TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.247

TEST REPORT

For

Guangzhou Robustel LTD

ROOM F315, NO.95 DAGUAN MIDDLE ROAD, TIANHE DISTRICT, GUANGZHOU, China

FCC ID: 2AAJGR2000S

Report Type:	**Product Name:**
Class II Permissive Change Report	Industrial Dual SIM Cellular VPN Router

Report Number:	RDG201009008-00AA1
Report Date:	2020-11-16
Reviewed By:	Ivan Cao Assistant Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		Industrial Dual SIM Cellular VPN Router
EUT Model:		R2000-4L
Multiple Models:		R2000-3P, R2000-4M
Operation Frequency:		2412-2462 MHz(802.11b/g/n ht20), 2422-2452 MHz(802.11n ht40)
Maximum Peak Output Power (Conducted):		16.94 dBm
Modulation Type:		DSSS, OFDM
Antenna Gain△ :		1.4 dBi
Rated Input Voltage:		DC 12V from adapter
Adapter Information	**Model:**	NBS18C120150D5
	Input:	100-240V~, 50/60Hz, 0.6A
	Output:	DC 12.0V, 1.5A
Serial Number:		RDG201009008-RF-A1-S1
EUT Received Date:		2020.10.11
EUT Received Status:		Good

The device contains RF module, FCC ID: XMR201605EC25A

Objective

This report is prepared on behalf of ***Guangzhou Robustel 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 Rules Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

This is Class II Permissive Change report for the purpose of changed the WLAN and WWAN antenna.And reduce the WLAN output power. But only models without POE have been changed.

The changes made to the device affected radiation spurious emissions test, and output power test. Therefore the two items data was recorded in this report.

Related Submittal(s)/Grant(s)

No related submittal.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB,200M~1GHz: 5.92 dB,1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

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 a triangle symbol "△ ". Customer model name, addresses, names, trademarks etc. are not considered data.

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

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SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance*
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Bandwidth	Compliance*
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance*
§15.247(e)	Power Spectral Density	Compliance*

Compliance*: Please refer to the original report: RDG190214005-00A, which was issued by Bay Area Compliance Laboratories Corp. (Dongguan).

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For 2.4GHz band, total 11 channels are provided:

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 802.11b, 802.11g, and 802.11n ht20 modes were test with channel 1, 6, 11.
For 802.11n ht40 modes were test with channel 3, 6, 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. The device supports SISO in all modes, and MIMO 2T2R in 802.11n modes, per pretest, 2TX mode was the worst mode and reported for 802.11n modes.

EUT Exercise Software

The software "Tftpd32.exe" was used for testing, which was provided by manufacturer. The maximum power was configured as below table, that provided by the manufacturer△ :

Mode	Channel	Frequency (MHz)	Data Rate	Power level Setting	
				Chain 0	Chain 1
802.11 b	Low	2412	1Mbps	15	15
	Middle	2437	1Mbps	15	15
	High	2462	1Mbps	17	17
802.11 g	Low	2412	6Mbps	14.5	17
	Middle	2437	6Mbps	14.5	19
	High	2462	6Mbps	14.5	17
802.11n ht20	Low	2412	MCS8	13	13
	Middle	2437	MCS8	15	15
	High	2462	MCS8	13.5	13.5
802.11n ht40	Low	2422	MCS8	14	14
	Middle	2437	MCS8	14	14
	High	2452	MCS8	8	8

Equipment Modifications

No modification was made to the EUT.

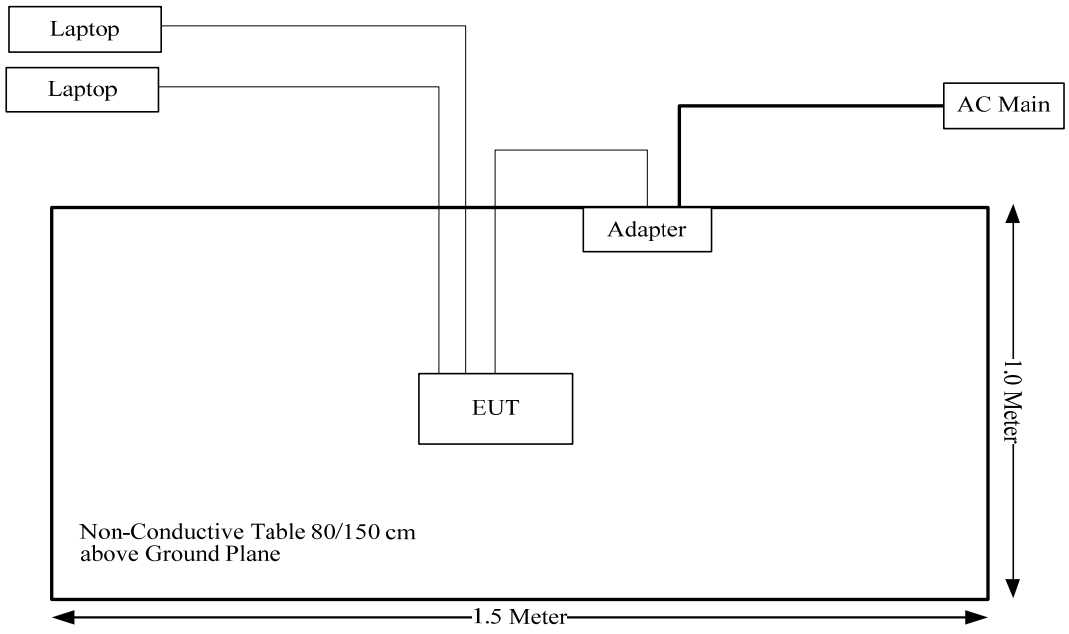
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1232
DELL	Laptop	PP11L	QDS-BRCM1012

