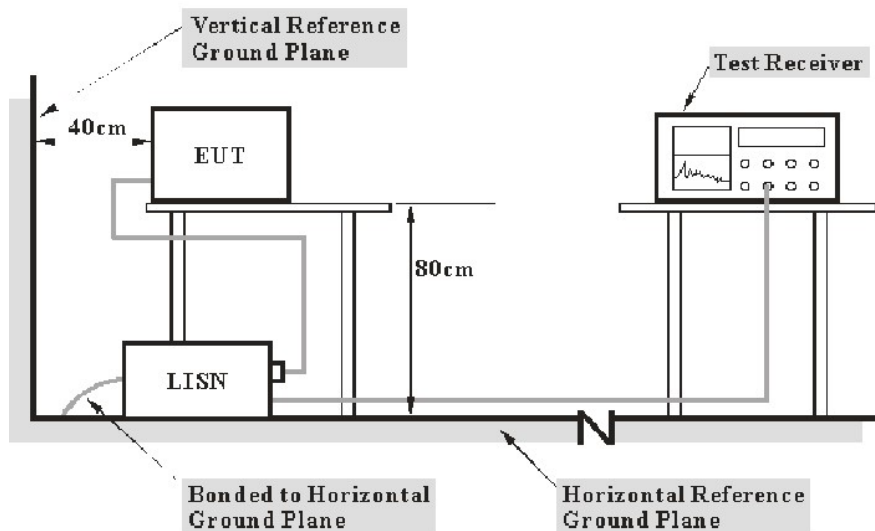
Result: Compliance

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

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

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

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

Test Procedure

During the conducted emission test, the adapter was connected to the first L.I.S.N.

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

The "**Margin**" column of the following data tables indicates the degree of compliance within 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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data

Test Environment Conditions

Temperature:	20 °C
Relative Humidity:	60 %
ATM Pressure:	95.7 kPa

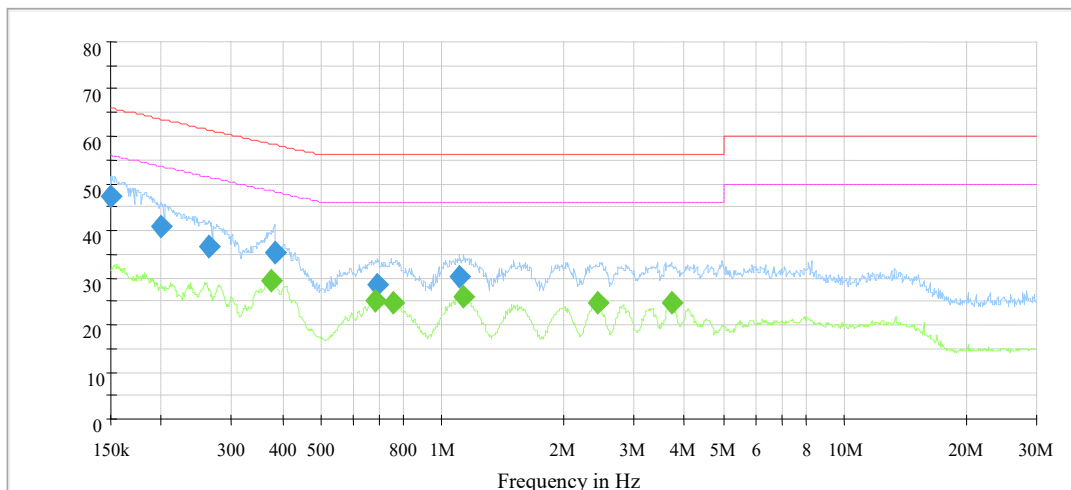
The testing was performed by Winfred Wang on 2020-11-23.

Test Mode: Transmitting

802.11b_Low Channel-Chain 2-Worst Case

Tested Model: IR615-S-FS39

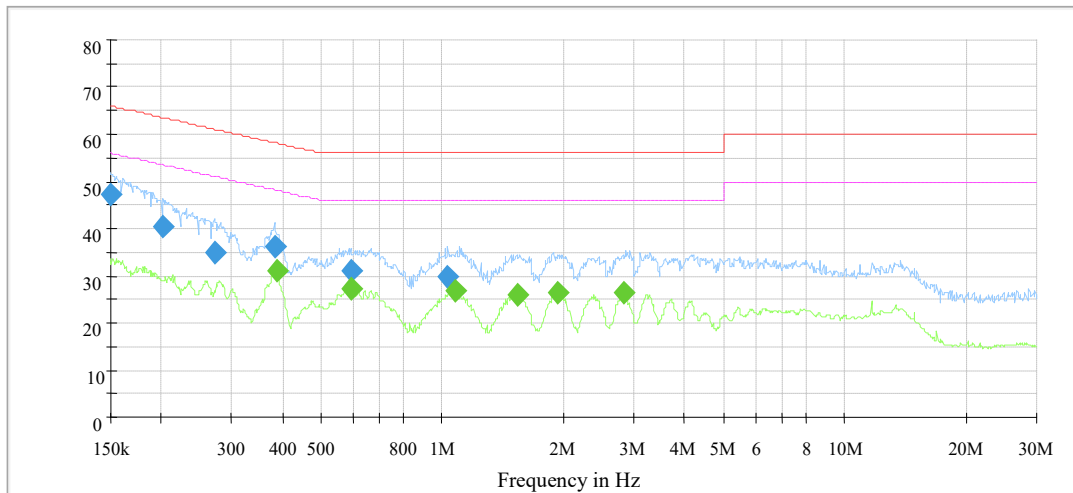
AC120V/60Hz, Line:



Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	47.4	200.0	9.000	L1	19.6	18.6	66.0
0.200319	40.7	200.0	9.000	L1	19.7	22.9	63.6
0.263546	36.5	200.0	9.000	L1	19.7	24.8	61.3
0.383099	35.2	200.0	9.000	L1	19.7	23.0	58.2
0.690091	28.7	200.0	9.000	L1	19.7	27.3	56.0
1.102850	30.0	200.0	9.000	L1	19.6	26.0	56.0

Frequency (MHz)	Average (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.375532	29.3	200.0	9.000	L1	19.7	19.1	48.4
0.683242	25.1	200.0	9.000	L1	19.7	20.9	46.0
0.758685	24.9	200.0	9.000	L1	19.7	21.1	46.0
1.130698	25.9	200.0	9.000	L1	19.6	20.1	46.0
2.425236	24.5	200.0	9.000	L1	19.6	21.5	46.0
3.705691	24.5	200.0	9.000	L1	19.6	21.5	46.0

AC120V/60Hz, Neutral:

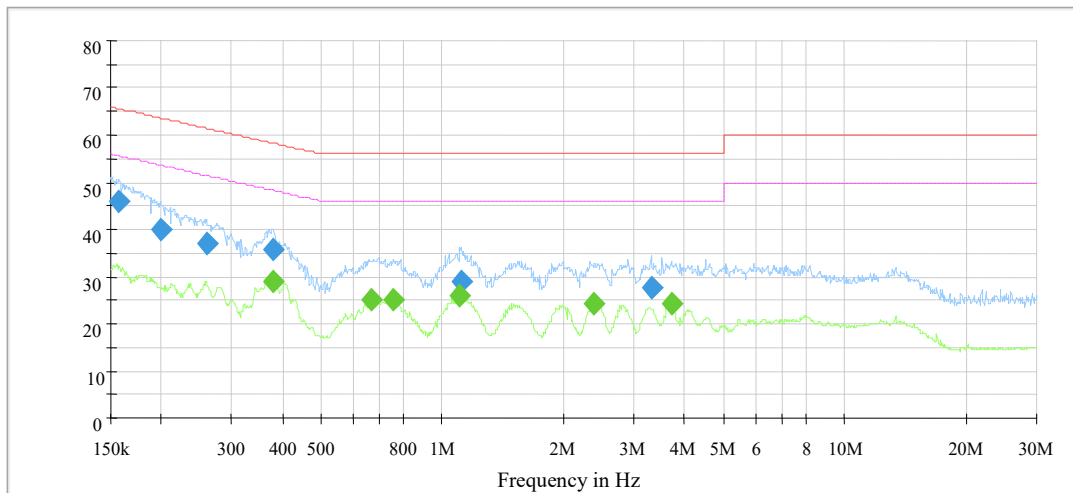


Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	47.4	200.0	9.000	N	19.6	18.6	66.0
0.202328	40.3	200.0	9.000	N	19.6	23.2	63.5
0.271552	34.7	200.0	9.000	N	19.7	26.4	61.1
0.383099	36.1	200.0	9.000	N	19.7	22.1	58.2
0.591233	31.0	200.0	9.000	N	19.7	25.0	56.0
1.033612	29.9	200.0	9.000	N	19.6	26.1	56.0

Frequency (MHz)	Average (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.386940	31.0	200.0	9.000	N	19.7	17.1	48.1
0.597160	27.2	200.0	9.000	N	19.7	18.8	46.0
1.081065	26.7	200.0	9.000	N	19.6	19.3	46.0
1.532768	26.0	200.0	9.000	N	19.6	20.0	46.0
1.937676	26.3	200.0	9.000	N	19.6	19.7	46.0
2.816669	26.3	200.0	9.000	N	19.6	19.7	46.0

Multi-listing Model: IR615-S-FQ38

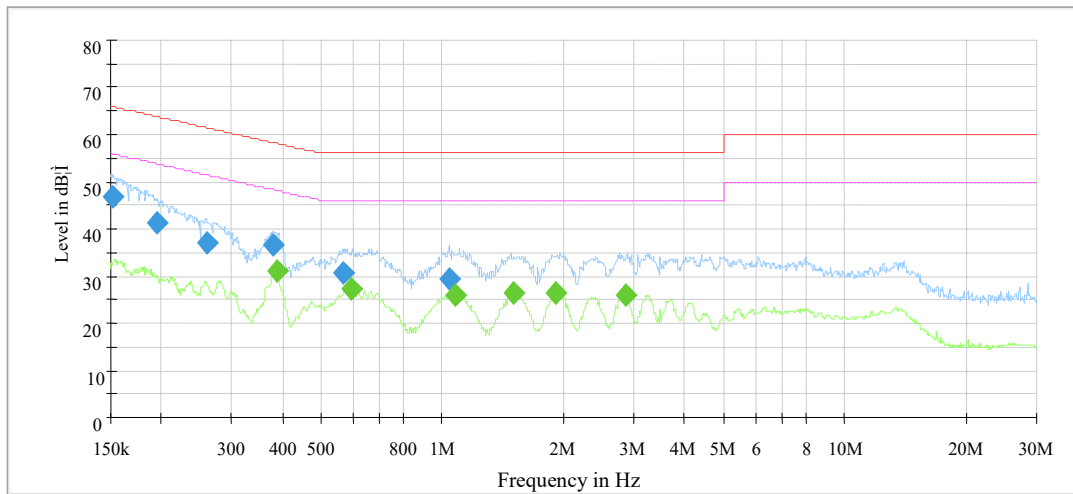
AC120V/60Hz, Line:



Frequency (MHz)	QuasiPeak (dB μV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μV)
0.157671	45.8	200.0	9.000	L1	19.6	19.8	65.6
0.199323	40.0	200.0	9.000	L1	19.7	23.6	63.6
0.259632	36.8	200.0	9.000	L1	19.7	24.6	61.4
0.379297	35.9	200.0	9.000	L1	19.7	22.4	58.3
1.113906	28.8	200.0	9.000	L1	19.6	27.2	56.0
3.304075	27.8	200.0	9.000	L1	19.6	28.2	56.0

Frequency (MHz)	Average (dB μV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μV)
0.379297	29.1	200.0	9.000	L1	19.7	19.2	48.3
0.663098	25.2	200.0	9.000	L1	19.7	20.8	46.0
0.758685	25.1	200.0	9.000	L1	19.7	20.9	46.0
1.108364	25.9	200.0	9.000	L1	19.6	20.1	46.0
2.377332	24.4	200.0	9.000	L1	19.6	21.6	46.0
3.705691	24.3	200.0	9.000	L1	19.6	21.7	46.0

AC120V/60Hz, Neutral:



Frequency (MHz)	QuasiPeak (dB µ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.152261	46.8	200.0	9.000	N	19.6	19.1	65.9
0.196363	41.3	200.0	9.000	N	19.6	22.5	63.8
0.259632	36.9	200.0	9.000	N	19.7	24.5	61.4
0.381193	36.4	200.0	9.000	N	19.7	21.9	58.3
0.565280	30.7	200.0	9.000	N	19.7	25.3	56.0
1.038780	29.3	200.0	9.000	N	19.6	26.7	56.0

Frequency (MHz)	Average (dB µ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.386940	30.9	200.0	9.000	N	19.7	17.2	48.1
0.597160	27.2	200.0	9.000	N	19.7	18.8	46.0
1.081065	26.1	200.0	9.000	N	19.6	19.9	46.0
1.510004	26.2	200.0	9.000	N	19.6	19.8	46.0
1.918444	26.3	200.0	9.000	N	19.6	19.7	46.0
2.844906	25.8	200.0	9.000	N	19.6	20.2	46.0

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
The corrected factor has been input into the transducer of the test software.
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

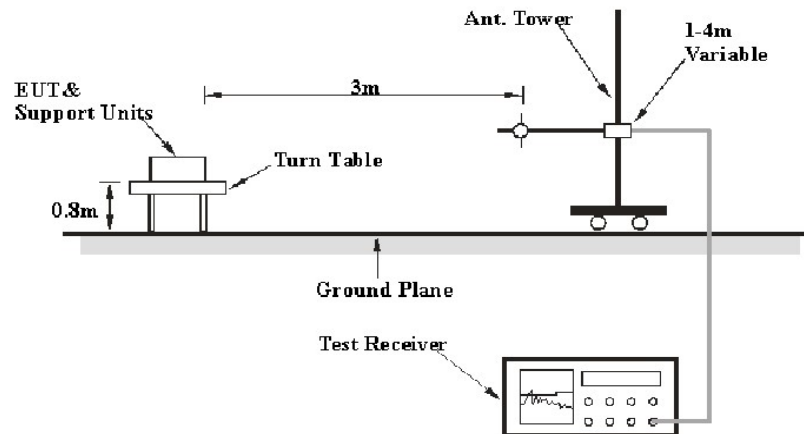
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

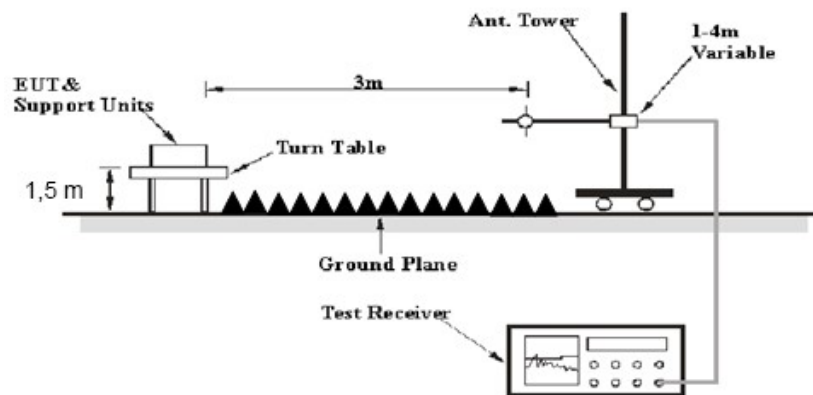
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber 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.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26 GHz.

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

Frequency Range	RBW	Video B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	QP
Above 1 GHz	1MHz	3 MHz	PK
	1MHz	3 MHz	AV

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

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

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

Corrected Amplitude & Margin Calculation

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

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

Corrected Amplitude = Meter Reading + Antenna Loss + Cable Loss

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

Margin = Limit –Corrected Amplitude

Test Data

Test Environment Conditions

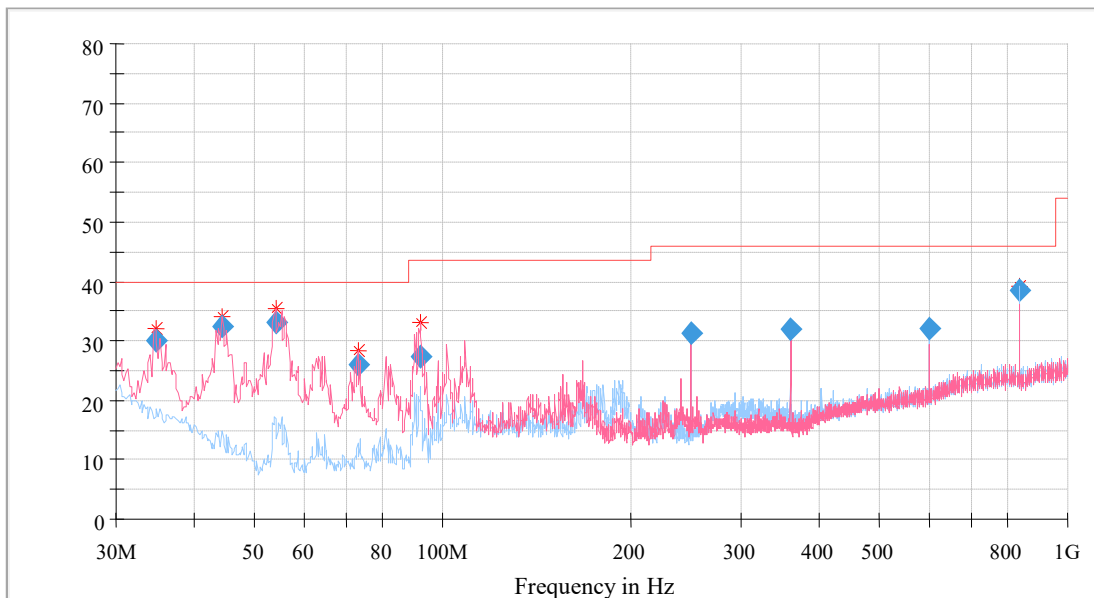
Temperature:	19 °C	21 °C
Relative Humidity:	54 %	53 %
ATM Pressure:	95.7 kPa	95.6 kPa
Test Measure:	Radiated	Conducted
Test Date:	2020-11-25	2020-12-08

The testing was performed by Winfred Wang.

Test Mode: Transmitting

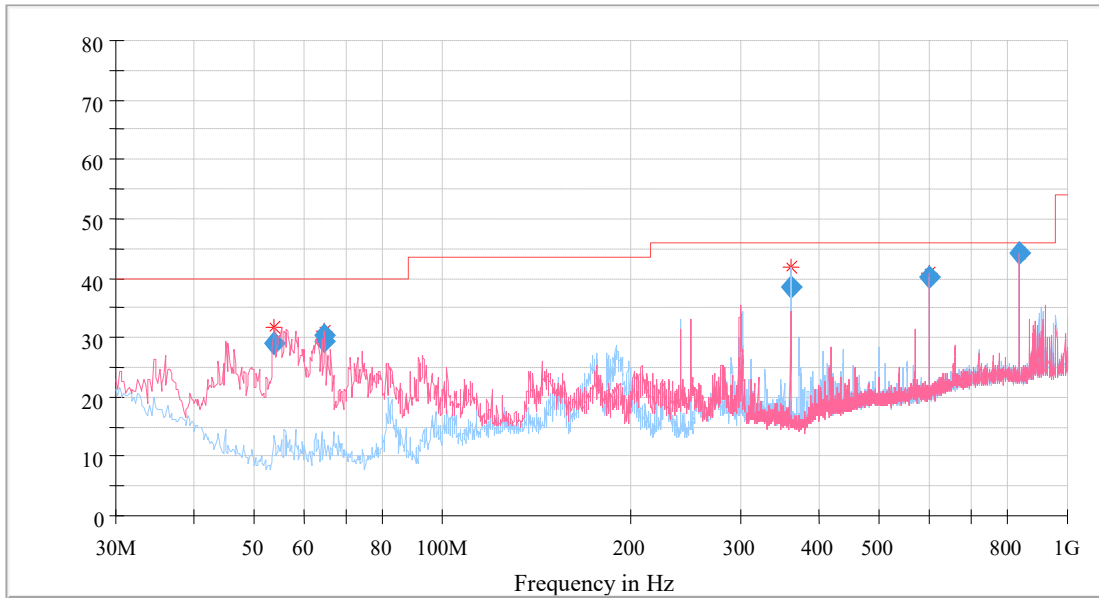
30 MHz to 1 GHz: 802.11b_Low Channel-Chain 2-Worst Case

Tested Model: IR615-S-FS39



Frequency (MHz)	QuasiPeak (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
34.666000	30.05	40.00	9.95	200.0	120.000	104.0	V	6.0	-7.6
44.436625	32.54	40.00	7.46	200.0	120.000	104.0	V	142.0	-14.1
54.201500	33.08	40.00	6.92	200.0	120.000	109.0	V	223.0	-18.1
73.170375	25.83	40.00	14.17	200.0	120.000	105.0	V	204.0	-17.0
92.438625	27.35	43.50	16.15	200.0	120.000	103.0	V	214.0	-17.0
249.996000	32.27	46.00	13.73	200.0	120.000	105.0	H	88.0	-12.9
359.994000	32.79	46.00	13.21	200.0	120.000	108.0	H	189.0	-10.6
599.972000	31.18	46.00	14.82	200.0	120.000	110.0	H	220.0	-5.8
840.000750	38.52	46.00	7.48	200.0	120.000	103.0	H	42.0	-2.6

Multi-listing Model: IR615-S-FQ38



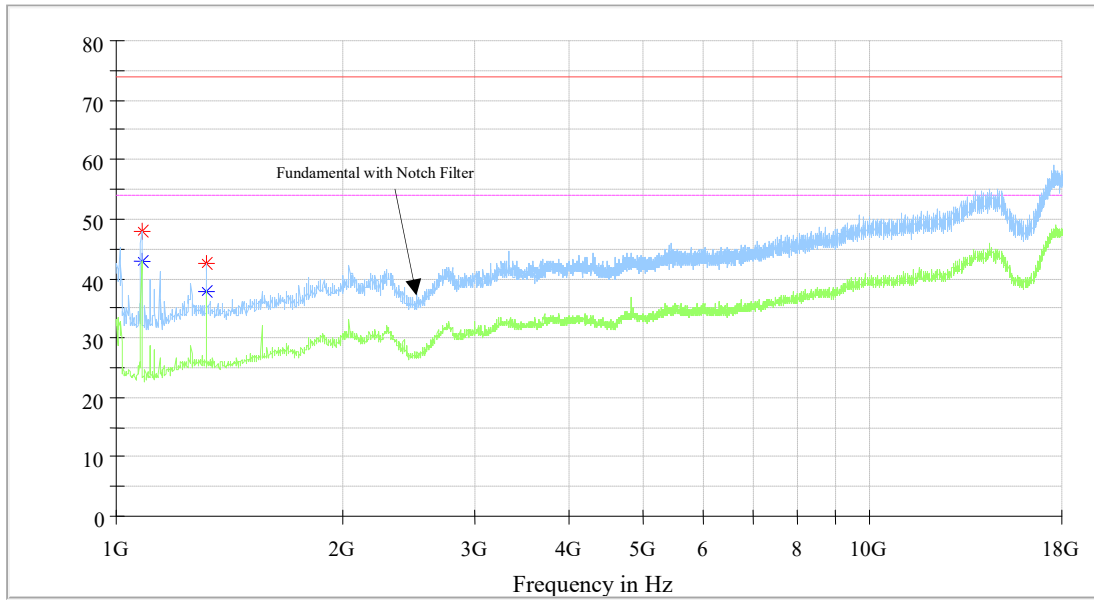
Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
53.911250	29.17	40.00	10.83	200.0	120.000	103.0	V	234.0	-18.1
64.774750	29.38	40.00	10.62	200.0	120.000	106.0	V	52.0	-17.4
64.787500	30.22	40.00	9.78	200.0	120.000	107.0	V	61.0	-17.4
360.001875	38.44	46.00	7.56	200.0	120.000	103.0	H	225.0	-10.6
599.996375	40.15	46.00	5.85	200.0	120.000	145.0	V	328.0	-5.8
840.000375	44.17	46.00	1.83	200.0	120.000	105.0	V	4.0	-2.6

1 GHz to 18 GHz:

Chain 2

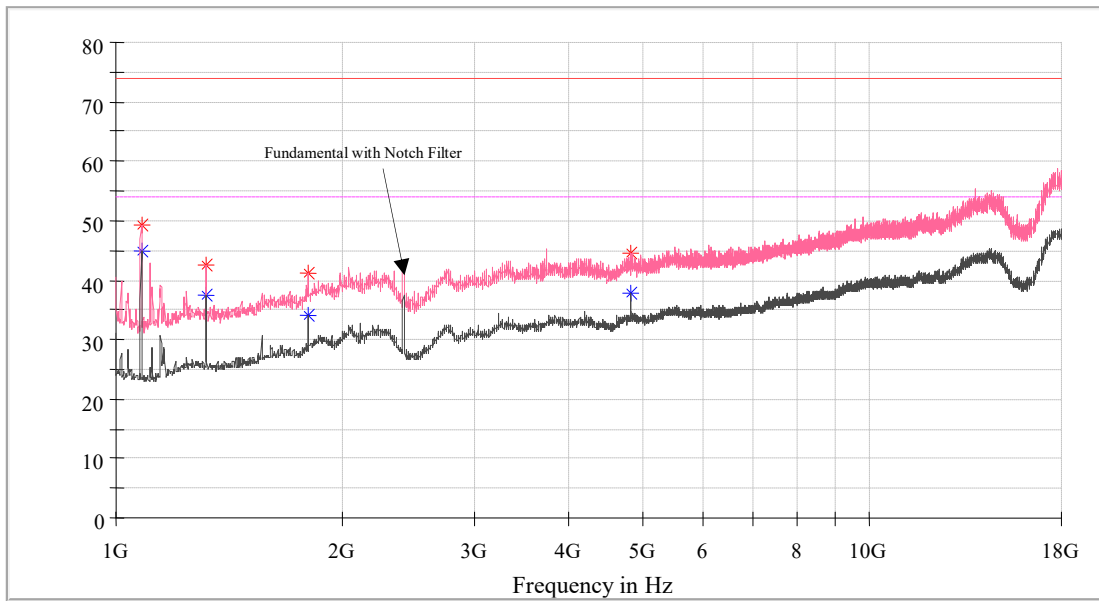
802.11b Mode

2412 MHz (Horizontal)



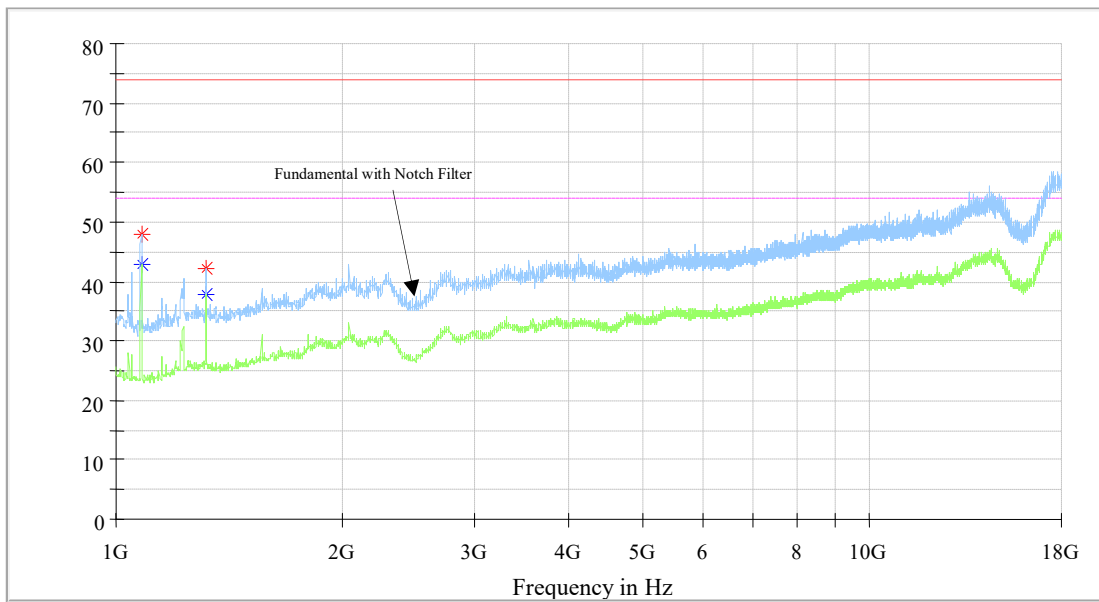
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	42.78	54.00	11.22	150.0	H	252.0	-0.1
1079.900000	47.78	---	74.00	26.22	150.0	H	252.0	-0.1
1319.600000	---	37.78	54.00	16.22	150.0	H	202.0	0.8
1319.600000	42.57	---	74.00	31.43	150.0	H	202.0	0.8

2412 MHz (Vertical)



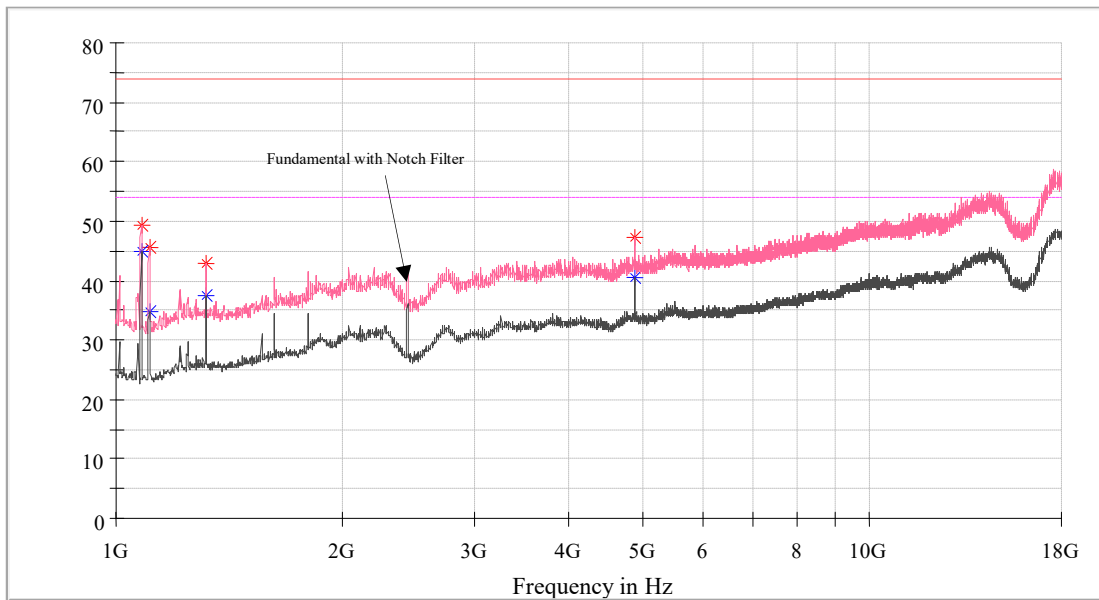
Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	44.81	54.00	9.19	150.0	V	31.0	-0.1
1079.900000	49.22	---	74.00	24.78	150.0	V	31.0	-0.1
1319.600000	---	37.56	54.00	16.44	150.0	V	41.0	0.8
1319.600000	42.50	---	74.00	31.50	150.0	V	41.0	0.8
1799.000000	---	33.97	54.00	20.03	150.0	V	1.0	4.2
1799.000000	41.24	---	74.00	32.76	150.0	V	1.0	4.2
4823.300000	44.64	---	74.00	29.36	150.0	V	91.0	11.9
4823.300000	---	37.73	54.00	16.27	150.0	V	91.0	11.9

2437 MHz (Horizontal)



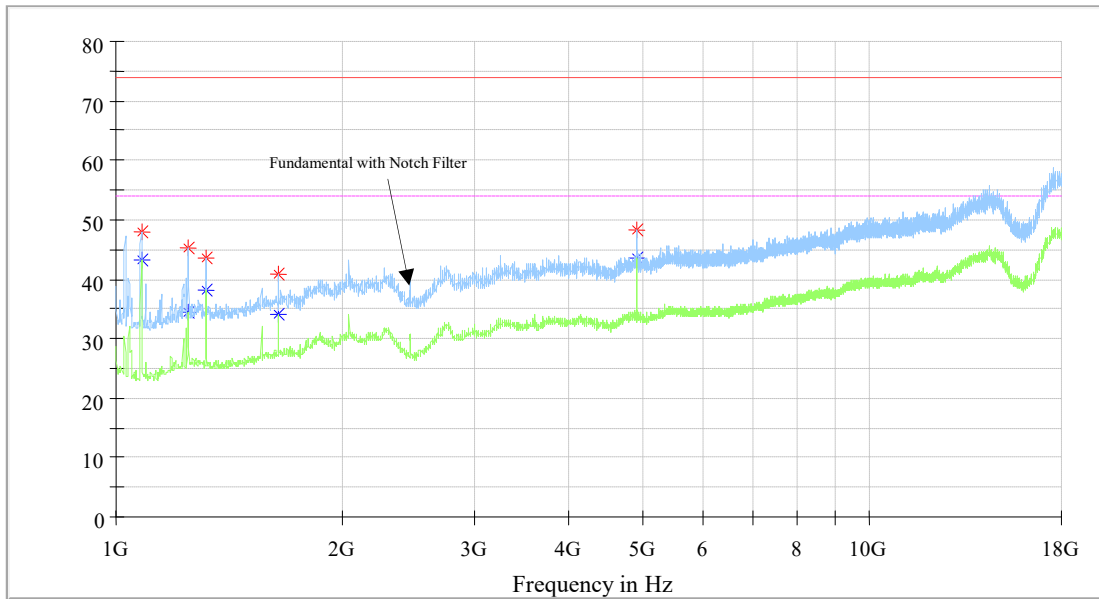
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	42.97	54.00	11.03	150.0	H	248.0	-0.1
1079.900000	47.82	---	74.00	26.18	150.0	H	248.0	-0.1
1319.600000	42.27	---	74.00	31.73	150.0	H	217.0	0.8
1319.600000	---	37.79	54.00	16.21	150.0	H	217.0	0.8

