



TEST REPORT

No. I19D00082-SRD07

For

Client: Shanghai Sunmi Technology Co.,Ltd.

Production: Handheld Wireless Terminal

Model Name: T8A01

Brand Name: SUNMI

FCC ID : 2AH25T8A01

Hardware Version: V1.01

Software Version: L2K_V1.8_20190426

Issued date: 2019-08-13

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

Add: 7-8F, G Area, No.668, Beijing East Road, Huangpu District, Shanghai, P. R. China

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Revision Version

| Report Number | Revision | Date | Memo |
|----------------------|-----------------|-------------|---------------------------------|
| I19D00082-SRD07 | 00 | 2019-07-25 | Initial creation of test report |
| I19D00082-SRD07 | 01 | 2019-08-13 | Scend 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 | 958356 |

1.2. Testing Environment

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

1.3. Project Data

| | |
|--------------------|------------|
| Project Leader | Zhou Yan |
| Testing Start Date | 2019-06-12 |
| Testing End Date | 2019-06-15 |

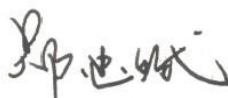
1.4. Signature



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 | Shanghai Sunmi Technology Co.,Ltd. |
| Address | Room 505, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai, China |
| Telephone | 18721763396 |
| Postcode | / |

2.2. Manufacturer Information

| | |
|--------------|---|
| Company Name | Shanghai Sunmi Technology Co.,Ltd. |
| Address | Room 505, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai, China |
| Telephone | 18721763396 |
| Postcode | / |

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

3.1. About EUT

| | |
|-------------------------|----------------------------|
| Production | Handheld Wireless Terminal |
| Model name | T8A01 |
| WLAN (5G) | 802.11 a/n20/n40 |
| Frequency Range | ISM Bands: 5150MHz-5250MHz |
| WLAN type of modulation | OFDM |
| Extreme Temperature | -20/+60°C |
| Nominal Voltage | 3.8V |
| Extreme High Voltage | 4.35V |
| Extreme Low Voltage | 3.45V |
| Maximum of Antenna Gain | WIFI5 Ghz: 0.78 dBi |

Note:

- Photographs of EUT are shown in ANNEX A of this test report.
- 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 |
|---------|-----------------|------------|-------------------|-----------------|
| N05 | 863036040001745 | V1.01 | L2K_V1.8_20190426 | 2019-06-10 |
| N06 | 863036040001653 | V1.01 | L2K_V1.8_20190426 | 2019-06-10 |

*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 |

5. Test Results

5.1. Summary of Test Results

| Measurement Items | Sub-clause of Part15C | Verdict |
|---|-----------------------|---------|
| Maximum Output Power | 15.407 | P |
| Power Spectral Density | 15.407 | P |
| 99% Occupied Bandwidth | 15.407 | P |
| Band edge compliance | 15.407 | P |
| Transmitter spurious emissions radiated | 15.407 | P |
| Spurious emissions radiated < 30 MHz | 15.407 | P |
| Spurious emissions conducted < 30 MHz | 15.407 | P |
| Peak Excursion | 15.407 | P |
| Frequency Stability | 15.407 | P |
| Transmit Power Control | 15.407 | 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 T8A01 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 | Serial Number | 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 |

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:

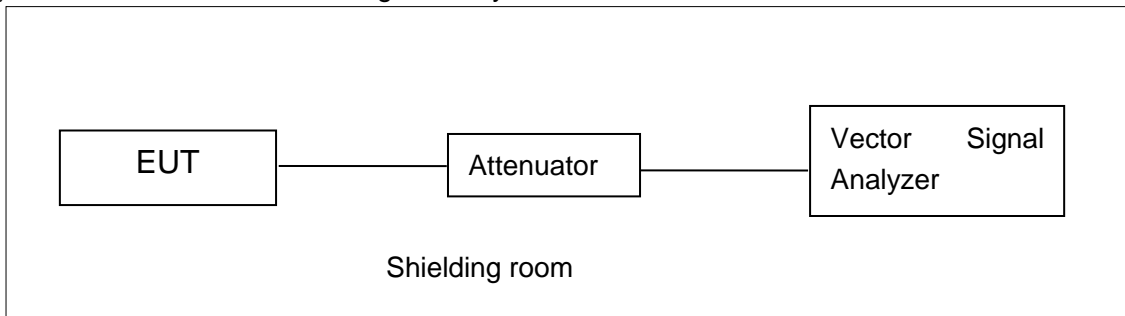
| | |
|------------------------------|--|
| Temperature | Min. = 15 °C, Max. = 35 °C |
| Relative humidity | Min. = 25 %, Max. = 75 % |
| Shielding effectiveness | > 100 dB |
| Electrical insulation | > 10 kΩ |
| Ground system resistance | < 0.5 Ω |
| VSWR | Between 0 and 6 dB, from 1GHz to 18GHz |
| 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

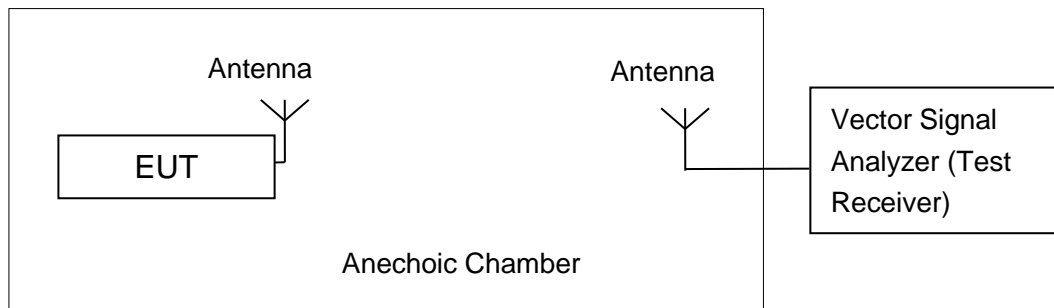
A.1.1. Conducted Measurements

- 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 | Data Rate(Mbps) | Teat Result(dBm) | | |
|---------|-----------------|------------------|---------|---------|
| | | 5180MHz | 5200MHz | 5240MHz |
| 802.11a | 6 | 12.63 | 12.16 | 11.89 |

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 | Data Rate(Index) | Teat Result(dBm) | | |
|----------------|------------------|------------------|---------|---------|
| | | 5180MHz | 5200MHz | 5240MHz |
| 802.11n(20MHz) | MCS0 | 10.83 | 10.41 | 10.09 |

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

802.11n-HT40 mode U-NII-1

| Mode | Data Rate(Index) | Teat Result(dBm) | | |
|----------------|------------------|------------------|---|---------|
| | | 5190MHz | / | 5230MHz |
| 802.11n(40MHz) | MCS0 | 11.53 | / | 10.54 |

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:

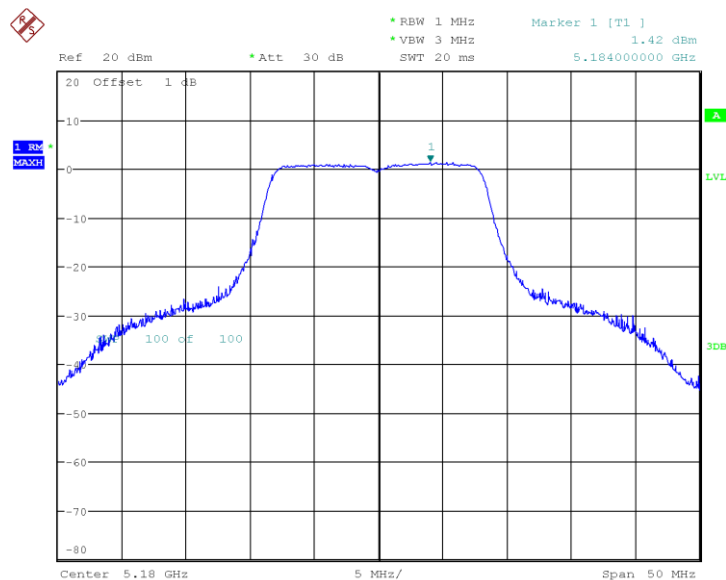
| Standard | Frequency (MHz) | Limit (dBm/MHz) |
|------------------------|-----------------|-----------------|
| FCC CRF Part 15.407(a) | 5150MHz~5250MHz | 11 |
| | 5250MHz~5350MHz | 11 |
| | 5470MHz~5725MHz | 11 |

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

Measurement Results:

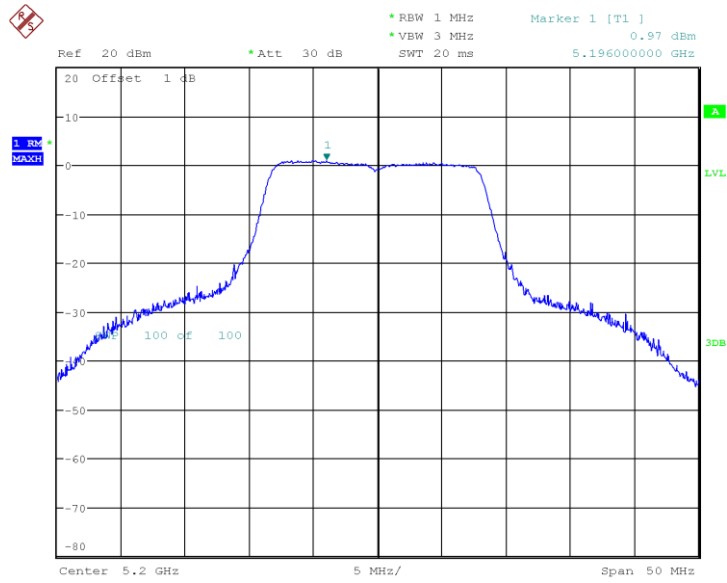
| Mode | Channel | Power Spectral Density (dBm/MHz) | | Conclusion |
|-----------------|----------|----------------------------------|--------|------------|
| 802.11a | 5180 MHz | Fig.1 | 2.006 | P |
| | 5200 MHz | Fig.2 | 1.558 | P |
| | 5240 MHz | Fig.3 | 1.098 | P |
| 802.11n HT20 | 5180 MHz | Fig.4 | 0.160 | P |
| | 5200 MHz | Fig.5 | -0.255 | P |
| | 5240 MHz | Fig.6 | -0.850 | P |
| 802.11n HT40 | 5190 MHz | Fig.7 | -2.165 | P |
| | 5230 MHz | Fig.8 | -3.089 | P |

