



FCC Part 15.247; LP0002-2018

RSS-247 Issue 2, Feb 2017; RSS-Gen Issue 5, Feb 2019

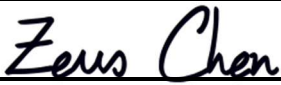
TEST REPORT

For

Cisco Systems, Inc.

125 West Tasman Dr., San Jose, CA 95134, USA

FCC ID: LDKAX5122118
IC : 2461N-AX5122118

Report Type :	Original Report
Product Type :	Cisco Catalyst 9130AX Series Wi-Fi 6 Access Points
Product Name :	For FCC: C9130AXI-B For Canada: C9130AXI-A For Taiwan: C9130AXI-T
Report Number :	RLK190621001-00E
Report Date :	2019/08/30
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Taiwan).

Revision History

Revision	Report Number	Issue Date	Description
1.0	RLK190621001-00E	2019/08/30	Original Report

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	Cisco Systems, Inc. 125 West Tasman Dr., San Jose, CA 95134, USA
Manufacturer	Cisco Systems, Inc. 125 West Tasman Dr., San Jose, CA 95134, USA
Brand(Trade) Name	Cisco
Product (Equipment)	Cisco Catalyst 9130AX Series Wi-Fi 6 Access Points
Model Name	For FCC: C9130AXI-B For Canada: C9130AXI-A For Taiwan: C9130AXI-T
Frequency Range	802.11b/g/n HT20/ax HE20: 2412-2462 MHz BLE: 2402-2480 MHz
Received Date	Jun. 21, 2019.
Date of Test	Jun. 21, 2019 ~ Aug. 26, 2019
Modulation Type	IEEE 802.11b : DSSS IEEE 802.11g/n HT20/ax HE20: OFDM BLE mode: GFSK
Related Submittal(s)/Grant(s)	FCC Part 15.407 UNII with FCC ID: LDKAX5122118 ISED RSS-247: UNII IC: 2461N-AX5122118

*All measurement and test data in this report was gathered from production sample serial number: KWC2317002 (Assigned by BACL-LK)

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☒ DC Type ☒ PoE: 30W <i>Brand Name: Cisco</i> <i>Model: SB-PWR-INJ2</i> <i>I/P: 100-240Vac,50/60Hz, 0.67A</i> <i>O/P: 55Vdc,0.6A</i> ☐ By Power Core
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1.3 Objective and Test Methodology

The Objective of this Test Report was to document the compliance of the Cisco System, Inc. Appliance (Model: For FCC: C9130AXI-B; For Canada: C9130AXI-A, For Taiwan: C9130AXI-T) to the requirements of the following Standards:

- Part 2, Subpart J, Part 15 Subparts A and Part 15 Subparts E of the Federal Communication Commission's rules.
- ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- KDB 662911 D01 Multiple Transmitter Output v02r01.
- KDB 789033 D02 General U-NII Test Procedures New Rules v02r01.
- RSS-247 Issue 2, Feb 2017 — Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.
- RSS-Gen Issue 5, Feb 2019 — General Requirements for Compliance of Radio Apparatus.
- LP0002 — Low-power Radio-frequency Devices Technical Regulations.

1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power with Power Meter	± 0.55 dB
Occupied Channel Bandwidth	± 4.45 %
RF Conducted test with Spectrum	± 1.45 dB
AC Power Line Conducted Emission	± 2.66 dB
Radiated Below 1G	± 3.57 dB
Radiated Above 1G-18G	± 4.29 dB
Radiated Above 18G-40G	± 4.67 dB

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on

☒ No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.).

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database. The FCC Registration No.: 0027578244. Designation No.: TW3546. The Test Firm Registration No.: 181430.

2 System Test Configuration

2.1 Test Channels and Description of Worst Test Configuration

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

No special accessory, No modification was made to the EUT and No special equipment used during test.

- For Wi-Fi 2.4G mode:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	-	-
6	2437	-	-
7	2442	-	-

For 802.11b/g/n HT20/ax HE20 modes: Channel 1, 6 and 11 were tested.

- For BLE mode:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	--	--
2	2406	--	--
3	2408	37	2476
--	--	38	2478
12	2426	39	2480

For BLE modes: Channel 0, 12 and 39 were tested.

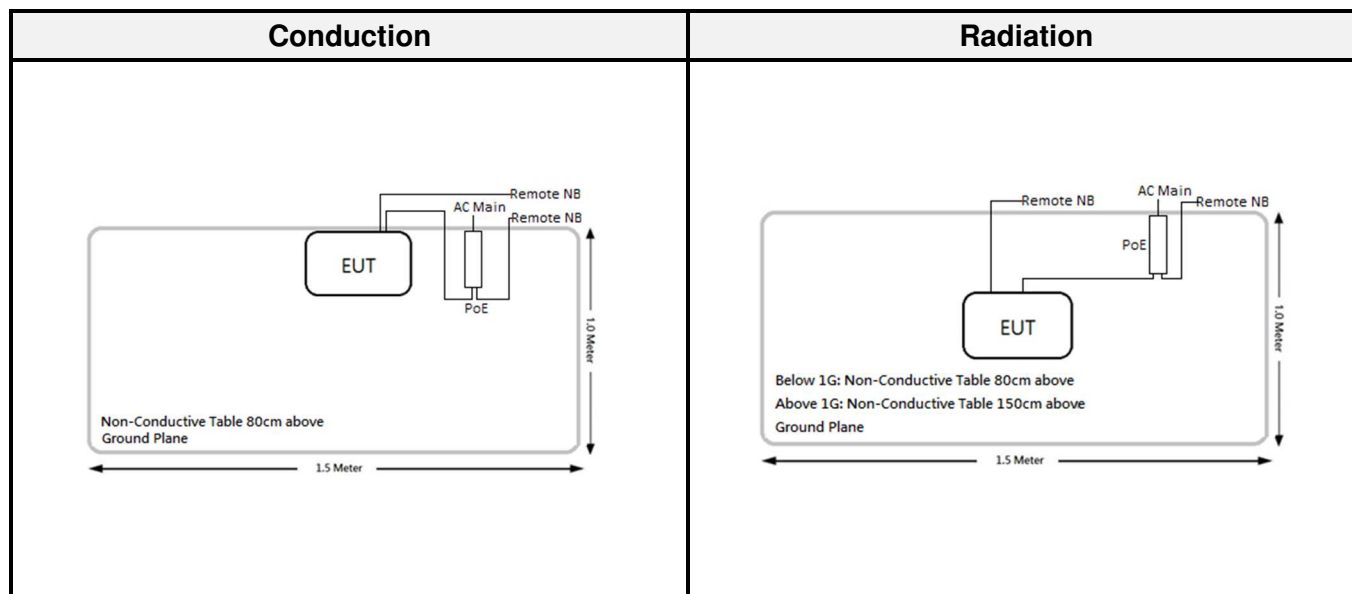
Radiated below 1G were tested worst output power mode.

2.2 Support Equipment List and External Cable List

No.	Description	Manufacturer	Model Number	BSMI	FCC ID / DoC
A	Notebook PC*2	DELL	Latitude E5470	R33002	DoC

No.	Cable Description	Length (m)	From	To
1	LAN Cable	Non- Shielded	EUT	NB
2	LAN Cable	Non- Shielded	EUT	PoE
3	LAN Cable	Non- Shielded	NB	PoE

2.3 Block Diagram of Test Setup



Modulation Used for Conformance Test

Configuration	NTX	Data Rate	Worst Data Rate
802.11b mode	4	1-11 Mbps	1 Mbps
802.11g mode	4/1(ChillWave)	6-54 Mbps	6 Mbps
802.11n HT 20 mode	4	MCS 0-7	MCS 0
802.11ax HE 20 mode	4	MCS 0-7	MCS 0
BLE mode	1	125 kbps-1 Mbps	1 Mbps

Worst Case of Power Setting

EUT Exercise Software		Command		
Configuration	NTX	Low CH	Mid CH	High CH
802.11b mode	4	17	17	17
802.11g mode	4/1(ChillWave)	17	17	17
802.11n HT 20 mode	4	17	17	17
802.11ax HE 20 mode	4	17	17	17
BLE mode	1	5	5	5

2.4 Duty Cycle

According to KDB 558074 D01 15.247 Meas Guidance v05r02:

All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum power transmission duration, T, are required for each tested mode of operation.

Configuration	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b mode	0.96	1.17	92.10	0.36
802.11g mode	1.43	1.56	82.26	0.85
802.11n HT 20 mode	5.43	5.75	96.11	0.17
802.11ax HE 20 mode	5.45	5.74	95.73	0.19
BLE mode	-	-	100	0
ChillWave mode 802.11g	-	-	100	0

**Note: Duty Factor = $10 \cdot \log(1/\text{Duty cycle})$*

3 Summary of Test Results

FCC/ISED/NCC Rules	Description of Test	Result
§15.247(i), §1.1317, §2.1091 ISED RSS-102 LP0002 Sec 5.20.2	Maximum Permissible Exposure (MPE)	Note ¹
FCC §15.203 ISED RSS-Gen Sec 6.8 LP0002-2018 Sec 2.2 and 3.10.1.3	Antenna Requirement	Compliance
FCC §15.207 ISED RSS-Gen Sec 8.8 LP0002-2018 Sec 2.3	AC Line Conducted Emissions	Compliance
FCC §15.205, §15.209, §15.247(d) ISED RSS-Gen Sec 8.9 and 8.10 ISED RSS-247 Sec 5.5 LP0002-2018 Sec 3.10, 2.7 and 2.8	Spurious Unwanted Emission	Compliance
FCC §15.247(a)(2) ISED RSS-247 Sec 5.2 ISED RSS-Gen Sec 6.7 LP0002 Sec 3.10.1.6	Emission Bandwidth	Note ²
FCC §15.247(b)(3) ISED RSS-247 Sec 5.4(d) LP0002 Sec 3.10.1.2	Maximum Output Power	Note ²
FCC §2.1051, §15.247(d) ISED RSS-247 Sec 5.5 LP0002 Sec 3.10.1.5	Band Edge	Note ²
FCC §15.247(e) ISED RSS-247 Sec 5.2(b) LP0002 Sec 3.10.1.6(2)(b)	Power Spectral Density	Note ²

Note¹: RF Exposure evaluation was recorded in a separate report in this filing.