2437 MHz (Vertical)



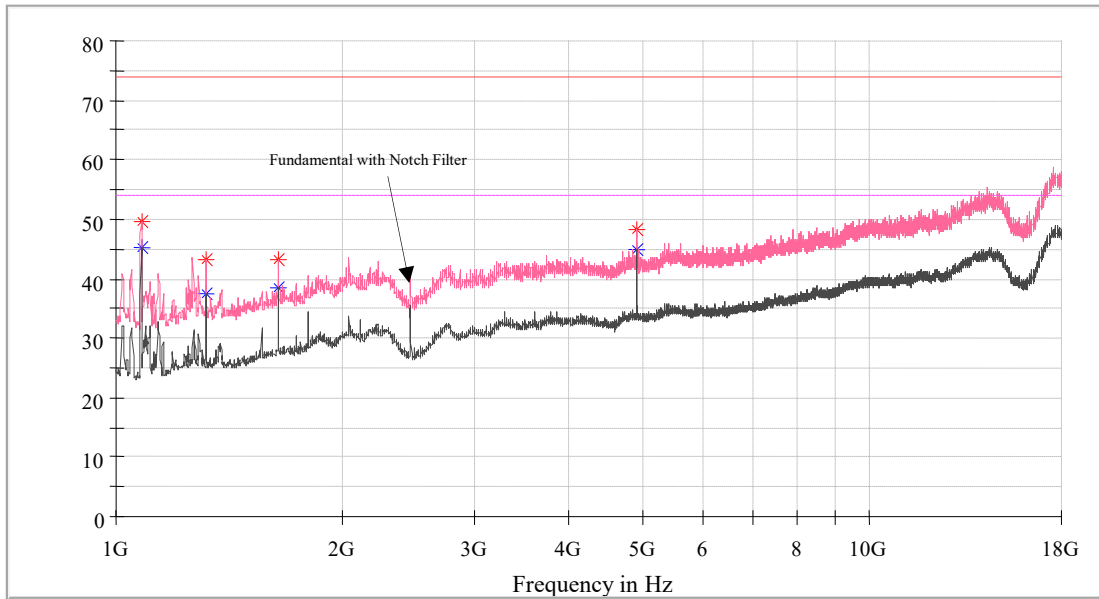
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	44.90	54.00	9.10	150.0	V	33.0	-0.1
1079.900000	49.39	---	74.00	24.61	150.0	V	33.0	-0.1
1107.100000	---	34.63	54.00	19.37	150.0	V	294.0	0.1
1107.100000	45.53	---	74.00	28.47	150.0	V	294.0	0.1
1319.600000	---	37.47	54.00	16.53	150.0	V	53.0	0.8
1319.600000	42.74	---	74.00	31.26	150.0	V	53.0	0.8
4874.300000	47.21	---	74.00	26.79	150.0	V	180.0	12.0
4874.300000	---	40.35	54.00	13.65	150.0	V	180.0	12.0

2462 MHz (Horizontal)



Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	43.20	54.00	10.80	150.0	H	255.0	-0.1
1079.900000	47.90	---	74.00	26.10	150.0	H	255.0	-0.1
1244.800000	45.39	---	74.00	28.61	150.0	H	9.0	0.6
1244.800000	---	34.39	54.00	19.61	150.0	H	9.0	0.6
1319.600000	---	38.01	54.00	15.99	150.0	H	204.0	0.8
1319.600000	43.50	---	74.00	30.50	150.0	H	204.0	0.8
1640.900000	---	34.16	54.00	19.84	150.0	H	102.0	2.8
1640.900000	40.81	---	74.00	33.19	150.0	H	102.0	2.8
4923.600000	---	43.45	54.00	10.55	150.0	H	154.0	12.2
4923.600000	48.26	---	74.00	25.74	150.0	H	154.0	12.2

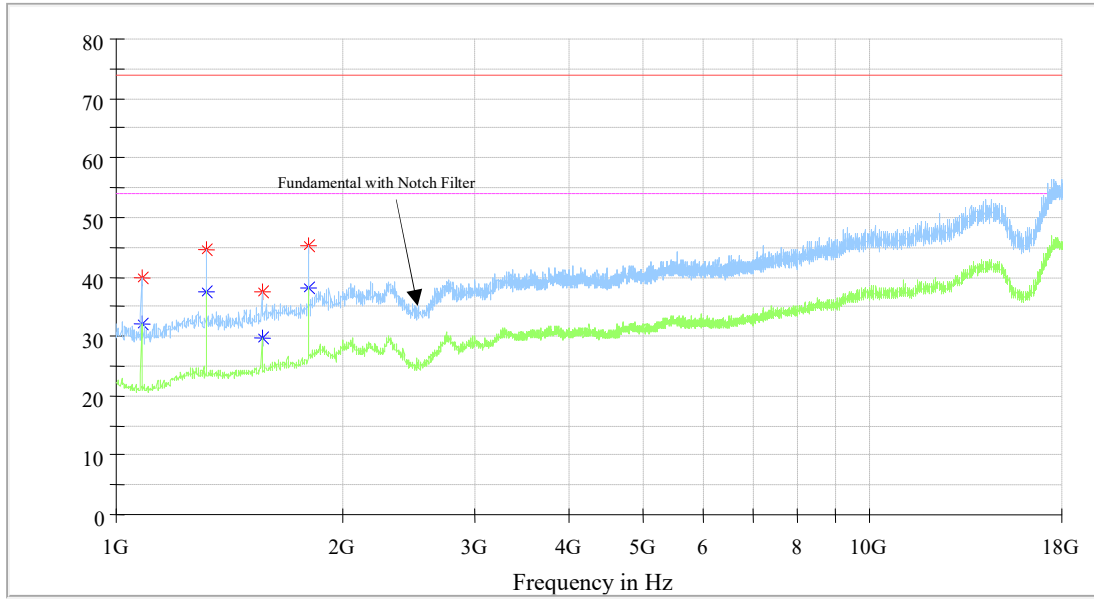
2462 MHz (Vertical)



Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	45.21	54.00	8.79	150.0	V	23.0	-0.1
1079.900000	49.64	---	74.00	24.36	150.0	V	23.0	-0.1
1319.600000	---	37.39	54.00	16.61	150.0	V	43.0	0.8
1319.600000	43.10	---	74.00	30.90	150.0	V	43.0	0.8
1640.900000	---	38.43	54.00	15.57	150.0	V	13.0	2.8
1640.900000	43.28	---	74.00	30.72	150.0	V	13.0	2.8
4923.600000	---	44.84	54.00	9.16	150.0	V	173.0	12.2
4923.600000	48.20	---	74.00	25.80	150.0	V	173.0	12.2

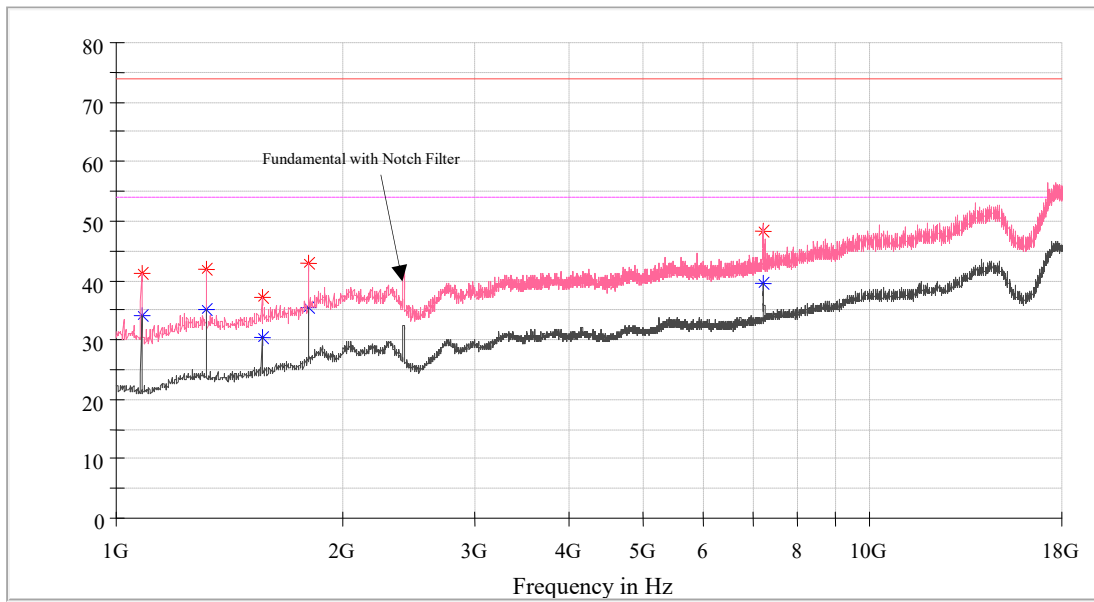
802.11g Mode

2412 MHz (Horizontal)



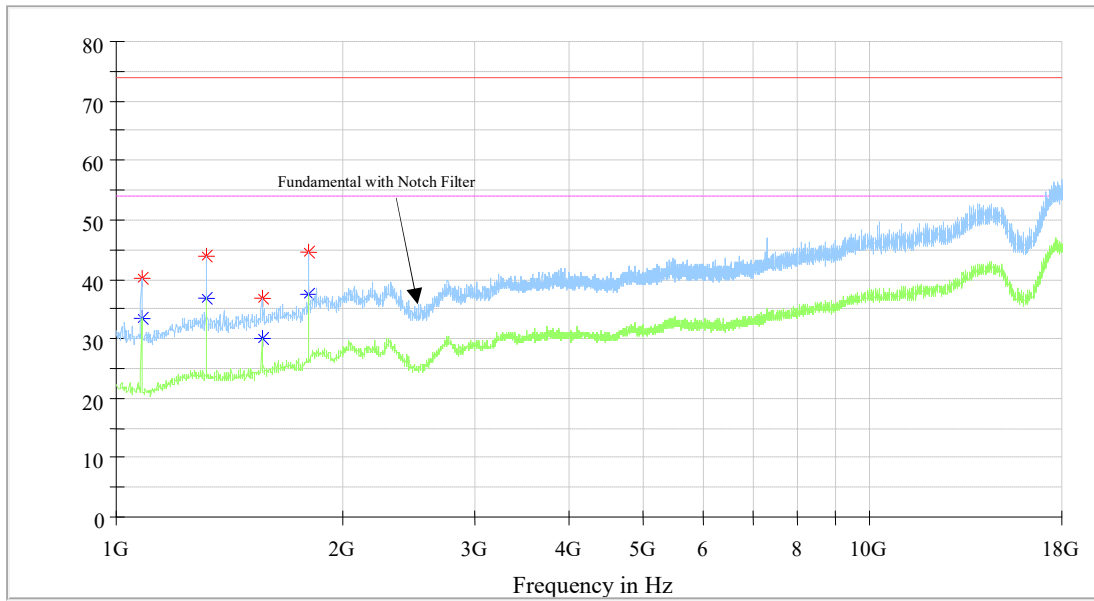
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	32.18	54.00	21.82	150.0	H	237.0	-0.1
1079.900000	39.96	---	74.00	34.04	150.0	H	237.0	-0.1
1319.600000	---	37.56	54.00	16.44	150.0	H	215.0	0.8
1319.600000	44.68	---	74.00	29.32	150.0	H	215.0	0.8
1559.300000	37.61	---	74.00	36.39	150.0	H	215.0	2.0
1559.300000	---	29.60	54.00	24.40	150.0	H	215.0	2.0
1799.000000	---	38.20	54.00	15.80	150.0	H	160.0	4.2
1799.000000	45.31	---	74.00	28.69	150.0	H	160.0	4.2

2412 MHz (Vertical)



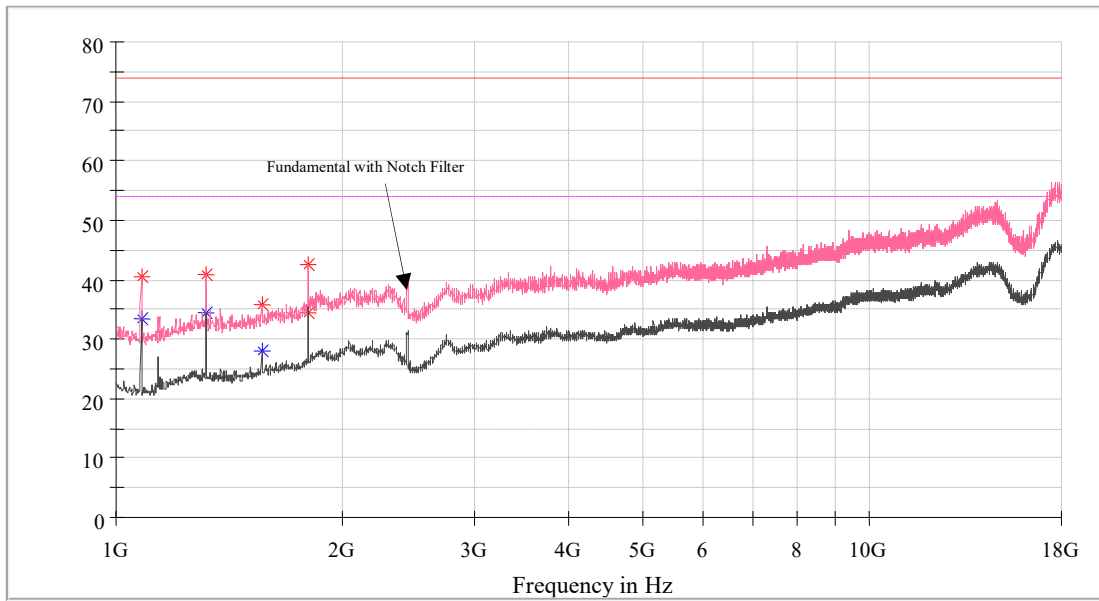
Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	34.06	54.00	19.94	150.0	V	350.0	-0.1
1079.900000	41.10	---	74.00	32.90	150.0	V	350.0	-0.1
1319.600000	---	35.04	54.00	18.96	150.0	V	188.0	0.8
1319.600000	41.70	---	74.00	32.30	150.0	V	188.0	0.8
1559.300000	---	30.31	54.00	23.69	100.0	V	36.0	2.0
1559.300000	37.25	---	74.00	36.75	100.0	V	36.0	2.0
1799.000000	---	35.35	54.00	18.65	150.0	V	156.0	4.2
1799.000000	42.71	---	74.00	31.29	150.0	V	156.0	4.2
7225.400000	48.42	---	74.00	25.58	100.0	V	72.0	15.3
7233.900000	---	39.47	54.00	14.53	100.0	V	83.0	15.3

2437 MHz (Horizontal)



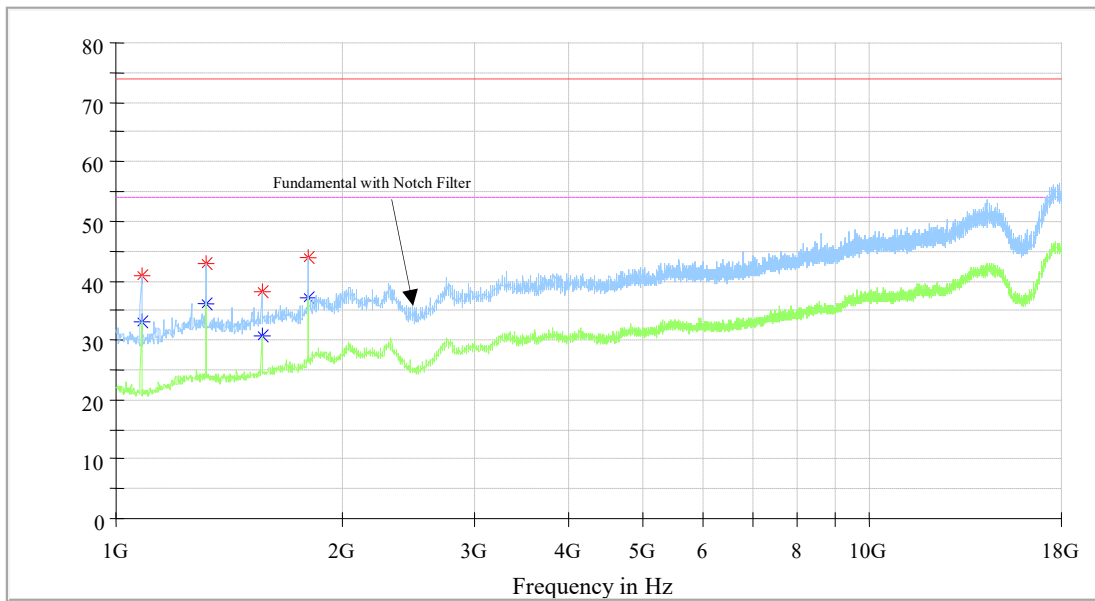
Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	33.36	54.00	20.64	150.0	H	58.0	-0.1
1079.900000	40.11	---	74.00	33.89	150.0	H	58.0	-0.1
1319.600000	---	36.80	54.00	17.20	150.0	H	69.0	0.8
1319.600000	43.93	---	74.00	30.07	150.0	H	69.0	0.8
1559.300000	36.72	---	74.00	37.28	150.0	H	69.0	2.0
1559.300000	---	29.90	54.00	24.10	150.0	H	69.0	2.0
1799.000000	---	37.52	54.00	16.48	150.0	H	156.0	4.2
1799.000000	44.58	---	74.00	29.42	150.0	H	156.0	4.2

2437 MHz (Vertical)



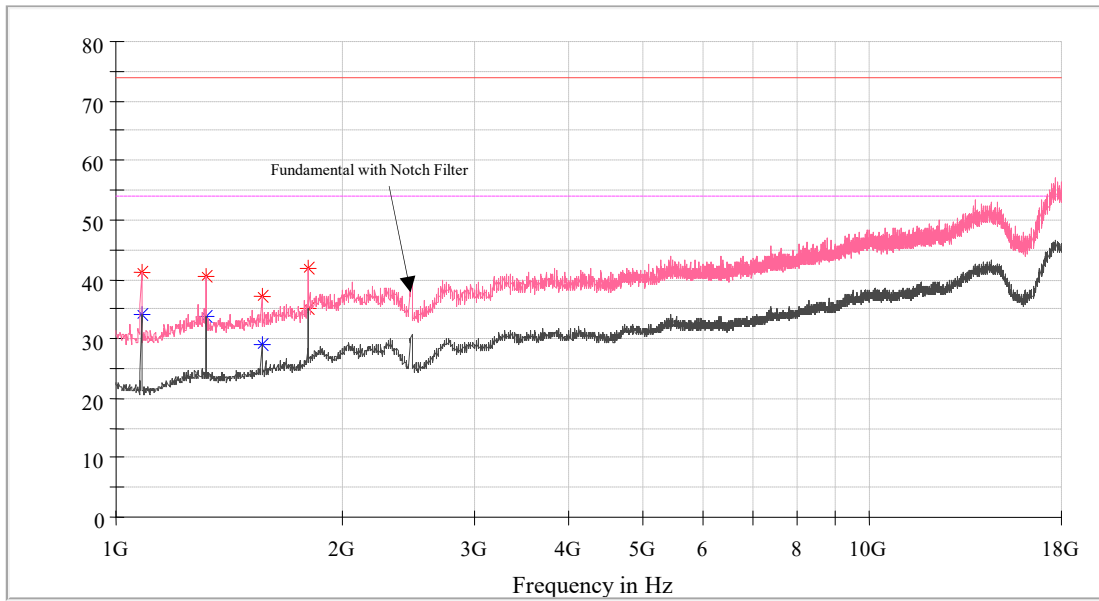
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	33.27	54.00	20.73	150.0	V	340.0	-0.1
1079.900000	40.60	---	74.00	33.40	150.0	V	340.0	-0.1
1319.600000	---	34.29	54.00	19.71	150.0	V	59.0	0.8
1319.600000	40.97	---	74.00	33.03	150.0	V	59.0	0.8
1559.300000	35.83	---	74.00	38.17	150.0	V	350.0	2.0
1559.300000	---	28.04	54.00	25.96	150.0	V	350.0	2.0
1799.000000	42.54	---	74.00	31.46	150.0	V	0.0	4.2
1804.100000	34.51	---	74.00	39.49	150.0	V	318.0	4.3

2462 MHz (Horizontal)



Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	32.93	54.00	21.07	150.0	H	0.0	-0.1
1079.900000	40.81	---	74.00	33.19	150.0	H	0.0	-0.1
1319.600000	---	36.06	54.00	17.94	150.0	H	221.0	0.8
1319.600000	42.97	---	74.00	31.03	150.0	H	221.0	0.8
1559.300000	---	30.58	54.00	23.42	150.0	H	357.0	2.0
1559.300000	38.23	---	74.00	35.77	150.0	H	357.0	2.0
1799.000000	---	37.11	54.00	16.89	150.0	H	198.0	4.2
1799.000000	43.85	---	74.00	30.15	150.0	H	198.0	4.2

2462 MHz (Vertical)

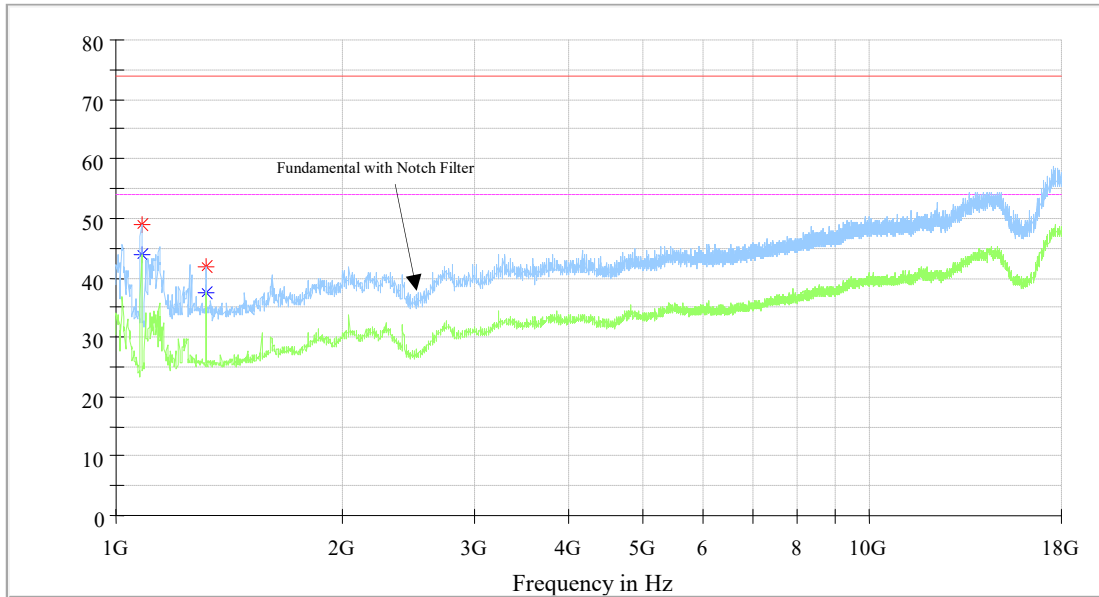


Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	34.00	54.00	20.00	150.0	V	338.0	-0.1
1079.900000	41.33	---	74.00	32.67	150.0	V	338.0	-0.1
1319.600000	40.61	---	74.00	33.39	150.0	V	51.0	0.8
1319.600000	---	33.78	54.00	20.22	150.0	V	51.0	0.8
1559.300000	---	28.96	54.00	25.04	150.0	V	172.0	2.0
1559.300000	37.03	---	74.00	36.97	150.0	V	172.0	2.0
1797.300000	35.24	---	74.00	38.76	150.0	V	3.0	4.2
1799.000000	41.87	---	74.00	32.13	150.0	V	359.0	4.2

Chain 1 + Chain 2

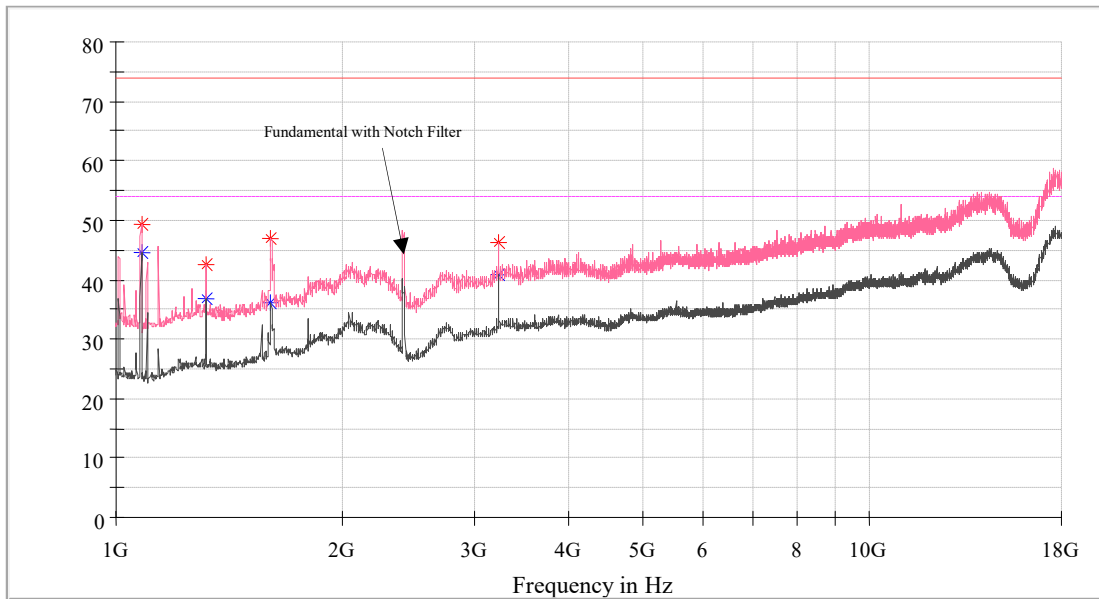
802.11n-HT20 Mode

2412 MHz (Horizontal)



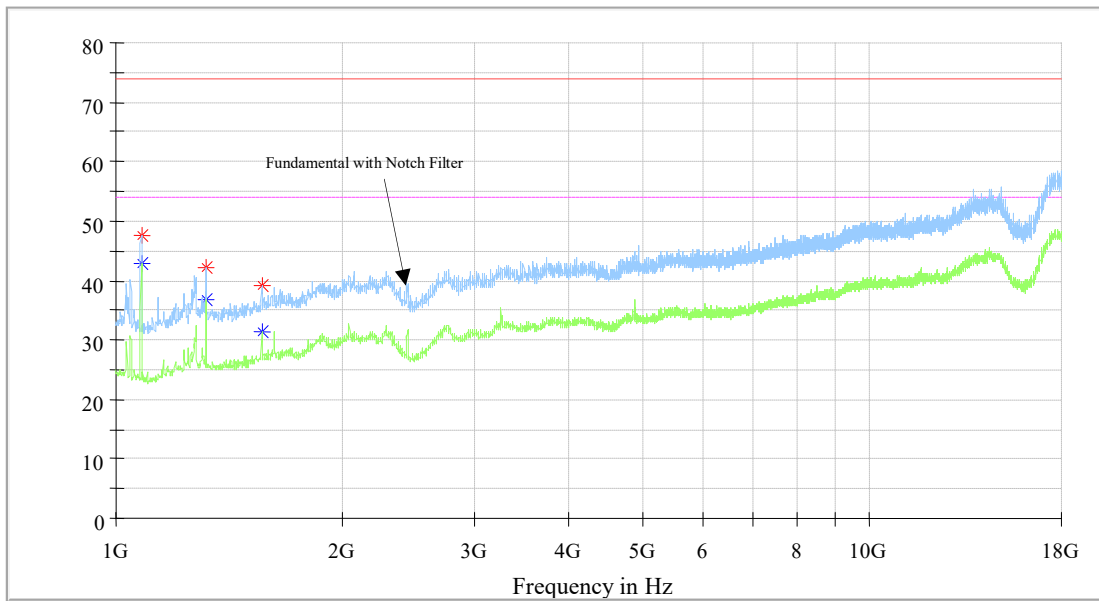
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1205.700000	44.57	---	74.00	29.43	164.0	V	308.0	-0.8
1207.400000	---	37.34	54.00	16.66	164.0	V	308.0	-0.8
4821.600000	48.80	---	74.00	25.20	164.0	V	250.0	10.2
4821.600000	---	40.56	54.00	13.44	164.0	V	250.0	10.2
7240.700000	52.53	---	74.00	21.47	164.0	V	164.0	14.3
7239.000000	---	43.85	54.00	10.15	164.0	V	164.0	14.3
17996.600000	53.65	---	74.00	20.35	164.0	V	155.0	27.6
17989.800000	---	46.50	54.00	7.50	164.0	V	4.0	27.5

2412 MHz (Vertical)



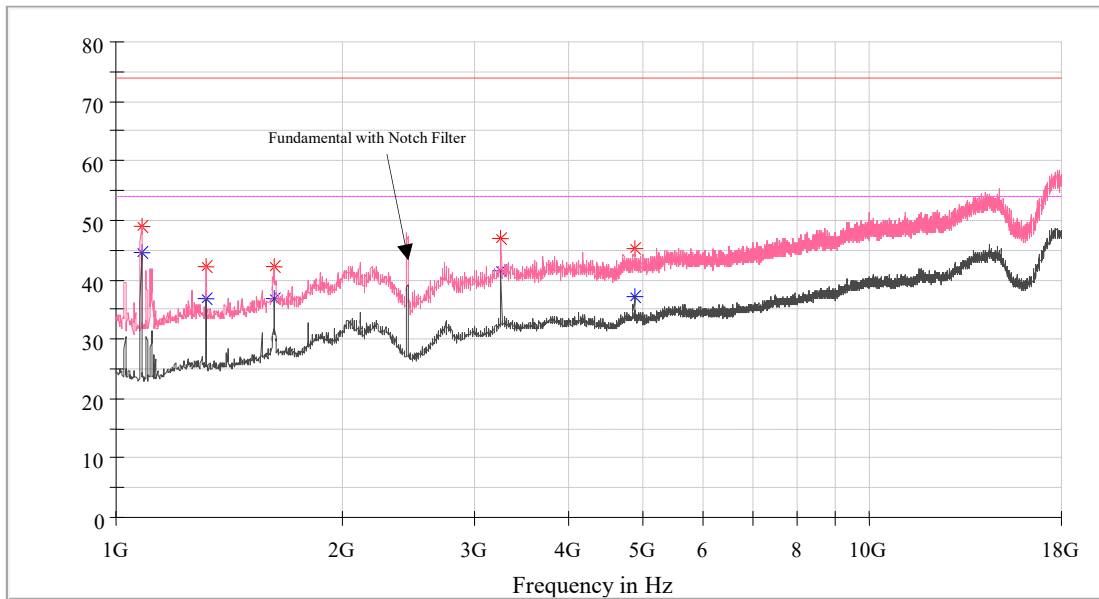
Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	44.52	54.00	9.48	150.0	V	23.0	-0.1
1079.900000	49.30	---	74.00	24.70	150.0	V	23.0	-0.1
1319.600000	---	36.73	54.00	17.27	150.0	V	42.0	0.8
1319.600000	42.39	---	74.00	31.61	150.0	V	42.0	0.8
1606.900000	---	36.27	54.00	17.73	150.0	V	23.0	2.5
1606.900000	46.84	---	74.00	27.16	150.0	V	23.0	2.5
3215.100000	---	40.74	54.00	13.26	150.0	V	183.0	8.2
3215.100000	46.13	---	74.00	27.87	150.0	V	183.0	8.2

2437 MHz (Horizontal)



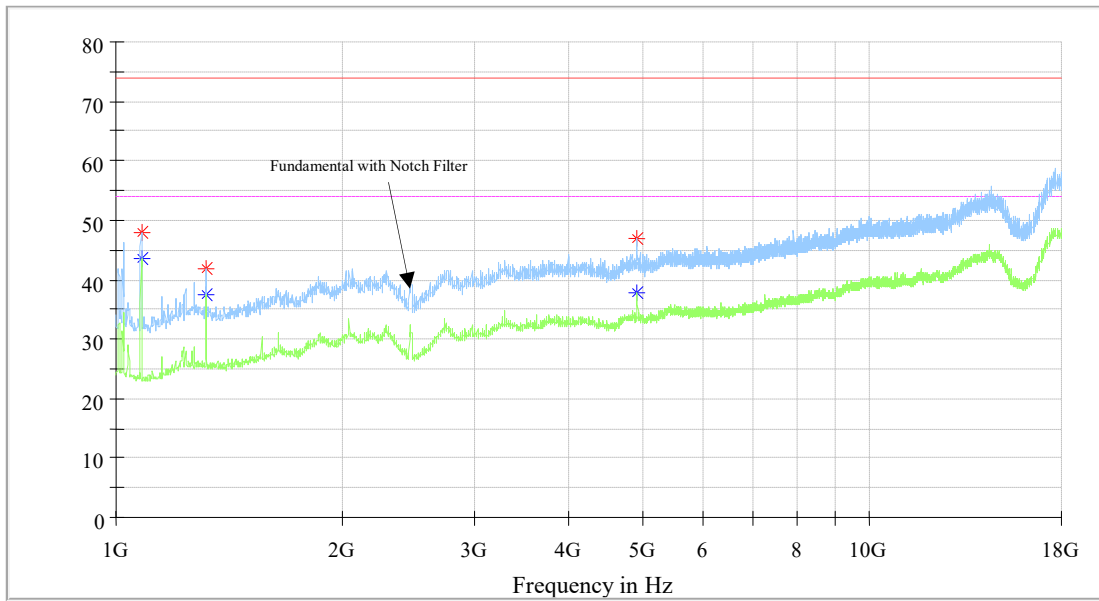
Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	42.93	54.00	11.07	150.0	H	271.0	-0.1
1079.900000	47.51	---	74.00	26.49	150.0	H	271.0	-0.1
1319.600000	---	36.96	54.00	17.04	150.0	H	210.0	0.8
1319.600000	42.34	---	74.00	31.66	150.0	H	210.0	0.8
1559.300000	---	31.30	54.00	22.70	150.0	H	65.0	2.0
1559.300000	39.05	---	74.00	34.95	150.0	H	65.0	2.0

