



*Full*

# TEST REPORT

**No. I18D00140-SRD03**

*For*

**Client : Wingtech Group (Hong Kong) Limited**

**Production : arrows hello AT01**

**Model Name : AT01**

**FCC ID : 2APXW-YDE022**

**Hardware 81119\_1\_10**

**Software YD\_AT01\_1.0.1(SW\_Q81119BA1\_V001**

**Version: \_M10\_YD\_AT01\_USRD\_TEST)**

**Issued date: 2018-09-12**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of ECIT Shanghai.

**Test Laboratory:**

ECIT Shanghai, East China Institute of Telecommunications

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# RF Test Report

Report No.: I18D00140-SRD03

## Revision Version

Report Number	Revision	Date	Memo
I18D00140-SRD03	00	2018-09-12	Initial creation of test report

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## 1. Test Laboratory

### 1.1. Testing Location

Company Name:	ECIT Shanghai, East China Institute of Telecommunications
Address:	7-8F, G Area, No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China
Postal Code:	200001
Telephone:	(+86)-021-63843300
Fax:	(+86)-021-63843301

### 1.2. Testing Environment

Normal Temperature:	15-35°C
Extreme Temperature:	-10/+55°C
Relative Humidity:	20-75%

### 1.3. Project data

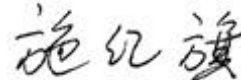
Project Leader:	Chen Minfei
Testing Start Date:	2018-08-02
Testing End Date:	2018-08-24

### 1.4. Signature



Yang Dejun

(Prepared this test report)



Shi Hongqi

(Reviewed this test report)



Zheng Zhongbin

Director of the laboratory

(Approved this test report)

## **2. Client Information**

### **2.1. Applicant Information**

Company Name: Wingtech Group (Hong Kong) Limited  
Address: Flat/RM 1903, 19/F, Podium Plaza 5 Hanoi Road, Tsim Sha Tsui Kowloon, Hong Kong  
Postcode: /  
Telephone: /

### **2.2. Manufacturer Information**

Company Name: Wingtech Group (Hong Kong) Limited  
Address: Flat/RM 1903, 19/F, Podium Plaza 5 Hanoi Road, Tsim Sha Tsui Kowloon, Hong Kong  
Postcode: /  
Telephone: /

### 3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

#### 3.1. About EUT

EUT Description	arrows hello AT01
Model name	AT01
WLAN Frequency	2412MHz-2462MHz
WLAN Channel	Channel1-Channel11
WLAN type of modulation	802.11b:DSSS 802.11g/n: OFDM
Extreme Temperature	-10/+55°C
Nominal Voltage	3.85V
Extreme High Voltage	4.4V
Extreme Low Voltage	3.0V

Note: Photographs of EUT are shown in ANNEX A of this test report.

#### 3.2. Internal Identification of EUT used during the test

##### First Supply

EUT ID*	Model Name	SN or IMEI	HW Version	SW Version	Date of receipt
N02	AT01	N/A	81119_1_10	YD_AT01_1.0.1(SW_Q81119BA1_V001_M10_YD_AT01_USRD_TEST)	2018-08-02
N16	AT01	N/A	81119_1_10	YD_AT01_1.0.1(SW_Q81119BA1_V001_M10_YD_AT01_USRD_TEST)	2018-08-02

\*EUT ID: is used to identify the test sample in the lab internally.

#### 3.3. Internal Identification of AE used during the test

AE ID*	Description	SN
AE1	RF cable	---
AE2	---	---

\*AE ID: is used to identify the test sample in the lab internally.

## 4. Reference Documents

### 4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part15	FCC CFR 47, Part 15,Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.	Jun,2016 Edition
ANSI 63.10	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9KHz to 40GHz	2013



## 5. Summary of Test Results

A brief summary of the tests carried out is shown as following.

Measurement Items	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.247(a)	/	P
Peak Power Spectral Density	15.247(e)	/	P
Occupied 6dB Bandwidth	15.247(d)	/	P
Band Edges Compliance	15.247(b)	/	P
Transmitter Spurious Emission-Conducted	15.247	/	P
Transmitter Spurious Emission-Radiated	15.247,15.209,	/	P
AC Powerline Conducted Emission	15.107,15.207	/	P

Please refer to part 5 for detail.

The measurements are according to Public notice KDB558074 and ANSI C63.4.

Terms used in Verdict column

P	Pass, the EUT complies with the essential requirements in the standard.
NP	Not Perform, the test was not performed by ECIT.
NA	Not Applicable, the test was not applicable.
F	Fail, the EUT does not comply with the essential requirements in the standard.

**Test Conditions**

Tnom	Normal temperature
Tmin	Low Temperature
Tmax	High Temperature
Vnom	Normal Voltage
Vmin	Low Voltage
Vmax	High Voltage
Hnom	Norm Humidity
Anom	Norm Air Pressure

For this report, all the test case listed above are tested under Normal Temperature and Normal Voltage, and also under norm humidity, the specific conditions as following:

Temperature	Tnom	25°C
Voltage	Vnom	3.85V
Humidity	Hnom	48%
Air Pressure	Anom	1010hPa

## 5.1. Notes

All reported tests were carried out on a sample equipment to demonstrate limited compliance with section 3.

The test results of this test report relate exclusively to the item(s) tested as specified in section 5.

## 5.2. Statements

The AT01, supporting BT/BLE/WIFI, manufactured by Wingtech Group (Hong Kong) Limited, which is a new product for testing.

ECIT has verified that the compliance of the tested device specified in section 5 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 5 of this test report.

## 6. Test result

### 6.1. Maximum Output Power

#### 6.1.1 Measurement Limit and method:

Standard	Limit(dBm)
FCC CRF 15.247(b)	< 30

#### 6.1.2 Test procedure

The measurement is according to ANSI C63.10 clause 11.2

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set RBW  $\geq$  OBW, VBW  $\geq$  3RBW.
4. Detector : Peak.
5. Trace mode: Max Hold

#### 6.1.3 Measurement Uncertainty:

Measurement Uncertainty	0.75dB
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#### 6.1.4 Maximum Peak Output Power-conducted

##### Measurement Results:

##### 802.11b/g mode

Mode	Data Rate(Mbps)	Teat Result(dBm)		
		2412MHz(Ch1)	2437MHz(Ch6)	2462MHz(Ch11)
802.11b	1	/	/	16.57
	2	/	/	16.77
	5.5	/	/	18.22
	11	19.14	19.38	19.75
802.11g	6	/	/	22.83
	9	/	/	22.91
	12	/	/	23.08
	18	/	/	23.47

	24	/	/	23.55
	36	/	/	23.82
	48	/	/	23.88
	54	22.43	22.54	23.93

The data rate 11 Mbps and 54 Mbps are selected as worse condition, and the following cases are performed with this condition.

**802.11n mode**

Mode	Data Rate(Index)	Teat Result(dBm)		
		2412MHz(Ch1)	2437MHz(Ch6)	2462MHz(Ch11)
802.11n(20MHz)	MCS0	/	/	22.71
	MCS1	/	/	22.97
	MCS2	/	/	23.05
	MCS3	/	/	23.43
	MCS4	/	/	23.56
	MCS5	/	/	23.70
	MCS6	/	/	23.75
	MCS7	22.26	22.65	23.81

The data rate MCS7 for 802.11n(20M) are selected as worse condition, and the following case are performed with this condition.

**6.1.5 Maximum Average Output Power-conducted**
**802.11b/g mode**

Mode	Test Result(dBm)		
	2412MHz (Ch1)	2437MHz (Ch6)	2462MHz (Ch11)
802.11b	15.12	16.05	16.74
802.11g	16.30	16.75	17.76

**802.11n mode**

Mode	Test Result(dBm)		
	2412MHz (Ch1)	2437MHz (Ch6)	2462MHz (Ch11)
802.11n( 20MHz)	16.39	16.44	17.87

**Conclusion: PASS**

## 6.2. Peak Power Spectral Density

### 6.2.1 Measurement Limit:

Standard	Limit
FCC CFR Part 15.247(e)	< 8dBm/3 KHz

### 6.2.2 Test procedures

The measurement is according to ANSI C63.10 clause 11.10.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set analyzer center frequency to DTS channel center frequency.
4. Set the span to 1.5 times the DTS bandwidth.
5. Set the RBW to 3 kHz  $\leq$  RBW  $\leq$  100 kHz.
6. Set the VBW  $\geq$  [3  $\times$  RBW].
7. Detector = peak.
8. Sweep time = auto couple.
9. Trace mode = max hold.
10. Allow trace to fully stabilize.
11. Use the peak marker function to determine the maximum amplitude level within the RBW.
12. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

### 6.2.3 Measurement Uncertainty:

Measurement Uncertainty	0.75dB
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### 6.2.4 Measurement Results:

#### 802.11b/g mode

Mode	Channel	Power Spectral Density(dBm/3kHz)	Conclusion

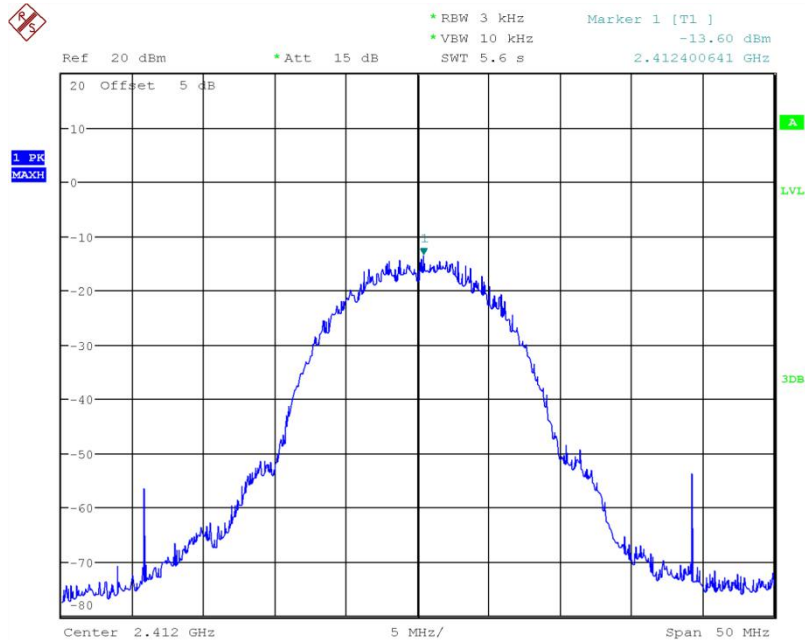
802.11b	1	Fig 1.	-13.595	P
	6	Fig 2.	-12.107	P
	11	Fig 3.	-10.771	P
802.11g	1	Fig 4.	-14.489	P
	6	Fig 5.	-13.771	P
	11	Fig 6.	-12.6	P

**802.11n mode**

Mode	Channel	Power Spectral Density(dBm/3kHz)	Conclusion	
802.11n(20MHz)	1	Fig 7.	-14.87	P
	6	Fig 8.	-14.395	P
	11	Fig 9.	-12.502	P

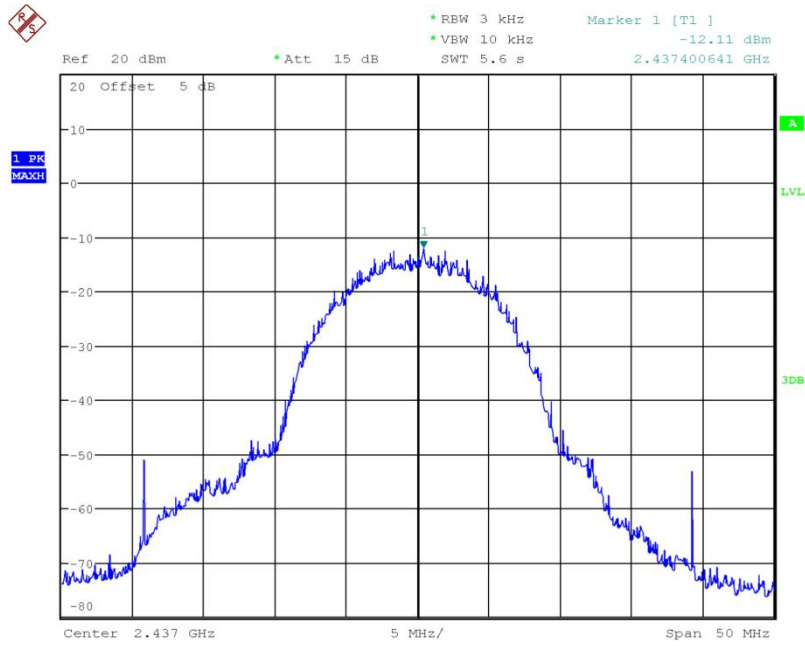
**Conclusion: PASS**

**Test graphs as below:**



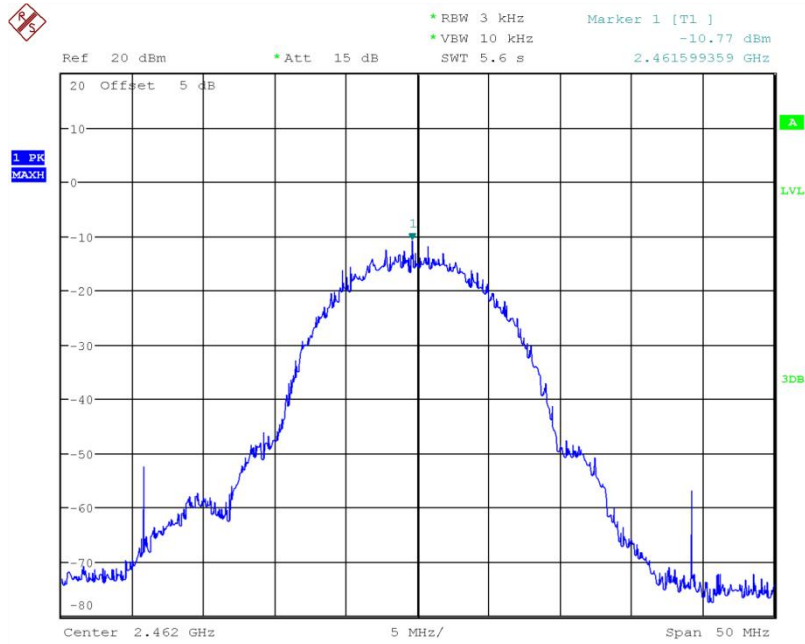
Date: 2.AUG.2018 10:47:57

**Fig 1. Power Spectral Density (802.1b,Ch1)**



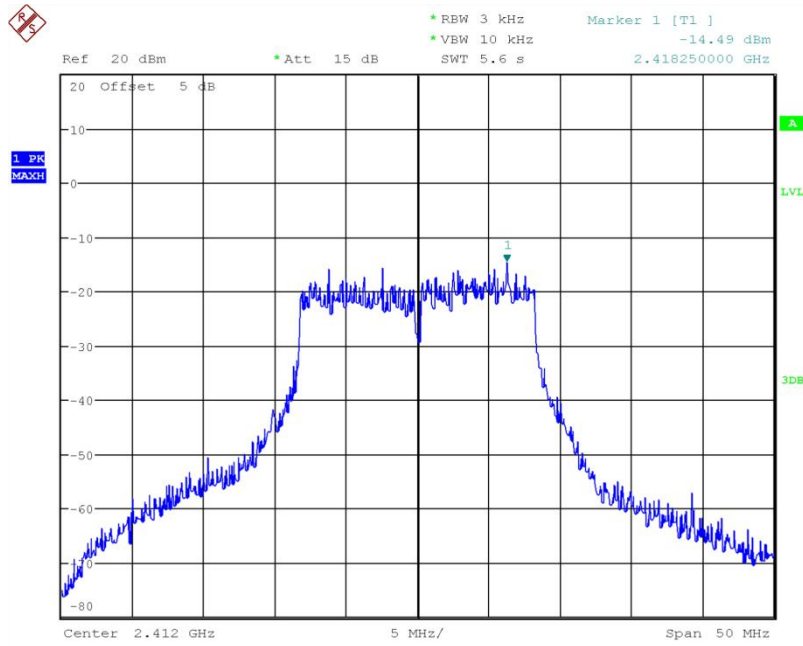
Date: 2.AUG.2018 10:48:35

**Fig 2. Power Spectral Density (802.1b,Ch6)**



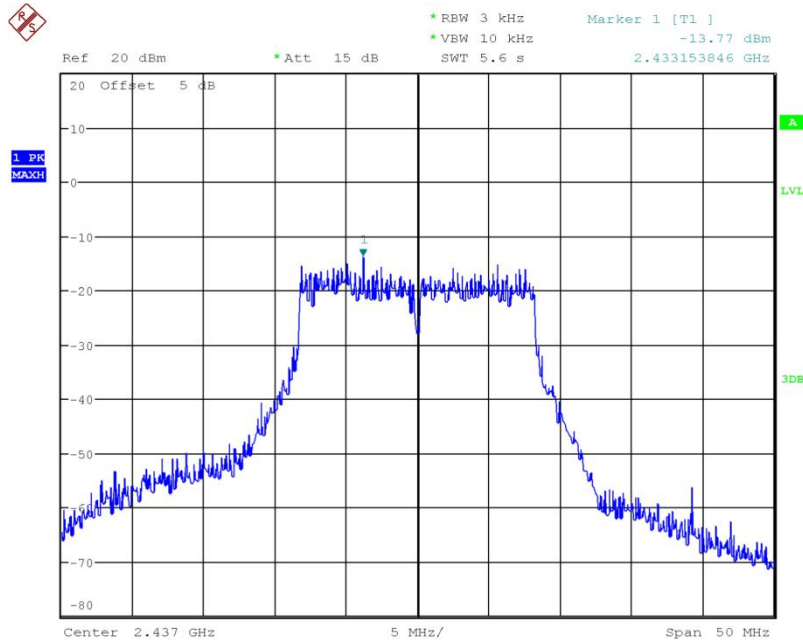
Date: 2.AUG.2018 10:50:49

**Fig 3. Power Spectral Density (802.1b,Ch11)**



Date: 2.AUG.2018 10:51:58

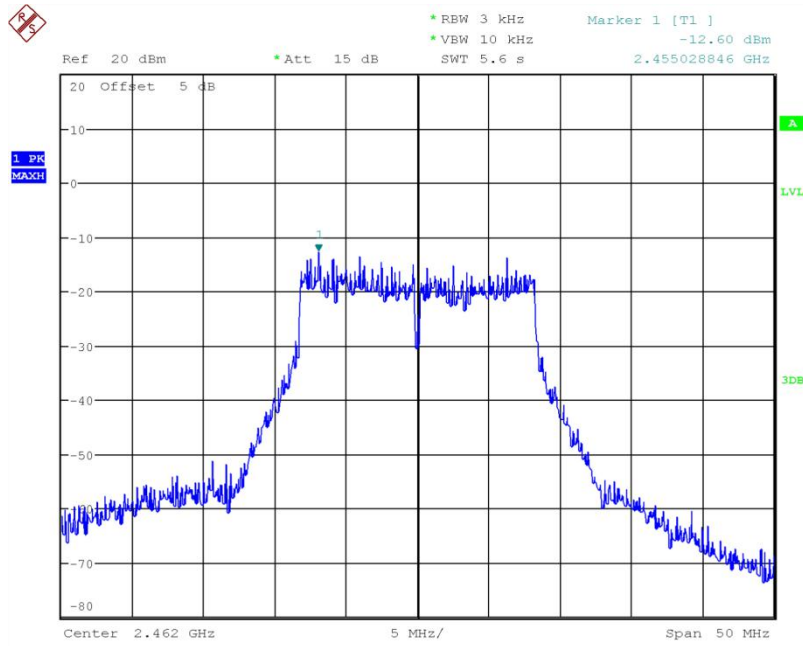
**Fig.4 Power Spectral Density (802.1g,Ch1)**