Conclusion: PASS



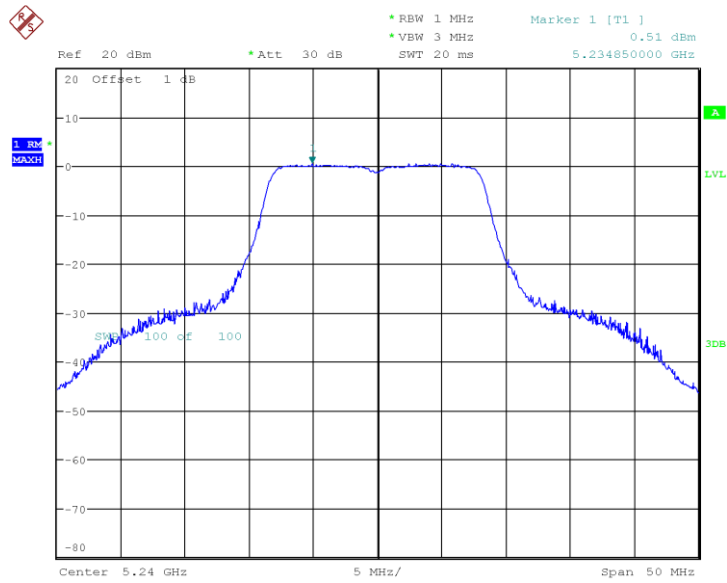
Date: 15.JUN.2019 06:23:34

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



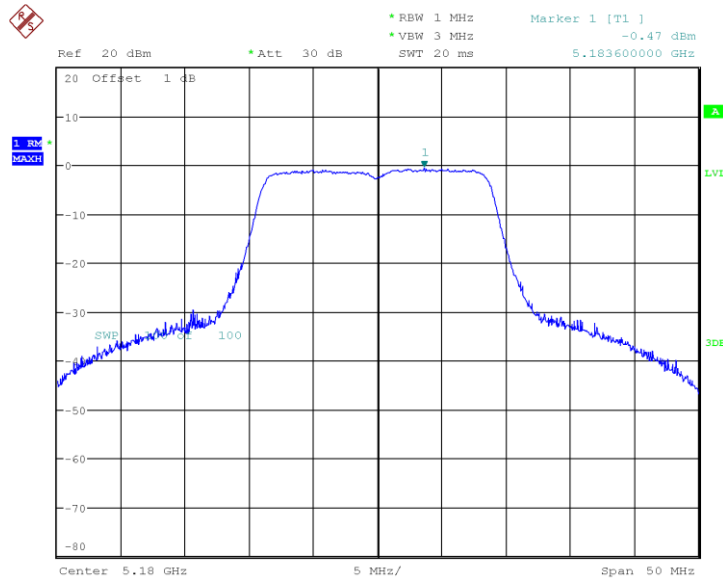
Date: 15.JUN.2019 06:24:39

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



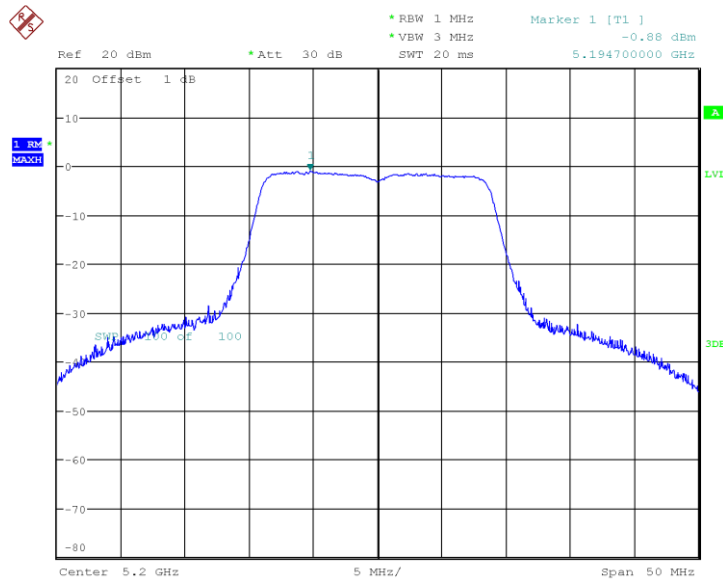
Date: 15.JUN.2019 06:25:43

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



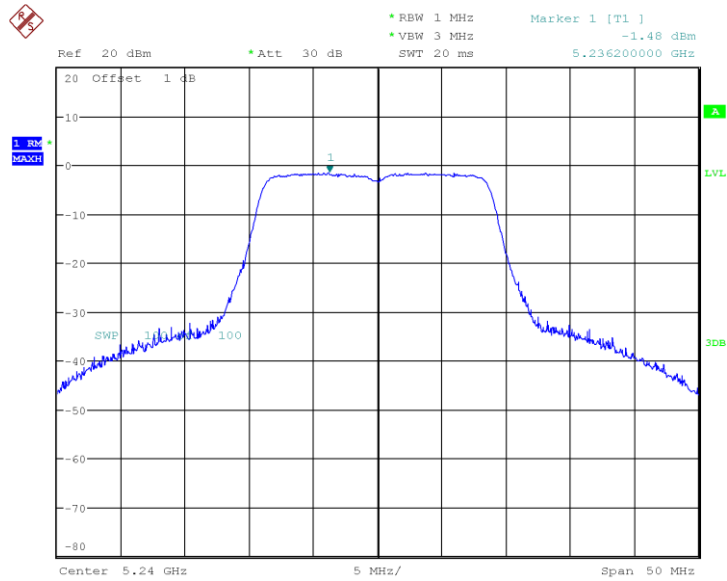
Date: 15.JUN.2019 06:27:46

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



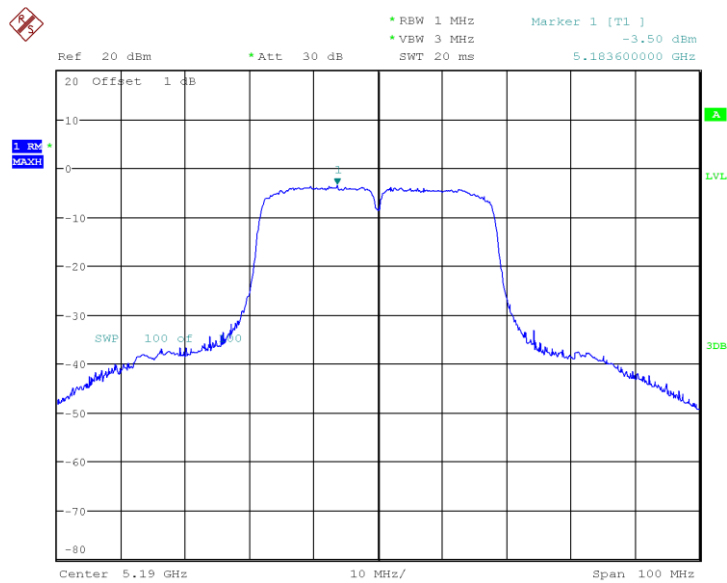
Date: 15.JUN.2019 06:28:47

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



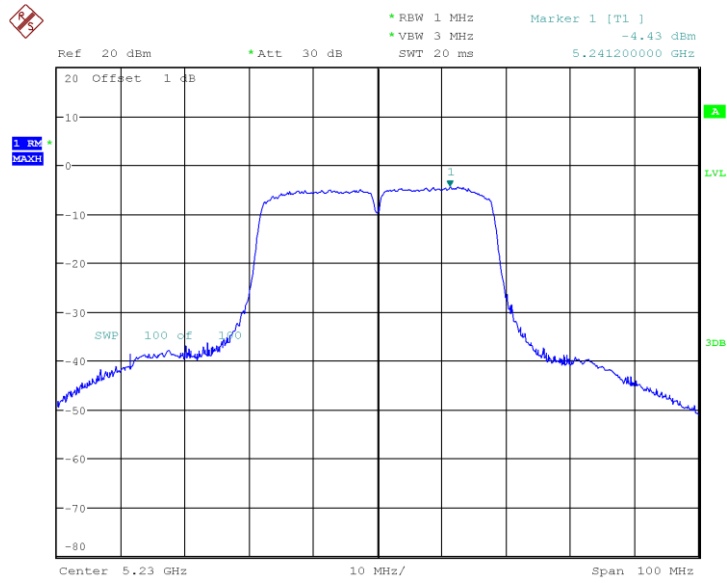
Date: 15.JUN.2019 06:30:05

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



Date: 15.JUN.2019 06:31:49

Fig. 7 Power Spectral Density (802.11n-HT40, 5190MHz)



Date: 15.JUN.2019 06:33:09

Fig. 8 Power Spectral Density (802.11n-HT40, 5230MHz)

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

Measurement Limit:

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

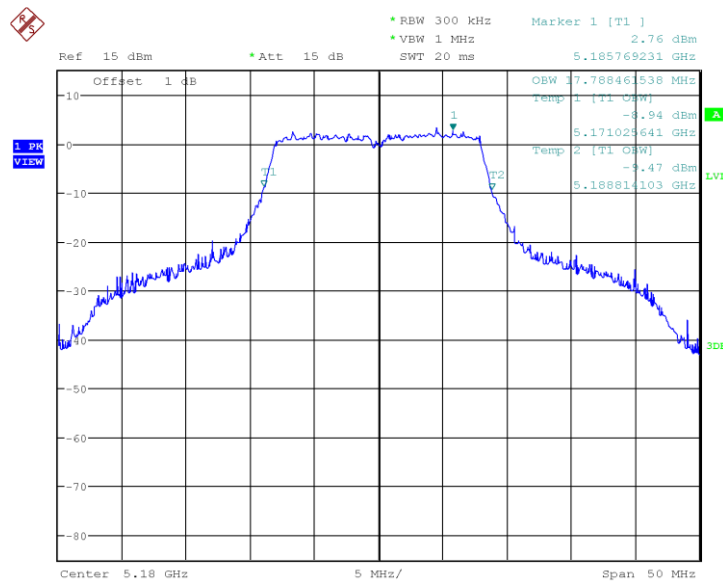
The measurement is made according to KDB 789033

Measurement Result:

| Mode | Channel | 99% Occupied Bandwidth (MHz) | | conclusion |
|-----------------|----------|-------------------------------|--------|------------|
| | | Fig. | Value | |
| 802.11a | 5180 MHz | Fig.9 | 17.788 | P |
| | 5200 MHz | Fig.10 | 17.949 | P |
| | 5240 MHz | Fig.11 | 17.788 | P |
| 802.11n HT20 | 5180 MHz | Fig.12 | 18.510 | P |
| | 5200 MHz | Fig.13 | 18.590 | P |
| | 5240 MHz | Fig.14 | 18.429 | P |
| 802.11n HT40 | 5190 MHz | Fig.15 | 36.218 | P |
| | 5230 MHz | Fig.16 | 36.218 | P |

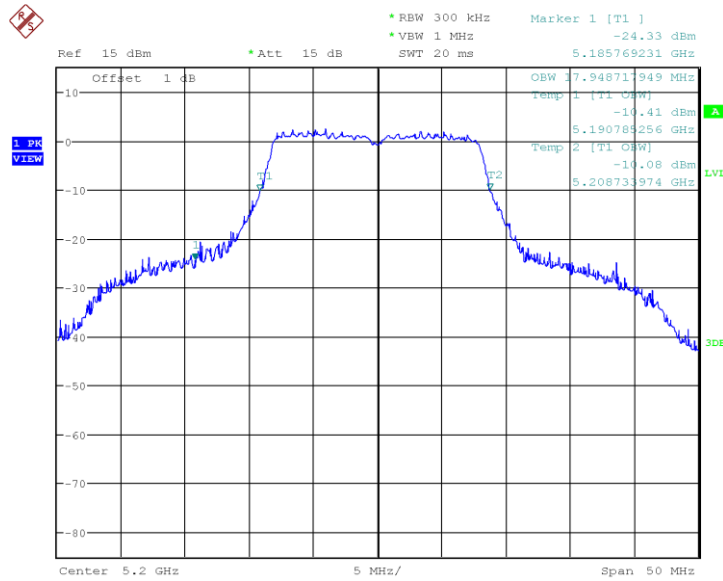
Conclusion: PASS

Test graphs as below:



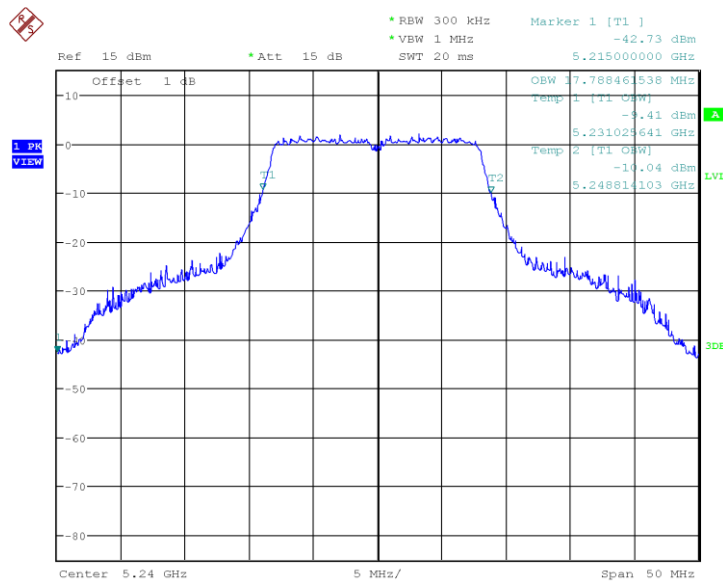
Date: 15.JUN.2019 05:53:09

Fig. 9 99% Occupied Bandwidth (802.11a, 5180MHz)



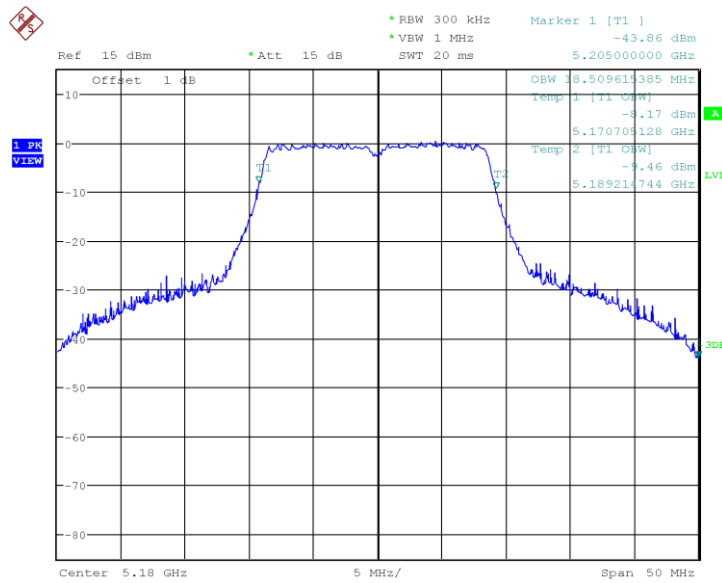
Date: 15.JUN.2019 05:54:13

Fig. 10 99% Occupied Bandwidth (802.11a, 5200MHz)



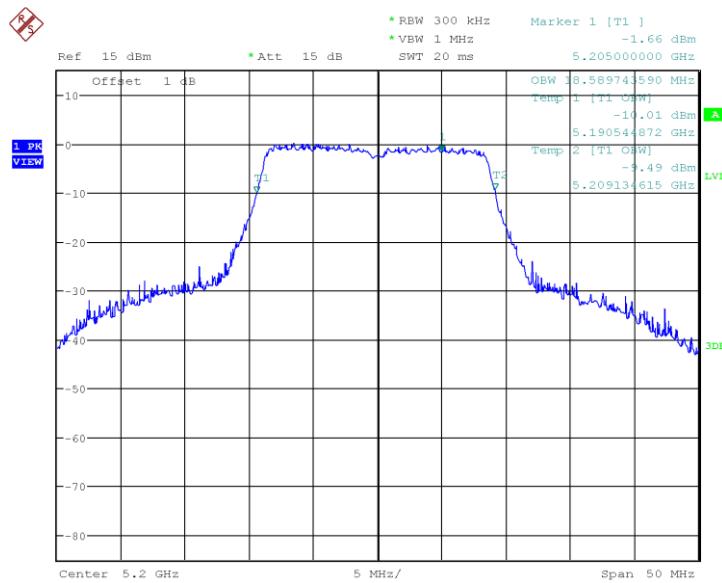
Date: 15.JUN.2019 05:55:54

Fig. 11 99% Occupied Bandwidth (802.11a, 5240MHz)



