TESTING LABORATORY
CERTIFICATE#4323.01

RSS-GEN ISSUE 5 MARCH 2019
RSS-247 ISSUE 2, FEBRUARY 2017
TEST REPORT

For

Tersus GNSS Inc.

Rm 203, Building 2, No. 666 Zhangheng Road, Zhangjiang Hi-tech Park Pudong Shanghai, P.R.C
Shanghai 201200 China

IC: 25725-OSCAR

Report Type:	**Product Type:**
Original Report	Surveying GNSS Receiver

Project Engineer:	Chao Gao
Report Number:	RSHA191209001-08A
Report Date:	2021-03-24
Reviewed By:	Oscar Ye EMC Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test

Applicant:	Tersus GNSS Inc.
Tested Model:	Oscar Ultimate
Series Model	Oscar Advanced, Oscar Basic
Product Type:	Surveying GNSS Receiver
Power Supply:	DC 9V~28V from external power supply and DC 7.4V from battery
RF Function:	2.4G Wi-Fi, BLE
Operating Band/Frequency:	2.4G Wi-Fi: 2412~2462 MHz (802.11b/g/n20), 2422~2452 MHz (802.11n40) BLE: 2402-2480 MHz
Channel Number:	2.4G Wi-Fi: 11 (802.11b/g/n20), 7 (802.11n40) BLE: 40
Channel Separation:	2.4G Wi-Fi: 5MHz, BLE: 2MHz
Modulation Type:	2.4G Wi-Fi: OFDM, DSSS; BLE: GFSK
Antenna Type:	2.4G Wi-Fi/BLE: PCB antenna
*Maximum Antenna Gain:	2.4G Wi-Fi: 1.0 dBi, BLE: 1.0 dBi
Maximum Output Power:	2.4G Wi-Fi: 21.01 dBm, BLE: 9.59 dBm

Note: The maximum antenna gain is provided by the applicant.

Note: The difference between tested model and series model was explained in the attached declaration letter.

**All measurement and test data in this report was gathered from production sample serial number: RSHA191209001-1(Assigned by the BACL. The EUT supplied by the applicant was received on 2019-12-09)*

Objective

This type approval report is prepared on behalf of *Tersus GNSS Inc.* in accordance with RSS-247 Issue 2 February 2017 and RSS-GEN Issue 5 March 2019 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

RSS-247 submissions with IC: 25725-OSCAR.
RSS-119 submissions with IC: 25725-OSCAR.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with RSS-247 Issue 2 February 2017 of the Innovation, Science and Economic Development Canada & RSS-GEN Issue 5 March 2019: General Requirements for Compliance of Radio Apparatus & ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

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

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 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.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0004.

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 software: Secure CRT.

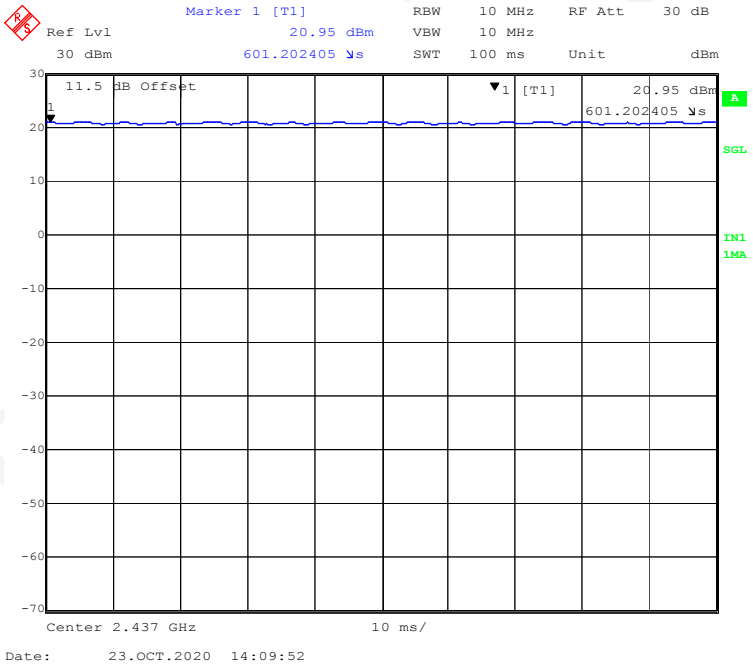
*Pre-scan with all the data rates, and the worst case was performed as below:

Mode	Data Rate	Power Level Setting
802.11b	1 Mbps	2000
802.11g	6 Mbps	1400
802.11n-HT20	MCS0	1500
802.11n-HT40	MCS0	1600
BLE	1Mbps	0x07

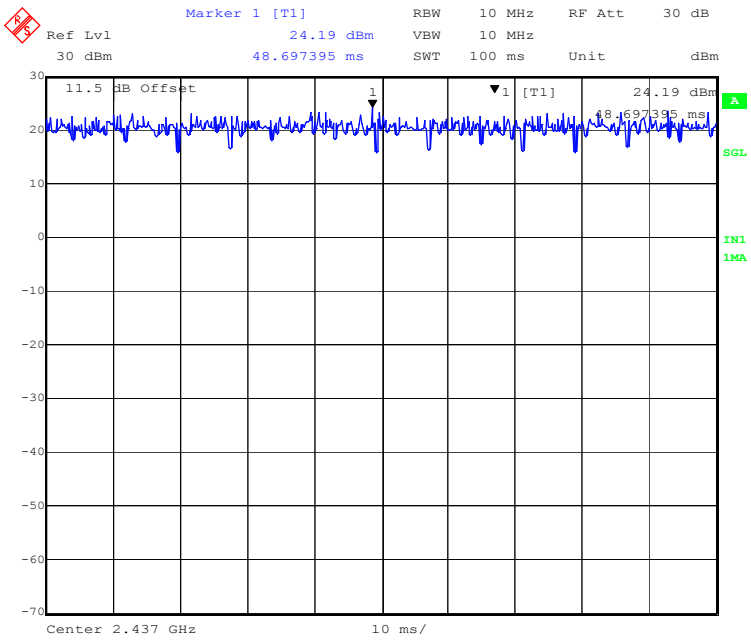
Note: The power level setting was declared by the applicant.

Duty Cycle:

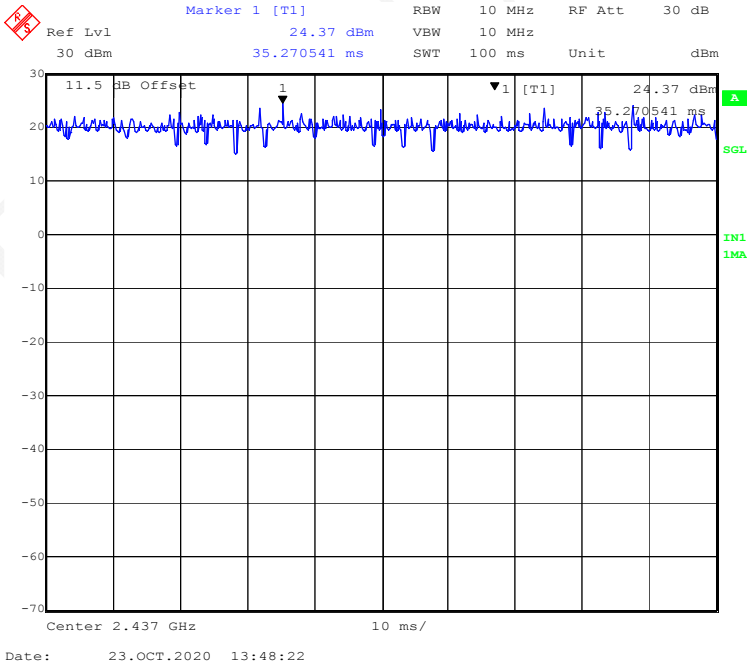
802.11b Mode Middle Channel



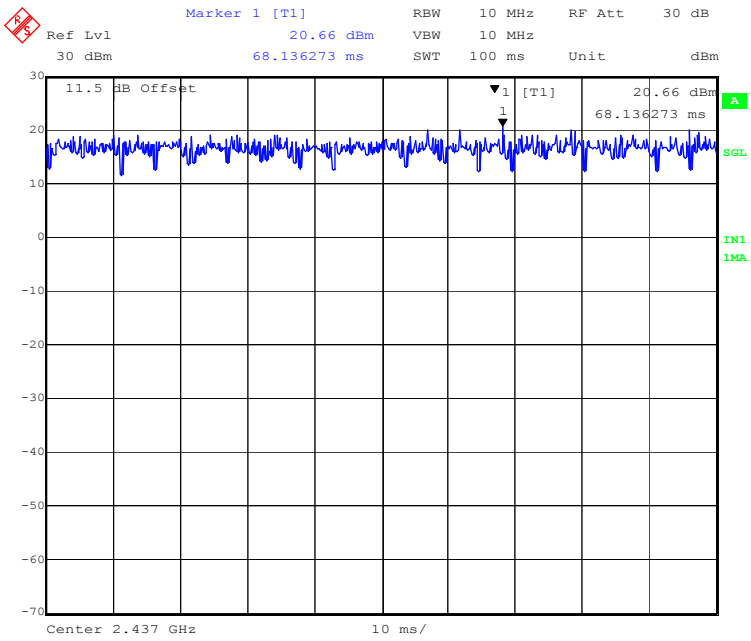
802.11g Mode Middle Channel



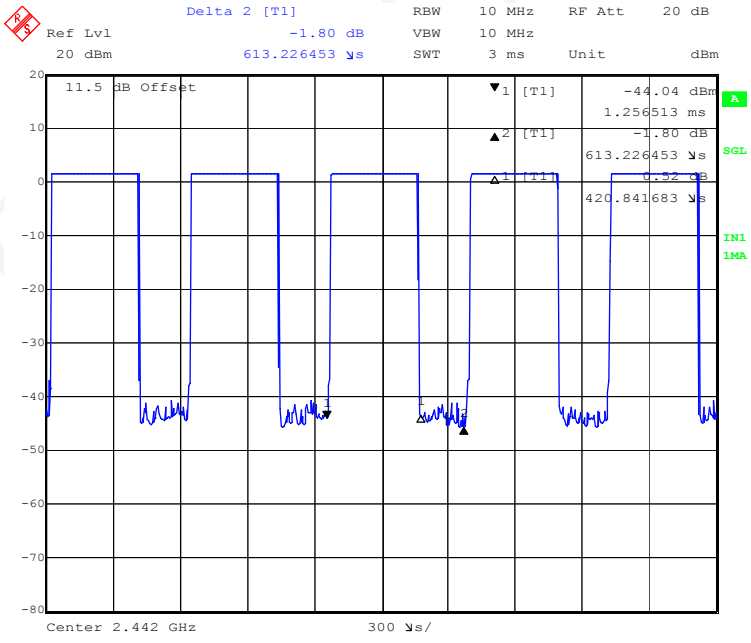
802.11n-HT20 Mode Middle Channel



802.11n-HT40 Mode Middle Channel



BLE Mode Middle Channel



Mode	Duty Cycle (%)	T(ms)	1/T(kHz)	10log(1/x)
802.11b	100	/	/	0
802.11g	100	/	/	0
802.11n-HT20	100	/	/	0
802.11n-HT40	100	/	/	0
BLE	68.68	0.421	2.38	1.63

Note: "x" means the Duty Cycle.

Support Equipment List and Details

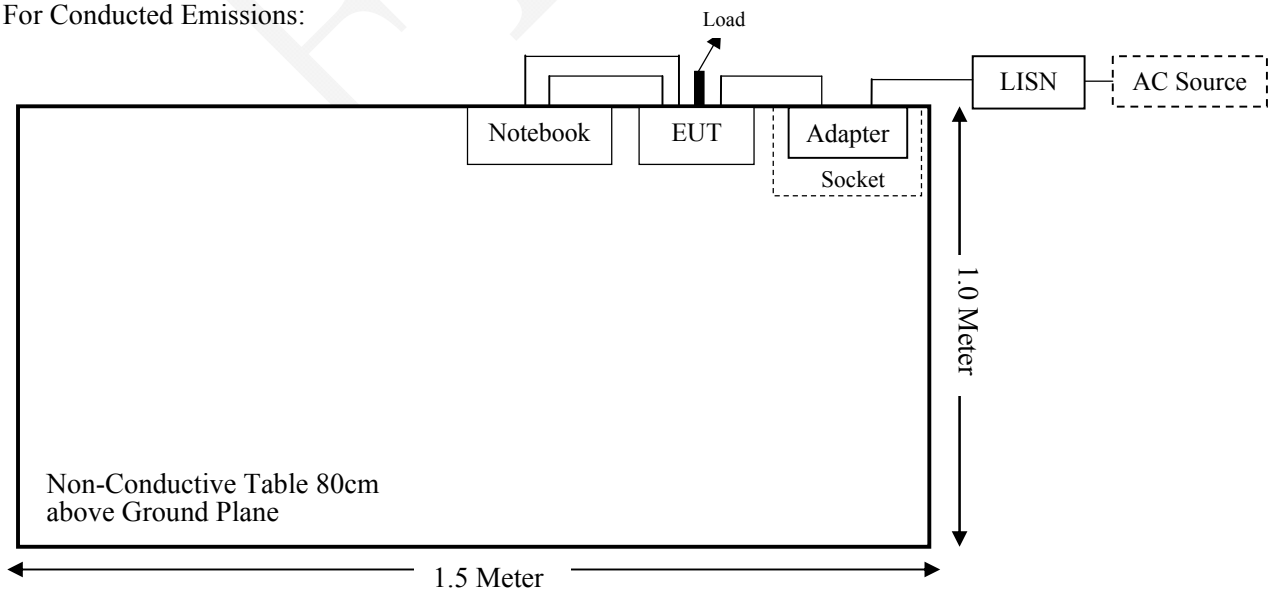
Manufacturer	Description	Model	Serial Number
DELL	Notebook	E6410	3094742521
SHENZHENTIANYIN ELECTRONICS CO.,LTD	Adapter	TPA-46B050100UVU	Unknown
Unknow	Load	Unknown	Unknown
Unknow	Socket	Unknown	Unknown

External I/O Cable

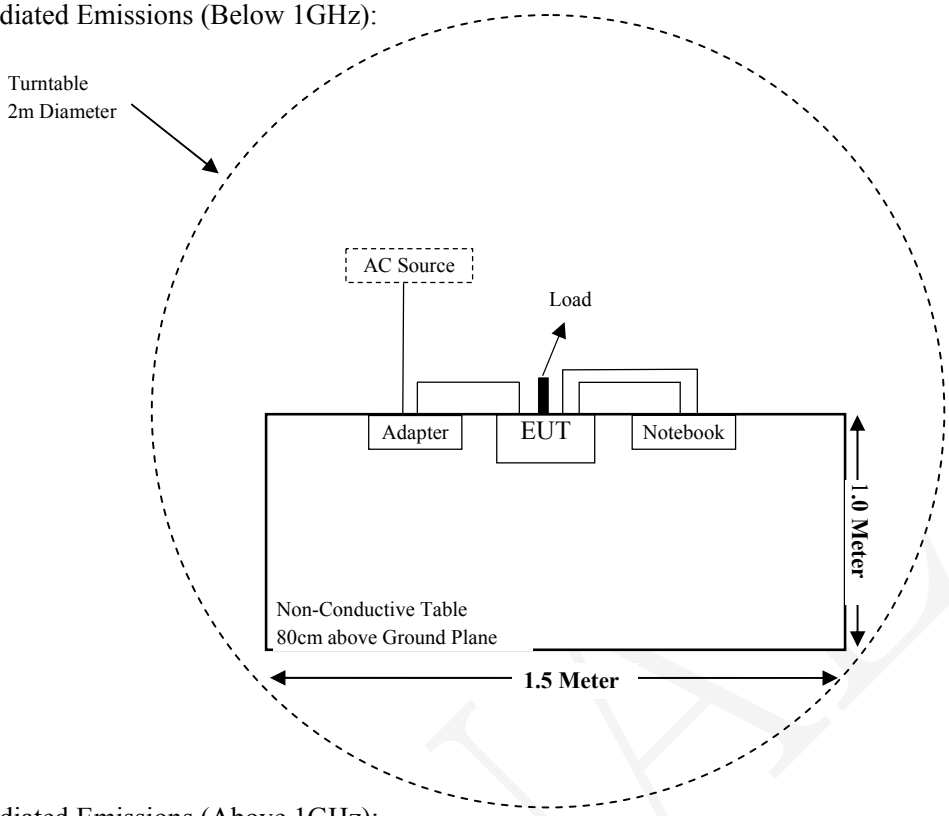
Cable Description	Length (m)	From Port	To
Data Cable	1.5	EUT	Notebook
Data Cable	1.0	EUT	Notebook
Power Cable	1.5	EUT	Adapter
Power Cable	1.0	Adapter	LISN/AC Source

Block Diagram of Test Setup

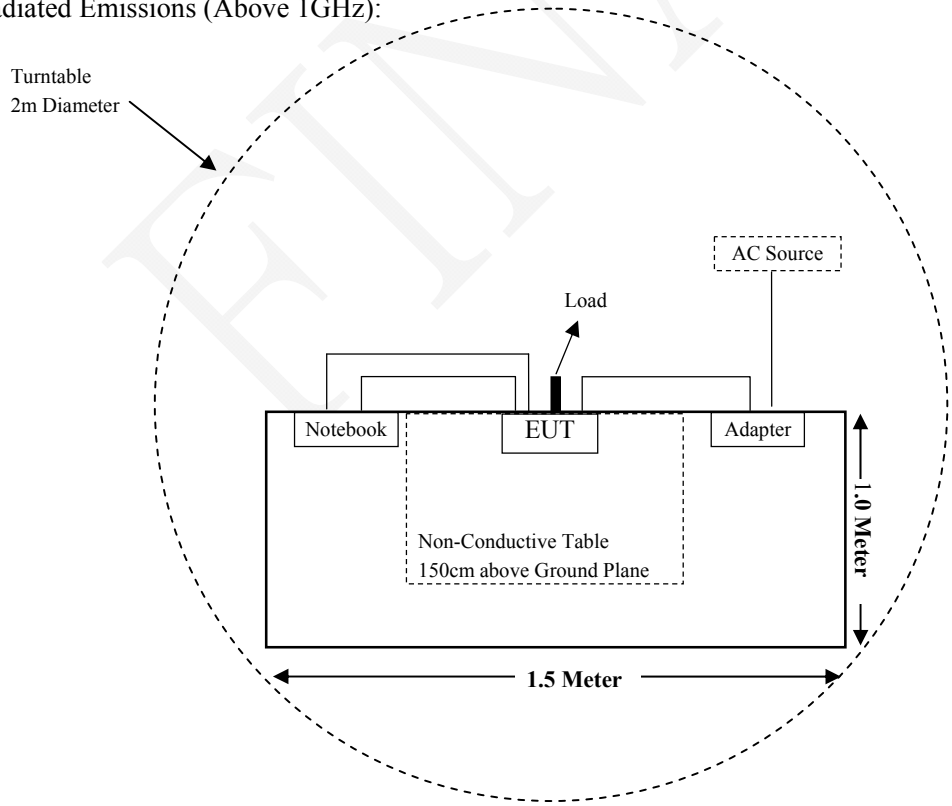
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

ISED RSS-247 & RSS-GEN Rules	Description of Test	Result
RSS-GEN Issue 5 Clause 6.8	Transmit Antenna	Compliant
RSS-102 Issue5 Clause 4	RF Exposure Evaluation	Compliant
RSS-GEN Issue 5 Clause 8.8	AC Power-line Conducted Emissions Limits	Compliant
RSS-247 Issue 2 Clause 5.5 RSS-GEN Issue 5 Clause 8.10	Unwanted Emissions & Restricted Frequency Bands	Compliant
RSS-247 Issue 2 Clause 5.2 a)	6 dB Emission Bandwidth	Compliant
RSS-GEN Issue 5 Clause 6.7	Occupied Bandwidth	Compliant
RSS-247 Issue 2 Clause 5.2 b)	Power Spectral Density	Compliant
RSS-247 Issue 2 Clause 5.4 d)	Transmitter Output Power Measurement	Compliant
RSS-247 Issue 2 Clause 5.5	Out of Band Emissions	Compliant

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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
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2020-11-27	2021-11-26
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2017-08-05	2020-08-04
Sunol Sciences	Hybrid Antenna	JB3	A090314-2	2020-01-07	2023-01-06
Sonoma Instrument	Pre-amplifier	310N	171205	2019-08-14	2020-08-13
Sonoma Instrument	Amplifier	310N	171205	2020-08-14	2021-08-13
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-8	008	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2020-08-15	2021-08-14
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2019-04-01	2020-03-31
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	3115	9207-3900	2020-07-15	2023-07-14
ETS-LINDGREN	Horn Antenna	3116	2516	2017-01-17	2020-01-16
ETS-LINDGREN	Horn Antenna	3116	2516	2020-01-17	2023-01-16
A.H.Systems,inc	Amplifier	PAM-0118P	512	2019-08-14	2020-08-13
A.H. Systems,inc.	Amplifier	PAM-0118P	512	2020-08-14	2021-08-13
EM Electronics Corporation	Amplifier	EM18G40G	060726	2019-03-22	2020-03-21
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
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2020-08-05	2021-08-04
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Narda	Attenuator	10dB	010	2020-08-15	2021-08-14
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-6	006	2020-12-12	2021-12-11
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2020-08-15	2021-08-14

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	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
Tersus GNSS Inc.	RF Cable	Tersus GNSS Inc.C01	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	357.8810.52	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).

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RSS-GEN ISSUE 5 Clause 6.8 - TRANSMITTER ANTENNA

Applicable Standard

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has an internal antenna for Wi-Fi and BLE, the 2.4G Wi-Fi and BLE antenna gain are 1.0dBi, the antenna is permanently attached to the unit, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	Mode	Antenna Gain	Input impedance
PCB	2.4G Wi-Fi	1.0dBi	50Ω
PCB	BLE	1.0dBi	50Ω

Result: Compliant.

RSS-102 ISSUE 5 CLAUSE 4 – RF EXPOSURE EVALUATION

Applicable Standard

According to RSS-102 Clause 4:

For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
* Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

S = PG/4 π R² = power density (in appropriate units, e.g. W/m^2);
P = power input to the antenna (in appropriate units, e.g., W);
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., m);

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

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

Test Result

RF exposure evaluation at 30 cm distance:

Based on Uncontrolled Environment:

Mode	Frequency Range (MHz)	Tune-up Conducted Power (dBm)	Antenna Gain (dBi)	Tune-up EIRP		Power Density (W/m^2)	RF Exp. Limit (W/m^2)	Ratio
				(dBm)	(W)			
802.11b	2412-2462	20.0	1.0	21.00	0.126	0.1113	5.3660	0.0207
802.11g	2412-2462	21.5	1.0	22.50	0.178	0.1572	5.3660	**0.0293**
802.11n-HT20	2412-2462	18.5	1.0	19.50	0.089	0.0788	5.3660	0.0147
802.11n-HT40	2422-2452	15.5	1.0	16.50	0.045	0.0395	5.3812	0.0073
BLE	2402-2480	10.0	1.0	11.00	0.013	0.0111	5.3508	0.0021
BT	2402-2480	12.5	1.0	13.50	0.022	0.0198	5.3508	0.0037
WCDMA Band II	1850-1910	24.0	1.0	25.00	0.316	0.2796	4.4763	0.0625
WCDMA Band V	824-849	24.0	1.0	25.00	0.316	0.2796	2.5756	**0.1086**
LTE Band 2	1850-1910	23.5	1.0	24.50	0.282	0.2492	4.4763	0.0557
LTE Band 4	1710-1755	23.5	1.0	24.50	0.282	0.2492	4.2419	0.0587
LTE Band 5	824-849	23.0	1.0	24.00	0.251	0.2221	2.5756	0.0862
LTE Band 12	699-716	23.0	1.0	24.00	0.251	0.2221	2.3017	0.0965
LTE Band 13	777-787	23.0	1.0	24.00	0.251	0.2221	2.4743	0.0898
LTE Band 17	704-716	23.0	1.0	24.00	0.251	0.2221	2.3130	0.0960

UHF: (Based on Controlled Environment)

Mode	Channel Spacing	Frequency Range (MHz)	Tune-up Conducted Power(dBm)	Antenna Gain	Tune-up EIRP		Power Density (W/m^2)	RF Exp. Limit (W/m^2)	Ratio
				(dBi)	(dBm)	(W)			
UHF	12.5 kHz	410~430	34.00	5.5	39.50	8.913	7.8794	13.07	0.6029
		450~470	33.50	5.5	39.00	7.943	7.0225	13.69	0.5130

Note:

1. The tune-up output power was declared by the Manufacturer.
2. The LTE/3G module IC: 5131A-LE910NAV2(Grant: 07/05/2016).
3. 2.4G Wi-Fi/BT/BLE, WCDMA and UHF can transmit simultaneously; the worst condition is as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0293+0.1086+0.6029=0.7408 < 1.0$$

Conclusion: The device meets RF exposure limits at 30 cm distance.

RSS-GEN ISSUE5 Clause 8.8 – AC POWER-LINE CONDUCTED EMISSIONS LIMITS

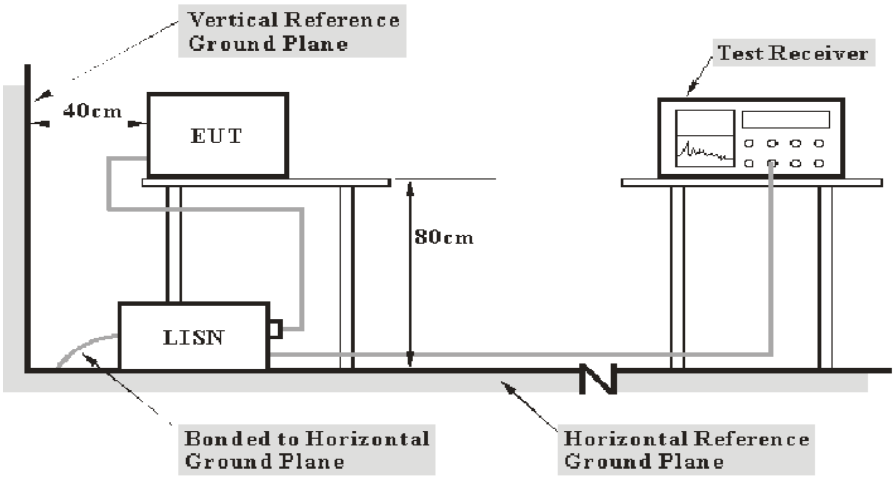
Applicable Standard

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 µH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.
For a EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequencies ranges. The device used to power the EUT shall be representative of typical applications.

Table 4 - AC Power Line Conducted Emissions Limits		
Frequency range (MHz)	Conducted limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56[1]	56 to 46[1]
0.5 – 5	56	46
5 – 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

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 ANSI C63.10-2013.

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 Setup

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

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

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

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

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

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

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 RSS-GEN Issue 5.

Test Data

Environmental Conditions

Temperature:	24.9 ℃
Relative Humidity:	50%
ATM Pressure:	101.7 kPa

The testing was performed by Chao Gao on 2019-12-28.

