



## **TEST REPORT**

**No. I19D00119-SRD07**

*For*

**Client : Inseego Corp.**

**Production : Industrial Cellular Gateway with Ethernet,WiFi,  
Bluetooth,GPS/GLNSS and USB Connectivity**

**Model Name : SKG1EM7455**

**Brand Name : SKYUS 160NE**

**FCC ID : PKRISGSKG1EM7455**

**IC ID : 3229A-SKG1EM7455**

**Hardware Version : P2**

**Software Version : 2.110.1.2**

**Issued date : 2019-11-07**

## NOTE

1. The test results in this test report relate only to the devices specified in this report.
2. This report shall not be reproduced except in full without the written approval of East China Institute of Telecommunications.
3. KDB 789033 standard has not been accredited by A2LA.
4. For the test results, the uncertainty of measurement is not taken into account when judging the compliance with specification, and the results of measurement or the average value of measurement results are taken as the criterion of the compliance with specification directly.

**Test Laboratory:**

East China Institute of Telecommunications

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**Revision Version**

<b>Report Number</b>	<b>Revision</b>	<b>Date</b>	<b>Memo</b>
I19D00119-SRD07	00	2019-08-12	Initial creation of test report
I19D00119-SRD07	01	2019-11-07	Second creation of test report

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## 1. Test Laboratory

### 1.1. Testing Location

Company Name	East China Institute of Telecommunications
Address	7-8/F., Area G, No.668, Beijing East Road, Shanghai, China
Postal Code	200001
Telephone	+86 21 63843300
Fax	+86 21 63843301
FCC registration No	CN1177
IC registration No	10766A-1

### 1.2. Testing Environment

Normal Temperature	15°C-35°C
Relative Humidity	20%-75%

### 1.3. Project Data

Project Leader	Chen Minfei
Testing Start Date	2019-07-30
Testing End Date	2019-07-31

### 1.4. Signature



Wang Liang  
(Prepared this test report)



Fan Songyan  
(Reviewed this test report)



Zheng Zhongbin  
(Approved this test report)

## 2. Client Information

### 2.1. Applicant Information

Company Name	Inseego Corp.
Address	9605 Scranton Road, Suite 300, San Diego, CA 92121, USA
Telephone	+1 858-812-0606
Postcode	/

### 2.2. Manufacturer Information

Company Name	Inseego Corp.
Address	9605 Scranton Road, Suite 300, San Diego, CA 92121, USA
Telephone	+1 858-812-0606
Postcode	/

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

#### 3.1. About EUT

Production	Industrial Cellular Gateway with Ethernet,WiFi, Bluetooth,GPS/GLNSS and USB Connectivity
Model name	SKG1EM7455
WLAN (5G)	802.11 a/n20/ac20
Frequency Range	ISM Bands: 5150MHz-5250MHz
WLAN type of modulation	OFDM
Extreme Temperature	-30/+60°C
Nominal Voltage	12V
Extreme High Voltage	32V
Extreme Low Voltage	9V
Maximum of Antenna Gain	WIFI5 Ghz: 5 dBi

Note:

- a. Photographs of EUT are shown in ANNEX A of this test report.
- b. The value of the antenna gain is provided by the customer. For specific antenna information, please check the antenna specifications of the customer.

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

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N04	/	2.110.1.2	P2	2019-07-30
N16	/	2.110.1.2	P2	2019-07-30

\*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	Type	Manufacturer
AE1	RF cable	---	AE1

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



## 4. Reference Documents

### 4.1. Documents supplied by applicant

All technical documents are supplied by the client or manufacturer, which is the basis of testing.

### 4.2. Reference Documents for testing

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

Reference	Title	Version
FCC Part15	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices	2018-10-01
ANSI 63.10	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2013
KDB 789033	Information Infrastructure (U-NII) Devices - Part 15, Subpart E	2017
KDB 905462	COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION	2016
RSS-247	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices	2017-02
RSS-Gen	General Requirements for Compliance of Radio Apparatus	2018-04

## 5. Test Results

### 5.1. Summary of Test Results

Measurement Items	Sub-clause of Part15E	Sub-clause of IC	Verdict
Maximum Output Power	15.407	RSS-247,6.2	P
Power Spectral Density	15.407	RSS-247,6.2	P
Occupied 26dB Bandwidth	15.403	RSS-GEN,6.7	P
Band edge compliance	15.407	RSS-247,6.2	P
Transmitter spurious emissions radiated	15.407	RSS-GEN,8.8	P
Spurious emissions radiated < 30 MHz	15.407	RSS-GEN,7.1.2	P
Spurious emissions conducted < 30 MHz	15.407	RSS-GEN,8.8	P
Peak Excursion	15.407	RSS-247,6.2	P
Frequency Stability	15.407	RSS-247,6.2	P
Transmit Power Control	15.407	RSS-247,6.2	P

Note: Please refer to section 6 for detail; please refer to Annex A in this test report for the detailed test results.

The following terms are used in the above table.

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	3.8V
Humidity	Hnom	48%
Air Pressure	Anom	1010hPa

## 5.2. Statements

The SKG1EM7455 is an initial product for testing.

ECIT only performed test cases which identified with P/NP/NA/F results in Annex A.

ECIT has verified that the compliance of the tested device specified in section 3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 4 of this test report.

## 6. Test Equipments Utilized

### 6.1. Conducted Test System

Item	Instrument Name	Type	SN	Manufacturer	Cal. Date	Cal. interval
1	Vector Signal Analyzer	FSQ40	200063	R&S	2019-05-10	1 year
2	DC Power Supply	ZUP60-14	LOC-220Z006-0007	TDL-Lambda	2019-05-10	1 year
3	Universal Radio Communication Tester	CMW500	104178	R&S	2019-05-10	1 year

### 6.2. Radiated Emission Test System

Item	Instrument Name	Type	SN	Manufacturer	Cal. Date	Cal. interval
1	Universal Radio Communication Tester	CMU200	123123	R&S	2019-05-10	1 year
2	EMI Test Receiver	ESU40	100307	R&S	2019-05-10	1 year
3	TRILOG Broadband Antenna	VULB9163	VULB9163-515	Schwarzbeck	2017-02-25	3 years
4	Double- ridged Waveguide Antenna	ETS-3117	00135890	ETS	2017-01-11	3 years
5	2-Line V-Network	ENV216	101380	R&S	2019-05-10	1 year
6	Loop Antenna	AL-130R	121083	COM-POWER	2016-11-21	3 years

### 6.3. Conducted Test Software

Software Name	Version
Eagle1.0	20181112

### 6.4. Radiated Test Software

Software Name	Version
EMC32	V10.35.02

### Anechoic chamber

Fully anechoic chamber by ETS

## 7. Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in ECIT documents . The detailed measurement uncertainty is defined in ECIT documents.

Measurement Items	Range	Confidence Level	Calculated Uncertainty
Peak Output Power-Conducted	5100MHz-5850MHz	95%	$\pm 1.024\text{dB}$
Peak Power Spectral Density	5100MHz-5850MHz	95%	$\pm 1.024\text{dB}$
Occupied 6dB Bandwidth	5100MHz-5850MHz	95%	$\pm 62.04\text{Hz}$
Frequency Band Edges-Conducted	5100MHz-5850MHz	95%	$\pm 1.024\text{dB}$
Conducted Emission	30MHz-2GHz	95%	$\pm 0.90\text{dB}$
Conducted Emission	2GHz-3.6GHz	95%	$\pm 0.88\text{dB}$
Conducted Emission	3.6GHz-8GHz	95%	$\pm 0.96\text{dB}$
Conducted Emission	8GHz-20GHz	95%	$\pm 0.94\text{dB}$
Conducted Emission	20GHz-22GHz	95%	$\pm 0.88\text{dB}$
Conducted Emission	22GHz-26GHz	95%	$\pm 0.86\text{dB}$
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	$\pm 5.66\text{dB}$
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	$\pm 4.98\text{dB}$
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	$\pm 5.06\text{dB}$
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	$\pm 5.20\text{dB}$
AC Power line Conducted Emission	0.15MHz-30MHz	95%	$\pm 3.66\text{ dB}$

## 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 Ω

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

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. =30 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

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

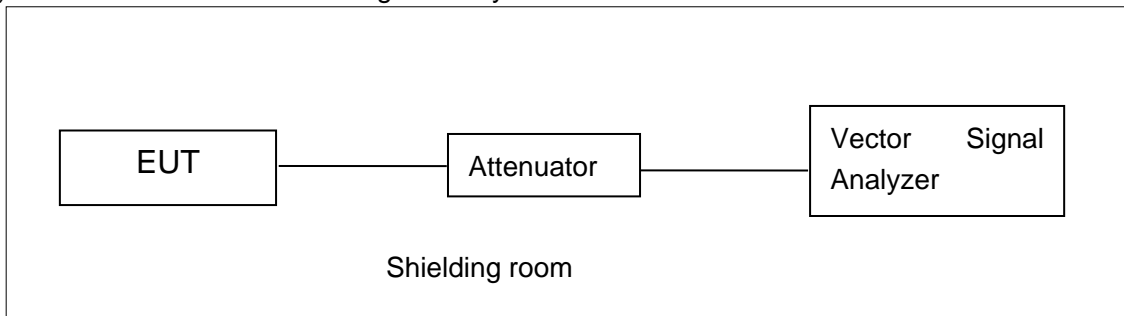
Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field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

## ANNEX A. Detailed Test Results

### ANNEX A.1. Measurement Method

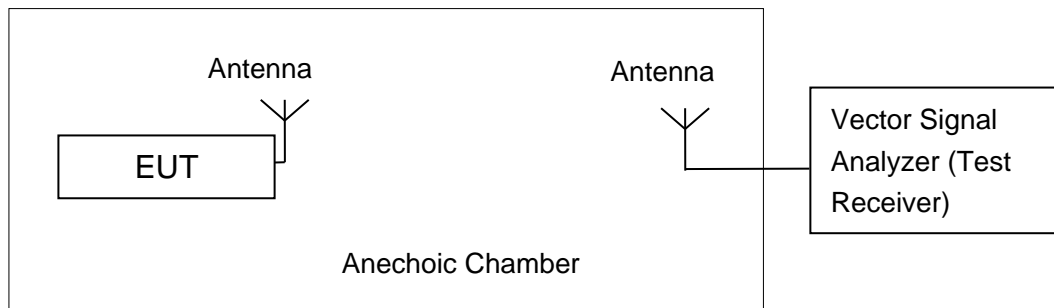
#### A.1.1. Conducted Measurements

- 1). Connect the EUT to the test system correctly.
- 2). Set the EUT to the required work mode.
- 3). Set the EUT to the required channel.
- 4). Set the spectrum analyzer to start measurement.
- 5). Record the values. Vector Signal Analyzer



#### A.1.2. Radiated Emission Measurements

In the case of radiated emission, the used settings are as follows,  
 Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;  
 Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 10Hz;



The measurement is made according to KDB 789033

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

## ANNEX A.2. Maximum output Power

### Measurement Limit and Method:

Standard	Frequency (MHz)	Limit (dBm)
FCC CRF Part 15.407(a)	5150MHz~5250MHz	24dBm
	5250MHz~5350MHz	24dBm or 11+10logB
	5470MHz~5725MHz	24dBm or 11+10logB

Limit use the less value, and B is the 26dB bandwidth.

The measurement method SA-1 is made according to KDB 789033.

Set the spectrum analyzer in the following:

Detector: RMS.

RBW=1MHz.

VBW=3MHz.

Sweep time = AUTO.

Span:30MHz (for 20MHz); 50MHz (for 40MHz).

### Measurement Results:

#### 802.11a mode U-NII-1

Mode	Test Level	Data Rate(Mbps)	Output power(dBm)		
			5180MHz	5200MHz	5240MHz
802.11a	PCL17	6	15.45	15.49	15.44
Mode	Test Level	Data Rate(Mbps)	EIRP(dBm)		
			5180MHz	5200MHz	5240MHz
802.11a	PCL17	6	20.45	20.49	20.44

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

#### 802.11n-HT20 mode U-NII-1

Mode	Test Level	Data Rate(Index)	Output power(dBm)		
			5180MHz	5200MHz	5240MHz
802.11n(20MHz)	PCL17	MCS0	15.53	15.75	15.78
Mode	Test Level	Data Rate(Index)	EIRP(dBm)		
			5180MHz	5200MHz	5240MHz
802.11n(20MHz)	PCL17	MCS0	20.53	20.75	20.78

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.



