

TEST REPORT



Report No.: TW2210072E  
Applicant: Shenzhen Bilian Electronic Co.,Ltd.  
Product: 2.4GHz wifi mainboard  
Model No.: BL-R8189RM2  
Trademark: N/A  
Test Standards: FCC Part 15.247

Test result: It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15.247 for the evaluation of electromagnetic compatibility

Approved By

A handwritten signature in black ink that reads 'Terry Tang'.

---

Terry Tang

Manager

Dated: October 24, 2022

**Results appearing herein relate only to the sample tested**

**The technical reports is issued errors and omissions exempt and is subject to withdrawal at**

**SHENZHEN TIMEWAY TESTING LABORATORIES**

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com



### **Special Statement:**

The testing quality ability of our laboratory meet with “Quality Law of People’s Republic of China” Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAL. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

#### **CNAL-LAB Code: L2292**

The EMC Laboratory has been assessed and in compliance with CNAL/AC01:2002 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

#### **FCC-Registration No.: 744189**

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

#### **Industry Canada (IC) —Registration No.:5205A**

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

#### **A2LA (Certification Number:5013.01)**

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

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## 1.0 General Details

### 1.1 Test Lab Details

Name: SHENZHEN TIMEWAY TESTING LABORATORIES.  
Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China  
Telephone: (755) 83448688  
Fax: (755) 83442996  
Site Listed with Federal Communications commission (FCC)  
Registration Number:744189  
For 3m Anechoic Chamber  
Site Listed with Industry Canada of Ottawa, Canada  
Registration Number: IC: 5205A  
For 3m Anechoic Chamber

### 1.2 Applicant Details

Applicant: Shenzhen Bilian Electronic Co.,Ltd.  
Address: Room 501, Building 3, No. 32, Dafu Road, Zhangge Community, Fucheng Street, Longhua District, Shenzhen City, China  
Telephone: --  
Fax: --

### 1.3 Description of EUT

Product: 2.4GHz wifi mainboard  
Manufacturer: Shenzhen Bilian Electronic Co.,Ltd.  
Address: Room 501, Building 3, No. 32, Dafu Road, Zhangge Community, Fucheng Street, Longhua District, Shenzhen City, China  
Trademark: N/A  
Model Number: BL-R8189RM2  
Additional Model Number: N/A  
Hardware Version: V2.2  
Software Version: N/A  
Serial No.: RMDLB05BHG0276  
Type of Modulation IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK)  
IEEE 802.11g/n (HT20, HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)  
Frequency range IEEE 802.11b/g/n (HT20): 2412-2462MHz;  
IEEE 802.11n HT40: 2422-2452MHz;  
Channel Spacing 5MHz for IEEE 802.11b/g/n (HT20, HT40)  
Air Data Rate IEEE 802.11b: 11, 5.5, 2, 1 Mbps  
IEEE 802.11g: 54, 48,36, 24, 18, 12, 9, 6 Mbps

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IEEE 802.11n HT20/HT40: mcs0-mcs7  
Frequency Selection By software  
Channel Number IEEE 802.11b/g/n (HT20): 11 Channels;  
IEEE 802.11n (HT40): 7 Channels;  
Antenna: Dipole antenna provided to the EUT.  
with Gain 2.0dBi maximum (Get from the antenna specification)  
Rating: DC3.3V

1.4 Submitted Sample: 1 Samples

1.5 Test Duration  
2022-10-11 to 2022-10-21

1.6 Test Uncertainty  
Conducted Emissions Uncertainty =3.6dB  
Radiated Emissions below 1GHz Uncertainty =4.7dB  
Radiated Emissions above 1GHz Uncertainty =6.0dB  
Conducted Power Uncertainty =6.0dB  
Occupied Channel Bandwidth Uncertainty =5%  
Note: The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

1.7 Test Engineer *Andy Xing*  
The sample tested by \_\_\_\_\_

Print Name: Andy Xing



<b>2.0 Test Equipment</b>					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2022-07-15	2023-07-14
LISN	R&S	EZH3-Z5	100294	2022-07-18	2023-07-17
LISN	R&S	EZH3-Z5	100253	2022-07-18	2023-07-17
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2022-07-18	2023-07-17
Loop Antenna	EMCO	6507	00078608	2022-07-18	2025-07-17
Spectrum	R&S	FSIQ26	100292	2022-07-15	2023-07-14
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2022-07-18	2025-07-17
Horn Antenna	R&S	BBHA 9120D	9120D-631	2022-07-18	2024-07-17
Power meter	Anritsu	ML2487A	6K00003613	2022-07-18	2023-07-17
Power sensor	Anritsu	MA2491A	32263	2022-07-18	2023-07-17
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2022-07-18	2025-07-17
9*6*6 Anechoic	--	--	N/A	2022-07-26	2025-07-25
EMI Test Receiver	RS	ESVB	826156/011	2022-07-15	2023-07-14
EMI Test Receiver	RS	ESCS 30	834115/006	2022-07-15	2023-07-14
Spectrum	HP/Agilent	E4407B	MY50441392	2022-07-15	2023-07-14
Spectrum	RS	FSP	1164.4391.38	2022-07-15	2023-07-14
RF Cable	Zhengdi	ZT26-NJ-NJ-8 M/FA	--	2022-07-15	2023-07-14
RF Cable	Zhengdi	7m	--	2022-07-15	2023-07-14
Pre-Amplifier	Schwarebeck	BBV9743	#218	2022-07-15	2023-07-14
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2022-07-15	2023-07-14
LISN	SCHAFFNER	NNB42	00012	2022-08-18	2023-07-17

## 2.2 Automation Test Software

### For Conducted Emission Test

Name	Version
EZ-EMC	Ver.EMC-CON 3A1.1

### For Radiated Emissions

Name	Version
EMI Test Software BL410-EV18.91	V18.905
EMI Test Software BL410-EV18.806 High Frequency	V18.06

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### 3. DESCRIPTION OF TEST MODES

#### IEEE 802.11b, 802.11g, 802.11n (HT20) mode

The EUT had been tested under operating condition. There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b mode: 1Mbps data rate (worst case) was chosen for full testing. IEEE 802.11g mode: 6Mbps data rate (worst case) was chosen for full testing. IEEE 802.11n (HT20) mode: mcs0 (worst case) were chosen for full testing

#### IEEE 802.11n (HT40) mode

The EUT had been tested under operating condition. There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2422
Middle	2437
High	2452

IEEE 802.11n (HT40) mode: mcs0 data rate (worst case) were chosen for full testing

Note: During the test, the duty cycle was set up to >98%

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### 3.0 Technical Details

#### 3.1 Summary of test results

<b>The EUT has been tested according to the following specifications:</b>			
<b>Standard</b>	<b>Test Type</b>	<b>Result</b>	<b>Notes</b>
<b>FCC Part 15, Paragraph 15.203</b>	<b>Antenna Requirement</b>	<b>Pass</b>	<b>Complies</b>
<b>FCC Part 15, Paragraph 15.207</b>	<b>Conducted Emission Test</b>	<b>Pass</b>	<b>Complies</b>
<b>FCC Part 15 Subpart C Paragraph 15.247(a)(2) Limit</b>	<b>Spectrum bandwidth of a Orthogonal Frequency Division Multiplex System Limit: 6dB bandwidth &gt; 500kHz</b>	<b>Pass</b>	<b>Complies</b>
<b>FCC Part 15, Paragraph 15.247(b)</b>	<b>Maximum peak output power Limit: max. 30dBm</b>	<b>Pass</b>	<b>Complies</b>
<b>FCC Part 15, Paragraph 15.109, 15.205 &amp; 15.209</b>	<b>Transmitter Radiated Emission Limit: Table 15.209</b>	<b>Pass</b>	<b>Complies</b>
<b>FCC Part 15, Paragraph 15.247(e)</b>	<b>Power Spectral Density Limit: max. 8dBm/3kHz</b>	<b>Pass</b>	<b>Complies</b>
<b>FCC Part 15, Paragraph 15.247(d)</b>	<b>Out of Band Emission and Restricted Band Radiation Limit: 20dB less than peak value of fundamental frequency Restricted band limit: Table 15.209</b>	<b>Pass</b>	<b>Complies</b>

#### 3.2 Test Standards

**FCC Part 15 Subpart & Subpart C, Paragraph 15.247**

#### 4.0 EUT Modification

**No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.**

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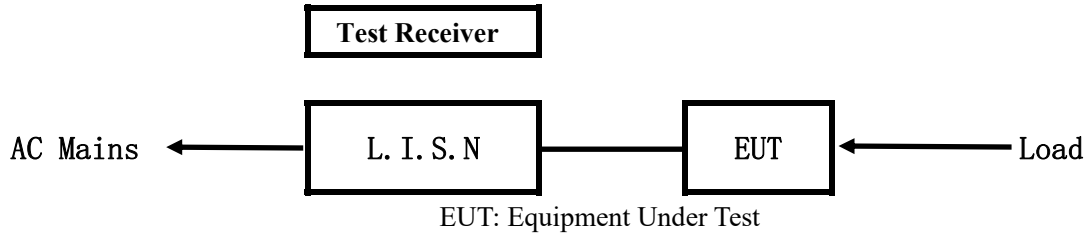
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**5.0 Power Line Conducted Emission Test**

5.1 Schematics of the test

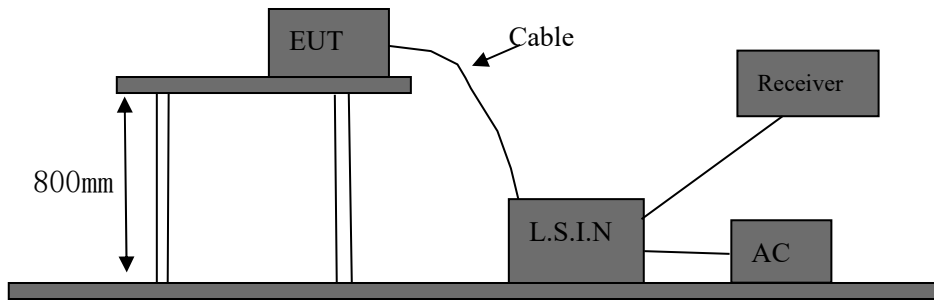


5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10 –2013.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



5.3 Configuration of the EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model	FCC ID
2.4GHz wifi mainboard	Shenzhen Bilian Electronic Co.,Ltd.	BL-R8189RM2	2AL6K-BL-R8189RM2

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	FCC ID/DOC	Cable
PC	DELL	P54G	--	--

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5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10-2013.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

- Notes:
1. \*Decreasing linearly with logarithm of frequency.
  2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

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**A: Conducted Emission on Live Terminal (150kHz to 30MHz)**

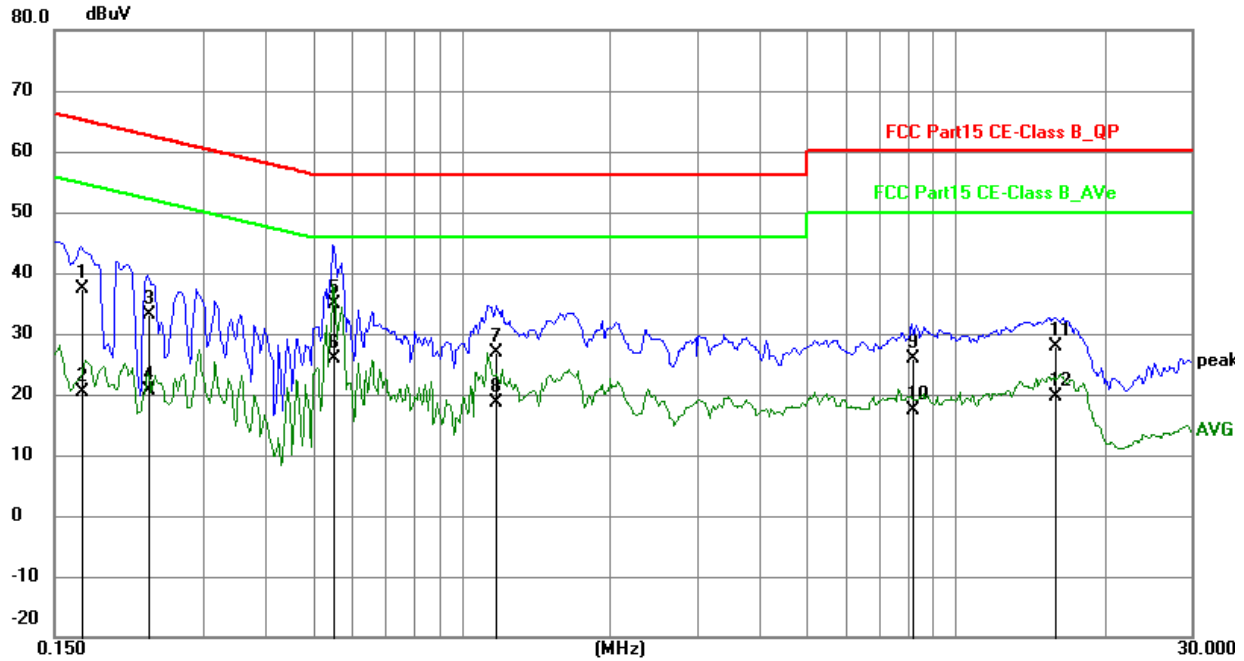
**EUT Operating Environment**

Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Keep WIFI Transmitting**

**Results: Pass**

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1695	27.53	9.77	37.30	64.98	-27.68	QP	P
2	0.1695	10.62	9.77	20.39	54.98	-34.59	AVG	P
3	0.2319	23.40	9.75	33.15	62.38	-29.23	QP	P
4	0.2319	10.94	9.75	20.69	52.38	-31.69	AVG	P
5	0.5517	25.20	9.77	34.97	56.00	-21.03	QP	P
6	0.5517	16.23	9.77	26.00	46.00	-20.00	AVG	P
7	1.1756	17.14	9.79	26.93	56.00	-29.07	QP	P
8	1.1756	8.88	9.79	18.67	46.00	-27.33	AVG	P
9	8.1909	15.73	10.07	25.80	60.00	-34.20	QP	P
10	8.1909	7.42	10.07	17.49	50.00	-32.51	AVG	P
11	15.8310	17.40	10.43	27.83	60.00	-32.17	QP	P
12	15.8310	9.30	10.43	19.73	50.00	-30.27	AVG	P

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**B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)**

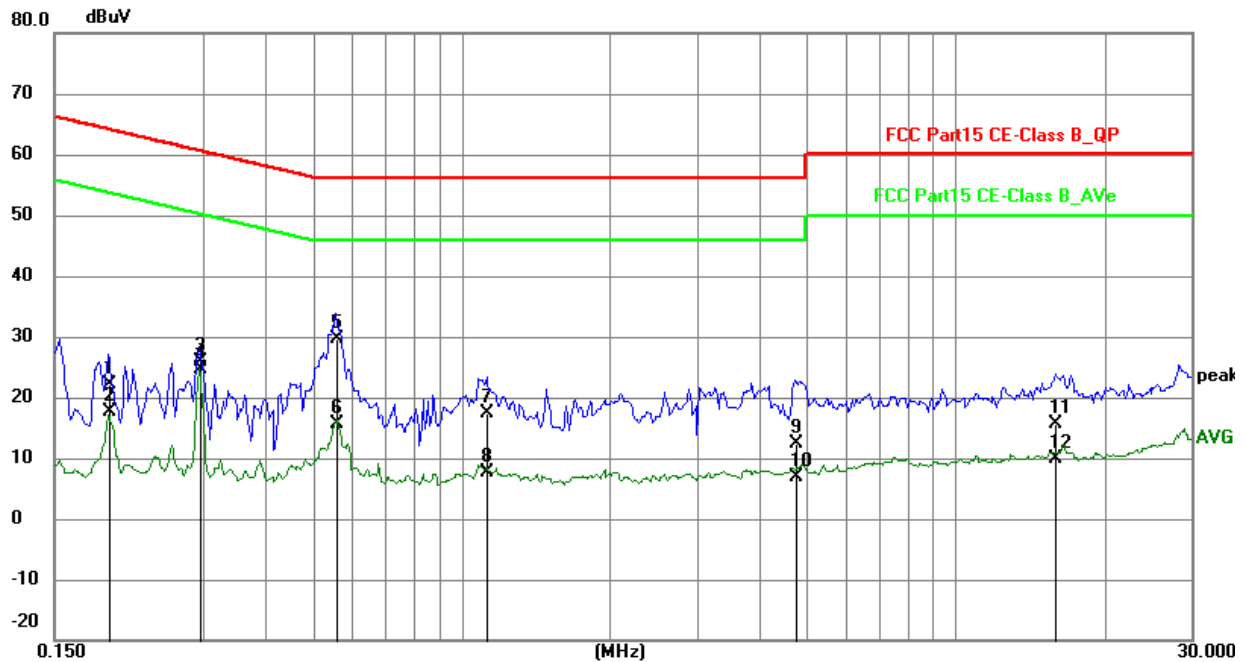
**EUT Operating Environment**

Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Keep WIFI Transmitting**

**Results: Pass**

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1929	12.50	9.75	22.25	63.91	-41.66	QP	P
2	0.1929	7.87	9.75	17.62	53.91	-36.29	AVG	P
3	0.2943	16.13	9.76	25.89	60.40	-34.51	QP	P
4	0.2943	14.97	9.76	24.73	50.40	-25.67	AVG	P
5	0.5556	19.75	9.77	29.52	56.00	-26.48	QP	P
6	0.5556	5.90	9.77	15.67	46.00	-30.33	AVG	P
7	1.1250	7.65	9.79	17.44	56.00	-38.56	QP	P
8	1.1250	-2.19	9.79	7.60	46.00	-38.40	AVG	P
9	4.7355	2.54	9.92	12.46	56.00	-43.54	QP	P
10	4.7355	-3.04	9.92	6.88	46.00	-39.12	AVG	P
11	15.8895	5.22	10.43	15.65	60.00	-44.35	QP	P
12	15.8895	-0.59	10.43	9.84	50.00	-40.16	AVG	P

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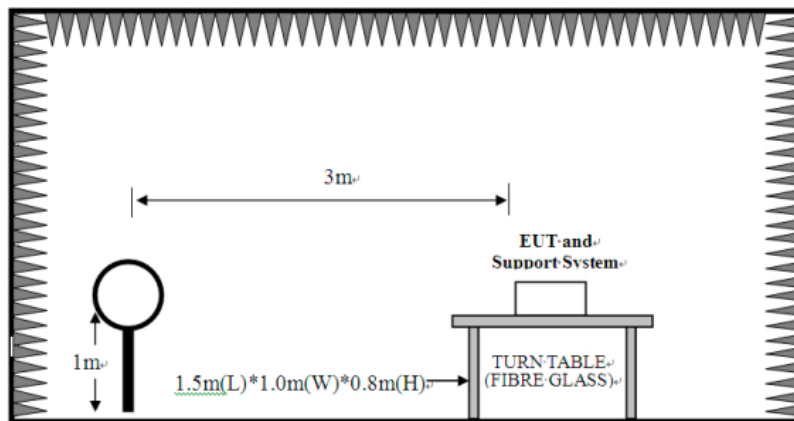
## 6 Radiated Emission Test

### 6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.
- (3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are Quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=1MHz VBW=3MHz and PK detector. AV value with RBW=1MHz, VBW=3MHz and RMS detector. Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a “QP” in the data table.
- (6) The antenna polarization: Vertical polarization and Horizontal polarization.