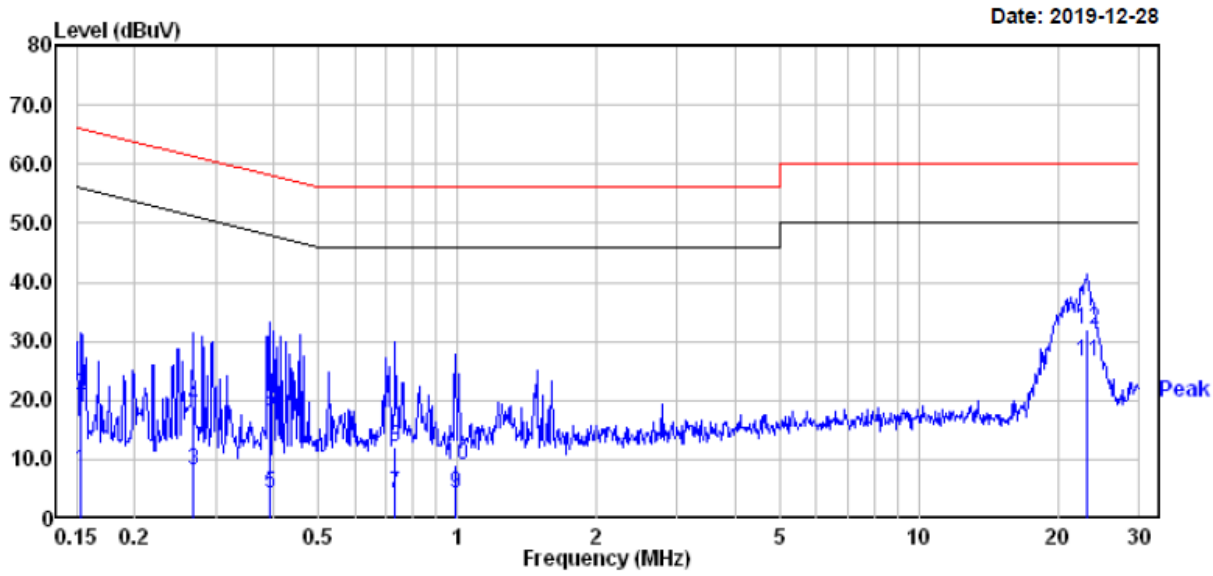
Test Result: Compliant

FINAL

For Wi-Fi Mode:

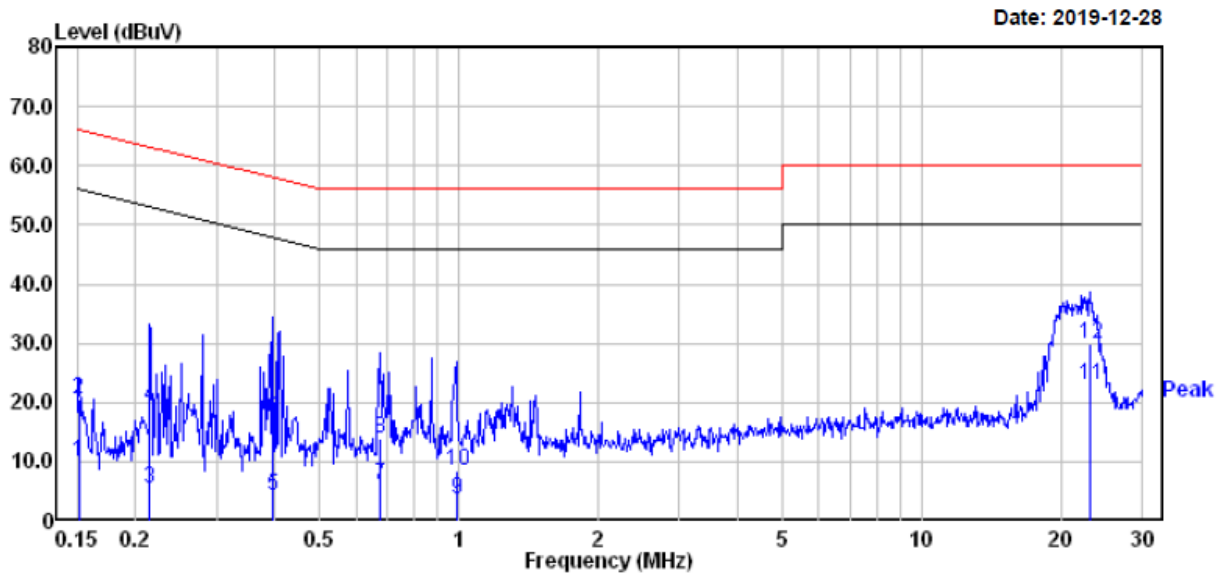
EUT operation mode: Transmitting in 802.11g mode low channel (worst case)

AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.153	-11.70	19.82	8.12	55.82	-47.70	Average
2	0.153	0.90	19.82	20.72	65.82	-45.10	QP
3	0.267	-11.80	19.82	8.02	51.20	-43.18	Average
4	0.267	-0.70	19.82	19.12	61.20	-42.08	QP
5	0.393	-15.50	19.75	4.25	47.99	-43.74	Average
6	0.393	-1.70	19.75	18.05	57.99	-39.94	QP
7	0.735	-15.40	19.73	4.33	46.00	-41.67	Average
8	0.735	-7.70	19.73	12.03	56.00	-43.97	QP
9	0.994	-15.60	19.82	4.22	46.00	-41.78	Average
10	0.994	-10.80	19.82	9.02	56.00	-46.98	QP
11	23.140	6.79	19.79	26.58	50.00	-23.42	Average
12	23.140	12.29	19.79	32.08	60.00	-27.92	QP

AC 120V/60 Hz, Neutral



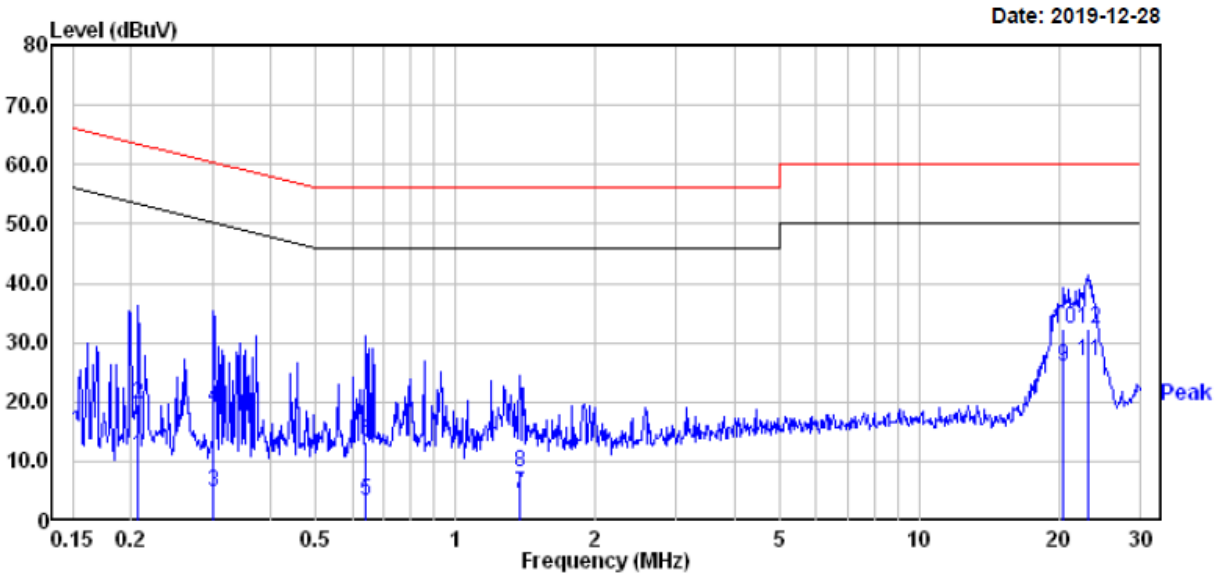
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.151	-9.80	19.82	10.02	55.96	-45.94	Average
2	0.151	0.60	19.82	20.42	65.96	-45.54	QP
3	0.215	-14.50	19.82	5.32	53.01	-47.69	Average
4	0.215	-0.50	19.82	19.32	63.01	-43.69	QP
5	0.396	-15.61	19.75	4.14	47.95	-43.81	Average
6	0.396	-2.41	19.75	17.34	57.95	-40.61	QP
7	0.675	-13.70	19.75	6.05	46.00	-39.95	Average
8	0.675	-5.90	19.75	13.85	56.00	-42.15	QP
9	0.989	-16.20	19.81	3.61	46.00	-42.39	Average
10	0.989	-11.40	19.81	8.41	56.00	-47.59	QP
11	23.140	3.29	19.79	23.08	50.00	-26.92	Average
12	23.140	10.19	19.79	29.98	60.00	-30.02	QP

Note:
1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Over Limit (dB) = Read level (dBµV) + Factor (dB) - Limit (dBµV)

For BLE Mode:

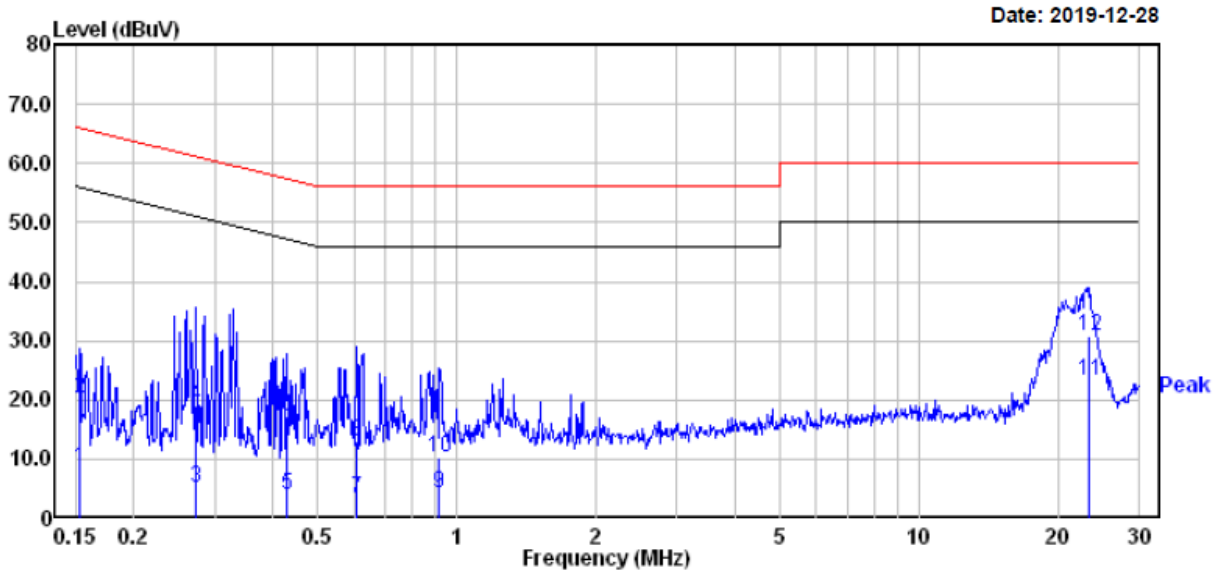
EUT operation mode: Transmitting in low channel (worst case)

AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.207	-9.10	19.82	10.72	53.32	-42.60	Average
2	0.207	-0.10	19.82	19.72	63.32	-43.60	QP
3	0.302	-15.11	19.83	4.72	50.19	-45.47	Average
4	0.302	-0.81	19.83	19.02	60.19	-41.17	QP
5	0.641	-16.30	19.75	3.45	46.00	-42.55	Average
6	0.641	-6.60	19.75	13.15	56.00	-42.85	QP
7	1.374	-15.30	19.83	4.53	46.00	-41.47	Average
8	1.374	-11.60	19.83	8.23	56.00	-47.77	QP
9	20.486	6.10	19.93	26.03	50.00	-23.97	Average
10	20.486	12.30	19.93	32.23	60.00	-27.77	QP
11	23.140	7.09	19.79	26.88	50.00	-23.12	Average
12	23.140	12.59	19.79	32.38	60.00	-27.62	QP

AC 120V/60 Hz, Neutral



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.153	-11.40	19.82	8.42	55.82	-47.40	Average
2	0.153	0.30	19.82	20.12	65.82	-45.70	QP
3	0.273	-14.80	19.82	5.02	51.03	-46.01	Average
4	0.273	-0.80	19.82	19.02	61.03	-42.01	QP
5	0.428	-15.80	19.75	3.95	47.29	-43.34	Average
6	0.428	-2.40	19.75	17.35	57.29	-39.94	QP
7	0.608	-16.30	19.75	3.45	46.00	-42.55	Average
8	0.608	-6.90	19.75	12.85	56.00	-43.15	QP
9	0.918	-15.51	19.75	4.24	46.00	-41.76	Average
10	0.918	-9.61	19.75	10.14	56.00	-45.86	QP
11	23.387	3.60	19.77	23.37	50.00	-26.63	Average
12	23.387	11.00	19.77	30.77	60.00	-29.23	QP

Note:
1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Over Limit (dB) = Read level (dBµV) + Factor (dB) - Limit (dBµV)

RSS-247 ISSUE 2 Clause 5.5 & RSS-GEN ISSUE5 Clause 8.10 –UNWANTED EMISSIONS & RESTRICTED FREQUENCY BANDS

Applicable Standard

According to RSS-247 Issue2 Clause 5.5

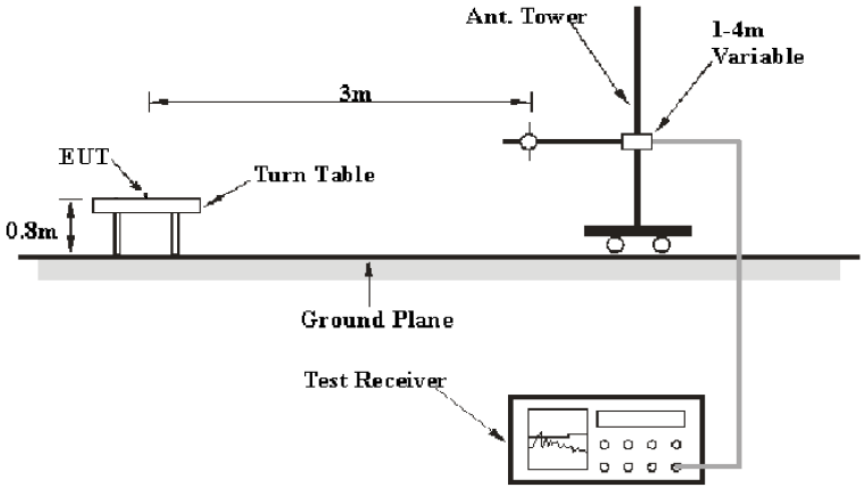
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-GEN is not required.

According to RSS-GEN Issue5 Clause 8.10

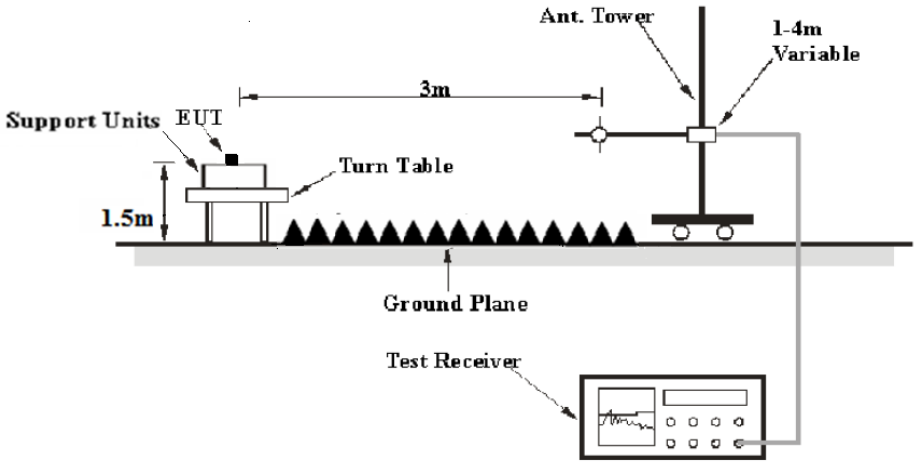
Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:
(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287;
(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.
(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

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 RSS-247 Issue2 Clause 5.5 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

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 Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude (dBμV/m) = Meter Reading (dBμV) + 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 (dBμV/m) – Corrected Amplitude (dBμV/m)

Test Results Summary

According to the recorded data in following table, the EUT complied with the RSS-247 Issue2 Clause 5.5.

Test Data

Environmental Conditions

Temperature:	23.4~24.6 ℃
Relative Humidity:	50~54 %
ATM Pressure:	100.6~101.7 kPa

The testing was performed by Chao Gao from 2019-12-20 to 2021-02-22.

EUT operation mode: Transmitting

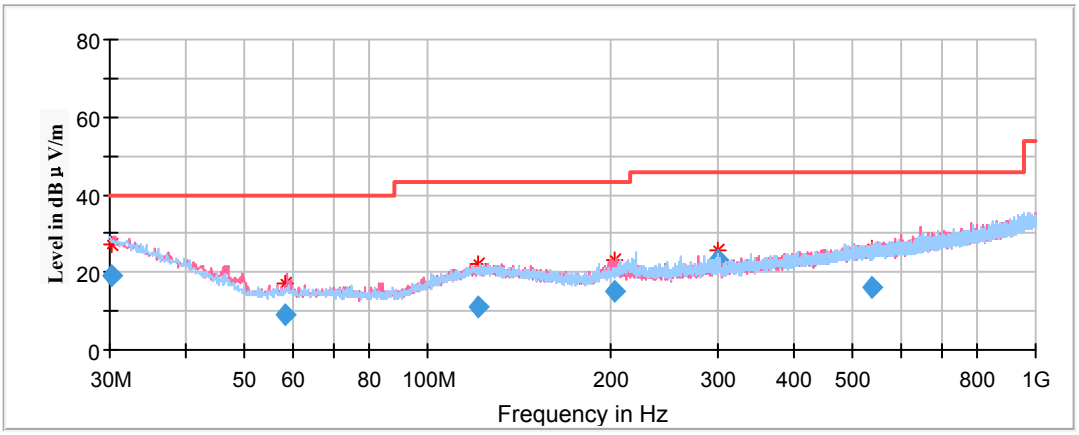
FINAL

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 802.11g mode in Z-axis of orientation*** *was recorded*



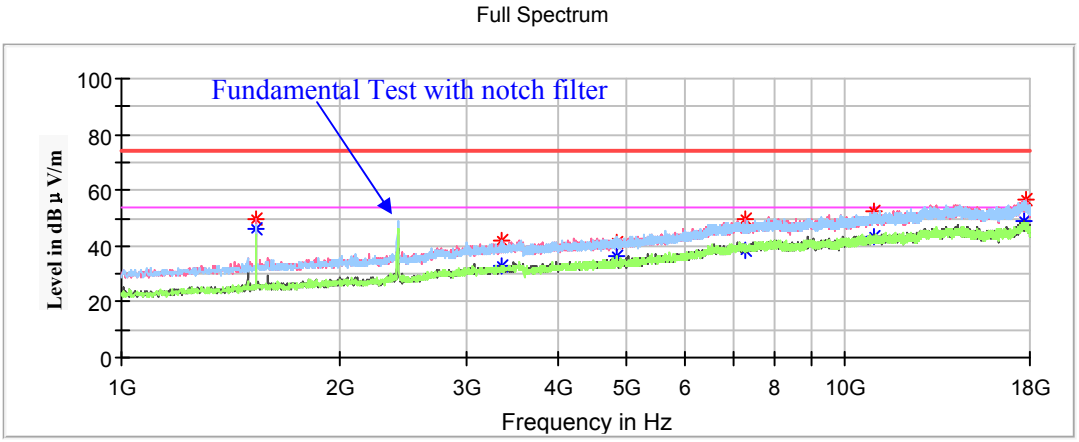
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dBµV/m)	Height (cm)	Polar (H/V)				
30.22	18.88	200.0	H	78.0	-4.1	40.00	21.12
58.51	9.28	100.0	V	247.0	-17.9	40.00	30.72
121.21	10.84	100.0	H	144.0	-11.2	43.50	32.66
203.33	15.22	100.0	V	304.0	-12.3	43.50	28.28
300.01	23.35	100.0	H	340.0	-10.5	46.00	22.65
537.82	15.98	200.0	V	13.0	-5.8	46.00	30.02

1GHz-18GHz:

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

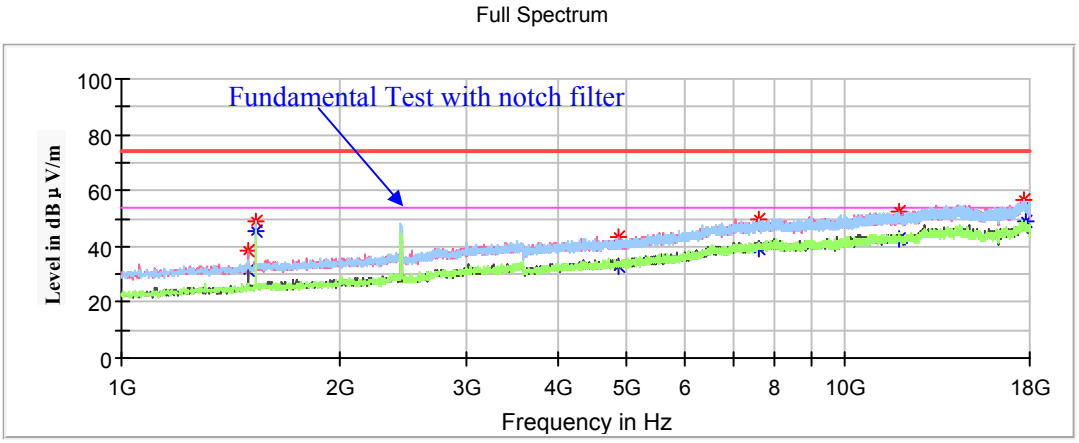
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Low Channel: 2412MHz



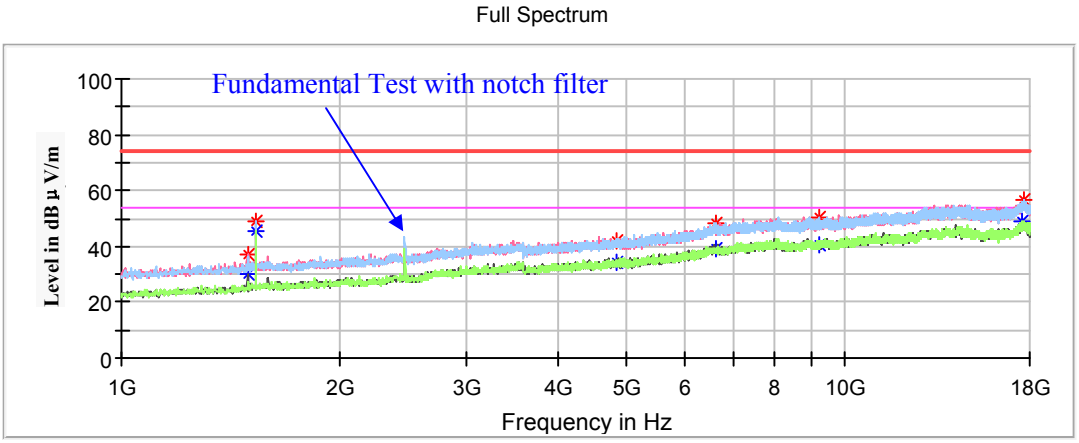
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1533.80	---	45.90	200	V	279.0	-9.8	54.00	8.10
1533.80	49.59	---	200	V	279.0	-9.8	74.00	24.41
3356.20	---	32.92	200	H	264.0	-3.8	54.00	21.08
3356.20	41.72	---	200	H	264.0	-3.8	74.00	32.28
4824.00	---	36.31	150	H	337.0	-0.5	54.00	17.69
4824.00	41.12	---	150	H	337.0	-0.5	74.00	32.88
7236.00	---	38.69	150	V	6.0	5.8	54.00	15.31
7236.00	49.43	---	150	V	6.0	5.8	74.00	24.57
10980.70	---	43.03	150	V	190.0	9.7	54.00	10.97
10980.70	52.20	---	150	V	190.0	9.7	74.00	21.80
17734.80	---	49.03	200	V	64.0	14.1	54.00	4.97
17734.80	56.40	---	200	V	64.0	14.1	74.00	17.60

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1496.40	---	31.34	200	V	0.0	-9.9	54.00	22.66
1496.40	38.45	---	200	V	0.0	-9.9	74.00	35.55
1533.80	---	45.35	200	V	274.0	-9.8	54.00	8.65
1533.80	48.93	---	200	V	274.0	-9.8	74.00	25.07
4874.00	---	33.11	150	V	0.0	-0.5	54.00	20.89
4874.00	43.13	---	150	V	0.0	-0.5	74.00	30.87
7604.50	---	39.21	200	H	280.0	6.3	54.00	14.79
7604.50	49.61	---	200	H	280.0	6.3	74.00	24.39
11880.00	---	42.43	150	V	186.0	10.0	54.00	11.57
11880.00	52.26	---	150	V	186.0	10.0	74.00	21.74
17765.40	---	48.94	200	H	169.0	14.1	54.00	5.06
17765.40	56.34	---	200	H	169.0	14.1	74.00	17.66

High Channel: 2462MHz

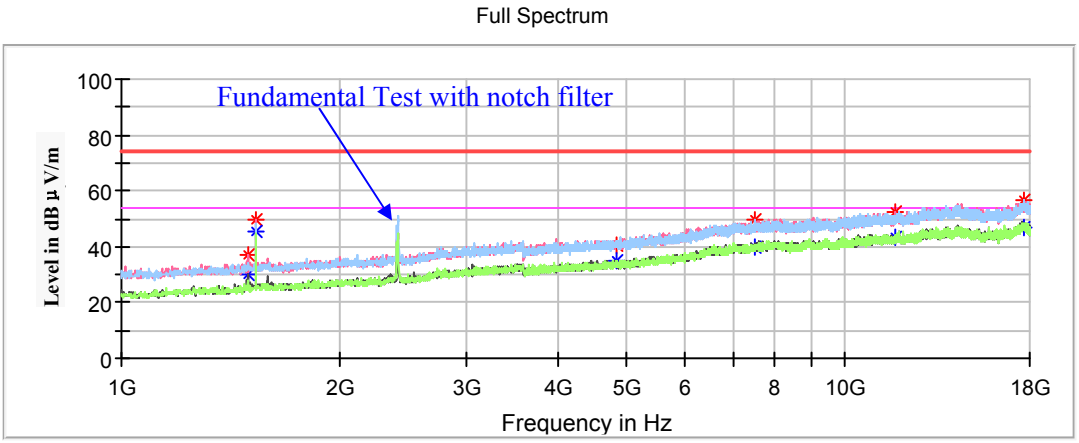


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1493.00	---	29.88	150	V	5.0	-10.0	54.00	24.12
1493.00	37.40	---	150	V	5.0	-10.0	74.00	36.60
1533.80	---	45.65	150	H	230.0	-9.8	54.00	8.35
1533.80	49.03	---	150	H	230.0	-9.8	74.00	24.97
4825.00	---	34.11	200	H	95.0	-0.5	54.00	19.89
4825.00	41.63	---	200	H	95.0	-0.5	74.00	32.37
6633.80	---	39.15	200	H	355.0	4.7	54.00	14.85
6633.80	48.31	---	200	H	355.0	4.7	74.00	25.69
9238.20	---	40.51	150	H	351.0	7.7	54.00	13.49
9238.20	50.17	---	150	H	351.0	7.7	74.00	23.83
17627.70	---	49.13	200	H	140.0	14.1	54.00	4.87
17627.70	56.35	---	200	H	140.0	14.1	74.00	17.65

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

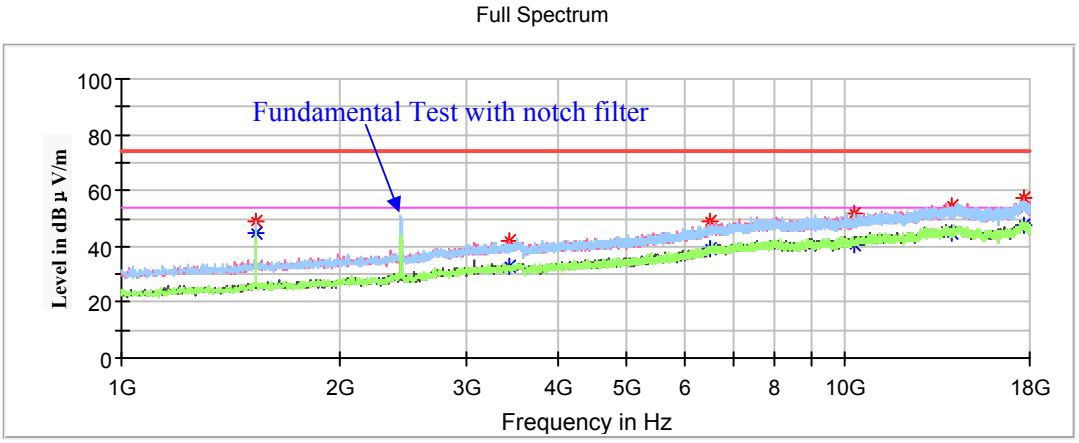
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Low Channel: 2412MHz