**802.11ac-VHT20 mode**
**U-NII-1**

Mode	Test Level	Data Rate(Mbps)	Output power(dBm)		
			5180MHz	5200MHz	5240MHz
802.11ac(20MHz)	PCL17	6	15.53	15.75	15.78
Mode	Test Level	Data Rate(Mbps)	EIRP(dBm)		
			5180MHz	5200MHz	5240MHz
802.11ac(20MHz)	PCL17	6	20.53	20.75	20.78

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

### ANNEX A.3. Peak Power Spectral Density (conducted)

#### Measurement Limit:

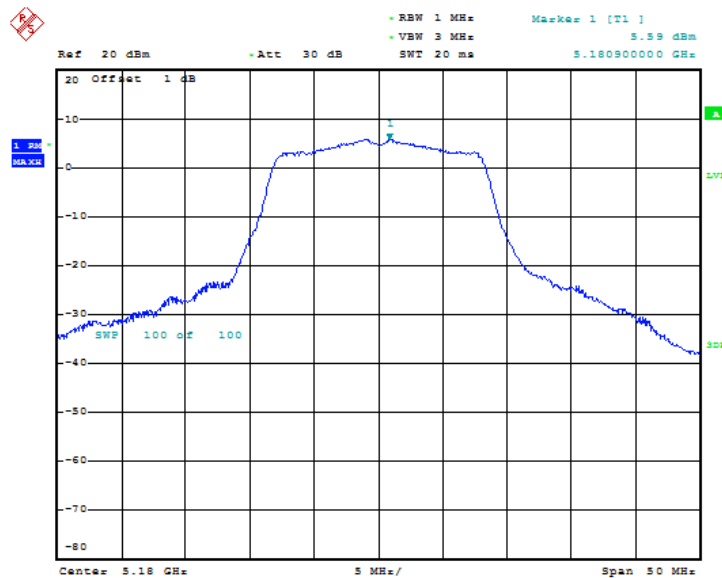
Standard	Frequency (MHz)	Limit (dBm/MHz)
FCC CRF Part 15.407(a)	5150MHz~5250MHz	11
	5250MHz~5350MHz	11
	5470MHz~5725MHz	11

The output power measurement method SA-1 is made according to KDB 789033

#### Measurement Results:

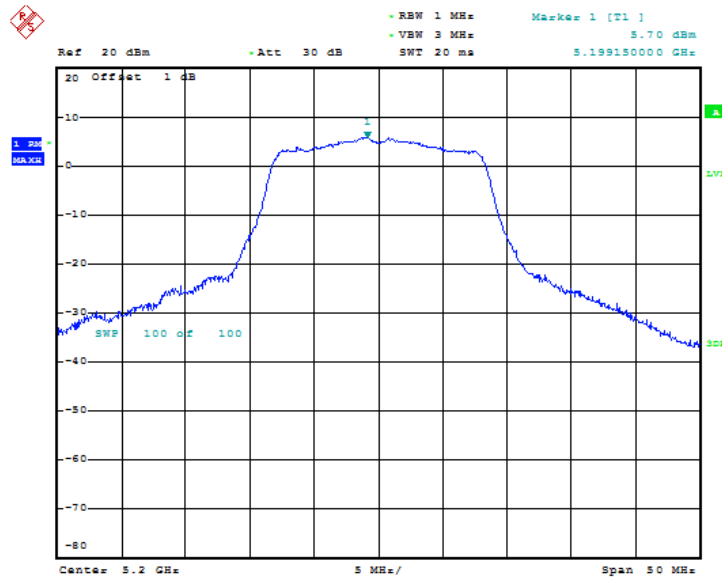
Mode	Channel	Power Spectral Density (dBm/MHz)		Conclusion
		Fig.	Value	
802.11a	5180 MHz	Fig.1	2.006	P
	5200 MHz	Fig.2	1.558	P
	5240 MHz	Fig.3	1.098	P
802.11n HT20	5180 MHz	Fig.4	0.160	P
	5200 MHz	Fig.5	-0.255	P
	5240 MHz	Fig.6	-0.850	P
802.11ac VHT20	5180 MHz	Fig.7	5.762	P
	5200 MHz	Fig.8	5.923	P
	5240 MHz	Fig.9	6.032	P

**Conclusion: PASS**



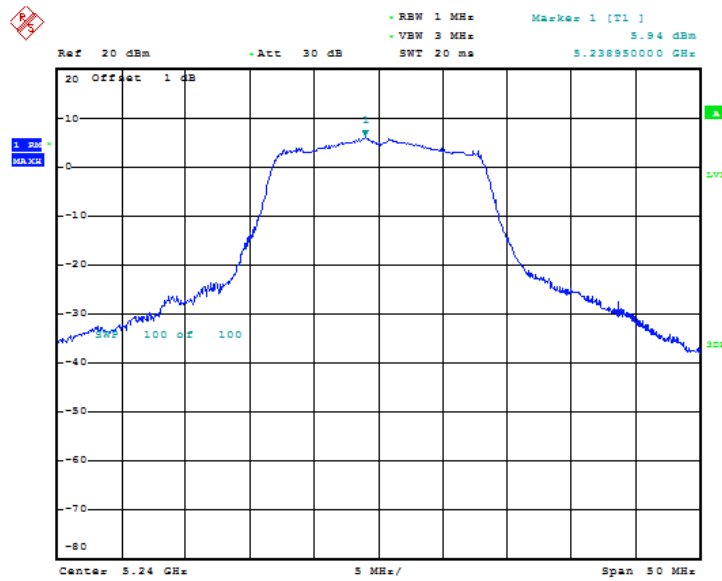
Date: 30.JUL.2019 05:22:41

Fig. 1 Power Spectral Density (802.11a, 5180MHz)



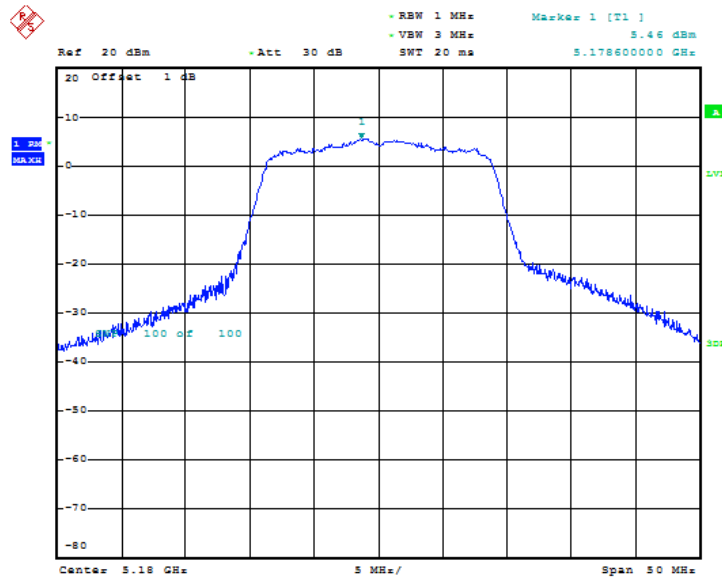
Date: 30.JUL.2019 05:23:31

Fig. 2 Power Spectral Density (802.11a, 5200MHz)



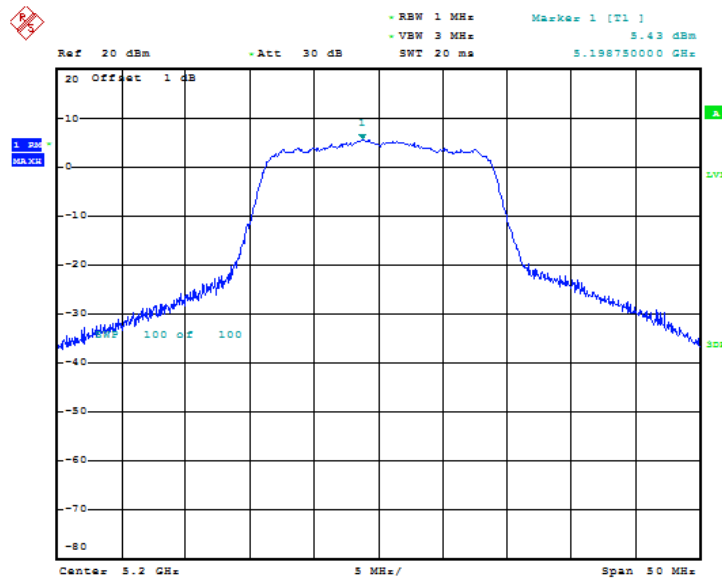
Date: 30.JUL.2019 05:24:35

Fig. 3 Power Spectral Density (802.11a, 5240MHz)



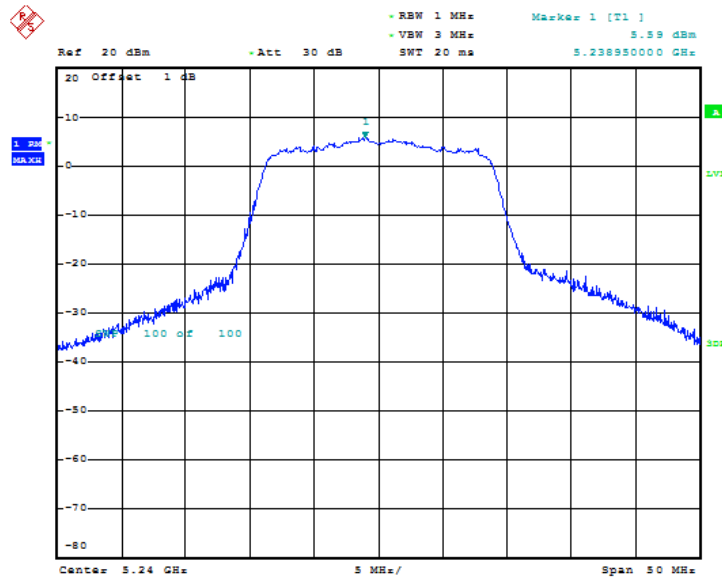
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Fig. 4 Power Spectral Density (802.11n-HT20, 5180MHz)



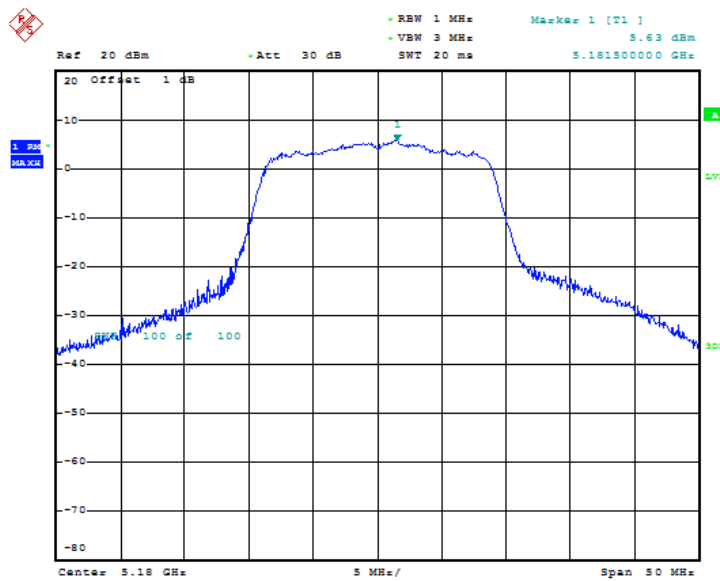
Date: 30.JUL.2019 06:27:49

Fig. 5 Power Spectral Density (802.11n-HT20, 5200MHz)



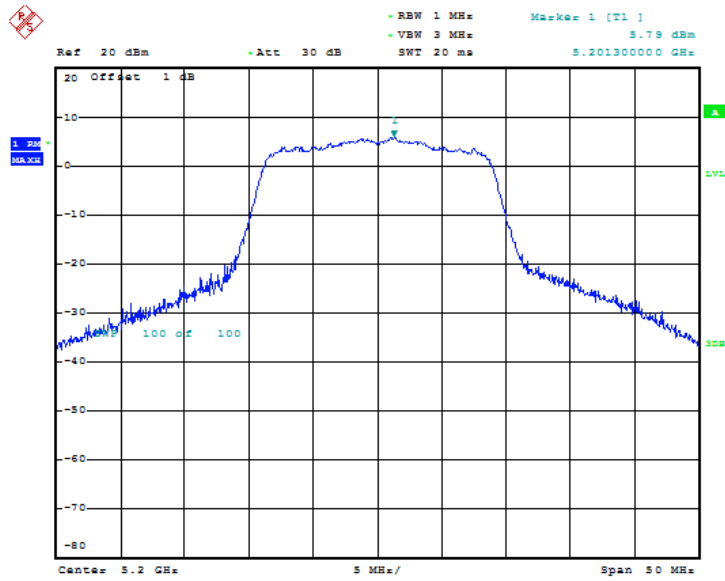
Date: 30.JUL.2019 06:28:42

Fig. 6 Power Spectral Density (802.11n-HT20, 5240MHz)



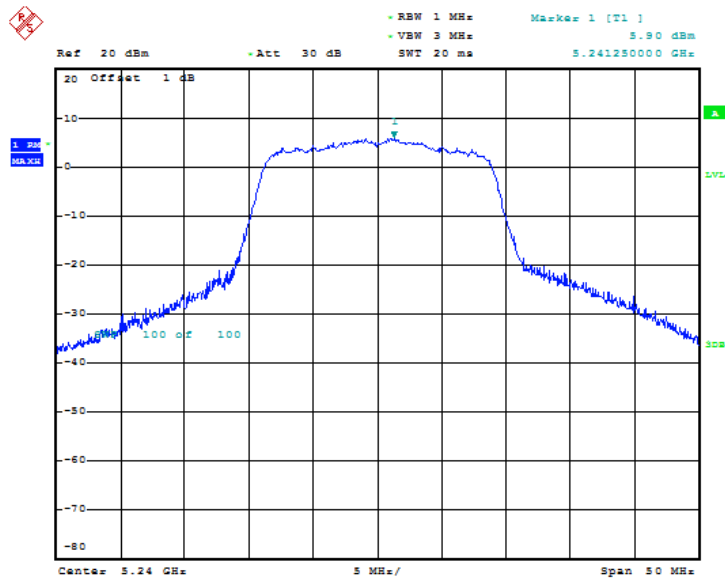
Date: 30.JUL.2019 07:40:42

Fig. 7 Power Spectral Density (802.11ac-HT20, 5180MHz)



Date: 30.JUL.2019 07:41:30

Fig. 8 Power Spectral Density (802.11ac-HT20, 5200MHz)



Date: 30.JUL.2019 07:42:35

Fig. 9 Power Spectral Density (802.11ac-HT20, 5240MHz)

## ANNEX A.4. 99% Occupied Bandwidth(conducted)

### Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.407 (e)	/

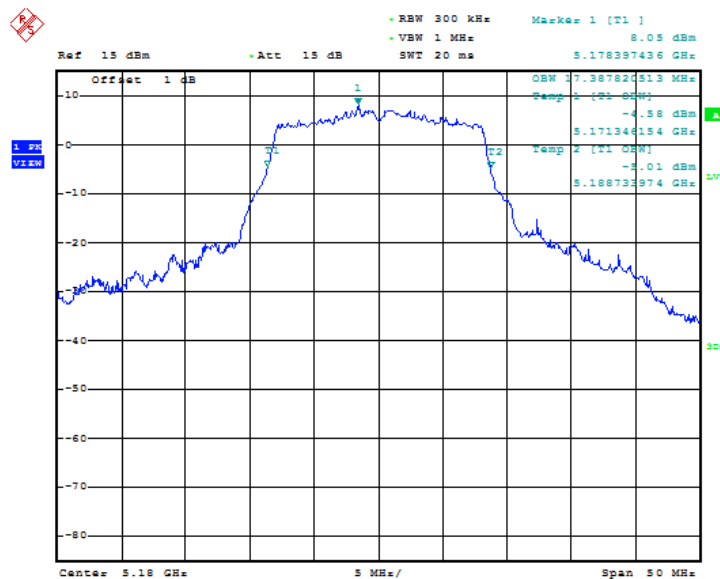
The measurement is made according to KDB 789033