Note²: Compliance test data was recorded in a separate reports, please refer to Test Report: EDCS-17873174, EDCS-17873187, EDCS-17873175.

4 FCC §15.203, RSS-Gen and LP0002 Sec 2.2- Antenna Requirements

4.1 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.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi

4.2 Antenna List and Details

Radio	Item	Manufacturer	Antenna Type	Antenna Gain
BLE	BLE	Cisco	Internal antenna	4 dBi
XOR	Wi-Fi 2.4G Chain 0	Cisco	Internal antenna	4 dBi
	Wi-Fi 2.4G Chain 1	Cisco	Internal antenna	4 dBi
	Wi-Fi 2.4G Chain 2	Cisco	Internal antenna	4 dBi
	Wi-Fi 2.4G Chain 3	Cisco	Internal antenna	4 dBi
	Wi-Fi 5G Chain 0	Cisco	Internal antenna	6 dBi
	Wi-Fi 5G Chain 1	Cisco	Internal antenna	6 dBi
	Wi-Fi 5G Chain 2	Cisco	Internal antenna	6 dBi
	Wi-Fi 5G Chain 3	Cisco	Internal antenna	6 dBi
Regular	Wi-Fi 5G Chain 4	Cisco	Internal antenna	6 dBi
	Wi-Fi 5G Chain 5	Cisco	Internal antenna	6 dBi
	Wi-Fi 5G Chain 6	Cisco	Internal antenna	6 dBi
	Wi-Fi 5G Chain 7	Cisco	Internal antenna	6 dBi
Chillwave	Wi-Fi 2.4G	Cisco	Internal antenna	5 dBi
	Wi-Fi 5G	Cisco	Internal antenna	6 dBi

The EUT has an internal antenna arrangement, which was permanently attached, fulfill the requirement of this section.

5 FCC §15.207, §15.407 (b), RSS-Gen Sec 8.8 and LP0002 Sec 2.3 - AC Line Conducted Emissions

5.1 Applicable Standard

According to FCC §15.407(b) (6) , RSS-Gen Sec 8.8 and LP0002 Sec 2.3.

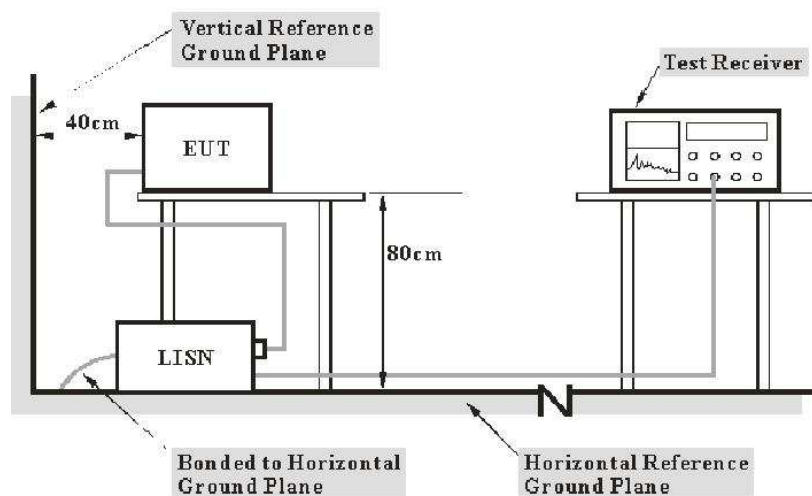
Any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Channel	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 ^{Note 1}	56 to 46 ^{Note 2}
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency. Note 2: A linear average detector is required

5.2 EUT Setup and Test Procedure



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

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

The 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	Receiver RBW
150 kHz - 30 MHz	9 kHz

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.

5.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conduction Room					
LISN	Rohde & Schwarz	ENV216	101612	2019/02/21	2020/02/20
LISN	Rohde & Schwarz	ENV216	101248	2019/06/26	2020/06/25
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2018/08/03	2019/08/02
RF Cable	EMEC	EM-CB5D	001	2019/07/01	2020/06/30
Software	AUDIX	E3	LKCO01	N.C.R	N.C.R

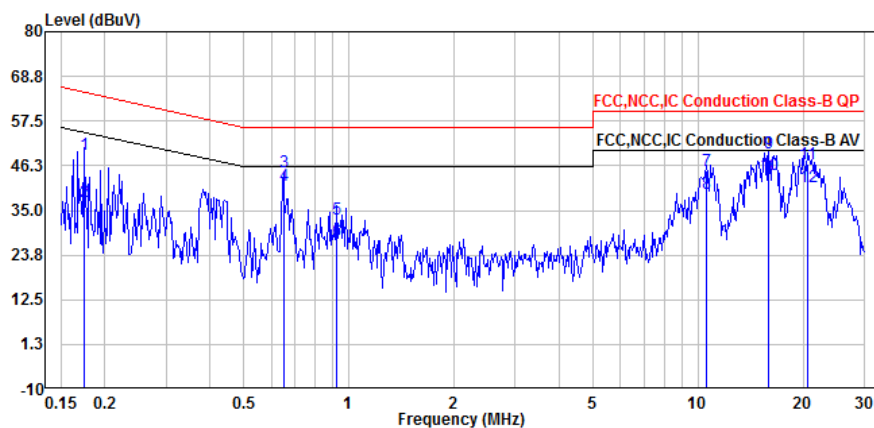
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

5.4 Test Environmental Conditions

Temperature:	20-25 °C	Relative Humidity:	45-55 %
ATM Pressure:	1010 hPa	Test Engineer:	Ray Huang
Test Date:	2019-08-27		

5.5 AC Line Conducted Emission Test Plot and Data

Mode: AC 120V/60 Hz, Co-location (2.4G+BLE), Line



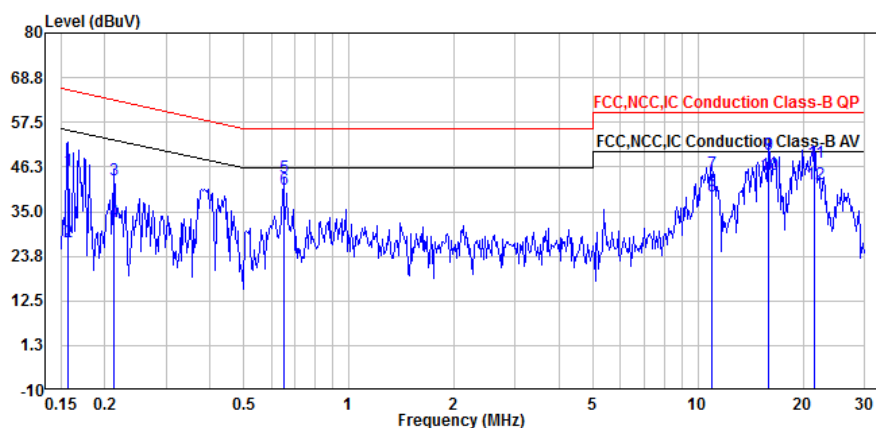
	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.175	29.33	49.19	19.86	64.74	-15.55	QP
2	0.175	17.41	37.27	19.86	54.74	-17.47	Average
3	0.650	24.81	44.70	19.89	56.00	-11.30	QP
4	0.650	21.30	41.19	19.89	46.00	-4.81	Average
5	0.923	12.87	32.76	19.89	56.00	-23.24	QP
6	0.923	7.59	27.48	19.89	46.00	-18.52	Average
7	10.564	25.05	45.15	20.10	60.00	-14.85	QP
8	10.564	19.27	39.37	20.10	50.00	-10.63	Average
9	15.987	29.22	49.37	20.15	60.00	-10.63	QP
10	15.987	23.95	44.10	20.15	50.00	-5.90	Average
11	20.630	26.50	46.68	20.18	60.00	-13.32	QP
12	20.630	20.92	41.10	20.18	50.00	-8.90	Average

Note:

$Level = Read\ Level + Factor$

$Over\ Limit\ (Margin) = Level - Limit\ Line$

$Factor = (LISN, ISN, PLC\ or\ current\ probe)\ Factor + Cable\ Loss + Attenuator$