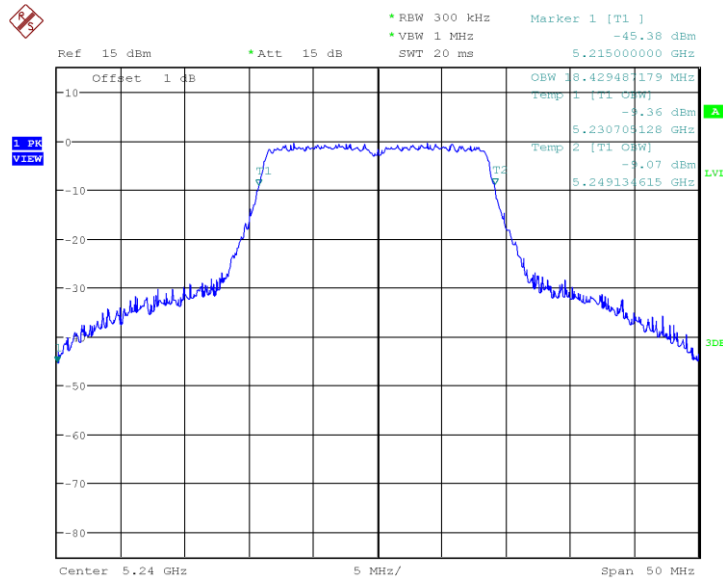
Date: 15.JUN.2019 05:57:21

Fig. 12 99% Occupied Bandwidth (802.11n-HT20, 5180MHz)



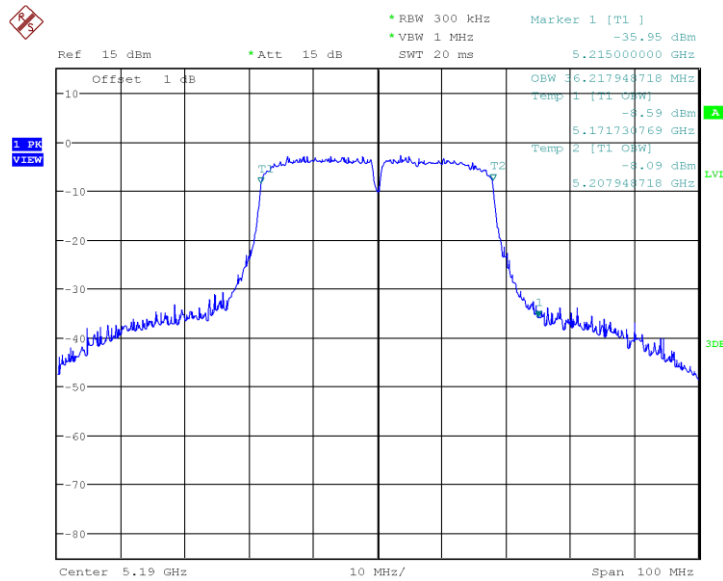
Date: 15.JUN.2019 05:58:24

Fig. 13 99% Occupied Bandwidth (802.11n-HT20, 5200MHz)



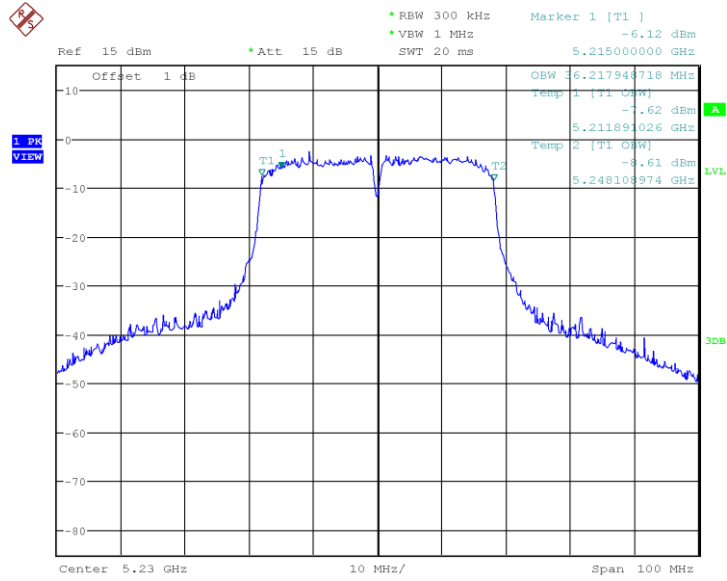
Date: 15.JUN.2019 05:59:59

Fig. 14 99% Occupied Bandwidth (802.11n-HT20, 5240MHz)



Date: 15.JUN.2019 06:01:24

Fig. 15 99% Occupied Bandwidth (802.11n-HT40, 5190MHz)



Date: 15.JUN.2019 06:02:33

Fig. 16 99% Occupied Bandwidth (802.11n-HT40, 5230MHz)

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 |

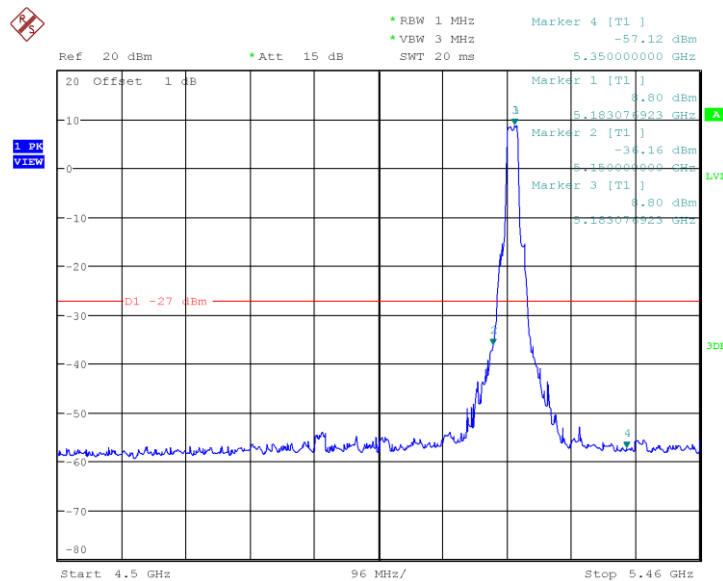
The measurement is made according to KDB 789033

Measurement Result:

| Mode | Channel | Test Results | Conclusion |
|-----------------|----------|--------------|------------|
| 802.11a | 5180 MHz | Fig.17 | P |
| | 5240 MHz | Fig.18 | P |
| 802.11n HT20 | 5180 MHz | Fig.19 | P |
| | 5240 MHz | Fig.20 | P |
| 802.11n HT40 | 5190 MHz | Fig.21 | P |
| | 5230 MHz | Fig.22 | P |

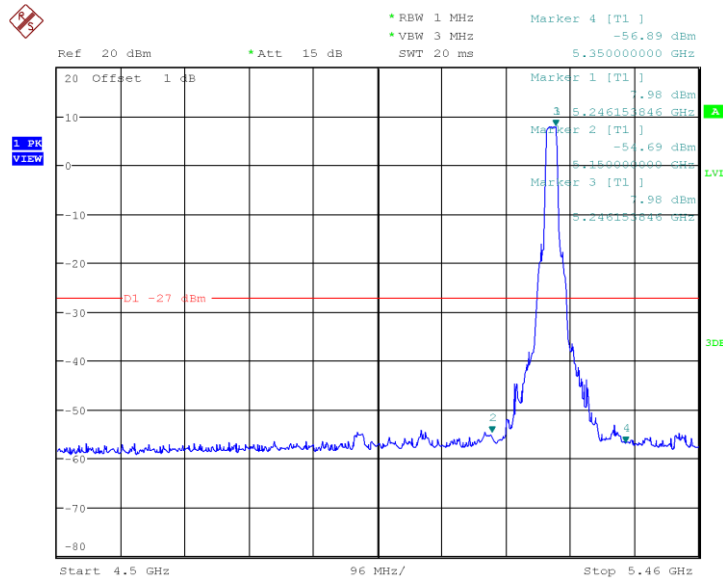
Conclusion: PASS

Test graphs as below:



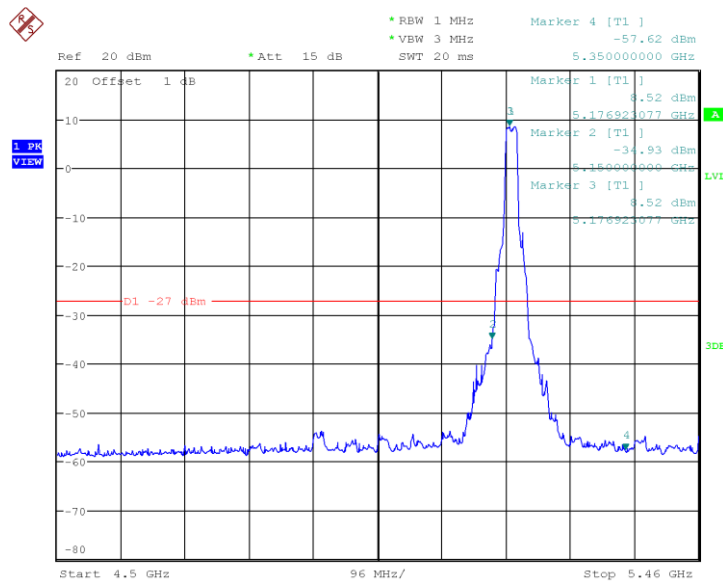
Date: 15.JUN.2019 06:48:09

Fig. 17 Band Edges (802.11a, 5180MHz)



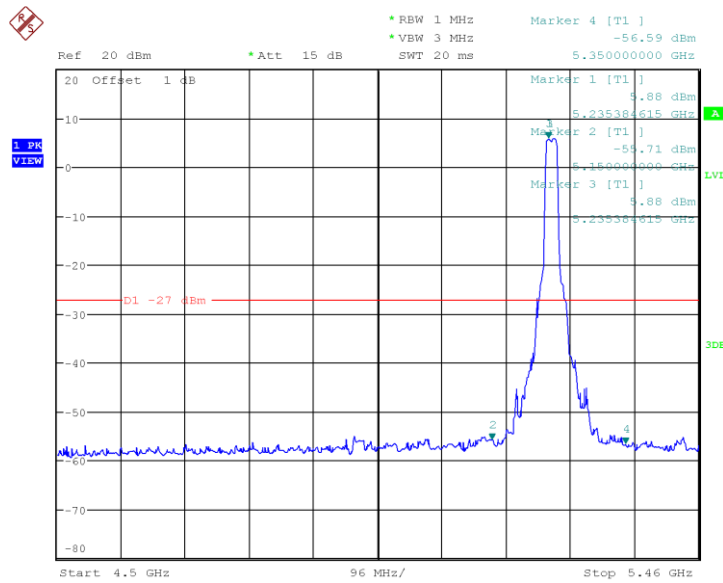
Date: 15.JUN.2019 06:53:17

Fig. 18 Band Edges (802.11a, 5240MHz)



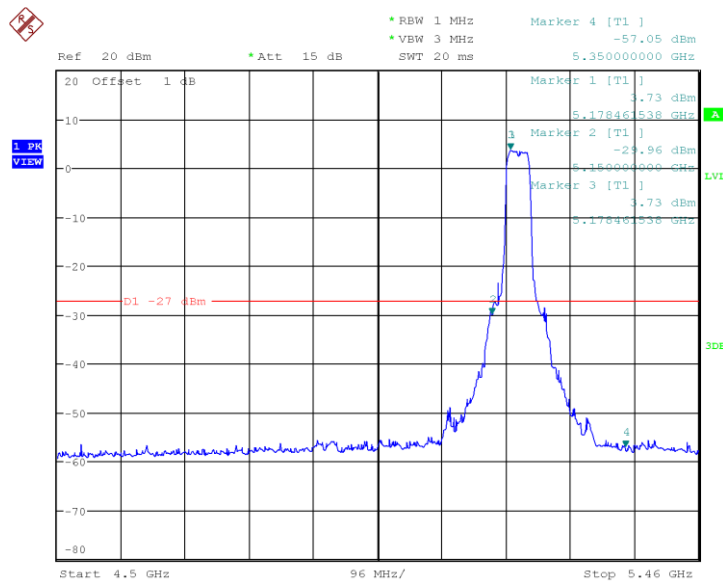
Date: 15.JUN.2019 06:56:16

Fig. 19 Band Edges (802.11n-HT20, 5180MHz)



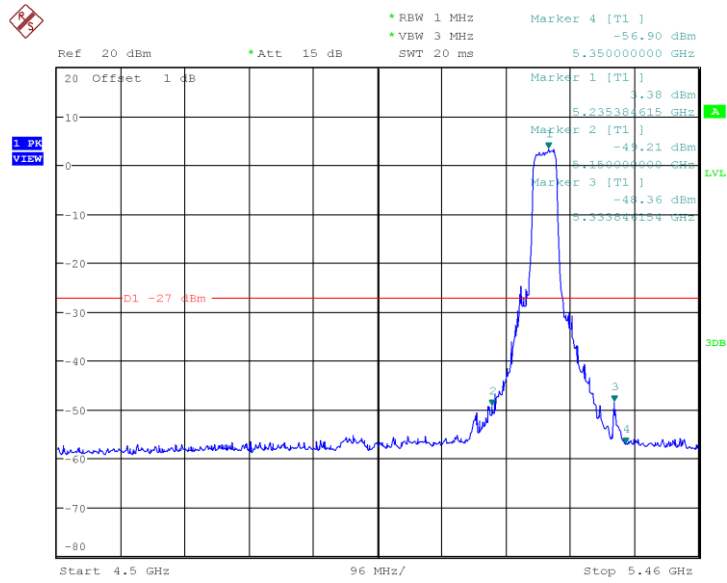
Date: 15.JUN.2019 07:01:53

Fig. 20 Band Edges (802.11n-HT20, 5240MHz)



Date: 15.JUN.2019 07:05:48

Fig. 21 Band Edges (802.11n-HT40, 5190MHz)



Date: 15.JUN.2019 07:09:01

Fig. 22 Band Edges (802.11n-HT40, 5230MHz)

A.6.2 Band Edges - Radiated

Measurement Limit:

| Standard | Limit (dB μ V/m) | |
|----------|------------------------|------|
| | FCC 47 CFR Part 15.209 | Peak |
| | Average | 54 |

The measurement is made according to KDB 789033.

