# FCC PART 15C
# TEST REPORT
## No.I19Z61261-IOT03

**for**

**TCL Communication Ltd.**

**HSUPA/HSDPA/UMTS Bi-Bands/GSM Quad-Bands/LTE 7 Bands/CDMA Tri-bands mobile phone**

**4053S**

**With**

**FCC ID: 2ACCJN033**

**Hardware Version: 05**

**Software Version: 1A38**

**Issued Date: 2019-10-12**

TESTING
NVLAP LAB CODE 600118-0

**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 CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

**Test Laboratory:**

CTTL, Telecommunication Technology Labs, CAICT

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# REPORT HISTORY

| Report Number | Revision | Description | Issue Date |
|---|---|---|---|
| I19Z61261-IOT03 | Rev.0 | 1st edition | 2019-10-12 |

# CONTENTS

# 1. TEST LATORATORY

## 1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

## 1.2. Testing Location

Conducted testing Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191

Radiated testing Location: CTTL(BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology Development Area, Beijing, P. R. China 100176

Radiated testing Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191

## 1.3. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

## 1.4. Project data

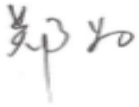
Testing Start Date: 2019-07-24

Testing End Date: 2019-09-16

## 1.5. Signature

**Xie Fangfang**

**(Prepared this test report)**



**Zheng Wei**

**(Reviewed this test report)**

**Hu Xiaoyu**

**(Approved this test report)**

# 2. CLIENT INFORMATION

## 2.1 Applicant Information

| | |
|---|---|
| Company Name: | TCL Communication Ltd. |
| Address: | 5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong |
| City: | Hong Kong |
| Postal Code: | / |
| Country: | China |
| Telephone: | 0086-755-36611722 |
| Fax: | 0086-755-36612000-81722 |

## 2.2 Manufacturer Information

| | |
|---|---|
| Company Name: | TCL Communication Ltd. |
| Address: | 75/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong |
| City: | Hong Kong |
| Postal Code: | / |
| Country: | China |
| Telephone: | 0086-755-36611722 |
| Fax: | 0086-755-36612000-81722 |

# 3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARYEQUIPMENT(AE)

## 3.1. About EUT

| | |
|---|---|
| Description | HSUPA/HSDPA/UMTS Bi-Bands/GSM Quad-Bands/LTE 7 Bands/CDMA Tri-bands mobile phone |
| Model name | 4053S |
| FCC ID | 2ACCJN033 |
| WLAN Frequency Range | ISM Bands:<br>-5150MHz~5250MHz |
| Type of modulation | OFDM |
| Antenna | Integral Antenna |
| Voltage | 3.8V |

Note: Photographs of EUT are shown in ANNEX C of this test report. Components list, please refer to documents of the manufacturer.

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

| EUT ID* | SN or IMEI | HW Version | SW Version |
|---|---|---|---|
| EUT34 | 015501000008516 | 05 | 1A38 |
| EUT02 | 015501000009423 | 05 | 1A38 |

*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 | SN |
|---|---|---|---|
| AE1 | Battery | / | / |
| AE2 | Travel charger | / | / |
| AE3 | Travel charger | / | / |
| AE4 | USB Cable | / | / |
| AE5 | USB Cable | / | / |

AE1

| | |
|---|---|
| Model | TLi017C1 |
| Manufacturer | / |
| Capacitance | 1780 mAh |
| Nominal voltage | 3.8V |

AE2

| | |
|---|---|
| Model | UC11US |
| Manufacturer | PUAN |
| Length of cable | / |

AE3

| | |
|---|---|
| Model | UC11US |
| Manufacturer | Chenyang |
| Length of cable | / |

AE4

| | |
|---|---|
| Model | CDA0000123C1 |
| Manufacturer | Juwei |
| Length of cable | / |

AE5

| | |
|---|---|
| Model | CDA0000123C2 |
| Manufacturer | Shenghua |
| Length of cable | / |

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

### 3.4. General Description

The Equipment under Test (EUT) is a model of HSUPA/HSDPA/UMTS Bi-Bands/GSM Quad-Bands/LTE 7 Bands/CDMA Tri-bands mobile phone with integrated antenna and inbuilt battery.
It has Bluetooth (EDR)function.
It consists of normal options: travel charger, USB cable.
Manual and specifications of the EUT were provided to fulfil the test.
Samples undergoing test were selected by the client.

### 3.5. Interpretation of the Test Environment

For the test methods, the test environment uncertainty figures correspond to an expansion factor k=2.

Measurement Uncertainty

| Parameter | Uncertainty |
|---|---|
| temperature | 0.48°C |
| humidity | 2 % |
| DC voltages | 0.003V |

## 4. REFERENCE DOCUMENTS

### 4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant 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.

| | | |
|---|---|---|
| FCC Part15 | Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices | 2018 |
| ANSI C63.10 | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz | 2013 |
| UNII: KDB 789033 D02 | General U-NII Test Procedures New Rules v02r01 | 2017-12 |

## 5. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

# 6. SUMMARY OF TEST RESULTS

## 6.1. Summary of Test Results

| SUMMARY OF MEASUREMENT RESULTS | Sub-clause of Part15E | Sub-clause of IC | Verdict |
|---|---|---|---|
| Maximum Output Power | 15.407 | / | **P** |
| Power Spectral Density | 15.407 | / | **P** |
| Occupied 26dB Bandwidth | 15.403 | / | **P** |
| Band edge compliance | 15.209 | / | **P** |
| Transmitter spurious emissions radiated | 15.407 | / | **P** |
| Spurious emissions radiated < 30 MHz | 15.407 | / | **P** |
| Spurious emissions conducted < 30 MHz | 15.407 | / | **P** |
| Frequency Stability | 15.407 | / | **P** |
| Transmit Power Control | 15.407 | / | **NA** |

Please refer to **ANNEX A** for detail.

Terms used in Verdict column

| | |
|---|---|
| P | Pass, The EUT complies with the essential requirements in the standard. |
| NM | Not measured, The test was not measured by CTTL |
| NA | Not Applicable, The test was not applicable |
| F | Fail, The EUT does not comply with the essential requirements in the standard |

## 6.2. Statements

CTTL has evaluated the test cases requested by the client/manufacturer as listed in section 6.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.1.

This report only deals with the WLAN function among the features described in section 3.

## 6.3. Test Conditions

For this report, all the test cases are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

| | |
|---|---|
| Temperature | 26℃ |
| Voltage | 3.8V |
| Humidity | 44% |

# 7. TEST EQUIPMENTS UTILIZED

**Conducted test system**

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration Period | Calibration Due date |
|---|---|---|---|---|---|---|
| 1 | Vector Signal Analyzer | FSQ40 | 200089 | Rohde & Schwarz | 1 year | 2020-05-15 |
| 2 | Test Receiver | ESCI | 100766 | Rohde & Schwarz | 1 year | 2020-03-14 |
| 3 | LISN | ESH2-Z5 | 829991/012 | Rohde & Schwarz | 1 year | 2020-02-14 |
| 4 | Shielding Room | S81 | / | ETS-Lindgren | / | / |

**Radiated emission test system**

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration Period | Calibration Due date |
|---|---|---|---|---|---|---|
| 1 | Test Receiver | ESU26 | 100235 | Rohde & Schwarz | 1 year | 2020-02-27 |
| 2 | BiLog Antenna | VULB9163 | 1222 | Schwarzbeck | 1 year | 2020-03-14 |
| 3 | Dual-Ridge Waveguide Horn Antenna | 3115 | 00167250 | ETS-Lindgren | 1 year | 2020-05-14 |
| 4 | EMI Antenna | 3116 | 2661 | ETS-Lindgren | 1 year | 2020-10-15 |
| 5 | Spectrum Analyzer | FSV40 | 101047 | Rohde & Schwarz | 1 year | 2020-05-16 |

# 8. Measurement Uncertainty

## 8.1 Transmitter Output Power

Measurement Uncertainty: 0.387dB,k=1.96

## 8.2 Peak Power Spectral Density

Measurement Uncertainty: 0.705dB,k=1.96

## 8.3 Occupied Channel Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

## 8.4 Band Edges Compliance

Measurement Uncertainty : 0.62dB,k=1.96

## 8.5 Spurious Emissions

**Conducted (k=1.96)**

| Frequency Range | Uncertainty(dB) |
|---|---|
| 30MHz ≤ f ≤ 2GHz | 1.22 |
| 2GHz ≤ f ≤3.6GHz | 1.22 |
| 3.6GHz ≤ f ≤8GHz | 1.22 |
| 8GHz ≤ f ≤12.75GHz | 1.51 |
| 12.75GHz ≤ f ≤26GHz | 1.51 |
| 26GHz ≤ f ≤40GHz | 1.59 |

**Radiated (k=2)**

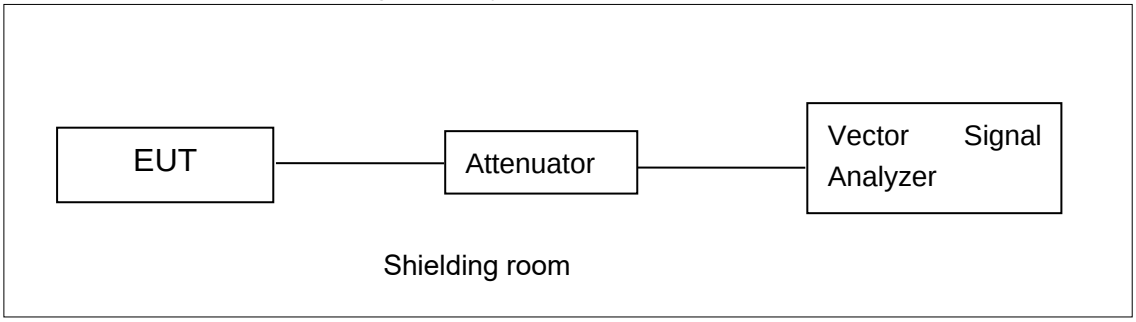
| Frequency Range | Uncertainty(dB) |
|---|---|
| 9kHz-30MHz | / |
| 30MHz ≤ f ≤ 1GHz | 5.40 |
| 1GHz ≤ f ≤18GHz | 4.32 |
| 18GHz ≤ f ≤40GHz | 5.26 |

# ANNEX A: MEASUREMENT RESULTS

## A.1. Measurement Method

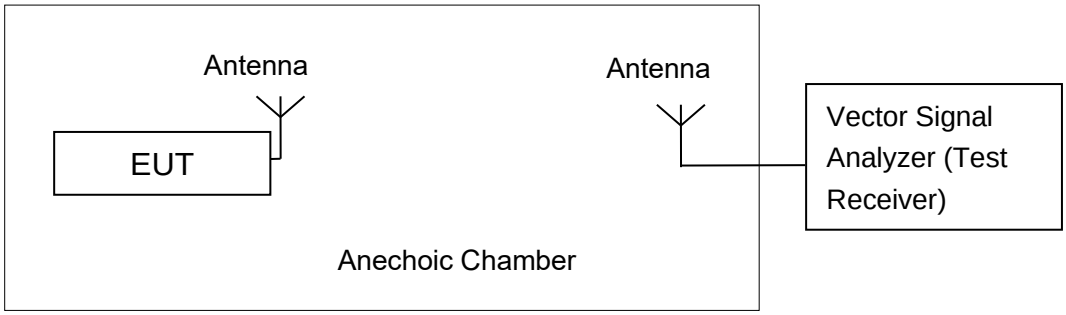
### A.1.1. Conducted Measurements

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.

## A.2. Maximum output Power

**Measurement Limit and Method:**

| Standard | Frequency (MHz) | Limit (dBm) |
|---|---|---|
| FCC CRF Part 15.407(a) | 5150MHz~5250MHz | 24dBm |

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

The measurementmethod SA-1 is made according to KDB 789033

**Measurement Results:**

**802.11a mode**

| Mode | Channel | Test Result (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate (Mbps) | | | | | | | |
| | | 6 | 9 | 12 | 18 | 24 | 36 | 48 | 54 |
| 802.11a | 5180MHz | 15.70 | / | / | / | / | / | / | / |
| | 5200MHz | 15.89 | 14.78 | 13.75 | 13.72 | 13.68 | 13.67 | 13.62 | 13.13 |
| | 5240MHz | 15.67 | / | / | / | / | / | / | / |

The data rate 6Mbps is selected as worse condition, and the following cases are performed with this condition.