### Measurement Result:

Mode	Channel	99% Occupied Bandwidth ( MHz)		conclusion
		Fig.	Value	
802.11a	5180 MHz	Fig.10	17.788	P
	5200 MHz	Fig.11	17.949	P
	5240 MHz	Fig.12	17.788	P
802.11n HT20	5180 MHz	Fig.13	18.510	P
	5200 MHz	Fig.14	18.590	P
	5240 MHz	Fig.15	18.429	P
802.11ac VHT20	5180 MHz	Fig.16	18.590	P
	5200 MHz	Fig.17	18.590	P
	5240 MHz	Fig.18	18.510	P

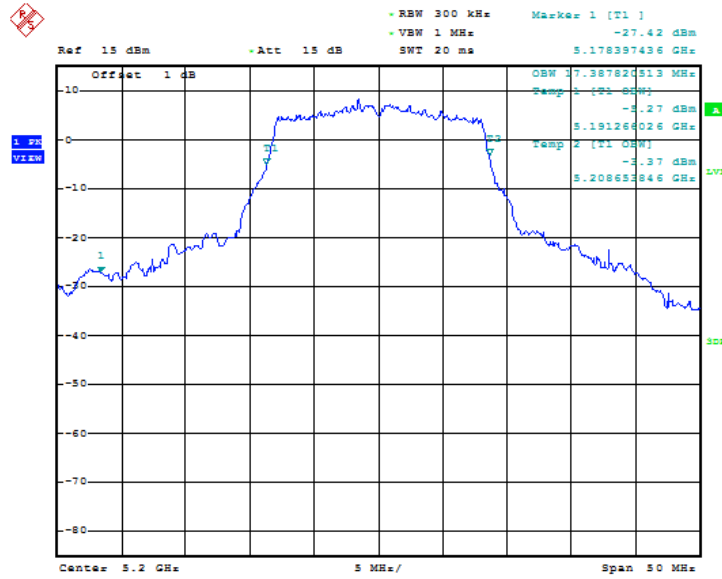
**Conclusion: PASS**

Test graphs as below:



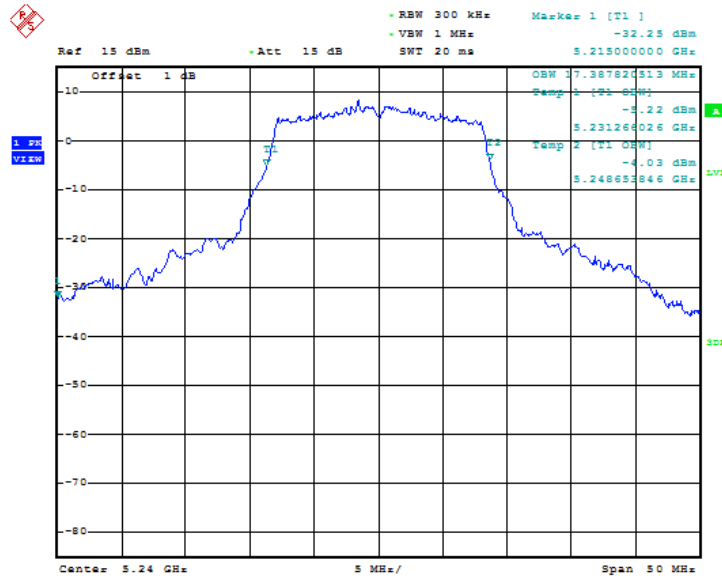
Date: 30.JUL.2019 05:09:12

Fig. 10 99% Occupied Bandwidth (802.11a, 5180MHz)



Date: 30.JUL.2019 05:10:33

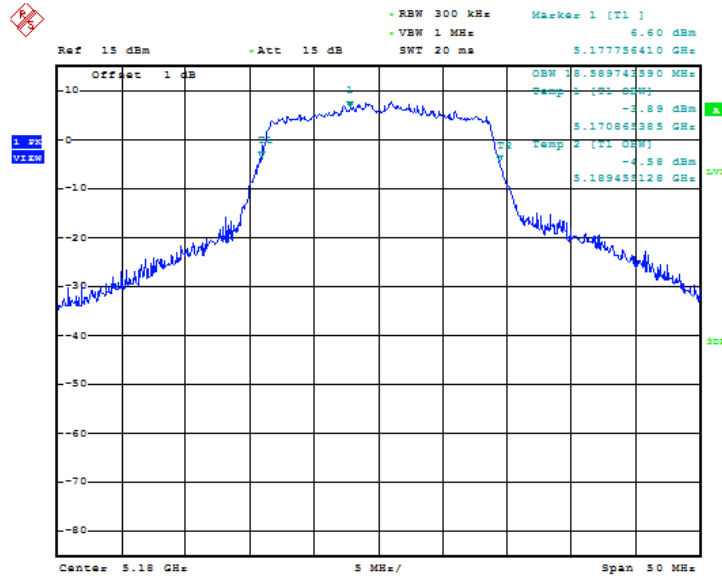
Fig. 11 99% Occupied Bandwidth (802.11a, 5200MHz)



Date: 30.JUL.2019 05:11:42

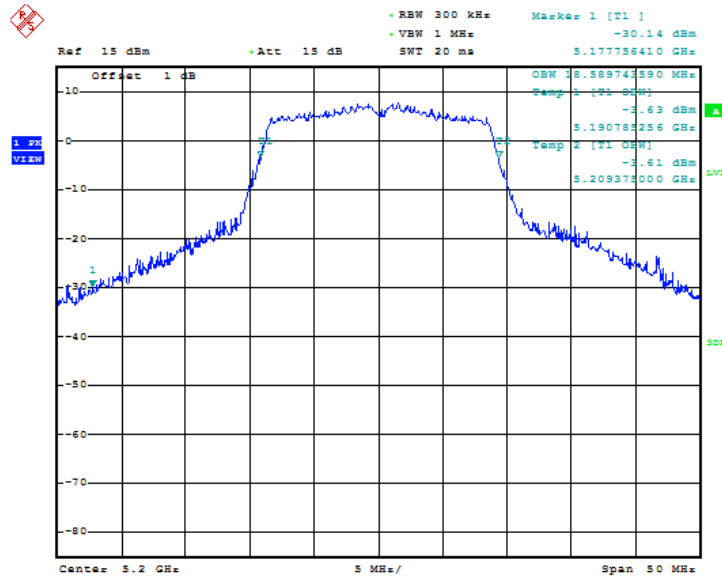
Fig. 12 99% Occupied Bandwidth (802.11a, 5240MHz)





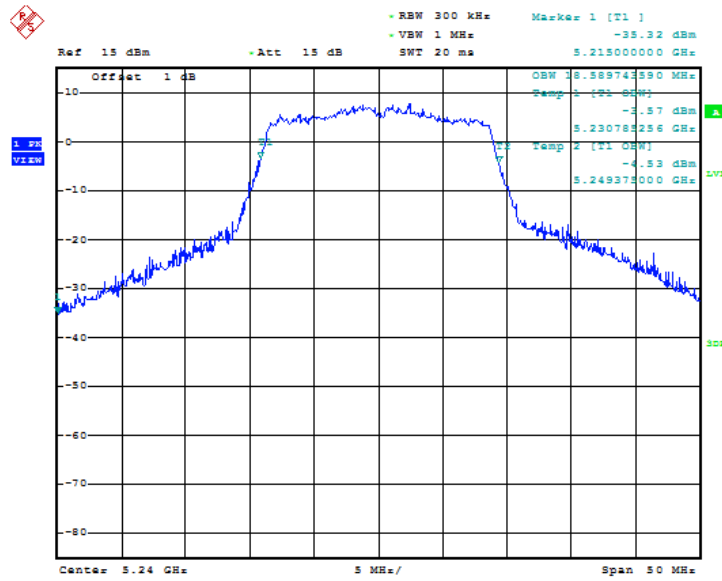
Date: 30.JUL.2019 06:17:26

Fig. 13 99% Occupied Bandwidth (802.11n-HT20, 5180MHz)



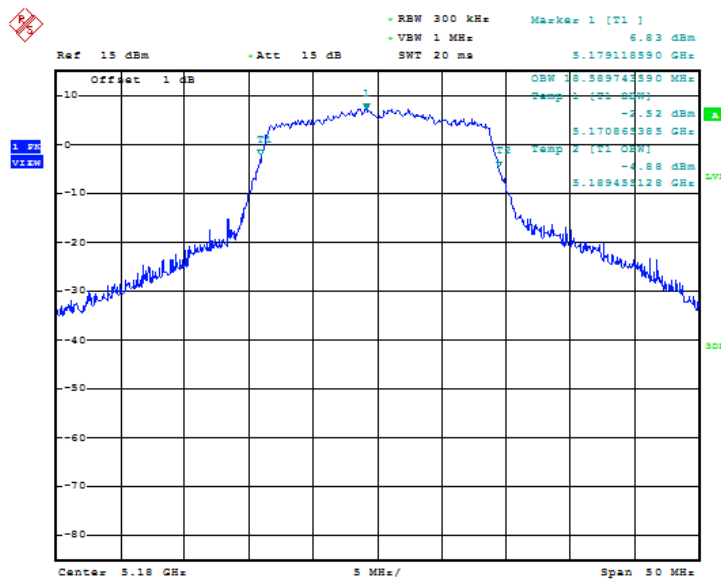
Date: 30.JUL.2019 06:18:23

Fig. 14 99% Occupied Bandwidth (802.11n-HT20, 5200MHz)



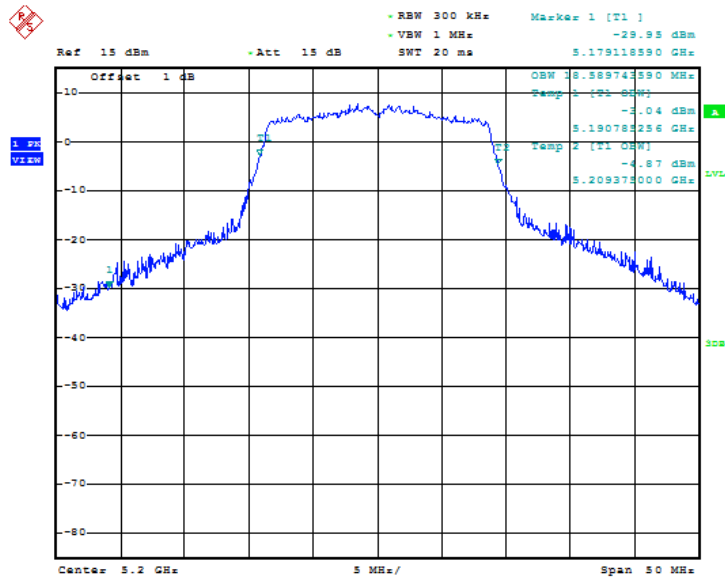
Date: 30.JUL.2019 06:19:19

Fig. 15 99% Occupied Bandwidth (802.11n-HT20, 5240MHz)



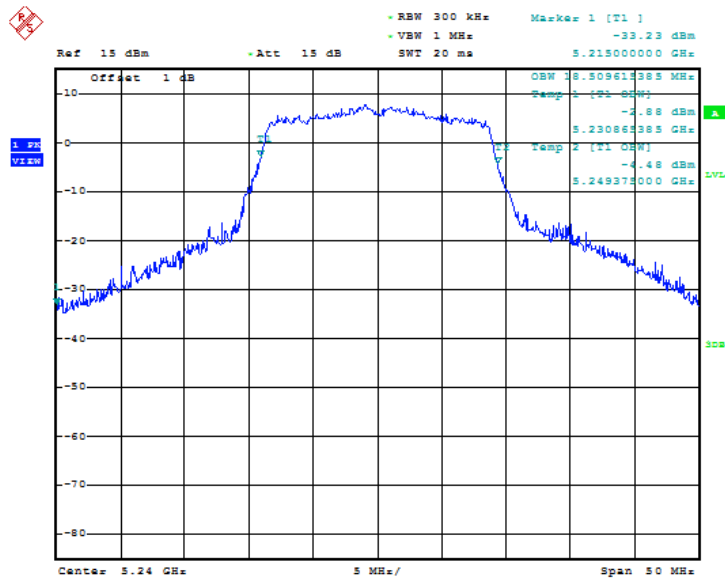
Date: 30.JUL.2019 07:31:17

Fig. 16 99% Occupied Bandwidth (802.11ac-HT20, 5180MHz)



Date: 30.JUL.2019 07:32:27

Fig. 17 99% Occupied Bandwidth (802.11ac-HT20, 5200MHz)



Date: 30.JUL.2019 07:33:26

Fig. 18 99% Occupied Bandwidth (802.11ac-HT20, 5240MHz)

## ANNEX A.5. Band Edges Compliance

### A.6.1 Band Edges - conducted

#### Measurement Limit:

Standard	Limit (dBm/MHz)
FCC 47 CFR Part 15.407	< -27

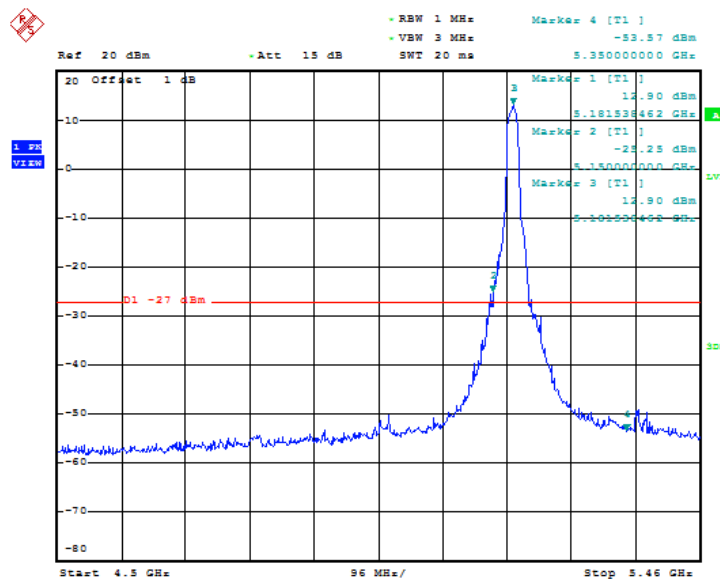
The measurement is made according to KDB 789033

#### Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5180 MHz	Fig.19	P
	5240 MHz	Fig.20	P
802.11n HT20	5180 MHz	Fig.21	P
	5240 MHz	Fig.22	P
802.11ac HT20	5180 MHz	Fig.23	P
	5240 MHz	Fig.24	P