Date: 2.AUG.2018 10:53:18

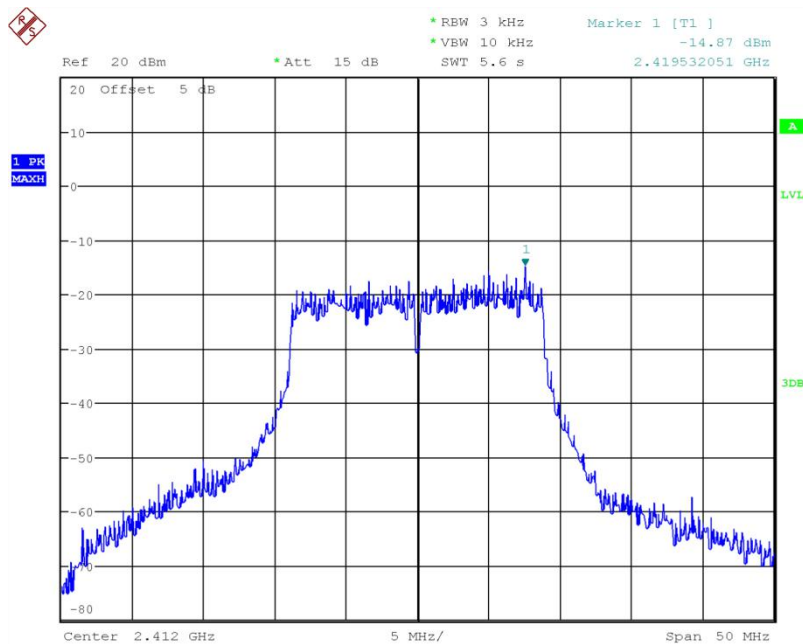
**Fig.5 Power Spectral Density (802.1g,Ch6)**





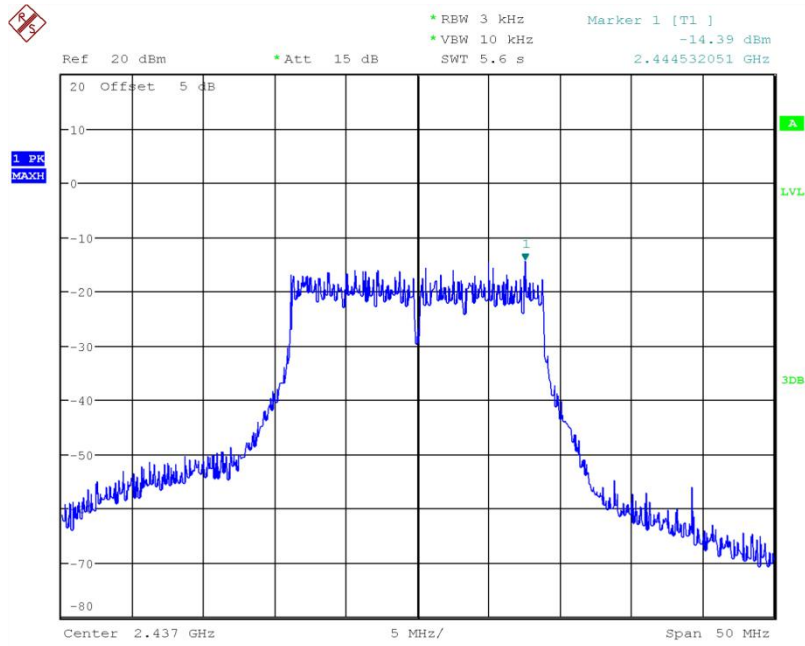
Date: 2.AUG.2018 10:54:20

**Fig.6 Power Spectral Density (802.1g,Ch11)**



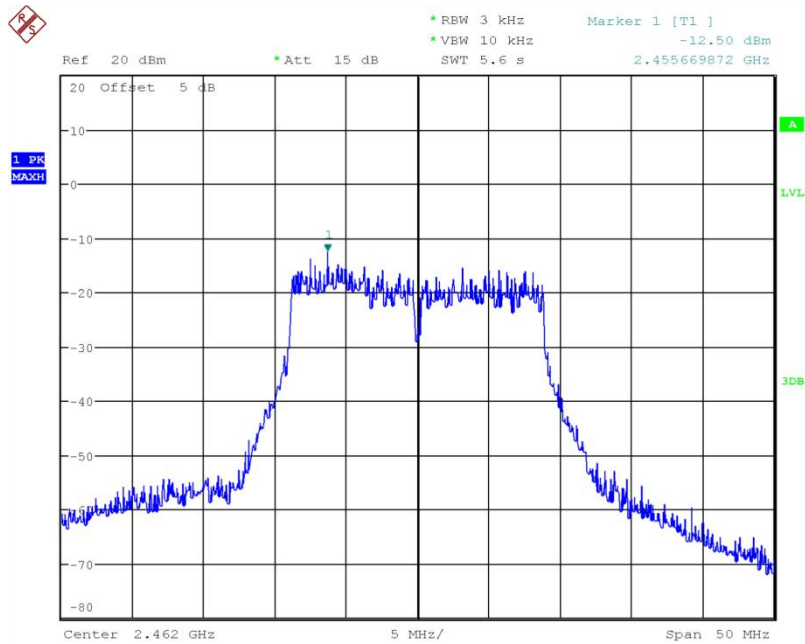
Date: 2.AUG.2018 10:55:05

**Fig.7 Power Spectral Density (802.1n-20MHz,Ch1)**



Date: 2.AUG.2018 10:55:45

**Fig.8 Power Spectral Density (802.1n-20MHz,Ch6)**



Date: 2.AUG.2018 10:56:57

**Fig.9 Power Spectral Density (802.1n-20MHz,Ch11)**

**6.3. Occupied 6dB Bandwidth**

**6.3.1 Measurement Limit:**

Standard	Limit(KHz)
FCC 47 CFR Part 15.247(a)	≥500

**6.3.2 Test procedure**

The measurement is according to ANSI C63.10 clause 11.8.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set RBW = 100 kHz.
4. Set the VBW  $\geq [3 \times \text{RBW}]$ .
5. Detector = peak.
6. Trace mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize.
9. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

**6.3.3 Measurement Uncertainty:**

Measurement Uncertainty	60.80Hz
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**6.3.4 Measurement Result:**

**802.11b/g mode**

Mode	Channel	Occupied 6dB Bandwidth(KHz)	Conclusion	
802.11b	1	Fig 10.	10.096	P
	6	Fig 11.	8.894	P
	11	Fig 12.	10.897	P
802.11g	1	Fig 13.	16.426	P
	6	Fig 14.	16.587	P
	11	Fig 15.	16.506	P

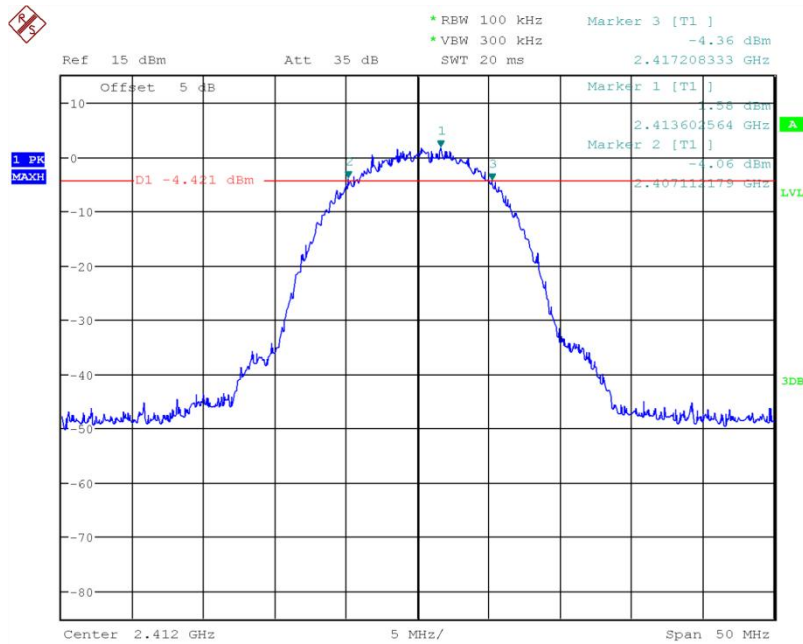
**802.11n mode**

Mode	Channel	Occupied 6dB Bandwidth(KHz)	Conclusion
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802.11n(20MHz)	1	Fig 16.	17.708	P
	6	Fig 17.	17.788	P
	11	Fig 18.	17.788	P