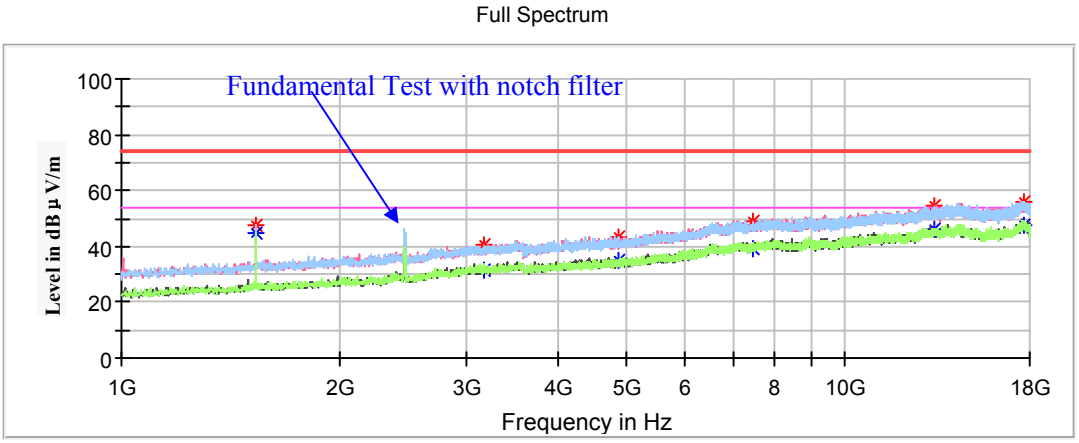
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1498.10	36.86	---	150	V	218.0	-9.9	74.00	37.14
1498.10	---	29.73	150	V	218.0	-9.9	54.00	24.27
1533.80	49.60	---	200	V	280.0	-9.8	74.00	24.40
1533.80	---	45.75	200	V	280.0	-9.8	54.00	8.25
4824.00	40.81	---	150	V	310.0	-0.5	74.00	33.19
4824.00	---	34.88	150	V	310.0	-0.5	54.00	19.12
7488.90	49.62	---	150	H	338.0	6.1	74.00	24.38
7488.90	---	39.79	150	H	338.0	6.1	54.00	14.21
11735.50	52.56	---	150	V	188.0	9.9	74.00	21.44
11735.50	---	43.58	150	V	188.0	9.9	54.00	10.42
17673.60	56.55	---	150	V	188.0	14.0	74.00	17.45
17673.60	---	46.81	150	V	188.0	14.0	54.00	7.19

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.67	150	H	312.0	-9.8	54.00	9.33
1533.80	48.74	---	150	H	312.0	-9.8	74.00	25.26
3437.80	---	32.99	200	V	2.0	-3.6	54.00	21.01
3437.80	41.84	---	200	V	2.0	-3.6	74.00	32.16
6523.30	---	39.26	150	V	99.0	4.5	54.00	14.74
6523.30	49.09	---	150	V	99.0	4.5	74.00	24.91
10305.80	---	40.49	200	H	217.0	8.7	54.00	13.51
10305.80	51.71	---	200	H	217.0	8.7	74.00	22.29
14083.20	---	44.75	150	V	264.0	12.5	54.00	9.25
14083.20	54.64	---	150	V	264.0	12.5	74.00	19.36
17673.60	---	47.21	200	V	339.0	14.0	54.00	6.79
17673.60	57.16	---	200	V	339.0	14.0	74.00	16.84

High Channel: 2462MHz

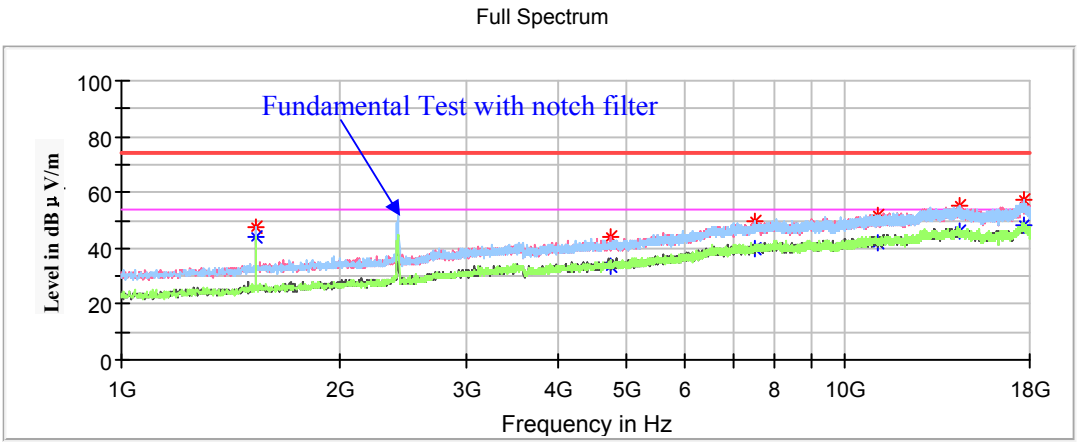


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.51	150	H	311.0	-9.8	54.00	9.49
1533.80	47.78	---	150	H	311.0	-9.8	74.00	26.22
3179.40	---	31.22	200	V	188.0	-4.1	54.00	22.78
3179.40	40.30	---	200	V	188.0	-4.1	74.00	33.70
4852.20	---	35.22	150	H	340.0	-0.5	54.00	18.78
4852.20	43.04	---	150	H	340.0	-0.5	74.00	30.96
7475.30	---	39.20	200	V	327.0	6.1	54.00	14.80
7475.30	49.00	---	200	V	327.0	6.1	74.00	25.00
13301.20	---	46.08	200	V	114.0	12.0	54.00	7.92
13301.20	54.64	---	200	V	114.0	12.0	74.00	19.36
17671.90	---	47.86	150	H	282.0	14.0	54.00	6.14
17671.90	56.19	---	150	H	282.0	14.0	74.00	17.81

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

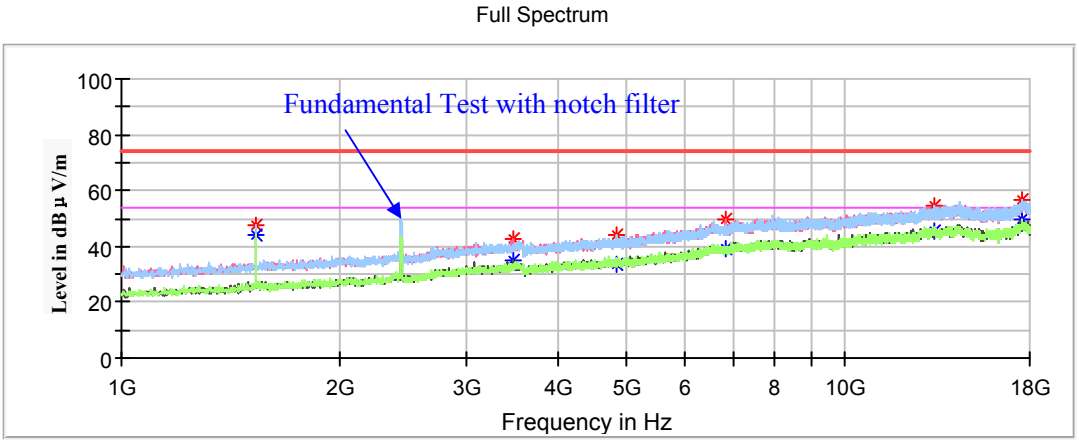
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Low Channel: 2412MHz



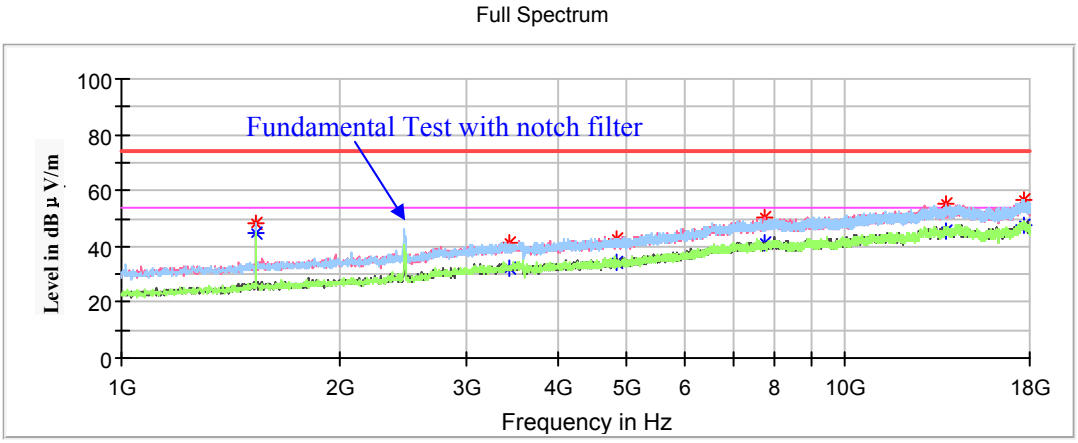
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.30	150	H	314.0	-9.8	54.00	9.70
1533.80	47.76	---	150	H	314.0	-9.8	74.00	26.24
4753.60	---	33.44	200	V	39.0	-0.6	54.00	20.56
4753.60	43.83	---	200	V	39.0	-0.6	74.00	30.17
7504.20	---	39.60	150	V	279.0	6.1	54.00	14.40
7504.20	49.55	---	150	V	279.0	6.1	74.00	24.45
11089.50	---	42.02	150	H	284.0	9.8	54.00	11.98
11089.50	52.01	---	150	H	284.0	9.8	74.00	21.99
14367.10	---	46.27	200	H	142.0	12.6	54.00	7.73
14367.10	55.30	---	200	H	142.0	12.6	74.00	18.70
17656.60	---	48.60	150	H	328.0	14.0	54.00	5.40
17656.60	57.62	---	150	H	328.0	14.0	74.00	16.38

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	43.85	200	V	341.0	-9.8	54.00	10.15
1533.80	47.50	---	200	V	341.0	-9.8	74.00	26.50
3478.60	---	35.03	150	V	12.0	-3.6	54.00	18.97
3478.60	42.65	---	150	V	12.0	-3.6	74.00	31.35
4874.00	---	33.24	150	H	341.0	-0.5	54.00	20.76
4874.00	44.04	---	150	H	341.0	-0.5	74.00	29.96
6822.50	---	38.95	200	V	295.0	5.0	54.00	15.05
6822.50	49.32	---	200	V	295.0	5.0	74.00	24.68
13321.60	---	45.59	150	H	279.0	12.0	54.00	8.41
13321.60	54.57	---	150	H	279.0	12.0	74.00	19.43
17588.60	---	49.84	200	H	106.0	14.1	54.00	4.16
17588.60	56.55	---	200	H	106.0	14.1	74.00	17.45

High Channel: 2462MHz

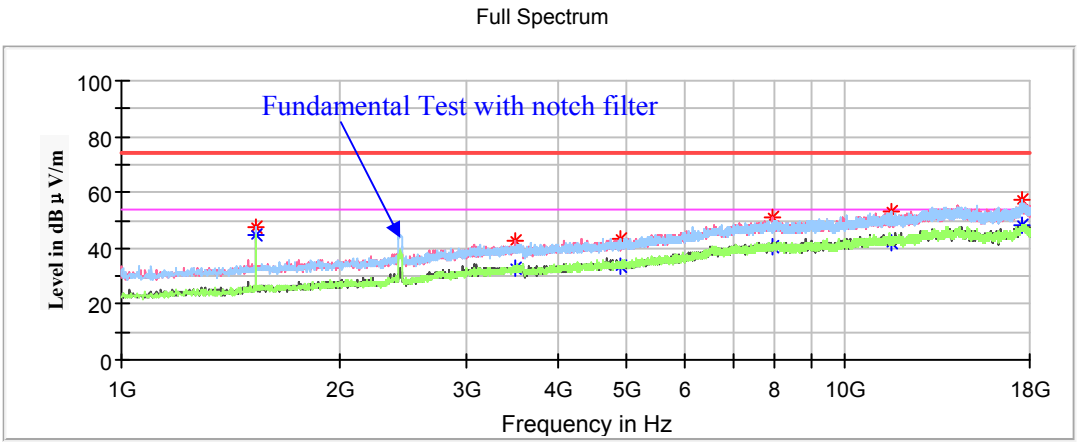


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.49	150	H	321.0	-9.8	54.00	9.51
1533.80	48.10	---	150	H	321.0	-9.8	74.00	25.90
3446.30	---	31.89	150	V	91.0	-3.6	54.00	22.11
3446.30	41.38	---	150	V	91.0	-3.6	74.00	32.62
4821.60	---	34.35	200	H	336.0	-0.5	54.00	19.65
4821.60	42.84	---	200	H	336.0	-0.5	74.00	31.16
7747.30	---	41.31	150	V	18.0	6.6	54.00	12.69
7747.30	50.62	---	150	V	18.0	6.6	74.00	23.38
13750.00	---	45.16	150	H	356.0	12.2	54.00	8.84
13750.00	54.92	---	150	H	356.0	12.2	74.00	19.08
17619.20	---	47.89	200	H	136.0	14.1	54.00	6.11
17619.20	56.70	---	200	H	136.0	14.1	74.00	17.30

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

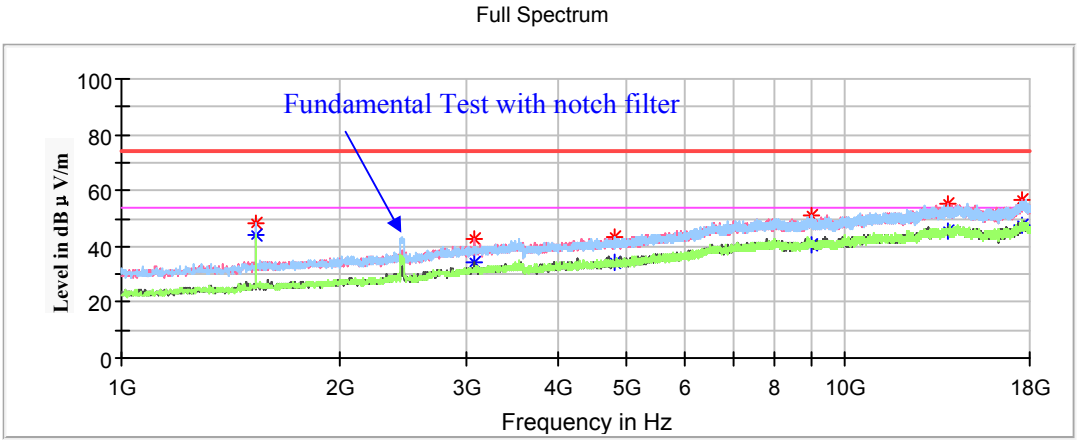
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Low Channel: 2422MHz



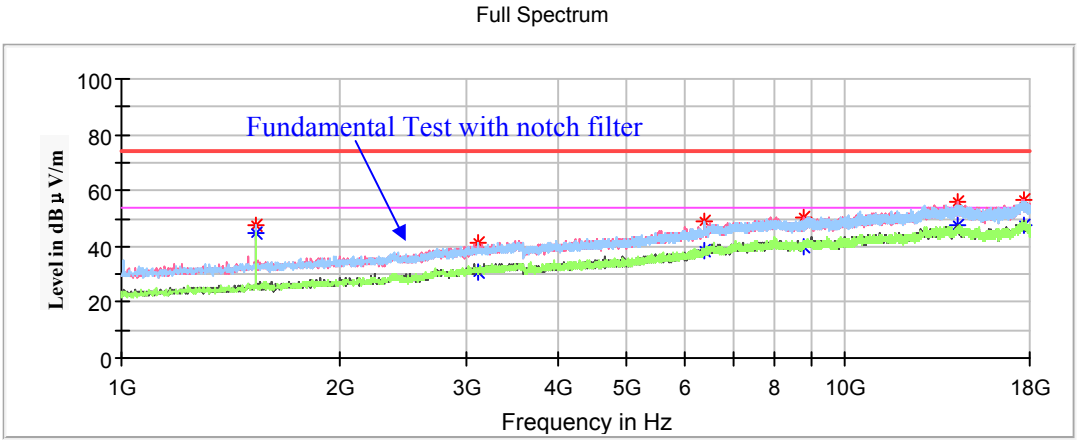
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.45	150.0	H	310.0	-9.8	54.00	9.55
1533.80	47.63	---	150.0	H	310.0	-9.8	74.00	26.37
3497.30	---	32.74	200.0	V	306.0	-3.5	54.00	21.26
3497.30	42.42	---	200.0	V	306.0	-3.5	74.00	31.58
4844.00	---	33.48	200.0	H	221.0	-0.4	54.00	20.52
4844.00	43.62	---	200.0	H	221.0	-0.4	74.00	30.38
7947.90	---	40.63	150.0	V	189.0	7.0	54.00	13.37
7947.90	50.87	---	150.0	V	189.0	7.0	74.00	23.13
11565.50	---	42.06	200.0	H	100.0	9.8	54.00	11.94
11565.50	53.22	---	200.0	H	100.0	9.8	74.00	20.78
17547.80	---	48.08	150.0	H	310.0	14.2	54.00	5.92
17547.80	57.46	---	150.0	H	310.0	14.2	74.00	16.54

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.08	150.0	H	308.0	-9.8	54.00	9.92
1533.80	48.20	---	150.0	H	308.0	-9.8	74.00	25.80
3068.90	---	34.05	200.0	V	280.0	-4.3	54.00	19.95
3068.90	42.61	---	200.0	V	280.0	-4.3	74.00	31.39
4799.50	---	34.20	200.0	H	200.0	-0.6	54.00	19.80
4799.50	43.20	---	200.0	H	200.0	-0.6	74.00	30.80
8988.30	---	40.36	150.0	H	229.0	7.7	54.00	13.64
8988.30	51.02	---	150.0	H	229.0	7.7	74.00	22.98
13855.40	---	45.46	150.0	V	58.0	12.3	54.00	8.54
13855.40	55.25	---	150.0	V	58.0	12.3	74.00	18.75
17598.80	---	47.45	150.0	V	189.0	14.1	54.00	6.55
17598.80	56.35	---	150.0	V	189.0	14.1	74.00	17.65

High Channel: 2452MHz

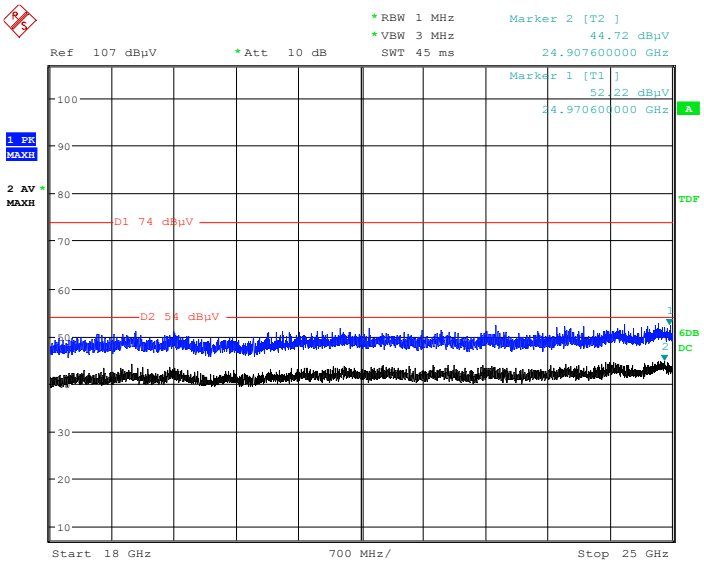


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.72	150.0	H	318.0	-9.8	54.00	9.28
1533.80	47.72	---	150.0	H	318.0	-9.8	74.00	26.28
3118.20	---	31.06	150.0	H	111.0	-4.2	54.00	22.94
3118.20	41.55	---	150.0	H	111.0	-4.2	74.00	32.45
6407.70	---	38.62	200.0	V	350.0	4.0	54.00	15.38
6407.70	48.61	---	200.0	V	350.0	4.0	74.00	25.39
8770.70	---	39.87	200.0	V	215.0	7.0	54.00	14.13
8770.70	50.17	---	200.0	V	215.0	7.0	74.00	23.83
14334.80	---	47.35	150.0	V	230.0	12.6	54.00	6.65
14334.80	55.79	---	150.0	V	230.0	12.6	74.00	18.21
17637.90	---	47.21	150.0	V	357.0	14.1	54.00	6.79
17637.90	56.50	---	150.0	V	357.0	14.1	74.00	17.50

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 802.11g mode in Z-axis of orientation** was recorded*

Horizontal



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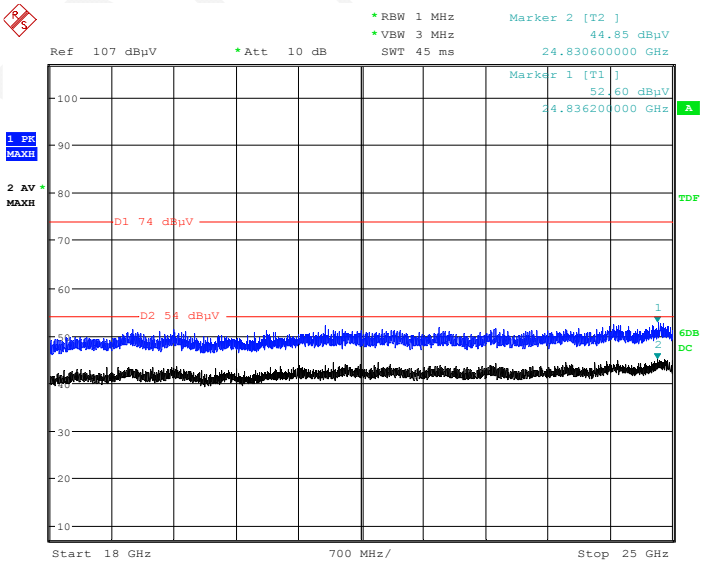
Vertical



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Restricted Bands Emissions Test:

Note:
1. 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)

802.11b Mode: *(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	---	44.90	200.0	H	0.0	2.8	54.00	9.10
2390.000000	50.63	---	200.0	H	0.0	2.8	74.00	23.37
High Channel: 2462MHz								
2483.500000	49.77	---	200.0	H	288.0	3.0	74.00	24.23
2483.500000	---	43.61	200.0	H	288.0	3.0	54.00	10.39

802.11g Mode: *(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	59.03	---	200.0	H	0.0	2.8	74.00	14.97
2390.000000	---	50.43	200.0	H	0.0	2.8	54.00	3.57
High Channel: 2462MHz								
2483.500000	---	51.09	200.0	H	359.0	3.0	54.00	2.91
2483.500000	59.37	---	200.0	H	359.0	3.0	74.00	14.63

802.11n-HT20 Mode: *(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	---	51.17	200.0	H	8.0	2.8	54.00	2.83
2390.000000	64.19	---	200.0	H	8.0	2.8	74.00	9.81
High Channel: 2462MHz								
2483.500000	---	50.81	150.0	H	275.0	3.0	54.00	3.19
2483.500000	59.49	---	200.0	H	275.0	3.0	74.00	14.51

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

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
Low Channel: 2422MHz								
2390.000000	---	44.87	200.0	H	2.0	2.8	54.00	9.13
2390.000000	56.03	---	200.0	H	2.0	2.8	74.00	17.97
High Channel: 2452MHz								
2483.500000	60.54	---	200.0	H	358.0	3.0	74.00	13.46
2483.500000	---	46.72	200.0	H	358.0	3.0	54.00	7.28

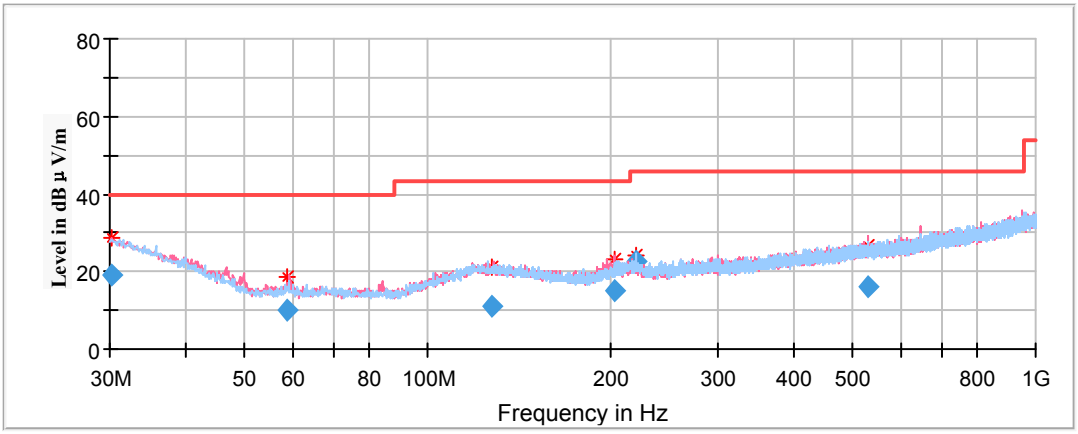
FINAL

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



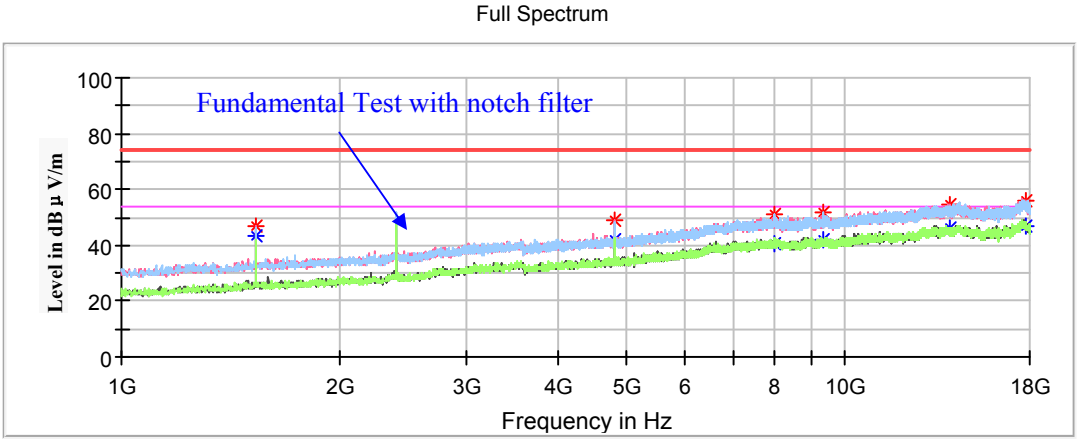
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dBµV/m)	Height (cm)	Polar (H/V)				
30.30	18.88	200	V	50.0	-4.1	40.00	21.12
58.72	10.05	100	V	341.0	-17.9	40.00	29.95
127.38	10.91	100	V	1.0	-11.5	43.50	32.59
202.85	15.30	100	V	116.0	-12.3	43.50	28.20
220.02	22.66	100	H	113.0	-12.2	46.00	23.34
529.21	15.95	200	V	243.0	-5.9	46.00	30.05