**802.11n-HT20 mode**

| Mode | Channel | Test Result (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate | | | | | | | |
| | | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
| 802.11n (HT20) | 5180MHz | 15.00 | 13.96 | 13.91 | 13.88 | 13.87 | 13.84 | 11.94 | 10.95 |
| | 5200MHz | 14.98 | / | / | / | / | / | / | / |
| | 5240MHz | 14.75 | / | / | / | / | / | / | / |

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

**802.11n-HT40 mode**

| Mode | Channel | Test Result (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate | | | | | | | |
| | | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
| 802.11n (HT40) | 5190MHz | 13.85 | 12.91 | 12.91 | 12.83 | 12.79 | 12.77 | 11.78 | 10.77 |
| | 5230MHz | 13.77 | / | / | / | / | / | / | / |

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

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

**Measurement Limit:**

| Standard | Frequency (MHz) | Limit (dBm/MHz) |
|---|---|---|
| FCC CRF Part 15.407(a) | 5150MHz~5250MHz | 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 | 7.25 | P |
| | 5200 MHz | 6.76 | P |
| | 5240 MHz | 7.04 | P |
| 802.11n HT20 | 5180 MHz | 6.16 | P |
| | 5200 MHz | 5.81 | P |
| | 5240 MHz | 5.89 | P |
| 802.11n HT40 | 5190 MHz | 2.21 | P |
| | 5230 MHz | 1.84 | P |

**Conclusion: PASS**

## A.4. Occupied 26dB Bandwidth(conducted)

**Measurement Limit:**

| Standard | Limit (kHz) |
|---|---|
| FCC 47 CFR Part 15.403 (i) | / |

The measurement is made according to KDB 789033

**Measurement Uncertainty:**

| | |
|---|---|
| Measurement Uncertainty | 60.80Hz |

**Measurement Result:**

| Mode | Channel | Occupied 26dB Bandwidth ( MHz) | | conclusion |
|---|---|---|---|---|
| 802.11a | 5180 MHz | Fig.1 | 41.65 | P |
| | 5200 MHz | Fig.2 | 39.90 | P |
| | 5240 MHz | Fig.3 | 38.10 | P |
| 802.11n HT20 | 5180 MHz | Fig.4 | 39.30 | P |
| | 5200 MHz | Fig.5 | 37.80 | P |
| | 5240 MHz | Fig.6 | 39.95 | P |
| 802.11n HT40 | 5190 MHz | Fig.7 | 60.00 | P |
| | 5230 MHz | Fig.8 | 56.80 | P |