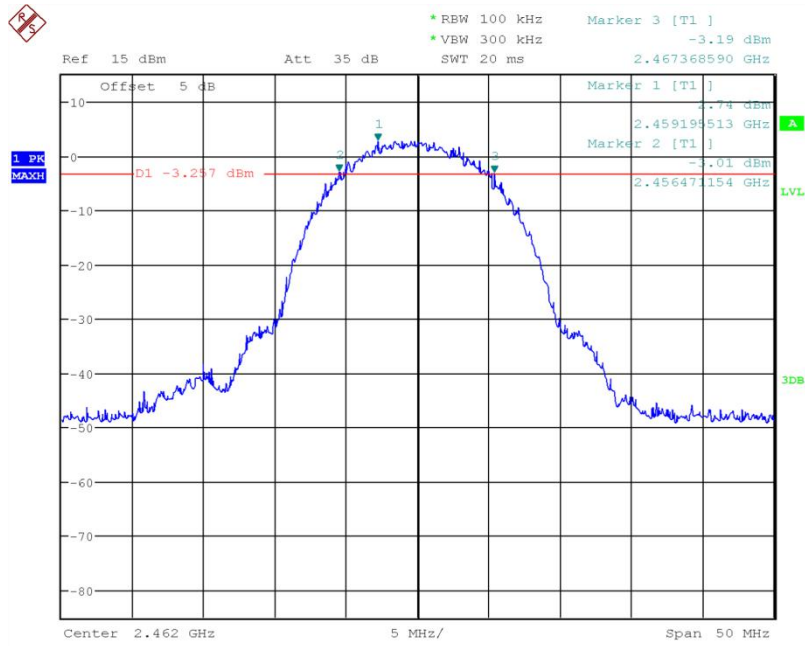
**Conclusion: PASS**

**Test graphs as below:**



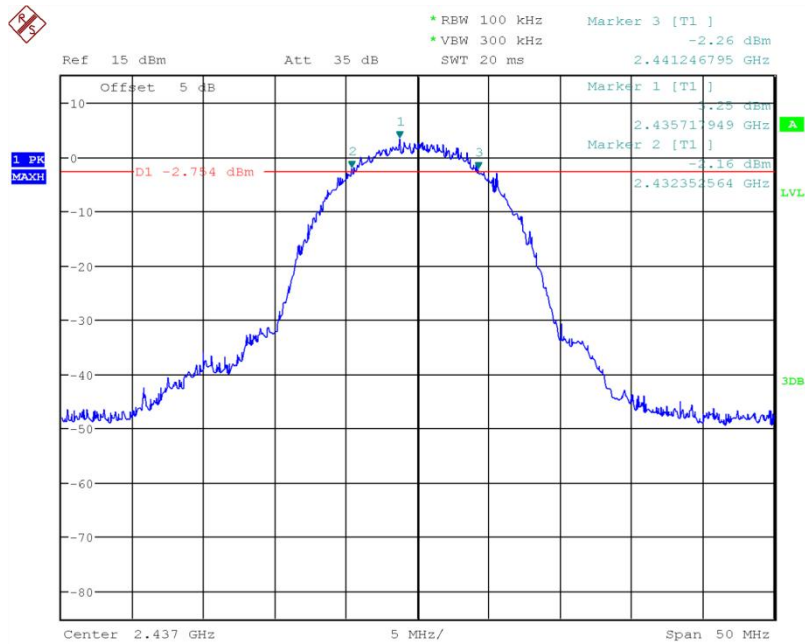
Date: 2.AUG.2018 11:21:25

**Fig.10 Occupied 6dB Bandwidth (802.11b, Ch1)**



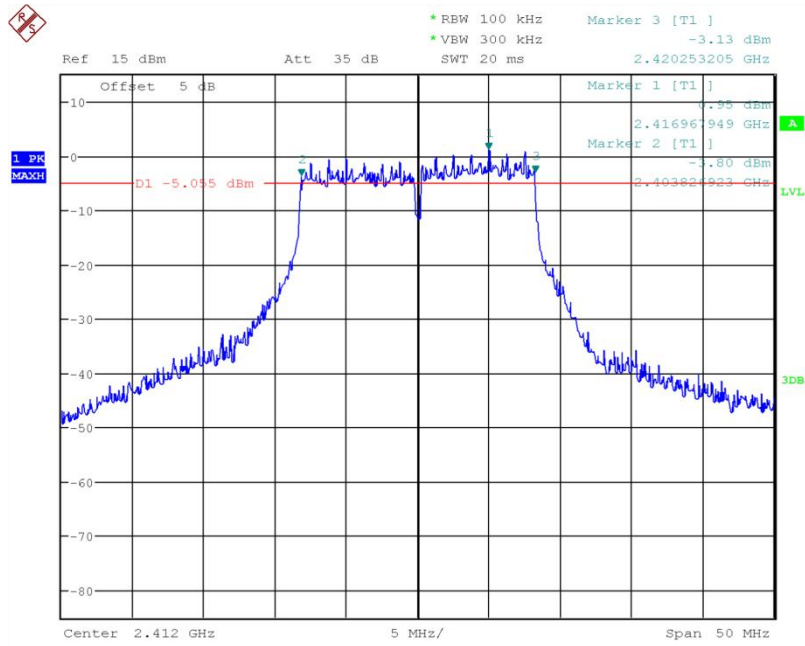
Date: 2.AUG.2018 11:30:18

**Fig.11 Occupied 6dB Bandwidth (802.11b, Ch6)**

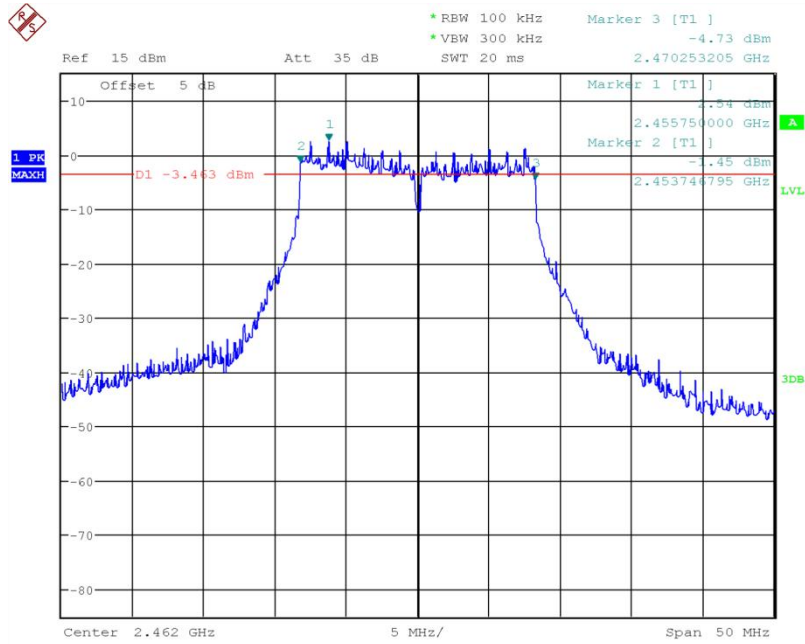


Date: 2.AUG.2018 11:21:58

**Fig.12 Occupied 6dB Bandwidth (802.11b, Ch11)**

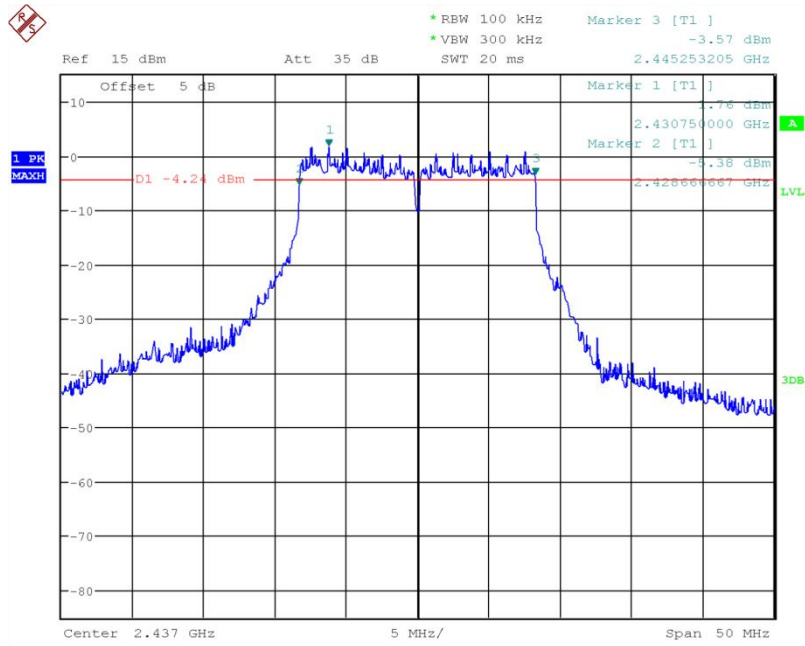


Date: 2.AUG.2018 11:32:50

**Fig.13 Occupied 6dB Bandwidth (802.11g, Ch1)**

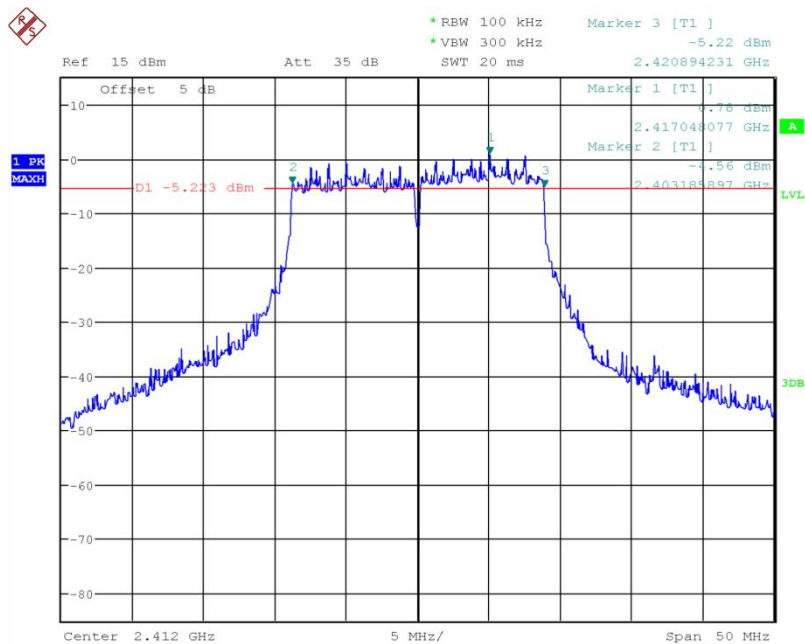
Date: 2.AUG.2018 11:40:37

**Fig.14 Occupied 6dB Bandwidth (802.11g, Ch6)**



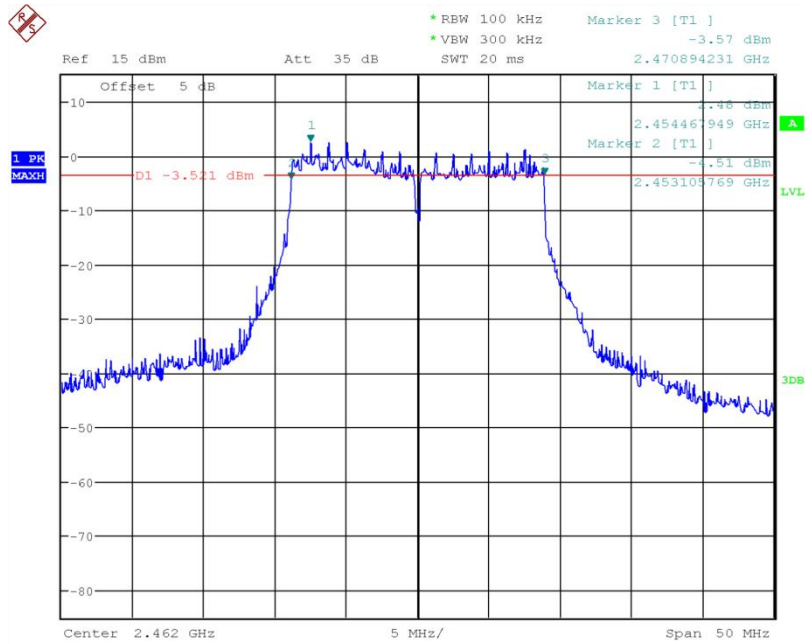
Date: 2.AUG.2018 11:39:55

### Fig.15 Occupied 6dB Bandwidth (802.11g, Ch11)



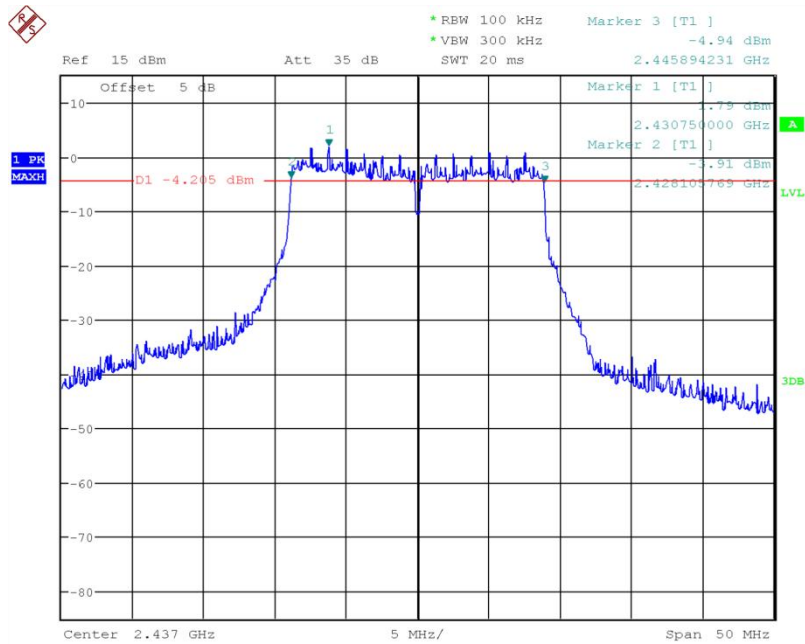
Date: 2.AUG.2018 11:41:39

### Fig.16 Occupied 6dB Bandwidth (802.11n-20MHz, Ch1)



Date: 2.AUG.2018 11:43:05

**Fig.17 Occupied 6dB Bandwidth (802.11n-20MHz, Ch6)**



Date: 2.AUG.2018 11:42:33

**Fig.18 Occupied 6dB Bandwidth (802.11n-20MHz, Ch11)**

## 6.4. Band Edges Compliance

### 6.4.1 Measurement Limit:



Standard	Limited(dBc)
FCC 47 CFR Part 15.247(d)	>20

### 6.4.2 Test procedures

The measurement is according to ANSI C63.10 clause 11.13.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set instrument center frequency to the frequency of the emission to be measured (must be within 2MHz of the authorized band edge).
4. Set span to 2 MHz.
5. RBW = 100 kHz.
6. VBW  $\geq$  [3  $\times$  RBW].
7. Detector = peak.
8. Sweep time = auto.
9. Trace mode = max hold.
10. Allow sweep to continue until the trace stabilizes

### 6.4.3 Measurement Uncertainty:

Measurement Uncertainty	0.75dB
-------------------------	--------

### 6.4.4 Measurement results

#### 802.11b/g mode

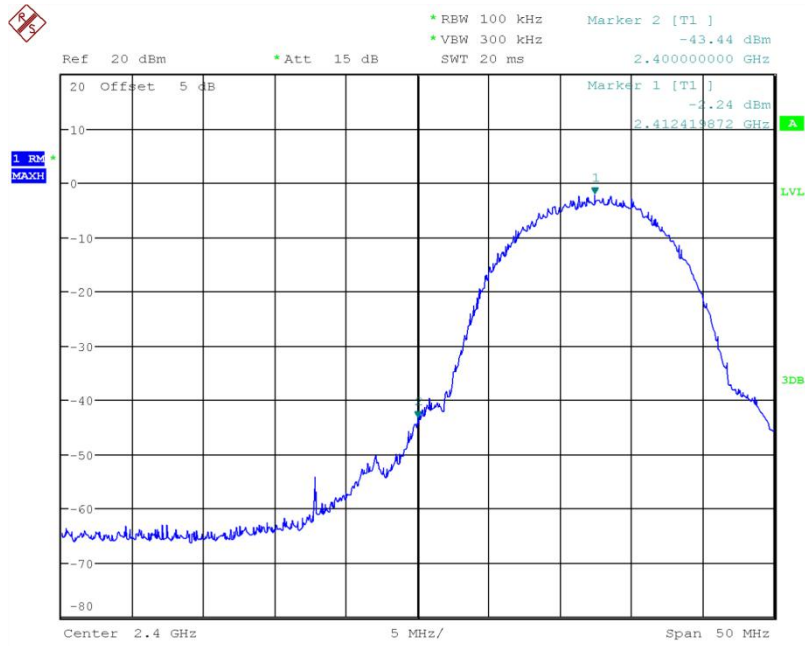
Mode	Channel	Test Results	Conclusion
802.11b	1	Fig 19.	P
	11	Fig 20.	P
802.11g	1	Fig 21.	P
	11	Fig 22.	P

#### 802.11n mode

Mode	Channel	Test Results	Conclusion
802.11n(20MHz)	1	Fig 23.	P
	11	Fig 24.	P

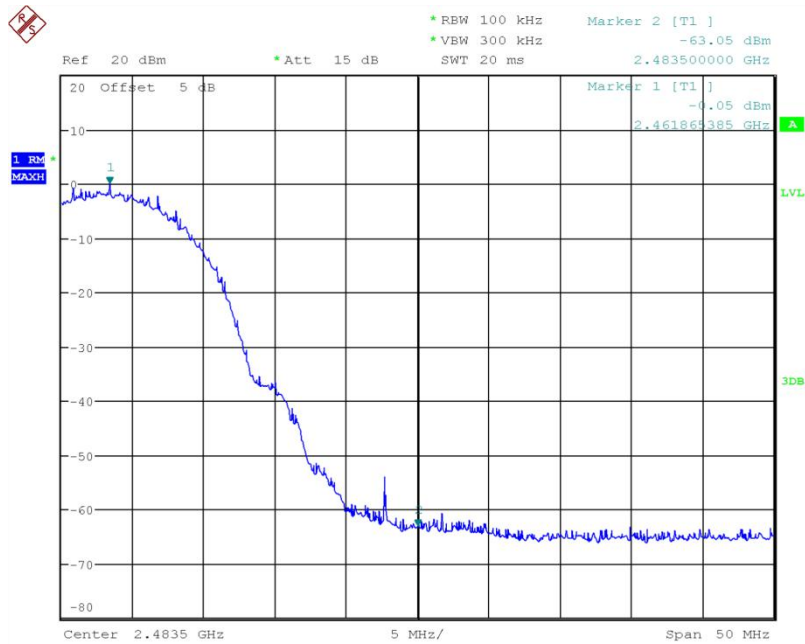
**Conclusion: PASS**

**Test graphs as blew:**



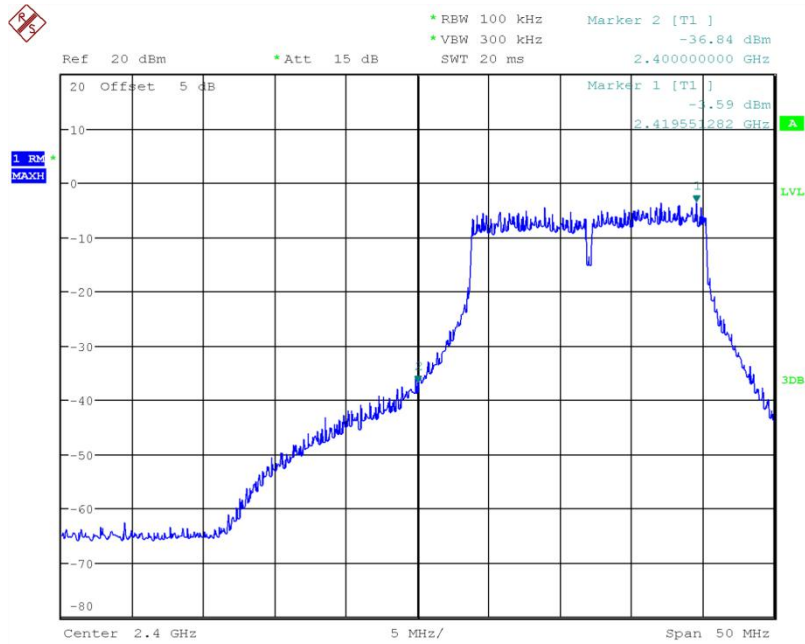
Date: 2.AUG.2018 10:58:56

**Fig.19 Band Edges (802.11b, Ch1)**

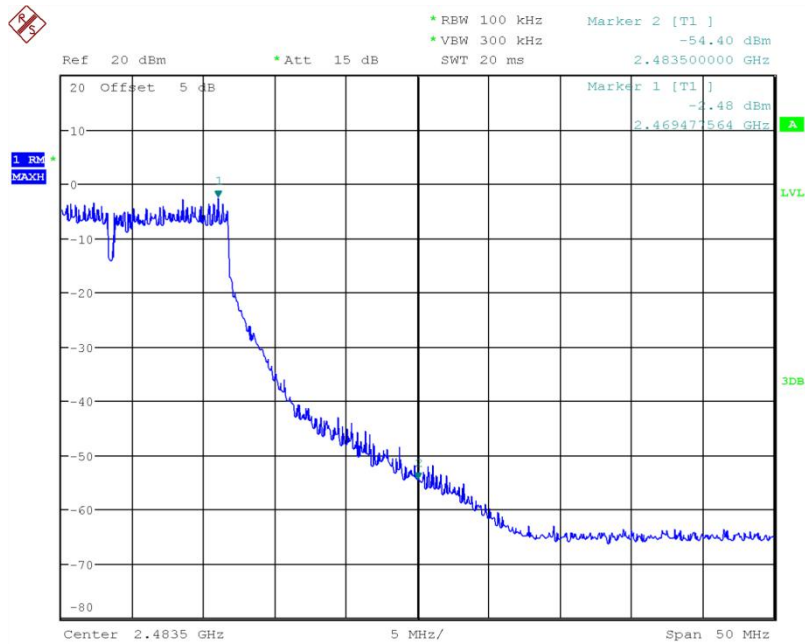


Date: 2.AUG.2018 11:00:01

**Fig.20 Band Edges (802.11b, Ch11)**

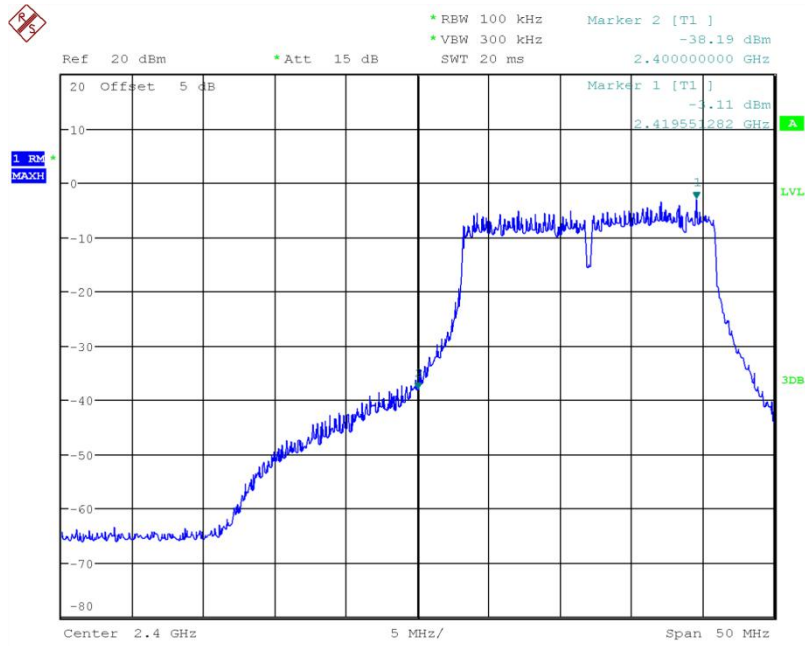


Date: 2.AUG.2018 11:01:01

**Fig.21 Band Edges (802.11g, Ch1)**

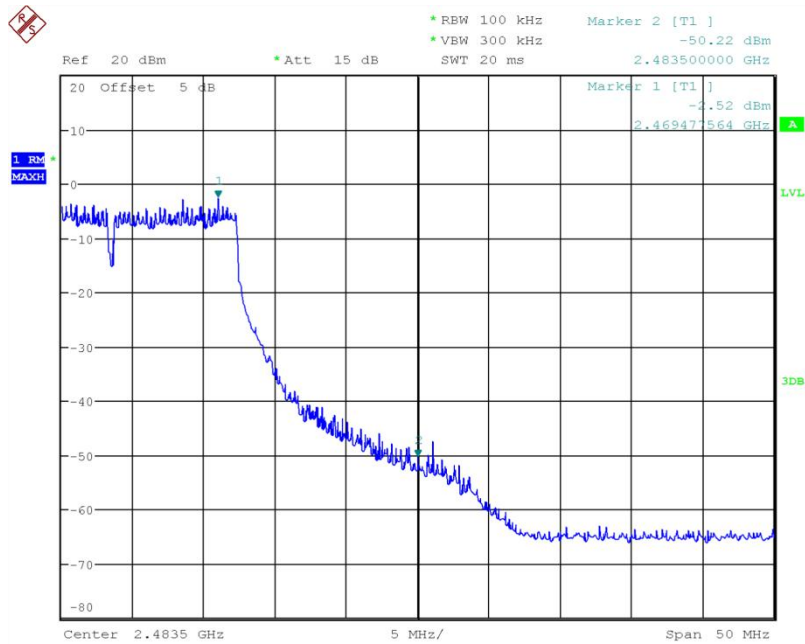
Date: 2.AUG.2018 11:02:03

**Fig.22 Band Edges (802.11g, Ch11)**



Date: 2.AUG.2018 11:03:44

**Fig.23 Band Edges (802.11n-20MHz, Ch1)**



Date: 2.AUG.2018 11:04:43

**Fig.24 Band Edges (802.11b-20MHz, Ch11)**

## 6.5. Transmitter Spurious Emission-conducted

### 6.5.1 Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(d)	20dB below peak output power in 100KHz bandwidth

### 6.5.2 Test procedures

This measurement is according to ANSI C63.10 clause 11.11.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.

Reference level measurement

3. Set instrument center frequency to DTS channel center frequency.
4. Set the span to  $\geq 1.5$  times the DTS bandwidth.
5. Set the RBW = 100 kHz.
6. Set the VBW  $\geq [3 \times \text{RBW}]$ .
7. Detector = peak.
8. Sweep time = auto couple.
9. Trace mode = max hold.
10. Allow trace to fully stabilize.
11. Use the peak marker function to determine the maximum PSD level.

Emission level measurement

12. Set the center frequency and span to encompass frequency range to be measured.
13. Set the RBW = 100 kHz.
14. Set the VBW  $\geq [3 \times \text{RBW}]$ .
15. Detector = peak.
16. Sweep time = auto couple.
17. Trace mode = max hold.
18. Allow trace to fully stabilize.
19. Use the peak marker function to determine the maximum amplitude level.