Mode: AC 120V/60 Hz, Co-location (2.4G+BLE), Neutral

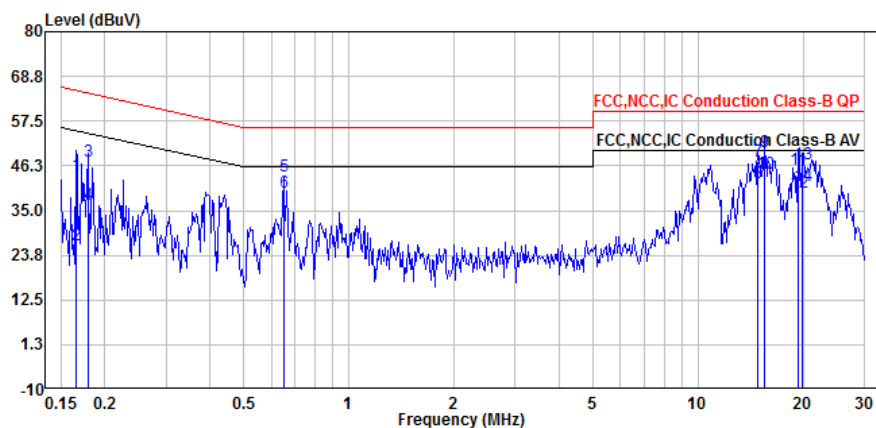
	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.157	25.57	45.44	19.87	65.60	-20.16	QP
2	0.157	7.64	27.51	19.87	55.60	-28.09	Average
3	0.213	23.04	42.90	19.86	63.09	-20.19	QP
4	0.213	12.68	32.54	19.86	53.09	-20.55	Average
5	0.650	23.70	43.59	19.89	56.00	-12.41	QP
6	0.650	20.64	40.53	19.89	46.00	-5.47	Average
7	10.994	24.44	44.57	20.13	60.00	-15.43	QP
8	10.994	18.74	38.87	20.13	50.00	-11.13	Average
9	15.987	29.41	49.60	20.19	60.00	-10.40	QP
10	15.987	24.17	44.36	20.19	50.00	-5.64	Average
11	21.640	27.33	47.55	20.22	60.00	-12.45	QP
12	21.640	21.58	41.80	20.22	50.00	-8.20	Average

Note:

$Level = Read\ Level + Factor$

$Over\ Limit\ (Margin) = Level - Limit\ Line$

$Factor = (LISN, ISN, PLC\ or\ current\ probe)\ Factor + Cable\ Loss + Attenuator$

Mode: AC 110V/60 Hz, Co-location (2.4G+BLE), Line

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.165	24.24	44.11	19.87	65.21	-21.10	QP
2	0.165	6.63	26.50	19.87	55.21	-28.71	Average
3	0.179	27.45	47.31	19.86	64.54	-17.23	QP
4	0.179	16.62	36.48	19.86	54.54	-18.06	Average
5	0.650	23.73	43.62	19.89	56.00	-12.38	QP
6	0.650	19.79	39.68	19.89	46.00	-6.32	Average
7	14.881	27.39	47.53	20.14	60.00	-12.47	QP
8	14.881	21.94	42.08	20.14	50.00	-7.92	Average
9	15.485	29.55	49.69	20.14	60.00	-10.31	QP
10	15.485	24.16	44.30	20.14	50.00	-5.70	Average
11	19.356	25.35	45.52	20.17	60.00	-14.48	QP
12	19.356	19.48	39.65	20.17	50.00	-10.35	Average
13	19.983	26.67	46.84	20.17	60.00	-13.16	QP
14	19.983	21.20	41.37	20.17	50.00	-8.63	Average

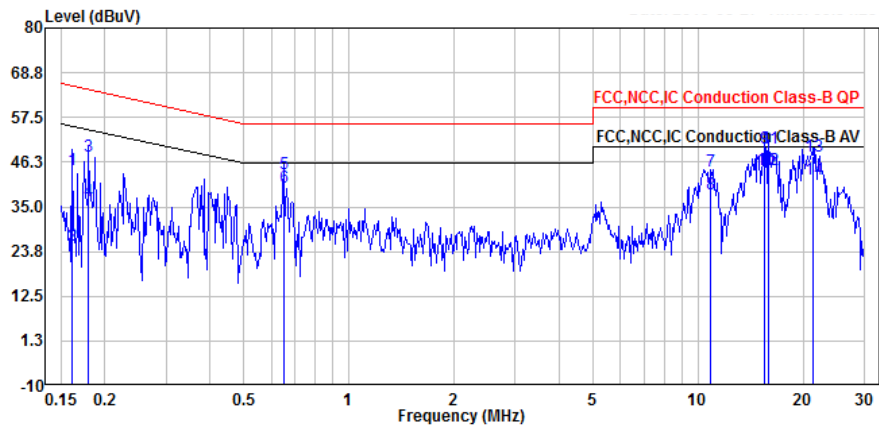
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$Factor = (LISN, ISN, PLC\ or\ current\ probe)\ Factor + Cable\ Loss + Attenuator$

Mode: AC 110V/60 Hz, Co-location (2.4G+BLE), Neutral



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.161	24.60	44.47	19.87	65.40	-20.93	QP
2	0.161	5.49	25.36	19.87	55.40	-30.04	Average
3	0.180	27.78	47.64	19.86	64.48	-16.84	QP
4	0.180	16.56	36.42	19.86	54.48	-18.06	Average
5	0.650	23.34	43.23	19.89	56.00	-12.77	QP
6	0.650	19.92	39.81	19.89	46.00	-6.19	Average
7	10.906	23.74	43.87	20.13	60.00	-16.13	QP
8	10.906	18.15	38.28	20.13	50.00	-11.72	Average
9	15.485	29.69	49.87	20.18	60.00	-10.13	QP
10	15.485	24.17	44.35	20.18	50.00	-5.65	Average
11	15.987	29.42	49.61	20.19	60.00	-10.39	QP
12	15.987	24.08	44.27	20.19	50.00	-5.73	Average
13	21.298	27.40	47.62	20.22	60.00	-12.38	QP
14	21.298	21.68	41.90	20.22	50.00	-8.10	Average

Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

6 FCC §15.209, §15.205, §15.247(d), §2.1053, RSS-Gen Sec 8.9, 8.10, RSS-247 Sec 5.5 and LP0002 Sec 3.10, 2.7 and 2.8 – Spurious Unwanted Emissions

6.1 Applicable Standard

According to FCC §15.247 (d), LP0002 Sec 3.10,. ISED RSS-247 Sec 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c). (7) The provisions of §15.205 apply to intentional radiators operating under this section.

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	13.36-13.41	399.9-410	4.5-5.15
0.495-0.505	16.42-16.423	608-614	5.35-5.46
2.1735-2.1905	16.69475-16.69525	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6

As per NCC Section 2.7,

MHz	MHz	MHz
0.090 - 0.110	167.72 - 173.20	3260.0 - 3267.0
0.490 - 0.510	240.00 - 285.00	3332.0 - 3339.0
2.172 - 2.198	322.00 - 335.40	3345.8 - 3358.0
3.013 - 3.033	399.90 - 410.00	3500.0 - 4400.0
4.115 - 4.198	608.00 - 614.00	4500.0 - 5250.0
5.670 - 5.690	703.00 - 748.00	5350.0 - 5460.0
6.200 - 6.300	758.00 - 803.00	7250.0 - 7750.0
8.230 - 8.400	825.00 - 915.00	8025.0 - 8500.0
12.265 - 12.600	930.00 - 1240.0	9000.0 - 9200.0
13.340 - 13.430	1300.0 - 1427.0	9300.0 - 9500.0
14.965 - 15.020	1435.0 - 1626.5	10600 - 12700
16.700 - 16.755	1660.0 - 1785.0	13250 - 13400
19.965 - 20.020	1805.0 - 1880.0	14470 - 14500
25.500 - 25.700	1885.0 - 1900.0	15350 - 16200
37.475 - 38.275	1905.0 - 1985.0	17700 - 21400
73.500 - 75.400	2010.0 - 2025.0	22010 - 23120
108.00 - 138.00	2110.0 - 2170.0	23600 - 24000
149.90 - 150.05	2200.0 - 2300.0	31200 - 31800
156.70 - 156.90	2310.0 - 2390.0	36430 - 36500
162.01 - 167.17	2483.5 - 2900.0	Above 38600

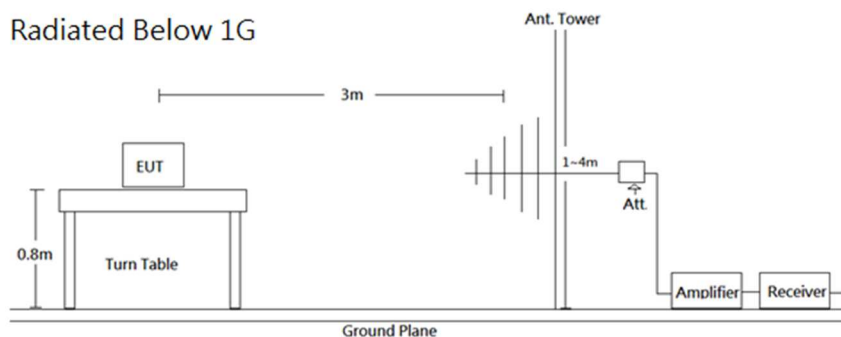
As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