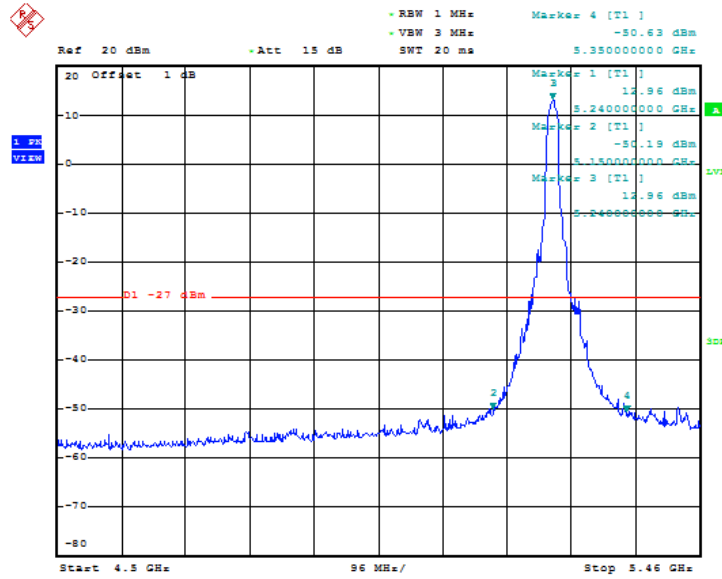
**Conclusion: PASS**

Test graphs as below:



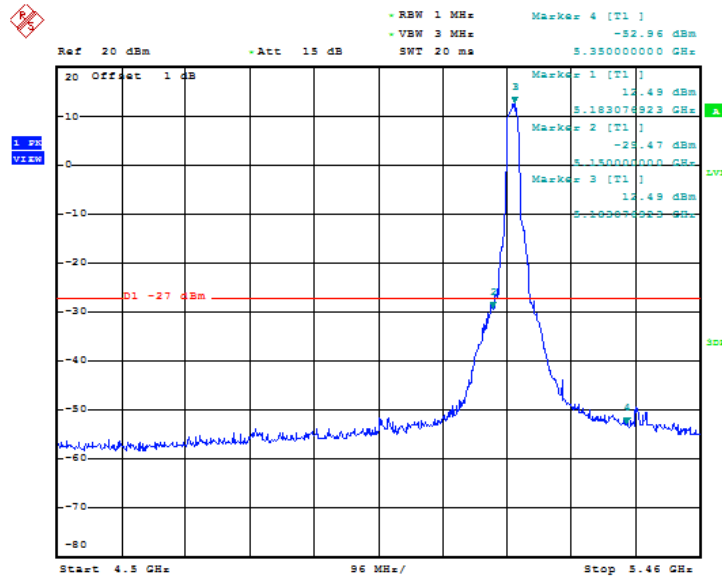
Date: 30.JUL.2019 05:27:24

Fig. 19 Band Edges (802.11a, 5180MHz)



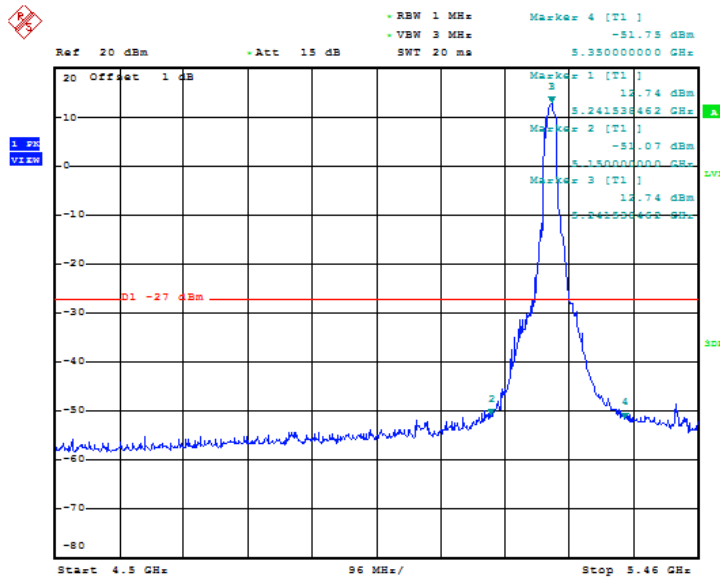
Date: 30.JUL.2019 05:32:33

Fig. 20 Band Edges (802.11a, 5240MHz)



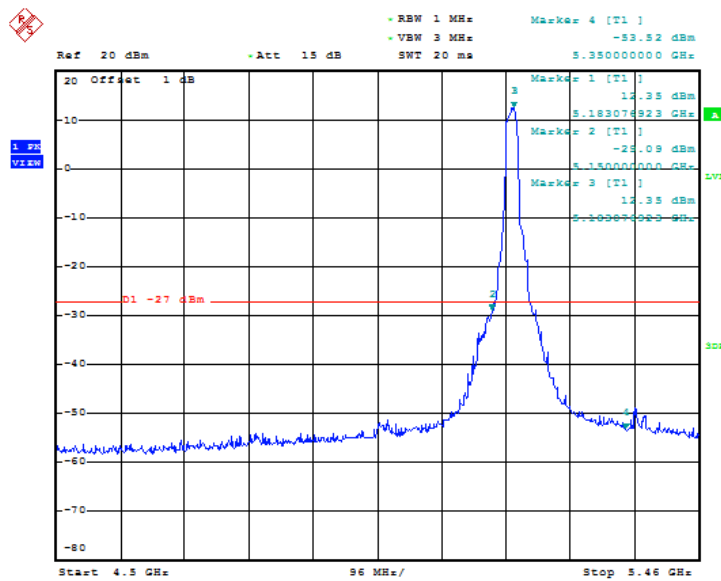
Date: 30.JUL.2019 06:30:17

Fig. 21 Band Edges (802.11n-HT20, 5180MHz)



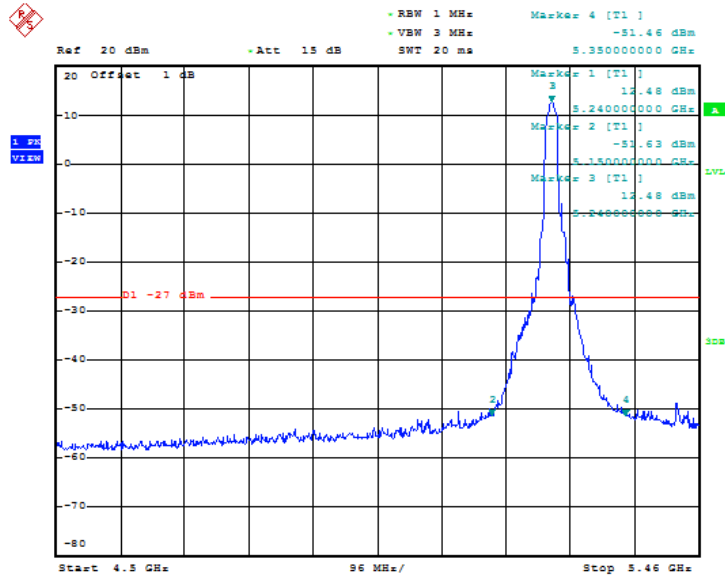
Date: 30.JUL.2019 06:35:42

Fig. 22 Band Edges (802.11n-HT20, 5240MHz)



Date: 30.JUL.2019 07:44:53

Fig. 23 Band Edges (802.11ac-HT20, 5180MHz)



Date: 20.JUL.2019 07:50:35

Fig. 24 Band Edges (802.11ac-HT20, 5240MHz)

### A.6.2 Band Edges - Radiated

#### Measurement Limit:

Standard	Limit (dB $\mu$ V/m)	
FCC 47 CFR Part 15.209	Peak	74
	Average	54

The measurement is made according to KDB 789033.

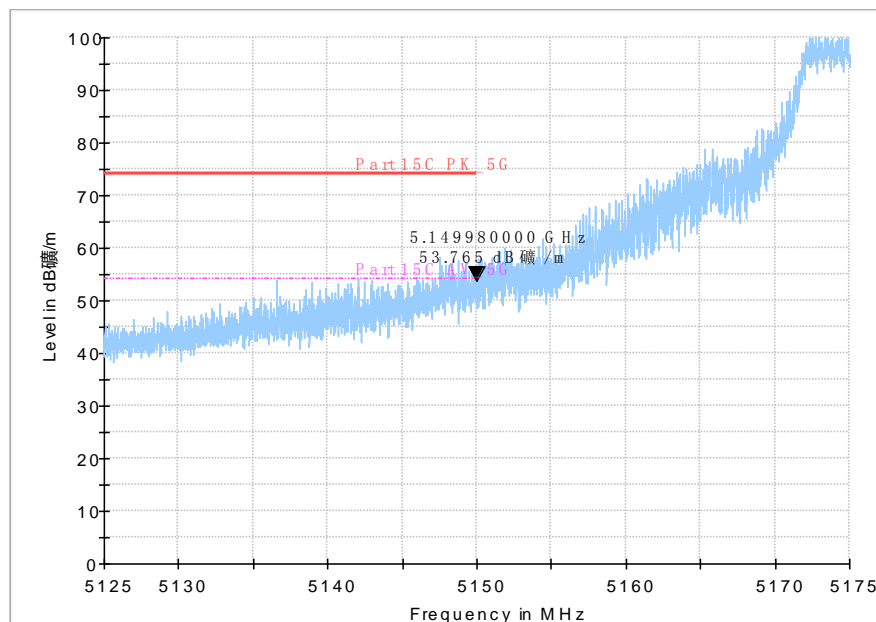
In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

#### Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5180 MHz	Fig.25	P
	5240 MHz	Fig.26	P
802.11n HT20	5180 MHz	Fig.27	P
	5240 MHz	Fig.28	P
802.11ac HT20	5180 MHz	Fig.29	P
	5240 MHz	Fig.30	P

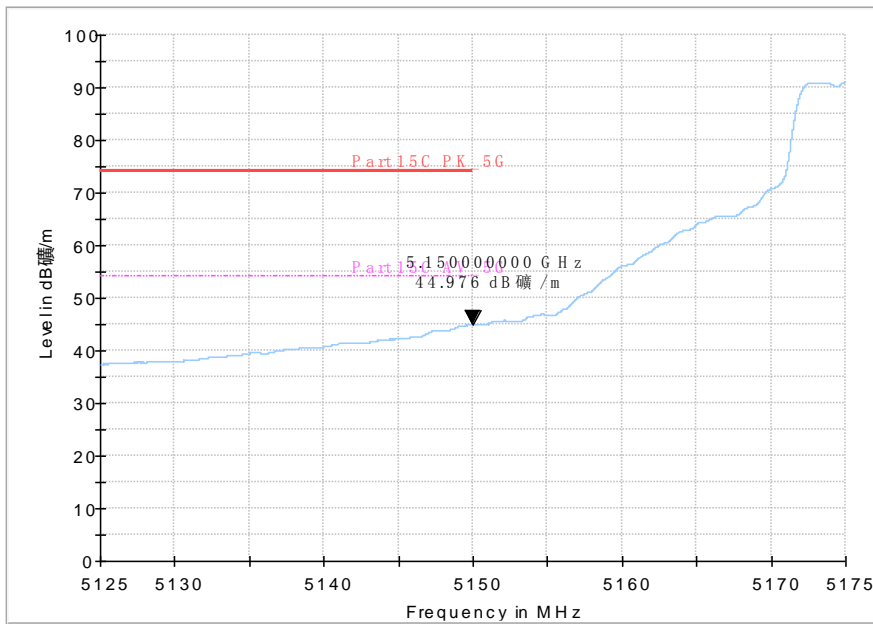
**Conclusion: PASS**

Test graphs as below:

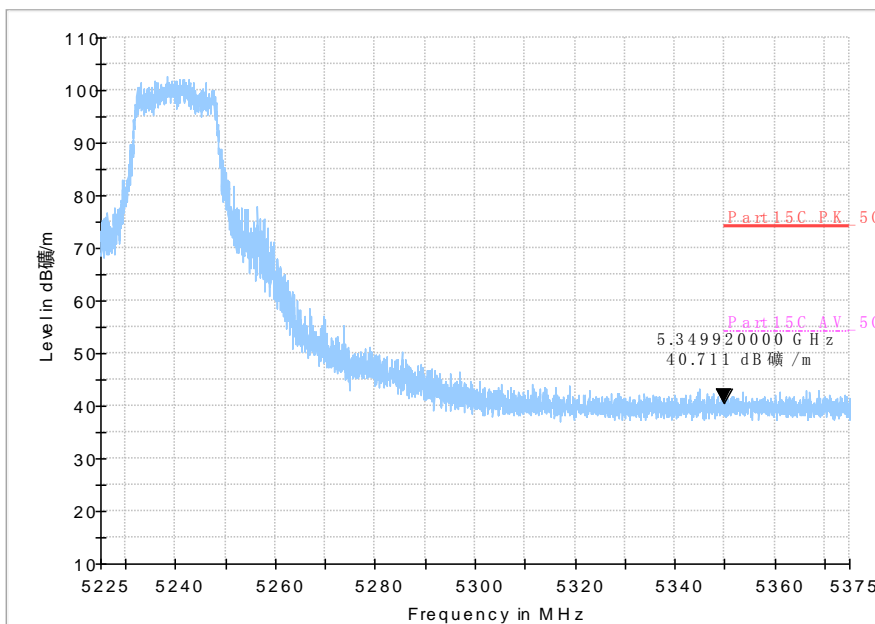


Peak

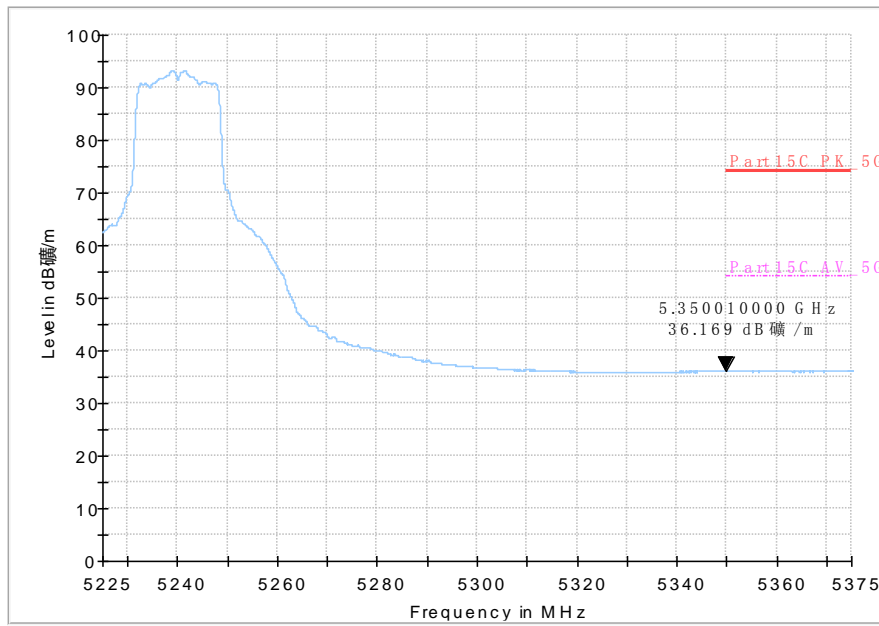




Average  
 Fig. 25 Band Edges (802.11a, 5180MHz)