### Block diagram of Test setup

For radiated emissions from 9kHz to 30MHz



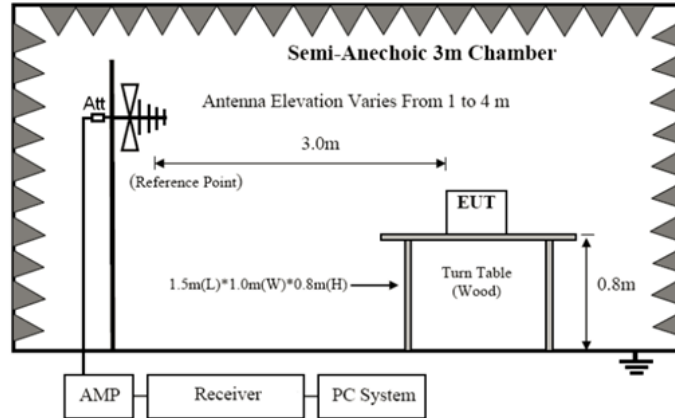
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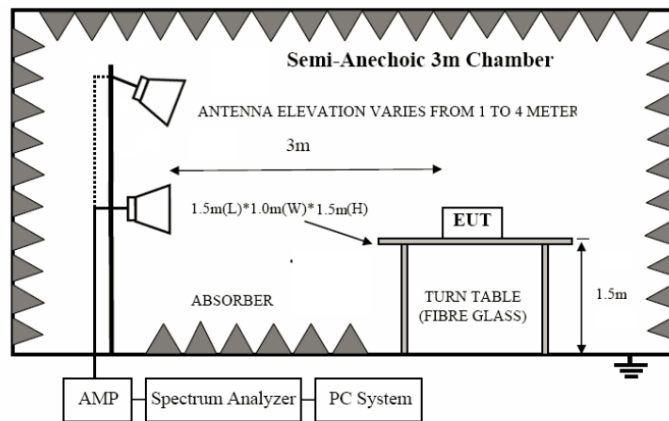
In the event of the improper use of the report. The SHENZHEN TIMEWAY TESTING LABORATORIES, reserves the rights to withdraw it and to adopt any other remedies which may be appropriate.



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



## 6.2 Configuration of The EUT

Same as section 5.3 of this report

## 6.3 EUT Operating Condition

Same as section 5.4 of this report.

## 6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

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**Frequencies in restricted band are compiled to limit on Paragraph 15.209**

Frequency Range (MHz)	Distance (m)	Field strength (dB $\mu$ V/m)
0.009-0.490	3	$20\log(2400/F(\text{kHz})) + 40\log(300/3)$
0.490-1.705	3	$20\log(24000/F(\text{kHz})) + 40\log(30/3)$
1.705-30	3	69.5
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
  2. In the Above Table, the higher limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
  4. **Worse case were recorded in the test report. 802.11b was the worst case.**

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**Test result**

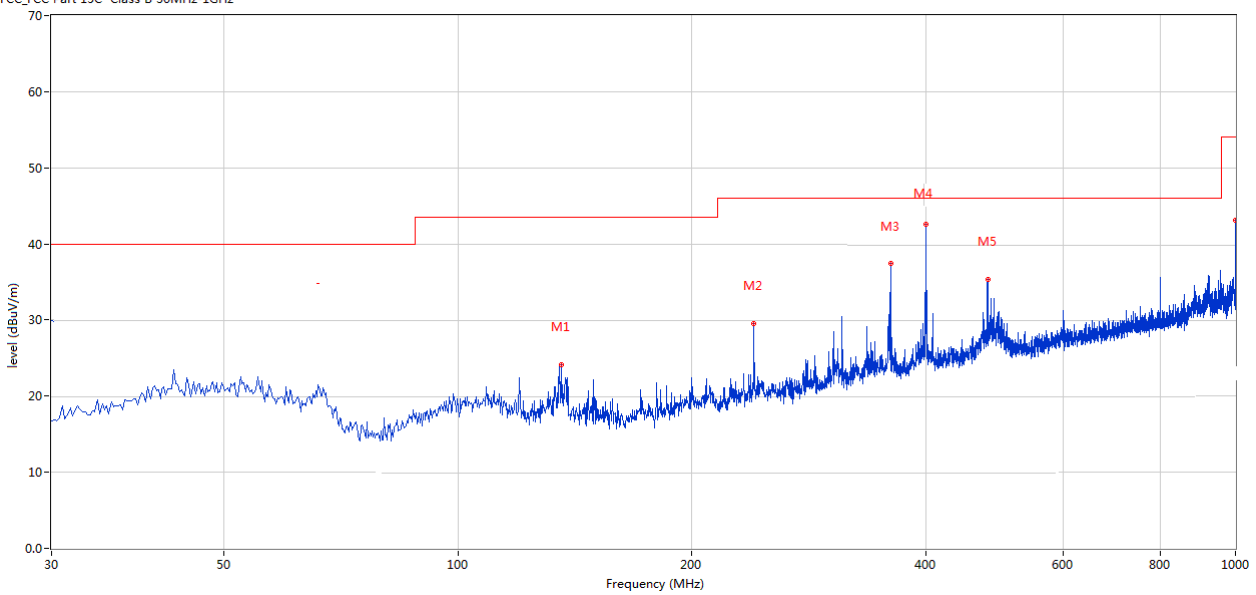
**General Radiated Emission Data and Harmonics Radiated Emission Data**

**Radiated Emission In Horizontal (30MHz----1000MHz)**

EUT set Condition: **Keep Transmitting**

**Results: Pass**

FCC\_FCC Part 15C Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	135.946	24.2	-17.16	43.5	-19.3	QP	320.00	100	Horizontal	Pass
2	239.953	29.66	-12.33	46	-16.34	QP	270.00	100	Horizontal	Pass
3	359.96	37.51	-9.46	46	-8.49	QP	255.00	100	Horizontal	Pass
4	399.963	42.57	-8.57	46	-3.43	QP	255.00	100	Horizontal	Pass
5	479.968	35.5	-7.4	46	-10.5	QP	153.00	100	Horizontal	Pass
6	1000	38.26	-1.24	46	-7.74	QP	248.00	100	Horizontal	Pass

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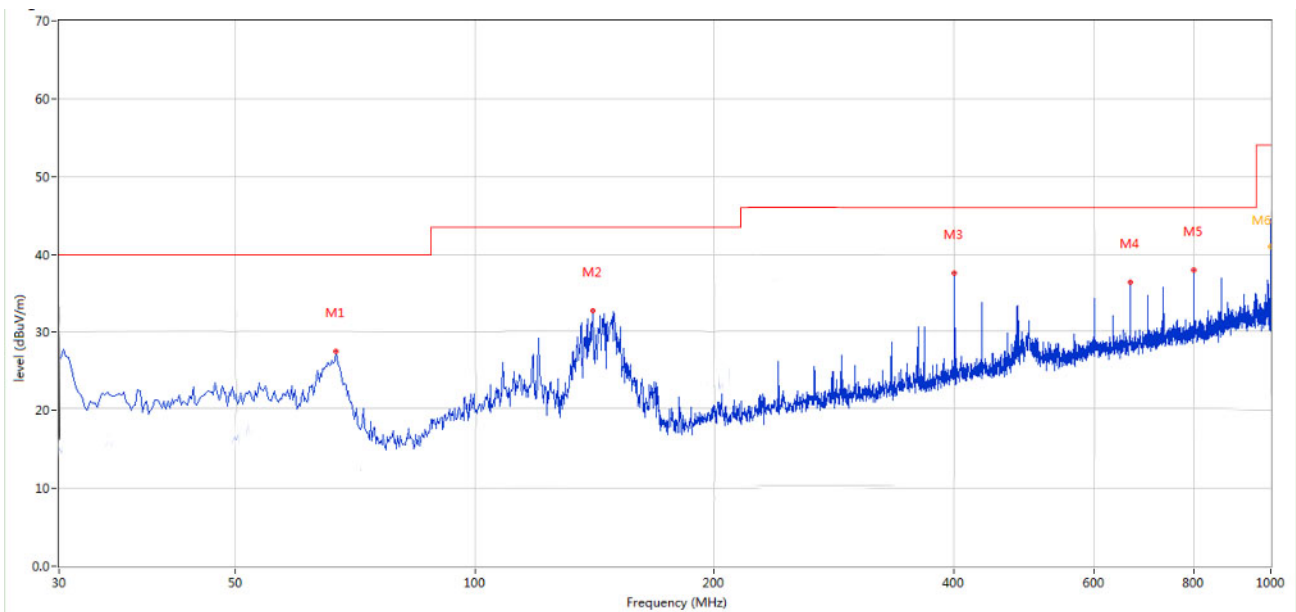
**Test result**

**General Radiated Emission Data and Harmonics Radiated Emission Data**

**Radiated Emission In Vertical (30MHz----1000MHz)**

EUT set Condition: **Keep Transmitting**

**Results: Pass**



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	66.608	27.39	-14.16	40	-12.61	QP	262.00	100	Vertical	Pass
2	140.31	32.67	-17.22	43.5	-10.83	QP	148.00	100	Vertical	Pass
3	399.963	37.57	-8.57	46	-8.43	QP	166.00	100	Vertical	Pass
4	666.646	36.41	-4.5	46	-9.59	QP	5.00	100	Vertical	Pass
5	799.988	38	-2.96	46	-8.00	QP	91.00	100	Vertical	Pass
6*	1000	40.98	-1.24	46	-5.02	QP	241.00	100	Vertical	Pass

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**Operation Mode: Transmitting under CH01 for 802.11b mode**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
4824.00	51.2 (PK) / 40.4 (AV)	H	74(Peak)/ 54(AV)
4824.00	55.3 (PK) / 44.2 (AV)	V	74(Peak)/ 54(AV)
7236.00	--	H/V	74(Peak)/ 54(AV)
9648.00	--	H/V	74(Peak)/ 54(AV)
12060	--	H/V	74(Peak)/ 54(AV)
14472	--	H/V	74(Peak)/ 54(AV)
16884	--	H/V	74(Peak)/ 54(AV)
19296	--	H/V	74(Peak)/ 54(AV)
21708	--	H/V	74(Peak)/ 54(AV)
24120	--	H/V	74(Peak)/ 54(AV)

**Operation Mode: Transmitting under CH06 for 802.11b mode**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
4874.00	48.9 (PK)/ 39.0 (AV)	H	74(Peak)/ 54(AV)
4874.00	55.7 (PK)/ 45.1 (AV)	V	74(Peak)/ 54(AV)
7311.00	--	H/V	74(Peak)/ 54(AV)
9748.00	--	H/V	74(Peak)/ 54(AV)
12185	--	H/V	74(Peak)/ 54(AV)
14622	--	H/V	74(Peak)/ 54(AV)
17059	--	H/V	74(Peak)/ 54(AV)
19496	--	H/V	74(Peak)/ 54(AV)
21933	--	H/V	74(Peak)/ 54(AV)
24370	--	H/V	74(Peak)/ 54(AV)

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**Operation Mode: Transmitting under CH11 for 802.11b mode**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
4924	48.6 (PK)/ 37.2 (AV)	H	74(Peak)/ 54(AV)
4924	53.9 (PK)/ 42.1 (AV)	V	74(Peak)/ 54(AV)
7368	--	H/V	74(Peak)/ 54(AV)
9848	--	H/V	74(Peak)/ 54(AV)
12310	--	H/V	74(Peak)/ 54(AV)
14772	--	H/V	74(Peak)/ 54(AV)
17234	--	H/V	74(Peak)/ 54(AV)
19696	--	H/V	74(Peak)/ 54(AV)
22158	--	H/V	74(Peak)/ 54(AV)
24620	--	H/V	74(Peak)/ 54(AV)

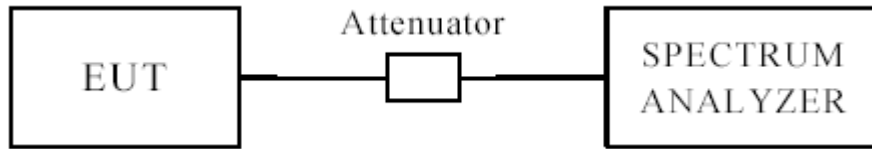
- Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit  
 2. Remark “---” means that the emissions level is too low to be measured  
 3. For 802.11b mode at 1Mbps  
 4. For radiated Emissions from 18-25GHz and below 30MHz, it is only the floor noise and less than the limit for more than 20dB. No necessary to take down.  
 5. Note: the final peak measurement results less than the AV limit. No necessary to take down the final AV measurement result

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## 7.0 6dB Bandwidth Measurement

### 7.1 Test Setup



### 7.2 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is >500 kHz

### 7.3 Test Procedure

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

### 7.4 Test Result

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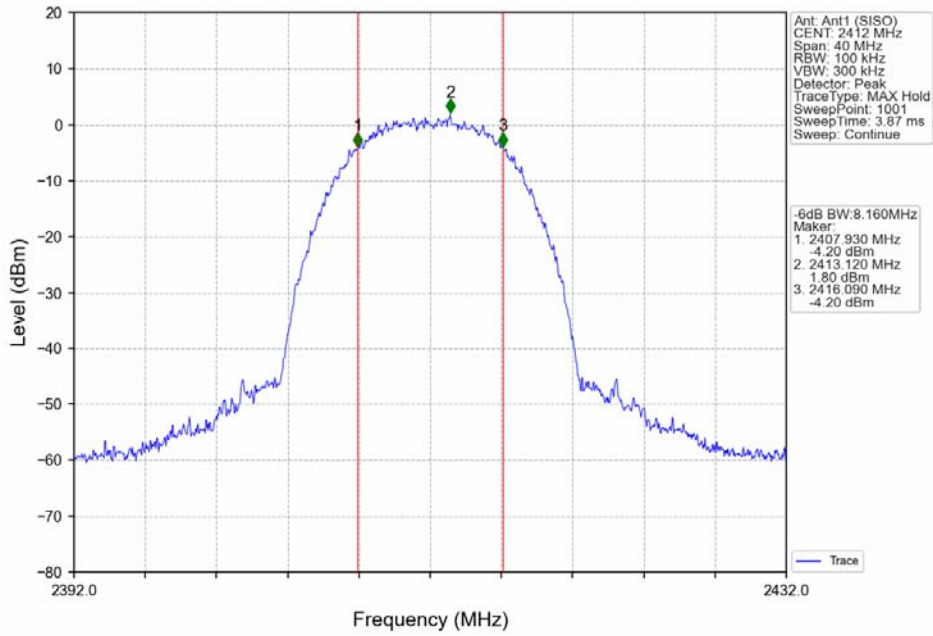
**6dB Occupied Bandwidth**

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
802.11b	SISO	2412	1	8.160	>=0.5	Pass
		2437	1	8.380	>=0.5	Pass
		2462	1	8.605	>=0.5	Pass
802.11g	SISO	2412	1	15.200	>=0.5	Pass
		2437	1	15.209	>=0.5	Pass
		2462	1	15.187	>=0.5	Pass
802.11n (HT20)	SISO	2412	1	15.190	>=0.5	Pass
		2437	1	16.366	>=0.5	Pass
		2462	1	15.176	>=0.5	Pass
802.11n (HT40)	SISO	2422	1	36.031	>=0.5	Pass
		2437	1	35.757	>=0.5	Pass
		2452	1	35.564	>=0.5	Pass

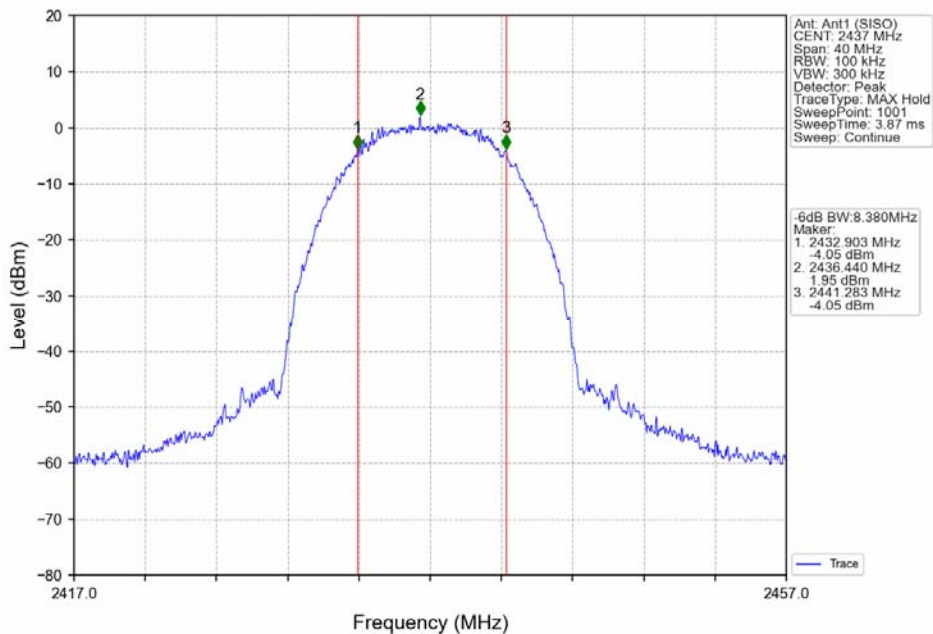
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802.11b\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



802.11b\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

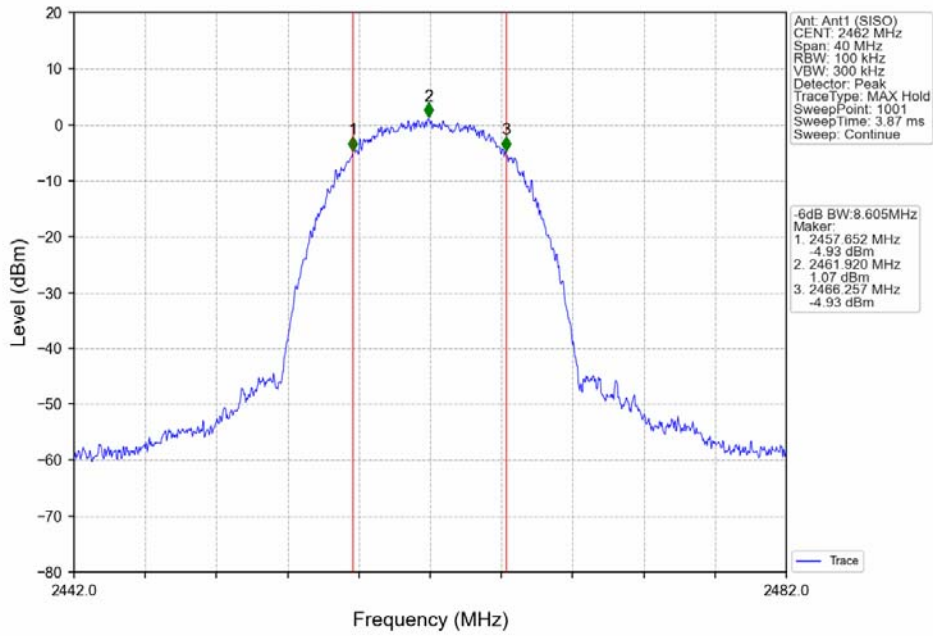


The report refers only to the sample tested and does not apply to the bulk.