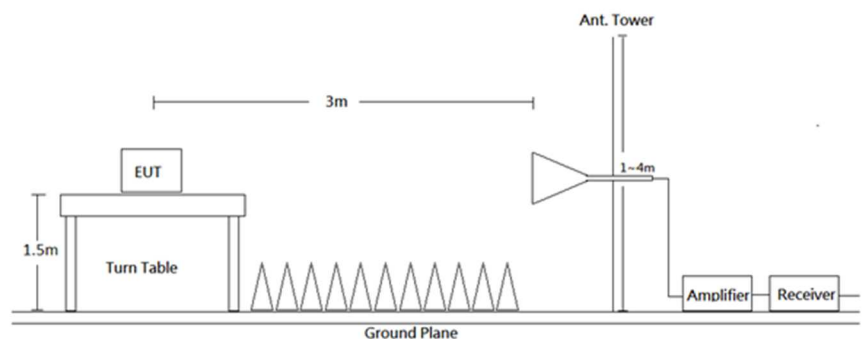
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

6.2 EUT Setup and Test Procedure

Radiated Below 1G



Radiated Above 1G



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Detector	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	QP	-	QP
Above 1 GHz	1 MHz	3 MHz	PK	-	PK
	1 MHz	3 MHz	RMS	>98%	Ave
	1 MHz	1/T	PK	<98%	Ave

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations. All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

6.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
966A Room					
Active Loop Antenna	ETS-Lindgren	6502	00035796	2019/03/12	2020/03/11
Bilog Antenna with 6 dB Attenuator	Sunol & Mini-Circuits	JB6/UNAT-6+	A050115/15542_01	2018/12/11	2019/12/10
Horn Antenna	EMCO	SAS-571	1983	2019/04/30	2020/04/29
Horn Antenna	ETS-Lindgren	3116	62638	2018/08/29	2019/08/28
Preamplifier	Sonoma	310N	130601	2018/09/20	2019/09/19
Preamplifier	EM Electronics Corp.	EM01G18G	060698	2019/04/12	2020/04/11
Microwave Preamplifier	EM Electronics Corporatino	EM18G40G	060656	2019/01/11	2020/01/10
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Spectrum Analyzer	Rohde & Schwarz	FSV40	101204	2019/07/04	2020/07/03
Microflex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225756-001	2019/07/01	2020/06/30
Microflex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2018/11/19	2019/11/18
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2019/03/04	2020/03/03
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2019/01/16	2020/01/15
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	AUDIX	E3	LKCO01	N.C.R	N.C.R

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

6.4 Test Environmental Conditions

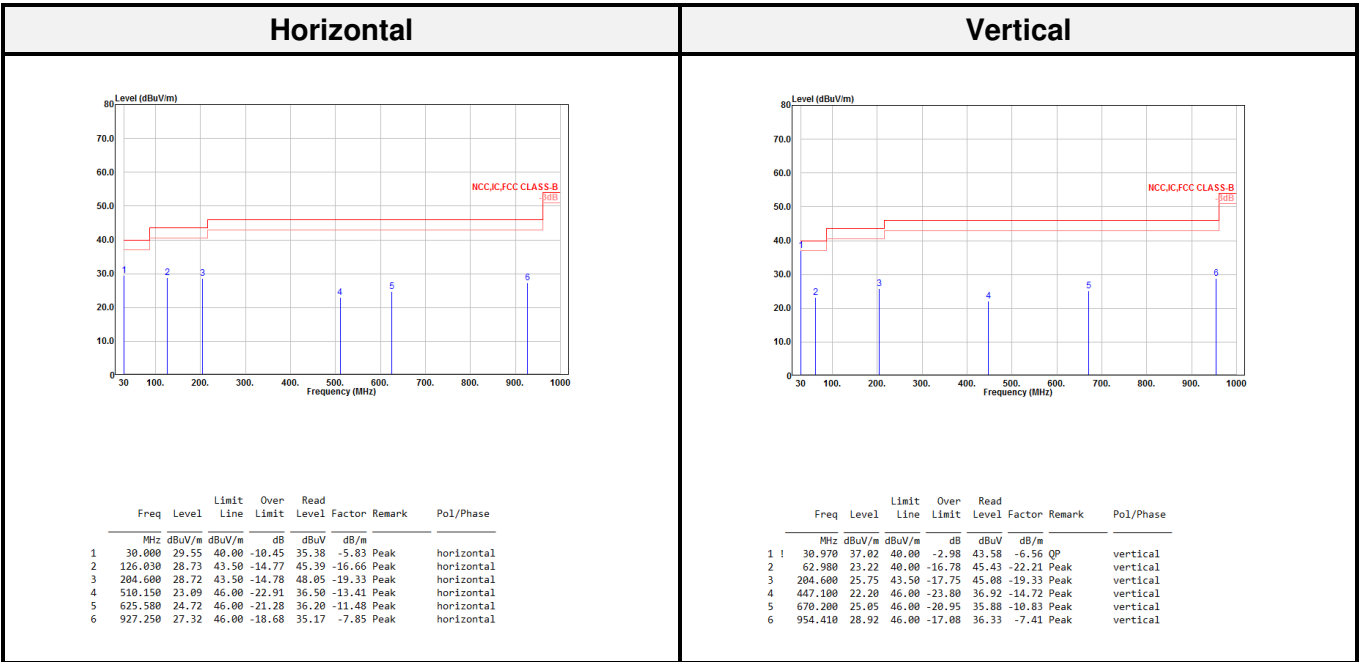
Temperature:	20-25 °C	Relative Humidity:	45-55 %
ATM Pressure:	1014hPa	Test Engineer:	Leo Chang
Test Date:	2019-06-19~2019-08-06	-	-

6.5 Radiated Emission Test Plot and Data

Wi-Fi 2.4G mode - 4TX

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

Below 1G (30 MHz-1 GHz) test the output power worst mode

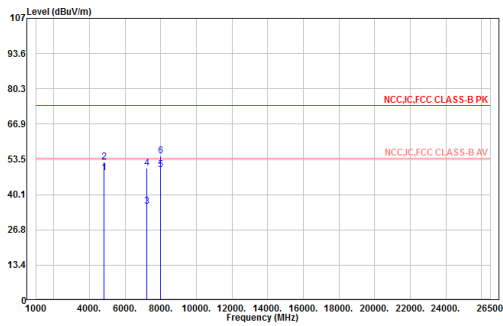


Result = Reading + Correct Factor

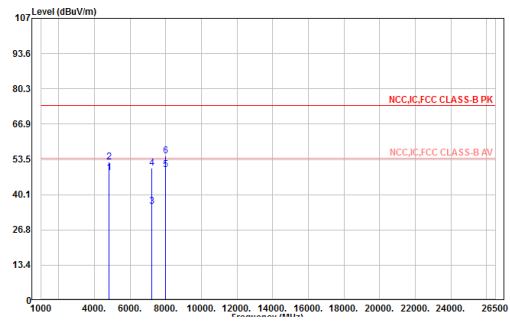
Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

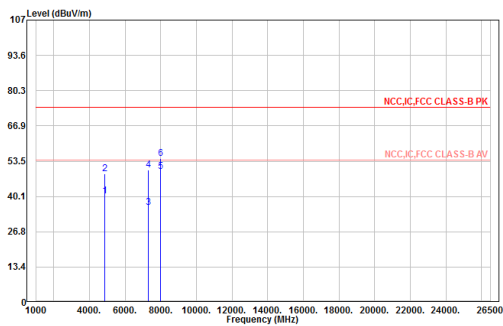
Spurious emissions more than 20 dB below the limit were not reported

Wi-Fi 2.4G mode - 4TX**Above 1G (1 GHz-26.5 GHz):****802.11b mode: 2412MHz****Horizontal**

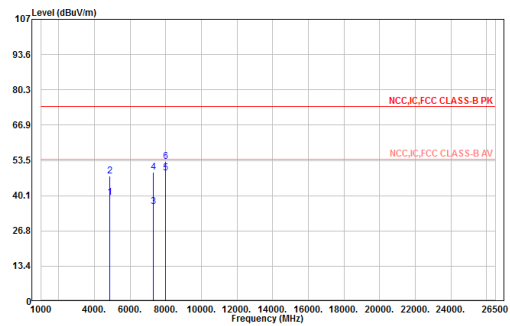
Freq	Level	Limit	Over	Read	Factor	Remark	Pol/Phase
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 ! 4824.000	48.44	54.00	-5.56	47.80	0.64	Average	horizontal
2 4874.000	52.43	74.00	-21.57	51.79	0.64	Peak	horizontal
3 ! 7236.000	35.80	54.00	-18.20	30.42	5.38	Average	horizontal
4 7236.000	50.14	74.00	-23.86	44.76	5.38	Peak	horizontal
5 ! 8000.000	49.45	54.00	-4.55	43.20	6.25	Average	horizontal
6 ! 8000.000	54.87	74.00	-19.13	48.62	6.25	Peak	horizontal

Vertical

Freq	Level	Limit	Over	Read	Factor	Remark	Pol/Phase
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 ! 4824.000	48.44	54.00	-5.56	47.80	0.64	Average	horizontal
2 4874.000	52.43	74.00	-21.57	51.79	0.64	Peak	horizontal
3 ! 7236.000	35.80	54.00	-18.20	30.42	5.38	Average	horizontal
4 7236.000	50.14	74.00	-23.86	44.76	5.38	Peak	horizontal
5 ! 8000.000	49.45	54.00	-4.55	43.20	6.25	Average	horizontal
6 ! 8000.000	54.87	74.00	-19.13	48.62	6.25	Peak	horizontal