**Conclusion: PASS**

**Test graphs as below:**

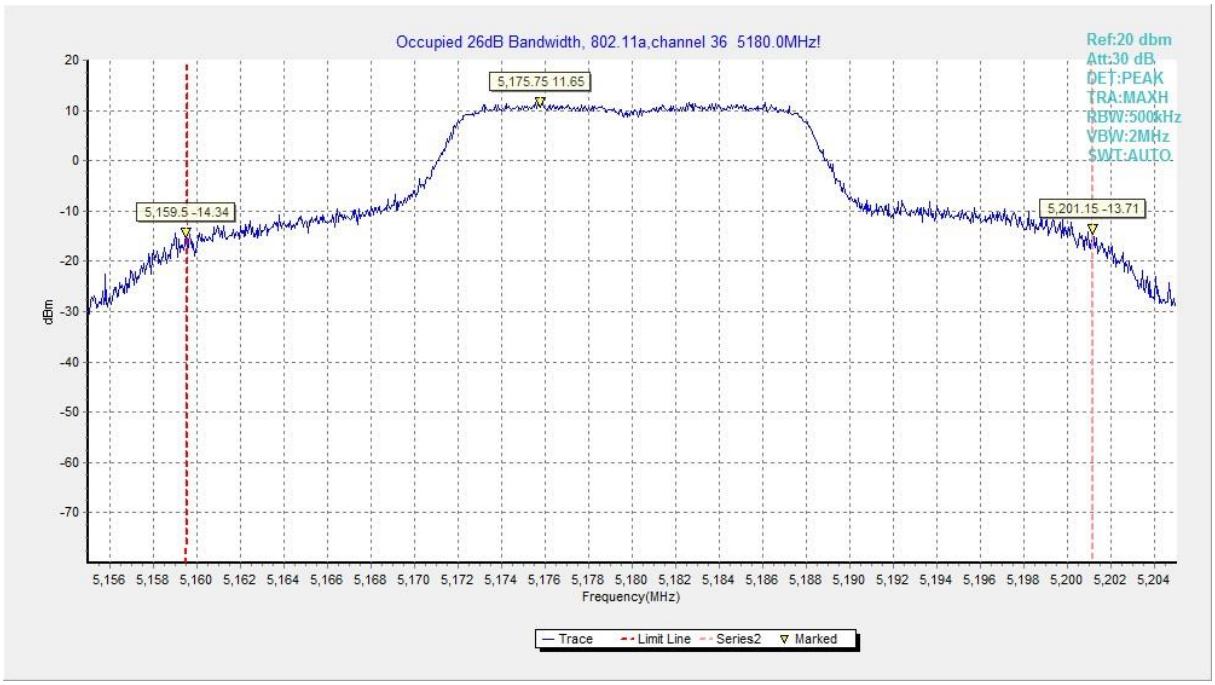



**Fig.1 Occupied 26dB Bandwidth (802.11a, 5180MHz)**

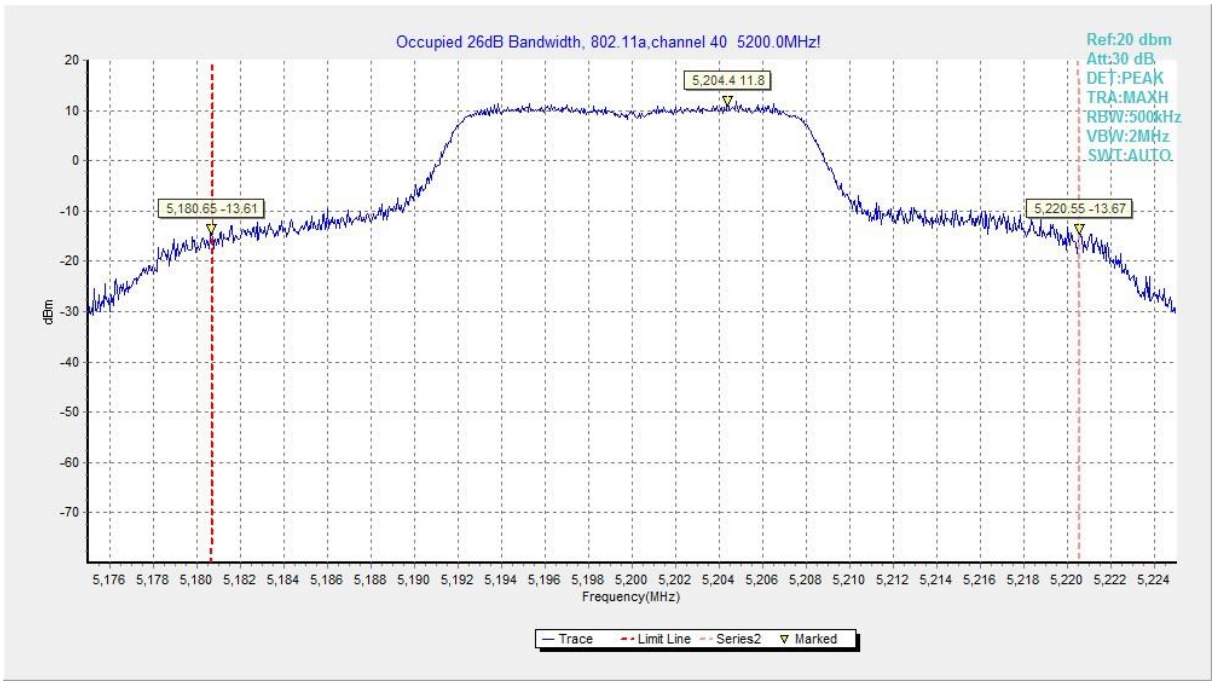



**Fig.2 Occupied 26dB Bandwidth (802.11a, 5200MHz)**

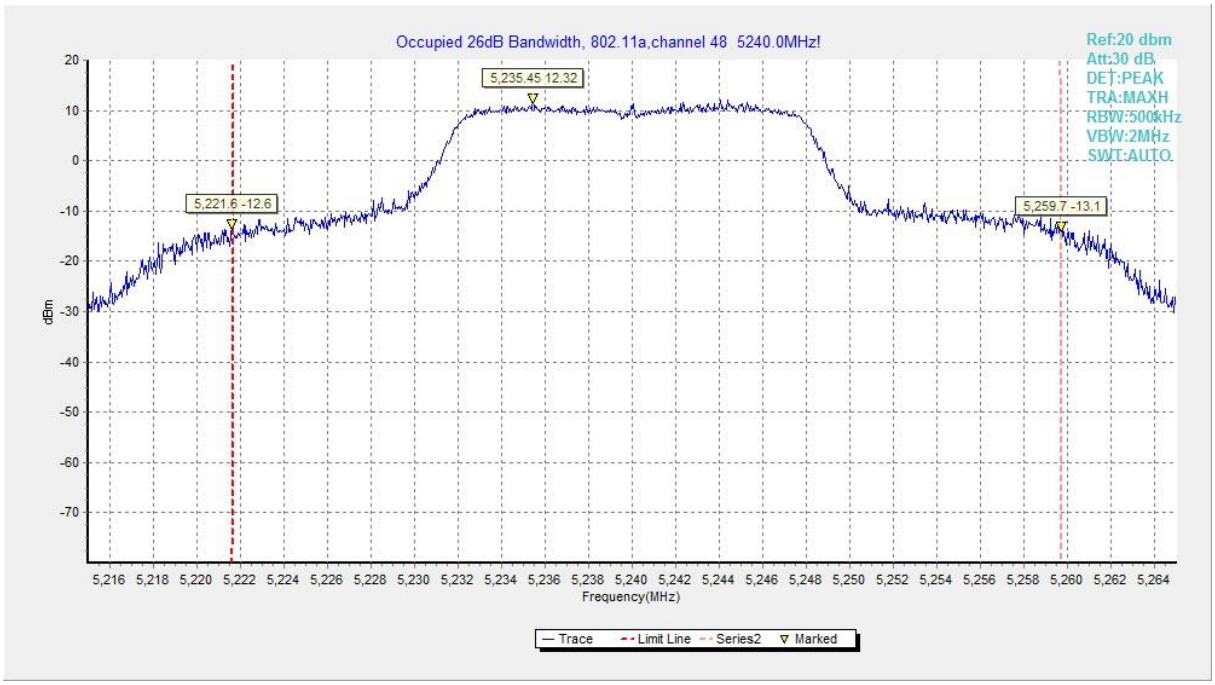



**Fig.3 Occupied 26dB Bandwidth (802.11a, 5240MHz)**

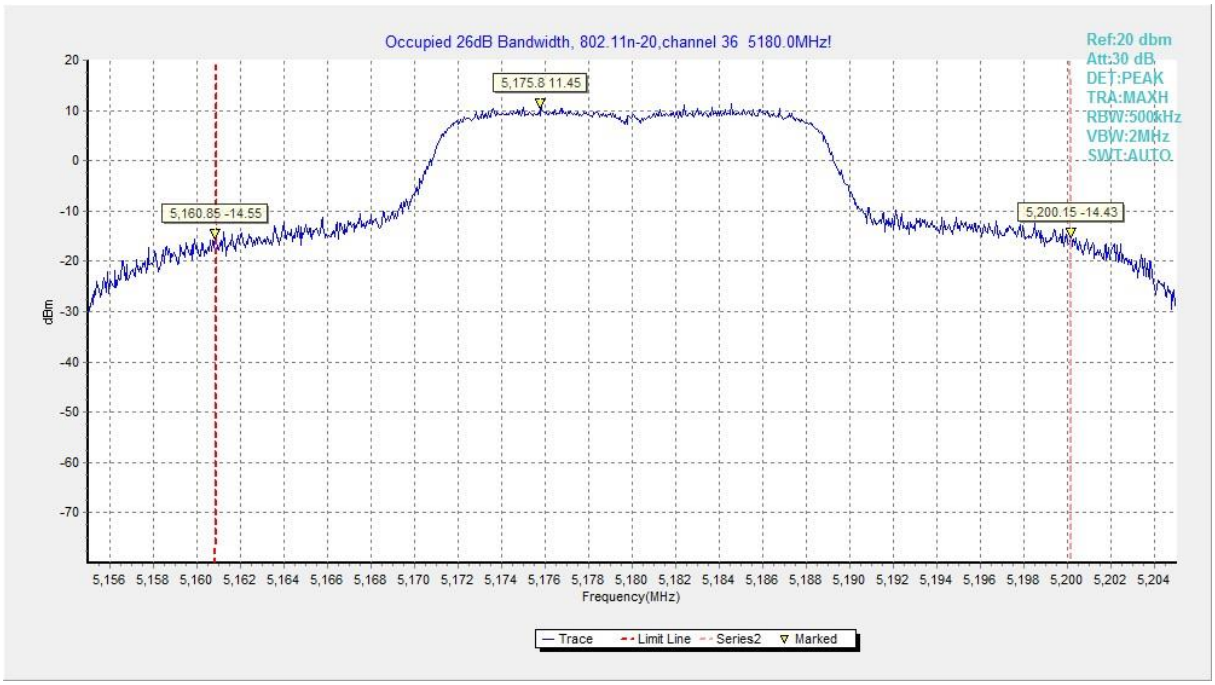



**Fig.4 Occupied 26dB Bandwidth (802.11n-HT20, 5180MHz)**

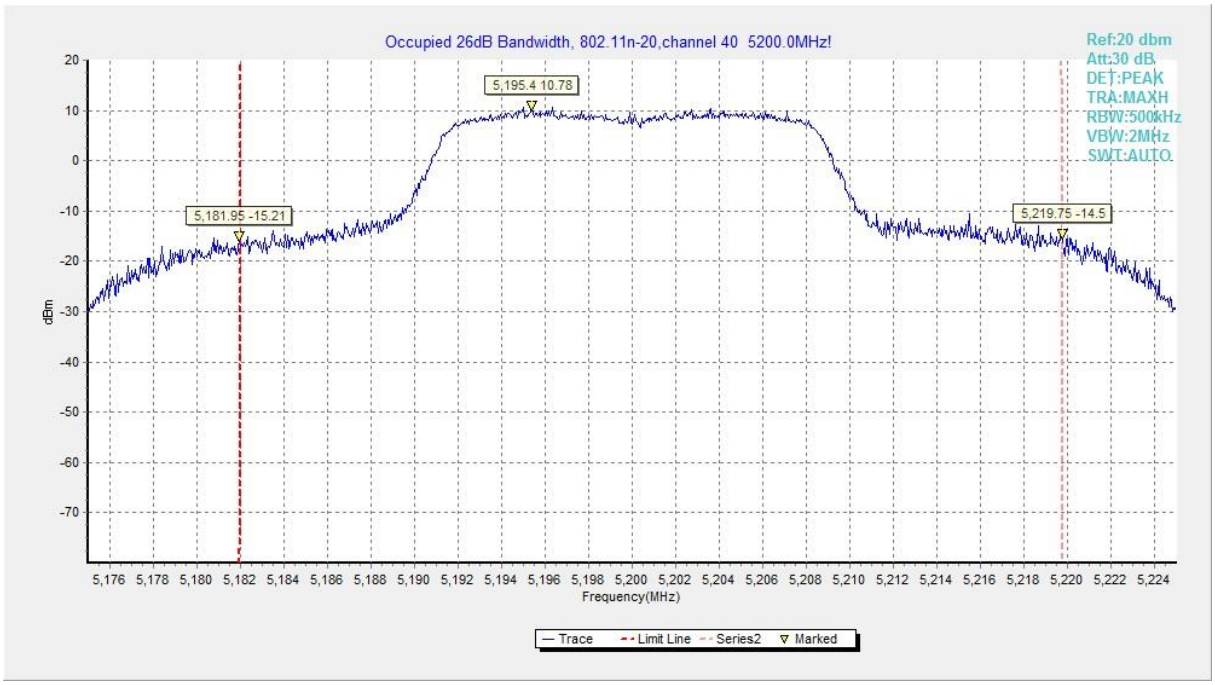



**Fig.5 Occupied 26dB Bandwidth (802.11n-HT20, 5200MHz)**

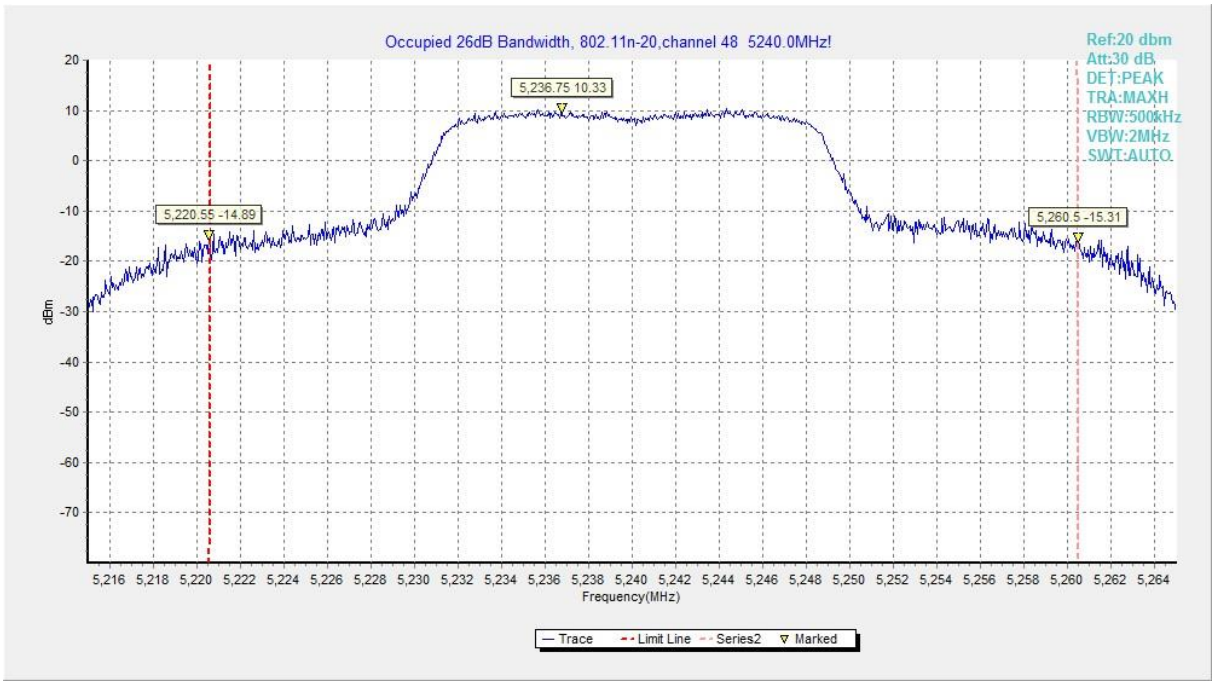



**Fig.6 Occupied 26dB Bandwidth (802.11n-HT20, 5240MHz)**

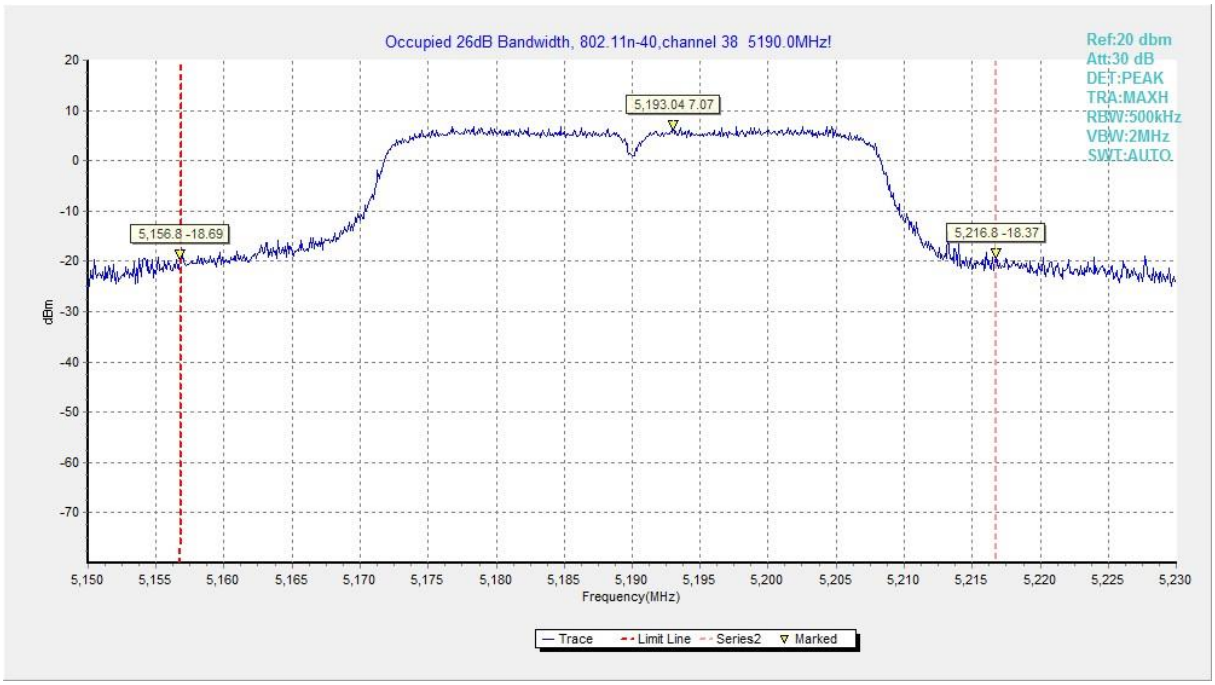



**Fig.7 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)**

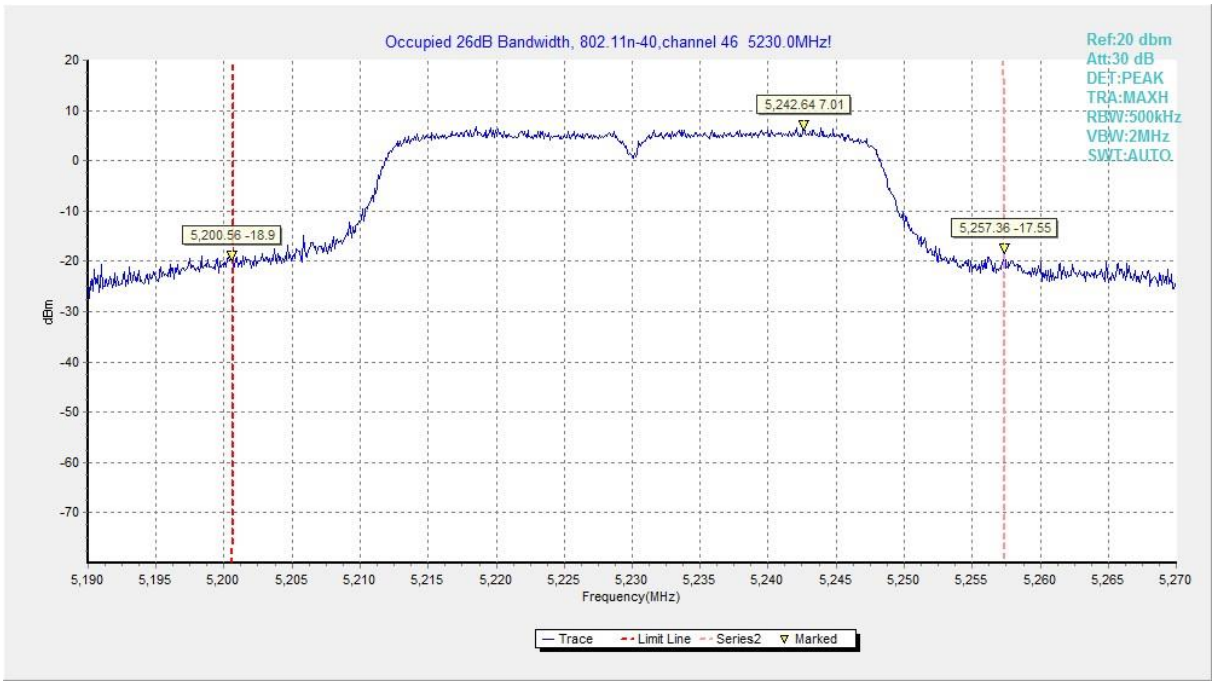



**Fig.8 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)**

## A.5. Band Edges Compliance

### A5.1 Band Edges - Radiated

**Measurement Limit:**

| Standard | Limit (dB μ 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 Uncertainty:**