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Adapter Cable	No	No	1.2	Adapter	EUT
RJ45 Cable	Yes	No	10	EUT	Laptop
RJ45 Cable	Yes	No	10	EUT	Laptop

Block Diagram of Test Setup



FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

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

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

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	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.

Calculation formula:

Prediction of power density at the distance of the applicable MPE limit
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

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

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

Calculated Data:

Mode	Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
WLAN	2412-2462	1.4	1.38	17	50.12	20.00	0.014	1.0
WCDMA band 2	1850-1910	1.6	1.45	23.5	223.87	20.00	0.064	1.0
WCDMA Band 5	824-849	-1.1	0.78	23.5	223.87	20.00	0.03	0.55
LTE band 2	1850-1910	1.6	1.45	24	251.19	20.00	0.07	1.0
LTE band 4	1710-1755	2.9	1.95	24	251.19	20.00	0.10	1.0
LTE band 12	699-716	-1.8	0.66	24	251.19	20.00	0.03	0.47

The device contains a WWAN RF module, FCC ID: XMR201605EC25A, The WLAN and WWAN can transmit simultaneously:

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

$=S_{WLAN}/S_{limit\text{-}\ WLAN}+ S_{WWAN}/S_{limit\text{-}\ WWAN}$

=0.014/1+0.10/1.0

=0.114

< 1.0

Result: The device meet FCC MPE at 20 cm distance

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

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

Antenna Connector Construction

The EUT has 2 external antenna for 2.4G WLAN use a unique type of connector to attach to the EUT, fulfill the requirement of this section. Please refer to the EUT photos and below information:

Antenna	Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
2.4G Chain 0	Dipole	50	1.4 dBi/2.4-2.5GHz
2.4G Chain 1	Dipole	50	1.4 dBi/2.4-2.5GHz

Result: Compliance.

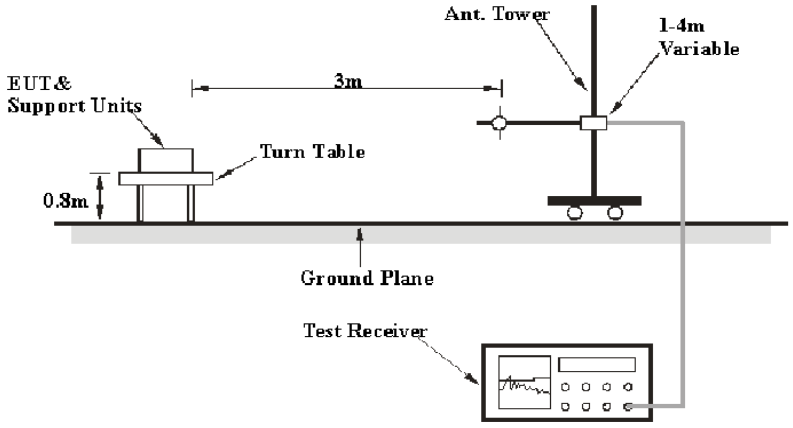
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

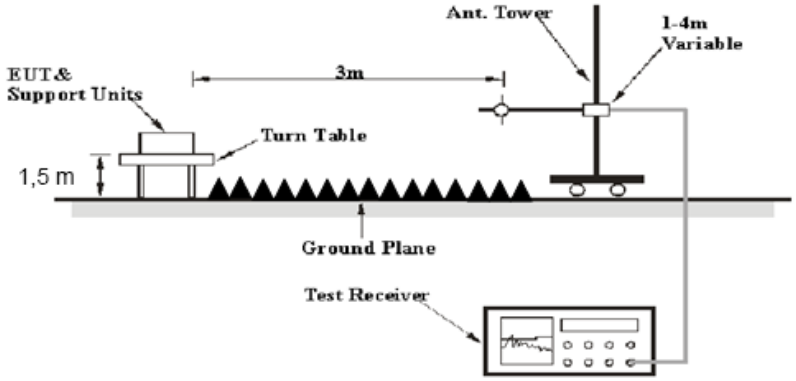
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission below 1GHz tests were performed in the 10 meters chamber test site, above 1GHz tests were performed in the 3 meters chamber test site A, 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 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