1GHz-18GHz

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

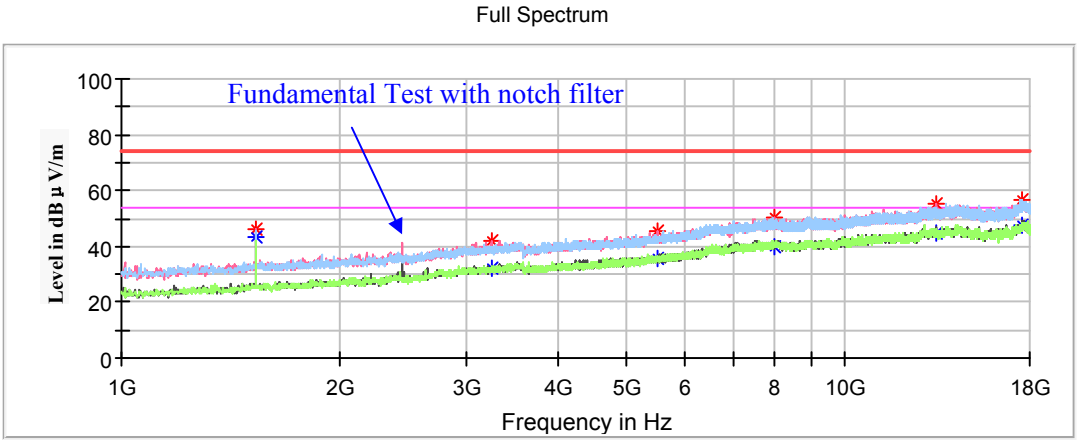
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
   Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Low Channel: 2402MHz



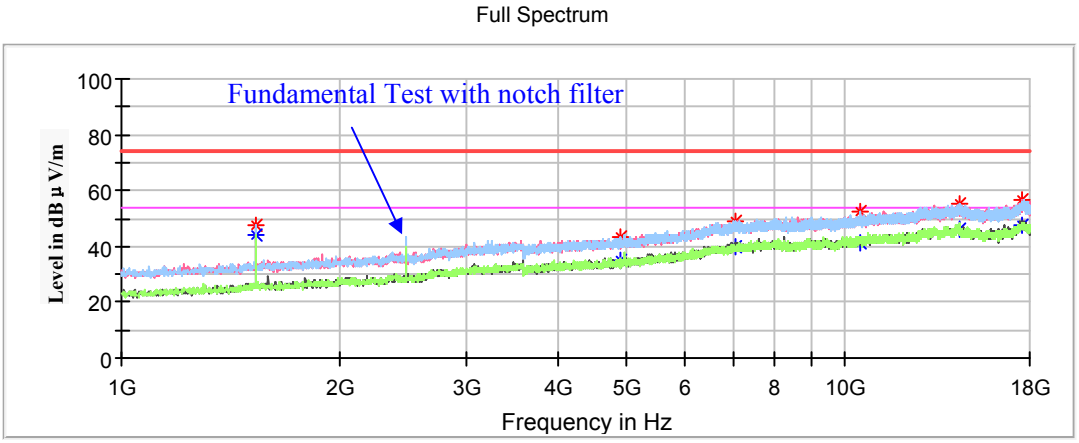
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1533.80	---	43.23	200	V	351.0	-9.8	54.00	10.77
1533.80	46.72	---	200	V	351.0	-9.8	74.00	27.28
4804.00	---	41.83	150	V	336.0	-0.6	54.00	12.17
4804.00	48.88	---	150	V	336.0	-0.6	74.00	25.12
8005.70	---	40.35	200	H	322.0	7.1	54.00	13.65
8005.70	50.84	---	200	H	322.0	7.1	74.00	23.16
9331.70	---	42.07	200	H	322.0	7.7	54.00	11.93
9331.70	51.44	---	200	H	322.0	7.7	74.00	22.56
13926.80	---	46.03	200	V	296.0	12.4	54.00	7.97
13926.80	54.89	---	200	V	296.0	12.4	74.00	19.11
17758.60	---	46.64	150	V	349.0	13.9	54.00	7.36
17758.60	56.22	---	150	V	349.0	13.9	74.00	17.78

Middle Channel: 2440MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	43.27	200	V	351.0	-9.8	54.00	10.73
1533.80	46.43	---	200	V	351.0	-9.8	74.00	27.57
3240.60	---	32.07	200	V	248.0	-4.0	54.00	21.93
3240.60	42.21	---	200	V	248.0	-4.0	74.00	31.79
5503.30	---	35.94	150	V	131.0	1.4	54.00	18.06
5503.30	45.23	---	150	V	131.0	1.4	74.00	28.77
7988.70	---	40.18	150	V	12.0	7.0	54.00	13.82
7988.70	50.54	---	150	V	12.0	7.0	74.00	23.46
13331.80	---	44.64	150	V	131.0	12.0	54.00	9.36
13331.80	55.14	---	150	V	131.0	12.0	74.00	18.86
17547.80	---	47.53	150	H	265.0	14.2	54.00	6.47
17547.80	56.37	---	150	H	265.0	14.2	74.00	17.63

High Channel: 2480MHz

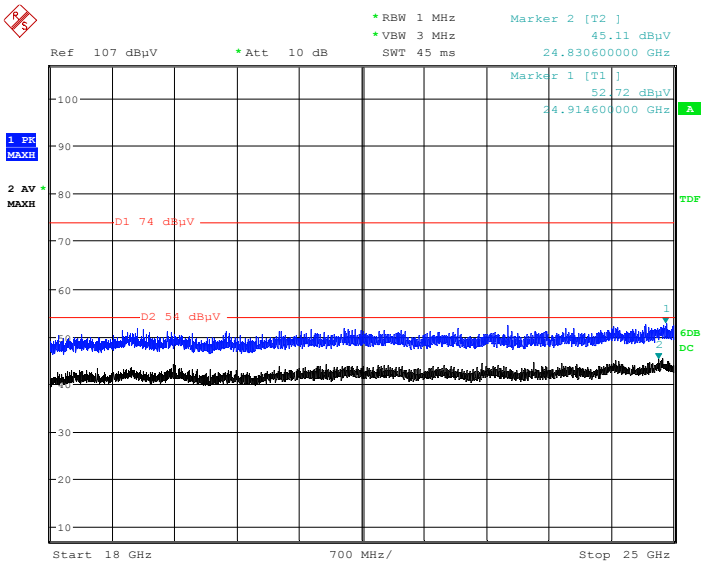


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.80	---	44.16	200	V	341.0	-9.8	54.00	9.84
1533.80	47.78	---	200	V	341.0	-9.8	74.00	26.22
4887.90	---	34.69	200	H	48.0	-0.4	54.00	19.31
4887.90	43.27	---	200	H	48.0	-0.4	74.00	30.73
7050.30	---	39.98	150	H	10.0	5.4	54.00	14.02
7050.30	49.22	---	150	H	10.0	5.4	74.00	24.78
10484.30	---	41.02	150	H	65.0	9.0	54.00	12.98
10484.30	52.11	---	150	H	65.0	9.0	74.00	21.89
14424.90	---	45.90	150	H	50.0	12.7	54.00	8.10
14424.90	55.43	---	150	H	50.0	12.7	74.00	18.57
17559.70	---	47.81	200	V	249.0	14.2	54.00	6.19
17559.70	56.48	---	200	V	249.0	14.2	74.00	17.52

18GHz-25GHz

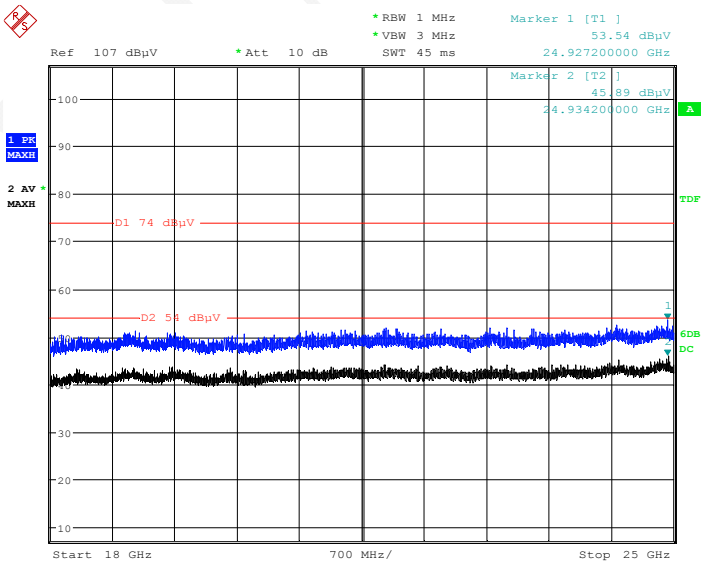
*(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **low channel of operation in the X axis of orientation** was recorded)*

Horizontal



Date: 21.DEC.2019 12:26:53

Vertical



Date: 21.DEC.2019 12:48:14

Restricted Bands Emissions Test:

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

Note:

1. Corrected Factor (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)

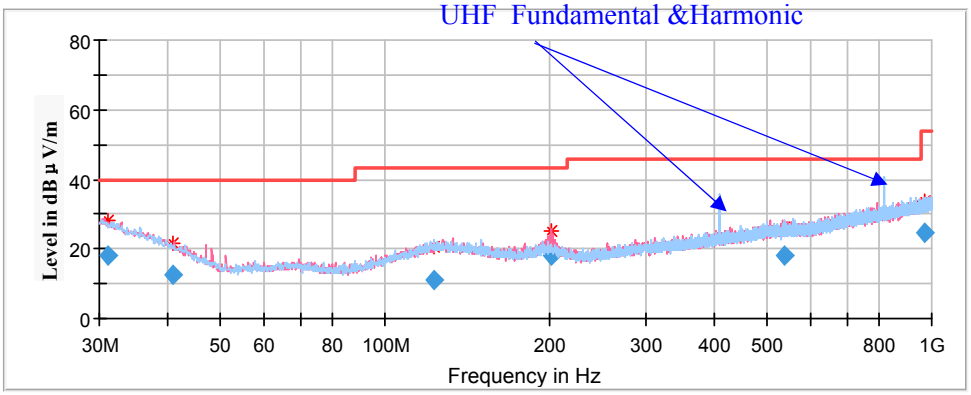
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
Low Channel: 2402MHz								
2390.000000	47.27	---	150.0	H	89.0	2.8	74.00	26.73
2390.000000	---	38.07	150.0	H	89.0	2.8	54.00	15.93
High Channel: 2480MHz								
2483.500000	---	47.29	150.0	H	273.0	3.0	54.00	6.71
2483.500000	52.00	---	150.0	H	273.0	3.0	74.00	22.00

FINAL

Transmitting simultaneously test:

30MHz-1GHz

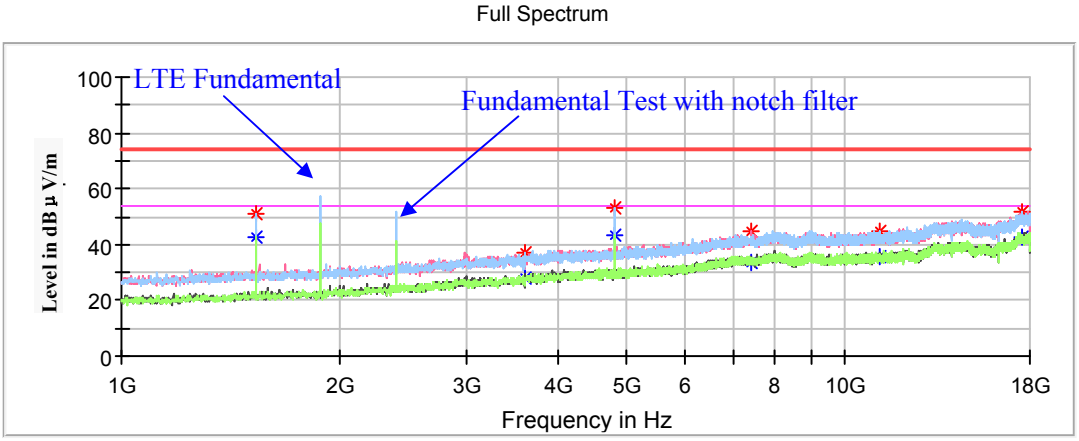
***(The worst case 2.4G Wi-Fi 802.11g high channel, LTE Band 2 and UHF mode transmitting simultaneously** was recorded)*



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)				
31.131442	18.04	200.0	V	175.0	-5.3	40.00	21.96
40.844500	12.49	200.0	V	199.0	-11.8	40.00	27.51
122.895800	10.88	100.0	H	329.0	-11.5	43.50	32.62
201.462750	17.89	100.0	V	151.0	-11.6	43.50	25.61
537.435900	18.28	200.0	H	186.0	-5.8	46.00	27.72
972.523350	24.77	100.0	H	192.0	1.5	53.90	29.13

1GHz-18GHz

(The worst case 2.4G Wi-Fi 802.11g high channel, LTE Band 2 and UHF mode transmitting simultaneously** was recorded**)

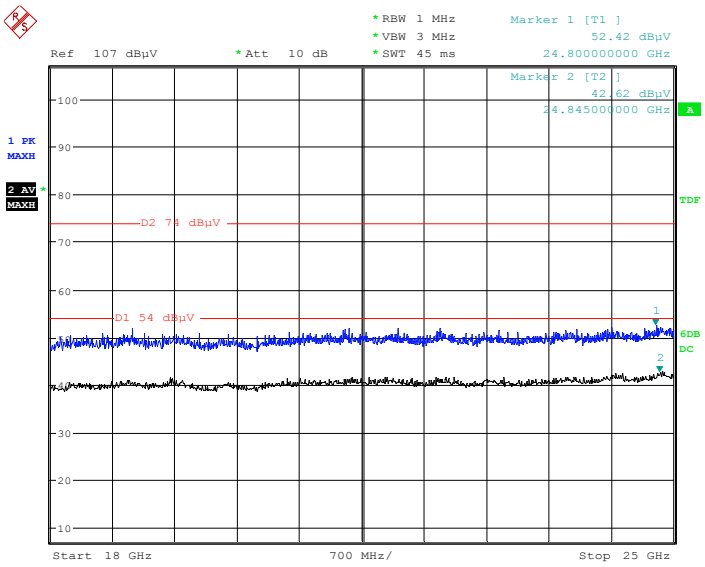


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1533.800000	50.90	---	150.0	H	160.0	-16.2	74.00	23.10
1533.800000	---	42.34	150.0	H	160.0	-16.2	54.00	11.66
3611.200000	37.10	---	150.0	H	121.0	-8.4	74.00	36.90
3611.200000	---	27.75	150.0	H	121.0	-8.4	54.00	26.25
4802.900000	---	43.38	150.0	H	108.0	-5.6	54.00	10.62
4802.900000	52.83	---	200.0	H	108.0	-5.6	74.00	21.17
7412.400000	44.55	---	200.0	V	335.0	0.8	74.00	29.45
7412.400000	---	33.66	150.0	V	335.0	0.8	54.00	20.34
11133.700000	44.47	---	150.0	H	313.0	2.9	74.00	29.53
11133.700000	---	35.71	150.0	H	313.0	2.9	54.00	18.29
17564.800000	51.43	---	200.0	V	173.0	8.9	74.00	22.57
17564.800000	---	42.68	200.0	V	173.0	8.9	54.00	11.32

18GHz-25GHz:

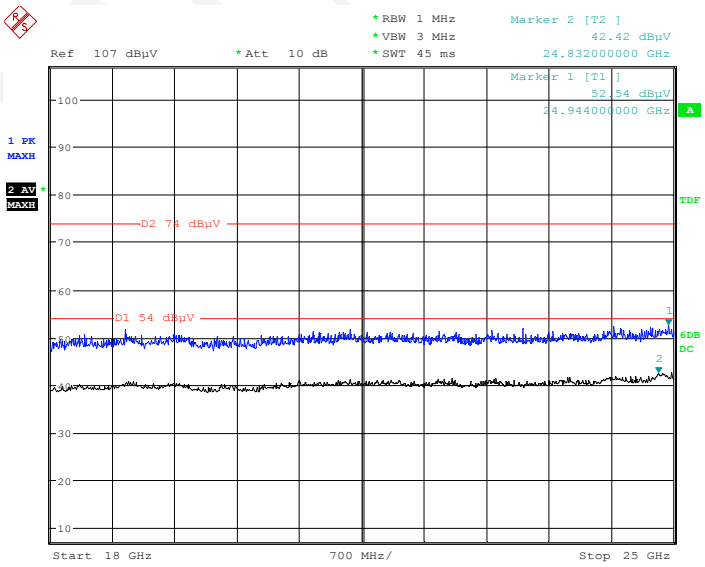
(The worst case 2.4G Wi-Fi 802.11g high channel, LTE Band 2 and UHF mode transmitting simultaneously** was recorded**)