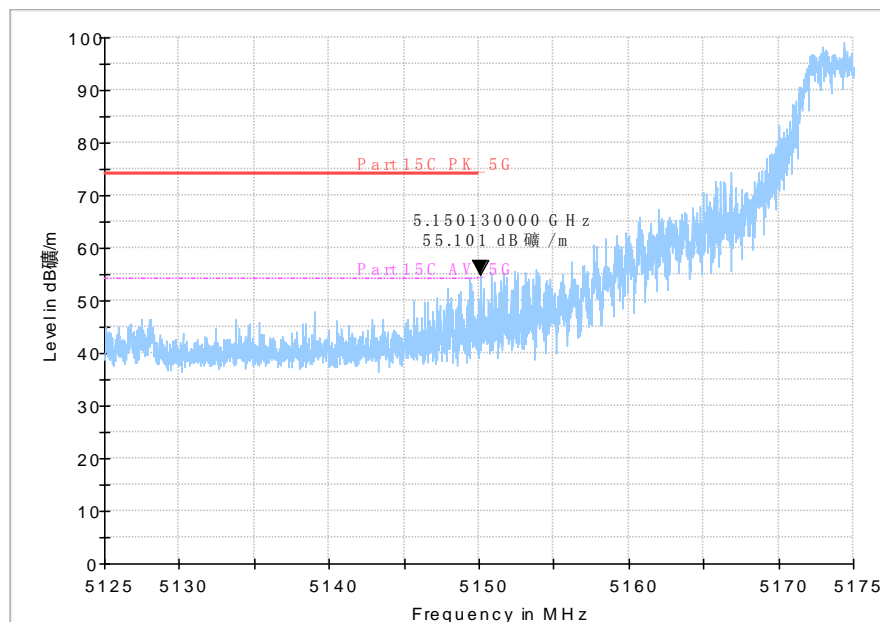
In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Measurement Result:

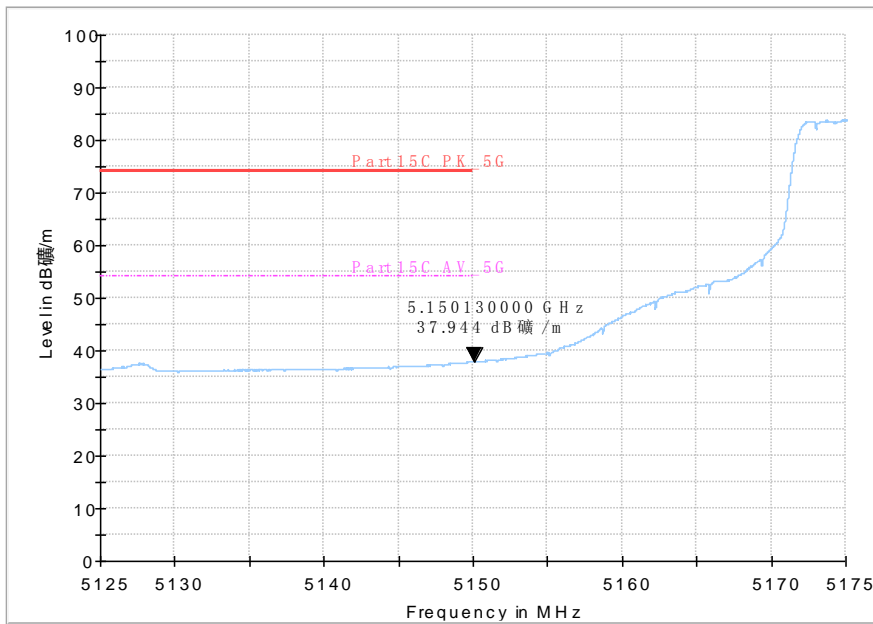
| Mode | Channel | Test Results | Conclusion |
|-----------------|----------|--------------|------------|
| 802.11a | 5180 MHz | Fig.23 | P |
| | 5240 MHz | Fig.24 | P |
| 802.11n HT20 | 5180 MHz | Fig.25 | P |
| | 5240 MHz | Fig.26 | P |
| 802.11n HT40 | 5190 MHz | Fig.27 | P |
| | 5230 MHz | Fig.28 | P |

Conclusion: PASS

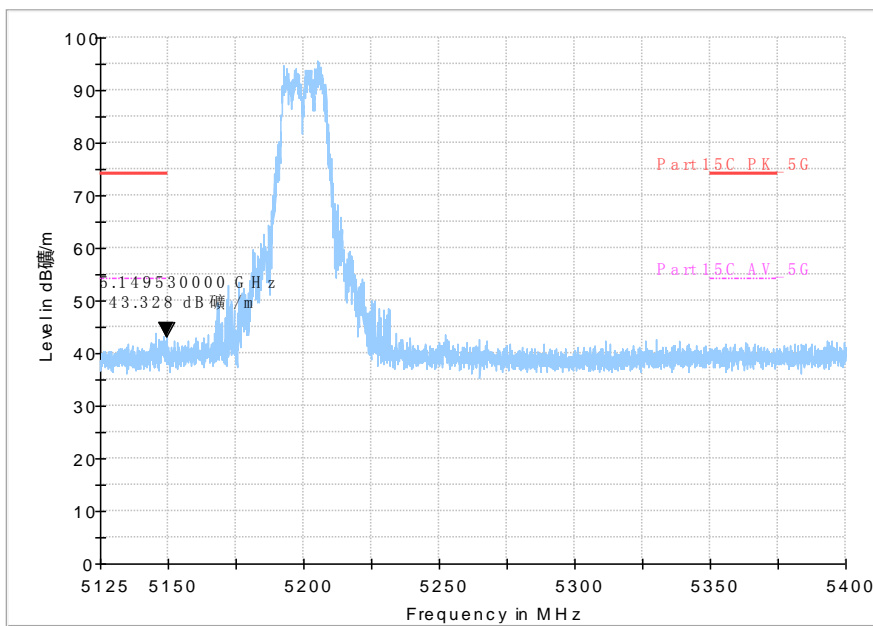
Test graphs as below:



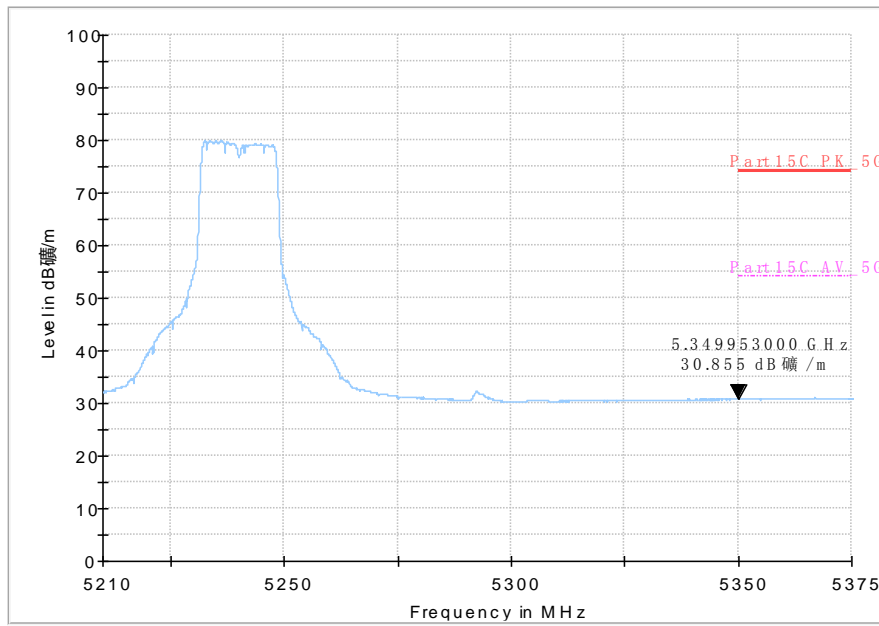
Peak



Average
Fig. 23 Band Edges (802.11a, 5180MHz)

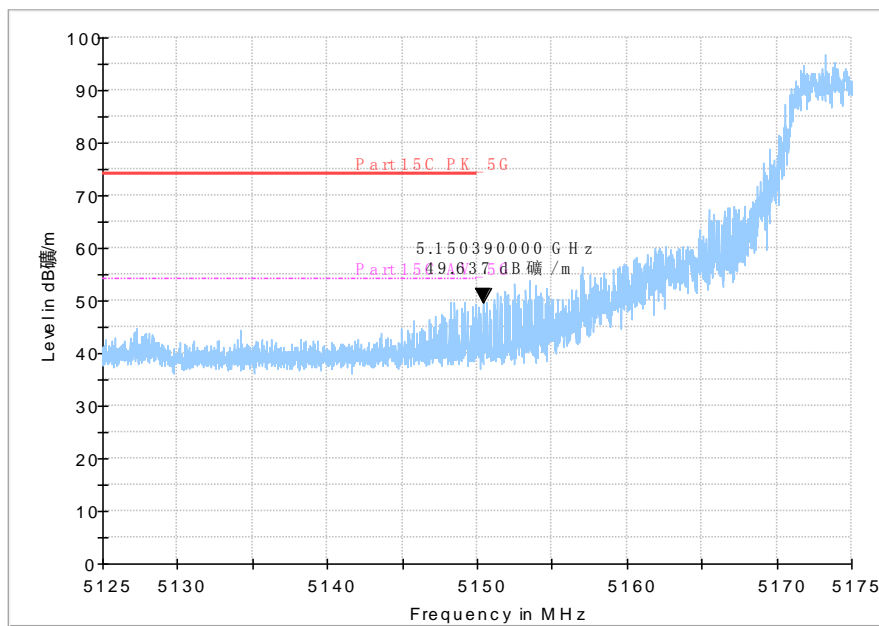


Peak

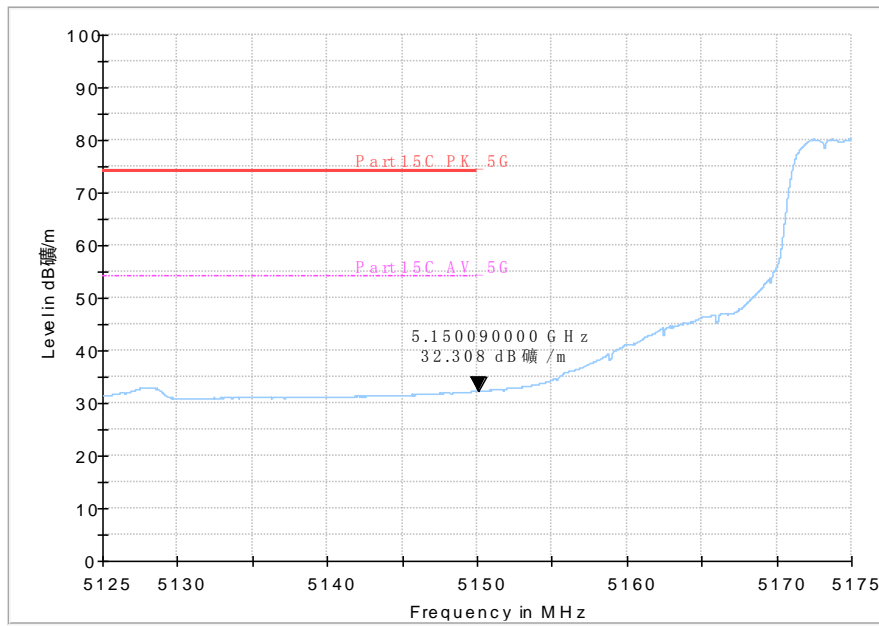


Average

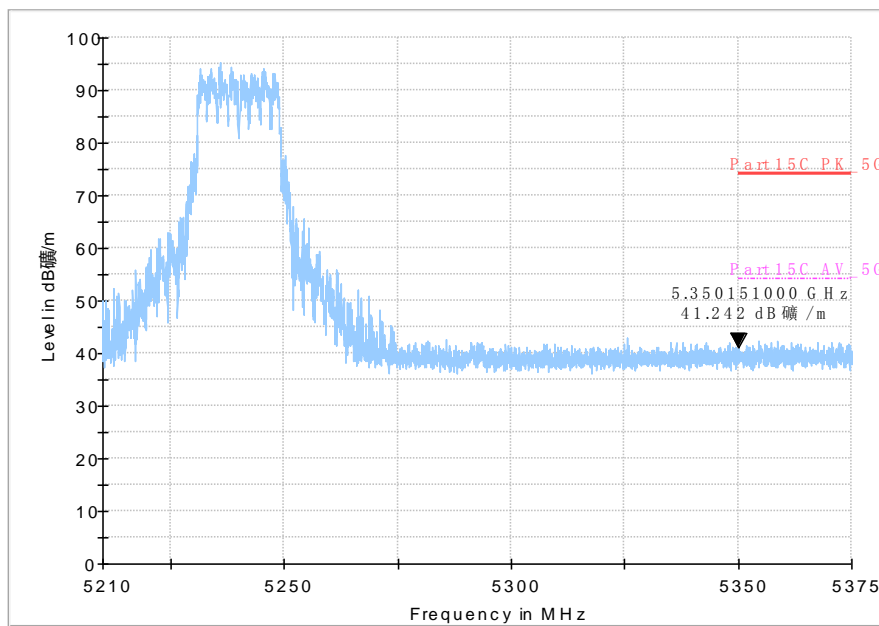
Fig. 24 Band Edges (802.11a, 5240MHz)