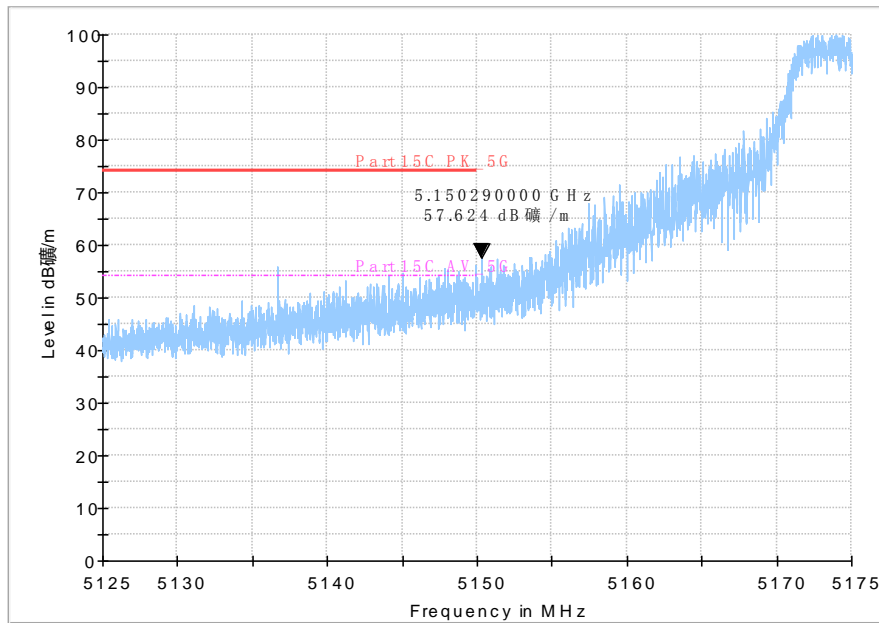


Peak

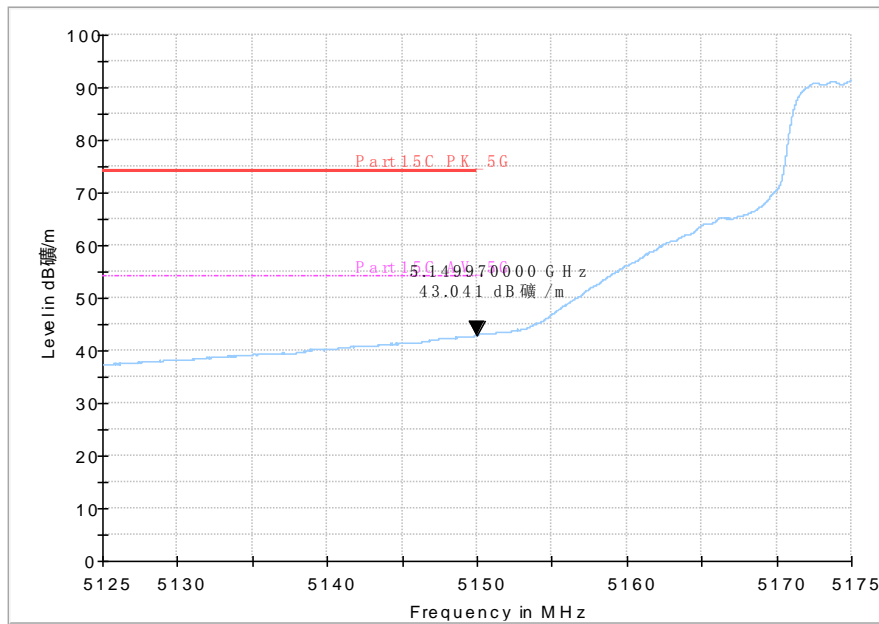


Average

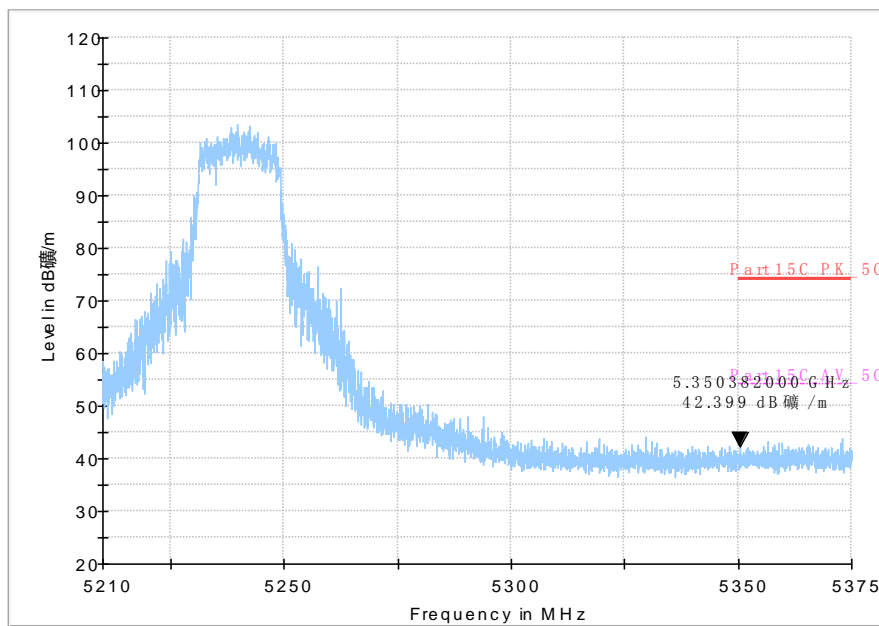
Fig. 26 Band Edges (802.11a, 5240MHz)



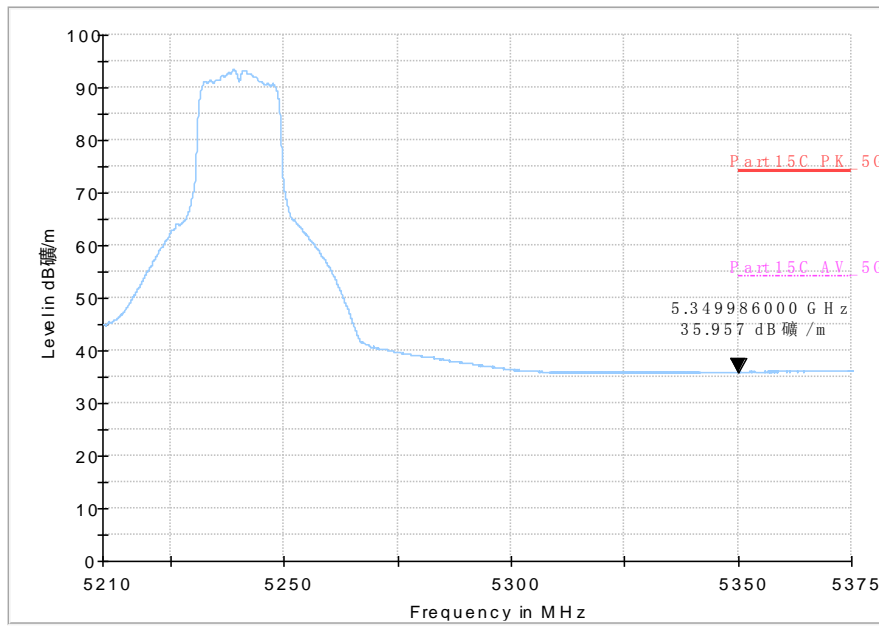
Peak



Average  
Fig. 27 Band Edges (802.11n-HT20, 5180MHz)

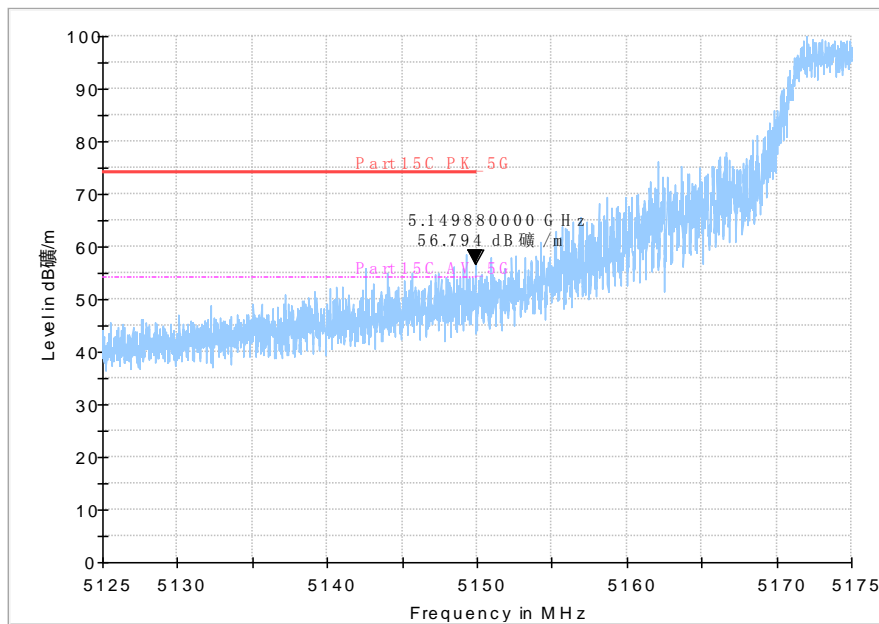


Peak

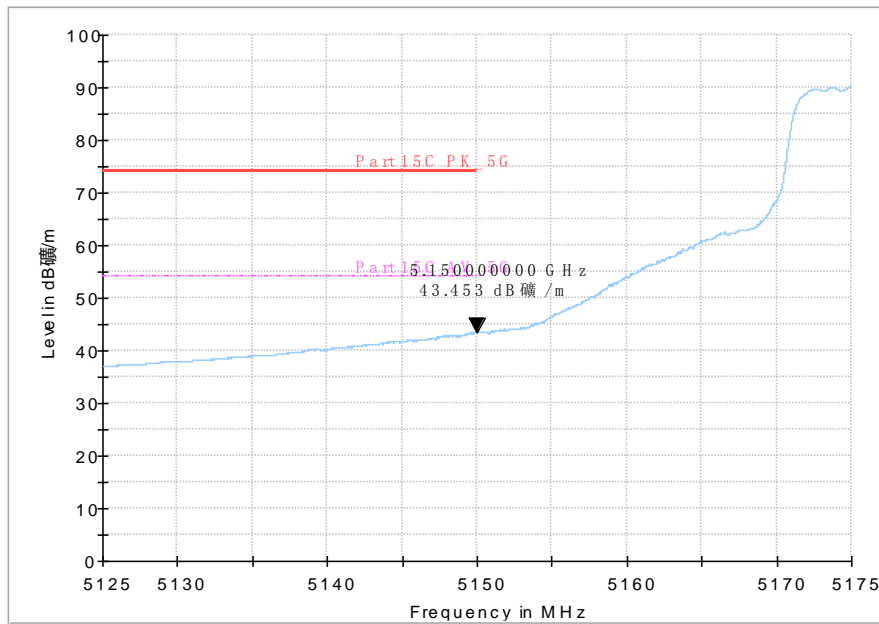


Average

Fig. 28 Band Edges (802.11n-HT20, 5240MHz)

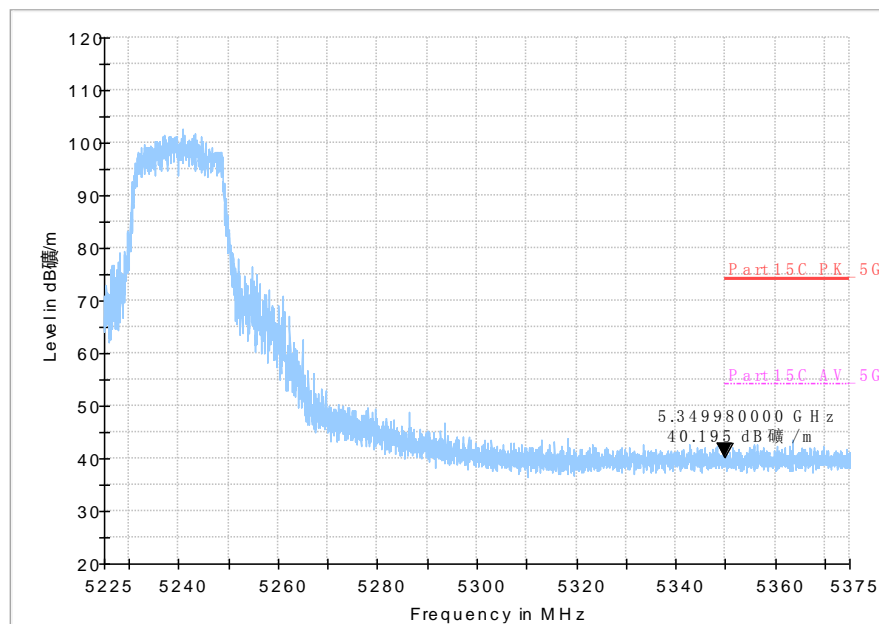


Peak

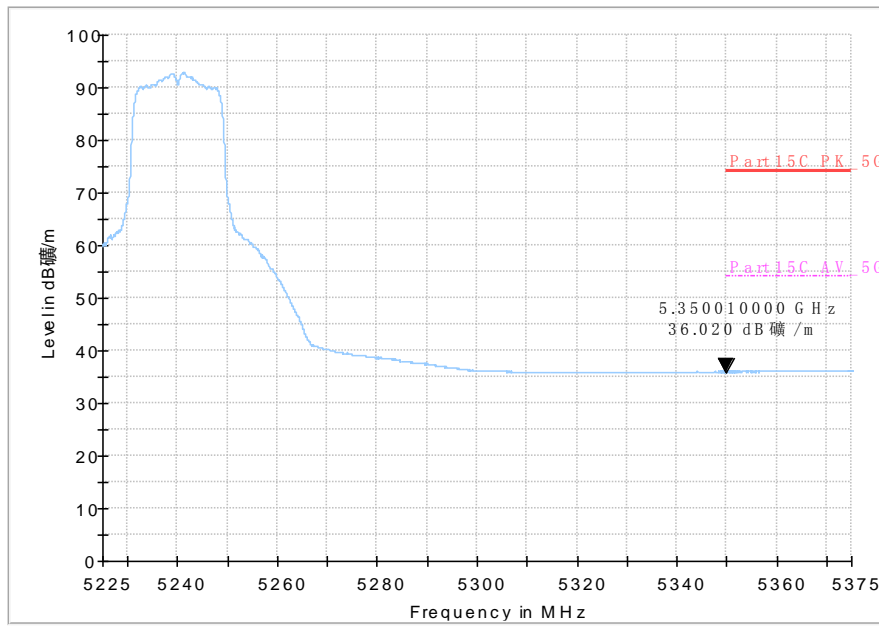


Average

Fig. 29 Band Edges (802.11ac-HT20, 5810MHz)