Vertical



Date: 22.FEB.2021 16:44:39

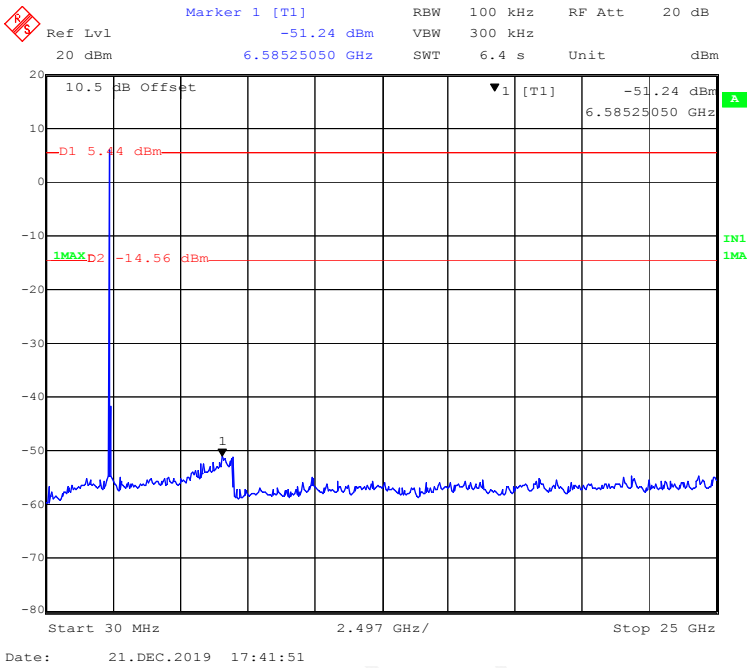
Horizontal



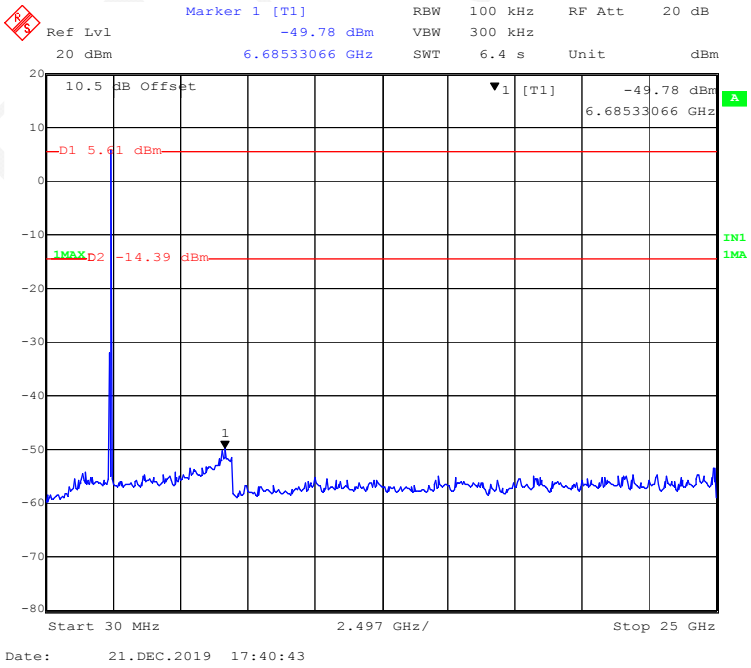
Date: 22.FEB.2021 16:36:19

Conducted Spurious Emissions at Antenna Port

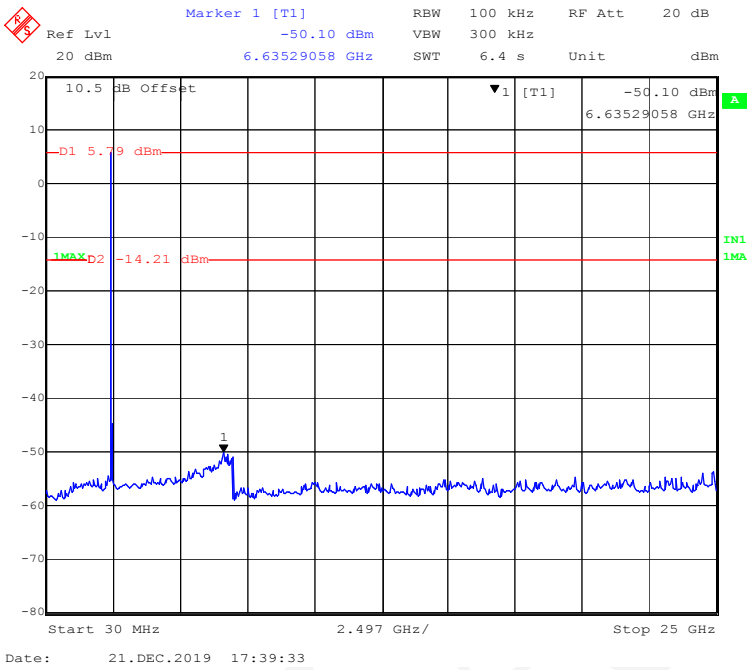
802.11b Mode Low Channel



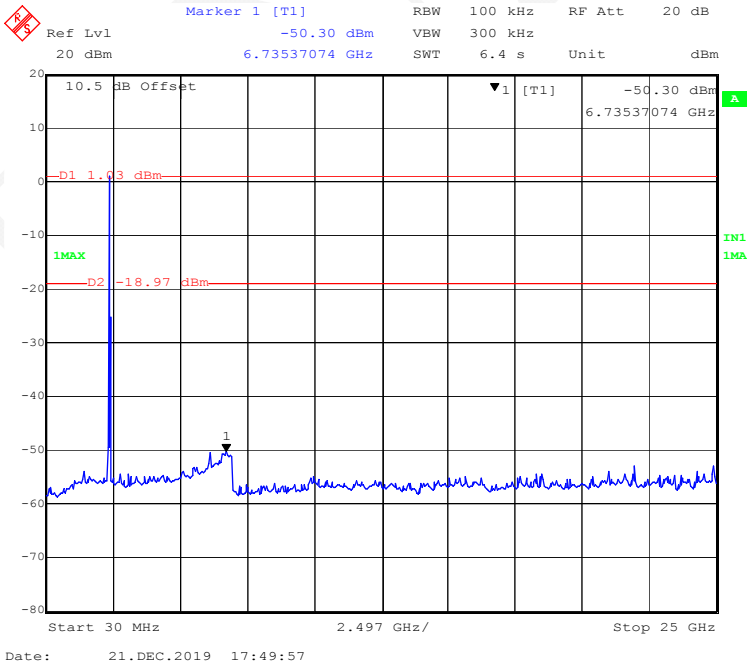
802.11b Mode Middle Channel



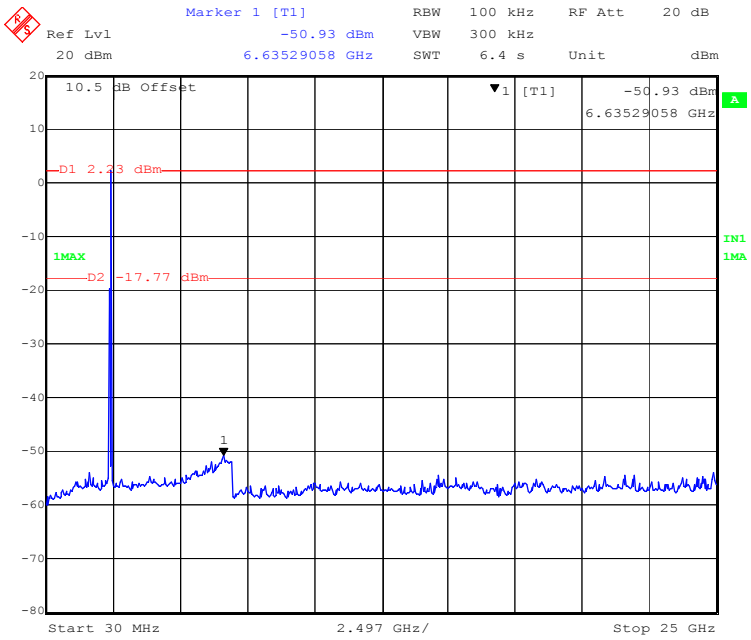
802.11b Mode High Channel



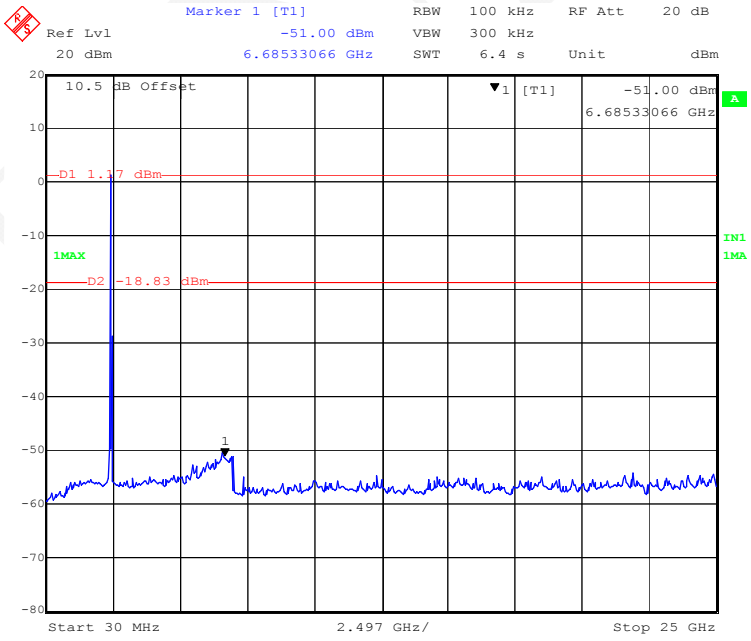
802.11g Mode Low Channel



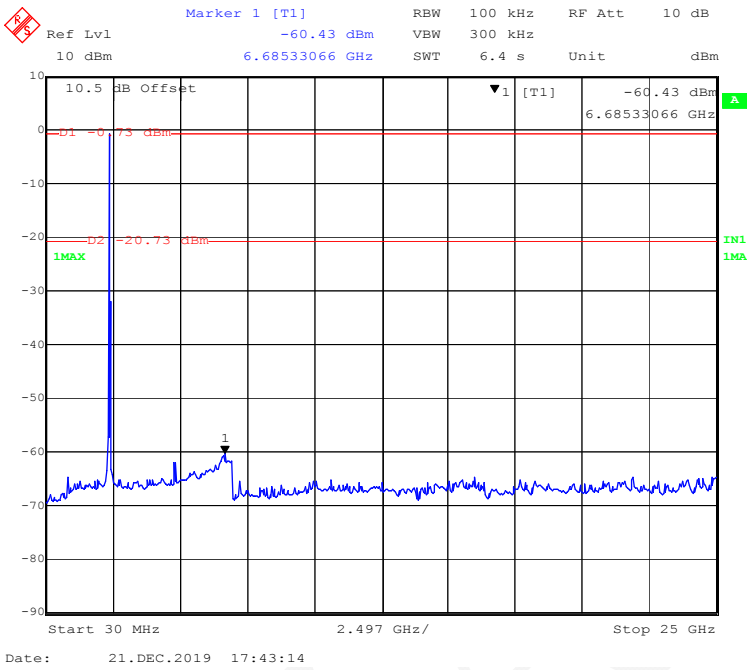
802.11g Mode Middle Channel



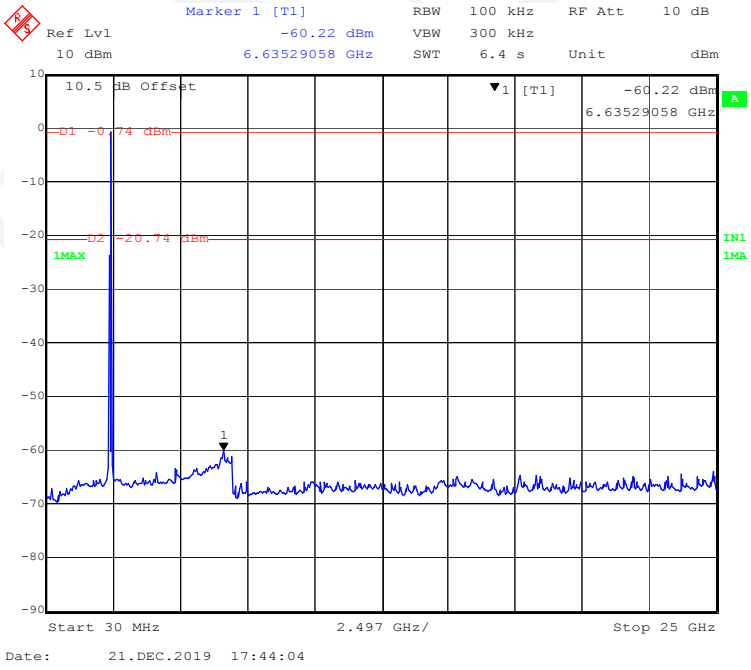
802.11g Mode High Channel



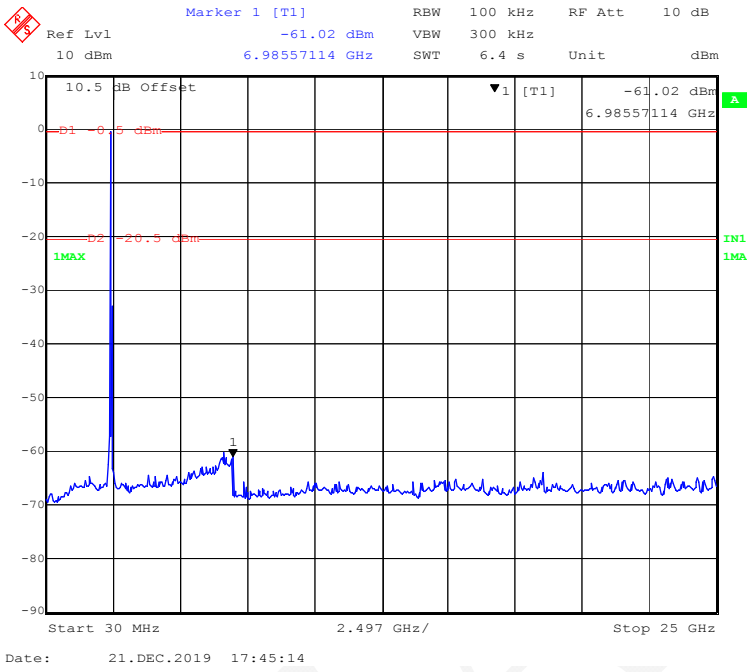
802.11n-HT20 Mode Low Channel



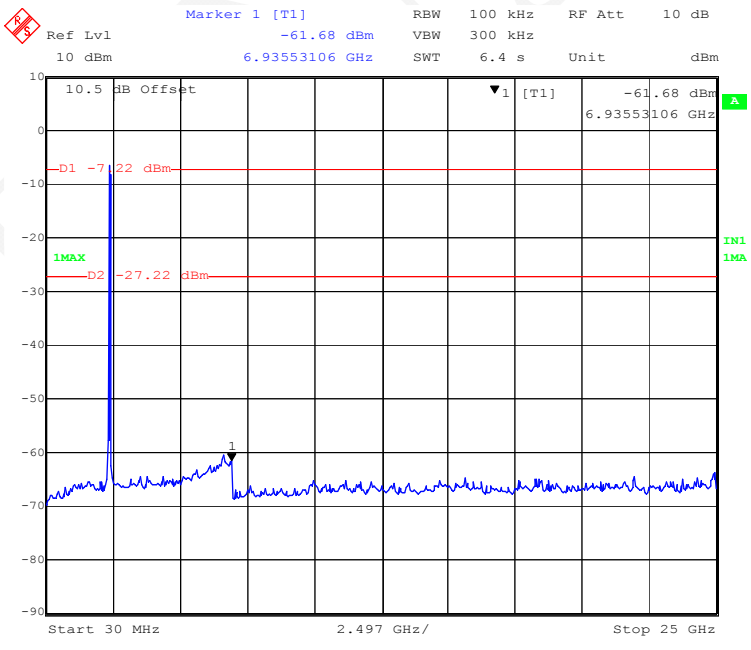
802.11n-HT20 Mode Middle Channel



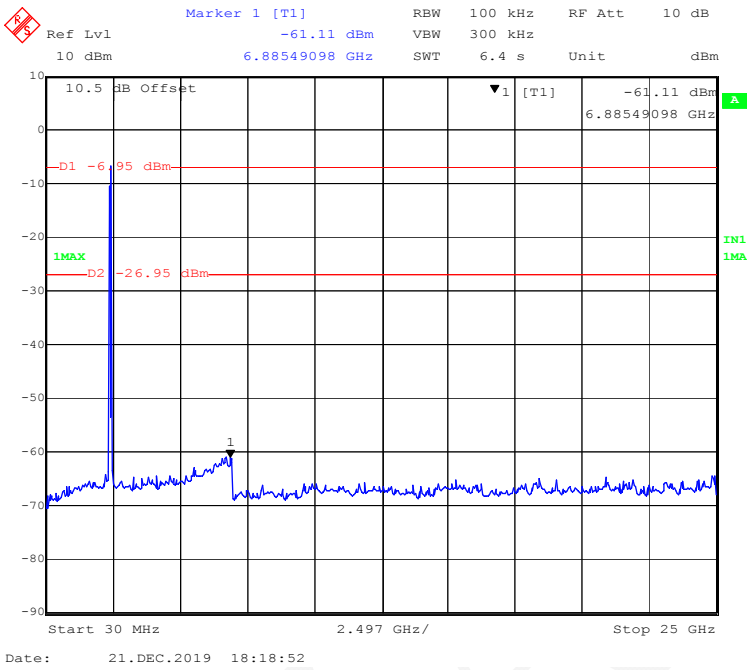
802.11n-HT20 Mode High Channel



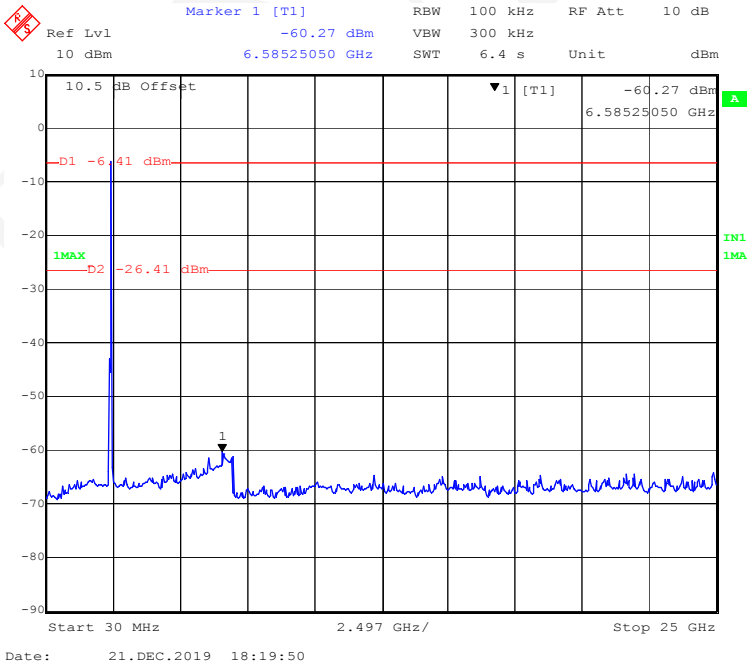
802.11n-HT40 Mode Low Channel



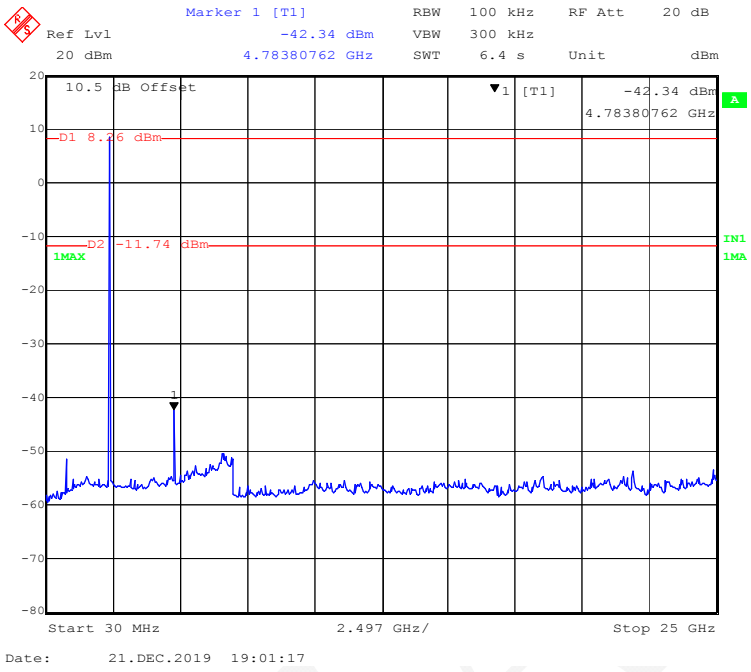
802.11n-HT40 Mode Middle Channel



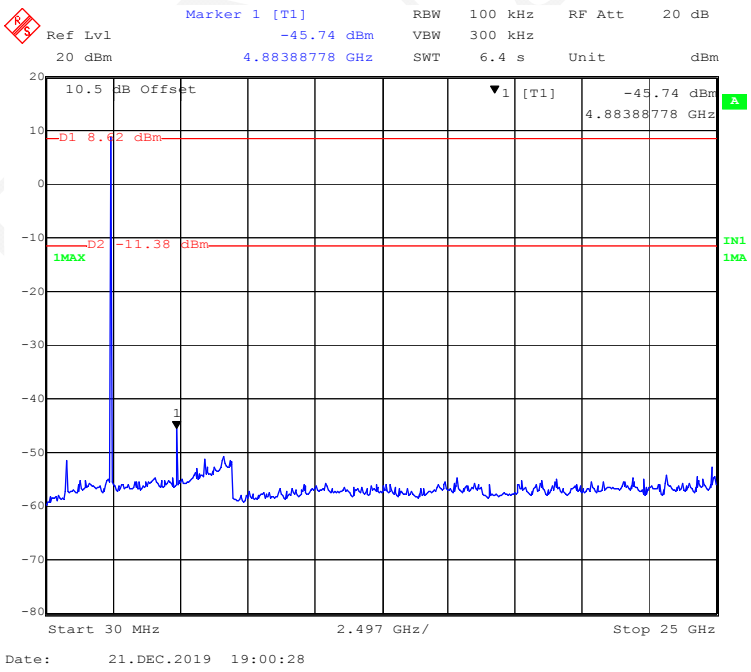
802.11n-HT40 Mode High Channel



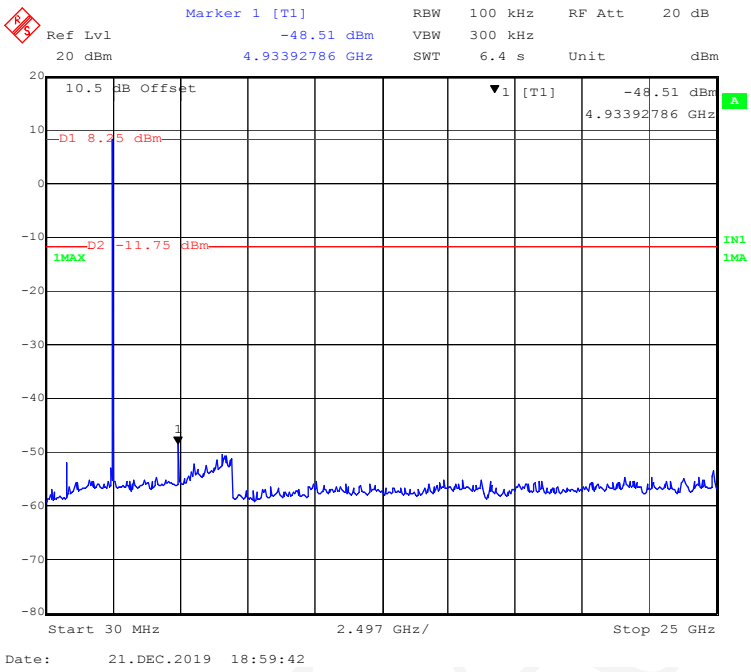
BLE Mode Low Channel



BLE Mode Middle Channel



BLE Mode High Channel



RSS-247 ISSUE 2 Clause 5.2 a) – 6 dB EMISSION BANDWIDTH

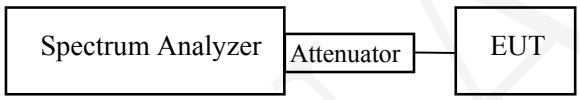
Applicable Standard

According to RSS-247 Clause 5.2 a)

The minimum 6 dB bandwidth shall be 500 kHz.

Test Procedure

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



Test Data

Environmental Conditions

Temperature:	24.0℃
Relative Humidity:	48 %
ATM Pressure:	101.3 kPa

The testing was performed by Chao Gao on 2019-12-21.

Test Result: Compliant.

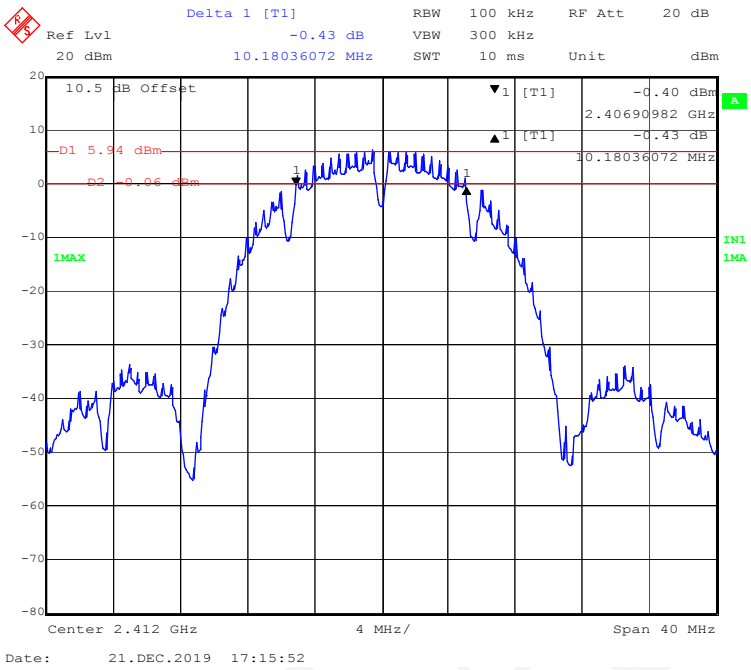
EUT operation mode: Transmitting

FINAL

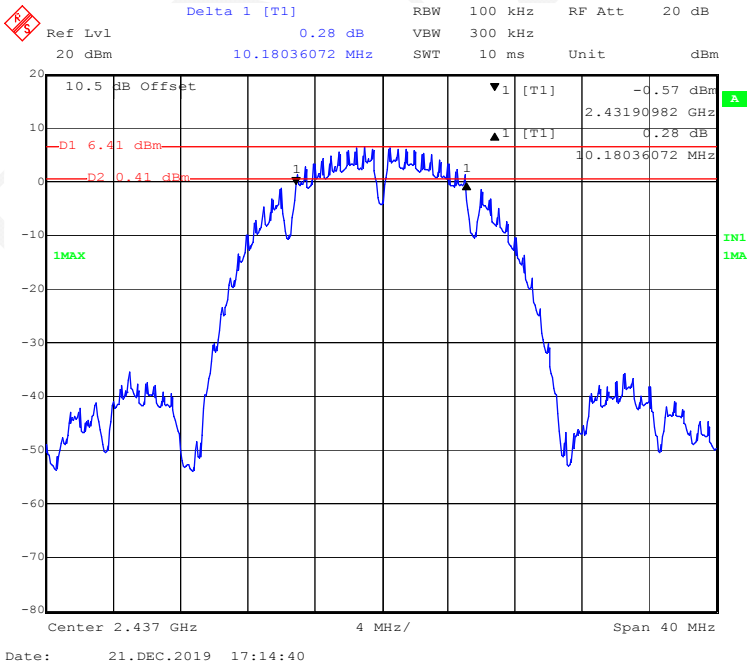
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b Mode			
Low	2412	10.180	≥0.5
Middle	2437	10.180	≥0.5
High	2462	10.180	≥0.5
802.11g Mode			
Low	2412	15.311	≥0.5
Middle	2437	15.311	≥0.5
High	2462	15.311	≥0.5
802.11n-HT20 Mode			
Low	2412	15.311	≥0.5
Middle	2437	15.311	≥0.5
High	2462	15.311	≥0.5
802.11n-HT40 Mode			
Low	2422	35.431	≥0.5
Middle	2437	35.200	≥0.5
High	2452	35.431	≥0.5
BLE Mode			
Low	2402	0.739	≥0.5
Middle	2440	0.758	≥0.5
High	2480	0.745	≥0.5