2437 MHz (Vertical)



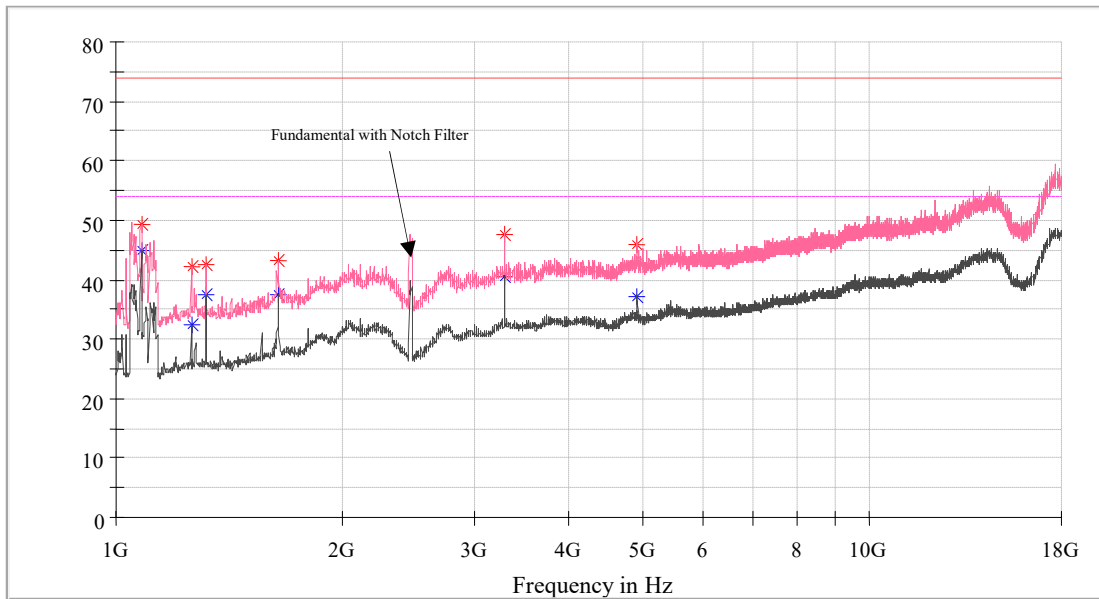
Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	44.42	54.00	9.58	150.0	V	30.0	-0.1
1079.900000	48.85	---	74.00	25.15	150.0	V	30.0	-0.1
1319.600000	---	36.92	54.00	17.08	150.0	V	40.0	0.8
1319.600000	42.08	---	74.00	31.92	150.0	V	40.0	0.8
1620.500000	42.19	---	74.00	31.81	150.0	V	0.0	2.6
1623.900000	---	36.87	54.00	17.13	150.0	V	305.0	2.6
3249.100000	---	41.39	54.00	12.61	150.0	V	180.0	8.3
3249.100000	47.07	---	74.00	26.93	150.0	V	180.0	8.3
4872.600000	45.30	---	74.00	28.70	150.0	V	170.0	12.0
4874.300000	---	37.25	54.00	16.75	150.0	V	170.0	12.0

2462 MHz (Horizontal)



Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	43.49	54.00	10.51	150.0	H	222.0	-0.1
1079.900000	48.00	---	74.00	26.00	150.0	H	222.0	-0.1
1319.600000	---	37.46	54.00	16.54	150.0	H	212.0	0.8
1319.600000	42.01	---	74.00	31.99	150.0	H	212.0	0.8
4923.600000	---	37.87	54.00	16.13	150.0	H	148.0	12.2
4923.600000	46.78	---	74.00	27.22	150.0	H	148.0	12.2

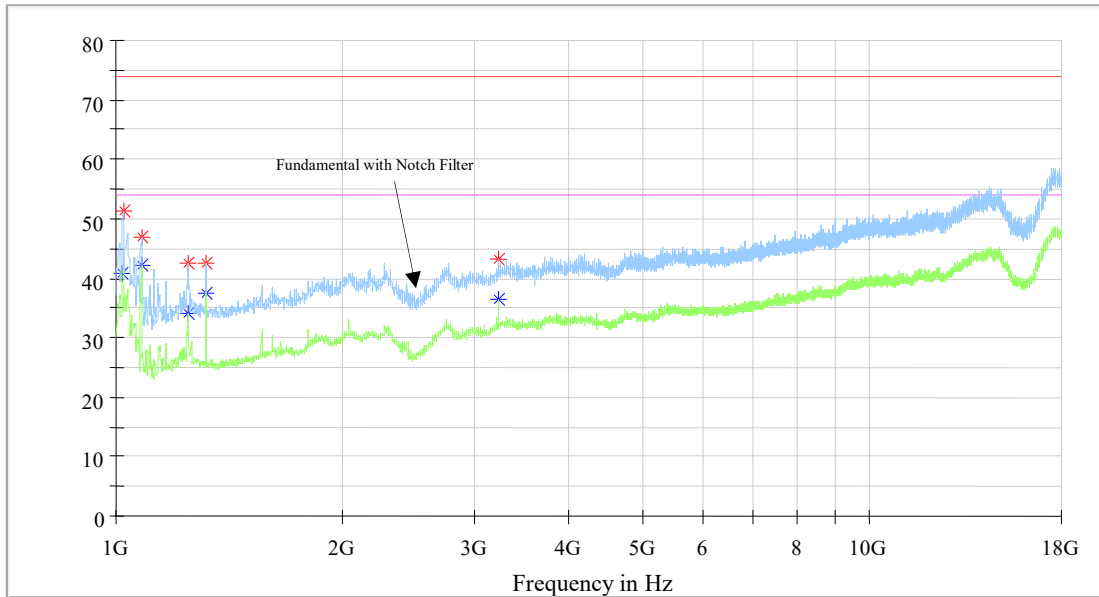
2462 MHz (Vertical)



Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	44.77	54.00	9.23	150.0	V	20.0	-0.1
1079.900000	49.34	---	74.00	24.66	150.0	V	20.0	-0.1
1258.400000	---	32.55	54.00	21.45	150.0	V	138.0	0.6
1258.400000	42.19	---	74.00	31.81	150.0	V	138.0	0.6
1319.600000	---	37.51	54.00	16.49	150.0	V	319.0	0.8
1319.600000	42.40	---	74.00	31.60	150.0	V	319.0	0.8
1640.900000	43.20	---	74.00	30.80	150.0	V	20.0	2.8
1640.900000	---	37.41	54.00	16.59	150.0	V	20.0	2.8
3283.100000	---	40.53	54.00	13.47	150.0	V	200.0	8.5
3283.100000	47.63	---	74.00	26.37	150.0	V	200.0	8.5
4923.600000	45.98	---	74.00	28.02	150.0	V	159.0	12.2
4925.300000	---	37.28	54.00	16.72	150.0	V	159.0	12.2

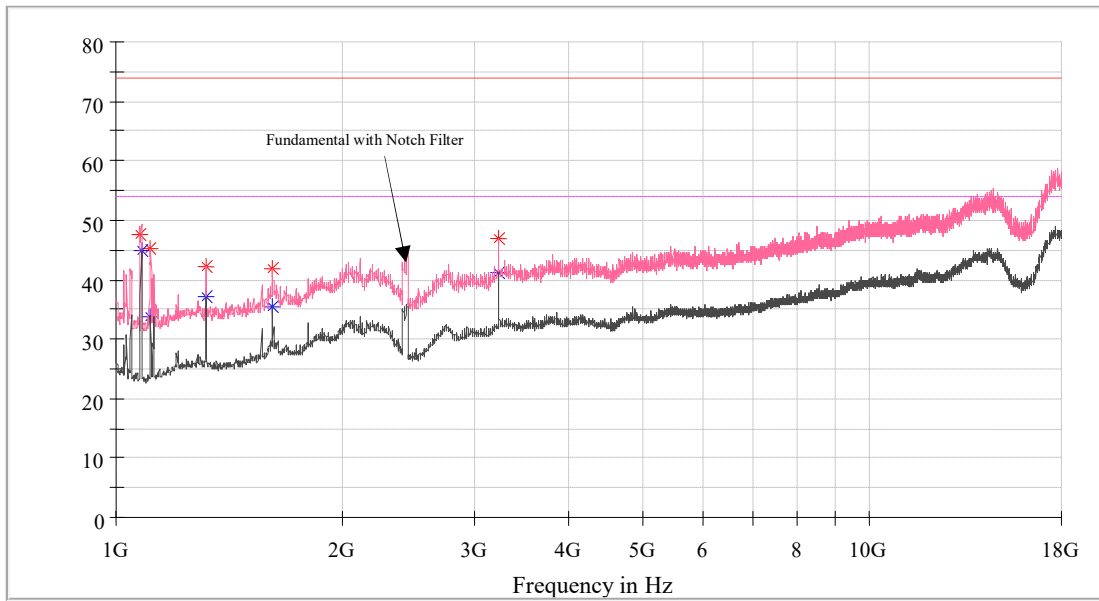
802.11n-HT40 Mode

2422 MHz (Horizontal)



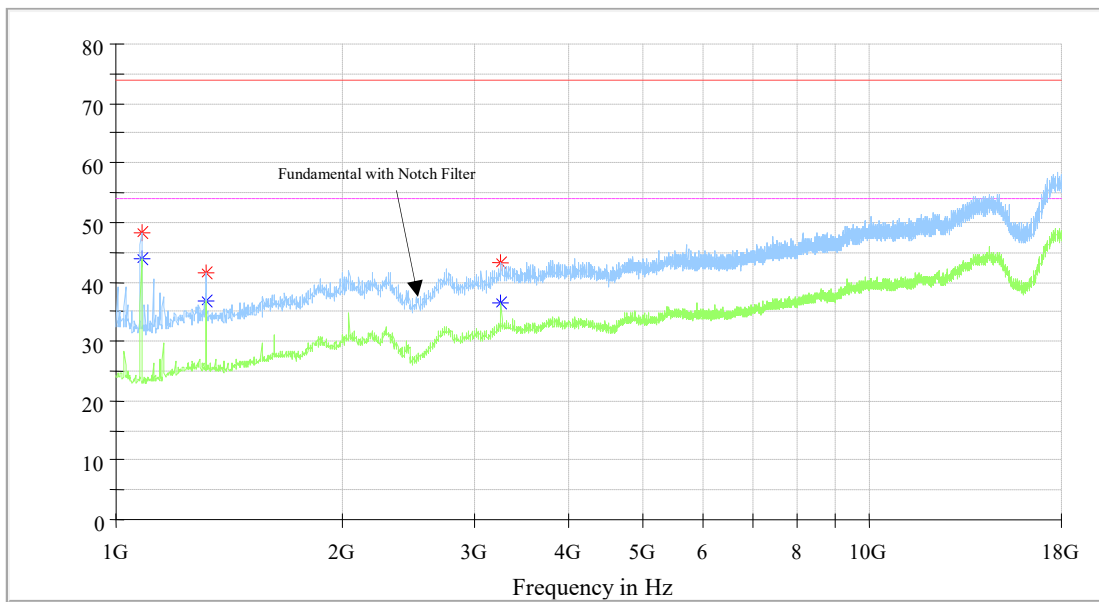
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1020.400000	---	40.83	54.00	13.17	150.0	H	257.0	-0.3
1022.100000	51.27	---	74.00	22.73	150.0	H	257.0	-0.3
1079.900000	---	42.12	54.00	11.88	150.0	H	267.0	-0.1
1079.900000	46.90	---	74.00	27.10	150.0	H	267.0	-0.1
1244.800000	---	34.17	54.00	19.83	150.0	H	358.0	0.6
1244.800000	42.54	---	74.00	31.46	150.0	H	358.0	0.6
1319.600000	---	37.33	54.00	16.67	150.0	H	206.0	0.8
1319.600000	42.44	---	74.00	31.56	150.0	H	206.0	0.8
3221.900000	43.06	---	74.00	30.94	150.0	H	0.0	8.2
3228.700000	---	36.57	54.00	17.43	150.0	H	95.0	8.2

2422 MHz (Vertical)



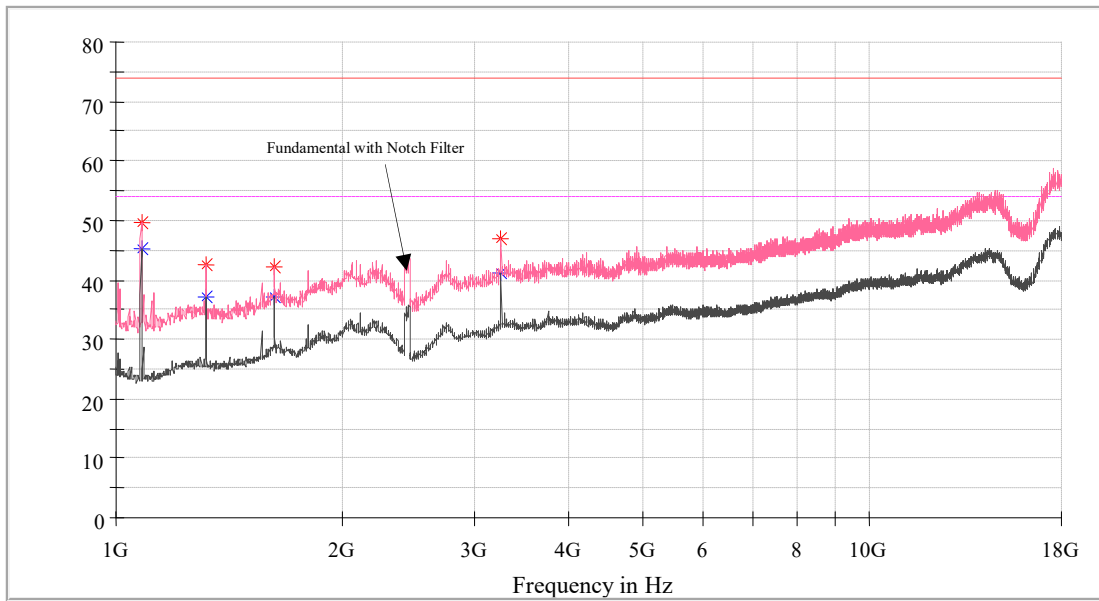
Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1078.200000	47.57	---	74.00	26.43	150.0	V	25.0	-0.1
1079.900000	---	44.77	54.00	9.23	150.0	V	25.0	-0.1
1110.500000	---	33.84	54.00	20.16	150.0	V	310.0	0.1
1112.200000	45.25	---	74.00	28.75	150.0	V	310.0	0.1
1319.600000	---	37.24	54.00	16.76	150.0	V	46.0	0.8
1319.600000	42.31	---	74.00	31.69	150.0	V	46.0	0.8
1613.700000	---	35.54	54.00	18.46	150.0	V	25.0	2.5
1613.700000	41.98	---	74.00	32.02	150.0	V	25.0	2.5
3228.700000	---	41.14	54.00	12.86	150.0	V	137.0	8.2
3228.700000	47.02	---	74.00	26.98	150.0	V	137.0	8.2

2437 MHz (Horizontal)



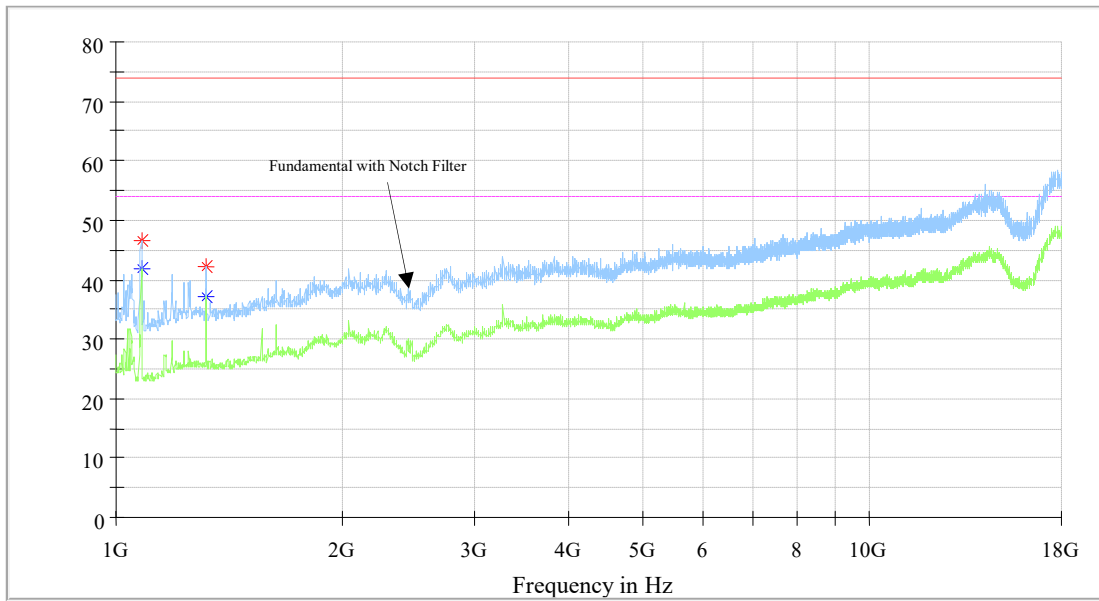
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	43.80	54.00	10.20	150.0	H	228.0	-0.1
1079.900000	48.32	---	74.00	25.68	150.0	H	228.0	-0.1
1319.600000	---	36.86	54.00	17.14	150.0	H	207.0	0.8
1319.600000	41.64	---	74.00	32.36	150.0	H	207.0	0.8
3249.100000	---	36.51	54.00	17.49	150.0	H	48.0	8.3
3249.100000	43.16	---	74.00	30.84	150.0	H	48.0	8.3

2437 MHz (Vertical)



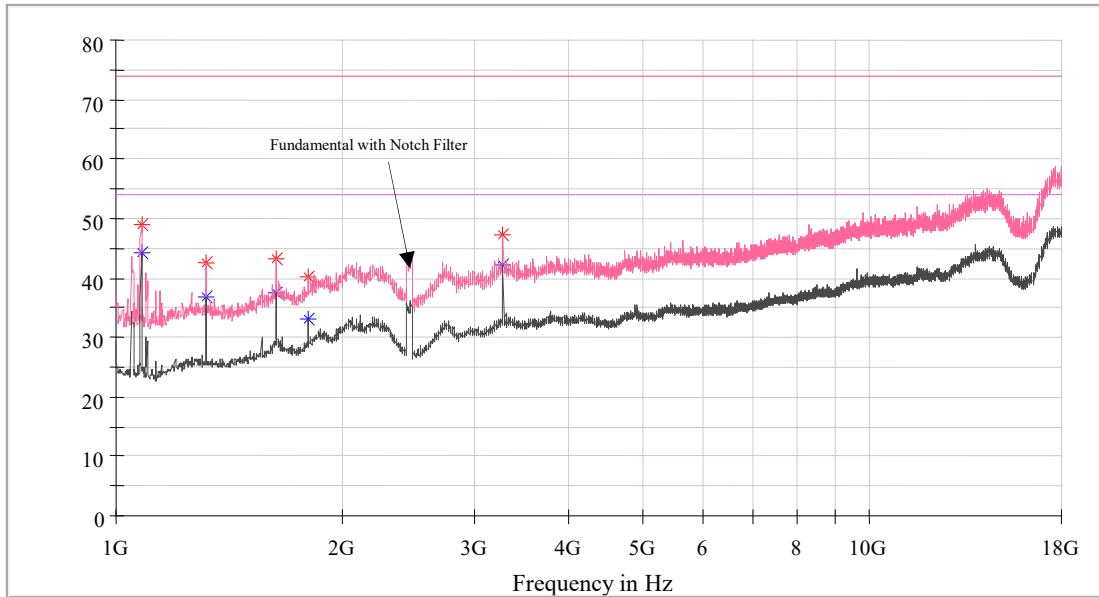
Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	45.30	54.00	8.70	150.0	V	22.0	-0.1
1079.900000	49.77	---	74.00	24.23	150.0	V	22.0	-0.1
1319.600000	---	37.24	54.00	16.76	150.0	V	44.0	0.8
1319.600000	42.46	---	74.00	31.54	150.0	V	44.0	0.8
1623.900000	---	37.07	54.00	16.93	150.0	V	304.0	2.6
1623.900000	42.36	---	74.00	31.64	150.0	V	304.0	2.6
3249.100000	---	41.06	54.00	12.94	150.0	V	174.0	8.3
3249.100000	46.78	---	74.00	27.22	150.0	V	174.0	8.3

2452 MHz (Horizontal)



Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	41.97	54.00	12.03	150.0	H	244.0	-0.1
1079.900000	46.75	---	74.00	27.25	150.0	H	244.0	-0.1
1319.600000	---	37.26	54.00	16.74	150.0	H	204.0	0.8
1319.600000	42.25	---	74.00	31.75	150.0	H	204.0	0.8

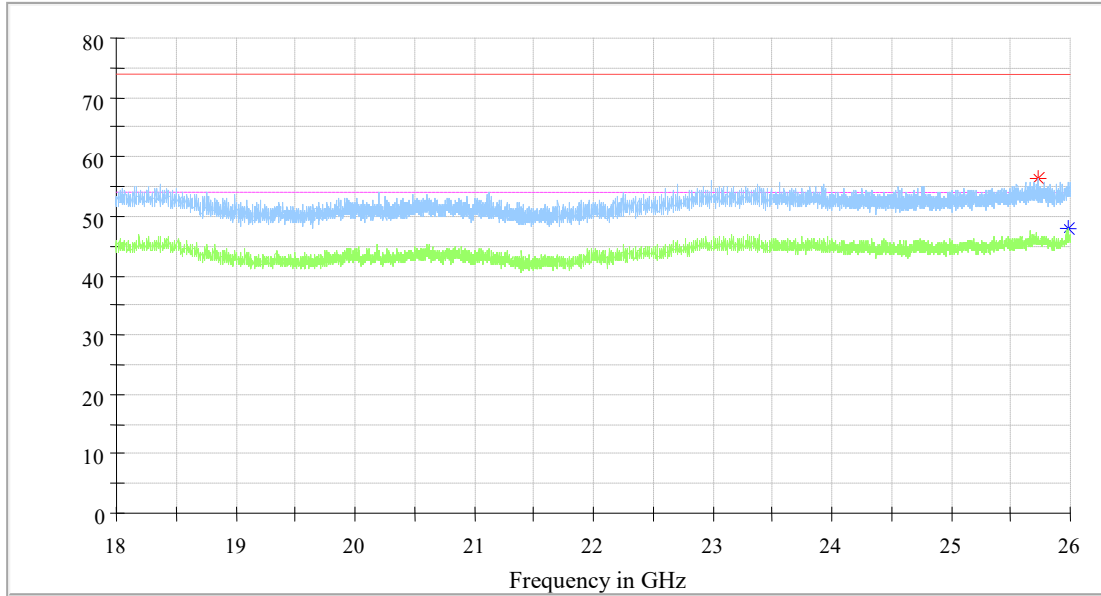
2452 MHz (Vertical)



Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1079.900000	---	44.19	54.00	9.81	150.0	V	23.0	-0.1
1079.900000	48.83	---	74.00	25.17	150.0	V	23.0	-0.1
1319.600000	---	36.96	54.00	17.04	150.0	V	44.0	0.8
1319.600000	42.37	---	74.00	31.63	150.0	V	44.0	0.8
1634.100000	---	37.61	54.00	16.39	150.0	V	2.0	2.7
1634.100000	43.16	---	74.00	30.84	150.0	V	2.0	2.7
1799.000000	40.05	---	74.00	33.95	150.0	V	7.0	4.2
1799.000000	---	33.24	54.00	20.76	150.0	V	7.0	4.2
3269.500000	---	42.31	54.00	11.69	150.0	V	64.0	8.4
3269.500000	47.14	---	74.00	26.86	150.0	V	64.0	8.4

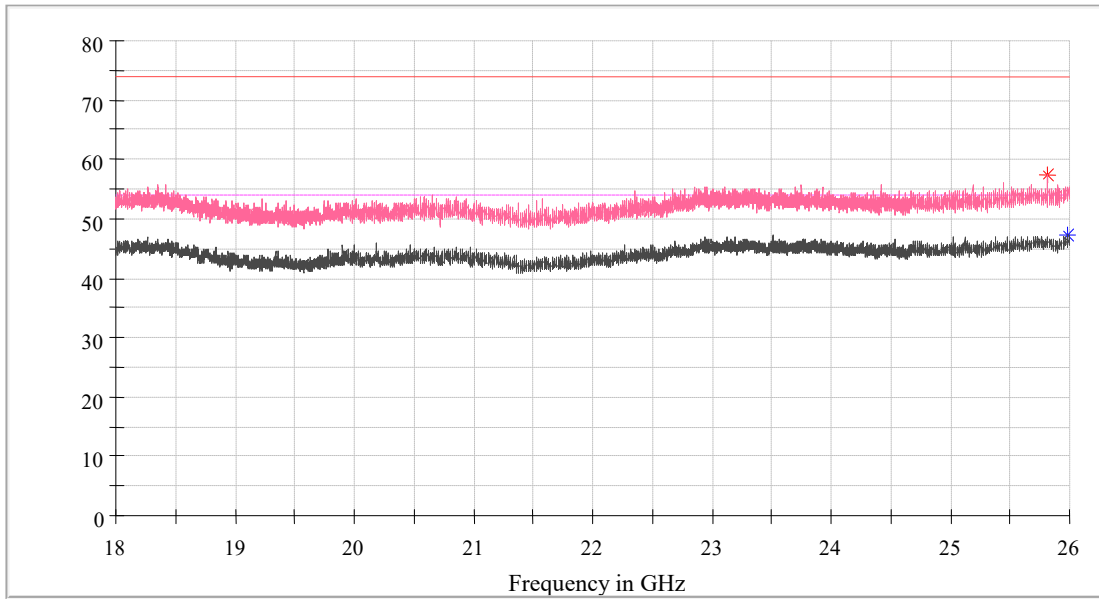
18 GHz to 26 GHz: 802.11b_Low Channel-Chain 2-Worst Case

Horizontal



Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
25815.200000	57.22	---	74.00	16.78	100.0	V	304.0	13.0
25990.400000	---	47.35	54.00	6.65	100.0	V	296.0	13.2

Vertical



Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
25815.200000	57.22	---	74.00	16.78	100.0	V	304.0	13.0
25990.400000	---	47.35	54.00	6.65	100.0	V	296.0	13.2

Note:

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor or Antenna factor (RX) + Cable Loss

Margin = Limit- Corr. Amplitude

Band Edge Emission:

802.11b Mode

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
Chain 1									
Frequency: 2412 MHz									
2390	29.15	PK	V	29.15	3.01	0.00	61.31	74.00	12.69
2390	17.07	AV	V	29.15	3.01	0.00	49.23	54.00	4.77
Frequency: 2462 MHz									
2483.5	28.41	PK	V	29.02	3.07	0.00	60.50	74.00	13.50
2483.5	15.65	AV	V	29.02	3.07	0.00	47.74	54.00	6.26
Chain 2									
Frequency: 2412 MHz									
2390	29.56	PK	V	29.15	3.01	0.00	61.72	74.00	12.28
2390	17.52	AV	V	29.15	3.01	0.00	49.68	54.00	4.32
Frequency: 2462 MHz									
2483.5	29.12	PK	V	29.02	3.07	0.00	61.21	74.00	12.79
2483.5	14.93	AV	V	29.02	3.07	0.00	47.02	54.00	6.98

802.11g Mode

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
Chain 1									
Frequency: 2412 MHz									
2390	39.59	PK	V	29.15	3.01	0.00	71.75	74.00	2.25
2390	20.15	AV	V	29.15	3.01	0.00	52.31	54.00	1.69
Frequency: 2462 MHz									
2483.5	38.65	PK	V	29.02	3.07	0.00	70.74	74.00	3.26
2483.5	19.25	AV	V	29.02	3.07	0.00	51.34	54.00	2.66
Chain 2									
Frequency: 2412 MHz									
2390	40.76	PK	V	29.15	3.01	0.00	72.92	74.00	1.08
2390	21.15	AV	V	29.15	3.01	0.00	53.31	54.00	0.69
Frequency: 2462 MHz									
2483.5	35.85	PK	V	29.02	3.07	0.00	67.94	74.00	6.06
2483.5	17.96	AV	V	29.02	3.07	0.00	50.05	54.00	3.95

802.11n-HT20 Mode (Chain 1+Chain 2) (worst case)

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
Frequency: 2412 MHz									
2390	37.08	PK	V	29.15	3.01	0.00	69.24	74.00	4.76
2390	18.56	AV	V	29.15	3.01	0.00	50.72	54.00	3.28
Frequency: 2462 MHz									
2483.5	38.50	PK	V	29.02	3.07	0.00	70.59	74.00	3.41
2483.5	18.55	AV	V	29.02	3.07	0.00	50.64	54.00	3.36

802.11n-HT40 Mode (Chain 1+Chain 2) (worst case)

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
Frequency: 2422 MHz									
2390	35.99	PK	V	29.15	3.01	0.00	68.15	74.00	5.85
2390	21.05	AV	V	29.15	3.01	0.00	53.21	54.00	0.79
Frequency: 2452 MHz									
2483.5	35.07	PK	V	29.02	3.07	0.00	67.16	74.00	6.84
2483.5	20.44	AV	V	29.02	3.07	0.00	52.53	54.00	1.47

Note:

Corrected Amplitude = Corrected Factor + Reading

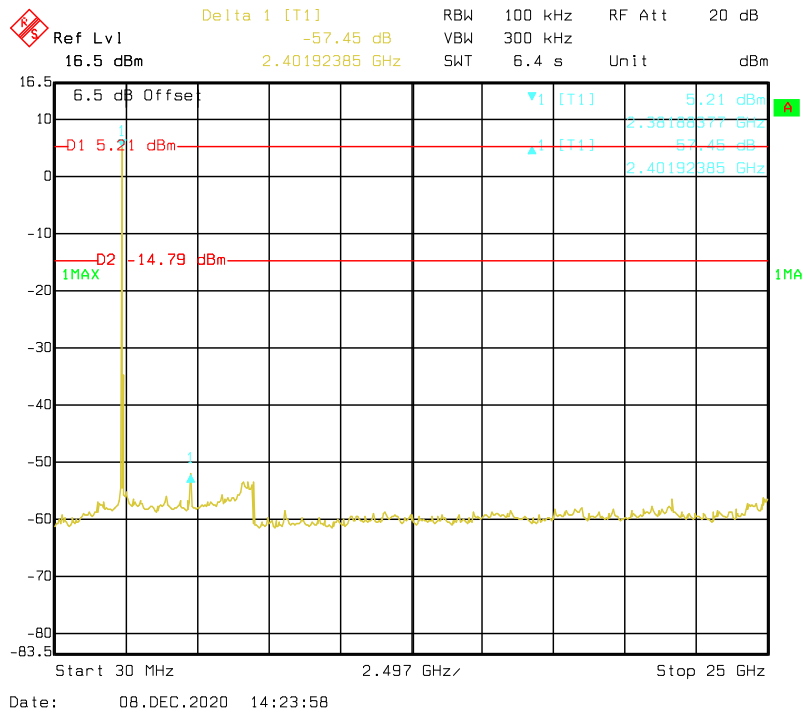
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor or Antenna factor (RX) + Cable Loss

Margin = Limit- Corr. Amplitude

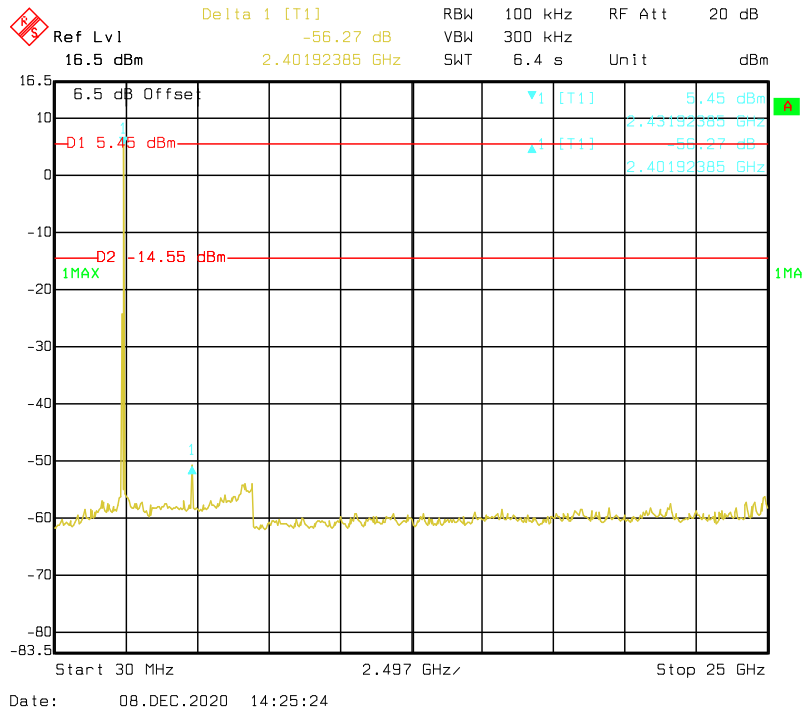
Conducted Spurious Emissions at Antenna Port