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

**Measurement Result:**

| Mode | Channel | Test Results | Conclusion |
|---|---|---|---|
| 802.11a | 5180 MHz | Fig.9 | P |
| | 5240 MHz | Fig.10 | P |
| 802.11n HT20 | 5180 MHz | Fig.11 | P |
| | 5240 MHz | Fig.12 | P |
| 802.11n HT40 | 5190 MHz | Fig.13 | P |
| | 5230 MHz | Fig.14 | P |

**Conclusion: PASS**

**Test graphs as below:**

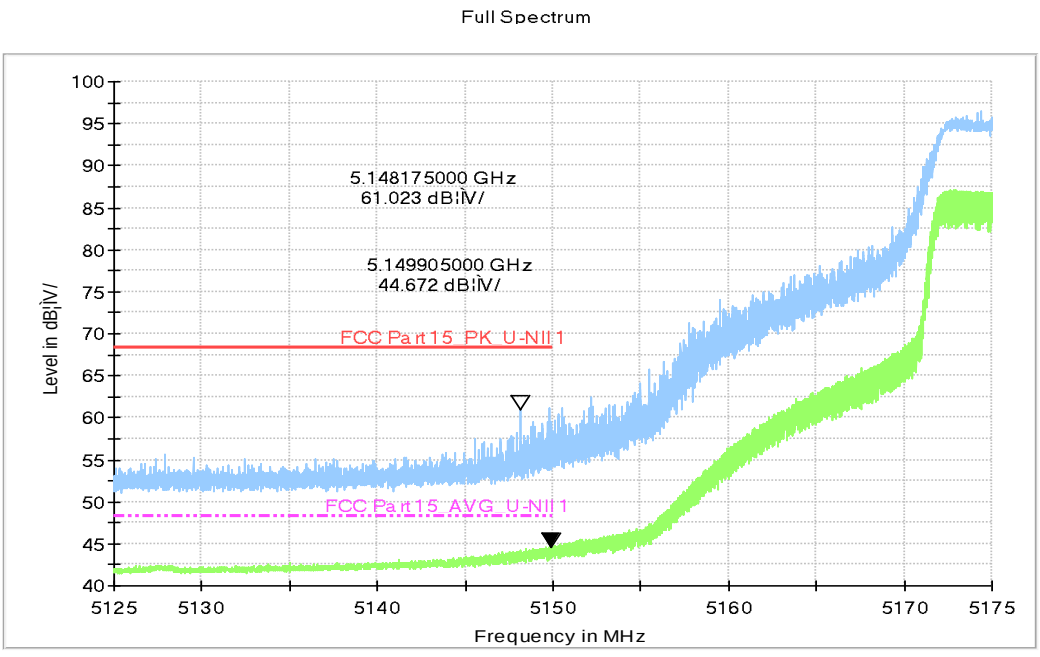



**Fig.9 Band Edges (802.11a, 5180MHz)**

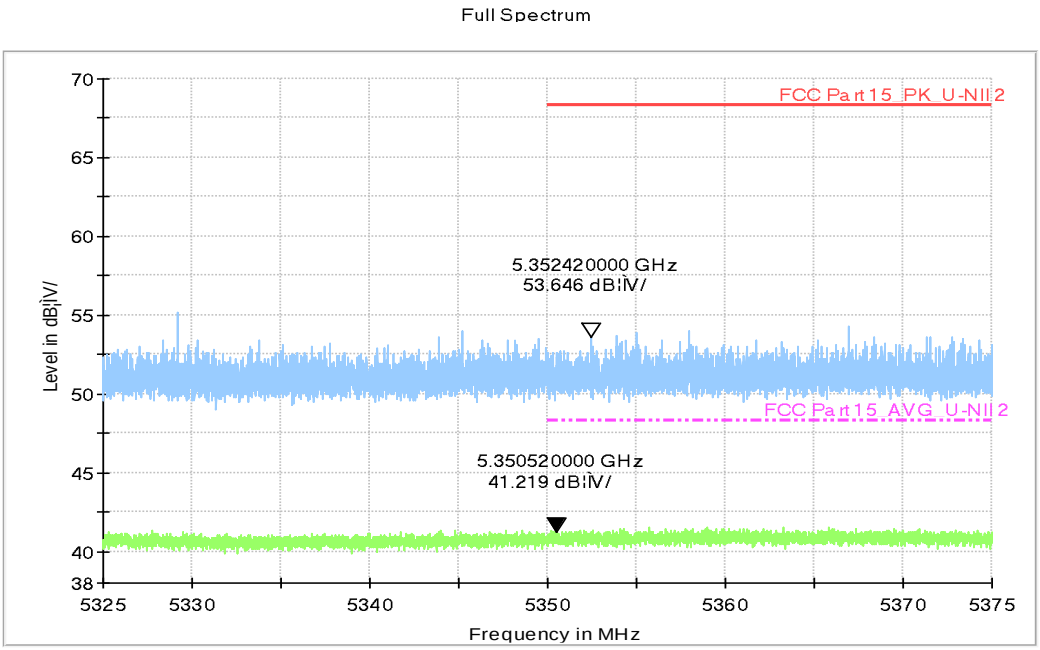



**Fig.10 Band Edges (802.11a, 5240MHz)**

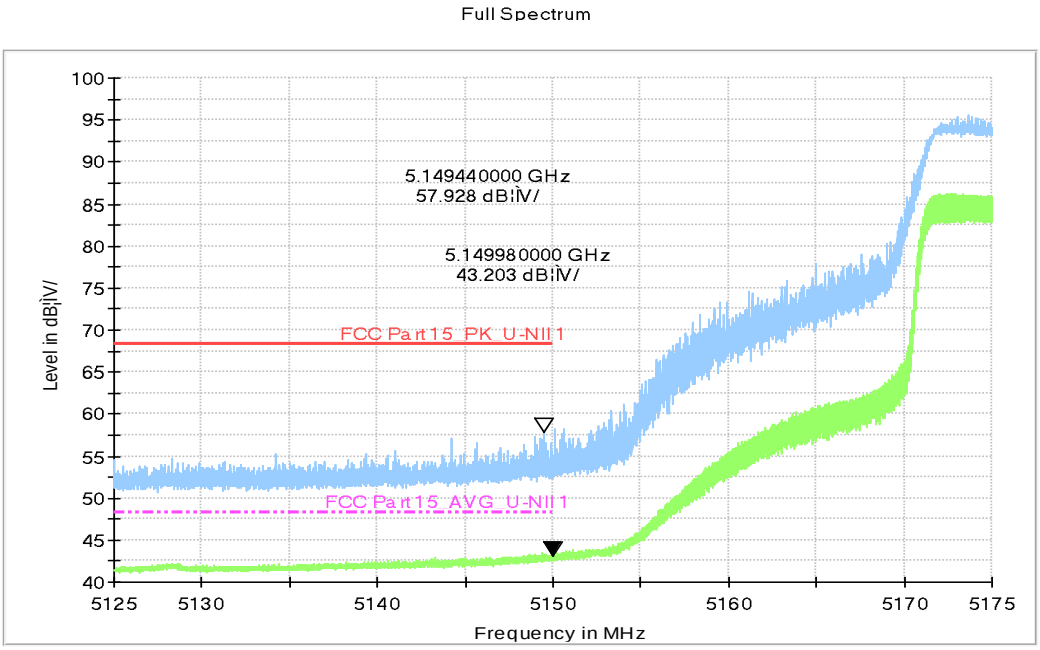



**Fig.11 Band Edges (802.11n-HT20, 5180MHz)**

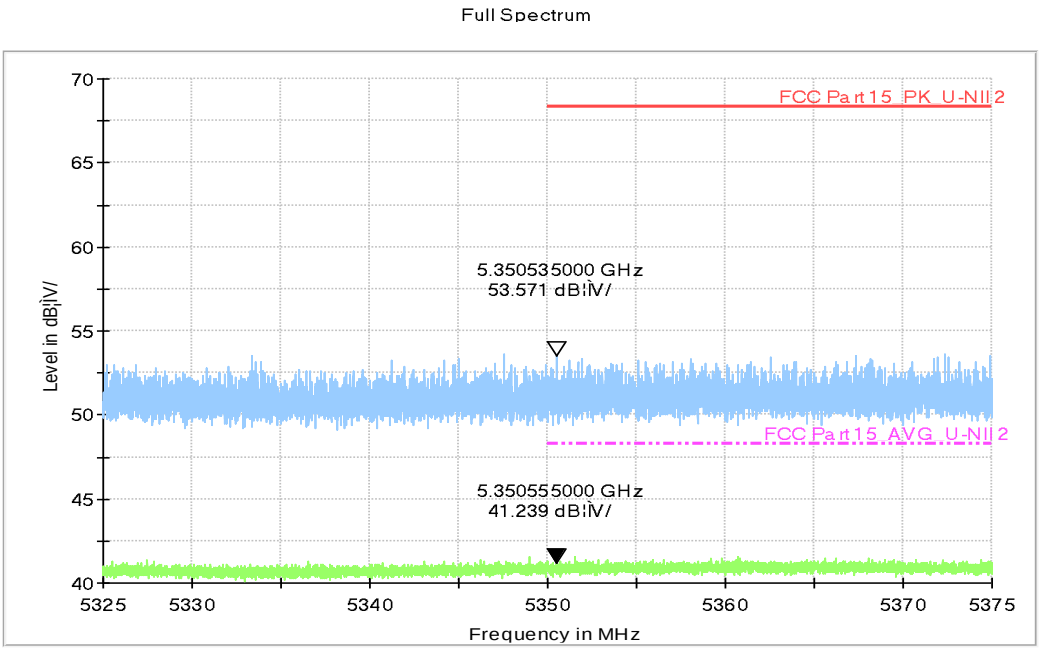



**Fig.12 Band Edges (802.11n-HT20, 5240MHz)**

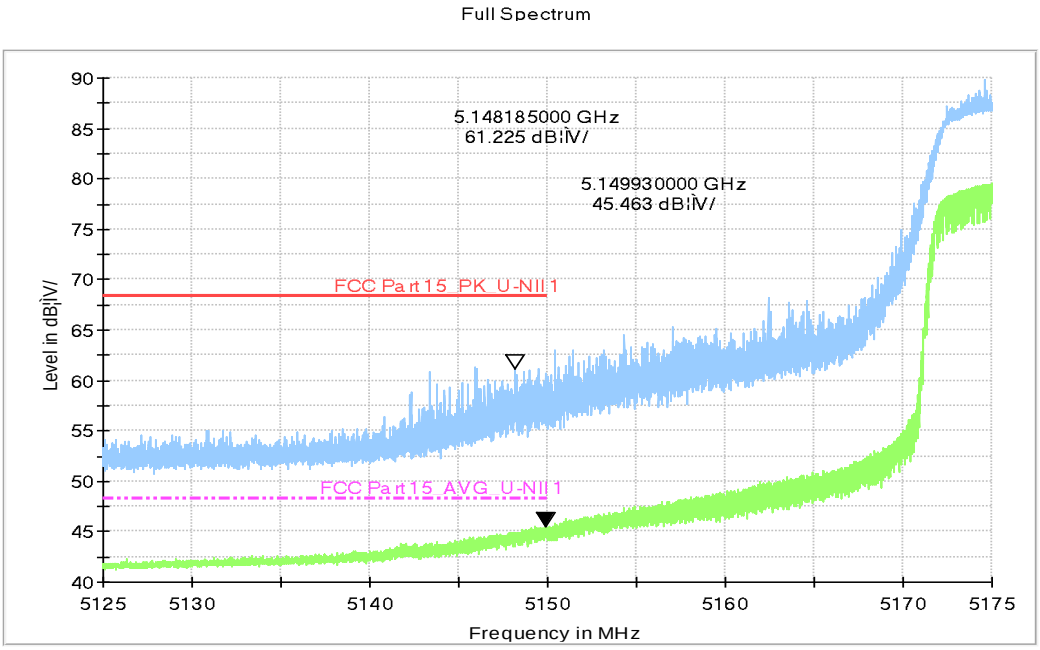



**Fig.13 Band Edges (802.11n-HT40, 5190MHz)**

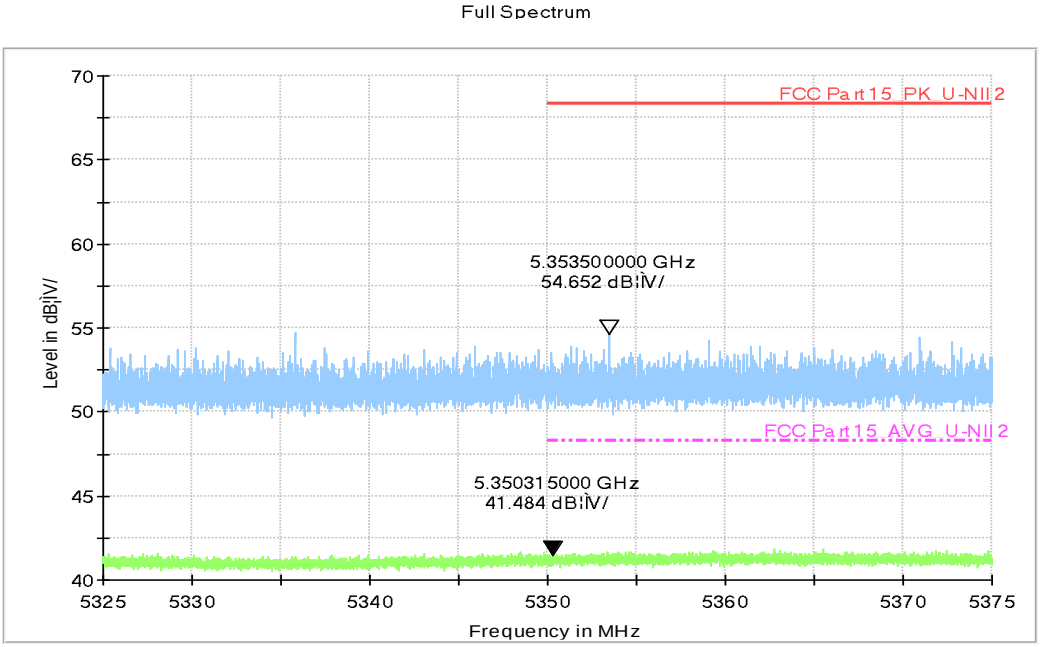



**Fig.14 Band Edges (802.11n-HT40, 5230MHz)**

## 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)).

**Limit in restricted band:**

| Frequency of emission (MHz) | Field strength(dBμV/m) | Measurement distance(m) |
|---|---|---|
| 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

**Measurement uncertainty:**

Expanded measurement uncertainty for this test item is U =3.9dB, k=2.

**Measurement Results:**

**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

**Average**

**82.11a**

Channel 36

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 17980.200 | 35.40 | -5.42 | 33.80 | 7.02 | H |
| 17989.000 | 35.40 | -5.42 | 43.40 | -2.58 | V |
| 17985.700 | 35.30 | -5.42 | 43.40 | -2.68 | H |
| 17964.800 | 35.20 | -5.42 | 43.40 | -2.78 | H |
| 17996.700 | 35.20 | -5.42 | 43.40 | -2.78 | H |
| 51499.050 | 44.70 | -6.54 | 46.40 | 4.84 | H |

Channel 40

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 17993.400 | 35.80 | -5.42 | 43.40 | -2.18 | H |
| 17969.200 | 35.60 | -5.42 | 33.80 | 7.22 | H |
| 17989.000 | 35.50 | -5.42 | 43.40 | -2.48 | V |
| 17959.300 | 35.50 | -5.42 | 43.40 | -2.48 | H |
| 17885.600 | 35.40 | -5.74 | 43.40 | -2.26 | H |
| 17934.000 | 35.40 | -5.42 | 43.40 | -2.58 | H |

Channel 48

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5352.420 | 53.60 | -16.58 | 33.40 | 36.78 | H |
| 17970.300 | 35.60 | -5.42 | 33.80 | 7.22 | H |
| 17962.600 | 35.60 | -5.42 | 43.40 | -2.38 | V |
| 17991.200 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17961.500 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17949.400 | 35.40 | -5.42 | 43.40 | -2.58 | H |

**802.11n-HT20**

Channel 36

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5149.980 | 43.20 | -16.61 | 33.40 | 26.41 | H |
| 17980.200 | 35.70 | -5.42 | 33.80 | 7.32 | H |
| 17978.000 | 35.70 | -5.42 | 43.40 | -2.28 | V |
| 17958.200 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17967.000 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17987.900 | 35.50 | -5.42 | 43.40 | -2.48 | H |

Channel 40

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 17980.200 | 35.80 | -5.42 | 43.40 | -2.18 | H |
| 17954.900 | 35.70 | -5.42 | 33.80 | 7.32 | H |
| 17971.400 | 35.60 | -5.42 | 43.40 | -2.38 | V |
| 17993.400 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17990.100 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17997.800 | 35.60 | -5.42 | 43.40 | -2.38 | H |

Channel 48

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5350.550 | 41.20 | -16.58 | 33.40 | 24.38 | H |
| 17995.600 | 35.80 | -5.42 | 33.80 | 7.42 | H |
| 17997.800 | 35.70 | -5.42 | 43.40 | -2.28 | V |
| 17985.700 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17959.300 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17989.000 | 35.60 | -5.42 | 43.40 | -2.38 | H |

**802.11n-HT40**

Channel 38

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5149.930 | 45.50 | -16.61 | 33.40 | 28.71 | H |
| 17991.200 | 35.80 | -5.42 | 33.80 | 7.42 | H |
| 17972.500 | 35.70 | -5.42 | 43.40 | -2.28 | V |