Peak



Average

Fig. 30 Band Edges (802.11ac-HT20, 5240MHz)

## ANNEX A.6. Transmitter Spurious Emission

### Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.407	-27 dBm/MHz

The measurement is made according to KDB 789033

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

Below 1GHz(detector: Peak and Quasi-Peak)

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz(detector: Peak):

(a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=3MHz / Sweep= AUTO

### Limit in restricted band:

Frequency of emission (MHz)	Field strength(dB $\mu$ V/m)	Measurement distance(m)
0.009-0.490	129-94	3
0.490-1.705	74-63	3
1.705-30	70	3
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

Note: for frequency range below 960MHz, the limit in 15.209 is defined in 10m test distance. The limit used above is calculated from 10m to 3m

Modulation type and data rate tested (Only worst case result is given below):

Mode	Data rate	Channel
802.11a	6Mbps	36(5180MHz)
802.11n-HT20	MCS0	36(5180MHz)

### Measurement Results:

**802.11a mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11a	36(5180MHz)	30 MHz ~ 1 GHz	Fig.31	P
		1 GHz ~ 8 GHz	Fig.32	P
		8 GHz ~ 18 GHz	Fig.33	P
		18 GHz ~ 26.5 GHz	Fig.34	P
		26.5 GHz ~ 40 GHz	Fig.35	P

**802.11n-HT20 mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n-HT20	36(5180MHz)	30 MHz ~ 1 GHz	Fig.36	P
		1 GHz ~ 8 GHz	Fig.37	P
		8 GHz ~ 18 GHz	Fig.38	P
		18 GHz ~ 26.5 GHz	Fig.39	P
		26.5 GHz ~ 40 GHz	Fig.40	P

**802.11ac-HT20 mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11ac (HT20)	36(5180MHz)	30 MHz ~1 GHz	Fig.1	P
		1 GHz ~ 8 GHz	Fig.2	P
		8 GHz ~ 18 GHz	Fig.3	P
		18 GHz ~ 26.5 GHz	Fig.4	P
		26.5 GHz~ 40 GHz	Fig.5	P

**Conclusion: PASS**
**Note:**

A "reference path loss" is established and the  $A_{Rpl}$  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:

Result= $P_{Mea}+A_{Rpl}= P_{Mea}+Cable Loss+Antenna Factor$



**802.11a**

Channel 36 ( 30MHz ~1GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
34.6	16.12	-27.5	43.62	V
40.3	28.46	-26.1	54.56	V
119.6	20.8	-28.6	49.4	H
175.0	23.53	-29	52.53	H
375.0	20.94	-24.1	45.04	V
750.0	28.23	-16.9	45.13	H

Channel 36 ( 1GHz ~ 8GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
4523.0	43.58	2.5	41.08	H
5486.4	47.16	4.5	42.66	V
5823.4	45.01	4.6	40.41	H
6443.8	46.5	5.9	40.6	V
7183.2	46.3	7.2	39.1	V
7790.8	48.78	8.5	40.28	H

Channel 36 ( 8GHz ~ 18GHz ) (Peak)

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
9525.6	48.09	10.8	37.29	H
11497.4	51.78	15.1	36.68	H
13639.2	54.76	18.5	36.26	H
14677.0	53.92	19.8	34.12	H
15652.0	55.42	21.6	33.82	V
17536.2	56.72	24.6	32.12	V

Channel 36 ( 8GHz ~ 18GHz )(Average)

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
13639.2	41.73	18.5	23.23	H

15652.0	43.08	21.6	21.48	V
17536.2	44.75	24.6	20.15	V

## Channel 36 ( 18GHz ~ 26.5GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
18986.0	38.65	-5.4	44.05	H
19951.6	39.59	-5	44.59	V
21109.3	42.28	-4.2	46.48	V
22341.0	43.41	-3.2	46.61	H
23563.2	43.36	-2.8	46.16	V
24835.7	44.25	-2.3	46.55	V

## Channel 36 ( 26.5GHz ~ 40GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
28321.2	44.9	-0.9	45.8	V
30825.4	45.66	0.3	45.36	H
33468.7	44.23	1.2	43.03	H
35460.0	47.03	1.5	45.53	V
37603.8	45.32	1.1	44.22	V
39100.9	50.51	4.2	46.31	V

**802.11n-HT20**

## Channel 36 ( 30MHz ~1GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
33.3	16.64	-27.3	43.94	V
34.5	15.53	-27.3	42.83	V
101.8	17.09	-27.3	44.39	V
125.0	22.82	-29.7	52.52	H
250.0	32.09	-26.9	58.99	H
375.0	23.22	-24	47.22	H

## Channel 36 ( 1GHz ~ 8GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
2993.8	44.28	-1.3	45.58	V
5621.6	46.22	4.7	41.52	V
5998.2	44.85	4.6	40.25	V
6508.0	46.96	6	40.96	H
7167.6	45.97	7.2	38.77	H
7411.4	46.58	7.2	39.38	V

## Channel 36 ( 8GHz ~ 18GHz ) (Peak)

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
8813.0	48.55	9.7	38.85	V
10580.4	50.61	13.1	37.51	H
12551.6	53.81	16.7	37.11	H
14667.4	53.99	19.8	34.19	V
16211.0	55.51	22.3	33.21	V
17671.2	56.91	24.4	32.51	H

## Channel 36 ( 8GHz ~ 18GHz )(Average)

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
16211.0	43.18	22.3	20.88	V
17671.2	44.75	24.4	20.35	H

## Channel 36 ( 18GHz ~ 26.5GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
19175.6	39.57	-5.6	45.17	H
20401.2	40.98	-4.5	45.48	H
21790.2	43	-3.4	46.4	V
23041.4	42.95	-3	45.95	V
24668.2	44.34	-2.3	46.64	H

26013.0	46.55	-1.9	48.45	V
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## Channel 36 ( 26.5GHz ~ 40GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
27474.7	44.53	-0.9	45.43	V
30760.6	45.98	0.1	45.88	H
33314.8	44.48	1	43.48	V
35318.2	48.28	1.4	46.88	V
37825.2	44.75	1.2	43.55	V
39562.6	51.46	4.4	47.06	V

**802.11ac-HT20**

## Channel 36 ( 30MHz ~1GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
41.4	36.49	-25.7	62.19	V
89.8	26.62	-29.1	55.72	V
200.0	28.93	-28	56.93	H
249.9	21.92	-26.9	48.82	H
425.0	26.93	-23.1	50.03	H
750.0	28.66	-16.6	45.26	H

## Channel 36 ( 1GHz ~ 8GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
4243.2	44.04	1.5	42.54	H
5466.8	46.7	4.5	42.2	H
6067.2	45.36	4.7	40.66	V
6789.8	47.57	6.7	40.87	H
7439.2	48.17	7.3	40.87	V
7805.0	48.47	8.5	39.97	H

## Channel 36 (8GHz ~ 18GHz )( Peak )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
9721.6	49.29	11.1	38.19	H
11610.2	51.64	15.2	36.44	V
13333.2	54.61	18.1	36.51	H
14589.2	54.07	19.4	34.67	H
15707.0	55.56	21.8	33.76	H
17575.8	57.12	24.6	32.52	H

## Channel 36(8GHz ~ 18GHz )( Average )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
13333.2	41.53	18.1	23.43	H
14589.2	41.86	19.4	22.46	H
15707.0	43.32	21.8	21.52	H
17575.8	44.76	24.6	20.16	H

## Channel 36 (18GHz ~ 26.5GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
19050.6	39.98	-5.5	45.48	H
20346.0	40.73	-4.6	45.33	H
21815.6	43.72	-3.4	47.12	V
23046.4	43.32	-3	46.32	V
24106.4	44.26	-2.8	47.06	H
25373.8	44.04	-2.6	46.64	H

## Channel 36 (26.5GHz ~ 40GHz )

Frequency (MHz)	Result (dB $\mu$ V/m)	ARpl (dB)	PMea (dB $\mu$ V/m)	Polarity
27955.3	43.7	-0.3	44	H
30363.7	44.84	-0.7	45.54	V
32314.4	44.56	0.5	44.06	H

34415.0	45.49	1.3	44.19	H
36896.4	45.89	1.9	43.99	H
38895.7	50.66	3.8	46.86	H

Test graphs as below:

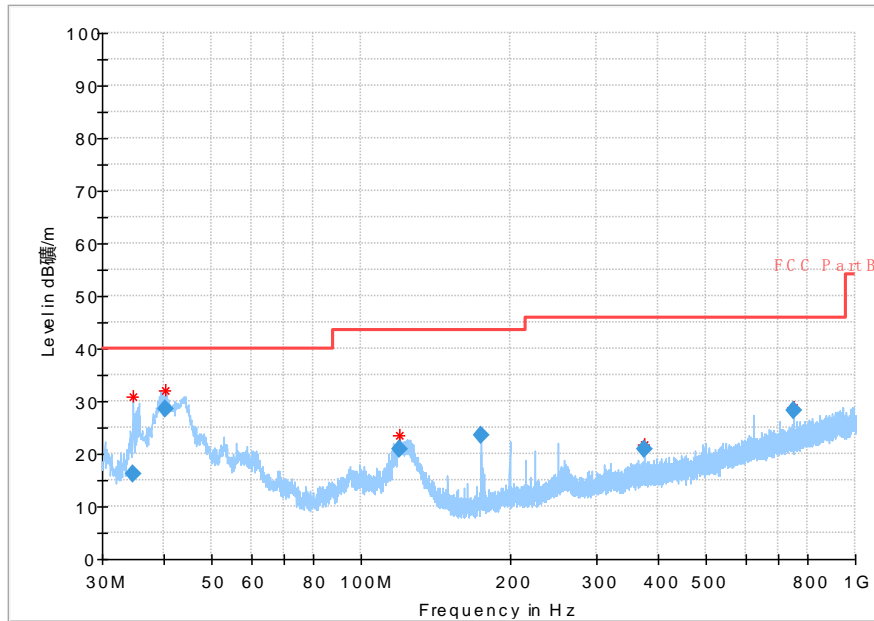


Fig. 31 Radiated Spurious Emission (802.11a, ch36, 30 MHz-1 GHz)

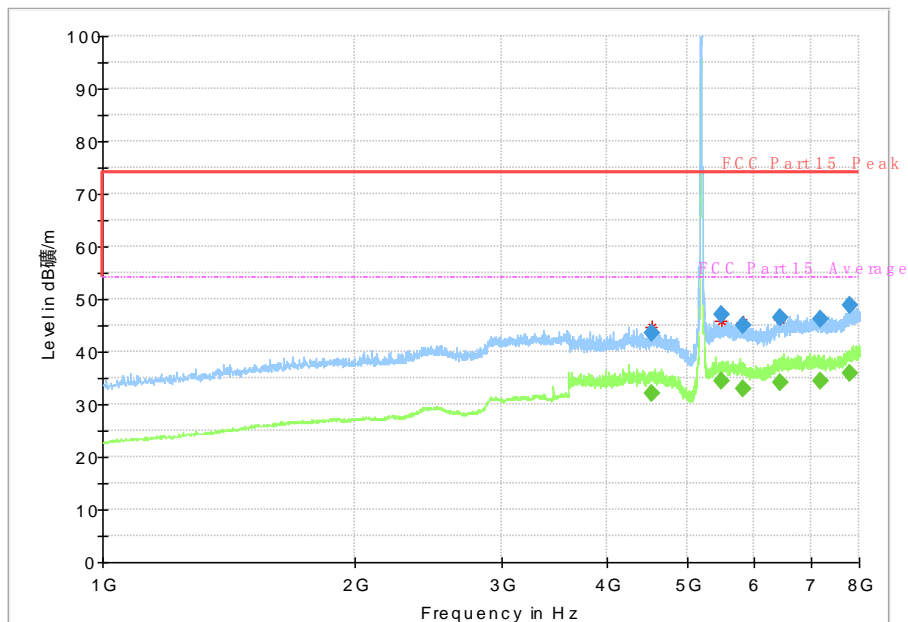


Fig. 32 Radiated Spurious Emission (802.11a, ch36, 1 GHz-8 GHz)