Chain 1

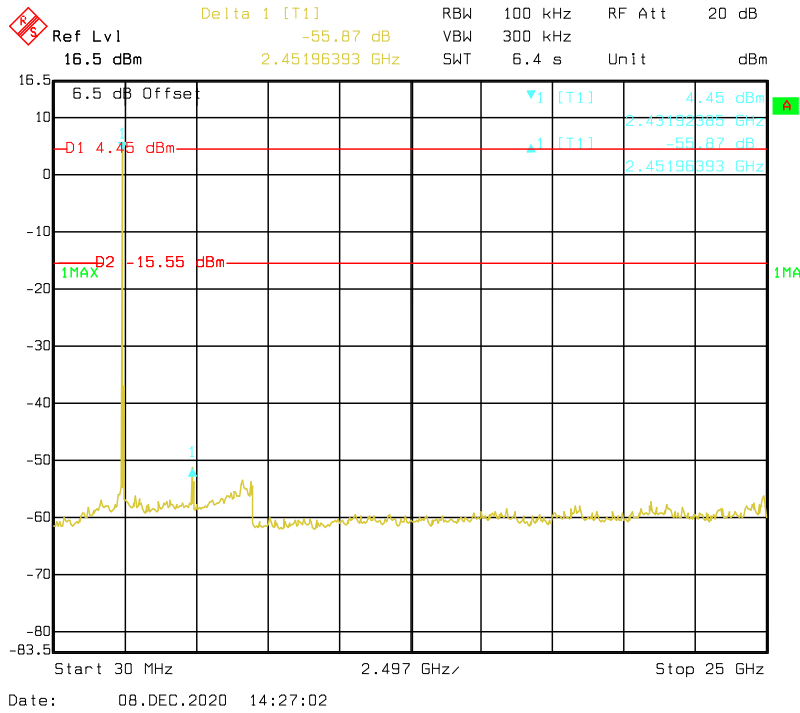
802.11b Low Channel



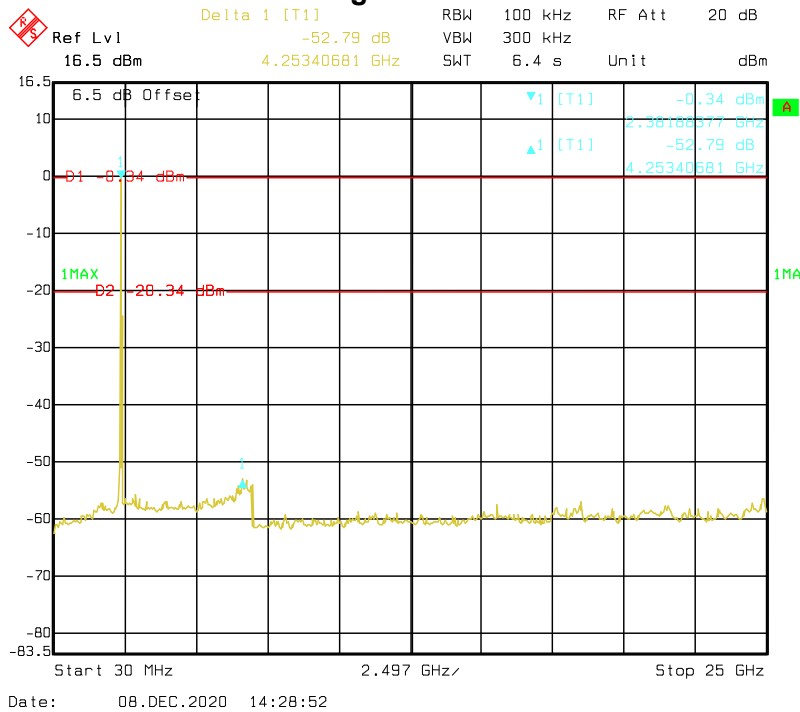
802.11b Middle Channel



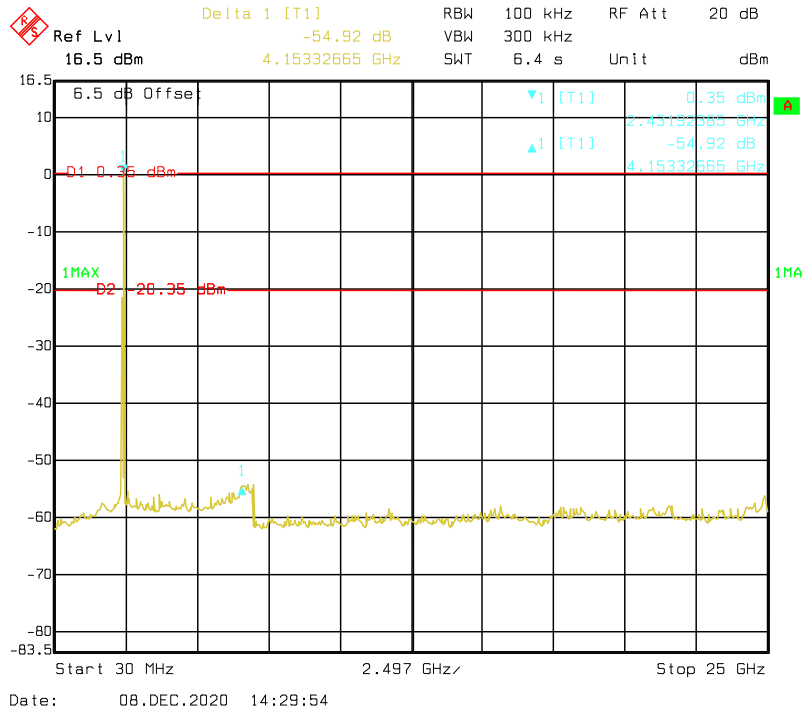
802.11b High Channel



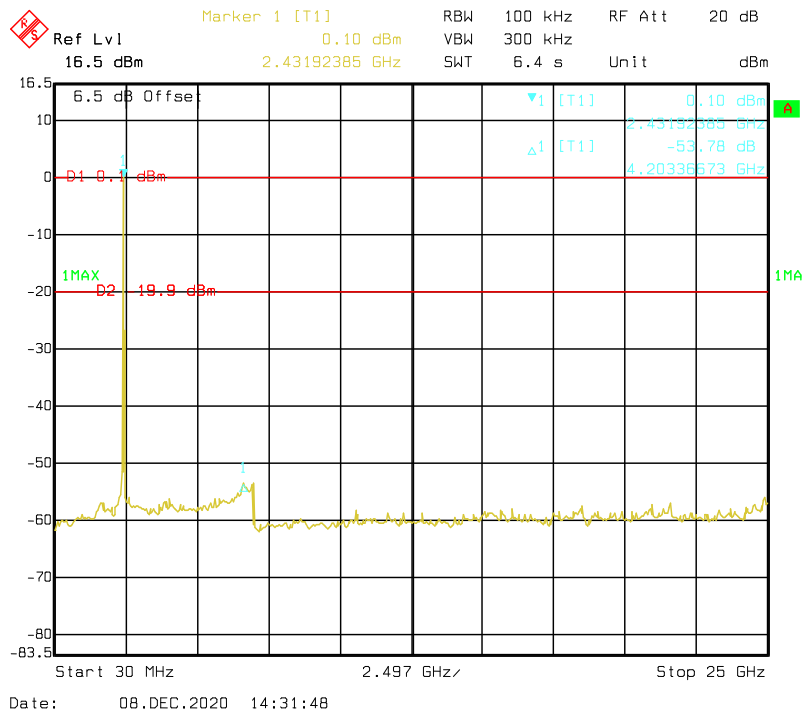
802.11g Low Channel



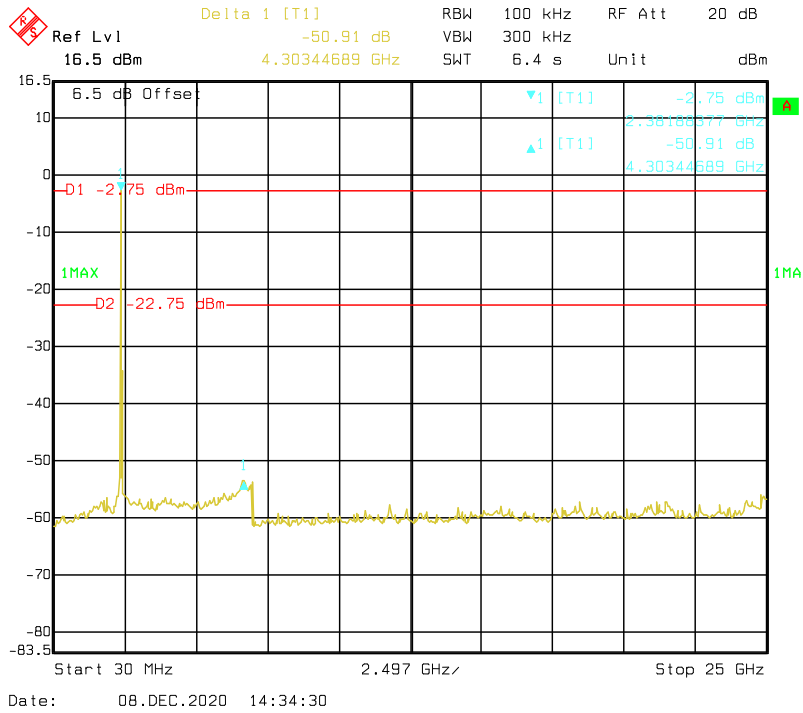
802.11g Middle Channel



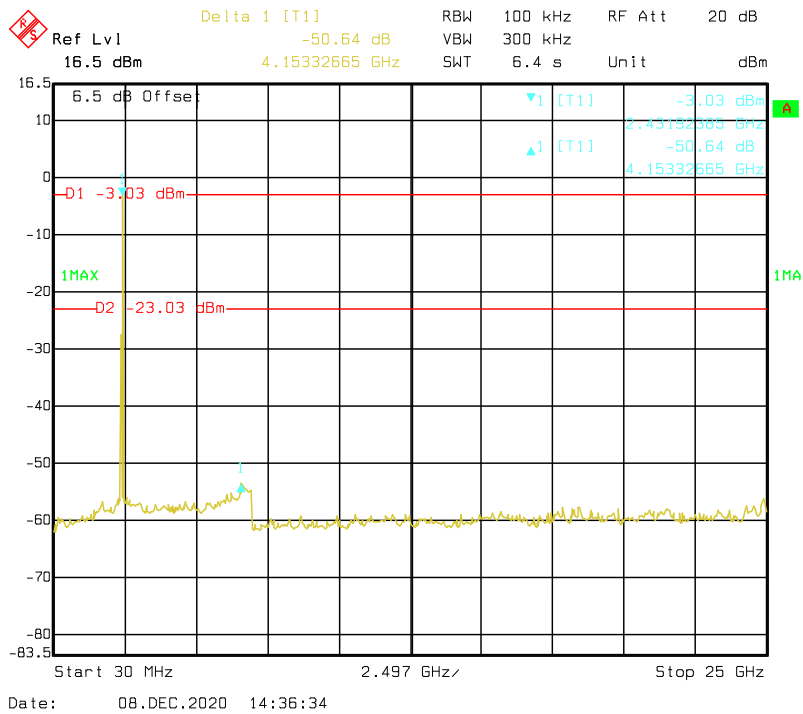
802.11g High Channel



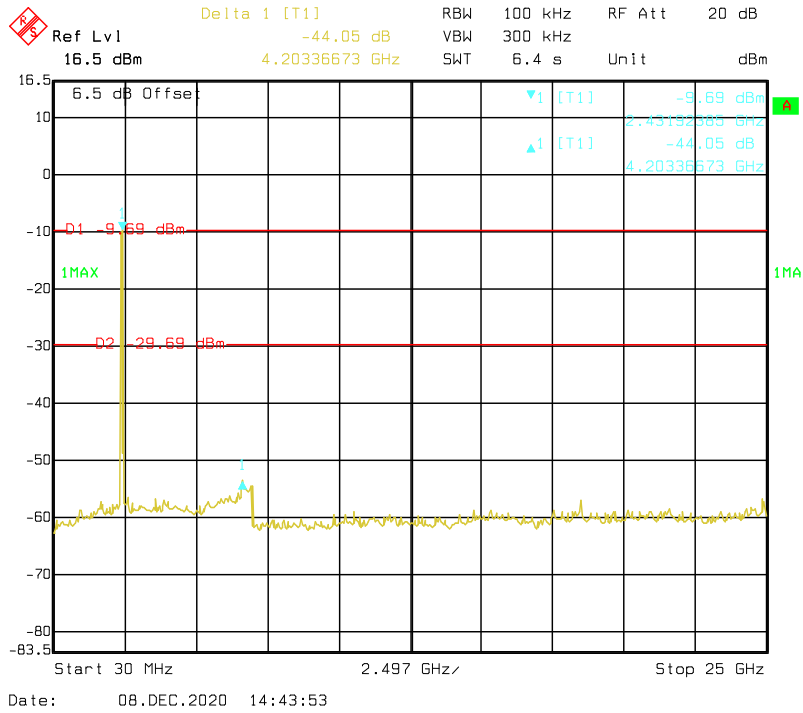
802.11n-HT20 Low Channel



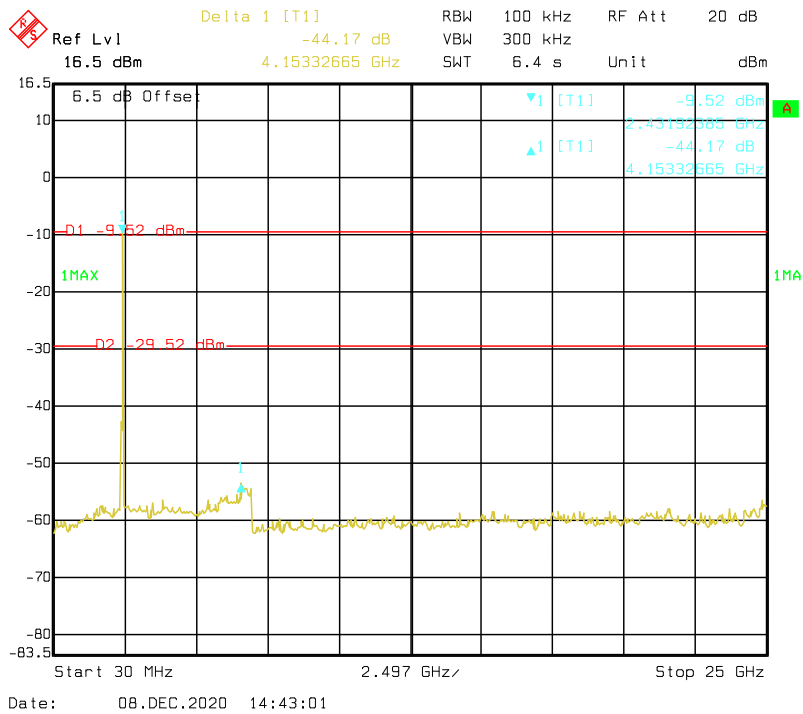
802.11n-HT20 Middle Channel



802.11n-HT40 Middle Channel

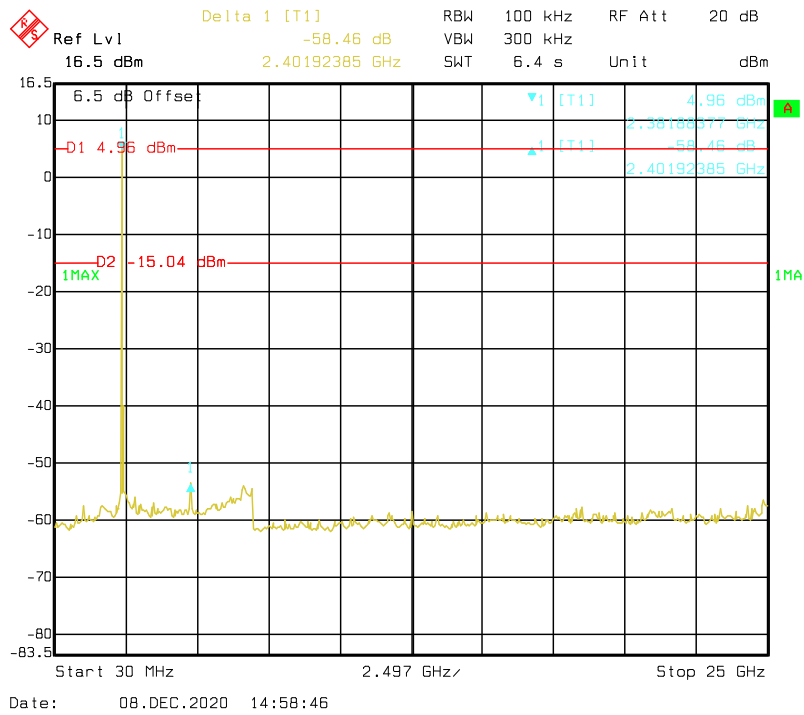


802.11n-HT40 High Channel

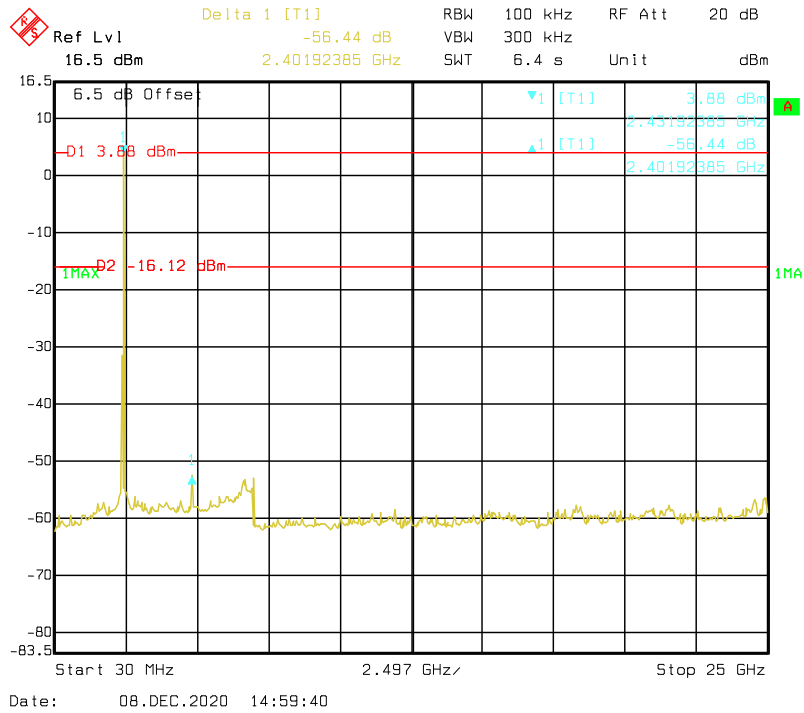


Chain 2

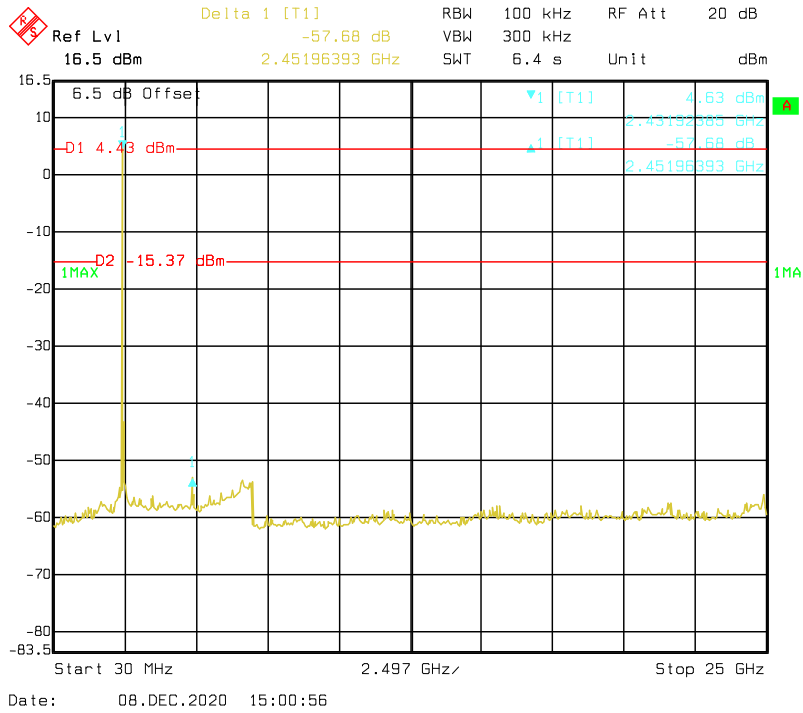
802.11b Low Channel



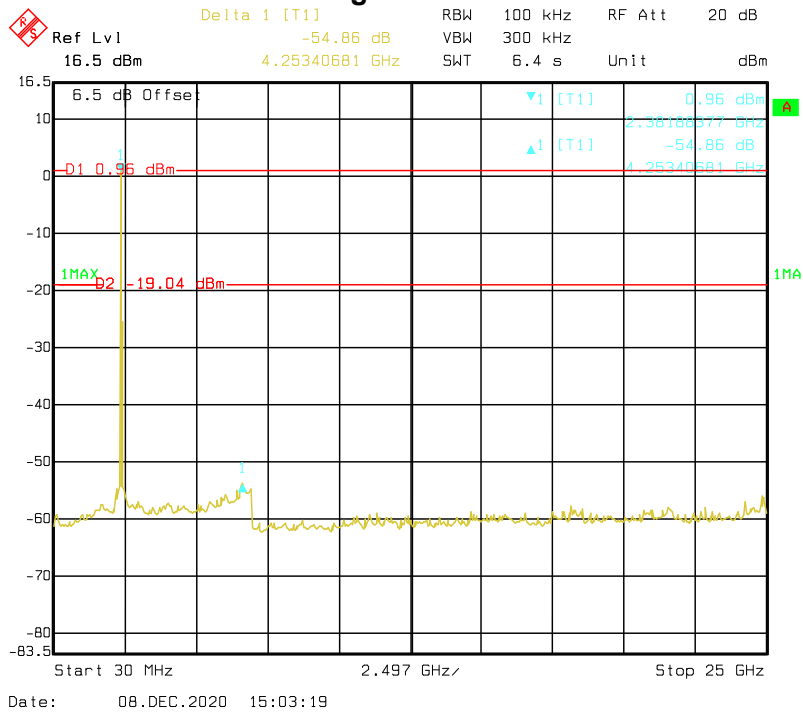
802.11b Middle Channel



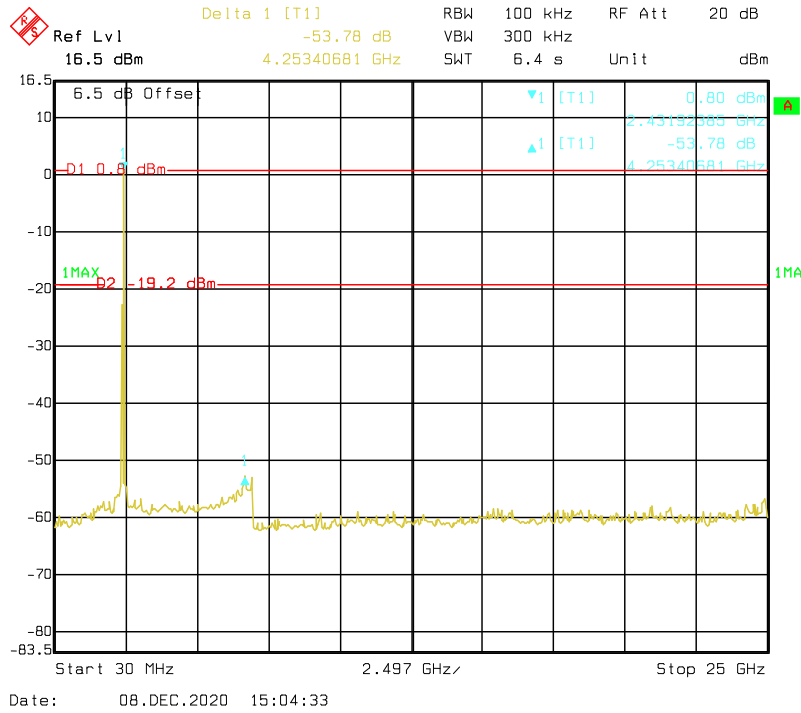
802.11b High Channel



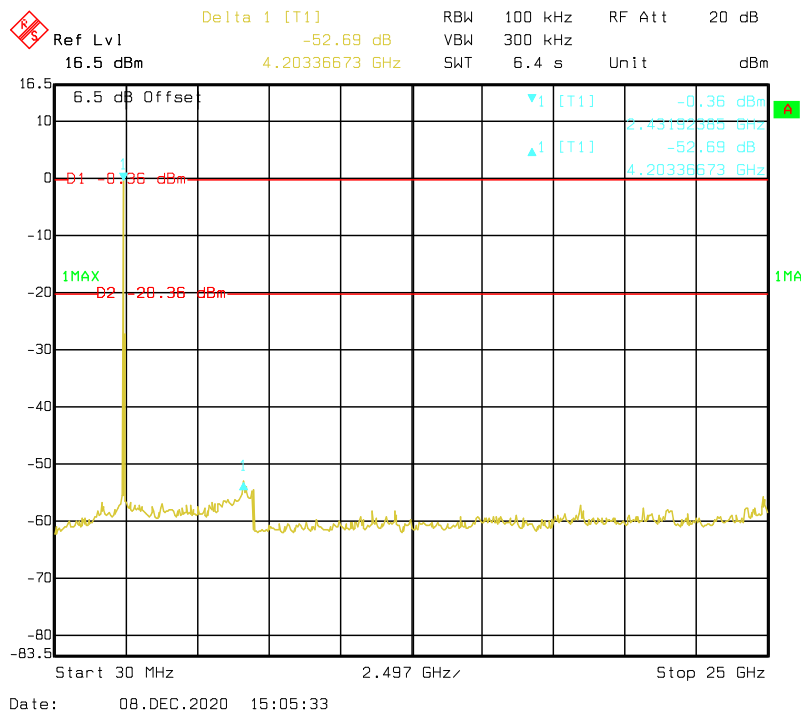
802.11g Low Channel



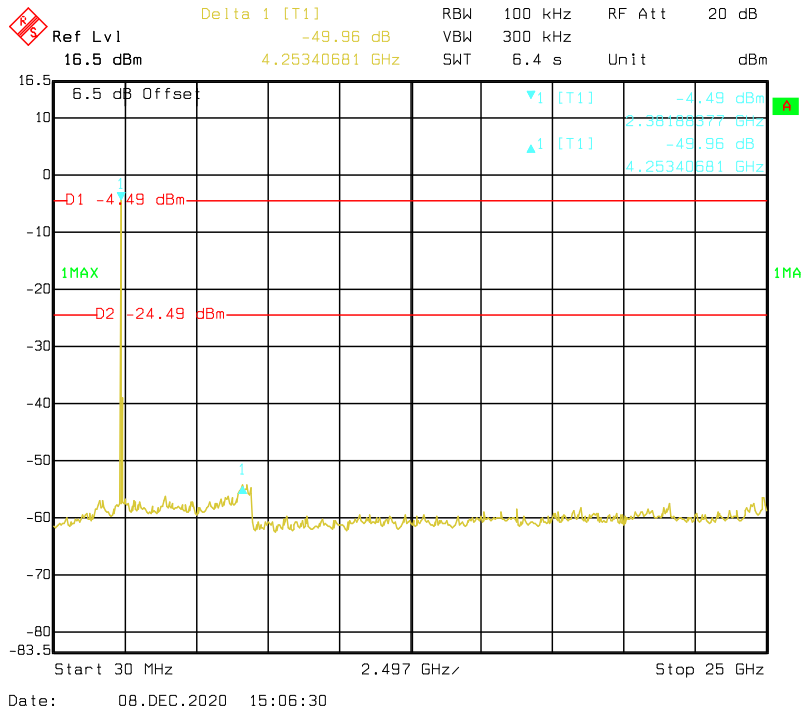
802.11g Middle Channel



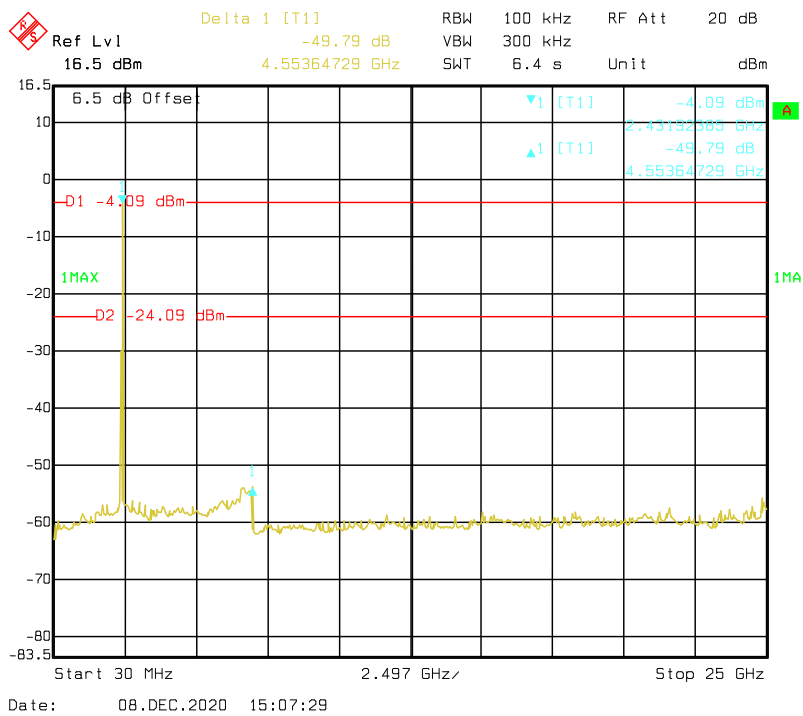
802.11g High Channel



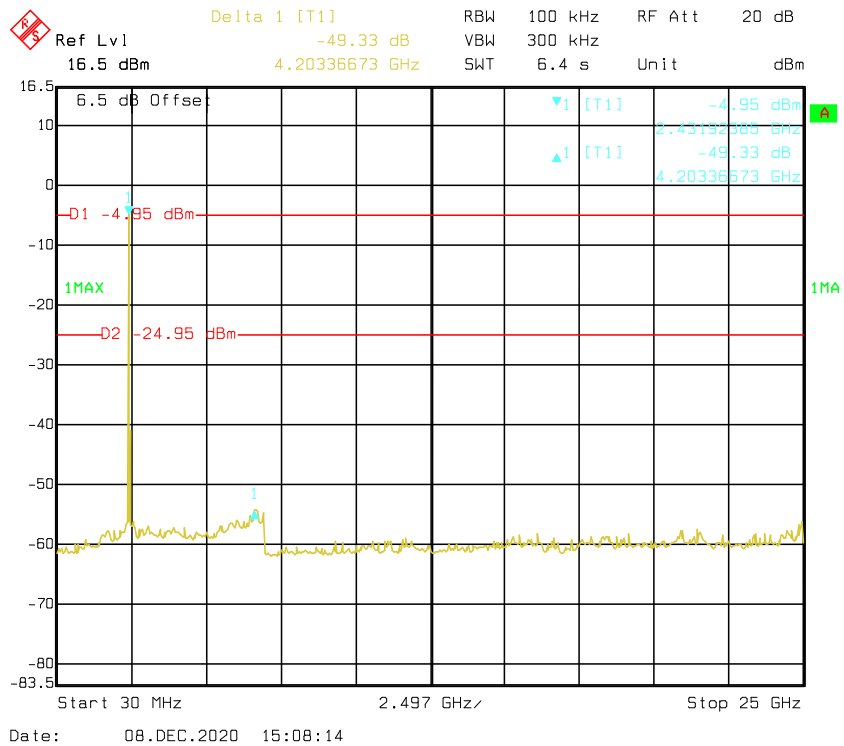
802.11n-HT20 Low Channel



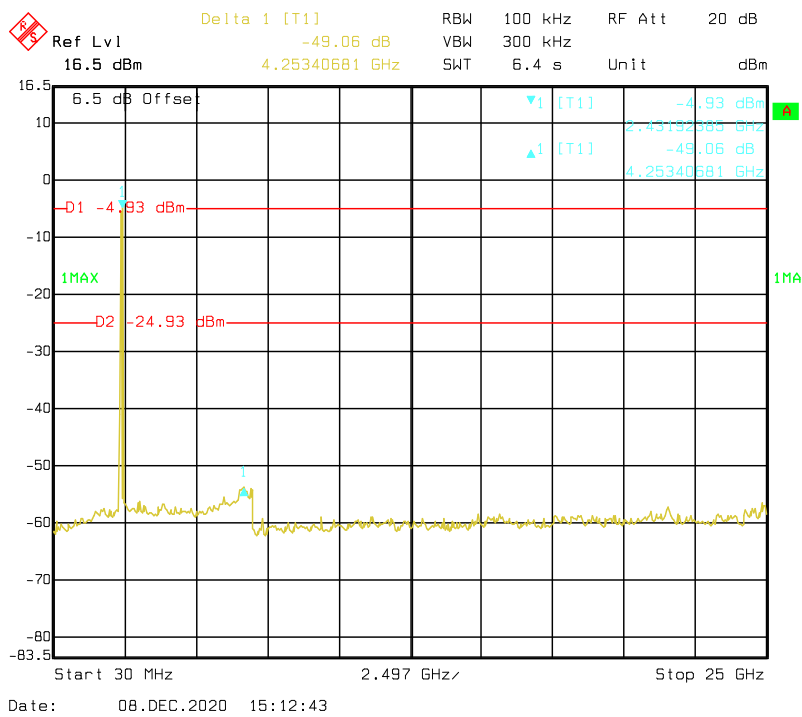
802.11n-HT20 Middle Channel



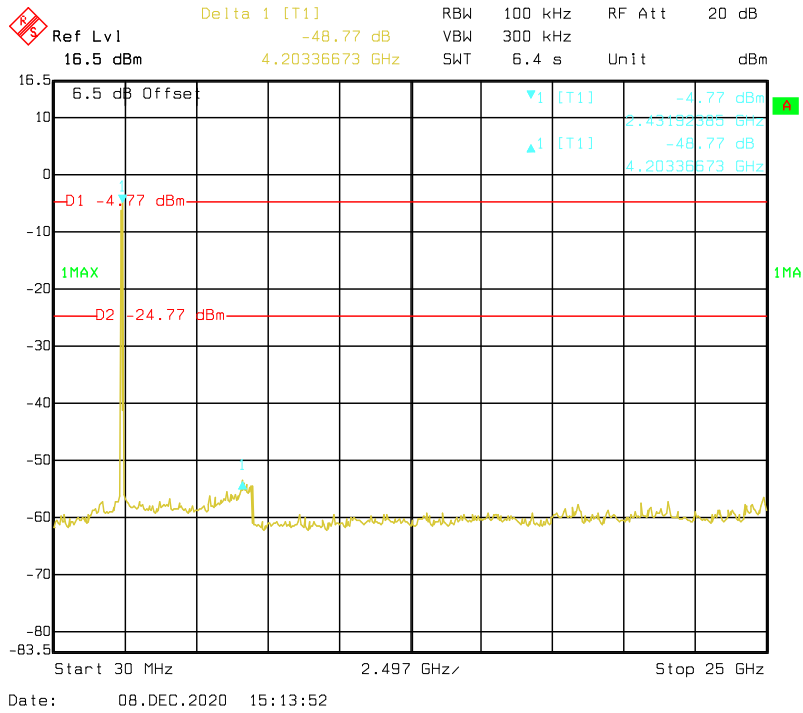
802.11n-HT20 High Channel



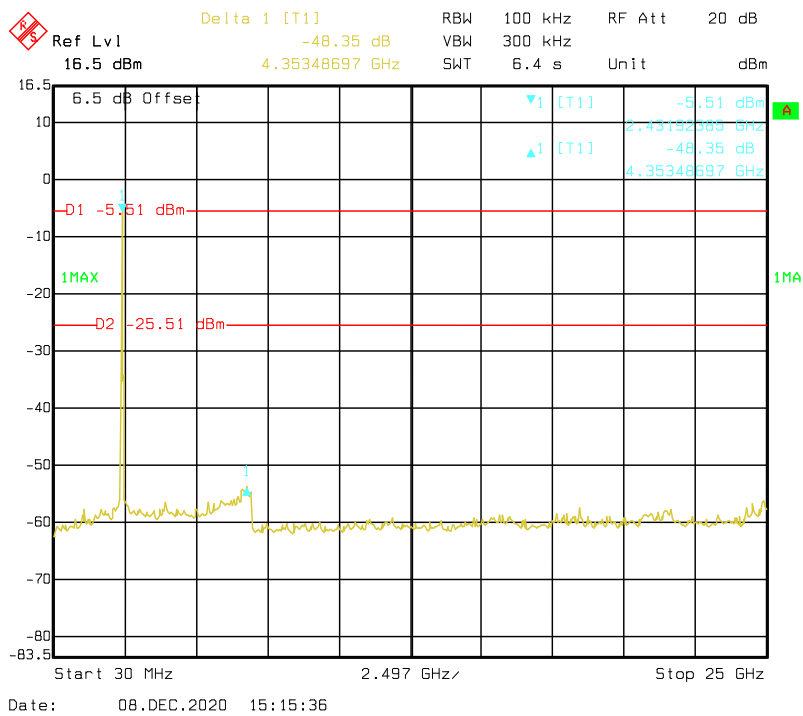
802.11n-HT40 Low Channel



802.11n-HT40 Middle Channel



802.11n-HT40 High Channel



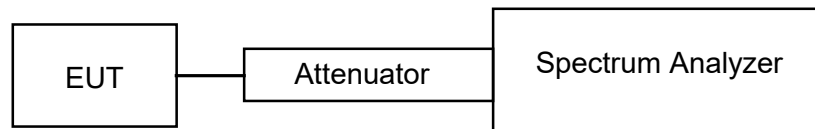
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) 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 °C
Relative Humidity:	53 %
ATM Pressure:	95.6 kPa

The testing was performed by Winfred Wang on 2020-12-08.