FINAL

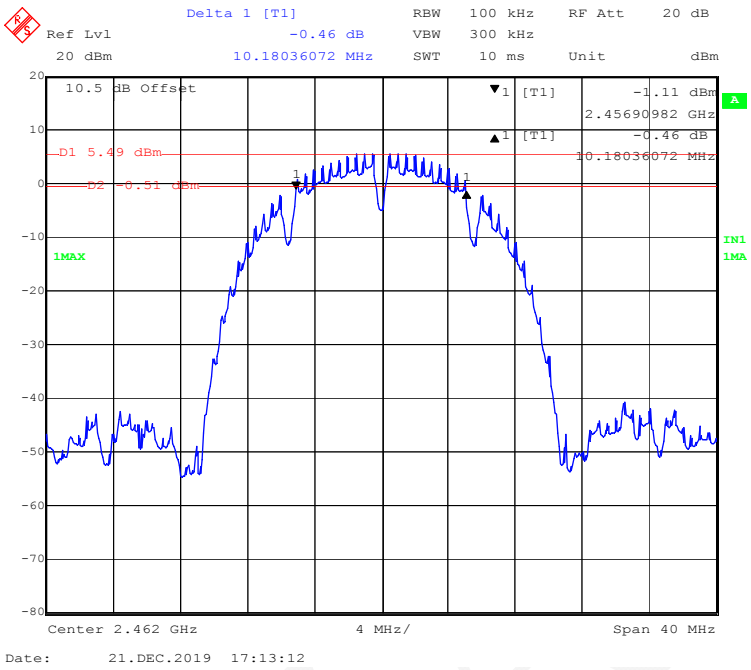
802.11b Mode Low Channel



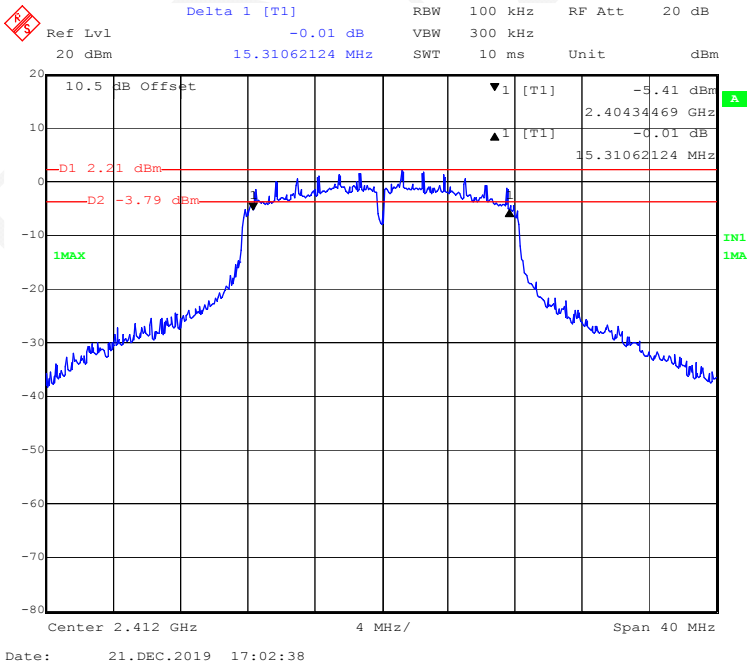
802.11b Mode Middle Channel



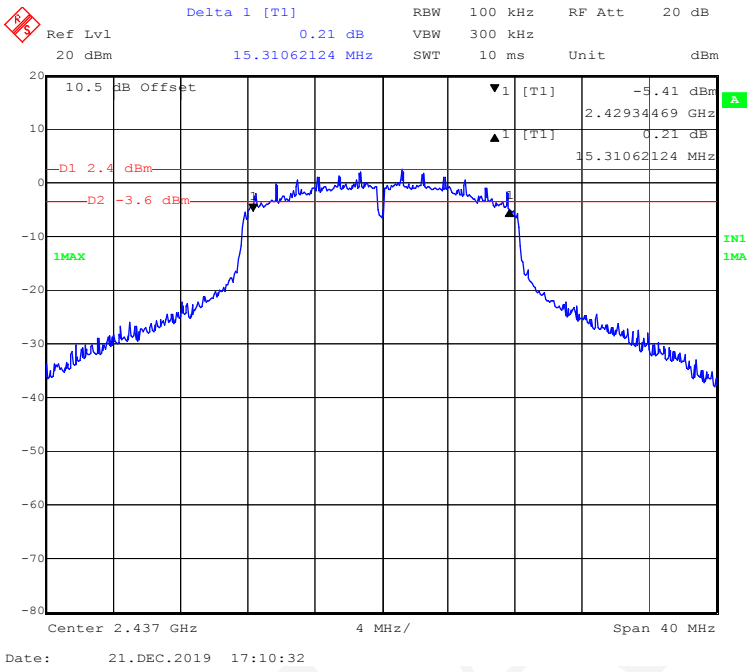
802.11b Mode High Channel



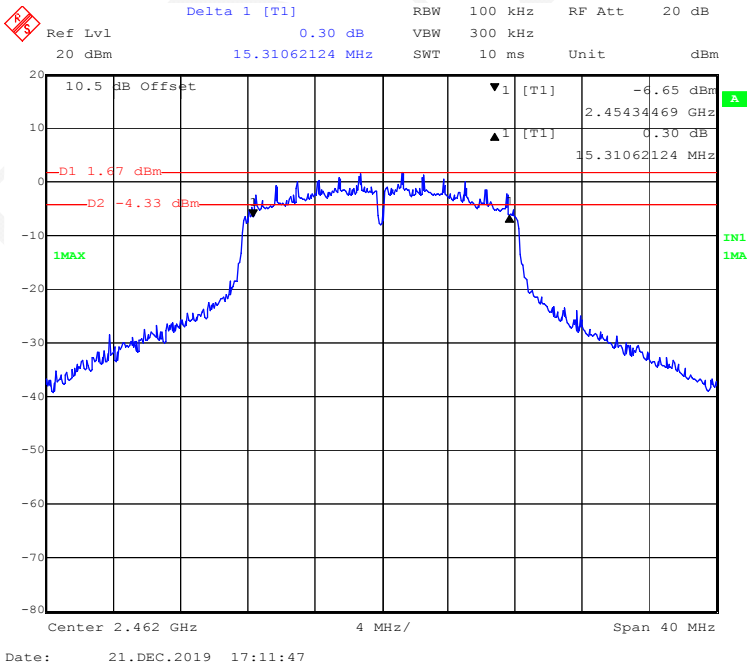
802.11g Mode Low Channel



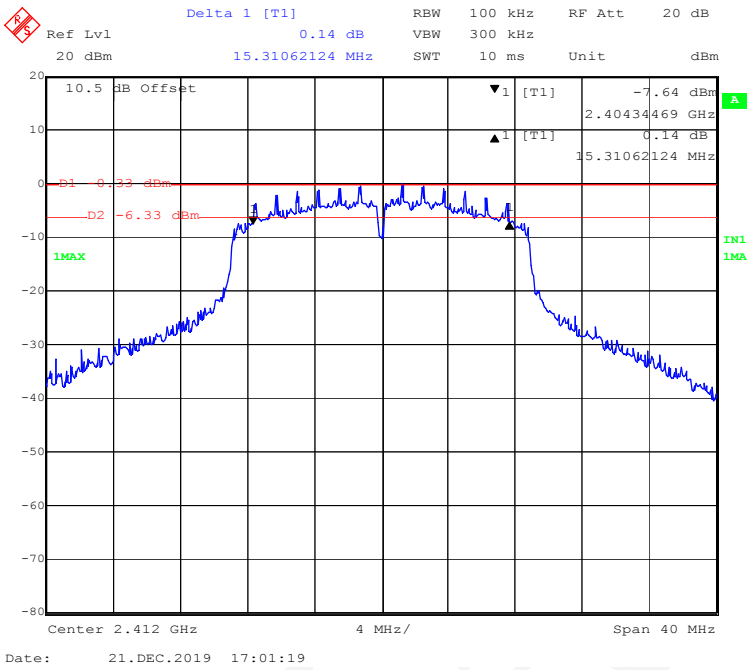
802.11g Mode Middle Channel



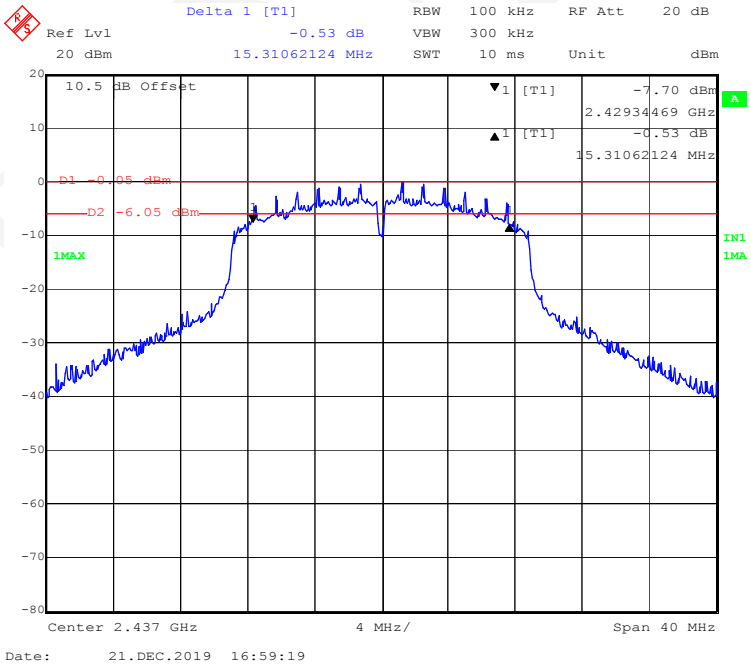
802.11g Mode High Channel



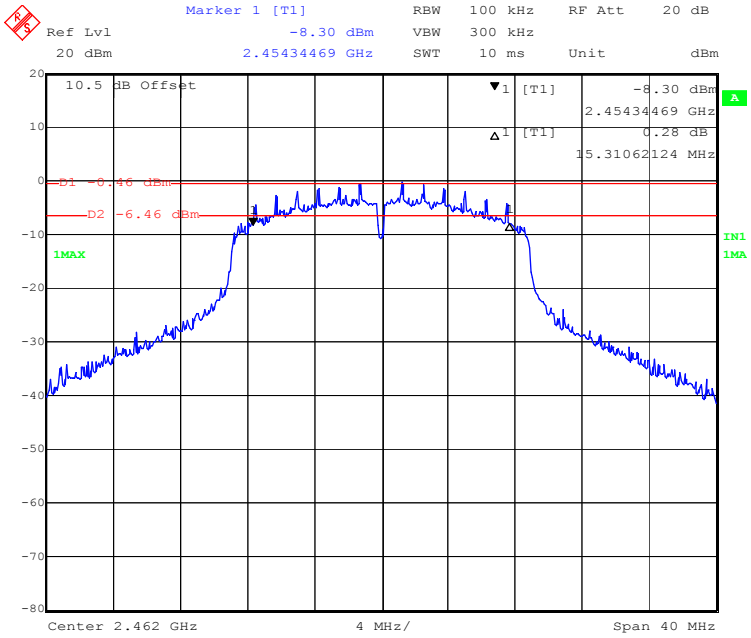
802.11n-HT20 Mode Low Channel



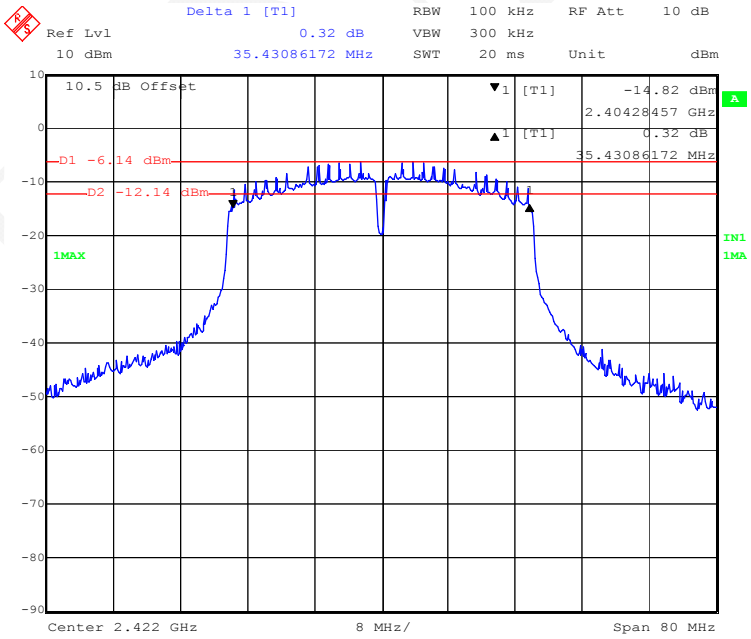
802.11n-HT20 Mode Middle Channel



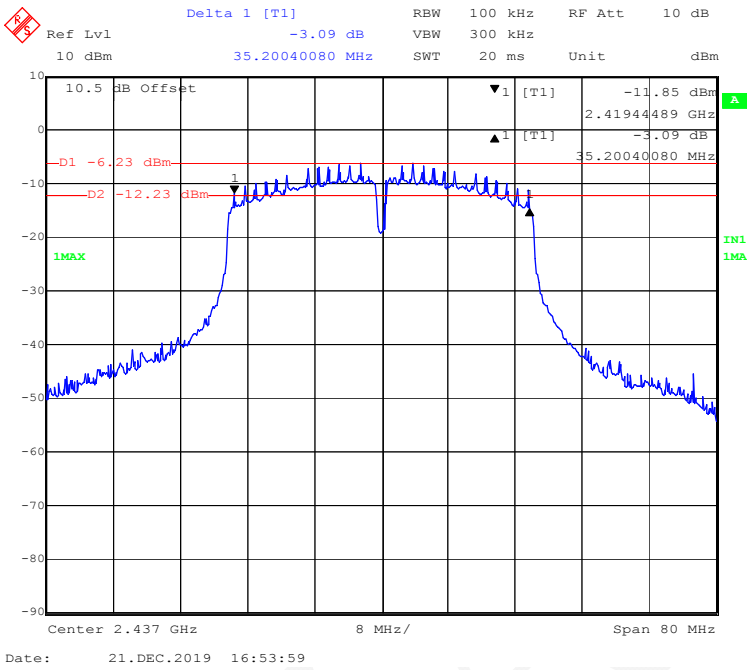
802.11n-HT20 Mode High Channel



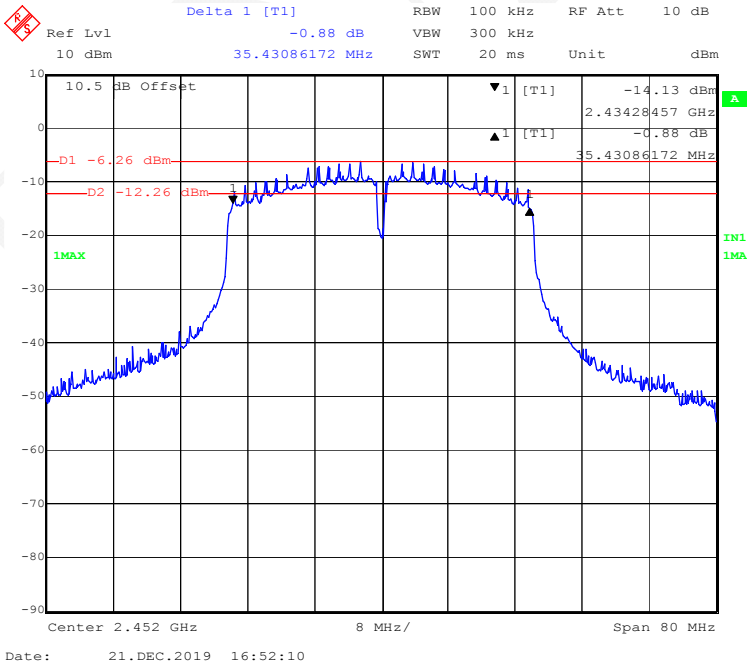
802.11n-HT40 Mode Low Channel



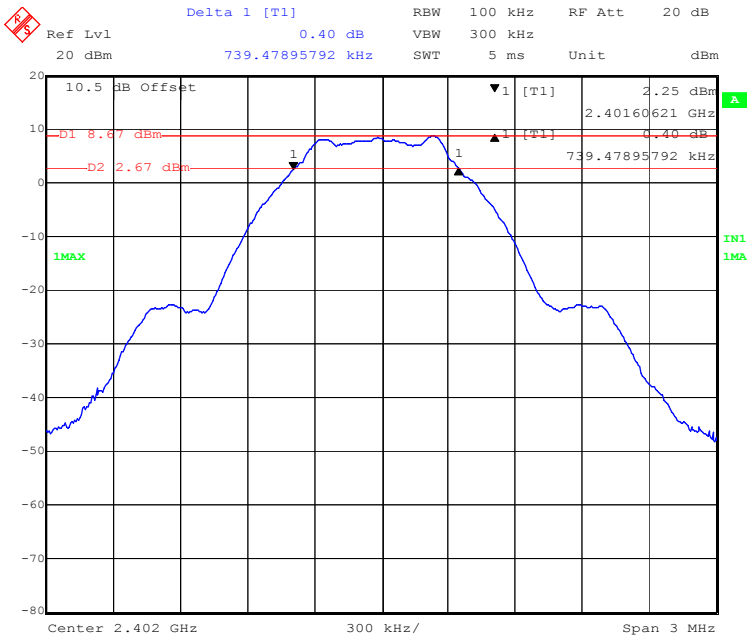
802.11n-HT40 Mode Middle Channel



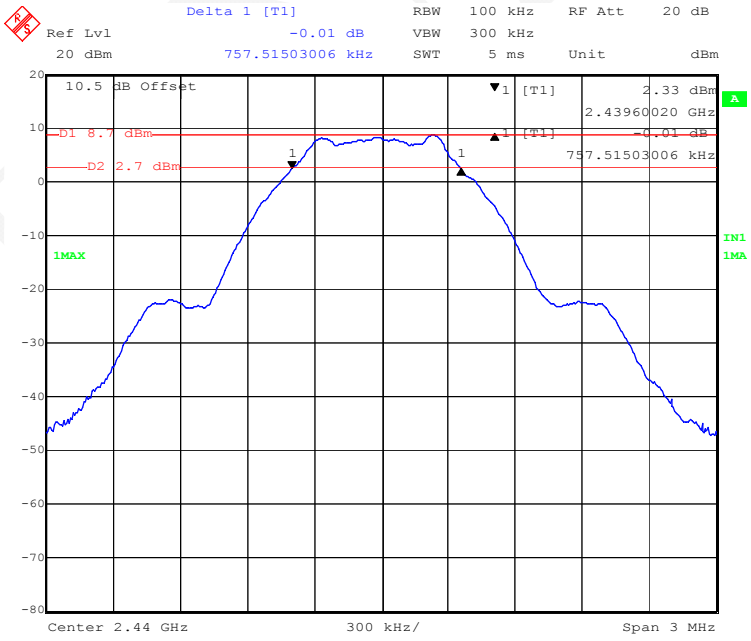
802.11n-HT40 Mode High Channel



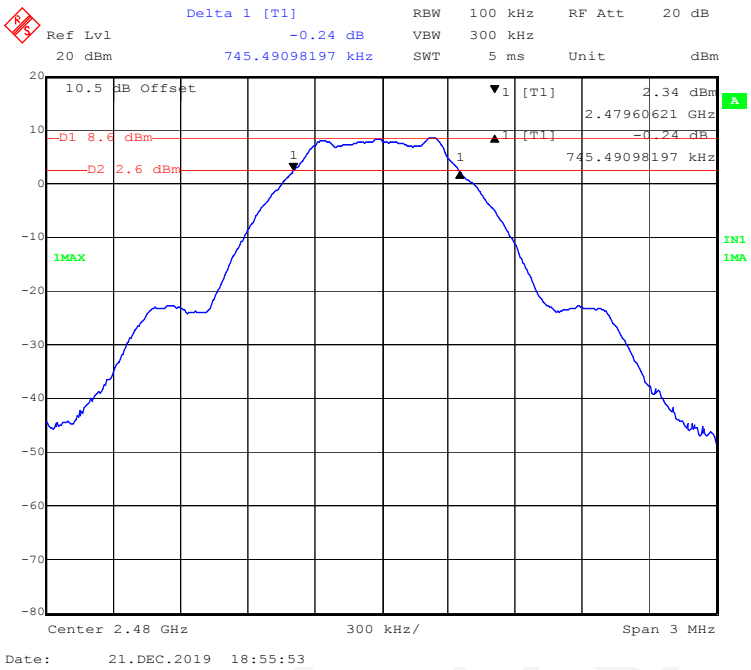
BLE Mode Low Channel



BLE Mode Middle Channel



BLE Mode High Channel



RSS-GEN ISSUE 5 Clause 6.7 – OCCUPIED BANDWIDTH

Applicable Standard

According to RSS-GEN Issue 5 Clause 6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

Test Procedure

The following conditions shall be observed for measuring the occupied bandwidth:

1. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
2. The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
3. The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied if the device is not transmitting continuously.
4. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Test Data

Environmental Conditions

Temperature:	24.0℃
Relative Humidity:	48 %
ATM Pressure:	101.3 kPa

The testing was performed by Chao Gao on 2019-12-21.

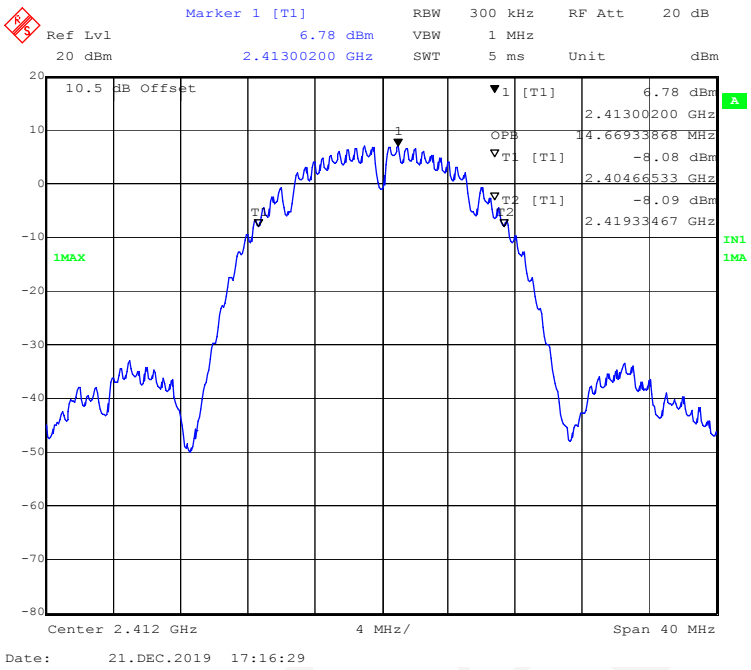
Test Mode: Transmitting

Test Result: Pass

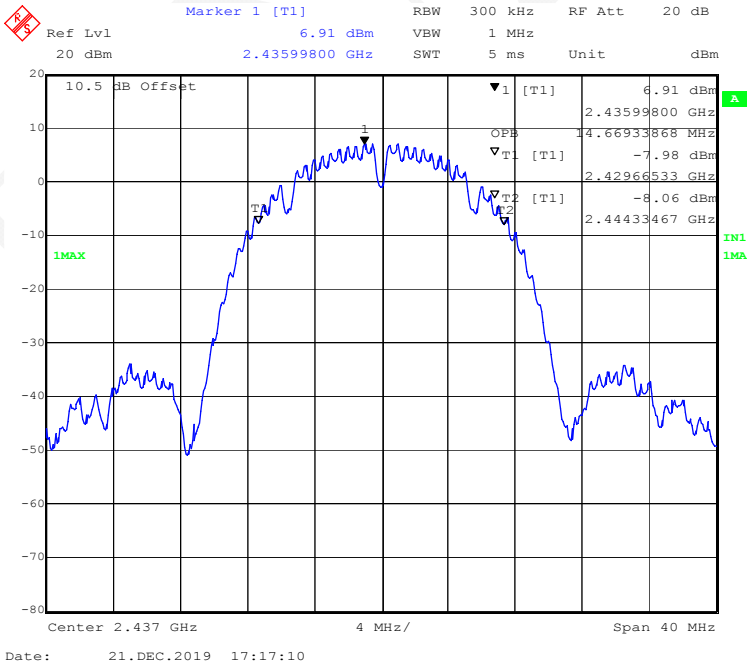
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
802.11b Mode		
Low	2412	14.669
Middle	2437	14.669
High	2462	14.669
802.11g Mode		
Low	2412	16.914
Middle	2437	16.914
High	2462	16.914
802.11n-HT20 Mode		
Low	2412	18.036
Middle	2437	17.956
High	2462	17.956
802.11n-HT40 Mode		
Low	2422	36.072
Middle	2437	36.072
High	2452	36.072
BLE Mode		
Low	2402	1.028
Middle	2440	1.028
High	2480	1.040