802.11b mode: 2437 MHz**Horizontal**

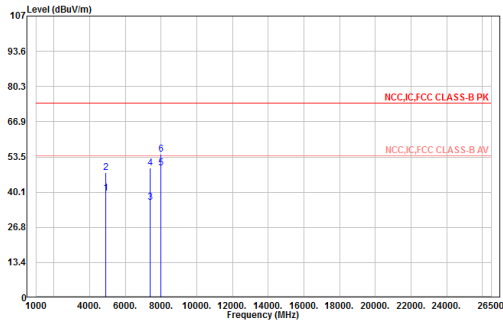
Freq	Level	Limit	Over	Read	Factor	Remark	Pol/Phase
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 ! 4874.000	40.19	54.00	-13.81	39.40	0.79	Average	horizontal
2 4874.000	48.64	74.00	-25.36	47.85	0.79	Peak	horizontal
3 ! 7311.000	36.08	54.00	-17.92	30.44	5.64	Average	horizontal
4 7311.000	50.04	74.00	-23.96	44.40	5.64	Peak	horizontal
5 ! 8000.000	49.47	54.00	-4.53	43.22	6.25	Average	horizontal
6 ! 8000.000	54.53	74.00	-19.47	48.28	6.25	Peak	horizontal

Vertical

Freq	Level	Limit	Over	Read	Factor	Remark	Pol/Phase
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		
1 ! 4874.000	39.41	54.00	-14.59	38.62	0.79	Average	vertical
2 4874.000	47.59	74.00	-26.41	46.80	0.79	Peak	vertical
3 ! 7311.000	35.99	54.00	-18.01	30.35	5.64	Average	vertical
4 7311.000	48.98	74.00	-25.02	43.34	5.64	Peak	vertical
5 ! 8000.000	48.60	54.00	-5.40	42.35	6.25	Average	vertical
6 8000.000	53.16	74.00	-20.84	46.91	6.25	Peak	vertical

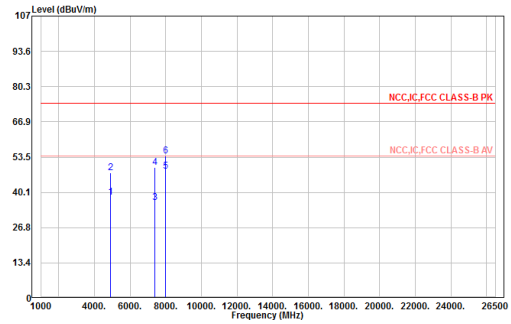
802.11b mode: 2462 MHz

Horizontal



	Freq	Level	Limit	Over	Read			
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark
1	4924.000	39.66	54.00	-14.34	38.82	0.84	Average	horizontal
2	4924.000	47.69	74.00	-26.31	46.85	0.84	Peak	horizontal
3	7386.000	36.28	54.00	-17.72	30.36	5.92	Average	horizontal
4	7386.000	49.31	74.00	-24.69	43.39	5.92	Peak	horizontal
5	8000.000	49.40	54.00	-4.60	43.15	6.25	Average	horizontal
6	8000.000	54.47	74.00	-19.53	48.22	6.25	Peak	horizontal

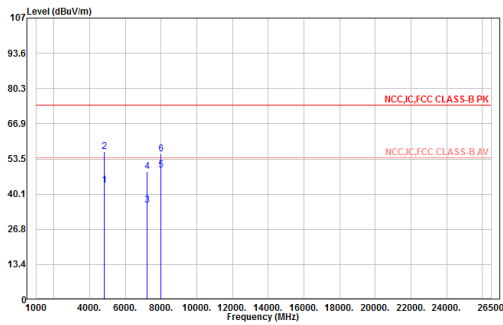
Vertical



	Freq	Level	Limit	Over	Read			
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark
1	4924.000	38.38	54.00	-15.62	37.54	0.84	Average	vertical
2	4924.000	47.42	74.00	-26.58	46.58	0.84	Peak	vertical
3	7386.000	36.28	54.00	-17.72	30.36	5.92	Average	vertical
4	7386.000	49.47	74.00	-24.53	43.55	5.92	Peak	vertical
5	8000.000	48.07	54.00	-5.93	41.82	6.25	Average	vertical
6	8000.000	53.86	74.00	-20.14	47.61	6.25	Peak	vertical

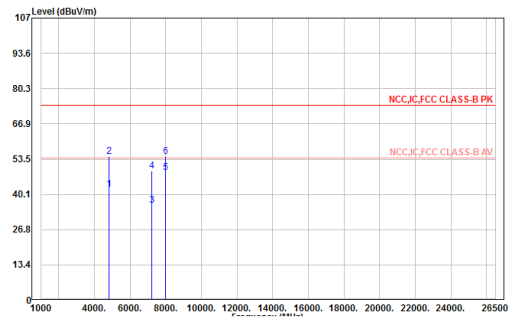
802.11g mode: 2412 MHz

Horizontal



	Freq	Level	Limit	Over	Read			
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark
1	4814.000	43.49	54.00	-10.51	42.88	0.61	Average	horizontal
2	4814.000	56.23	74.00	-17.77	55.62	0.61	Peak	horizontal
3	7236.000	36.04	54.00	-17.96	30.66	5.38	Average	horizontal
4	7236.000	48.74	74.00	-25.26	43.36	5.38	Peak	horizontal
5	8000.000	49.31	54.00	-4.69	43.06	6.25	Average	horizontal
6	8000.000	55.29	74.00	-18.71	49.04	6.25	Peak	horizontal

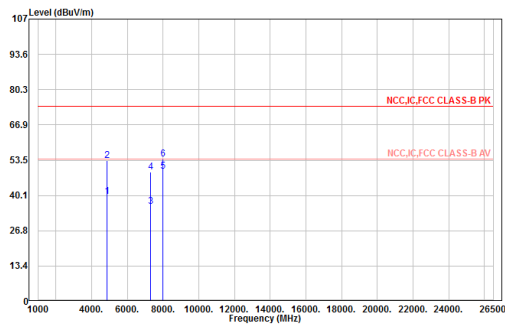
Vertical



	Freq	Level	Limit	Over	Read			
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark
1	4814.000	42.17	54.00	-11.83	41.56	0.61	Average	vertical
2	4814.000	54.47	74.00	-19.53	53.83	0.64	Peak	vertical
3	7236.000	35.96	54.00	-18.04	30.58	5.38	Average	vertical
4	7236.000	48.92	74.00	-25.08	43.54	5.38	Peak	vertical
5	8000.000	48.41	54.00	-5.59	42.13	6.28	Average	vertical
6	8000.000	54.41	74.00	-19.59	48.16	6.25	Peak	vertical

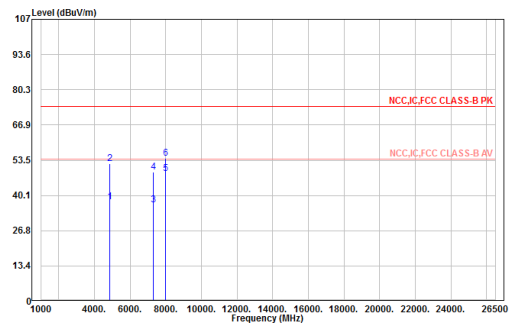
802.11g mode: 2437 MHz

Horizontal



	Freq	Level	Limit	Over	Read			
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Remark	Pol/Phase
1	4862.000	39.74	54.00	-14.26	39.04	0.70	Average	horizontal
2	4862.000	53.46	74.00	-20.54	52.76	0.70	Peak	horizontal
3	7311.000	35.97	54.00	-18.03	30.33	5.64	Average	horizontal
4	7311.000	49.01	74.00	-24.99	43.37	5.64	Peak	horizontal
5	8000.000	49.31	54.00	-4.69	43.06	6.25	Average	horizontal
6	8000.000	53.99	74.00	-20.01	47.74	6.25	Peak	horizontal

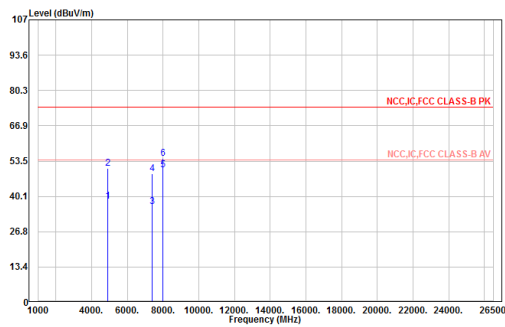
Vertical



	Freq	Level	Limit	Over	Read			
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Remark	Pol/Phase
1	4862.000	37.68	54.00	-16.32	36.98	0.70	Average	vertical
2	4862.000	52.15	74.00	-21.85	51.45	0.70	Peak	vertical
3	7311.000	36.66	54.00	-17.34	31.02	5.64	Average	vertical
4	7311.000	48.90	74.00	-25.10	43.26	5.64	Peak	vertical
5	8000.000	48.49	54.00	-5.51	42.24	6.25	Average	vertical
6	8000.000	54.19	74.00	-19.81	47.94	6.25	Peak	vertical