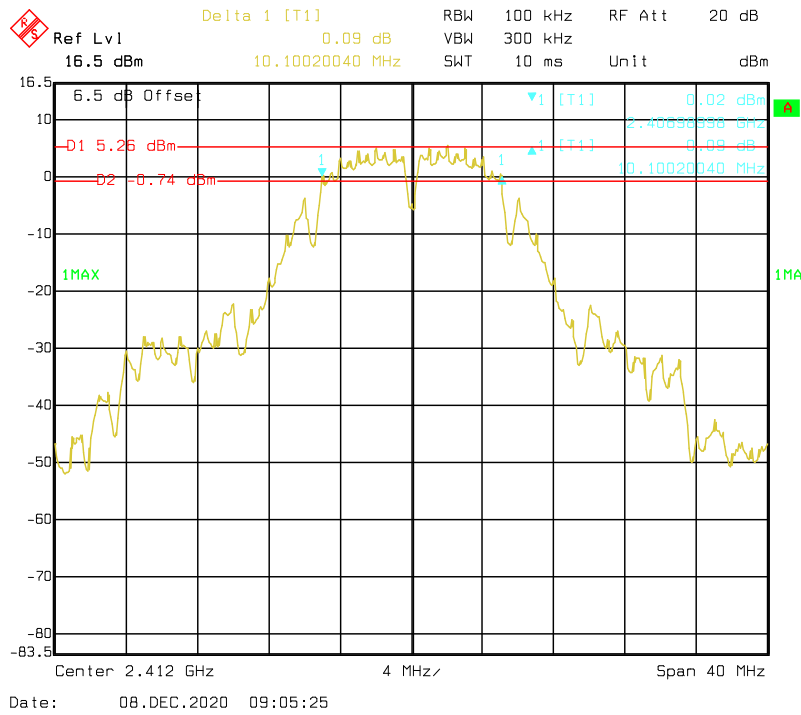
Test Mode: Transmitting

Test Result: Compliance. Please refer to the following table and plots.

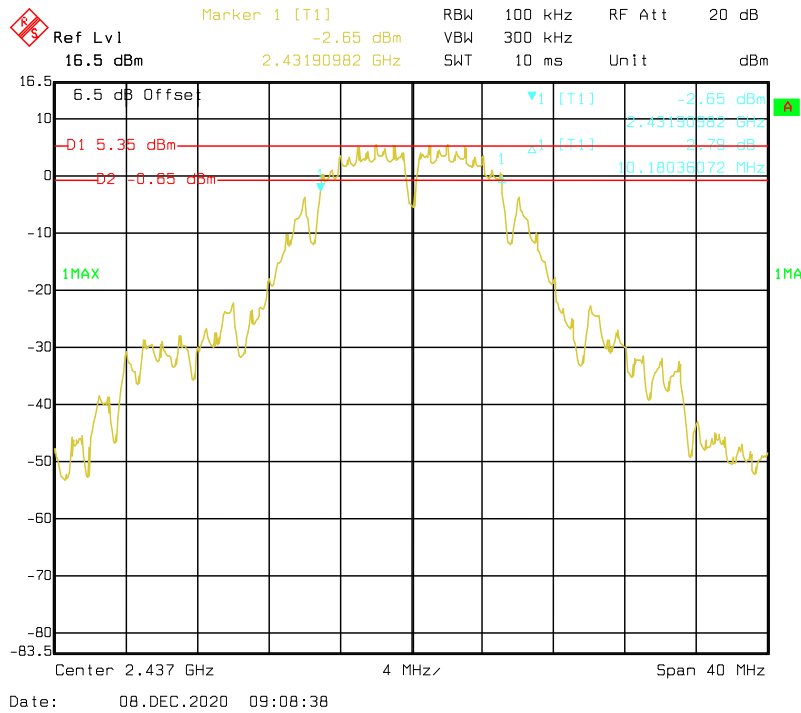
Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)		Limit (MHz)
			Chain 1	Chain 2	
802.11b	Low	2412	10.10	10.18	≥0.50
	Middle	2437	10.18	10.18	
	High	2462	10.11	10.18	
802.11g	Low	2412	16.67	16.67	
	Middle	2437	16.67	16.76	
	High	2462	16.68	16.69	
802.11n-HT20	Low	2412	17.80	17.80	
	Middle	2437	17.80	17.81	
	High	2462	17.81	17.80	
802.11n-HT40	Low	2422	36.75	36.67	
	Middle	2437	36.66	36.74	
	High	2452	36.73	36.65	