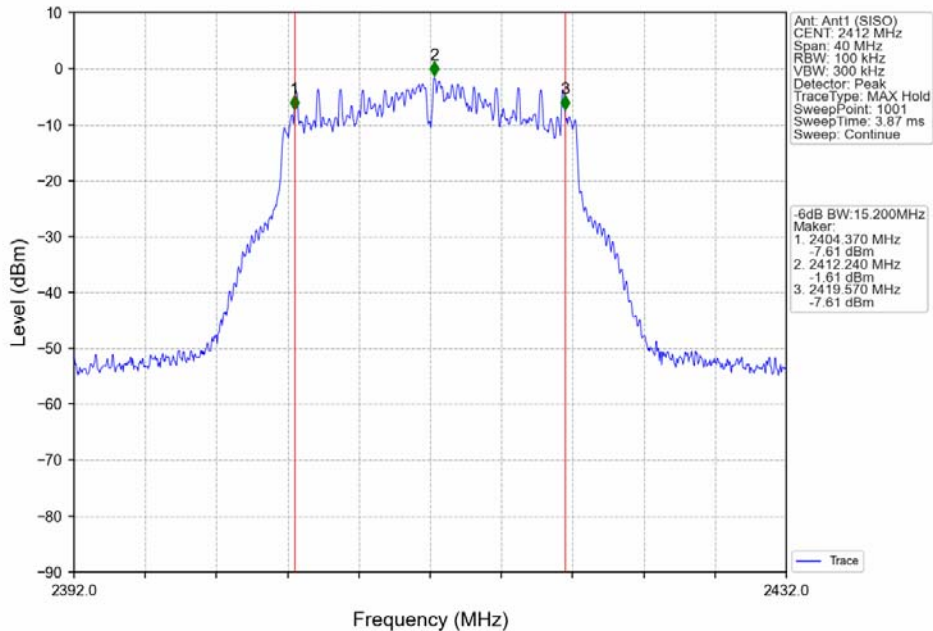
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802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

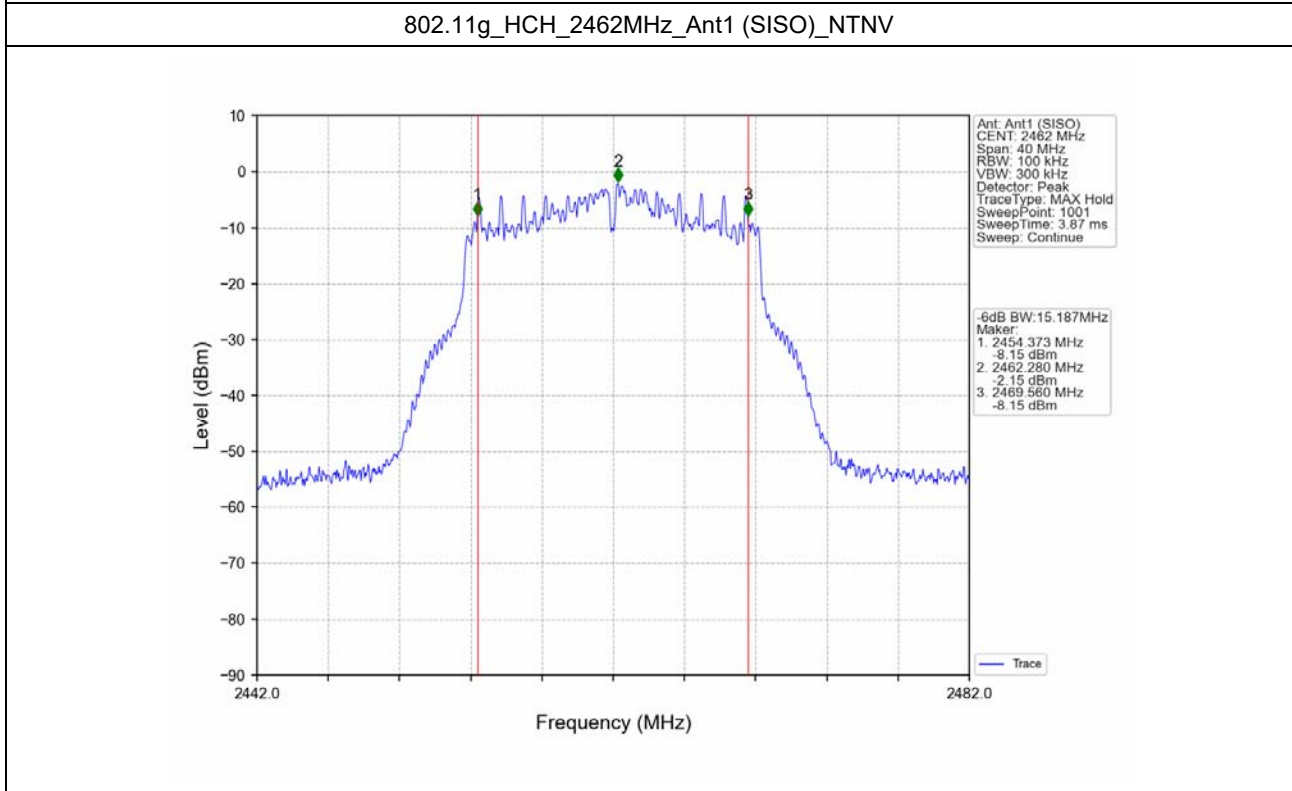
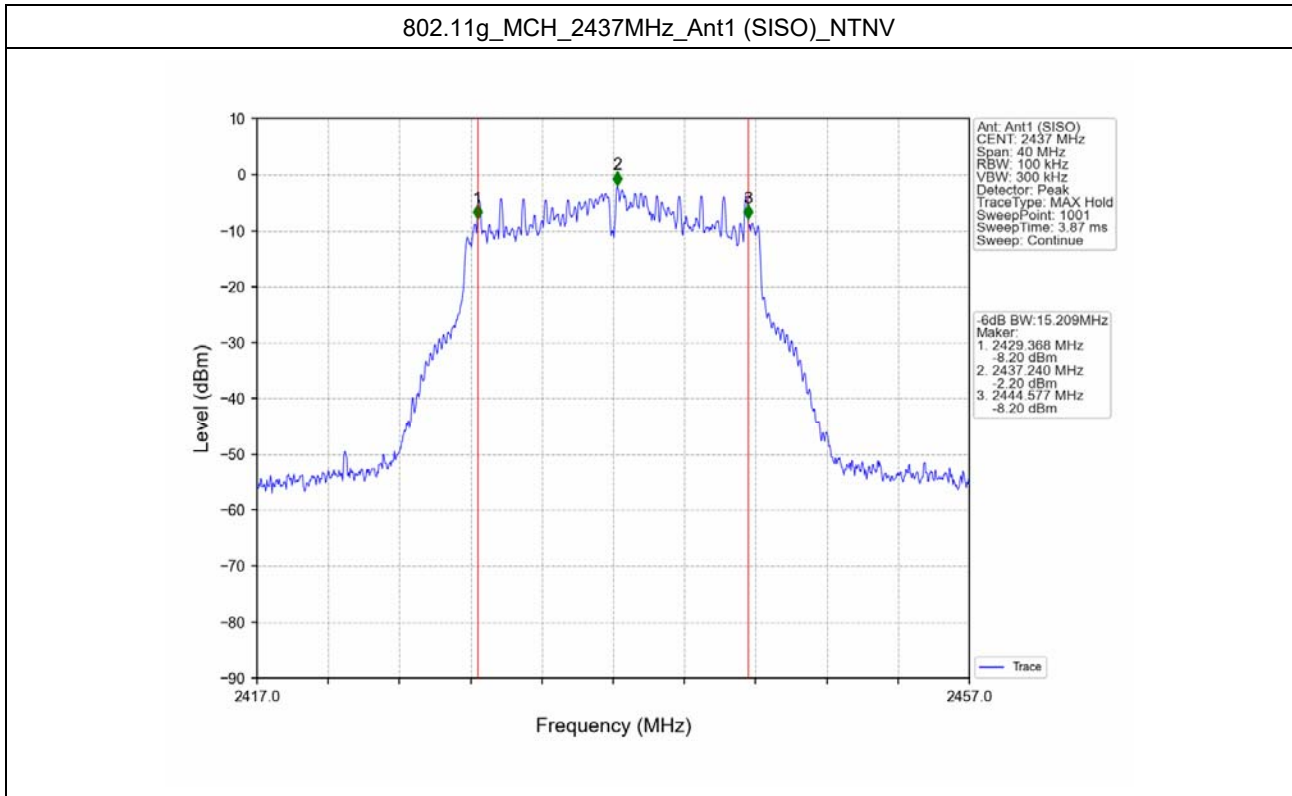


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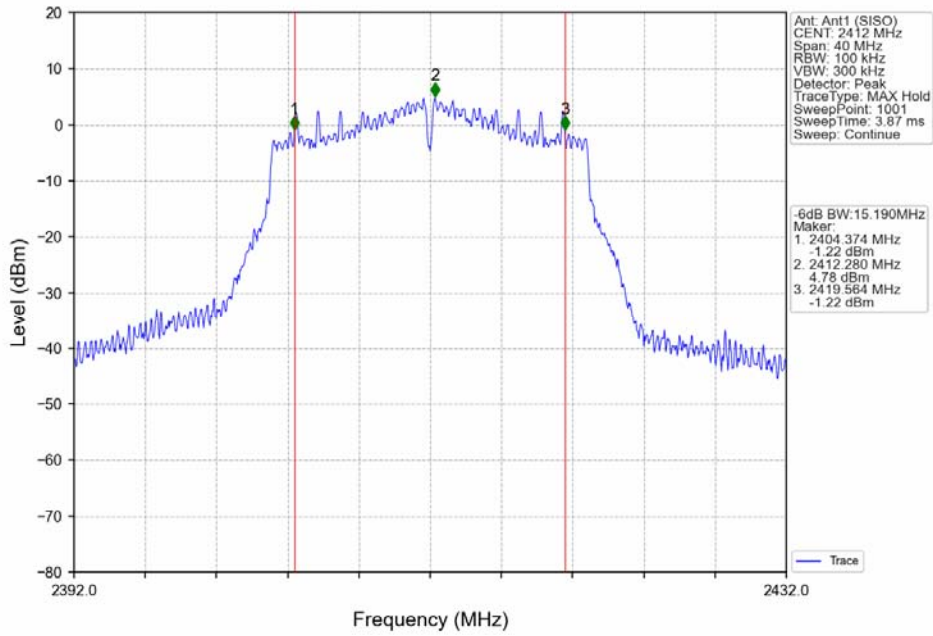


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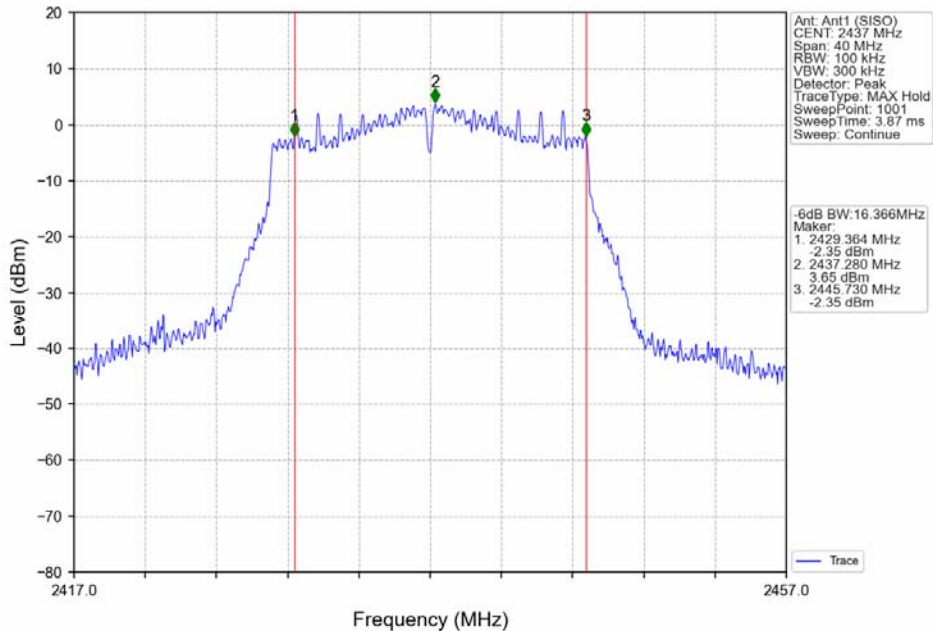




802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



802.11n(HT20)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



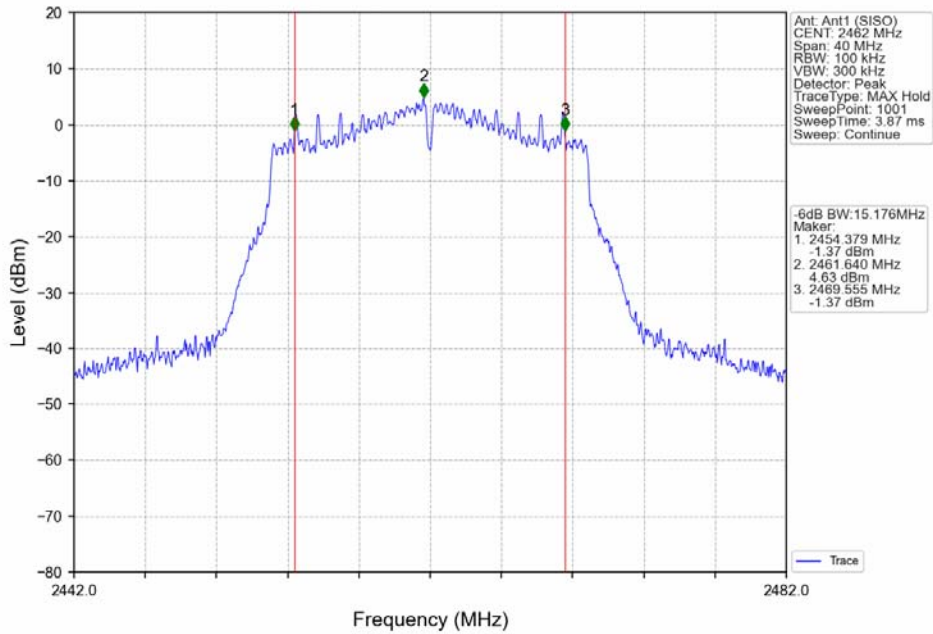
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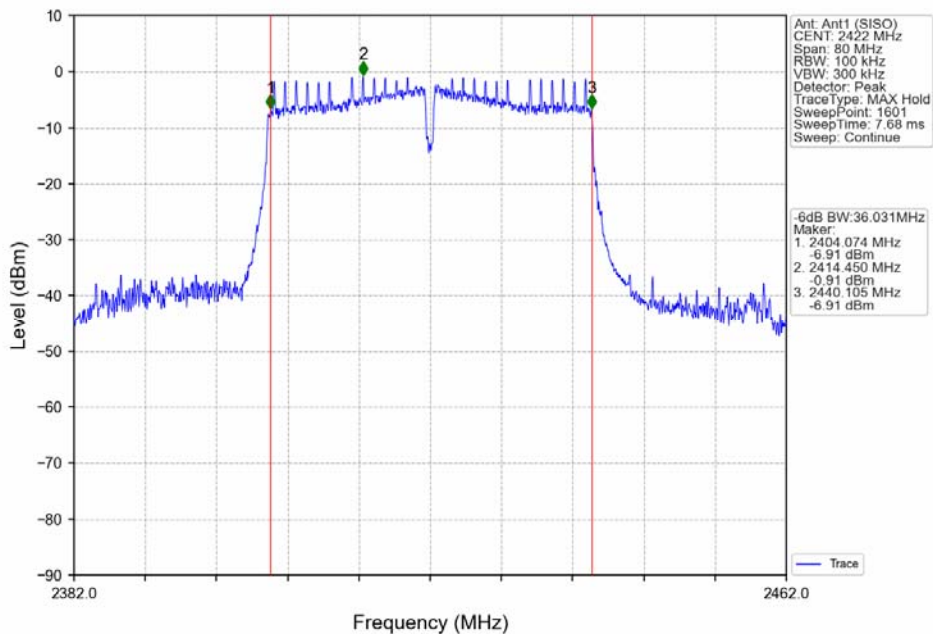
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802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

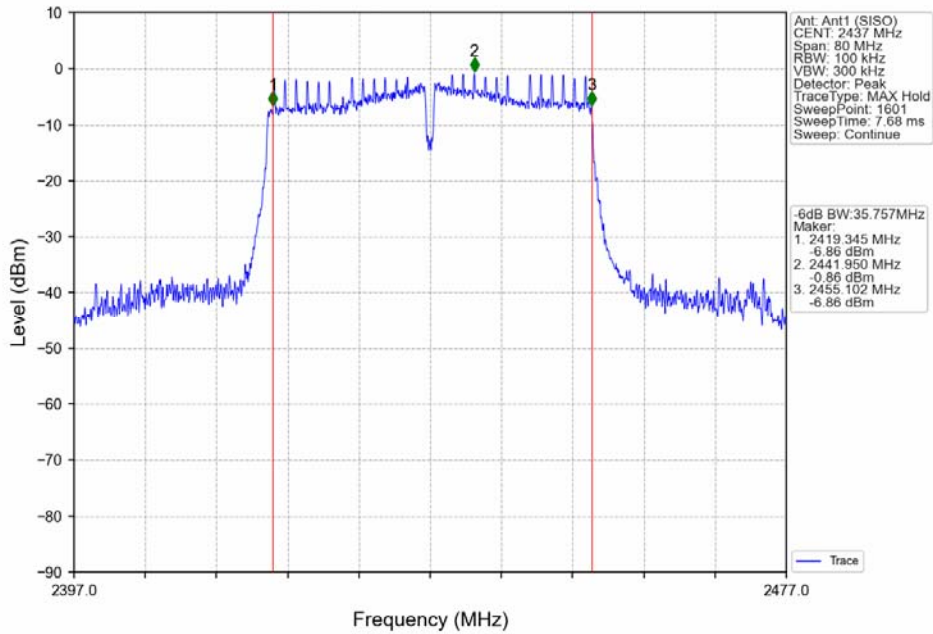


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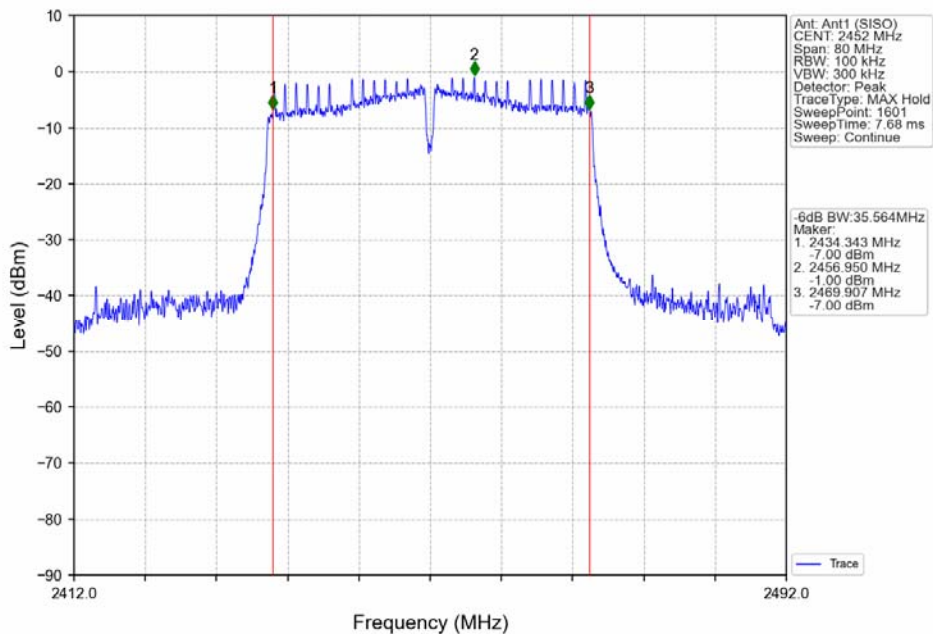
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802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV



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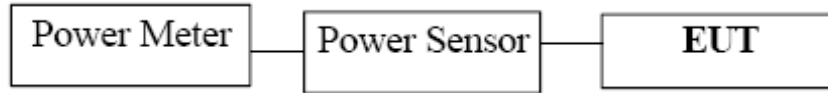
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## 8. Maximum Output Power

### 8.1 Test Setup



### 8.2 Limits of Maximum Output Power

The Maximum Output Power Measurement is 30dBm.

### 8.3 Test Procedure

The RF power output was measured with a Power meter connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate centre frequency.