### 6.5.3 Measurement Uncertainty:

Frequency Range	Uncertainty
$30\text{MHz} \leq f \leq 2\text{GHz}$	0.63
$2\text{GHz} \leq f \leq 3.6\text{GHz}$	0.82
$3.6\text{GHz} \leq f \leq 8\text{GHz}$	1.55
$8\text{GHz} \leq f \leq 20\text{GHz}$	1.86
$20\text{GHz} \leq f \leq 22\text{GHz}$	1.90

22GHz≤ f ≤26GHz	2.20
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**6.5.4 Measurement Result:**
**802.11b/g mode**

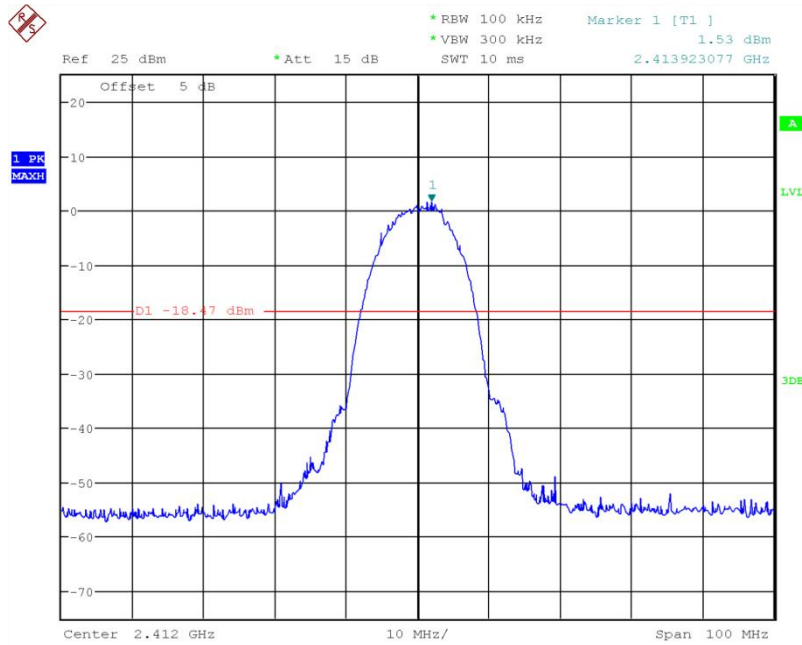
Mode	Channel	Frequency Range	Test Results	Conclusion
802.11b	1	2.412GHz	Fig 25.	P
		30MHz~26GHz	Fig 26.	P
	6	2.437GHz	Fig 27.	P
		30MHz~26GHz	Fig 28.	P
	11	2.462GHz	Fig 29.	P
		30MHz~26GHz	Fig 30.	P
802.11g	1	2.412GHz	Fig 31.	P
		30MHz~26GHz	Fig 32.	P
	6	2.437GHz	Fig 33.	P
		30MHz~26GHz	Fig 34.	P
	11	2.462GHz	Fig 35.	P
		30MHz~26GHz	Fig 36.	P

**802.11n mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n(20MHz)	1	2.412GHz	Fig 37.	P
		30MHz~26GHz	Fig 38.	P
	6	2.437GHz	Fig 39.	P
		30MHz~26GHz	Fig 40.	P
	11	2.462GHz	Fig 41.	P
		30MHz~26GHz	Fig 42.	P

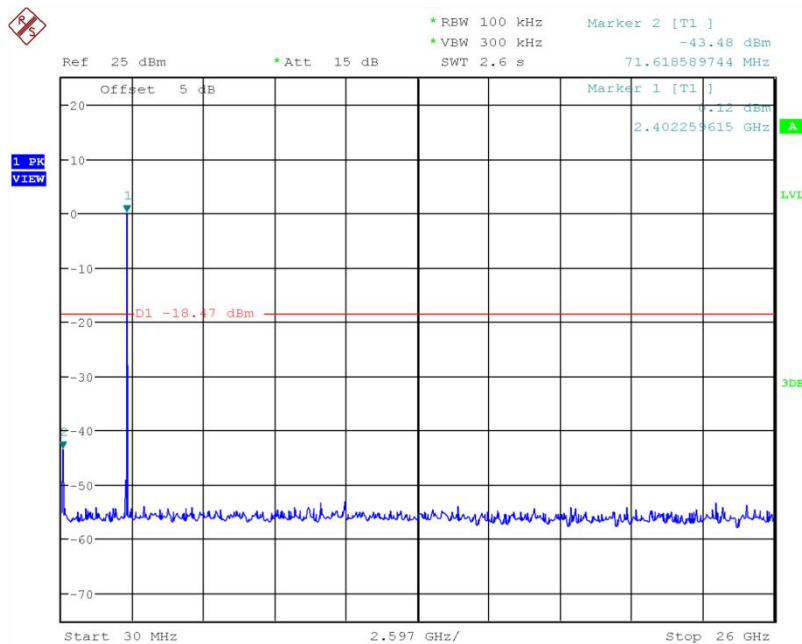
**Conclusion: PASS**

Test graphs as below:



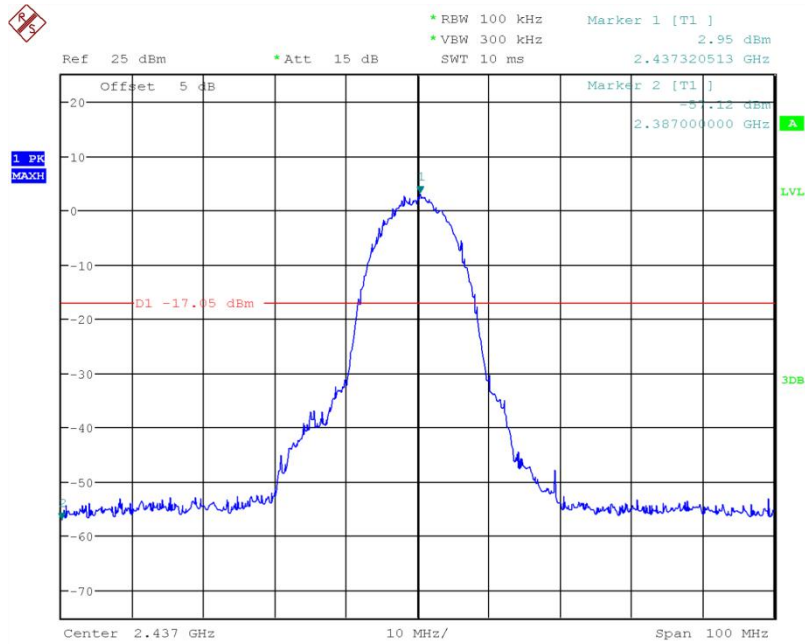
Date: 2.AUG.2018 11:05:57

**Fig.25 Conducted Spurious Emission (802.11b, Ch1)**



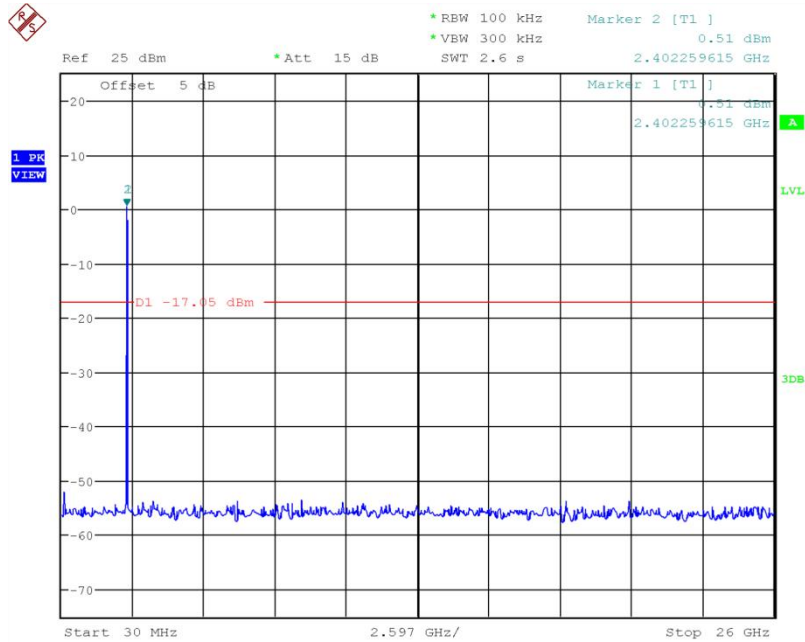
Date: 2.AUG.2018 11:06:16

**Fig.26 Conducted Spurious Emission (802.11b, Ch1, 30MHz~26GHz)**



Date: 2.AUG.2018 11:07:06

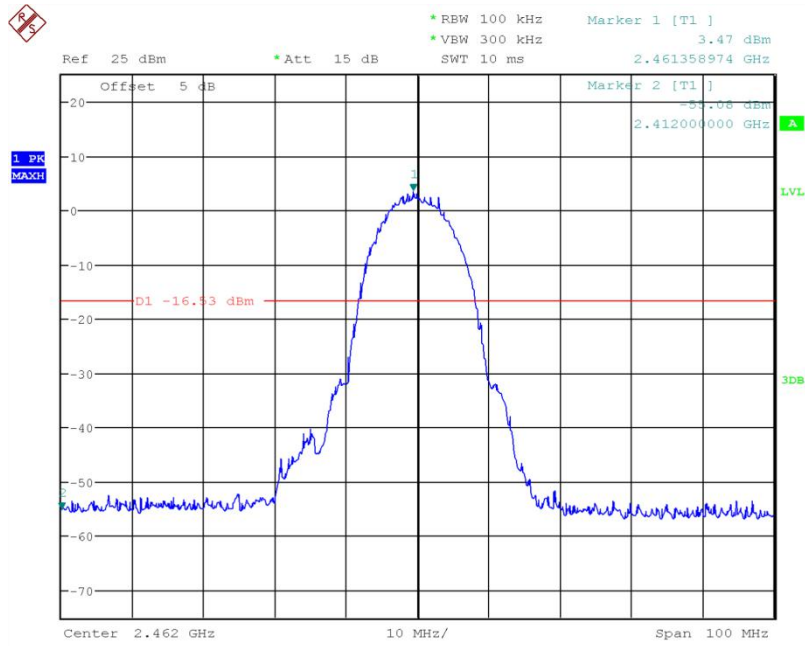
**Fig.27 Conducted Spurious Emission (802.11b, Ch6)**



Date: 2.AUG.2018 11:07:25

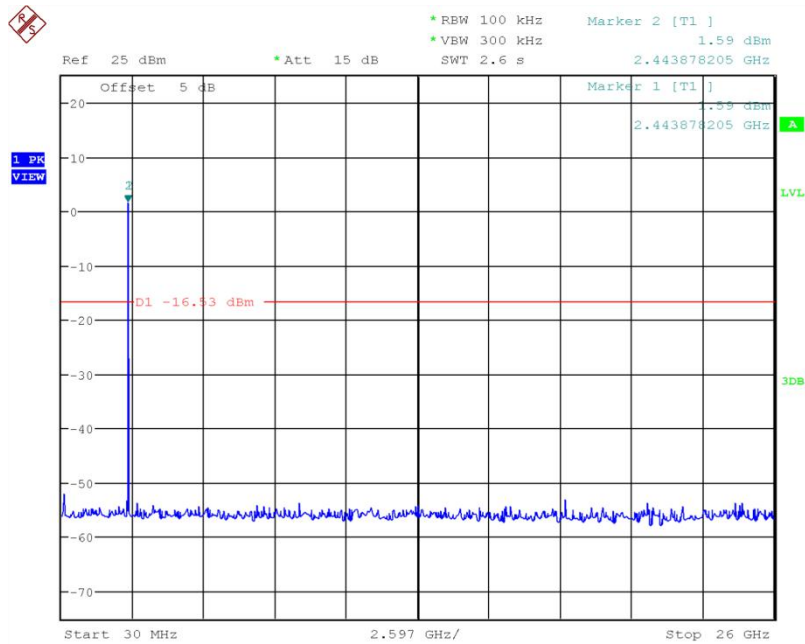
**Fig.28 Conducted Spurious Emission (802.11b, Ch6, 30MHz~26GHz)**





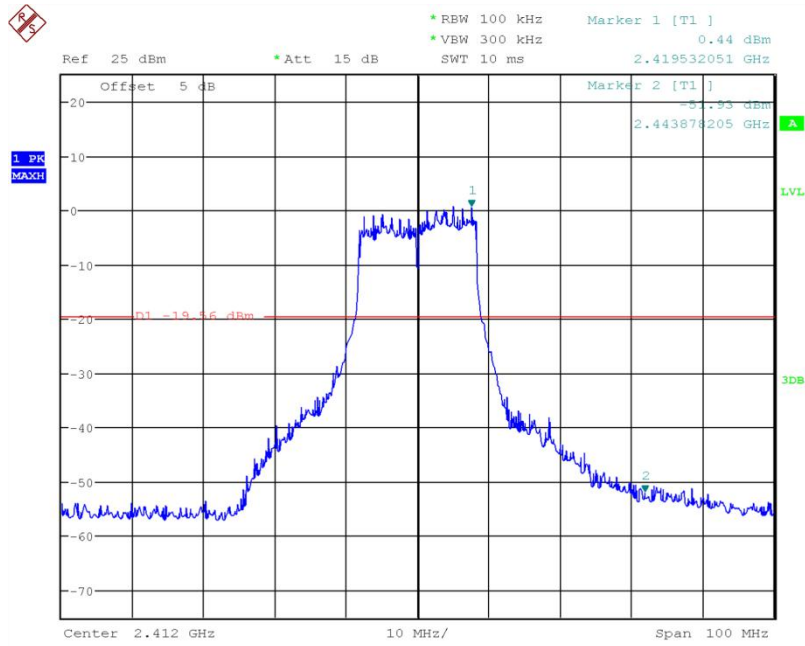
Date: 2.AUG.2018 11:09:38

**Fig.29 Conducted Spurious Emission (802.11b, Ch11)**



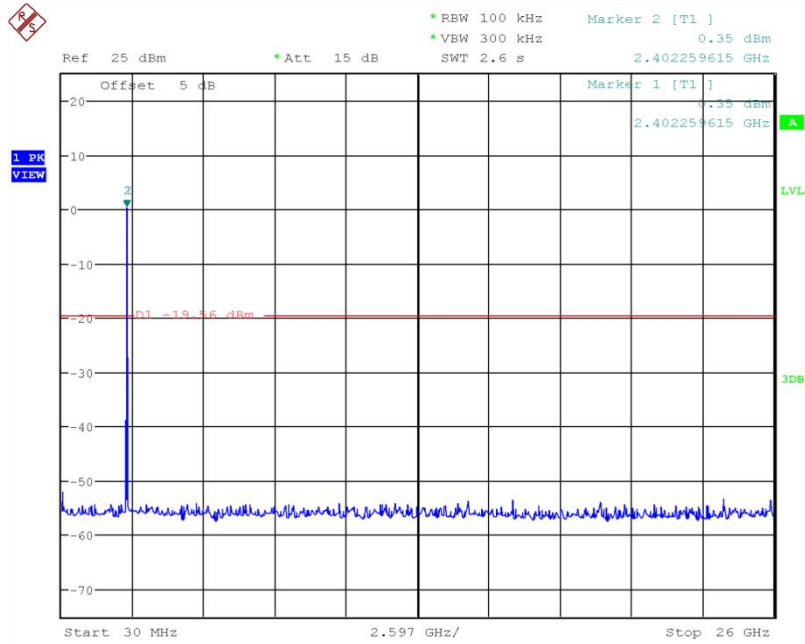
Date: 2.AUG.2018 11:09:57

**Fig.30 Conducted Spurious Emission (802.11b, Ch11, 30MHz~26GHz)**



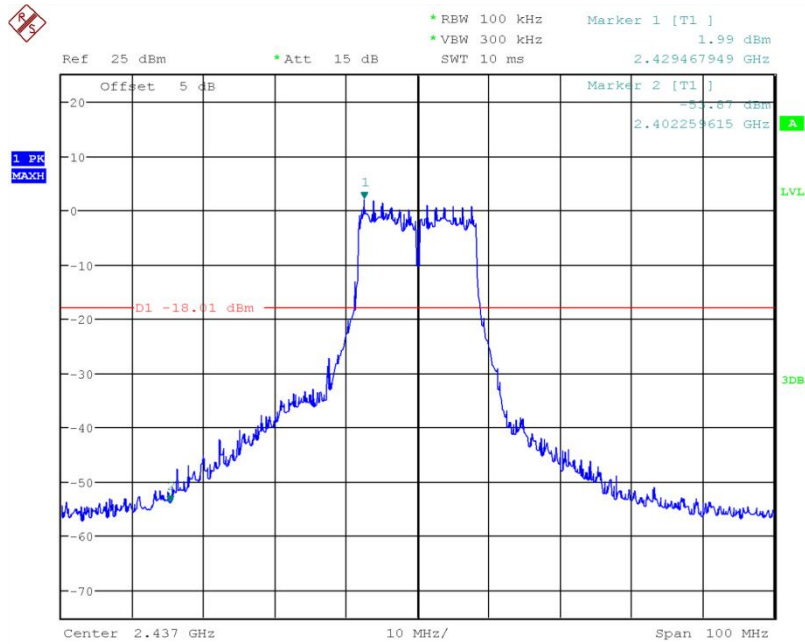
Date: 2.AUG.2018 11:10:45

Fig.31 Conducted Spurious Emission (802.11g, Ch1)



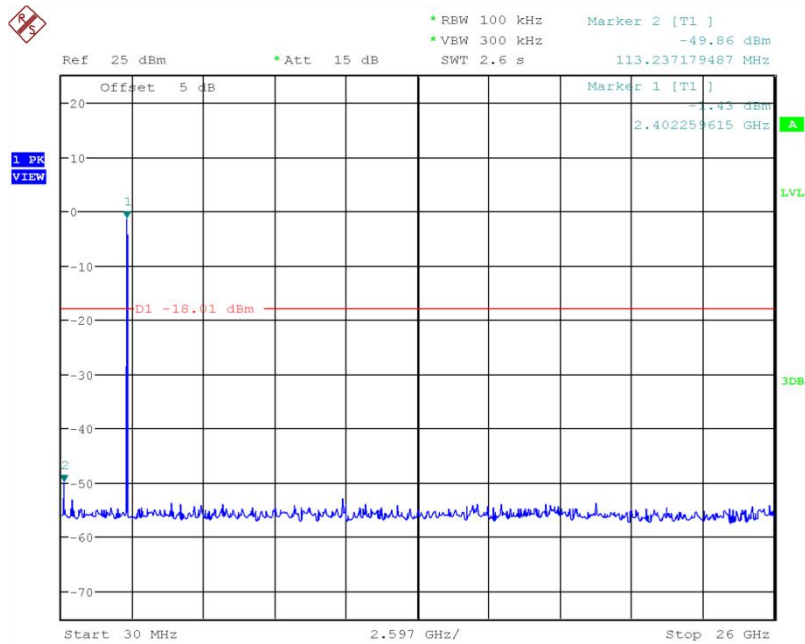
Date: 2.AUG.2018 11:11:04

Fig.32 Conducted Spurious Emission (802.11g, Ch1, 30MHz~26GHz)