Chain 1

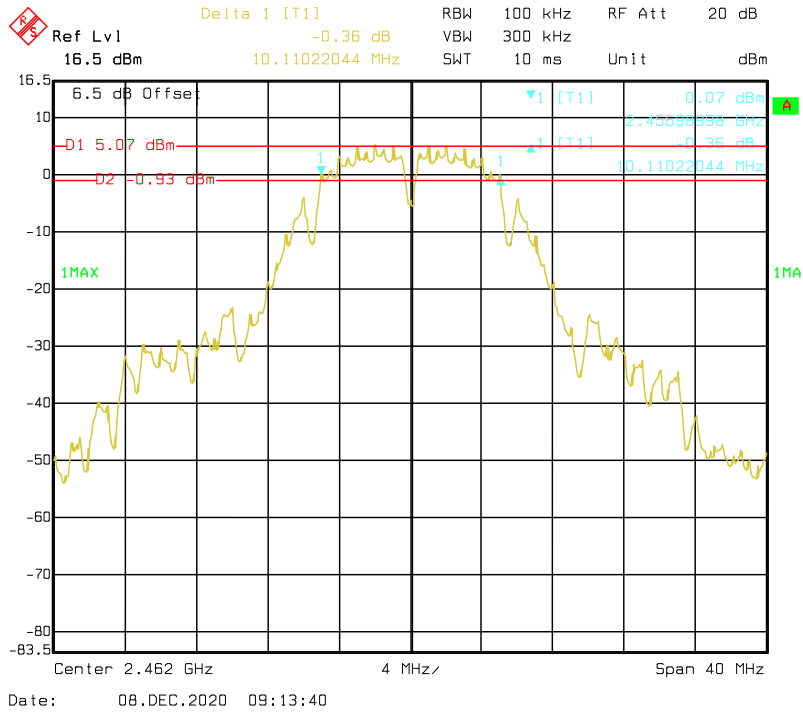
802.11b Low Channel



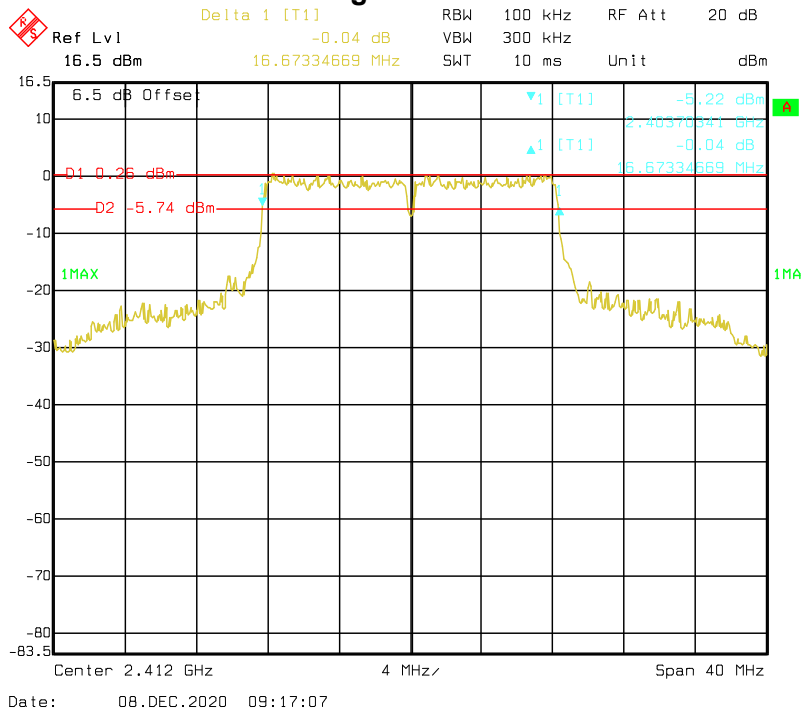
802.11b Middle Channel



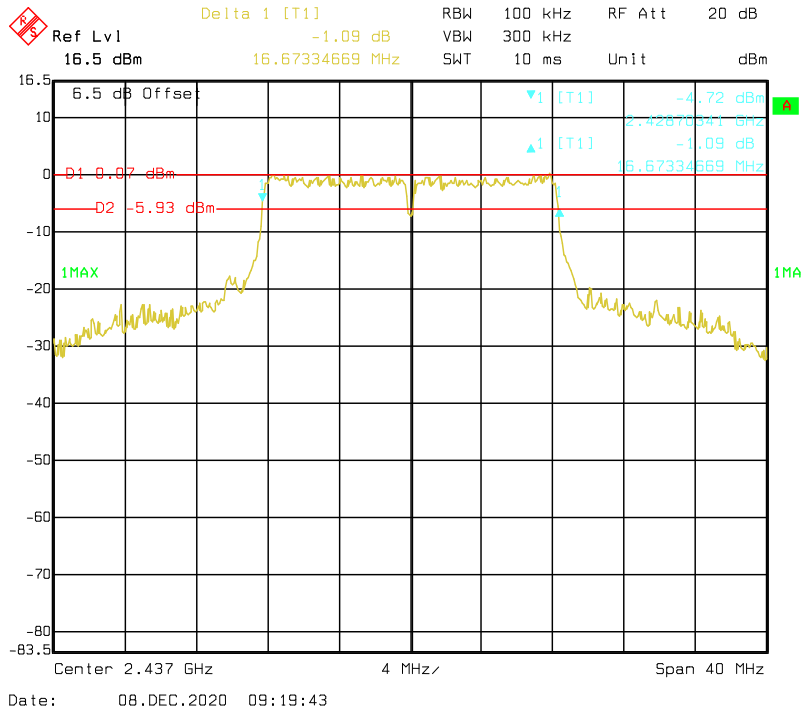
802.11b High Channel



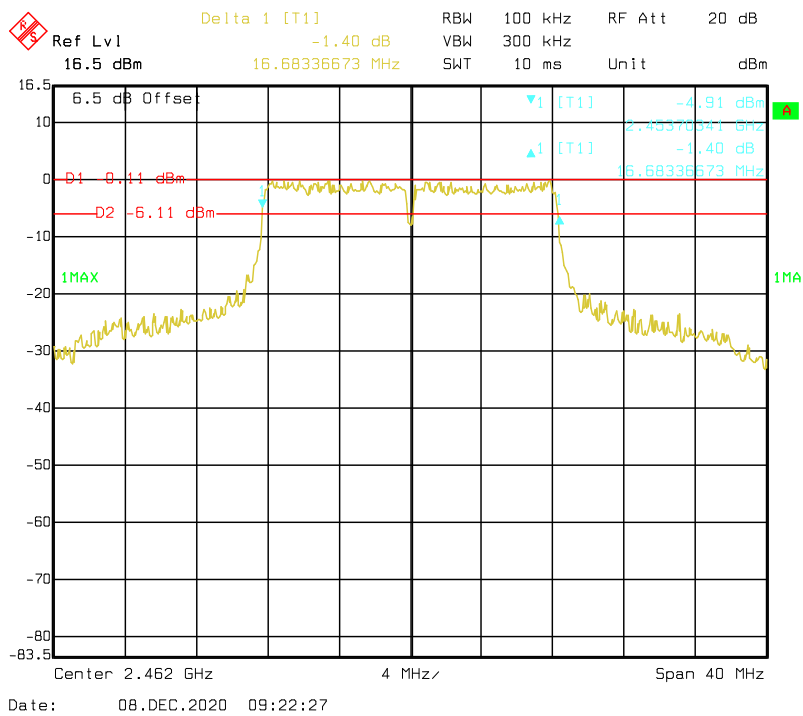
802.11g Low Channel



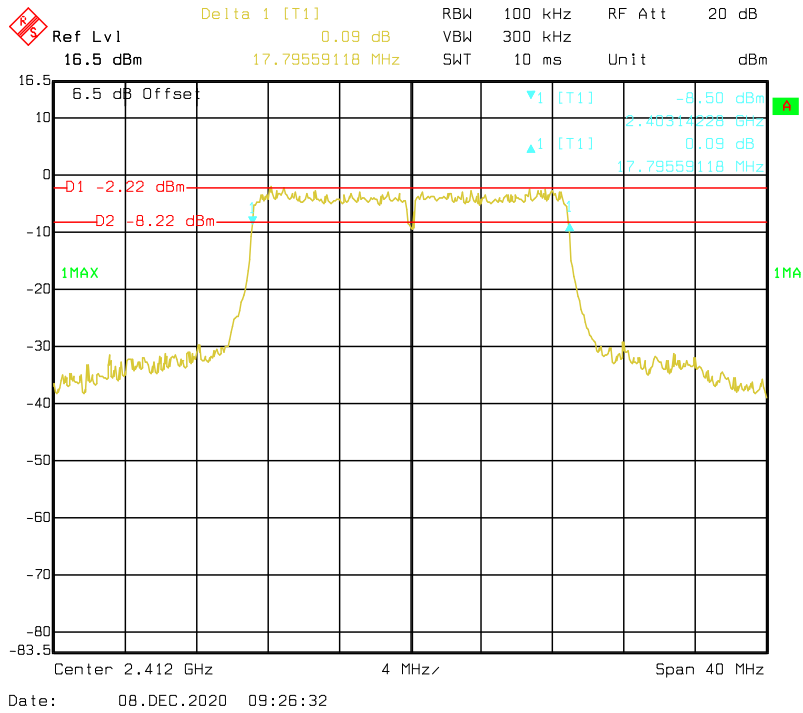
802.11g Middle Channel



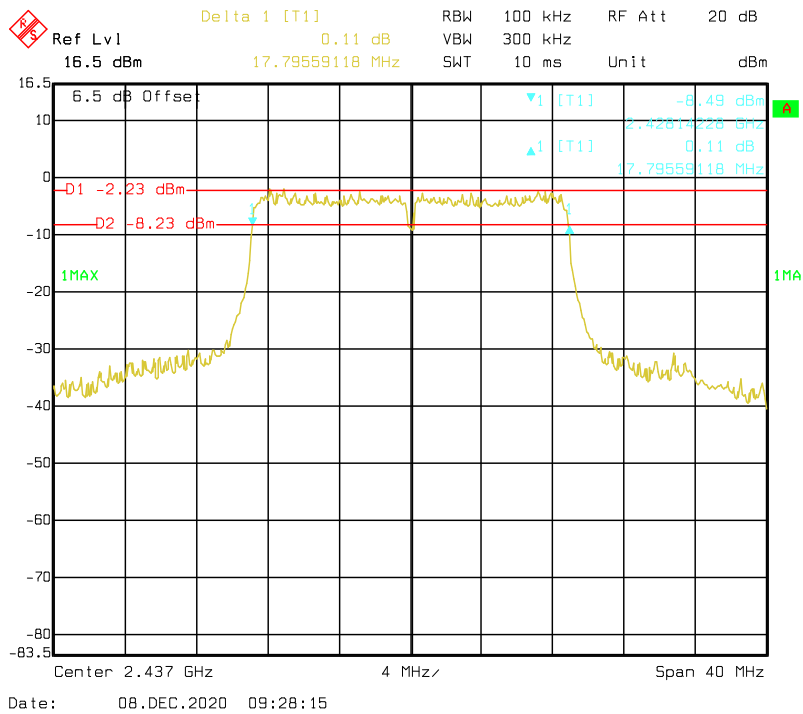
802.11g High Channel



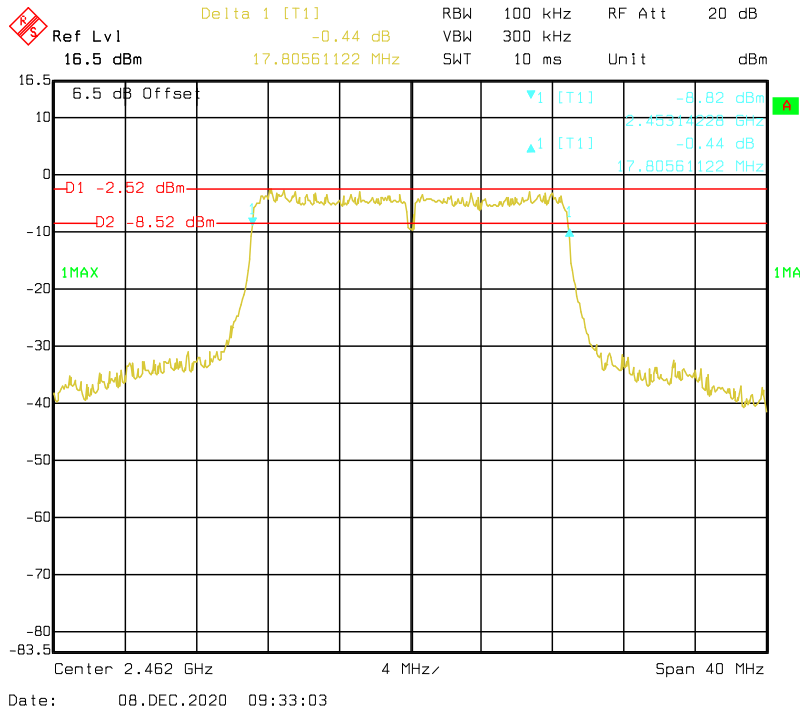
802.11n-HT20 Low Channel



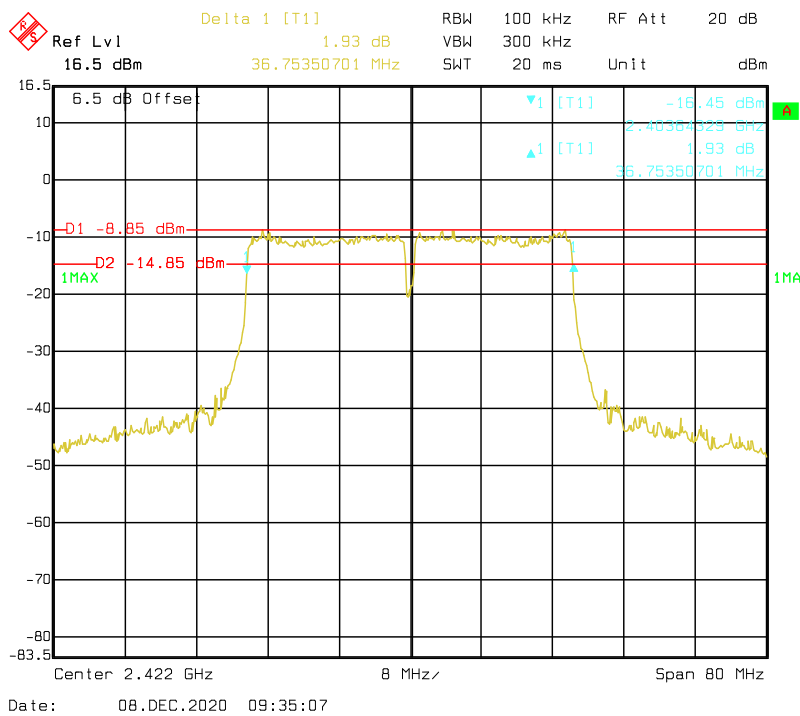
802.11n-HT20 Middle Channel



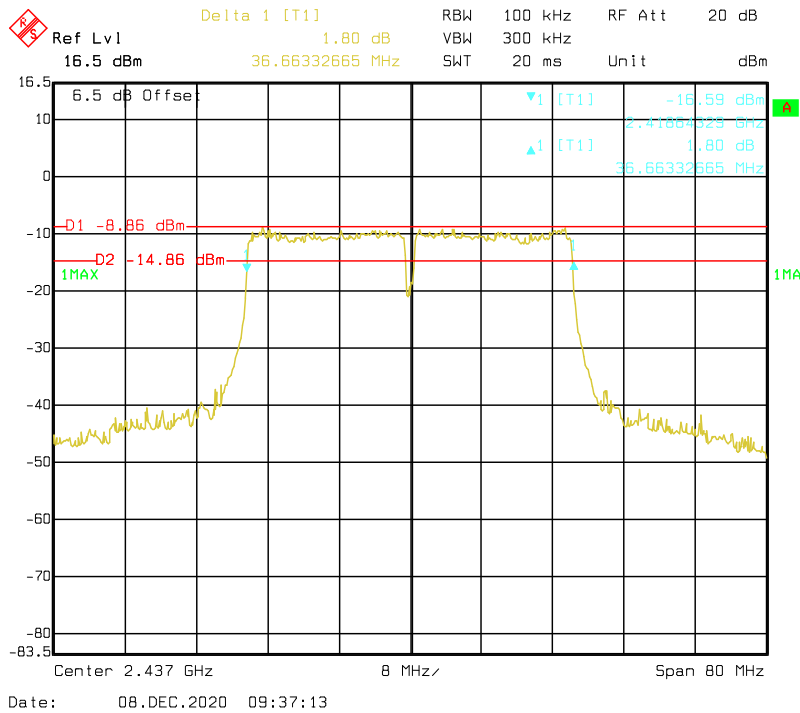
802.11n-HT20 High Channel



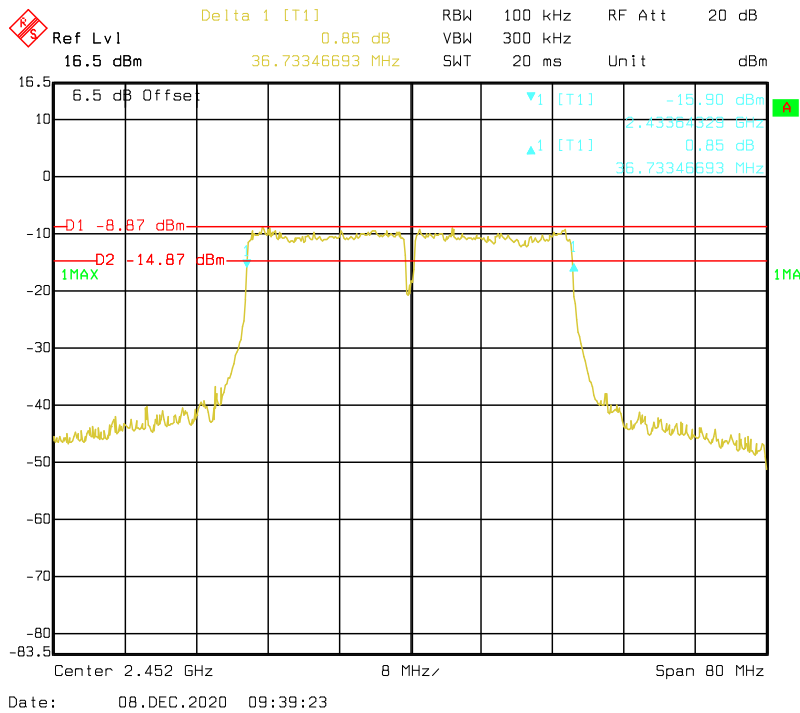
802.11n-HT40 Low Channel



802.11n-HT40 Middle Channel

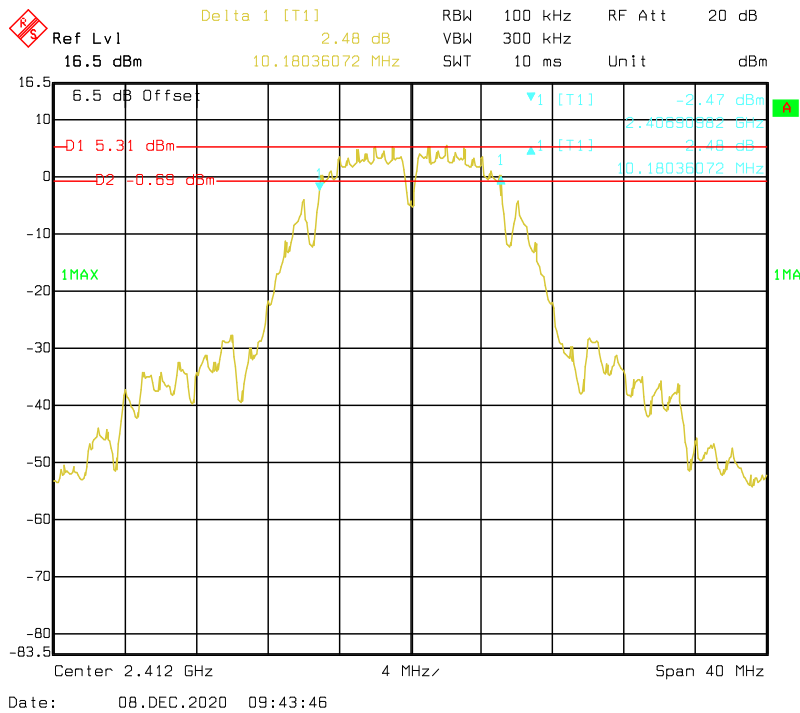


802.11n-HT40 High Channel

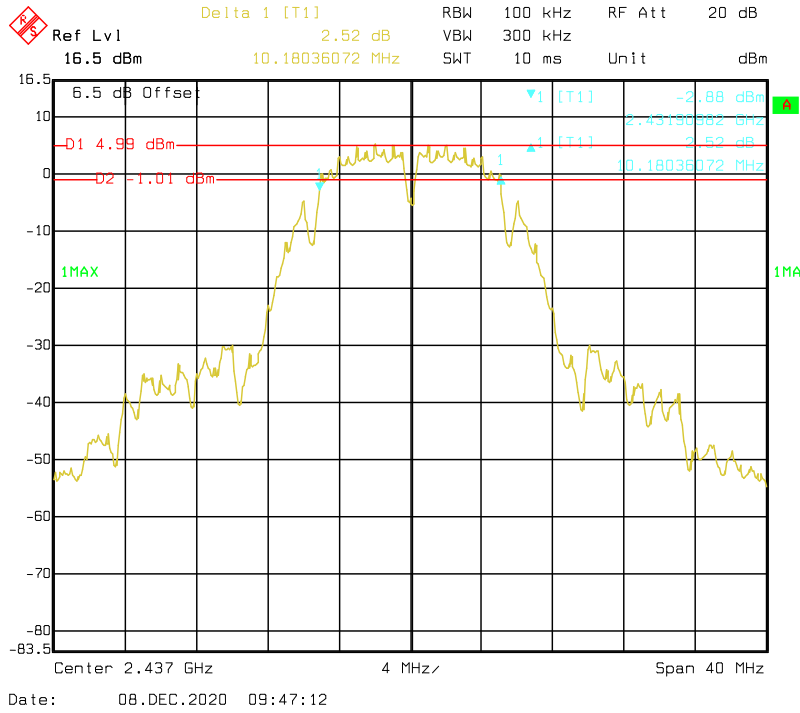


Antenna 2

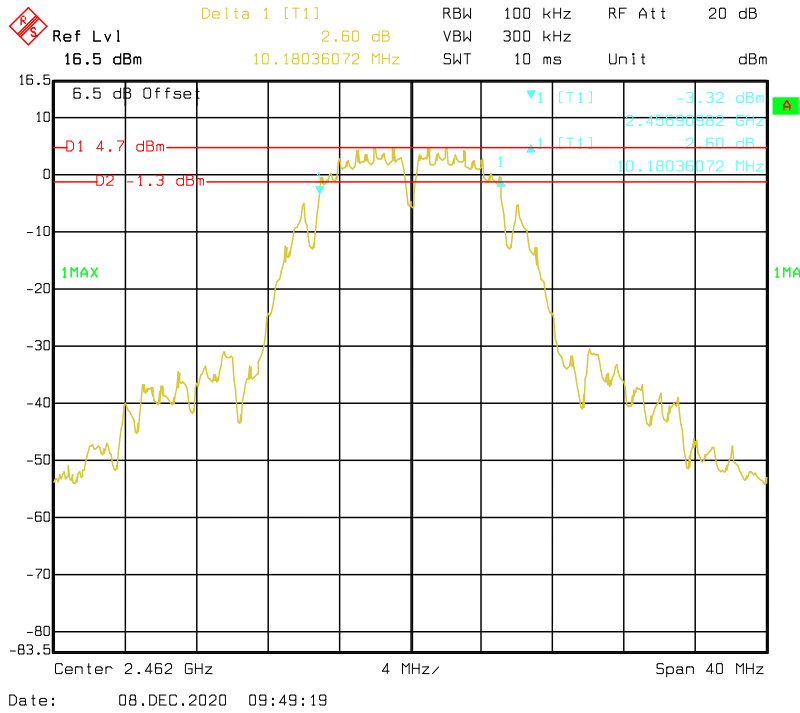
802.11b Low Channel



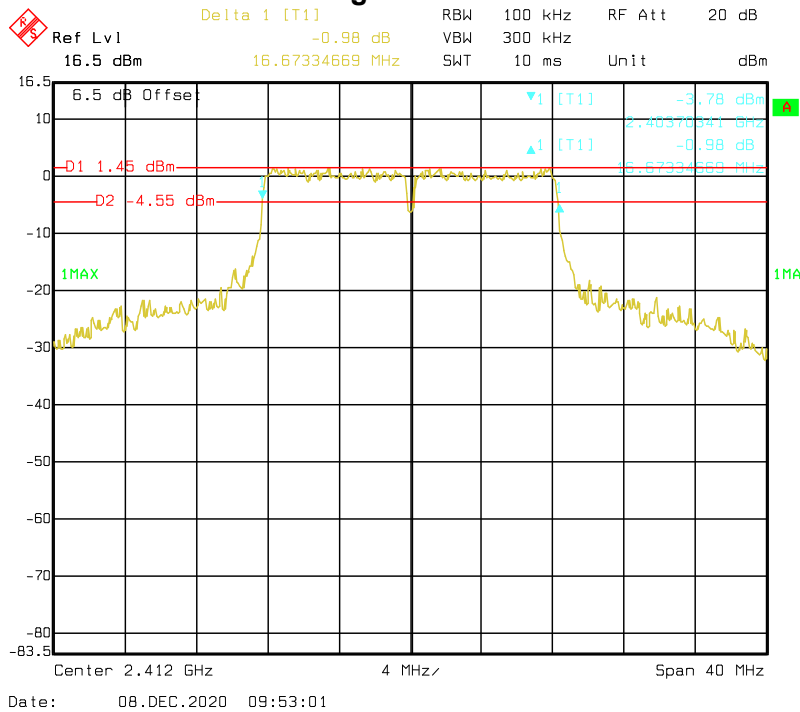
802.11b Middle Channel



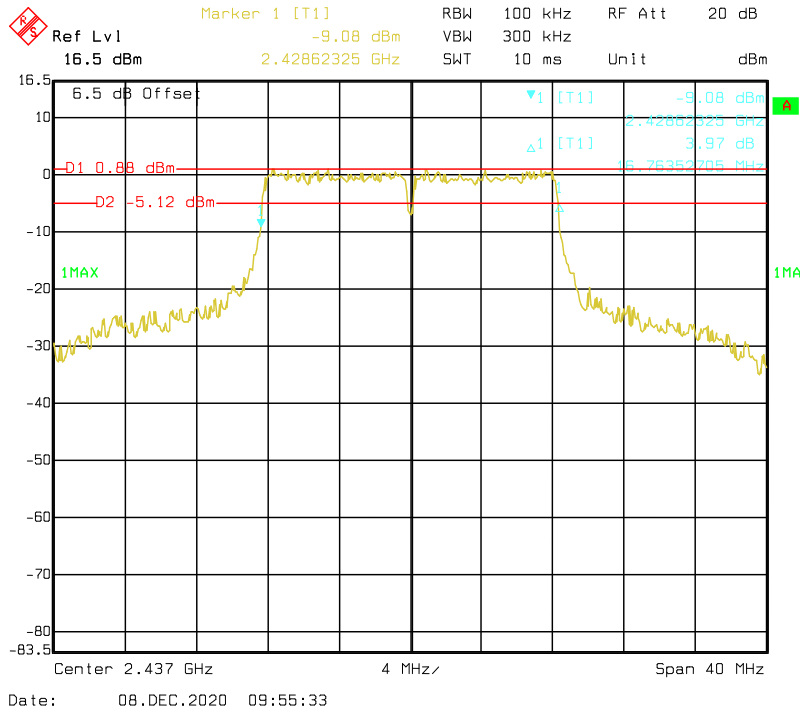
802.11b High Channel



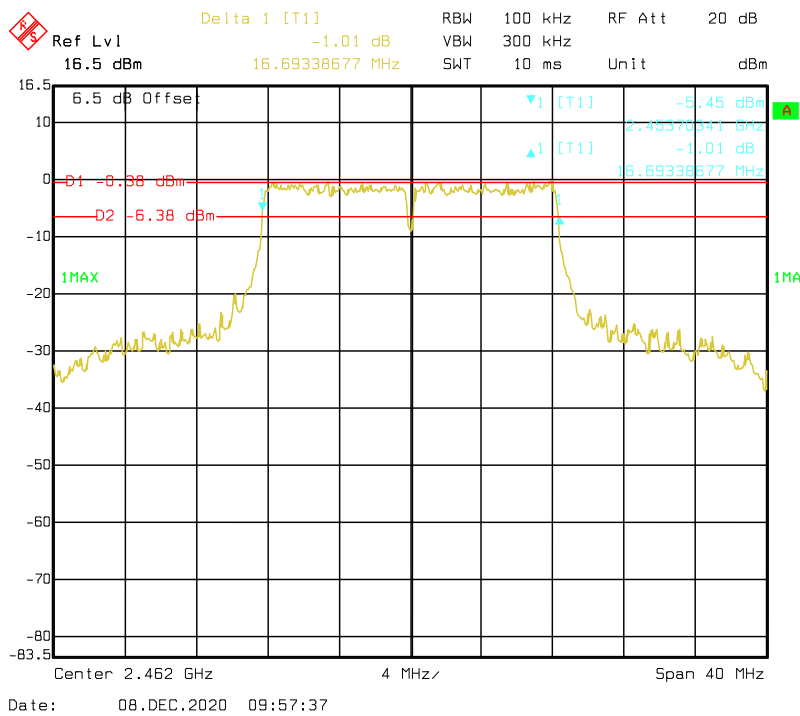
802.11g Low Channel



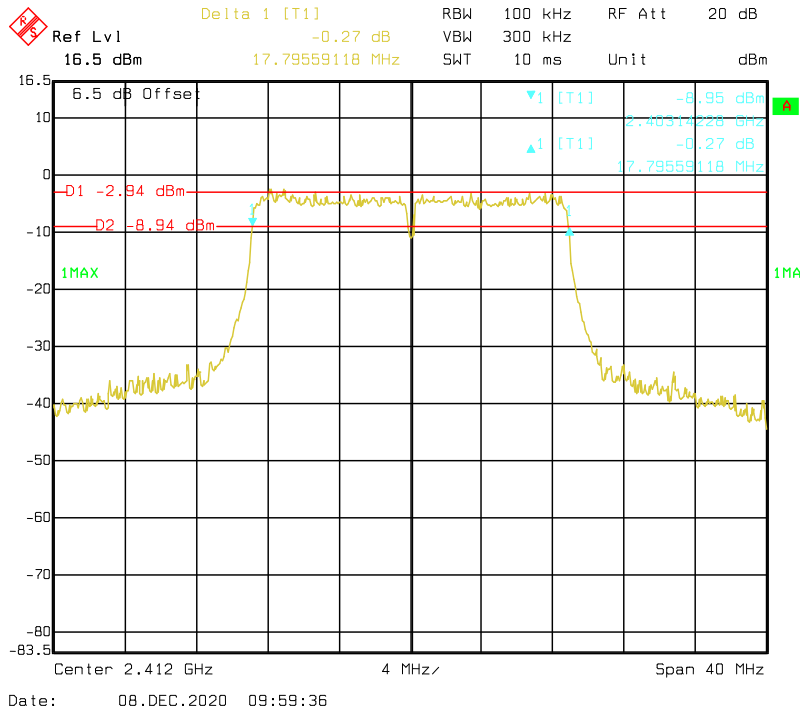
802.11g Middle Channel



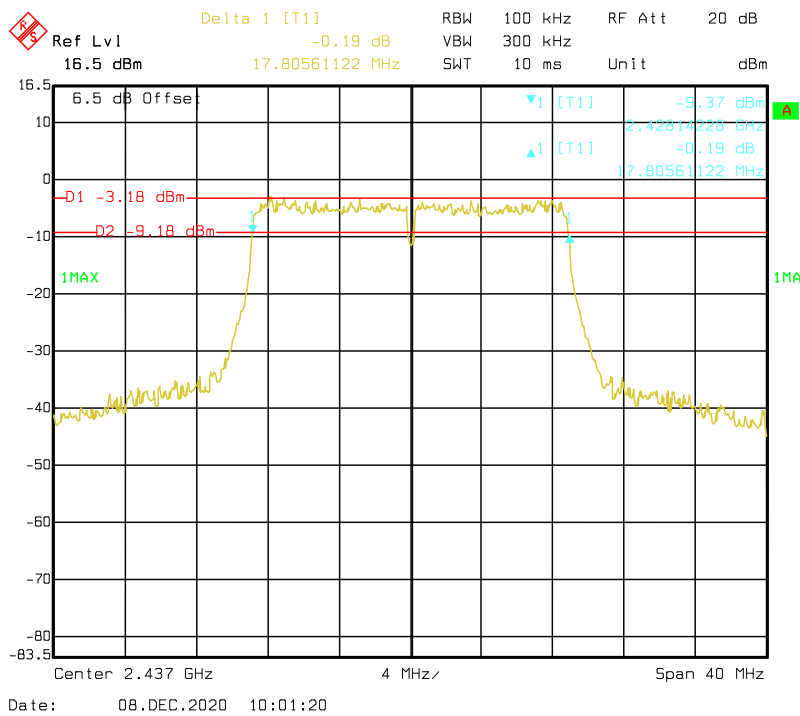
802.11g High Channel



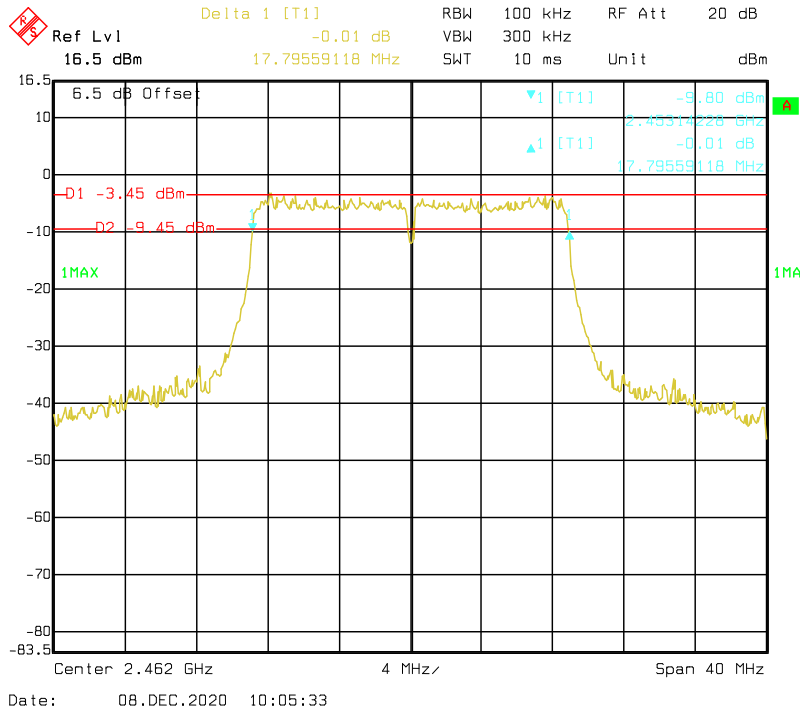
802.11n-HT20 Low Channel



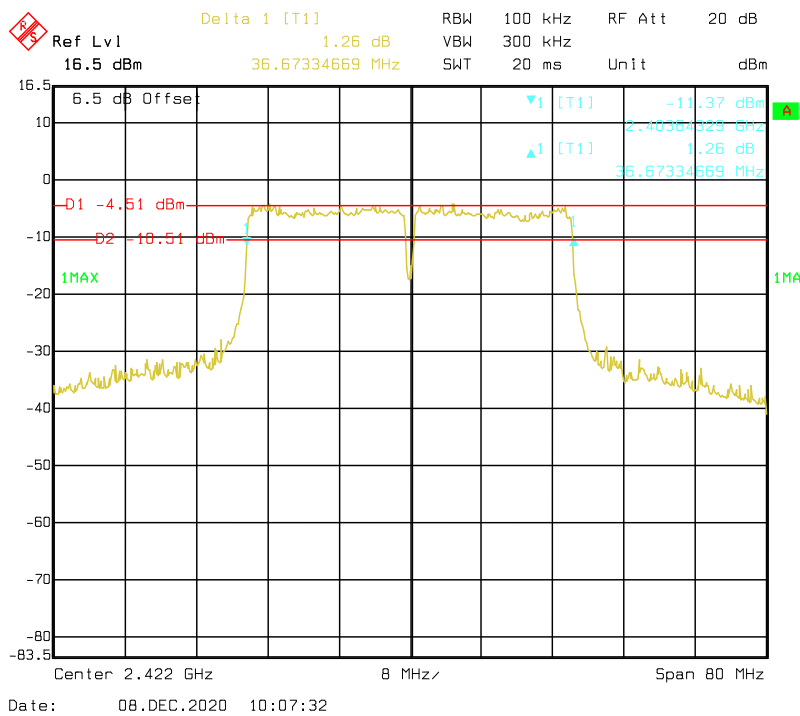
802.11n-HT20 Middle Channel



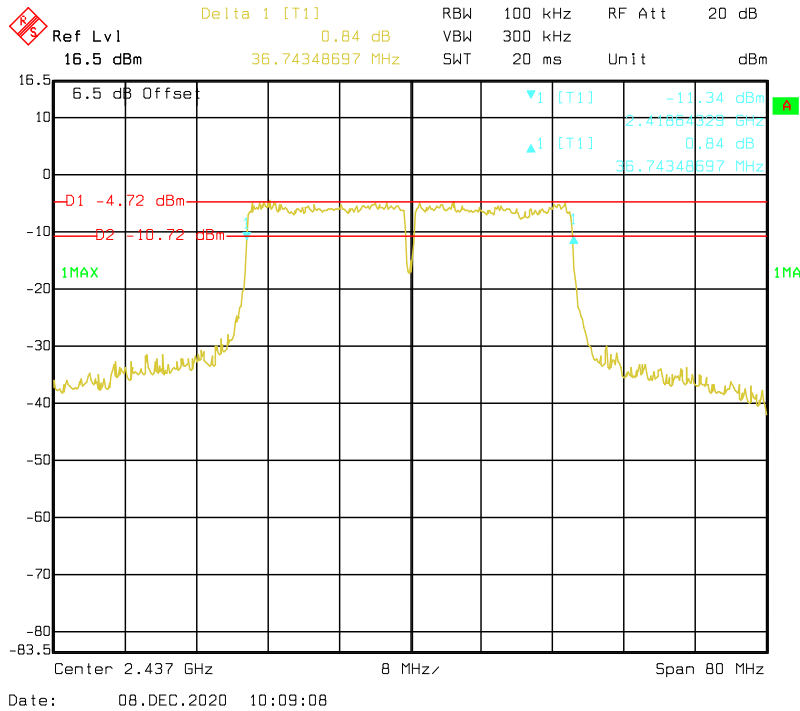
802.11n-HT20 High Channel



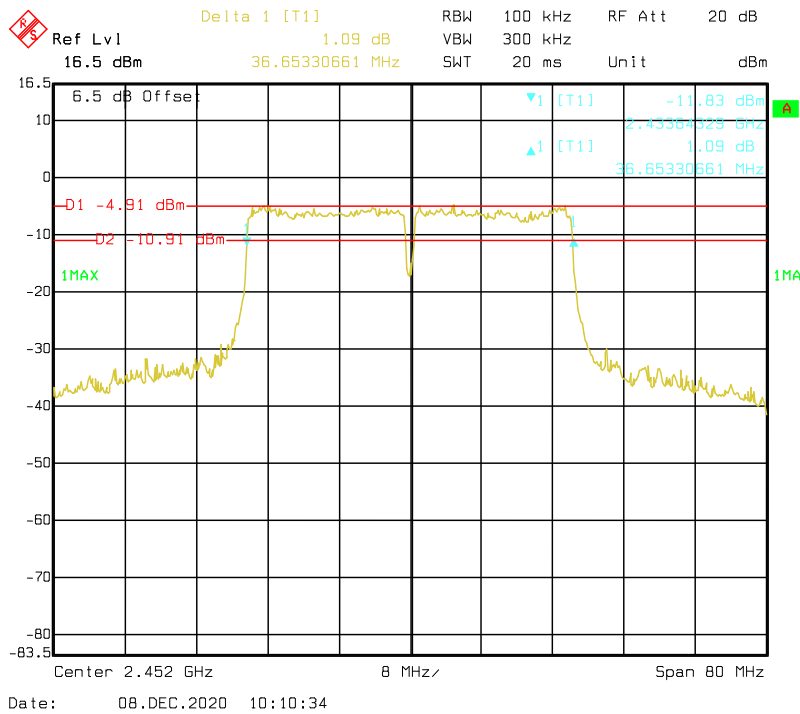
802.11n-HT40 Low Channel



802.11n-HT40 Middle Channel



802.11n-HT40 High Channel



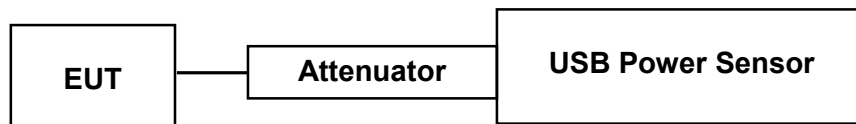
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

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

Test Procedure

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



Test Data

Environmental Conditions

Temperature:	21 °C
Relative Humidity:	53 %
ATM Pressure:	95.6 kPa

The testing was performed by Winfred Wang on 2020-12-08.

Test Mode: Transmitting

Test Result: Compliance. Please refer to the following table.

Mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)			Limit (dBm)
			Chain 1	Chain 2	Total	
802.11b	Low	2412	17.52	18.12	-	30
	Middle	2437	17.87	17.89	-	
	High	2462	17.17	17.68	-	
802.11g	Low	2412	18.53	20.25	-	
	Middle	2437	18.74	20.15	-	
	High	2462	18.62	19.87	-	
802.11n-HT20	Low	2412	17.11	17.15	20.14	
	Middle	2437	17.36	17.04	20.21	
	High	2462	16.91	16.71	19.82	
802.11n-HT40	Low	2422	17.23	20.89	22.44	
	Middle	2437	17.51	20.95	22.57	
	High	2452	17.73	20.78	22.53	

Mode	Channel	Frequency (MHz)	Max Average Conducted Output Power (dBm)			Limit (dBm)
			Chain 1	Chain 2	Total	
802.11b	Low	2412	15.33	15.31	-	30
	Middle	2437	15.46	15.09	-	
	High	2462	14.84	14.88	-	
802.11g	Low	2412	14.41	14.60	-	
	Middle	2437	14.55	14.42	-	
	High	2462	14.22	13.82	-	
802.11n-HT20	Low	2412	10.75	10.35	13.56	
	Middle	2437	10.24	9.85	13.06	
	High	2462	9.77	9.57	12.68	
802.11n-HT40	Low	2422	9.81	14.85	16.03	
	Middle	2437	10.09	14.73	16.01	
	High	2452	10.45	14.53	15.96	

Note:

1. The max antenna gain* is 3.0dBi
2. 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 $N_{ANT} \leq 4$;

So:

Directional gain = $G_{ANT} + \text{Array Gain} = 3.0\text{dBi} < 6.0\text{dBi}$.

No power limit was reduced in MIMO mode.

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

Applicable Standard

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

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	21 °C
Relative Humidity:	53 %
ATM Pressure:	95.6 kPa

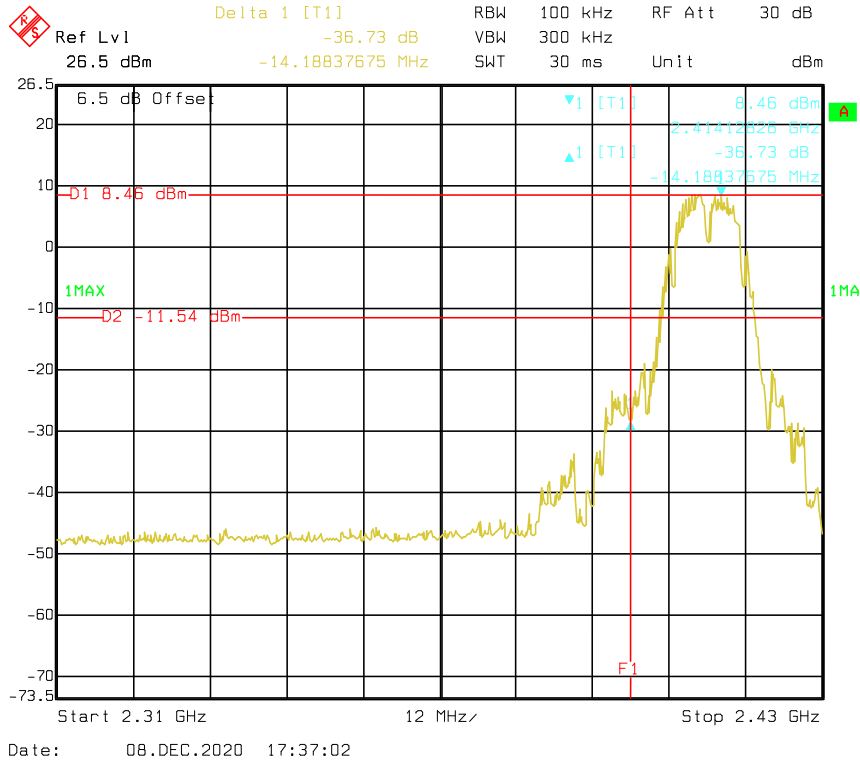
The testing was performed by Winfred Wang on 2020-12-08.

Test mode: Transmitting

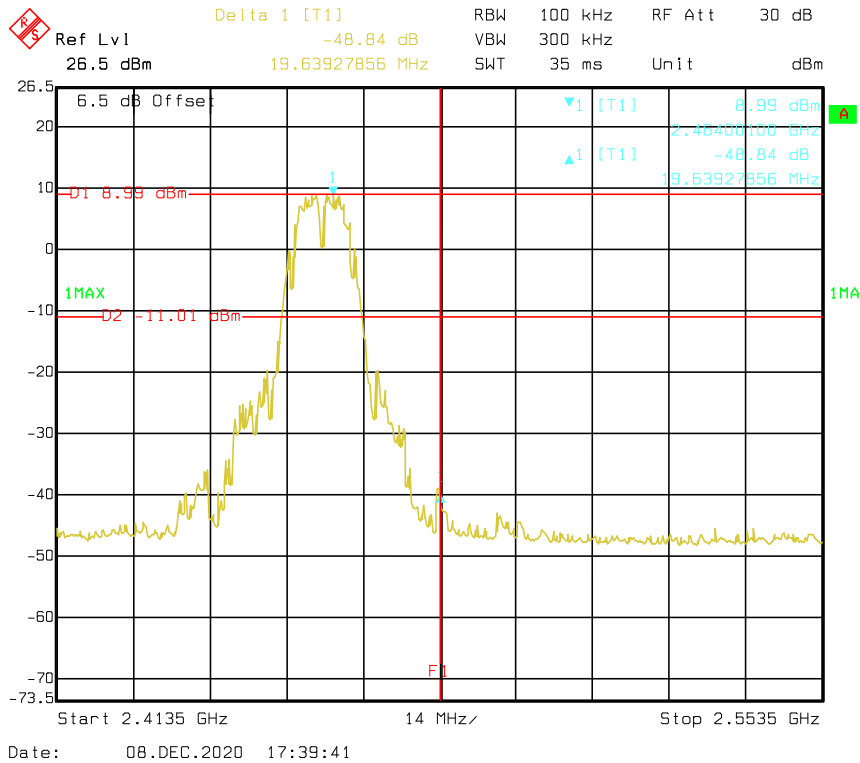
Test Result: Compliance. Please refer to following plots.