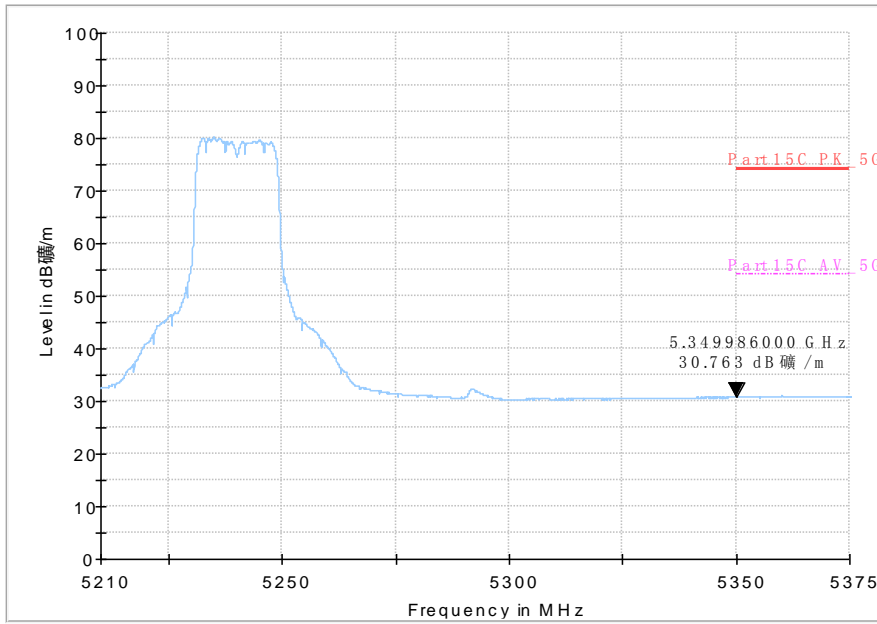
Peak



Average
Fig. 25 Band Edges (802.11n-HT20, 5180MHz)

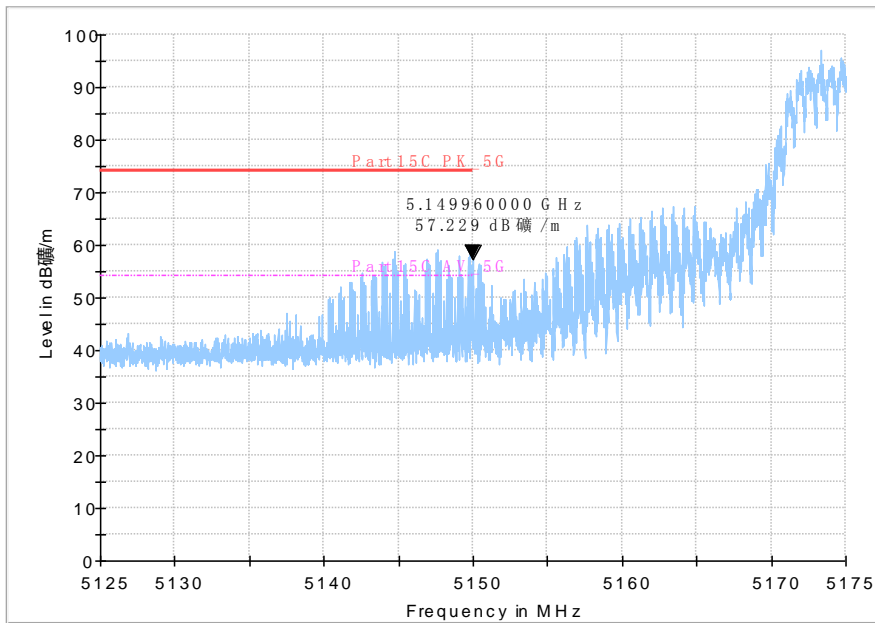


Peak

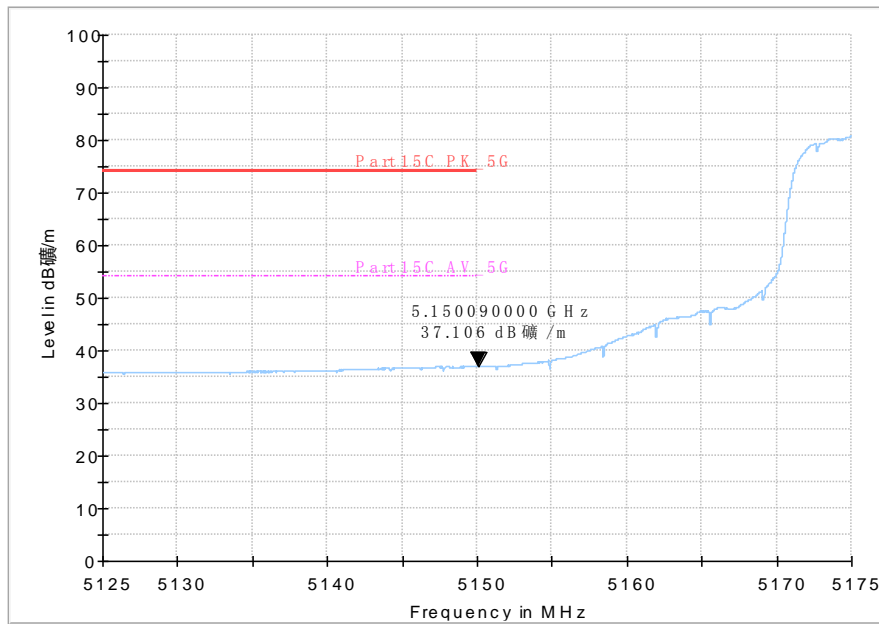


Average

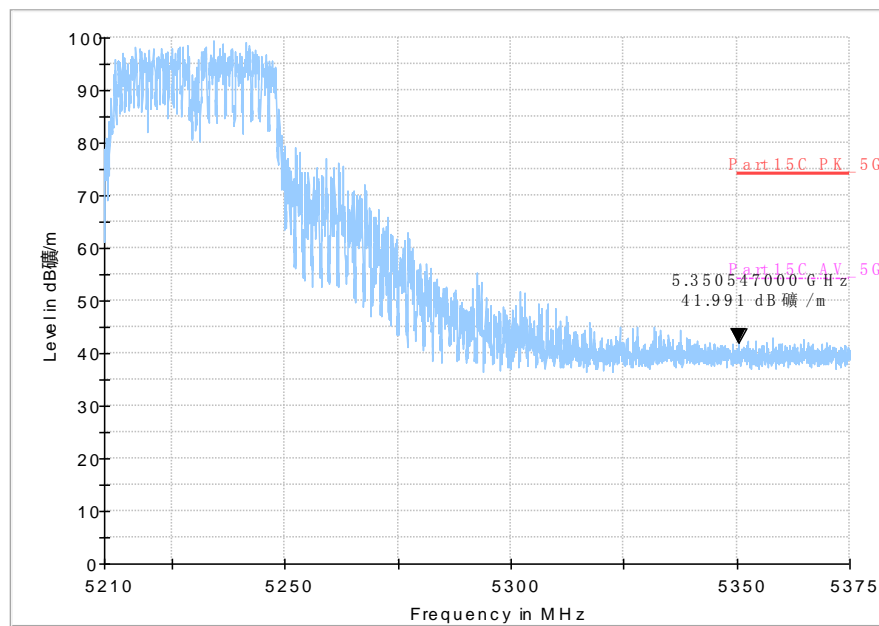
Fig. 26 Band Edges (802.11n-HT20, 5240MHz)



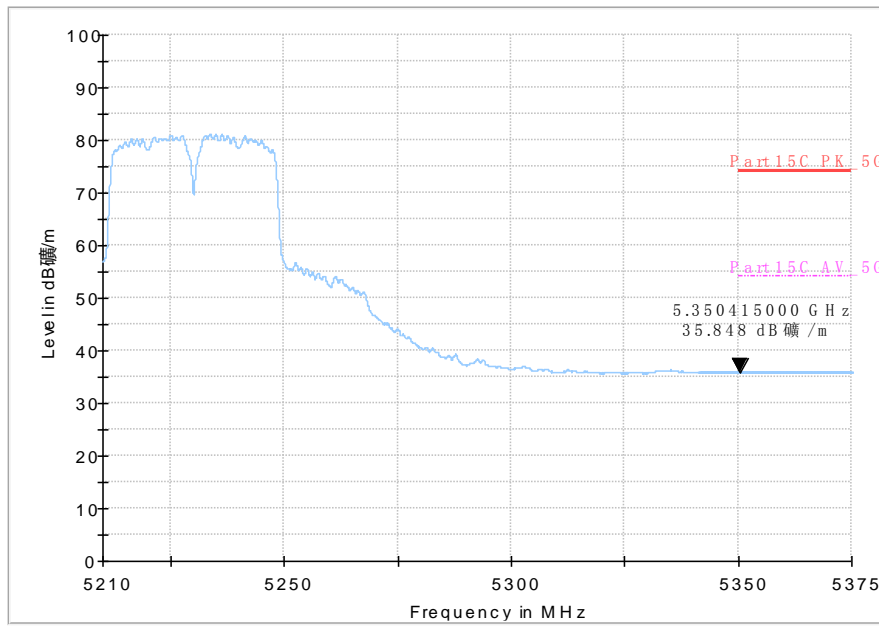
Peak



Average
Fig. 27 Band Edges (802.11n-HT40, 5190MHz)



Peak



Average

Fig. 28 Band Edges (802.11n-HT40, 5230MHz)

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 μ 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) |
| 802.11n-HT40 | MCS0 | 38(5190MHz) |

Measurement Results:

802.11a mode

| Mode | Channel | Frequency Range | Test Results | Conclusion |
|---------|-------------|-------------------|--------------|------------|
| 802.11a | 36(5180MHz) | 30 MHz ~ 1 GHz | Fig.29 | P |
| | | 1 GHz ~ 8 GHz | Fig.30 | P |
| | | 8 GHz ~ 18 GHz | Fig.31 | P |
| | | 18 GHz ~ 26.5 GHz | Fig.32 | P |
| | | 26.5 GHz ~ 40 GHz | Fig.33 | P |

802.11n-HT20 mode

| Mode | Channel | Frequency Range | Test Results | Conclusion |
|--------------|-------------|-------------------|--------------|------------|
| 802.11n-HT20 | 36(5180MHz) | 30 MHz ~ 1 GHz | Fig.34 | P |
| | | 1 GHz ~ 8 GHz | Fig.35 | P |
| | | 8 GHz ~ 18 GHz | Fig.36 | P |
| | | 18 GHz ~ 26.5 GHz | Fig.37 | P |
| | | 26.5 GHz ~ 40 GHz | Fig.38 | P |

802.11n-HT40 mode

| Mode | Channel | Frequency Range | Test Results | Conclusion |
|--------------|-------------|-------------------|--------------|------------|
| 802.11n-HT40 | 38(5190MHz) | 30 MHz ~ 1 GHz | Fig.39 | P |
| | | 1 GHz ~ 8 GHz | Fig.40 | P |
| | | 8 GHz ~ 18 GHz | Fig.41 | P |
| | | 18 GHz ~ 26.5 GHz | Fig.42 | P |
| | | 26.5 GHz ~ 40 GHz | Fig.43 | P |

Radiated Spurious Emission (9kHz-30MHz)

| Mode | Channel | Frequency Range | Test Results | Conclusion |
|--------------|--------------|-----------------|--------------|------------|
| 802.11n-HT40 | 134(5190MHz) | 9kHz~30 MHz | Fig.44 | 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 μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 34.3 | 16.13 | -27.3 | 43.43 | V |
| 64.0 | 14.95 | -28.1 | 43.05 | V |
| 109.9 | 16.5 | -27.4 | 43.9 | H |
| 175.7 | 19.66 | -29.2 | 48.86 | H |
| 289.4 | 17.17 | -25.8 | 42.97 | H |
| 425.3 | 18.21 | -23.1 | 41.31 | H |

Channel 36 (1GHz ~ 8GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 2993.0 | 43.86 | -1.3 | 45.16 | V |
| 5464.4 | 46.27 | 4.5 | 41.77 | V |
| 5656.0 | 45.97 | 4.7 | 41.27 | V |
| 5998.4 | 44.98 | 4.6 | 40.38 | H |
| 6507.0 | 46.25 | 6 | 40.25 | H |
| 6900.4 | 45.94 | 7 | 38.94 | H |

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

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 9061.2 | 48.96 | 10.3 | 38.66 | V |
| 10441.6 | 50.4 | 12.9 | 37.5 | V |
| 12654.6 | 53.06 | 16.8 | 36.26 | V |
| 14194.6 | 53.99 | 19.2 | 34.79 | H |
| 15682.4 | 55.19 | 21.7 | 33.49 | V |
| 17317.4 | 57.49 | 24.1 | 33.39 | V |

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

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 15682.4 | 43.29 | 21.7 | 21.59 | V |

| | | | | |
|---------|------|------|------|---|
| 17317.4 | 44.6 | 24.1 | 20.5 | V |
|---------|------|------|------|---|

Channel 36 (18GHz ~ 26.5GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 18980.9 | 39.06 | -5.4 | 44.46 | V |
| 19908.2 | 41.01 | -5 | 46.01 | H |
| 21320.1 | 41.95 | -3.6 | 45.55 | H |
| 22673.3 | 43.08 | -2.8 | 45.88 | H |
| 24142.1 | 44.37 | -2.8 | 47.17 | H |
| 26071.6 | 48.36 | -2 | 50.36 | H |

Channel 36 (26.5GHz ~ 40GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 28283.4 | 43.42 | -0.7 | 44.12 | V |
| 30123.4 | 44 | -1.1 | 45.1 | H |
| 32215.9 | 44.5 | 0.5 | 44 | V |
| 34450.2 | 45.98 | 1.2 | 44.78 | V |
| 36950.4 | 47.84 | 1.6 | 46.24 | H |
| 38847.1 | 49.49 | 3.6 | 45.89 | V |