Note: The Peak Power was measured

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**8.4 Test Results**

Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
802.11b	SISO	2412	16.66	<=30	Pass
		2437	16.35	<=30	Pass
		2462	16.58	<=30	Pass
802.11g	SISO	2412	16.07	<=30	Pass
		2437	16.08	<=30	Pass
		2462	16.64	<=30	Pass
802.11n (HT20)	SISO	2412	15.44	<=30	Pass
		2437	15.37	<=30	Pass
		2462	15.21	<=30	Pass
802.11n (HT40)	SISO	2422	16.14	<=30	Pass
		2437	15.89	<=30	Pass
		2452	15.95	<=30	Pass

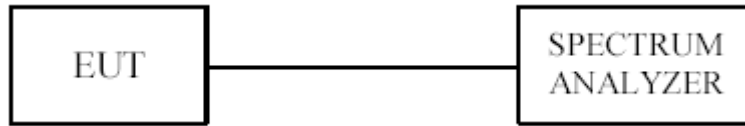
Note1: Antenna Gain: Ant1: 2.00dBi;

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## 9. Power Spectral Density Measurement

### 9.1 Test Setup



### 9.2 Limits of Power Spectral Density Measurement

The Maximum Power Spectral Density Measurement is 8dBm/3kHz.

### 9.3 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 = 3 kHz.
3. Set the VBW  $\geq$  10 kHz.
4. Set the span to 1.5 times the DTS channel 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.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be  $\leq$  8 dBm/3kHz.

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**9.4 Test Result**

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
802.11b	SISO	2412	-13.86	<=8	Pass
		2437	-12.93	<=8	Pass
		2462	-13.96	<=8	Pass
802.11g	SISO	2412	-17.21	<=8	Pass
		2437	-17.34	<=8	Pass
		2462	-16.85	<=8	Pass
802.11n (HT20)	SISO	2412	-16.99	<=8	Pass
		2437	-16.23	<=8	Pass
		2462	-16.76	<=8	Pass
802.11n (HT40)	SISO	2422	-19.46	<=8	Pass
		2437	-18.36	<=8	Pass
		2452	-19.63	<=8	Pass

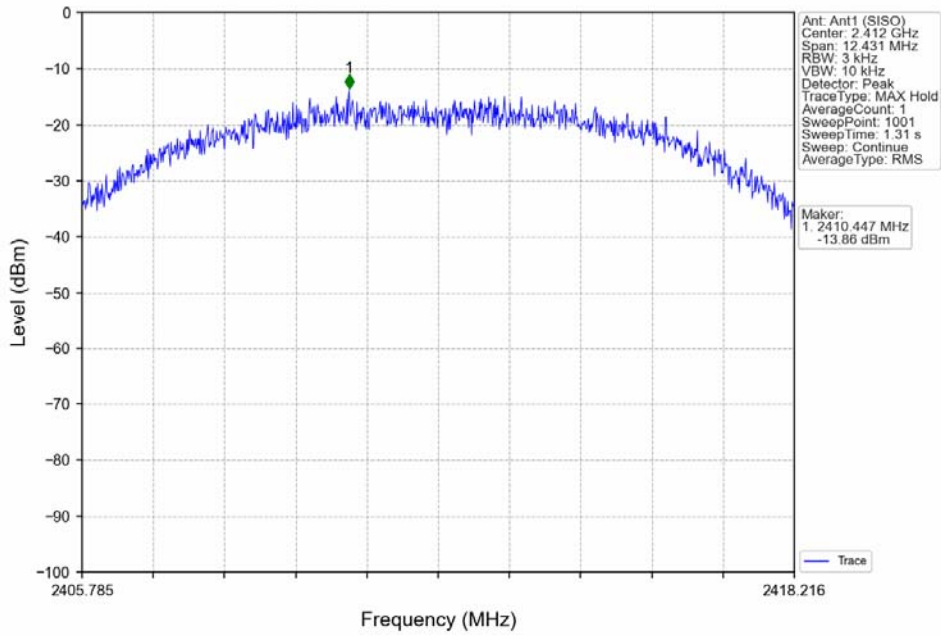
Note1: Antenna Gain: Ant1: 2.00dBi;

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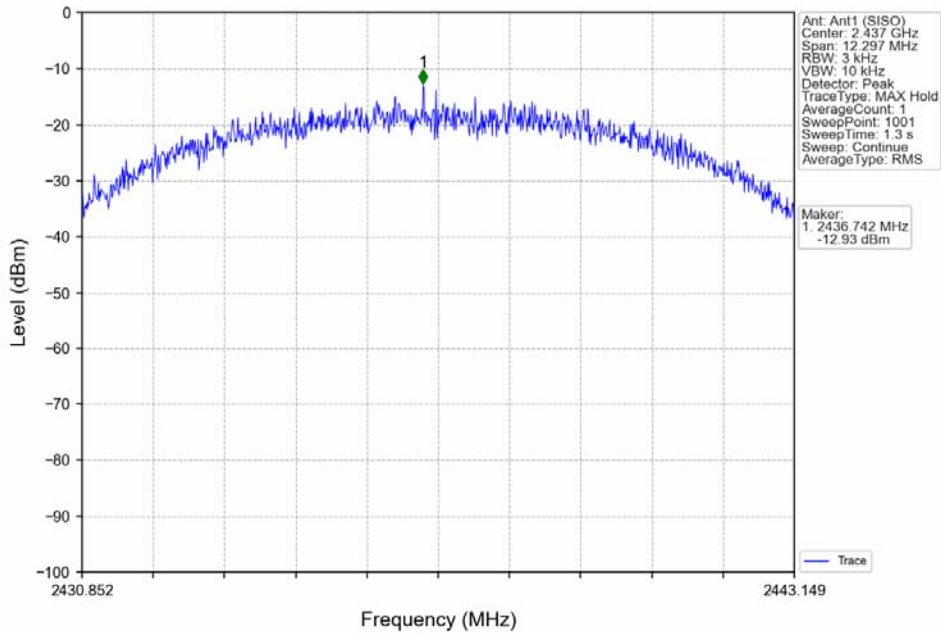




802.11b\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



802.11b\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



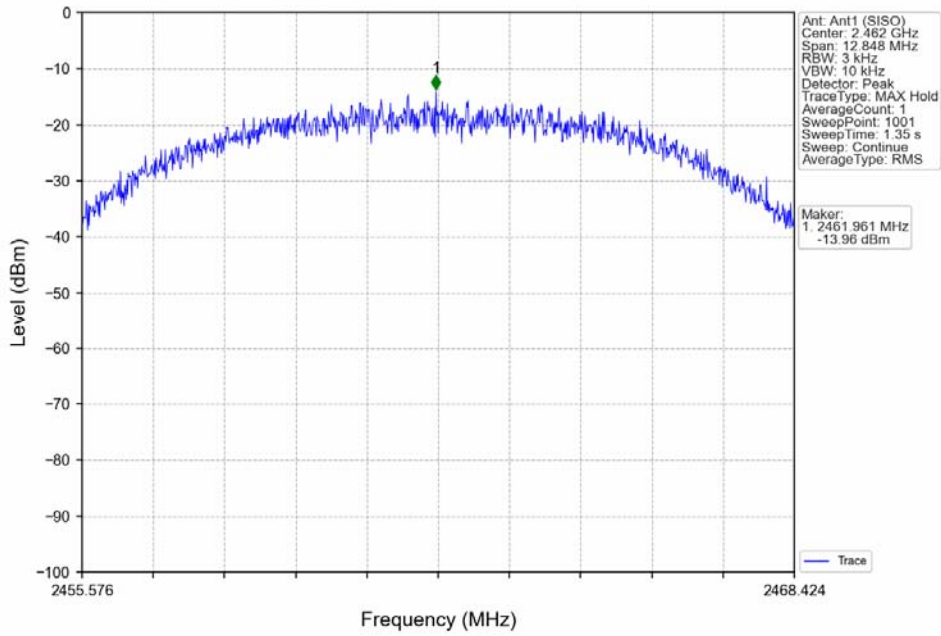
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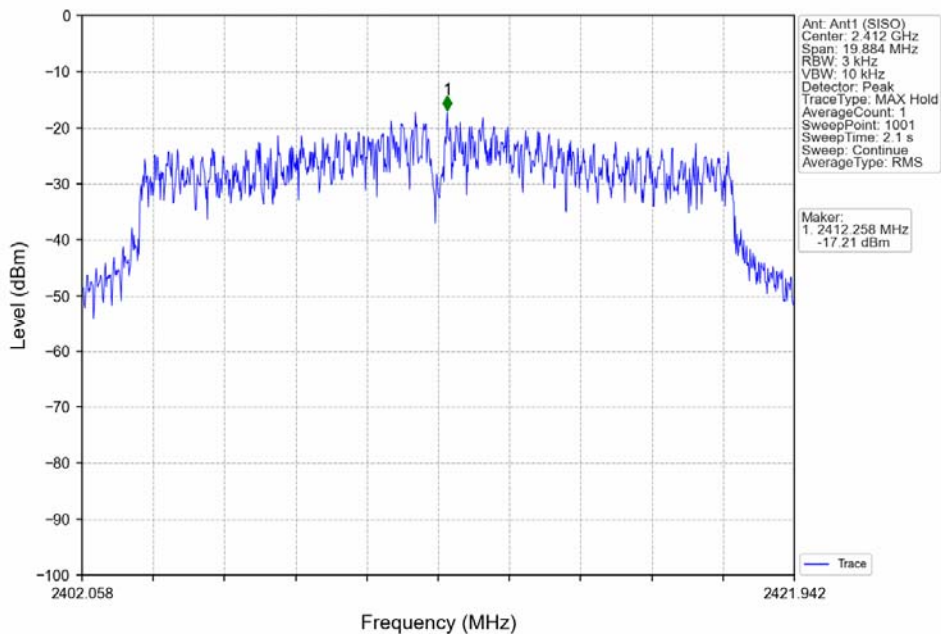




802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



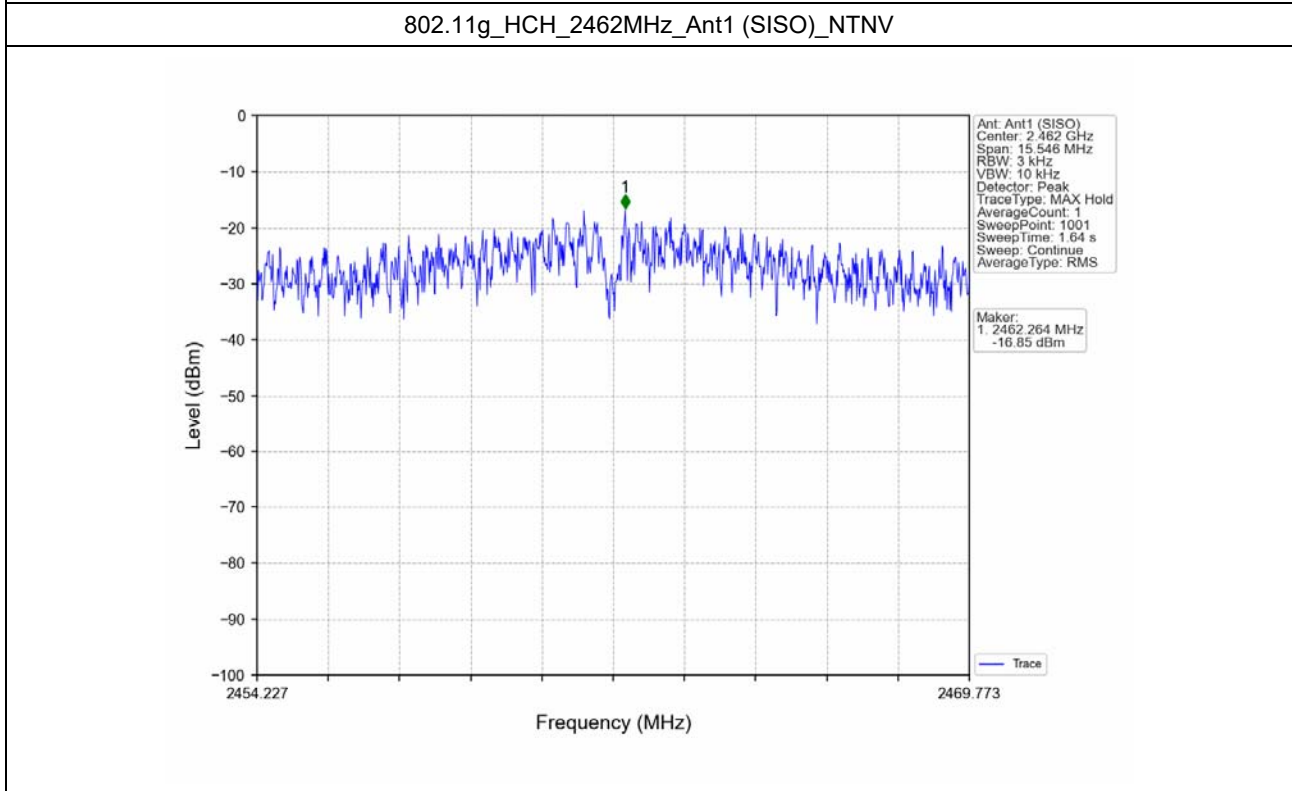
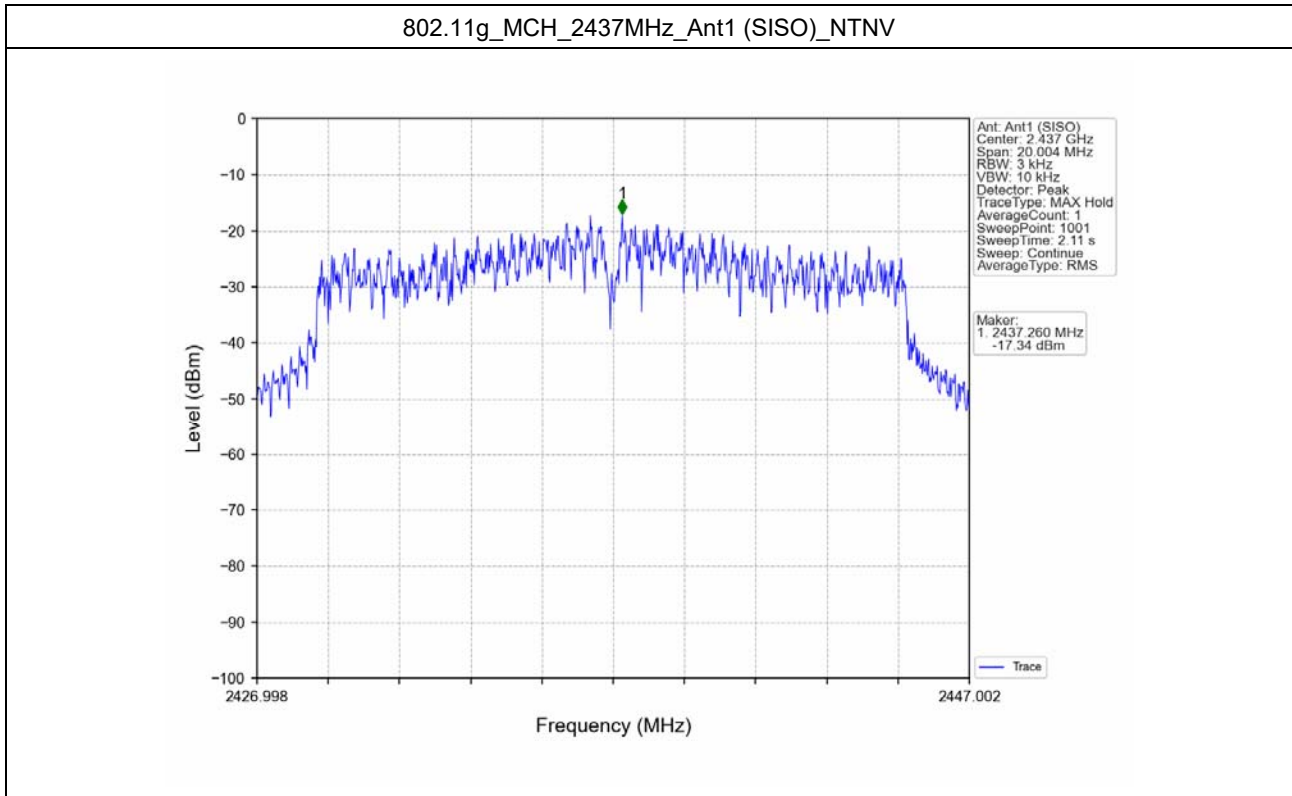
802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



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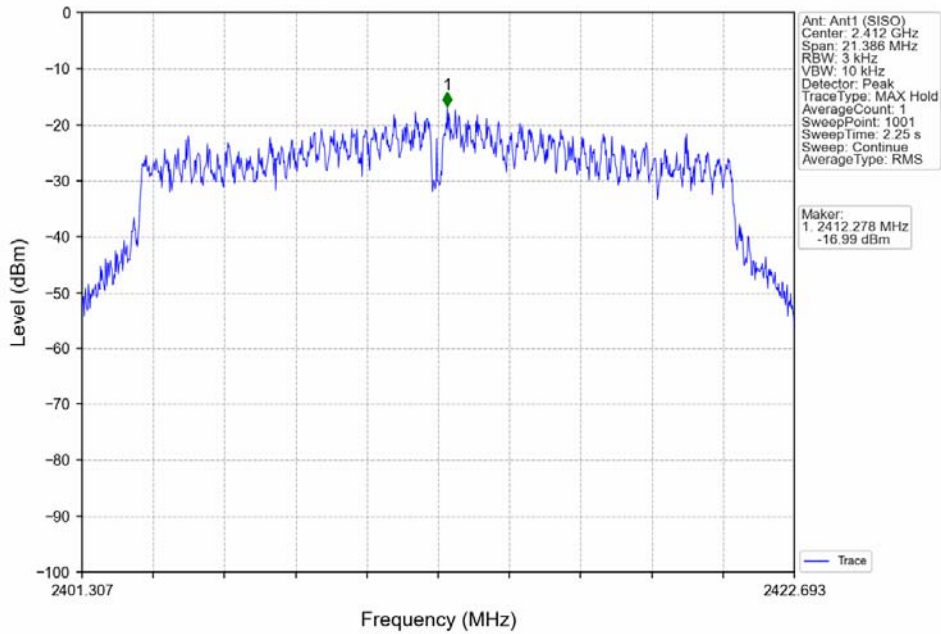
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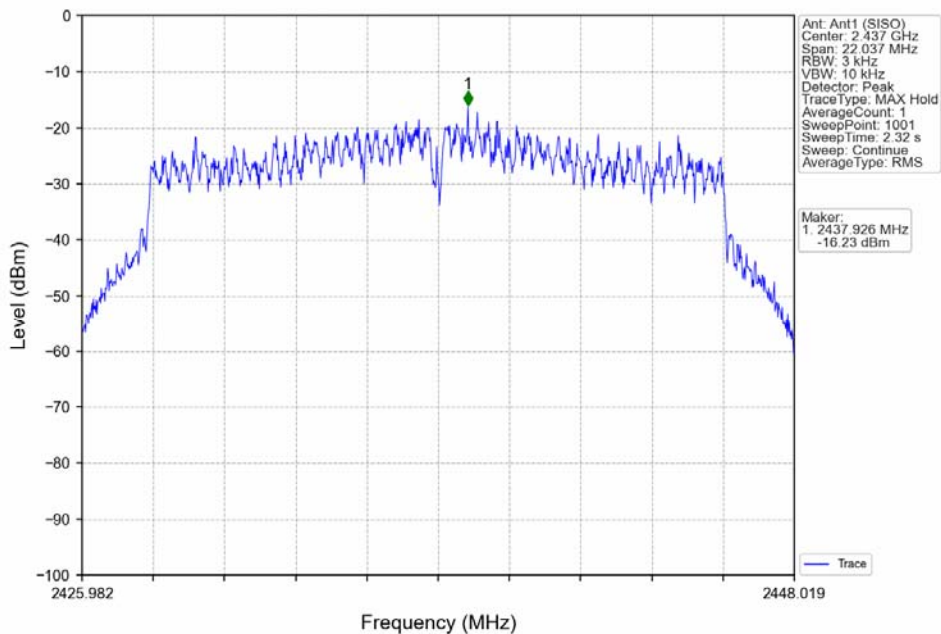
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802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