30MHz-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
AV	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

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

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

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

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiation Below 1GHz					
Sunol Sciences	Antenna	JB3	A060611-2	2020-08-25	2023-08-25
R&S	EMI Test Receiver	ESCI	100224	2020-09-12	2021-09-12
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2020-09-24	2021-09-24
Sonoma	Amplifier	310N	185914	2020-10-13	2021-10-13
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Radiation Above 1GHz					
TDK RF	Horn Antenna	HRN-0118	130 084	2018-10-12	2021-10-12
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2017-12-06	2020-12-05
R&S	Spectrum Analyzer	FSP 38	100478	2020-07-07	2021-07-07
HUBER+SUHNER	Coaxial Cable	SUCOFLEX 126EA	MY369/26/26EA	2020-09-25	2021-09-25
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2020-09-05	2021-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2020-06-27	2021-06-27
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2020-06-16	2021-06-16
Micro-tronics	High Pass Filter	HPM50111	S/N-G217	2020-06-16	2021-06-16

**** Statement of Traceability:*** *Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data

Environmental Conditions

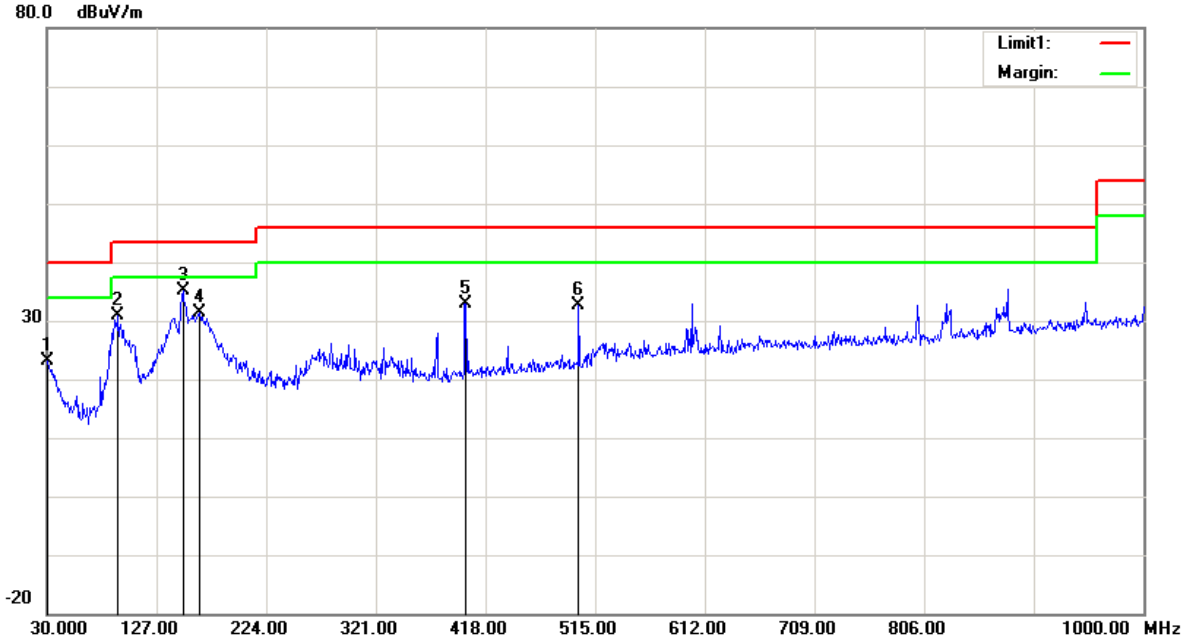
Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	27.4°C	24.1 °C
Relative Humidity:	41 %	37 %
ATM Pressure:	100.6kPa	101.2kPa
Tester:	Joker Chen	Jalon Liu
Test Date:	2020-11-02	2020-11-04