802.11n-HT20

Channel 36 (30MHz ~1GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 34.5 | 16.18 | -27.3 | 43.48 | V |
| 49.3 | 19.59 | -25.1 | 44.69 | V |
| 72.0 | 18.04 | -29.9 | 47.94 | H |
| 188.3 | 18.01 | -28.4 | 46.41 | H |
| 256.3 | 15.86 | -26.6 | 42.46 | H |
| 398.2 | 17.01 | -23.5 | 40.51 | H |

Channel 36 (1GHz ~ 8GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 2992.0 | 43.11 | -1.3 | 44.41 | V |
| 5514.6 | 46.35 | 4.6 | 41.75 | H |
| 6441.2 | 46.43 | 5.8 | 40.63 | H |
| 6758.8 | 47.35 | 6.7 | 40.65 | H |
| 7118.8 | 47.03 | 7.3 | 39.73 | H |
| 7873.4 | 48.36 | 8.7 | 39.66 | V |

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

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 10083.0 | 50.05 | 11.5 | 38.55 | V |
| 11211.8 | 50.97 | 13.8 | 37.17 | V |
| 13087.0 | 54.39 | 17.8 | 36.59 | V |
| 14704.6 | 53.86 | 19.9 | 33.96 | H |
| 16324.8 | 55.95 | 22.8 | 33.15 | V |
| 17322.6 | 56.56 | 24.1 | 32.46 | V |

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

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 13087.0 | 41.25 | 17.8 | 23.45 | V |
| 16324.8 | 43.41 | 22.8 | 20.61 | V |
| 17322.6 | 44.65 | 24.1 | 20.55 | V |

Channel 36 (18GHz ~ 26.5GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 18649.4 | 39.67 | -5.7 | 45.37 | V |
| 20573.8 | 41.41 | -4.4 | 45.81 | H |
| 21264.0 | 43.58 | -3.7 | 47.28 | V |
| 22897.7 | 44.37 | -3 | 47.37 | H |

| | | | | |
|---------|-------|------|-------|---|
| 24352.9 | 44.95 | -2.8 | 47.75 | H |
| 26067.4 | 48.01 | -2 | 50.01 | H |

Channel 36 (26.5GHz ~ 40GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 28438.6 | 42.67 | -1.2 | 43.87 | V |
| 30780.8 | 46.5 | 0.2 | 46.3 | V |
| 33449.8 | 45.11 | 1.2 | 43.91 | V |
| 35613.8 | 47.2 | 1.4 | 45.8 | V |
| 36876.1 | 47.12 | 2 | 45.12 | V |
| 38940.2 | 49.02 | 3.9 | 45.12 | V |

802.11n-HT40

Channel 38 (30MHz ~ 1GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 34.1 | 17.53 | -27.3 | 44.83 | V |
| 36.9 | 17.02 | -26.8 | 43.82 | V |
| 72.0 | 19.41 | -29.9 | 49.31 | V |
| 187.7 | 15.03 | -28.5 | 43.53 | H |
| 256.5 | 15.21 | -26.6 | 41.81 | H |
| 399.3 | 18.33 | -23.5 | 41.83 | H |

Channel 38 (1GHz ~ 8GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 2999.6 | 52.11 | -1.3 | 53.41 | H |
| 5679.8 | 45.51 | 4.7 | 40.81 | V |
| 5925.6 | 45.03 | 4.7 | 40.33 | H |
| 6577.0 | 46.4 | 6.2 | 40.2 | H |
| 7146.8 | 47.35 | 7.3 | 40.05 | H |
| 7750.2 | 47.72 | 8.4 | 39.32 | H |

Channel 38 (8GHz ~ 18GHz)(Peak)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 9157.6 | 48.98 | 10.4 | 38.58 | V |
| 10546.8 | 50.41 | 13.1 | 37.31 | H |
| 11976.2 | 51.86 | 14.9 | 36.96 | V |
| 14007.0 | 54.41 | 19.1 | 35.31 | H |
| 16126.8 | 56.01 | 22.4 | 33.61 | V |
| 17549.4 | 57.12 | 24.6 | 32.52 | H |

Channel 38 (8GHz ~ 18GHz)(Average)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 14007.0 | 41.74 | 19.1 | 22.64 | H |
| 16126.8 | 44 | 22.4 | 21.6 | V |
| 17549.4 | 44.9 | 24.6 | 20.3 | H |

Channel 38 (18GHz ~ 26.5GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 19825.8 | 40.35 | -5.1 | 45.45 | H |
| 21185.8 | 42.85 | -4 | 46.85 | V |
| 22687.8 | 44.09 | -2.8 | 46.89 | V |
| 23657.6 | 44.3 | -2.8 | 47.1 | H |
| 24148.0 | 45.92 | -2.8 | 48.72 | V |
| 25698.4 | 45.34 | -2.3 | 47.64 | H |

Channel 38 (26.5GHz ~ 40GHz)

| Frequency (MHz) | Result (dB μ V/m) | ARpl (dB) | PMea (dB μ V/m) | Polarity |
|-----------------|-----------------------|-----------|---------------------|----------|
| 27742.0 | 45.13 | -0.5 | 45.63 | H |
| 29529.4 | 42.83 | -0.6 | 43.43 | V |
| 33036.7 | 44.78 | 1.1 | 43.68 | H |
| 35408.6 | 47.1 | 1.6 | 45.5 | V |

| | | | | |
|---------|-------|-----|-------|---|
| 36940.9 | 47.02 | 1.7 | 45.32 | H |
| 39665.2 | 52.31 | 4.8 | 47.51 | V |

Test graphs as below:

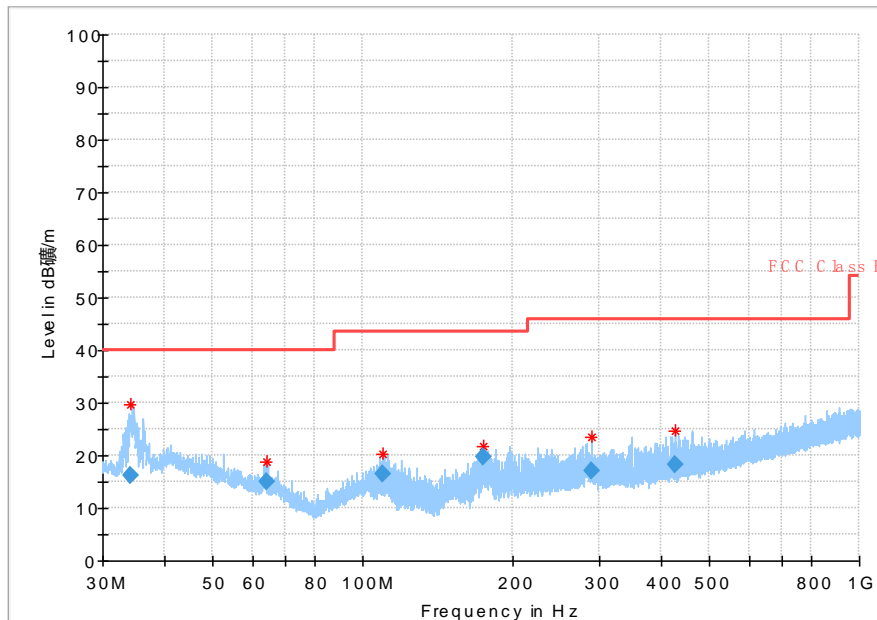


Fig. 29 Radiated Spurious Emission (802.11a, ch36, 30 MHz-1 GHz)

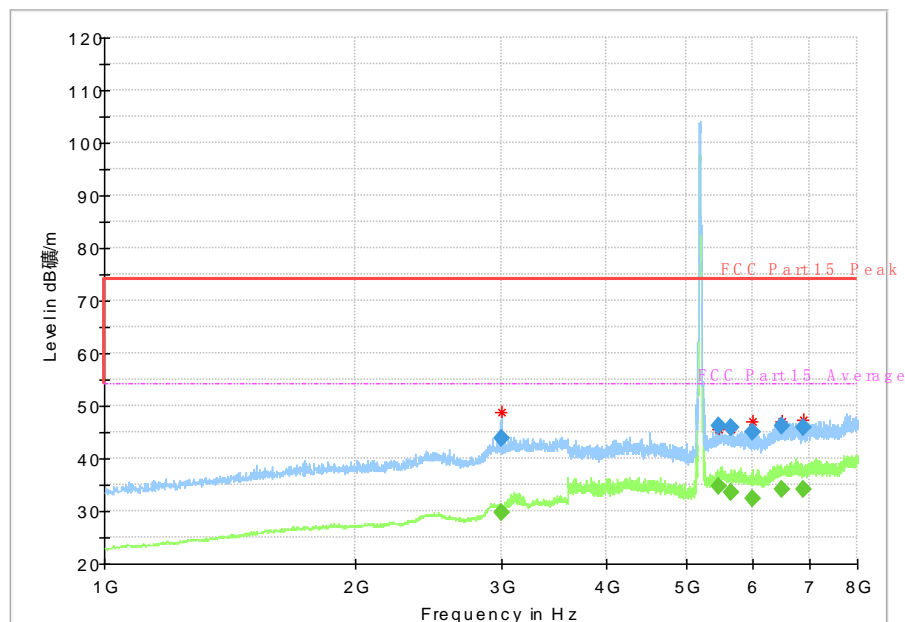


Fig. 30 Radiated Spurious Emission (802.11a, ch36, 1 GHz-8 GHz)

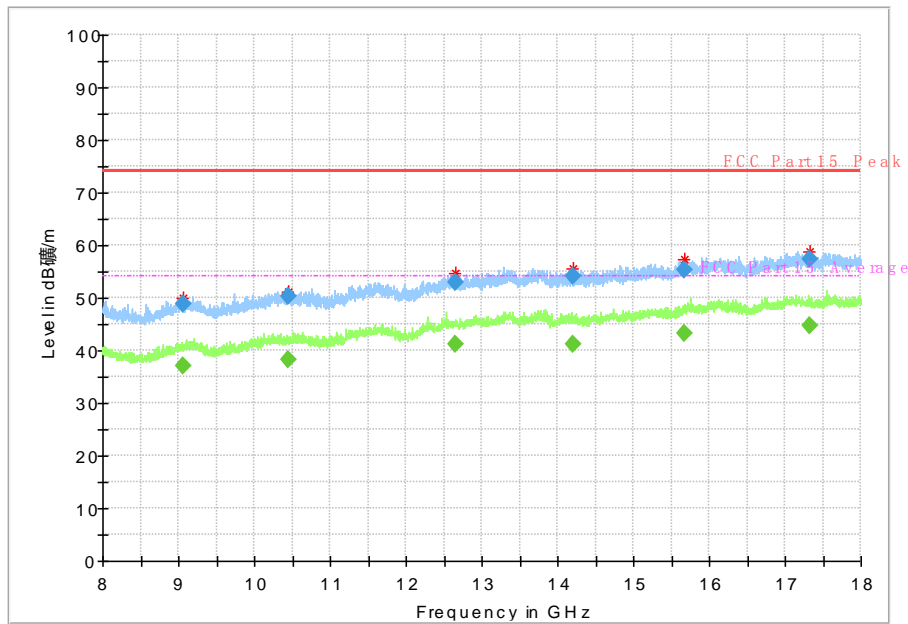


Fig. 31 Radiated Spurious Emission (802.11a, ch36, 8 GHz-18 GHz)

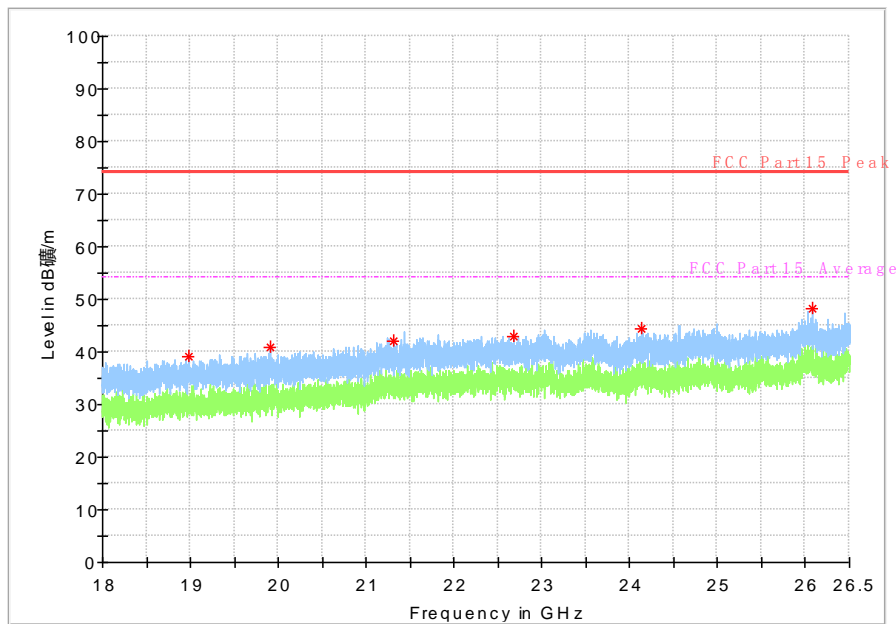


Fig. 32 Radiated Spurious Emission (802.11a, ch36, 18 GHz-26.5 GHz)