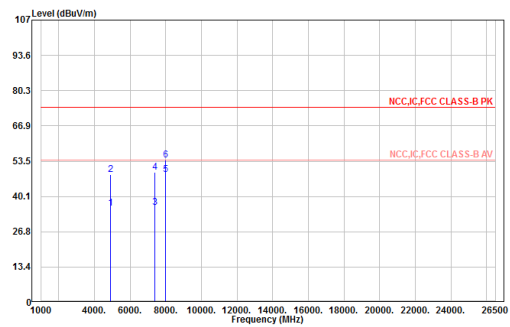
802.11g mode: 2462 MHz

Horizontal



	Freq	Level	Limit	Over	Read			
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Remark	Pol/Phase
1	4912.000	38.28	54.00	-15.72	37.43	0.85	Average	horizontal
2	4912.000	50.64	74.00	-23.36	49.79	0.85	Peak	horizontal
3	7386.000	36.35	54.00	-17.65	30.43	5.92	Average	horizontal
4	7386.000	48.76	74.00	-25.24	42.84	5.92	Peak	horizontal
5	8000.000	50.15	54.00	-3.85	43.90	6.25	Average	horizontal
6	8000.000	54.65	74.00	-19.35	48.40	6.25	Peak	horizontal

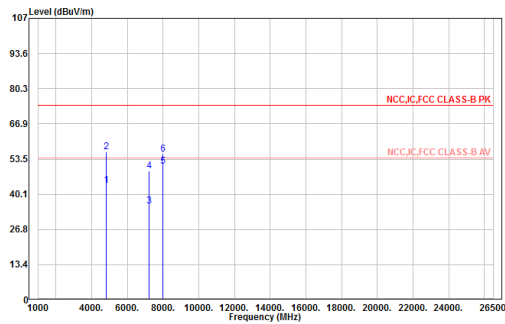
Vertical



	Freq	Level	Limit	Over	Read			
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Remark	Pol/Phase
1	4912.000	35.60	54.00	-18.40	34.75	0.85	Average	vertical
2	4912.000	48.43	74.00	-25.57	47.58	0.85	Peak	vertical
3	7386.000	36.06	54.00	-17.94	30.14	5.92	Average	vertical
4	7386.000	49.24	74.00	-24.76	43.32	5.92	Peak	vertical
5	8000.000	48.51	54.00	-5.49	42.26	6.25	Average	vertical
6	8000.000	53.90	74.00	-20.10	47.65	6.25	Peak	vertical

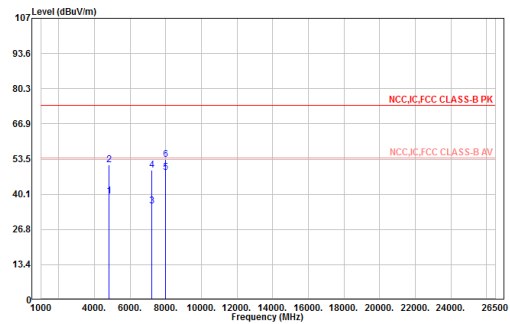
802.11n HT20 mode: 2412 MHz

Horizontal



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	Limit	Level	Factor	Remark	Pol/Phase	
1	4837.000	43.50	74.00	-30.50	42.86	0.64	Average	horizontal	
2	4837.000	56.26	74.00	-17.74	55.62	0.64	Peak	horizontal	
3	7236.000	35.66	54.00	-18.34	30.28	5.38	Average	horizontal	
4	7236.000	48.98	74.00	-25.02	43.60	5.38	Peak	horizontal	
5	8000.000	50.80	54.00	-3.20	44.55	6.25	Average	horizontal	
6	8000.000	55.40	74.00	-18.60	49.15	6.25	Peak	horizontal	

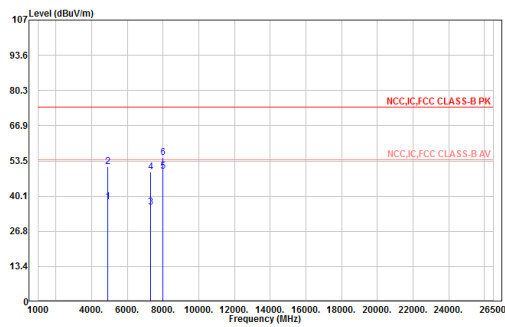
Vertical



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	Limit	Level	Factor	Remark	Pol/Phase	
1	4837.000	39.31	54.00	-14.69	38.67	0.64	Average	vertical	
2	4837.000	51.30	74.00	-22.70	50.66	0.64	Peak	vertical	
3	7236.000	35.61	54.00	-18.39	30.23	5.38	Average	vertical	
4	7236.000	49.30	74.00	-24.70	43.92	5.38	Peak	vertical	
5	8000.000	48.45	54.00	-5.55	42.20	6.25	Average	vertical	
6	8000.000	53.41	74.00	-20.59	47.16	6.25	Peak	vertical	

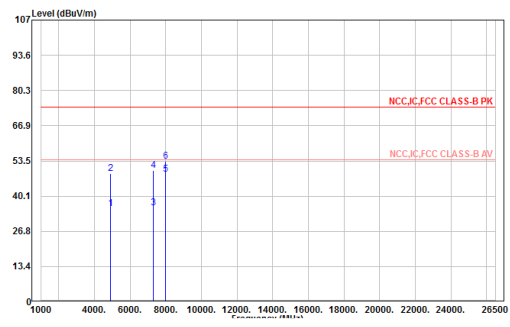
802.11n HT20 mode: 2437 MHz

Horizontal



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	Limit	Level	Factor	Remark	Pol/Phase	
1	4886.000	38.04	54.00	-15.96	37.24	0.80	Average	horizontal	
2	4886.000	51.47	74.00	-22.53	50.67	0.80	Peak	horizontal	
3	7311.000	36.09	54.00	-17.91	30.45	5.64	Average	horizontal	
4	7311.000	49.31	74.00	-24.69	43.67	5.64	Peak	horizontal	
5	8000.000	49.46	54.00	-4.54	43.21	6.25	Average	horizontal	
6	8000.000	54.80	74.00	-19.20	48.55	6.25	Peak	horizontal	

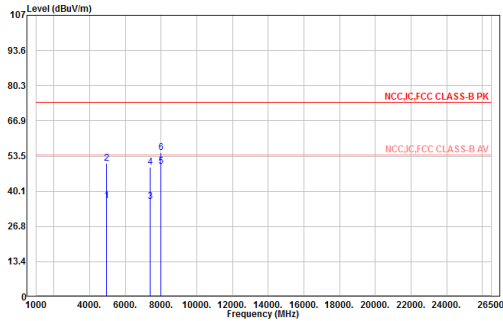
Vertical



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	Limit	Level	Factor	Remark	Pol/Phase	
1	4886.000	35.50	54.00	-18.50	34.71	0.79	Average	vertical	
2	4886.000	48.71	74.00	-25.29	47.92	0.79	Peak	vertical	
3	7311.000	35.80	54.00	-18.20	30.16	5.64	Average	vertical	
4	7311.000	49.82	74.00	-24.18	44.18	5.64	Peak	vertical	
5	8000.000	48.44	54.00	-5.56	42.19	6.25	Average	vertical	
6	8000.000	53.47	74.00	-20.53	47.19	6.28	Peak	vertical	

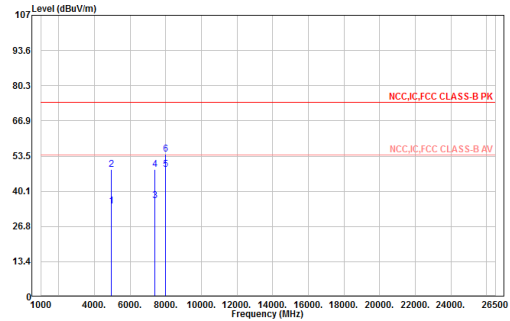
802.11n HT20 mode: 2462 MHz

Horizontal



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark	Pol/Phase
1	4937.000	36.53	54.00	-17.47	35.70	0.83	Average	horizontal	
2	4937.000	59.72	74.00	-23.28	49.89	0.83	Peak	horizontal	
3	7386.000	36.17	54.00	-17.83	30.25	5.92	Average	horizontal	
4	7386.000	49.39	74.00	-24.61	43.47	5.92	Peak	horizontal	
5	8000.000	49.52	54.00	-4.48	43.27	6.25	Average	horizontal	
6	8000.000	54.92	74.00	-19.08	48.67	6.25	Peak	horizontal	

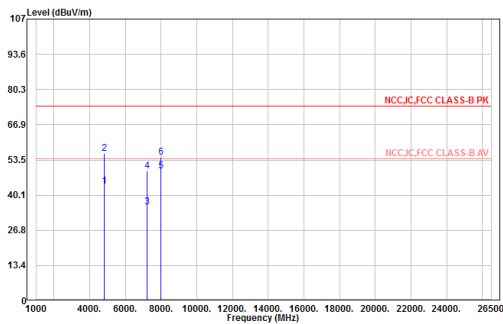
Vertical



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark	Pol/Phase
1	4937.000	34.58	54.00	-19.42	33.75	0.83	Average	vertical	
2	4937.000	48.49	74.00	-25.51	47.66	0.83	Peak	vertical	
3	7386.000	36.40	54.00	-17.60	30.48	5.92	Average	vertical	
4	7386.000	48.56	74.00	-25.44	42.64	5.92	Peak	vertical	
5	8000.000	48.40	54.00	-5.60	42.15	6.25	Average	vertical	
6	8000.000	54.18	74.00	-19.82	47.93	6.25	Peak	vertical	