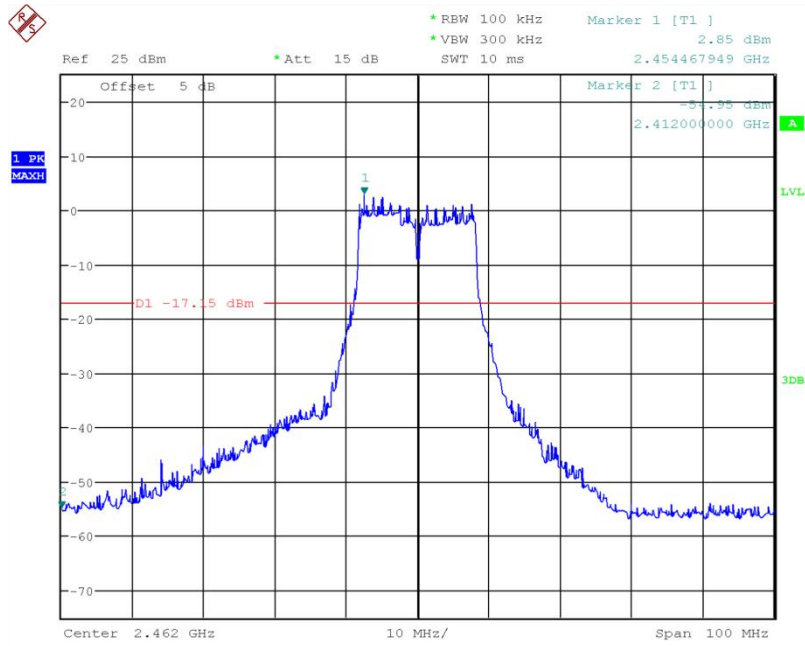
Date: 2.AUG.2018 11:12:51

**Fig.33 Conducted Spurious Emission (802.11g, Ch6)**



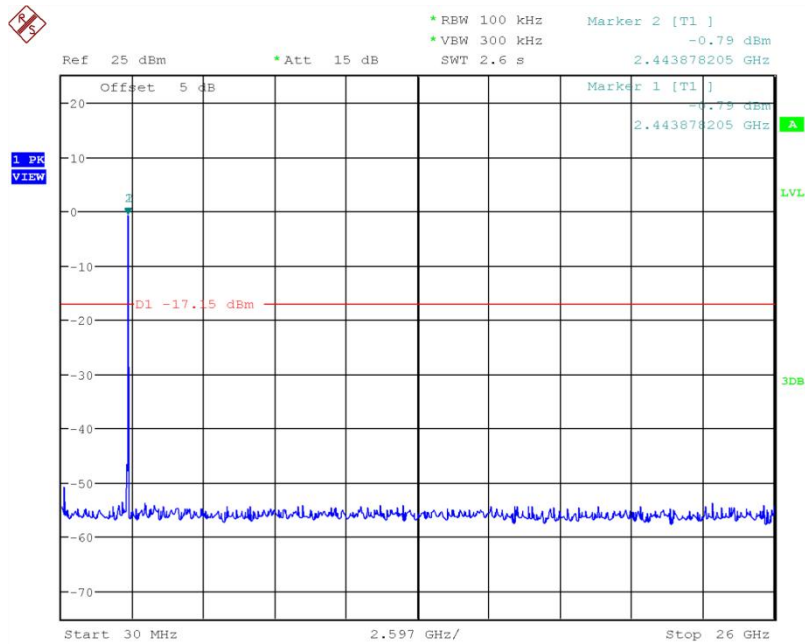
Date: 2.AUG.2018 11:13:10

**Fig.34 Conducted Spurious Emission (802.11g, Ch6, 30MHz~26GHz)**



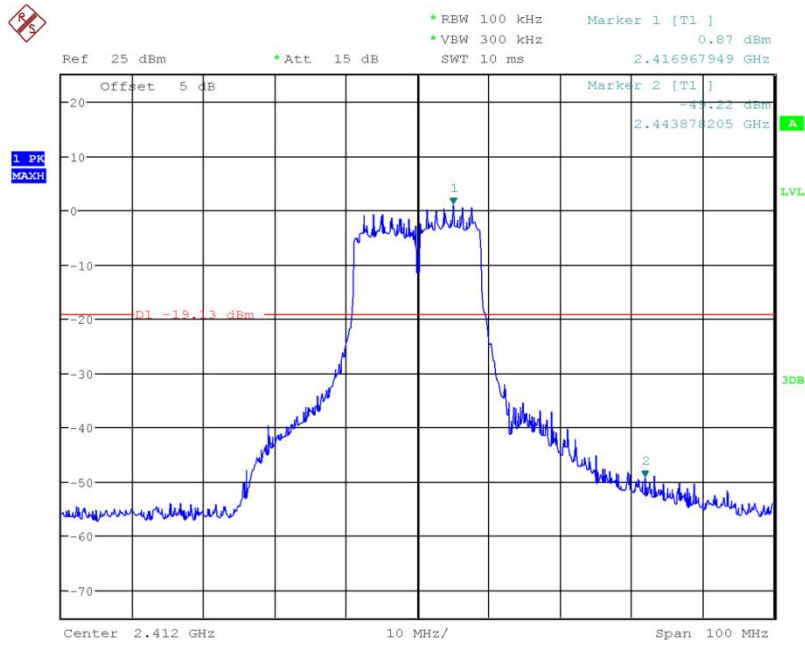
Date: 2.AUG.2018 11:15:37

**Fig.35 Conducted Spurious Emission (802.11g, Ch11)**



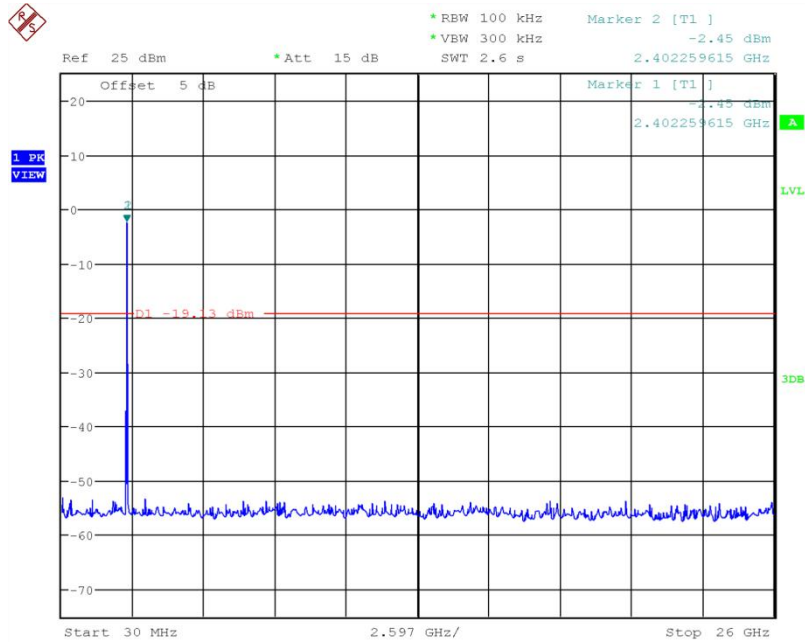
Date: 2.AUG.2018 11:15:56

**Fig.36 Conducted Spurious Emission (802.11g, Ch11, 30MHz~26GHz)**



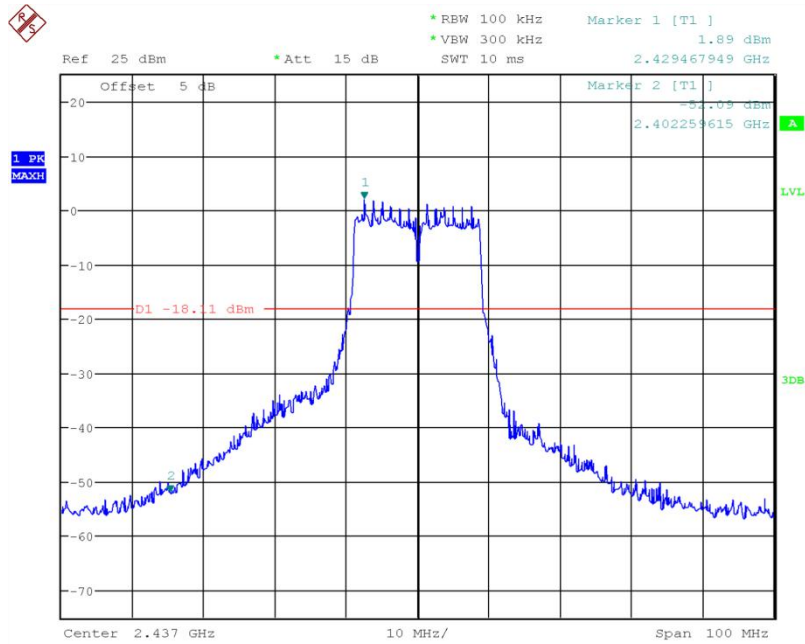
Date: 2.AUG.2018 11:17:20

**Fig.37 Conducted Spurious Emission (802.11n-20MHz, Ch1)**



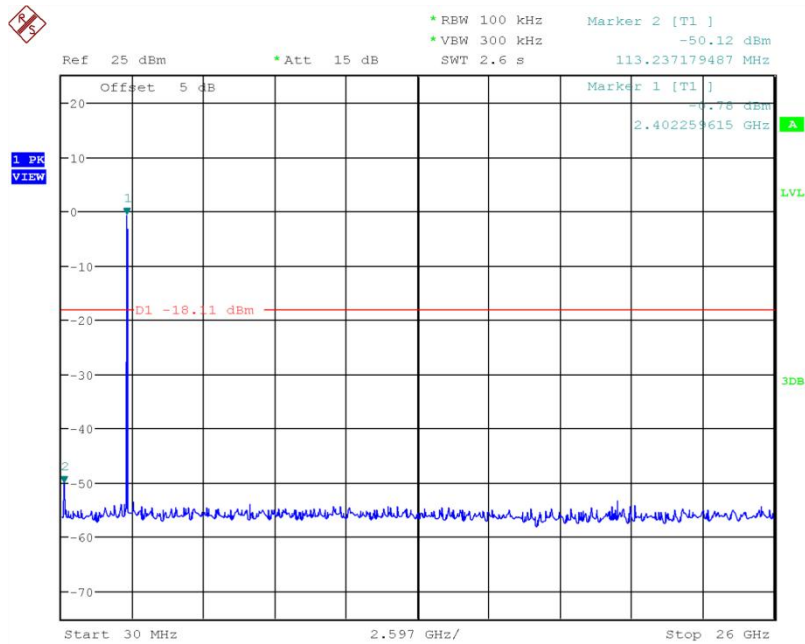
Date: 2.AUG.2018 11:17:38

**Fig.38 Conducted Spurious Emission (802.11n-20MHz, Ch1, 30MHz~26GHz)**



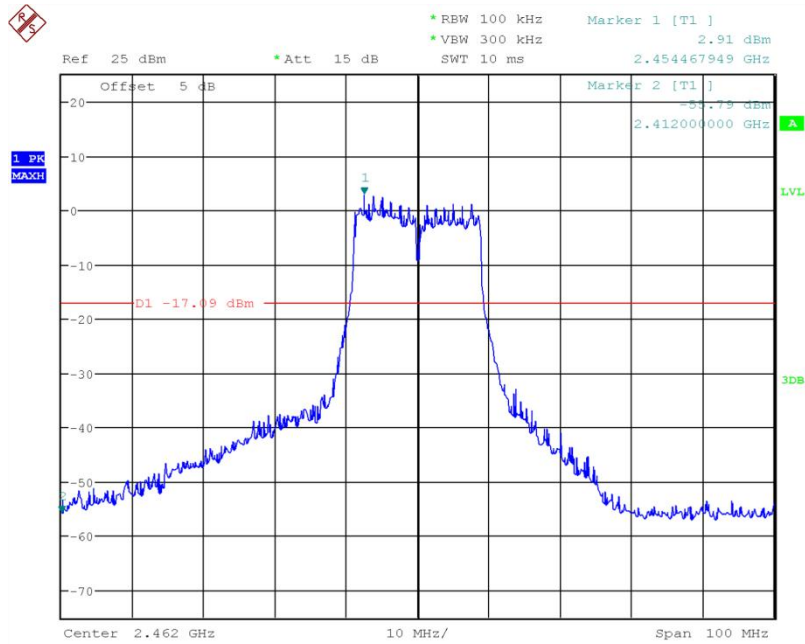
Date: 2.AUG.2018 11:18:24

**Fig.39 Conducted Spurious Emission (802.11n-20MHz, Ch6)**



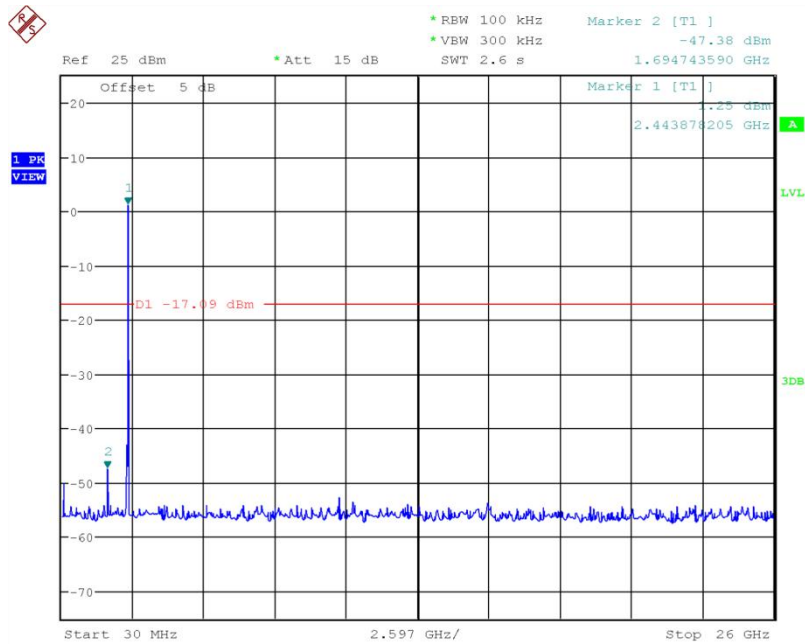
Date: 2.AUG.2018 11:18:43

**Fig.40 Conducted Spurious Emission (802.11n-20MHz, Ch6, 30MHz~26GHz)**



Date: 2.AUG.2018 11:19:27

**Fig.41 Conducted Spurious Emission (802.11n-20MHz, Ch11)**



Date: 2.AUG.2018 11:19:46

**Fig.42 Conducted Spurious Emission (802.11n-20MHz, Ch11, 30MHz~26GHz)**

## 6.6. Transmitter Spurious Emission-Radiated

### 6.6.1 Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247,15.205,15.209	20dB below peak output power

In addition, radiated emissions which fall in the restricted bands, as defined in 25.205(a), must also comply with the radiated emission limits specified in 15.209(a)(see 15.205(c)). The measurement is according to ANSI C63.10 clause 11.11 and 11.12.

### 6.6.2 Limit in restricted band:

Frequency of emission(MHz)	Field strength(uV/m)	Field strength(dBuV/m)
30~88	100	40
88~216	150	43.5
216~960	200	46
Above 960	500	54

### 6.6.3 Test procedures

Portable, small, lightweight, or modular devices that may be handheld, worn on the body, or placed on a table during operation shall be positioned on a nonconducting platform, the top of which is 80 cm above the reference ground plane. The preferred area occupied by the EUT arrangement is 1 m by 1.5 m, but it may be larger or smaller to accommodate various sized EUTs. For testing purposes, ceiling- and wall-mounted devices also shall be positioned on a tabletop (see also ANSI C63.4-2013 section 6.3.4 and 6.3.5). In making any tests involving handheld, body-worn, or ceiling-mounted equipment, it is essential to recognize that the measured levels may be dependent on the orientation (attitude) of the three orthogonal axes of the EUT. Thus, exploratory tests as specified in 8.3.1 shall be carried out for various axes orientations to determine the attitude having maximum or near-maximum emission level.

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During testing, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emission from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Times (s)
30~1000	100KHz/300KHz	5
1000~4000	1MHz/1MHz	15
4000~18000	1MHz/1MHz	40



18000~26500	1MHz/1MHz	20
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**802.11b/g mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11b	Power	2.38GHz~2.45GHz	Fig 43.	P
	Power	2.45GHz~2.5GHz	Fig 44.	P
	11	30MHz~1GHz	Fig 45.	P
		1GHz~3GHz	Fig 46.	P
		3GHz~18GHz	Fig 47.	P
802.11g	Power	2.38GHz~2.45GHz	Fig 48.	P
	Power	2.45GHz~2.5GHz	Fig 49.	P
	11	30MHz~1GHz	Fig 50.	P
		1GHz~3GHz	Fig 51.	P
		3GHz~18GHz	Fig 52.	P

**802.11n mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n(20MHz)	Power	2.38GHz~2.45GHz	Fig 53.	P
	Power	2.45GHz~2.5GHz	Fig 54.	P
	11	30MHz~1GHz	Fig 55.	P
		1GHz~3GHz	Fig 56.	P
		3GHz~18GHz	Fig 57.	P

**Conclusion: PASS**

**Note:**

A "reference path loss" is established and  $A_{Rpi}$  is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

$P_{Mea}$  is the field strength recorded from the instrument.

The measurement results are obtained as described below:

$AR_{pi} = \text{Cable loss} + \text{Antenna Gain} - \text{Preamplifier gain}$

Result =  $P_{Mea} + \text{Cable loss} + \text{Antenna Gain} - \text{Preamplifier gain} = P_{Mea} + AR_{pi}$  .