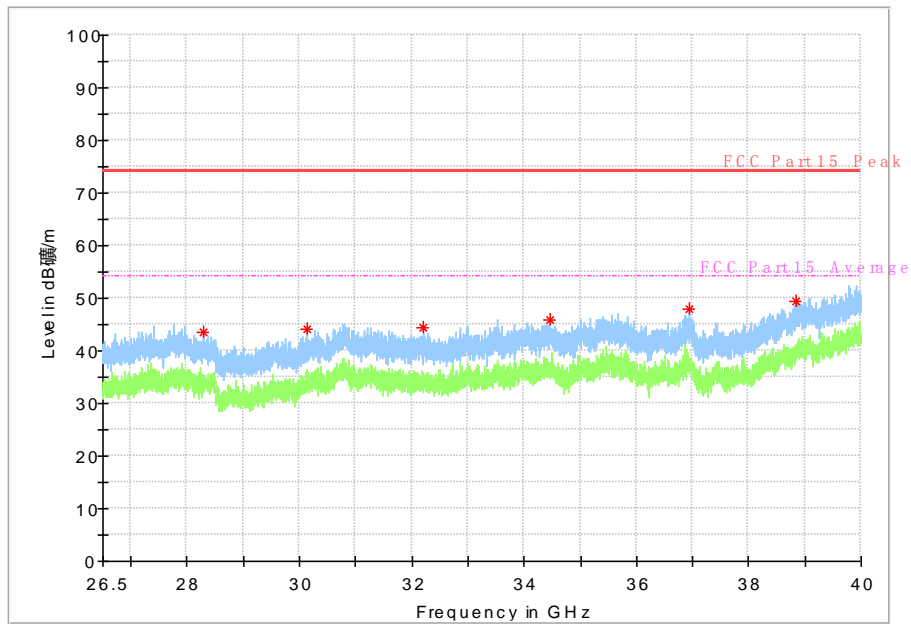


Fig. 33 Radiated Spurious Emission (802.11a, ch36, 26.5 GHz-40 GHz)

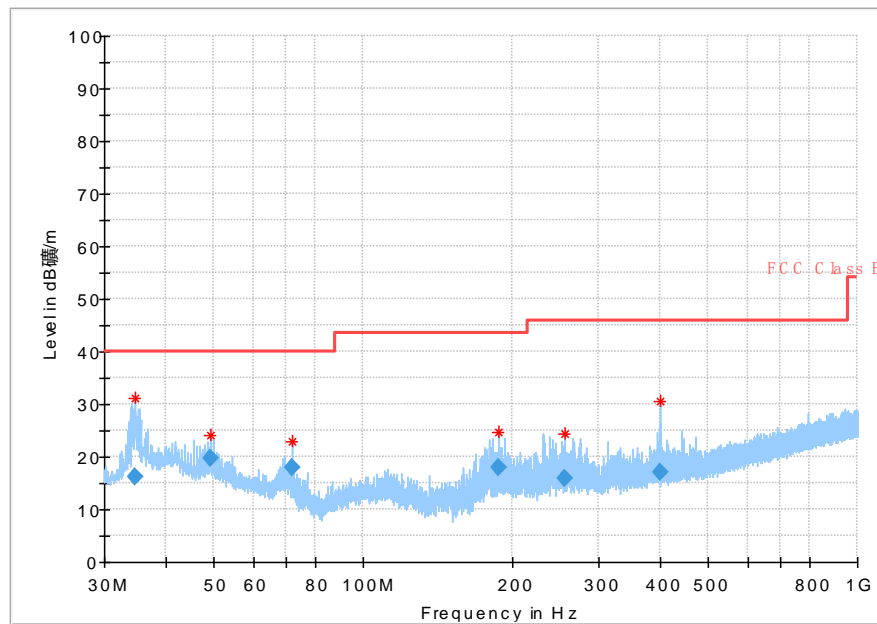


Fig. 34 Radiated Spurious Emission (802.11n-HT20, ch36, 30 MHz-1 GHz)

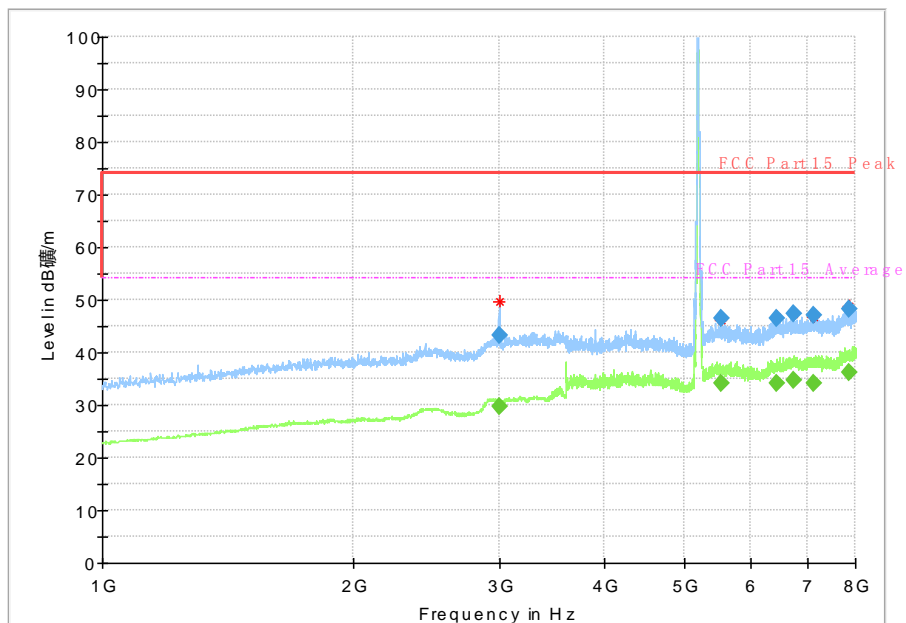


Fig. 35 Radiated Spurious Emission (802.11n-HT20, ch36, 1 GHz-8 GHz)

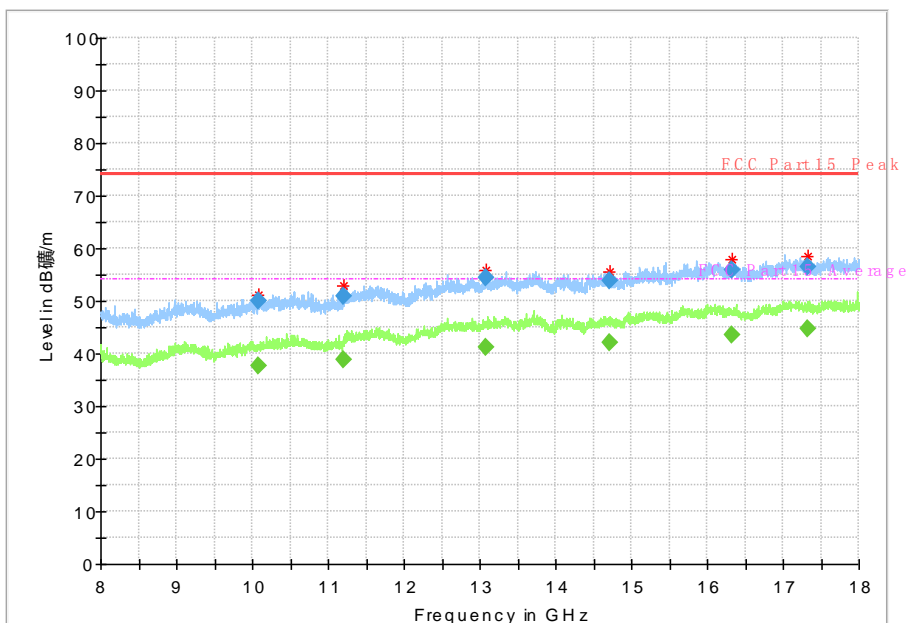


Fig. 36 Radiated Spurious Emission (802.11n-HT20, ch36, 8 GHz-18 GHz)

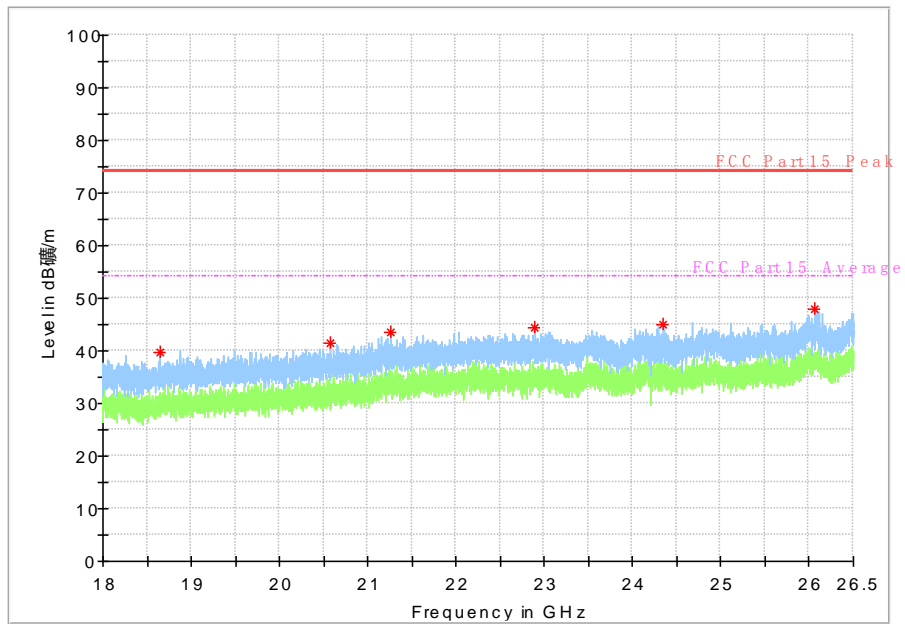


Fig. 37 Radiated Spurious Emission (802.11n-HT20, ch36, 18 GHz-26.5 GHz)

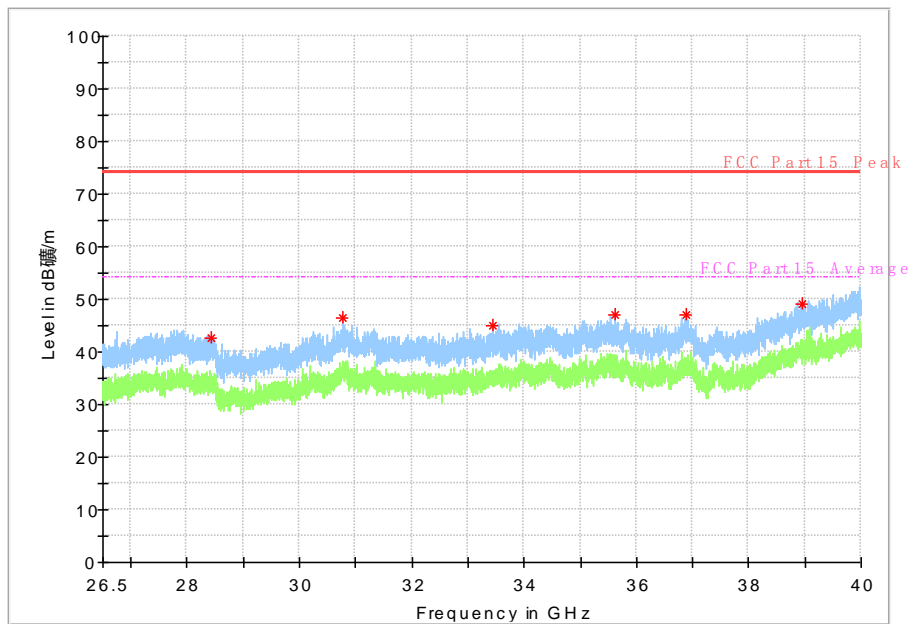


Fig. 38 Radiated Spurious Emission (802.11n-HT20, ch36, 26.5 GHz-40 GHz)

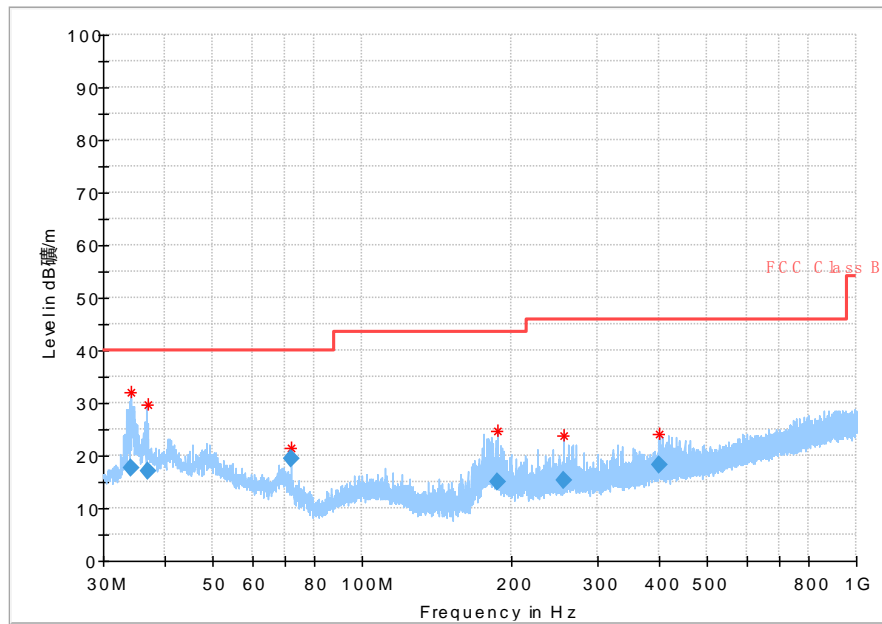


Fig. 39 Radiated Spurious Emission (802.11n-HT40, ch38, 30 MHz-1 GHz)