FINAL

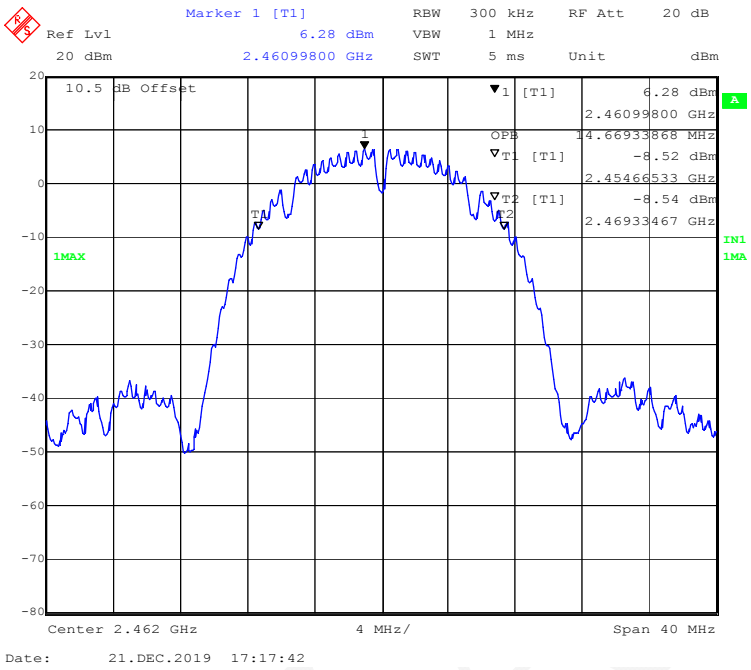
802.11b Mode Low Channel



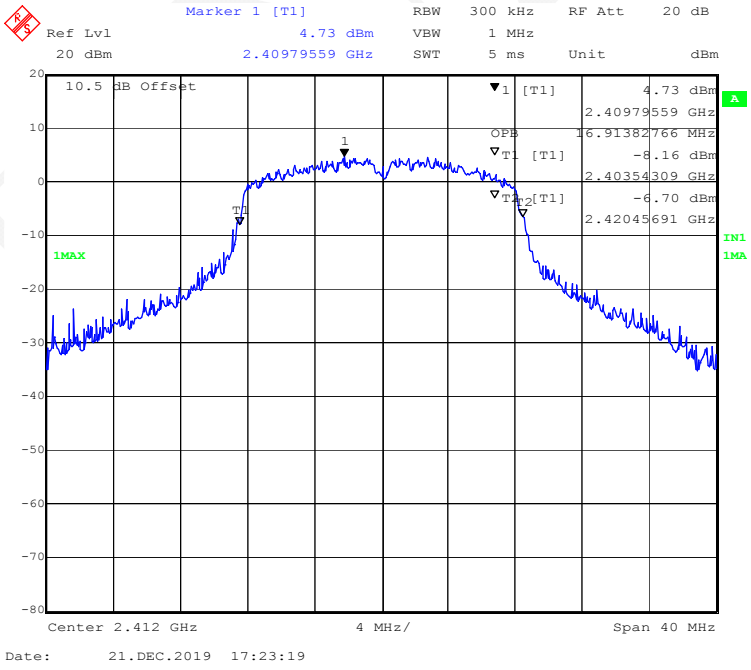
802.11b Mode Middle Channel



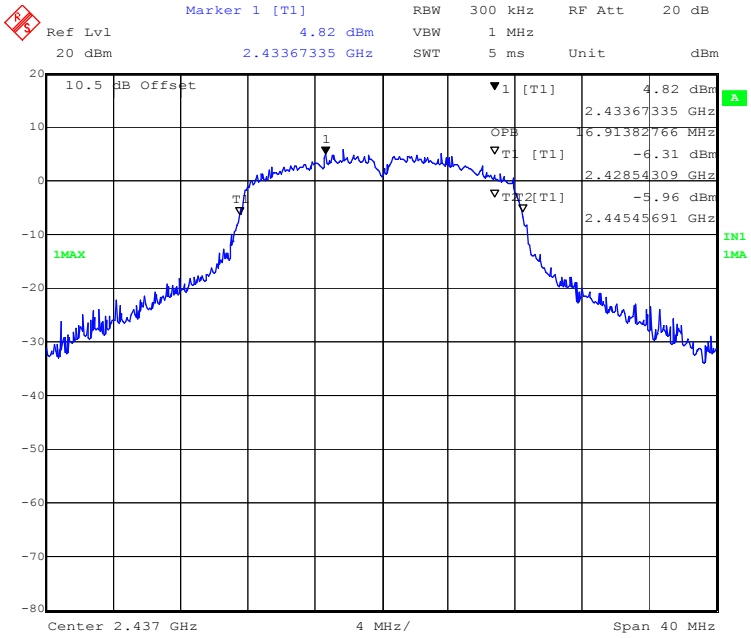
802.11b Mode High Channel



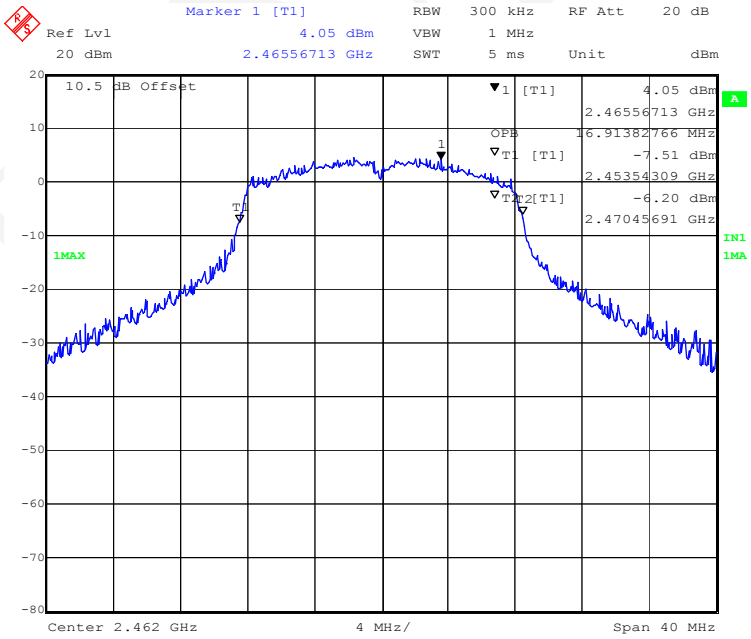
802.11g Mode Low Channel



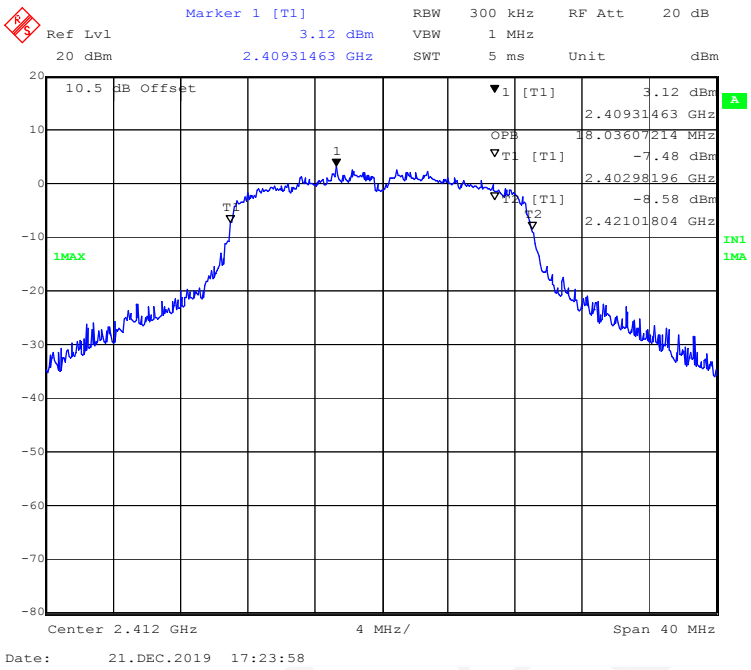
802.11g Mode Middle Channel



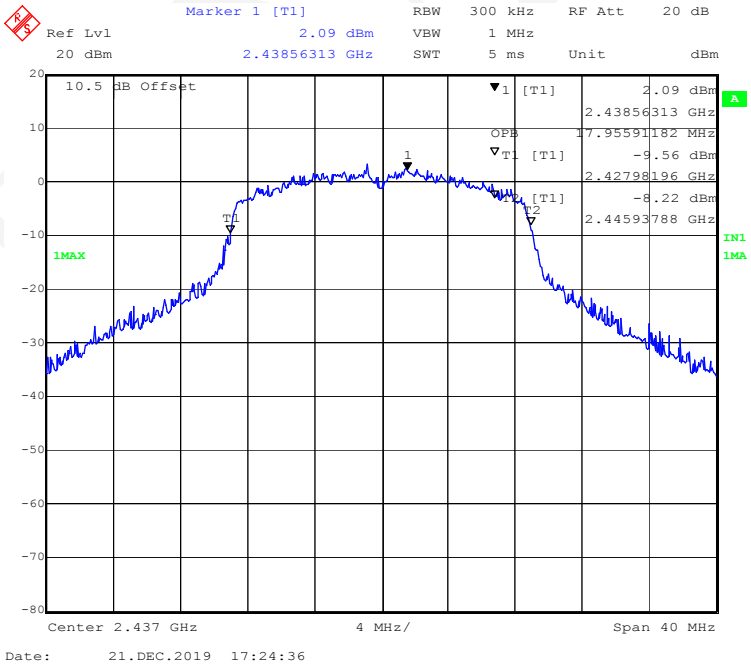
802.11g Mode High Channel



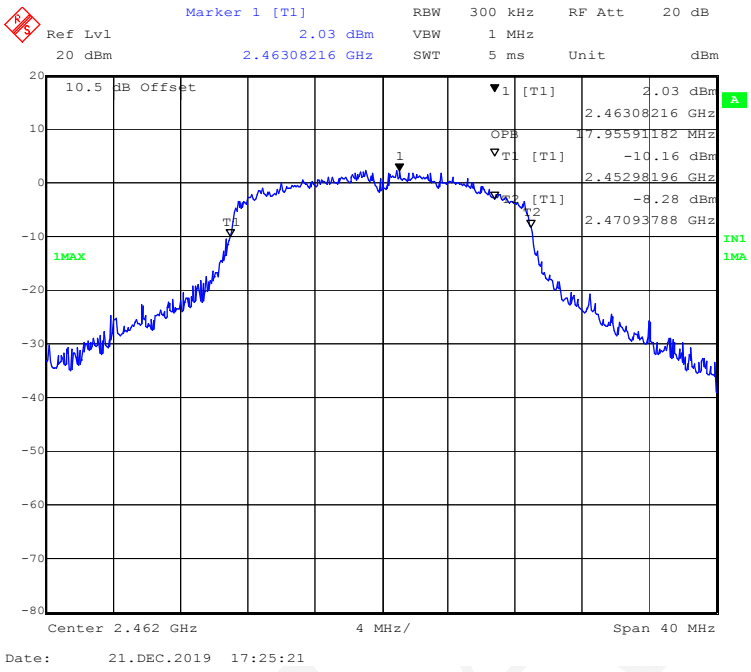
802.11n-HT20 Mode Low Channel



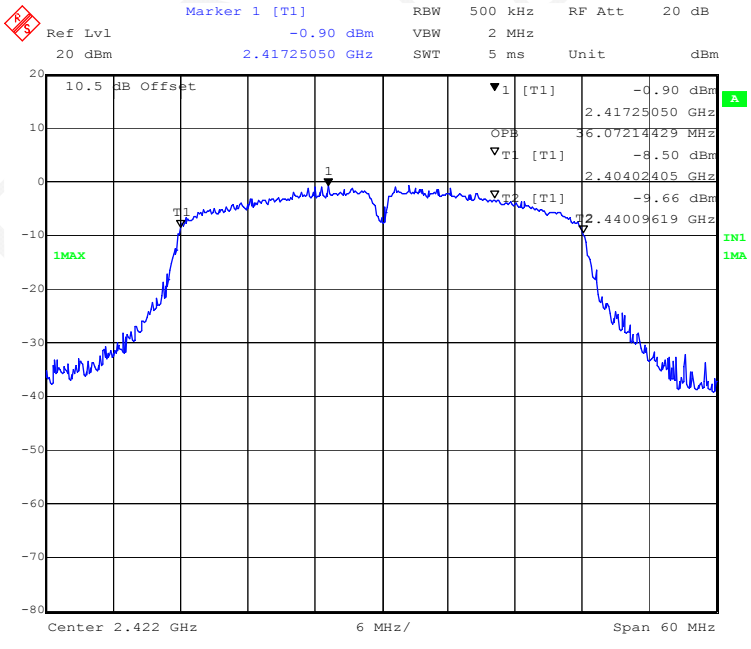
802.11n-HT20 Mode Middle Channel



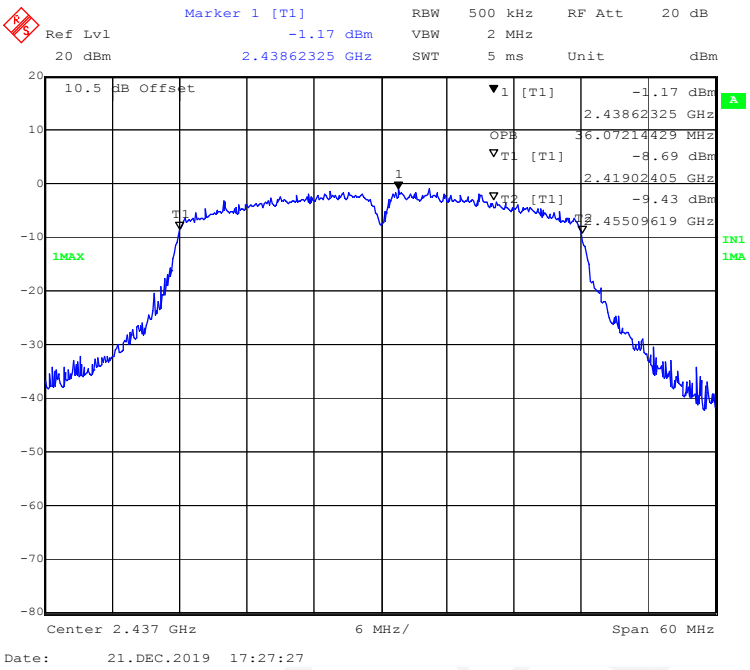
802.11n-HT20 Mode High Channel



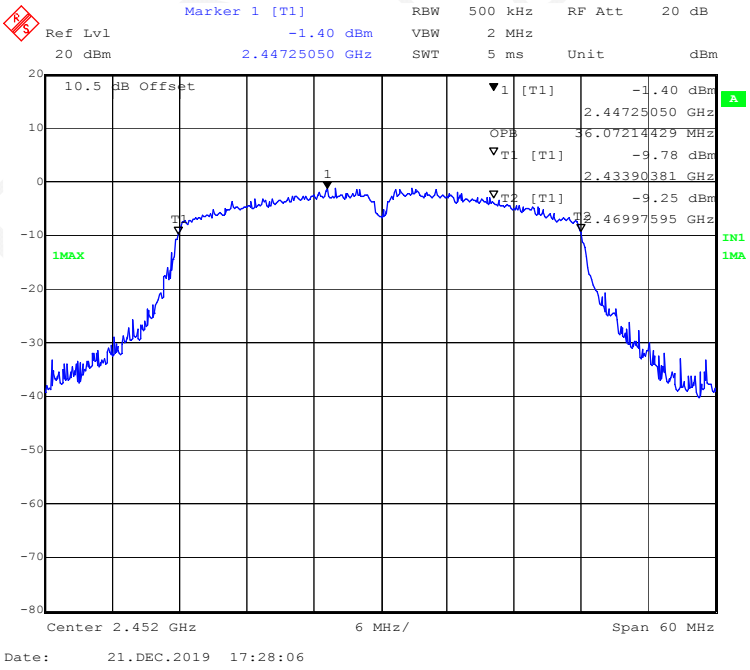
802.11n-HT40 Mode Low Channel



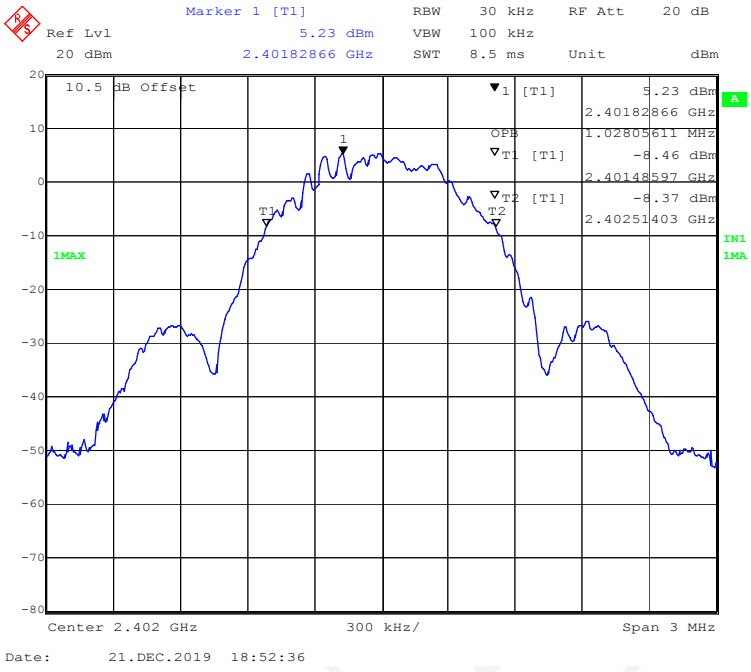
802.11n-HT40 Mode Middle Channel



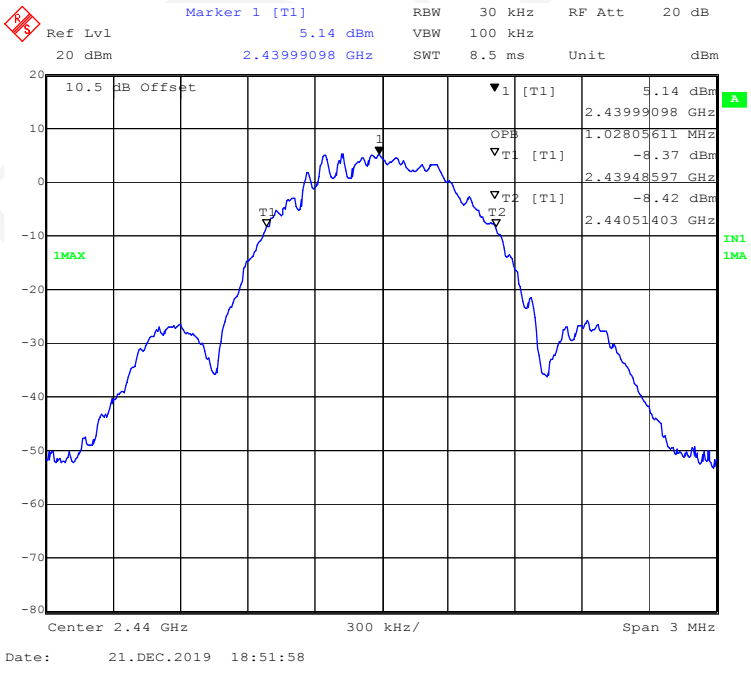
802.11n-HT40 Mode High Channel



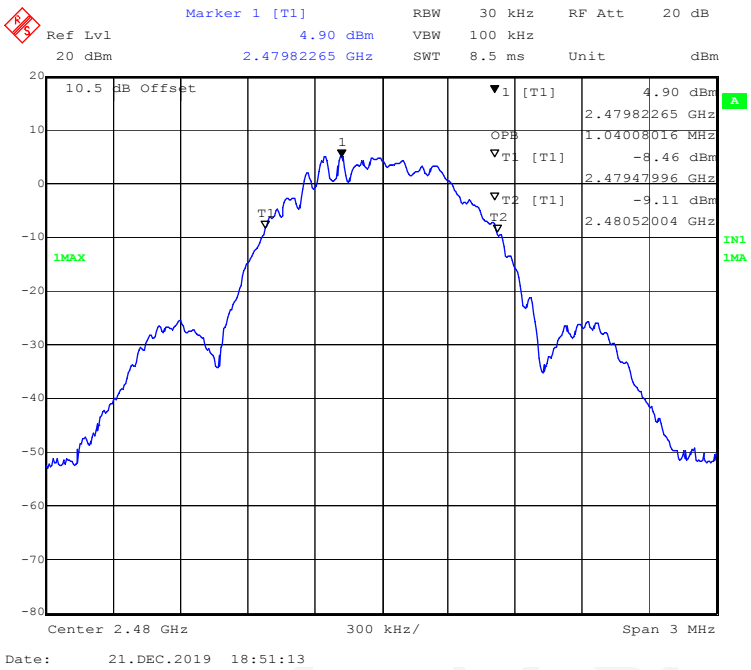
BLE Mode Low Channel



BLE Mode Middle Channel



BLE Mode High Channel



RSS-247 ISSUE 2 Clause5.2 b) – POWER SPECTRAL DENSITY

Applicable Standard

According to RSS-247 Issue2 Clause5.2 b)

The transmitter power spectral density conducted from the transmitter 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 section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz ≤ RBW ≤ 100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Data

Temperature:	24.0℃
Relative Humidity:	48 %
ATM Pressure:	101.3 kPa

The testing was performed by Chao Gao on 2019-12-21.

EUT operation mode: Transmitting

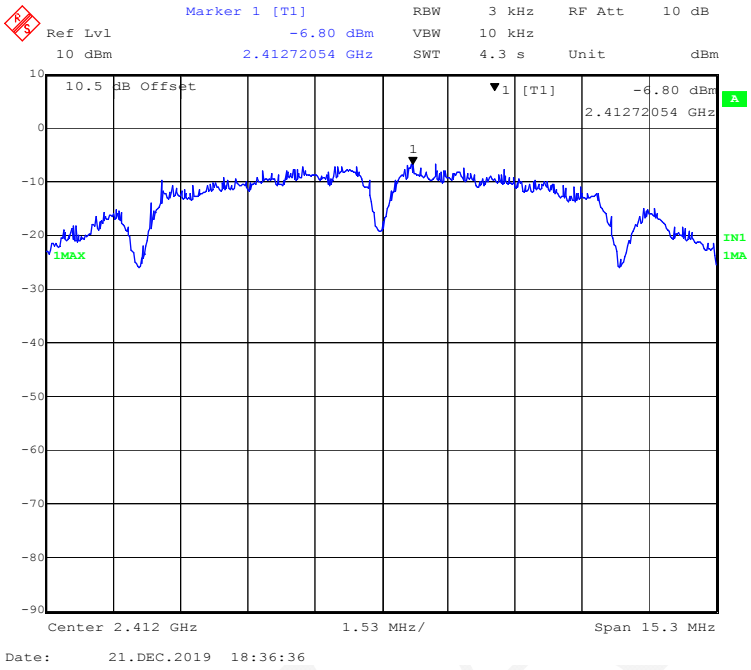
Test Result: Compliant.

FINAL

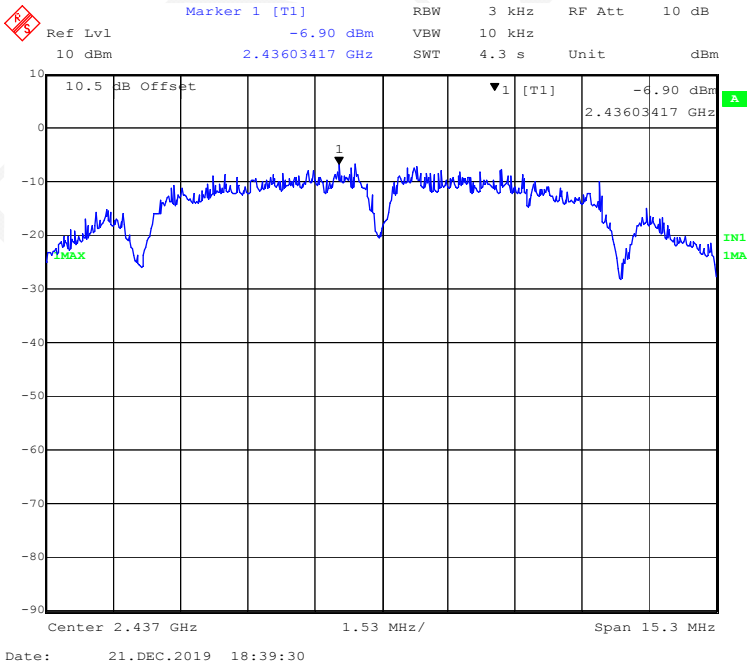
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b Mode			
Low	2412	-6.80	≤8
Middle	2437	-6.90	≤8
High	2462	-6.86	≤8
802.11g Mode			
Low	2412	-10.47	≤8
Middle	2437	-11.39	≤8
High	2462	-11.43	≤8
802.11n-HT20 mode			
Low	2412	-14.01	≤8
Middle	2437	-13.46	≤8
High	2462	-12.35	≤8
802.11n-HT40 mode			
Low	2422	-18.66	≤8
Middle	2437	-18.50	≤8
High	2452	-20.51	≤8
BLE Mode			
Low	2402	-6.71	≤8
Middle	2440	-6.92	≤8
High	2480	-7.06	≤8