**802.11b mode**
**Ch11 30MHz~1GHz**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
36.3	10.96	-21.6	32.56	V
73.4	14.35	-25.8	40.15	V
122.9	14.65	-25.9	40.55	V
185.2	16.78	-24.9	41.68	H
271.5	12.96	-22.6	35.56	H
399.7	15.99	-19.1	35.09	H

**Ch11 1GHz~3GHz(Peak)**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
1994.3	54.99	1.6	53.39	H
2598.5	54.91	7.3	47.61	V
2712.1	54.06	7.8	46.26	H
2793.8	54.32	7.9	46.42	V
2893.3	54.66	8.8	45.86	H
2937.2	55.66	8.7	46.96	H

**Ch11 1GHz~3GHz(Average)**

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
1994.3	36.13	1.6	34.53	H
2598.5	41.86	7.3	34.56	V
2712.1	42.13	7.8	34.33	H
2793.8	42.36	7.9	34.46	V
2893.3	43.21	8.8	34.41	H
2937.2	43.34	8.7	34.64	H

**Ch11 3GHz~18GHz(Peak)**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
14305.9	55.78	20.7	35.08	H
14729.9	54.53	21	33.53	H
15512.7	54.83	22.6	32.23	V
16159.4	58.23	24.9	33.33	V
16864.3	60.66	27.4	33.26	V
17573.9	59.53	27.7	31.83	H

**Ch11 3GHz~18GHz(Average)**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
14305.9	42.58	20.7	21.88	H
14729.9	42.83	21	21.83	H
15512.7	43.35	22.6	20.75	V
16159.4	46.09	24.9	21.19	V
16864.3	48.24	27.4	20.84	V
17573.9	47.83	27.7	20.13	H

**802.11g**
**Ch11 30MHz~1GHz**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
34.4	16.17	-22	38.17	V
74.7	13.65	-26.1	39.75	V
122.9	14.01	-25.9	39.91	V
237.7	15.53	-23.1	38.63	H
264.7	15.84	-22.6	38.44	H
729.4	20.35	-12.2	32.55	H

**Ch11 1GHz~3GHz**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
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2605.7	54.24	7.3	46.94	V
2656.9	54.29	7.7	46.59	H
2765.4	54.38	7.8	46.58	H
2889.0	56.16	8.8	47.36	H
2935.0	56.18	8.7	47.48	V
2988.3	57.85	8.9	48.95	H

**Ch11 1GHz~3GHz(Average)**

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
2605.7	41.81	7.3	34.51	V
2656.9	42.4	7.7	34.7	H
2765.4	42.05	7.8	34.25	H
2889.0	43.16	8.8	34.36	H
2935.0	43.38	8.7	34.68	V
2988.3	43.33	8.9	34.43	H

**Ch11 3GHz~18GHz(Peak)**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
12850.6	52.91	16.8	36.11	V
14051.7	52.9	18.6	34.3	V
14703.1	55.79	21.1	34.69	H
15976.7	58.76	25.1	33.66	V
16905.0	60.54	27.5	33.04	V
17653.2	60.05	27.4	32.65	H

**Ch11 3GHz~18GHz(Average)**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
14703.1	43.11	21.1	22.01	H
15976.7	46.61	25.1	21.51	V
16905.0	48.35	27.5	20.85	V

17653.2	48.03	27.4	20.63	H
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**802.11n-20MHz**
**Ch11 30MHz~1GHz**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
36.4	16.94	-21.6	38.54	V
74.7	14.21	-26.1	40.31	V
122.9	14.11	-25.9	40.01	V
260.1	16.11	-22.6	38.71	H
338.8	16.75	-20.9	37.65	H
644.5	18.9	-13.7	32.6	H

**Ch11 1GHz~3GHz(Peak)**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
2606.1	53.42	7.3	46.12	H
2654.5	53.93	7.7	46.23	H
2743.5	53.79	7.7	46.09	V
2811.1	54.93	8	46.93	V
2887.8	54.84	8.7	46.14	H
2953.3	55.32	8.7	46.62	V

**Ch11 1GHz~3GHz(Average)**

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
2811.1	42.49	8	34.49	V
2887.8	43.09	8.7	34.39	H
2953.3	42.97	8.7	34.27	V

**Ch11 3GHz~18GHz(Peak)**

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
12868.6	51.85	16.9	34.95	V
13694.5	52.77	17.6	35.17	V

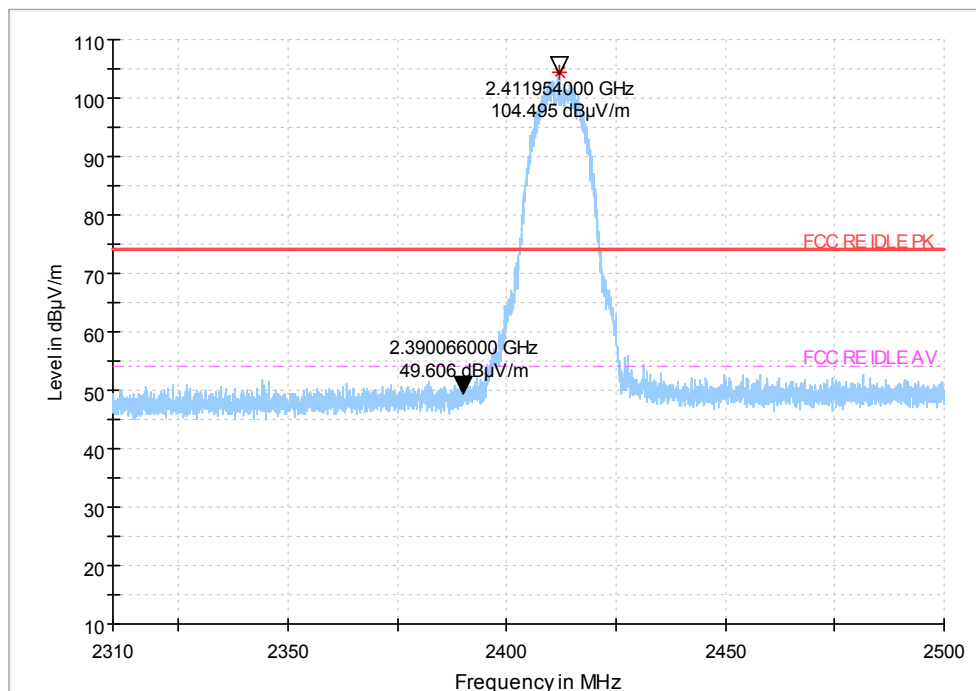
14656.0	54.1	20.6	33.5	V
15133.3	55.3	21.2	34.1	V
15687.6	56.78	23.2	33.58	H
16909.8	60.4	27.4	33	V

#### Ch11 3GHz~18GHz(Average)

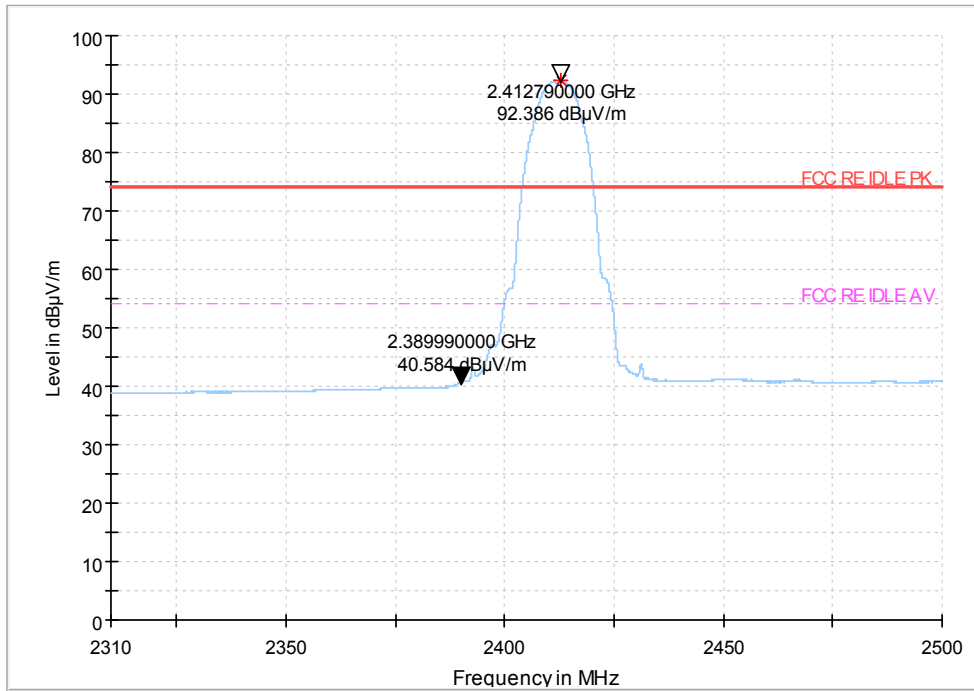
Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
14656.0	42.48	20.6	21.88	V
15133.3	42.79	21.2	21.59	V
15687.6	44.82	23.2	21.62	H
16909.8	48.36	27.4	20.96	V

**Note: Only the worst case is written in the report.**

**Test graphs as below:**

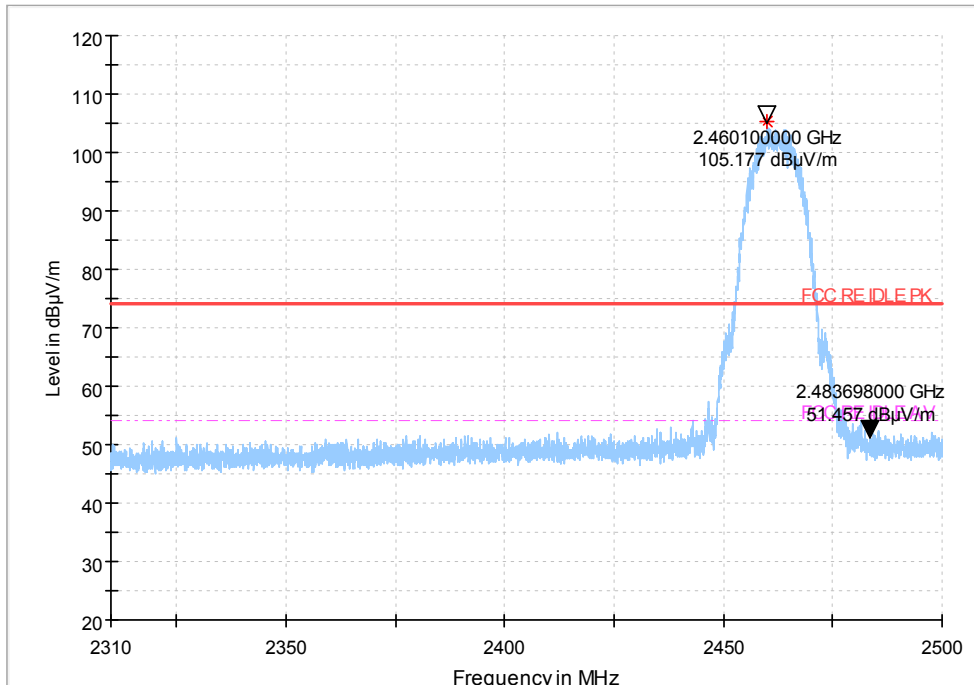


**Peak detector**

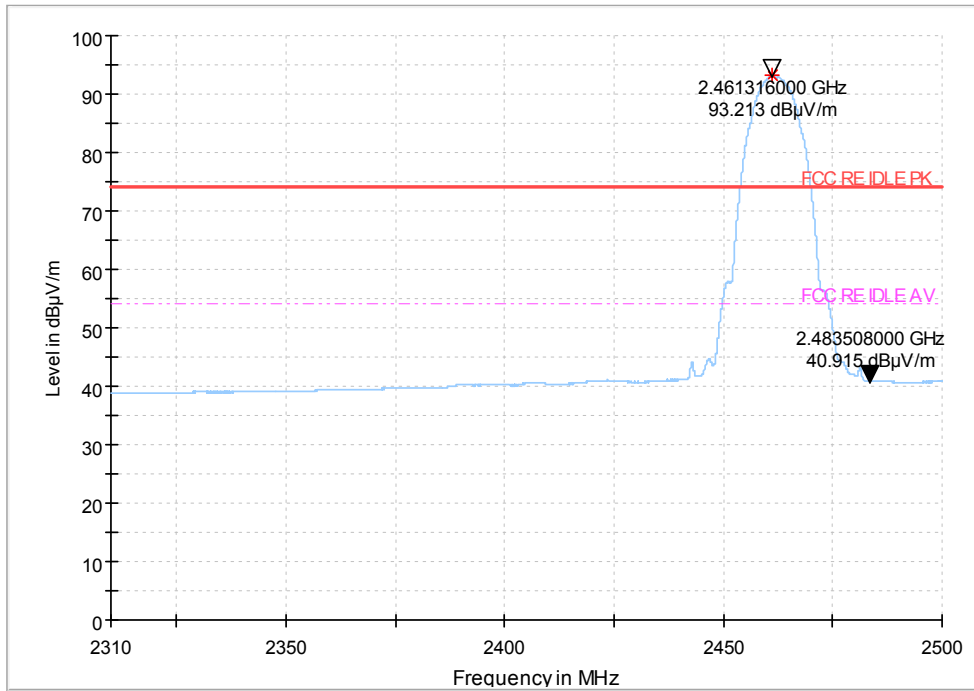


**AV detector**

**Fig.43 Radiated emission (Power): 802.11b, low channel**

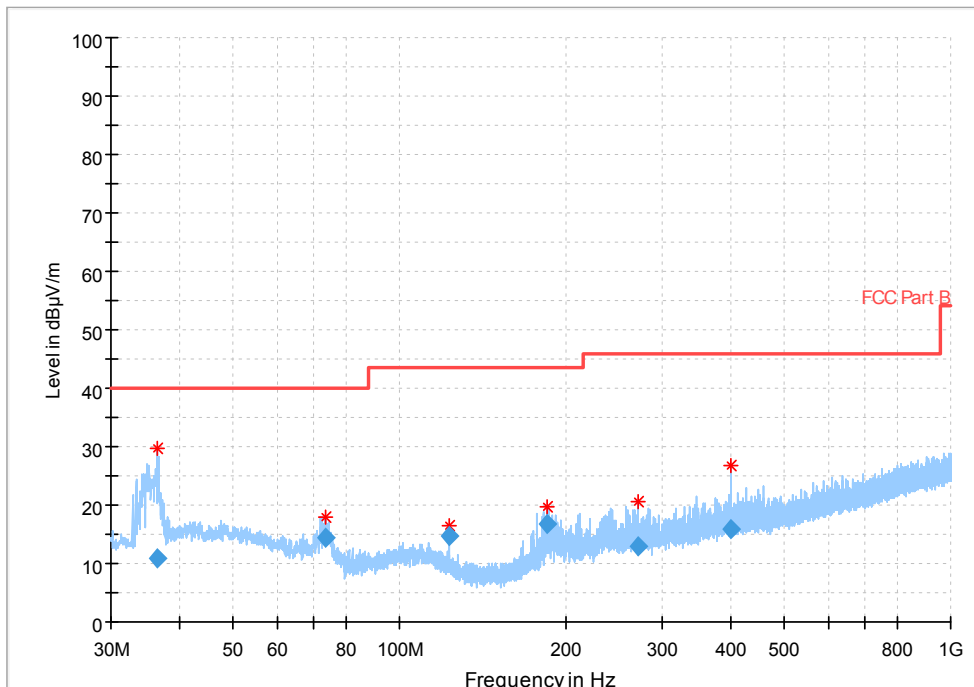


**Peak detector**



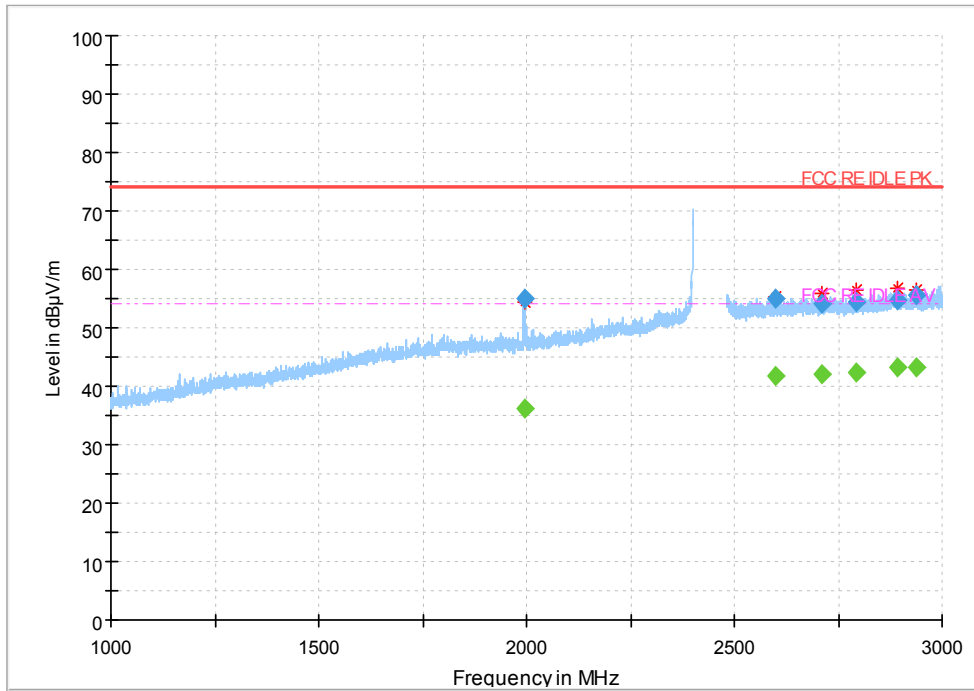
**AV detector**

**Fig.44 Radiated emission (Power): 802.11b, high channel**

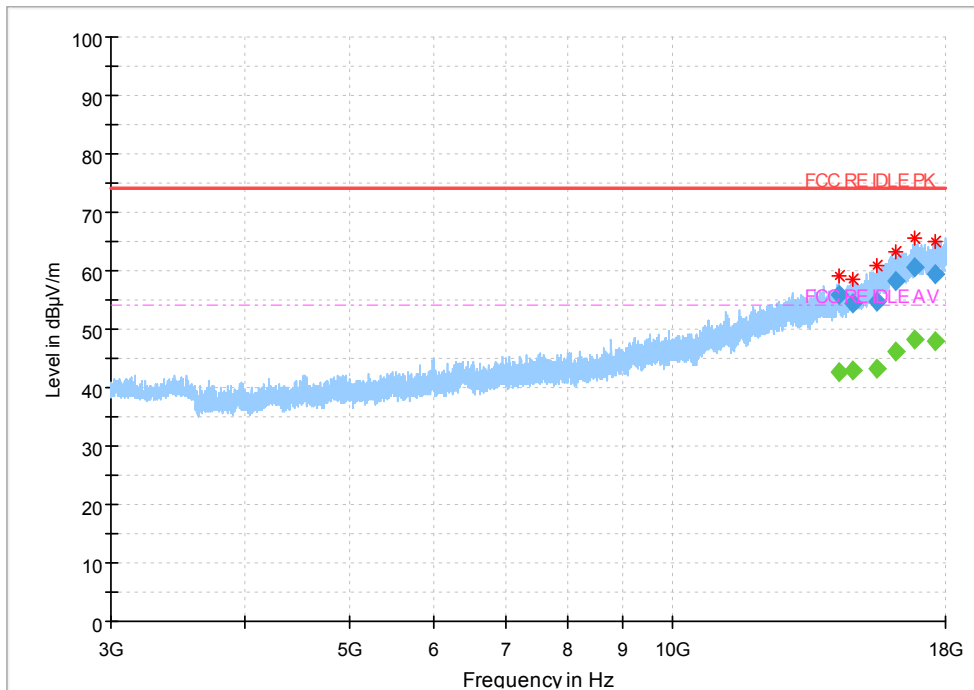


**Fig.45 Radiated Spurious Emission (802.11b,Ch11,30MHz~1GHz)**

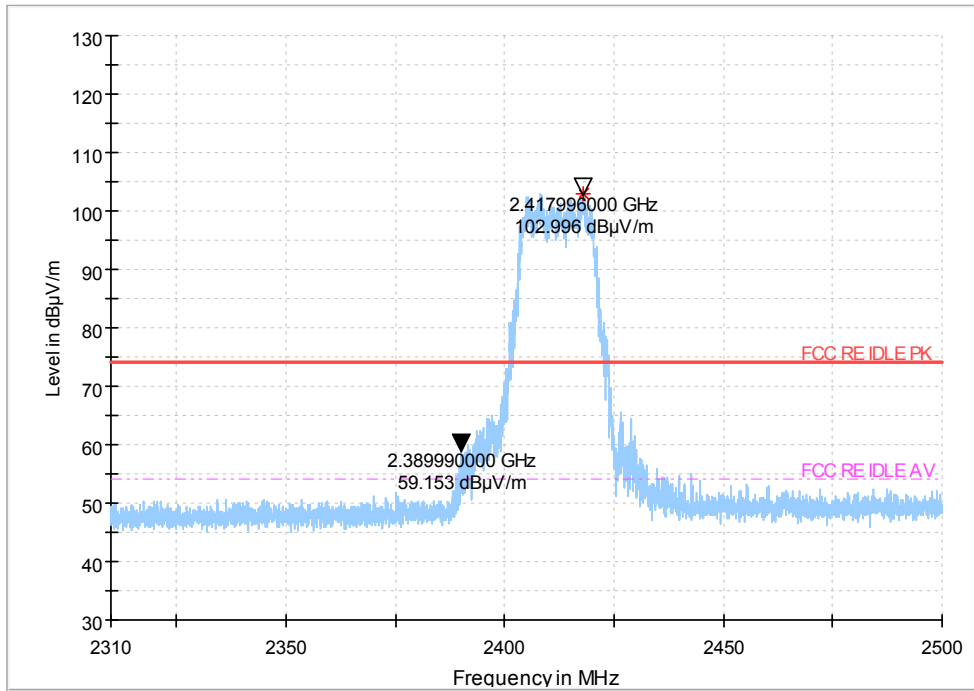




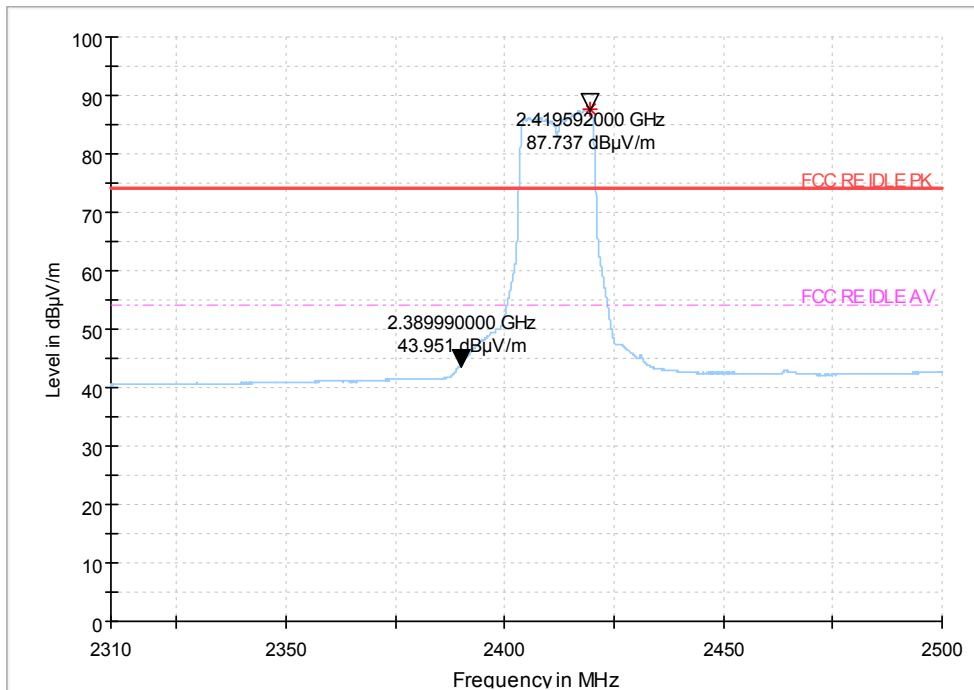
**Fig.46 Radiated Spurious Emission (802.11b,Ch11,1GHz~3GHz)**