802.11n(HT20)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



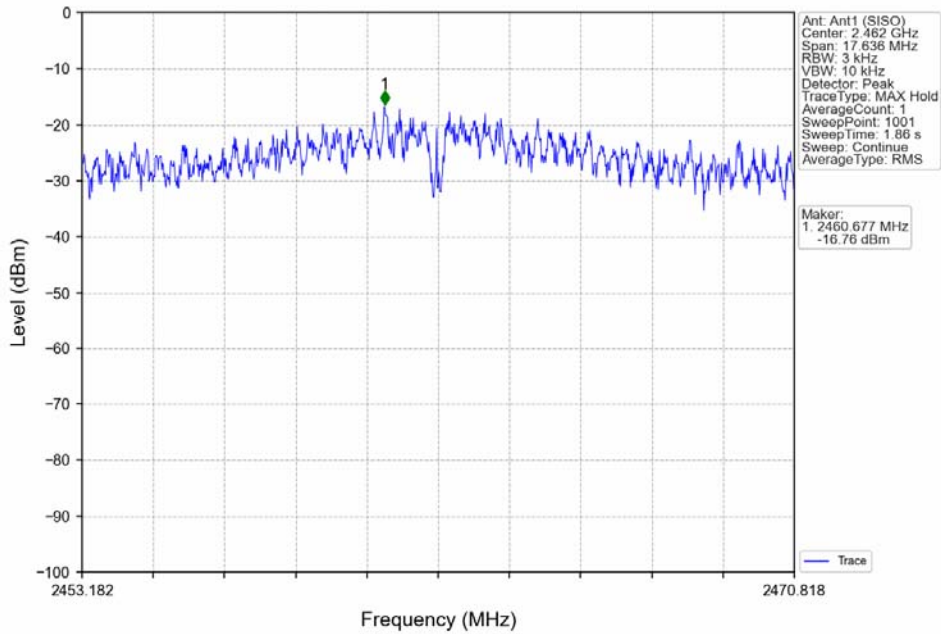
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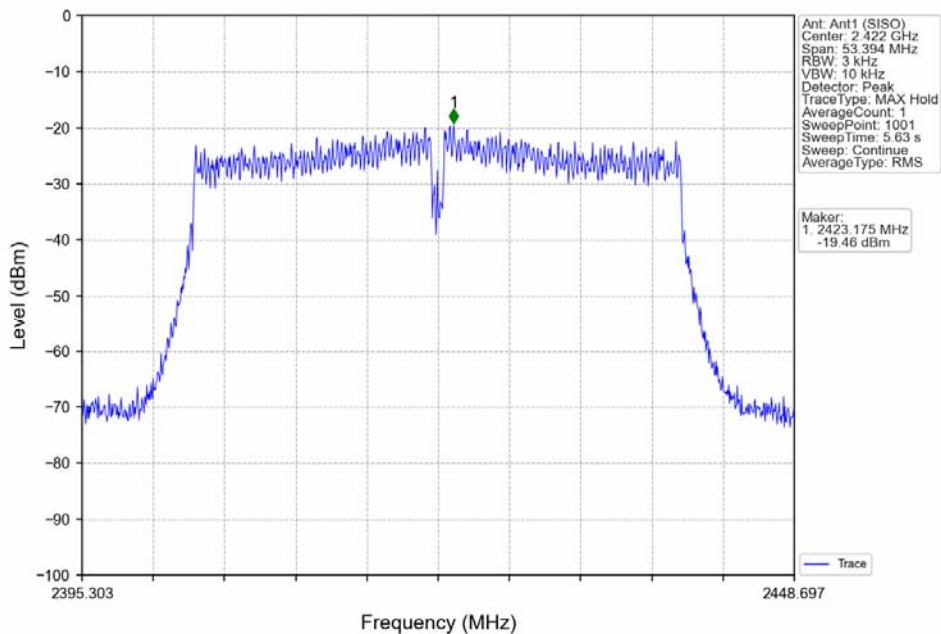
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802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

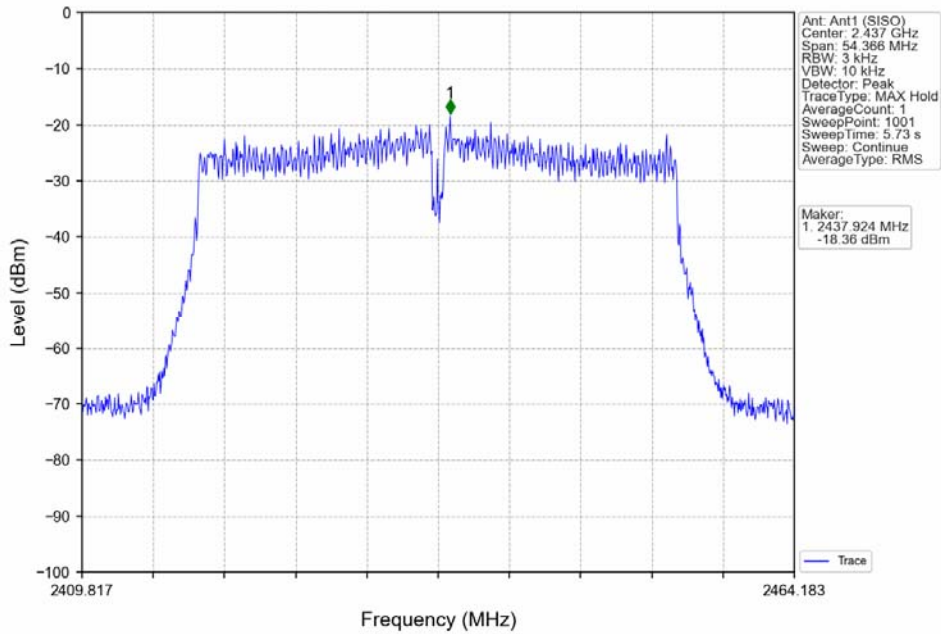


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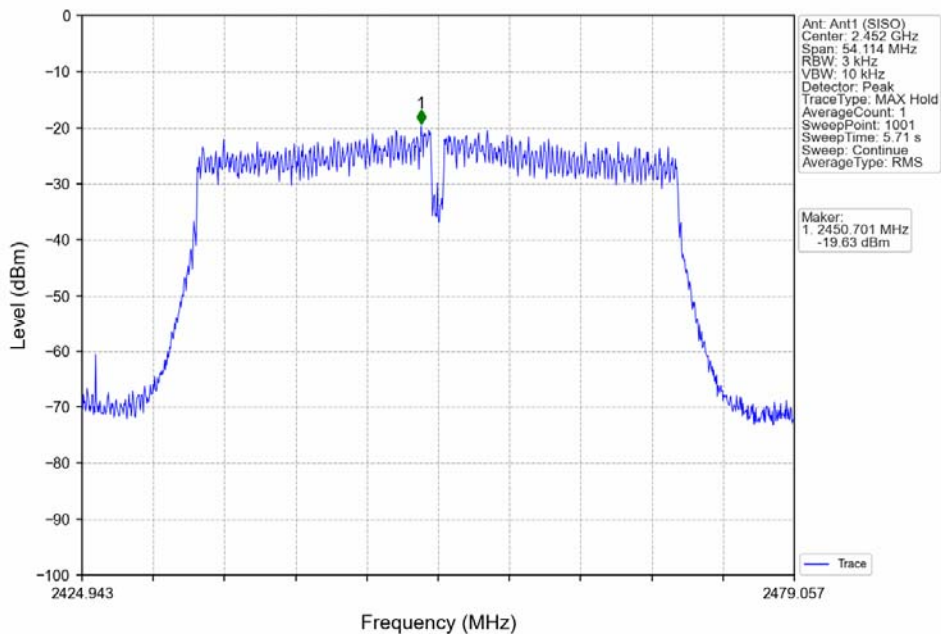
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802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV



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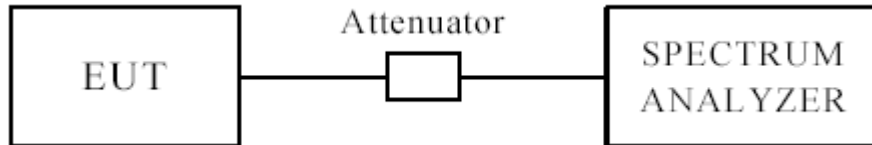
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## 10 Out of Band Measurement

### 10.1 Test Setup for band edge



The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup

### 10.2 Limits of Out of Band Emissions Measurement

1. Below  $-20\text{dB}$  of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

### 10.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of radiated emission test. (Peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector)

For bandage test, the spectrum set as follows: RBW=100, VBW=300 kHz. A conducted measurement used

### 10.4 Test Result

Please see next pages

Note: For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

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**Test Result**

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
802.11b	SISO	2412	1	1.17	-18.83	Pass
		2437	1	1.17	-18.83	Pass
		2462	1	1.17	-18.83	Pass
802.11g	SISO	2412	1	-1.72	-21.72	Pass
		2437	1	-1.72	-21.72	Pass
		2462	1	-1.72	-21.72	Pass
802.11n (HT20)	SISO	2412	1	-1.90	-21.90	Pass
		2437	1	-1.90	-21.90	Pass
		2462	1	-1.90	-21.90	Pass
802.11n (HT40)	SISO	2422	1	-5.74	-25.74	Pass
		2437	1	-5.74	-25.74	Pass
		2452	1	-5.74	-25.74	Pass

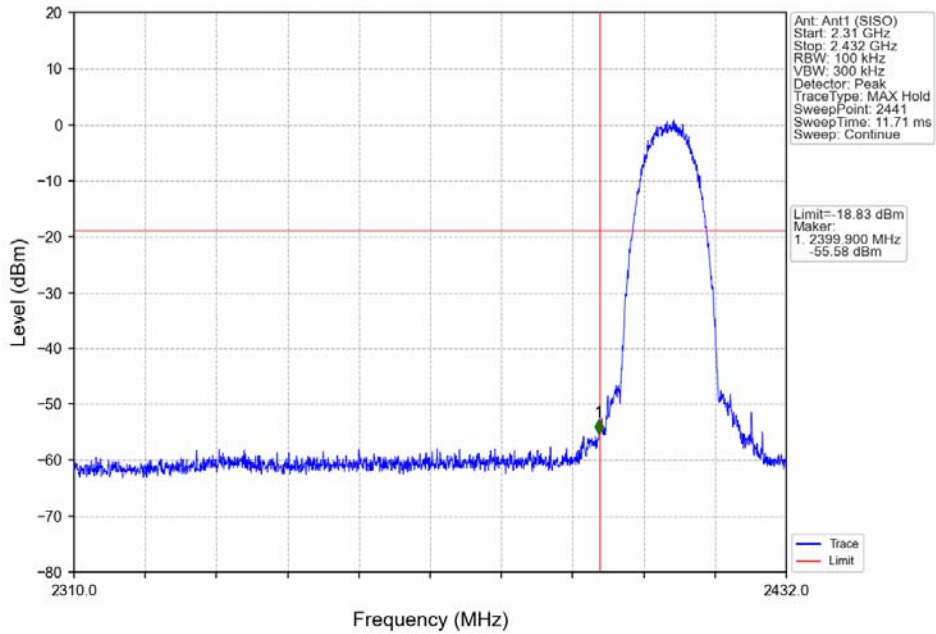
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

Note2: RBW = 1MHz was used during the pre-test. The final test will be performed at RBW=100kHz while the margin is less than 3dB.

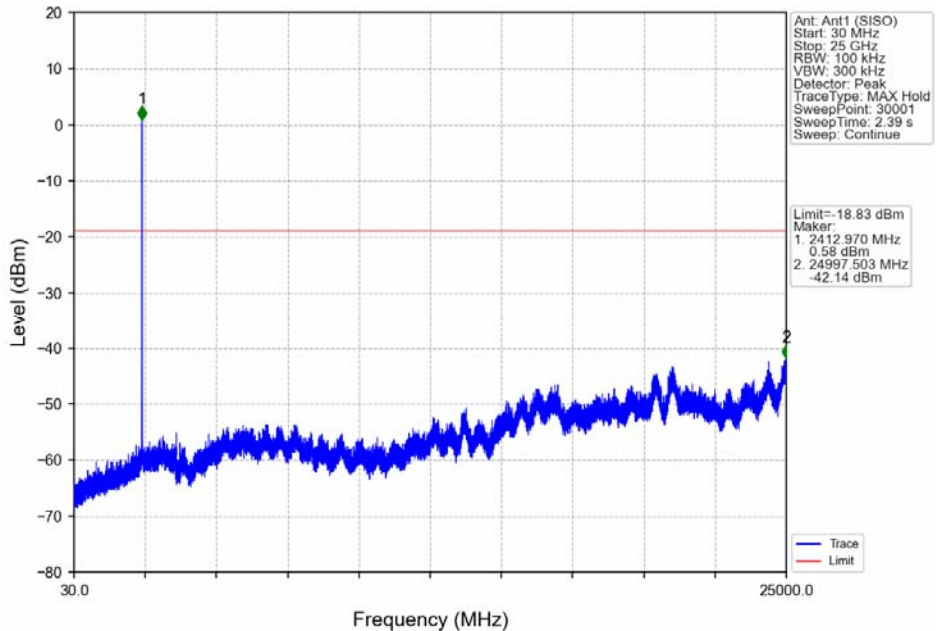
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802.11b\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



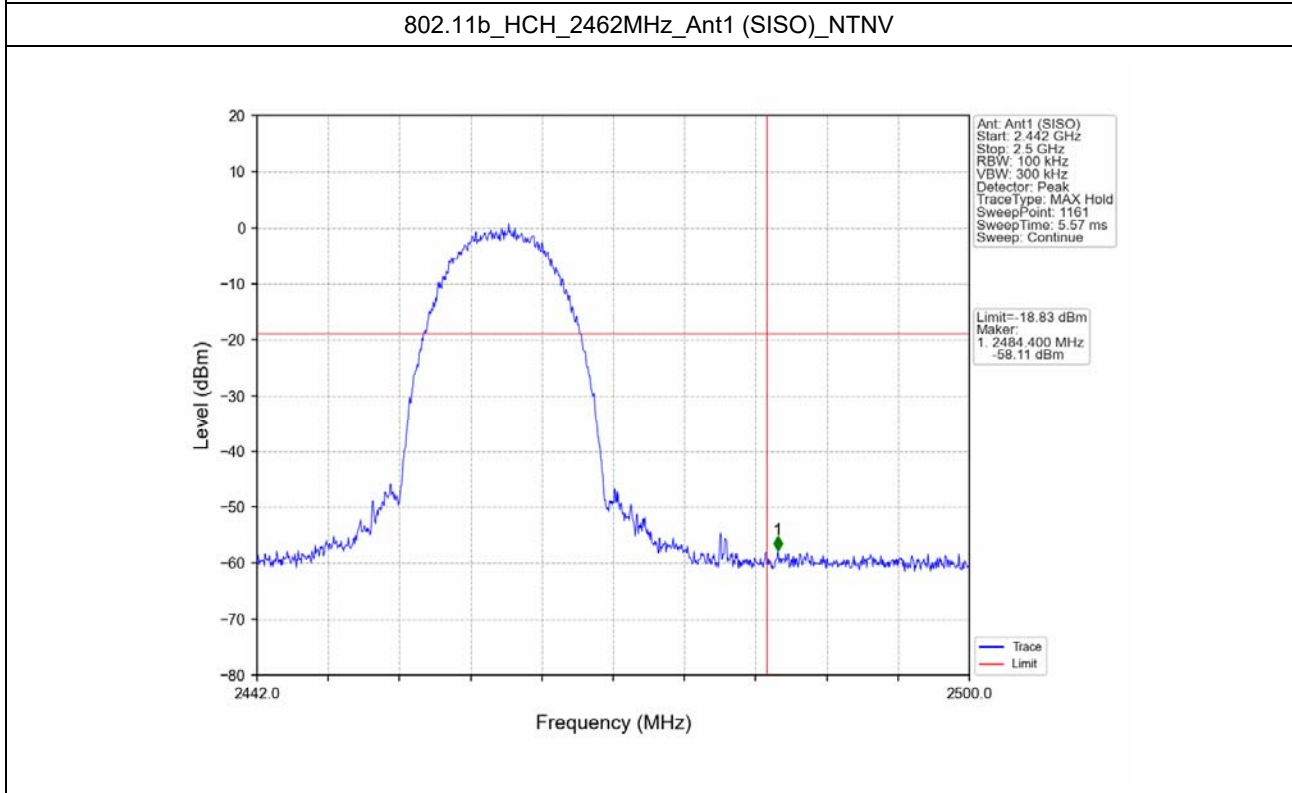
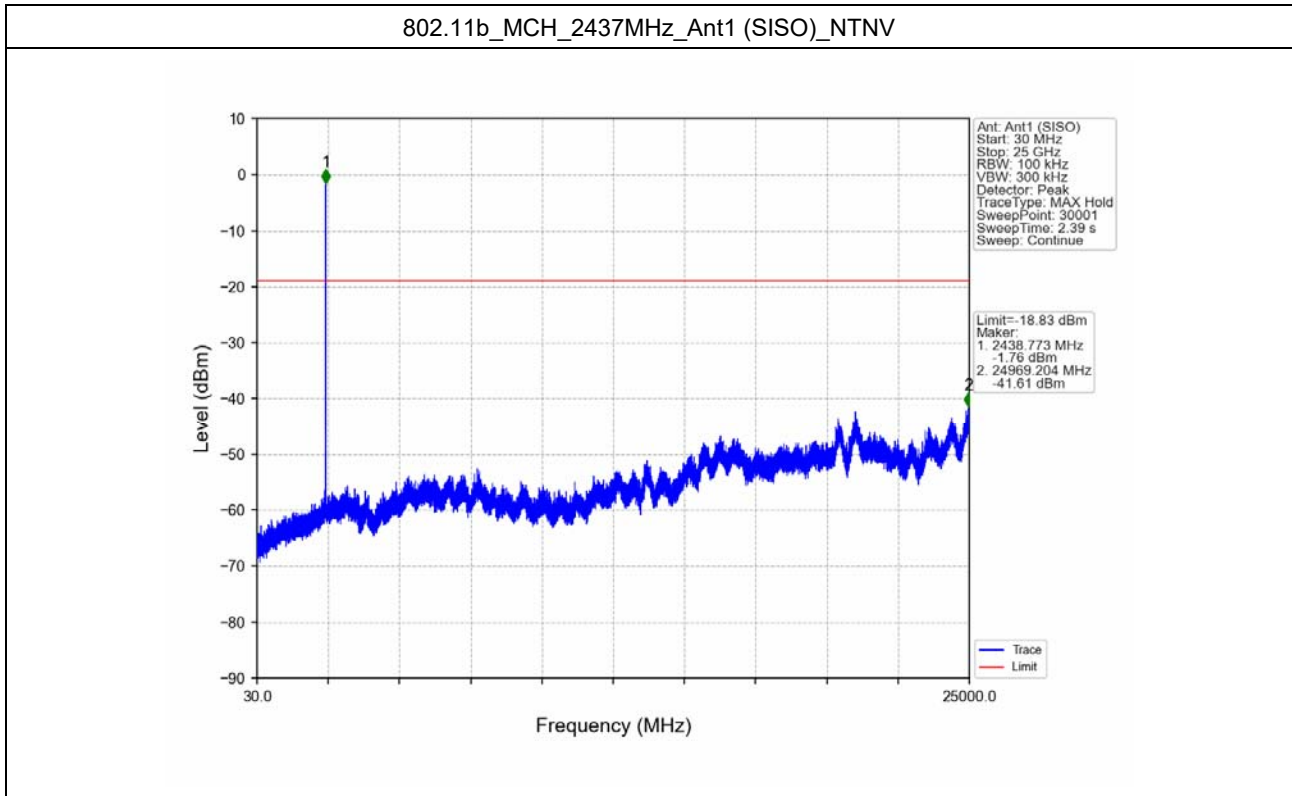
802.11b\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