Test Result: Compliance, please Refer to the following data

Test Mode: Transmitting

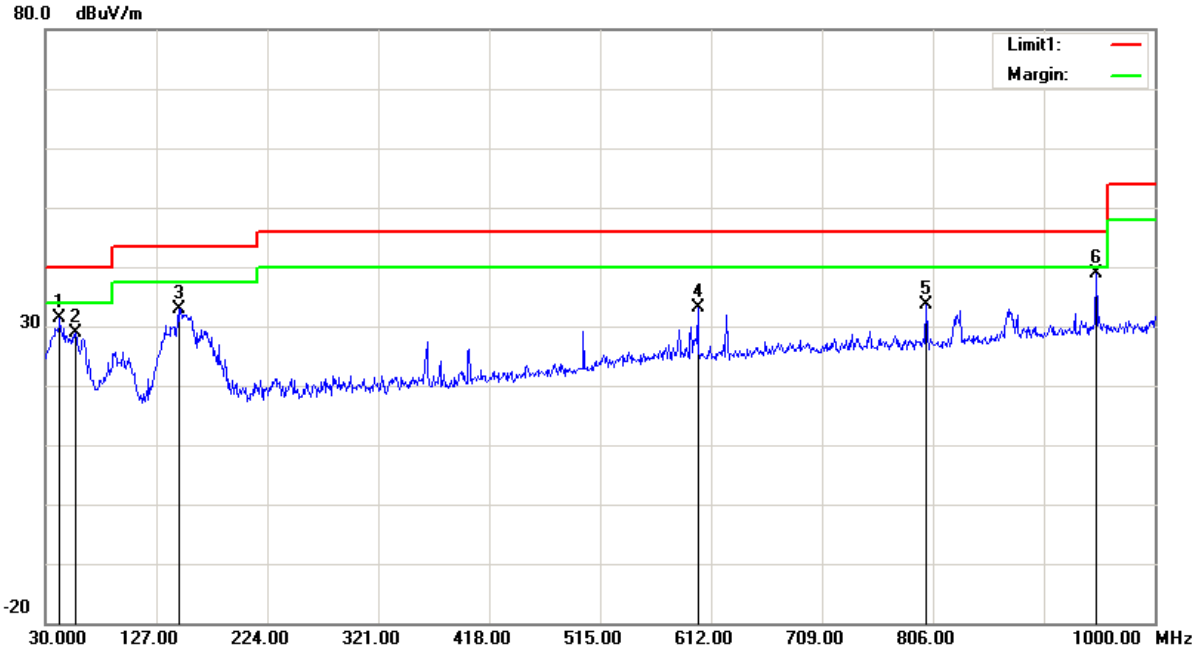
1) 30MHz-1GHz(802.11b_Chain 1 Middle channel was the worst)

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	27.79	peak	-4.66	23.13	40.00	16.87
93.0500	45.64	peak	-14.82	30.82	43.50	12.68
150.2800	44.44	peak	-9.33	35.11	43.50	8.39
164.8300	40.70	peak	-9.40	31.30	43.50	12.20
400.5400	38.16	peak	-5.23	32.93	46.00	13.07
500.4500	36.10	peak	-3.45	32.65	46.00	13.35

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
42.6100	42.36	peak	-11.05	31.31	40.00	8.69
56.1900	45.09	peak	-16.32	28.77	40.00	11.23
146.4000	42.08	peak	-9.17	32.91	43.50	10.59
600.3600	34.52	peak	-1.39	33.13	46.00	12.87
800.1800	32.52	peak	1.03	33.55	46.00	12.45
948.5900	34.13	peak	4.63	38.76	46.00	7.24

2) 1-25GHz:
802.11b Mode:
Chain 0

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2390.00	27.17	PK	V	24.80	2.50	0.00	54.47	74.00	19.53
2390.00	16.08	AV	V	24.80	2.50	0.00	43.38	54.00	10.62
4824.00	37.17	PK	V	29.75	3.59	27.41	43.10	74.00	30.90
4824.00	25.08	AV	V	29.75	3.59	27.41	31.01	54.00	22.99
7236.00	36.98	PK	V	33.98	4.67	27.22	48.41	74.00	25.59
7236.00	24.11	AV	V	33.98	4.67	27.22	35.54	54.00	18.46
Middle Channel: 2437 MHz									
4874.00	40.03	PK	V	29.85	3.58	27.54	45.92	74.00	28.08
4874.00	35.68	AV	V	29.85	3.58	27.54	41.57	54.00	12.43
7311.00	35.87	PK	V	34.10	4.65	27.28	47.34	74.00	26.66
7311.00	26.49	AV	V	34.10	4.65	27.28	37.96	54.00	16.04
High Channel: 2462 MHz									
2483.50	26.96	PK	V	24.97	2.53	0.00	54.46	74.00	19.54
2483.50	14.99	AV	V	24.97	2.53	0.00	42.49	54.00	11.51
4924.00	42.43	PK	V	29.95	3.58	27.51	48.45	74.00	25.55
4924.00	37.95	AV	V	29.95	3.58	27.51	43.97	54.00	10.03
7386.00	38.27	PK	V	34.22	4.62	27.18	49.93	74.00	24.07
7386.00	28.72	AV	V	34.22	4.62	27.18	40.38	54.00	13.62