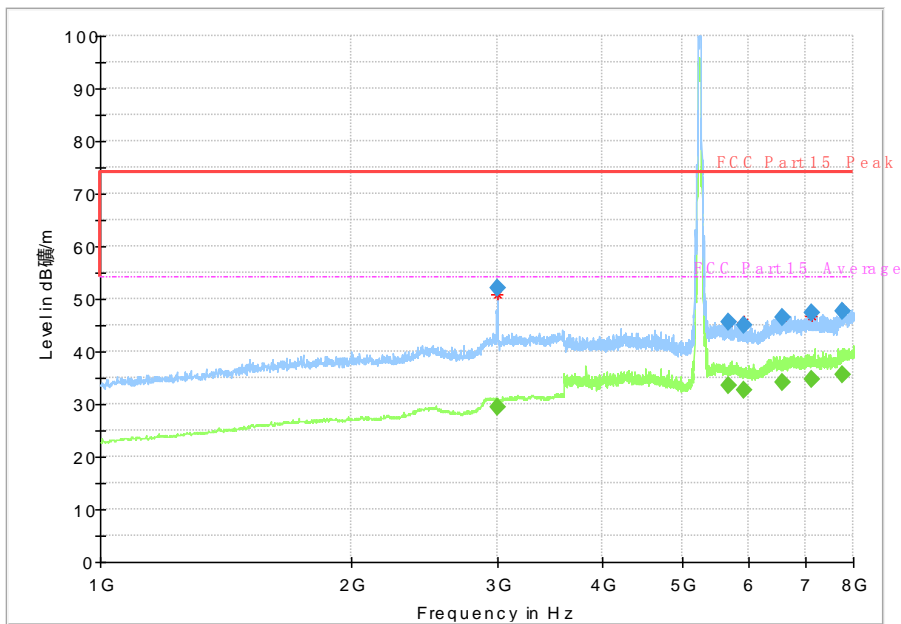


Fig. 40 Radiated Spurious Emission (802.11n-HT40, ch38, 1 GHz-8 GHz)

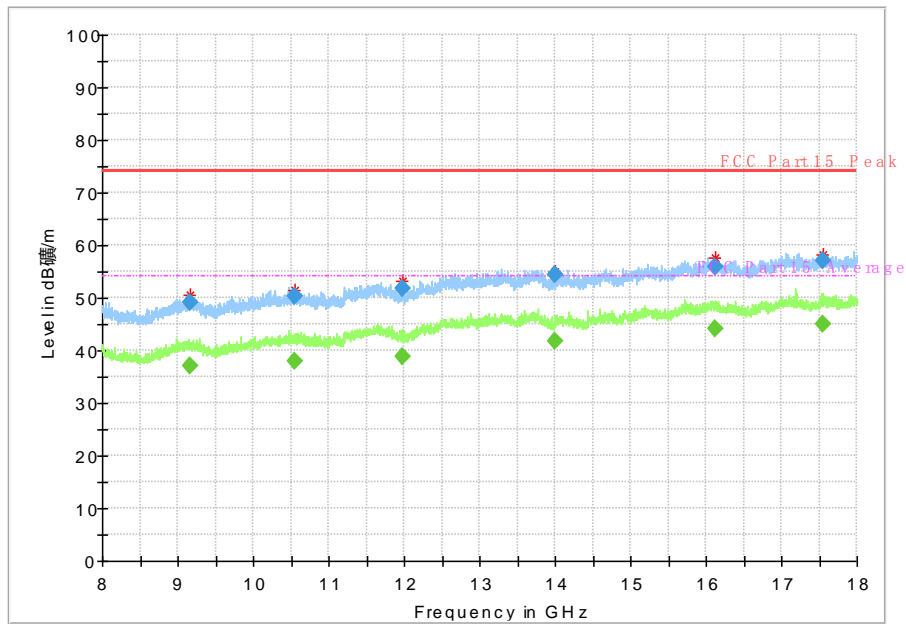


Fig. 41 Radiated Spurious Emission (802.11n-HT40, ch38, 8 GHz-18 GHz)

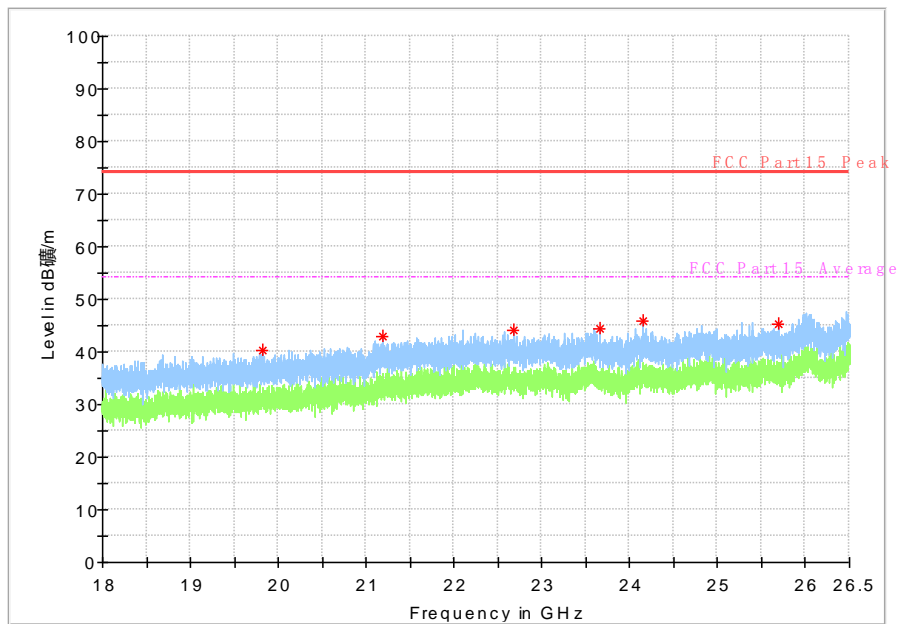


Fig. 42 Radiated Spurious Emission (802.11n-HT40, ch38, 18 GHz-26.5 GHz)

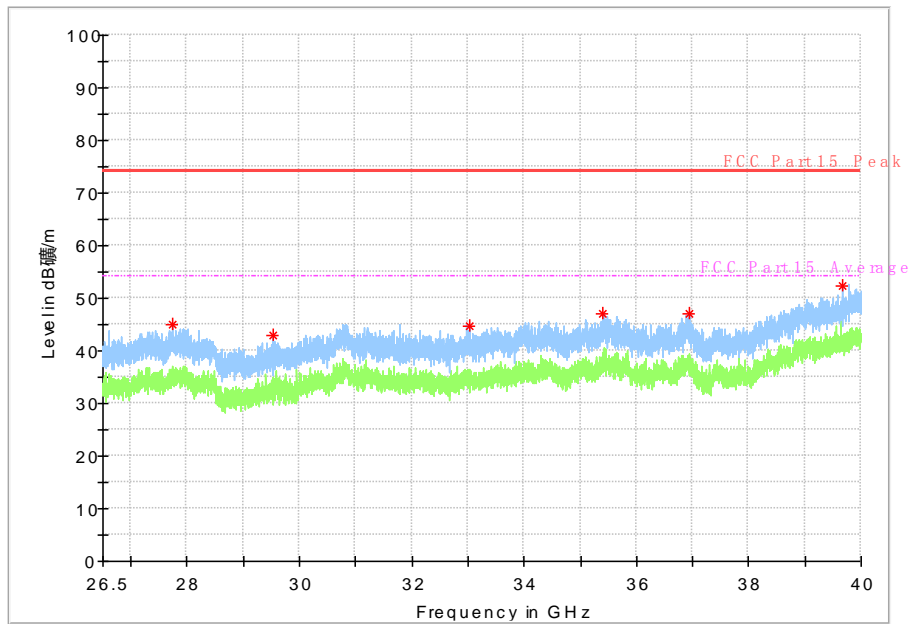


Fig. 43 Radiated Spurious Emission (802.11n-HT40, ch38, 26.5 GHz-40 GHz)

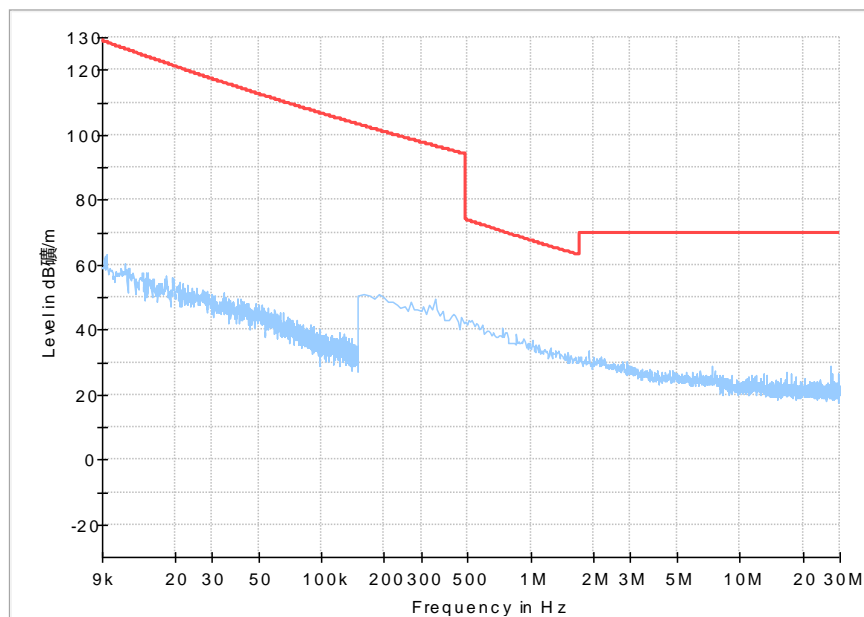


Fig. 44 Radiated Spurious Emission (9kHz-30MHz)

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 μ V) | Result (dB μ V) | | Conclusion |
|-----------------------|-------------------------------|---------------------|------|------------|
| | | With charger | | |
| | | 11a mode | Idle | |
| 0.15 to 0.5 | 66 to 56 | Fig.45 | | 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 μ V) | Result (dB μ V) | | Conclusion |
|-----------------------|----------------------------|---------------------|------|------------|
| | | With charger | | |
| | | 11a mode | Idle | |
| 0.15 to 0.5 | 56 to 46 | Fig.53 | | 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:

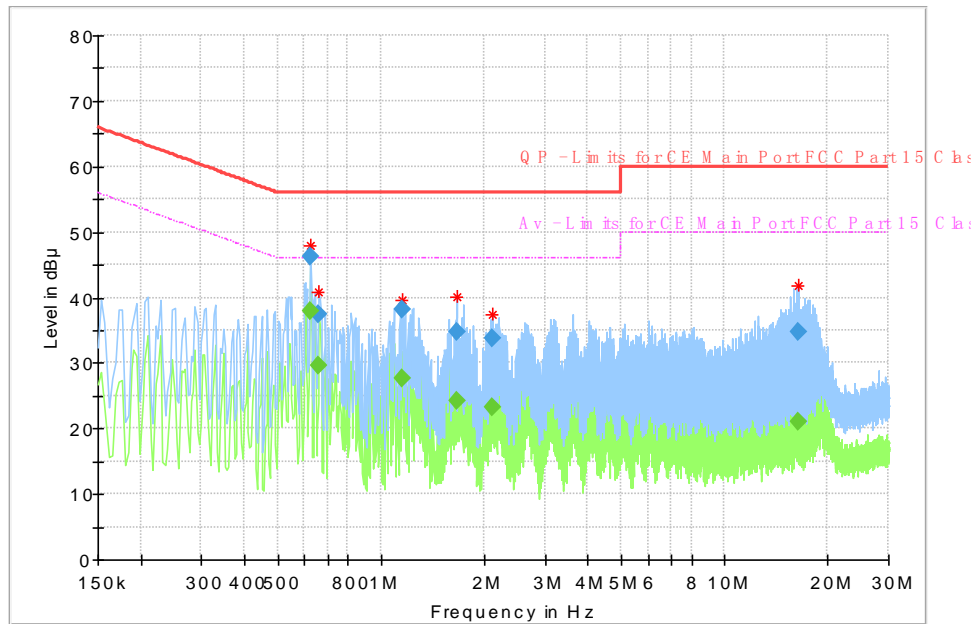


Fig. 45 Conducted Emission(802.11a, TX)

Measurement Result:

| Frequency (MHz) | Quasi Peak (dB μ V) | Average (dB μ V) | Limit (dB μ V) | Marg in (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|-------------------------|----------------------|--------------------|--------------|-----------------|-----------------|------|--------|------------|
| 0.620138 | --- | 37.86 | 46.00 | 8.14 | 15000.0 | 9.000 | L1 | ON | 9.8 |
| 0.620138 | 46.30 | --- | 56.00 | 9.70 | 15000.0 | 9.000 | L1 | ON | 9.8 |
| 0.661181 | --- | 29.55 | 46.00 | 16.4 | 15000.0 | 9.000 | L1 | ON | 9.8 |
| 0.661181 | 37.52 | --- | 56.00 | 18.4 | 15000.0 | 9.000 | L1 | ON | 9.8 |
| 1.157438 | --- | 27.53 | 46.00 | 18.4 | 15000.0 | 9.000 | L1 | ON | 9.9 |
| 1.157438 | 38.26 | --- | 56.00 | 17.7 | 15000.0 | 9.000 | L1 | ON | 9.9 |
| 1.661156 | --- | 24.24 | 46.00 | 21.7 | 15000.0 | 9.000 | L1 | ON | 9.9 |
| 1.661156 | 34.78 | --- | 56.00 | 21.2 | 15000.0 | 9.000 | L1 | ON | 9.9 |
| 2.120100 | --- | 23.20 | 46.00 | 22.8 | 15000.0 | 9.000 | L1 | ON | 10.0 |
| 2.120100 | 33.68 | --- | 56.00 | 22.3 | 15000.0 | 9.000 | L1 | ON | 10.0 |
| 16.399594 | --- | 21.13 | 50.00 | 28.8 | 15000.0 | 9.000 | N | ON | 13.2 |
| 16.399594 | 34.68 | --- | 60.00 | 25.3 | 15000.0 | 9.000 | N | ON | 13.2 |

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-JLAC-JAF 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 the Report*****