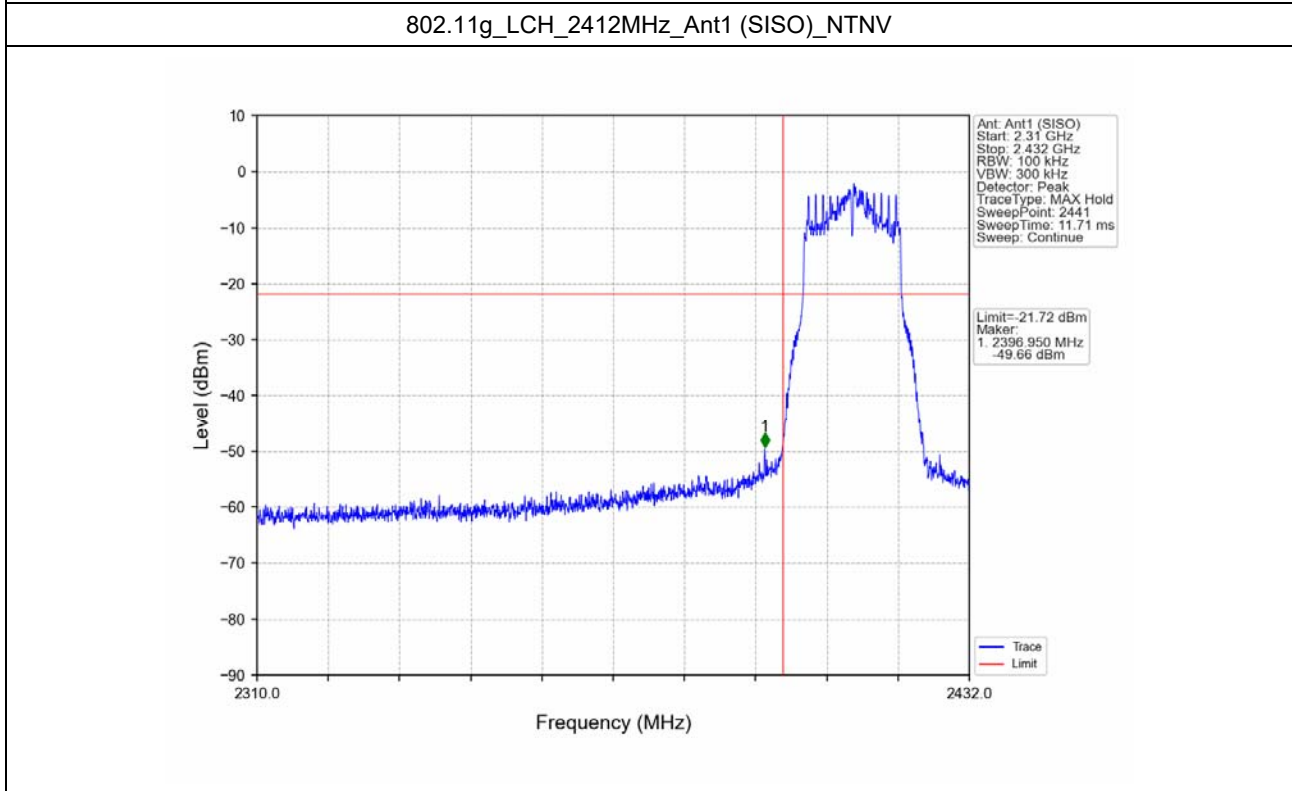
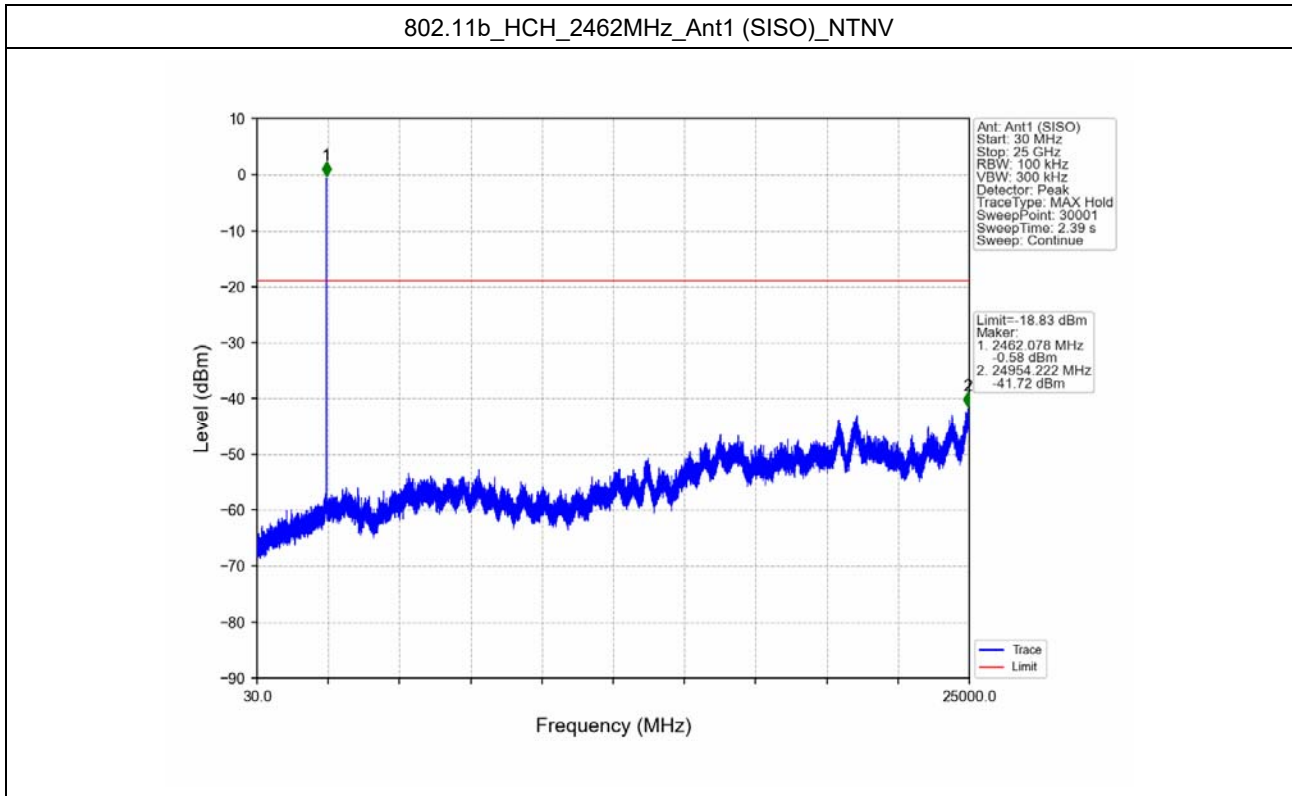
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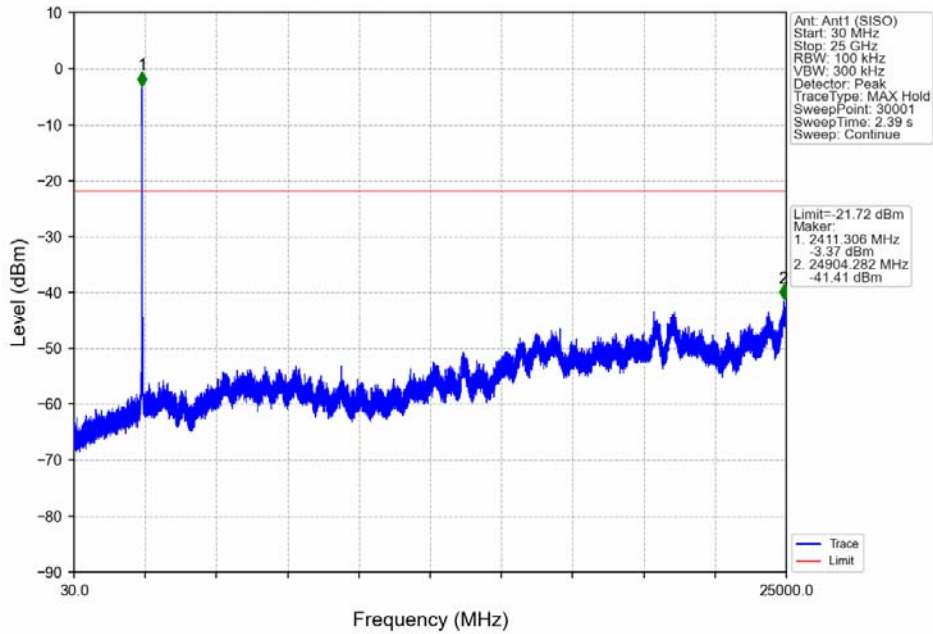
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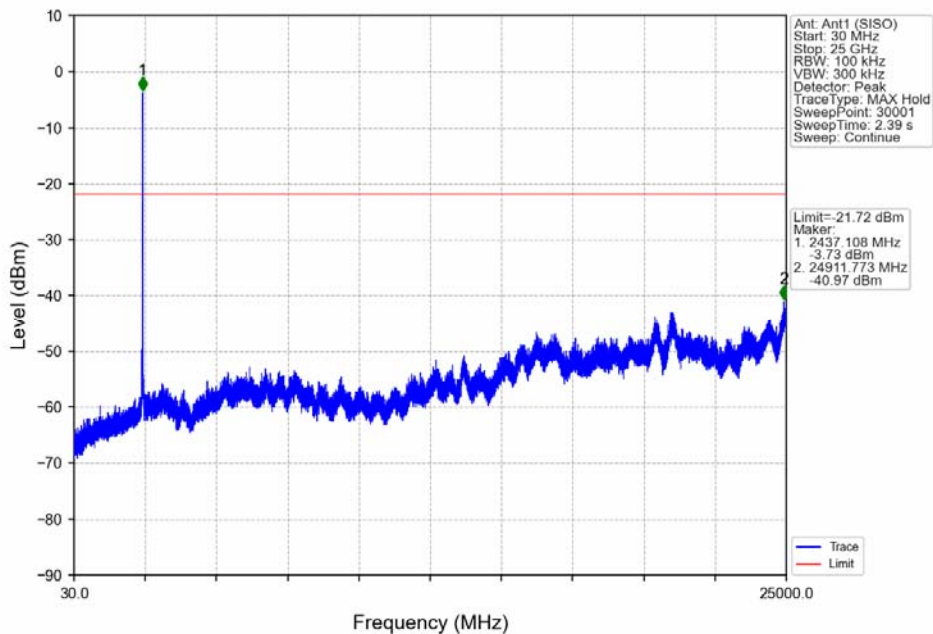
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802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



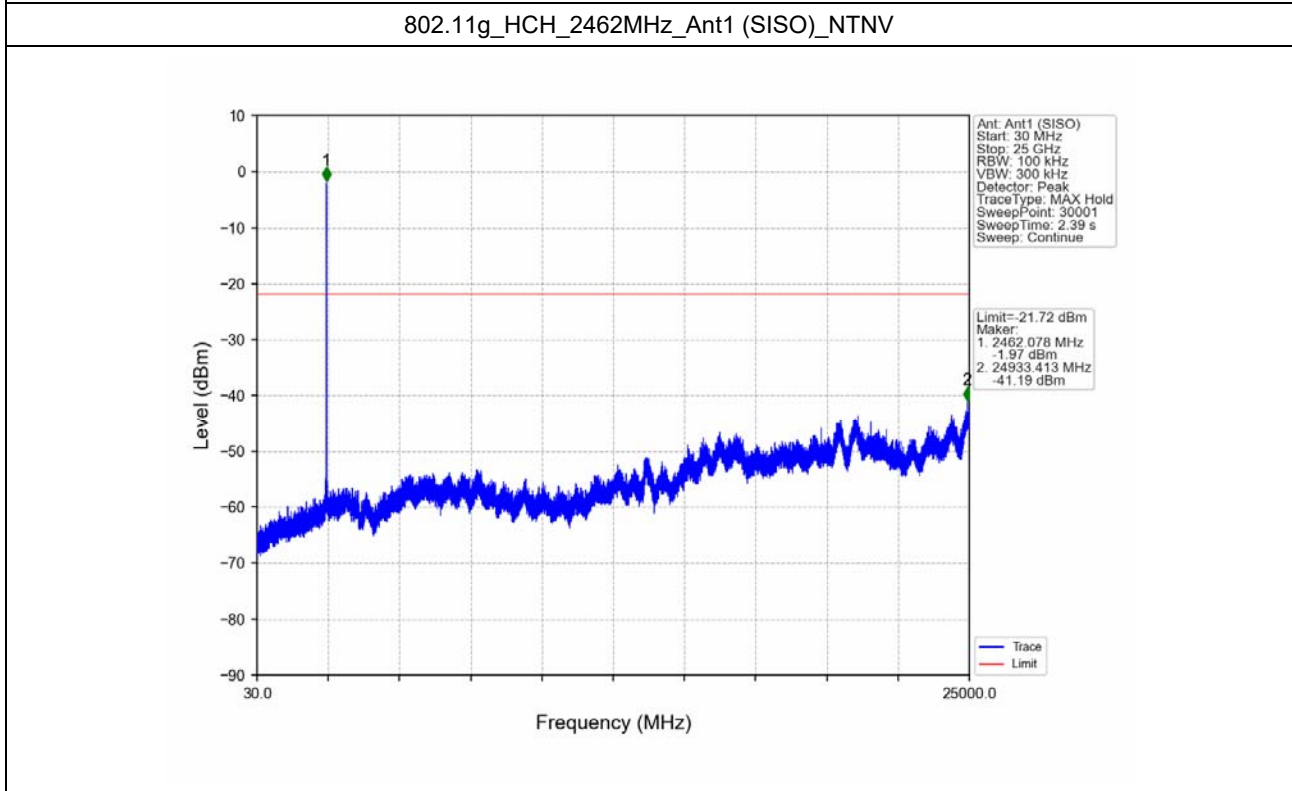
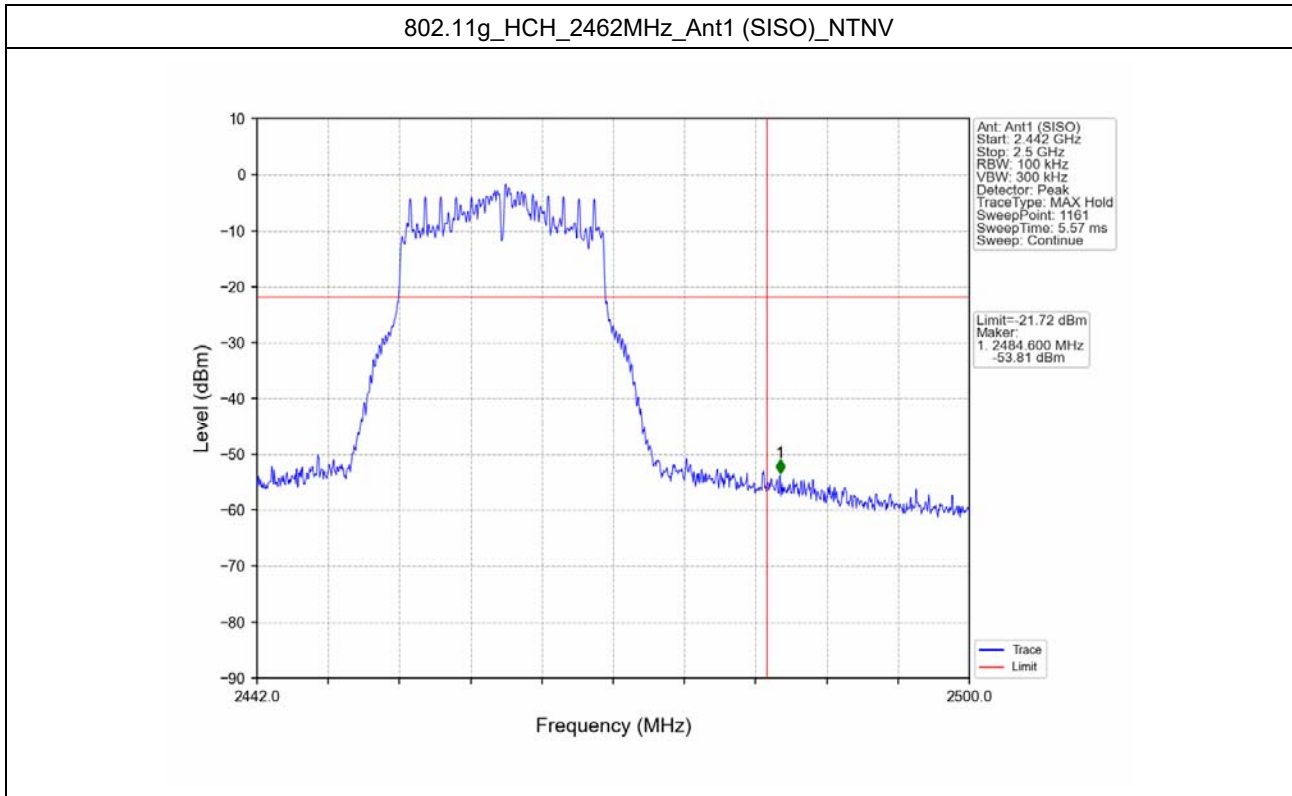
802.11g\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



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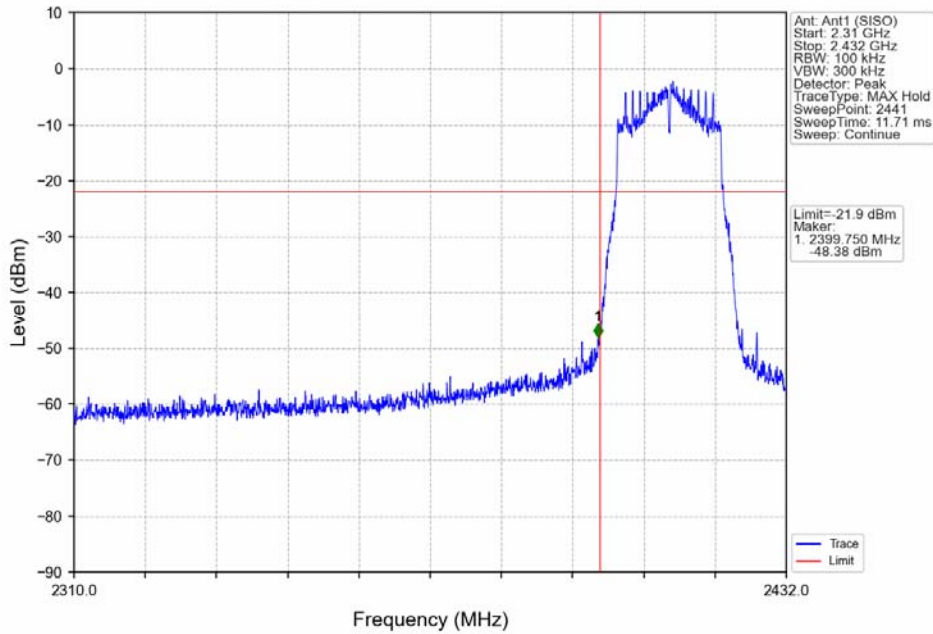
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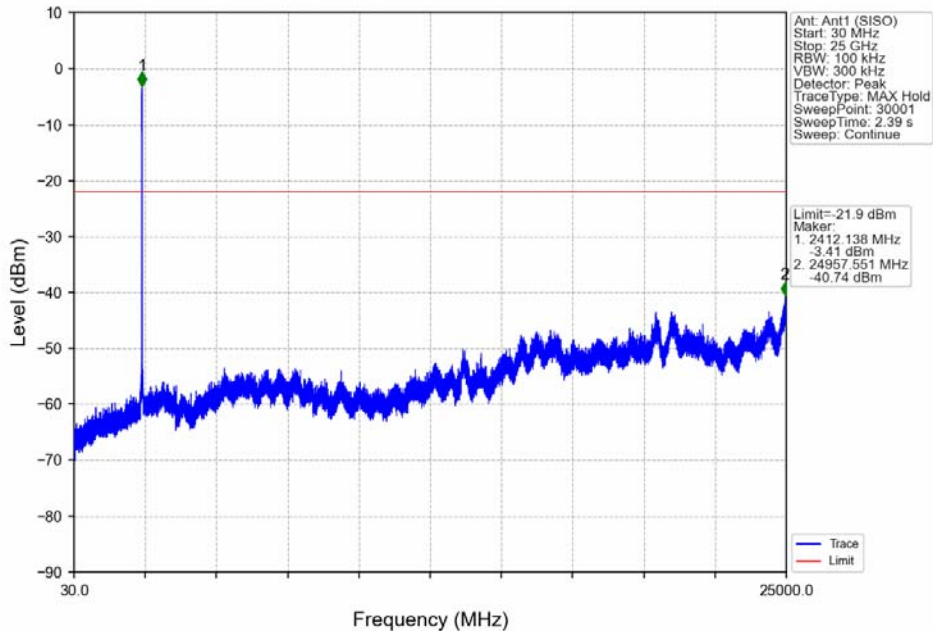
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802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV



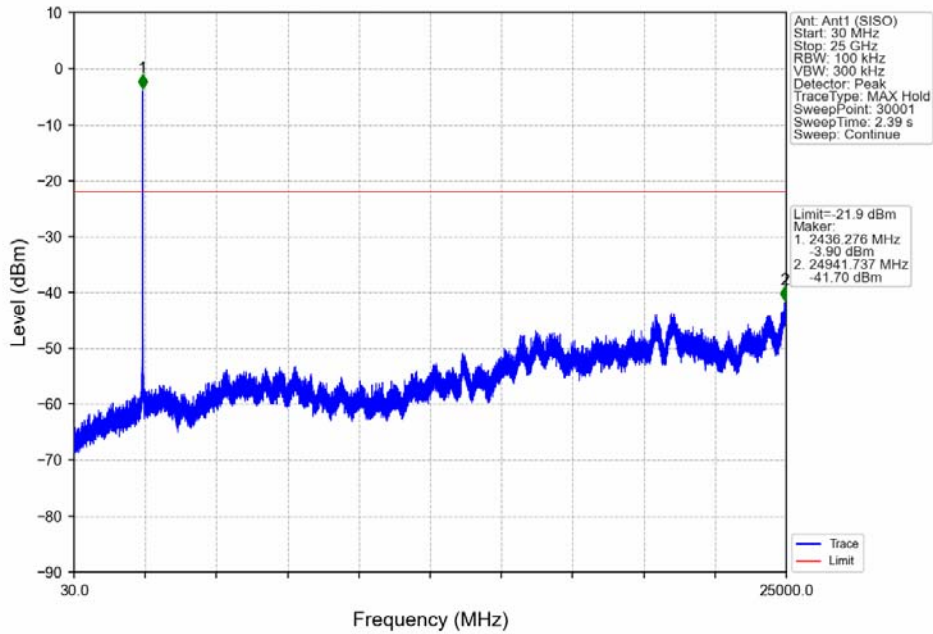
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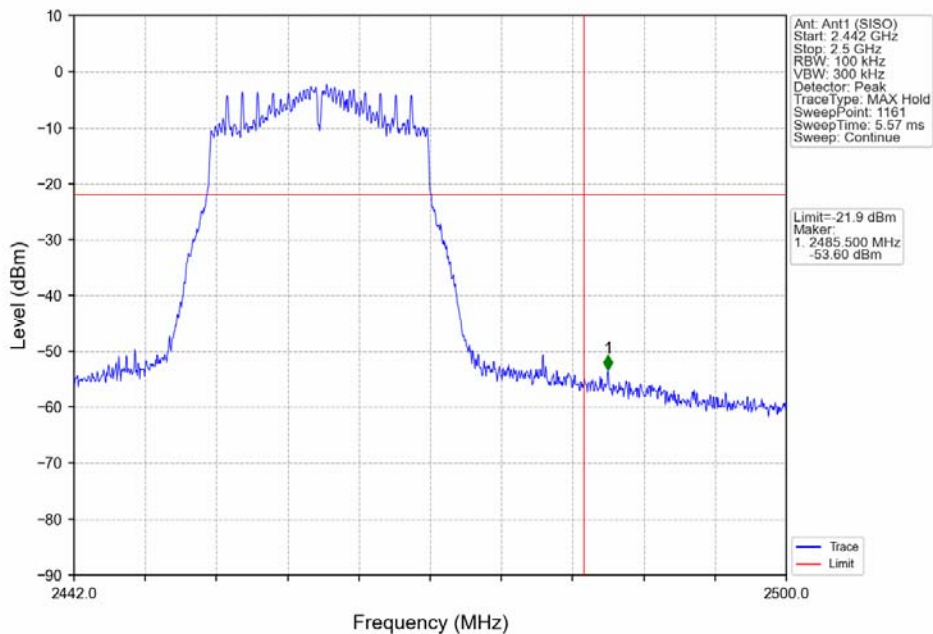




802.11n(HT20)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

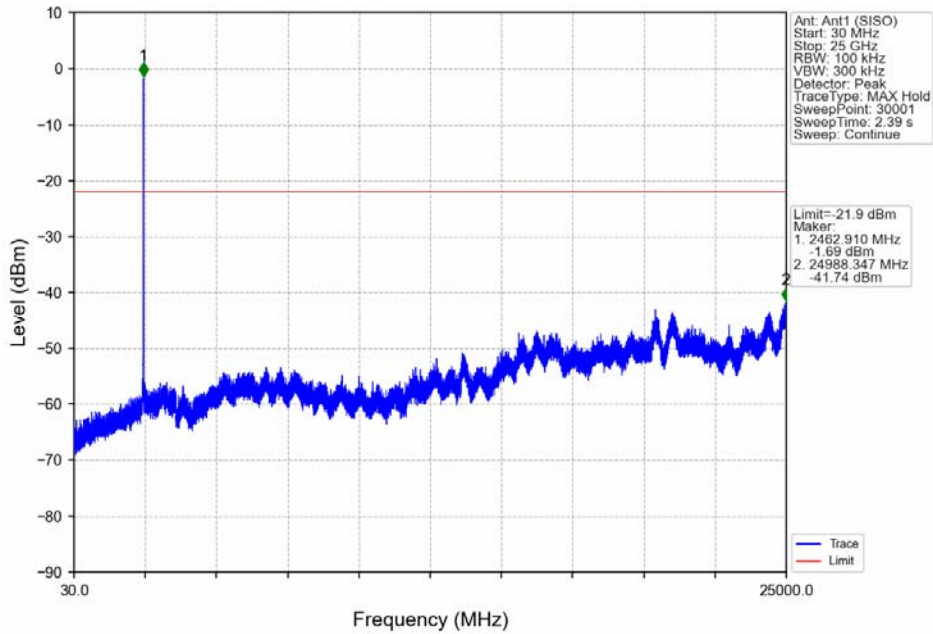


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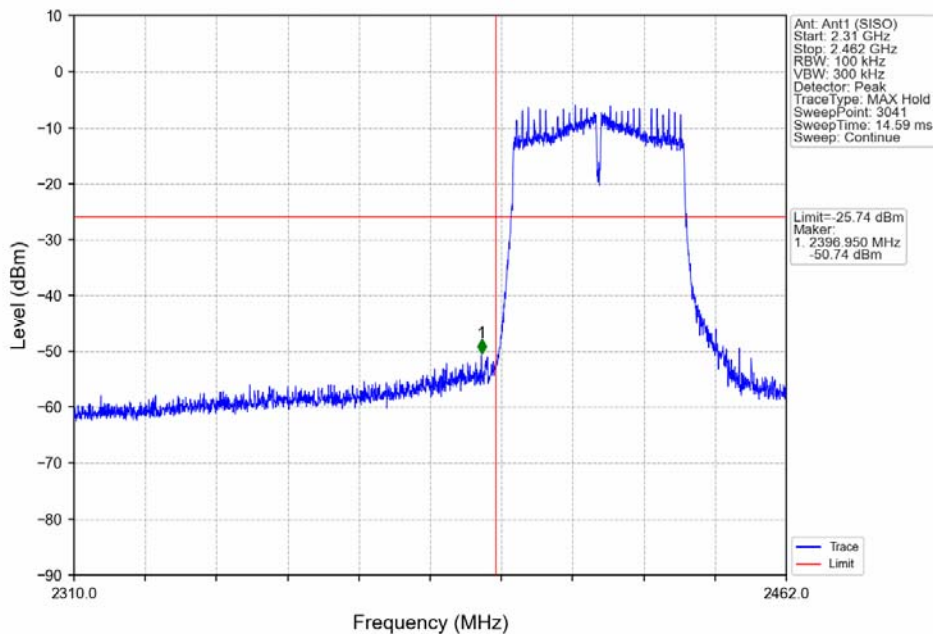
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802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

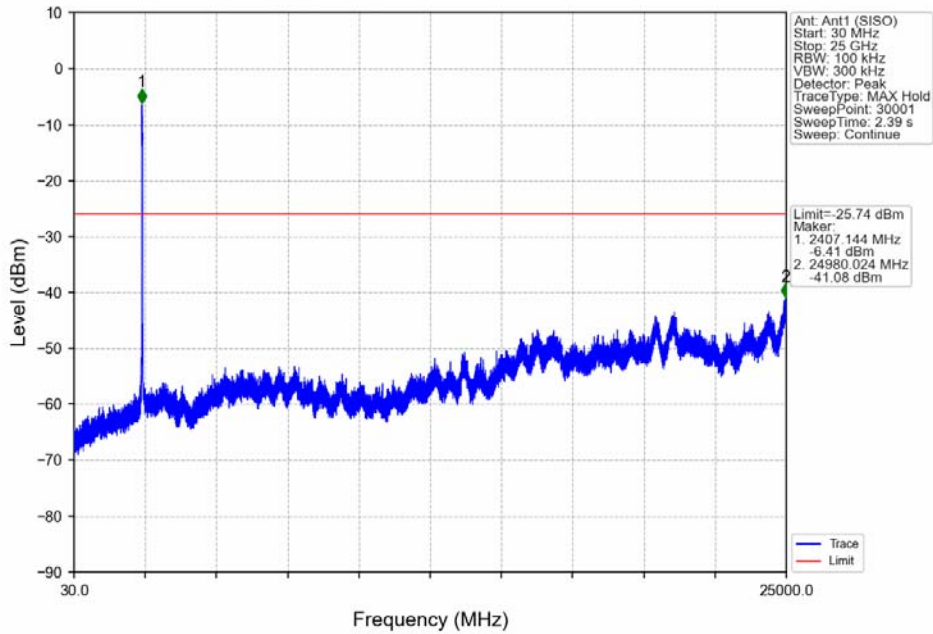


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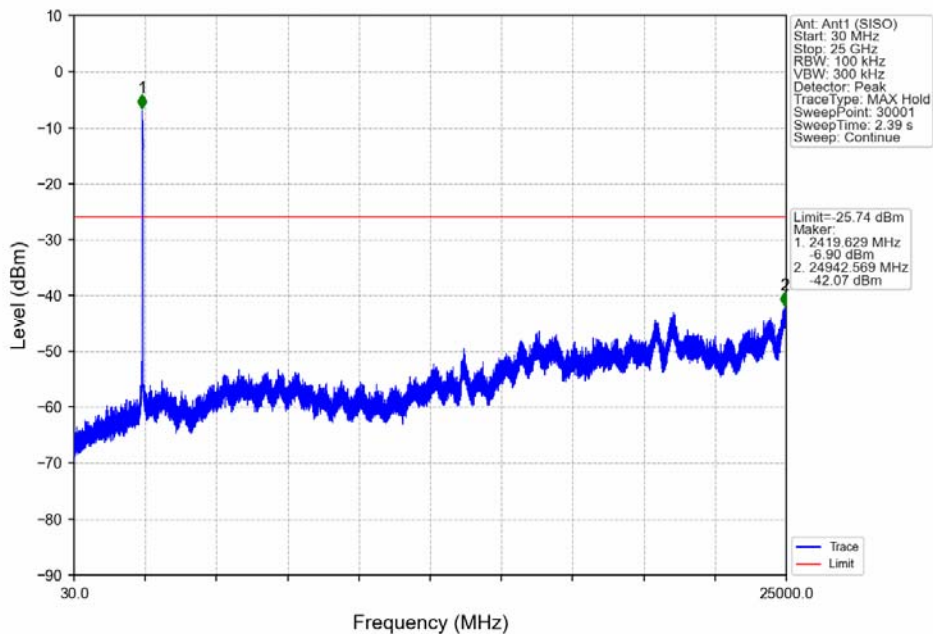
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802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



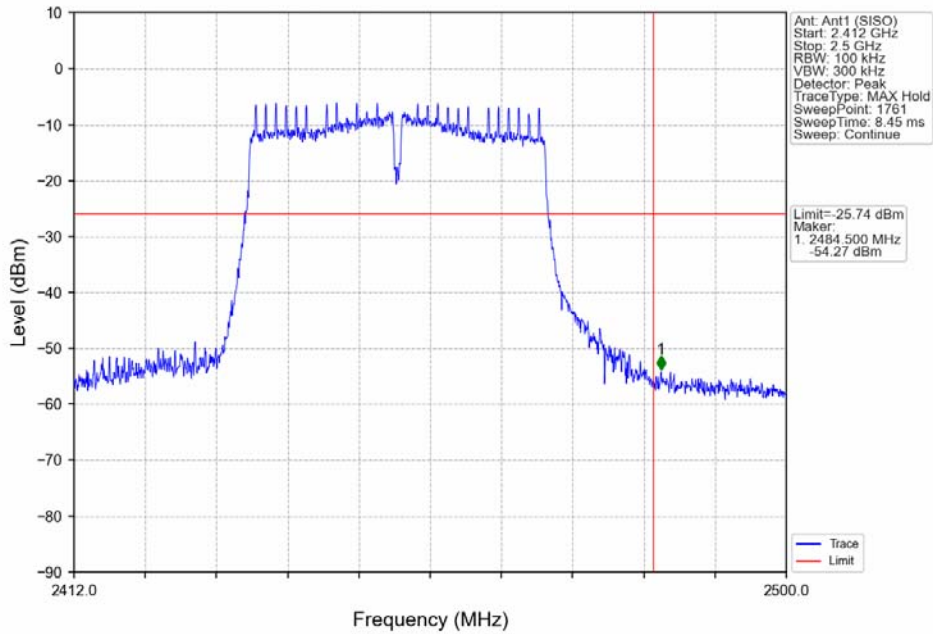
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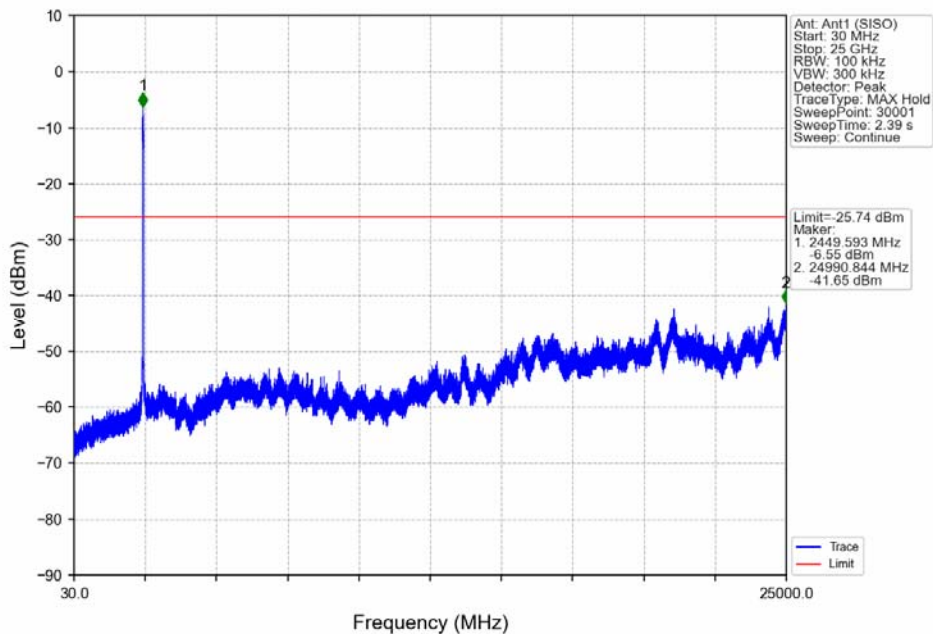




802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV



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**10.5 Restricted band Measurement**

EUT	2.4GHz wifi mainboard		Model	BL-R8189RM2
Mode	Keeping Transmitting		Test Voltage	DC3.3V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11b mode, Low Channel, Horizontal				
2390	PK (dB $\mu$ V/m)	46.6	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)
802.11b mode, Vertical				
2390	PK (dB $\mu$ V/m)	48.3	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

**10.5 Restricted band Measurement**

EUT	2.4GHz wifi mainboard		Model	BL-R8189RM2
Mode	Keeping Transmitting		Test Voltage	DC3.3V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11b mode, High Channel, Horizontal				
2483.5	PK (dB $\mu$ V/m)	47.6	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)
802.11b mode, High Channel, Vertical				
2483.5	PK (dB $\mu$ V/m)	49.8	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

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**10.5 Restricted band Measurement**

EUT	2.4GHz wifi mainboard		Model	BL-R8189RM2
Mode	Keeping Transmitting		Test Voltage	DC3.3V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11g mode, Low Channel, Horizontal				
2390	PK (dB $\mu$ V/m)	50.1	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)
802.11g mode, Vertical				
2390	PK (dB $\mu$ V/m)	52.8	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	38.9		54(dB $\mu$ V/m)

**10.5 Restricted band Measurement**

EUT	2.4GHz wifi mainboard		Model	BL-R8189RM2
Mode	Keeping Transmitting		Test Voltage	DC3.3V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11g mode, High Channel, Horizontal				
2483.5	PK (dB $\mu$ V/m)	55.6	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	42.1		54(dB $\mu$ V/m)
802.11g mode, High Channel, Vertical				
2483.5	PK (dB $\mu$ V/m)	58.7	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	44.9		54(dB $\mu$ V/m)

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**10.5 Restricted band Measurement**

EUT	2.4GHz wifi mainboard		Model	BL-R8189RM2
Mode	Keeping Transmitting		Test Voltage	DC3.3V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11n HT20 mode, Low Channel, Horizontal				
2390	PK (dB $\mu$ V/m)	50.9	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)
802.11n HT20 mode, Low Channel, Vertical				
2390	PK (dB $\mu$ V/m)	54.0	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	39.3		54(dB $\mu$ V/m)

**10.5 Restricted band Measurement**

EUT	2.4GHz wifi mainboard		Model	BL-R8189RM2
Mode	Keeping Transmitting		Test Voltage	DC3.3V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11n HT20 mode, High Channel, Horizontal				
2483.5	PK (dB $\mu$ V/m)	55.9	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	43.0		54(dB $\mu$ V/m)
802.11n HT20 mode, High Channel, Vertical				
2483.5	PK (dB $\mu$ V/m)	60.3	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	46.1		54(dB $\mu$ V/m)

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**10.5 Restricted band Measurement**

EUT	2.4GHz wifi mainboard		Model	BL-R8189RM2
Mode	Keeping Transmitting		Test Voltage	DC3.3V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11n HT40 mode, Low Channel, Horizontal				
2390	PK (dB $\mu$ V/m)	52.3	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	37.9		54(dB $\mu$ V/m)
802.11n HT40 mode, Low Channel, Vertical				
2390	PK (dB $\mu$ V/m)	55.6	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	40.7		54(dB $\mu$ V/m)

**10.5 Restricted band Measurement**

EUT	2.4GHz wifi mainboard		Model	BL-R8189RM2
Mode	Keeping Transmitting		Test Voltage	DC3.3V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11n HT40 mode, High Channel, Horizontal				
2483.5	PK (dB $\mu$ V/m)	59.3	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	45.6		54(dB $\mu$ V/m)
802.11n HT40 mode, High Channel, Vertical				
2483.5	PK (dB $\mu$ V/m)	63.9	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	49.7		54(dB $\mu$ V/m)

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## **11.0 Antenna Requirement**

### **11.1 Standard Applicable**

For intentional device, according to FCC 47 CFR Section 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.