Chain 1

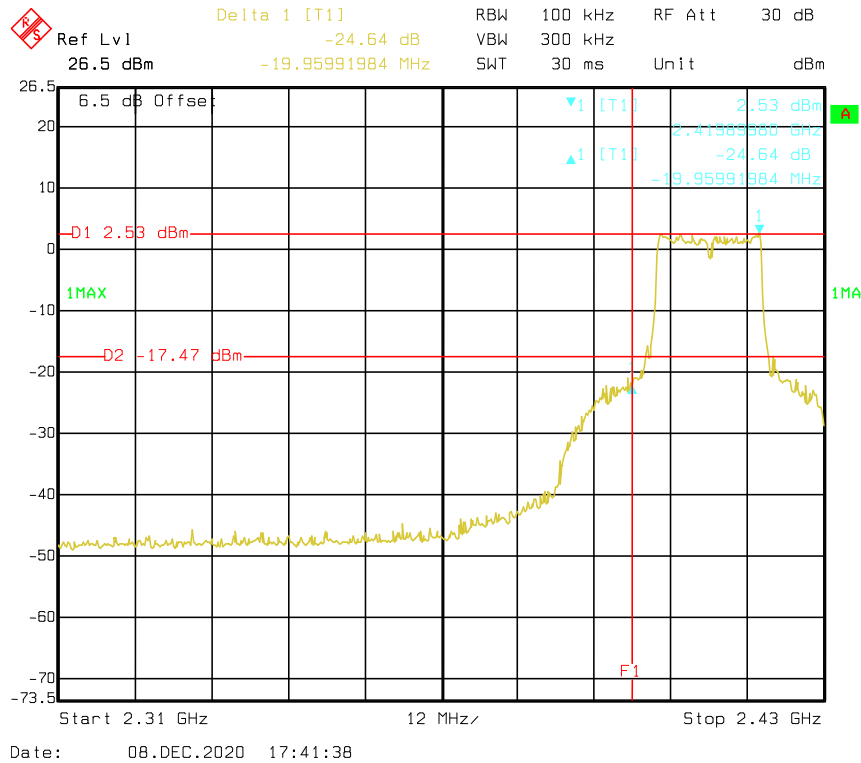
802.11b: Band Edge, Left Side



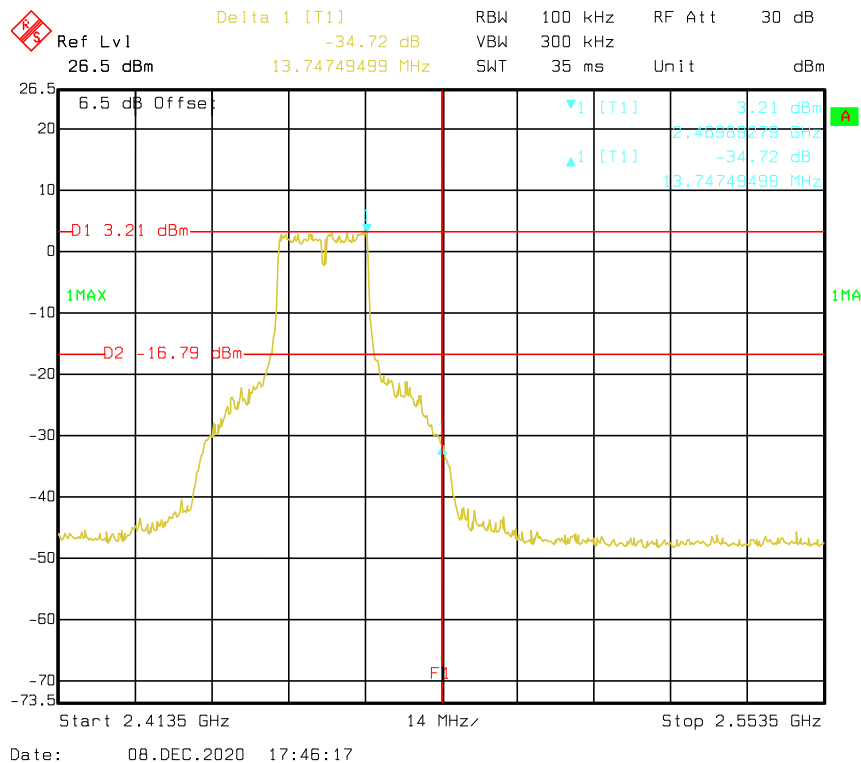
802.11b: Band Edge, Right Side



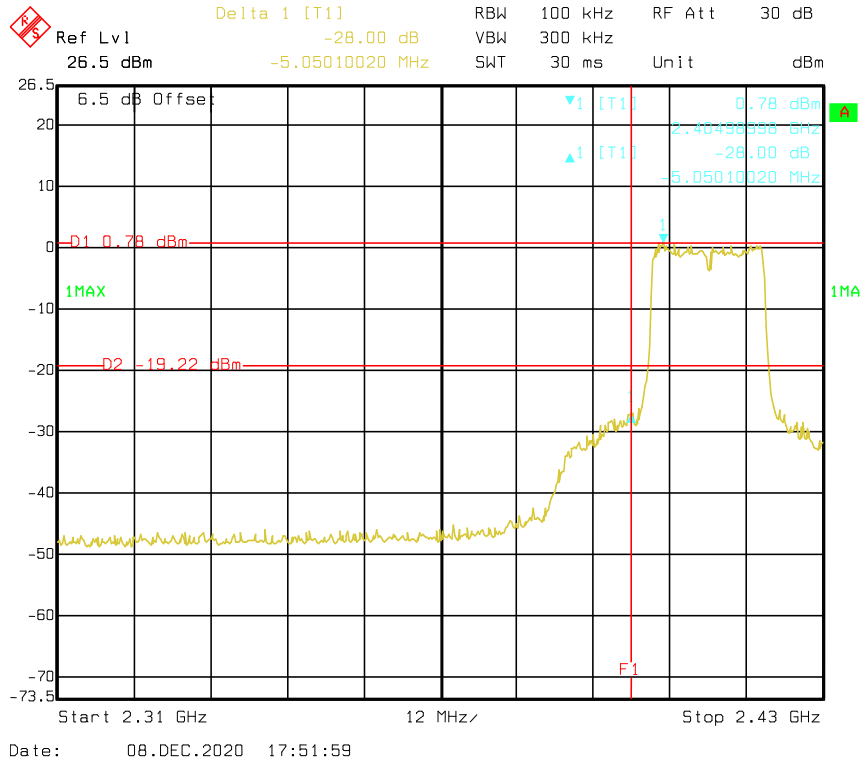
802.11g: Band Edge, Left Side



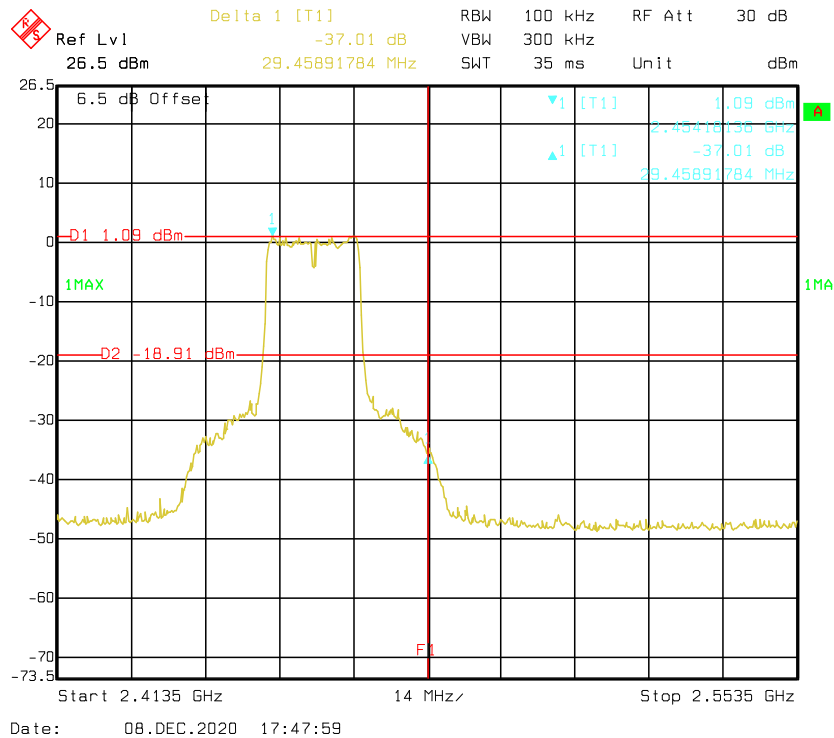
802.11g: Band Edge, Right Side



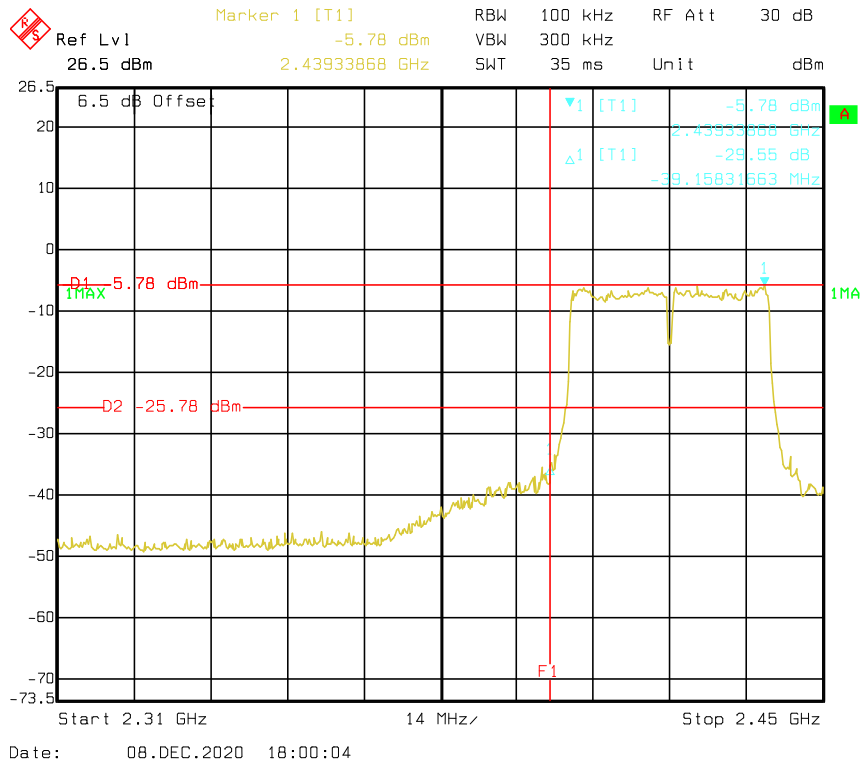
802.11n-HT20 Band Edge, Left Side



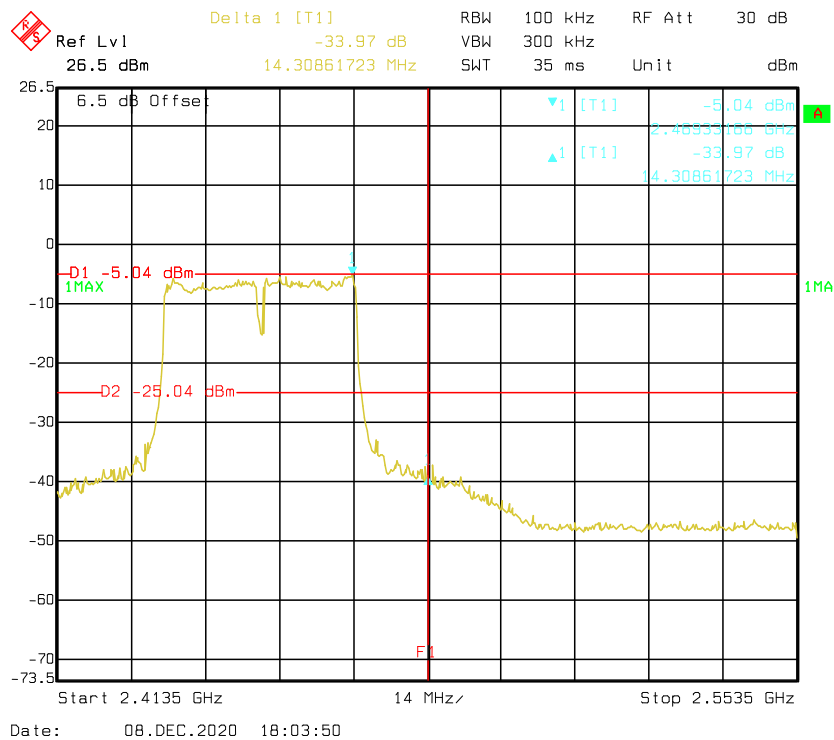
802.11n-HT20 Band Edge, Right Side



802.11n-HT40 Band Edge, Left Side

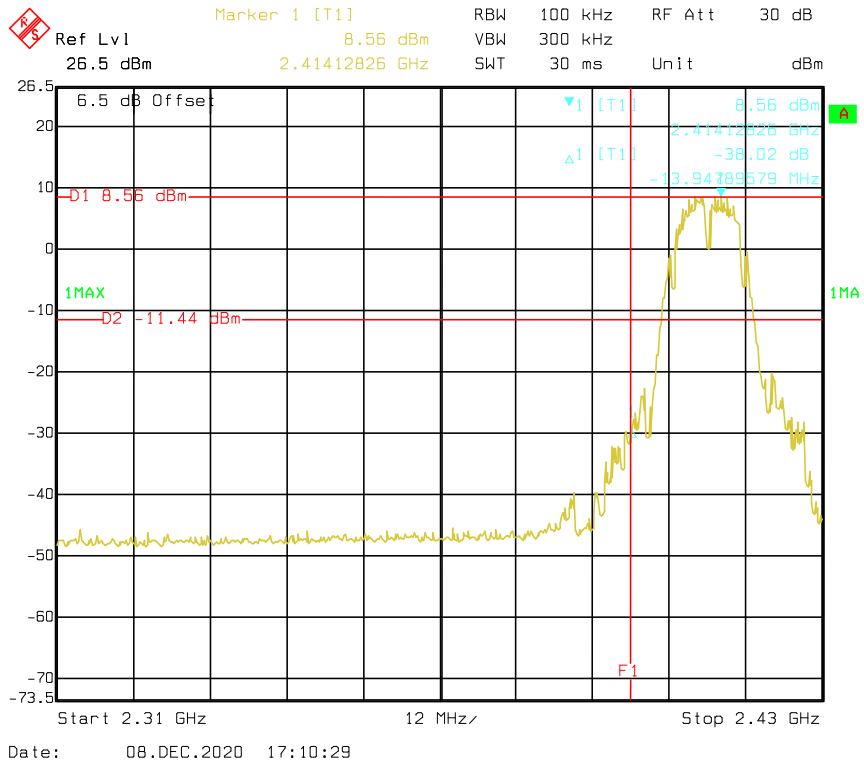


802.11n-HT40 Band Edge, Right Side

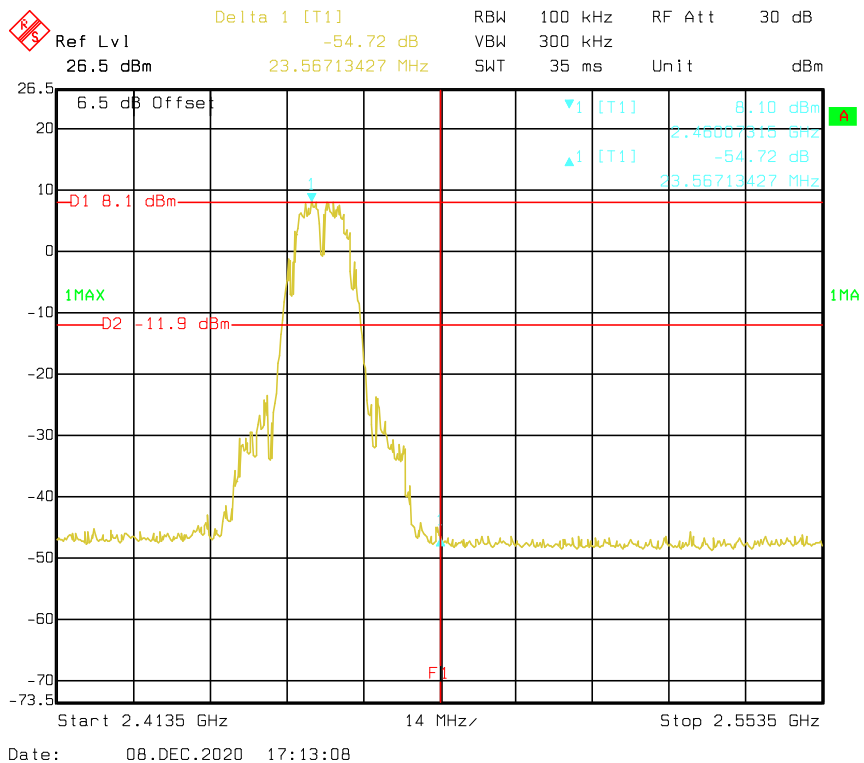


Chain 2

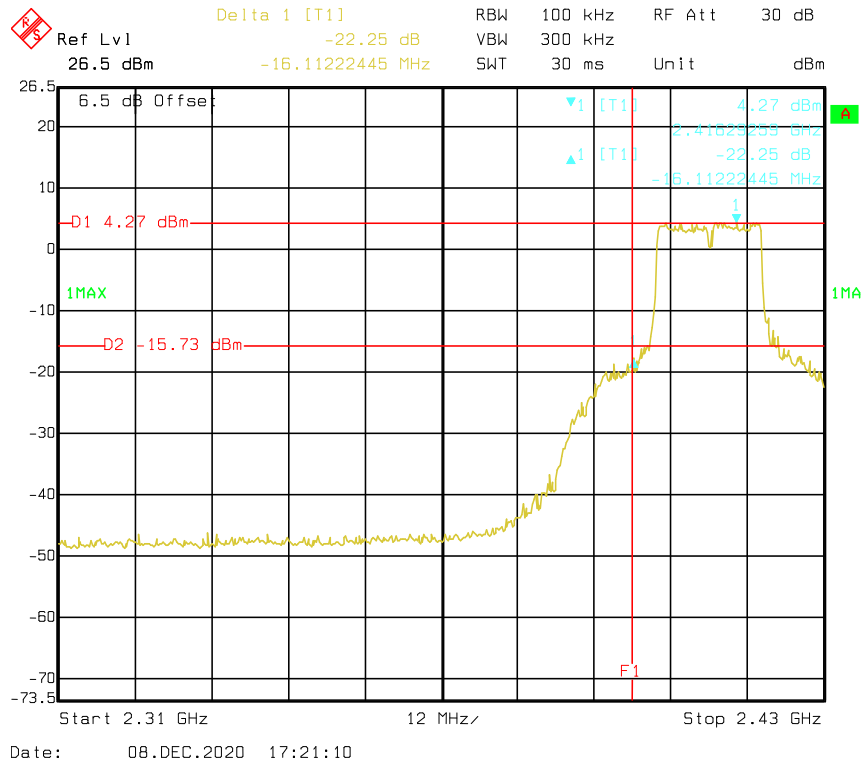
802.11b: Band Edge, Left Side



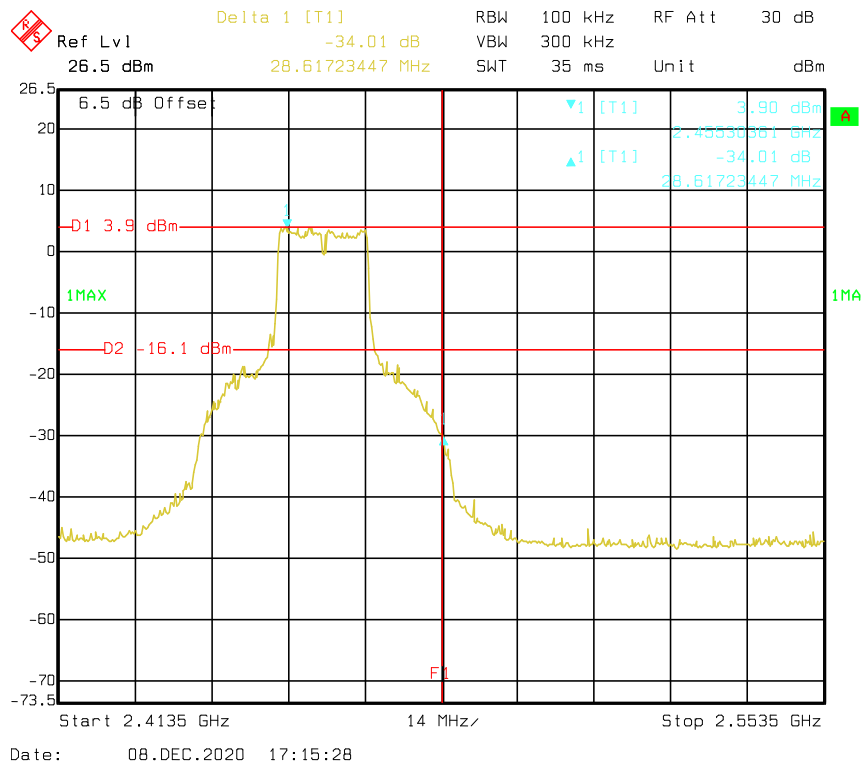
802.11b: Band Edge, Right Side



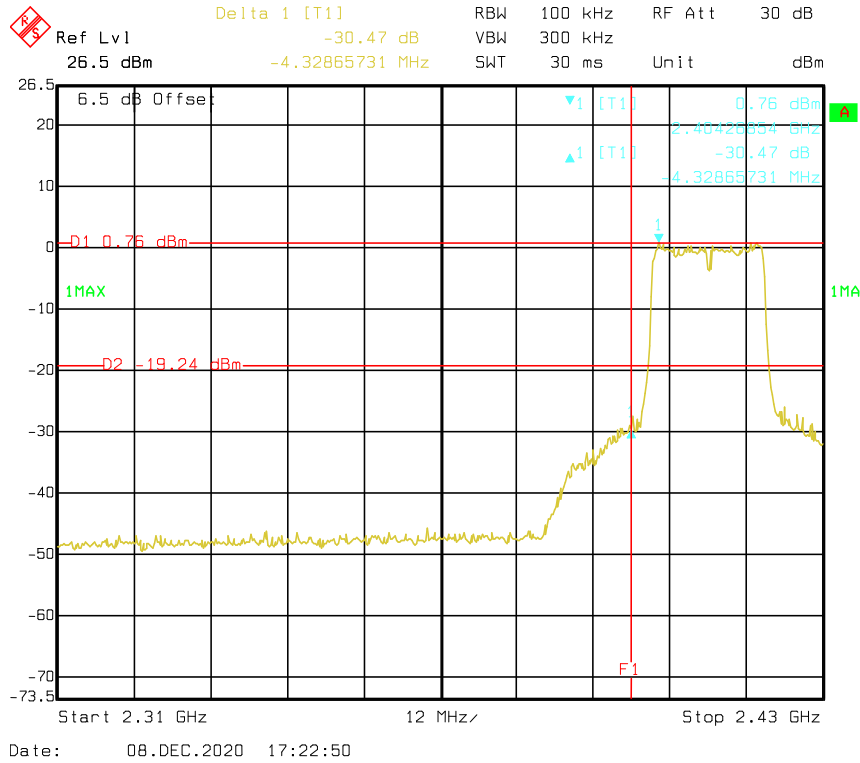
802.11g: Band Edge, Left Side



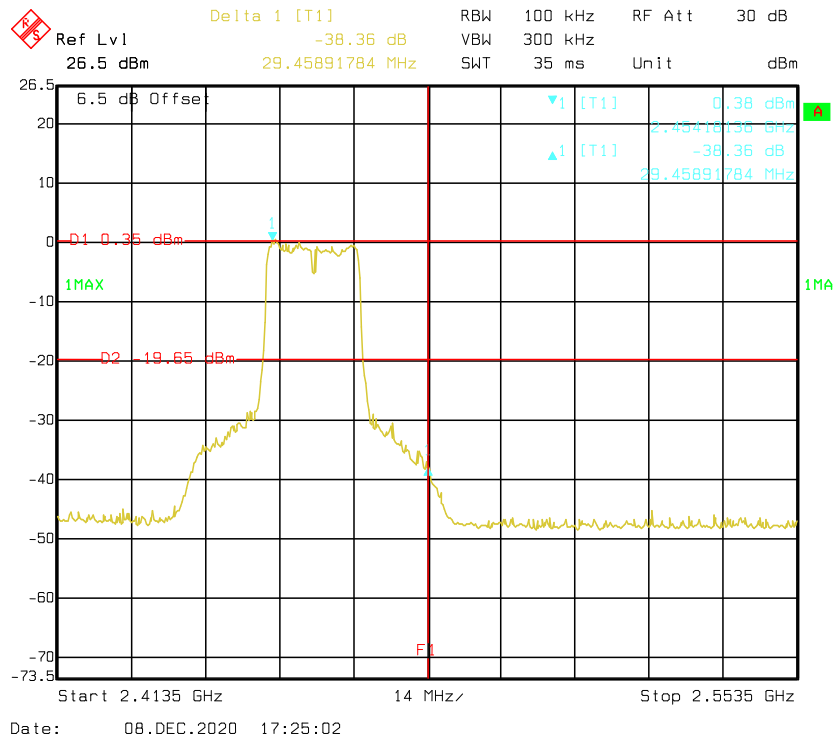
802.11g: Band Edge, Right Side



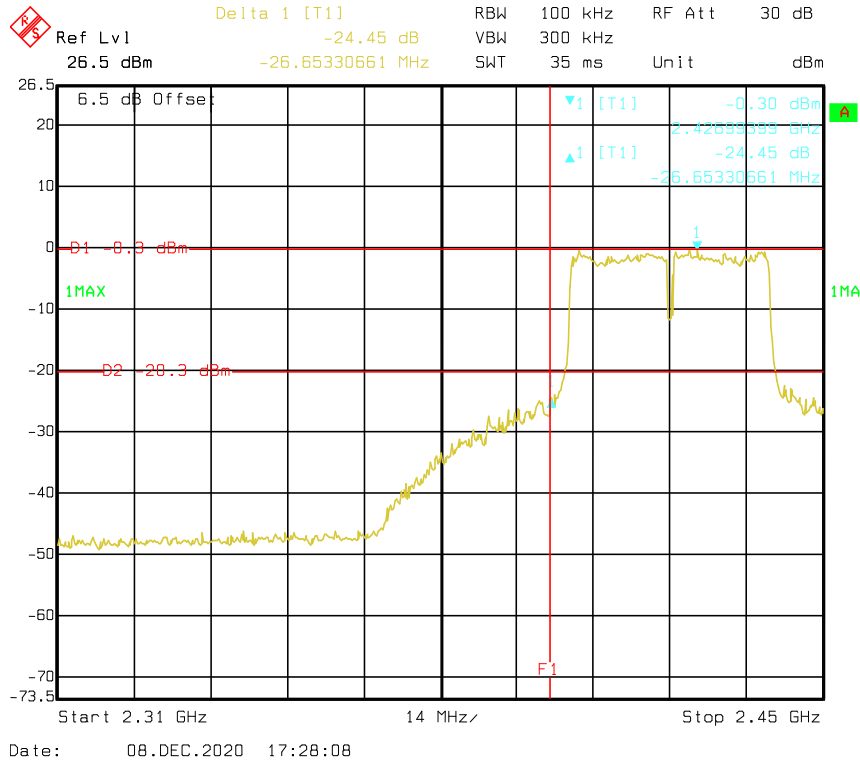
802.11n-HT20 Band Edge, Left Side



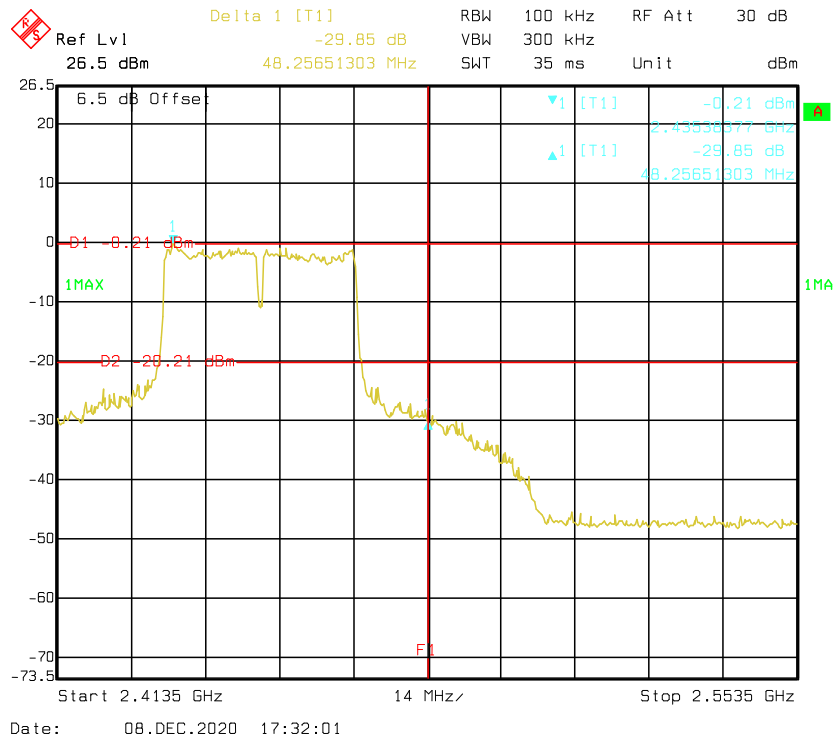
802.11n-HT20 Band Edge, Right Side



802.11n-HT40 Band Edge, Left Side



802.11n-HT40 Band Edge, 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

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Data

Environmental Conditions

Temperature:	21 °C
Relative Humidity:	53 %
ATM Pressure:	95.6 kPa

The testing was performed by Winfred Wang on 2020-12-08.

Test Mode: Transmitting

Test Result: Compliance. Please refer to the following table and plots

Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)			Limit (dBm/3kHz)
			Chain 1	Chain 2	Total	
802.11b	Low	2412	-13.30	-13.11	-	≤8
	Middle	2437	-13.17	-13.35	-	
	High	2462	-13.31	-13.75	-	
802.11g	Low	2412	-14.07	-12.67	-	
	Middle	2437	-14.33	-13.14	-	
	High	2462	-14.47	-14.46	-	
802.11n-HT20	Low	2412	-15.88	-16.05	-12.95	
	Middle	2437	-16.56	-16.56	-13.55	
	High	2462	-16.46	-17.17	-13.79	
802.11n-HT40	Low	2422	-18.28	-14.17	-12.75	
	Middle	2437	-18.42	-15.05	-13.41	
	High	2452	-16.87	-15.22	-12.96	

Note:

1. The max antenna gain* is 3.0dBi
2. The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

$$\text{Array Gain} = 10 \log(N_{\text{ANT}}/N_{\text{SS}}) \text{ dB.}$$

So:

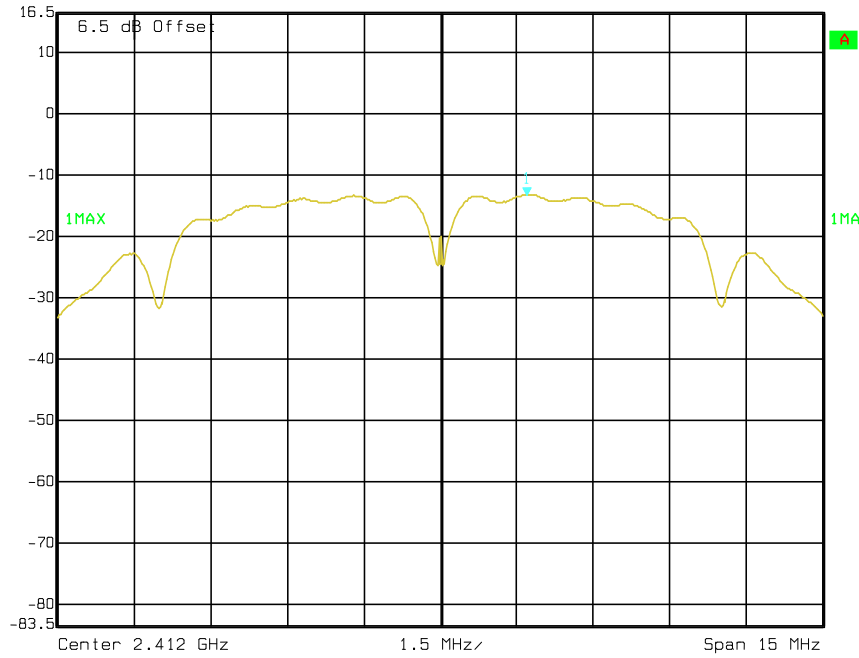
$$\text{Directional gain} = G_{\text{ANT}} + \text{Array Gain} = 3.0 + 10 \cdot \log(2) = 6.0 \text{ dBi}$$

No power density limit was reduced in MIMO mode.

Chain 1

Power Spectral Density, 802.11b Low Channel

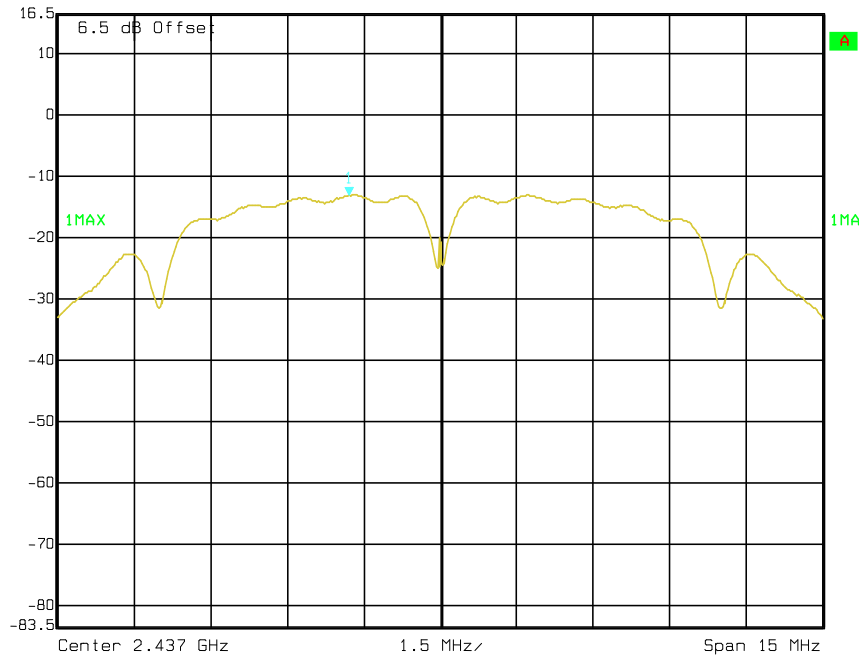
Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -13.30 dBm VBW 10 kHz
16.5 dBm 2.41369840 GHz SWT 4.2 s Unit dBm



Date: 08.DEC.2020 13:09:36

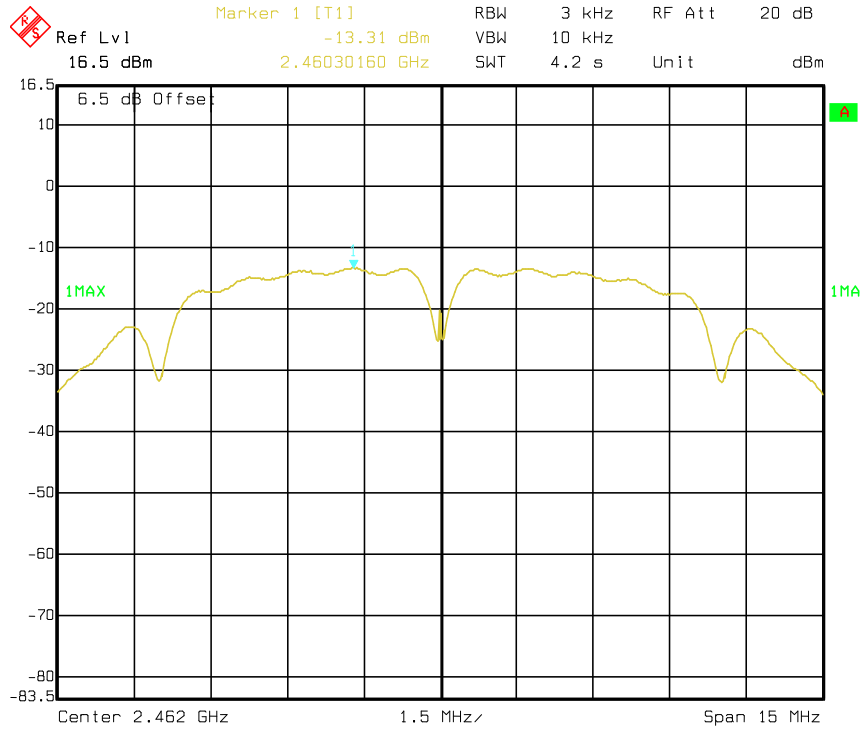
Power Spectral Density, 802.11b Middle Channel

Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -13.17 dBm VBW 10 kHz
16.5 dBm 2.43521142 GHz SWT 4.2 s Unit dBm



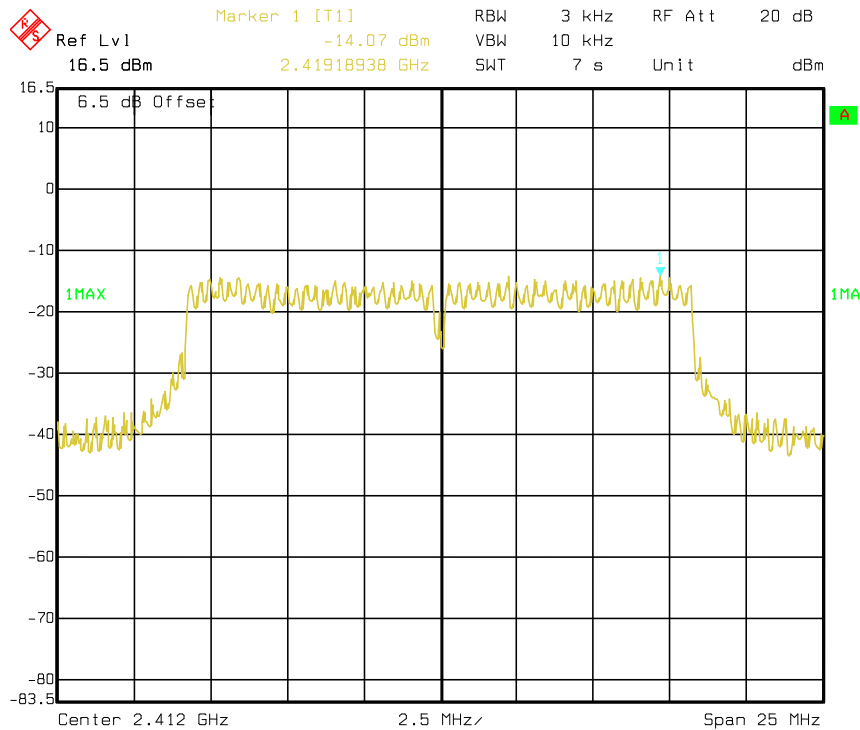
Date: 08.DEC.2020 13:10:34

Power Spectral Density, 802.11b High Channel



Date: 08.DEC.2020 13:11:26

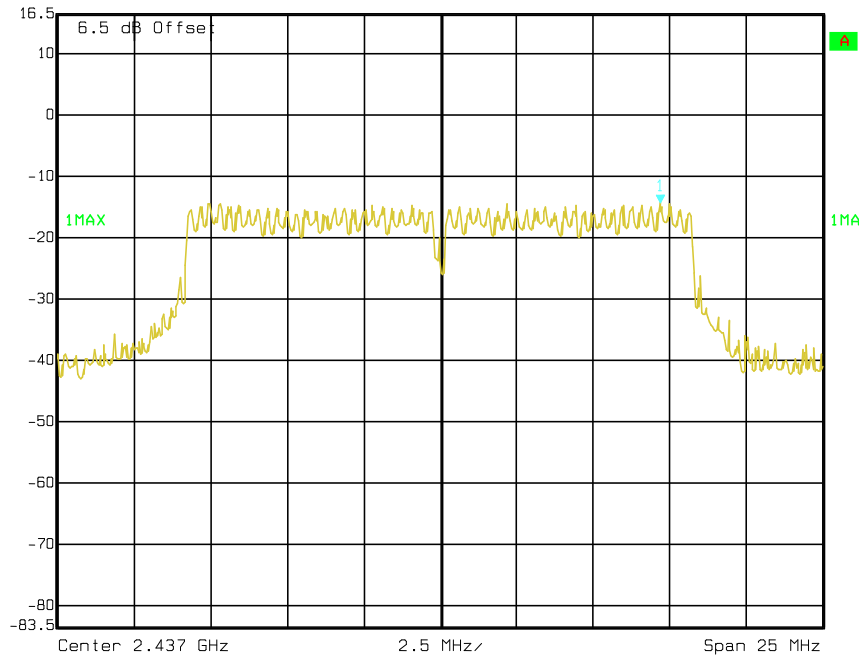
Power Spectral Density, 802.11g Low Channel



Date: 08.DEC.2020 13:12:33

Power Spectral Density, 802.11g Middle Channel

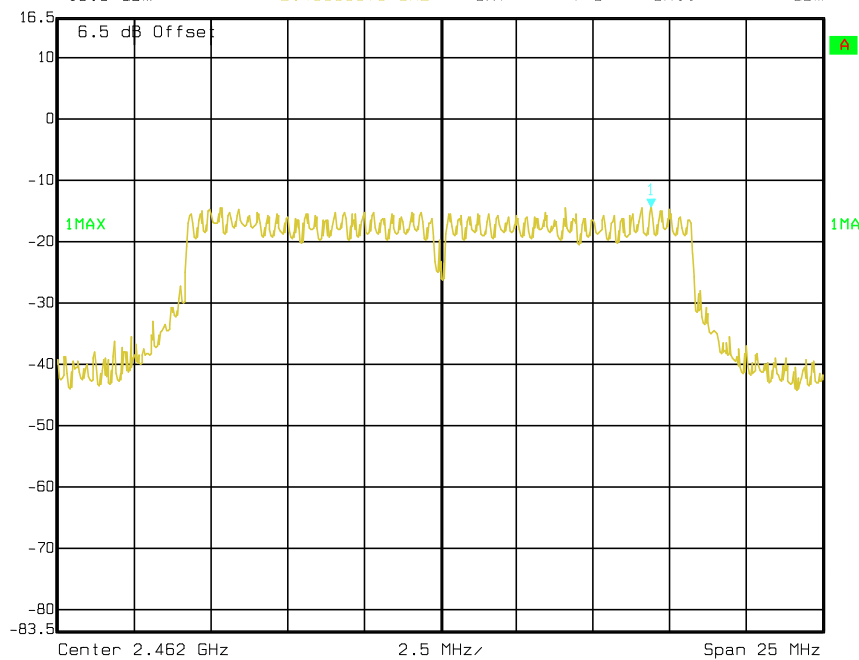
Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -14.33 dBm VBW 10 kHz
16.5 dBm 2.44418938 GHz SWT 7 s Unit dBm



Date: 08.DEC.2020 13:13:37

Power Spectral Density, 802.11g High Channel

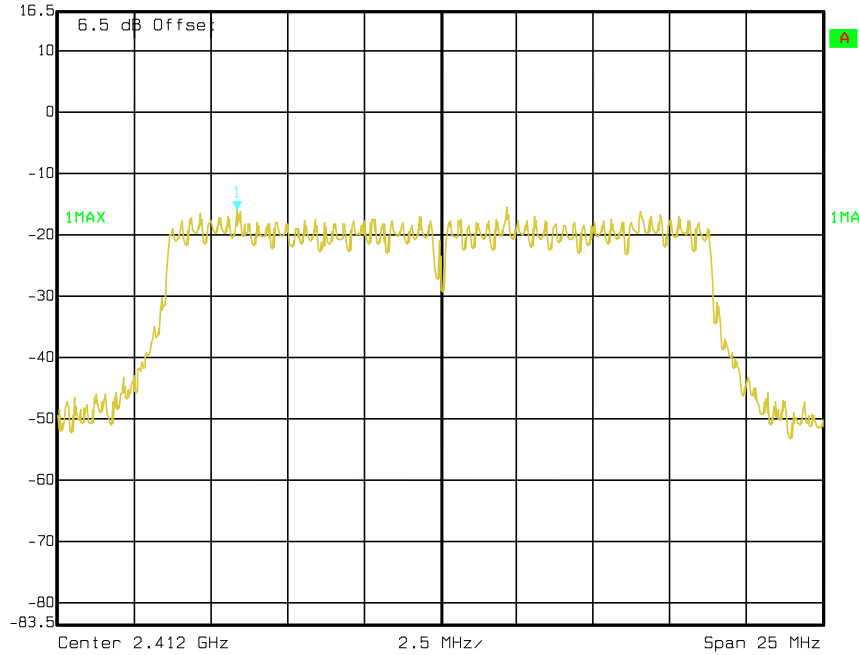
Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -14.47 dBm VBW 10 kHz
16.5 dBm 2.46888878 GHz SWT 7 s Unit dBm