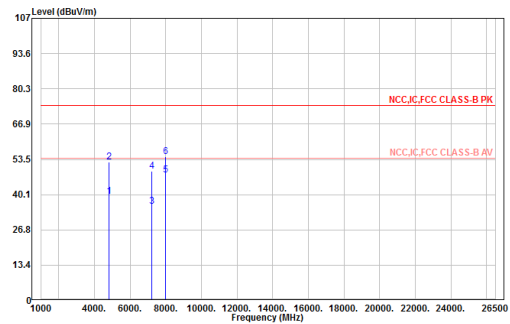
802.11ax HE20 mode: 2412 MHz

Horizontal



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark	Pol/Phase
1	4836.000	43.53	54.00	-10.47	42.89	0.64	Average	horizontal	
2	4836.000	56.06	74.00	-17.94	55.42	0.64	Peak	horizontal	
3	7236.000	35.66	54.00	-18.34	30.28	5.38	Average	horizontal	
4	7236.000	49.36	74.00	-24.64	43.98	5.38	Peak	horizontal	
5	8000.000	49.41	54.00	-4.59	43.16	6.25	Average	horizontal	
6	8000.000	54.43	74.00	-19.57	48.18	6.25	Peak	horizontal	

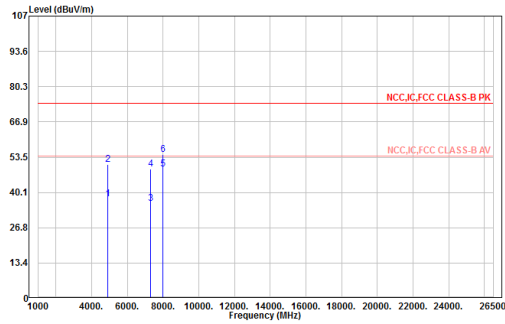
Vertical



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark	Pol/Phase
1	4836.000	39.54	54.00	-14.46	38.90	0.64	Average	vertical	
2	4836.000	52.61	74.00	-21.39	51.97	0.64	Peak	vertical	
3	7236.000	35.64	54.00	-18.36	30.26	5.38	Average	vertical	
4	7236.000	49.14	74.00	-24.86	43.76	5.38	Peak	vertical	
5	8000.000	47.64	54.00	-6.36	41.39	6.25	Average	vertical	
6	8000.000	54.42	74.00	-19.58	48.17	6.25	Peak	vertical	

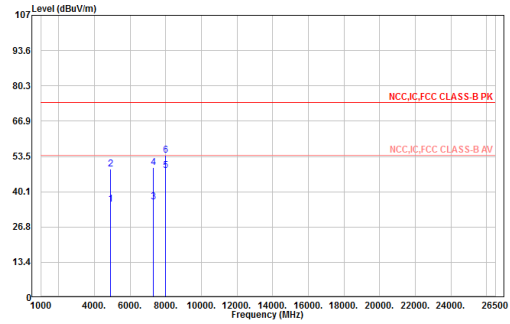
802.11ax HE20 mode: 2437 MHz

Horizontal



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark	Pol/Phase
1	4887.000	37.68	54.00	-16.32	36.88	0.80	Average	horizontal	
2	4887.000	50.82	74.00	-23.18	50.02	0.80	Peak	horizontal	
3	7311.000	35.95	54.00	-18.05	30.31	5.64	Average	horizontal	
4	7311.000	48.97	74.00	-25.03	43.33	5.64	Peak	horizontal	
5	8000.000	49.03	54.00	-4.97	42.78	6.25	Average	horizontal	
6	8000.000	54.43	74.00	-19.57	48.18	6.25	Peak	horizontal	

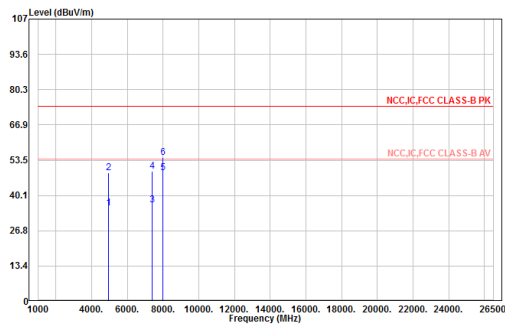
Vertical



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark	Pol/Phase
1	4887.000	35.51	54.00	-18.49	34.72	0.79	Average	vertical	
2	4887.000	48.66	74.00	-25.34	47.87	0.79	Peak	vertical	
3	7311.000	36.17	54.00	-17.83	30.53	5.64	Average	vertical	
4	7311.000	49.21	74.00	-24.79	43.57	5.64	Peak	vertical	
5	8000.000	48.02	54.00	-5.98	41.77	6.25	Average	vertical	
6	8000.000	53.85	74.00	-20.15	47.60	6.25	Peak	vertical	

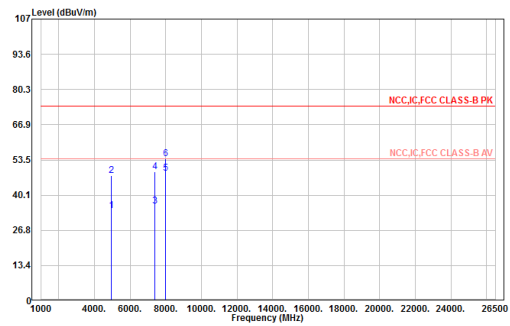
802.11ax HE20 mode: 2462 MHz

Horizontal



	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark	Pol/Phase
1	4937.000	35.45	54.00	-18.55	34.62	0.83	Average	horizontal	
2	4937.000	48.58	74.00	-25.42	47.75	0.83	Peak	horizontal	
3	7386.000	36.52	54.00	-17.48	30.60	5.92	Average	horizontal	
4	7386.000	49.38	74.00	-24.62	43.46	5.92	Peak	horizontal	
5	8000.000	48.84	54.00	-5.16	42.59	6.25	Average	horizontal	
6	8000.000	54.64	74.00	-19.36	48.39	6.25	Peak	horizontal	

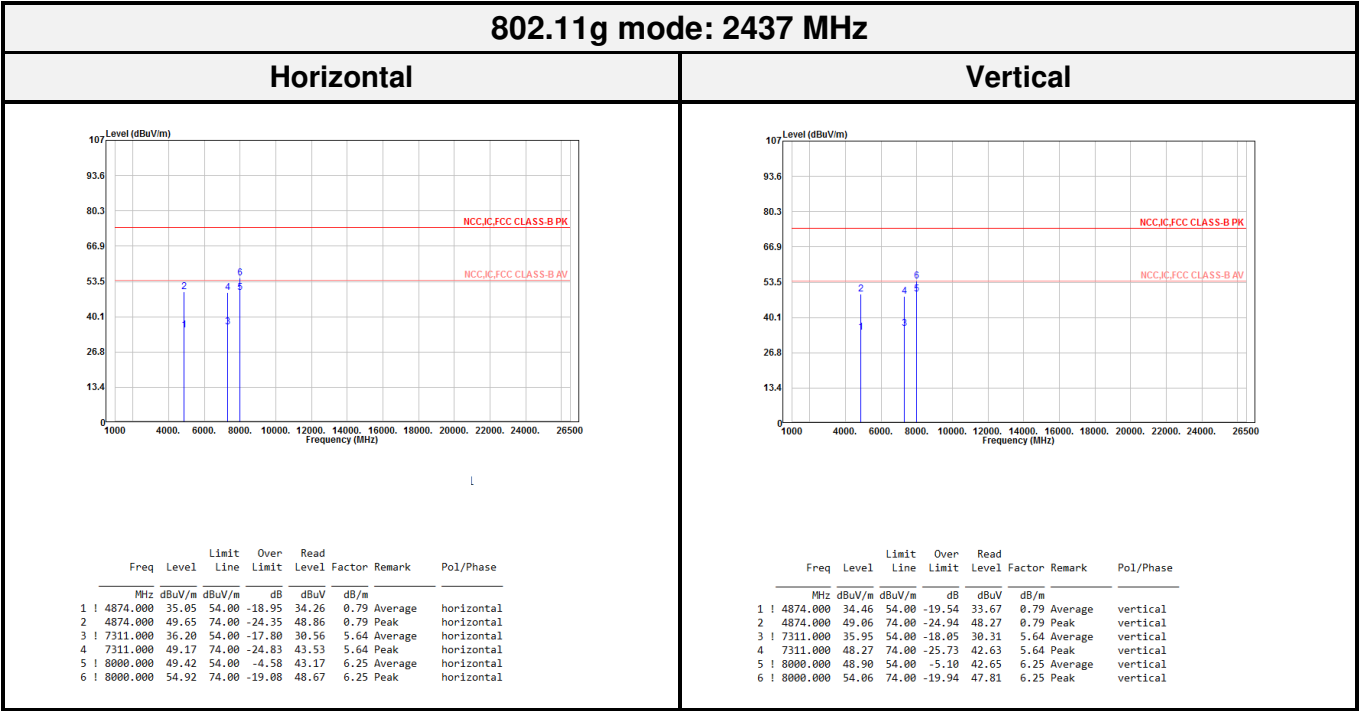
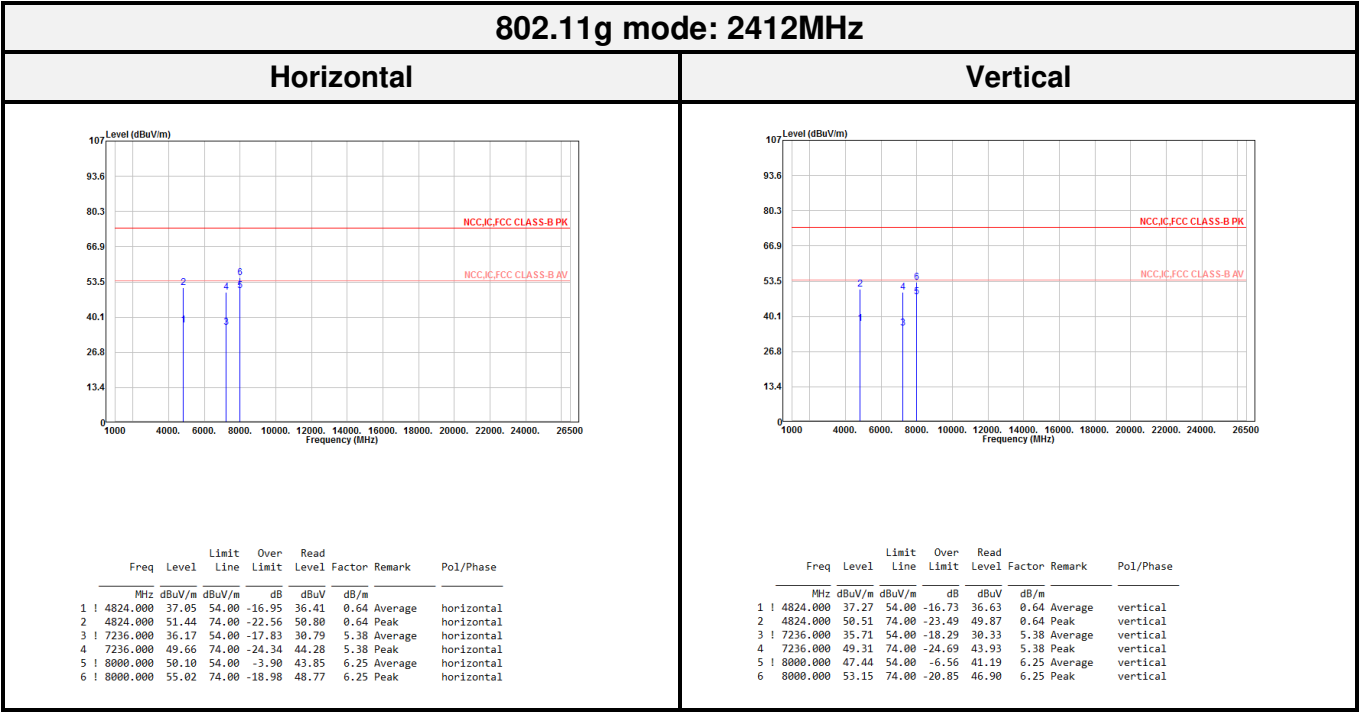
Vertical