Chain 1

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2390.00	28.50	PK	V	24.80	2.50	0.00	55.80	74.00	18.20
2390.00	17.13	AV	V	24.80	2.50	0.00	44.43	54.00	9.57
4824.00	37.72	PK	V	29.75	3.59	27.41	43.65	74.00	30.35
4824.00	25.23	AV	V	29.75	3.59	27.41	31.16	54.00	22.84
7236.00	37.28	PK	V	33.98	4.67	27.22	48.71	74.00	25.29
7236.00	24.12	AV	V	33.98	4.67	27.22	35.55	54.00	18.45
Middle Channel: 2437 MHz									
4874.00	40.52	PK	V	29.85	3.58	27.54	46.41	74.00	27.59
4874.00	36.11	AV	V	29.85	3.58	27.54	42.00	54.00	12.00
7311.00	36.30	PK	V	34.10	4.65	27.28	47.77	74.00	26.23
7311.00	26.78	AV	V	34.10	4.65	27.28	38.25	54.00	15.75
High Channel: 2462 MHz									
2483.50	27.95	PK	V	24.97	2.53	0.00	55.45	74.00	18.55
2483.50	14.50	AV	V	24.97	2.53	0.00	42.00	54.00	12.00
4924.00	44.83	PK	V	29.95	3.58	27.51	50.85	74.00	23.15
4924.00	41.55	AV	V	29.95	3.58	27.51	47.57	54.00	6.43
7386.00	36.47	PK	V	34.22	4.62	27.18	48.13	74.00	25.87
7386.00	23.24	AV	V	34.22	4.62	27.18	34.90	54.00	19.10

802.11g Mode:
Chain 0

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2390.00	43.77	PK	V	24.80	2.50	0.00	71.07	74.00	2.93
2390.00	24.55	AV	V	24.80	2.50	0.00	51.85	54.00	2.15
4824.00	38.00	PK	V	29.75	3.59	27.41	43.93	74.00	30.07
4824.00	23.69	AV	V	29.75	3.59	27.41	29.62	54.00	24.38
7236.00	36.33	PK	V	33.98	4.67	27.22	47.76	74.00	26.24
7236.00	23.06	AV	V	33.98	4.67	27.22	34.49	54.00	19.51
Middle Channel: 2437 MHz									
4874.00	42.41	PK	V	29.85	3.58	27.54	48.30	74.00	25.70
4874.00	28.79	AV	V	29.85	3.58	27.54	34.68	54.00	19.32
7311.00	41.07	PK	V	34.10	4.65	27.28	52.54	74.00	21.46
7311.00	25.98	AV	V	34.10	4.65	27.28	37.45	54.00	16.55
High Channel: 2462 MHz									
2483.50	43.21	PK	V	24.97	2.53	0.00	70.71	74.00	3.29
2483.50	23.00	AV	V	24.97	2.53	0.00	50.50	54.00	3.50
4924.00	41.28	PK	V	29.95	3.58	27.51	47.30	74.00	26.70
4924.00	26.71	AV	V	29.95	3.58	27.51	32.73	54.00	21.27
7386.00	39.12	PK	V	34.22	4.62	27.18	50.78	74.00	23.22
7386.00	23.96	AV	V	34.22	4.62	27.18	35.62	54.00	18.38

Chain 1:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2390.00	42.21	PK	V	24.80	2.50	0.00	69.51	74.00	4.49
2390.00	22.91	AV	V	24.80	2.50	0.00	50.21	54.00	3.79
4824.00	39.38	PK	V	29.75	3.59	27.41	45.31	74.00	28.69
4824.00	25.68	AV	V	29.75	3.59	27.41	31.61	54.00	22.39
7236.00	37.28	PK	V	33.98	4.67	27.22	48.71	74.00	25.29
7236.00	24.63	AV	V	33.98	4.67	27.22	36.06	54.00	17.94
Middle Channel: 2437 MHz									
4874.00	43.86	PK	V	29.85	3.58	27.54	49.75	74.00	24.25
4874.00	29.67	AV	V	29.85	3.58	27.54	35.56	54.00	18.44
7311.00	42.09	PK	V	34.10	4.65	27.28	53.56	74.00	20.44
7311.00	27.16	AV	V	34.10	4.65	27.28	38.63	54.00	15.37
High Channel: 2462 MHz									
2483.50	43.39	PK	V	24.97	2.53	0.00	70.89	74.00	3.11
2483.50	23.61	AV	V	24.97	2.53	0.00	51.11	54.00	2.89
4924.00	46.19	PK	V	29.95	3.58	27.51	52.21	74.00	21.79
4924.00	32.12	AV	V	29.95	3.58	27.51	38.14	54.00	15.86
7386.00	37.75	PK	V	34.22	4.62	27.18	49.41	74.00	24.59
7386.00	23.40	AV	V	34.22	4.62	27.18	35.06	54.00	18.94

802.11n ht20 Mode (2Tx mode was the worst):