Date: 08.DEC.2020 13:14:32

Power Spectral Density, 802.11n-HT20 Low Channel

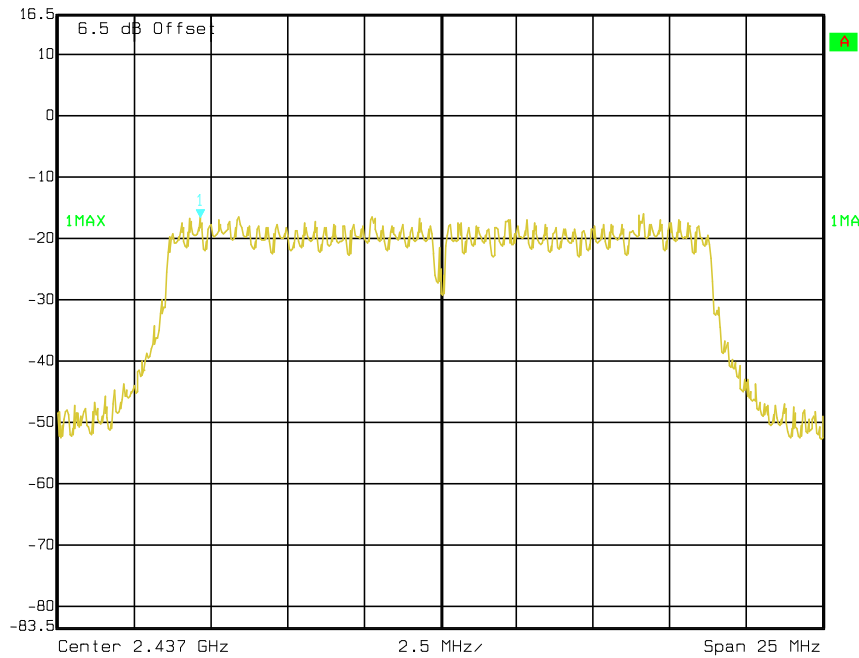
Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -15.88 dBm VBW 10 kHz
16.5 dBm 2.40536172 GHz SWT 7 s Unit dBm



Date: 08.DEC.2020 13:15:46

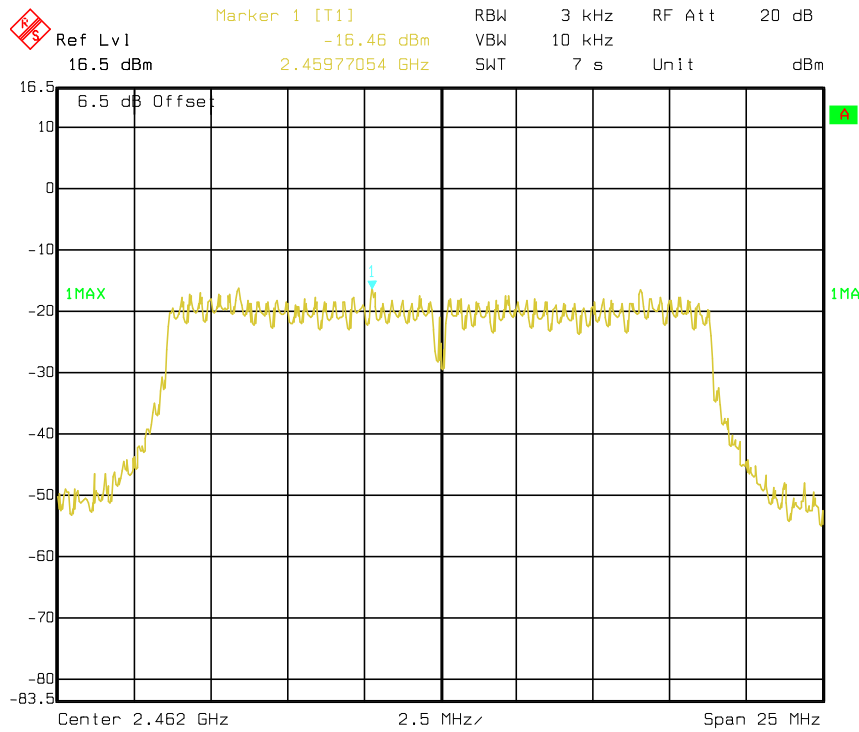
Power Spectral Density, 802.11n-HT20 Middle Channel

Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -16.56 dBm VBW 10 kHz
16.5 dBm 2.42915932 GHz SWT 7 s Unit dBm



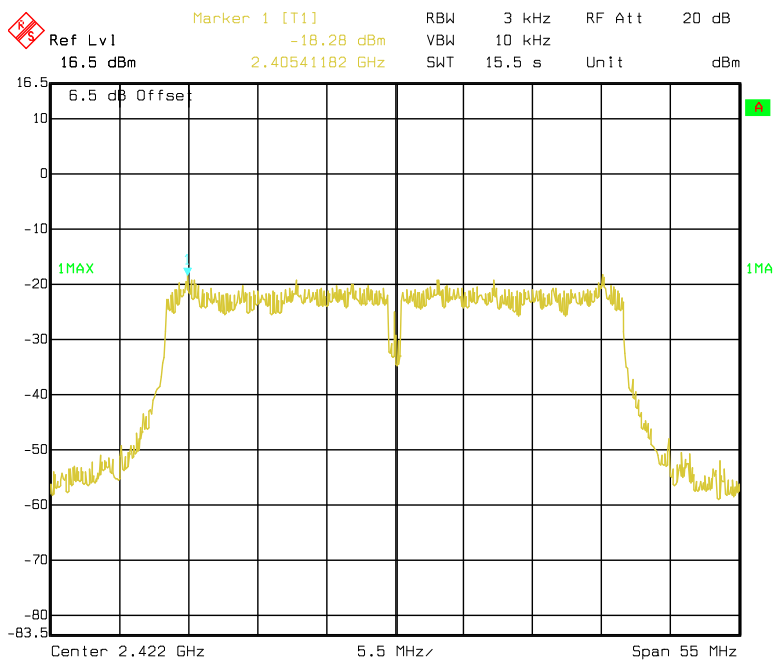
Date: 08.DEC.2020 13:16:53

Power Spectral Density, 802.11n-HT20 High Channel



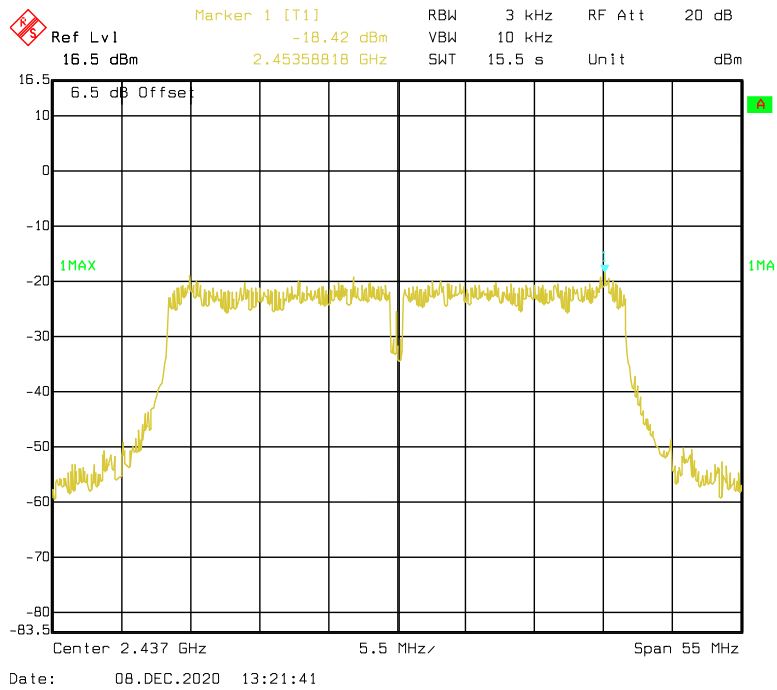
Date: 08.DEC.2020 13:17:51

Power Spectral Density, 802.11n-HT40 Low Channel

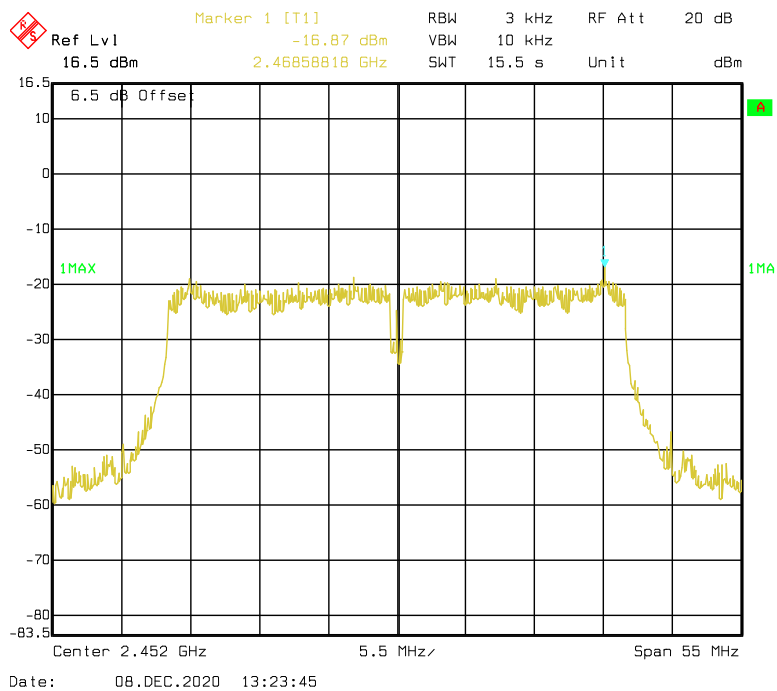


Date: 08.DEC.2020 13:20:10

Power Spectral Density, 802.11n-HT40 Middle Channel



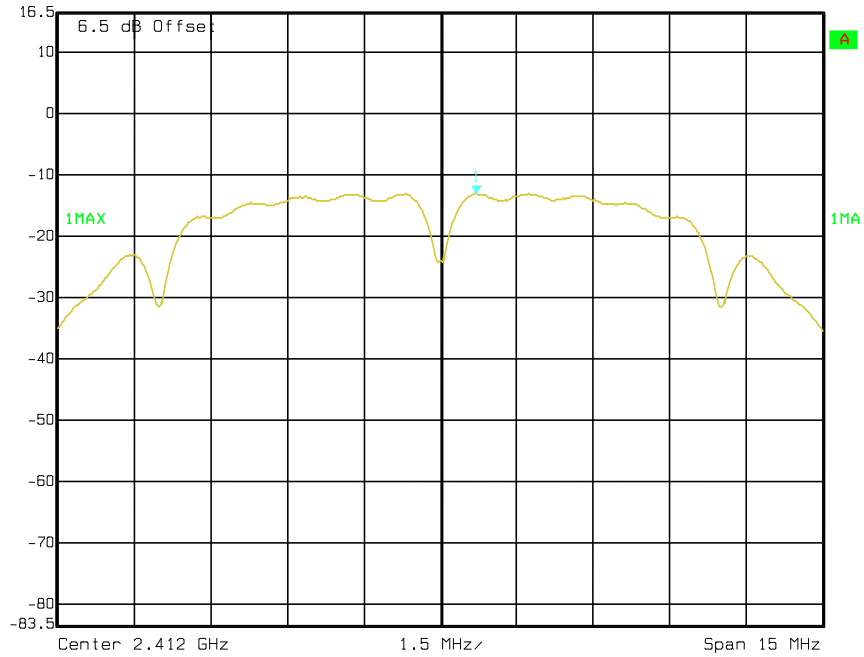
Power Spectral Density, 802.11n-HT40 High Channel



Chain 2

Power Spectral Density, 802.11b Low Channel

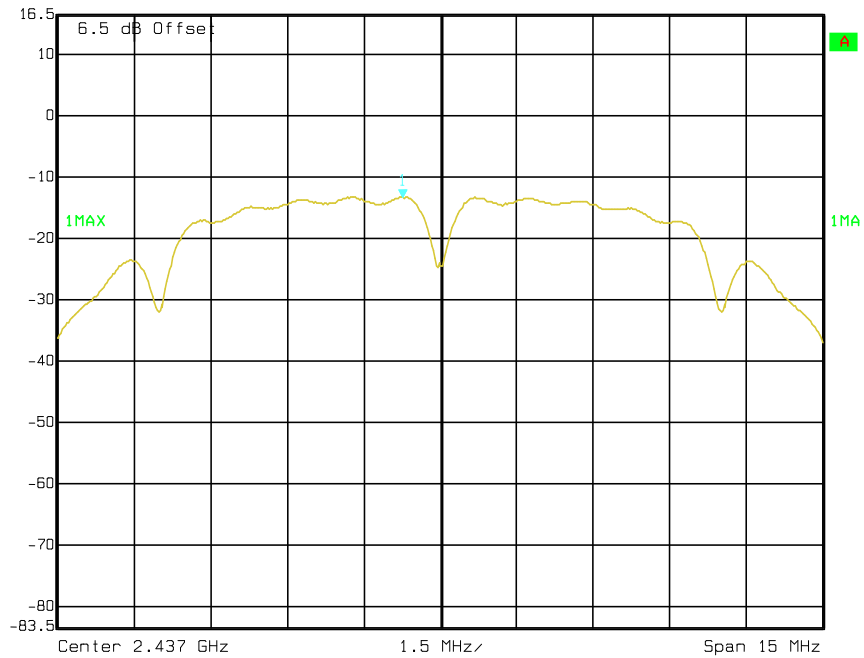
Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -13.11 dBm VBW 10 kHz
16.5 dBm 2.41270641 GHz SWT 4.2 s Unit dBm



Date: 08.DEC.2020 13:35:16

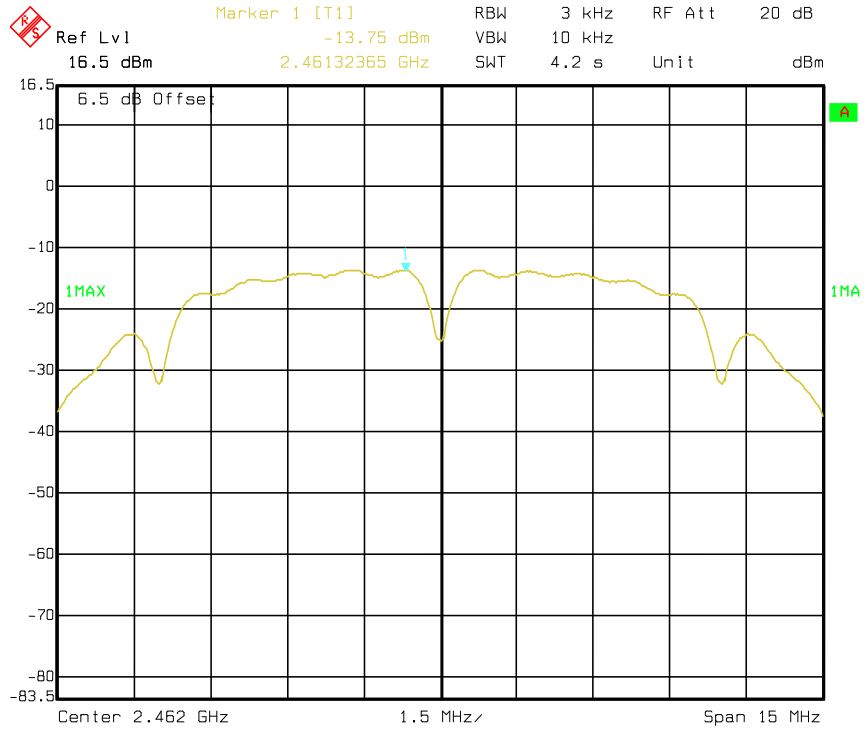
Power Spectral Density, 802.11b Middle Channel

Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -13.35 dBm VBW 10 kHz
16.5 dBm 2.43626353 GHz SWT 4.2 s Unit dBm



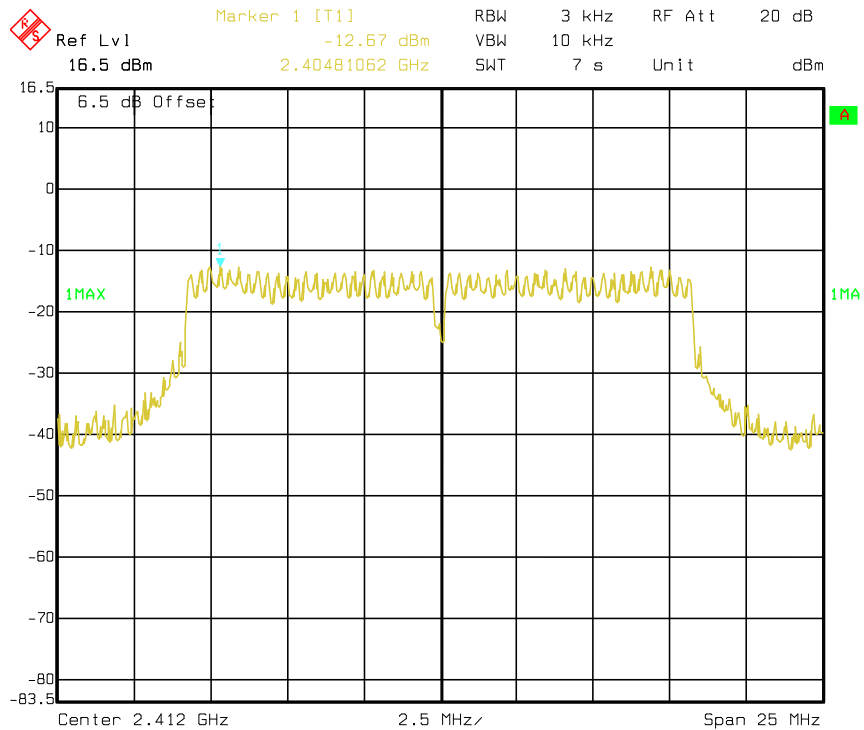
Date: 08.DEC.2020 13:36:15

Power Spectral Density, 802.11b High Channel



Date: 08.DEC.2020 13:37:06

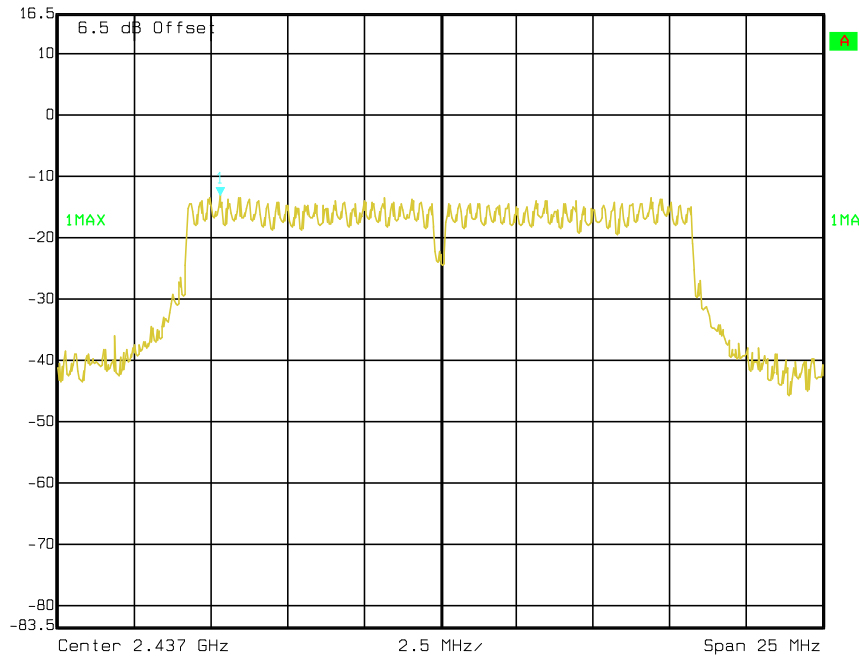
Power Spectral Density, 802.11g Low Channel



Date: 08.DEC.2020 13:38:12

Power Spectral Density, 802.11g Middle Channel

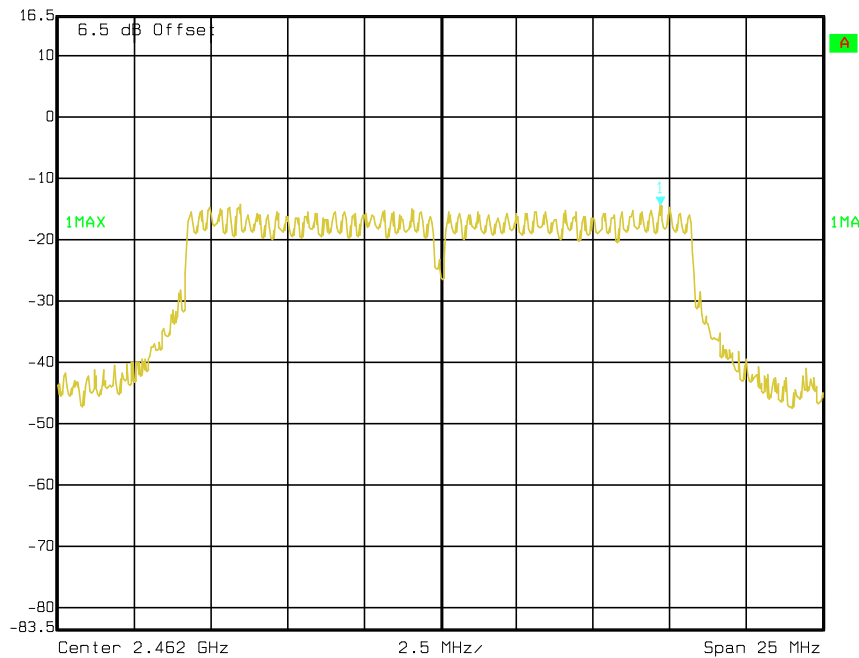
Ref Lvl 16.5 dBm
Marker 1 [T1] -13.14 dBm
2.42981062 GHz
RBW 3 kHz
RF Att 20 dB
VBW 10 kHz
SWT 7 s
Unit dBm



Date: 08.DEC.2020 13:39:07

Power Spectral Density, 802.11g High Channel

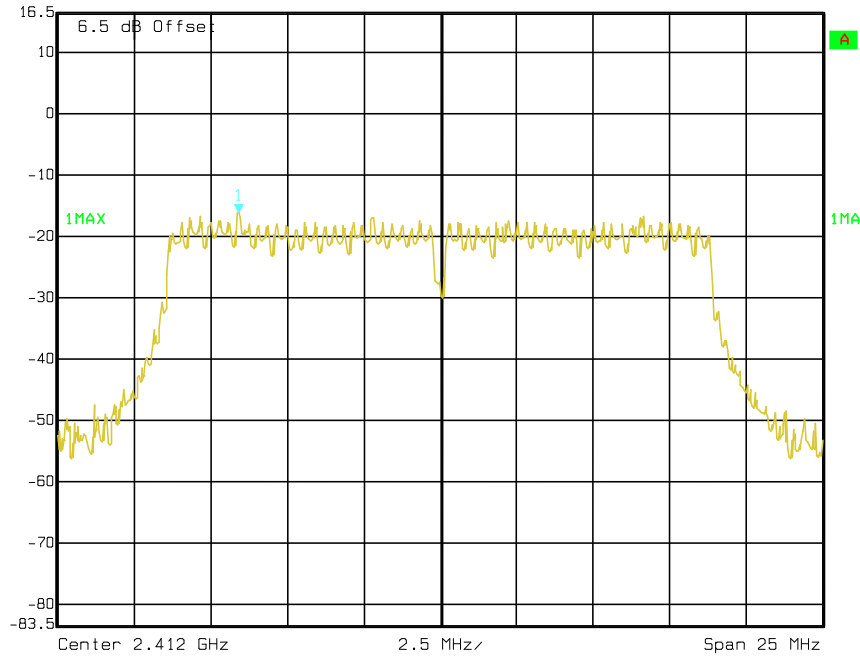
Ref Lvl 16.5 dBm
Marker 1 [T1] -14.46 dBm
2.46918938 GHz
RBW 3 kHz
RF Att 20 dB
VBW 10 kHz
SWT 7 s
Unit dBm



Date: 08.DEC.2020 13:40:10

Power Spectral Density, 802.11n-HT20 Low Channel

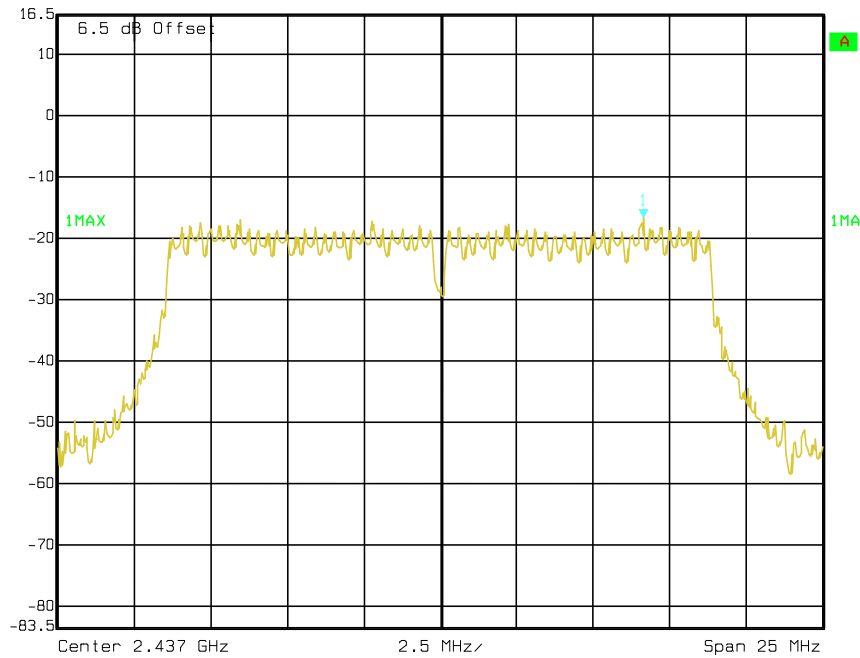
Ref Lvl 16.5 dBm
Marker 1 [T1] -16.05 dBm
2.40541182 GHz
RBW 3 kHz RF Att 20 dB
VBW 10 kHz
SWT 7 s Unit dBm



Date: 08.DEC.2020 13:41:17

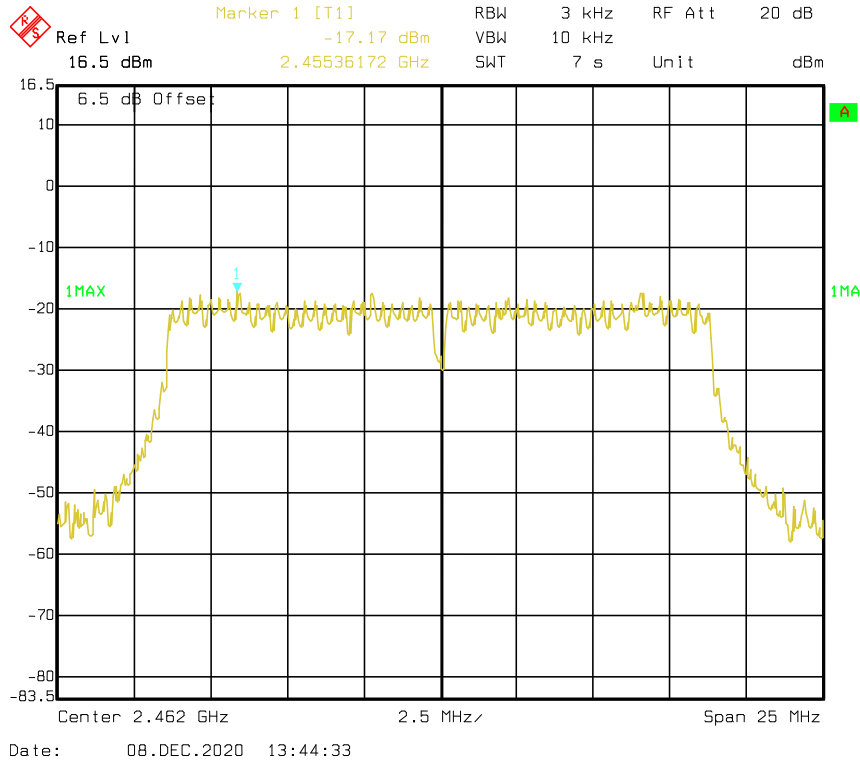
Power Spectral Density, 802.11n-HT20 Middle Channel

Ref Lvl 16.5 dBm
Marker 1 [T1] -16.56 dBm
2.44363828 GHz
RBW 3 kHz RF Att 20 dB
VBW 10 kHz
SWT 7 s Unit dBm

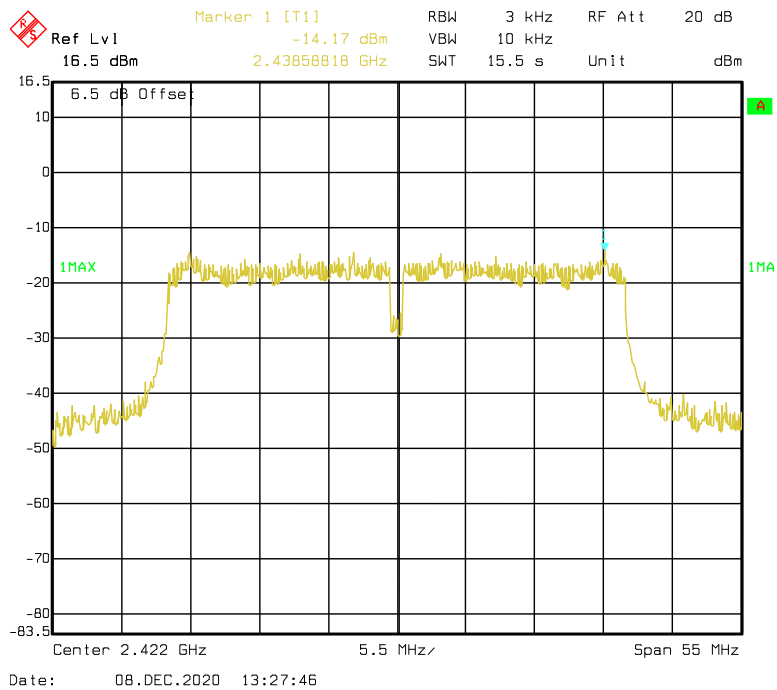


Date: 08.DEC.2020 13:43:02

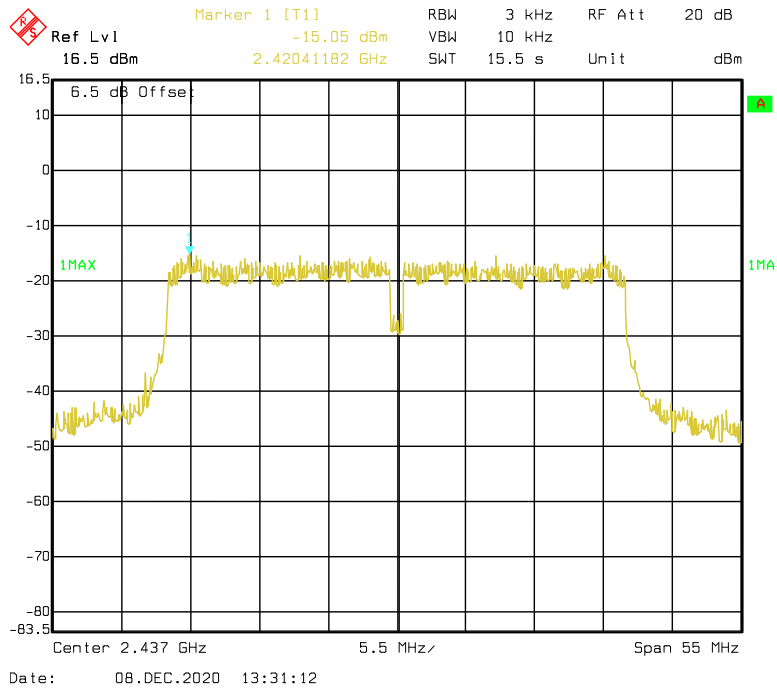
Power Spectral Density, 802.11n-HT20 High Channel



Power Spectral Density, 802.11n-HT40 Low Channel



Power Spectral Density, 802.11n-HT40 Middle Channel



Power Spectral Density, 802.11n-HT40 High Channel

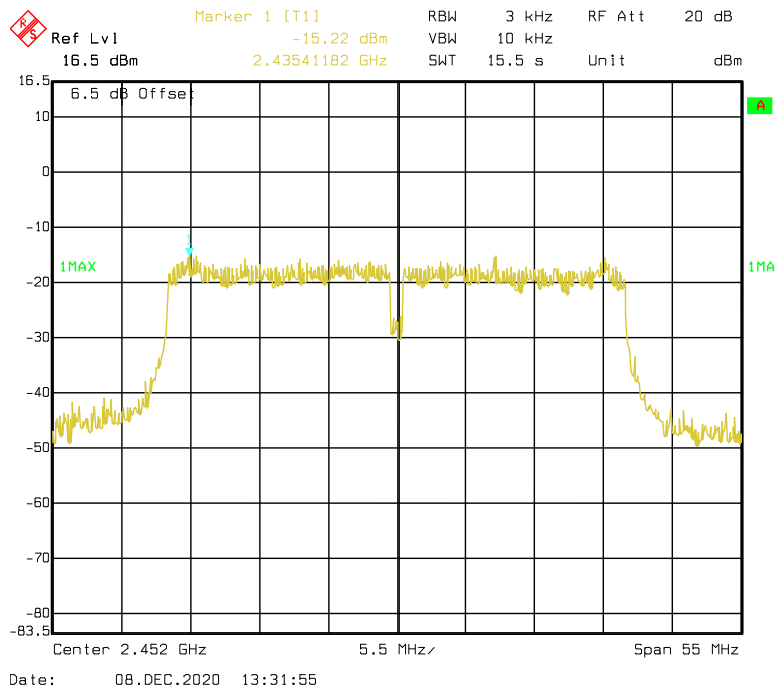


EXHIBIT A – MODEL DIFFERENCE

Product name	Industrial Cellular Router		
Test model number	Multi-listing model number	Difference items	Details
IR615-S-FS39 (LTE module model number: PLAS9-X)	IR615-S-FQ38	For the marketing need, using different LTE module or using different model name	LTE module model number: EC25-AF
	IR615-FQ38		LTE module model number: EC25-AF
	IR615-FS39		LTE module model number: PLAS9-X

END OF REPORT