| 17979.100 | 35.70 | -5.42 | 43.40 | -2.28 | H |
| 17983.500 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17989.000 | 35.60 | -5.42 | 43.40 | -2.38 | H |

Channel 46

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5350.150 | 41.50 | -16.58 | 33.40 | 24.68 | H |
| 17972.500 | 35.90 | -5.42 | 33.80 | 7.52 | H |
| 17943.900 | 35.70 | -5.42 | 43.40 | -2.28 | V |
| 17994.500 | 35.70 | -5.42 | 43.40 | -2.28 | H |
| 17982.400 | 35.60 | -5.42 | 43.40 | -2.38 | H |
| 17980.200 | 35.60 | -5.42 | 43.40 | -2.38 | H |

**Peak**

**802.11a**

Channel 36

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5148.175 | 61.00 | -16.61 | 33.40 | 44.21 | H |
| 17960.400 | 48.20 | -5.42 | 33.80 | 19.82 | H |
| 17969.200 | 47.40 | -5.42 | 43.40 | 9.42 | V |
| 17896.600 | 47.10 | -5.74 | 43.40 | 9.44 | H |
| 17995.600 | 46.90 | -5.42 | 43.40 | 8.92 | H |
| 17869.100 | 46.80 | -5.74 | 43.40 | 9.14 | H |

Channel 40

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 17942.800 | 47.70 | -5.42 | 43.40 | 9.72 | H |
| 17901.000 | 47.30 | -5.74 | 33.80 | 19.24 | H |
| 17916.400 | 47.20 | -5.42 | 43.40 | 9.22 | V |
| 17978.000 | 47.10 | -5.42 | 43.40 | 9.12 | H |
| 17970.300 | 47.10 | -5.42 | 43.40 | 9.12 | H |
| 17912.000 | 47.10 | -5.74 | 43.40 | 9.44 | H |

Channel 48

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5350.520 | 41.20 | -16.58 | 33.40 | 24.38 | H |
| 17987.900 | 47.90 | -5.42 | 33.80 | 19.52 | H |
| 17982.400 | 47.70 | -5.42 | 43.40 | 9.72 | V |
| 17519.300 | 47.60 | -5.92 | 43.40 | 10.12 | H |
| 17457.700 | 47.10 | -5.92 | 40.10 | 12.92 | H |
| 17473.100 | 47.10 | -5.92 | 40.10 | 12.92 | H |

**802.11n-HT20**

Channel 36

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5149.440 | 57.90 | -16.61 | 33.40 | 41.11 | H |
| 17939.500 | 48.00 | -5.42 | 33.80 | 19.62 | H |
| 17876.800 | 47.30 | -5.74 | 43.40 | 9.64 | V |
| 17737.100 | 47.20 | -5.74 | 43.40 | 9.54 | H |
| 17972.500 | 47.20 | -5.42 | 43.40 | 9.22 | H |
| 17453.300 | 47.10 | -5.92 | 40.10 | 12.92 | H |

Channel 40

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 17390.600 | 47.70 | -5.92 | 40.10 | 13.52 | H |
| 17963.700 | 47.50 | -5.42 | 33.80 | 19.12 | H |
| 17984.600 | 47.40 | -5.42 | 43.40 | 9.42 | V |
| 17952.700 | 47.30 | -5.42 | 43.40 | 9.32 | H |
| 17906.500 | 47.10 | -5.74 | 43.40 | 9.44 | H |
| 17264.100 | 47.10 | -6.50 | 40.10 | 13.50 | H |

Channel 48

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5350.535 | 53.60 | -16.58 | 33.40 | 36.78 | H |
| 17969.200 | 47.70 | -5.42 | 33.80 | 19.32 | H |
| 17993.400 | 47.30 | -5.42 | 43.40 | 9.32 | V |
| 17981.300 | 47.30 | -5.42 | 43.40 | 9.32 | H |
| 17980.200 | 47.10 | -5.42 | 43.40 | 9.12 | H |
| 17861.400 | 47.10 | -5.74 | 43.40 | 9.44 | H |

**802.11n-HT40**

Channel 38

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5141.185 | 61.20 | -16.61 | 33.40 | 44.41 | H |
| 17760.200 | 48.10 | -5.74 | 33.80 | 20.04 | H |
| 17775.600 | 47.70 | -5.74 | 43.40 | 10.04 | V |
| 17885.600 | 47.50 | -5.74 | 43.40 | 9.84 | H |
| 17876.800 | 47.40 | -5.74 | 43.40 | 9.74 | H |
| 17960.400 | 47.30 | -5.42 | 43.40 | 9.32 | H |

Channel 46

| Frequency(MHz) | Result (dBuV/m) | Cable Loss | Antenna Factor | $P_{Mea}$ (dBuV/m) | Polarization |
|---|---|---|---|---|---|
| 5353.500 | 54.70 | -16.58 | 33.40 | 37.88 | H |
| 17500.600 | 47.60 | -5.92 | 33.80 | 19.72 | H |
| 17949.400 | 47.40 | -5.42 | 43.40 | 9.42 | V |
| 18000.000 | 47.30 | -6.54 | 46.40 | 7.44 | H |
| 17958.200 | 47.30 | -5.42 | 43.40 | 9.32 | H |
| 17610.600 | 47.30 | -6.90 | 43.40 | 10.80 | H |

Sample calculation: 802.11n 40MHz CH46–Peak, 5353.500MHz

Peak ERP(dBm) = $P_{Mea}$(37.88 dBuV/m) + Cable Loss(-16.58) + Antenna Factor(33.40) = 54.70 dBuV/m

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

**Test Condition:**

| Voltage（V） | Frequency（Hz） |
|---|---|
| 110 | 60 |

**Measurement uncertainty:**

Expanded measurement uncertainty for this test item is U =3.08dB, k=2.