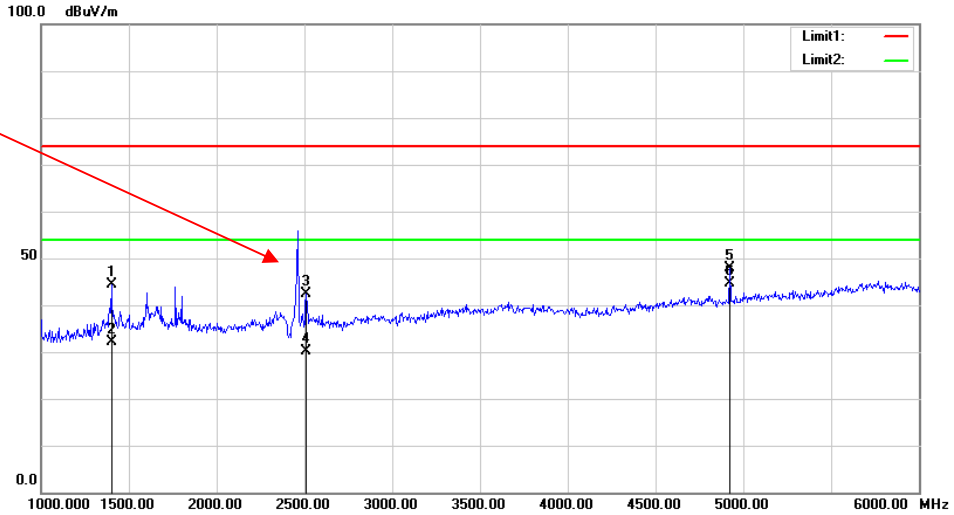
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2390.00	44.15	PK	V	24.80	2.50	0.00	71.45	74.00	2.55
2390.00	24.01	AV	V	24.80	2.50	0.00	51.31	54.00	2.69
4824.00	37.45	PK	V	29.75	3.59	27.41	43.38	74.00	30.62
4824.00	25.18	AV	V	29.75	3.59	27.41	31.11	54.00	22.89
7236.00	35.57	PK	V	33.98	4.67	27.22	47.00	74.00	27.00
7236.00	22.76	AV	V	33.98	4.67	27.22	34.19	54.00	19.81
Middle Channel: 2437 MHz									
4874.00	38.77	PK	V	29.85	3.58	27.54	44.66	74.00	29.34
4874.00	26.38	AV	V	29.85	3.58	27.54	32.27	54.00	21.73
7311.00	36.73	PK	V	34.10	4.65	27.28	48.20	74.00	25.80
7311.00	24.13	AV	V	34.10	4.65	27.28	35.60	54.00	18.40
High Channel: 2462 MHz									
2483.50	39.91	PK	V	24.97	2.53	0.00	67.41	74.00	6.59
2483.50	20.95	AV	V	24.97	2.53	0.00	48.45	54.00	5.55
4924.00	48.90	PK	V	29.95	3.58	27.51	54.92	74.00	19.08
4924.00	34.43	AV	V	29.95	3.58	27.51	40.45	54.00	13.55
7386.00	43.76	PK	V	34.22	4.62	27.18	55.42	74.00	18.58
7386.00	27.18	AV	V	34.22	4.62	27.18	38.84	54.00	15.16

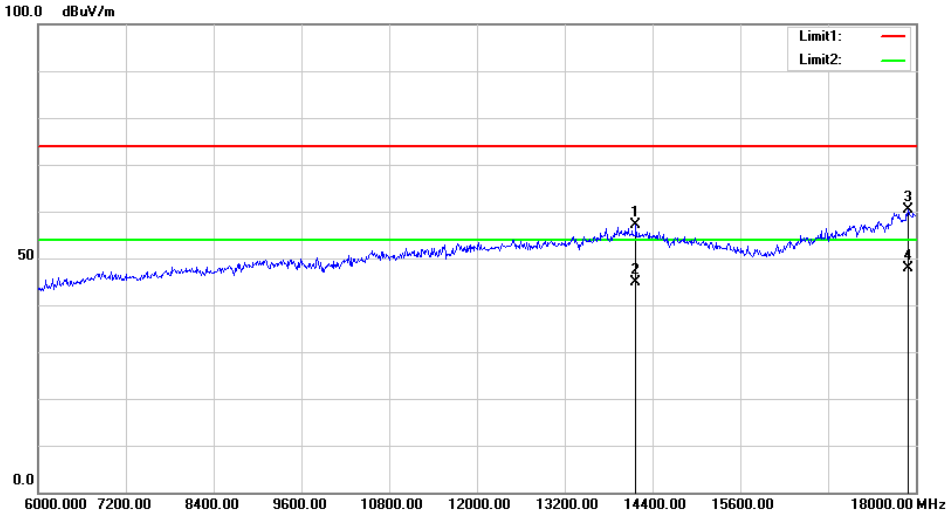
802.11n ht40 Mode (2Tx mode was the worst):