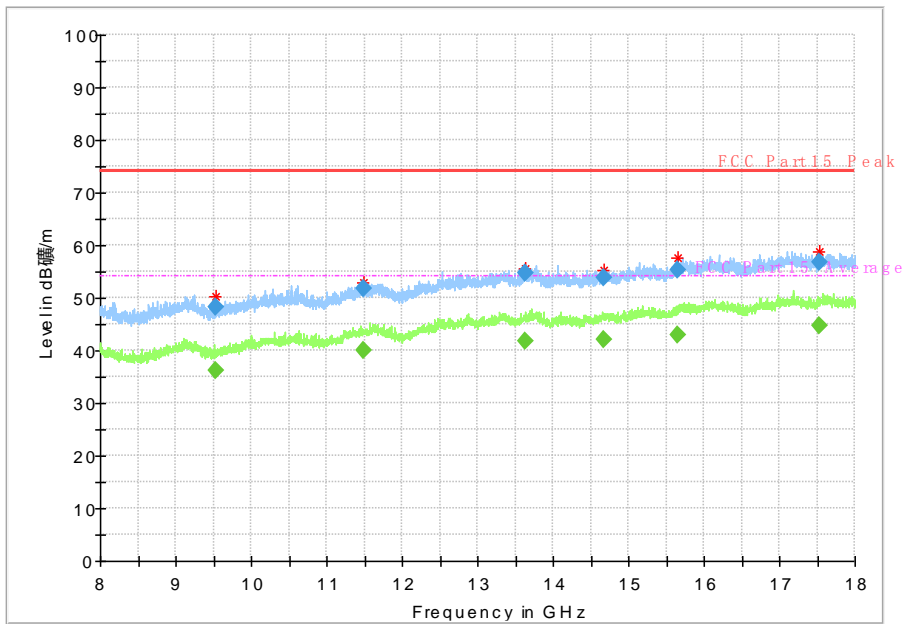


Fig. 33 Radiated Spurious Emission (802.11a, ch36, 8 GHz-18 GHz)

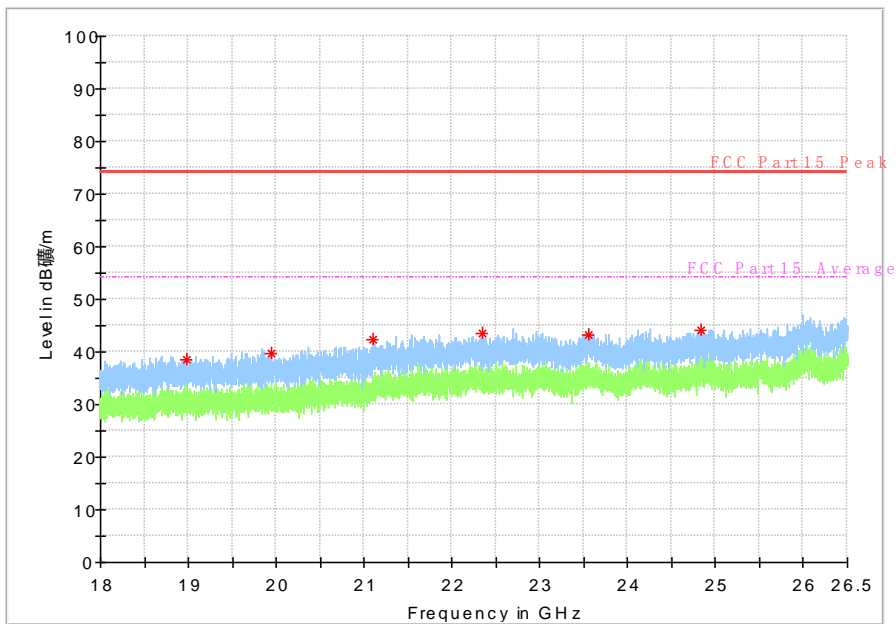


Fig. 34 Radiated Spurious Emission (802.11a, ch36, 18 GHz-26.5 GHz)

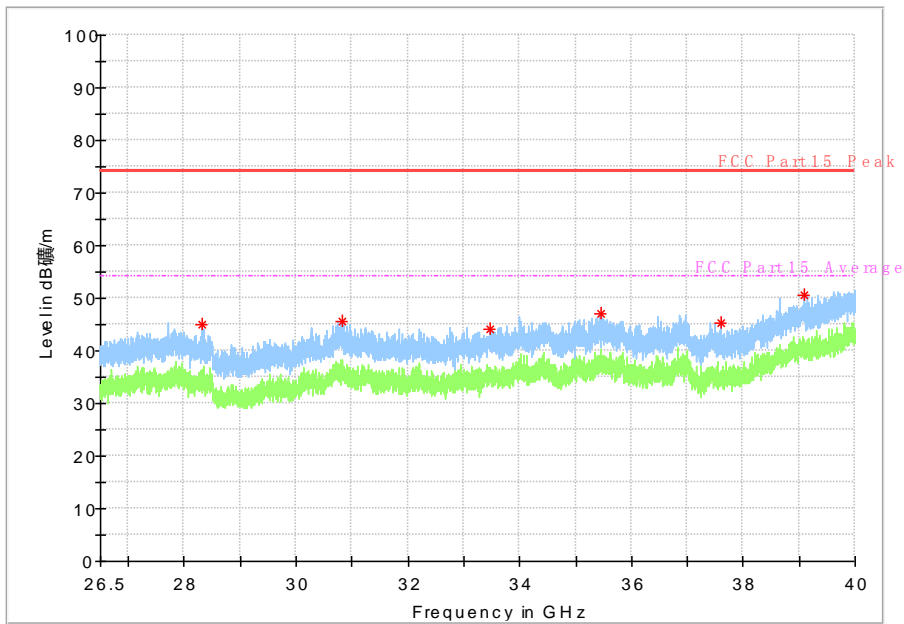


Fig. 35 Radiated Spurious Emission (802.11a, ch36, 26.5 GHz-40 GHz)

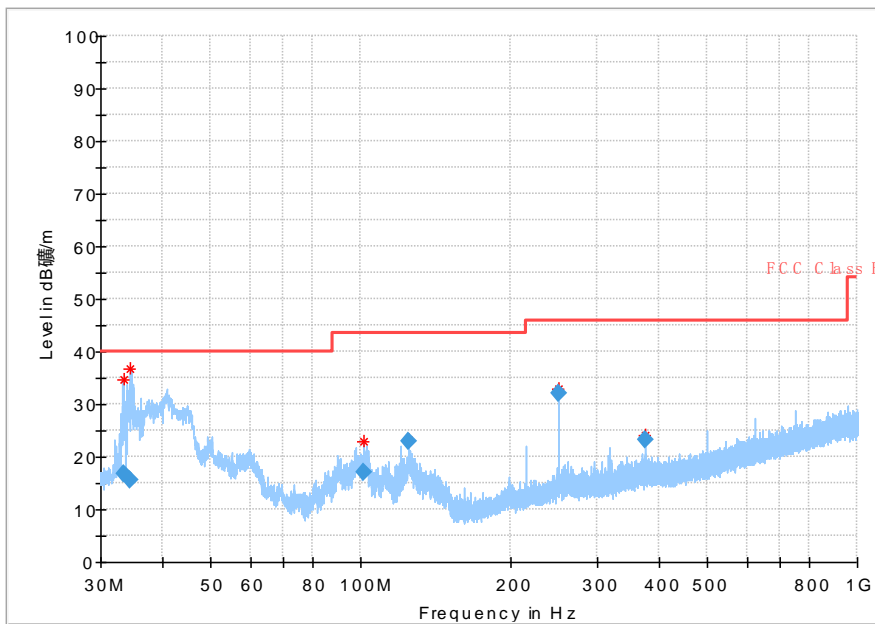


Fig. 36 Radiated Spurious Emission (802.11n-HT20, ch36, 30 MHz-1 GHz)



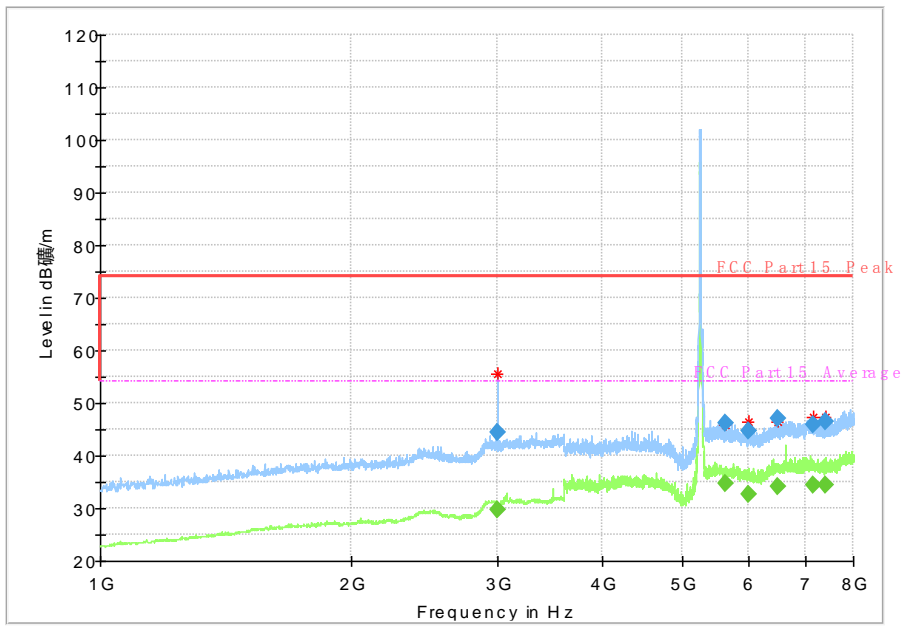


Fig. 37 Radiated Spurious Emission (802.11n-HT20, ch36, 1 GHz-8 GHz)

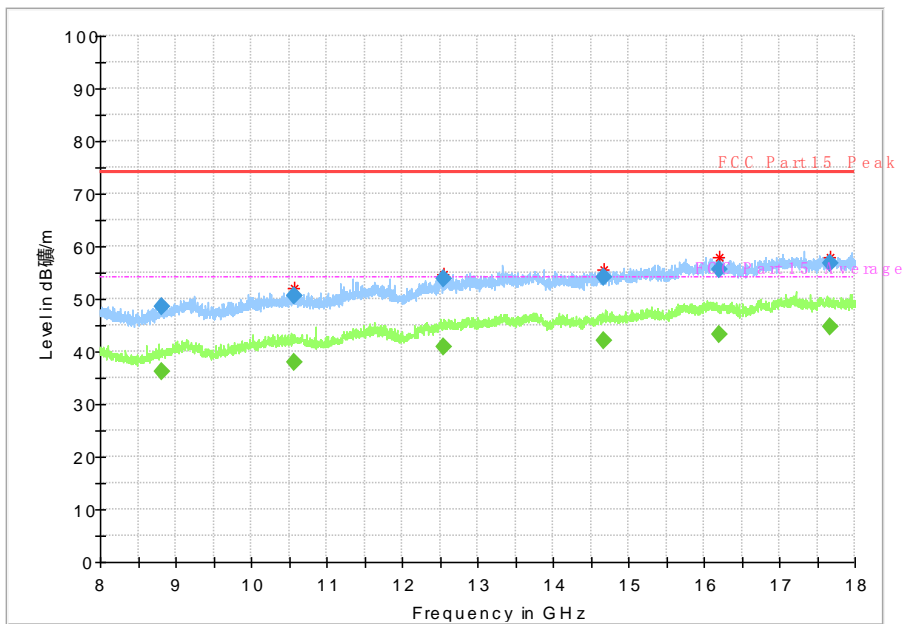


Fig. 38 Radiated Spurious Emission (802.11n-HT20, ch36, 8 GHz-18 GHz)

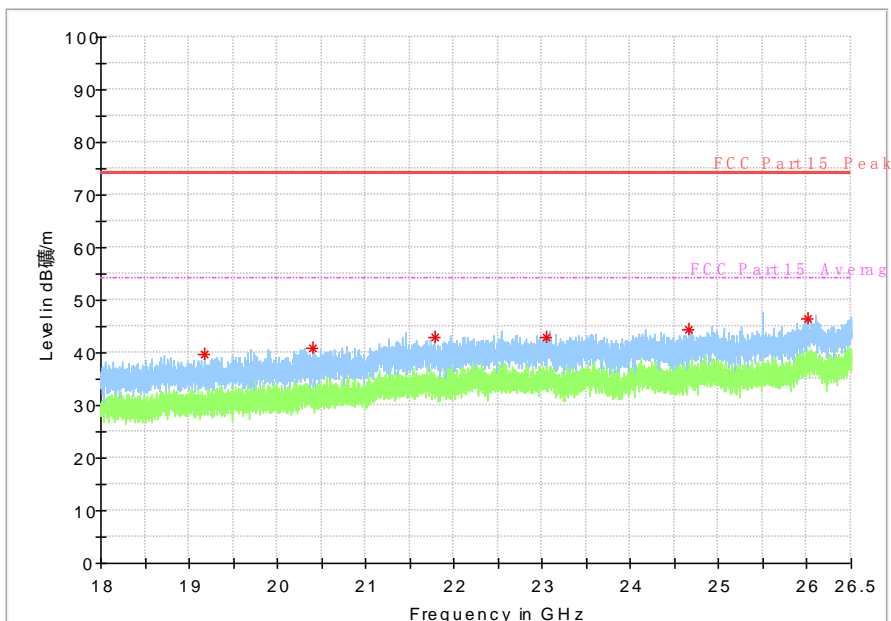


Fig. 39 Radiated Spurious Emission (802.11n-HT20, ch36, 18 GHz-26.5 GHz)

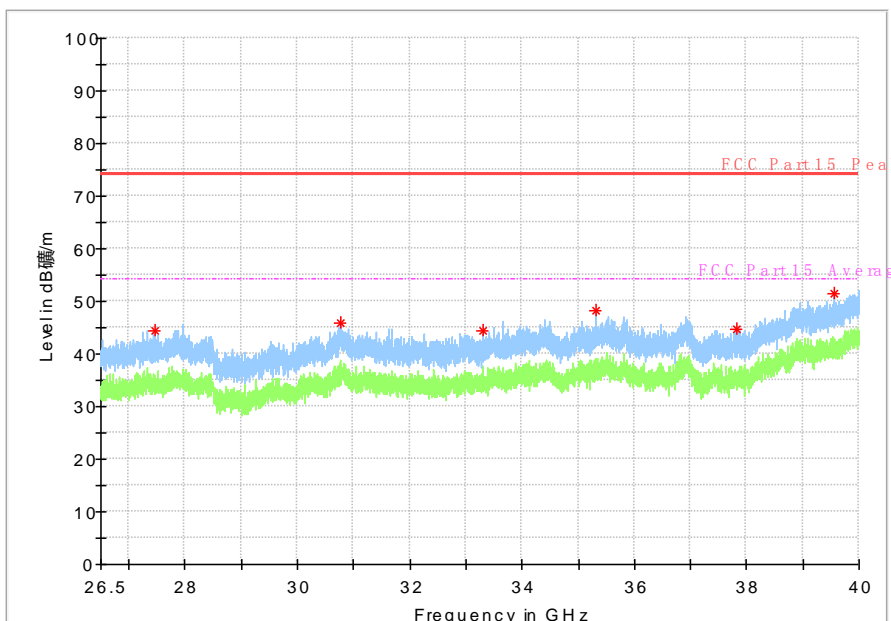


Fig. 40 Radiated Spurious Emission (802.11n-HT20, ch36, 26.5 GHz-40 GHz)