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

### **11.2 Antenna Connected construction**

Dipole antenna provided to the EUT. The gain of the antenna is 2.0dBi. (Get from the antenna specification provided the applicant)

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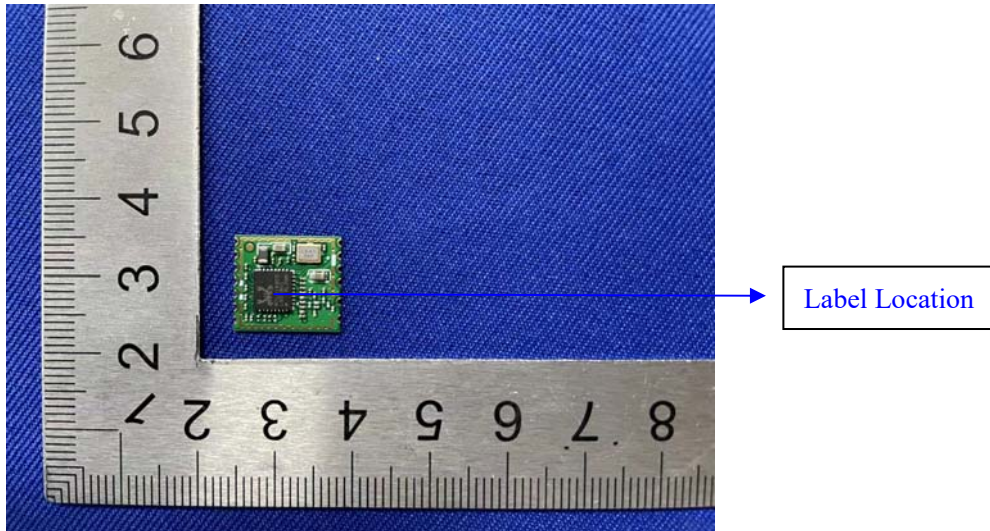


## 12.0 FCC ID Label

### FCC ID: 2AL6K-BL-R8189RM2

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

#### Mark Location:



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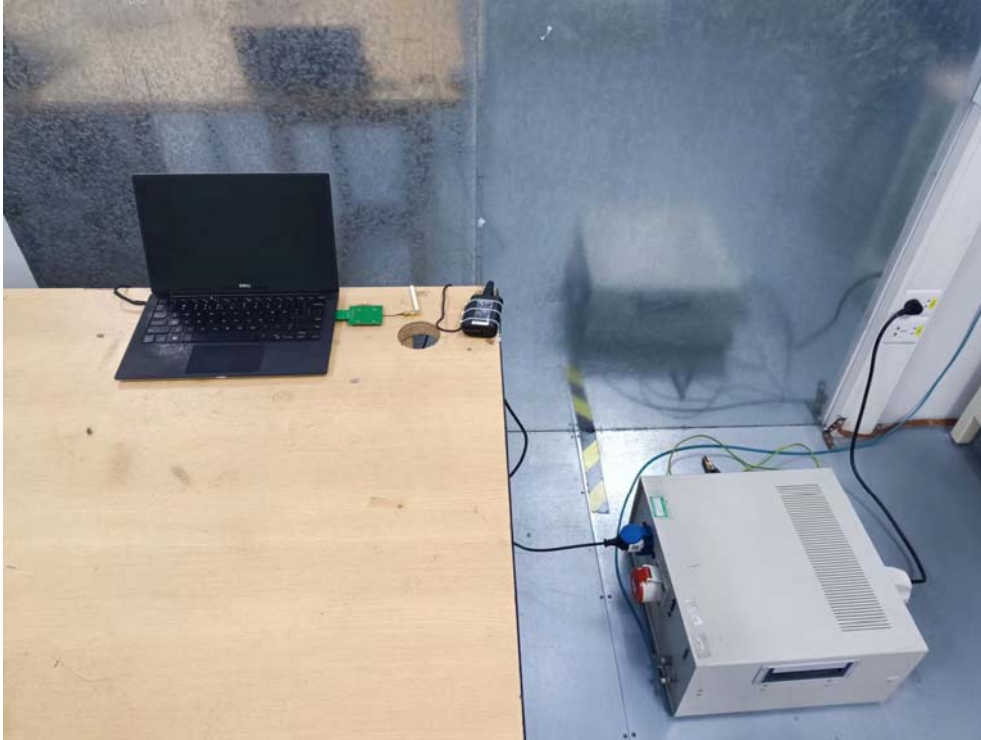
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### 13.0 Photo of testing

Conducted Emission Test Setup:



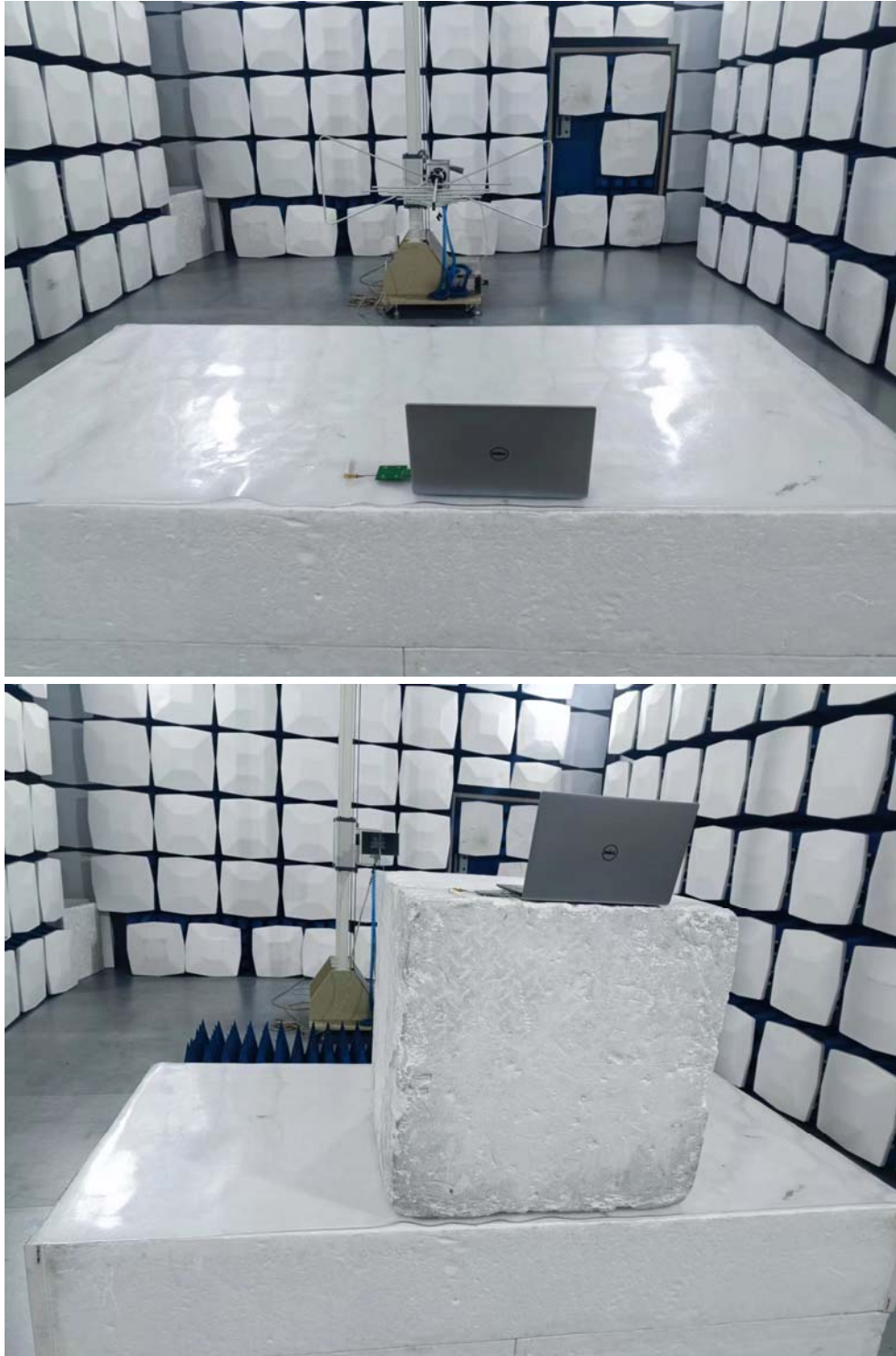
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Radiated Emission Test Setup:

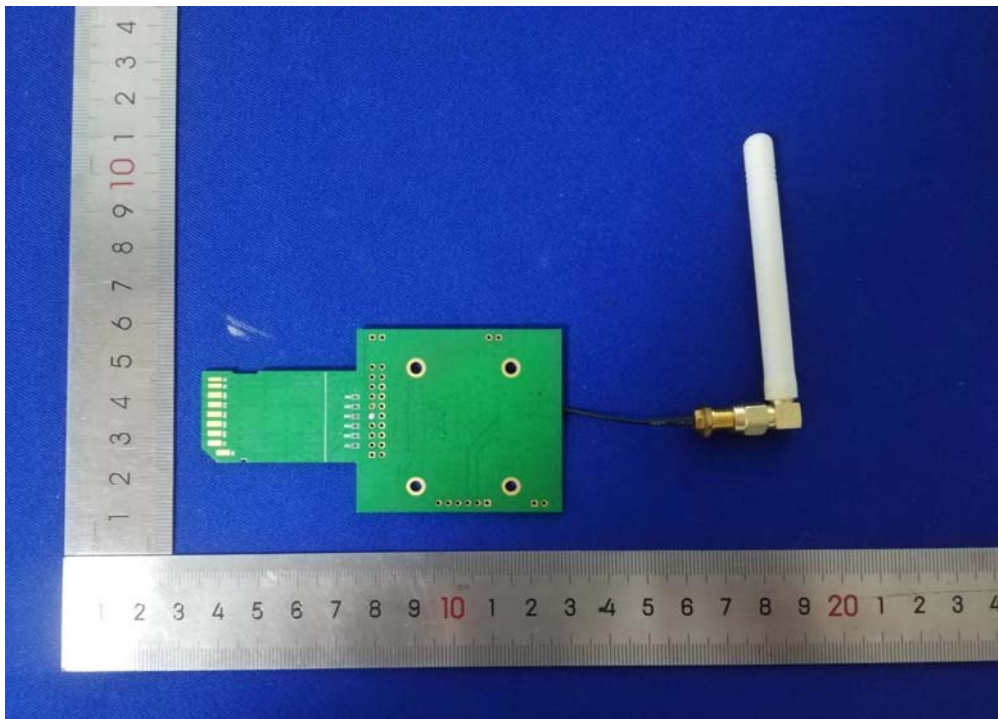
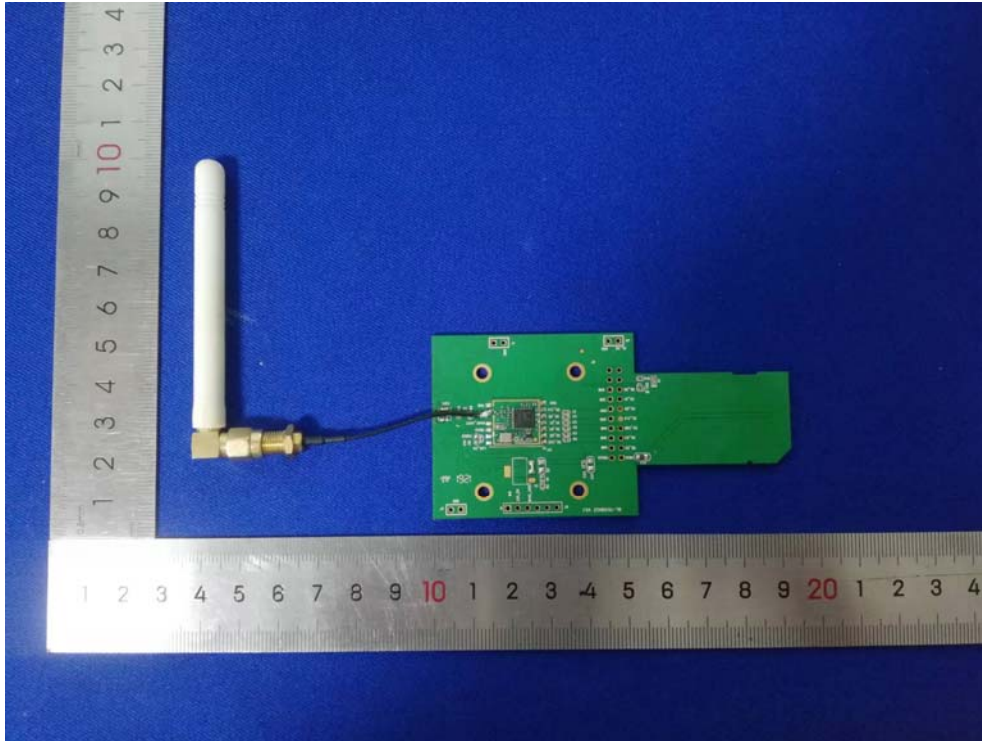


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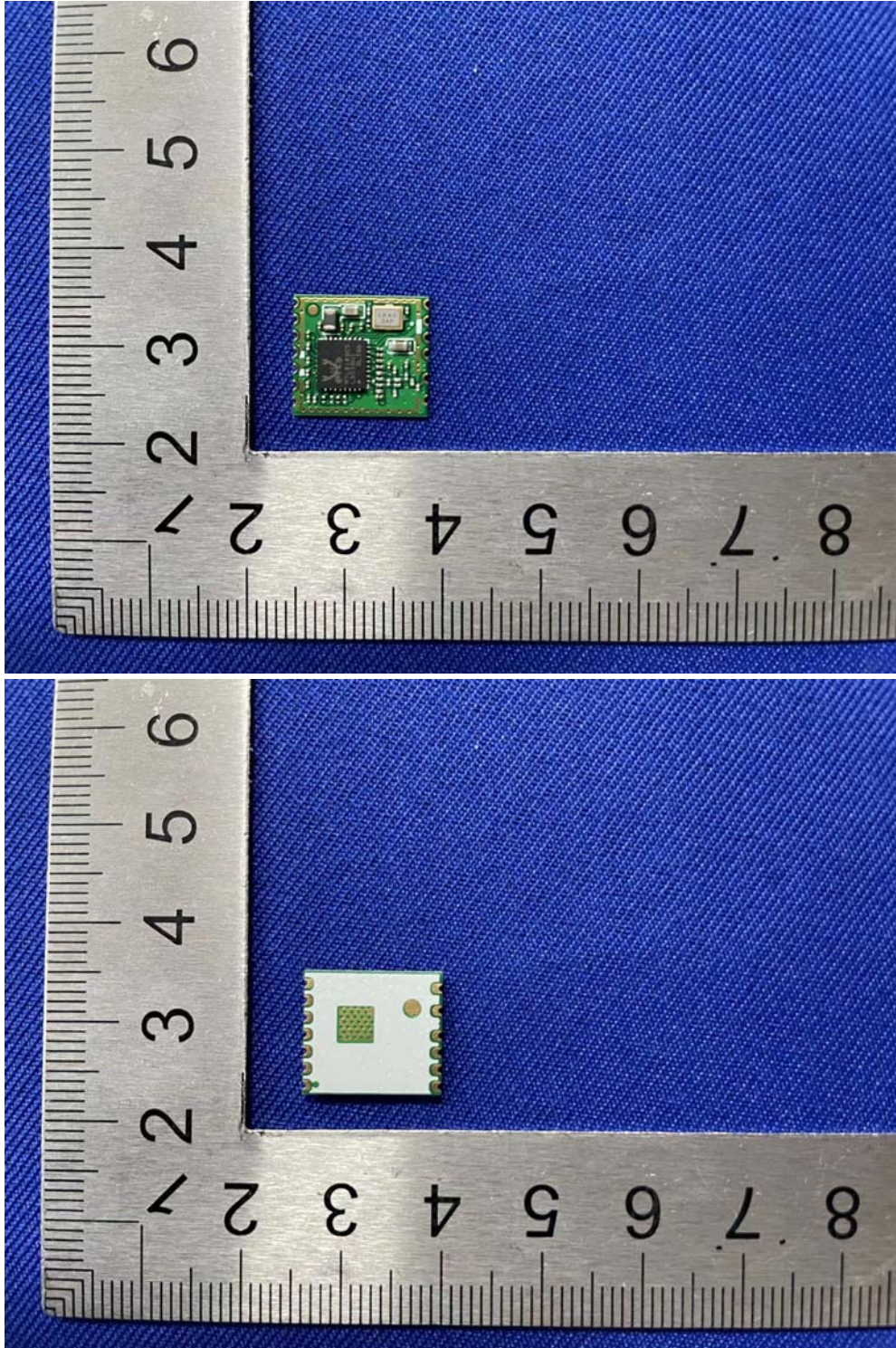


**Photographs – EUT**



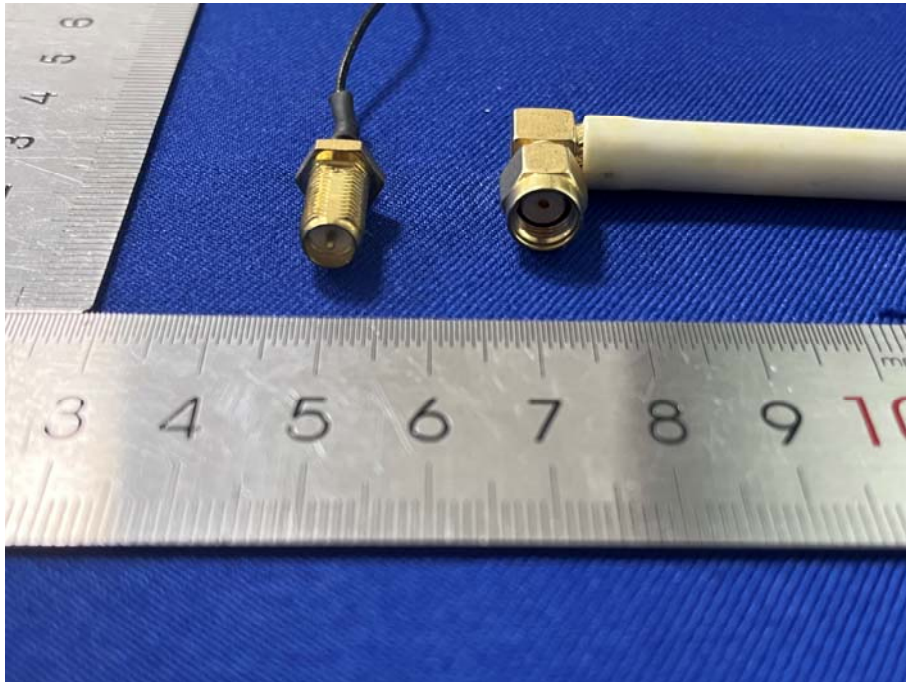
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**--End of the report--**

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