**Measurement Result and limit:**

WLAN (Quasi-peak Limit)

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Result (dBμV) | | Conclusion |
|---|---|---|---|---|
| | | With charger | | |
| | | 11a mode | Idle | |
| 0.15 to 0.5 | 66 to 56 | Fig.15 Fig.17 | Fig.16 | 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 (dBμV) | Result (dBμV) | | Conclusion |
|---|---|---|---|---|
| | | With charger | | |
| | | 11a mode | Idle | |
| 0.15 to 0.5 | 56 to 46 | Fig.15 Fig.17 | Fig.16 | 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:**

**Traffic UC11US PUAN**

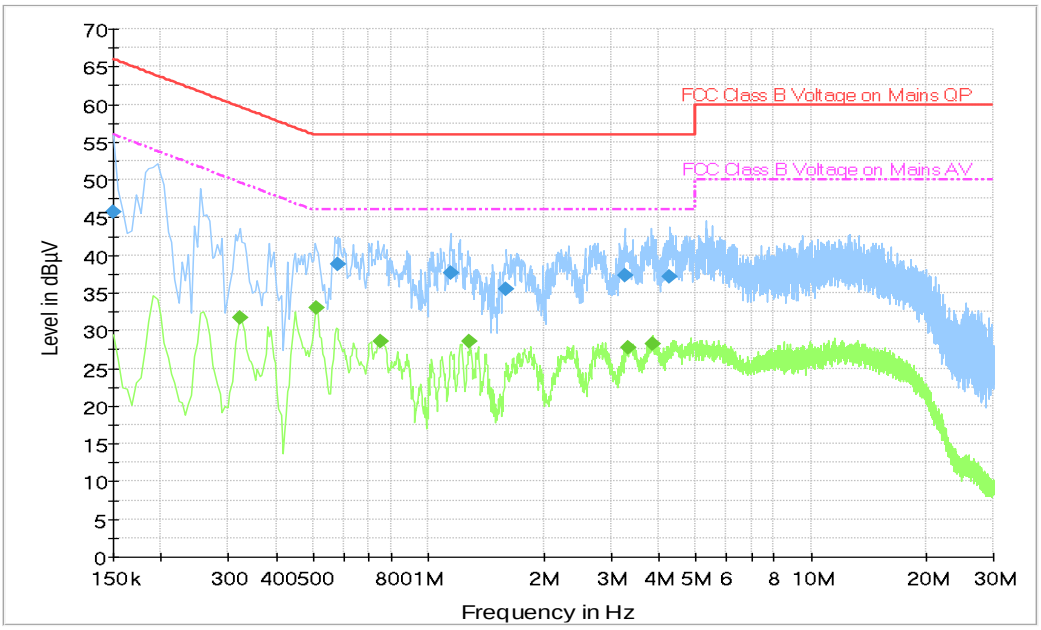



**Fig. 15 Conducted Emission(802.11a, Ch40, TX)**

Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|
| 0.150000 | 45.7 | N | 30.6 | 20.3 | 66.0 |
| 0.577500 | 38.8 | L1 | 19.8 | 17.2 | 56.0 |
| 1.144500 | 37.6 | L1 | 19.7 | 18.4 | 56.0 |
| 1.594500 | 35.5 | L1 | 19.6 | 20.5 | 56.0 |
| 3.255000 | 37.3 | L1 | 19.6 | 18.7 | 56.0 |
| 4.254000 | 37.1 | L1 | 19.6 | 18.9 | 56.0 |

Final Result 2

| Frequency (MHz) | QuasiPeak (dBµV) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|
| 0.321000 | 31.7 | N | 19.8 | 18.0 | 49.7 |
| 0.510000 | 33.1 | N | 19.8 | 12.9 | 46.0 |
| 0.753000 | 28.5 | N | 19.8 | 17.5 | 46.0 |
| 1.279500 | 28.6 | N | 19.6 | 17.4 | 46.0 |
| 3.336000 | 27.7 | L1 | 19.6 | 18.3 | 46.0 |
| 3.853500 | 28.3 | L1 | 19.6 | 17.7 | 46.0 |

**Idle UC11US PUAN**

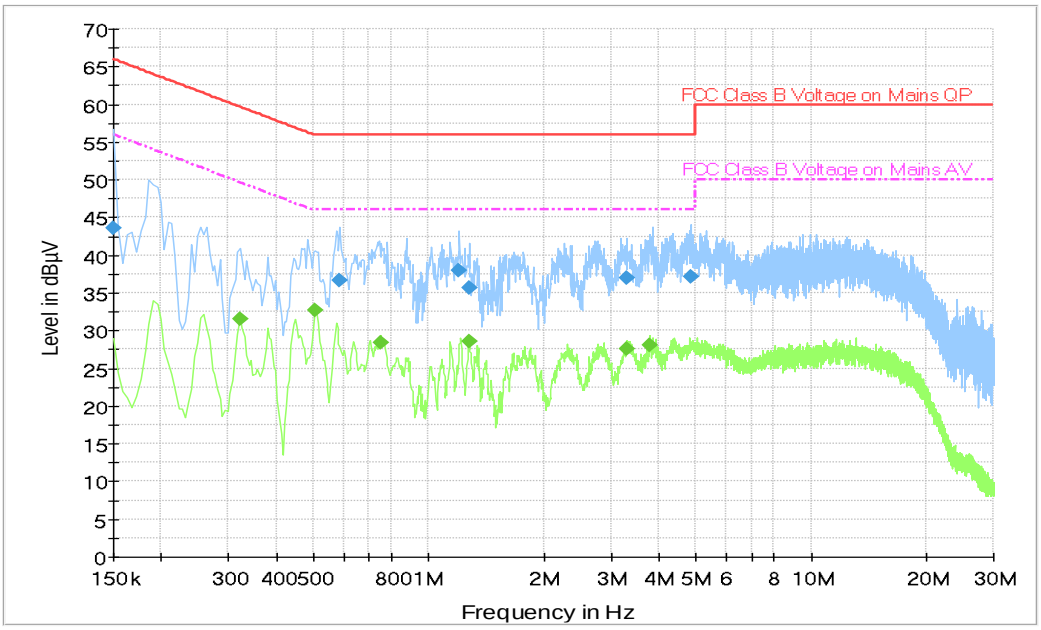



**Fig. 16 Conducted Emission(802.11a, IDLE)**

Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|
| 0.150000 | 43.5 | L1 | 30.7 | 22.5 | 66.0 |
| 0.586500 | 36.6 | L1 | 19.8 | 19.4 | 56.0 |
| 1.203000 | 38.0 | L1 | 19.7 | 18.0 | 56.0 |
| 1.279500 | 35.7 | L1 | 19.6 | 20.3 | 56.0 |
| 3.309000 | 36.9 | L1 | 19.6 | 19.1 | 56.0 |
| 4.852500 | 37.2 | L1 | 19.6 | 18.8 | 56.0 |

Final Result 2

| Frequency (MHz) | QuasiPeak (dBµV) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|
| 0.321000 | 31.6 | N | 19.8 | 18.1 | 49.7 |
| 0.505500 | 32.8 | N | 19.8 | 13.2 | 46.0 |
| 0.748500 | 28.5 | N | 19.8 | 17.5 | 46.0 |
| 1.279500 | 28.6 | N | 19.6 | 17.4 | 46.0 |
| 3.313500 | 27.6 | L1 | 19.6 | 18.4 | 46.0 |
| 3.804000 | 28.1 | L1 | 19.6 | 17.9 | 46.0 |

**Traffic UC11US Chenyang**

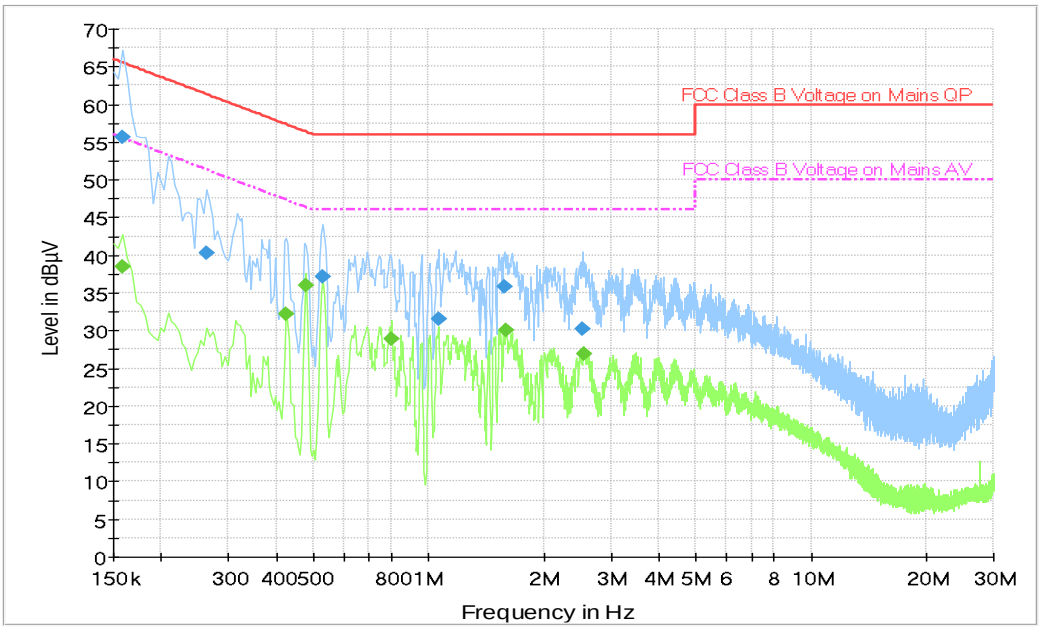



**Fig. 17 Conducted Emission(802.11a, IDLE)**

Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|
| 0.150000 | 43.5 | L1 | 30.7 | 22.5 | 66.0 |
| 0.586500 | 36.6 | L1 | 19.8 | 19.4 | 56.0 |
| 1.203000 | 38.0 | L1 | 19.7 | 18.0 | 56.0 |
| 1.279500 | 35.7 | L1 | 19.6 | 20.3 | 56.0 |
| 3.309000 | 36.9 | L1 | 19.6 | 19.1 | 56.0 |
| 4.852500 | 37.2 | L1 | 19.6 | 18.8 | 56.0 |

Final Result 2

| Frequency (MHz) | QuasiPeak (dBµV) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|
| 0.321000 | 31.6 | N | 19.8 | 18.1 | 49.7 |
| 0.505500 | 32.8 | N | 19.8 | 13.2 | 46.0 |
| 0.748500 | 28.5 | N | 19.8 | 17.5 | 46.0 |
| 1.279500 | 28.6 | N | 19.6 | 17.4 | 46.0 |
| 3.313500 | 27.6 | L1 | 19.6 | 18.4 | 46.0 |
| 3.804000 | 28.1 | L1 | 19.6 | 17.9 | 46.0 |

## A.8. 99% Occupied bandwidth

Method of Measurement: See ANSI C63.10-2013-clause 12.4.2.