**Fig.47 Radiated Spurious Emission (802.11b,Ch11,3GHz~18GHz)**

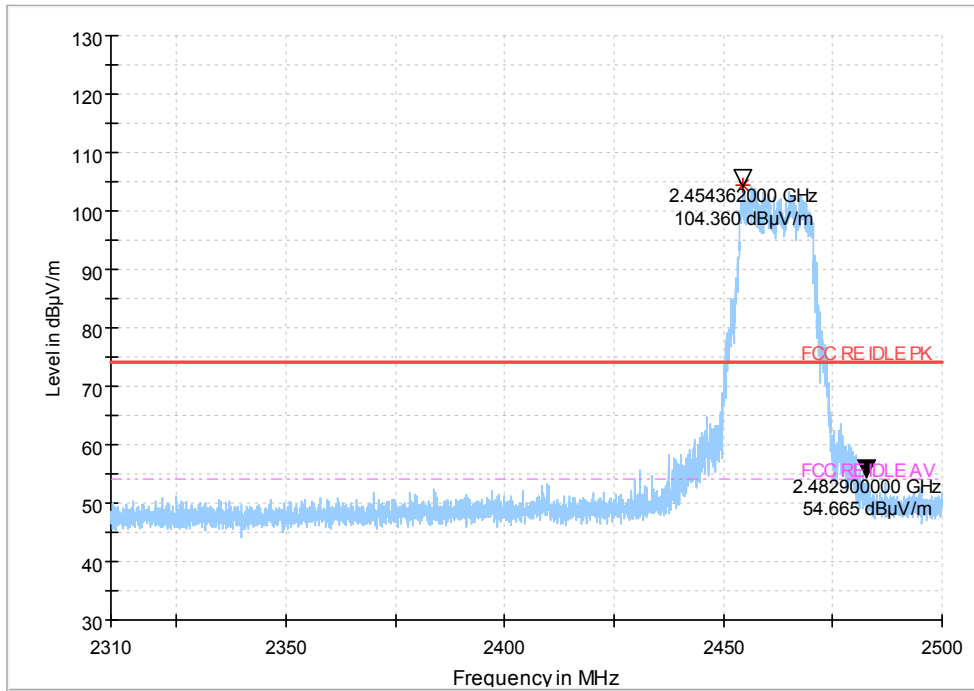


**Peak detector**

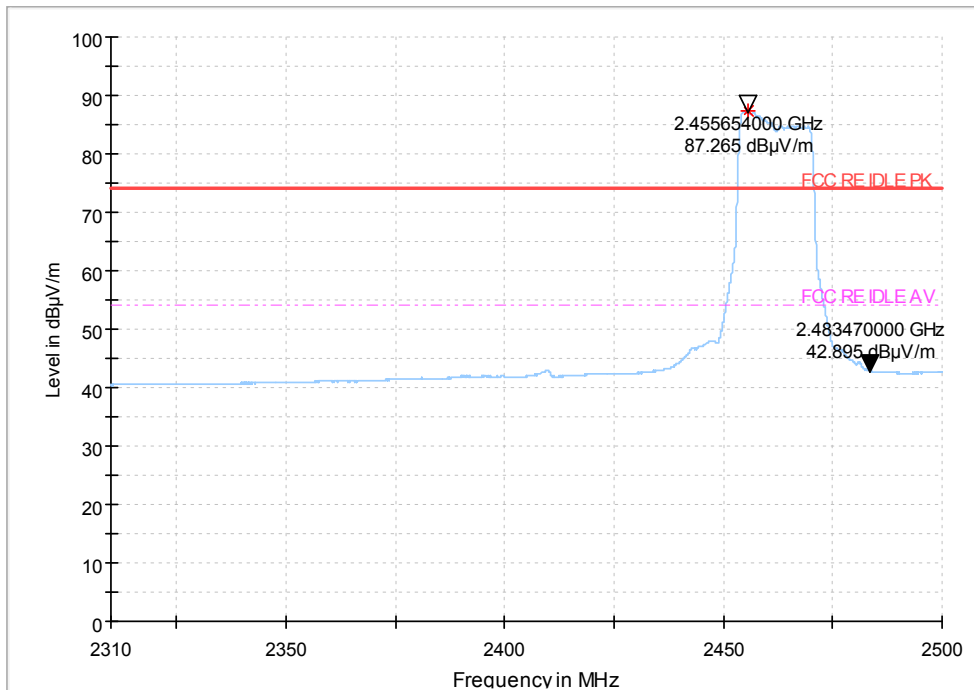


**AV detector**

**Fig.48 Radiated emission (Power): 802.11g, low channel**

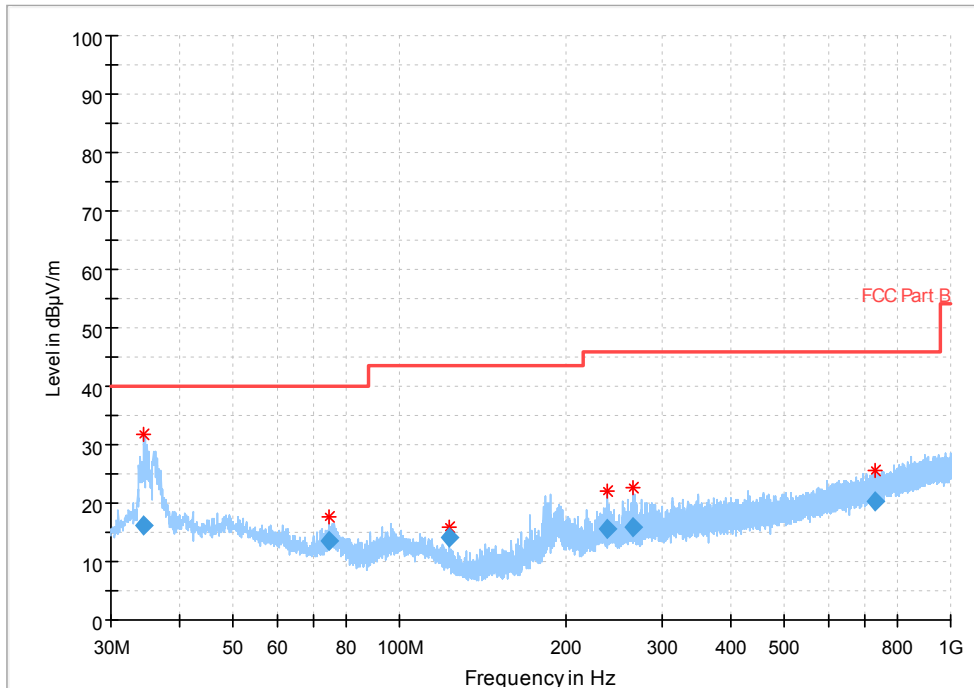


**Peak detector**

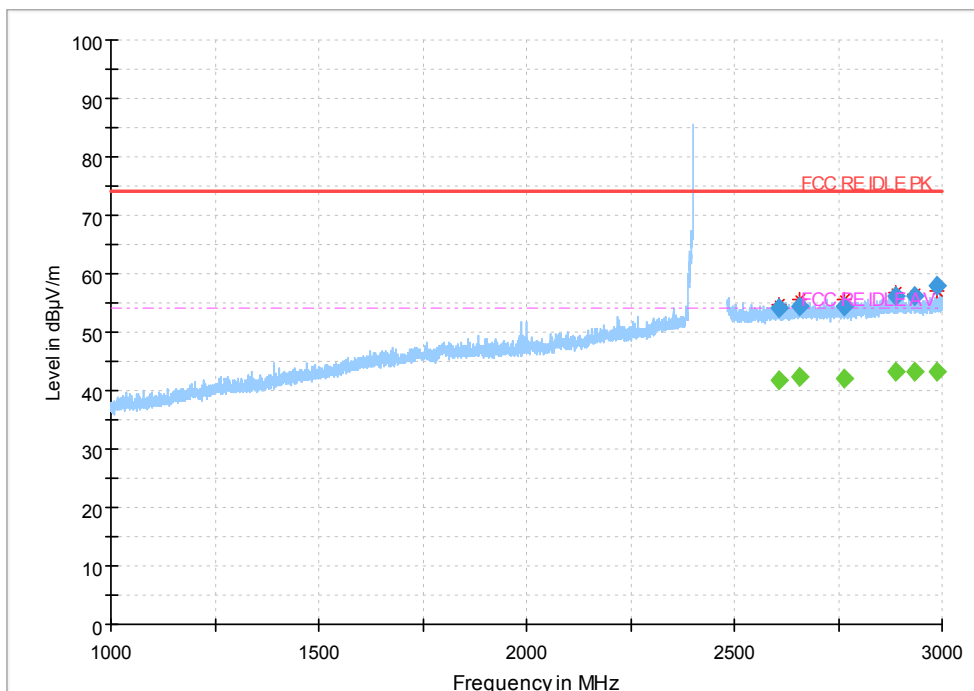


**AV detector**

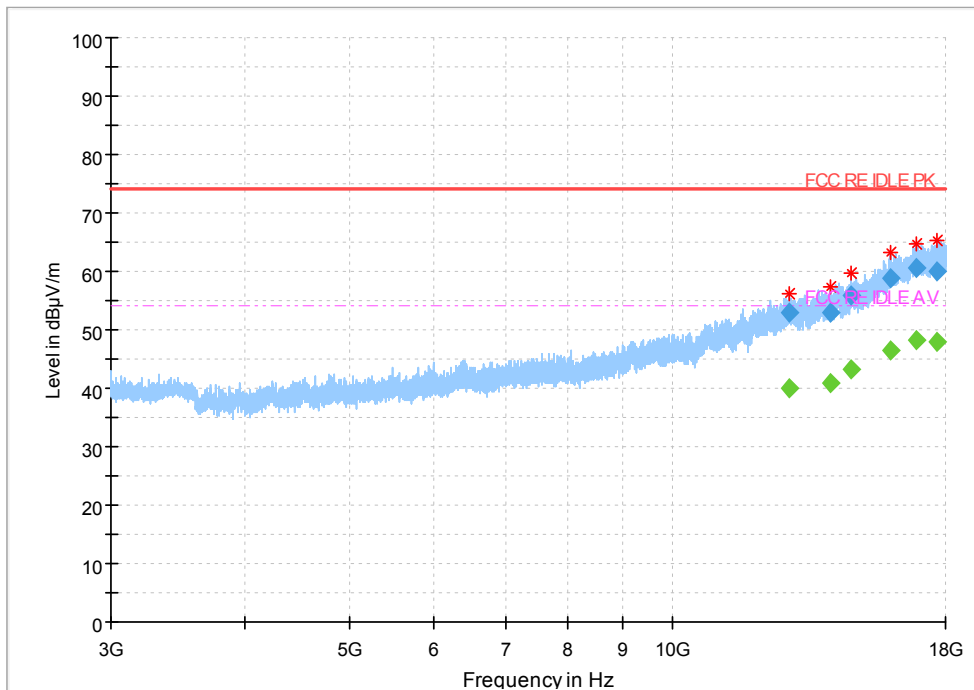
**Fig.49 Radiated emission (Power): 802.11g, high channel**



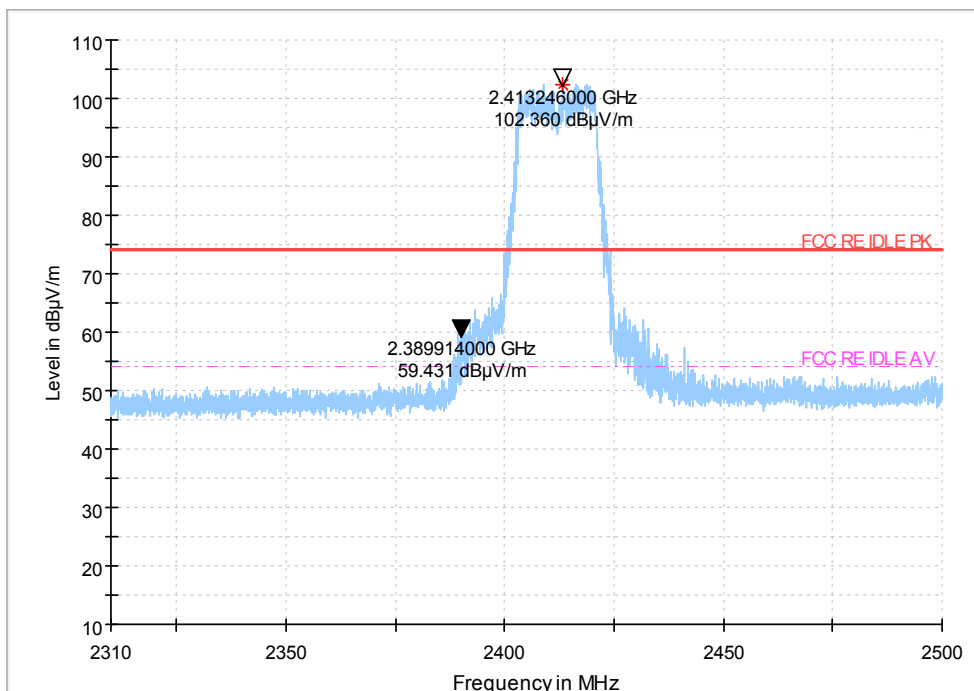
**Fig.50 Radiated Spurious Emission (802.11g,Ch11,30MHz~1GHz)**



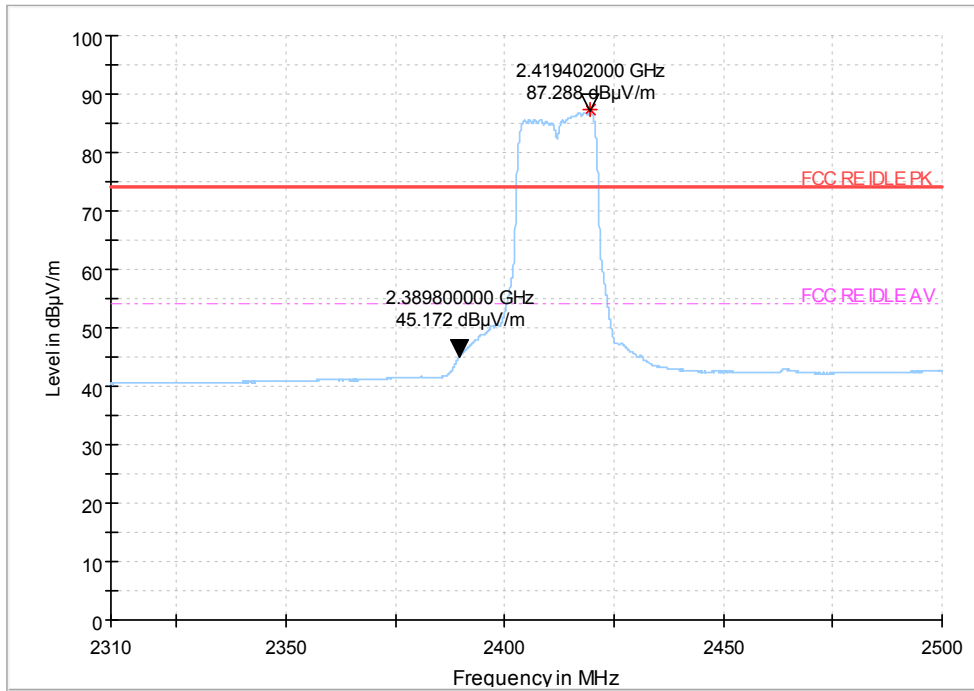
**Fig.51 Radiated Spurious Emission (802.11g,Ch11,1GHz~3GHz)**