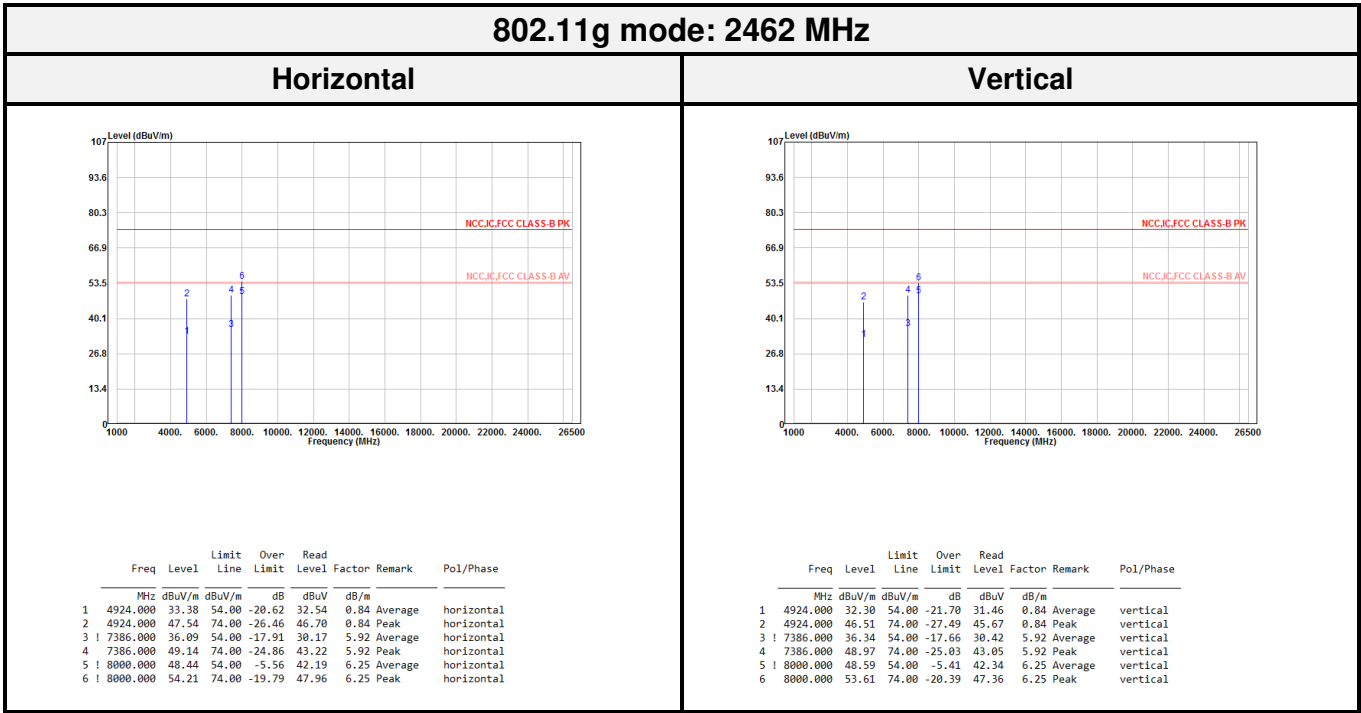


	Freq	Level	Limit	Over	Read				
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	Factor	Remark	Pol/Phase
1	4937.000	34.14	54.00	-19.86	33.30	0.84	Average	vertical	
2	4937.000	47.58	74.00	-26.42	46.74	0.84	Peak	vertical	
3	7386.000	36.05	54.00	-17.95	30.13	5.92	Average	vertical	
4	7386.000	48.93	74.00	-25.07	43.01	5.92	Peak	vertical	
5	8000.000	48.34	54.00	-5.66	42.09	6.25	Average	vertical	
6	8000.000	53.82	74.00	-20.18	47.57	6.25	Peak	vertical	

ChillWave mode -

Above 1G (1 GHz-26.5 GHz):

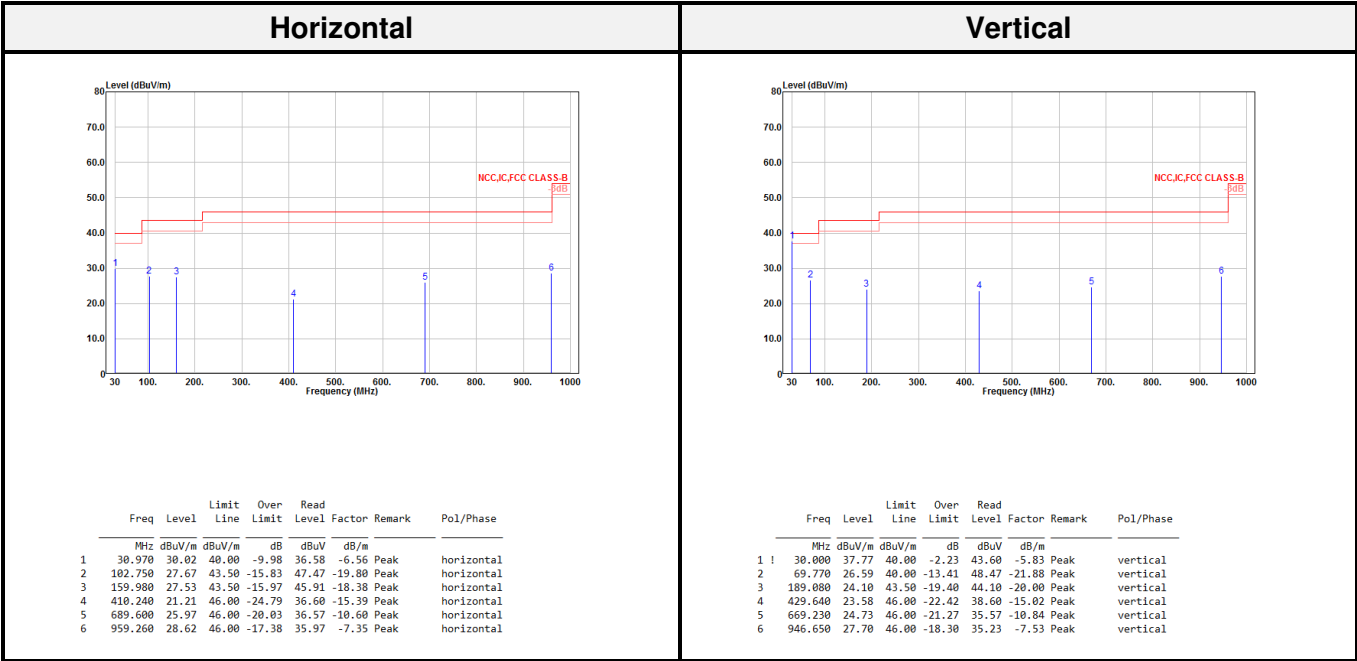




BLE mode

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

Below 1G (30 MHz-1 GHz) test the output power worst mode



Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Above 1G (1 GHz-26.5 GHz):