FINAL

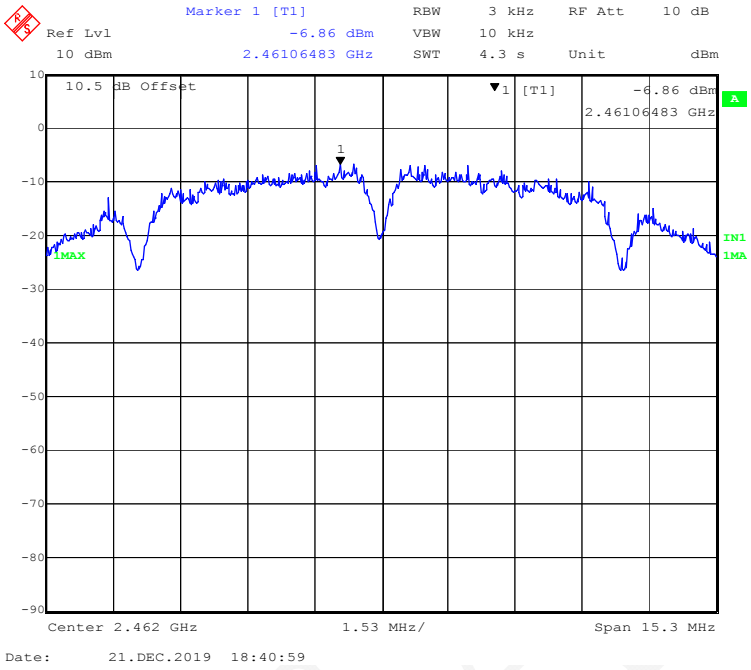
802.11b Mode Low Channel



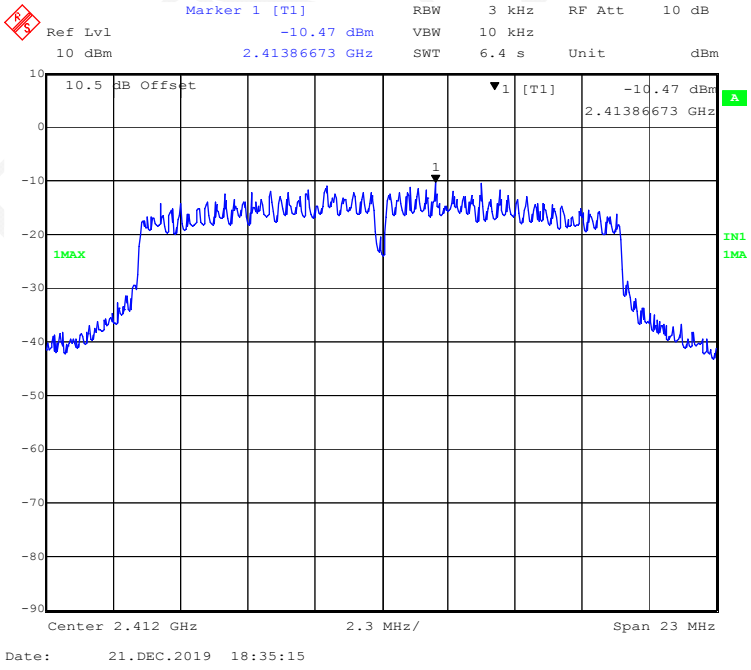
802.11b Mode Middle Channel



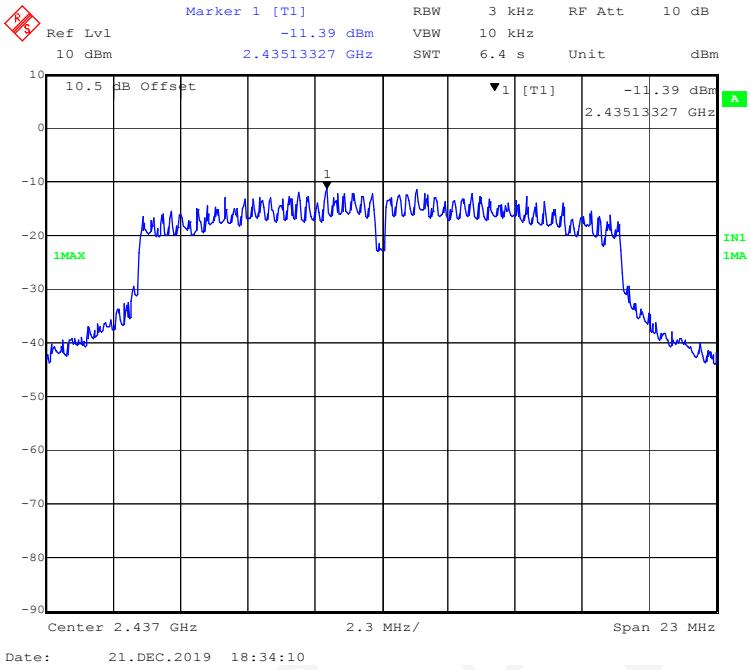
802.11b Mode High Channel



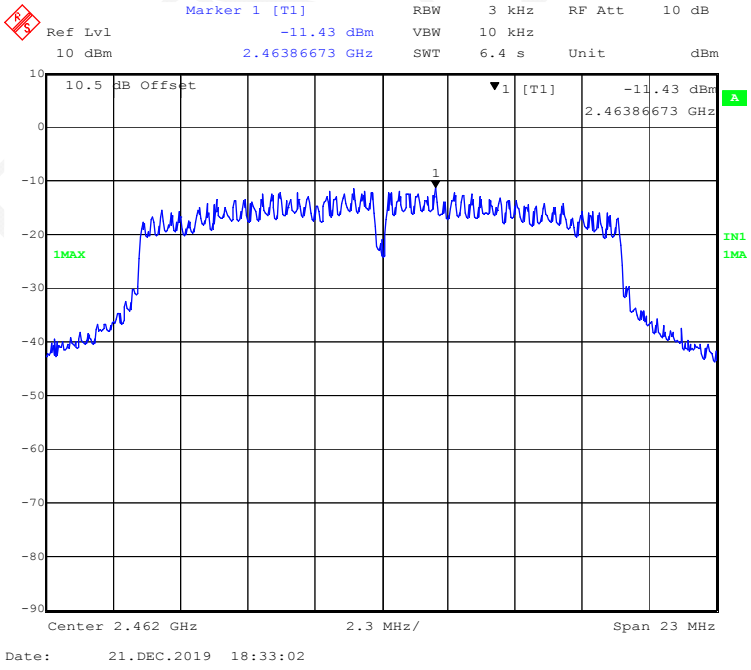
802.11g Mode Low Channel



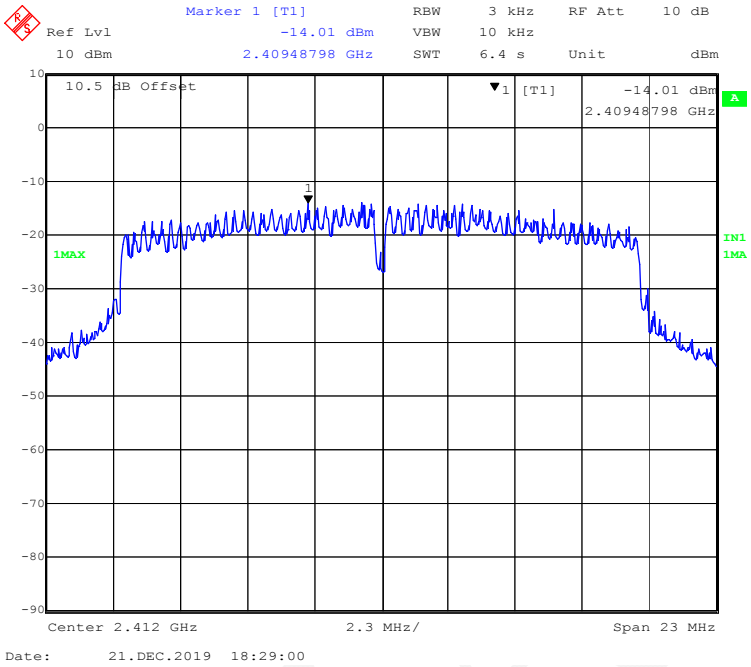
802.11g Mode Middle Channel



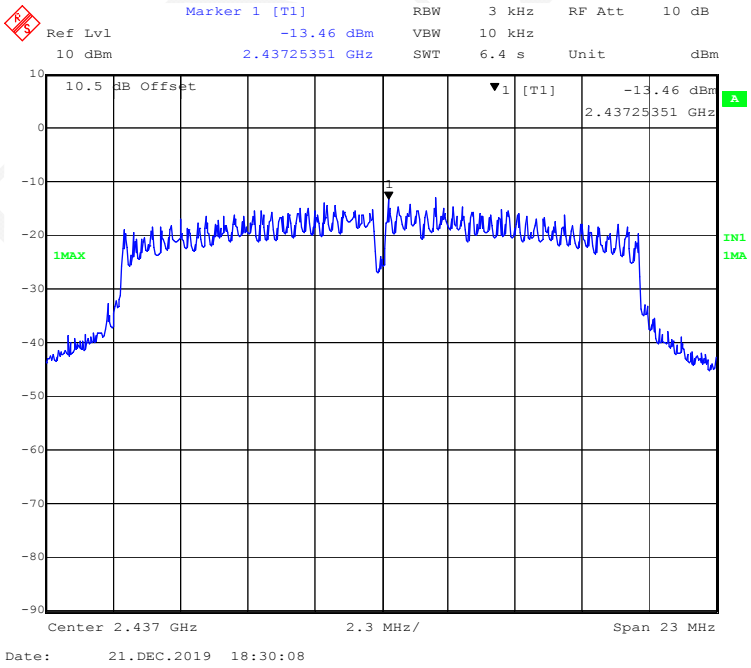
802.11g Mode High Channel



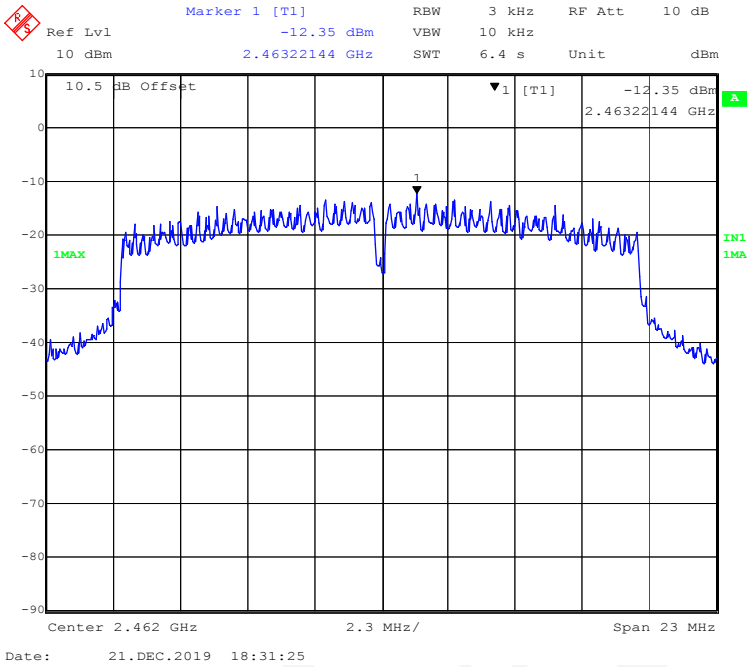
802.11n-HT20 Mode Low Channel



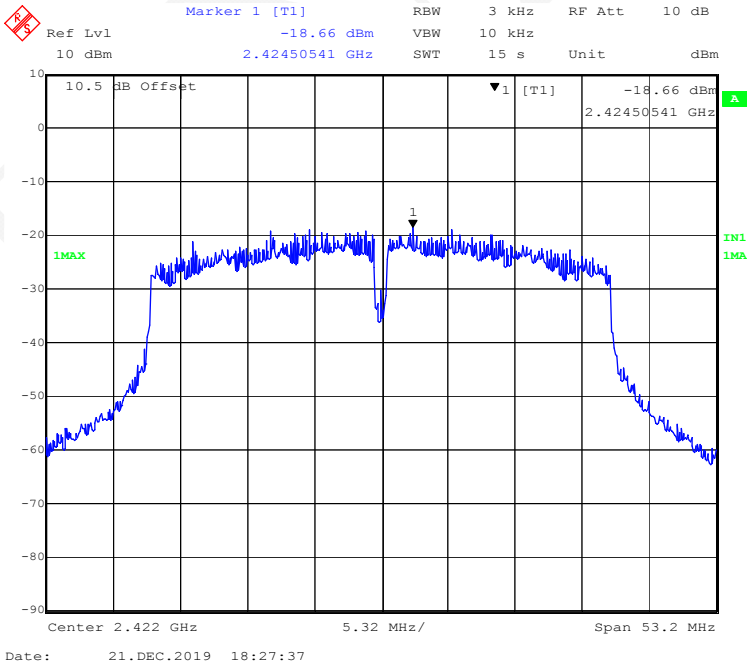
802.11n-HT20 Mode Middle Channel



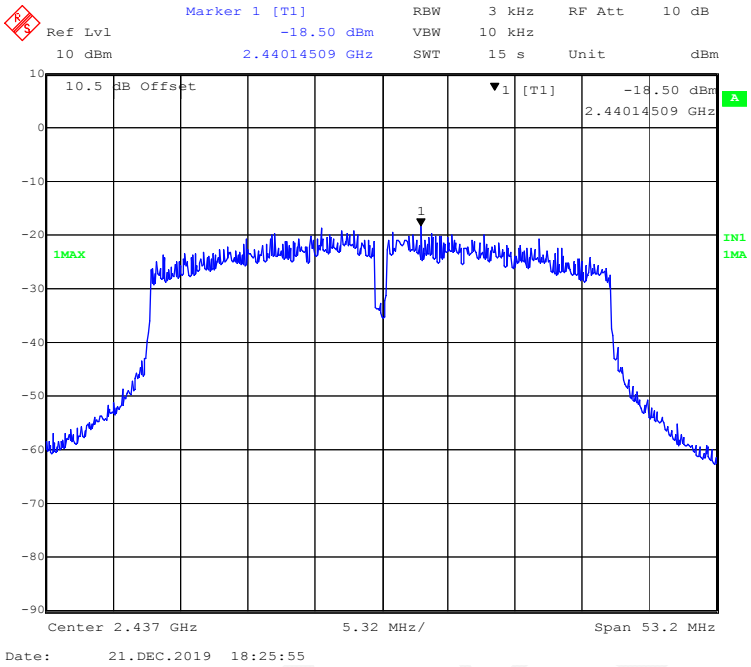
802.11n-HT20 Mode High Channel



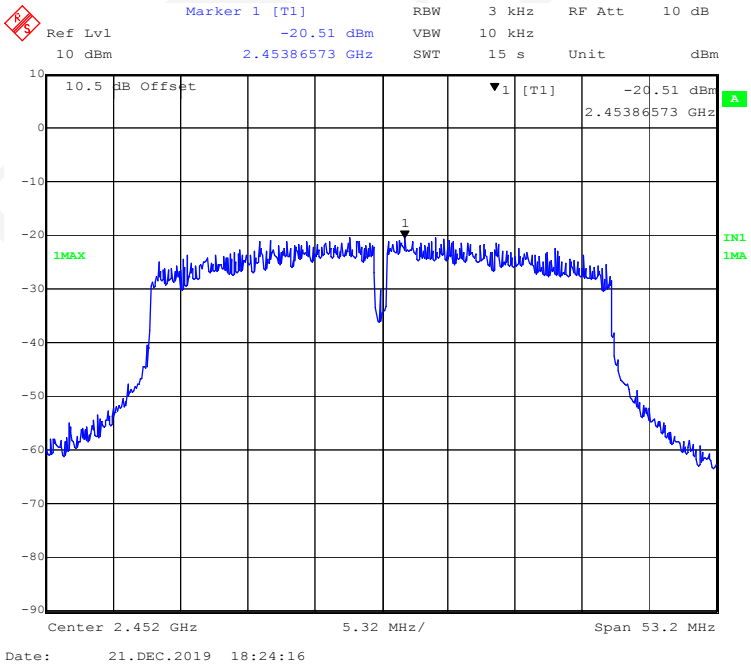
802.11n-HT40 Mode Low Channel



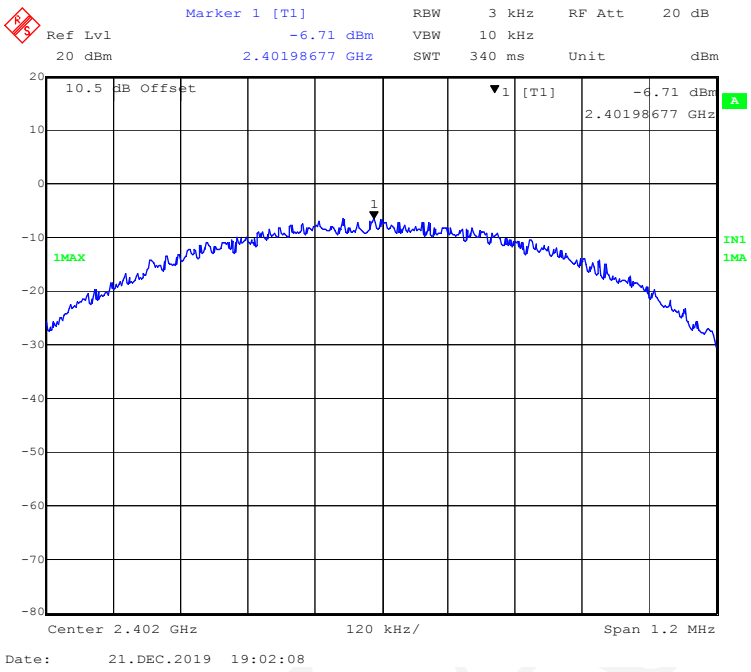
802.11n-HT40 Mode Middle Channel



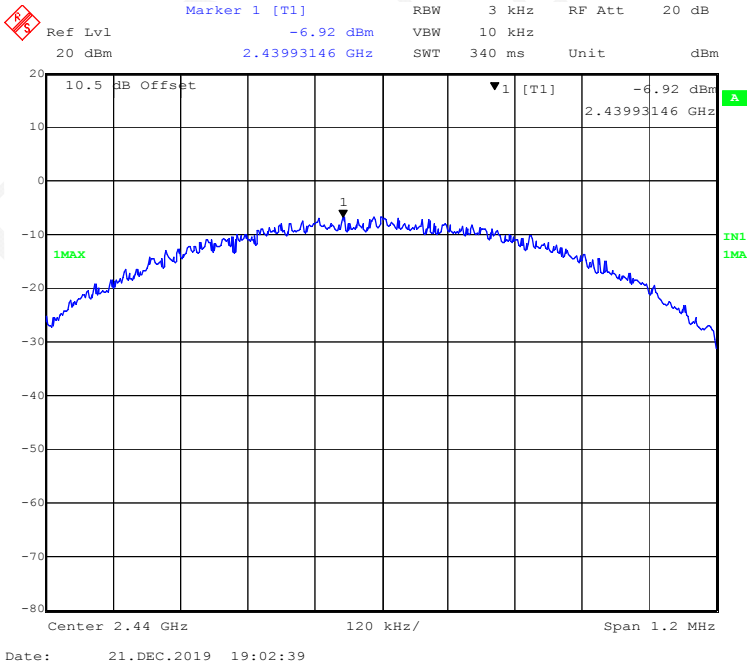
802.11n-HT40 Mode High Channel



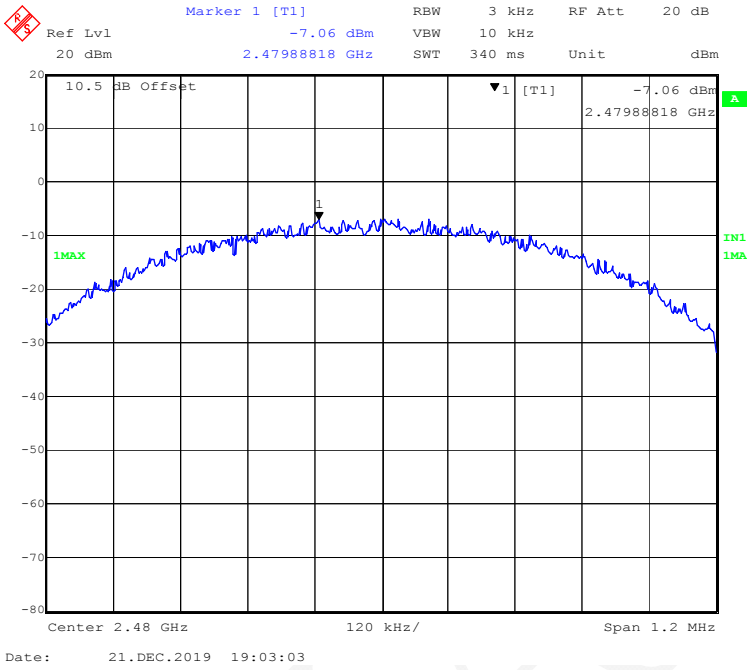
BLE Mode Low Channel



BLE Mode Middle Channel



BLE Mode High Channel



RSS-247 ISSUE 2 Clause 5.4 d) - TRANSMITTER OUTPUT POWER MEASUREMENT

Applicable Standard

According to RSS-247 Issue2 Clause5.4 d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling 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 transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

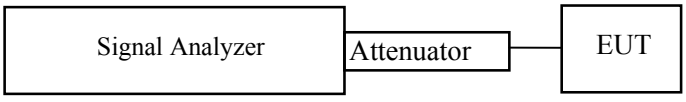
For Wi-Fi:

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

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

For BLE:

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



Test Data

Environmental Conditions

Temperature:	24.0℃
Relative Humidity:	48 %
ATM Pressure:	101.3 kPa

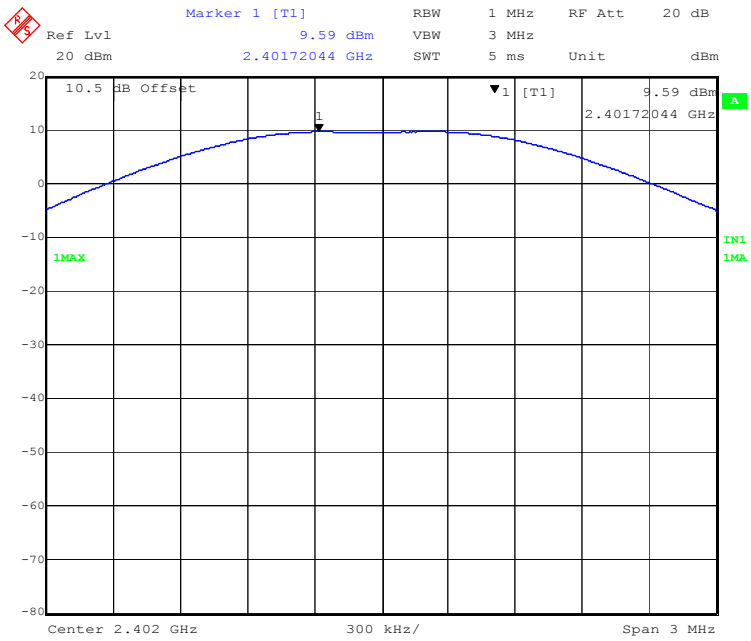
The testing was performed by Chao Gao on 2019-12-21.

EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Peak Output Power Limit (dBm)	Ant Gain (dBi)	e.i.r.p (dBm)	e.i.r.p Limit (dBm)
802.11b Mode						
Low	2412	19.50	≤30	1.0	20.50	≤36
Middle	2437	18.75	≤30	1.0	19.75	≤36
High	2462	18.20	≤30	1.0	19.20	≤36
802.11g Mode						
Low	2412	21.01	≤30	1.0	22.01	≤36
Middle	2437	20.59	≤30	1.0	21.59	≤36
High	2462	20.19	≤30	1.0	21.19	≤36
802.11n-HT20 Mode						
Low	2412	18.36	≤30	1.0	19.36	≤36
Middle	2437	18.10	≤30	1.0	19.10	≤36
High	2462	18.00	≤30	1.0	19.00	≤36
802.11n-HT40 Mode						
Low	2422	15.36	≤30	1.0	16.36	≤36
Middle	2437	15.34	≤30	1.0	16.34	≤36
High	2452	15.20	≤30	1.0	16.20	≤36
BLE Mode						
Low	2402	9.59	≤30	1.0	10.59	≤36
Middle	2440	9.59	≤30	1.0	10.59	≤36
High	2480	9.48	≤30	1.0	10.48	≤36

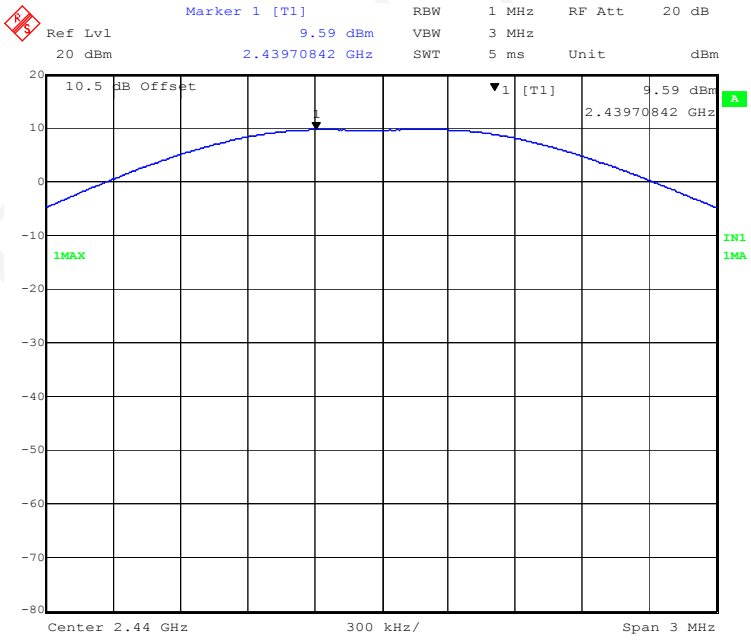
Note: The maximum antenna gain is 1.0 dBi for Wi-Fi and 1.0 dBi for BLE.

BLE Mode Low Channel



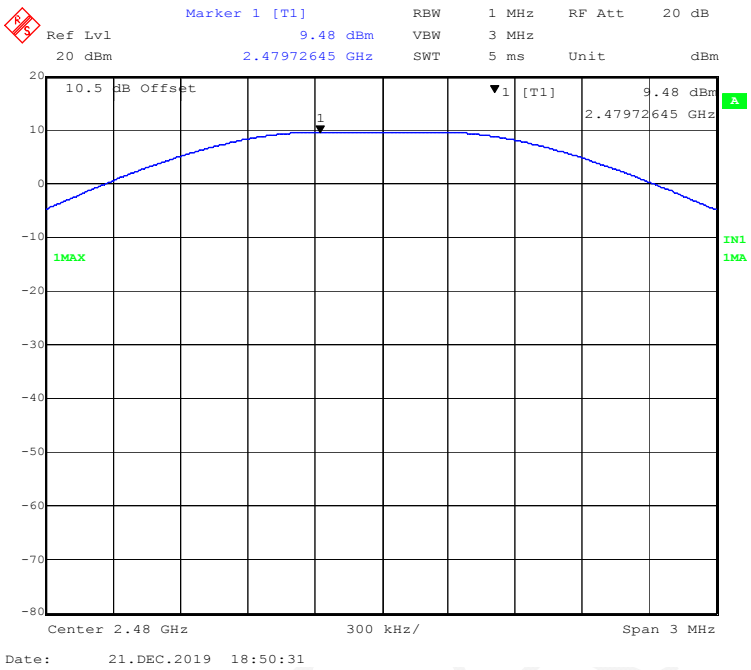
Date: 21.DEC.2019 18:49:30

BLE Mode Middle Channel



Date: 21.DEC.2019 18:50:04

BLE Mode High Channel



RSS-247 ISSUE 2 Clause 5.5 - OUT OF BAND EMISSIONS

Applicable Standard

According to RSS-247 Issue2 Clause5.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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 and VBW of spectrum analyzer to 100 kHz and 300kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Data

Environmental Conditions

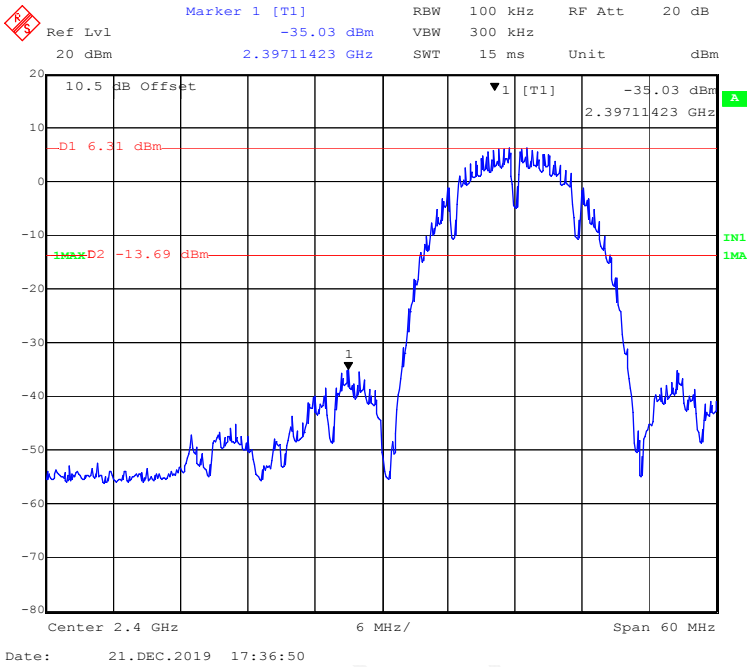
Temperature:	24.0℃
Relative Humidity:	48 %
ATM Pressure:	101.3 kPa

The testing was performed by Chao Gao on 2019-12-21.

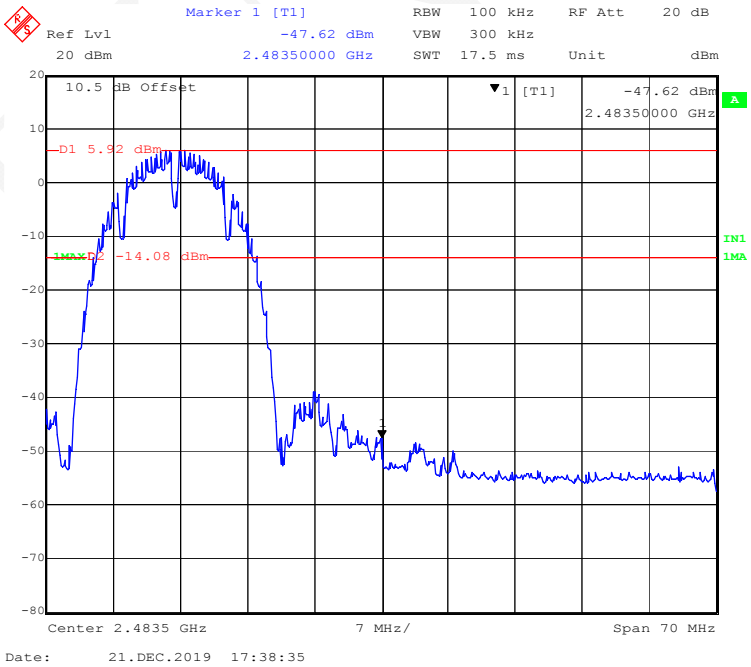
Test Result: Compliant.

EUT operation mode: Transmitting

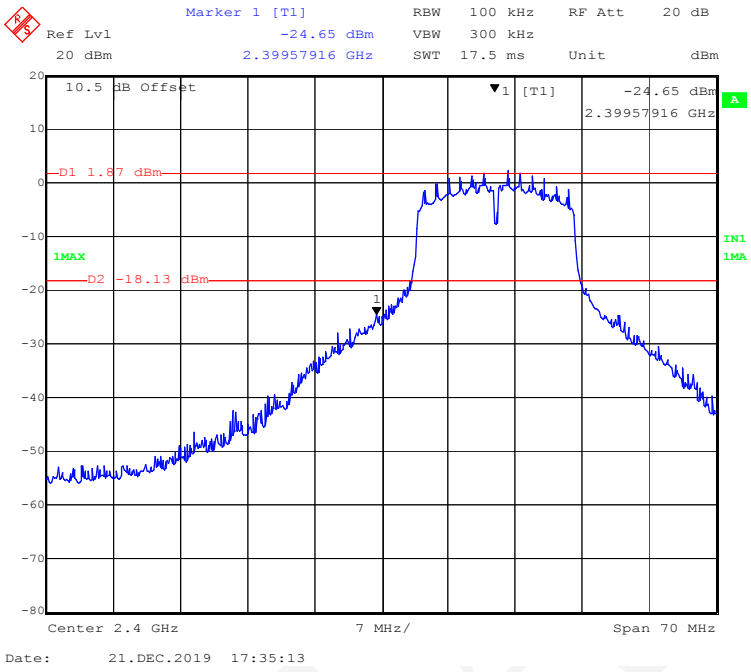
802.11b Mode Left Side



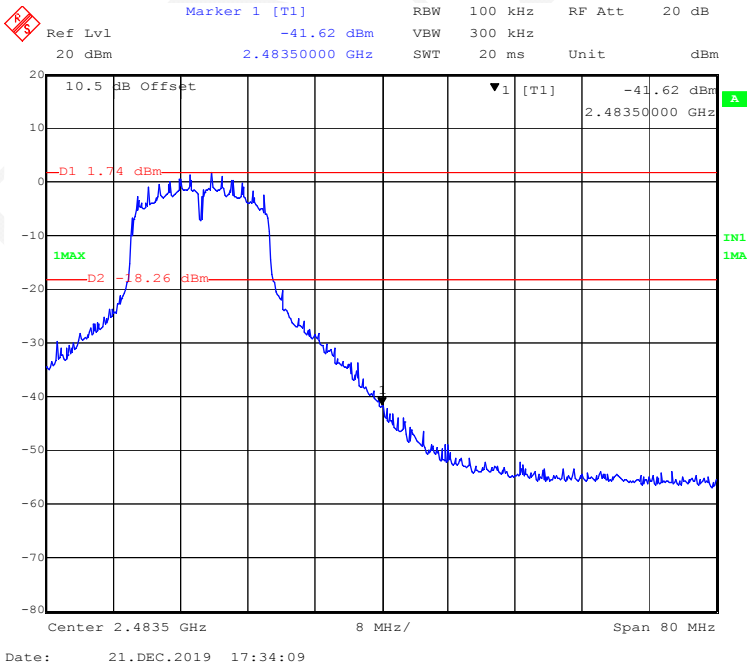
802.11b Mode Right Side



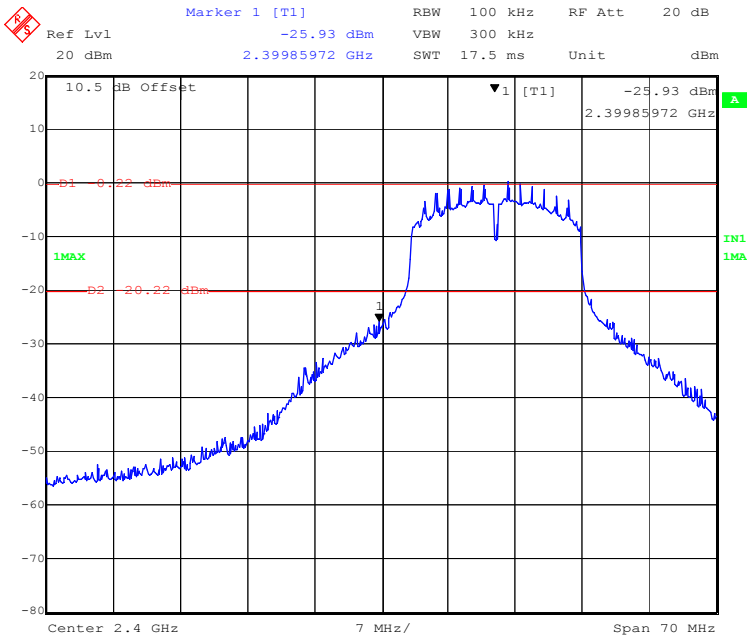
802.11g Mode Left Side



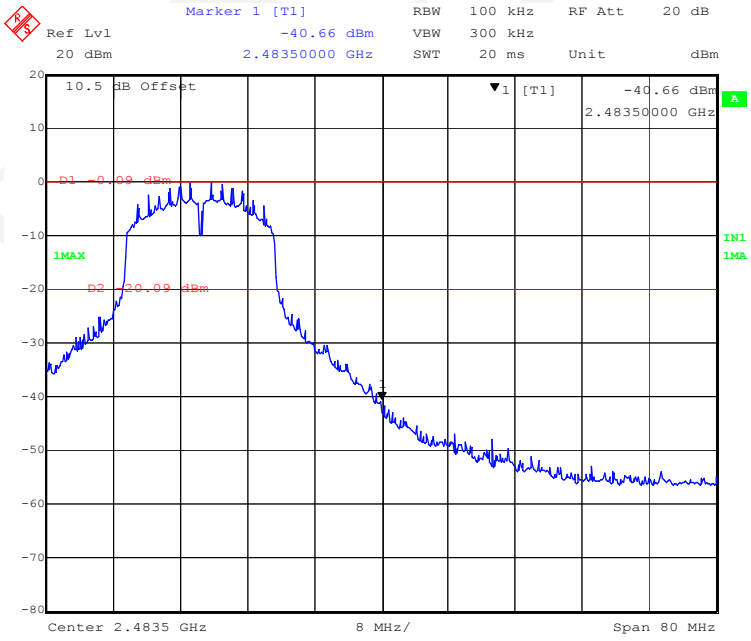
802.11g Mode Right Side



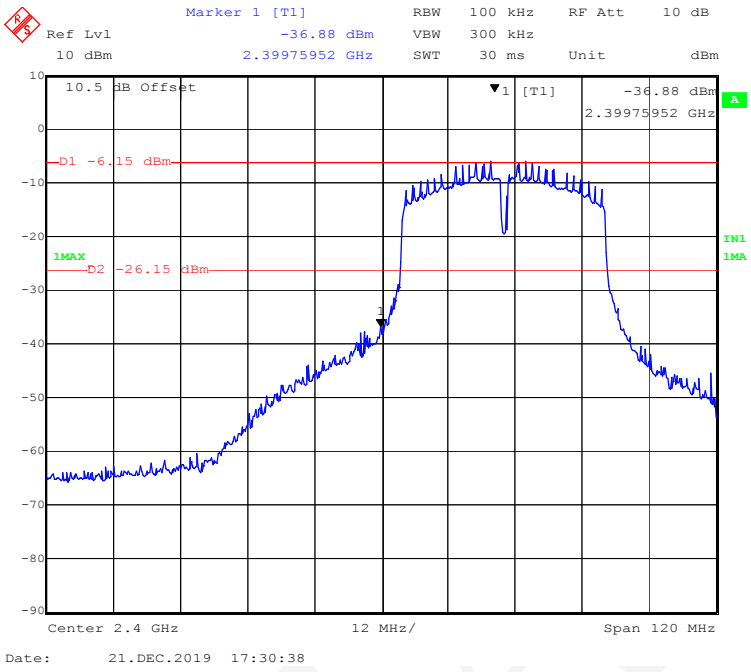
802.11n-HT20 Mode Left Side



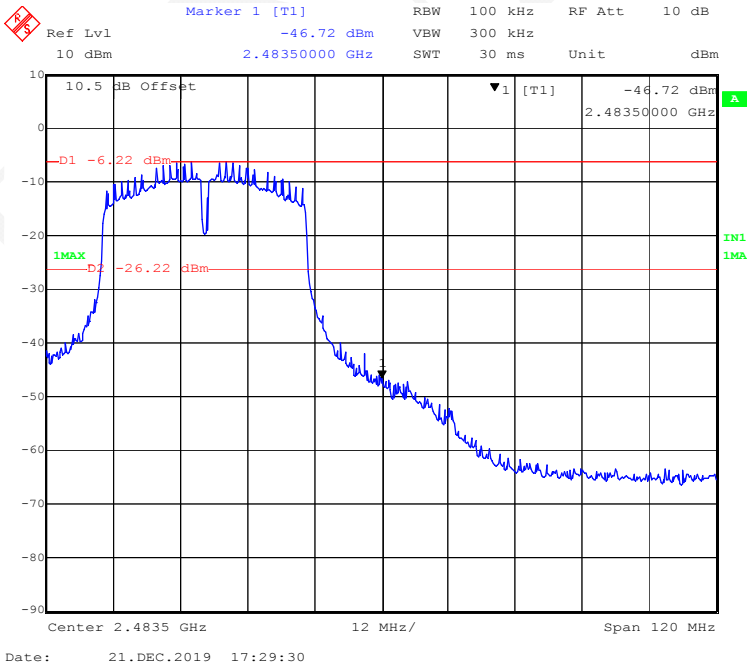
802.11n-HT20 Mode Right Side



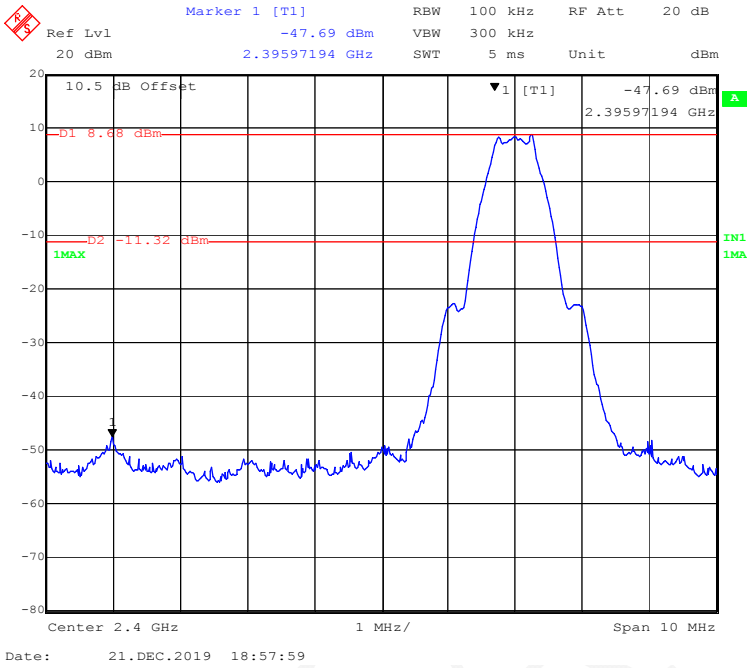
802.11n-HT40 Mode Left Side



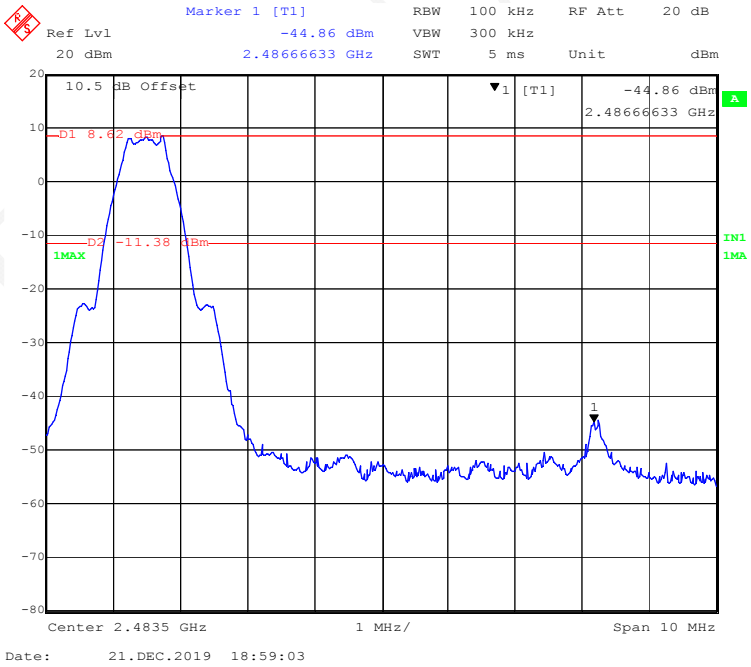
802.11n-HT40 Mode Right Side



BLE Mode Left Side



BLE Mode Right Side



Declarations

1: BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

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

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

4: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

5: This report cannot be reproduced except in full, without prior written approval of the Company.

6: This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

FINAL

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