**Fig.52 Radiated Spurious Emission (802.11g,Ch11,3GHz~18GHz)**

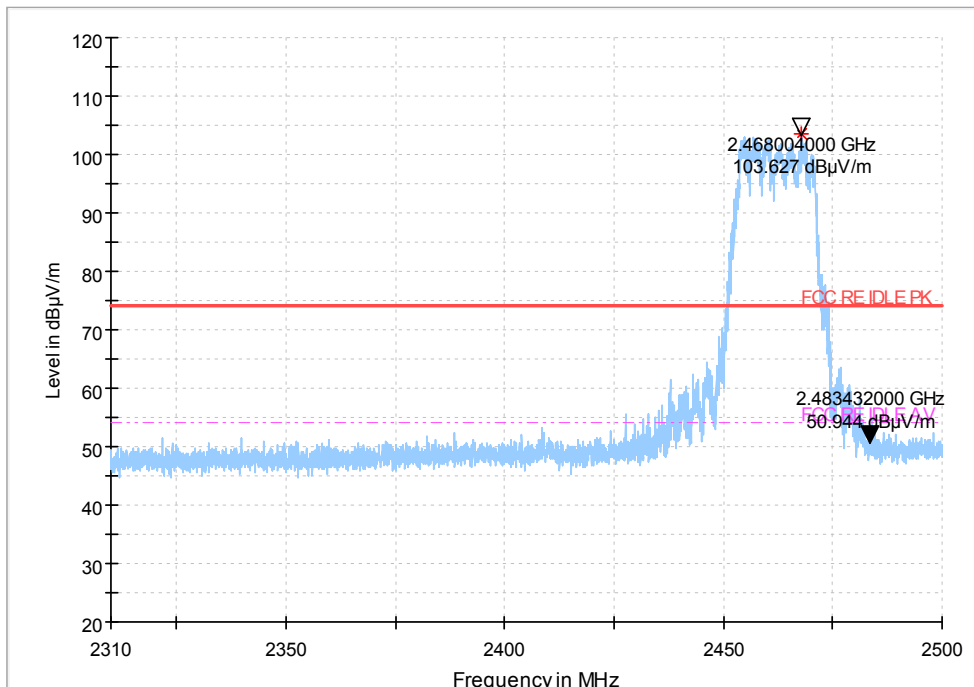


**Peak detector**

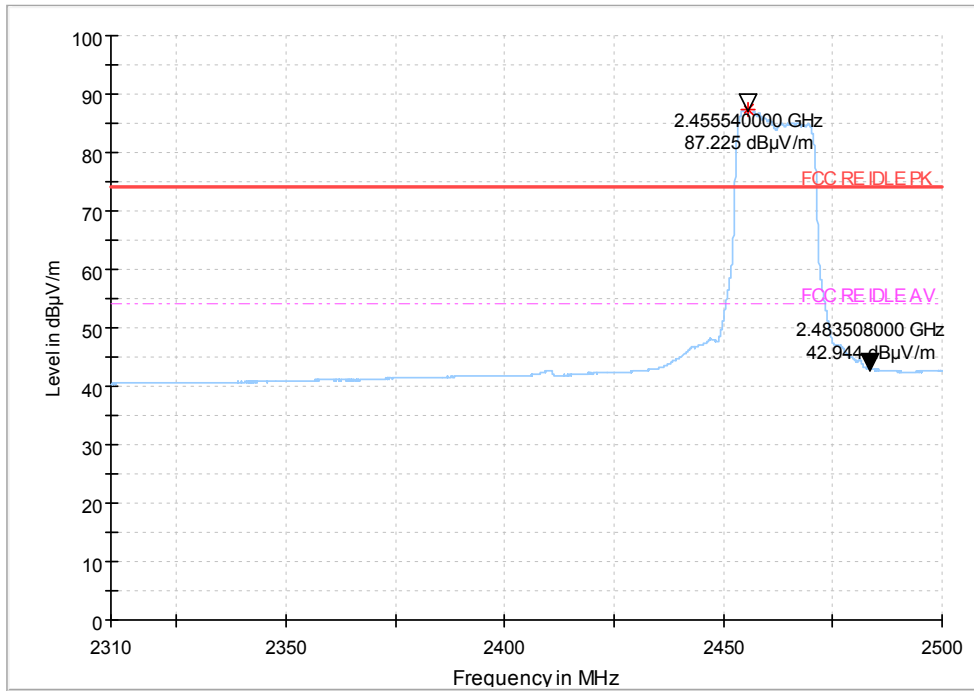


**AV detector**

**Fig.53 Radiated emission (Power): 802.11n, low channel**

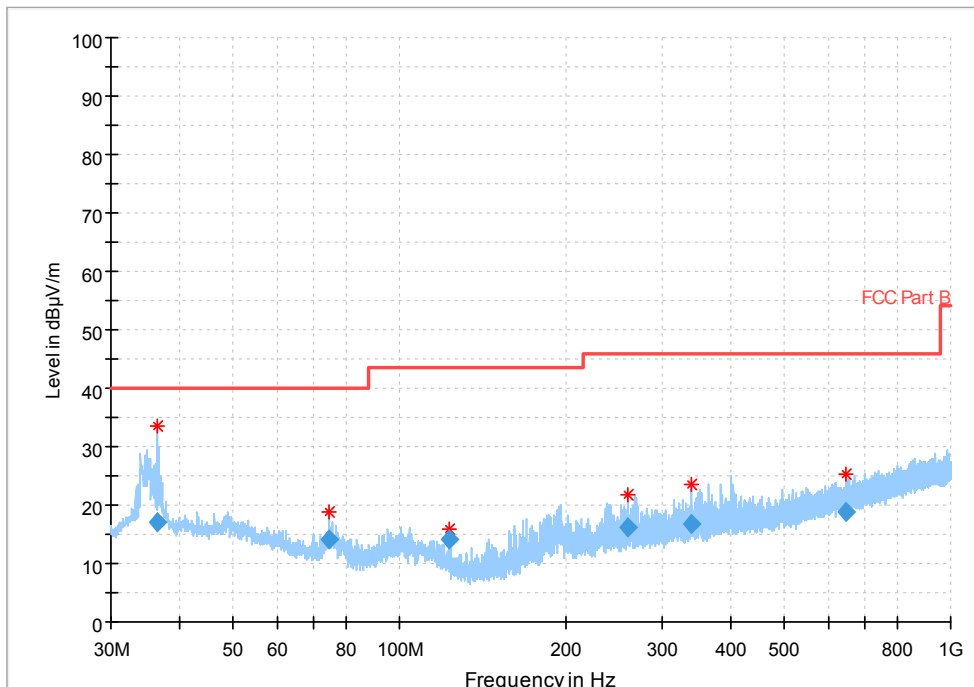


**Peak detector**

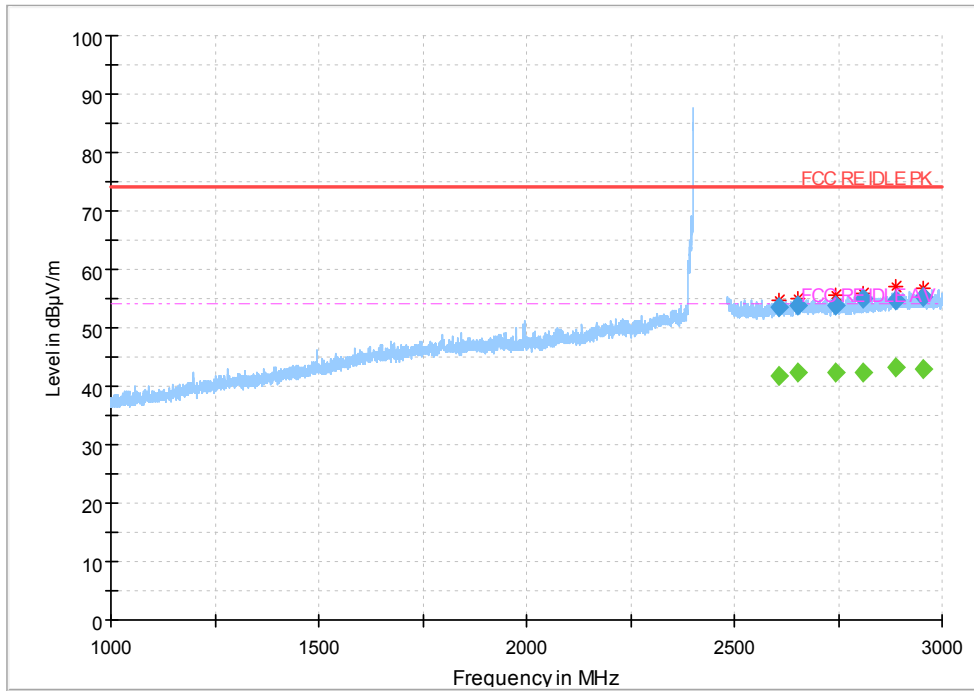


**AV detector**

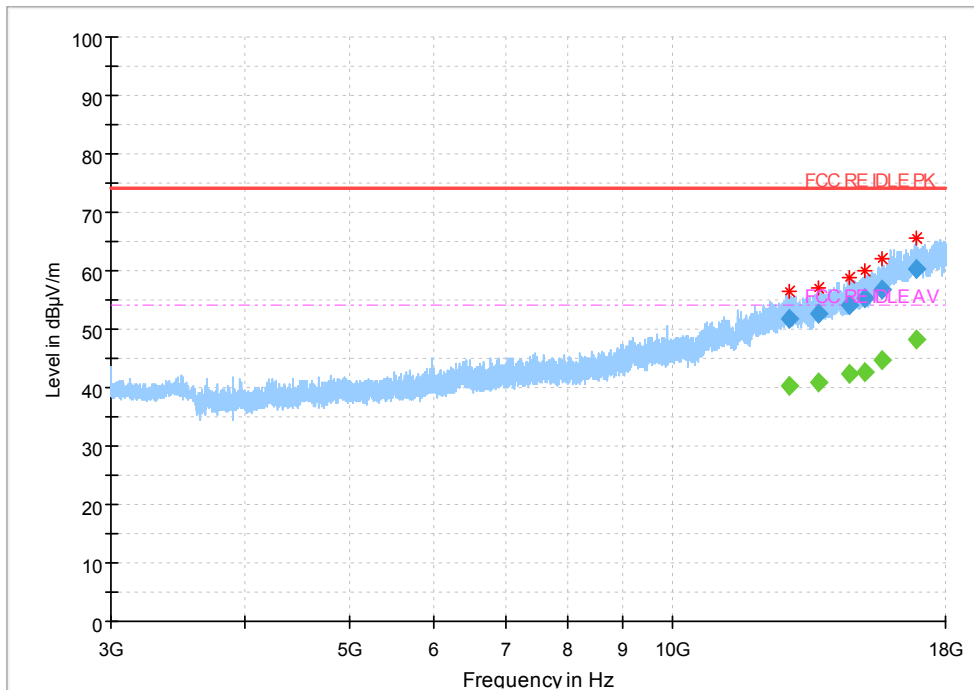
**Fig.54 Radiated emission (Power): 802.11n, high channel**



**Fig.55 Radiated Spurious Emission (802.11 n-20MHz,Ch11,30MHz~1GHz)**

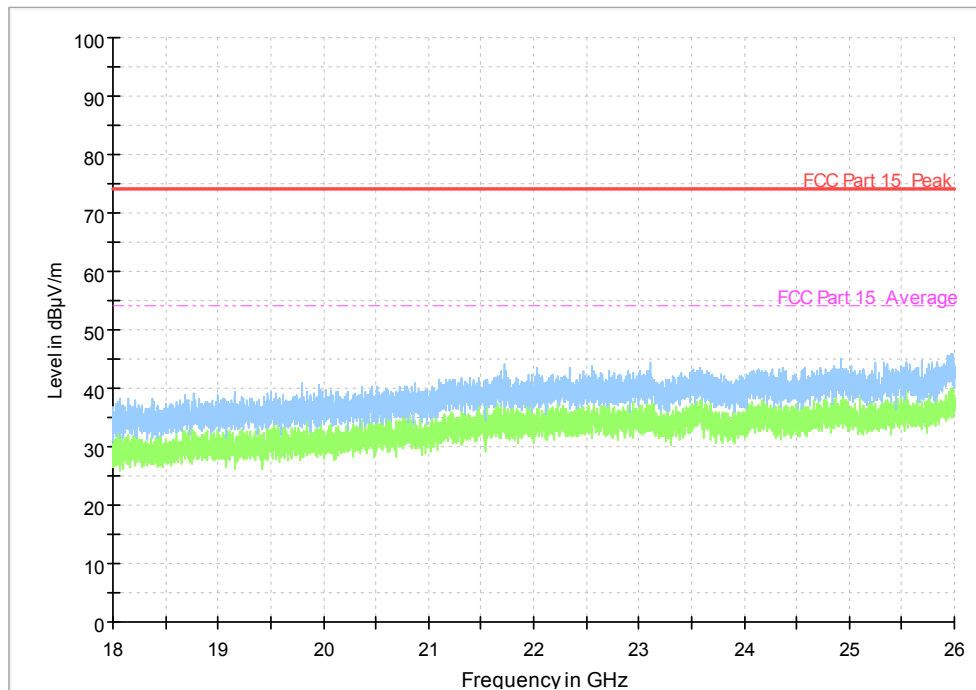


**Fig.56 Radiated Spurious Emission (802.11 n-20MHz,Ch11,1GHz~3GHz)**



**Fig.57 Radiated Spurious Emission (802.11 n-20MHz,Ch11,3GHz~18GHz)**





**ALL Channel 18GHz~26GHz**

### 6.7. AC Powerline Conducted Emission

**Method of Measurement: See ANSI C63.10-2013-clause 6.2**

- 1 The one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement, while applying the appropriate modulating signal to the EUT.
- 2 If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed.
- 3 The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without further variation of the EUT arrangement, cable positions, or EUT mode of operation.
- 4 If the EUT is comprised of equipment units that have their own separate ac power connections, e.g., floor-standing equipment with independent power cords for each shelf that are able to connect directly to the ac power network, each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be separately measured. If a power strip is provided by the manufacturer, to supply all of the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.

If the EUT uses a detachable antenna, these measurements shall be made with a suitable

dummy load connected to the antenna output terminals; otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended. When measuring the ac conducted emissions from a device that operates between 150 kHz and 30 MHz a non-detachable antenna may be replaced with a dummy load for the measurements within the fundamental emission band of the transmitter, but only for those measurements.<sup>36</sup> Record the six highest EUT emissions relative to the limit of each of the current-carrying conductors of the power cords of the equipment that comprises the EUT over the frequency range specified by the procuring or regulatory agency. Diagram or photograph the test setup that was used. See Clause 8 for full reporting requirements.

**Test Condition:**

<b>Voltage (V)</b>	<b>Frequency (Hz)</b>
120	60

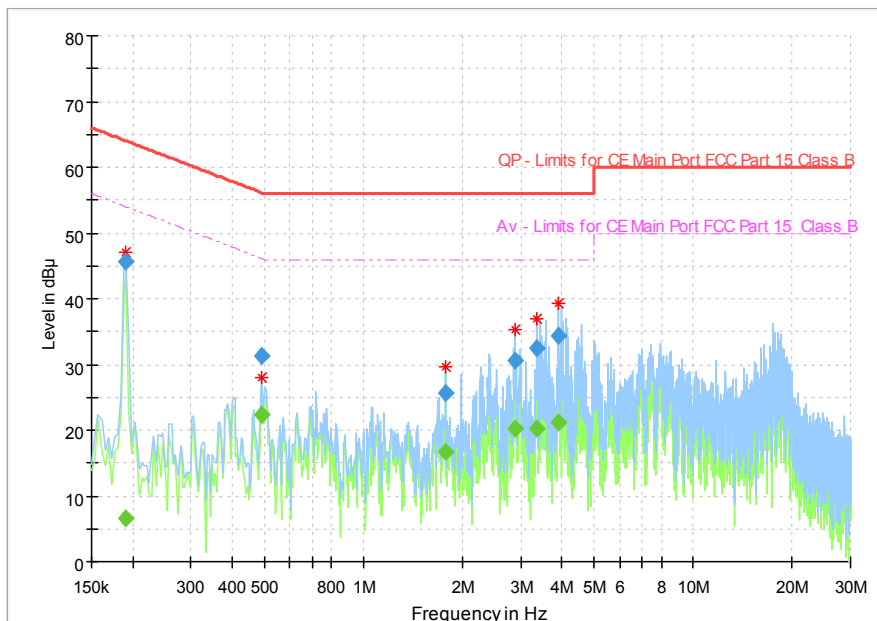
**Measurement Result and limit:**

(Quasi-peak-average Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Average Limit (dBμV)	Result (dBμV)	Conclusion
			With charger	
			802.11b	
0.15 to 0.5	66 to 56	56 to 46	Fig 58.	<b>P</b>
0.5 to 5	56	46		
5 to 30	60	50		

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

**Conclusion: Pass**



**Fig.58 AC Powerline Conducted Emission**

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Average (dB $\mu$ V)	Limit (dB $\mu$ )	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.191044	---	6.62	53.99	47.37	1000.0	9.000	L1	ON	9.7
0.191044	45.57	---	63.99	18.42	1000.0	9.000	L1	ON	9.7
0.489544	---	22.35	46.18	23.83	1000.0	9.000	L1	ON	9.7
0.489544	31.34	---	56.18	24.84	1000.0	9.000	L1	ON	9.7
1.776825	---	16.74	46.00	29.26	1000.0	9.000	L1	ON	9.7
1.776825	25.70	---	56.00	30.30	1000.0	9.000	L1	ON	9.7
2.885006	---	20.34	46.00	25.66	1000.0	9.000	L1	ON	9.7
2.885006	30.67	---	56.00	25.33	1000.0	9.000	L1	ON	9.7
3.347681	---	20.18	46.00	25.82	1000.0	9.000	L1	ON	9.7
3.347681	32.37	---	56.00	23.63	1000.0	9.000	L1	ON	9.7
3.899906	---	21.26	46.00	24.74	1000.0	9.000	L1	ON	9.7
3.899906	34.46	---	56.00	21.54	1000.0	9.000	L1	ON	9.7

## 7. Test Equipment and Ancillaries Used For Tests

The test equipment and ancillaries used are as follows.

### Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Vector Signal Analyzer	FSQ26	101096	Rohde&Schwarz	2018-05-11	1 Year
2	DC Power Supply	ZUP60-14	LOC-220Z006-0007	TDL-Lambda	2018-05-11	1 Year

### Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Universal Radio Communication Tester	CMU200	123123	R&S	2018-05-11	1 Year
2	EMI Test Receiver	ESU40	100307	R&S	2018-05-11	1 Year
3	TRILOG Broadband Antenna	VULB9163	VULB9163-515	Schwarzbeck	2017-02-25	3 Year
4	Double-ridged Waveguide Antenna	ETS-3117	00135890	ETS	2017-01-11	3 Year
5	2-Line V-Network	ENV216	101380	R&S	2018-05-11	1 Year

### Anechoic chamber

Fully anechoic chamber by Frankonia German.

## 8. Test Environment

**Shielding Room1** (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5

**Control room** did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. =25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 k
Ground system resistance	< 0.5

**Fully-anechoic chamber1** (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 k
Ground system resistance	< 0.5
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

**ANNEX A. Deviations from Prescribed Test Methods**

No deviation from Prescribed Test Methods.

**ANNEX B. Accreditation Certificate**



**Accredited Laboratory**

A2LA has accredited

**EAST CHINA INSTITUTE OF TELECOMMUNICATIONS**

*Shanghai, People's Republic of China*

for technical competence in the field of

**Electrical Testing**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).



Presented this 15<sup>th</sup> day of March 2017.

  
President and CEO  
For the Accreditation Council  
Certificate Number 3682.01  
Valid to February 28, 2019

*For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.*



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