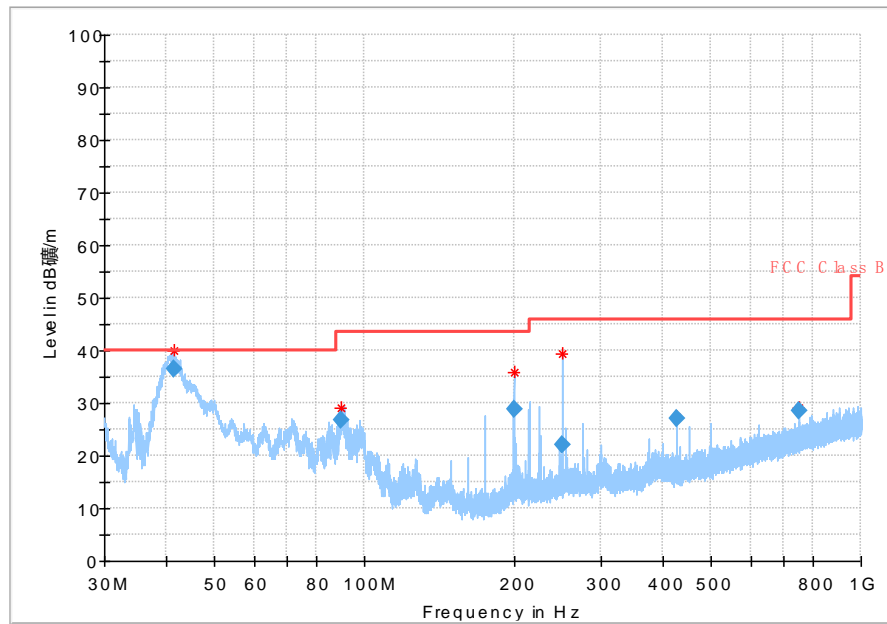


Fig. 41 Radiated Spurious Emission (802.11ac-HT20, Ch36, 30 MHz-1 GHz)

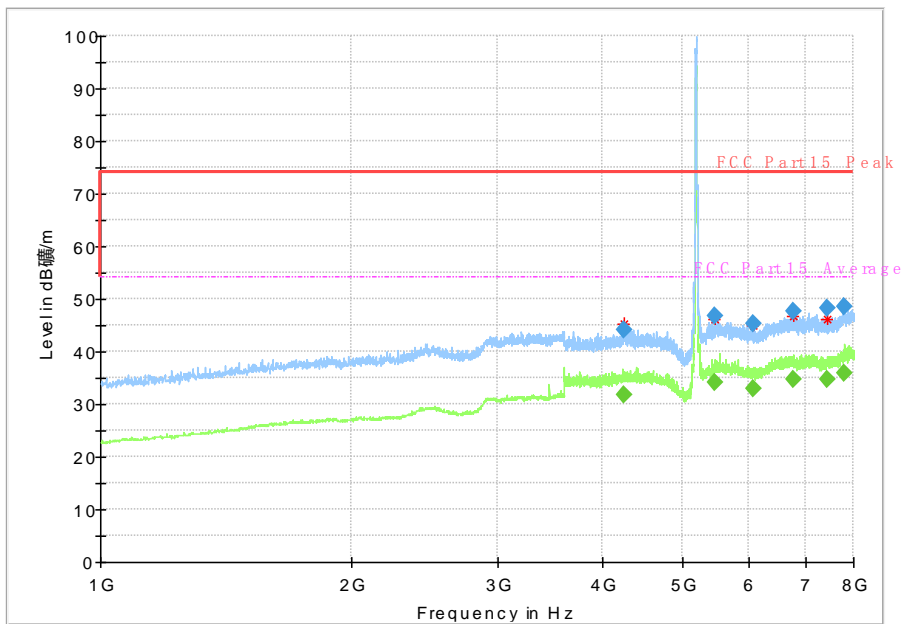


Fig. 42 Radiated Spurious Emission (802.11ac-HT20, Ch36, 1 GHz-8 GHz)

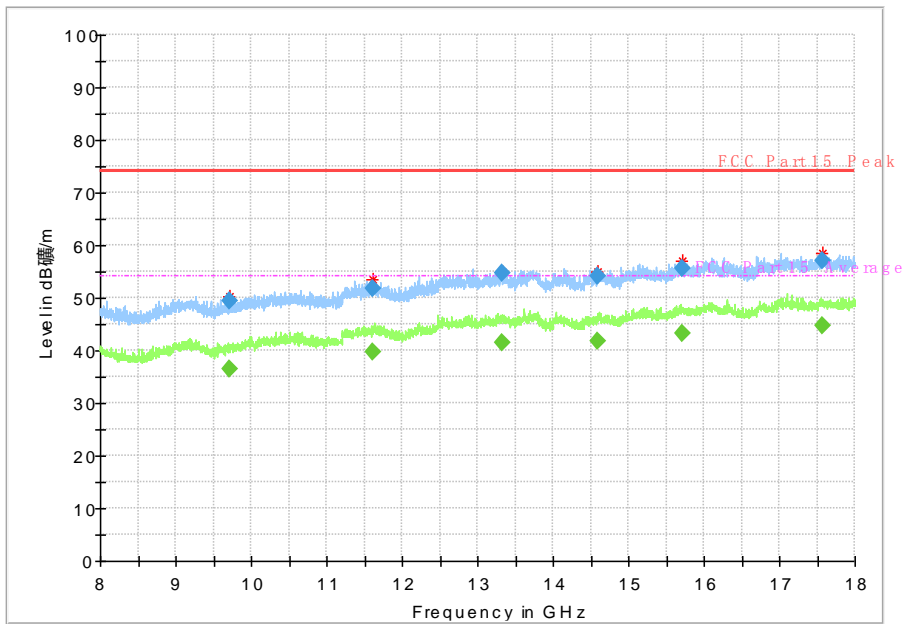


Fig. 43 Radiated Spurious Emission (802.11ac-HT20, Ch36, 8 GHz-18 GHz)

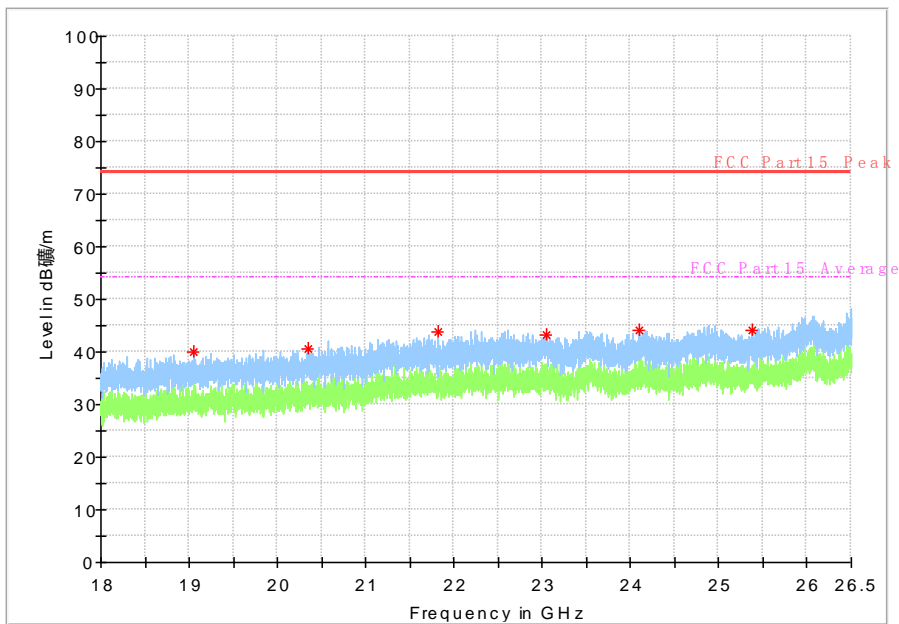


Fig. 44 Radiated Spurious Emission (802.11ac-HT20, Ch36, 18 GHz-26.5 GHz)

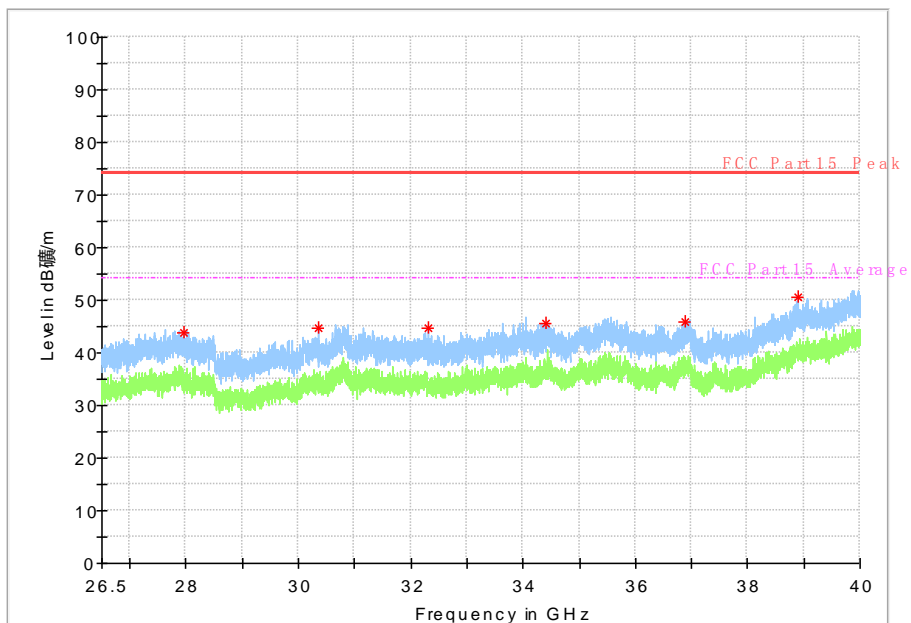


Fig. 45 Radiated emission: 802.11n, (802.11ac-HT20, Ch36, 26.5 GHz - 40 GHz)

## ANNEX A.7. Conducted Emission (150kHz- 30MHz)

### Test Condition:

Voltage (V)	Frequency (Hz)
110	60

### Measurement Result and limit:

#### WLAN (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)		Conclusion
		With charger		
		11a mode	Idle	
0.15 to 0.5	66 to 56	Fig.55		P
0.5 to 5	56			
5 to 30	60			

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

#### WLAN (Average Limit)

Frequency range (MHz)	Average Limit (dB $\mu$ V)	Result (dB $\mu$ V)		Conclusion
		With charger		
		11a mode	Idle	
0.15 to 0.5	56 to 46	Fig.55		P
0.5 to 5	46			
5 to 30	50			

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

**Conclusion: PASS**

Test graphs as below:

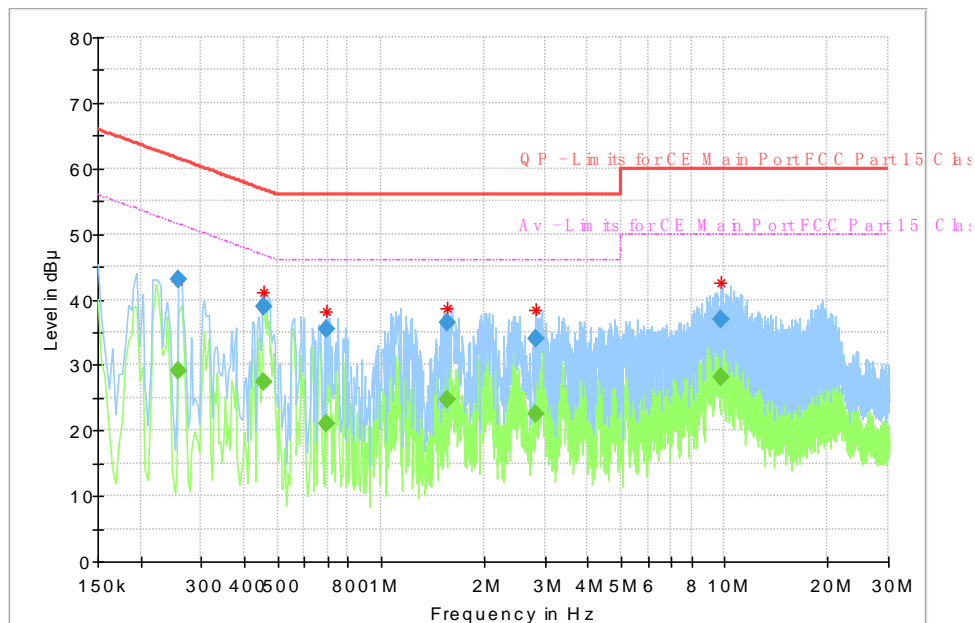


Fig. 46 Conducted Emission(802.11a, TX)

## Measurement Result:

Frequency (MHz)	Quasi Peak (dB $\mu$ V)	Average (dB $\mu$ V)	Limit (dB $\mu$ V)	Marg in (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.258206	---	29.09	51.49	22.40	15000.0	9.000	L1	ON	9.8
0.258206	42.97	---	61.49	18.52	15000.0	9.000	L1	ON	9.8
0.455963	38.94	---	56.77	17.83	15000.0	9.000	N	ON	9.8
0.455963	---	27.32	46.77	19.45	15000.0	9.000	N	ON	9.8
0.691031	35.58	---	56.00	20.42	15000.0	9.000	N	ON	9.8
0.691031	---	21.00	46.00	25.00	15000.0	9.000	N	ON	9.8
1.564144	36.53	---	56.00	19.47	15000.0	9.000	N	ON	9.9
1.564144	---	24.80	46.00	21.20	15000.0	9.000	N	ON	9.9
2.810381	33.89	---	56.00	22.11	15000.0	9.000	N	ON	10.0
2.810381	---	22.47	46.00	23.53	15000.0	9.000	N	ON	10.0
9.761700	---	28.02	50.00	21.98	15000.0	9.000	L1	ON	11.2
9.761700	37.03	---	60.00	22.97	15000.0	9.000	L1	ON	11.2

**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 17025:2017 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 April 2017).



Presented this 6th day of May 2019.



Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 3682.01  
Valid to February 28, 2021

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

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