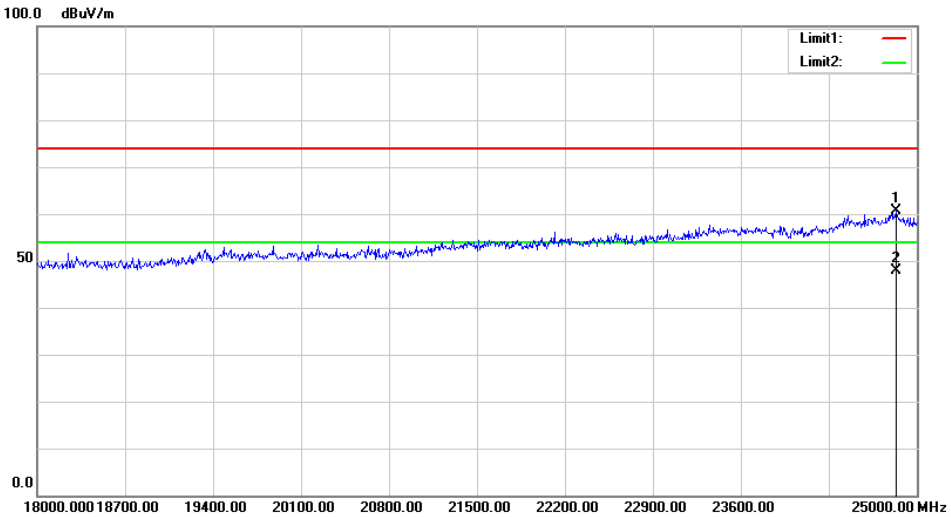
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2422 MHz									
2390.00	43.90	PK	V	24.80	2.50	0.00	71.20	74.00	2.80
2390.00	23.74	AV	V	24.80	2.50	0.00	51.04	54.00	2.96
4844.00	36.34	PK	V	29.79	3.59	27.46	42.26	74.00	31.74
4844.00	24.16	AV	V	29.79	3.59	27.46	30.08	54.00	23.92
7266.00	36.22	PK	V	34.03	4.66	27.25	47.66	74.00	26.34
7266.00	23.37	AV	V	34.03	4.66	27.25	34.81	54.00	19.19
Middle Channel: 2437 MHz									
4874.00	37.21	PK	V	29.85	3.58	27.54	43.10	74.00	30.90
4874.00	24.94	AV	V	29.85	3.58	27.54	30.83	54.00	23.17
7311.00	36.86	PK	V	34.10	4.65	27.28	48.33	74.00	25.67
7311.00	24.24	AV	V	34.10	4.65	27.28	35.71	54.00	18.29
High Channel: 2452 MHz									
2483.50	44.86	PK	V	24.97	2.53	0.00	72.36	74.00	1.64
2483.50	21.49	AV	V	24.97	2.53	0.00	48.99	54.00	5.01
4904.00	36.36	PK	V	29.91	3.58	27.58	42.27	74.00	31.73
4904.00	23.90	AV	V	29.91	3.58	27.58	29.81	54.00	24.19
7356.00	35.59	PK	V	34.17	4.63	27.22	47.17	74.00	26.83
7356.00	22.82	AV	V	34.17	4.63	27.22	34.40	54.00	19.60

Test plots(802.11b Chain 1,high channel was the worst)
Horizontal:

Fundamental Test with Band Rejection Filter

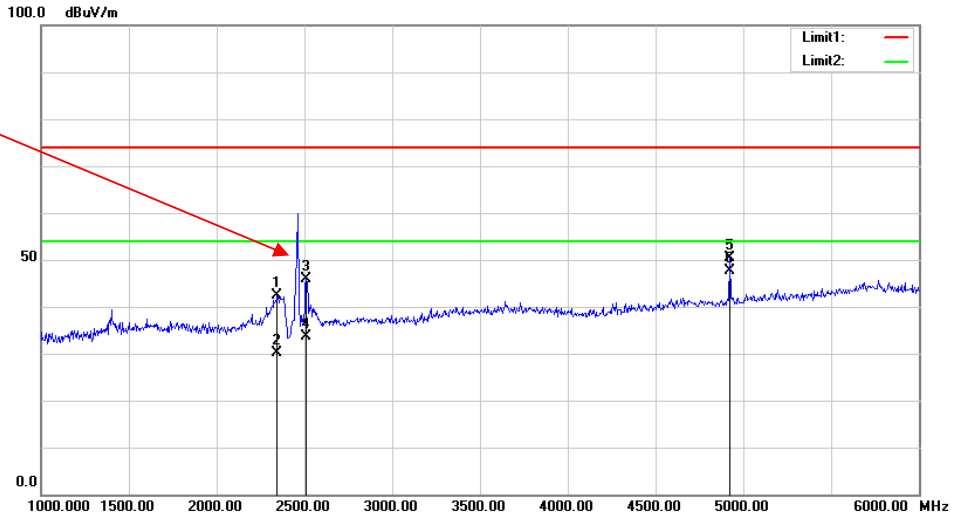


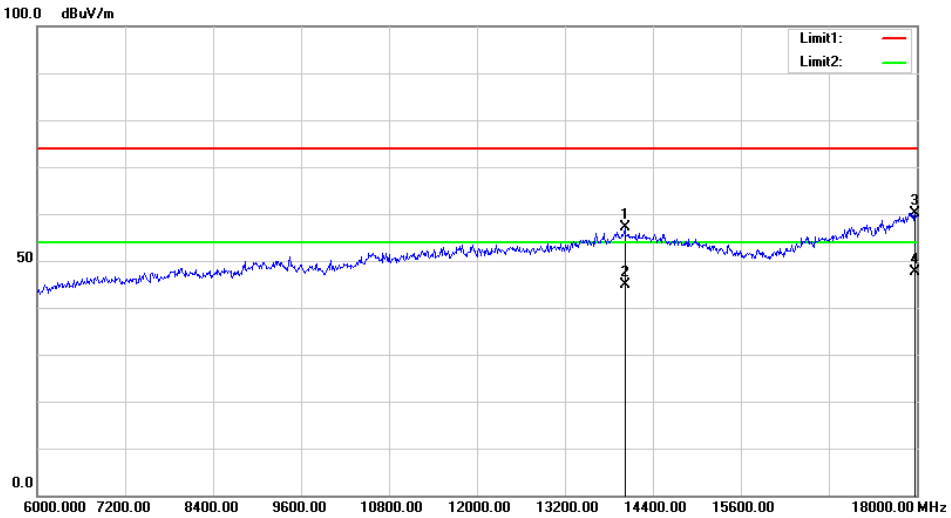


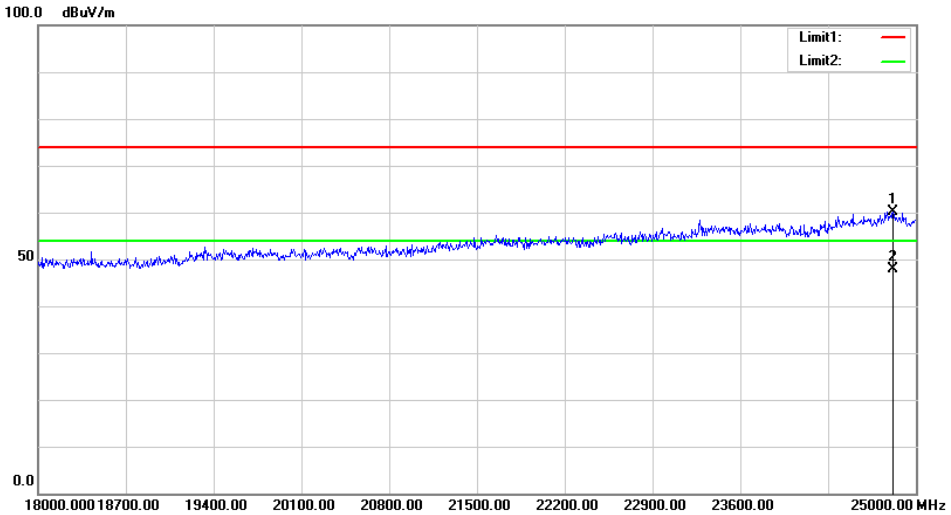


Vertical:

Fundamental Test with Band Rejection Filter







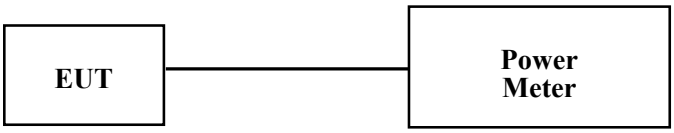
FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER

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.
4. Set the power meter to test average output power, record the result as average power.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
E-Microwave	Blocking Control	EMDCB-00036	OE01203218	Each time	N/A
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	Each time	N/A
Agilent	USB Wideband Power Sensor	U2021XA	MY5425009	2020-09-12	2021-09-12

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26.1 °C
Relative Humidity:	39 %
ATM Pressure:	101 kPa
Test by:	James Chen
Test Date:	2020-11-10

Test Mode: Transmitting

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

Mode	Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)			Limit (dBm)
			Chain 0	Chain 1	Total	
802.11 b	Low	2412	11.99	11.42	/	30
	Middle	2437	10.95	9.23	/	30
	High	2462	13.56	12.56	/	30
802.11 g	Low	2412	14.09	15.6	/	30
	Middle	2437	14.24	15.64	/	30
	High	2462	14.28	15.42	/	30
802.11n ht20	Low	2412	13.26	12.2	15.77	30
	Middle	2437	14.2	13.31	16.79	30
	High	2462	13.76	13.43	16.61	30
802.11n ht40	Low	2422	13.6	14.24	16.94	30
	Middle	2437	13.81	13.02	16.44	30
	High	2452	12.36	12.33	15.36	30

Note:
The maximum antenna gain is 1.4dBi in 2.4GHz band. 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 = 1.4dBi

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