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% ofthe total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

**Measurement Uncertainty:**

| | |
|---|---|
| Measurement Uncertainty | 60.80Hz |

**Measurement Result:**

| Mode | Channel | 99% Occupied bandwidth ( MHz) | | conclusion |
|---|---|---|---|---|
| 802.11a | 5180 MHz | Fig.18 | 19.20 | P |
| | 5200 MHz | Fig.19 | 18.72 | P |
| | 5240 MHz | Fig.20 | 19.12 | P |
| 802.11n HT20 | 5180 MHz | Fig.21 | 18.96 | P |
| | 5200 MHz | Fig.22 | 18.84 | P |
| | 5240 MHz | Fig.23 | 18.88 | P |
| 802.11n HT40 | 5190 MHz | Fig.24 | 36.88 | P |
| | 5230 MHz | Fig.25 | 36.80 | P |

**Conclusion: PASS**

**Test graphs as below:**

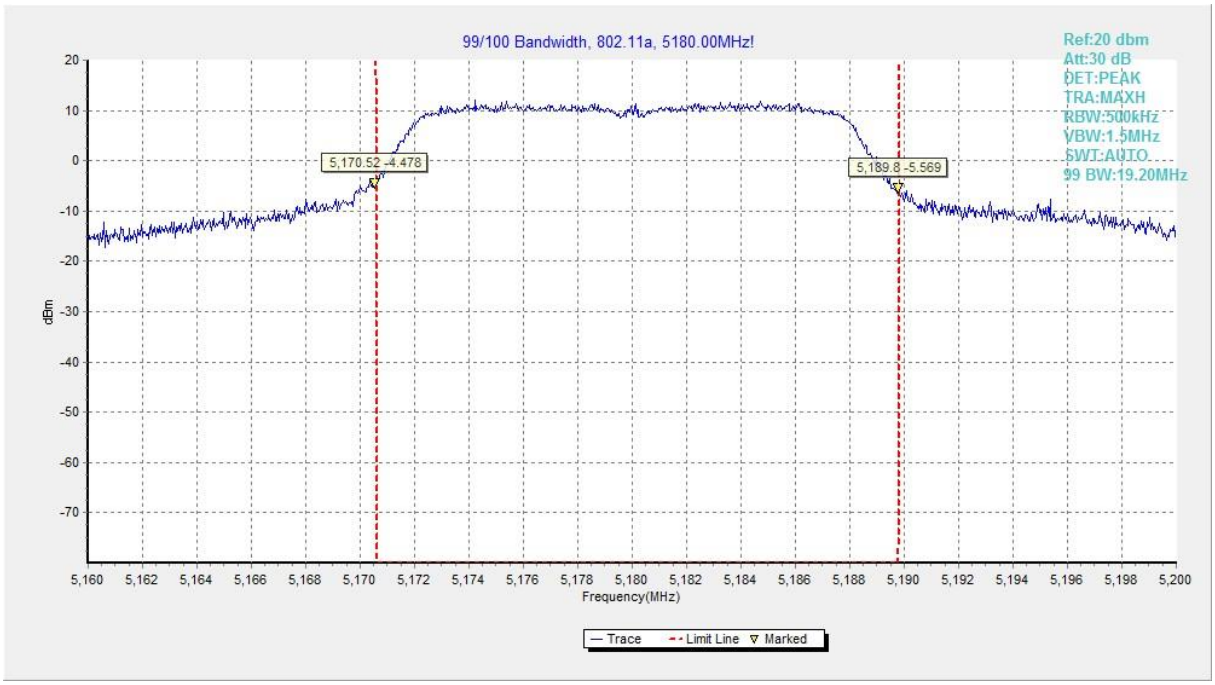



**Fig.18 99% Occupied bandwidth (802.11a, 5180MHz)**

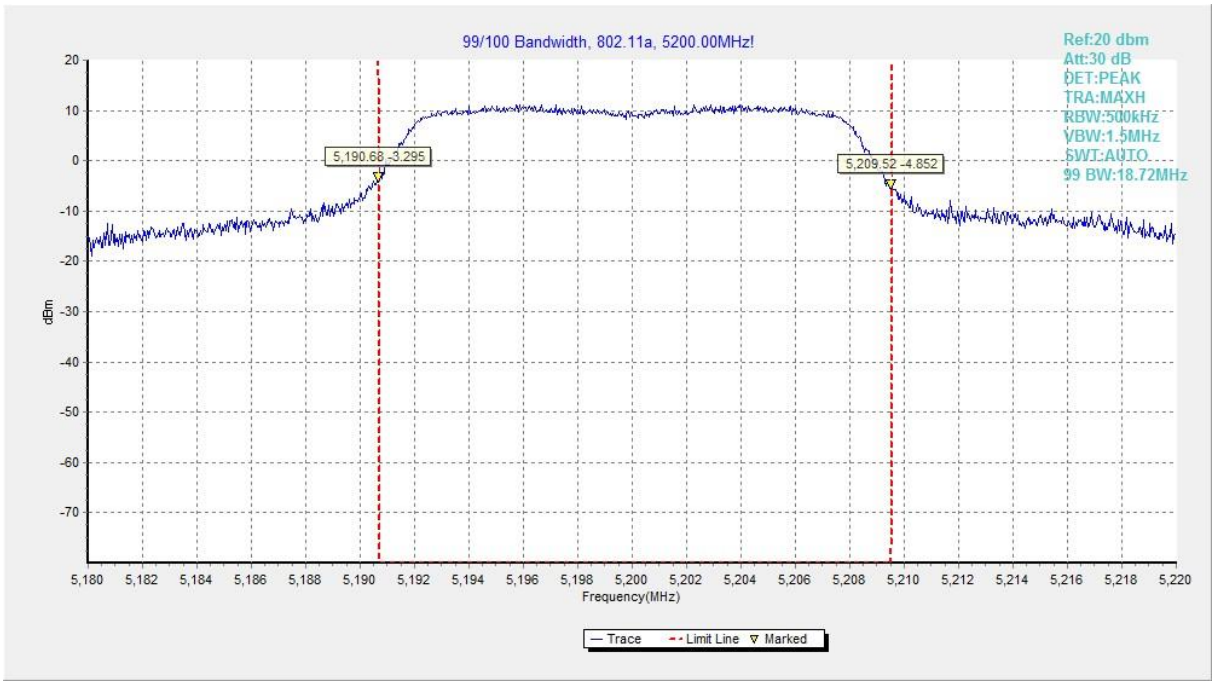



**Fig.19 99% Occupied bandwidth (802.11a, 5200MHz)**

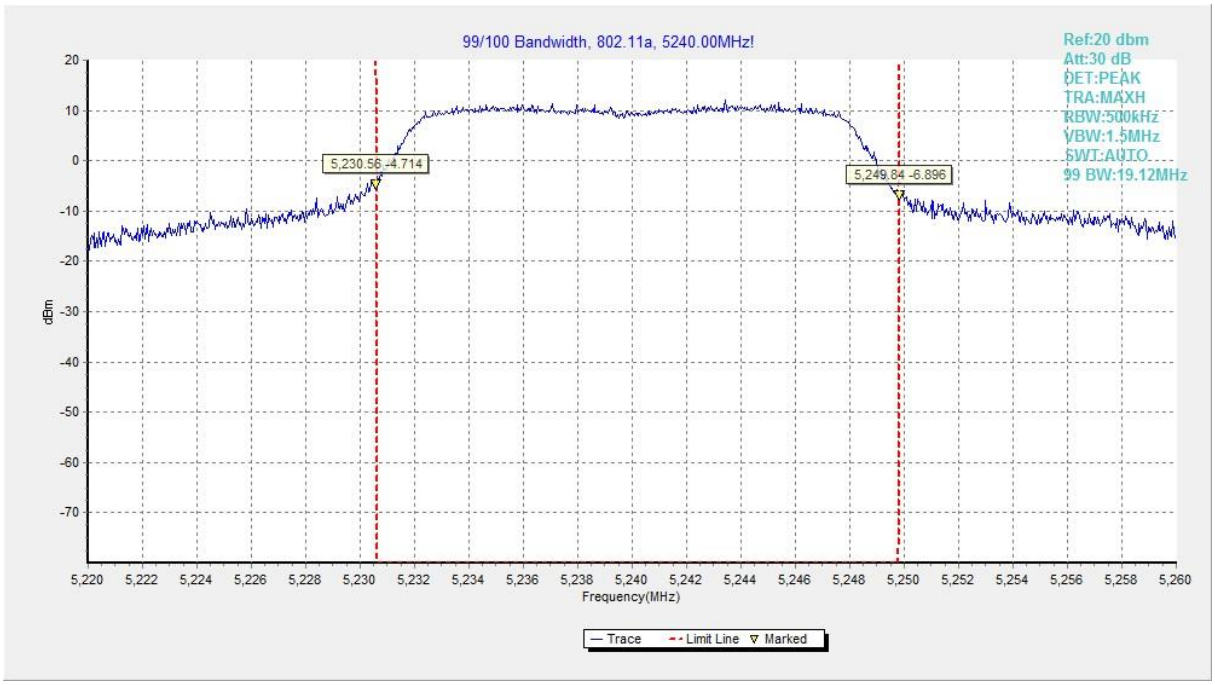



**Fig.20 99% Occupied bandwidth (802.11a, 5240MHz)**

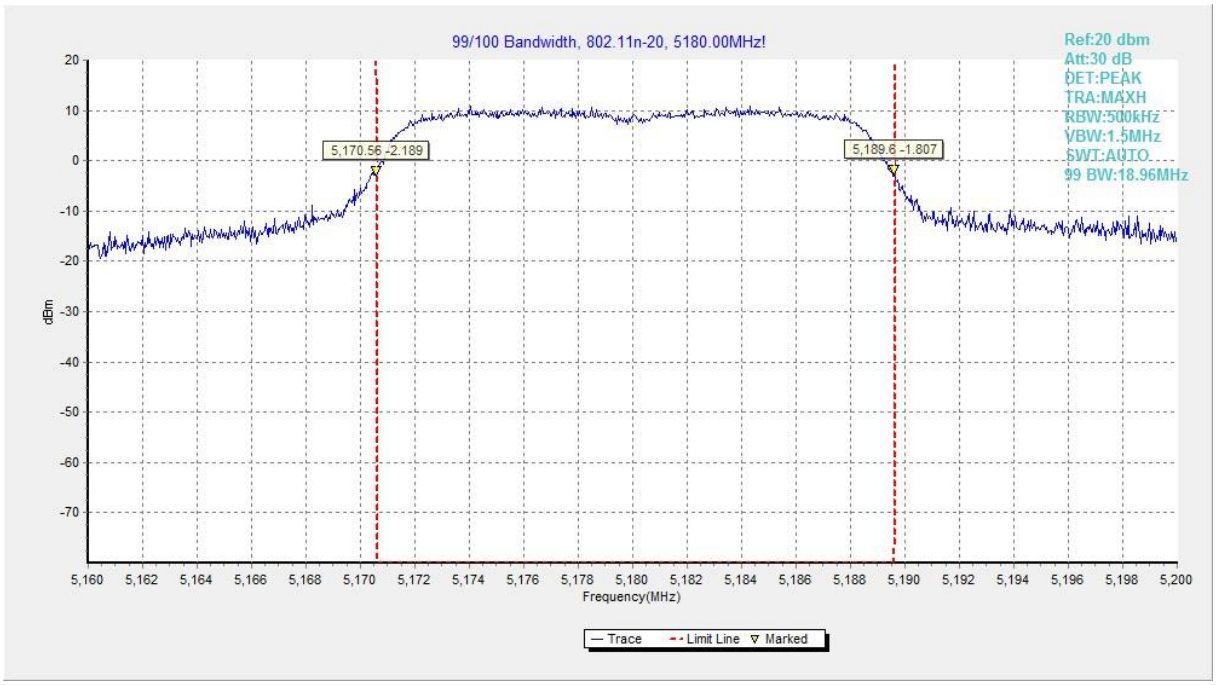



**Fig.21 99% Occupied bandwidth (802.11n-HT20, 5180MHz)**

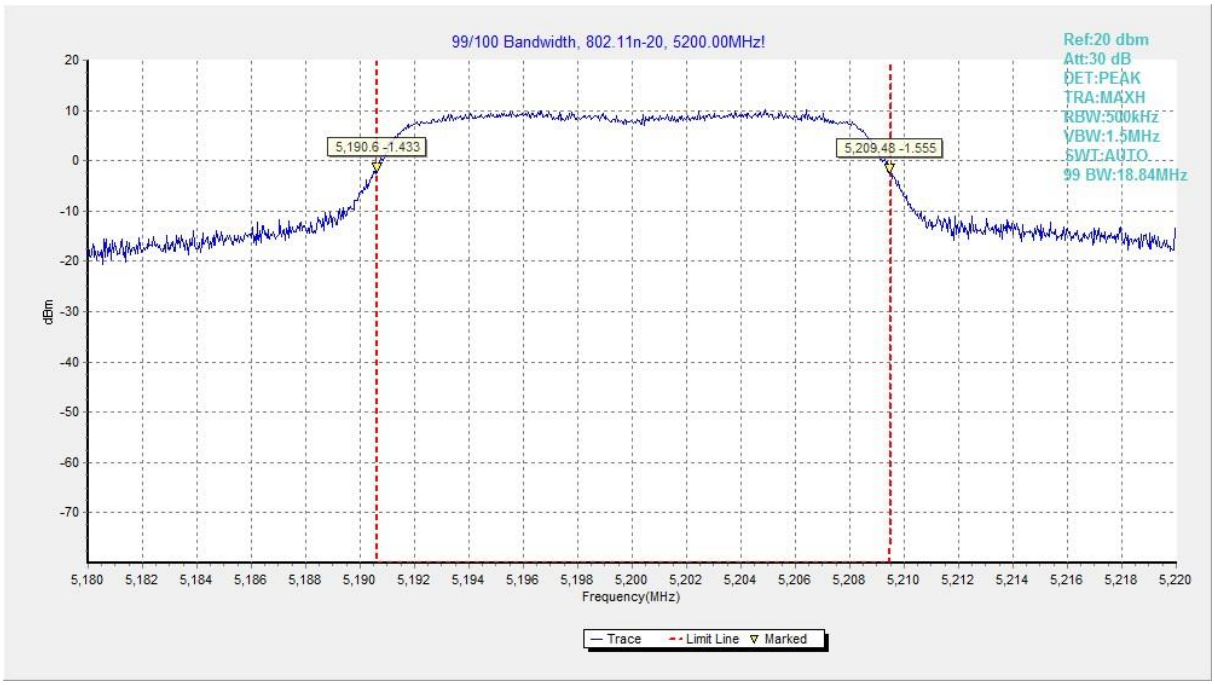



**Fig.22 99% Occupied bandwidth (802.11n-HT20, 5200MHz)**

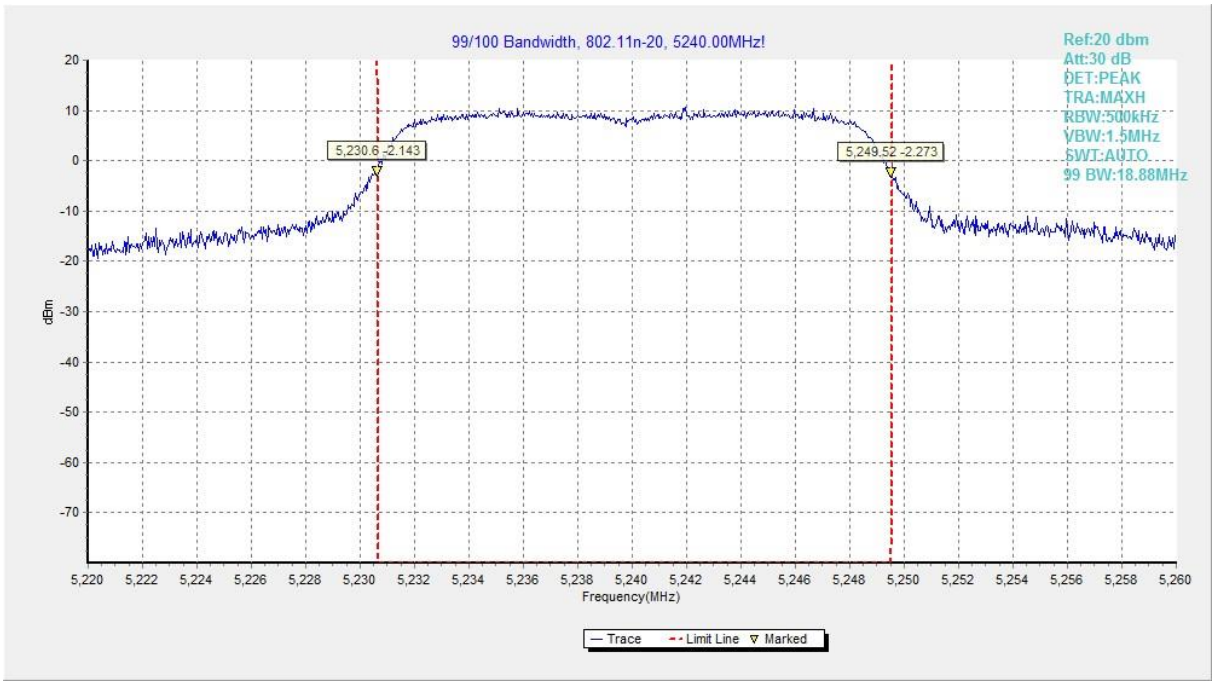



**Fig.23 99% Occupied bandwidth (802.11n-HT20, 5240MHz)**

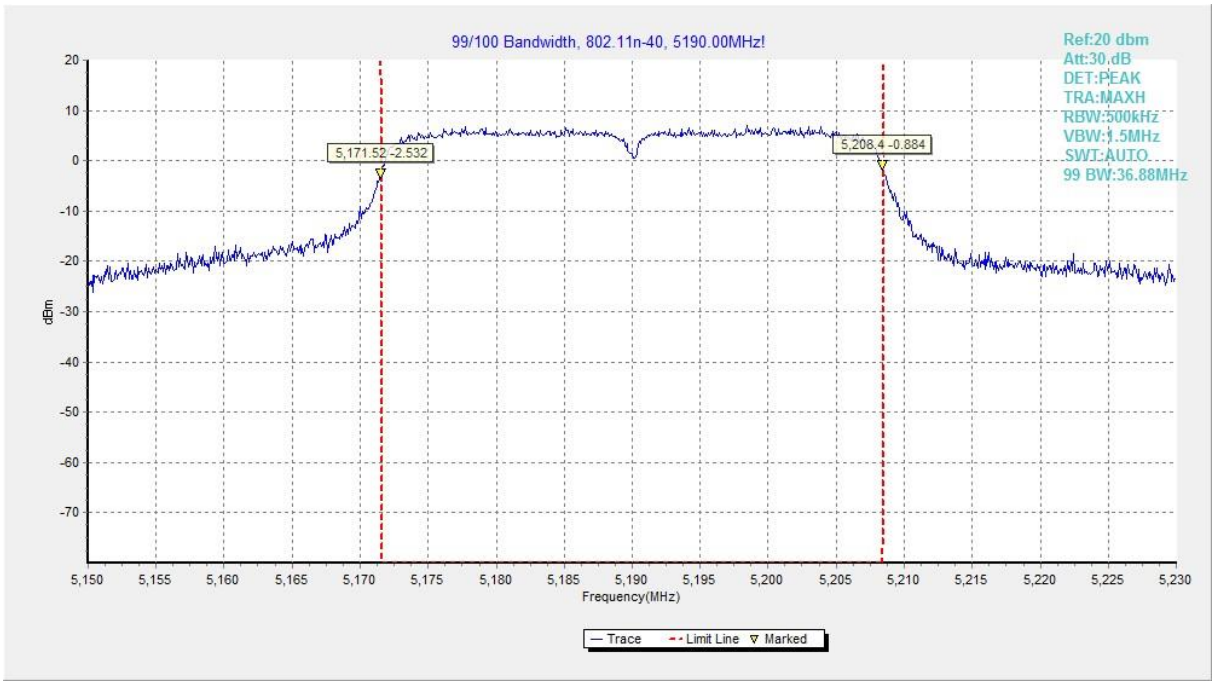



**Fig.24 99% Occupied bandwidth (802.11n-HT40, 5190MHz)**

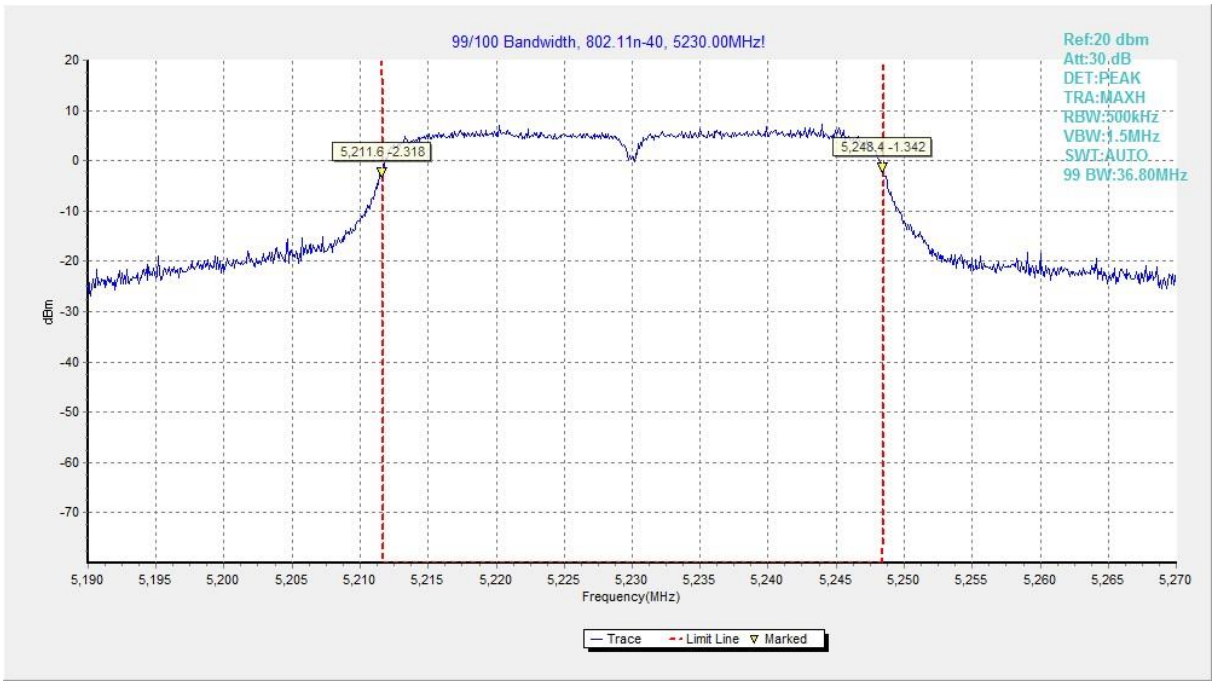



**Fig.25 99% Occupied bandwidth (802.11n-HT40, 5230MHz)**

## A.9. Frequency Stability

Manufacturers ensured the EUT meet the requirement of frequency stability, such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

**Measurement Result:**

| Mode | Channel | Test Condition | | Result(MHz) |
|---|---|---|---|---|
| 802.11n-20 | 5240MHz | Tnom | Vnom | 0.02 |
| | | Tmax | Vnom | |
| | | Tmin | Vnom | |
| | | Vmax | Tnom | |
| | | Vmin | Tnom | |

## A.10. Power control

A Transmission Power Control mechanism is not required for systems with an e.i.r.p. of less than 27dBm (500 mW).

## ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

**Certificate of Accreditation to ISO/IEC 17025:2005**

**NVLAP LAB CODE: 600118-0**

**Telecommunication Technology Labs, CAICT**
Beijing
China

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:*

**Electromagnetic Compatibility & Telecommunications**

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

2019-09-26 through 2020-09-30
*Effective Dates*

*For the National Voluntary Laboratory Accreditation Program*

***** END OF REPORT BODY *****